添　付　資　料　7

その他の資料・情報

7-1　ジェリコ最終処分場建設地地質調査報告書

Interpretive Ground Investigation Report

At

Jericho Solid Waste Landfill

Submitted to

NJS Consultants Co. LTD

On behalf of

JICA

Job No. SI-12-058
April 2012

Alquds Center for Civil and Environmental Engineering studies
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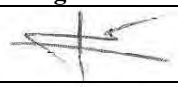
	Title, Company	Name	Signature	Date
Originator	**General Manager, Ziad Adi**	**Ziad Adi**		**28/04/2012**
Approved	**General Manager, Ziad Adi**	**Ziad Adi**		**28/04/2012**

Document Revision History:

01	28/04/2012	Z. Adi	-	-
Revision	Date	By	Section Amended	Details of Amendments

Messrs.: NJS Consultants Co. LTD

Subject: Site Investigation Report for Proposed Solid waste Landfill in Jericho.

Dear Sir,

It is of our pleasure to submit you this geotechnical report for the site mentioned above. This investigation was carried out according to your request.

This report includes the results of field investigation, laboratory results, and the required conclusions recommendations needed for design & construction of the most safe and economical foundation.

For any further information or clarifications, please don't hesitate to contact us.

Yours Sincerely,
General Manager
Eng. Ziad Adi

EXECUTIVE SUMMARY

Alquds Center for Civil and Environmental Engineering Studies (ACCEES) was commissioned by NJS Consultants Co. LTD to undertake a ground investigation at the site of the proposed Solid Waste Landfill in Jericho.

The purpose of the investigation was to provide geotechnical information on the subsoil to aid in the design of the wastewater treatment plant.

Six boreholes were sunk to a maximum depth of 10.0 meters below ground level (mbgl). Selected soil samples were submitted to our geotechnical laboratory for both geotechnical and contamination analysis.

Stratigraphic records from the boreholes indicate that at the location of the proposed building the ground is underlain by CLAYEY soil and WADI material.

The permeability of the existing soil ranges from $6*10^{-6}$ to $1*10^{-8}$. Thus, the natural existing soil could not be considered a natural barrier for the control of leachate draining into the groundwater. Thus, it is recommended to design a geotexile barrier for the control of leachate.

Groundwater was not encountered at any of the boreholes. However, according to information gathered from different sources, the site is underlain by an aquifer with a substantial source of groundwater.

Qualitative seismic analysis was undertaken using previous information about the site and using UBC code and the site was found not to inhibit any serious risk of seismic activity. The estimated ground peak acceleration that should be used is 0.20g.

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1.0 INTRODUCTION

This report includes the final results of the foundation ground inspection at the location of the proposed solid waste landfill in Jericho.

2.0 PURPOSE OF STUDY

The aim of this study is to determine the physical and mechanical properties of the subsurface soil to provide the structural engineer with information needed for safe and economical foundation design and construction. This report provides information relating to the allowable bearing capacity of the soil recommended as foundation ground, recommended foundation depth and type, expected elastic settlement of soil under foundations, safe side slope excavation, suitable backfill material, geotechnical consideration for earthquake design and other recommendations that would result in safe structure.

3.0 SCOPE OF WORK

The work undertaken consisted of the following:

1. Collecting general information such as site plan, geological maps, topographic maps and other information related to the site.
2. Undertaking site visits in order to collect information about site nature, topography of the site, geological features and other properties concerning the project site.
3. Drilling three boreholes and sampling of disturbed and undisturbed samples.
4. Carrying out necessary field and laboratory tests.
5. Performing classification and description of the sampled soil.
6. Analysis of field and laboratory tests results.
7. Developing comprehensive conclusions and recommendations for design and construction of the most safe and economical foundation system.

4.0 GEOTECHNICAL EXPLORATION & FIELD TESTING

4.1 Borehole Schedule

Table 1 shows the finished drilling program of the boreholes within the plot:

Table 1**: Finished Drilling Program of Boreholes**

Borehole No.	Depth	Date of drilling	Location	Elevation*
BH 1	10.00	09/04/2012	See Appendix A	**-322.88**
BH 2	10.00	09/04/2012		**-327.96**
BH 3	10.00	09/04/2012		**-319.60**
BH 4	10.00	09/04/2012		**-321.52**
BH 5	10.00	09/04/2012		**-321.70**
BH 6	10.00	09/04/2012		**-321.80**

* This level is at the level of the existing excavation.

4.2 Methods of Sampling

Samples were obtained continuously from the boreholes every half meter or when change in the sampled soil was detected. Down the hole hammer was used at layers of hard bands of rock or highly cemented soil were encountered.

The collected samples were placed in waterproof plastic bags to keep their moisture content, and then they were placed in proper sequence in wooden boxes. These samples were taken to our laboratory to be classified and described by our geological and geotechnical engineers.

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5.0 RESULTS OF LABORATORY TESTING

5.1 Laboratory Testing

After carrying out the geological description on the obtained samples, a laboratory tests program was issued. The program included all required tests on selected samples in order to determine the physical and mechanical properties of the encountered materials. The following tests were performed in accordance with **American Society for Testing and Materials** (**ASTM**) Standards listed below:

1. **ASTM D 2488-93**, "Description and Identification of Soils (Visual-Manual Procedure).

2. **ASTM D 2216-92**, "Laboratory Determination of Water (Moisture) Content of Soil, Rock and Soil Aggregate Mixtures"

3. **ASTM D 1586**; "Standard Test Method for Standard Penetration Test"

4. **ASTM D 3080**, "Standard Test Method for Direct Shear"

5. **ASTM D 6913**, "Standard Test method for Particle-size Distribution"

6. **ASTM D 2434**, "Standard test Method for Permeability"

7. ASTM D 4318, "Standard test Method for Liquid Limit, Plastic Limit, and Plasticity Index for Soil"

5.2 Laboratory Tests Results:

- **Visual Description:**

The ground is underlain by:

- CLAYEY SOIL
- WADI material

- **Moisture Content:**

- The moisture content of the CLAYEY soil ranges from 21.4% to 32.6%
- The moisture content of the WADI material ranges from 10.7% to 19.3%

- **Liquid Limit**
  - The Liquid Limit for the CLAYEY soil ranges from 32.2 to 43.3
  - The Liquid Limit for the WADI Material ranges from 35.7 to 44.9

- **Plastic Index**
  - The Plastic Index for the CLAYEY soil ranges from 10.4 to 17.4
  - The Plastic Index for the WADI material ranges from 9.7 to 15.2

- **Cohesion of soil**
  - The cohesion of the CLAYEY soil ranges from 38 KN/m^2 to 41 KN/m^2.
  - The cohesion of the WADI material ranges from 36 KN/m^2 to 39 KN/m^2.

- **Angle of friction**
  - The angle of friction of the soil ranges from 14^o to 16^o
  - The angle of friction of the WADI material ranges from 15^o to 17^o

- **The permeability**
  - Permeability of the CLAYEY soil ranges from 3 x 10^{-7} m/s to 1 x 10^{-8} m/s
  - Permeability of the WADI material ranges from 6 x 10^{-6} m/s to 3 x 10^{-7} m/s

6.0 Ground Water and Cavities

Groundwater was not encountered at any of the boreholes. No cavities were encountered in any of the boreholes.

7.0 CONCLUSIONS AND RECOMMENDATIONS FOR FOUNDATION SYSTEM.

According to field exploration, laboratory testing, subsurface conditions, and engineering analysis, it can be concluded that the existing ground at the site can support the expected building loads, provided that the following recommendations are strictly followed.

7.1 Foundation Ground, Depth & Type

Foundation Ground:

According to our findings and the encountered materials, the clayey soil and wadi material shall not be considered as a natural barrier for the control of leachate draining into groundwater. Thus, it is essential to design a geotexile barrier for the landfill.

7.2 Allowable Bearing Pressure

The allowable bearing capacity for the MARL is calculated using Terzaghi;s equation. y applying a factor of safety (F) to the unconfined compression strength of the intact samples as expressed:

$$q_{ult} = 1.3N_c c + qN_q + 0.4B\gamma N_\gamma$$

$$q_{net} = q_{ult} - q$$

$$q_{all} = q_{net}/FS$$

Where:
q_{utl} = Ultimate bearing Capacity;
q_{net} = Net bearing Capacity ;
q_{all} = Allowable bearing Capacity
FS = Factor of Safety.
c = cohesion of soil =
$q = \gamma D_f =$
γ = unit weight of soil
D_f = Depth of bottom of footing from ground level
B = width of footing
N_c, N_q, N_γ = bearing Capacity factors

Table 2: Bearing Capacity of soil

Soil Type	BH #	c	ϕ	q_{ult} (KN/m^2)	q_{net} (KN/m^2)	FS	q_{all} (Kg/cm^2)
Clayey soil	1	41	14	855	807	4	2.06
	2	41	14	855	807	4	2.06
	3	39	15	885	837	4	2.13
	4	40	14	839	791	4	2.02
	5	38	16	935	887	4	2.26
	6	39	15	885	837	4	2.13
Wadi Material	1	39	15	900	849	4	2.16
	2	36	17	991	940	4	2.40
	3	36	17	991	940	4	2.40
	4	38	15	883	832	4	2.12
	5	37	16	934	883	4	2.25
	6	39	15	900	849	4	2.16

7.3 Settlement Determination

In general the settlement of any foundation can be divided into two major categories:

a) Elastic or Immediate Settlement: which takes place during or immediately after the construction of the structure.
b) Consolidation Settlement: this occurs over time.

The elastic settlement of a footing after application of load can be computed from the theory of elasticity equation:

$$\Delta H = q.B\frac{(1-\mu^2)}{E_S}I_W$$

Where:
ΔH = settlement;
q = intensity of contact pressure in units of Es;
B = least lateral dimension of footing in units of ΔH;
Iw = influence factor, Table (5);
Es, μ = elastic properties of rock, (Poisson's ratio m is assumed; (0.15-0.25).

7.4 Modulus of Elasticity Determination

The modulus of elasticity for the CLAYEY soil is 780 Kg/cm^2.

The modulus of elasticity for the WADI material is 785 Kg/cm^2.

The modulus of elasticity for the basecoarse material is 875 Kg/cm^2.

7.5 Modulus of Sub grade Reaction Ks

The modulus of sub grade Reaction Ks for the CLAYEY soil is 390 Kg/cm^3.

The modulus of sub grade Reaction Ks for the CLAYEY soil is 392 Kg/cm^3.

The modulus of sub grade Reaction Ks for the CLAYEY soil is 392 Kg/cm^3.

7.6 Excavation Methods:

It is expected that the excavation will be through CLAYEY soil and WADI material. Therefore, machine mounted jack hammers with compression and rock breakers in

addition to the conventional excavation equipment such as loaders and dozers will be needed for the excavation works.

7.7 Surface & Subsurface Drainage:

It is recommended to protect the foundation ground and excavation from surface water both during and after construction by providing proper drainage and protection system. Surface water, if existed, should be diverted away from the edges of the excavations. The side walk should be extended beyond the building line for a distance of at least 2.5 meters in every direction. A slope of 1.5 cm in 100 cm is suggested to allow proper drainage.
However, the slab on grade and the foundation system shall be isolated using a proper isolation material. This material shall be selected by the supervisor engineer according to the required specifications.

7.8 Material for Backfilling Purposes:

CLAYEY soil and WADI material excavated is not suitable for backfilling material.

1) The materials to be used for backfilling purposes shall be a soil or soil-rock mixture which is free from organic matter or other deleterious substances. It shall not contain rocks or lumps over 15 cm in greatest dimension, and not more than 15 percent larger than 7 cm. The Liquid limit and plasticity index for the backfill material shall not be more than 35 % and 10 %, respectively.
2) Selected backfill material should not contain more than 25% of fine materials pass sieve #200 (particle size =0.075 mm).
3) It shall be spread in lifts not exceeding 25 cm in uncompacted thickness, moisture conditioned to its optimum moisture content, and compacted to a dry density not less than 95 percent of the maximum dry density as obtained by standard proctor compaction test **(ASTM D 698).**
4) Foundation must be safe against overturning, rotation, sliding or soil rupture; especially for retaining walls. The following parameters for wall design are suggested:

- Height of fill to be retained by the wall (1-3.0 m).

- If surcharge loads are available, take it in consideration.

- Weight of earth (γ) =1.80 ton/cu.m, fill is level (fill is non expansive soil-selected engineering fill).

- Angle of internal friction (ϕ) = 30 degrees and cohesion (c) = 0.5 Kg/Sq.cm. (For more safety)

- Angle of friction between soil and base slab (δ) = 22 deg.

7.9 Earth Pressure

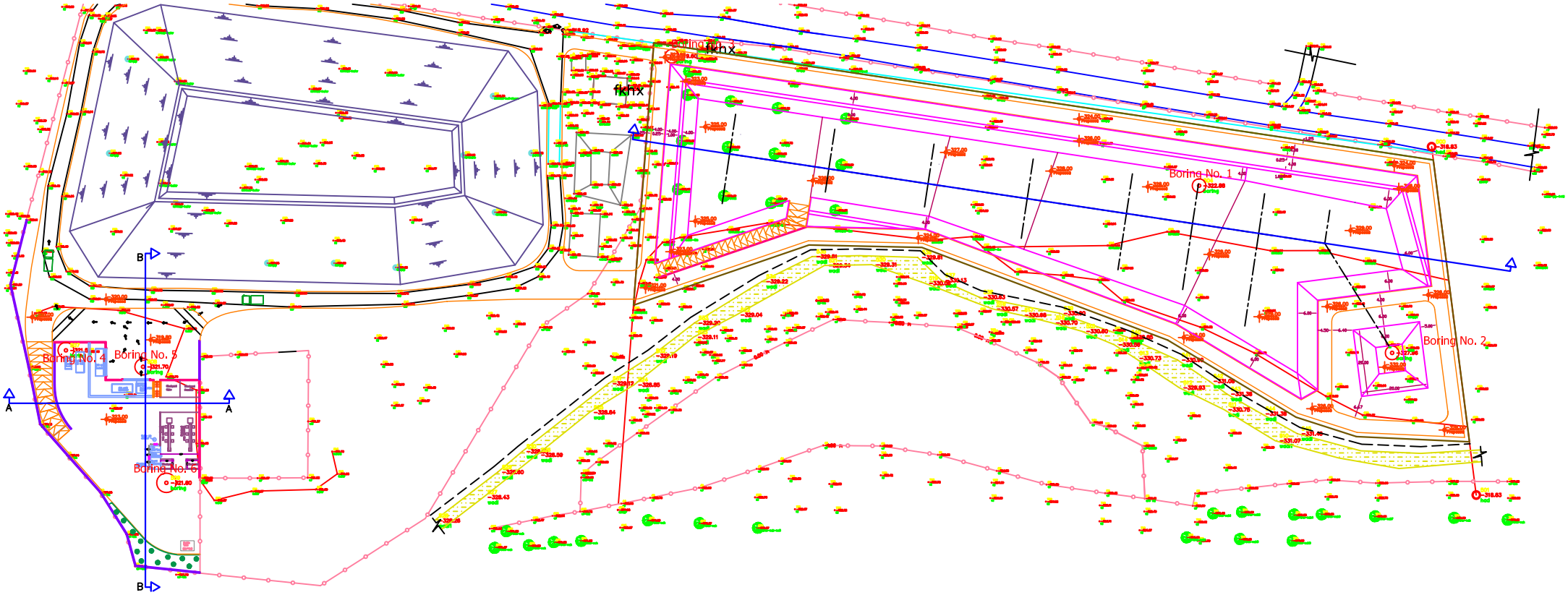
The underground basement walls of the building, if any, shall be designed for an equivalent fluid pressure of 0.8 gm/cm^3 (800 kg/m^3) plus a uniform lateral pressure which corresponds to the maximum expected surface loads.

7.10 Site Seismicity:

- Peak Ground Acceleration: PGA = 0.3g
- Soil Profile = S_E
- C_a = 0.36
- C_v = 0.84

Appendices

Appendix A – Site Plan and Location of Boreholes


Boring No. 1
Boring No. 2
Boring No. 3
Boring No. 4
Boring No. 5
Boring No. 6
A
A
B
B

Appendix B – Borehole Log

AL-QUDS CENTER for CIVIL & ENVIRONMENTAL ENGINEERING STUDIES	BORHEHOLE No. 1	Ground Level	-322.88
START DATE: 09/04/2012 END DATE: 09/04/2012	BORHEHOLE Diameter: 79 mm		

Drilling Method: Down the Hole Hammer for Disturbed Samples

DATE	DEPTH (m)	SPT				Strata		Depth (m)	Level (Relative)	Moisture Content %	Unit Weight KN/m3	LL	PL	PI	c KN/m2	ϕ	Soil Classification		Permeability m/s
		15	15	15	N	LITHOLOGY	Description of Strata										AASHTO	USCS	
09/04/2012	0.00	7	15	18	33	CLAY	Brownish CLAYEY soil with organic material	-0.00	-322.88	32.6	14.1	32.2	18.6	13.6	41	14	A-6	OL	3*10-7
	1.00					WADI Material	WADI material	-0.60	-323.48	19.3	17.7	41.8	32.1	9.7	38	16	A-5	OL	6*10-6
	2.00																		
	3.00																		
	4.00																		
	5.00							-5.5	-328.38										
	6.00	8	17	18	35	CLAY	Dark grayish CLAYEY soil			22.4	16.5	35.9	20.7	15.2	40	15	A-6	CL	4*10-8
	7.00	7	12	17	29														
	8.00	8	12	19	31														
	9.00	8	14	18	32			-10.0	-332.88										

Notes:

SPT = Standard Penetration Test

LL = Liquid Limit

PL = Plastic Limit

PI = Plastic Index

c = cohesion of Soil

ϕ = Friction angle of soil

Logged By: AIA

Compiled By: AIA

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Jericho Solid Waste Landfill			

AL-QUDS CENTER for CIVIL & ENVIRONMENTAL ENGINEERING STUDIES	BORHEHOLE No. 2	Ground Level	-327.96
START DATE: 09/04/2012 END DATE: 09/04/2012	BORHEHOLE Diameter: 79 mm		

Drilling Method: Down the Hole Hammer for Disturbed Samples

DATE	DEPTH (m)	SPT				Strata		Depth (m)	Level (Relative)	Moisture Content %	Unit Weight KN/m3	LL	PL	PI	c KN/m2	ϕ	Soil Classification		Permeability m/s
		15	15	15	N	LITHOLOGY	Description of Strata										AASHTO	USCS	
09/04/2012	0.00					WADI Material	WADI material	-0.00	-327.96	15.4	16.9	35.7	25.3	10.4	39	15	A-6	CL	3*10-6
	1.00	6	14	19	33	CLAY	Grayish CLAYEY soil	-1.00	-328.96	25.7	15.9	35.7	20.5	15.2	38	15	A-6	OL	1*10-8
	2.00	7	17	17	34														
	3.00	8	15	16	31														
	4.00	7	14	15	29														
	5.00	6	16	16	32														
	6.00	8	13	18	31														
	7.00	7	11	17	28	CLAY	Dark grayish CLAYEY soil	-7.00	-334.96	23.1	16.2	43.3	25.9	17.4	40	14	A-7	CL	2*10-8
	8.00	6	11	19	30														
	9.00	8	14	18	32			-10.0	-337.96										

Notes:

SPT = Standard Penetration Test

LL = Liquid Limit

PL = Plastic Limit

PI = Plastic Index

c = cohesion of Soil

ϕ = Friction angle of soil

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Checked By: ZA

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AL-QUDS CENTER for CIVIL & ENVIRONMENTAL ENGINEERING STUDIES	BORHEHOLE No. 3	Ground Level	-319.60
START DATE: 09/04/2012 END DATE: 09/04/2012	BORHEHOLE Diameter: 79 mm		

Drilling Method: Down the Hole Hammer for Disturbed Samples

DATE	DEPTH (m)	SPT				Strata		Depth (m)	Level (Relative)	Moisture Content %	Unit Weight KN/m3	LL	PL	PI	c KN/m2	ϕ	Soil Classification		Permeability m/s
		15	15	15	N	LITHOLOGY	Description of Strata										AASHTO	USCS	
09/04/2012	0.00	8	15	16	31	CLAY	Creamy stiff CLAYEY soil	-0.00	-319.60	22.1	16.1	42.6	32.6	10.0	38	15	A-5	CL	2*10-7
	1.00	5	11	18	29														
	2.00	7	14	17	31														
	3.00	7	16	16	32	CLAY	Grayish CLAYEY soil	-2.50	-322.10	25.6	15.8	37.2	24.6	12.6	41	14	A-6	CL	4*10-8
	4.00	6	16	18	34														
	5.00	7	15	15	30	CLAY	Creamy stiff CLAYEY soil	-5.00	-324.60	23.9	16.0	33.5	22.3	11.2	39	15	A-6	CL	5*10-8
	6.00	8	17	18	35														
	7.00	6	13	16	29														
	8.00	7	14	18	32	CLAY	Dark grayish CLAYEY soil	-8.00	-327.60	24.6	16.1	34.8	17.4	17.4	40	14	A-6	CL	3*10-7
	9.00	8	14	16	30			-10.0	-329.60										

Notes:

SPT = Standard Penetration Test

LL = Liquid Limit

PL = Plastic Limit

PI = Plastic Index

c = cohesion of Soil

ϕ = Friction angle of soil

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AL-QUDS CENTER for CIVIL & ENVIRONMENTAL ENGINEERING STUDIES	BORHEHOLE No. 4	Ground Level	-321.52
START DATE: 09/04/2012 END DATE: 09/04/2012	BORHEHOLE Diameter: 79 mm		

Drilling Method: Down the Hole Hammer for Disturbed Samples

DATE	DEPTH (m)	SPT				Strata		Depth (m)	Level (Relative)	Moisture Content %	Unit Weight KN/m3	LL	PL	PI	c KN/m2	ϕ	Soil Classification		Permeability m/s
		15	15	15	N	LITHOLOGY	Description of Strata										AASHTO	USCS	
09/04/2012	0.00	7	14	17	31	CLAY	Brownish CLAYEY soil with organic material	-0.0	-321.52	23.4	16.2	40.6	26.5	14.1	41	15	A-7	OL	4*10-8
	1.00																		
	2.00					WADI Material	WADI material	-1.50	-323.02	12.1	17.5	38.9	27.3	11.6	39	16	A-6	CL	3*10-7
	3.00																		
	4.00																		
	5.00							-5.5	-327.02										
	6.00	8	13	18	31	CLAY	Dark grayish CLAYEY soil			22.4	16.4	39.7	23.0	16.7	40	14	A-6	CL	5*10-8
	7.00	7	12	16	28														
	8.00	8	17	17	34														
	9.00	8	13	19	32			-10.0	-331.52										

Notes:

SPT = Standard Penetration Test

LL = Liquid Limit

PL = Plastic Limit

PI = Plastic Index

c = cohesion of Soil

ϕ = Friction angle of soil

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AL-QUDS CENTER for CIVIL & ENVIRONMENTAL ENGINEERING STUDIES	BORHEHOLE No. 5	Ground Level	-321.70
START DATE: 09/04/2012 END DATE: 09/04/2012	BORHEHOLE Diameter: 79 mm		

Drilling Method: Down the Hole Hammer for Disturbed Samples

DATE	DEPTH (m)	SPT				Strata		Depth (m)	Level (Relative)	Moisture Content %	Unit Weight KN/m3	LL	PL	PI	c KN/m2	ϕ	Soil Classification		Permeability m/s
		15	15	15	N	LITHOLOGY	Description of Strata										AASHTO	USCS	
09/04/2012	0.00	7	15	14	29	CLAY	Creamy stiff CLAYEY soil	-0.0	-321.70	23.5	12.6	37.1	24.5	12.6	41	14	A-6	CL	1*10-8
	1.00					WADI Material	WADI material	-1.50	-323.20	13.4	17.5	44.9	27.7	17.2	41	14	A-7	CL	6*10-6
	2.00																		
	3.00																		
	4.00																		
	5.00							-5.5	-327.20										
	6.00	6	13	15	28	CLAY	Dark grayish CLAYEY soil			21.4	16.7	42.1	30.6	11.5	41	14	A-7	CL	3*10-7
	7.00	8	16	17	33														
	8.00	8	14	19	33														
	9.00	7	15	17	32			-10.0	-331.70										

Notes:

SPT = Standard Penetration Test

LL = Liquid Limit

PL = Plastic Limit

PI = Plastic Index

c = cohesion of Soil

ϕ = Friction angle of soil

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Checked By: ZA

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AL-QUDS CENTER for CIVIL & ENVIRONMENTAL ENGINEERING STUDIES	BORHEHOLE No. 6	Ground Level	-321.80
START DATE: 09/04/2012 END DATE: 09/04/2012	BORHEHOLE Diameter: 79 mm		

Drilling Method: Down the Hole Hammer for Disturbed Samples

DATE	DEPTH (m)	SPT				Strata		Depth (m)	Level (Relative)	Moisture Content %	Unit Weight KN/m3	LL	PL	PI	c KN/m2	ϕ	Soil Classification		Permeability m/s
		15	15	15	N	LITHOLOGY	Description of Strata										AASHTO	USCS	
09/04/2012	0.00	6	15	16	31	CLAY	Creamy stiff CLAYEY soil	-0.0	-321.80	23.6	16.4	35.6	25.6	10.0	40	15	A-4	CL	4*10-8
	1.00																		
	2.00					WADI Material	WADI material	-1.50	-323.30	17.2	16.4	37.2	24.8	12.4	39	15	A-6	CL	1*10-6
	3.00																		
	4.00																		
	5.00							-5.5	-327.30										
	6.00	7	17	17	34	CLAY	Dark grayish CLAYEY soil			21.5	16.7	43.3	31.8	11.5	38	16	A-7	CL	3*10-7
	7.00	8	14	18	32														
	8.00	8	12	18	30														
	9.00	8	16	17	33			-10.0	-331.80										

Notes:

SPT = Standard Penetration Test

LL = Liquid Limit

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PI = Plastic Index

c = cohesion of Soil

ϕ = Friction angle of soil

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7-2　環境社会配慮調査報告書（中継基地建設計画用）








NJS CONSULTANTS CO., LTD.

PREPARATORY SURVEY FOR CAPACITY ENHANCEMENT ON SOLID WASTE MANAGEMENT IN THE WEST BANK IN PALESTINE

Survey on Environmental and Social Considerations for Four Proposed Solid Waste Transfer Stations at Tubas, Jericho, Qalqiliya, and Salfit

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Nablus, Palestine
February, 2012

Table of Contents

List of Abbreviations

EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EQA	Environment Quality Authority
GESC	Guidelines for Environmental and Social Considerations
HPC	Higher Planning Council
IEE	Initial Environmental Evaluation
JICA	Japan International Cooperation Agency
JSC	Joint Service Council
LGU	Local Government Unit
MoA	Ministry of Agriculture
MoH	Ministry of Health
MoL	Ministry of Labor
MoT	Ministry of Transportation
MoTA	Ministry of Tourism and Antiquities
MoLG	Ministry of Local Government
MoNE	Ministry of National Economy
NSSWM	National Strategy for Solid Waste Management
PA	Palestinian Authority
PCBS	Palestinian Central Bureau of Statistics
PEL	Palestinian Environmental Law
PEAP	Palestinian Environmental Assessment Policy
PGA	Peak Ground Acceleration (factor Z)
PLA	Palestinian Land Authority
SW	Solid Waste
SWM	Solid Waste Management
SWTS	Solid Waste Transfer Stations
TOR	Terms of Reference
UBC	Uniform Building Code
UG	Universal Group for Engineering and Consulting
VECs	Valued environmental components

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1. INTRODUCTION

Solid Waste Management (SWM) is a complex process because it involves many technologies and disciplines. These include the control of generation, handling, storage, collection, transfer, transportation, processing, and disposal of solid wastes. Therefore, these processes have to be carried out within existing legal and social guidelines that protect the public health and the environment and are aesthetically and economically acceptable.

Collection and transportation of solid waste in the Palestinian cities is relatively acceptable, but disposal is not adequate since the most common method of the disposal are dumping and/or burning in open areas. The inadequate number and distribution of collection containers and irregular collection schedule have encouraged the accumulation of solid waste in streets; therefore, it is important to look for new collection sites and to construct transfer stations.

Due to these challenges that are facing the solid waste sector in Palestine and its major negative impacts on the water resources in particular and on the environment in general, and the implications this has on the public health of the Palestinian citizens, in addition to the tremendous economic and social acts the Palestinian community bears, the National Strategy for Solid Waste Management (NSSWM) 2010-2014, has stated policies and measures to improve the SW sector. Policy (4) of the strategic objective three of the NSSWM reads: "Developing the current management systems for SW and transport, in order to improve the quality and effectiveness of services and its availability to all citizens". Policy (5) of the same objective reads: "Safe and efficient disposal of SW in regional sanitary landfills servicing all communities".

Zahart Al-Finjan sanitary landfill has been put in operation in 2007 and is currently receiving solid wastes from most of the northern West Bank cities. Al-Minya sanitary landfill is to serve Hebron and Bethlehem governorates and is under construction. A third sanitary landfill to serve the middle areas of the West Bank has passed the planning and

feasibility phases. In Jericho, the sanitary landfill is overloaded and requires expanding and/or replacing.

Among others, four Solid Waste Transfer Stations (SWTS) are proposed as to enhance the capacity on solid waste management in the West Bank. These are located in Tubas, Jericho, Qalqilya and Salfit governorates. Universal Group (UG) has been contracted by NGS to conduct survey on environmental and social considerations for these proposed four sites. The survey is to cover the current state on environmental and social conditions of the areas and the laws and regulations relating environmental and social consideration. It is also to scoping works and estimation of environmental and social impacts addressing mitigation measures against these impacts.

2. LAWS AND REGULATIONS RELATING ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

2.1 EIA System and Administrations

2.1.1 The Palestinian Environmental Law

The Palestinian environmental legal and administrative framework has taken major strides towards protecting environmental resources and institutionalizing their sustainable management. The Palestinian Environmental Law (PEL) No. 7 of 1999 is comprehensive, covering the main issues relevant to environmental protection and law enforcement. Among the objectives of the PEL are:

- Protecting the environment from all sorts and types of pollution
- Protecting public health and social welfare
- Incorporating environmental resources protection in all social and economic development plans and promote sustainable development to protect the rights of future generations;
- Conserving ecologically sensitive areas, protecting biodiversity, and rehabilitating environmentally damaged areas;
- Setting inter-ministerial cooperation regulations and standards various environmental protection areas and jurisdictions;
- Promoting environmental information collection and publication, public awareness, education and training.

The PEL addresses various environmental issues including:

- Management and protection of various resources. Issues covered are related to land environment, air environment, water resources and aquatic environment, and natural, archeological, and historical heritage protection.
- Environmental Impact Assessment (EIA) and auditing, permitting of development projects, monitoring of environmental resources and their parameters.
- Penalties to be applied in case of violation of any article presented under the law.

- Other issues addressed by the legislation include emergency preparedness, public participation, research training and public education.

The PEL has stated in article 45, "The Ministry (Nowadays, the Environment Quality Authority (EQA)), in coordination with the competent agencies, shall set standards to determine which projects and fields shall be subject to the environmental impact assessment studies. It shall also prepare lists of these projects and set the rules and procedures of the environmental impact assessment".

Article 47 of the PEL states that: "The Ministry (EQA), in coordination with the competent agencies, shall determine the activities and projects that have to obtain an environmental approval before being licensed. This includes the projects that are allowed to be established in the restricted areas".

2.1.2 Palestinian Environmental Assessment Policy

The Palestinian Ministerial Council approves the Palestinian Environmental Assessment Policy (PEAP), through resolution No: 27-23/4/2000. This Policy shall be interpreted and implemented to support the sustainable economic and social development of the Palestinian people through assisting in meeting the following goals:

1. Ensuring an adequate standard of life in all its aspects, and not negatively affecting the basic needs, and the social, cultural and historical values of people as a result of development activities.
2. Preserving the capacity of the natural environment to clean and sustain it.
3. Conserving biodiversity, landscapes and the sustainable use of natural resources.
4. Avoiding irreversible environmental damage, and minimizing reversible environmental damage, from development activities.

For the purpose of considering Environmental Approval of projects, the Policy has identified two main types of Environmental Assessment (EA) studies that may be required, which are as follows:

a) An Initial Environmental Evaluation (IEE) for projects where significant environmental impacts are uncertain, or where compliance with environmental regulations must be ensured.
b) An Environmental Impact Assessment (EIA) for projects which are likely to have significant environmental impacts. An EIA may be carried out as a result of an IEE.

The PEAP has listed proposed projects for which an EIA must be conducted. The proposed projects are as follows:

1. Power plants (including gas turbines, substations and super tension lines)
2. Quarries and mines
3. Waste water treatment plants including main sewers
4. Cement plants
5. Solid waste disposal sites
6. Hazardous waste disposal sites
7. Plants producing, storing or using hazardous substances
8. Airports and landing strips
9. Seaports, jetties and harbors
10. Refineries
11. Industrial estates
12. Major dams and reservoirs
13. Major roads
14. Steel mills

For projects which are not listed in the above-mentioned list, a determination of whether or not an IEE or EIA must be conducted will be based on screening criteria. The criterion will be based on whether the project is likely to:

1. Use a natural resource in a way that pre-empts other uses of that resource
2. Displace people or communities
3. Be located in or near environmentally sensitive areas such as natural reserves, wetlands, or registered archaeological and cultural sites

4. Generate unacceptable levels of environmental impact
5. Create a state of public concern, or
6. Require further related development activities that may cause significant environmental impacts

2.1.3 Environmental Assessment Administrative procedures

The administrate procedure for obtaining Environmental Approval (EA) for a project is listed in Annex A along with a flowchart of the steps and estimated time. The PEAP has stated the following steps for obtaining an EA for a proposed project:

1) Application for Environmental Approval:

The project proponent must first obtain initial approval from the appropriate Ministry or Local Planning Committee. The proponent then submits an Application for Environmental Approval to the EQA. The EQA will notify the appropriate permitting authorities that an Application for Environmental Approval has been received and that an EIA is required.

The Application for Environmental Approval is the project document informing the relevant permitting authorities and the EQA that a project is being considered which may be subject to the EA Policy. It is the document used by the EQA to screen a project for its disposition under the EA Policy, and to consider permitting conditions.

The application for Environmental Approval should also list what environmental and other permits must be obtained and complied with, indicate how the expected conditions of these permits will be fulfilled, and include a signed statement by the proponent that these conditions will be fulfilled.

2) The Initial Environmental Evaluation (IEE) Report:

The Initial Environmental Evaluation (IEE) Report documents the results of a general, reconnaissance-level evaluation of the likely environmental impacts of a proposed project, based largely on existing information. An IEE should be prepared during pre-feasibility

studies of a project. Its main purpose is to identify likely impacts, to estimate their severity, to indicate which impacts may be significant, and to indicate what opportunities are available to mitigate adverse environmental impacts and enhance potential environmental benefits. As appropriate, an IEE should include proposals for monitoring and managing likely impacts, especially those which affect local people.

Terms-of-reference (TOR) for an IEE are prepared by the EQA on the advice of the EA Committee and in consultation with the proponent, if required. The EQA may require the proponent to carry out scoping studies as part of TOR preparation. Scoping for this purpose means the process of establishing the range of action alternatives and potential impacts to be included in terms of reference for environmental assessment studies.

The proponent submits a draft IEE Report to the EQA which conducts an initial, internal review to determine if the report contains the minimum requirements specified in TOR. Once the EQA is satisfied that the minimum requirements have been met, the proponent finalizes the IEE Report and the EQA accepts it for review. The EQA then conducts a detailed technical review of the Report with the assistance of the EA Committee.

The IEE Report is used as a basis for granting Environmental Approval, or for requiring either project changes or a revised IEE Report or a request for an EIA Report before Environmental Approval is granted.

3) The Environmental Impact Assessment (EIA) Report

The EIA Report documents the results of a comprehensive environmental impact assessment of a project, based on TOR approved by the EQA. It is broader in scope and contains more detailed analysis than an IEE. An EIA involves sufficient surveys and fieldwork to adequately study and analyze the issues to be addressed. It should be undertaken during pre-feasibility and/or detailed feasibility studies of a project, and in close cooperation with engineering, financial and other project planning works.

The EIA describes the environmental planning that went into a project and what features are incorporated to mitigate adverse impacts and capture potential benefits. It includes an

analysis of the severity and significance of impacts and benefits, especially for individuals and communities directly affected by the project. The EIA is also to define the environmental impacts of the project and the measures to mitigate the adverse impacts or capture potential environmental benefits. It also provides an environmental monitoring and management plan.

Terms-of-reference (TOR) for an EIA are prepared by the EQA on the advice of the EA Committee and in consultation with the proponent, if required. The EQA may require the proponent to carry out scoping studies as part of TOR preparation.

The EIA Report is used as a basis for determining whether or not Environmental Approval is granted and, if so, under what conditions.

The proponent submits a draft EIA Report to the EQA which conducts an initial, internal review to determine if the report contains the minimum requirements specified in TOR. Once the EQA is satisfied that the minimum requirements have been met, the proponent finalizes the EIA Report and the EQA accepts it for review. The EQA then conducts a detailed technical review of the Report with the assistance of the EA Committee.

When the EQA review is complete, the EQA must attest that the EIA Report has been satisfactory carried out and:

i. Grant Environmental Approval with, if necessary, conditions to be included in subsequent permits, or
ii. Withheld Environmental Approval since the project has unacceptable environmental impact.

2.1.4 Environmental Assessment for non listed projects

The proponent submits the Application for Environmental Approval to the competent permitting authorities as part of his overall application package for initial approval. These authorities then refer the project to the EQA. The EQA may ask the proponent for further information to ensure the Application is sufficient for consideration under the EA Policy.

Based on the application for Environmental Approval, screening criteria are used to determine whether an IEE or an EIA is required for a project.

If an IEE Report or EIA Report is not required, the EQA will determine, in coordination with the relevant permitting authorities or the EA Committee as required, whether or not Environmental Approval will be granted and, if so, under what conditions.

Once the EQA considers that an Application for Environmental Approval is complete, it has a maximum of 14 business days to determine the need for an IEE or an EIA, or to determine whether Environmental Approval will be granted based on the Application alone. If this deadline is not met, the proponent has the right to submit a written complaint to the Head of the EQA, who must respond in writing within a week from receipt of the complaint.

2.1.5 Environmental Approval

Without limiting its content, an Environmental Approval may specify:

- Required measures to mitigate adverse environmental impacts or capture potential environmental benefits, including a compliance schedule
- Measures that the proponent must implement in order to comply with relevant standards and requirements
- Monitoring and reporting duties of the proponent

The proponent of the project shall express the commitment to the standards and requirements for the protection of the environment and to apply all the required mitigation measures addressed in the EIA. He shall express the legal commitment towards the EIA.

2.2 Laws and Regulations relating to Resettlement, Land Expropriation and Involuntary Resettlement

The Jordanian Expropriation Law No. 2 for 1953 which is applied in the West Bank/Palestine covers the process of expropriating private lands for public use and the compensation should be paid.

Annex B presents the administrative procedure for land acquisition and expropriation in steps and as flowchart. The estimated duration for each step is also presented. The process of expropriating private lands for public use is defined as follows:

1) The project proponent has to publish an announcement in the official newspapers (Gazette) for 15 days; declaring his willingness to request a resolution from the Cabinet in order to expropriate a private land, defined in the announcement, for public use.
2) After the expiry of the announcement, the project proponent has to submit an application to the Cabinet attached with a map for the land he is willing to expropriate, and a proof of his financial capacity that he is capable to implement the project.
3) When the Cabinet makes sure of the proponent's financial capacity and the public benefits of the project; the Cabinet has the right to decide:

    - The absolute expropriation of the land.
    - Dispossession of the land for a limited period of time.
    - Dispossession of any easement right, or any other rights related to the land.

4) The Cabinet's resolution should be approved by the President of Palestine, and then published in the official Gazette.
5) The Proponent, then, has to inform the Land Registrar in the area where the land exists, who subsequently informs the owners with the Cabinet Resolution.
6) After informing the land owner of the resolution, the project proponent has to negotiate the expropriation, disposition or the limited use of the land with the land owner or with anyone has a right in it.

7) If the project proponent and the land owner didn't agree upon the amount of the compensation, any of them can submit a request to the court to estimate the compensation.
8) After paying the compensation to the land owner or to the court, the Land Registrar then registers the land under the name of the proponent.

The abovementioned process applies for lands in zones A, B and C as to Oslo agreement classification. However, in zone C, approval from the Israeli side must be obtained before the expropriation.

2.3 Laws and Regulations relating to Community Participation to Project Formulation

The Palestinian Environmental Policy has referred to the stakeholder (any person in his natural or legal capacity with an interest in or affected by a development activity) consultation in two stages:

1) The Initial Environmental Evaluation (IEE) Report; where the policy stated that the stakeholder consultation is optional when undertaking an IEE. In consultation with the proponent and the EA Committee as required, the EQA determines whether stakeholder consultation is required and, if so, what the minimum requirements should be. It may be required during scoping and terms-of-reference preparation, and during the conduct of the IEE.
2) The Environmental Impact Assessment (EIA) Report; where the policy stated that the stakeholder consultation is mandatory when undertaking an EIA. In consultation with the proponent and the EA Committee, the EQA determines what the minimum requirements for stakeholder consultation should be. It may be required during scoping and terms-of-reference preparation, and during the conduct of the EIA. At the minimum, the proponent must meet with the principal stakeholders to inform them about the proposed project and to solicit their views about it. More problematic projects should involve more extensive consultations. The methods and results of these consultations must be documented in the EIA Report.

2.4 Laws and Regulations relating to Information Disclosure

As part of the expropriation process that is defined in the Jordanian Expropriation Law No 2 for 1953, the project proponent has to publish an announcement in the official Gazette for 15 days; declaring his willingness to request a resolution from the Cabinet in order to expropriate a private land, defined in the announcement, for public use.

2.5 Laws and Regulations relating to Preservation of Cultural or Historical Assets

2.5.1 Jordanian Antique Law No 51 for 1966

The Jordanian Antique Law No 51 for 1966 which is applied in Palestine / West Bank has considered the antiques as states' assets. The Ministry of Antiques is responsible for managing and supervision of the antiques and it is its duty to publish a report in the official gazette with the names of antique places and to add on it from time to time.

The Law has prohibited doing anything in the antique places without permission from the minister. It also has obliged anyone who finds antique places to record the place to the government within three days.

In spite of the crucial need, legislations and laws concerning the conservation of cultural and traditional heritage in Palestine are still immature; however there are some initiatives that contribute to the design of by-laws and regulations that underwent many debates on several levels but have not got the legitimate status yet.

2.5.2 Law of Antiquities No. 51 for the year 1966

The law of antiquities deals with the movable and immovable antiquities which are deemed part of the cultural heritage. The second article of the law defines the antiquities as "any historical movable or immovable iniquities made, or composed or carved (inscribed) or built or explored or produced or modified by a human being before the year 1700 A.D including any part added to the antiquities or reconstructed after that date" article 2.A.

Also falls under this definition according to article 2.C “any movable or immovable antiquities that dates after the year 1700 A.D that is proclaimed by the minister through an ordinance he issues and states that it is a historical remain”.

Antiquities included in the above-mentioned definition shall be listed according to article 9.A and announced in the official newspaper: “the director publishes in the official news paper a table approved by the minister that includes historical buildings and sites. He is allowed from time to time to add to this table and modify it.”

Titled as the prohibited acts, article 10 of the law of antiquities states that any person either is not allowed without permission from the minister to:

a. Excavate any historical site that is inscribed in the declared list or was mentioned in any later amendment to the list, or
b. Start a process of excavation or construct a building, or open quarries, or establishing irrigation actions or lime burning or a like in the historical buildings and sites or beside them or putting soil or dumping them or converting them into cemeteries. Or
c. Destroy any antiquities, or demolish part of it or move it, or
d. Introducing transformations to any antiquities or adding to it or restoring it, or
e. Constructing buildings or walls that encroaches any artifact or being adjacent to it.

Paragraphs d and e are not applied to historical buildings designated for religious purposes or owned by a religious body.

Sanctions are determined in Article 46. In paragraph 5 everyone who distorts, or destroys, or obliterate, or remove or block any historical artifact shall be punished by imprisonment for a term not exceeding two years or a fine of 20 dinars to 200 dinars. The year of approval is this law is 1966.

2.5.3 Charter on the Safeguarding of Palestinian Historic Towns and Urban Landscape

This charter which was signed and endorsed by the minister of local government and the minister of tourism and antiquities in 2009 calls upon the signatory parties to pursue principles of cultural heritage protection such as:

- The safeguarding of cultural and natural heritage relies on principles and rules aimed at ensuring the protection of the cultural and natural resources and their rational use as well as enhancing the environmental, cultural, architectural and social assets of the historic towns and the urban landscapes.
- It is essential to identify the elements of the cultural heritage to be preserved and those of the natural environment to be protected; all those elements that the local community and culture consider “invariable”.
- it is necessary to gradually draw the attention of both decision makers and the society towards the historic town, addressing urban rehabilitation and planning as indispensable tools, looking at buildings and spaces that can be re-used within the monumental areas, the ordinary fabric, the buffer zones and along the edge of a territory that is continuously transformed; where the phenomena of occupation and irreversible exploitation of land are tangible and therefore ad-hoc rules and interventions are necessary.

2.5.4 General Rules for the Protection of Historic Areas

In March 2006 one an advanced step in the field of cultural heritage protection was achieved. A legal protection for historic areas and individual historic buildings was provided for the first time by the decision no 54 of the higher council of planning:

“The Higher Council of Planning decided in its meeting no 4/2006 on 11 March 2006 according to the decision no. 54 to approve the General Rules for the protection of historic areas and individual historic buildings. These rules are considered part of the Building and Planning Regulations for the Local Authorities approved with a decision of the Higher Council of Planning no. 30 on 24 August 1996”

This amendment to the building and planning regulations for the local authorities was vital because it prevents demolish or remove any historic buildings or demolish or distort any element of that forming the root of the historic town (the traditional urban fabric) such as paths, alleys, open spaces, covered passages and portals.

However, the law of building and planning for the local authorities of the year 2011 has not broadly mentioned the above mentioned amendment. On the contrary, it only points that historic towns are mandated to the special committee responsible of building and planning in local authorities.

2.6 Laws and Regulations relating to Environmental Management or Monitoring

The Public Health Law No 20 for 2004 has articulated that it is part of the Ministry of Health's tasks and authorities is to license the establishments specialized in waste collections, method of waste treatment, and disposal.

It also states that it is under the ministry of health's authority in cooperation with the competent authorities to specify the rules and conditions of transferring, saving, treatment or disposal of the hazardous waste. No one is allowed to do what is stated here above unless it is in accordance with the conditions and rules.

The Palestinian Environmental Law No. 7 for 1999, under the third chapter, required from the EQA to follow up the implementation of decisions which are issued concerning the environmental impact through cooperation with the competent authorities. The EQA shall, in coordination with the competent authorities, control the various corporations, projects and activities in order to ascertain the extent of its compliance with the approved specifications, standards and instructions for the protection of environment and vital resources formulated by them according to the provisions of this law.

For the above purposes the law entitles the EQA inspectors and other inspectors who are appointed in the Ministries and other authorities who have the capacity of judicial police as per the law may impound the environmental violations and crimes that take place in

violation with this law. The EQA inspectors shall also have, in cooperation with the competent departments and authorities; the right of entry into the installations for the purpose of inspecting them, taking samples, carries out the measurements and ascertains the application of the standards and conditions of the environment protection and prevention of pollution. The owners of projects and other activities should enable the EQA inspectors and competent authorities to carry out their functions and provide them with the information and particulars which they deem necessary to obtain in implementation of the provisions of the Law.

Owner of Projects should also carry out self supervision operations according to the standards and conditions formulated by the EQA in coordination with the competent authorities and submission of reports according to the instructions of the EQA.

The competent authority shall have the right, with respect to every installation or project which has violated the environmental conditions necessary for granting the license, to cancel the license or withdraw same before the competent court.

The law has entitled the competent authorities to cancel or withdraw the license of any violating project. Should the project not remove the violation, the competent authority shall remove same at the project's own account.

The Minister may decide to stop the work in any project or prohibit the use of any machine or material in part or in whole if the continuation of work in the project or use of the machine or article involves a serious hazard to the environment. The stoppage or prohibition shall be for a period not exceeding two weeks and may not be extended except by a judicial order from the competent court. Whoever was harmed from the stoppage or prohibition order may take exception towards it before the competent court.

2.7 Administrative Procedure for Planning, Parceling and Land Use Change

As detailed in Annex C, there will be a need to follow certain administrative procedure to change the land use of the proposed sites from its current land use to a SWTS. These are to include filling an application and submit it to the MoLG. The application should

prepare survey maps stamped by a licensed (accredited) surveyor. The maps should be stamped by the Palestinian Land Authority (PLA) and the Ministry of Tourism and Antiquates (MoTA).

The registration documents and the approval of the land owners in writing should be obtained. In case the land is leased; the "No objection" of the owner in writing and the Lease contract should be presented. The application documents and maps are sent to the Ministry of Agriculture (MoA), Ministry of Health (MoH), Ministry of National Economy (MoNE), and Environment Quality Authority (EQA) to get their "No Objection";

The MoLG has then to announce the subject open to the public for objections for two months. The public has the right to object in writing against the change of the land use and/or parceling and the municipality and/or the Local Government Unit (LGU) must reply in writing.

After the settlement of all objections, then a recommendation is raised by the MoLG to the Higher Planning Council (HPC) to approve the land use change, which is then announced for two weeks in the newspapers before implementation actions are taken.

2.8 JICA Guidelines for Environmental and Social Considerations

Japan International Cooperation Agency (JICA) has in April 2010 issued the Guidelines for Environmental and Social Considerations (GESC). The objectives of the guidelines are to encourage project proponents to have appropriate consideration for environmental and social impacts, as well as to ensure that JICA's support for an examination of environmental and social considerations are conducted accordingly. The guidelines outline JICA's responsibilities and procedures, along with its requirements for project proponents in order to facilitate the achievement of these objectives. In doing so, JICA endeavors to ensure transparency, predictability, and accountability in its support for an examination of environmental and social considerations.

When encouraging the appropriate consideration of environmental and social aspects, it is JICA's policy to provide active support to projects that promote environmental conservation and to projects that contribute to the protection of the global environment. JICA also has a policy of being actively involved in supporting the enhancement of environmental and social considerations in developing countries. The inclusion of environmental and social costs in development costs and the social and institutional framework that makes such inclusion possible are crucial for sustainable development. Internalization and an institutional framework are requirements for measures regarding environmental and social considerations.

In these guidelines, JICA has created clear requirements regarding environmental and social considerations, which project proponents must meet. JICA provides support in order to facilitate the achievement of these requirements through the preparation and implementation of cooperation projects. JICA examines undertakings by project proponents in accordance with the requirements, and makes adequate decisions regarding environmental and social considerations on the basis of examination results. JICA recognizes the following seven principles to be very important.

1. A wide range of impacts must be addressed: The types of impacts addressed by JICA cover a wide range of environmental and social issues.
2. Measures for environmental and social considerations must be implemented from an early stage to a monitoring stage: JICA applies a Strategic Environmental Assessment when conducting Master Plan Studies etc., and encourages project proponents etc. to ensure environmental and social considerations from an early stage to a monitoring stage.
3. JICA is responsible for accountability when implementing cooperation projects: JICA ensures accountability and transparency when implementing cooperation projects.
4. JICA asks stakeholders for their participation: JICA incorporates stakeholder opinions into decision-making processes regarding environmental and social considerations by ensuring the meaningful participation of stakeholders in order to have consideration for environmental and social factors and to reach a consensus

accordingly. JICA replies to stakeholders' questions. Stakeholders who participate in meetings are responsible for what they say.

5. JICA discloses information: JICA itself discloses information on environmental and social considerations in collaboration with project proponents etc., in order to ensure accountability and to promote the participation of various stakeholders.
6. JICA enhances organizational capacity: JICA makes efforts to enhance the comprehensive capacity of organizations and operations in order for project proponents etc., to have consideration for environmental and social factors, appropriately and effectively, at all times.
7. JICA makes serious attempts at promptness: JICA addresses request of acceleration for the prompt implementation of projects while undertaking environmental and social considerations.

3. CURRENT STATE ON ENVIRONMENTAL AND SOCIAL CONDITIONS

3.1 Tubas SWTS Site

3.1.1 Location and Topography

Tubas Governorate is located in the north region of West Bank, it is located 20 km northeast Nablus Governorate, and 24 km southeast Jenin Governorate. The center of the governorate is Tubas city which is geographically surrounded by a number of villages including Bardalah, Ein Albaida, Kardalah, Kherbet Tall Alhama, Ibzaiq, Salhab, Aqaba, Tayasir, Al- Faresieh, Al Aqqaba, Al Thograh, Al Maleh, Qashdah, Kherbet Yarzah, Ras Alfara'ah, Al Fara'a Camp, Kherbet Aras Alahmer, Wadi Al Fara'a, Tamoun, Kherbet Atouf, Al Hadideyah, Kherbet Humsah. These villages are expected to be served by the proposed solid waste transfer station.

The land area of Tubas Governorate consists of approximately 292,000 dunums of which 7,250 dunums is developed area. The SWTS is proposed to be located in the western part of Tubas City. **Figure 1** shows the proposed location of the SWTS west of Tubas city.

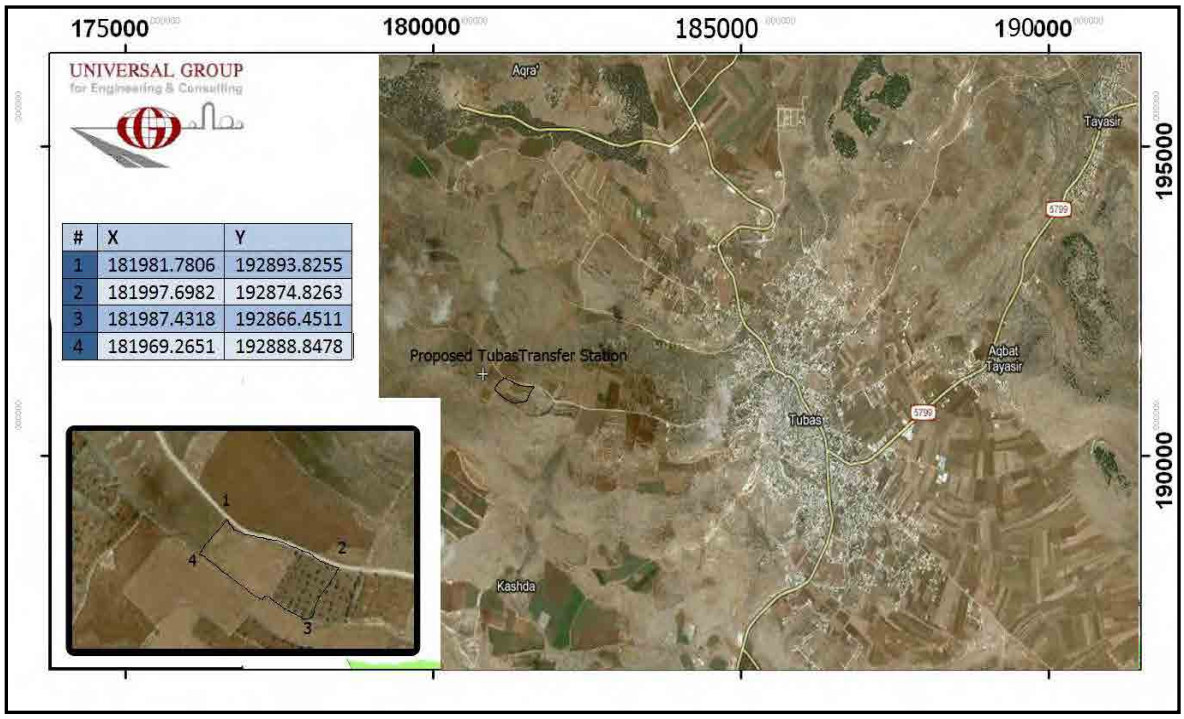


Figure 1: The Location of the Proposed Transfer Station in Tubas City

Tubas area has diverse topography and altitude and is primarily classified as agriculture. The topography can be divided into two parts: the mountainous area and the flat area. The proposed transfer station site is located uphill from Tubas city at an elevation of about 500m above sea level. The topography shows continuous decrease in elevation from about 600 m above sea level in the west to 300 m in the east.

3.1.2 Geopolitical Aspects

Oslo agreement has classified the lands of the Palestinian Territories as A, B, or C. The Palestinian Authority (PA) has civil and security control only over area A and area C is totally under the control of the Israeli authorities. The civil affairs in area B, which extends outside the Palestinian cities and villages, are managed by the PA, while the security is kept in hands of Israel.

Tubas city and the surrounding neighboring areas is classified as area A, but is surrounded from all sides by areas classified as "B". The proposed SWTS site is located within area A (**Figure 2**).

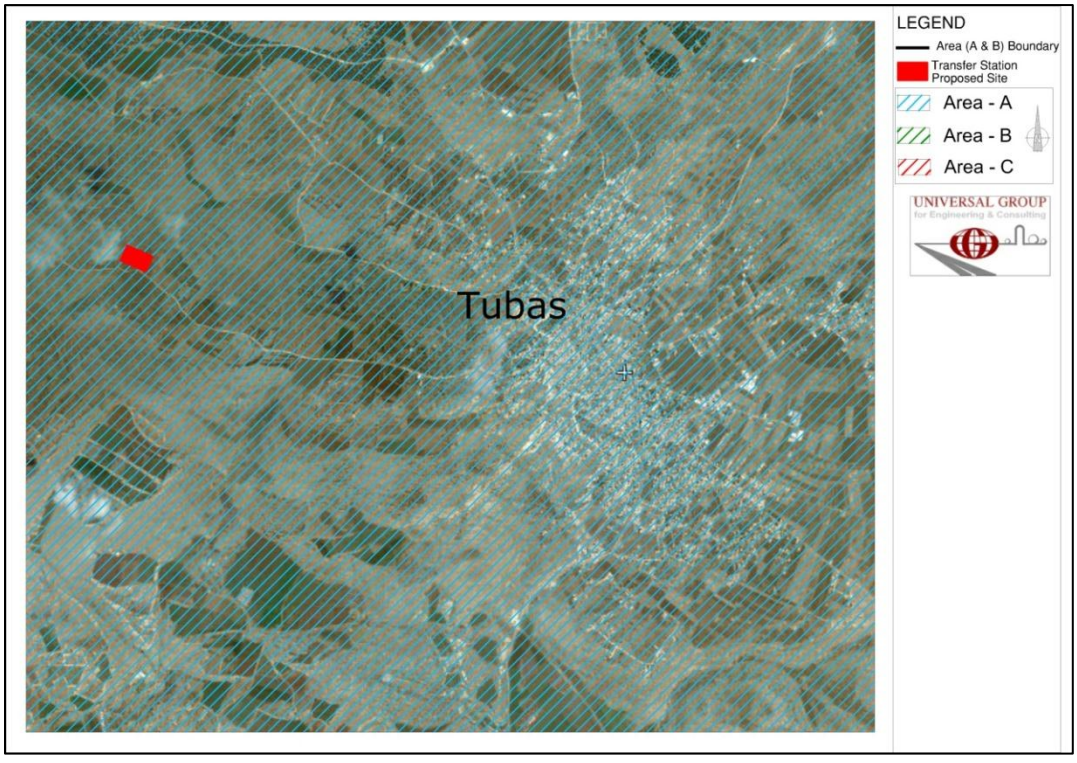


Figure 2: Location of the proposed Tubas Transfer station within Area A

3.1.3 Demography and Population

Based on data from the Palestinian Central Bureau of Statistic (PCBS), 2007 census, Tubas governorate area had a population of 49,489 inhabitants, with an approximate 50:50 ratio of females to males. The average capita per household is between 4.5 and 5.8 persons depending on different localities. The average annual growth rate is 3.44%. Additional information regarding population projections can be found in **Table 1**.

Table 1: Households and Population in Tubas Governorate (PCBS 2007)

No.	Name	Households (2007)	Population (2007)	Population (2011)
1.	Tubas	3,805	309,51	309.50
2.	Bardala	286	3913.	390,0
3.	Ein el Beida	205	393,0	39133
4.	Kardala	52	15.	1,1
5.	Ibziq	37	.50	.10
6.	Aqqaba	1207	19,,6	6916,
7.	Tayasir	496	.9,03	.9050
8.	Al Farisiya	28	3,,	365
9.	Al 'Aqaba	20	35.	336
10.	Ath Thaghra	126	010	130
11.	Al Malih	57	11,	,36
12.	Ras al Far'a	3,5	1,0	6,1
13.	El Far'a Camp	33,0	091.,	19,16
14.	Khirbet ar Ras al Ahmar	15	361	.5.
15.	Wadi al Far'a	031	.9100	19566
16.	Tammun	2235	3591.,	3.9311
17.	Khirbet 'Atuf	34	310	3,1
18.	Khirbet Humsa	22	313	305
19.	Other Localities	1.	301	360
Total Tubas Governorate		**10,476**	**,44,94**	**4646,4**

3.1.4 Climate

The prevailing climate in West Bank is considered Mediterranean, characterized by long, dry hot summers and short rainy winters. This climate is influenced by different features in each region such as its elevation and proximity to the Mediterranean Sea.

The climatic characteristic in Tubas area is considered subtropical. Tubas experiences hot and dry summers and moderate winters; the maximum temperatures are measured in August and reaches a maximum average of 34^{o}C. The minimum temperatures are in January at a monthly average of 7^{o}C.

The prevailing wind directions over the Tubas area are southwest and northwest. In the summer months, winds are primarily northerly. The average daily wind speed from June to August is 2.8 m/s while the average daily wind speed from December to February is 2.1 m/s. The Sirocco (Khamasin) winds blow at the beginning of summer time, mainly during April to June. These winds blow from the Arabian Desert and are full of sand and dust, causing a rise in temperature and a drop in humidity. The highest winds occur during July and August.

The mean annual relative humidity in Tubas area is 69%; 60-65% in the summer, and 74-84% in the winter. The minimum relative humidity is during the Sirocco (Khamasin) wind in May. The relative humidity varies during the day - high in the early morning and low in the afternoon.

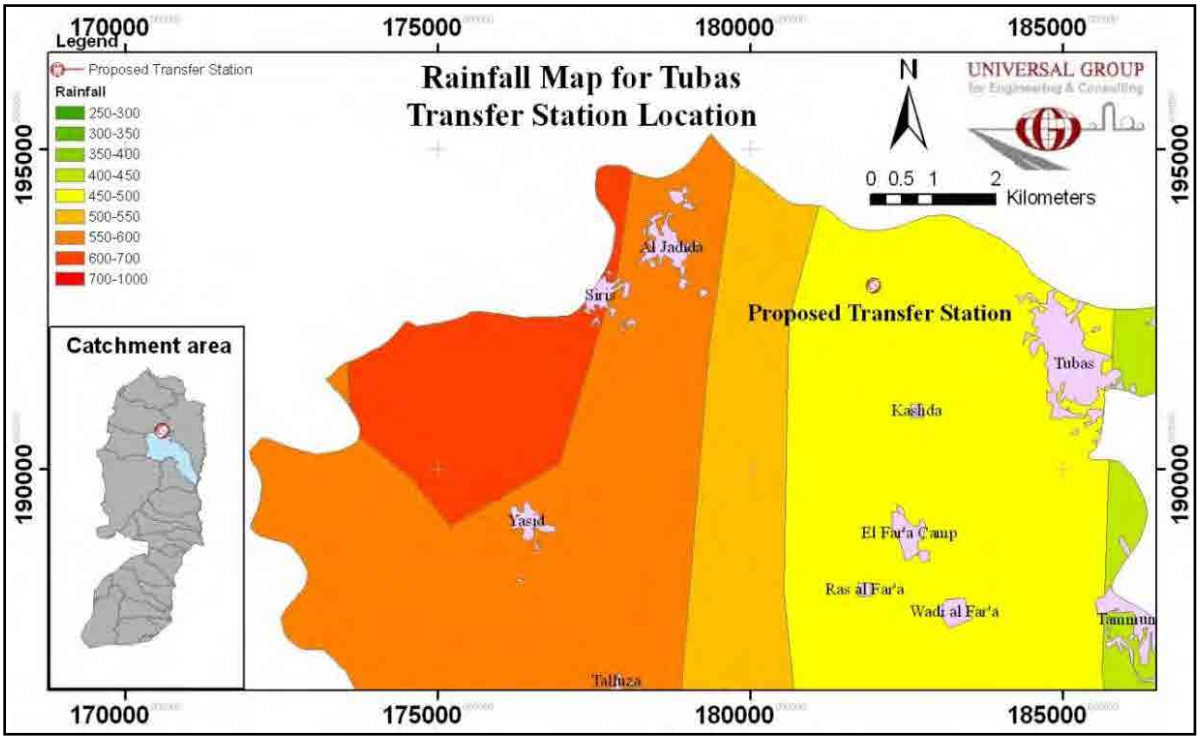


Figure 3: Rainfall Map of the Tubas Area

Winds from the west direction are normally saturated with moisture from the Mediterranean Sea which brings rain to the study area. Rainfall is distributed over an average of 55 rainy days, and almost 80% of the total rainfall occurs between November and March. The mean annual rainfall in the study area is approximately 400 mm (**Figure 3**).

3.1.5 Land Use

The land use map of the study area is shown below in **Figure 4**. The total agricultural area in the study area is 175,000 dunums. About 12% of the agricultural area is cultivated (20,975 dunums). The most important crops in the study area are fruit trees (mainly olive), vegetables and field crops.

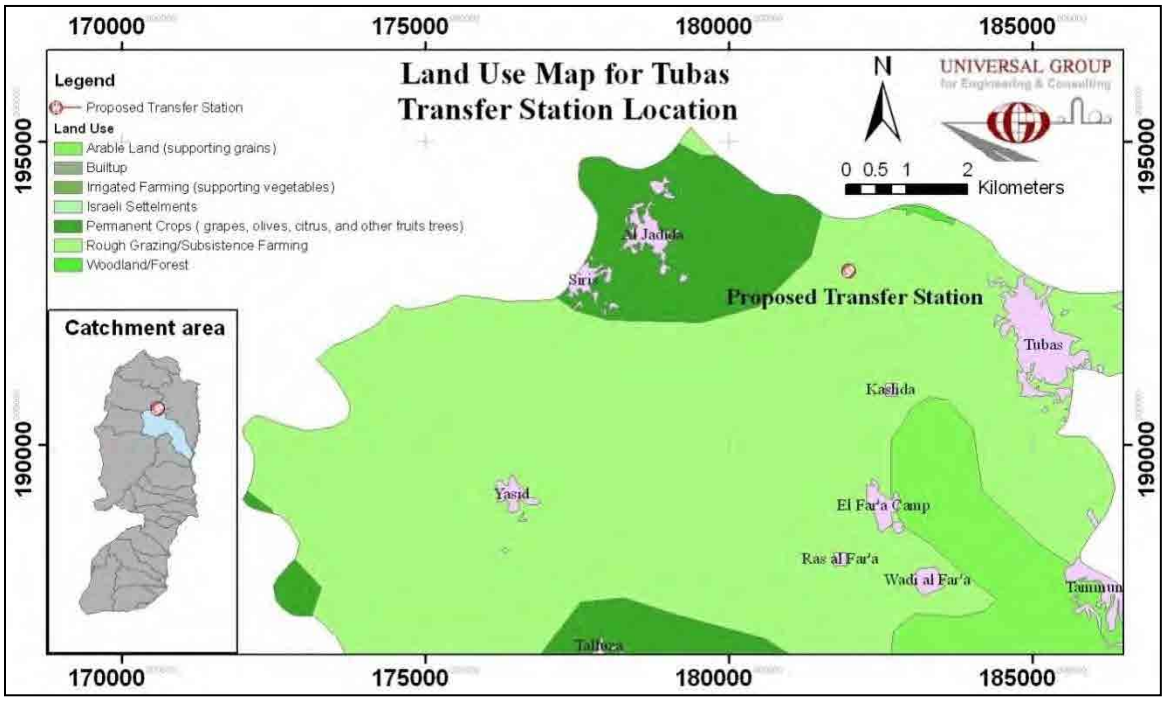


Figure 4: Land use in the neighborhood of the Tubas SWTS

3.1.6 Geology and rock formation

The expected outcropping and encountered rock formations at Tubas area range in age from Cretaceous to Recent. Cretaceous and Tertiary rock formations are characterized by marine carbonate sediments such as limestone, dolomite, chalk and marl, frequently

interspersed with chert nodules. Recent rocks are mainly wadi fill and Nari deposits. **Figure 5** is a geological map of the study area.

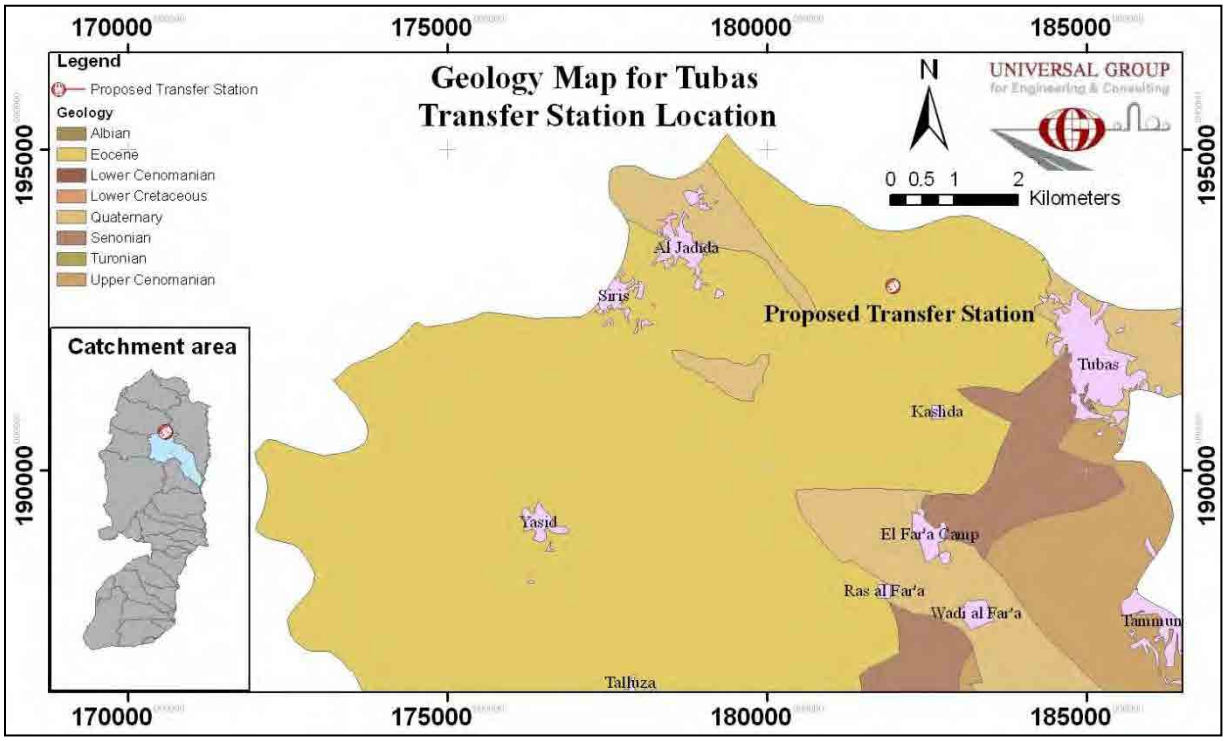


Figure 5: Geological Map of the Study Area

3.1.7 Soil

The large expanses of cultivated area in Tubas area attributable to the rich and fertile soil cover which is a mixture of Terra Rosa, Brown Rendzinas and Pale Rendzinas, and Grumusols. The soil is agricultural with low salinity. The soil thickness varies between the flat areas and hilly areas, where its thickness increases in flat area and decreases in hilly areas. The soil type of the proposed transfer station location is Brown Rendzinas and Pale Rendzinas. The major soil types found in the Tubas area are described in further detail in the following sections.

- ***Grumusols***

Grumusols is a soil type found in areas with smooth to gently sloping topography. This soil is formed from fine textured alluvial or Aeolian sediments. Grumusols are churning,

heavy clay soils with a high proportion of swelling clay. These soils form deep wide cracks from the surface downward when dried. Grumusols have a very low hydraulic conductivity and are poorly drained. The available calcium and magnesium contents of these soils are high and pH is above 7. The overall productivity of Grumusols is normally low; especially where no irrigation water is available, and nitrogen and phosphorus are normally deficient. Saline Grumusols may develop under irrigation, but they are rare under natural conditions.

- ***Terra Rossa, Brown Rendzinas and Pale Rendzinas***

This type of soil is a characteristic of the hilltop; 30-50% of this soil type is rock outcrops. Different soil slopes are permanent in this type of soil according to various topography and elevation. Accordingly, soil depths ranging from 0.5-2 m are found in different areas of this type of soil. The parent materials, from which this soil originally was initiated, are mainly dolomite and hard limestone. In general, this soil has a pH range of 7.5-8.1 with clay-to-clay loam soil texture.

3.1.8 Water Resources

The three main aquifer basins in the West Bank are Eastern, Northeastern and Western basins. The study area location lie over Northeastern Basin, a few kilometers west of the water divide between the Northeastern and Eastern basins.

The Northeastern Aquifer basin extends from the area south of Nablus towards the north beyond the borders of the West Bank. The area of Northeastern basin is about 1,424 square kilometers (km^2) of which 1,053 km^2 lies within the West Bank and 371 km^2 lies within Israel. It is the smallest of the three basins with the smallest portion of recharge. The Northeastern Aquifer is located in the large and gentle syncline in the central mountain part of the northern West Bank. Groundwater flows north and northeastward from its recharge areas in the mountains through a system of two superimposed calcareous aquifers, the Upper Aquifer (Cenomanian-Turonian) and the Eocene aquifer. Therefore the direction of groundwater flow in the study area is northeast to east.

The total long-term average recharge of the Northeastern aquifer is from rainfall that reaches the groundwater body and is estimated at approximately 165 million cubic meters per year (mcm/yr).

Figure 6 shows that the nearest water well near the proposed site is located more than 3 km to the south. This indicates that the impact on the water resources will be minimal.

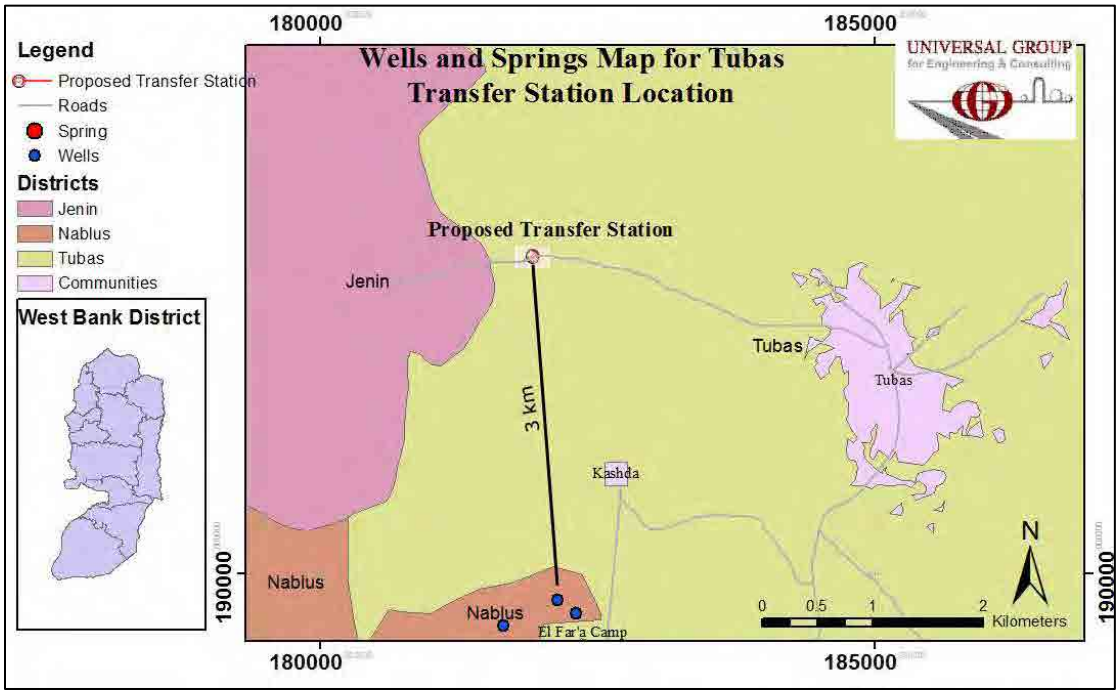


Figure 6: Nearest water well to Tubas proposed transfer station site

3.1.9 Ecological Resources

Tubas Governorate is considered an agricultural area, 60% of the population work in various agricultural fields. The total area of arable land in the Tubas governorate is 150,000 dunums, whilst the cultivated area has reached 10604 dunums. 124,450 further dunums are forests and 1000 dunums are grazing area. Out of 10604 dunums which are cultivated, 4224 dunums are primarily planted with fruit trees, 1160 dunums are for the cultivation of vegetables and 5215 dunums are for the cultivation of field crops.

The natural forests are the main forest types inhabiting the suggested area wherein Pines, *Pinus spp;* Carob*, Ceratonia spp. Oak, Quercus spp*, are the most representative tree

species. The Israeli military actions and confiscation resulted in a vast reduction of the natural and human made forests, in addition, the Palestinians depleted the forested areas through woodcutting used for fuel (either as biomass or for coal production). These activities, combined with natural destructive elements such as wind, snow, soil erosion, aging, and accidental fires left dramatic scars on forests in the region.

The bordering area of the project site is characterized by a low biodiversity area including many olives, almond, and fig trees, as well as, many natural forest trees such as Carob, *Ceratonia silqua*, Oak, *Quercus calliprinos*. Also, herbs and plant covers that once characterized the area included: Grass Pea, *Lathyrus spharicus*, Common Squill *Bellevalia longipes*, False Yellowhead, *Dittrichia viscosa*, Chrysanthemum *chrysanthemum morifolium*, Spanish marigold *Anemone coronaria*, Pampas Grass, *cortaderia selloana*, Black Cally Lily *Arum palaestinum*, and Wavyleaf Mullein *Verbascum sinuatum*.

This area is part of the northern valley region, where many birds, mammals and reptiles live in the area. There are many birds that nest through the year in the area, including the Palestine Sunbird or Northern Orange-Tufted Sunbird, *Cinnyris oseus*; Bulbul, *Pycnonotidae*; and songbirds such as Sylvia Warblers and Goldcrests, *Regulus regulus*. Mammals in the area include: Palestinian mountain gazelles or Edmi, Gazella *gazella gazelle*; Palestine wild boar, *Sus scrofa libycus*; foxes like the Palestinian red fox, *Vulpes vulpes palaestina*, Palestinian jungle cats, *Felis chaus furax*; Nubian ibex, *Capra ibex nubiana*. Reptiles and lizards, like the Lebanon Lizard, *lacerta laevis*; the Roughtail Rock Agama, *laudakia stellio stellio*; Desert Monitors, *Varanus griseus*; Egyptian Dabb or Mastigure or spiny-tailed lizard, *uromastyx aegyptius*; skinks, geckos like the Mediterranean Gecko, *Hemidactylus turcicus*; are all living in the area.

The proposed solid waste transfer location is within the olive cultivated area between Alfara'a and Aljdedeih. The main vegetative cover prevails in the area includes: *Qurecus calliprinos, Ceratonia siliqua, Pistachia palaestina and Pistachia lentiscus*. In addition to the above plant species several other species including mainly *Sarcopoterium spinosum, Cistus creticus, Phlomis viscosa* and *Thymus capitatus* are prevailed. As part of the Eastern slopes the area is suitable mainly for grazing with many annual and perennial

herbs including *Poa bulbosa, Sarcopoterium spinosum, Asphodelus aestivus, Ergngium certicum, Stipa capensis* as in **Figure 7**.

Figure 7: Left: Suggested location in Tubas. Middle: Olive groves down the location
Right: Qurecus Calliprinos in the vicinity of the site

Tubas area is part of the northern valley region, where many birds, mammals and reptiles live in the area. There are many birds that nest through the year in the area, including the Palestine Sunbird or Northern Orange-Tufted Sunbird, Cinnyris oseus; Bulbul, Pycnonotidae; and songbirds such as Sylvia Warblers and Goldcrests, Regulus regulus. Mammals in the area include: Palestinian mountain gazelles or Edmi, Gazella gazella gazelle; Palestine wild boar, Sus scrofa libycus; foxes like the Palestinian red fox, Vulpes vulpes palaestina, Palestinian jungle cats, Felis chaus furax; Nubian ibex, Capra ibex nubiana. Reptiles and lizards, like the Lebanon Lizard, lacerta laevis; the Roughtail Rock Agama, laudakia stellio stellio; Desert Monitors, Varanus griseus; Egyptian Dabb or Mastigure or spiny-tailed lizard, uromastyx aegyptius; skinks, geckos like the Mediterranean Gecko, Hemidactylus turcicus; are all living in the area.

However, destruction of forests and hunting has resulted in the extermination of many of these species. Within the district, animals and birds are not considered rare. Some of the listed wild birds, according to the Israeli Nature Reserves Authority, are: osprey, black francolin, golden eagle, honey buzzard, bran owl, eagle owl, sparrow hawk and goshawk. Reptiles are also found in the area. They include common species of Chelonia (Turtles), sauria, squamata and snakes.

3.1.10 Historical and Archeological Resources

West Bank played a great and elaborate role throughout the whole history of Palestine. It is one of the most famous and richest zones in Palestine, it contains a very fertile lands, with plenty of water which encourage a continuously occupation from the very ancient periods until the present. These facts appear in the numerous numbers of archaeological and historical sites in this region, which reflect variant types of civilizations from different periods. Moreover, this zone served as an economy and military corridor between Egypt in the south and Syria in the north since the third millennium B.C. to the late Islamic periods. The following is a description of most of the existing archaeological sites that are located in Tubas district. **Table 2** lists these sites and further information about each.

Tubas City

Tubas city itself is a small important town located 20 km north east of Nablus. It was very famous during the Canaanite and Roman periods. This still important town is situated on the slopes and the summit of a hill whose sides are pierced with numerous cisterns, some still in use and others half filled up. There are many caves cut in the rock. These are certainly of very great antiquity. Outside the town there are several ancient tombs cut in the flanks of the neighboring hills. They are found on every side, but all violated. Some have their entrance closed. Others were widened in order to give shelter to the cattle, sheep, and goats owned by the people of Tubas.

Al-Kufeir

The site is located 8 km north of Tubas city. Its name means a small village. It is an abandoned village, whose houses were built by the Arabs of old materials and whose antiquity is proved by the existence of the rock-cut cisterns. A sarcophagus has been discovered there dated to the first century A.D. **Figure 8** shows the ruins of an old house in El-Kufeir

Figure 8: Ruins of a house in Al-Kufeir

Khirbet Ibziq

The site located 5 km northeast of Tubas. The name "Bazeq" in Canaanite means, seeding the seeds. It was changed to "Bezeq" in the Roman era. It seems that the site was a Canaanite city and continued to be settled during the Byzantine and Islamic periods. It contains a tomb for a Muslim wely known as "Skaikh Buzqeen", which may be the same place for an ancient Canaanite temple, traces of ruins, houses, cisterns and caves are existed as well.

Sir

18 km located to the south of Jenin. The ruin west of the village has the appearance of an ancient site, foundations, cisterns cut in the rock, heaps of stones among bushes, two rock-cut tombs, a large mound with terraces cut in the sides and a good well below.

Khirbet Salhab

The site is located to the northeast of Tubas. It is a small-destroyed town on a hill whose rocky sides are pierced by numerous cisterns. The occupied place is now covered with

confused materials; the remains of demolished dwellings and disposed for the most part in circular heaps round silos or subterranean magazines cut in the rock.

Aqqaba

A relatively large village located on the northern slope of Ras El-'Akra Mountain. It is surrounded by brushwood on the hills, but has arable land below.

Khirbet Kashda

The site is located to the south of Tubas city. It includes some ruined structures from later periods similar to those structures in Talfit and Al-Kufeir, which seem to be built 100 years ago (**Figure 9**). Ayyubid and Mamluk pottery shreds have been collected from the surface.

Figure 9: Khirbet Kashda south of Tubas City

Tell Al-Fara'a

The site is located at about 15 km northeast of Nablus, 5 km south of Tubas. It was first occupied in the Chalcolithic period about the 4th millennium B.C., and then it grew into a well-known Canaanite city-state in the 3rd millennium B.C.

The site includes many ancient ruins. The most important of which is the fortification system such as the city wall with exterior glacis, gateways and towers such as Burj Al-Fara'a (Al-Fara'a Tower), in addition to a considerable number of mud-brick houses and a number of large group tombs. The city was abandoned after the Babylonian invasion to Palestine in the 6th century B.C.

Maqam Houda

It is located on the edge of a Wadi southeast of Yasid, 15 km west of Tubas. The site contains a large cave cut in the rock; a large cistern with a pear-shaped cut in the rock but its mouth is built of hewn stones. The importance of this site appears in the existence of a Maqam called "Maqam Houda". This maqam consists of two square chambers; each one has a semicircular dome and a Mihrab towards the south, in addition to a square door opening to the east. This structure was built of medium and large dressed stones covered with white plaster. Maqam Houda is shown in **Figure 10**

In front of this maqam two huge oak trees are still standing. Before reaching the maqam, an old cistern full of water can be seen.

Khirbet Um El-'Urush

It is located to the southeast of Khirbet Houda. It contains traces of ruins.

Khirbet Al-Manounah

It is located east of Talluza. It contains some caves cut in the rock.

Figure 10: Maqam Houda Southeast of Yasid

Khirbet Mayyasah

It is located northwest of Al-Badhan. It contains some caves and cisterns cut in the rock. According to the pottery shreds, which scattered on the surface, it seems that the site belongs to the Roman-Byzantine periods.

Khirbet El-Kharaibeh

It is located southeast of Al-Badhan. It contains an old road, a pool, different structures and walls.

Khirbet El-Kuz

The site is located north of Khirbet Al-'Uqud. It has an important strategic location on the ancient trade routes from Shekem to Tell Al-Fara'a. Little information has known about its history. Ruins of walls for housing structure are still visible. Many Roman cisterns and carved stone shelters still exist on the site, in addition to a heap of stones with a spring below it.

Table 2: Most of the existing archaeological sites in Tubas district

Name of the site	Size of the architecture	Importance of the site
Al-Kufeir	About ten structures 100x100 m	Stone structures with arches-cisterns
Khirbet Ibziq		A sacred shrine-caves-cisterns
Sir	Unlimited village	Ruined walls-caves
Khirbet Salhab	Less than ten houses 200x100 m	Ruined stones
Aqqaba	A modern town	Agricultural landscape
Tubas	A modern town	Cisterns-tombs
Khirbet Kashda	Four stone structures 150x100 m	Stone structures (late periods)
Tell Al-Fara'a	300x300 m	Canaanite city-tower
Maqam Houda	15x15 m	Islamic shrine
Khirbet Um El-'Urush	10x10 m	Traces of ruins
Khirbet Al-Manounah	10x10 m	Caves
Khirbet Mayyasah	15x15 m	Caves-cisterns
Khirbet El-Kharaibeh	50x20 m	Walls
Khirbet El-Kuz	30x30 m	Roman cisterns

3.2 Jericho SWTS Site

3.2.1 Location and Topography

The topography of the city of Jericho shows continuous decrease in elevation from about 150 m below sea level in the East to 300 m below sea level in the West. Thus, most of the built up area where the SWTS project is proposed is within an elevation of 100-300 m below sea level. The SWTS is located at the edge of the exiting landfill site within Jericho city about 2 km from the city center.

Still, no deep wadies or hills are within the project area, and thus an aerial photo of the area shows almost a flat city as shown in **Figure 11**.

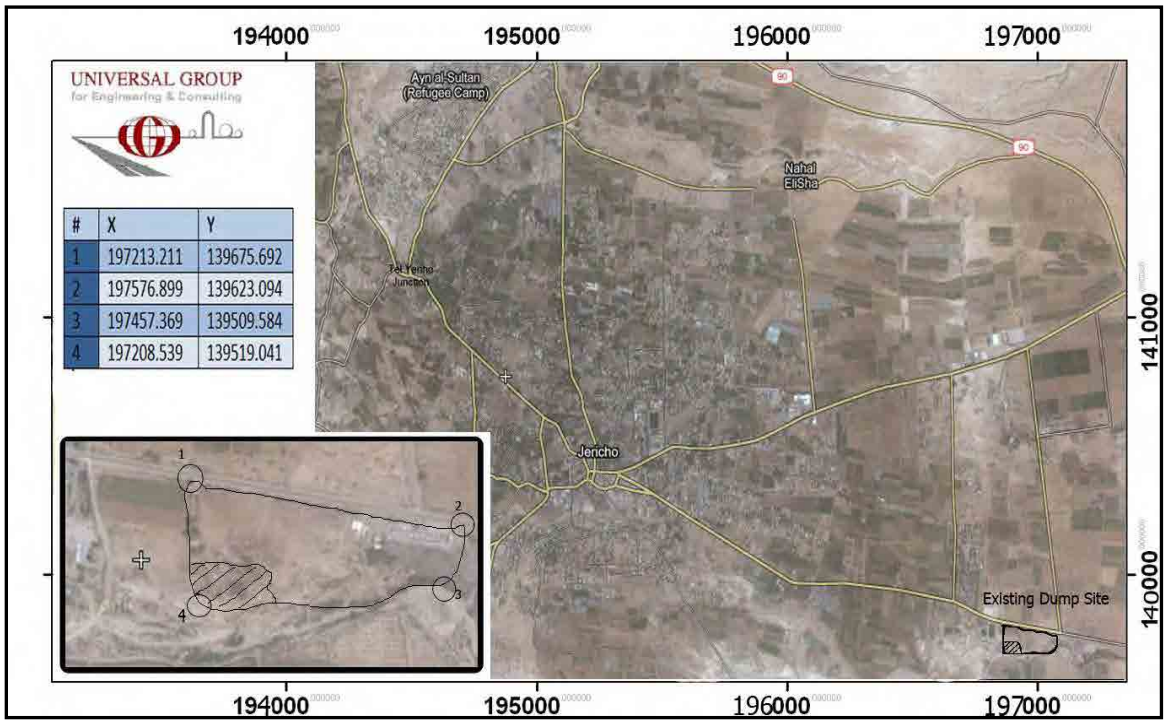


Figure 11: The Location of Jericho landfill and site of proposed SWTS

3.2.2 Geopolitical Aspects

Jericho city is classified as Area A, but is surrounded from all sides by areas classified as Area C. This is adding to the complications of Jericho as most infrastructure facilities has to cross the municipal boundary and thus to conflict the restrictions of Oslo agreement

and classifications. The solid waste landfill and the proposed SWTS are within Jericho boundary in Area A (**Figure 12**).

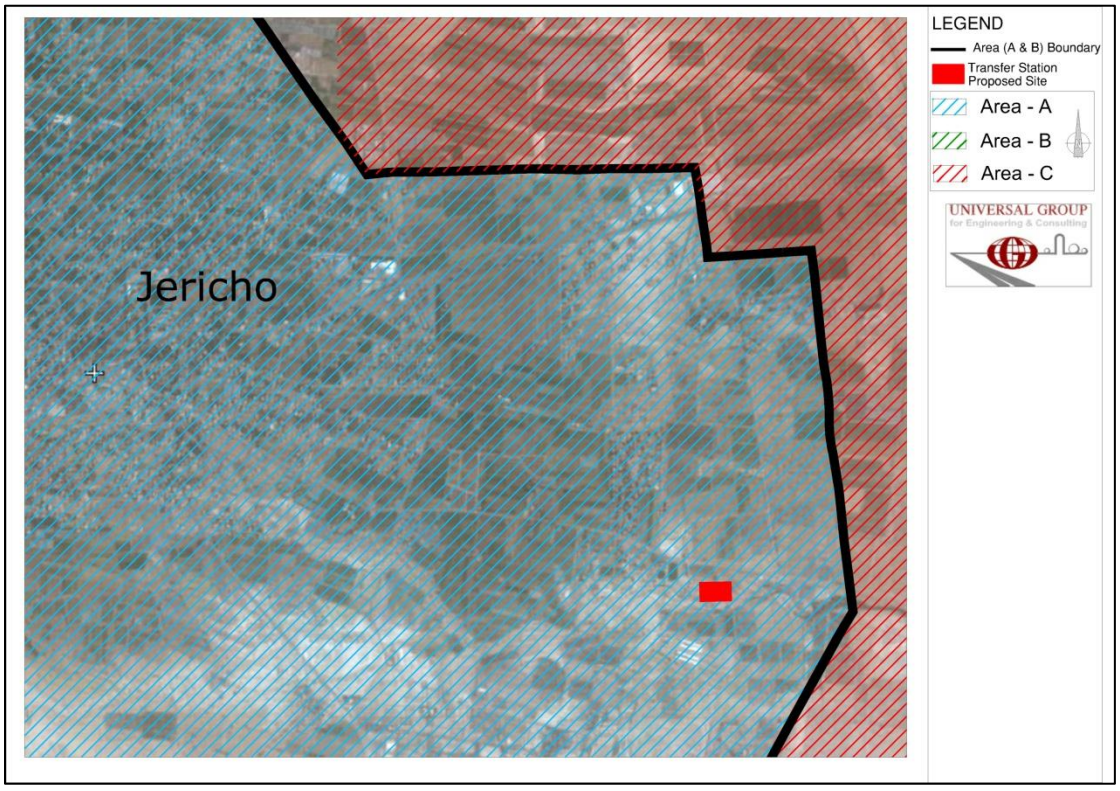


Figure 12: Location of the Jericho SWTS site within Area A

3.2.3 Demography and Population

Compared to other regions in the West Bank, the Jericho region has a relatively low population density. This is due to the large Israeli designated closed military areas, military bases, nature reserves and the Israeli settlements located there. The present population of the Jericho district is estimated at 46,717 Palestinians, living in the city of Jericho, the four villages (Al-Auja, An-Nuwe'ma, Dyouk Al-Tahta and Dyouk Al-Fouqa) and the two refugee camps (Ein Al-Sultan and Aqbat Jaber) and other small localities (PCBS, 2007).

Table 3 lists the population numbers in Jericho Governorate as of the PCBS 2007 and those estimated for 2011 at an average annual growth rate of 2.85%. The average capita per household is between 5.4 and 11.4 with an average of 6.0.

Table 3: Households and Population in Jericho Governorate (PCBS 2007)

No.	Name	Population (2007)	Population (2011)
1.	Jericho (Ariha)	309335	.59.01
2.	Marj Na'ja	651	60,
3.	Az Zubeidat	39,51	3901,
4.	Marj al Ghazal	.55	..,
5.	Al Jiftlik	19111	,9355
6.	Fasayil	3951,	393,5
7.	Al 'Auja	,9516	,90,0
8.	An Nuwei'ma	39..,	3916,
9.	Ein ad Duyuk al Fauqa	035	,51
10.	Ein as Sultan Camp	1933,	19,00
11.	Aqbat Jaber Camp	6950,	69,..
12.	An Nabi Musa	150	1,3
13.	Other Localities	3.	31
Total Jericho Governorate		**,74114**	**,64171**

The population of the city of Jericho is 18110 (PCBS 2007) distributed evenly (about 50% each) between males and females. The population is considered young as 58% of the populations are in the age group of 0-19 years and 24% of the population is in the age group of 20-30 years.

Employment and income are indicators of the economy and standard of living in any country. For Palestine, all the available figures are general and unspecific for one region or district. Unemployment rate in the West Bank reached approximately 14.5% according to the latest sanction in the second quarter of 2010, divided between 22.4% of the males in and 25% females. The average net daily wage of employees working in Palestine is $17.10 for males and $16.30 for females (PCBS, 2007).

3.2.4 Climate

Sufficient climatic data may contribute to the enhancement of understanding and determination of the necessary operational and management processes as at the proposed SWTS.

The climate of Jericho is classified as arid, that is characterized by hot summer and warm winter with very rare frost incidents. January is the coldest month and August is the warmest month. For the period from 2006 – 2010, the average maximum temperature is in July at 39.4^{o}C, whilst the average minimum temperature is 9.3^{o}C recorded in January. The maximum humidity is 60% and the minimum is 41%. The average monthly wind speed ranges from 0.94 m/sec in November to 2.31 m/sec in May and June. The main trend of wind direction in Jericho is from North and North West, minor trends of southern winds occur in early mornings. Jericho has the hottest and driest climatic conditions among the four proposed SWTS.

Figure 13 shows the wind directions and wind speed in Jericho as to the Ministry of Transportation. Most of the wind in Jericho is from North and North West.

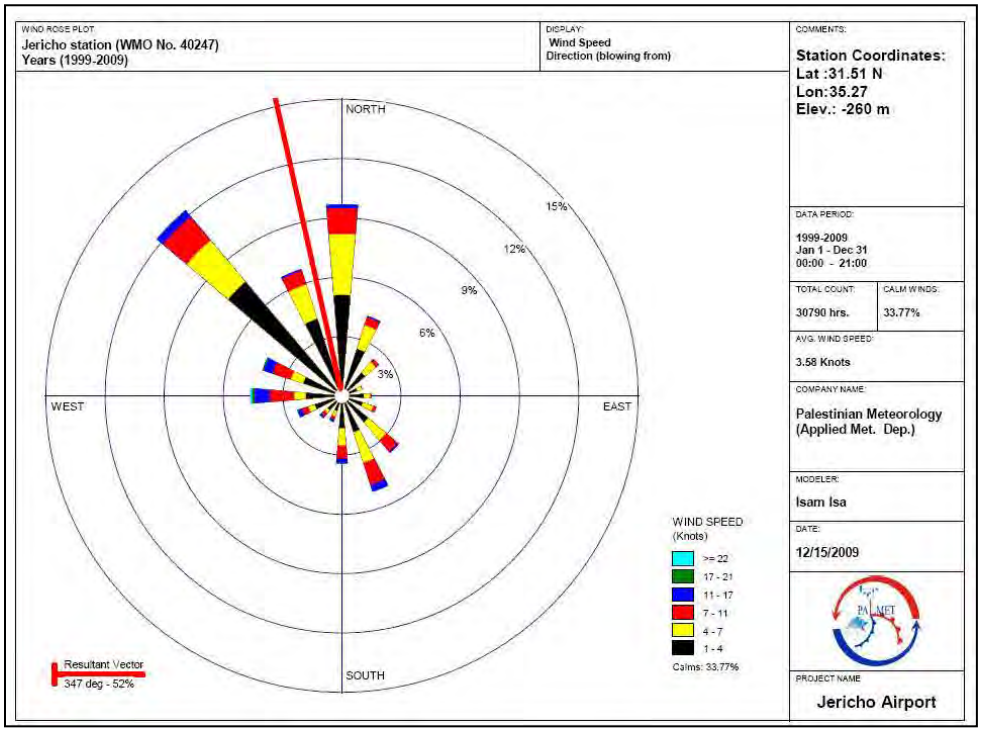


Figure 13: Wind Rose in Jericho

The amount of rainfall in the Jericho area is less than that of the surrounding mountains and the coastal regions, with an average annual amount of 150 millimeters. Therefore, Jericho area relies entirely on subterranean wells and springs for drinking and irrigation, mainly the Ein Al-Sultan spring as described further in the Water Resources section below.

Evaporation is of the basic climatologically parameter for the generation of olfactory active chemical substances as gases and triggers the emissions of these mixed gases into the atmosphere, where they are perceivable as odors.

Table 4 gives the monthly climatic data for Jericho as reported by the office of meteorological data of the Ministry of Transport.

Table 4: Average Monthly Climatic Data for Jericho (2006-2010)

Month	Max. Temp. (^{o}C)	Min. Temp. (^{o}C)	Relative Humidity (%)	Rainfall (mm)	Daily Sunshine (hrs)	Pan Evap. (mm/day)	Wind speed (m/s)	Pressure (mbar)
January	20.2	9.3	60.5	30.56	6.0	2.3	2.07	1044.8
February	22.2	10.8	60.5	38.14	6.3	2.7	1.67	1043.0
March	26.0	13.3	53.0	8.26	7.6	4.4	1.76	1040.7
April	30.1	16.7	44.7	15.76	8.8	6.4	2.16	1037.9
May	34.6	20.2	41.2	0.24	10.2	7.8	2.31	1036.1
June	38.6	23.7	42.0	0	11.8	10.1	2.31	1032.9
July	39.4	25.0	42.7	0	11.7	10.1	2.26	1030.3
August	38.6	26.3	45.2	0	11.2	9.3	1.84	1030.4
September	37.0	24.8	49.0	0.05	9.7	7.7	1.67	1034.8
October	34.0	22.0	48.0	5.58	8.0	5.6	1.30	1040.0
November	29.5	15.3	51.3	15.05	7.6	3.5	0.94	1043.9
December	22.8	11.3	56.6	16.75	6.0	2.6	1.15	1045.3
Average Total	**31.1**	**18.2**	**49.6**	**130**	**8.7**	**6.04 2205**	**1.79**	**1038.3**

3.2.5 Land Use

The land use map of the City of Jericho is shown below in **Figure 14**. The existing solid waste landfill and the proposed SWTS site are located in areas that are classified as irrigated farming. The SWTS is to be located at the south western corner from the landfill site at about 2 km from the city center and more than 1000 m from the nearest building.

Despite the fact that Jericho city has prepared a city master plan in 2004, the construction of illegal buildings is continuous whereas the ability of the city to control and take action is limited.

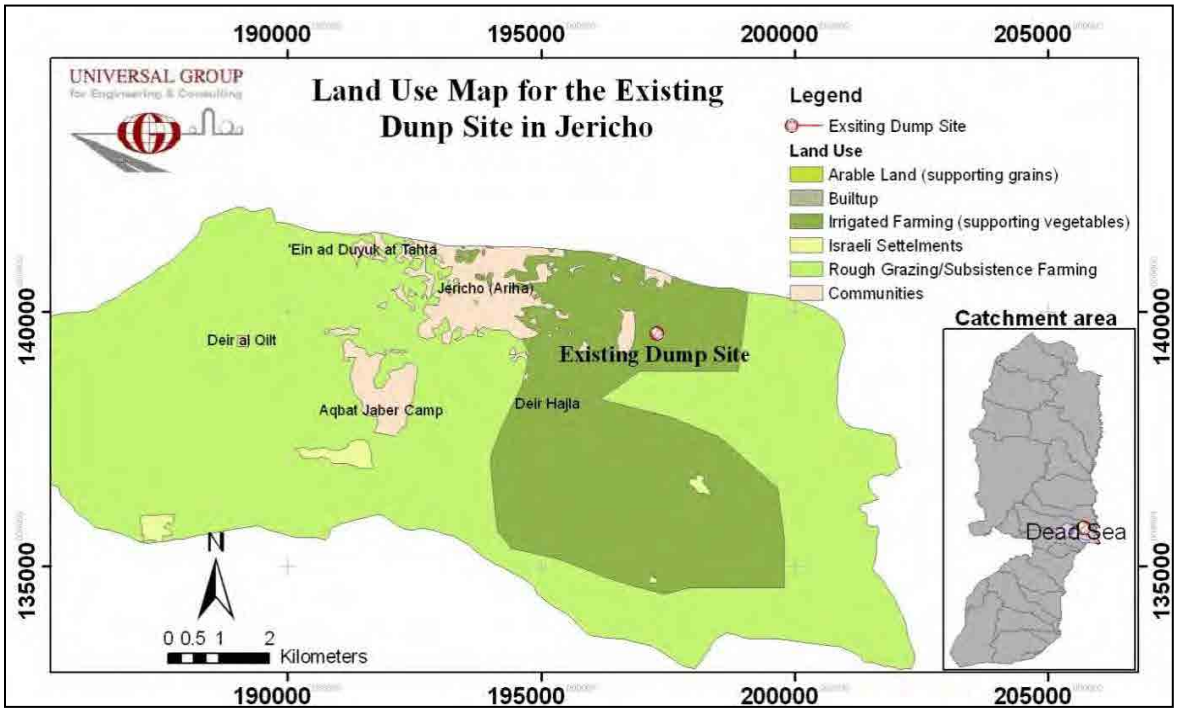


Figure 14: Jericho City Land Use Map

3.2.6 Geology and rock formation

The geology of the city of Jericho is characterized by the Jordan rift valley deposits which are mainly composed of Marl and Pleistocene Alluvial formation. The geology formation of Jericho and the site where the landfill and the proposed SWTS are located is shown in **Figure 15**. This type of formation is favorable for groundwater protection, and the formation is covered structurally by minor faults.

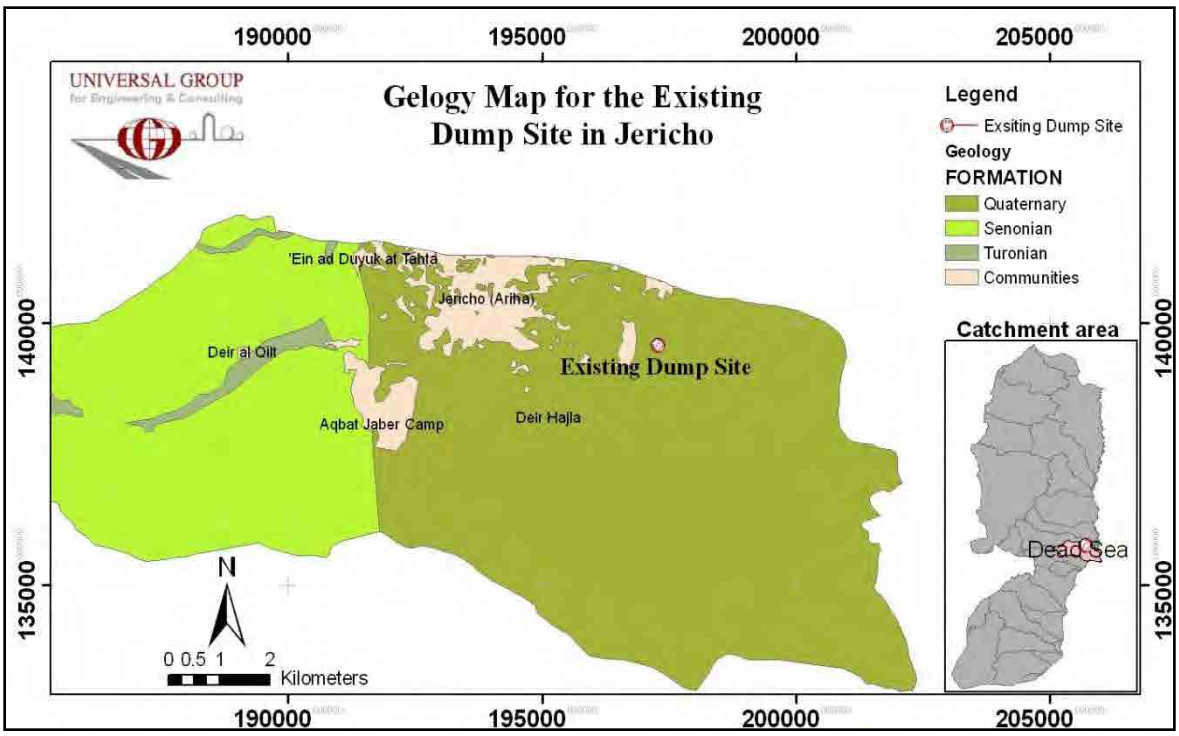


Figure 15: Geology map of Jericho and the SWTS

3.2.7 Soil

Figure 16 indicates that Jericho falls mainly over the Loessial Serozem soil type and that the existing solid waste landfill and proposed transfer station site is within regosols soil. A description of this soil type and other soils found in Jericho area are described:

- ***Regosol***

This soil is found as bad-lands along the terrace escarpments in the Jordan Valley. The soils are quite variable in texture and color. The soil parent materials are sand, clay and loess. The dominant vegetation types found in this region are Anabasis articulate, Salsola vermiculata and Salsola tetrandra. The area is used for grazing.

- ***Brown Lithosols and Loessial Arid Brown Soils***

Rock outcrops in such soils range between 50-60%. They are pale brown to yellowish brown or brown, loamy and calcareous. Brown lithosols are found in the pockets among the rocks. Loessial arid brown soils are found on flat hilltops, plateaus and foot-slopes.

The parent rocks of this soil association are chalk, marl, limestone and conglomerates. The deeper layers consist of either brown clay or yellowish brown loam. Field crops are planted in areas where the top soil is deep enough and sloping is moderate. However, in shallow and steep areas, grazing is the common activity.

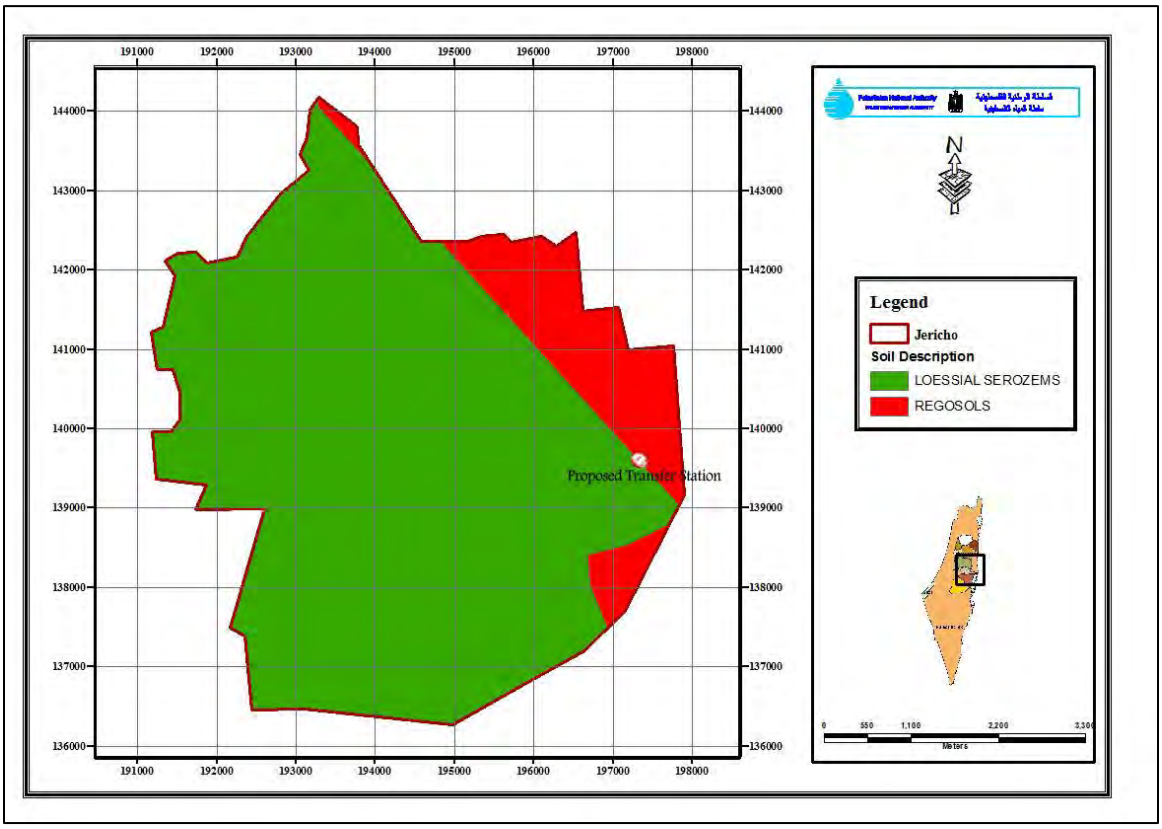


Figure 16: Soil Description of the Jericho City

- ***Brown Lithosols and Loessial Serozems***

Lithosols are typical of the steep hill slopes. Brown lithosols are found also on small plateaus. Inclusions of loessial Serozems are found in broad valleys, terraces, and on large plateaus. The soils are originally formed from limestone, chalk, dolomite and flint. The structure of this horizon is subangular blocky or prismatic, with many lime nodules. The transition to the rocks is mostly sharp. Many rock outcrops are found, usually at the surface; the soil is restricted to the pockets among these rocks. Major vegetation types found in these regions are Anavasetea articulatae and Zygophyllum. Such soils suffer from extensive erosions due to runoff, especially in steep slopes. The soil association is

also suffering from salt accumulation due to limited salt leaching capabilities. The current land use is restricted to winter crops that are grown by Bedouins in some wadis.

- ***Regisoils and Coarse Desert Alluvium***

It is found in plains and dissected low plateaus and characterized by large valleys and alluvial fans. Its parent materials are of mainly unconsolidated mixed stone and deposits. At greater depths there are stones and weathered rocks. Gypsum crystals or petrogypsic horizons are found in the deeper soil layer. The vegetation is restricted in few areas to rivulets. In most areas, dwarf shrubs such as anabasis articulate and Reaumuria are dominant. The area is of almost no agricultural value with the native vegetation able to supply only very poor grazing for camels, goats and sheep.

3.2.8 Aquifer Systems

There are several aquifer systems in the Jericho region, mainly:

1- Lower Cenomanian Aquifer System
2- Upper Cenomanian-Turonian Aquifer System
3- Quaternary Aquifer System

The Lower Cenomanian Aquifer System is composed of the Lower Beit Kahil, Upper Beit Kahil and the Yatta Geological Formations. The Lower Beit Kahil Formation and Upper Beit Kahil Formation and sometimes the lower part of the Yatta Formation comprise the Lower Aquifer, which is deeply confined across most of the West Bank. It is an excellent regional source of drinking water, the high water bearing capacity and productivity reflects the thickness of dolomitic limestone and limestone. Water quality is generally good, though slightly salinity has been encountered towards the Jordan Valley.

Turonian (Jerusalem) aquifer formation consists of massive limestone (sometimes thinly bedded limestone), and dolomitic limestone with well developed karst features. It is part of the Upper Aquifer, but it is isolated from the main part of the Upper Aquifer in the south and parts of the eastern West Bank wherever the underlying Bethlehem Formation becomes a weakly permeable aquitard. It forms a good aquifer especially where the

saturation thickness is in tens of meters. Water quality is generally good but in some areas there is evidence of deterioration because of pollution by sewage and agrochemicals.

The Upper Cenomanian aquifer consists of the Bethlehem and Hebron Formations which are mainly bedded dolomite and chalky limestone. In the southern and eastern part of the West Bank, the Bethlehem Formation is considered an aquitard, while to the north and west it has aquiferous characteristics. The Lower Part of Yatta formation represents a fair aquifer. The Lower Yatta Formation hydraulically separates the two regional aquifers (Upper and Lower Aquifers) across most of the West Bank, although to the north, the presence of limestone gives rise to minor springs and seepage. Water levels (heads) in the Upper Aquifer are generally higher than in the Lower Aquifer.

The Quaternary Aquifer System is composed of three formations: Lisan, Alluvial and Gravel fans. The Lisan Formation (Pleistocene Aquifer), a marl, gypsum and silt unit, is an aquiclude to a weak aquifer. The Alluvial and gravel fans (Holocene) are distributed in the Jordan Valley. These Alluvial fans are still accumulating after large floods and consist of debris from neighboring lithologies. The alluvium is mainly formed of laminated marls with occasional sands. Gravel fans are widely distributed in the Jordan Valley and have the capability of transferring groundwater from the limestone aquifers. The Palestinian wells in the Jericho region tap the Upper Cenomanian-Turonian aquifer system and the Neogene and Pleistocene shallow aquifer systems.

3.2.9 Water Resources

Groundwater is used as the main source of water supply for Palestinians in the Jericho city either by wells or springs. Water of wells is taken from the quaternary aquifers. The aquifers are recharged from seasonal rainfall through the outcropping mountainous areas in the West Bank. The eastern basin is considered the main source of water for shallow wells through direct infiltrations from the surface runoff or by lateral flow from the mountain aquifers.

Figure 17 shows that several water wells, mainly agricultural, exist in Jericho area and that the nearest well near the proposed transfer station site is within 0.5 m and that the

site is adjacent to wadi Al-Qilt. This indicates that the impact on the water resources and the wadi should be tackled.

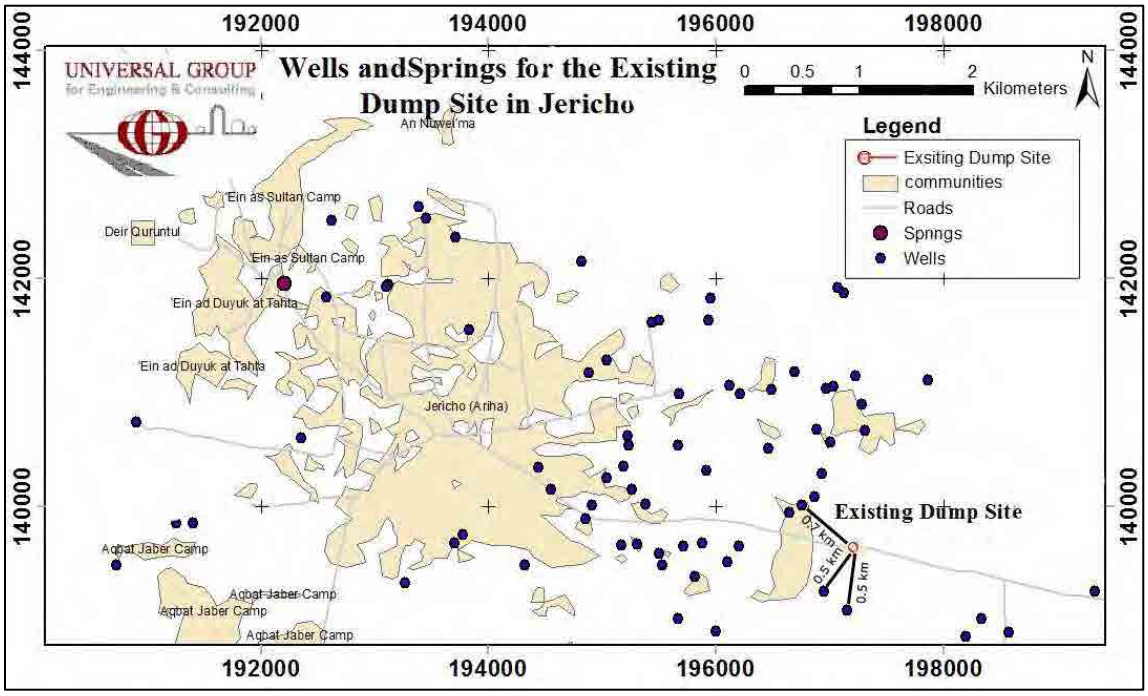


Figure 17: Water wells within Jericho city and the nearest to the propose site

The working agricultural wells are 28 out of 93 wells. The remaining wells are non-pumping and abandoned wells. The main source for water in Jericho city is Ein Al Sultan which provides a steady output throughout the year of approximately 680 m^3/hr and has the salinity of 600 fractions in one million, whereas the Jericho area using the spring has quite high water use efficiency. The irrigation methods in Jericho area have been originally advanced from the viewpoint of water- saving agriculture.

3.2.10 Historical and Archeological Resources

Jericho is an attraction for foreign visitors and Palestinians alike because of its long history, rich array of cultural artifacts, and sights in which desert and oasis converge.

Jericho city was inhabited during Mesolithic Period. The Herodion Jericho was restored by the Romans on the rift of Wadi Al-Qilt. During the period 306 to 337 AD, Jericho became the center of Christianity, continuing to be an important city through the

Byzantine Period (527-565 AD). In the seventh century, Muslims took control of Jericho, whose development of irrigated agriculture there earned it the description of the "City of Palms".

There are several historical sites in Jericho, mostly located in the western parts of the city. Among these are:

1. The Mount of Temptation (Deir Qruntul): The Monastery, perched on the side of the mount of temptation, dates from the 12th century. It has two churches associated with the temptation of Christ: one constructed near a cave, the other on top of the mountain (**Figure 18**).

Figure 18: The Mount of Temptation in Jericho

2. The Fortress: Iron Age II fortification lies near the southern entrance to Jericho.
3. Herodian Palace (Kypros): located on a nearby conic-shaped hill, 3 km southwest of Jericho city, are the remains of the ancient fortress of Kypros.
4. Tell Es-Sultan (Ancient Jericho) located northwest. The site records going back to prehistoric Natufian culture of the 11th – 9th century BC, making Jericho arguably the oldest continually inhabited site on earth.
5. Herod's Winter Palace (Tel Abu al-'Alayiq)
6. Hisham's Palace (Khirbet al-Mafjar); archaeologists call it "the Versailles of the Middle East." It was built at the beginning of the eighth century by Omayyad Caliph

Hisham Ibn Abd al-Malik (724-743), only to be partially destroyed 20 years later in an earthquake (**Figure 19**).

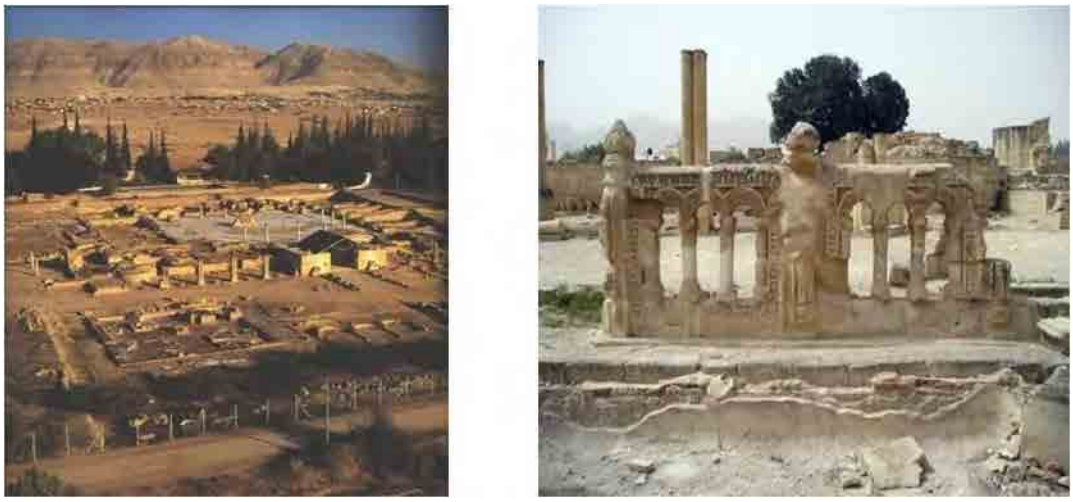


Figure 19: Hisham's Palace

7. The Na'aran Synagogue, another Byzantine era construction, was discovered on the northern outskirts of Jericho in 1918. It has a larger mosaic and is in similar condition.

8. Ein al-Sultan (Spring of Elisha); Wadi Al-Qilt; St. George Monastery; Khirbet Mugheifir; and Khirbet Es-Samara.

Most of the archeological and ruins of Jericho are located in the western parts of Jericho and not to the east where the sanitary landfill is and where the SWTS is proposed. Therefore the construction of the SWTS and/or the expansion of the existing landfill are not to impact any of these archeological sites.

3.2.11 Flora and Fauna

The Jericho and Al-Aghwar area shape the Jordan Valley ecosystem (from 375 m below sea level to 200 m above sea level and from 200 mm to 50 mm of annual average rainfall), where unique and rich biological diversity exists, including the plants of *Tamarix jordanica* (Jordanian Tamarisk); *Atriplex halimus* (shrubby saltbush); *Phragmites australis*, (common reed); *Ziziphus Lotus*, (lotus tree); and others, which all tolerate high temperatures and salinity. There are also a number of animals that prefer to inhibit this

area, including Erinaceus europaeus (hedgehog); Crocidura russula (shrew); Rousettus aegyptiacus (Egyptian bat); Herpestes ichneumon (Egyptian mongoose); Sus scorfa (wild boar); and Vipera palastinae (Palestinian viper). In addition, as part of the Jordan Valley, the districts receive the migratory birds, the largest concentration of birds in Palestine in the winter period as a low-lying areas, and birds can be monitored precisely in Jericho and some other areas of the Jordan Valley.

3.2.12 Agricultural activities

Almost 50,000 dunums in Jericho and Al-Aghwar are cultivated lands that form 2.9 percent of the total cultivated area of the West Bank. All the agricultural area is irrigated and forms 33.2% of the irrigated lands. Of the total cultivated area, 75 percent is cultivated with vegetable crops, 14 percent with fruit trees, and 11 percent with field crops and forage. Date palm plantation has been expanded rapidly in the past ten years in Jericho district. According to the Ministry of Agriculture, the total area in Jericho city planted with palm is about 60,000 dunums; about 50% of this area was cultivated during the last two years (**Figure 20**). **Figure 21** is a photo taken from the existing solid waste landfill site showing the date palm plantation nearest to the proposed transfer station site; whereas **Figure 22** shows the site close to wadi Al-qilt that drains the rainwater flowing during heavy storms form the West Bank Mountains. On the other hand the wadi is already impacted by septage from the septic tanks and cesspits that is dumped by vacuum trucks into the wadi.

The assessment of the construction of the transfer station site should include the impacts on the nearby wadi and the agricultural activities.

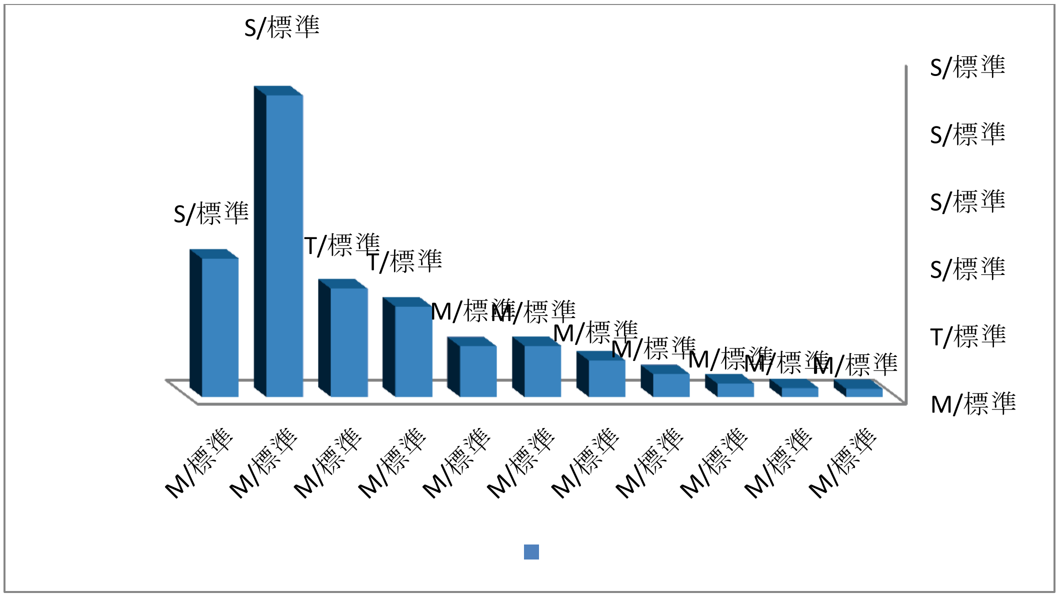


Figure 20: Cultivated area with date palm in dunums in Jericho from 2001-2011

Figure 21: The existing solid waste landfill site close to date palm plantation

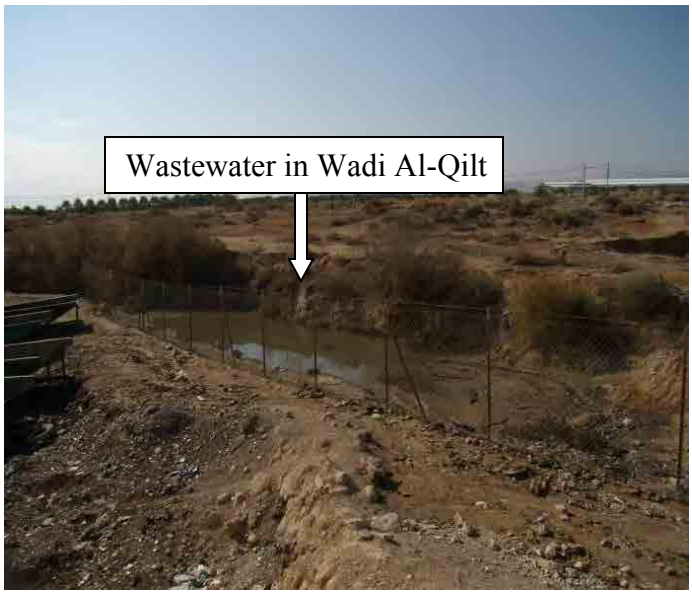


Figure 22: The proposed site for Jericho SWTS close to Wadi Al-Qilt

3.2.13 Industrial Activities

There are three major industrial groups in Jericho city:

- First group includes: stone-cutting, brick and tiles, and ready-mix concrete. These form the basic part of construction and building material.
- Second group includes: food industry, vegetable oil, slaughterhouses and meat processing.
- Third group consists of steel workshops, chemicals, pharmaceuticals cosmetics industries, in addition to miscellaneous economic activities.

It is estimated that 62% of industrial facilities of the entire West Bank do not undertake separation of solid waste, which imposes difficulty on the management and treatment of waste. Only 1.7% of industrial facilities undertake solid waste treatment whilst most of the industries in the West Bank (62%) burn waste in open air, a practice most commonly found Middle and Southern West Bank governorates.

On the other side, the proposed Jericho SWTS is about 600 m from a newly established dairy (cows) farm for Aljunidei Company south of the site. The nearest household to the proposed SWTS site is at about 1.2 km to the east.

3.3 Qalqilya SWTS Site

3.3.1 Topography

Qalqilya Governorate is located in the north region of West Bank on the western slopes of the Nablus mountain range. It is approximately 28 km south of Tulkarem Governorate and 14 km away from the Mediterranean Sea with an average altitude of 60-70 meter above mean sea level (amsl). The capital of the governorate is Qalqilya city which is bordered by the green line from the West and surrounded by a number of municipalities and villages including. The Governorate includes Azzoun, Kufur Thulth, Hableh, Azzoun Atma, Baqah, Baqat Al Hatab, Beit Amin, Islah, Jayyous, Kafr Qaddum, Kafr Laqif, Kafr Jamal, Khirbet Sir and Falameh. The land area of Qalqilya Governorate consists of approximately 166 km^2.

Figure 23 shows the location of the proposed Qalqilya solid waste transfer station, which is within the vicinity of Kufr Thuluth town east of Qalqilya city.

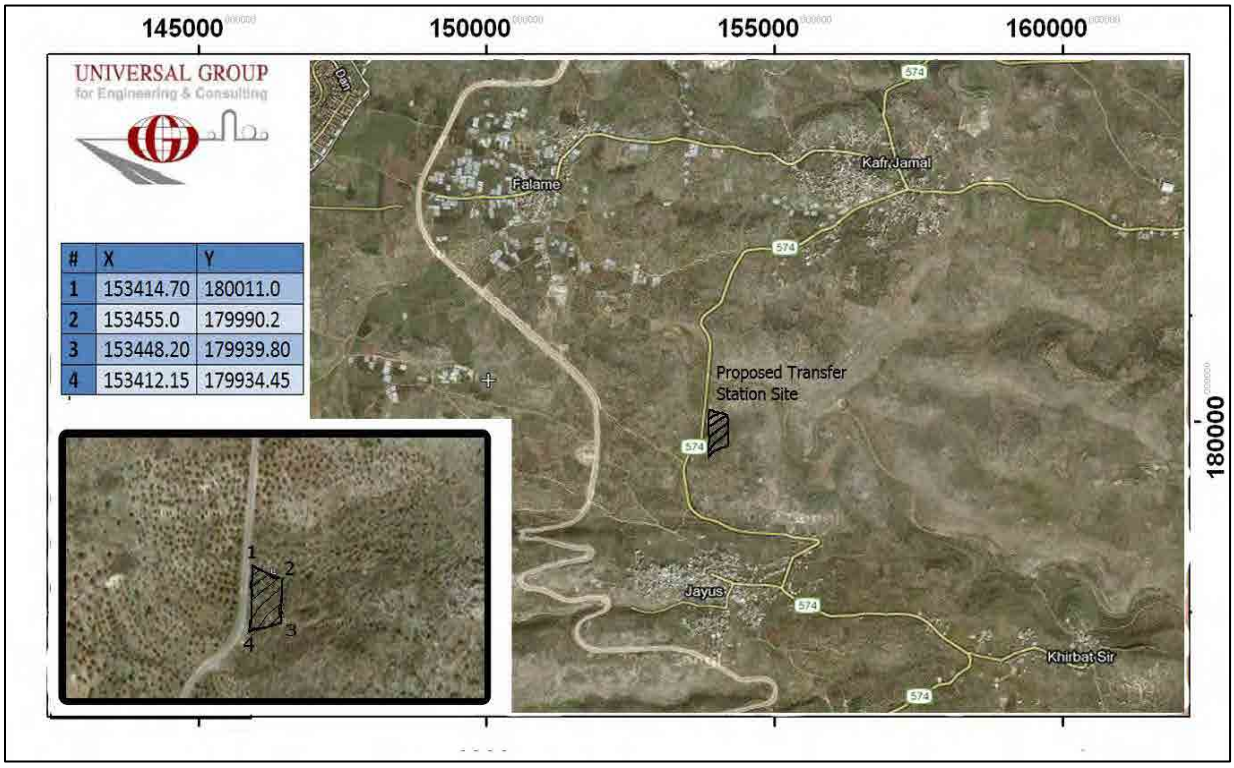


Figure 23: Location of the Qalqilya proposed transfer station

3.3.2 Geopolitical Aspects

The proposed site for the Qalqilya SWTS is classified as Area B (**Figure 24**), therefore shall be dealt with upon the Palestinian Authority civil regulations and procedures.

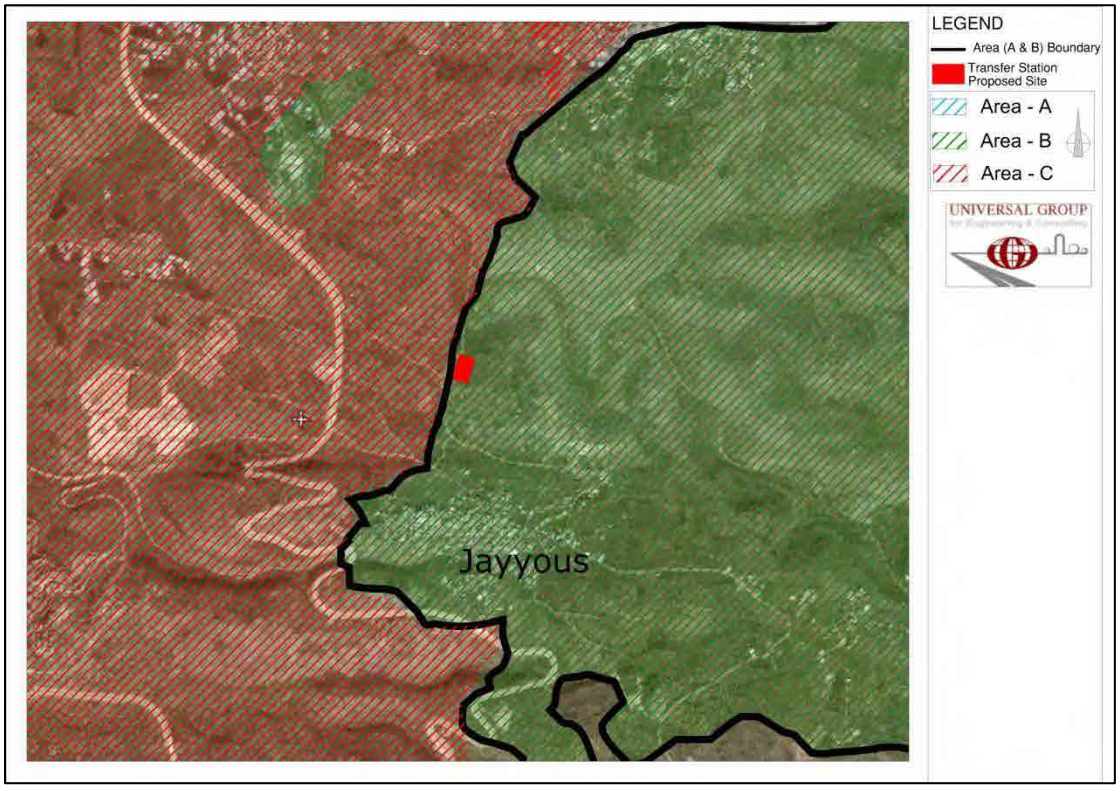


Figure 24: Location of the Qalqilya solid waste transfer site within Area B

3.3.3 Demography and Population

Based on data from the Palestinian Central Bureau of Statistic (PCBS), 2007 census, Qalqilya area had a population of ,593.5 inhabitants in 2007, whereas projections for 2011 is 100,012 with an approximate 50:50 ratio of females to males and population density of 572 people/km^2. There are nearly 16,036 households with an average size per household of 6 persons depending on different localities. **Table 5** list population figures for the years 2007 and 2011 for the different localities in Qalqilya governorate.

Table 5: Population Figures for the Localities of Qalqilya Governorate

No.	Name	Population (2007)	Population (2011)	No.	Name	Population (2007)	Population (2011)
1.	Qalqiliya	,39.16	,09611	18.	Azzun	696.6	09060
2.	Falamya	1.0	1,,	19.	Arab ar Ramadin al Janubi	.3,	.,1
3.	Kafr Qaddum	.9061	19300	20.	Isla	0,0	,16
4.	Jit	.9363	.9,5,	21.	Wadi ar Rasha	301	365
5.	Baqat al Hatab	391.,	39051	22.	Habla	09,,,	190,1
6.	Hajja	.93..	.9100	23.	Ras at Tira	10,	,1.
7.	Jayyus	.900,	19361	24.	Ras 'Atiya	3905,	3911,
8.	Khirbet Sir	,,.	,,5	25.	Ad Dab'a	113	116
9.	Far'ata	11,	65,	26.	Kafr Thulth	1906,	,9.,,
10.	Immatin	.910,	.9130	27.	Izbat Jal'ud	333	3.1
11.	Al Funduq	6,6	0.,	28.	Al Mudawwar	.10	.,6
12.	An Nabi Elyas	39306	39.0,	29.	Izbat Salman	631	6,.
13.	Kafr Laqif	0,1	,1,	30.	Izbat al Ashqar	133	1,0
14.	Arab Abu Farda	330	3.6	31.	Beit Amin	,,0	39356
15.	Izbat at Tabib	..0	.01	32.	Sanniriya	.96,6	195,0
16.	Jinsafut	.95,,	.91.1	33.	Azzun 'Atma	39605	39,,.
17.	Other Localities	350	116	**Total Qalqilya Governorate**		**90,120**	**100,012**

3.3.4 Climate

The prevailing climate in West Bank is considered Mediterranean, characterized by long, dry hot summers and short rainy winters. This climate is influenced by different features in each region such as its elevation and proximity to the Mediterranean Sea. Qalqilya area is located on the northern lowlands which has higher temperatures than other places in the West Bank except Jericho and the Jordan valley.

Qalqilya experiences moderate summers warm winters. Mean temperatures range from 10.9°C in the winter to 26.1°C in the summer, with an average annual temperature of 22.3°C. There is no metrological station in Qalqilyia. The closest station is Tulkarem's and is proximate to the proposed site in terms of metrological characteristics. **Table 6** below lists the average monthly climate data for Qalqilya. The average maximum temperature is in August at 29·6^{o}C, whilst the average minimum temperature is 8.6^{o}C in January.

Table 6: Average Monthly Climate Data for Qalqilya

Month	Mean (°C)	Mean min (°C)	Mean max (°C)	Relative humidity (%)	Wind speed (m/s)
January	10.9	8.6	13.3	72	1.19
February	11.2	8.7	13.8	76	1.14
March	13.7	10.8	16.7	75	1.06
April	17.6	13.8	21.5	65	0.94
May	20.2	15.9	24.6	62	0.92
June	23.3	19.4	27.2	69	0.81
July	25.5	22.1	29.0	68	0.81
August	26.1	22.7	29.6	74	0.75
September	24.7	21.2	28.2	70	0.72
October	23.0	19.2	26.8	67	0.81
November	17.5	14.3	20.8	64	1.06
December	13.2	10.6	15.9	71	1.11
Average	**18.9**	**15.6**	**22.3**	**69.4**	**0.94**

The prevailing wind directions over the study area are southwest and northwest, with an average daily speed of 0.94 m/s. The average monthly wind speed ranges from 0.7 m/sec to 1.2 m/sec. In the summer months, winds are primarily northerly. In winter, Qalqilya is influenced by the depressions passing from west to east over the Mediterranean. These depressions bring westerly rain bearing winds. In summer, Qalqilya District is influenced by the sea breeze that comes from the west in the morning. Towards noon, winds change their direction to southeast and later in the evening they turn to south and southwest.

The Sirocco (Khamasin) winds blow at the beginning of summer time, mainly during April to June. These winds blow from the Arabian Desert and are full of sand and dust, causing a rise in temperature and a drop in humidity. There is no officially published wind rose (a graphic tool used by meteorologists to give a succinct view of how wind speed and direction are typically distributed at a particular location) for Qalqilya by the Palestinian Meteorological Department.

Humidity in Qalqilia District reaches high levels with an annual average of 69.6%. In winter, this value increases to an average of 75.9% in February while in May it reaches its lowest value of 62.4%. Summer months are humid with an average humidity of 70.3% from June to August.

The average annual rainfall in Qalqilya area is approximately between 500 to 550 mm (**Figure 25**). The rainy season usually starts in late October and continues through May. Almost 70% of the annual rainfall occurs between December and February.

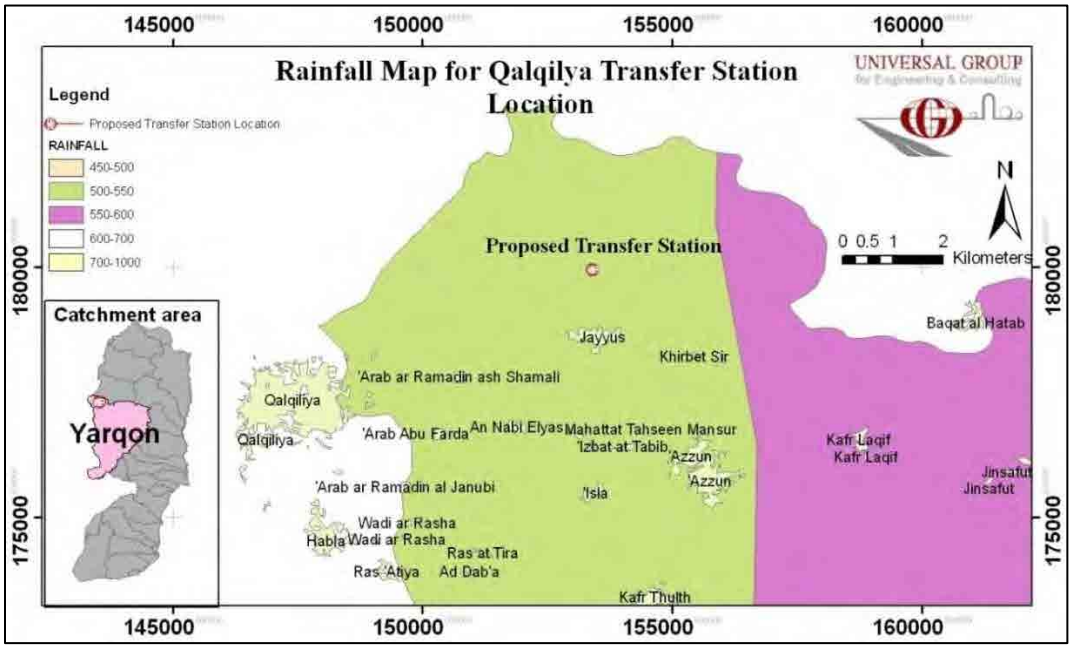


Figure 25: Rainfall Map of the proposed Qalqilya site

3.3.5 Land Use

Out of the total area of Qalqilya 166000 dunums are mostly of agricultural land. The total of cultivated area is 72,672 dunums. The most important crops in the study area are fruit trees (mainly olive and citrus) and followed by vegetables and field crops. In the year 2008 woods and forests comprised of 2500 dunums while pastures comprised of 12000 dunums. The proposed location for the transfer station near Kufr Thulth is in agricultural land as illustrated in **Figure 26**. Given the large agricultural area, Qalqilya is acknowledged for a high number of agricultural and herding establishments that reach 578 out of the total 3866 economic establishments according to the Qalqilya Governorate Annual Statistical Book of 2009. In addition, there are 577 industrial establishments, 1 mining and quarrying activity, whilst the majority of the remaining economic activities are in services sector.

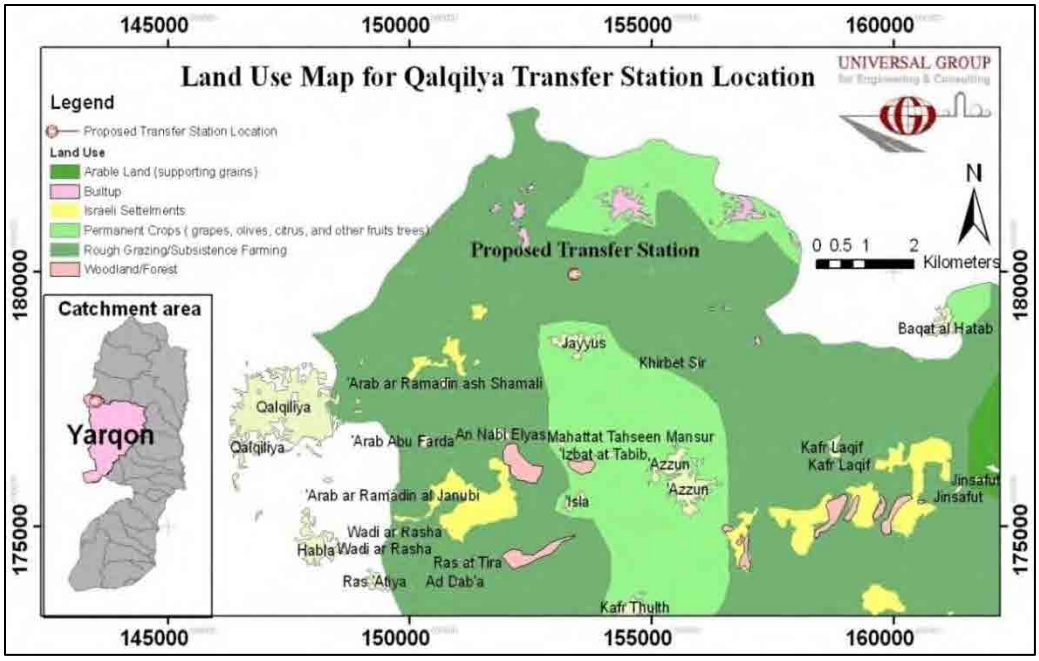


Figure 26: Land Use for Qalqilya area

3.3.6 Ecological and Natural Resources

Qalqilya governorate is situated on one of the most fertile grounds in the West Bank owing to its underground water aquifers. Before closure imposed on the governorate by the Israeli Segregation Wall, fruits and vegetables from the Qalqilya area were sold, not

only across Palestinian and Israeli towns but also exported abroad. The Wall construction imposed a very negative impact on Qalqilya and the surrounding villages. Approximately 50% of the farmland has been confiscated behind the Wall in addition to many key wells.

The governorate falls within the semi costal region; it is characterized by a considerable number of different vegetative plant species and includes a variety of plant formations. In addition to olive trees that dominated in the area, other natural plants are prevailed including Pinus spp., Ceratonia spp., Pistacia spp., Quercus spp., and Ziziphus spp. However, the proposed location of the solid waste transfer station is adjacent to the main road in route to Tulkarem. The site is owned by the municipality, and no wild birds or animals were observed in the area, the proximity to the main road and the animal farms is a reason for such lack of wildlife. One prevailing obstacles for the location is its proximity to a private poultry farm. No longer wild birds or animals are observed in the area near the SWTS proposed site, the closer to the main road and the poultry farmsis a reason for such disappearance.

3.3.7 Geology and rock formation

The expected outcropping and encountered rock formations at Qalqilya District / Kafr Thuluth area range in age from Cretaceous to Recent. Cretaceous and Tertiary rock formations are characterized by marine carbonate sediments such as limestone, dolomite, chalk and marl, frequently interspersed with chert nodules. Recent rocks are mainly wadi fill and Nari deposits. **Figure 27** is a geological/hydrogeological map of the study area where it indicates that the proposed SWTS site is located within the upper Cenomanian.

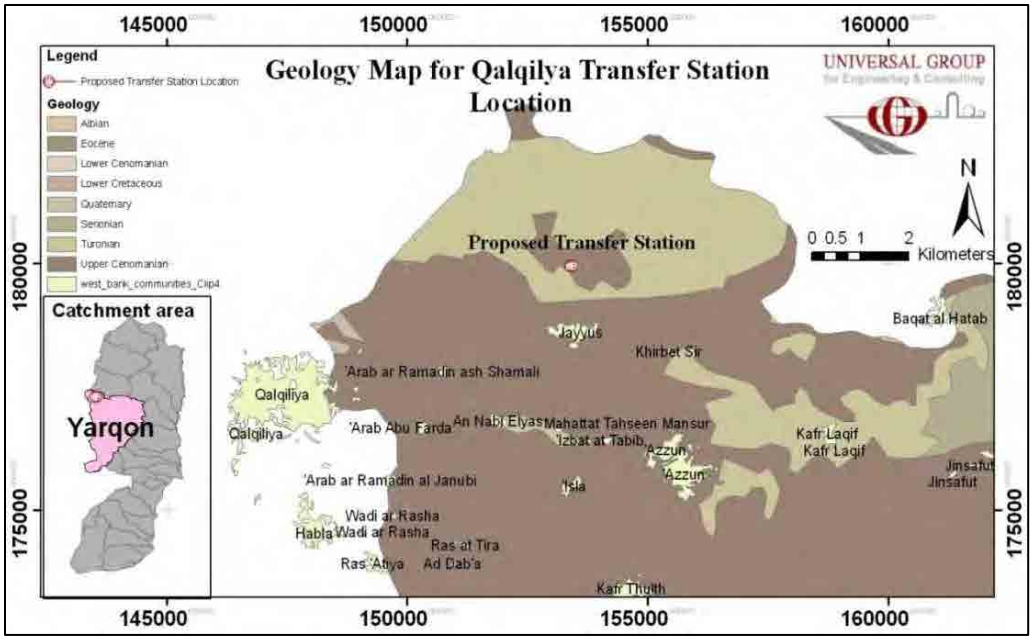


Figure 27: Geological Map of Qalqilya Area

3.3.8 Soil

In general, soil in the study area is agricultural. The soil thickness varies between the flat areas and hilly areas, where its thickness increases in flat area and decreases in hilly areas. The Terra Rossa is the most common soil in Qalqilia District. It originates from the hard rocks of the Cretaceous series. The color is red to light brown. The parent materials are Dolomite and hard Limestone. Only in the valleys it is thick enough to have significant covering capacity, while in other areas rock outcrops and thin layers of soil prevail. Lime content varies between 0-10%, lime-free soils are occasionally slightly unsaturated. Organic matter content is 2-8%. The pH is in the range of 6.5-7.8.

3.3.9 Water Resources

The three main aquifer basins in the West Bank are Eastern, Northeastern and Western basins. The study area location lies over the Western Basin. The Western Aquifer basin extends from the western part of the West Bank Mountains towards the coastal areas of

the Mediterranean. The area of Western basin is about 11,398 square kilometers (km^2) that is shared between West Bank and Israel; it is the largest of the three basins.

The total long-term average recharge of the Western aquifer is from rainfall that reaches the groundwater body and is estimated at approximately 400 - 440 mcm per year. Approximately 70% of this recharge is from the West Bank Mountains. Groundwater flows westward from its recharge areas in the mountains through a system of two superimposed calcareous aquifers, the Upper Aquifer (Cenomanian-Turonian) and the lower aquifer. Therefore the direction of groundwater flow in the western part of project area is west.

Figure 28 shows the wells and springs near the proposed solid waste transfer site and indicates the free distance from the transfer station site to the nearest wells. The figure shows that the nearest groundwater well is about 1.5 m from the proposed site.

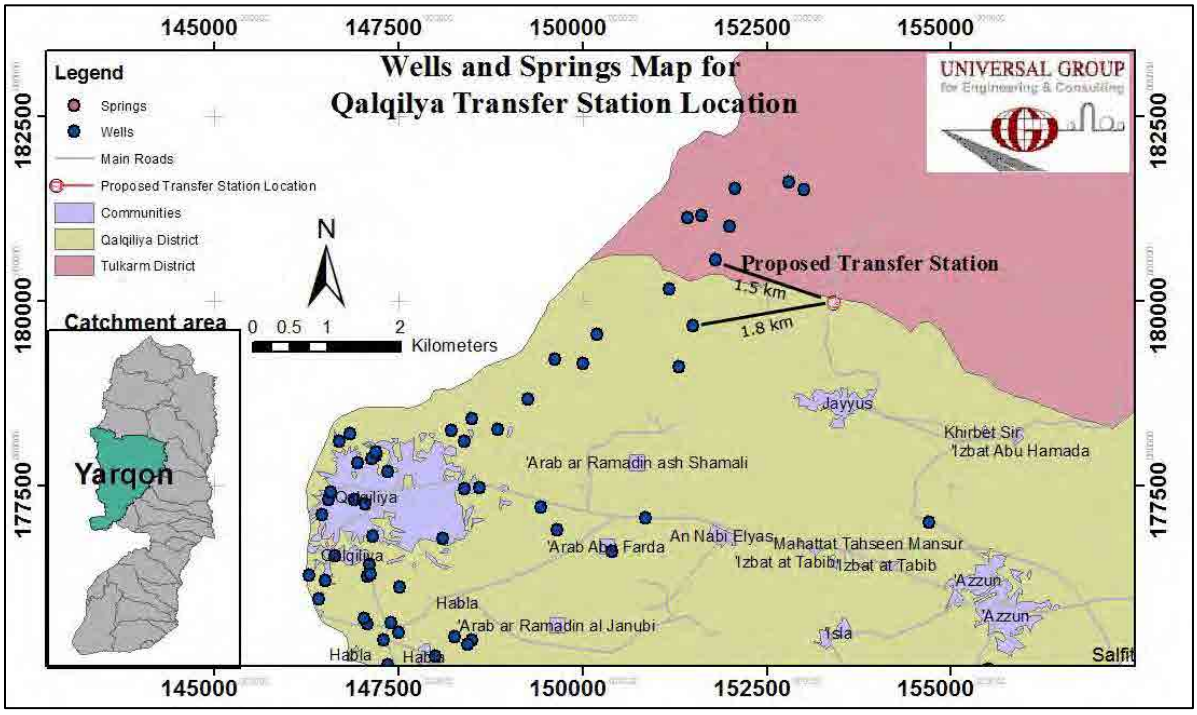


Figure 28: Wells, springs and roads in the neighborhood of Qalqilya Transfer Station

On the other hand **Figure 29** and **Figure 30** are photos of the proposed site showing the nearby chicken farm and that the site is adjacent to a paved road.

Figure 29: Qalqilya proposed transfer Station site

Figure 30: Nearest facility to Qalqilya propose SWTS site

3.3.10 Historical and Archeological Resources

The region has been populated since prehistoric times, as attested to by the discovery of prehistoric flint tools. The name of Qalqilya related to an old Romanian castle was named Jgalaa. The roots of Qaqilya name was from the Covenant Canaanite.

There are no historical areas near the proposed transfer station site; most of them are more than 1 km far from the proposed location. The following is a description of most of the existing archaeological sites that are located around the proposed transfer station site.

The old Mosque

A religious archaeological building, located at the center of Qalqilya city (**Figure 31**), about 3.5 km far from the proposed SWTS site. It was restored in 1842 AD, and there is no indication to the real history of the building, and it was constructed of ancient arches.

Figure 31: The old Mosque in Qalqilya City

Maqam Prophet Elias

This maqam consists of a chamber and an old mosque. This structure was built of medium and large dressed stones covered with white plaster.

Archaeological and religious maqam, located in the center of Prophet Elias village, east of Qalqilya, 2 km far from the proposed transfer station site. The tomb of the Prophet Elias was built by Sultan al-Zahir "Jaqmaq".

Khirbet Hanota

The site is located to the northeast of Qalqiliya city. It is a small-destroyed town on a hill whose rocky sides are pierced by numerous cisterns (**Figure 32**). The place contains cisterns in the rock, pottery rooms, carved and sculpted tombs, covered with confused materials; the remains of demolished dwellings and disposed for the most part in circular heaps round silos or subterranean magazines cut in the rock. Khirbet Hanota located 3 km west of the proposed Qalqilya SWTS site.

Figure 32: Khirbet Hanota northeast of Qalqilya City

Romanian Ponds

It is related to ancient Roman times, and is located in the center of the village of Sanniriya and consists of three medium-sized Roman ponds.

Im Al Balabil

It is consisting of an old cave located 4 km far east of the proposed SWTS site. There is no indication to the real history of it.

3.4 Salfit SWTS Site

3.4.1 Topography

Salfit proposed SWTS site is situated on the western ridge of the central mountain range that runs north-south in the West Bank within the boundaries of Salfit District. It has an elevation of 320 meters above sea level. Most of the built up area is far from the proposed site of the transfer station; an aerial photo of the area shows almost a hilly city as shown in **Figure 33.**

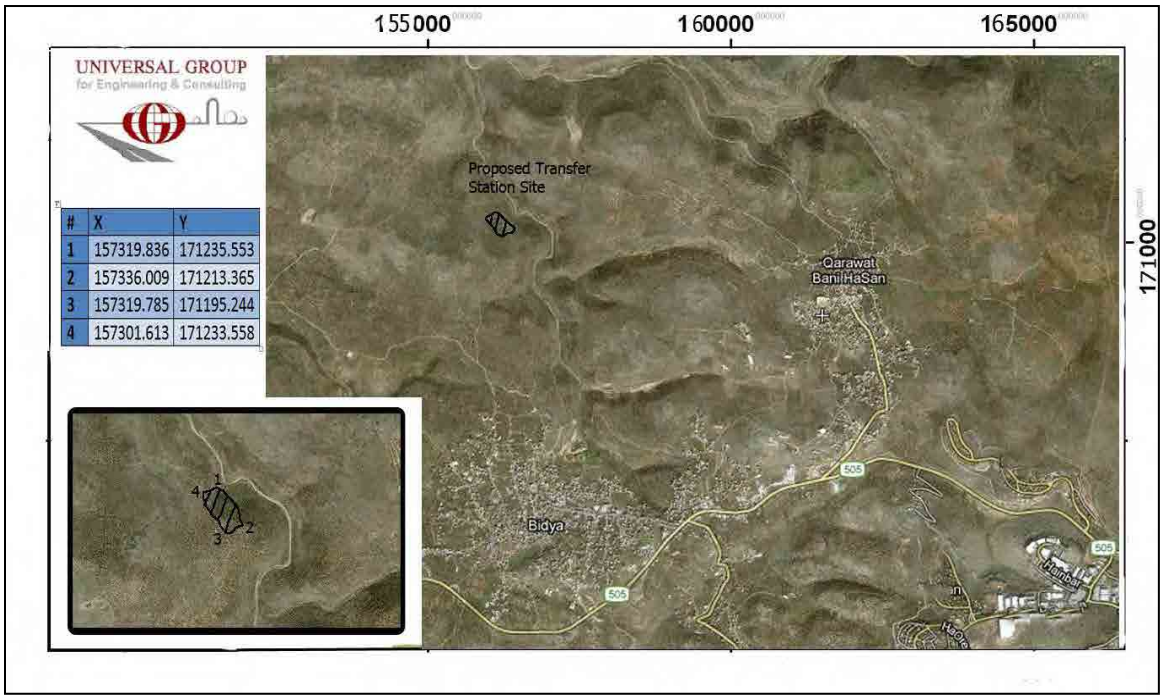


Figure 33: Location of the Proposed Salfit SWTS

3.4.2 Demography and Population

Salfit region has a relatively low population density. The population of Salfit district up till end of 2011 is estimated at 64,617 Palestinians, living in the city of Salfit, and other 19 different communities (PCBS, 2007). The capita per households is between 5.2 and 6.5 with an average of 5.5 persons with a total number of household at 11749 in 2011 and 10715 in 2007.

The main communities included in the SWTS are Bedya, Az Zawiya, Mas-ha, Rafat, Deir Ballut, Sarta, Qarawat Bani Hassan, and a probability to serve Kifl Haris, Haris, Qira, Marda, and Deir Istiya. **Table 7** lists the households and population numbers in Salfit Governorate as of 2007 according to the PCBS.

Table 7: Households and Population of the Salfit Area (PCBS, 2007)

No.	Name	Population (2007)	Population (2011)	No.	Name	Population (2007)	Population (2011)
1.	Salfit	0965.	,90,3	12.	Sarta	.9051	.96,,
2.	Qarawat Bani Hassan	19615	,93.1	13.	Az Zawiya	,9651	09306
3.	Qira	39313	39.,5	14.	Deir Istiya	1933.	19,3.
4.	Kifl Haris	19.31	190.1	15.	Rafat	390,3	.953,
5.	Marda	39,63	.9313	16.	Bruqin	19.53	19035
6.	Biddya	69,60	096,6	17.	Farkha	39103	39,0.
7.	Haris	1956,	19161	18.	Kafr ad Dik	,905,	,9,1,
8.	Yasuf	3915,	39600	19.	Deir Ballut	19313	19,11
9.	Mas-ha	39,0.	.9361	20.	Khirbet Qeis	..,	.,0
10.	Iskaka	,5.	,0,	**Total Salfit Governorate**		58,933	64,617
11.	Other Localities	33	3.				

3.4.3 Climate

The climatic characteristic in Salfit area is also Mediterranean, characterized by long, hot summers and short rainy winters. Temperatures range from the monthly average in January at 6.2^{o}C to maximum average at 30^{o}C in July and August. The mean monthly relative humidity in the study area ranges from 50% in April to 67% in December and January. The average rainfall in Salfit area is variable as illustrated in **Figure 34**. Rainfall in the area where the SWTS proposed site is between 550 – 600 mm. The wind spped in Salfit area reaches a monthly average of 3.5 m/s during June. The climte in Salfit and Tubas is cooler than in Jericho and Qalqilya. Jericho is he hottest and Qaliqilya is the most humid.

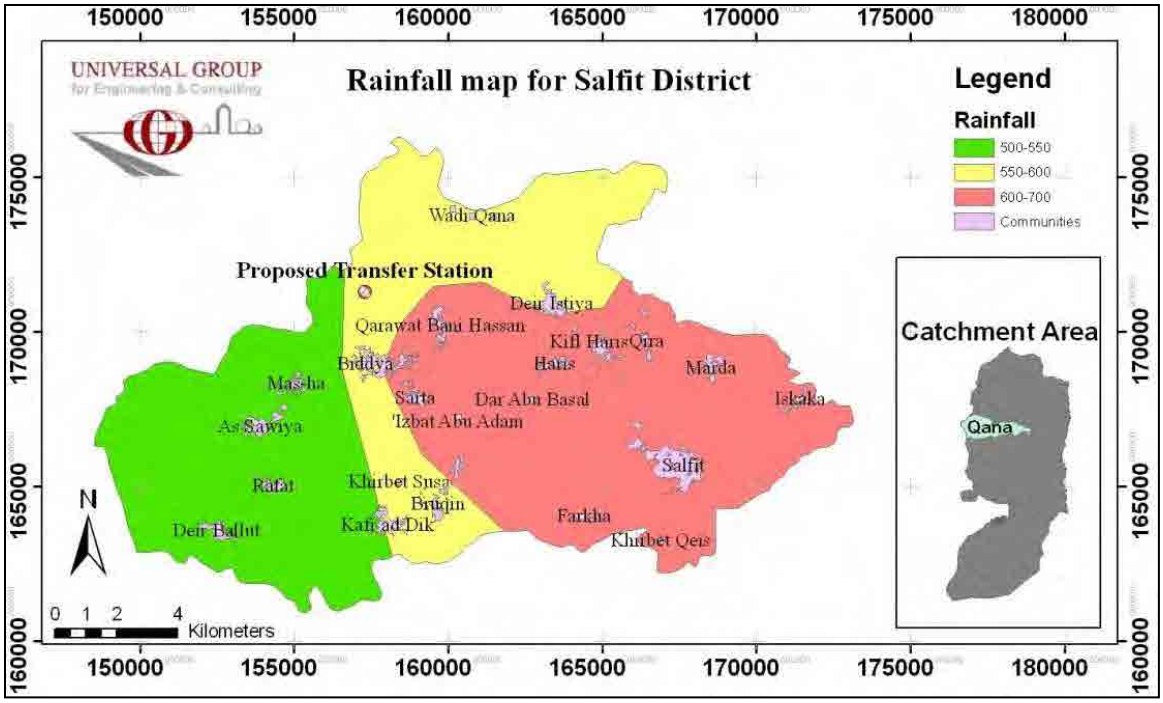


Figure 34: Rainfall Map of the Study Area

3.4.4 Geopolitical Aspects

The proposed Salfit SWTS (Bedya) is classified as Area C (**Figure 35**), which is totally under the control of the Israeli occupation authorities. EA reviews and approvals in Area C are still under the Israeli Civil Administration control. Experience has proven that such approvals for infrastructure project are very difficult to obtain and not promising for a near future improvement, therefore shall be deal with urgency and continuous follow up.

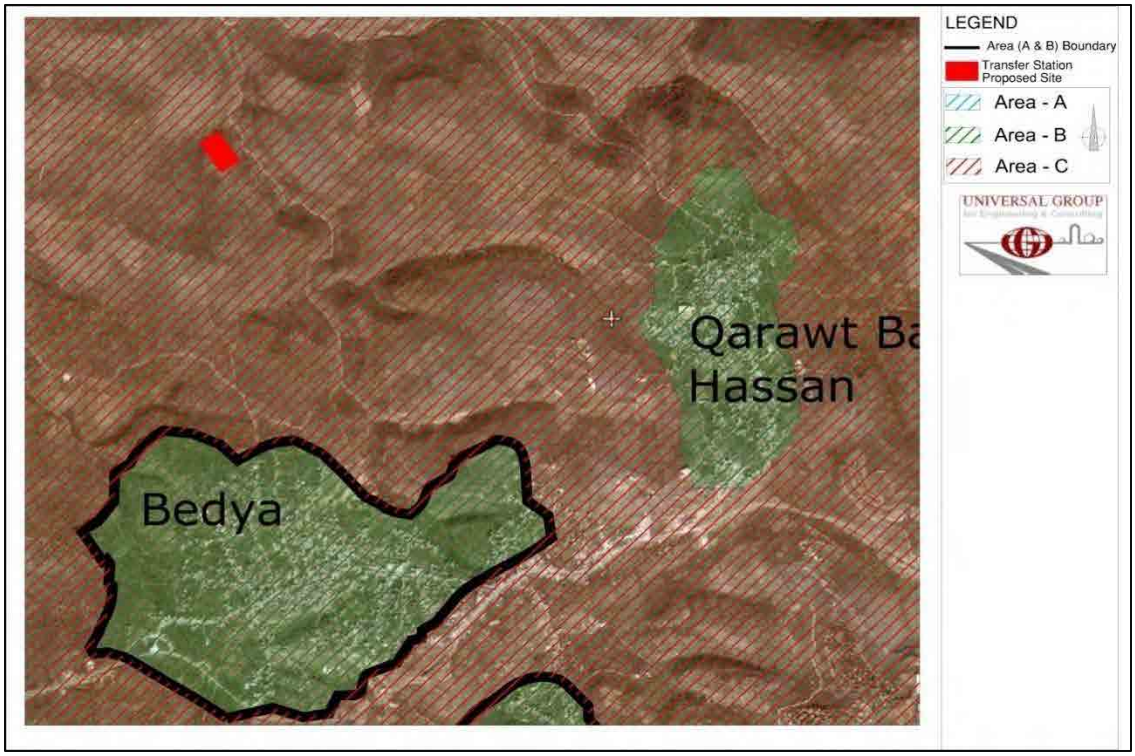


Figure 35: Oslo Classifications for areas, close up to Salfit SWTS

3.4.5 Land Use and Economic Activities

The proposed Salfit SWTS site is located in an old random dump site. The surrounding area is a grazing area with a few olive trees. The total study area is generally agricultural that is approximately 202,000 dunums where there is the total of 142 agricultural and herding establishments. The most important crops in the study area are mainly olive and other fruiting trees. The full land use map of Salfit District is shown below in **Figure 36**.

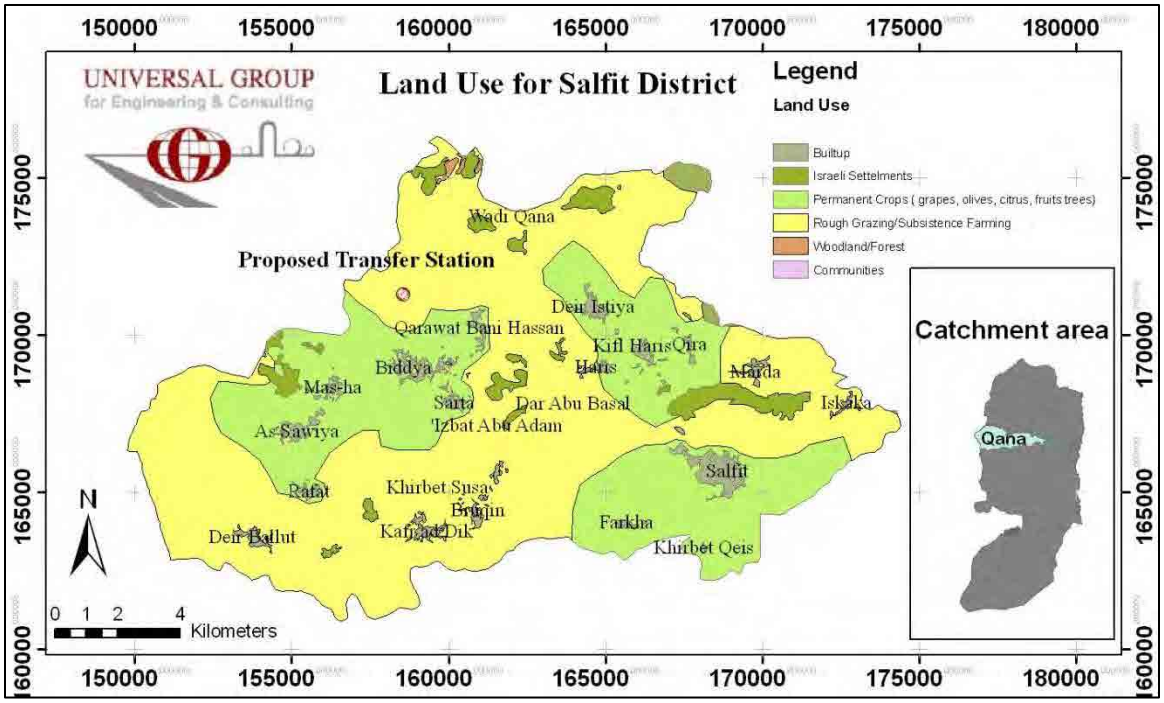


Figure 36: Land Use for Salfit Area

As for other economic activities, Salfit district has 2 stone cutting facilitates and 343 different industries whilst the majority of the other activities are in services and trading.

3.4.6 Flora and Fauna

The area of the proposed SWTS site is 6 dunums. It is mainly mountainous with a good average rainfall ranging between 300 – 600 mm. Flora is dominated by *Sarcopoterium Spinosum, Salsola vermiculata,Quercus Calliprinos*. In addition to the above plant species several other natural species including, P*hlomis viscosa, Sarcopoterium spinosum (Balan), Cistus creticus and Thymus capitatus (Thyme)* are prevailed. Natural plants are important as biodiversity conservation.

The SWTS site has no vegetated areas and, generally, the site is a degraded Garrigue that is already an old random dump site (**Figure 37**). Some natural plants, olive trees are cultivated in the surroundings.

Figure 37: Proposed Salfit SWTS site at Bedya Area

The wild life in the area is part of the fauna in the West Bank area which is wide ranging in response to the considerable variation of natural habitats. Fauna species recorded in the region and have been stated in literature include Red Fox (*vulpes vulpes palaestina*), Badger, Ichneumon , *Caracal Lynx*, Mountain Gazalle (*Gazalle gazalle*), Ibex, Hare *(Lepus capensis*). Notable bird species include the Dove (Rock and others), Black Kite, Griffen Vulture, Owl, Chukar, Quail, Lark, Pipit, and Raven. During the site visit no birds or animals were actually seen.

3.4.7 Geology and rock formation

The geology of the Salfit District is shown in **Figure 38**. The expected outcropping and encountered rock formations at the proposed Transfer station location area range in age from Cretaceous to Recent. Cretaceous and Tertiary rock formations are characterized by marine carbonate sediments such as limestone, dolomite, chalk and marl, frequently interspersed with chert nodules.

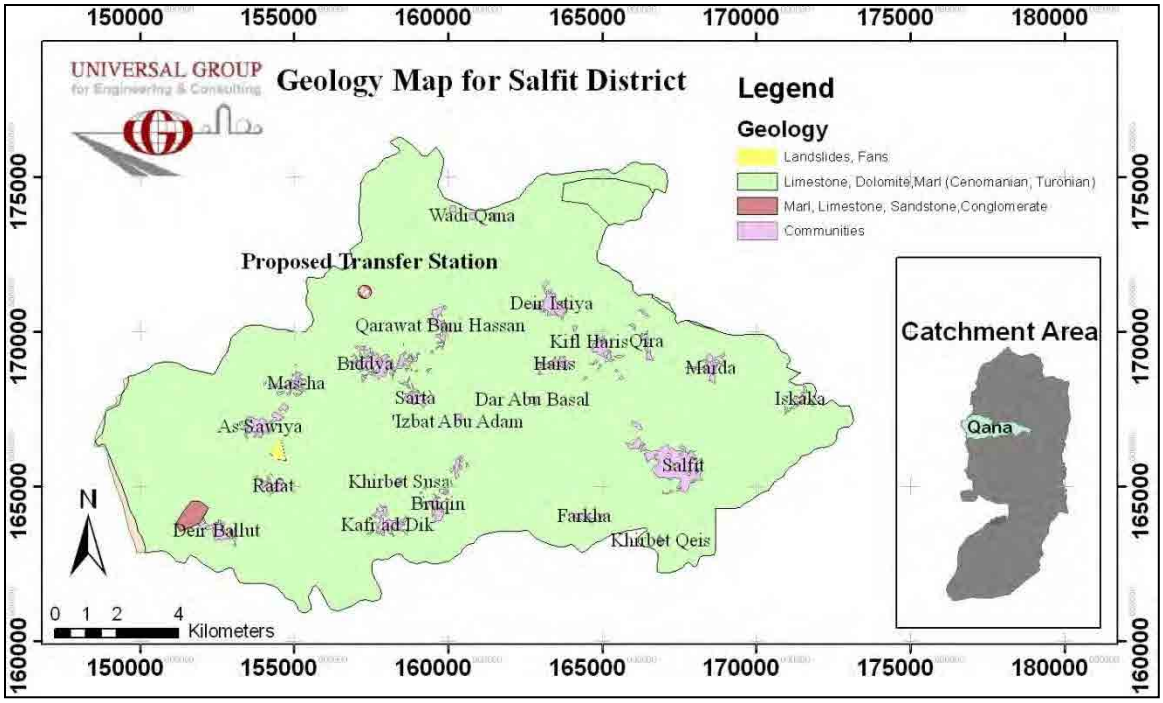


Figure 38: Geology Map of Salfit District

3.4.8 Soil

In general, soil in the study area is agricultural with low salinity. The soil thickness varies between the flat areas and hilly areas, whereas its thickness increases in flat area and decreases in hilly areas. The dominating soils in the study area are “Terra Rossa, and “Colluvial Alluvial”. A description of this soil type and other soils found in the area are described below. **Figure 39** show that the proposed site for Salfit transfer station falls mainly over Terra Rossa soil type.

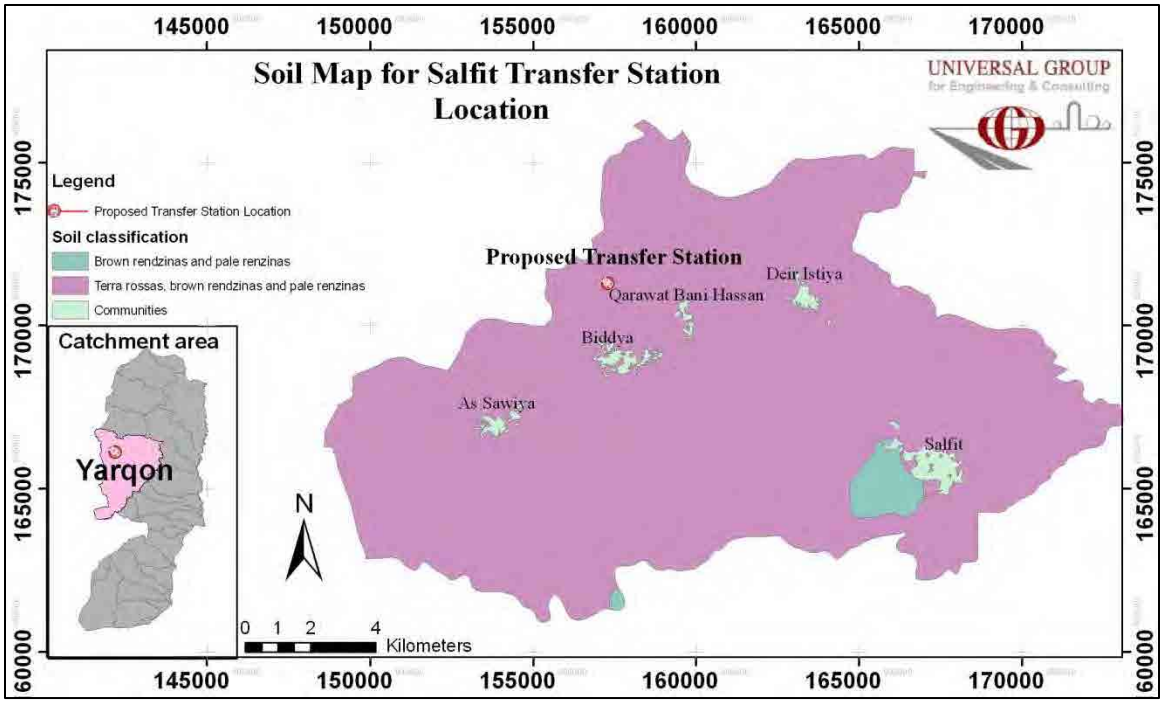


Figure 39: Soil Description For the proposed Salfit transfer station

- **Terra Rossa**

Terra Rossa is a type of red clay soil produced by the weathering of limestone. When limestone weathers, the clay contained in the rocks is left behind, along with any other non-soluble rock material. Under oxidizing conditions, when the soils are above the water table, iron oxide (rust) forms in the clay. This gives it a characteristic red to orange colour.

- **Colluvial Soil**

Colluvial soil consists of mixed deposits of rock fragments and soil materials accumulated at the bases of steep slopes through the influence of gravity. It holds only the extremely fine particles in suspension.

3.4.9 Water Resources and Groundwater Aquifers

There are 7 wells in Salfit district that serve the different community in the district. None of these are close to the proposed Salfit SWTS. The nearest well is more than 3.5 km away from the site (**Figure 40**).

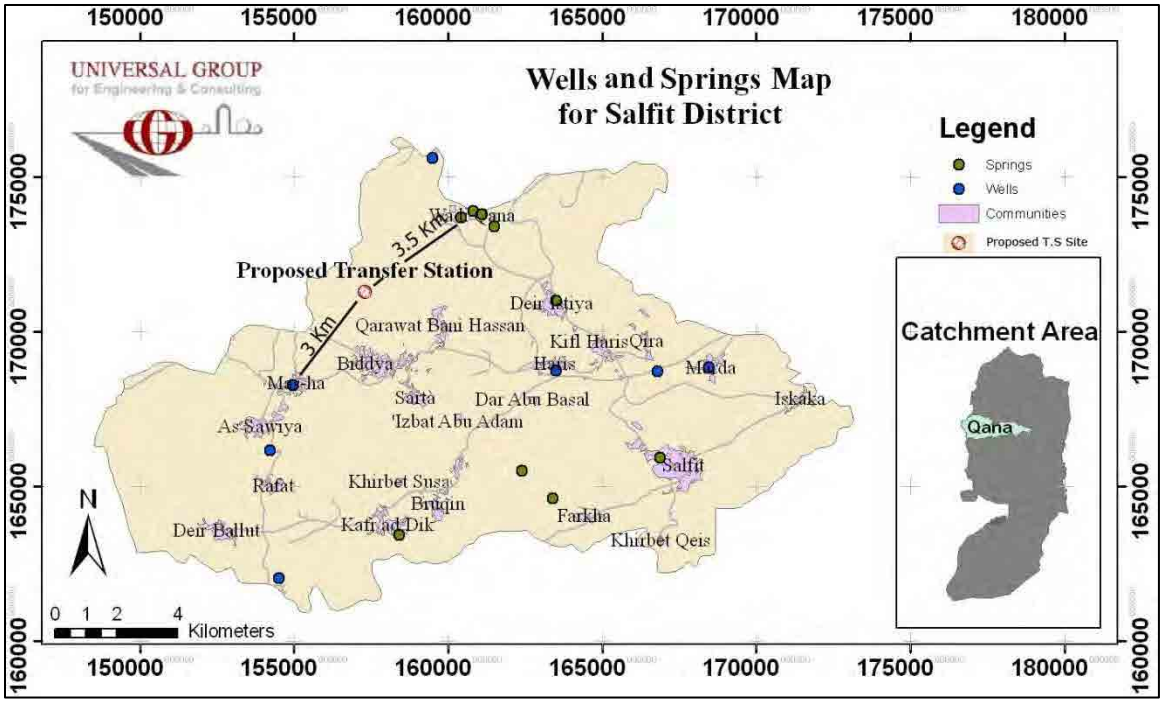


Figure 40: Wells, springs and roads within Salfit district

The most important aquifers in the project area are the Upper and Lower Aquifers. Turonian (Jerusalem) and Cenomanian (Bethlehem and Hebron).

- The Lower Aquifer

The Albian (Lower Beit Kahil Formation) and to a lesser extent the Albian (Upper Beit Kahil Formation) and sometimes the lower part of Yatta Formation form the Lower Aquifer, which is a deep confined aquifer across most the West Bank. It is a regional source of drinking water. Individual well yields across the West Bank range from 150-450 m3/hr. Well depths vary from 500 to 950 m. The high water bearing capacity and productivity is owed to the great thickness of dolomitic limestone and limestone. Water Quality in the in the Lower Aquifer is generally good.

- Turonian Aquifer

The Turonian Aquifer is part of the Upper Aquifer but can be classified as a distinct local aquifer if the formation beneath it acts as an aquitard (Upper Bethlehem) as is the case in some areas in the eastern and southern parts of the West Bank. The Turonian aquifer is

considered a fairly good aquifer especially where the saturation thickness is in tens of meters. The water quality of this aquifer is generally good but in some areas there is evidence of deterioration because of sewage and agro-chemical pollution.

3.4.10 Historical and Archeological Resources

There are no historical areas near the proposed Salfit SWTS site; most of them are more than 1.5 km far from the proposed location. The following is a description of most of the existing archaeological sites that are located around the proposed site.

Khirbet Hazema

The site is located to the south of Bedya city. It is old buildings that are not restored, and some old wells. The place contains cisterns in the rock, pottery rooms, and the remains of demolished dwellings and disposed for the most part in circular heaps round silos. Khirbet Hazma is located 2 km far from the proposed transfer station site.

Romanian pool

A pool of water date back to ancient Roman times, it has been rebuilt in the fifties of the previous century.

Maqam thu alkefl

This maqam consists of an old chamber. This structure was built of medium and large dressed stones covered with white plaster (**Figure 41**). It is located about 4 km southern the SWTS proposed site.

Figure 41: Maqam thu alkefl in Salfit

Qarawit bni Hassan

It is a small village that has some archaeological sites such as old Romanian buildings several Maqam. The village is located 2 km north of the proposed SWTS site.

Dir Istia

It is a small village that has a lot of archaeological sites such as an old Romanian irrigation system, and old city (**Figure 42**). The village is located 2 km north of the SWTS proposed site.

Figure 42: Romanian Acrckolgical building in Deir Istiy, Salfeet

3.5 Other General Baseline Data

3.5.1 Geopolitical Aspects

Oslo agreement between the Israelis and the Palestinians has classified the lands of the Palestinian Territories as A, B, or C. The Palestinian Authority (PA) has civil and security control only over area A and area C is totally under the control of the Israeli authorities. The civil affairs in area B, which extends outside the Palestinian cities and villages, are managed by the Palestinian Authority, while the security is kept in hands of Israel.

According to Article 12 for Environmental Protection of the Oslo II Agreement, powers and responsibilities in Area C in relation to environmental aspects including: sewage, solid waste, pesticides and hazardous substances, planning and zoning, air pollution, mining and quarrying and landscape preservation will be transferred gradually to Palestinian jurisdictions that will cover West Bank and Gaza Strip and that both sides shall ensure that a comprehensive Environmental Impact Assessment (EIA) shall be conducted for major development programs.

Up till today responsibilities over Area C have not been handed to the Palestinian Authority in the West Bank; and EIA reviews and approvals in Area C are still under the Israeli Civil Administration control. Experience has proven that such approvals for infrastructure project are very difficult to obtain and not promising for a near future improvement.

3.5.2 Hydrogeology and Rock Formations

Figure 43 is a geological cross section of the West Bank. The lithostratigraphical descriptions of various rock and aquifer formations are summarized according to their time sequence and are presented in **Figure 44**. It can be clearly seen form the stratigraphical and the cross-section that the West Bank mountains form the recharge area of the upper and lower aquifer basins. The rock formation of the lower aquifer outcrops at these mountains in Ramallah area where the rain drops infiltrate and recharge the aquifer. The excess rainwater generates the runoff flow in the wadies and infiltrates mostly to

recharge the upper and lower aquifers. Only few portions of the rainwater and the runoff (less than 9% on average) reach the sea.

Ramali formation (Neocomian)

The Ramali formation is comprised of gritty sandstone with occasional mud pellets but limits upwards towards the Beit Kahil formation. The formation is an excellent aquifer due to its poorly sorted and well jointed sandstone; however, it is restricted in outcrop. The sandstone comprises both softer and harder parts and various colours, such as brown, purple and at times red. The sandstone contacts basaltic volcanic intrusions assumed to be of Early Neocomian age. The thickness of the formation ranges between 130 m and 240 m in the different outcrops.

Lower Beit Kahil formation (Ka-LBK) (Albian)

According to Rofe and Raffety (1965), true limestone conditions developed later in the North and Northeast than in the South and Southwest, i.e., the Ramallah area. For Wadi Fara'a, in the northeast of the area, geologists report marl and shist in the lower part and sandy content except for the middle member. However, this could not be confirmed in other areas, i.e., at the wells west and south of Nablus. Rofe & Raffety, 1965, describe Lower Beit Kahil, as massively bedded at base at the outcrops and becoming increasingly thin, bedded and karstic towards the top. Additionally, Lower Beit Kahil is divided into LBK1 and LBK2.

Lower Beit Kahil One (LBK1)

This part of the LBK is dominated by finely dolomitic limestone, sometimes pure limestone, with very light to white colours. In places, dolomite locally replaces the limestone partly or completely, making the LBK appear buff to yellowish. No soft layers occur for at least 100 m. But the dolomite or limestone, though hard, can have some marly content. Smooth, not shiny, fracture surfaces are a typical feature. LBK1 is 180-190 m thick.

Lower Beit Kahil Two (LBK2)

In this part of the LBK, found near Nablus, the dolomitisation of the formation continues with dark grey and grey-brown, very hard, more massively bedded layers of coarse crystalline dolomite. South of Nablus, at the Audala well, some chert and marl is found in this upper, approximately 60 m thick, unit of the Lower Beit Kahil.

Upper Beit Kahil Formation (Ka - UBK) (Albian)

The most common rocks in this formation, dolomite and dolomitic limestone, are massively and thinly bedded. They are usually coarse crystalline but sometimes chalky. The formation becomes increasingly karstified upwards. It does not outcrop locally in Nablus but further east along the flanks of the Fara'a anticline. Its reported thickness is 120-220 m. Upper Beit Kahil is divided in an approximately 150 m-200 m thick lower member (UBK1) and a thinner or disappearing upper member (UBK2).

Upper Beit Kahil One (UBK1)

This section is dominated by sugary rock, often primarily dolomite, which is fine grained, and buff or grey in colour. Despite its fractured and karstic character, UBK1 is an intermediate to sometimes poor aquifer, due to the presence of marl and, as in the outcrops, chalk with clayey layers. Bands of marl or marly limestone and chert content, distributed in nodules rather than layers has been found in the boreholes close to Nablus City.

Upper Beit Kahil Two (UBK2)

While this section at times disappears, where it exists, it forms cliffs. The facies become more homogenous, with pure, hard dolomite, sometimes limestone, as the main component. The marl disappears upward but chert remains. Chalky content is reportedly found only in outcrops. Some limy layers contain oysters and rudists. The maximum thickness is around 50 m.

Yata Formation (Ka-Y) (lower Cenomanian)

The characteristic lithology of the Yatta formation is marly limestone interbedded with dolomistic limestone or dolomite. The dolomite and limestone usually appear in yellowish or brown colors, with a non-sugary grain fabric. Minor chert content, either nodular, lensoid or disseminated, is reportedly found in some locations. Besides this, some chalk, chalky marl, and marl are found throughout the formation but in high amounts at the base and at the top. Like the dolomite and limestone, marl appears in the lamination. The Yatta formation is divided into three sub-units:

- The Upper Yatta consists of a thin, impervious horizon of light yellowish brown and white marls interbedded with marly dolomite and limestone. Its thickness ranges from 5 to 15 m.
- The Middle Yatta is mostly carbonate, dolomite, limy dolomite and limestone layers alternating with marl horizons. Its thickness ranges from 40 to 50 m.
- The Lower Yatta's facies are chalk and marl. Its thickness ranges between 50 and 70 m.

Hebron Formation (Ka-H) (Upper Cenomanian)

The Hebron formation consists mainly of dolomite and limestone that is hard, coarsely or poorly bedded and non-fossiliferous. The top of the Hebron formation consists of dolomitic limestone that is hard, karstified and grey in colour, whereas the base of this formation consists of hard dolomite and dolomitic limestone with some silification. Brecciation is common throughout the formation, with limestone fragments embedded in dolomitic cement. Chert nodules are also common. Occurrence of chalk and marl has been reported at some outcrops and boreholes. The Hebron formation has a thickness of 105 to 260 m.

Bethlehem Formation (Ka-BL) (Upper Cenomanian)

The Bethlehem formation consists of limestone, dolomite with chalk, and marl massively bedded with a well-developed karst. Some parts with thin-bedded limestone are used for floor tiles. The dolomite forms a rugged morphology on general slopes. Southwest of Nablus, the formation consists of a chalky limestone with occasional marl beds towards

its top. This formation outcrops in the Fara'a Anticline, east of Nablus, and the Anabta Anticline, in wadi bottoms and hill tops to the west of Nablus. The thickness is 40 to 110 m. Bethlehem is divided as follows: The lower BL is missing or up to 20 m thick, whereas the upper BL can reach a thickness of more than 90 m, as in Tubbas area at the northern edge of the study area. Due to the facies changes from south to north, in the Nablus area the formation may be considered a vertical extension of the Hebron Formation. In this area, it has aquifer characteristics, whereas in the Jerusalem and Jericho areas, it is considered to be a confining unit.

Jerusalem Formation (Ka-Je) (Turonian)

The main body of formation is thinly bedded limestone, fine grained and uniform, sometimes dolomitic. It has a well-developed karst and forms cliff morphology. Its base is characterised by 2-3 m thick massive limestone resting on pink marl. This soft and reddish nodular limestone (with ammonites) is called Mizeh Ahmar and used as a building stone. The name applies to the middle member, a cliff forming limestone with rudists. Towards the top, chalk beds with occasional chert bands are common, and the formation is transitional to the facies above. However, in some areas, you find an upper sugary dolomitc limestone, Mizeh Helu, which is hard and forms an excellent building stone. The formation outcrops in the axial area of the Anabta anticline to the west of Nablus and in the Fara'a anticline to the east of Nablus. Its thickness is about 50 to 120 m.

Abu Dis Formation (Ka-N) (Senonian)

The Abu Dis formation consists mainly of massive chalk. It is fragmented and bedded in its lower portion, soft and unbedded in its upper portion. The undivided rocks of the Cretaceous-tertiary transition range from Senonian to Palaeocene in age. Chalk is the major component of this formation. It is sometimes interbedded with silicified limestone, hard phosphatic limestone, marl, chert and shales.

The Abu Dis formation contains the oldest rocks that outcrop in the vicinity of Nablus and Jenin cities. They consist mainly of chalk. The transition from the underlying Jerusalem Formation is rapid and occurs over a section of 25 m or less. The thickness of

the Abu Dis formation ranges from about 60 m to 430 m. The largest thickness is preserved in synclinal areas, with corresponding thinning of rocks in anticlinal areas.

Jenin subseries (Te-J) (Palaeocene and Eocene)

Outcrops occur primarily on the Qarn-Sartaba and Nablus synclines. Limestones are most common to the west along the Anabta anticline. The unit thickens northward and is more noticeable north of Wadi Fara'a. Its full thickness is unknown but exceeds 300m. Five different limestone and chalk facies can be distinguished: chalk with minor chert (k/T-c), chalk with minor interbedded nummulitic limestone, (Te-c/l), limestone with minor interbedded chalk, (Te-l/c), bedded massive nummulitic limestone, (Te-l) and reef limestone (Te-l).

Beida Formation (Te-B) (Neogene; Miocene-Pliocene)

The main outcrops lay in the areas of Wadi Fara'a, Wadi Malih, Bardala and near Beisan. The Beida formation mainly consists of conglomeritic rocks resting as a superficial mantle on earlier formations. The lenses of gravel and conglomerates pass into the marls and limestone. The conglomeratic lenses and margins form good aquifers, but the marly partings, found in the areas where deposits are thickest, act as a confining aquiclude. The thickness ranges from 0 to 400 m.

Quaternary (Qh-a) deposits

- Alluvium (Qha): Alluvial soils mainly form alongside the valleys and streambeds in the study area. The source of this soil is mainly derived from the adjacent rock formations. The thickness of these sediments reaches 10 m.
- Outwash Fans and Piedmont Cones: They occur where the valleys cross the abrupt changes of slope connected with the rift faulting. The Jordan Valley outwash fans build up and spread radially outwards, grading into alluvium. The gravel fans are important sites of groundwater transfer from limestone aquifers.
- Nari (Calcrate): Nari mainly occurs in high rainfall areas where carbonate rocks are dissolved by percolating water. The bicarbonate charged water returns back to the

surface by capillary action and (through evaporation) the carbonates deposit on the surface mixes with insoluble residues of the weathered rocks.

- Igneous rocks: Minor volcanic activity giving rise to agglomerates, tuffs, and basic lavas occurred between the time of deposition of the Malih and Ramali formations. The main exposures are found in both Wadi Fara'a and Wadi Malih. Four minor occurrences of basic igneous lava flows have been found in the upper Hebron, Bethlehem and lower Jerusalem formation rocks.

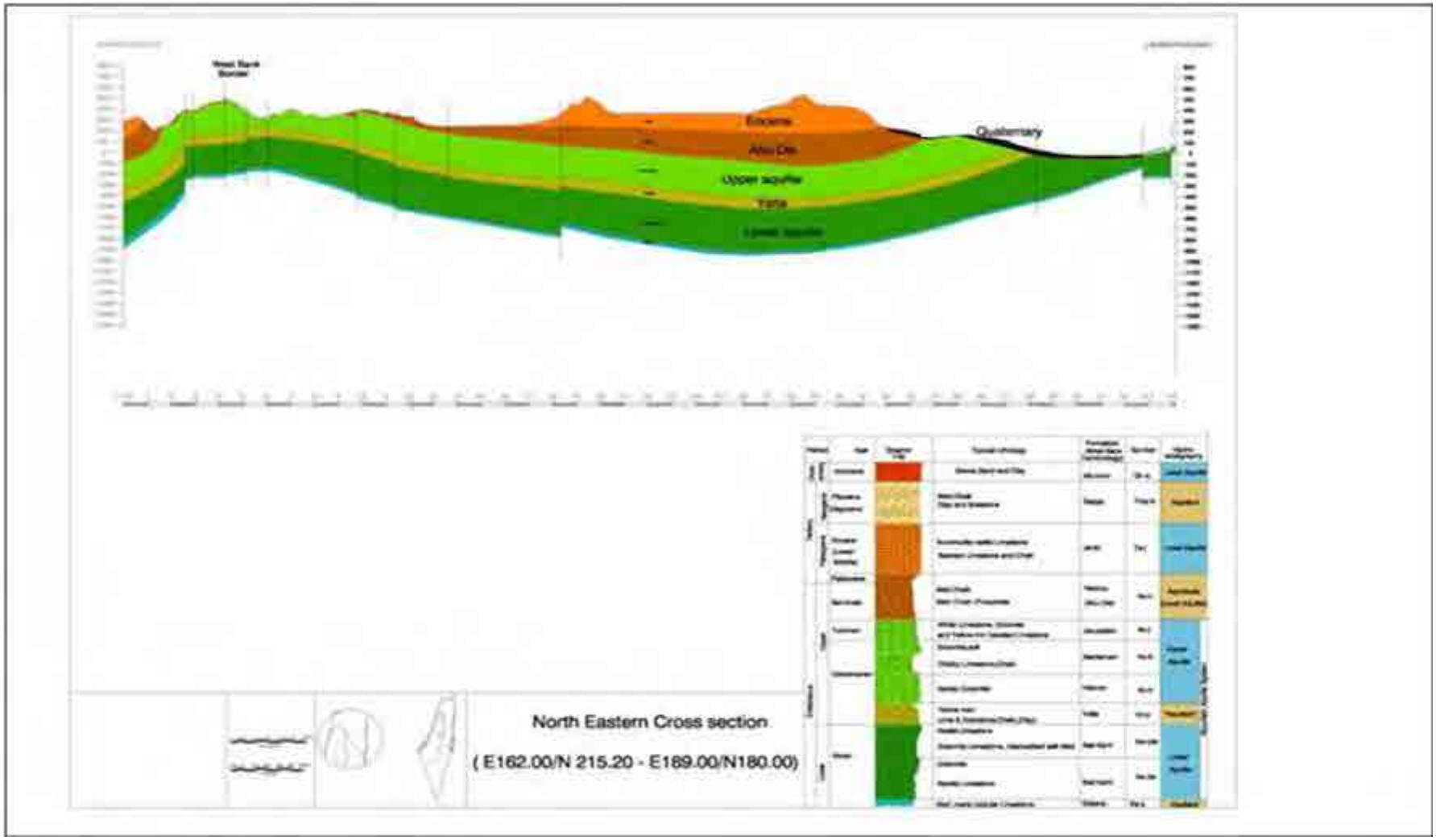


Figure 43: Geological Cross Section in the Northern West Bank

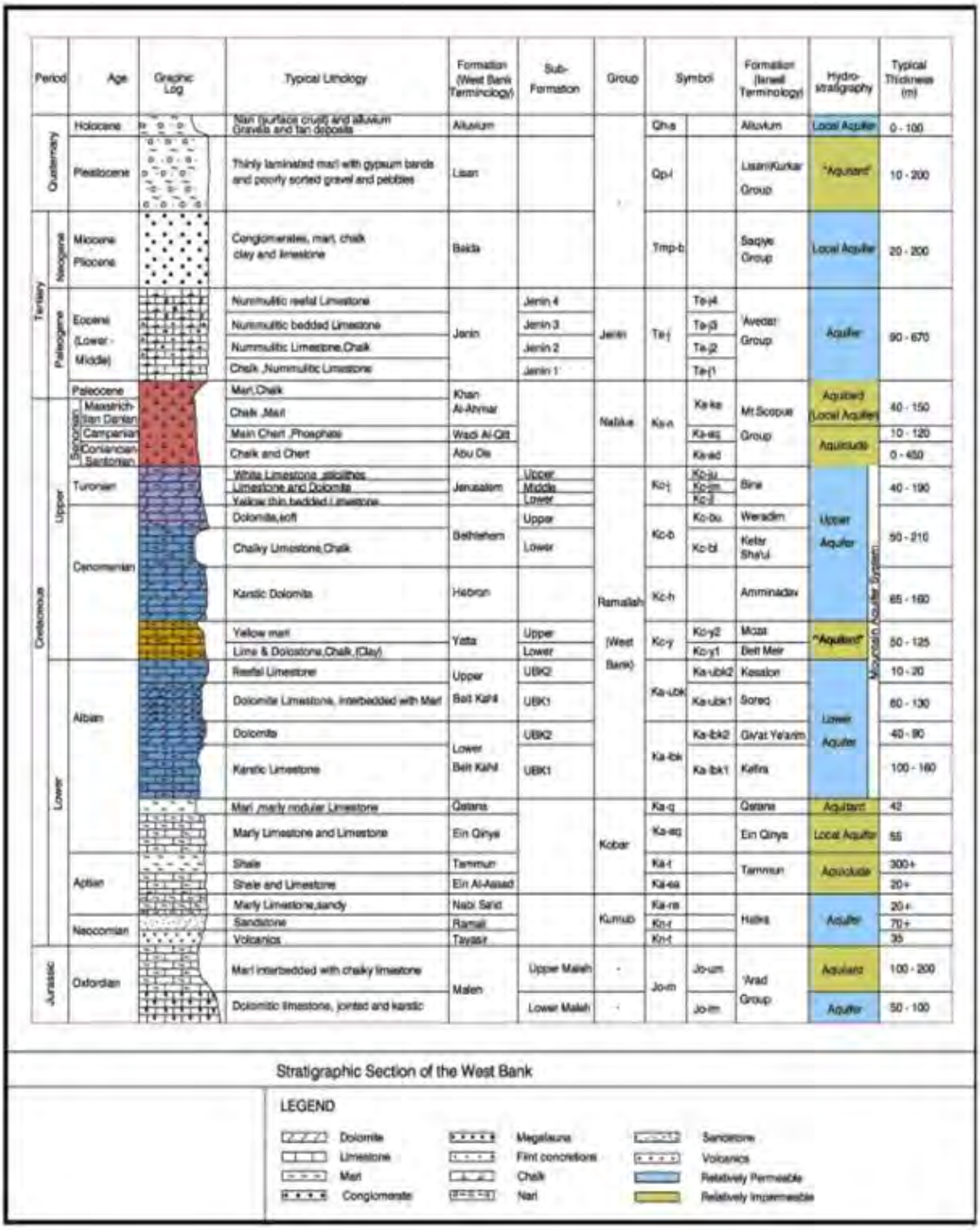


Figure 44: Stratigraphical Section of the West Bank

3.5.3 Wind Direction

The wind direction is a major concern for proposing the location of a waste facility. It should be taken into account that constructing the SWTS should avoid shifting the odors by the wind to the residential area and should avoid causing additional odour problem and air pollution. Special efforts and mitigations are required to reduce odour and air pollution from the proposed SWTSs, and regulations, monitoring and concentration measurements are required for this purpose. **Figure 45** presents the wind rose for the middle and northern West Bank districts covering Qalqilya, Salfit and Tubas. It indicates that most of the wind blows mainly from the west and south west. For Jericho the wind direction is north and northwestern.

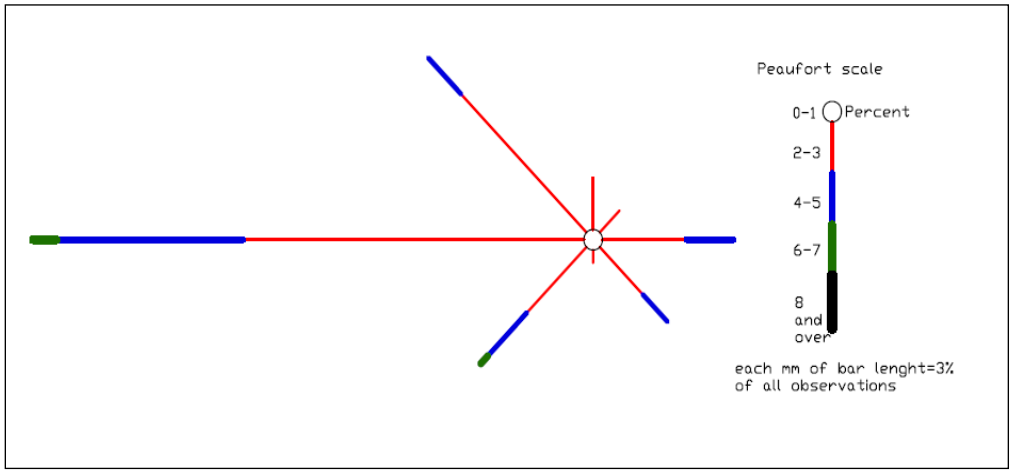


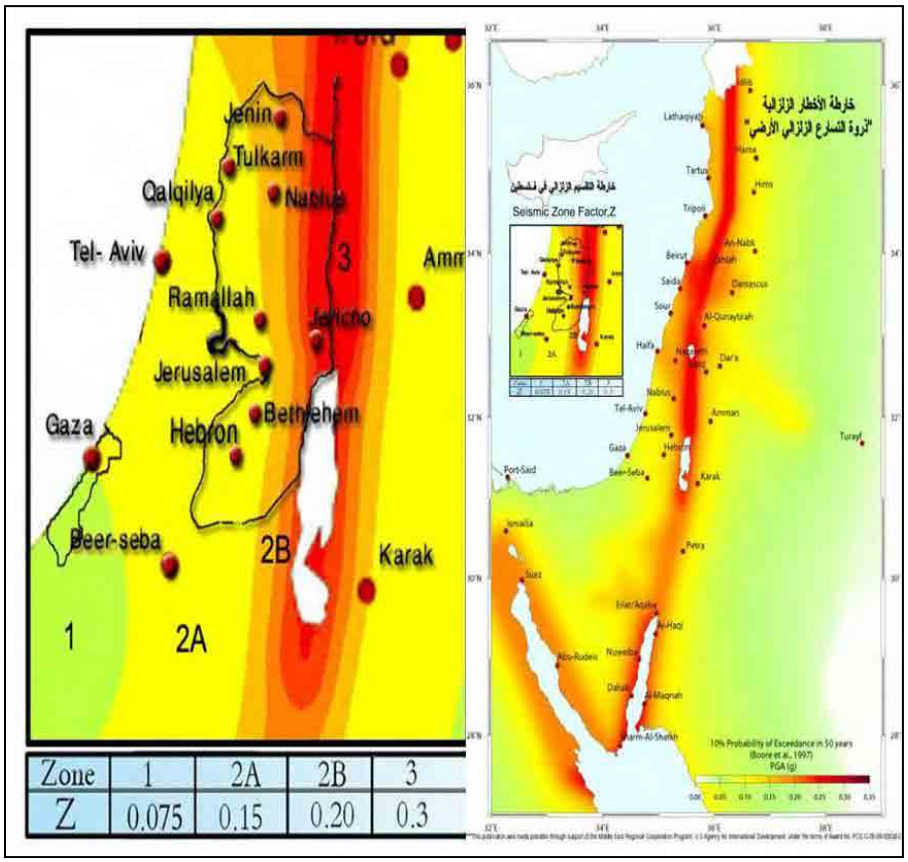
Figure 45: Wind Rose for middle and northern West Bank districts

3.5.4 Seismology

The Rift Valley in Palestine, is part of the regional Rift Valley which extends from the Gulf of Aden in the Red Sea to Al 'Aqaba Gulf and continues in Wadi Arabah, Dead Sea, in the Jordan Valley, Tiberius Lake and the Finger of Galilee up to Antakya in Turkey.

Palestine is located in what is described as a moderate active seismic zone with a Peak Ground Acceleration factor (PGA) of Z = 0.075 to Z = 0.3 on rocks. **Figure 46** shows the four different seismic zones that characterize Palestine ranging from a relatively weak Zone I in the south west, to a relatively strong zone of 6.5-7 on Richter scale in the east.

These figures have been estimated using the relation between the seismic gravitational acceleration and the Modified Mercally intensity scale including the seismic strength scale of Richter in addition to the relation between the seismic acceleration and the distance to the Epicenter distance.



Zone	1	2A	2B	3
Z	0.075	0.15	0.20	0.3

Figure 46: Seismic hazard map and seismic zone factor for building codes in Palestine

Tubas and Salfit are located within Zone 2B, which has a PGA factor Z of 0.2 according to the Uniform Building Code (UBC), whereas Jericho is located within Zone 3, which has a PGA factor Z of 0.30, which is considered the highest in the area. Qalqilya is located within 2A and has a PGA factor Z of 0.15, which is considered safer that the other three sites in terms of seismic activities.

4. ENVIRONMENTAL SCOPING

4.1 Scoping on Environmental assessment

The environmental assessment should be carried out in compliance to the requirements of PEAP. According to this policy solid waste transfer stations are not listed among those that require detailed EIA and are not likely to have significant adverse environmental impacts that are sensitive and diverse. This type of projects requires initial environmental examination IEE and the implementation of an Environmental Management Plan (EMP), which entails mitigation measures, institutional setup, monitoring plan, and training.

The IEE study should cover, but not limited to, the following:

1. Provide comprehensive description of the SWTS project components including using maps at appropriate scales when necessary.
2. Generate baseline data on relevant environmental characteristics of the project components area including description of physical environment, biological environment, and socio-economic and cultural constrains.
3. Outline and examine the pertinent regulations and standards governing environmental quality, health and safety, protection of sensitive areas, protection of water resources and pollution control, and land use control at the national and local level.
4. Identify and determine the potential positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts. The assessment of the potential impacts shall include, but not limited to, pollution of groundwater aquifer, landscape impacts of excavations and construction, loss of nature features habitats and species by construction and operation, soil contamination impacts, odor substances, noise pollution, and socio-economic and cultural impacts.
5. Prepare and develop management plan to mitigate the negative impacts, recommend feasible and cost effective measures to prevent or reduce significant negative impacts to acceptable national level.

6. Prepare a detailed plan to monitor the implementation of the mitigation measures and the impacts of the project during the construction and operation of project.

Table 8 presents, the most important Environmental items that are related to the construction of the SWTS. These are presented as per JICA Guidelines compared to the PA stakeholder considerations.

Table 8: Scoping table on Environmental items as per JICA Guidelines and stakeholder considerations

Category	Environmental Item	Main Check Items as per JICA Guidelines	Confirmation of Environmental Considerations (Stakeholders Recommendations and Reasons)
Permits and Explanation	EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	According to the PEAP, Waste Management one of the listed categories for a fully Detailed Environmental Impact Assessment, but not SWTS. Meeting with the Environment Quality Authority (EQA) representative in the EA Committee confirms the need of detailed consideration and study of environmental aspects. A number of these aspects were recommended and are included in this list. These recommendations do not substitute the official TOR and procedures of EIA and application for approval of a development. Environmental Approval Application must be submitted to Local EQA offices for each site.
	Explanation to the Local	(a) Have contents of the project and the potential impacts been adequately explained	(a) The following stakeholders have been visited and introduced to the scope of the project and the proposed

	Stakeholders	to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	locations: MoTA, MoA, EQA and MoLG. Attempts to meet with PWA but there was not possible. The visited stakeholders were informed of the possibility of further visits that is to introduce more details of the project when available. Ministry of Local Government highly recommended considering the allocation of transfer stations away from Area C. Jericho site may encounter such complication. Alternative sites need to be included by recommendation of the majority of interviewed stakeholders. (b)The Ministry of Agriculture representative highly recommended consulting and getting the approval of the land owners and farmers before project commencement and encourages cooperation with local councils. Should any farmer oppose the conversion of agricultural land for the proposed development, the MoA has "Vito" to reject the conversion of land use at the proposed site.
	Examination of	(a) Have alternative plans of the project been	Alternative sites need to be included by recommendation

	Alternatives	examined with social and environmental considerations?	of the majority of interviewed stakeholders. EQA stated bluntly that lack of presentation of location alternatives and clear explanation of reasons to choose the proposed sites may lead to project rejection by EA committee.
Pollution Control	Air Quality	(a) Do air pollutants, such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust, and dioxins emitted from various sources, such as incinerators, and vehicles used for waste collection and transportation comply with the country's emission standards and ambient air quality standards?	Inventory of Joint Service Council is being studied and needs assessment for needed equipment is being conducting as stated by the MoLG. Considerations for Air pollution need to be presented as recommended by the EQA representative.
	Water Quality	(a) Do effluents from various facilities comply with the country's effluent standards and ambient water quality standards? (b) Does the water quality of leachates from the waste disposal sites comply with the country's effluent standards and ambient water quality standards? (c) Are adequate measures taken to prevent contamination of surface water and groundwater by these effluents and	(a) Issue must be addressed as per EQA recommendation. Time of storage needs to be presented, as well as estimation of produced leachate, and means of dealing with leachate. Storm water system must be placed for rainwater discharge and prevention of pooling. (b) MoA highly recommended paying attention to groundwater in Jericho especially given the fact of the very shallow and adjacent recharge area, as well as the abundance of agricultural wells in the area. MoA was

		leachates?	given the coordinates of the proposed sites and will be looking deeper about suitability of the locations. (c) Majority of stakeholders emphasized on setting clear mitigation measures as well as a coherent Environmental Management and Monitoring Plan that considers water resources.
	Wastes	(a) Are wastes, such as treatment residues, cinder, and fly ash generated from crushing and segregation processes, and diverted wastes from composting process properly treated and disposed of in accordance with the country's regulations? (b) Are hazardous and dangerous wastes properly segregated from other wastes, stabilized, treated, and disposed of in accordance with the country's standards?	(a) Considerations for waste separation reuse and recycling on site of the proposed transfer stations are encouraged. Organic waste separation in attempt for commercial compost production must be in complete cooperation and involvement with MoA in order to insure compliance with national standards and regulations that govern soil protection and safety of consumers. (b) As per EQA recommendation Hazardous material and waste shall directly be transported to sanitary landfills where it is readily designed to handle such material rather than inappropriate handling in transfer stations.
	Soil Contamination	(a) Are adequate measures taken to prevent contamination of soil and groundwater by	(a) MoA highly recommends compliance to standards in construction of transfer stations. Prevention of soil

		leachates from the waste disposal sites?	contamination and groundwater is a top priority. Any attempts for the utilization of waste as a source to produce compost must involve the MoA as to insure appropriate standards for application on soils in the area as well as safety of crops consumption.
	Noise and Vibration	(a) Do noise and vibrations generated by the facility operations (especially incinerators, waste segregation and crushing facilities), and vehicle traffic for waste collection and transportation comply with the country's standards?	(a) Not a major impact from the project, except for the noise from collection and transportation vehicles, which could be mitigated by continuous maintenance and design of appropriate routes in the out risks of urban areas. The majority if stakeholders emphasized on carefully choosing transportation routes.
	Odor	(a) Are adequate odor control measures taken?	(a) Considerations for Odor to be presented as recommended by EQA representative
Natural Environment	Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) Highly recommended to consider by stakeholders. MoA to provide soon information about distances of proposed locations to designated areas, if any.
	Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs,	Wildlife and biodiversity are highly recommended to consider by stakeholders. Proposed transfer stations shall not interfere in the harmony and balance between

		mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the project will adversely affect aquatic organisms? If impacts are anticipated, are adequate measures taken to reduce the impacts on aquatic organisms? (e) Is there a possibility that the project will adversely affect vegetation and wildlife? If impacts are anticipated, are adequate measures taken to reduce the impacts on vegetation and wildlife?	natural resources and wildlife existence, including both flora and fauna. Area of proposed project to be scanned and carefully surveyed to confirm significance of any potential impact on wildlife habitat

Social Environment	Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socio-economic studies on resettlement? (d) Is the compensations going to be paid prior to the resettlement? (e) Is the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic	Not applicable to the proposed project.

		minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	
	Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?(b) Are considerations given to the existing recovery systems, including waste pickers? (c) Is there a possibility that waste transportation will adversely affect the regional traffic? (d) Is there a possibility that effluents from the project and leachates form	All aspects relevant to living conditions will be considered

		the waste disposal sites will adversely affect fisheries and other water uses by local inhabitants (especially drinking water)? (e) Is there a possibility that pathologic insects or other disease vectors will breed as a result of the project?	
	Heritage	Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	MoTA made an initial scan against the map of designated cultural and historical sites. There are no particular significant sites adjacent to the proposed locations of the four transfer stations. Further investigation will be conducted using the provided coordinates and shall reveal the need for field survey.
	Landscape	Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	Landscaping and intrinsic value of the area shall be considered during the design and construction. Green belts are recommended surrounding the proposed sites
	Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land	Not applicable to proposed project.

		and resources respected?	
	Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) Ministry of Labor (MoL) recommends binding to Palestinian Labor Law. Safe working environment during construction and operation shall be maintained.

Others	Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	To be clarified within a comprehensive EMP as recommended by majority of stakeholders
	Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements	To be clarified within a comprehensive EMP as recommended by majority of stakeholders

		pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	

4.2 Scoping on the proposed SWTS sites

The four different sites are proposed to be constructed as SWTS as to enhance the capacity on solid waste management in the West Bank. These are located in Tubas, Jericho, Qalqilya and Salfit governorates. **Table 9** compares the four sites in terms of the environmental scoping and the different environmental impacts. In terms of the suitability of the site, Jericho site is adjacent to the operating landfill and Safilt site is used as a random dumpsite. For Tubas site, an application for allocating the site as a SWST has been submitted and is under review. For Qalqilya site, the land is allocated by Qalqilya municipality for the JSC in-charge of the solid waste management in Qalqilya.

Table 9: Comparison of Scoping on the four SWTS site

Environmental Element	Tubas	Jericho	Qalqilya	Salfit	Comments
Location as to Oslo Agreement	A	A	B	C	Will face problems in approving Salfit by the Israeli authorities.
Population 2011	0191,4	46,718	100,012	64,615	Total 267,989 about 13% of West Bank
Land use	Agricultural	Sanitary landfill	Bare land	Dumpsite	The most problem is Qalqilya
Wind Direction	West and Southwestern	North and northwestern	West and Southwestern	West and Southwestern	Consider wind directions for odour
Nearest Well	3 km	0.5 km	1.5 km	3.5 km	All far enough except Jericho.
Nearest Facility	Agricultural trees and areas	Jericho Sanitary landfill	Chicken farm	Grazing areas	Qalqilya site has to consider the nearby chicken

					farm
Traffic and accessibility	Dirt road from main road	Main road leading to the landfill	Adjacent to main road	Dirt road from main road	Access roads to be paved and maintained
Groundwater vulnerability	Sensitive	Sensitive	Less sensitive	Less sensitive	Require further assessment
Seismology	Zone 2B, PGA 0.2	Zone 3 PGA 0.3	Zone 2A PGA 0.15	Zone 2B, PGA 0.2	Highest is Jericho

4.3 Scoping on Possible Impacts

Potential environmental impacts likely to occur during construction phase of the SWTS are (i) nuisance to people in surrounding of site due to dust /noise /smoke generated by the movement of vehicles /machinery which will be mitigated by regular air testing, vehicle noise and smoke tests; (ii) pollution due to wastewater and waste from the contractor's camp which will be mitigated by providing adequate arrangement for the safe disposal of wastewater and waste; (iii) health and safety of workers which will be mitigated by proper training of contractor's crew about First Aid and Health & Safety procedures; and (iv) accident hazards for people, which will be mitigated regulating the procurement of material.

During operation phase, potential environment impacts are related to (i) odor, littering, and groundwater pollution through leachate and (ii) chance of accident at SWTS or health problem of operator staff and labor. To mitigate this impact, construction labor and staff will be trained on the handling/storage of material and safety requirements.

Table 10 lists the possible impacts during construction and operation of the SWTS.

The other social issues associated with the construction of the SWTS include:

1) Permanent land acquisition for construction of the proposed SWTS.
2) Appropriately locating temporary construction camps and waste disposal sites and the social impact of operating these facilities.

3) Minimizing the impact on cultural sites or structures and community-owned assets during construction and operation.
4) Ensuring traffic safety during construction and operation.
5) Job creation and labour safety.

Table 10: Possible Impact Effects during Construction and Operation of the SWTS

Significant	Cause	Impact
CONSTRUCTION PHASE		
Short term	Resulting from construction activities and truck traffic	Noise and dust
Short term	Resulting from construction activities, land reclamation	Construction waste
Long term	Biodiversity land reclamation and construction activities leading to the destruction of the natural ecosystem at the facility site	the natural ecosystem at the facility site
OPERATION PHASE		
Long term	Light fraction of waste carried by winds	Litter
Short term	Waste trucks coming and leaving the facility thus generating foul odors and noise.	Odour and noise
Long term	potential leachate generated, uncontrolled drainage, and improper storage and receiving areas	Natural resources and soil Contamination

IMPACT ON BIODIVERSITY	**IMPACT**
Construction works	Habitat loss or destruction
Soil compaction, erosion	Altered abiotic/site factors
Destruction of vegetation	Mortality of individuals
Habitat removal and/or introduction of barriers	Habitat fragmentation
Due to construction noise, traffic, presence of people, etc.	Disturbance

4.4 Scoping on Mitigation Measures

In order to eliminate or reduce potential negative environmental impacts, mitigation measures are typically recommended to prevent the impacts associated with operation of the transfer stations. Mitigation measures are highly dependent on the significance of the predicted impact, the nature of the impact or the phase of the project (construction versus operation).

Table 11 lists the potential impacts and the recommended mitigation measures to be further tackled by the environmental assessment.

Table 11: Environmental Management during Construction and Operation of the SWTS

Potential Impact	Recommended Mitigation Measures	Which site?
Impact of Excavated Soil	Allocate adequate areas for spoil storage in the final design	All the four sites
	Ensure that the spoil will not cause un-favored changes to surface water drainage	All the four sites
Affecting air Quality by Air Emissions of Construction Works	Plantation of wind breaks at the borders of SWTS	Qalqilya and Tubas
	Spoil of soil to be reused should be stored	All the four sites
	Pavement of access road	Tubas and Salfit
	Washing of trucks wheels before leaving the site	All the four sites
Noise Impact	Noisy equipment should be supplied with adequate silencers	All the four sites
	Optimize the use of noisy machines	All the four sites
	Use acoustic barriers as necessary if complaints from neighbors were received	Qalailya site
	Construction and operations of the SWTS should be stopped during right	Qalqilya, Salfit. and Tubas
	Plantation of wind breaks	Qalqilya and Tubas
Odour Impact	Apply waste transfer plan in the project design	All the four sites
	Implement the design unloading procedures of the transfer station through a waste hopper	All the four sites
	Provide additional waste containers at the transfer station to ensure smooth operation and reduce vehicles waiting time	All the four sites
	Recommend to provide a roof to avoid the dispersion of odour	Qalqilya and Tubas
Impacts of	Include Leachate collection system in the	All the four sites

Leachate and Surface Water	design and tender documents.	
	Implement preventive maintenance schedule for the SWTS	All the four sites
	Transfer stations should have adequate roofs to prevent rain water from getting to the waste	Qalqilya, Salfit, and Tubas
Risks of Hazardous Wastes	Coordinate with planning authorities and the donor community to initiate a project for hazardous waste management	General
	Provide hazardous waste training to staff working in the project	All the four sites
	Flammable and explosive waste should be prevented from admission	All the four sites
	Prepare an emergency response plan for spill or fires	All the four sites
Risks on Public Health	Provide hygiene training to the staff working in the project and provide suitable showers, washing and cleansing facilities	All the four sites
	Prevention of unauthorized admission to the SWTS	All the four sites
	Effective application of the waste transfer plan	All the four sites
	Apply pesticide as needed through an application plan that would give preference to biological pesticide.	All the four sites
Visual Impact	Active waste area to be surrounded by a screen fence to prevent littering dispersion.	All the four sites
Affecting Air Quality by Vehicles Emissions	Implement preventive maintenance program for vehicles working in the project and promptly repair vehicles with visibly high exhaust	All the four sites

Impacts of Construction and Operation Waste other than Excavated Soil	Hazardous waste should be segregated and sent to a hazardous waste facility, if existing, or to a special facility	All the four sites
	Other non hazardous waste to be collected and transferred	All the four sites
	Sewage and wheels washing water should be collected and properly disposed and treated (septic tank)	All the four sites
Risks of Unforeseen Exceeding of SWTS Capacity	If SWTS capacity monitoring has shown rapid overloading, early modification and planning for station operation and expansion should be initiated	All the four sites
Risks of Damaging Chance-find Antiquities	In case of chance-find the excavation should be stopped, the Ministry of Tourism and Antiquities (MoTA) should be informed	All the four sites
Biodiversity	The facility should not destroy any sensitive habitat or species. However, if detected, sensitive species or habitats should be conserved. Furthermore, the facility and surrounding area should be kept clean, and the landscape plan properly implemented.	All the four sites

Further to the above listed impacts and mitigation measures, further considerations should be given to the following two main environmental elements:

Litter and Odour

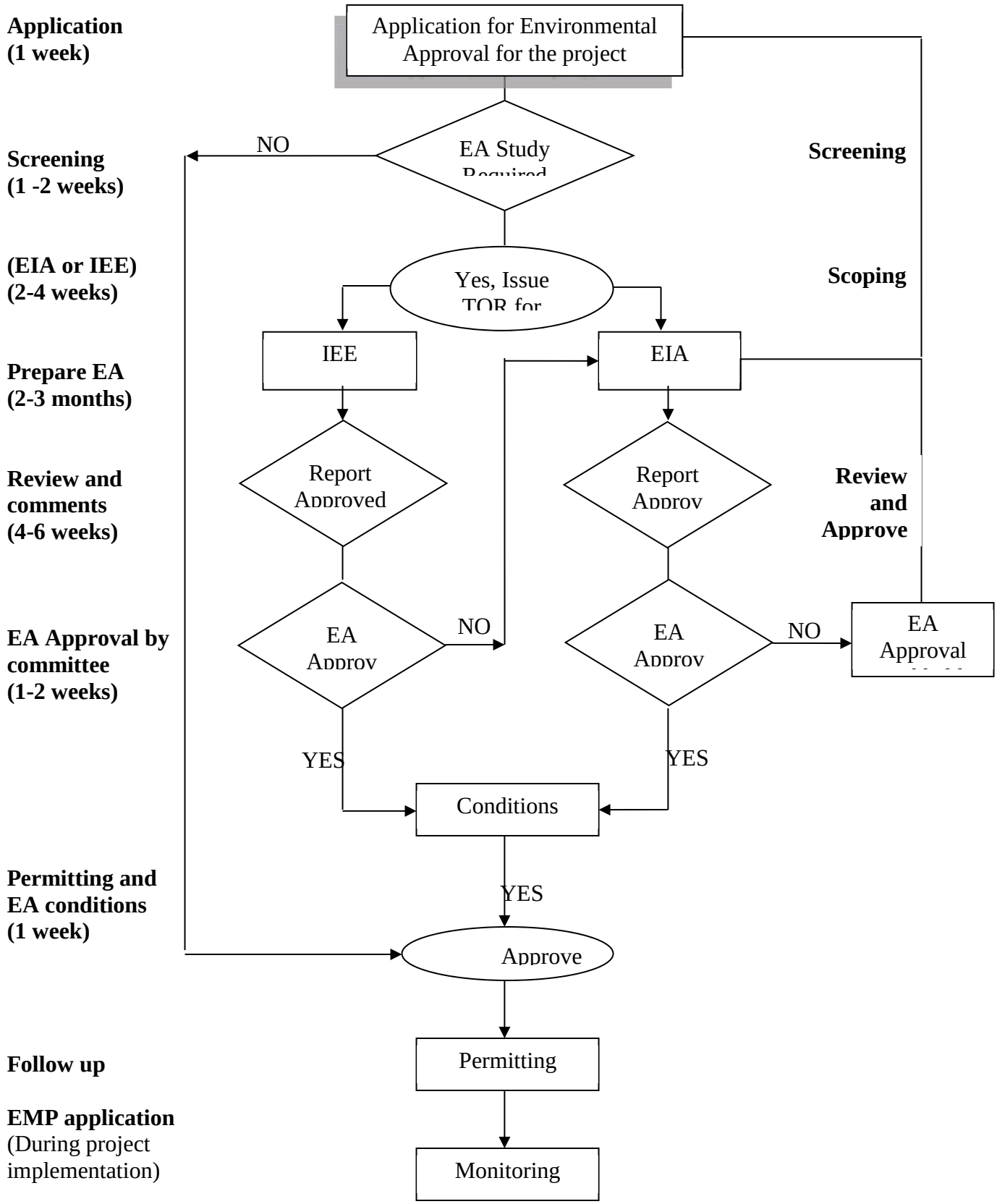
To prevent the contamination of the surrounding area by the light fraction of waste (paper and plastic bags) transported by winds, the unloading area should be designed as a depression pit, and all storage and receiving areas should be closed, which will also reduce the dispersion of odours. Furthermore, appropriate fencing (3 m and 25 mm net) around the facility area will catch any transported waste.

Natural Resources Contamination

All the facility, especially the storage and receiving areas should be paved with an impermeable floor structure. Furthermore, an effective drainage system must be established for leachate and storm water collection and management. Storm water and runoff should be diverted to avoid any contact with the waste or the compost in case encountered.

ANNEX A: ADMINISTRATIVE PROCEDURE FOR ENVIRONMENTAL APPROVAL

The following flowchart illustrates the administrative procedure for the Environmental Approval and for the preparation and review of the Environmental Assessment reports of a project. It also estimates the time requirement for each step.


Application
(1 week)
Application for Environmental Approval for the project
Screening
(1 -2 weeks)
NO
EA Study Required
Screening
(EIA or IEE)
(2-4 weeks)
Yes, Issue TOR for
Scoping
Prepare EA
(2-3 months)
IEE
EIA
Review and comments
(4-6 weeks)
Report Approved
Report Approv
Review and Approve
EA Approval by committee
(1-2 weeks)
EA Approv
NO
EA Approv
NO
EA Approval
YES
YES
Conditions
Permitting and EA conditions
(1 week)
YES
Approve
Follow up
Permitting
EMP application
(During project implementation)
Monitoring
Total = 6-10 months

ANNEX B: ADMINISTRATIVE PROCEDURE FOR LAND ACQUISITION AND EXPROPRIATION

Disclosure and informing the public (2-6 weeks)

1. The municipality and/or the Local Government Unit (LGU) advertise in the official newspapers that it intends to expropriate the specific land parcel for a specific public benefit. The advertisement should be for 15 days and objections should be accepted during this period.
2. The land owners and the public have the right to object in writing during the 15 days period.
3. The LGU has to reply in writing to the people and the reply has to be clear and specific

Application

4. After informing the public and replying to any objection and clarification, the LGU can apply to the Ministerial Cabinet asking for approving the acquisition and expropriation of the land parcels. The application should clarify the purpose of the acquisition and provide any necessary maps and documents.
5. The Ministerial Cabinet issues the decree and raises it to the Presidential office for accreditation.

The decree does not trigger the right of the LGU to expropriate 25% of the land with zero compensation for the purpose of land parceling as to allocate these 25% for public services.

6. The decree is published in the official Gazette. Then the land parcel is expropriated for the specific purpose and the owners are eligible for compensation.

This may take few months depending on the Cabinet and President agenda

Compensation

7. The LGU then pays the compensation to the land owners. The payments can be at installments.

8. The Land Valuation Committee (LVC) consisting of the officer of land registration, representative of the Ministry of Finance, representative of the Ministry of Local Government and three independent experts, agree on the value of the land and the compensation amounts.
9. If the land owner did not agree on the amount of the compensation, he can oppose the price to the court.
10. If any of the owners refuse to receive the compensation, the LGU can install the payments in a special account at the court treasurer at the names of the owners.

This may take few months depending of the LVC agenda

Registration

11. After the payment of the compensation amounts is paid and/or installed as the specific account, then the LGU can inform the land registration officer to mark the land parcel.
12. Then the land documents are marked as expropriated.

Total estimated period of the whole process is 10-15 months.

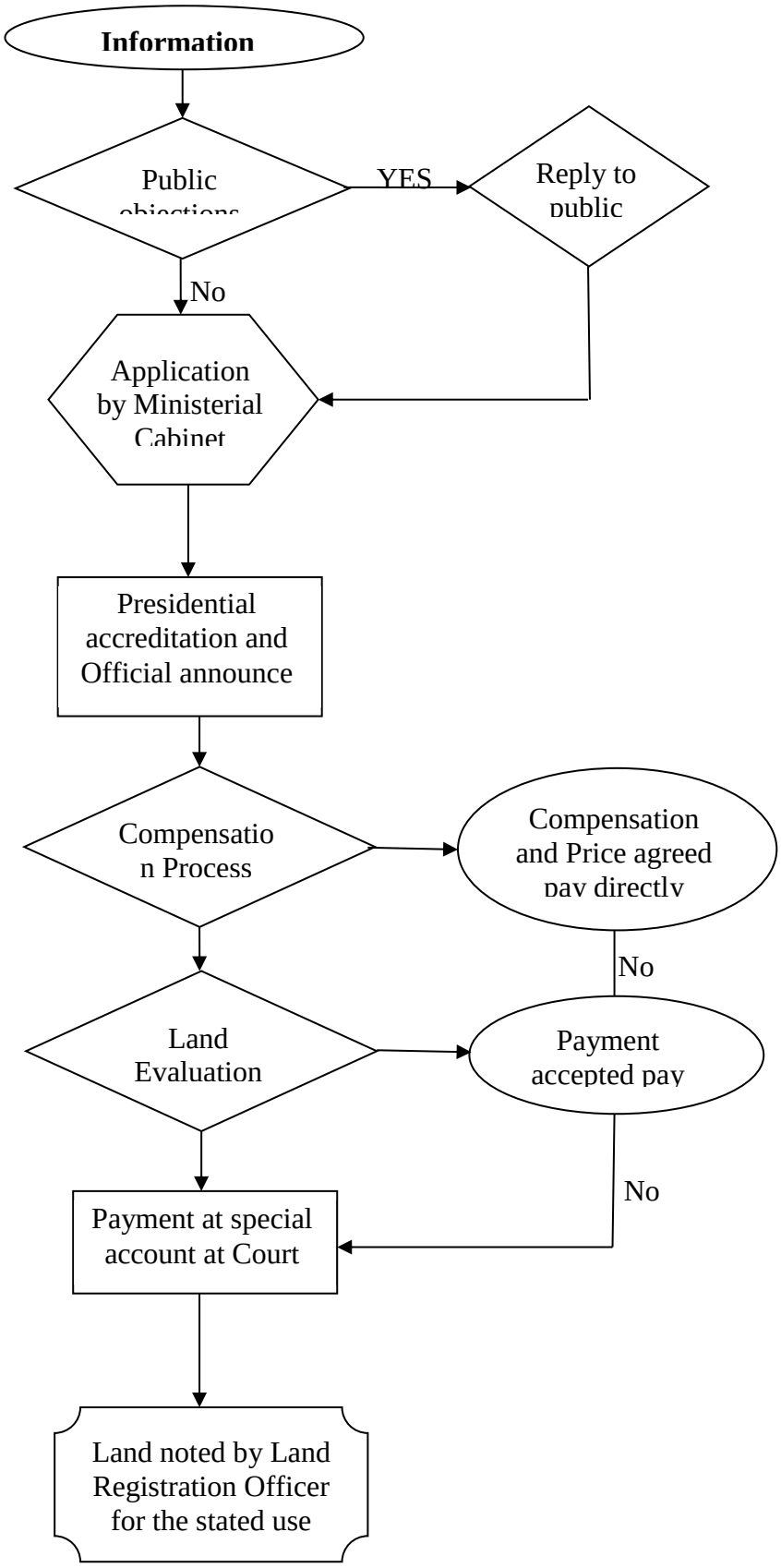
After 7 years of not using the land parcel for the specific announced use, then the land owners has the right to claim the land back.

Land Acquisition and Expropriation

- Informing the public by advertisements properly in the newspapers (15 days)
- Public can object in writing
- LGU has to reply in writing (15 days)
- Application by Ministerial Cabinet for specific use (1 week)
- Decree meet and accredited (Variable 2-3 months)
- Compensation is made directly to the owners if accepted (Variable)
- Price estimation by an official committee if compensation and price is not agreed (Variable 2-4 weeks)
- Open of special account in the names of the owners by the court treasurer (1 week)

Land is marked as acquisitioned and expropriated

Total: 4-6 months



ANNEX C: ADMINISTRATIVE PROCEDURE FOR LAND PARCELING AND CHANGE OF LAND USE

Application (2-4 weeks)

1. The application is submitted to the MoLG and should include appropriate documents and survey maps stamped by a licensed (accredited) surveyor. The surveying office should be registered and his tax file is clear.
2. The survey plans should be stamped by the local offices of the Palestinian Land Authority and the Ministry of Tourism and Antiquates (MoTA).
3. The application should be signed by the Municipality and/or LGU as appropriate and a heading letter is addressed to the MoLG.
4. If the land is not registered by the land registration office (Taboo), then the approval of all owners and neighbors of the land should be obtained. Their ID numbers and signatures should be on the plans.
5. If the land is registered by the land registration office, then the registration documents and the approval of all the other land owners in writing should be obtained.
6. For parceling only the "No objection" of 51% of the land owners is considered sufficient for proceeding with the process of parceling.
7. In case the land is leased; the "No objection" of the owner in writing and the Lease contract should be presented.

Official approvals (1-2 weeks)

8. The documents are sent to the different ministries to get their "No Objection"; Ministry of Agriculture, Ministry of Health, Ministry of national Economy, and Environment Quality Authority.

Information disclosure (2-3 months)

9. The MoLG has then to announce the subject open to the public for objections for two months.

10. The public has the right to object in writing against the change of the land use and/or parceling.
11. The municipality and/or the LGU must reply in writing to any objection.

Approval (variable 2-4 weeks)

12. After the settlement of all objections, then a recommendation is raised by the MoLG to the Higher Planning Council (HPC) to approve the land use change
13. After the Approval of the HPC is meeting, it should be announced for two weeks in the newspapers before implementation actions are taken.

Total is 4-6 months

ANNEX D: TERMS OF REFERENCE FOR EA

Project	Solid Waste Transfer Station
Proponent	
Contact Person	
Application Date	

1. GENERAL REQUIREMENTS

Waste Transfer Stations are facilities where municipal solid waste is unloaded from collection vehicles and briefly held while it is reloaded onto larger long distance transport vehicles for shipment to sanitary landfills or other treatment or disposal facilities.

These terms of reference (TOR) for an Environmental Assessment (EA) apply to the solid waste transfer station project as described in the Proponent's Application for Environmental Approval. The TOR need to be approved by the Palestinian Environment Quality Authority (EQA).

The EA shall be carried out in conformity with requirements of the *Palestinian Environmental Assessment Policy (PEAP)*, and with the *General Guidelines for Environmental Assessment* published by EQA.

The EA shall be a comprehensive evaluation of environmental impacts of the Project. Its main purposes are:

1) Assist the Proponent in planning the Project, and
2) Provide EQA with the information it needs to consider granting Environmental Approval.

The EA describes the environmental planning of the Project and what features are incorporated to mitigate adverse impacts and capture potential benefits. It shall include an analysis of the severity and significance of impacts and benefits, especially for individuals and communities directly affected by the project. It shall also provide an Environmental Management Plan (EMP).

2. SCOPE OF THE EVALUATION

The EA shall focus on addressing key issues important to:

i) improved Project planning and design;
ii) the local community;
iii) the EQA in considering Environmental Approval; and
iv) permitting and licensing authorities in considering the issuing of permits required for the Project to proceed.

Valued environmental components (VECs) which must be considered during the EA are indicated with a check mark (√) (section 7). The EIA shall assess project compliance with relevant local, district, regional and national land use and

development policies, plans and programmes, and with relevant regulatory standards. The EIA shall address all direct, indirect, and cumulative as well as transboundary impacts on the VECs.

3. ENVIRONMENTAL PLANNING

The EA is expected to contribute positively and significantly to the planning and design of the Project. The EA Report shall document how environmental factors were incorporated into Project planning and design, and what the results were. The Proponent shall pay particular attention to the need to:

i) consider alternatives in planning and designing the Project; and
ii) develop an Environmental Management Plan (EMP).

4. STAKEHOLDER CONSULTATION

In undertaking the EA, the Proponent shall consult with relevant local, district and national government agencies to ensure that their concerns, interests and regulatory requirements are adequately reflected in the EA strategy and report. The purposes of consultation are:

1. To inform the public of all issues and concerns related to the project;
2. To determine public concerns.
3. To specify project performance standards to be met;
4. To collect data, information or local knowledge;
5. To avoid future conflicts with affected or concerned stakeholders; and
6. To mitigate public environmental concerns.

Without limiting the scope of these consultations, a preliminary list of these agencies includes:

1. The site and neighborhood land owners.
2. The surrounding local government units
3. Public institutions in the area.
4. The Palestinian ministries of:
    - Agriculture
    - Transportation
    - Labor
    - Health
    - Local Government
    - Housing and Public Works
    - Water Authority
    - National Economy
    - Tourism and Antiquities.
    - Other stakeholders the consultant finds that they are affected by the project.

The significance of all issues and concerns mentioned in this TOR or presented during public consultations should be examined based on clear environmental criteria.

5. MINIMUM EIA REPORT REQUIREMENTS

The EIA Report must contain at least:

i) Non-technical executive summary;
ii) An introduction to the project, the proponent, and the EA strategy;
iii) A summary of stakeholder and public consultations about the project;
iv) Baseline conditions;
v) A description of the environmental planning for the project;
vi) A description of the project, including environmental design and protection features;
vii) Suitable maps showing the location of the project site, routes and alternatives, and the arrangement of project facilities within the preferred site;
viii) An assessment of significant, potential impacts and their mitigation measures;
ix) An environmental monitoring and management plan; and
x) Identification of the names and responsibilities of the people who carried out the EA.

The EA Report, and/or the letter of submission which accompanies it, must clearly indicate the extent to which the Proponent:

i) is in agreement with the contents of the Report; and
ii) is committed to implementing the environmental planning, design, mitigation, compensation and management measures it contains.

The Proponent shall submit three copies of the draft EA Report to the EQA. When EQA is satisfied that the EA Report meets the minimum reporting requirements, the Proponent shall submit 14 copies of the Report for detailed technical review under the provisions of the EA Policy.

6. MINIMUM REQUIREMENTS FOR AN EMMP

The EMP must cover at least:

- For monitoring each phase of the project:

i) Environmental variables to be monitored, and frequency; and
ii) Reporting to appropriate authorities and local community.

- Issues/concerns that are to be the subject of the environmental management plan, and reporting requirements to government and the public,
- Environmental standards and guidelines that will be adopted or required.
- Associated costs.

7. VALUED ENVIRONMENTAL COMPONENTS (VECs)

Category		Environmental Component
Biophysical, Resource and Land Use Components	√	Climate and air quality
	√	Surface water hydrology and quality
	√	Groundwater hydrology and quality
	√	Terrain and natural hazards
	√	Soils and vegetation
	√	Wildlife resources and use
		Aquatic resources and use
	√	Recreation and tourism resources and use
		Forest resources and use
	√	Agricultural resources and use
		Mineral resources and use
Economic Components	√	Direct employment and income
	√	Indirect/induced employment and income
		Labor market conditions
		Sources of supplies, materials and services
	√	Transportation requirements
	√	Infrastructure development requirements and costs
		Government revenues/costs
		Indirect/induced economic development opportunities
Cultural and Heritage Components	√	Archaeological sites
	√	Traditional use sites
	√	Historic sites and landscape features
Social Components	√	Social/demographic profile
	√	Population
	√	Housing and accommodation
	√	Land and water use
	√	Transportation and traffic
	√	Community service delivery
	√	Local government revenues/costs
	√	Social support services
		Community stability, cohesion and well being
		Gender equity
Health Components	√	Supply of health facilities and services
		Community water supply and watersheds
	√	Waste treatment and discharge
	√	Ambient air and water quality
	√	Public health risks
	√	Worker health and safety
	√	Noise
		Local community health

7-3　環境社会配慮調査報告書

（ジェリコ最終処分場拡張計画）

NJS CONSULTANTS CO., LTD.

PREPARATORY SURVEY FOR CAPACITY ENHANCEMENT ON SOLID WASTE MANAGEMENT IN THE WEST BANK IN PALESTINE

Survey on Environmental and Social Considerations
for
Proposed final landfill site in Jericho

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UNIVERSAL GROUP
for Engineering & Consulting

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List of Abbreviations

EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EQA	Environment Quality Authority
GESC	Guidelines for Environmental and Social Considerations
HPC	Higher Planning Council
IEE	Initial Environmental Evaluation
JICA	Japan International Cooperation Agency
JCspd	Joint Council for Services, Planning and Development
JSC	Joint Service Council
LGU	Local Government Unit
MoA	Ministry of Agriculture
MoH	Ministry of Health
MoL	Ministry of Labor
MoT	Ministry of Transportation
MoTA	Ministry of Tourism and Antiquities
MoLG	Ministry of Local Government
MoNE	Ministry of National Economy
NSSWM	National Strategy for Solid Waste Management
PA	Palestinian Authority
PCBS	Palestinian Central Bureau of Statistics
PEL	Palestinian Environmental Law
PEAP	Palestinian Environmental Assessment Policy
PGA	Peak Ground Acceleration (factor Z)
PLA	Palestinian Land Authority
SWM	Solid Waste Management
ToR	Terms of Reference
UBC	Uniform Building Code
UG	Universal Group for Engineering and Consulting
UNRWA	The United Nations Refugees and Welfare Agency
VECs	Valued environmental components

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1. INTRODUCTION

1.1 General

Solid Waste Management (SWM) is a complex process because it involves many technologies and disciplines. These include the control of generation, handling, storage, collection, transfer, transportation, processing, and disposal of solid wastes. The processes have to be carried out within existing and active legal and social guidelines that protect the public health and the environment and are aesthetically and economically acceptable.

Collection and transportation of solid waste in the Palestinian cities is relatively improving, in light of the inadequate number and distribution of collection containers and irregular collection schedule, which have encouraged the accumulation of litter in streets. Solid waste disposal is not adequate since the most common method of the disposal of solid waste in the West Bank are dumping and/or burning in open areas; therefore, it is no necessary to look for new collection sites and to improve the efficiency of the existing sanitary landfills.

The National Strategy for Solid Waste Management (NSSWM) 2010-2014 sets policies and measures to improve the solid waste sector. It addresses the challenges it faces and the major negative impacts it implies on the environment and public health in addition to the tremendous economic and social acts the Palestinian community bears. Policy four (4) of the strategic objective three (3) of the NSSWM reads: "Developing the current management systems for solid waste and transport, in order to improve the quality and effectiveness of services and its availability to all citizens". Policy (5) of the same objective reads: "Safe and efficient disposal of solid waste in regional sanitary landfills servicing all communities".

The two sanitary landfills that are properly functioning in the West Bank are Zahart Al-Finjan that has been put in operation in 2007 and is currently serving the northern governorates and Jericho landfill. Al-Minya sanitary landfill is currently under construction and is intended to serve Hebron and Bethlehem governorates. A forth

sanitary landfill proposed at Ramoun area in Ramallah district has passed the planning and feasibility phases and is intended to serve the middle areas of the West Bank.

1.2 Jericho Sanitary Landfill

Jericho sanitary landfill is serving 17 residential communities and is receiving solid waste from 6 towns of Nablus governorate and 3 towns of Tubas governorate in addition to the 11 communities of Jericho governorate. Jericho landfill is operated and managed by Joint Council for Services, Planning and Development (JCspd) and was subject to development and technical cooperation programme of the Japan International Cooperation Agency (JICA). Plate 1.1 shows Jericho landfill and operating vehicles at the site.

Plate 1.1: Jericho Municipality solid waste sanitary landfill

There are currently 4 components of the JICA grant aid project for SWM with Jericho JCspd.

- ✓ The construction of the landfill,
- ✓ Construction of a transfer station,
- ✓ Construction of Material Recovery Facility, and

- ✓ Procurement of machinery and equipment for collection and transport.

The primarily proposed project was intended to establish a transfer station for the planned sanitary at Ramoun that will serve the middle area of the West Bank. In the mean time, there is no horizon for that the establishment of this sanitary landfill will be in the near future, therefore, it is now necessary to work on prompt solutions in light of the depleting capacity of the existing landfill.

The Jericho landfill is currently 27 dunums and is 4.5 km away from the Jericho city center at the municipal boundary. It is also about 1.2 km east to the nearest household. The surface area includes the suggested separation station as well as administrative building, and 10,300 m^2 for dumping waste.

The JCspd in Jericho district has recently rented an area of 29 dunums, which is partly in area C and the other is in area A, of which 19 dunums will be used for the expansion of the existing landfill. However, there is still dispute over a part of the land in the valley area, should the dispute remain only 16 dunums of the land will be utilized. The primary design speaks of 240 m expansion to the eastern side, directly from the fence of the existing landfill till the borderline between area A and area C at a width of about 80 m.

There are no remarkable environmental problems accompanying the existing landfill. Impact on the groundwater quality is very minimal as the landfill is lined with 3 layers to prevent seepage from deep infiltration. Recent examinations on the quality of groundwater quality confirm that there is no significant pollution from solid waste in the wells of the area. However, there are areas which are out of control, where sludge and wastewater from the douche trucks are normally emptied in the valley near the landfill. Hence the source of pollution cannot be completely identified. A Summary of water quality parameters tests is attached this report in Annex B.

The system in the landfill involves appropriately covered waste undertaking a semi-aerobic process of decomposition. The technology depends on pipes that allow oxygen in, deep down the buried waste and the methane gas out. The system is advantageous in terms of its rapid decomposition rate; however, it resulted in two fire incidents which the

JCspd in cooperation with the Civil Defense were successfully able to control. On the other hand, the current landfill has facilitated the connection of the area with public services including electricity as well as paving roads by the JCspd through funds from JICA.

There is a distinctive area in the current landfill for waste coming from salutary houses and medical waste. Additional cells will be included in the expansion design. Hazardous waste however, is properly handled and sent to Zahrat Al Finjan sanitary landfill to the North of the West Bank.

The expansion of the sanitary landfill will include a separation station for reuse and recycling of possible wastes.

Universal Group (UG) has been contracted by NJS Co., Ltd. to conduct survey on environmental and social scoping for the proposed landfill expansion in Jericho area. The survey is to cover the current state on environmental and social conditions of the proposed expansion of Jericho landfill. It is also to cover laws and regulations relating environmental and social consideration and to include scoping works and estimation of environmental and social impacts which will be caused by the expansion of the landfill.

The scoping study has concluded that only an IEE is required for the expansion of Jericho landfill project. The final decision in this regard is to the EQA. To start the EA process, an Environmental Application has to be applied by the proponent of the project, namely the JCspd of Jericho.

2. LAWS AND REGULATIONS RELATING ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

2.1 EIA System and Administrations

2.1.1 The Palestinian Environmental Law

The Palestinian environmental legal and administrative framework has taken major strides towards protecting environmental resources and institutionalizing their sustainable management. The Palestinian Environmental Law (PEL) No. 7 of 1999 is comprehensive; it covers the main issues in relation to environmental protection by the rule of law. The major PEL objectives are:

- Protecting the environment from all sorts and types of pollution
- Protecting public health and social welfare
- Incorporating environmental resources protection in all social and economic development plans and promote sustainable development to protect the rights of future generations;
- Conserving ecologically sensitive areas, protecting biodiversity, and rehabilitating environmentally damaged areas;
- Setting inter-ministerial cooperation regulations and standards various environmental protection areas and jurisdictions;
- Promoting collection and publication of environmental information, environmental public awareness, education and training.

The PEL addresses various environmental issues including:

- Management and protection of various resources. Issues covered are related to land environment, air environment, water resources and aquatic environment, and natural, archaeological, and historical heritage protection.
- Environmental Impact Assessment (EIA) and auditing, permitting of development projects, monitoring of environmental resources and their parameters.
- Penalties to be applied in case of violation of any article presented under the law.

- Other issues addressed by the legislation include emergency preparedness, public participation, research training and public education.

The PEL has stated in article 45, "The Ministry (Nowadays, the Environment Quality Authority (EQA)), in coordination with the competent agencies, shall set standards to determine which projects and fields shall be subject to the environmental impact assessment studies. It shall also prepare lists of these projects and set the rules and procedures of the environmental impact assessment".

Article 47 of the PEL states that: "The Ministry (EQA), in coordination with the competent agencies, shall determine the activities and projects that have to obtain an environmental approval before being licensed. This includes the projects that are allowed to be established in the restricted areas".

2.1.2 The Palestinian Environmental Assessment Policy

The Palestinian Ministerial Council endorsed the Palestinian Environmental Assessment Policy (PEAP), through resolution No: 27-23/4/2000. This Policy shall be interpreted and implemented to support the sustainable economic and social development of the Palestinian people through assisting in meeting the following goals:

1. Ensuring an adequate standard of life in all its aspects, and not negatively affecting the basic needs, and the social, cultural and historical values of people as a result of development activities.
2. Maintaining a clean and sustainable natural environment and preserving its capacities.
3. Conserving biodiversity, landscapes and the sustainable use of natural resources.
4. Avoiding irreversible environmental damage, and minimizing reversible environmental damage, from development activities.

For the purpose of considering Environmental Approval of projects, the Policy has identified two main types of Environmental Assessment (EA) studies that may be required, which are as follows:

a) An Initial Environmental Evaluation (IEE) for projects where significant environmental impacts are uncertain, or where compliance with environmental regulations must be ensured.
b) An Environmental Impact Assessment (EIA) for projects which are likely to have significant environmental impacts. An EIA may be carried out as a result of an IEE.

The PEAP has listed proposed projects for which an EIA must be conducted. The proposed projects are as follows:

1. Power plants (including gas turbines, substations and super tension lines)
2. Quarries and mines
3. Waste water treatment plants including main sewers
4. Cement plants
5. Solid waste disposal sites
6. Hazardous waste disposal sites
7. Plants producing, storing or using hazardous substances
8. Airports and landing strips
9. Seaports, jetties and harbours
10. Refineries
11. Industrial estates
12. Major dams and reservoirs
13. Major roads
14. Steel mills

For projects which are not listed in the above-mentioned list, a determination of whether or not an IEE or EIA must be conducted will be based on screening criteria. The criterion will be based on whether the project is likely to:

1. Use a natural resource in a way that pre-empts other uses of that resource
2. Displace people or communities
3. Be located in or near environmentally sensitive areas such as natural reserves, wetlands, or registered archaeological and cultural sites

4. Generate unacceptable levels of environmental impact
5. Create a state of public concern, or
6. Require further related development activities that may cause significant environmental impacts

Solid waste disposal sites are listed as number 5, while expansion of existing solid waste disposal sites is not listed for mandatory EIA study. However, as the project may have adverse environmental impact and may create public concern an IEE may be required or an EIA further to the recommendations of the EQA.

2.1.3 Environmental Assessment Administrative procedures

The administrative procedures for obtaining an Environmental Approval (EA), is listed in Annex A of the PEAP. The PEAP states the following steps:

a) Application for Environmental Approval

At first, the project proponent must obtain an initial approval from the appropriate Ministry or Local Planning Committee. The proponent then submits an Application for Environmental Approval to the local EQA office. The EQA will notify the appropriate permitting authorities that an Application for Environmental Approval has been received.

The Application for Environmental Approval is the project document that informs relevant permitting authorities and the EQA that a project is being considered and may be subject to the EA Policy. It is the document used by the EQA to screen a project for its disposition under the EA Policy, and to consider permitting conditions.

Once the EQA considers that an Application for Environmental Approval is complete, it has a maximum of 14 business days to determine the need for an IEE or an EIA, or to determine whether Environmental Approval will be granted based on the Application alone.

After the preparation of the EA document (2-6 months depending on the size of project and the consultancy ToR and contract), 4 copies of the EA document are submitted to

EQA. The EQA has to comment within 40 working days. Then the proponent has to reply to the comments and modify the EA document accordingly. This cycle of commenting the EA document and consideration of the comments may repeat and every time EQA has 40 days for commenting. In most cases, the comments are accepted from the first cycle and the proponent is asked to submit 14 copies to be distributed to the EA committee. After this final submittal, EQA has 14 days to issue the approval.

In total this is about 16 weeks (4 months). Considering 2-4 months for preparation of the EA documents, the time period from the application up to final approval by EQA is 6-12 months.

The format of the Environmental Application is attached in Annex A. In the application it is to specify whether the project is a new project, an expansion of an existing project or an existing project. The PEAP did not differentiate between these different project types and the Environmental Application is the same for all projects. The decision what further documents are required is based on the screening criteria and on the EQA judgment, but normally considers if the project is new, expansion or existing.

b) The Initial Environmental Evaluation (IEE) Report

The Initial Environmental Evaluation (IEE) Report documents the results of a general, reconnaissance-level evaluation of the likely environmental impacts of a proposed project, based largely on existing information. An IEE should be prepared during pre-feasibility studies of a project. Its main purpose is to identify potential impacts, estimate their significance, and to indicate what opportunities are available to mitigate adverse environmental impacts and enhance potential environmental benefits. As appropriate, an IEE should include proposals for monitoring and managing impacts, especially those which affect local surroundings and people.

Terms-of-reference (ToR) for an IEE are prepared by the EQA on the advice of the EA Committee and in consultation with the proponent, if required. The EQA may require the proponent to carry out scoping studies as part of ToR preparation. Scoping for this

purpose means the process of establishing the range of action alternatives and potential impacts to be included in terms of reference for environmental assessment studies.

The proponent submits a draft IEE Report to the EQA which conducts an initial, internal review to determine if the report contains the minimum requirements as specified in TOR. Once the EQA is satisfied that the minimum requirements have been met, the proponent finalizes the IEE Report and the EQA accepts it for review. The EQA then conducts a detailed technical review of the Report with the assistance of the EA inter-ministerial committee.

The IEE Report is used as a basis for granting an Environmental Approval, or for requiring project changes, revising the IEE Report or requesting an EIA Report before Environmental Approval is granted.

c) The Environmental Impact Assessment (EIA) Report

The EIA Report documents the results of a comprehensive environmental impact assessment of a project, based on TOR approved by the EQA. It is broader in scope and contains more detailed analysis than an IEE. An EIA involves sufficient surveys and fieldwork to adequately study and analyze the issues to be addressed. It should be undertaken during pre-feasibility and/or detailed feasibility studies of a project, and in close cooperation with engineering, financial and other project planning works.

The EIA describes the environmental planning that went into a project and what features are incorporated to mitigate adverse impacts and capture potential benefits. It includes an analysis of the severity and significance of impacts and benefits, especially for individuals and communities directly affected by the project. The EIA is also to define the environmental impacts of the project and the measures to mitigate the adverse impacts or capture potential environmental benefits. It also provides an environmental monitoring and management plan.

Terms of reference (ToR) for an EIA are prepared by the EQA on the advice of the EA Committee and in consultation with the proponent, if required. The EQA may require the proponent to carry out scoping studies as part of ToR preparation.

d) Environmental Approval

The EA document is used as a basis for determining whether or not Environmental Approval is granted and, if so, under what conditions.

The proponent submits the draft EA document to the EQA which conducts an initial, internal review to determine if the report contains the minimum requirements specified in ToR. Once the EQA is satisfied that the minimum requirements have been met, the proponent finalizes the EA document and the EQA accepts it for review. The EQA then conducts a detailed technical review of the document with the assistance of the EA Committee.

When the EQA review is complete, the EQA must attest that the EA document has been satisfactory carried out and:

i. Grant Environmental Approval with, if necessary, conditions to be included in subsequent permits, or
ii. Withheld Environmental Approval since the project has unacceptable environmental impact.

The proponent of the project shall express the commitment to the standards and requirements for the protection of the environment and to apply all the required mitigation measures addressed in the EA document. The developer shall express the legal commitment towards the EA.

Annex C is a tentative ToR for the preparation of an EA document for the expansion of Jericho landfill.

2.2 Stakeholder Consultation

The Palestinian Environmental Policy refers to stakeholders as any person in his natural or legal capacity with an interest in or affected by a development activity. Consultation of stakeholders shall be fulfilled in two stages:

A. The Initial Environmental Evaluation (IEE) Report; where the policy stated that the stakeholder consultation is optional when undertaking an IEE. In consultation with the proponent and the EA Committee as required, the EQA determines whether stakeholder consultation is required and, if so, what the minimum requirements should be. It may be required during scoping and terms-of-reference preparation, and during conducting the IEE.
B. The Environmental Impact Assessment (EIA) Report; where the policy stated that the stakeholder consultation is mandatory when undertaking an EIA. In consultation with the proponent and the EA Committee, the EQA determines what the minimum requirements for stakeholder consultation should be. It may be required during scoping and terms-of-reference preparation, and during the conduct of the EIA. At the minimum, the proponent must meet with the principal stakeholders to inform them about the proposed project and to solicit their views about it. More problematic projects should involve more extensive consultations. The methods and results of these consultations must be documented in the EIA Report.

As part of the consultation process, it is sometimes necessary to have a public consultation meeting and invite the stakeholders. The PEAP did not differentiae the public consultation meeting among the three project types; new, expansion, and existing. The consultation meeting is mainly to inform the public, identify their concerns and to prepare the ToR. In practice this is not the case and the ToR are mostly prepared prior to the EA process and are issued by EQA based on the Environmental Application.

For the expansion of the existing Jericho landfill, a consultation meeting is not seen necessary and interviewing the stakeholders will be sufficient. The landfill exists and the public are aware of the project activities.

2.3 Environmental Management and Monitoring

The Public Health Law No 20 for 2004 has articulated that it is part of the Ministry of Health's tasks and responsibilities to license the establishment of waste collection premises and follow on methods of waste treatment, and disposal. It also states that it is under the ministry of health's authority in cooperation with competent authorities to

specify the rules and conditions of transferring, saving, treatment or disposal of hazardous waste.

The Palestinian Environmental Law No. 7 for 1999, under the third chapter, required from the EQA to follow up the implementation of decisions which are issued concerning the environmental impact through cooperation with the competent authorities. The EQA shall, in coordination with the competent authorities, control the various corporations, projects and activities in order to ascertain the extent of its compliance with the approved specifications, standards and instructions for the protection of environment and vital resources formulated by them according to the provisions of this law.

For the above purposes the law entitles the EQA inspectors and other inspectors who are appointed in the Ministries and other authorities who have the capacity of judicial police as per the law may impound the environmental violations and crimes that take place in violation with this law. The EQA inspectors shall also have, in cooperation with the competent departments and authorities; the right of entry into the installations for the purpose of inspecting them, taking samples, carry out the measurements and ascertain the application of the standards and conditions of the environment protection and prevention of pollution. The owners of projects and other activities should enable the EQA inspectors and competent authorities to carry out their functions and provide them with the information and particulars which they deem necessary to obtain in implementation of the provisions of the Law.

Project owners should also carry out self supervision operations according to the standards and conditions formulated by the EQA in coordination with the competent authorities and submission of reports according to the instructions of the EQA.

The competent authority shall have the right, with respect to every installation or project which has violated the environmental conditions necessary for granting the license, to cancel the license or withdraw same before the competent court.

The law has entitled the competent authorities to cancel or withdraw the license of any violating project. Should the project not remove the violation, the competent authority shall remove same at the project's own account.

The Minister may decide to stop the work in any project or prohibit the use of any machine or material in part or in whole if the continuation of work in the project or use of the machine or article involves a serious hazard to the environment. The stoppage or prohibition shall be for a period not exceeding two weeks and may not be extended except by a judicial order from the competent court. Whoever was harmed from the stoppage or prohibition order may take exception towards it before the competent court.

2.4 Laws and Regulations relating to Resettlement, Land Expropriation and Involuntary Resettlement

The Jordanian Expropriation Law No. 2 for 1953 which is applied in the West Bank/Palestine covers the process of expropriating private lands for public use and the compensation should be paid.

The administrative procedure for land acquisition and expropriation in steps is defined as follows. The estimated duration for each step is also presented:

1) The project proponent has to publish an announcement in the official newspapers (Gazette) for 15 days; declaring his willingness to request a resolution from the Cabinet in order to expropriate a private land, defined in the announcement, for public use.
2) After the expiry of the announcement, the project proponent has to submit an application to the Cabinet attached with a map for the land he is willing to expropriate, and a proof of his financial capacity that he is capable to implement the project.
3) When the Cabinet makes sure of the proponent's financial capacity and the public benefits of the project; the Cabinet has the right to decide:

   - The absolute expropriation of the land.
   - Dispossession of the land for a limited period of time.

- Dispossession of any easement right, or any other rights related to the land.

4) The Cabinet's resolution should be approved by the President of Palestine, and then published in the official Gazette.
5) The Proponent, then, has to inform the Land Registrar in the area where the land exists, who subsequently informs the owners with the Cabinet Resolution.
6) After informing the land owner of the resolution, the project proponent has to negotiate the expropriation, disposition or the limited use of the land with the land owner or with anyone has a right in it.
7) If the project proponent and the land owner didn't agree upon the amount of the compensation, any of them can submit a request to the court to estimate the compensation.
8) After paying the compensation to the land owner or to the court, the Land Registrar then registers the land under the name of the proponent.

The abovementioned process applies for lands in zones A, B and C as to Oslo agreement classification. However, in zone C, approval from the Israeli side must be obtained before the expropriation.

As part of the expropriation process that is defined in the Jordanian Expropriation Law No 2 for 1953, the project proponent has to publish an announcement in the official Gazette for 15 days; declaring his willingness to request a resolution from the Cabinet in order to expropriate a private land, defined in the announcement, for public use.

2.5 Laws and Regulations relating to Preservation of Cultural or Historical Assets

2.5.1 Jordanian Antique Law No 51 for 1966

The Jordanian Antique Law No 51 for 1966 which is applied in West Bank/Palestine and has considered the antiques as states' assets. The Ministry of Antiques is responsible for managing and supervision of the antiques and it is its duty to publish a report in the official gazette with the names of antique places and to add on it from time to time.

The Law has prohibited doing anything in the antique places without permission from the minister. It also has obliged anyone who finds antique places to record the place to the government within three days.

In spite of the crucial need, legislations and laws concerning the conservation of cultural and traditional heritage in Palestine are still immature; however there are some initiatives that contribute to the design of by-laws and regulations that underwent many debates on several levels but have not got the legitimate status yet.

2.5.2 Law of Antiquities No. 51 for the year 1966

The law of antiquities deals with the movable and immovable antiquities which are deemed part of the cultural heritage. The second article of the law defines the antiquities as "any historical movable or immovable iniquities made, or composed or carved (inscribed) or built or explored or produced or modified by a human being before the year 1700 A.D including any part added to the antiquities or reconstructed after that date" article 2.A.

Also falls under this definition according to article 2.C "any movable or immovable antiquities that dates after the year 1700 A.D that is proclaimed by the minister through an ordinance he issues and states that it is a historical remain".

Antiquities included in the above-mentioned definition shall be listed according to article 9.A and announced in the official newspaper: "the director publishes in the official news paper a table approved by the minister that includes historical buildings and sites. He is allowed from time to time to add to this table and modify it."

Titled as the prohibited acts, article 10 of the law of antiquities states that any person either is not allowed without permission from the minister to:

a. Excavate any historical site that is inscribed in the declared list or was mentioned in any later amendment to the list, or
b. Start a process of excavation or construct a building, or open quarries, or establishing irrigation actions or lime burning or a like in the historical buildings

and sites or beside them or putting soil or dumping them or converting them into cemeteries. Or

c. Destroy any antiquities, or demolish part of it or move it, or
d. Introducing transformations to any antiquities or adding to it or restoring it, or
e. Constructing buildings or walls that encroaches any artifact or being adjacent to it.

Paragraphs d and e are not applied to historical buildings designated for religious purposes or owned by a religious body.

Sanctions are determined in Article 46. In paragraph 5 everyone who distorts, or destroys, or obliterate, or remove or block any historical artifact shall be punished by imprisonment for a term not exceeding two years or a fine of 20 dinars to 200 dinars. The year of approval is this law is 1966.

2.5.3 Charter on the safeguarding of Palestinian historic towns and urban landscape

This charter which was signed and endorsed by the minister of local government and the minister of tourism and antiquities in 2009 calls upon the signatory parties to pursue principles of cultural heritage protection such as:

1- The safeguarding of cultural and natural heritage relies on principles and rules aimed at ensuring the protection of the cultural and natural resources and their rational use as well as enhancing the environmental, cultural, architectural and social assets of the historic towns and the urban landscapes.
2- It is essential to identify the elements of the cultural heritage to be preserved and those of the natural environment to be protected; all those elements that the local community and culture consider “invariable”.
3- it is necessary to gradually draw the attention of both decision makers and the society towards the historic town, addressing urban rehabilitation and planning as indispensable tools, looking at buildings and spaces that can be re-used within the monumental areas, the ordinary fabric, the buffer zones and along the edge of a territory that is continuously transformed; where the phenomena of occupation and

irreversible exploitation of land are tangible and therefore ad-hoc rules and interventions are necessary.

2.5.4 General rules for the protection of historic areas

In March 2006 one an advanced step in the field of cultural heritage protection was achieved. A legal protection for historic areas and individual historic buildings was provided for the first time by the decision no 54 of the higher council of planning:

"The Higher Council of Planning decided in its meeting no 4/2006 on 11 March 2006 according to the decision no. 54 to approve the General Rules for the protection of historic areas and individual historic buildings. These rules are considered part of the Building and Planning Regulations for the Local Authorities approved with a decision of the Higher Council of Planning no. 30 on 24 August 1996"

This amendment to the building and planning regulations for the local authorities was vital because it prevents demolish or remove any historic buildings or demolish or distort any element of that forming the root of the historic town (the traditional urban fabric) such as paths, alleys, open spaces, covered passages and portals.

However, the law of building and planning for the local authorities of the year 2011 has not broadly mentioned the above mentioned amendment. On the contrary, it only points that historic towns are mandated to the special committee responsible of building and planning in local authorities.

2.5.5 The inventory of cultural and natural heritage sites of potential outstanding universal value in Palestine

This Inventory was published in 2005 and was prepared by the MoTA with a technical assistance of UNESCO world heritage center and UNESCO Ramallah-Office. It contains 20 sites of cultural and natural potential universal value. The cultural heritage components of Jericho are classified under the site: "Palestine, the Lands of Olives and Vines".

Efforts to protect cultural heritage in the Palestinian context are continuously increasing. The vulnerability of cultural heritage assets entails preparing an assessment of adverse affects before the inception of any development project undertaken for the enhancement of the quality of life.

2.6 JICA Guidelines for Environmental and Social Considerations

Japan International Cooperation Agency (JICA) has in April 2010 issued the Guidelines for Environmental and Social Considerations (GESC). The objectives of the guidelines are to encourage project proponents to have appropriate consideration for environmental and social impacts, as well as to ensure that JICA's support for an examination of environmental and social considerations are conducted accordingly. The guidelines outline JICA's responsibilities and procedures, along with its requirements for project proponents in order to facilitate the achievement of these objectives. In doing so, JICA endeavours to ensure transparency, predictability, and accountability in its support for an examination of environmental and social considerations.

When encouraging the appropriate consideration of environmental and social aspects, it is JICA's policy to provide active support to projects that promote environmental conservation and to projects that contribute to the protection of the global environment. JICA also has a policy of being actively involved in supporting the enhancement of environmental and social considerations in developing countries. The inclusion of environmental and social costs in development costs and the social and institutional framework that makes such inclusion possible are crucial for sustainable development. Internalization and an institutional framework are requirements for measures regarding environmental and social considerations.

In these guidelines, JICA has created clear requirements regarding environmental and social considerations, which project proponents must meet. JICA provides support in order to facilitate the achievement of these requirements through the preparation and implementation of cooperation projects. JICA examines undertakings by project proponents in accordance with the requirements, and makes adequate decisions regarding

environmental and social considerations on the basis of examination results. JICA recognizes the following seven principles to be very important.

1. A wide range of impacts must be addressed: The types of impacts addressed by JICA cover a wide range of environmental and social issues.
2. Measures for environmental and social considerations must be implemented from an early stage to a monitoring stage: JICA applies a Strategic Environmental Assessment when conducting Master Plan Studies etc., and encourages project proponents etc. to ensure environmental and social considerations from an early stage to a monitoring stage.
3. JICA is responsible for accountability when implementing cooperation projects: JICA ensures accountability and transparency when implementing cooperation projects.
4. JICA asks stakeholders for their participation: JICA incorporates stakeholder opinions into decision-making processes regarding environmental and social considerations by ensuring the meaningful participation of stakeholders in order to have consideration for environmental and social factors and to reach a consensus accordingly. JICA replies to stakeholders' questions. Stakeholders who participate in meetings are responsible for what they say.
5. JICA discloses information: JICA itself discloses information on environmental and social considerations in collaboration with project proponents etc., in order to ensure accountability and to promote the participation of various stakeholders.
6. JICA enhances organizational capacity: JICA makes efforts to enhance the comprehensive capacity of organizations and operations in order for project proponents etc., to have consideration for environmental and social factors, appropriately and effectively, at all times.
7. JICA makes serious attempts at promptness: JICA addresses request of acceleration for the prompt implementation of projects while undertaking environmental and social considerations.

3. CURRENT STATE ON ENVIRONMENTAL AND SOCIAL CONDITIONS

3.1 Location and Topography

The topography of the city of Jericho shows continuous decrease in elevation from about 150 m below sea level in the East to 300 m below sea level in the West. There are no considerably deep wadis (valleys) or hills within the city of Jericho other than wadi Al-Qilt flowing adjacent to the sanitary landfill from the south; the aerial photo below shows an almost a flat area (Plate 3.1). The proposed project area for the expansion of the Jericho sanitary landfill is adjacent to the currently operating Jericho landfill that is located about 4 km form Jericho city center and about 1 km from the build up area at the eastern municipal boundary of Jericho city.

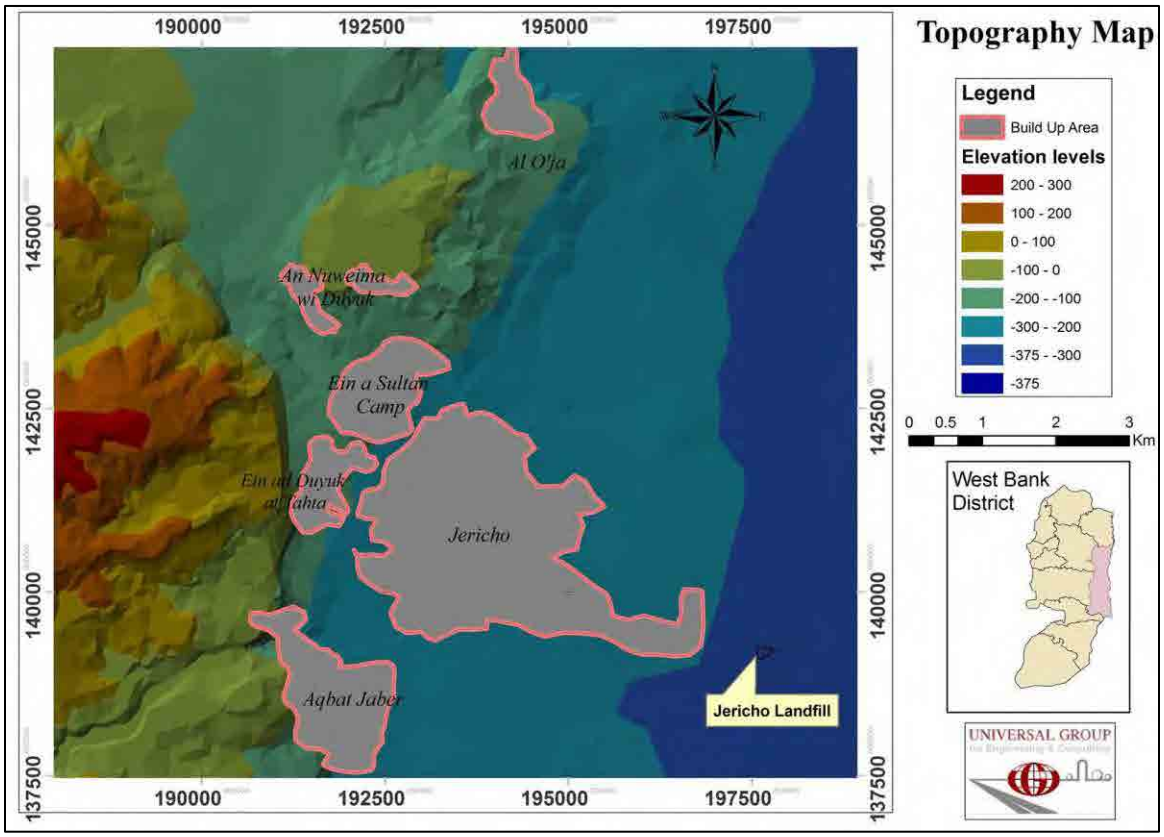
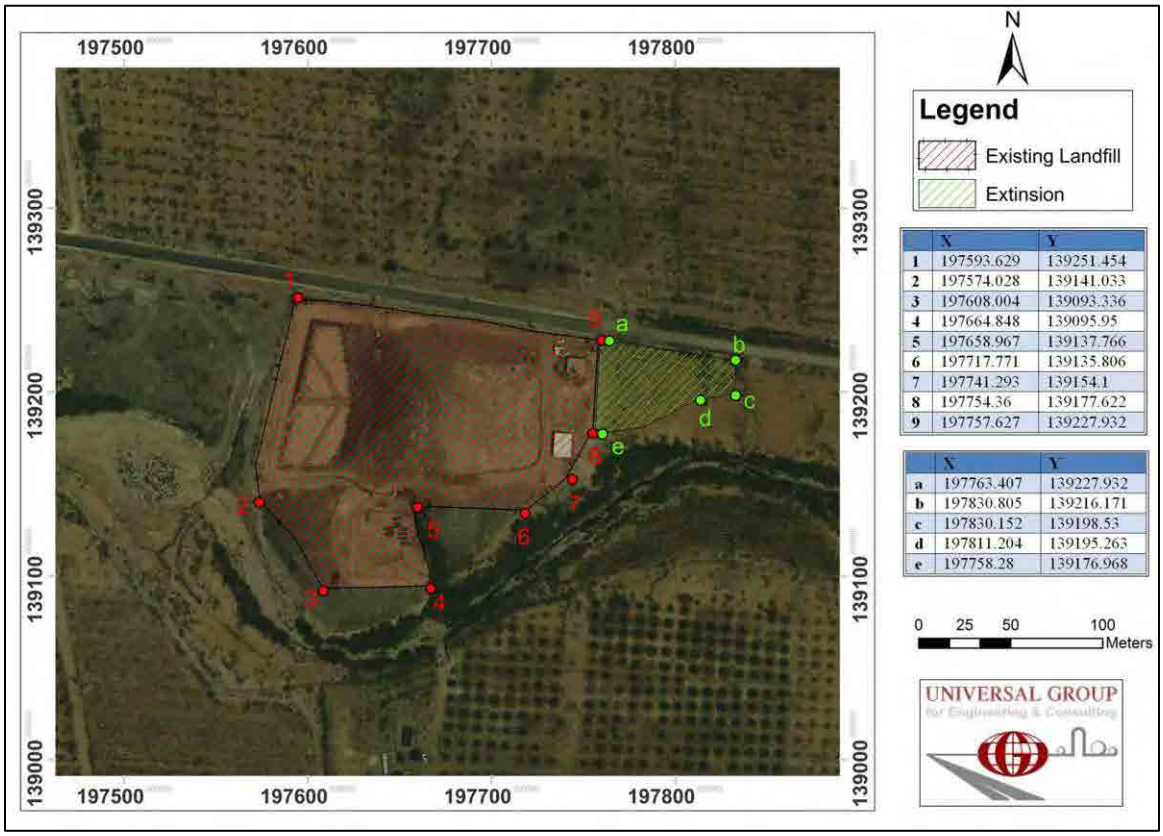


Plate 3.1: The Location and topography of Jericho Landfill Site

The access road to the existing landfill site is a paved straight road that is serving mainly the landfill and extends from the city center. **Plate 3.2** shows the boundary of the landfill

and the existing road that leads to the landfill at its northern edge. The road needs to be expanded and rehabilitated to serve the expansion.



	X	Y
1	197593.629	139251.454
2	197574.028	139141.033
3	197608.004	139093.336
4	197664.848	139095.95
5	197658.967	139137.766
6	197717.771	139135.806
7	197741.293	139154.1
8	197754.36	139177.622
9	197757.627	139227.932

	X	Y
a	197763.407	139227.932
b	197830.805	139216.171
c	197830.152	139198.53
d	197811.204	139195.263
e	197758.28	139176.968

Plate 3.2: The boundary of the Jericho landfill and proposed expansion

3.2 Geopolitical Aspects

Oslo agreement has classified the lands of the Palestinian Territories as A, B, or C. The Palestinian Authority (PA) has civil and security control only over area A and area C is totally under the control of the Israeli authorities. The civil affairs in area B, which extends outside the Palestinian cities and villages, are managed by the PA, while the security is kept in hands of Israel.

According to Article 12 for Environmental Protection of the Oslo II Agreement, powers and responsibilities in Area C in relation to environmental aspects including: sewage, solid waste, pesticides and hazardous substances, planning and zoning, air pollution, mining and quarrying and landscape preservation will be transferred gradually to Palestinian jurisdictions that will cover West Bank and Gaza Strip and that both sides

shall ensure that a comprehensive Environmental Impact Assessment (EIA) shall be conducted for major development programs.

Up till today responsibilities over Area C have not been handed to the Palestinian Authority in the West Bank; and EIA reviews and approvals in Area C are still under the Israeli Civil Administration control. Experience has proven that such approvals for infrastructure project are very difficult to obtain and are not likely to improve in the near future.

Jericho city is classified as Area A, but is surrounded from all sides by areas classified as Area C. This is adds to the complications faced by Jericho municipality, since most infrastructure facilities cross the municipal boundary .The solid waste landfill and the proposed expansion site are within Jericho boundary in Area A and therefore would not fall into licensing complications (Plate 3.3).

Plate 3.3: Location of the Jericho landfill site within Area A

The expansion site location is adjacen to the line that separates between area A and area C. The separation line extends 240 m from the eastern fence of the exsiting landfill site,

which makes the avilable land parcel for the expansion project 240 m by 80 m, that is about 19 donums in surface area.

3.3 Demography and Population

Compared to other regions in the West Bank, the Jericho region has a relatively low population density. This is due to large designated and closed Israeli military areas, military bases, nature reserves and adjacent Israeli settlements. The present population of the Jericho district is estimated at 46,717 Palestinians. These are divided between the city of Jericho, the four villages (Al-Auja, An-Nuwe'ma, Dyouk Al-Tahta and Dyouk Al-Fouqa) and the two refugee camps (Ein Al-Sultan and Aqbat Jaber) and other small localities (PCBS, 2007).

Table 3.1 lists the population numbers in Jericho Governorate according to the PCBS census in 2007 and those estimated for 2011 at an average annual growth rate of 2.85%. The average capita per household is between 5.4 and 11.4 with an average of 6.0.

The population of the city of Jericho is 18110 (PCBS 2007) distributed evenly (about 50% each) between males and females. The population of Jericho is considered young, as 58% of the populations are in the age group of 0-19 and 24% of the population is in the age group of 20-30.

Employment and income are indicators of the economy and standard of living. For Palestine, all available figures are generic and unspecified by region or district Unemployment rate in the West Bank reached approximately 14.5% according to the latest sanction in the second quarter of 2010 (ILO, 2010), divided between 22.4% for males and 25% for females. The average net daily wage of employees working in Palestine is $17.10 for males and $16.30 for females (PCBS, 2007).

Table 3.1: Households and Population in Jericho Governorate (PCBS 2007)

No.	Name	Population (2007)	Population (2011)
1.	Jericho (Ariha)	811881	,11,03
2.	Marj Na'ja	617	617
3.	Az Zubeidat	81413	81077
4.	Marj al Ghazal	,11	,,4
5.	Al Jiftlik	31777	41811
6.	Fasayil	81174	81871
7.	Al 'Auja	41176	41041
8.	An Nuwei'ma	81,,7	81364
9.	Ein ad Duyuk al Fauqa	181	717
10.	Ein as Sultan Camp	31887	31411
11.	Aqbat Jaber Camp	61114	617,,
12.	An Nabi Musa	310	348
13.	Other Localities	8,	83
Total Jericho Governorate		481660	471686

3.4 Climate

The climate of Jericho is classified as arid, that is characterized by hot summer and warm winter with very rare frost incidents. January is the coldest month and August is the warmest month. The average annual temperature is 23.5^{o}C. The highest average annual temperature is 30.5 degrees, whilst the lowest average annual temperature is 17^{o}C. The annual humidity is 52% in average and the average daily wind speed in the district is around 3.27 m/sec throughout the year. The main trend of wind direction in Jericho is from North and North West, minor trends of southern winds occur in early mornings.

Plate 3.4 shows the wind directions and wind speed in Jericho as to the Ministry of Transportation, and confirms that the wind direction will not carry any odours or possible emissions from the landfill site to the direction of residential areas. The wind travels to

the south eastern side which is where the date palms farm will act as a suitable buffer for odours.

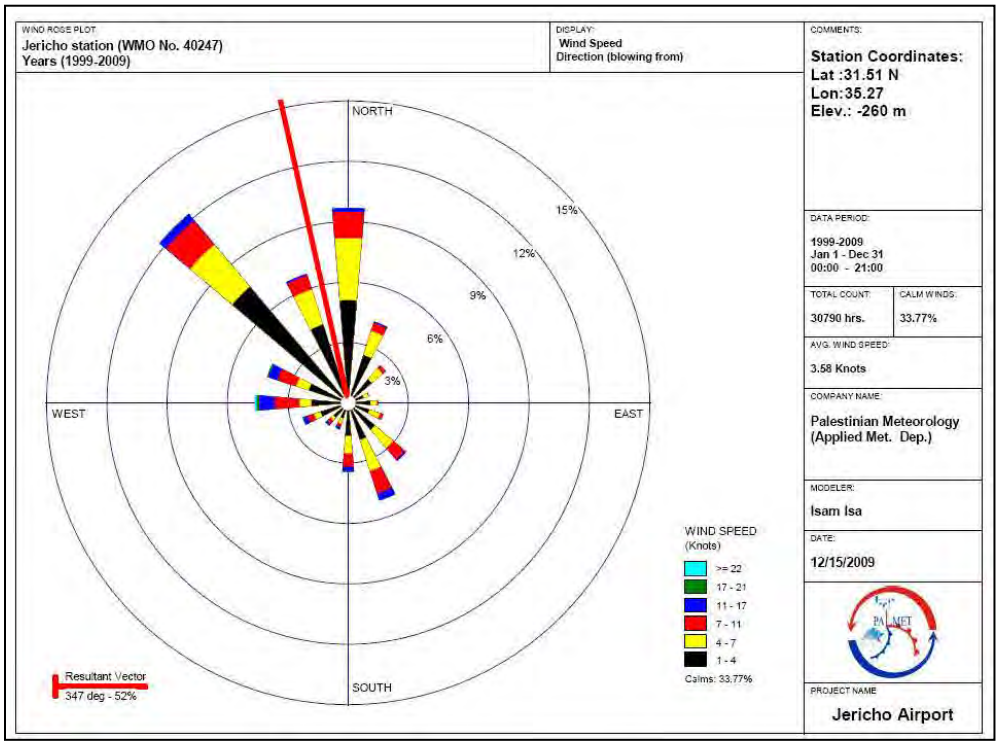


Plate 3.4: Wind Rose in Jericho

The amount of rainfall in the Jericho area is less than that of the surrounding mountains and the coastal regions, with an average annual amount of 150 mm. Therefore, Jericho area relies entirely on subterranean wells and springs for drinking and irrigation, mainly the Ein Al-Sultan spring as described further in the Water Resources section below.

For the assessment of environmental impacts, however, the data of wind and evaporation may be the most relevant parameters that directly trigger the impacts from solid waste transfer station such as odour emissions. In this respect, only the winds coming from easterly directions are of major importance, since they will in general shift emissions towards the westerly-situated populated areas.

Table 3.2 gives the monthly climatic data for Jericho as reported by the office of meteorological data of the Ministry of Transport.

Table 3.2: Average Monthly Climatic Data for Jericho (2006-2010)

Month	Max. Temp. (^oC)	Min. Temp. (^oC)	Relative Humidity (%)	Rainfall (mm)	Daily Sunshine (hrs)	Pan Evap. (mm/day)	Wind speed (m/s)	Pressure (mbar)
January	20.2	9.3	60.5	30.56	6.0	2.3	2.07	1044.8
February	22.2	10.8	60.5	38.14	6.3	2.7	1.67	1043.0
March	26.0	13.3	53.0	8.26	7.6	4.4	1.76	1040.7
April	30.1	16.7	44.7	15.76	8.8	6.4	2.16	1037.9
May	34.6	20.2	41.2	0.24	10.2	7.8	2.31	1036.1
June	38.6	23.7	42.0	0	11.8	10.1	2.31	1032.9
July	39.4	25.0	42.7	0	11.7	10.1	2.26	1030.3
August	38.6	26.3	45.2	0	11.2	9.3	1.84	1030.4
September	37.0	24.8	49.0	0.05	9.7	7.7	1.67	1034.8
October	34.0	22.0	48.0	5.58	8.0	5.6	1.30	1040.0
November	29.5	15.3	51.3	15.05	7.6	3.5	0.94	1043.9
December	22.8	11.3	56.6	16.75	6.0	2.6	1.15	1045.3
Average Total	**31.1**	**18.2**	**49.6**	**130**	**8.7**	**6.04**	**1.79**	**1038.3**

Evaporation is also a basic climatologically parameter for the generation of olfactory active chemical substances as gases and triggers the emissions of these mixed gases into the atmosphere, where they are perceivable as odours.

3.5 Land Use

The land use map of the City of Jericho is shown below in Plate 3.5, which shows that Jericho is an agricultural built up area in the middle of a rough grazing and irrigated farming. There are numerous illegal buildings in Jericho, despite the existence of a city master plan since 2004. The construction of illegal buildings is continuous whereas the ability to control and take action is limited.

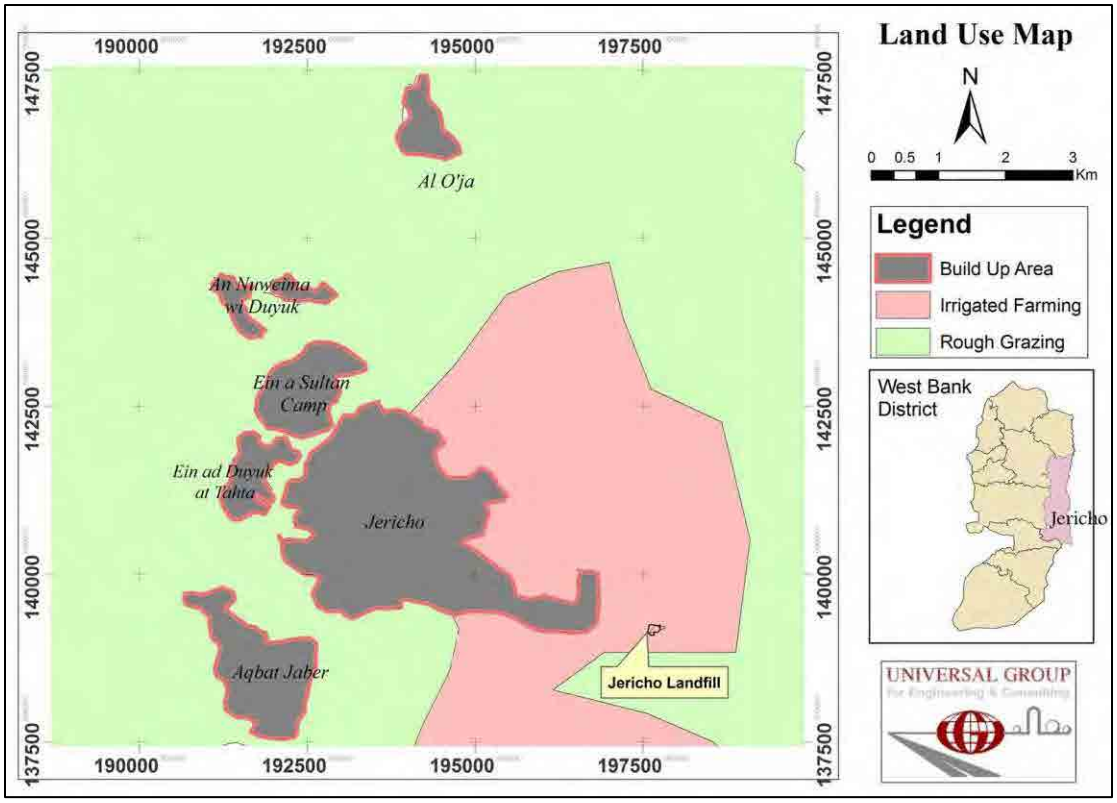


Plate 3.5: Jericho City Land Use Map

The sanitary landfill site is in the middle of the irrigated farming and so is the proposed expansion area of the landfill. The proposed land parcel for the expansion is privately owned by the Arab Society and is planted with young seedlings of date palm by a native resident. A lease agreement has been drafted between Jericho Municipality and the Arab Society to rent the land to be used as a landfill, which give the rights of use to JCspd.

The lease amount is only symbolic at $50 per dunum per year and the lease period is open. The agreement in (Arabic) is mainly to keep the landownership to the Arab Society. The agreement has specified that the use of the land is for the expansion of the solid waste landfill, i.e. it cannot be used for any other purposes.

Plate 3.6 is a photo of the proposed site for the expansion of the landfill showing the planted palm trees.

Plate 3.6: The proposed site for landfill expansion planted with palm trees

3.6 Geology and rock formation

The geology of the city of Jericho is characterized by the Jordan rift valley deposits which are mainly composed of Marl and Pleistocene Alluvial formation. This type of formation is favourable for groundwater protection, and the formation is covered structurally by minor faults. The geology formation of Jericho and the site where the landfill and its proposed expansion are located is shown in

The landfill and its expansion is at the boundary with the landslides and fans formation, which require further attention as to ensure the protection of the groundwater, whereas the clayish soil of this formation provides further protection of the groundwater aquifer.

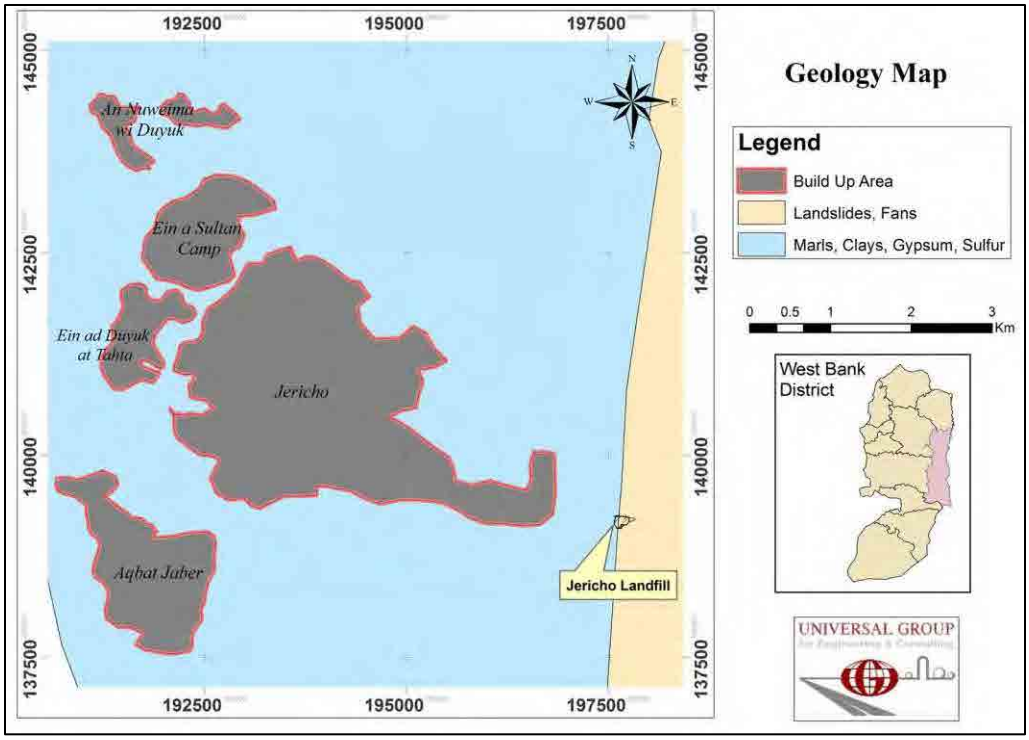


Plate 3.7.

The landfill and its expansion is at the boundary with the landslides and fans formation, which require further attention as to ensure the protection of the groundwater, whereas the clayish soil of this formation provides further protection of the groundwater aquifer.

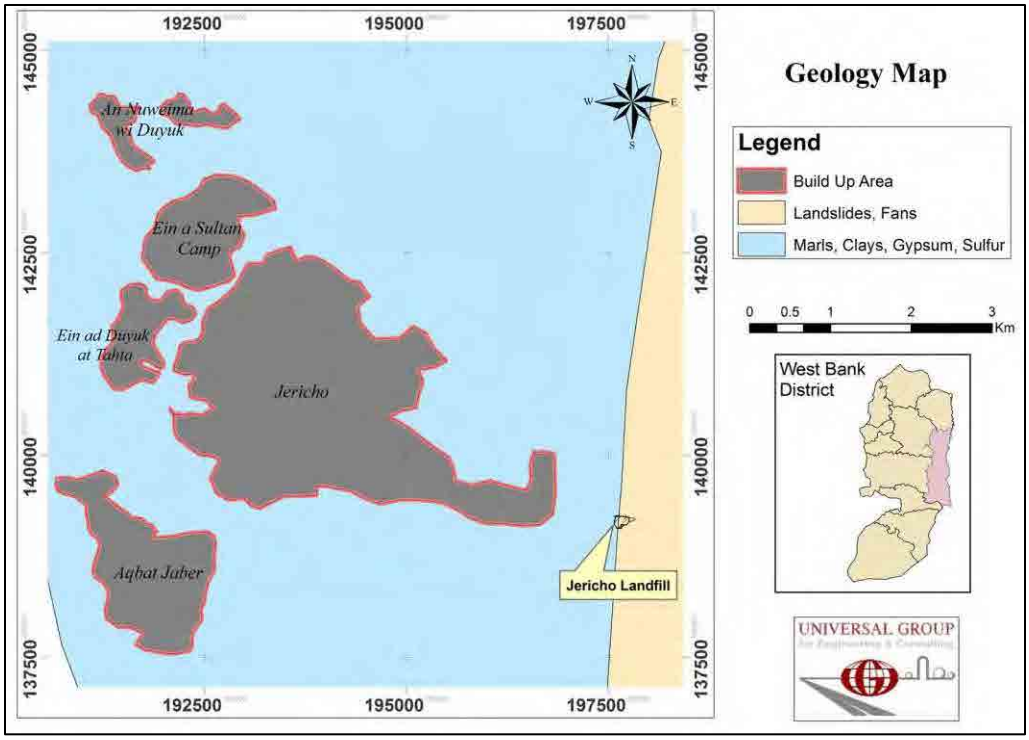


Plate 3.7: Geology map of Jericho and the landfill site

3.7 Soil

Plate 3.8 indicates that Jericho falls mainly over the Loessial Serozem soil type and that the existing solid waste landfill and its proposed expansion site within Regosols soil. A description of this soil type and other soils found in Jericho area are described below:

- ***Regosol***

This soil is found as bad-lands along the terrace escarpments in the Jordan Valley. The soils are quite variable in texture and colour. The soil parent materials are sand, clay and loess. The dominant vegetation types found in this region are Anabasis articulate, Salsola vermiculata and Salsola tetrandra. The area is used for grazing.

- ***Brown Lithosols and Loessial Arid Brown Soils***

Rock outcrops in such soils range between 50-60%. They are pale brown to yellowish brown or brown, loamy and calcareous. Brown lithosols are found in the pockets among the rocks. Loessial arid brown soils are found on flat hilltops, plateaus and foot-slopes.

The parent rocks of this soil association are chalk, marl, limestone and conglomerates. The deeper layers consist of either brown clay or yellowish brown loam. Field crops are planted in areas where the top soil is deep enough and sloping is moderate. However, in shallow and steep areas, grazing is the common activity.

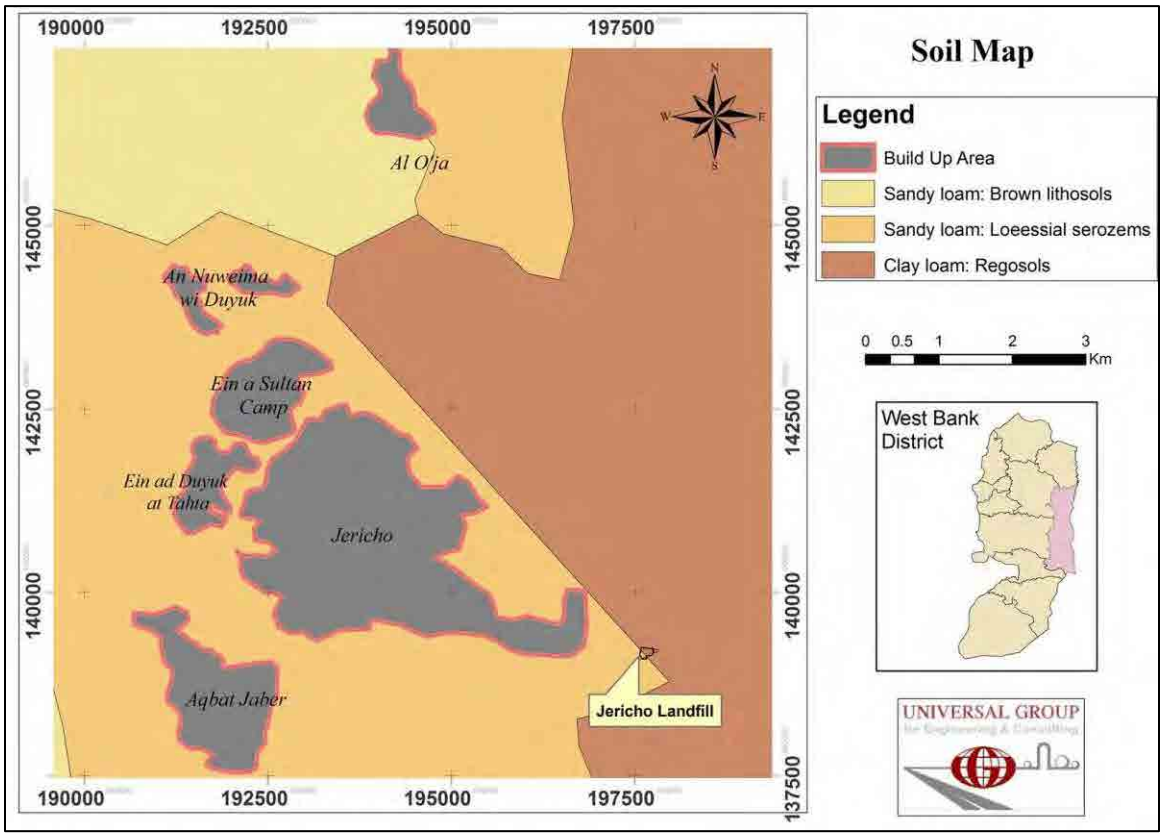


Plate 3.8: Soil Description of the Jericho City

- ***Brown Lithosols and Loessial Serozems***

Lithosols are typical of the steep hill slopes. Brown lithosols are found also on small plateaus. Inclusions of loessial Serozems are found in broad valleys, terraces, and on large plateaus. The soils are originally formed from limestone, chalk, dolomite and flint. The structure of this horizon is subangular blocky or prismatic, with many lime nodules. The transition to the rocks is mostly sharp. Many rock outcrops are found, usually at the surface; the soil is restricted to the pockets among these rocks. Major vegetation types found in these regions are Anavasetea articulatae and Zygophyllum. Such soils suffer from extensive erosions due to runoff, especially in steep slopes. The soil association is

also suffering from salt accumulation due to limited salt leaching capabilities. The current land use is restricted to winter crops that are grown by Bedouins in some wadis.

- ***Regisoils and Coarse Desert Alluvium***

It is found in plains and dissected low plateaus and characterized by large valleys and alluvial fans. Its parent materials are of mainly unconsolidated mixed stone and deposits. At greater depths there are stones and weathered rocks. Gypsum crystals or petrogypsic horizons are found in the deeper soil layer. The vegetation is restricted in few areas to rivulets. In most areas, dwarf shrubs such as anabasis articulate and Reaumuria are dominant. The area is of almost no agricultural value with the native vegetation able to supply only very poor grazing for camels, goats and sheep.

3.8 Aquifer Systems

There are several aquifer systems in the Jericho region, mainly:

- Lower Cenomanian Aquifer System
- Upper Cenomanian-Turonian Aquifer System
- Quaternary Aquifer System

The Lower Cenomanian Aquifer System is composed of the Lower Beit Kahil, Upper Beit Kahil and the Yatta Geological Formations. The Lower Beit Kahil Formation and Upper Beit Kahil Formation and sometimes the lower part of the Yatta Formation comprise the Lower Aquifer, which is deeply confined across most of the West Bank. It is an excellent regional source of drinking water, the high water bearing capacity and productivity reflects the thickness of dolomitic limestone and limestone. Water quality is generally good, though slightly salinity has been encountered towards the Jordan Valley.

Turonian (Jerusalem) aquifer formation consists of massive limestone (sometimes thinly bedded limestone), and dolomitic limestone with well developed karst features. It is part of the Upper Aquifer, but it is isolated from the main part of the Upper Aquifer in the south and parts of the eastern West Bank wherever the underlying Bethlehem Formation becomes a weakly permeable aquitard. It forms a good aquifer especially where the

saturation thickness is in tens of meters. Water quality is generally good but in some areas there is evidence of deterioration because of pollution by sewage and agrochemicals.

The Upper Cenomanian aquifer consists of the Bethlehem and Hebron Formations which are mainly bedded dolomite and chalky limestone. In the southern and eastern part of the West Bank, the Bethlehem Formation is considered an aquitard, while to the north and west it has aquiferous characteristics. The Lower Part of Yatta formation represents a fair aquifer. The Lower Yatta Formation hydraulically separates the two regional aquifers (Upper and Lower Aquifers) across most of the West Bank, although to the north, the presence of limestone gives rise to minor springs and seepage. Water levels (heads) in the Upper Aquifer are generally higher than in the Lower Aquifer.

The Quaternary Aquifer System is composed of three formations: Lisan, Alluvial and Gravel fans. The Lisan Formation (Pleistocene Aquifer), a marl, gypsum and silt unit, is an aquiclude to a weak aquifer. The Alluvial and gravel fans (Holocene) are distributed in the Jordan Valley. These Alluvial fans are still accumulating after large floods and consist of debris from neighbouring lithologies. The alluvium is mainly formed of laminated marls with occasional sands. Gravel fans are widely distributed in the Jordan Valley and have the capability of transferring groundwater from the limestone aquifers. The Palestinian wells in the Jericho region tap the Upper Cenomanian-Turonian aquifer system and the Neogene and Pleistocene shallow aquifer systems.

3.9 Water Resources

3.9.1 Groundwater

Groundwater is the main source of water supply for Palestinians in the Jericho city either by wells or springs. Water of wells is taken from the quaternary aquifers. The aquifers are recharged from seasonal rainfall through the outcropping mountainous areas in the West Bank. The eastern basin is considered the main source of water for shallow wells through direct infiltrations from the surface runoff or by lateral flow from the mountain aquifers.

Water allocation from wells and springs in the Jericho is 95% for agriculture and the remaining 5% is for human consumption. The working agricultural wells are 28 out of 93 wells. The remaining wells are non-pumping and abandoned wells. The main source for domestic water in Jericho city is Ein Al Sultan which provides a steady output throughout the year of about 680 m^3/hr and the salinity of 600 fractions per one million, whereas the Jericho area using the spring has quite high water use efficiency.

Several water wells, mainly agricultural, exist in Jericho area. The nearest well to Jericho landfill is within 0.5 km. Plate 3.9 shows the wells that are within 3 km from the landfill. The circles in the plate give readings of quality parameters of these wells. The impact on the water resources and the nearby wells and wadi should be tackled. Annex B lists further information about wells and their water quality parameters in the project area.

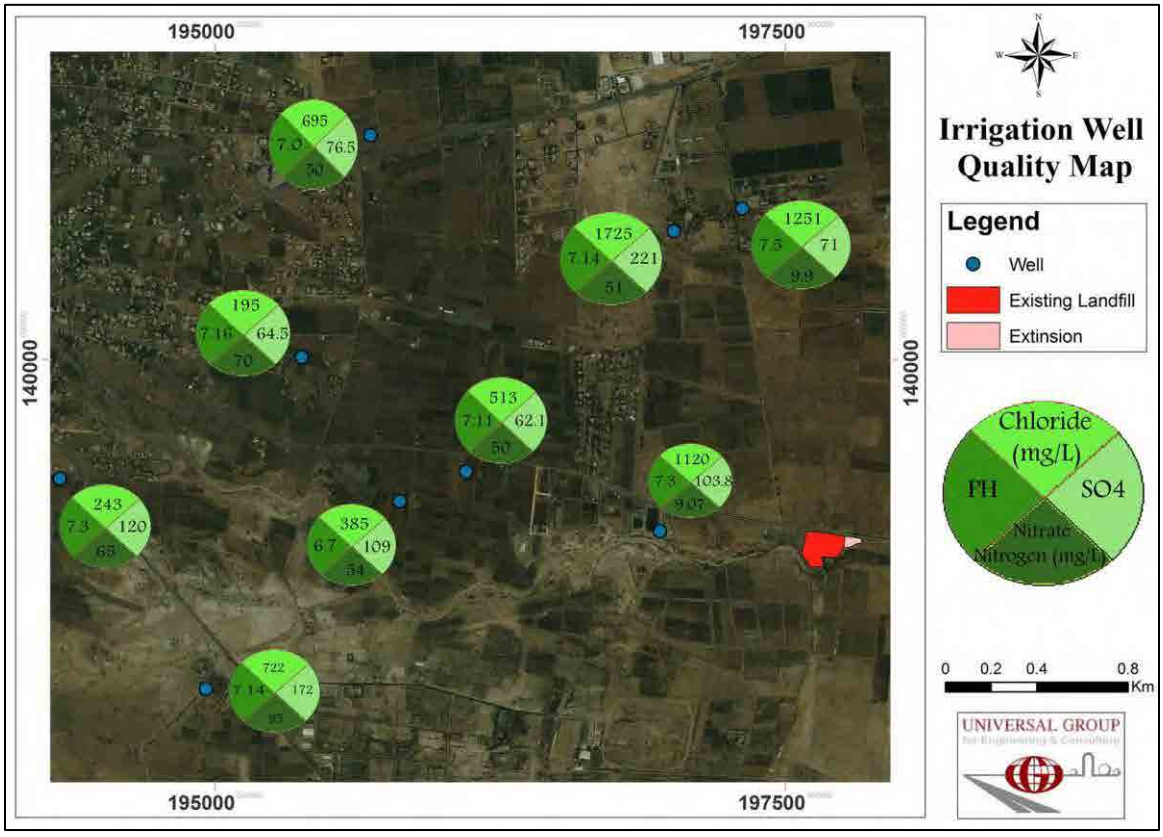


Plate 3.9: Water wells nearest to the landfill site

The chemical data in Annex B are the major anions and cations showing increase from west to east as you get nearer to the landfill site. Mg, K, Na and Br show good linear

correlations with the calculated TDS values, while Ca, Sr, B, SO_4 and HCO_3 show relatively low correlations and nitrate indicates very poor correlation; only scattered nitrate values being documented. These measure have been reported by a PhD thesis titled "Hydrochemistry and Isotope Hydrogeology in the Jericho Area/Palestine" prepared by S. K. Khayat, 2006 at University of Karlsruhe, Germany.

The groundwater from wells surrounding the landfill site shows the highest salinity in the Jericho area, with a chloride content of more than 1,800 mg/l for well 19-14/067 and a TDS value of 3,664 mg/l. This relatively high saline water is of the Na–Mg–Cl and Mg–Ca–Cl type. The SO_4 concentration is 320 mg/l. The groundwater from these wells is highly saturated with dolomite and relatively saturated with calcite, while the saturation indices for gypsum and anhydrite are higher than the rest of the wells but still under saturated. The carbonate concentration of 440 mg/l is relatively high. The groundwater from these wells shows the lowest tritium units which were below the detection limit of <0.6 TU for well 19-14/067.

These shallow wells tap water from the Jordan Valley deposits and have an average depth of 100 m and are of low discharge (less than 100 m^3/h). The nearest well to the site is well 19-13/096 (Bold in table B.1), which is about 500 m west of the site. This well is extensively used by two farmers for irrigation of the land leased from the Arab Society.

The other nearest well is to the east of the landfill site and has relatively low discharge. The well was used by the farmer for irrigation. The quality for three of the wells located near the site is controlled and tests for September 2006. January 2007, October 2007 and February 2008 are available. The EA study should consider comparing the water quality of these wells that are within about 500 m from the site with the environmental standards (WHO and FAO) and evaluate if the water quality of these wells have been impacted by the landfill.

3.9.2 Surface water

The sanitary landfill and the expansion site are located at the discharge of Wadi Qilt surface water catchment (Plate 3.10). The plate shows that three main surface water

catchments flow through Jericho. These catchments drain the eastern mountains of the West Bank and cause flooding of the relatively flat areas of Jericho during heavy rainy winter.

Wadi Al-Qilt course is bounding the landfill from the south and is currently used for dumping the septage by the vacuum tankers emptying the cesspits. **Plate 3.11** is a photo of wadi Al-Qilt near the landfill site where septage from wastewater cess pits is dumped by vacuum tankers.

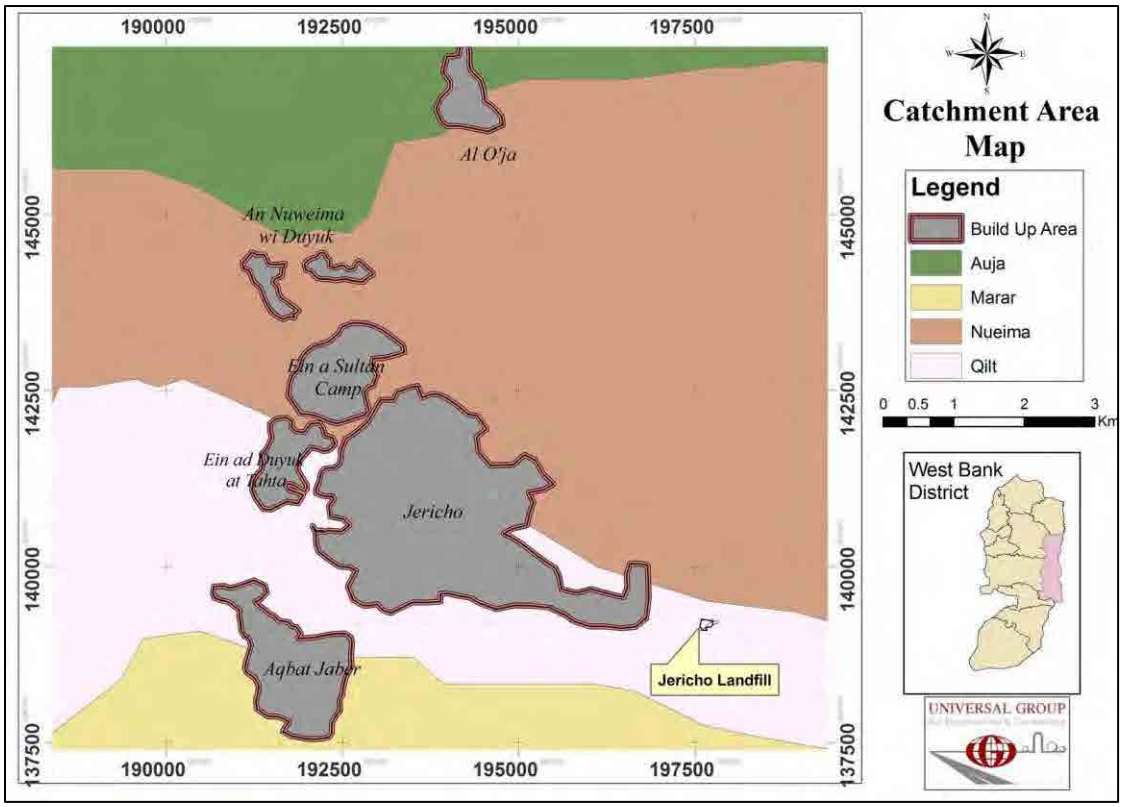


Plate 3.10: Jericho surface water catchment area map

Plate 3.11: Raw wastewater dumped by vacuum tankers at wadi Qilt

3.1 Solid Waste Management Service

The JCspd serves 17 communities including the entire Jericho governorate, 7 areas from Nablus and 3 from Tubas. The landfill of Jericho however serves 3 areas only, namely the two refugee camps, Jericho city, Al Dyouk and Al New'meh (Plate 3.12).

There are another two controlled dumpsite in the area operated by the JCspd. Al 'Auja area serving Al 'Auja and Fasayel and receives nearly 5-6 tons a week; the middle and northern areas of the Jordan valley area, including waste from Nablus and Tubas is moved to a transfer station in Tamoun and later to Zahrat Al Finjan upon agreement with the JSC in Jenin, this dumpsite receives 32-35 tons daily.

The JCspd earns 108,000 NIS as a lump sum from the Jericho Municipality for solid waste handling services. In return the municipality collects fees from citizens depending on size of the dwelling and the number of rooms it consists (24 JD for 2-3 rooms households and 32 JD for houses of 5 rooms and above).

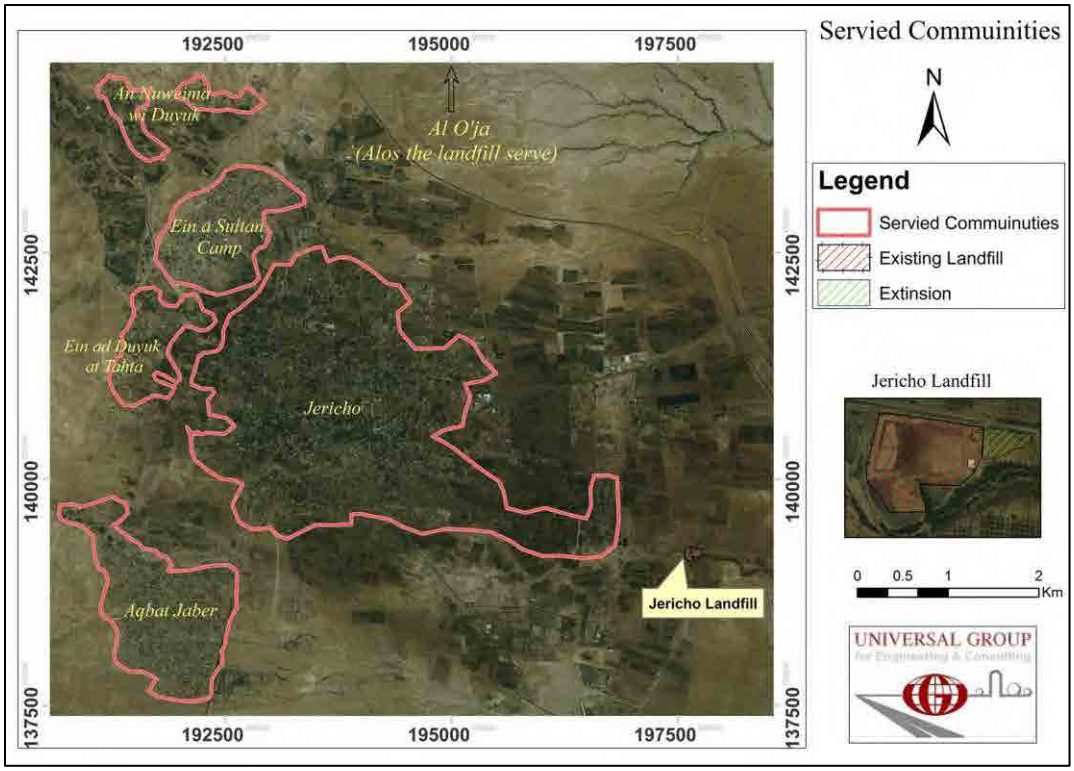


Plate 3.12: The areas around Jericho served by the sanitary landfill

In areas such as New'meh and Dyuok, the fees paid depending on size of household using a single kitchen (18NIS/month for a single family, 32 NIS/month for a multifarious family). As for refugee camps, fees is collected by municipality from the UNRWA and is included in the lump sum amount that the JCspd receives.

3.2 Historical and Archaeological Resources

Jericho is an attraction for foreign visitors and Palestinians alike because of its long history, rich array of cultural artifacts, and sights in which desert and oasis converge.

Jericho city was inhabited during Mesolithic Period. The Herodion Jericho was restored by the Romans on the rift of Wadi Al-Qilt. During the period 306 to 337 AD, Jericho became the center of Christianity, continuing to be an important city through the Byzantine Period (527-565 AD). In the seventh century, Muslims took control of Jericho, whose development of irrigated agriculture there earned it the description of the "City of Palms". There are several historical sites in Jericho, mostly located in the western parts of the city. Among these are:

The Mount of Temptation (Deir Qruntul): The Monastery perched on the side of the mount of temptation. (Plate 3.13)

Plate 3.13 The Mount of Temptation in Jericho

The Fortress: Iron Age II fortification lies near the southern entrance to Jericho

Herodian Palace (Kypros): located on a nearby conic-shaped hill, 3 km southwest of Jericho city.

Tell Es-Sultan (Ancient Jericho) located northwest. The site records going back to prehistoric Natufian culture of the $11^{th} – 9^{th}$ century BC, making Jericho arguably the oldest continually inhabited site on earth.

Hisham's Palace (Khirbet al-Mafjar): Hisham palace was one of the most impressive country residences of the Omayyad period; archaeologists call it "the Versailles of the Middle East." It was built at the beginning of the eighth century by Omayyad Caliph Hisham Ibn Abd al-Malik (724-743), only to be partially destroyed 20 years later in an earthquake (Plate 3.14).

Ein al-Sultan (Spring of Elisha); Wadi Al-Qilt; St. George Monastery; Khirbet Mugheifir; and Khirbet Es-Samara.

None of these are located east of Jericho city where the sanitary landfill is and where the proposed expansion is located. Therefore the expansion of the existing landfill is not to impact any of these archaeological sites.

Plate 3.14:Hisham's Palace

3.3 Flora and Fauna

The ecosystems in the West Bank, a composite of African, European, and Asian flora and fauna, have a diverse range of species and habitats. The Ministry of Planning studied ecologically significant and sensitive areas to identify and evaluate their "value, importance, sensitivity, and vulnerability." Using these studies, they have designated fifty areas for protection from development.

The site of the sanitary landfill in Jericho is not one of these areas and is located within the municipal boundaries. This means that the proposed site for expansion of the landfill is located within the physical plan of the city subject to urbanization and development. Therefore there is no biological value for the proposed site other than it is used for agriculture. The land owner has approved the allocation of the site for the expansion of the Jericho landfill.

The Jericho is characterized by the Jordan Valley ecosystem, where unique and rich biological diversity exists, including plants that tolerate high temperatures and salinity such as *Tamarix jordanica* (Jordanian Tamarisk); *Atriplex halimus* (shrubby saltbush); *Phragmites australis*, (common reed); *Ziziphus Lotus*, (lotus tree); and others. There are also a number of animal species that favour this area as habitat, including Erinaceus europaeus (hedgehog); Crocidura russula (shrew); Rousettus aegyptiacus (Egyptian bat); Herpestes ichneumon (Egyptian mongoose); Sus scorfa (wild boar); and Vipera palastinae (Palestinian viper). The area receives migratory birds particularly in winter period as a low-lying area. Many scavenging birds, which may be considered as disease victors, were observed within the landfill boarders (Plate 3.15) which are attracted to the open source of food on the site. Mechanisms for birds control need to be controlled on site as they may be cause of public health risks.

Plate 3.15: Scavenging Birds on Landfill Site

The Jericho landfill which is going to be expanded is located within the municipal boundaries of the city that is subject to urbanization and development. Therefore, there is

no biological value for the proposed site other than grazing and other agricultural activities on the hill opposite the landfill.

3.4 Agricultural activities

Almost 50,000 dunums in Jericho and Al-Aghwar are cultivated lands that form 2.9% of the total cultivated area of the West Bank. All the agricultural area is irrigated and forms 33.2% of total irrigated lands. Of the total cultivated area, 75 % is cultivated with vegetable crops, 14 % with fruit trees, and 11 % with field crops and forage. Date palm plantation has been expanded rapidly in the past ten years in Jericho district. According to the Ministry of Agriculture, the total area in Jericho city planted with palm is about 60,000 dunums; about 50% of this area was cultivated during the last two years (Plate 3.16).

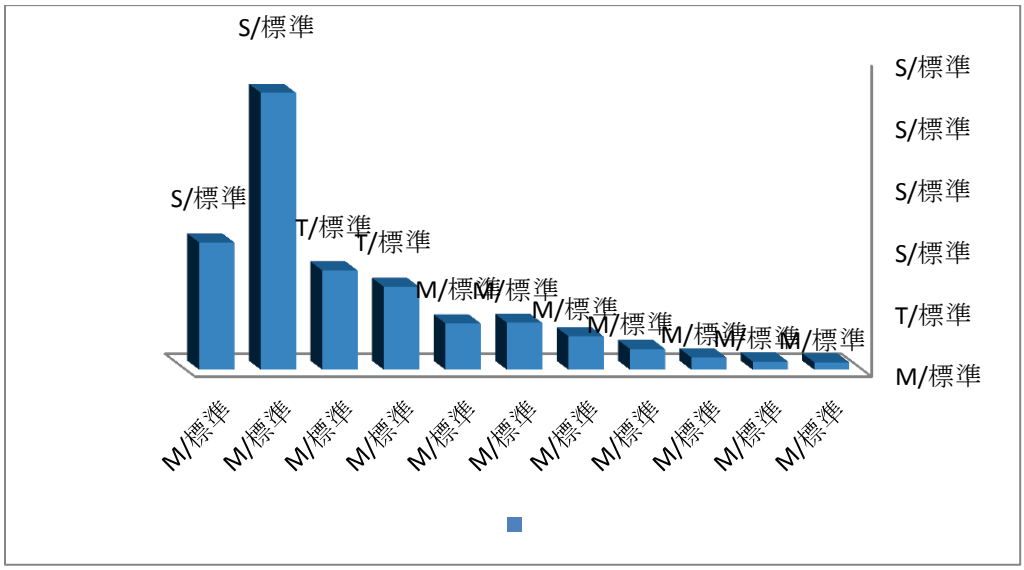


Plate 3.16: Cultivated area with date palm in dunums in Jericho from 2001-2011

Plate 3.17 is a photo taken from the existing solid waste landfill site showing the date palm plantation across the proposed expansion site, where they are separated by a shallow valley that is cultivated by olives. The wadi is known as the extended Wadi Al-Qilt that drains the rainwater flowing during heavy storms form the West Bank Mountains.

Plate 3.17: The existing solid waste landfill site close to date palm plantation

On the other hand the wadi is already impacted by seepage from the septic tanks and cesspits that is dumped by vacuum trucks into the wadi. The assessment of the construction of the landfill expansion should include the impacts on the nearby wadi and the agricultural activities.

3.5 Industrial Activities

There are three major industrial groups in Jericho city:

- First group includes: stone-cutting, brick and tiles, and ready-mix concrete. These form the basic part of construction and building material.
- Second group includes: food industry, vegetable oil, slaughterhouses and meat processing.
- Third group consists of steel workshops, chemicals, pharmaceuticals cosmetics industries, in addition to miscellaneous economic activities.

It is estimated that 62% of industrial facilities of the entire West Bank do not undertake separation of solid waste, which imposes difficulty on the management and treatment of waste. Only 1.7% of industrial facilities undertake solid waste treatment whilst most of the industries in the West Bank (62%) burn waste in open air, a practice most commonly found Middle and Southern West Bank governorates.

The nearest industrial establishment to the proposed expansion site is about 600 m to the south of the site, which is a newly established dairy (cows) farm for Aljunidei Company (Plate 3.18).

Plate 3.18: The Dairy farm south of the existing landfill site

3.6 Roads and Traffic

The main road to the landfill is Al Maghtass Street, which extends from the intersection with Road 449 and Road 90 at Jericho City Center. Plate 3.19 is the road map of Jericho city showing Al Maghtass road that leads to the landfill and the proposed expansion site.

In August 2008, a traffic survey was conducted for improving of internal roads in Jericho. The project was funded by JICA. The measured morning peak hour was between 11:15 to 12:15, while the evening peak hour was between 8:00 and 9:00 pm (Table 3.3).

Table 3.3: Sum of Traffic Counts and ADT factored from traffic counts

Name of Street	Period of Counts	Pedestrian	Bicycle/ Motorcycle	Pickup	Passenger car	Mini Bus	Large Bus	Light Truck	Heavy Truck Trailer	Total Vehicles
	24-hour Counts									
Jerusalem	24-hour count	125	152	264	7407	59	47	335	183	8447
	16-hour count	101	131	199	5964	42	45	294	170	6845
Ein Sultan	24-hour counts	626	442	221	4218	26	19	204	77	5207
	16-hour count	523	382	183	3731	25	19	190	72	4602
	16-hour Counts									
Amman	16-hour count	104	157	204	5255	51	53	135	74	5929
	24-hour ADT*	129	182	237	6526	72	55	154	80	7317
Palestine	16-Hour Counts	438	541	109	1135	13	4	63	2	1867
	24-hour ADT*	524	626	132	1283	14	4	68	2	2112
Hisham Palace	16-Hour Counts	331	412	82	1382	13	3	85	30	2007
	24-hour ADT*	396	477	99	1562	14	3	91	32	2271
Steel Company	16-Hour Counts	44	19	13	140	0	1	29	116	318
	24-hour ADT*	53	22	16	158	0	1	31	124	360
Al Maghtass	16-Hour Counts	101	95	115	544	4	2	114	26	900
	24-hour ADT*	121	110	139	615	4	2	122	28	1018
Jaffa	16-Hour Counts	354	241	12	568	6	7	43	14	891
	24-hour ADT*	424	279	14	642	6	7	46	15	1008
	3-hour Counts									
Estiraha	3-Hour Counts	17	10	2	50	0	0	10	0	72
	24-hour ADT**	180	67	14	311	0	0	49	0	451
AlKedawi	3-Hour Counts	62	51	102	101	0	0	11	0	265
	24-hour ADT**	192	256	751	504	0	0	86	0	1370
Kitf Alwad	3-Hour Counts	103	22	10	41	0	0	5	2	80
	24-hour ADT**	319	111	74	205	0	0	39	9	414

Source: Traffic Survey Report for the Improving of Internal Roads Project in Jericho, Diyar Consultants Co. For JICA, 2008

* ADT: Average Daily Traffic factored from traffic counts by using the percentage factor of 16-hour count to 24-hour ADT

** ADT: Average Daily Traffic factored from traffic counts by using the percentage factors of 3-hour count to 24-hour ADT

The ADT was calculated by using the 16-hour to 24-hours driven from the 24-hour counts on Ein Sultan and factored the 16-hour counts for Jafa Street, Hisham Palace Road, Palestine Road, Al Maghtass Street, Steel Company Street. The 3-hours factors were driven from Ein Sultan 24-hour counts and used to drive the ADT for Al Estiraha Street, Kitf Al Wad Street, and Al Kedawi Street.

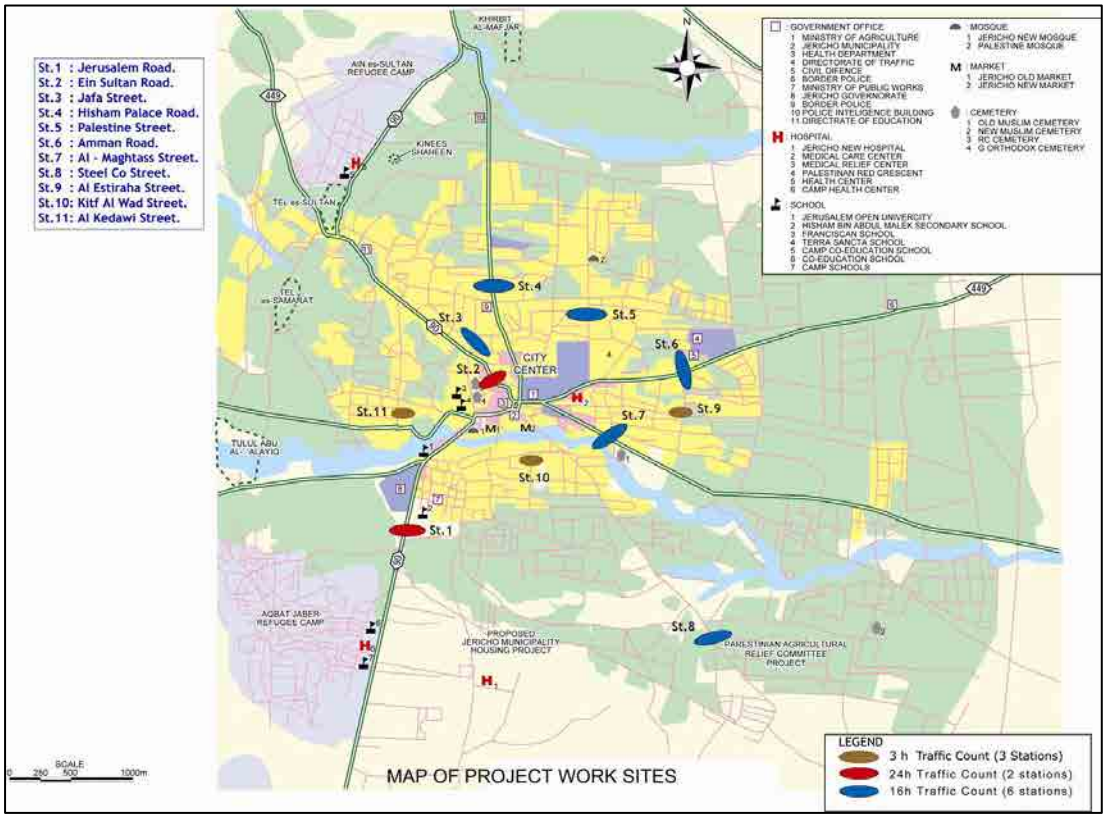


Plate 3.19: The road map of Jericho city

From the Table it is clear that the heavy trucks and trailer using Al Maghtass Street is less that 3% of the average daily traffic passing the street at about 100 vehicles. In 2008, Jericho landfill was in operation, therefore the expansion of the landfill will not add much traffic load on the street. The expansion of Jericho landfill is to serve the same areas and inhabitants as currently done and in fact it will be the final landfill site for Jericho. The current landfill is to be closed and a reuse project is to be integrated at that site.

Plate 3.20 shows Al Maghtass Street at its paved end near Jericho landfill facing Jericho city. The width of Al Maghtass Street is 12 m and is paved at about 8 m along most of its length towards the landfill and at 6 m for the last 1 km near the landfill.

The current condition of the street is fair, but will require rehabilitation and pavement to include the portion of the street leading to the expansion site.

Plate 3.20: The road leading to the landfill and the expansion site

3.7 Seismology

The Rift Valley in Palestine, is part of the regional Rift Valley which extends from the Gulf of Aden in the Red Sea to Al 'Aqaba Gulf and continues in Wadi Arabah, Dead Sea, in the Jordan Valley, Tiberius Lake and the Finger of Galilee up to Antakya in Turkey.

Palestine is located moderately active seismic zone with a Peak Ground Acceleration factor (PGA) of Z = 0.075 to Z = 0.3 on rocks. Plate 3.21 shows the four different seismic zones that characterize Palestine ranging from a relatively weak Zone I in the south west, to a relatively strong zone of 6.5-7 on Richter scale in the east (Zone 3). Several earthquakes have been registered in Palestine during the 20th Century. The most significant earthquakes were in 1900, 1903, 1923, 1927, 1954 and 1995.

As for Jericho district, it is located within Zone 3, which has a PGA factor of 0.30 according to the Uniform Building Code (UBC). It is considered the highest in the area, therefore, it is recommended to consider the seismic loads in the design and construction of any facilities in area.

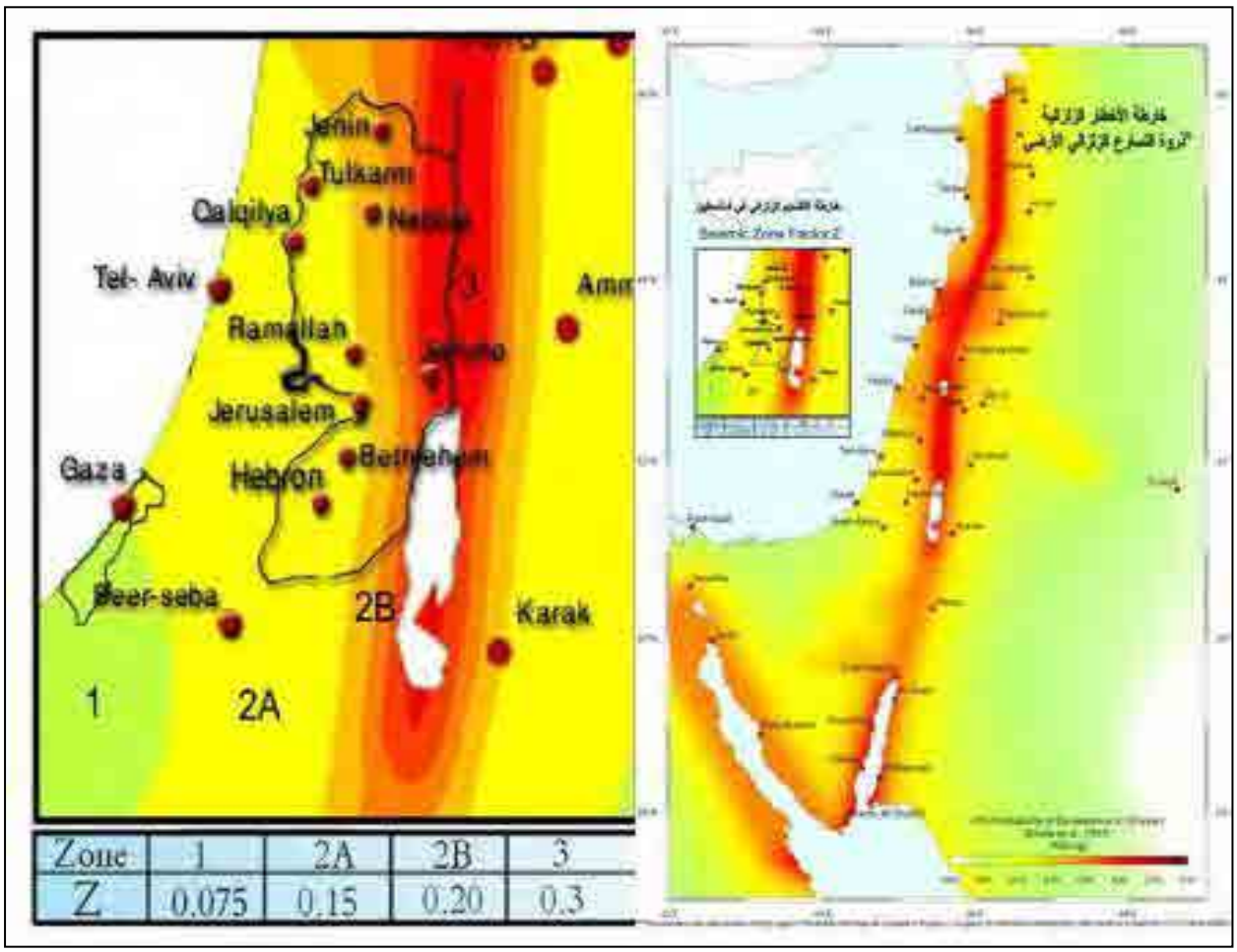


Plate 3.21: Seismic hazard map and seismic zone factor for building codes in Palestine

4. ENVIRONMENTAL SCOPING

4.1 Scoping on Environmental Assessment

The environmental assessment should be carried out in compliance to the requirements of PEAP. According to this policy solid waste disposal sites are listed among those that require detailed EIA and are likely to have significant adverse environmental impacts that are sensitive and diverse. On the other hand, the expansion of the existing Jericho sanitary landfill requires to be applied to the screening criteria as for EQA to determine what level of EA should be prepared.

The EA should cover, but not limited to, the following:

1. Provide comprehensive description of the project components including using maps at appropriate scales when necessary.
2. Generate baseline data on relevant environmental characteristics of the project components area including description of physical environment, biological environment, and socio-economic and cultural constrains.
3. Outline and examine the pertinent regulations and standards governing environmental quality, health and safety, protection of sensitive areas, protection of water resources and pollution control, and land use control at the national and local level.
4. Identify and determine the potential positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts. The assessment of the potential impacts shall include, but not limited to, pollution of groundwater aquifer, landscape impacts of excavations and construction, loss of nature features habitats and species by construction and operation, soil contamination impacts, odour substances, noise pollution, and socio-economic and cultural impacts.
5. Prepare and develop management plan to mitigate the negative impacts, recommend feasible and cost effective measures to prevent or reduce significant negative impacts to acceptable national level.
6. Prepare a detailed plan to monitor the implementation of the mitigation measures and the impacts of the project during the construction and operation of project.

4.2 Scoping on Social Assessment

The social impacts associated with the expansion of the sanitary landfill of Jericho include:

1. Impact on agricultural land and private properties.
2. Allocating temporary construction camps and the social impact of operating these facilities.
3. Impact on roads and traffic disturbances
4. Job creation and labour safety.
5. Information disclosure to ensure maximum broad and convenient among residents
6. Public awareness and social understanding and corporation.
7. Waste pickers and scavengers.

Plate 4.1: Waste picker at the existing Jericho landfill site

Plate 4.1 shows a waste picker at the existing Jericho landfill site. As the project main is the expansion of the sanitary landfill and possibly closure and rehabilitation of the

existing currently operated Jericho landfill, then the social assessment shall concentrate other social aspects including waste pickers.

The EA should consider mitigation measures for the waste pickers. There are 3-5 permanent waste pickers that come to the site. The plan of the JCspd is to employ these to work in the recycling plants as they have the experience in picking up the wastes that are of value. Among the other mitigation measures in this regard are:

- As part of the EA, a social management plan has to be prepared that should consider the vulnerable groups including the waste pickers, landowner, and the farmers.
- Integration of the waste pickers to work in the landfill activities (landfill, sorting and recycling, etc.).
- Provision of other possible Job opportunities.
- Facilitate access to micro-grants and sources of finance for improving livelihoods.
- Capacity development programs.

The other social issues associated with the expansion of Jericho landfill site include:

8. Minimizing the impact on cultural sites or structures and community-owned assets during construction and operation.
9. Ensuring traffic safety during construction and operation.

4.3 Confirmation of Environmental Considerations

According to JICA Guidelines for Environmental and Social Considerations and to the PA stakeholder considerations, the most important environmental and social items that are related to the construction of solid waste management facilities are addressed in this scoping report. According to the PEAP, Solid waste disposal sites are one of the listed categories for a fully detailed EIA. However, EA for the expansion of such facilities is not mandatory under the policy, but may require an IEE or further assessments according to the instructions of the EQA.

Meeting with EQA representative confirms the need of detailed consideration and study of environmental aspects. A number of these aspects were recommended and are included in this study; among which is the consideration for Odour that needs to

be presented in the EA. These recommendations do not substitute the official ToR and application for approval of the expansion. Environmental Approval Application must be submitted to the local EQA office.

The Ministry of Agriculture (MoA) has to approve the change of the land use from agricultural to landfill site. They will require consulting and obtaining approval of land owners and farmers before project commencement. MoA highly recommend considering groundwater in Jericho given the fact of the very shallow and adjacent recharge area. There are numerous agricultural wells in the area. Prevention of soil contamination and groundwater is a top priority for MoA.

As stated by the MoLG, needs assessment for the inventory of the JCspd including equipment for detecting air pollution is required .Considerations for Air pollution need to be presented as recommended by the EQA. Time of storage needs to be presented, as well as estimation of generated leachate, and means of dealing with leachate. Storm water system must be placed for rainwater discharge and prevention of pooling.

Considerations for waste separation, reuse, and recycling on site of the proposed expansion are recommended. At any case, organic waste separation in attempt for commercial compost production must be in complete cooperation and involvement of MoA in order to ensure compliance with national standards and regulations that govern soil protection and safety of consumers. Hazardous material and waste shall directly be transported to sanitary landfills where it is readily designed to handle such material. The JCspd already fulfils this task and shall continue to do so for the expansion project. Medical waste is currently buried in a fenced cell (Plate 4.2). The expansion project also includes a cell for medical waste and shall set appropriate procedures for handling it.

The proposed expansion shall not interfere in the harmony and balance between natural resources and wildlife existence, including both flora and fauna and wildlife and biodiversity must be considered by the EA study. Area of proposed expansion shall be scanned and carefully surveyed to confirm presence of any potential significant impact on wildlife habitat. Scavenging birds on landfill site can be observed by naked eye. They form part of the bio diversity of the area given the

importance of the region for migratory birds. Control of birds shall be addressed either by fencing or other controlling methods as to prevent risk on public health.

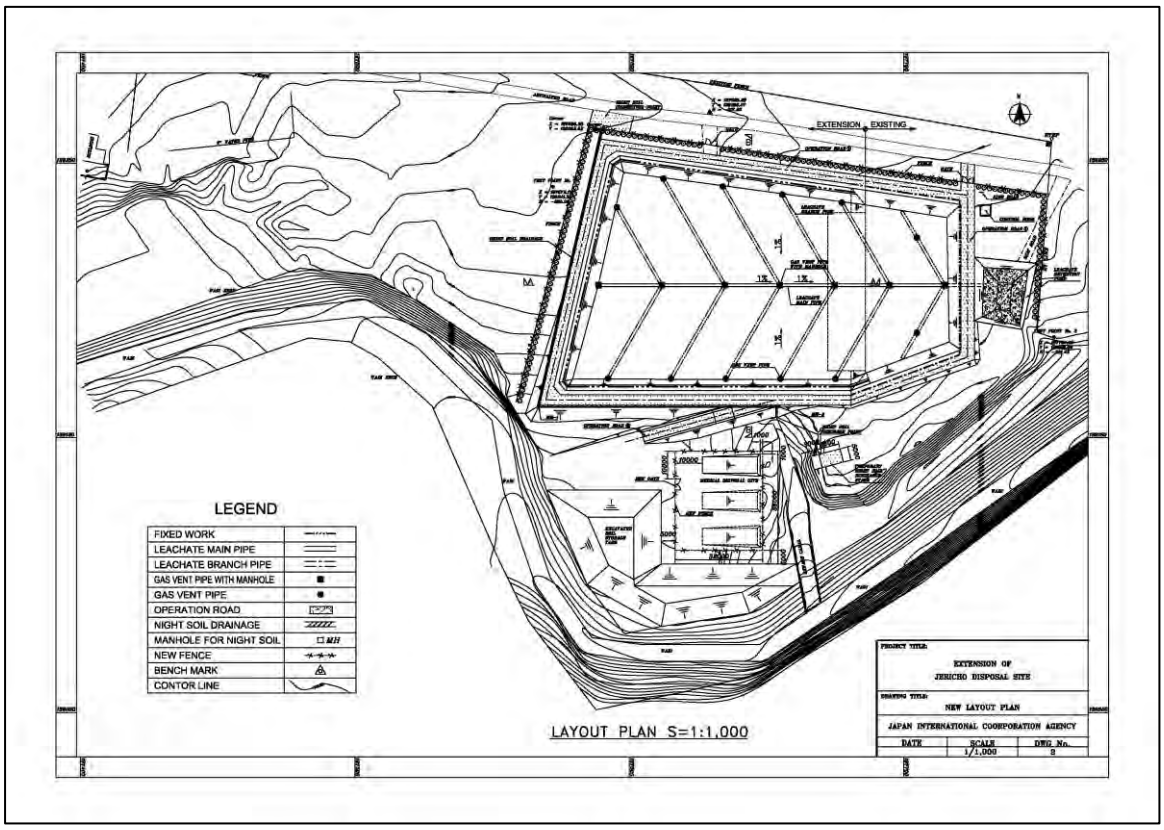


Plate 4.2: The layout of Jericho sanitary landfill

Noise and Vibration is not a major impact from the project, except for the noise from collection and transportation vehicles, which could be mitigated by continuous maintenance and taking appropriate routes in the out risks of urban areas. The majority of stakeholders emphasized on carefully choosing transportation routes.

Pests and insects in the currently landfill are properly controlled by continuous application of pesticides. The expansion will be using the same methodology therefore it is no likely to cause pathological impacts and disease victors in the area.

MoTA made an initial scan against the map of designated cultural and historical sites. There are no particular significant sites near the location of the current landfill and up to the expansion boundaries. Landscaping and intrinsic value of the area shall be considered during the design and construction.

Ministry of Labour (MoL) recommends binding to Palestinian Labour Law. Safe working environment during construction and operation shall be maintained. Occupational health and safety measures shall include proper clothing and coverage of workers on landfill site and appropriate signage at hazardous locations within the landfill.

The project is going to have impact on the local economy by providing jobs to the local community. There will be no significant impact on inhabitants due to its distant location from residential areas. The area is also very adjacent to Road 90 and area C which minimizes chances for urban expansion in that area.

Majority of stakeholders emphasized on setting clear mitigation measures and a coherent Environmental Management and Monitoring Plan that considers among others the water resources.

4.4 Scoping on Possible Impacts

Potential environmental impacts which are likely to occur during the construction phase of the expansion of Jericho landfill site are (i) nuisance to people in surrounding of site due to dust /noise /smoke generated by the movement of vehicles/machinery which will be mitigated by using vehicles of appropriate conditions and regular noise and smoke testing in order to set appropriate control measures; (ii) pollution due to wastewater and waste from the contractor's camp which will be mitigated by providing adequate arrangements for the safe disposal of wastewater and waste; (iii) health and safety of workers which will be mitigated by proper training of contractor's crew about First Aid and Health & Safety procedures; and (iv) accidental hazards on the public people, which will be mitigated by regulating procurement of material and adopting highest standards in engineering methods and mechanisms.

During the operational phase, the potential environment impacts will more likely be related to (i) odour, littering, and groundwater pollution by leachate and (ii) potential accident at the landfill site or health problems to operating staff and workers as well as proper isolation of landfill premises and control of landfill boarders in order to avoid uncontrolled penetration to the landfill. To mitigate this impact, the landfill workers and staff will be trained on the handling operations.

Table 4.1 lists the possible impacts during construction of the expansion of Jericho solid waste landfill site and during its operation.

4.1 Scoping on Mitigation Measures

In order to eliminate or reduce potential negative environmental impacts, mitigation measures are typically recommended to prevent the impacts associated with operation of the landfill expansion alongside the cumulative impact of the already existing landfill area. Mitigation measures are highly dependent on the significance of the predicted impact, the nature of the impact or the phase of the project (construction versus operation). Table 4-3 lists the potential impacts and the recommended environmental management measures that will be tackled further by the environmental assessment.

Table 4.1: Possible Impacts during Construction and Operation

Significant	Cause	Impact
CONSTRUCTION PHASE		
Short term	Resulting from construction activities and truck traffic	Noise and dust
Short term	Resulting from construction activities, land reclamation	Construction waste
Long term	Biodiversity land reclamation and construction activities leading to the destruction of the natural ecosystem at the expansion site	the natural ecosystem at the landfill site and habitat destruction
Long Term	Soil compaction, erosion and destruction of vegetation	Altered abiotic/site factors
OPERATION PHASE		
Long term	Light fraction of waste carried by winds	Litter
Short term	Waste trucks coming and leaving the facility thus generating foul odours and noise.	Odour and noise
Long term	potential leachate generated, uncontrolled drainage, and improper storage and receiving areas	Natural resources and soil Contamination
SOCIAL IMPACTS		
Long term	Resettlement of the farmer; the farmer will be given the opportunity to lease another land in return of his current illegal farming of the proposed agriculture site.	
Long term	Waste pickers (3-5) are to be given the opportunity to work at the project (recycling plant) or at other job opportunities.	

Table 4-3: Environmental Management during Construction and Operation

Potential Impact	Recommended Mitigation Measures
Impact of Excavated Soil	Allocate adequate areas for spoil storage in the final design. Ensure that the spoil generated during construction will not cause un-favoured changes to surface water drainage.
Affecting Air Quality by Air Emissions of Construction Works	Should plantation is found not feasible to apply as wind breaks at the borders of landfill expansion site, other means as wind breaks shall be constituted such as proper fencing. Spoil of soil to be reused should be appropriately covered and stored. Rehabilitation and pavement of access road. Washing of trucks wheels before leaving the site both during construction and operational phase. Continuous and regular maintenance of vehicles and machinery working on site in the landfill in a timely frame.
Noise Impact	Noisy equipment should be supplied with adequate matter. Use acoustic barriers as necessary if complaints from neighbours were received. Should plantation of wind breaks appear unfeasible, other sorts of sound barriers can be adopted such as proper fencing of landfill boarders. Optimize the use of noisy machines. Working hours with noisy machinery is restricted between 6:00 pm and 8:00 am. Construction and operations of the landfill expansion should be stopped during night time.
Odour Impact	Apply waste filling plan in the project design and promptly apply 15 cm soil cover on fresh waste. Provide additional waste containers at the site to ensure smooth operation and reduce vehicles waiting time. Provision of a roof is recommended to avoid dispersion of odour. Implement the designed unloading procedures of the expansion through a waste hopper.
Visual Impact	Active waste area to be surrounded by a screen fence to prevent littering dispersion.
Affecting Air Quality by Vehicles Emissions	Implement preventive maintenance program for vehicles working in the project and promptly repair vehicles with visibly high exhaust.
Impacts of Leachate and Surface Water	Include the leachate collection system in the design and tender documents. The design should include maintenance schedule for the system. Implement preventive maintenance schedule. Coordinate with the WWTP about the amounts of Leachate and sludge that could be discharged to the plant. In case the monitoring wells indicated high pollution loads that could be related to leak of Leachate, this leak should be identified and adequately handled.

Potential Impact	Recommended Mitigation Measures
Risks of Hazardous Wastes	Flammable and explosive waste should be prevented from admission. Prepare an emergency response plan for spills and fires. Coordinate with planning authorities and the donor community to initiate a project for hazardous waste management. Provide hazardous waste training to staff working in the project. In case that the landfill will operate without parallel hazardous waste facility a special cell should be constructed. Prepare an emergency response plan for spill or fires.
Risks on Public Health	Apply pesticide as needed through an application plan that would give preference to biological pesticides. Provide hygiene training for staff working in the project and provide suitable showers, washing and cleansing facilities. Prevention of unauthorized admission to the landfill. Effective application of the waste filling plan and daily cover.
Impacts of Construction and Operation Waste other than Excavated Soil	Sewage and wheels washing water should be collected and properly disposed and treated (septic tank). Hazardous waste should be segregated and sent to a hazardous waste facility, if existing, or to a special facility Other non hazardous waste to be collected and transferred.
Risks of unforeseen exceeding of the landfill expansion capacity	Continuous monitoring and assessment of the landfill capacity shall be maintained. Should this reveal rapid overloading, early modification and planning for operations and expansion should be initiated.
Risks of Damaging Chance-find Antiquities	Excavation shall be immediately stopped in case historical or archaeological artefacts or sites are revealed. The Ministry of Tourism and Antiquities (MoTA) shall be informed for appropriate instructions.
Biodiversity	The facility should not destroy any sensitive habitat or species. However, if detected, sensitive species or habitats should be conserved. Furthermore, the facility and surrounding area should be kept clean, and the landscape plan properly implemented.
Impact of Landfill Gas	Include a degassing system in the design. The design should include maintenance schedule of the degassing system. Ensure the lining system is adequately placed and tested. Ensure the waste filling schedule is followed, the gas vents are progressively placed, and the final cover and the degassing system are adequately maintained.

Potential Impact	Recommended Mitigation Measures
Traffic Impact	Rehabilitation, pavement and extension of Al Maghtass Street that leads to the landfill Strict monitoring to the road accidents as part of the monitoring plan. Arrange the times for transporting waste to and from the site to avoid traffic rush hours. Conduct monitoring survey to get the feedback from the roads users and address the community concerns

Further to the above listed impacts and mitigation measures, further considerations should be given to the following main environmental and social elements:

4.2 Landownership

The owner of the land proposed for the expansion of Jericho landfill is the Arab Society, who owns most of the agricultural land in the neighborhood of the landfill. The society has agreed to provide the land to be used for the expansion of the landfill. There is a lease agreement between Arab Society and Jericho municipality in this regard. The lease amount is only symbolic at $50 per dunum per year and the lease period is open. The agreement in (Arabic) is mainly to keep the landownership to the Arab Society. The agreement has specified that the use of the land is for the expansion of the solid waste landfill, i.e. it cannot be used for any other purposes. The EA should cover the landownership and should clarify the conditions of the lease and annex a copy of the agreement.

The land is currently used by a farmer who has no lease agreement to use it, but has planted the land with young seedlings of Date Palms. The land owner (Arab Society) has raised a case by the court against the farmer and has won it. There is a court decree that the farmer must give the land back.

On the other hand, JCspd agreed with the Arab Society to give the farmer priority to lease the rest of the land expanding outside the proposed site. JCspd also agreed to help the farmer in preparing and leveling the other land and in transporting the young seedlings of date palms that he planted (about 25-30 plants). The farmer is asking to compensate him for the Date Palms but the JCspd did not agree. The estimated price

for each of these young seedlings of Date Palms is only $30-40 each. The EA should prepare a social management plan addressing the vulnerable groups including the waste pickers, landowner, and the farmers and considering any compensation measures.

4.3 Litter and Odour

To prevent the contamination of the surrounding area by the light fraction of waste (paper and plastic bags) transported by winds, the unloading area should be designed as a depression pit, and all storage and receiving areas should be closed, which will also reduce the dispersion of odours. Furthermore, appropriate fencing (3m * 25mm net) around the facility area will catch any transported waste.

4.4 Natural Resources Contamination

All the facility, especially the storage and receiving areas should be paved with an impermeable floor structure. Furthermore, an effective drainage system must be established for leachate and storm water collection and management. Storm water and runoff should be diverted to avoid any contact with the waste or the compost in case encountered.

4.5 Scoping Conclusion

The expansion of Jericho sanitary landfill is not expected to trigger any of the 6 screening criteria listed by the PEAP and is therefore expected to require an IEE only. This is only to be officially decided by EQA. This scoping report furnishes the required information that will help in meeting the right decision in this regard.

To start the EA process, an Environmental Application has to be applied by the proponent of the project, namely the JCspd of Jericho. The official position of the EQA will be issued accordingly. Annex A in the following page is the EQA format of the Environmental Application.

ANNEX A: ENVIRONMENTAL APPLICATION FORM

Environmental Approval Request

Only, for the use of Environmental Quality Authority		
Project Name		
Project proponent		
Project classification	**[ ]** New Project **[ ]** Extension to existing project **[ ]** Existing project	
Application date		
Registration number at the Ministry		
Date	Design	Signature

Recommendations:

Environmental Approval Request

The applicant should complete all the required information below. In the parts which are not related to the project please write "not required". In the absence of adequate spaces for the information required please add additional pages. Please add copies of the reports, plans and maps related to the project. The exact project location should be specified in the provided information and attached documents.

To consider the application completed, the proponent should provide all the requested information by the Palestinian Environmental Authority for the Environmental Approval in accordance with the policy of the environmental assessment described in detail in the instructions of the Environmental Assessment which was circulated by the Authority.

1. APPLICANT INFORMATION/ PROJECT PROPONENT

- Name and address
- Delegate name and position
- Telephone: Fax:

2. PROJECT DESCRIPTION

2.1 Project classification

[ ] New Project
[ ] Extension to existing project
[ ] Existing project

2.2 General project description

2.3 Project location

a. The proposed locations for the project construction and the criteria for choosing the location:

b. The size of the project:

2.4 Products and generation rate:

2.5 Technology and production lines

2.6 Working periods in the project

a. Establishing phase/Construction:

b. Operating phase/Production:

2.7 Types and sources of raw materials, work and production requirements:

a. Establishing phase/Construction

b. Operating phase/Production

2.8 The project's traffic volume and vehicle kind:

a. Establishing phase/Construction

b. Operating phase/Production

2.9 Number and type of storage rooms:

2.10 Existence of laboratories and their objective:

2.11 Number of employees:

	Local	Foreign
Establishing phase/Construction		
Operating phase/Production		

2.12 Type and size of the required services and infrastructure:

a. Water supply:

b. Energy

c. Wastewater

d. Roads and transport vehicles

2.13 The generated waste quantities through project life:

a. Hazardous wastes

b. Non-Hazardous wastes

c. Liquid wastes

2.14 Systems and methods of wastes collection, treatment and disposal:

a. Hazardous wastes

b. Non-Hazardous wastes

c. Liquid wastes

2.15 Types and quantities of the expected pollutants to:

a. Air

b. Surface water

c. Groundwater

d. Soil

2.16 The expected noise level nearby the project:

2.17 The adopted measures in the project to prevent or mitigate the negative impacts on the nature and human:

2.18 Size and locations of other similar nearby projects in the area:

2.19 Additions to the project or other projects associated with the planned or expected to be implemented in the future:

2.20 Prior required licenses and approvals before the beginning of the project:

3. ENVIRONMENTAL SITUATION AND EXPECTED INTEREST

3.1 Proposed land use in and around the project site:

3.2 Would the project cross or relocate houses, businesses, public infrastructure or change land uses? In such cases, what will happen?

3.3 Does the construction and operation of the project considered compatible with the neighboring land uses in terms of noise, traffic, the existing aesthetic or general acceptance? If no, or not sure, why?

3.4 Can the public infrastructure capacity carry the new increase in use as a result of the construction and operation of the project (for example, roads and public services, health services and schools)? If no, or not sure, why?

3.5 Will the project be constructed on or near sensitive environmental areas (such as natural reserves, wetlands, archaeological sites and heritage important or in the habitats of species threatened with extinction)? Select these areas if the answer is yes?

3.6 Will the project utilize any of the natural resources in a manner that will negatively impact the other utilizations of this resource? If yes, please elaborate?

3.7 Did the proponent consult the surrounding population about their opinion of the project? If yes, what are their concerns and comments?

4. DO YOU HAVE ANY OTHER RELEVANT INFORMATION RELATED TO THE PROJECT THAT SHOULD BE MENTIONED:

I hereby declare that the Information contained in this application is complete and accurate according to the best of my knowledge. I therefore take the full responsibility for the consequences of any false or misleading information contained in this request. Based on that I sign,

Name:

Title:

Date: Stamp

The name of the employee who revised the application:

Recommendations:

Date:

ANNEX B: SUMMARY OF WATER QUALITY PARAMETERS

Plate 0.1 shows the location of the groundwater wells in Jericho city while Table 0.1 lists the chemical data and the major anions and cations of the water samples taken from these wells. There is an increase in the concentrations in the wells moving from west to east. Mg, K, Na and Br show good linear correlations with the calculated TDS values, while Ca, Sr, B, SO_4 and HCO_3 show relatively low correlations and nitrate indicates very poor correlation; only scattered nitrate values being documented. The groundwater salinity varies from fresh Ca–Mg–CO_3 water in the west to relatively high salinity Na–Mg–Cl and Mg– Ca–Cl water to the east.

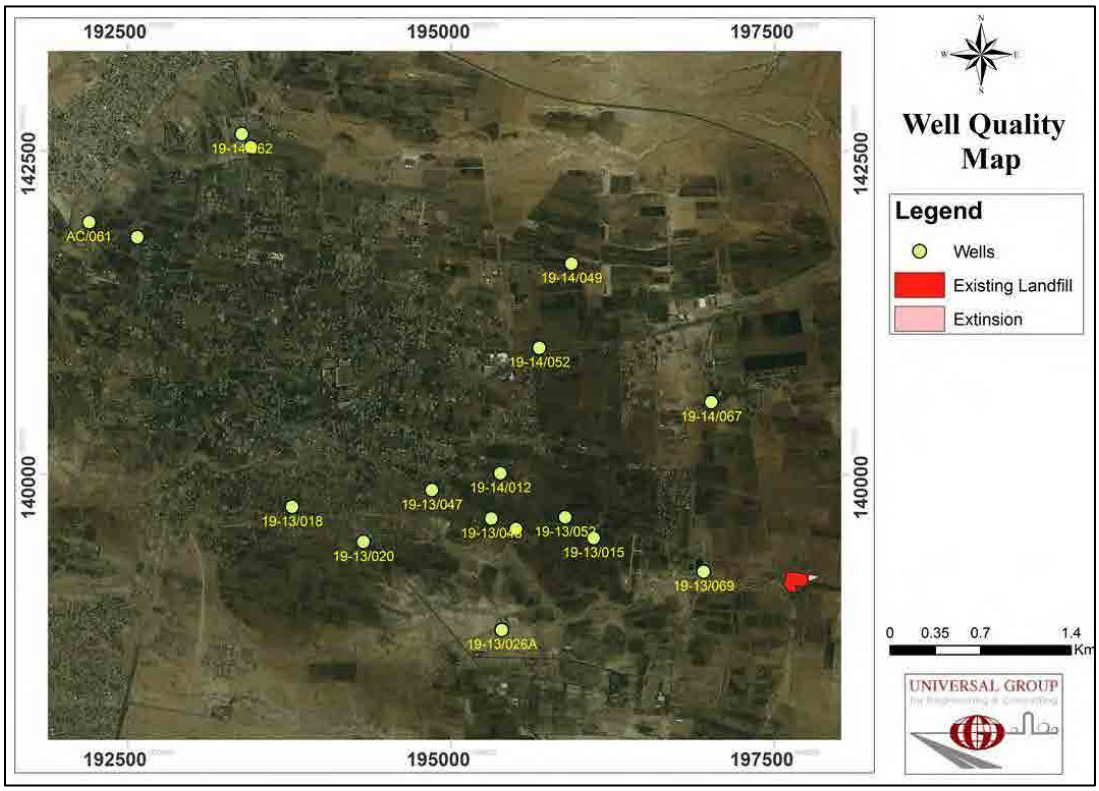


Plate 0.1: Wells of Jericho City

Source: S. K. Khayat, 2006 "Hydrochemistry and Isotope Hydrogeology in the Jericho Area/Palestine" PhD thesis prepared by at University of Karlsruhe, Germany.

The molar ratios for most of the elements tend to be stable in the east and in Wadi Qilt-East. This may be a result of a dominant source of salinity in the area. Some wells in Wadi Qilt-West which show lower chloride contents also show high boron and nitrate values, while wells to the north show less anthropogenic indicators and higher chloride

contents. The variability in bromide and nitrate concentrations depends on well location and agricultural/domestic activities around the borehole. The groundwater mineralization do not really reflect the spatial trend for the major elements, this being due to variation in ion input along the water path .

Most of the groundwater samples show tritium units of 0.8~4.5 which reflect a water mixture between sub-modern and recent recharge. The tritium units also distinguish two differently aged end members which represent this mixing. The groundwater in the western wells of the alluvial aquifer comprises mixtures of recharge from the past few years only (less than 5 years). The tritium level declines with increasing distance along the water path through the wadis and emphasizes that the mechanism of recharge is not related to direct infiltration of rainfall but rather of infiltrated runoff along the wadis which drain from the Jerusalem and Ramallah Mountains.

The groundwater from wells surrounding Jericho landfill site show the highest salinity in the Jericho area, with a chloride content of more than 1,800 mg/l for well 19-14/067 and a TDS value of 3,664 mg/l. This relatively high saline water is of the Na–Mg–Cl and Mg–Ca–Cl type. The SO_4 concentration is 320 mg/l. The groundwater from these wells is highly saturated with dolomite and relatively saturated with calcite, while the saturation indices for gypsum and anhydrite are higher than the rest of the wells but still under saturated. The carbonate concentration of 440 mg/l is relatively high. The groundwater from these wells shows the lowest tritium units which were below the detection limit of <0.6 TU for well 19-14/067.

The nearest well to the site is well 19-13/096 (Bold in table B.1), which is about 500 m west of the landfill site.

Table 0.1: Cation and anion concentrations of the groundwater of Jericho wells

Site	Well Code	Ph	Depth	T	Na	K	Mg	Ca	NH_4	B	Ba	Sr	Cl	Br	SO_4	NO_3	PO_4	HCO_3	Calc.TDS	Tr
Ein Dyouk	AC 060	7.14		21.0	23.15	2.4710	29.81	81.5	0.015	0.0407	0.0342	0.1324	34.9	0.5000	16.7	29.0700	0.097	295.24	547.79	4.3
Ein Sultan	AC 061	7.56		21.3	22.83	2.5030	30.08	79.1	0.005	0.0406	0.0301	0.1253	34.4	1.0000	17.2	42.460	0.095	287.31	548.04	4.5
Saeed Aladeen	19-14/062	6.89	21.0	24.4	230.00	24.180	109.9	140.7	0.016	0.2950	0.0790	1.1900	729.0	8.7000	40.6	5.1800	0.088	364.17	1,731.45	1.6
Mohammed	19-14/038	6.80	21.3	25.5	176.60	19.420	102.1	128.1	0.031	0.2940	0.1076	1.1660	547.8	6.1000	39.6	7.5000	0.000	380.03	1,504.98	1.5
Samed	19-14/26a	7.20	120	23.9	64.50	6.37	64.2	117.9	0.017	0.1239	0.0603	0.5250	120.9	1.7000	22.6	15.9700	0.000	437.37	906.39	1.0
Araikat	19-14/049	6.68	90	25.5	210.00	15.34	105.7	131.2	0.024	0.2927	0.1571	1.1270	581.8	5.8000	92.7	30.5800	0.004	364.78	1,656.11	2.6
AwniHijazi	19-14/052	6.88	82	25.3	300.20	35.78	124.3	122	0.012	0.4954	0.1649	2.8530	831.1	7.2000	72.1	34.0700	0.000	380.03	1,993.41	2.0
Basil Husaini	19-13/018	7.20	90	22.1	81.50	9.63	52.2	87.7	0.004	0.2160	0.0353	1.3000	161.9	2.2000	58.6	29.0800	0.000	304.39	831.33	3.6
Basil Husaini	19-13/020	7.16	83	23.7	148.30	17.01	73.4	92	0.007	0.4115	0.0838	1.6070	277.1	2.5000	110.1	49.3800	0.005	349.53	1,171.14	3.3
Fahmi Nahas	19-13/047	7.20	74	22.8	116.30	12.420	66.6	93.7	0.006	0.2671	0.0673	2.1440	231.5	2.2000	77.2	43.7300	0.000	347.7	1,049.58	3.5
Fahmi Nahas	19-13/048	7.18	57	23.0	113.6	15.380	69.9	91.5	0.000	0.2566	0.0651	2.0030	246.5	2.5000	70.0	41.6700	0.000	355.02	1,049.04	3.4
Salah Arouri	19-14/012	7.14	65	22.6	92.30	11.17	63.3	88.4	0.001	0.2083	0.0540	1.8870	186.5	1.9000	59.2	40.5400	0.000	417.85	1,023.13	3.5
Sabiru Rantizi	19-13/006	6.88	57	23.2	158.60	7.95	93.5	173.4	0.000	0.3118	0.1269	3.5530	449.5	2.5000	117.6	72.7100	0.301	376.37	1,533.57	3.8
Zuhdi Hashwa	19-13/052	7.15	160	23.4	207.40	28.32	113.9	127.7	0.005	0.4956	0.0713	3.5790	590.3	4.1000	166.0	46.5500	0.000	369.05	1,708.82	2.9
Fahed Hishmi	19-13/015	7.08	63	24.6	214.40	38.47	101.4	99.5	0.002	0.4760	0.0893	1.7320	554.1	5.3000	60.8	33.2400	0.001	378.81	1,545.41	2.7
Arab Project	**19-13/069**	**7.02**	**132**	**26.3**	**460.10**	**79.6**	**140**	**116.7**	**0.017**	**0.8180**	**0.1600**	**1.960**	**1,173**	**10.90**	**103.8**	**24.5100**	**0.012**	**418.46**	**2,597.32**	**0.9**
Iron factory	19-13/26a	7.22		24.7	104.80	16.7	97.6	130	0.005	0.2302	0.3069	4.3080	441.0	2.5000	90.0	70.1300	0.000	259.25	1,260.12	3.5
Ibrahim Daek	NW	7.00		24.2	315.10	39.52	130	131.7	0.008	0.7340	0.1260	2.2590	837.5	6.2000	167.7	29.6800	0.000	376.37	2,101.42	2.1
Arab Project	19-14/067	6.99	73	26.4	639.00	104.1	220.8	167.3	0.000	1.3200	0.1534	2.8430	1,861	14.000	183.4	38.8600	0.043	366.61	3,664.92	1.0

Source: S. K. Khayat, 2006 "Hydrochemistry and Isotope Hydrogeology in the Jericho Area/Palestine" PhD thesis prepared by at University of Karlsruhe, Germany.

ANNEX C: TERMS OF REFERENCE FOR EA

Project	Expansion of Jericho Landfill Site
Proponent	The Joint Council for Services, Planning and Development (JCspd) – Jericho District
Contact Person	XX
Application Date	XX

1. GENERAL REQUIREMENTS

These terms of reference (ToR) for an Environmental Assessment (EA) apply to the expansion of Jericho solid waste sanitary landfill site as described in the Proponent's Application for Environmental Approval. The ToR need to be approved by the Palestinian Environment Quality Authority (EQA).

The EA shall be carried out in conformity with requirements of the *Palestinian Environmental Assessment Policy (PEAP)*, and with the *General Guidelines for Environmental Assessment* published by EQA.

The EA shall be a comprehensive evaluation of environmental impacts of the Project. Its main purposes are:

1) Assist the Proponent in planning the Project, and
2) Provide EQA with the information it needs to consider granting Environmental Approval.

The EA describes the environmental planning of the Project and what features are incorporated to mitigate adverse impacts and capture potential benefits. It shall include an analysis of the severity and significance of impacts and benefits, especially for individuals and communities directly affected by the project. It shall also provide an Environmental and Social Management Plan (EMSP).

2. SCOPE OF THE EVALUATION

The EA shall focus on addressing key issues important to:

i) improved Project planning and design;
ii) the local community;
iii) the EQA in considering Environmental Approval; and
iv) permitting and licensing authorities in considering the issuing of permits required for the Project to proceed.

Valued environmental components (VECs) which must be considered during the EA are indicated with a check mark (√) (section 7). The EA shall assess project compliance with relevant local, district, regional and national land use and development policies, plans and programmes, and with relevant regulatory standards. The EA shall address all direct, indirect, and cumulative as well as transboundary impacts on the VECs.

3. ENVIRONMENTAL PLANNING

The EA is expected to contribute positively and significantly to the planning and design of the Project. The EA Report shall document how environmental factors were incorporated into Project planning and design, and what the results were. The Proponent shall pay particular attention to the need to:

i) consider alternatives in planning and designing the Project; and
ii) develop an Environmental and Social Management Plan (ESMP).

4. STAKEHOLDER CONSULTATION

In undertaking the EA, the Proponent shall consult with relevant local, district and national government agencies to ensure that their concerns, interests and regulatory requirements are adequately reflected in the EA strategy and report. The purposes of consultation are:

1. To inform the public of all issues and concerns related to the project;
2. To determine public concerns.
3. To specify project performance standards to be met;
4. To collect data, information or local knowledge;
5. To avoid future conflicts with affected or concerned stakeholders; and
6. To mitigate public environmental concerns.

Without limiting the scope of these consultations, a preliminary list of these agencies includes:

1. The site and neighbourhood land owners.
2. The surrounding local government units
3. Public institutions in the area.
4. The Palestinian ministries of:
    - Agriculture
    - Transportation
    - Labour
    - Health
    - Local Government
    - Housing and Public Works
    - Water Authority
    - National Economy
    - Tourism and Antiquities.
    - Other stakeholders the consultant finds that they are affected by the project.

The significance of all issues and concerns mentioned in this ToR or presented during public consultations should be examined based on clear environmental criteria.

5. MINIMUM EA REPORT REQUIREMENTS

The EA Report must contain at least:

i) Non-technical executive summary;
ii) An introduction to the project, the proponent, and the EA strategy;
iii) A summary of stakeholder and public consultations about the project;
iv) Baseline conditions;
v) A description of the environmental planning for the project;
vi) A description of the project, including environmental design and protection features;
vii) Suitable maps showing the location of the project site, routes and alternatives, and the arrangement of project facilities within the preferred site;

viii) An assessment of significant, potential impacts and their mitigation measures;
ix) An environmental and social management plan; and
x) Identification of the names and responsibilities of the people who carried out the EA.

The EA Report, and/or the letter of submission which accompanies it, must clearly indicate the extent to which the Proponent:

i) is in agreement with the contents of the Report; and
ii) is committed to implementing the environmental planning, design, mitigation, compensation and management measures it contains.

The Proponent shall submit three copies of the draft EA Report to the EQA. When EQA is satisfied that the EA Report meets the minimum reporting requirements, the Proponent shall submit 14 copies of the Report for detailed technical review under the provisions of the EA Policy.

6. MINIMUM REQUIREMENTS FOR AN ESMP

The ESMP must cover at least:

- For monitoring each phase of the project:

i) Environmental and social variables to be monitored, and frequency; and
ii) Reporting to appropriate authorities and local community.

- Issues/concerns that are to be the subject of the environmental management plan, and reporting requirements to government and the public,
- Environmental standards and guidelines that will be adopted or required.
- Resettlement plan for the farmers and the waste pickers.

7. VALUED ENVIRONMENTAL COMPONENTS (VECs)

Category		Environmental Component
Biophysical, Resource and Land Use Components	√	Climate and air quality
	√	Surface water hydrology and quality
	√	Groundwater hydrology and quality
		Terrain and natural hazards
	√	Soils and vegetation
	√	Wildlife resources and use
		Aquatic resources and use
	√	Recreation and tourism resources and use
		Forest resources and use
	√	Agricultural resources and use
		Mineral resources and use
Economic Components	√	Direct employment and income
	√	Indirect/induced employment and income
		Labour market conditions
		Sources of supplies, materials and services
	√	Transportation requirements
	√	Infrastructure development requirements and costs
		Government revenues/costs
		Indirect/induced economic development opportunities
Cultural and Heritage Components	√	Archaeological sites
	√	Traditional use sites
	√	Historic sites and landscape features
Social Components	√	Social/demographic profile
	√	Population
	√	Housing and accommodation
	√	Land and water use
	√	Transportation and traffic
	√	Community service delivery
	√	Local government revenues/costs
	√	Social support services
		Community stability, cohesion and well being
		Gender equity
Health Components	√	Supply of health facilities and services
		Community water supply and watersheds
	√	Waste treatment and discharge
	√	Ambient air and water quality
	√	Public health risks
	√	Worker health and safety
	√	Noise
	√	Local community health