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Environmental and Social Assessment for the Feasibility Study



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Address: Guidelle 92 – B-1200 Brussels Belgium

Tel: +32-2-739.46.90

E-mail:

Assignment Managing Party: SUEZ CONSULTING (SAFEGE).

Address: De Kleetlaan 5 B-1831 DIEGEM

Tel: + 32-2-739.46.90

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Quality Control Path

Team Leader: Bernard Dussart

Assignment Managing Party: SAFEGE (SUEZ CONSULTING)

Project Manager Joris Pierrard

Framework Contractor: Consortium SAFEGE (SUEZ CONSULTING)

FWC manager: Nicolas Jais-Nielsen

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The feasibility study is financed under the FEMIP Trust Fund. This Fund, which was established in 2004 and has been financed – to date – by 16 EU Member States and the European Commission, is intended to promote private sector development and bolster socioeconomic infrastructure in the Mediterranean region by financing project preparation and implementation, capacity building and risk capital support.

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Contributors

NAME	FUNCTION	QUALIFICATION
Bernard DUSSART	Team Leader	Water Supply and Sanitation Expert
Lana AL-ZU’BI	Environmental and Social Expert	M.Sc. in Water & Environmental Management
Essa BATAINEH		Environmental Engineer
Kareem SHUKRI		Environmental Engineer

EXECUTIVE SUMMARY

This report is related to the Environmental and Social Assessment for the Feasibility Study for Water Supply and Sanitation for Dair Alla and Al Karamah. It concerns seventeen localities in the Jordan Valley / Balqa Governorate. These localities are, from the north to the south: Balaooneh, Khazma, Dherar, Rwaihah, Debab, Twal Shamali, Dair Alla, Abu Ezzighan, Twal Janoobi, M'addi, Muthallath El Ardhah, Maisarat Fannosh, Muthallath El Masri, Damia, Dhahret Erramel, Ghour Kebed and Karamah. The number of inhabitants was evaluated at around 85 000 by the most recent census performed in 2015. Referring to current growth scenarios, this number may reach approximately 130 000 in 2035 and 180 000 in 2050.

For the Water Supply item, networks are very old and not properly separated by clearly identified distribution zones. High pressure causes important leakages and the rate of Non-Revenue Water (NRW) is among the highest in the country, i.e. more than 60%. Water resources are from deep wells with high levels of Total Dissolved Solids (TDS), excepted in the North (Wadi Rajeb). Desalination plants are necessary to produce the drinking water, with a recovery rate of approximately 65% at the main Reverse Osmosis (RO) facility at Abu Ezzighan. All these facilities, networks and RO plants are in need of major rehabilitation. Given that resources are not extensive, the main priority is to decrease this NRW rate to a target value of 30%. Based on this, future water demands have been evaluated at 18 900 m³/d for 2035 and 25 200 m³/d for 2050. The water demand can be covered by potential resources of 27 200 m³/d. To comply with this future water demand, four alternatives were suggested in the Feasibility Study, for a capital outlay evaluated at between €40m and €48m.

For the Sanitation item, wastewater collection is currently performed by vacuum trucks from each individual house's septic tank or cesspit. Soil pollution levels must therefore be high; a somewhat unhealthy situation for people living in these conditions. Effluents are treated in the Tal Almantah Wastewater Treatment Plant (WWTP) for a limited capacity of 400 m³/d which will be soon be increased to 600 m³/d. Topographical characteristics are important in forecasting wastewater facilities; gravity pipelines are highly recommended instead of under pressure networks with pumping stations. This area is characterized by a main slope from east to west and a secondary small slope from north to south, but only as far as M'addi, which is not in the south. This ground configuration requires the implementation of four main WWTPs, i.e. from north to south, Dair Alla (80 000 to 120 000 PE), Fannosh (20 000 PE), Dhahret Erramel (5 000 PE) and Karamah (20 000 PE). With this scheme, 90% of inhabitants may be connected to an efficient sewage facility in this area. For the others inhabitants, the existing system will be kept in operation. The total investment for the Sanitation item is evaluated at around €74m.

These alternatives and financial estimations were provided by the Feasibility Study (FS) team to the WAJ in order to assess the different options and make a final decision of priority investments. Referring this final choice, the option chosen would be implemented as first priority between 2019 and 2022.

In October 2018, the WAJ has concluded that the priority investment would be the development of Alternative 4 for the Water Supply item and the Dair Alla Sanitation System for the Sanitation item.

Following the Jordanian National environmental clearance requirements for this Project, a comprehensive Environmental and Social Impact Assessment (ESIA) study shall be required. The ESIA will be implemented during Pre-Design and Design Phase, and will include detailed assessment of physical and social impacts, as well as mitigation measures to reduce or compensate impacts of the project. This will include an Environment and Social Management Plan (ESMP), a Monitoring Plan (MP), and, if required, a Resettlement Action Plan (RAP). Public information and consultation, and hearing meetings, will be held during this stage.

At this stage of the Feasibility Study, the Consultant is solely implementing a first Initial ESIA at the FS level (This Report), in order to evaluate the constraints, the concerns and the main potential impacts of the project on the natural environment and on the human activities.

This part of the report will mainly address the following topics: legal and regulatory framework, and impacts on sensitive receptors as applicable within the Project area and based on the information available at this phase in relation to the project components and details as well as the available baseline information. Other kinds of impacts may come to light during the future ESIA process and those shall be covered in further details as part of the subsequent project phases.

It is important to highlight that this ESIA did not include any primary baseline measurements and no intensive stakeholder consultation. These tasks are anticipated as part of the subsequent detailed ESIA. The environmental clearance for this Project is governed by the Ministry of Environment (MoEnv), as stipulated by the “Environmental Impact Assessment Regulation No. (37) of 2005”. The MoEnv requires the preparation of a comprehensive Environmental Impact Assessment (EIA) for such a Project before an environmental permit is granted, in order to commence with construction and operational activities.

This first Initial ESIA at the FS level is considered as a useful tool to highlight specific environmental issues for the future designer of the project, and consequently can help to orient the design towards less impacting solutions.

This Environmental and Social Assessment undertaken as part of the Feasibility Study did not identify any redflags that would impede any further investigations or hinder the progression of the proposed investments towards the detailed design phase which should be able to identify the specific locations and technical specifications for the project components. Based on these details, additional studies should be undertaken in addition to a comprehensive Environmental and Social Impact assessment (and potentially a Resettlement Framework) in order to carry out the required baseline measurements and sufficiently address the potential impacts. This shall be carried out in the subsequent phases and not as part of this Feasibility study.

List of Abbreviations:

ALARP	As Low As Reasonably Practicable
BOD5	Biochemical Oxygen Demand 5-day test
BSL	Below Sea Level
CAMENA	Climate Action ‘envelope’ in the Middle East and North Africa
CIP	Capital Investment Plan
CITES	Convention on International Trade in Endangered Species of
CMS	Convention on Migratory Species
COD	Chemical Oxygen Demand
DB	Design and Build
DBO	Design-Build and Operate
DFID	Department for International Development (UK)
DIP	Ductile Iron Pipe
DM	Dry Matter
DoM	Department of Meteorology
DoS	Department of Statistics
DST	Dead Sea Transform
DVM	Dry Volatile Matter
DW	Drinking Water
E&S	Environmental & Social
EBI	Engler-Bunte-Institute
EHS	Environmental, Health & Safety
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EMP	Environmental Management Plan
EPC	Engineering, Procurement and Construction
ERP	Emergency Response Plan
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environment and Social Management Plan
EU	European Union
FEMIP	Facility for Euro-Mediterranean Investment and Partnership
FS	Feasibility Study
GHG	Greenhouse Gases
GoJ	Government of Jordan
hr	hour
IBA	Important Bird Area
IFIs	International Financing Institutions
ILO	International Labour Organization

ISO	International Organization for Standardization
ISSP	Institutional Support & Strengthening Program
IUCN	International Union for the Conservation of Nature
IWRM	Integrated Water Resources Management
JICA	Japanese International Cooperation Agency
JOD	Jordanian Dinar
JR	Jordan River
JS	Jordan Standards
JSMO	Jordan Standards and Metrology Organization
JV	Jordan Valley
JVA	Jordan Valley Authority
JWI	Jordan Water Infrastructure
KAC	King Abdullah Canal
Km ²	Square Kilometer
KTD	King Talal Dam
LACF	Land Acquisition and Compensation Framework
LDU	Local Development Unit
masl	meter above sea level
MBBR	Moving Bed Biofilm Reactor
MCC	Millennium Challenge Corporation
MCM	Million Cubic Meter
MeHSIP	Mediterranean Hot Spot Investment Programme
MoA	Ministry of Agriculture
MoEnv	Ministry of Environment
MoH	Ministry of Health
MoI	Ministry of Interior
MoL	Ministry of Labour
MoMA	Ministry of Municipal Affairs
MoPIC	Ministry of Planning and International Cooperation
MoTA	Ministry of Tourism and Antiquities
MP	Monitoring Plan
MPWH	Ministry of Public Works and Housing
MSDS	Material Safety Data Sheet
MTR	Minimum Technical Requirements
MWI	Ministry of Water and Irrigation Jordan
NGO	Non-Governmental Organization
NIF	Neighborhood Investment Facility
NO ₃	Nitrate
NRR	Noise Reduction Rating

NRW	Non-Revenue water
O&M	operation and maintenance
OHSP	Occupational Health and Safety Plan
OHSP	Occupational Health and Safety
OSHA	Occupational Safety and Health Administration
PMU	Project Management Unit
PO4	Phosphate
PPE	Personal Protective Equipment
R&D	Research and Development
RAP	Resettlement Action Plan
RO	Reverse osmosis
RSCN	Royal Society for the Conservation of Nature
RV	Residual value
TA	Technical Assistance
TDS	Total Dissolved Solids
ToR	Terms of Reference
TSS	Total Suspended Solids
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	UN Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UNRWA	United Nations Relief and Works Agency
USAID	United States Agency for International Development
WAJ	Water Authority of Jordan
WTP	Water Treatment Plant
WW	Wastewater
WWTP	Wastewater Treatment Plant
yr	Year

TABLE OF CONTENTS

1.	Context and Purpose of the Environmental and Social Impact Assessment	1
1.1	Project Background.....	1
1.2	Project Location and Setting	3
1.3	Project Proponents and Key Contributors.....	5
2.	Project Description and Alternatives	7
2.1	Water Supply.....	7
2.2	Wastewater and Sanitation.....	8
2.3	WAJ Decision Regarding Priority Investment Projects	12
2.4	Project Phases	13
2.4.1	Design and Construction Phase	13
2.4.2	Operation Phase	13
2.4.3	Decommissioning Phase	14
3.	ESIA Approach and Methodology	15
4.	Baseline Assessment analysis	20
5.	Consultation	28
6.	<i>Overview of the Strategic Environmental and Economic Opportunities of the Project</i>	34
7.	Summary of Anticipated Impacts.....	37
8.	Identification of Mitigation Measures, Monitoring Requirements, and MTRs	40
9.	Requirements for Environmental Clearance Process.....	52

ILLUSTRATIONS AND ANNEXES

List of figures

Figure 1.2-1: General Geographic Location of the project area in Jordan	3
Figure 1.2-2: Location of Beneficiary Communities (ECO Consult 2017)	4
Figure 5-1: Photos documenting local consultation session dated 13 Sep 2018 in Dair Alla	28

List of Tables

Table 1.3-1: Project Proponent and Key Contributors	5
Table 2-1: Dair Alla's Sanitation System Summary and Highlights	10
Table 2-2: Fannosh, Dhahret Erramel and Karamah Sanitation System Summary and Highlights	10
Table 3-1: Attributes and Baseline Assessment Methodology.....	15
Table 4-1: Description of land use settings for the proposed site for the Dair Alla WWTP	20
Table 4-2: Description of land use settings for the proposed site for the Fannosh WWTP	22
Table 4-3: Description of land use settings for the proposed site for the Dhahret Erramel WWTP	24
Table 4-4: Description of land use settings for the proposed site for the Karamah WWTP	25
Table 4-5: Summary of land planning challenges for the WWTP proposed sites	26
Table 5-1: List of invitees to the local consultation session dated 13 Sep 2018 in Dair Alla as provided by the Dair Alla municipality	29
Table 5-2: List of attendees to the local consultation session dated 13 Sep 2018 in Dair Alla	30
Table 6-1: Overview of the Strategic Environmental and Economic Opportunities (ECO Consult, 2018)	34
Table 7-1: Summary of Anticipated Impacts during Planning and Construction Phase	38
Table 7-2: Summary of Anticipated Impacts during Operation Phase.....	39
Table 8-1: Recommendations for Further Planning and Micro Siting for the Final WWTP Sites and Other Project Components to be Followed at the Detailed Engineering and Full ESIA Phase	41

Table 8-2: Proposed Mitigation Measures, Monitoring Requirements, and MTRs to be Implemented during the Construction Phase.....43

Table 8-3: Proposed Mitigation Measures, Monitoring Requirements, and MTRs to be Implemented during the Operation Phase48

Appendix 1: Consultation Diary

SECTION B4 Environmental and Social Assessment for the Feasibility Study

1. Context and Purpose of the Environmental and Social Impact Assessment

1.1 Project Background

The Jordan Valley (JV) is considered a high-value environmental asset, acting as the very lifeline to many Jordanians, and presently as a supporting ground to over 6 000 Syrian Refugees.

The communities of the 17 localities in the Jordan Valley / Balqa Governorate targeted by the ‘Feasibility Study for Water Supply and Sanitation for Dair Alla and Al Karamah’ were evaluated at around 85 000 by the most recent census carried out in 2015. Factoring in growth scenarios, this number may reach approximately 130 000 in 2035 and 180 000 in 2050.

For many years, it has been recognised that current water and sanitation trajectories in the JV are neither desirable nor sustainable. Not only is the water utility infrastructure aged and deteriorated, but it is falling short of providing satisfactory operational performance and coverage under everyday increasing demands. This is coupled with a troubling overall dependence on cesspits and septic tanks throughout the JV due to the lack of sewage infrastructure and a better alternative, posing substantial threat to both public health and the environment. Furthermore, the quality of water within the area is highly saline, necessitating treatment to improve the potability of water resources. The lack of quality infrastructure is an impediment to the regional development of the JV.

As part of Jordan’s continued efforts towards climate adaptation and mitigation, and the pursuit of a water resilient sector as iterated within the National Water Strategy 2016-2025, this Project aims to rehabilitate and install water supply and sanitation systems in central JV, specifically within the Dair Alla District and Karamah Locality of Shoonah Janoobiyah District. The sanitation system will also include Tal-Almantah Wastewater Treatment Plant (WWTP), which is beyond the project boundaries.

The existing water distribution system of Dair Alla and Al Karamah may be broadly divided into 4 parts: northern part, central part, southern part and Al Karamah. Water sources in the northern part depend on well water in the Dair Alla area and on the inflow of well water from the adjacent Irbid governorate. Water source of the central part and southern part is served in the area through the Abu Ezzighan Reverse osmosis (RO) Plant. Al Karamah is served by a private plant.

Water is currently distributed in the northern part by pumps from the existing Rajeb distribution reservoir. The central, southern parts and Al Karamah receive water supply from RO plants and

the water is distributed by gravity or through pumping stations where the low supply pressure is boosted.

For the Water Supply item, networks are very old and not properly separated by well-identified distribution zones, with the exception of Al Karamah, which is not connected to the three other areas. High pressure causes important leakages and the rate of Non-Revenue Water (NRW) is among the highest in the country, more than 60%. Noted increases in the NRW have compelled the Ministry of Water and Irrigation (MWI) to target a reduction in losses by 30% in 2025 and further reductions of technical losses to below 15%, as expressed by the Water Sector Capital Investment Plan 2016-2025 (MWI, 2016).

Water resources are from deep wells with high levels of Total Dissolved Solids (TDS), except in the North (Wadi Rajeb). Desalination plants are necessary to produce the drinking water with a recovery rate of about 65% at the main RO facility at Abu Ezzighan.

As far as Sanitation is concerned, wastewater collection is made by vacuum trucks from each individual house septic tank or cesspit. With thousands of cesspits and septic tanks scattered all over the Project Area, serving more than 85 000 inhabitants expected to reach a high scenario projection of 130 000 in 2035 and 180 000 in 2050, and the limited information on their design, operation, and condition, there is an increased risk for adverse environmental and social (E&S) impacts. Leaking cesspits, spillage, and the discharge of pumped wastewater (WW) into waterways and wadis by locals and tankers are frequently occurring (Kool, 2015), consequently affecting groundwater and surface water quality. This is of concern given the sandy gravel soils in the JV, the high-water table, and intensive agricultural practices (Alraggad et al., 2012).

The soil pollution level is most certainly very high, with clear health impacts for people living in these conditions. The effluents are treated in the Tal Almantah Wastewater Treatment Plant for a limited capacity of 400 m³/d which only serves 12 308 people (IRG, 2013) constituting less than 18% of the current population. Tal Almantah WWTP capacity will be extended soon to 600 m³/d.

The Project will potentially enhance the economic, agricultural and touristic status quo of the Project Area, and eventually reduce the health and environmental risk, otherwise found to be at significant levels due to the deficient supply of quality water and poor sanitation. In response, the Project aims to reduce groundwater pollution, decrease energy consumption of water supply, and improve sanitation systems concerned with the collection and treatment of WW, all of which align with the aforementioned National Water Strategy. Demand-driven targets guided these objectives to particular areas of interests which are investigated as part of this assignment. The explored opportunities include:

- Reuse of treated effluent and sludge;
- Optimal solutions in WW collection and treatment, including the installation of a fully-fledged sanitation system aimed to reduce leakages from septic tanks and cesspits;
- Utilizing gravitational flow, hydraulic power and energy efficient pumping technologies, where possible, for enhanced climate resilience; and,
- Repair pipe leakages from the current water supply system to reduce NRW.

The Proposed alternatives for each of the water supply and the sanitation will be outlined in the subsequent sections.

1.2 Project Location and Setting

The project area is located in Jordan, at the north west of Amman, in the Balqa Governorate and close to the east side of the Jordan River which is flowing from the Tiberius Lake at the North to the Dead Sea at the South.



Figure 1.2-1: General Geographic Location of the project area in Jordan

The located area is divided in two main parts: Dair Alla which includes seventeen villages/localities aligned along the highway # 65 and from the Northern JV to the Southern JV; and Al-Karamah at the south of this area.

The local communities to benefit from this Project are, from the North to the South as presented in Figure 6-3-2 Dair Alla, Twal Janoobi, M'addi, Dherar, Muthallath El-Ardhah, Damia, Twal Shamali, Khazma, Debab, Rwaihah, Abu Ezzighan, Dhahret Erramel, Balaooneh, Ghour Kebed, Maisarat Fannosh, Muthallath El-Masri and Karamah

The sanitation system will also include Tal-Almantah WWTP, which is beyond the project boundaries. The Project Area for Dair Alla is approximately 110 square kilometres, while Karamah is 15 square kilometres.



Figure 1.2-2: Location of Beneficiary Communities (ECO Consult 2017)

Note:

Maps incorporated within this study are based on the boundaries and maps provided by the involved parties and counterparts (including EIB and the WAJ) during the framework of the FS. The area within these boundaries is slightly larger than that stipulated in the ToR. It must be noted that such expansion of geographical boundary does not in any way expand the scope of the Consultant or increase the populations covered by the study. Any intersections occurring beyond the administrative boundaries of the Balqa Governorate will be excluded from the study. This includes overlapping with Ajloun and Irbid Governorates.



Location and Boundary for Project Area Assumed for the Conceptual Report



Location and Boundary for Project Area as provided in the Figure 2 in page 7 of the ToR

Box 1: Geographical Scope of the Project

1.3 Project Proponents and Key Contributors

The stakeholders involved at different phases of the Project are listed below with a general description of their roles and responsibilities.

Table 1.3-1: Project Proponent and Key Contributors

Relevance	Entity		General Description
Donor Coordinator	Ministry of Planning and International Cooperation (MoPIC)		The national promoter of the Project. MoPIC is responsible for the donor coordination framework in Jordan.
Project Beneficiaries	Ministry of Water and Irrigation (MWI)		MWI is responsible for regulating the Jordanian Water Sector. It encompasses two regulative bodies: Water Authority of Jordan (WAJ), and Jordan Valley Authority (JVA). MWI is the Project beneficiary. The Project Management Unit (PMU), a subsidiary of the MWI, is the implementing agency responsible for coordination and facilitation. Generally, the MWI has an overall responsibility for policies and strategies within the water sector, including planning and management.
	Water Authority of Jordan (WAJ)	WAJ-Balqa	WAJ is responsible for the protection, conservation, development and management of all projects regarding water resources and sewerage. WAJ is responsible for water supply and WW management in the project area. WAJ is currently part of the Technical Committee, providing inputs on alternatives and the general direction of this FS.
		WAJ-Dair Alla	
		WAJ-Shoonah Janoobiyah	
	Jordan Valley Authority (JVA)		JVA is responsible for activities occurring within the Jordan Valley (JV) regulative boundary, specifically those concerned with water, irrigation, construction work etc. JVA does not have a high level of influence on this Project but has a high level of interest in the Project and should be informed on the action plan and the interface with its main mandate in relation to water availability and quality for irrigation, water reuse, and any interruptions that may occur throughout the implementation of the project.
Financier	European Investment Bank (EIB)		The Feasibility Study financier and the Project's lead financier.
Consortium	SAFEGE (SUEZ CONSULTING)		The Framework Contractor and Consortium Project lead, responsible for the overall coordination and management of this Assignment, and its proper execution i.e. supervision of all deliverables.
	ECO Consult		The Framework Sub-Contractor, entrusted with providing inputs on E&S impacts and gender analysis.
	DAR AL-OMRAN		The Framework Sub-Contractor, entrusted to carry out the topographical and geotechnical survey.
Concerned Parties (related stakeholders)	Municipal Affairs	New Dair Alla	The three municipalities provide a number of infrastructural and urban services within their respective jurisdictions. Municipalities have assets and interests, and this project greatly intersects with their policies, work, and inspirations.
		New M'addi	
		Shoonah Janoobiyah	

		Ministry of Municipal Affairs (MoMA)	MoMA works with municipalities in the areas of planning, special projects and strategic issues, and interagency projects.
	Regulatory Bodies	Ministry of Environment (MoEnv)	These four ministries enforce laws and regulations under their respective mandates. All relevant laws, by-laws, regulations, policies and guidelines must be complied with by the Project Developer and Operator, and liaised accordingly with the corresponding ministry to ensure that all official measures and procedures are fulfilled. The ministries are authorized to inspect, monitor and evaluate the performance of different project components that intersect with their operations and strategies.
		Ministry of Agriculture (MoA)	
		Ministry of Tourism And Antiquities (MoTA)	
		Ministry of Labour (MoL)	
		Jordan Standards and Metrology Organization (JSMO)	
	Administration	The Local Governor Office / Dair Alla Mutasarfate	Governmental bodies with overall responsibility for the maintenance and enforcement of Internal Law and Order, encompassing Police, Civil Defence, and other related agencies. These entities represent the main state administration authority under the supervision of the Governor of Balqa.
Other International Financing Institutions (IFIs)	Japanese International Cooperation Agency -JICA		JICA has carried out some relevant work in Dair Alla to address the water demand and sanitary challenges in the area. This FS takes into account this work and proposed interventions that complement the existing work undertaken by JICA within the Project area.
	United States Agency for International Development - USAID		Through its Jordan Water Infrastructure (JWI) project, different tasks are incorporated including some in Dair Alla and Karamah. The JWI Project has recently been commissioned to a consultant to undertake the required tasks within and these shall be done in coordination with WAJ. Once approved, the outcomes of this FS shall be provided to the JWI consultant in order to take into account within their study for Deir Alla.

2. Project Description and Alternatives

Throughout the FS phase, the FS Team including the environmental expert discussed the potential interventions and iterated options and alternatives in order to propose suitable system components. These alternatives included location alternatives and design alternatives. The following section provides a brief description of the project components and alternatives.

2.1 Water Supply

This FS takes into account other developments taking place in the Project area, specifically the JICA Scheme which has a plan for dividing the existing water supply distribution zones into two distribution zones. However, the area of Al Karamah is not taken into account by the JICA project. To take into account the existing and projected distribution pipeline network, the existing distribution scheme and JICA project will be taken as the basis. Existing distribution areas will be divided into different distribution areas according to the proposed new alternatives.

All the water supply facilities, networks and RO plants are in need of major rehabilitation. As resources are not extensive the first priority is to decrease this NRW rate to a target value of 30%. Considering rehabilitation of the water supply system of the Project area, this is a step closer to achieving 2025 vision.

Based on this, the future water demands have been evaluated at 18 900 m³/d for 2035 and 25 200 m³/d for 2050. The water demand can be covered by potential resources of 27 200 m³/d. Three alternatives are suggested to realize the needed investments for a new efficient water supply system. Wells and Desalination plants are in need of large-scale rehabilitation, but other investments are also necessary, e.g. new pumping stations and reservoirs (total capacity of 10 000 m³) and new transmission pipelines (about 60 km from 160 mm to 400 mm).

Three alternatives that vary mainly by the number of resources mobilized and the interconnections between distribution areas are proposed. These alternatives will lead to the proposal of an optimised solution, known as alternative 4.

In order to optimise operation activities and reduce operation costs, it is preferable to focus production points on a small number of sites. Increasing the number of sites has the advantage of minimizing the impact of a technical or quality problem on one of the resources and affecting fewer people. In addition, it is preferable to provide interconnections between the distribution sectors to ensure continuity of service in case of unavailability of all or part of a resource.

In order to achieve the above, Alternative 2 and Alternative 3 are integrated to increase operational resources as well as transfer pipelines. This alternative, i.e. "Alternative 4", will also have to be optimized to take into account WAJ's concern to renew the asbestos cement mains by associating the present program with the program planned by JICA.

Based on the Alternative 4 Scheme described in detail in Section 1.4, the following are the main water supply project components proposed to be developed as part of this Project:

- The NRW system;
- New reservoirs: Rajeb, Rwaihah, Abu Ezzighan, M'addi, Dhahret Erramel, and Karamah;

- New RO Plants: Dhahret Erramel, potentially a new Karamah RO plant close to the governmental wells;
- Pumping stations;
- Upgrade and rehabilitation of all existing water supply facilities, wells, RO plants, and reservoirs;
- Water networks;
- Additional wells and connected pipelines to strengthen the current wells; and
- Replacement of the existing Asbestos cement networks.

To implement the new facilities needed for the future, there are three main models, (i) Detailed design, (ii) Design and Build (DB) or (iii) Design-Build and Operate (DBO).

To realize a new project, there are three main actors; (i) the Employer, i.e. the owner of the facility at the end of the works; (ii) the Contractor, i.e. the builder of this facility, and (iii) the Engineer, i.e. the designer and supervisor of the works.

Proposed main procurement models for the new facilities are as follows:

- Detailed design model for the water networks
- DB model for the pumping stations
- DBO model for the treatment plants (RO Plants) with a specific defined period for operation and maintenance (O&M) during which employer staff are trained to take over the O&M after specified period.

2.2 Wastewater and Sanitation

Topographical characteristics are important for forecasting wastewater facilities. This area is characterized by a main slope from East to West and a secondary small slope from North to South but only as far as M'addi, not in the South. Based on this ground configuration, several possibilities to connect all the inhabitants of this Dair Alla and Al Karamah area with sewage networks to wastewater treatment plants were considered at the western extremity of each catchment basin in the intensive agricultural zone. The main parameters for these possibilities and locations were the topographical conditions, a sufficient distance from the inhabitants and to practice reuse of treated water.

In this scheme, four WWTPs are proposed to cover about 90% of the foreseen inhabitants in 2035 and which are from the North to the South:

- Dair Alla: 80 000 PE
- Fannosh: 20 000 PE
- Dhahret Erramel: 5 000 PE
- Karamah: 20 000 PE

The existing Tal Almantah WWTP must be kept in operation. This facility has been built for an initial capacity of 400 m³/d; WAJ has taken the decision to extend this capacity to 600 m³/d. This WWTP receives only wastewater by trucks which empty septic tanks of each household.

In this scheme, all the inhabitants are not expected to be connected to a sewage network before 2030-2035 which necessitates maintaining Tal Almantah WWTP in good working order.

The location alternatives and the design alternatives for the WWTP took into account different criteria, such as land use, pollution risks, proximity to sensitive receptors, MoEnv siting requirements, efficiency, cost, electricity consumption, sustainability, O&M requirements. These are discussed in detail in Section 3.

The reuse of treated water for irrigation is a main objective of the project. To practice reuse with all kinds of crops that may change each year by rotation, a high level of treatment is required and with a tertiary treatment included sand filtration and disinfection. The quality of the effluent reclaimed wastewater for reuse is decided based on the type of agriculture to be irrigated. As the Jordan valley contains many different crop types, including vegetables, the most restricting norms are to be applied (class A) as per ‘Reclaimed Domestic Wastewater Jordanian Standards 893/2006’, which is to be applied for cooked vegetables, parks, playgrounds and sides of roads within city limits.

The main conveyor irrigation system is the King Abdullah Canal (KAC) which flows all along the main road from the North to the South. The principle for the reuse was to discharge the treated water into the KAC, which requires that WWTPs be located not too far from this canal. The common rule is on the contrary to have a sufficient distance from localities and houses. The main challenge is to find the “best” location for the WWTPs in this project. Several alternatives are suggested and for each alternative several possible locations.

Instead of the KAC, the treated water can used also directly to the closest fields all around the location of the WWTPs. In any case, the water quality will be monitored accordingly to Jordanian law.

The design proposed for the sanitation system already takes into account the pollution risks and integrates mitigation measures in the design. Such measures include specific sludge age and particular management of the treatment phases to eliminate carbon and nitrogen based pollution; and implementation of tertiary stage treatment including filtration, UV radiation, and final in addition to chlorination. More details are provided in the table below:

Table 2-1: Dair Alla’s Sanitation System Summary and Highlights

Sanitation System	Dair Alla’s Sanitation System
WWTP Design Capacity	80 000 inhabitants, expandable to 120 000 inhabitants
Service Area	Covers the localities of Balaooneh, Khazma, Dherar, Rwaihah, Debab, Twal Shamali, Twal Janoobi, Dair Alla, Abu Ezzighan (and partially M’addi).
WWTP Location	Proposed location is on parcel N°377 located at the South west of this area. Location defined after several site visits and meeting with mayors of Dair Alla and M’addi.
Sewage Collection zones	Several collection zones proposed: Balaooneh, Dherar, Khazma, Rwaihah, Debab, Abu Ezzighan, Twal Shamali, Dair Alla, Twal Janoobi, and M’addi
Sewage Networks Length (m)	87 000
Sewage transmission pipelines	<ul style="list-style-type: none"> Connect communities to proposed WWTP location by gravity pipelines laid along several paths in the agriculture area. <i>A detailed site assessment for the plots, land use, ownership, agricultural uses, utilities, and availability of agricultural roads should be undertaken in order to finalise the layout of the sewage transmission pipeline in order to avoid disturbing existing land use and follow available agricultural roads to the extent possible. This shall be done as part of the detailed engineering and the detailed ESIA. This shall also feed into the assessment in relation to land acquisition and resettlement requirements.</i>
Design considerations for reducing/mitigating E&S impacts	<ul style="list-style-type: none"> Design measures: specific sludge age and particular management of the treatment phases to eliminate carbon and nitrogen based pollution; and implementation of tertiary stage treatment including filtration (to reduce quantity of suspended solids in the effluent and eliminate the phosphorus-based pollution that is associated to these suspended solids), UV Disinfection before use in irrigation, and final chlorination to ensure the total elimination of microorganism and the presence of residual chlorine reduces risk of algae development. Wastewater pre-treatment by-products are separately collected: Grease is collected for transportation to disposal in a suitable landfill approved by the related authorities. Thin screens refusals and grits are separated and stored in skips to be evacuated on a weekly basis. Sludge treatment options that will cause the sludge to be stabilised and have less odour issues: 1. The ‘Basic Solution’ where the sludge extracted from the plant is secondary sludge and treatment includes liming stage and this decreases odour issues; and 2. the ‘Variant Solution’ where the sludge will be a mix of primary and secondary sludge and thus will have more odour issues caused by the sludge and by the aerobic treatment tank and this treatment method will also require more electricity. This will not have a liming phase which will reduce the final dryness percentage and potentially reduce opportunities for marketing. Specific processes and designs to manage the WWTP design capacity requirements. The design considers use of industrial water for washing and cleaning where required. Industrial water is the clear water produced by the plant, to avoid the consumption of drinking water. Separate sanitation facilities provided for male/female The laboratory of the Deir Alla treatment plant will be the laboratory in which all the required analyses for the four WWTPs are to be made. Civil works instructions and design Minimum Technical Requirements are also provided in order to ensure subsequent detailed design phase complies with the design requirements and targets.
Reuse Facilities	<ul style="list-style-type: none"> The high quality of water after treatment allows the reuse of water for irrigation. The treated water shall be pumped to the King Abdullah Canal as it is the main conveyor system in this area. This treated water shall be mixed with the existing KAC water and used downstream for irrigation. The Solar energy for the Pumping stations has been assessed and it has been concluded that solar energy as a sole source cannot be used due to the limited availability during specific hours of the day and the need to compensate this by oversizing the buffer tank, pumps, and pipeline diameter which becomes unfeasible. <i>It would be of great value if the subsequent detailed studies and assessments could assess the possibility of using a hybrid system that uses solar energy in conjunction with conventional energy.</i> The discharge pipe from the WWTP to the KAC shall be laid along several paths in the agriculture area. <i>The water quality in the KAC is monitored by WAJ Laboratory and the data received from January 2017 to September 2018 shows compliance with the Irrigation Water Quality Guideline JS 1766:2014. The detailed studies to be undertaken at a later stage should define if the treated water has to be reuse directly on the closest fields of the WWTP or to be discharge in the KAC. This should be discussed in consultation with the end users as well in order to agree on the approach going forward. In any case, the tertiary phase from the treatment process is mandatory. This should be assessed and studies in detail in the detailed design phase and in the detailed ESIA.</i>
Estimation of the duration of the works	<ul style="list-style-type: none"> Total duration of the work is estimated at 36 months. Two years may be added in case of a DBO model in order to allow sufficient time for capacity building and handover to the Employer staff
Lost opportunity	<ul style="list-style-type: none"> Energy to pump the final treated wastewater to the cleared water storage tank is obtained from the national electricity grid. An option was considered to use solar energy but this was disregarded. This is quite justifiable given the limited capacity in the grid in the JV but if applied, would be a good demonstration of sustainable solutions.
Highlighted Issues	<ul style="list-style-type: none"> The plant will not have any capacity to store the quantity of sludge produced (28 tonnes per day). The sludge will be taken by trucks. <i>Currently, in Jordan, there is no suitable disposal or treatment means for stabilised sludge. Suitable solutions and final destination should be considered in the final detailed studies and designs.</i>

Table 2-2: Fannosh, Dhahret Erramel and Karamah Sanitation System Summary and Highlights

Sanitation System	Fannosh’s Sanitation System	Dhahret Erramel’ s Sanitation System	Karamu’s Sanitation System
WWTP Design Capacity	20 000 inhabitants (The number of inhabitants expected in 2025 is 16 169 and 21 569 in 2050)	5 000 inhabitants (inhabitants expected in 2035 is 4 766 and 6 358 in 2050)	20 000 inhabitants (The population expected in 2035 is 16 883 and 22 520 in 2050)
Service Area	Covers the localities of M’addi, Muthallath El Ardham and Maisarat Fannosh	This sanitation system is foreseen to cover only the locality of Dhahret Erramel	This sanitation system is foreseen to cover only the locality of Karamah.
WWTP Location	After several site visits, the location has been defined on the parcel N° 493 located at the west of M’addi. The three localities concerned are on the east of the main road.	The WWTP is located at less than 1 000 m to the west of main road n°65. It is on a private parcel n° 9a .	The WWTP is located at about 2 000 m to the west of main road n°65. It is on a private parcel n° 282 .
Sewage Collection zones	Three collection zones proposed, one for each locality	This collection zone concerns only the locality of Dhahret Erramel.	This collection zone concerns only the locality of Al Karamah.
Sewage Networks Length (m)	37 000	9 500	34 400
Sewage transmission pipelines	<ul style="list-style-type: none"> Connect communities to proposed WWTP location by gravity pipelines laid along several paths in the agriculture area. <i>A detailed site assessment for the plots, land use, ownership, agricultural uses, utilities, and availability of agricultural roads should be undertaken in order to finalise the layout of the sewage transmission pipeline in order to avoid disturbing existing land use and follow available agricultural roads to the extent possible. This shall be done as part of the detailed engineering and the detailed ESIA. This shall also feed into the assessment in relation to land acquisition and resettlement requirements.</i> 		
Design considerations for reducing/mitigating E&S impacts	<ul style="list-style-type: none"> Same considerations listed above taken into account but design customised for a smaller capacity WWTP. No need for grit and grease trap 		

	<ul style="list-style-type: none">▪ Tertiary Treatment includes Physical filtration stage▪ Drying beds are proposed at the sludge dewatering line since this WWTP will treat less water than the Deir Alla one, it will produce much less sludge.▪ Once the sludge has been dewatered it can be taken away by a backhoe loader and taken away in dumps. <i>Currently, in Jordan, there is no suitable disposal or treatment means for stabilised sludge. Suitable solutions and final destination should be considered in the final detailed studies and designs.</i>▪ This basic technology requires no electric equipment, but the sludge must be managed efficiently to ensure minimal use of surface area.
Reuse Facilities	<ul style="list-style-type: none">▪ The high quality of water after treatment allows the reuse of water for irrigation.▪ The treated water shall be pumped to the King Abdullah Canal as it is the main conveyor system in this area. This treated water shall be mixed with the existing KAC water and used downstream for irrigation.▪ The Solar energy for the Pumping stations has been assessed and it has been concluded that solar energy as a sole source cannot be used due to the limited availability during specific hours of the day and the need to compensate this by oversizing the buffer tank, pumps, and pipeline diameter which becomes unfeasible. <i>It would be of great value if the subsequent detailed studies and assessments could assess the possibility of using a hybrid system that uses solar energy in conjunction with conventional energy.</i>▪ The discharge pipe from the WWTP to the KAC shall be laid along several paths in the agriculture area.▪ <i>The water quality in the KAC is monitored by WAJ Laboratory and the data received from January 2017 to September 2018 shows compliance with the Irrigation Water Quality Guideline JS 1766:2014. The detailed studies to be undertaken at a later stage should define if the treated water has to be reuse directly on the closest fields of the WWTP or to be discharge in the KAC. This should be discussed in consultation with the end users as well in order to agree on the approach going forward. In any case, the tertiary phase from the treatment process is mandatory. This should be assessed and studies in detail in the detailed design phase and in the detailed ESIA</i>
Estimation of the duration of the works	<ul style="list-style-type: none">▪ 36 months for each system but that can be done in parallel
Lost opportunity	<ul style="list-style-type: none">▪ None
Highlighted Issues	<ul style="list-style-type: none">▪ The plant will not have any capacity to store the quantity of sludge produced (28 tonnes per day). The sludge will be taken by trucks. <i>Currently, in Jordan, there is no suitable disposal or treatment means for stabilised sludge. Suitable solutions and final destination should be considered in the final detailed studies and designs.</i>

In conclusion, this FS proposes to build the WWTPs based on a low load aeration tank (Conventional Activated System, with a sludge age of 12 days and nitrification and denitrification realized in this tank by means of intermittent aeration).

There follows a summary of the rationale behind proposing this system:

- This system is very easy to operate for the suggested sizes of WWTP (less than 100 000 PE).
- Sludge produced is either stored on drying beds (Fannosh, Karamah and Dhahret Erramel) or stabilized on site with lime (Dair Alla) to avoid odours in the surroundings and facilitate transportation to a storage yard which location has to be defined later.
- After two years of training, employer teams will be able to operate the WWTPs without any private sector support.

The FS proposed four options:

- Option 1: Dair Alla sanitation system;
- Option 2: Dair Alla and Karamah sanitation systems
- Option 3: Dair Alla, Karamah and Fannosh sanitation systems
- Option 4: All four sanitation systems

The total investment cost for four sanitation systems is around 74M€.

Based on the above description of the proposed sanitation systems, the following are the main sanitation and wastewater project components proposed to be developed as part of this Project:

- Sewage pipelines on the collection zones
- Transmission pipelines
- Four WWTPs including laboratory in Dair Alla WWTP
- Reuse facilities

Proposed main procurement models for the new facilities are as follows:

- Detailed Design model for the pipes and networks
- DBO model for the wastewater treatment plants with two additional years on the operating phase after the Take-Over.
- DBO model also on the RO Plants with two additional years on the operating phase.

2.3 WAJ Decision Regarding Priority Investment Projects

These alternatives and financial estimations were provided by the FS team to the WAJ in order to assess the different options and make a final decision of priority investments. Referring this final choice, the option chosen would be implemented as first priority between 2019 and 2022.

In October 2018, the WAJ has concluded that the priority investment would be the development of Alternative 4 for the Water Supply item and the Dair Alla Sanitation System for the Sanitation item.

2.4 Project Phases

The Project phases encompass three main phases, i.e. design and construction, operating the systems and facilities of the Dair Alla and Al-Karamah water supply and sanitation project, and decommissioning. These phases are summarised below.

2.4.1 Design and Construction Phase

This phase encompasses the activities leading to and including the set-up of the Dair Alla and Al-Karamah water supply and sanitation project.

- Detailed mapping and site assessment of the areas selected for the water supply and sanitation project components in order to have a final selection on the locations and routes. This includes undertaking specific surveys by the design team as well as the ESIA team (e.g. topography, geotechnical, archaeological, land use and ownership, customary land use and need for land acquisition and resettlement, socio-economic context, utilities and infrastructure...etc);
- Preparation of final detailed design and locations of the Project components and facilities;
- Identification of the original and extended ROW and the properties that will be affected by excavation activities. Upon completion of the detailed design and identification of the land parcels that will be affected by the Project, the details of compensation measures and processes for any further land acquisition will be have to be put in place and agreed with WAJ;
- Procurement and selection of contractors (depending on the model used for each of the project components, i.e. Detailed Design, DB, or DBO model)
- Delivery of the permanent and temporary equipment and material to the site location, all of which will be provided by the contractor;
- Supply of materials including water, cement, sand, gravel, concrete, etc.
- Construction of the project components and facilities (each according its own timeline and procurement model and package) to include excavation, positioning, installations, electrical and mechanical works, cathodic protection, backfilling and reinstatement of the ground and soil...etc.
- Installing the connections between the different project components (i.e. Sewage pipelines on the collection zones with the Transmission pipelines, Transmission pipelines with the WWTPs; WWTPs with the pumping station and the pipeline to KAC; sludge treatment facilities...etc.)
- Managing road intersections;
- Testing and commissioning of the system components (each according its own timeline and procurement model and package).

2.4.2 Operation Phase

- The operation phase includes all operational and maintenance activities that will be undertaken once the construction phase is completed and includes all Project-related activities during the operational life of the project.

- Maintenance of the water and wastewater pipeline network and all facilities (e.g. checks, prevention of pipe clogging, etc.)
- Disposal and removal of waste streams to include in particular sludge generated from WWTP to an off-site disposal location.

2.4.3 Decommissioning Phase

- The Project components are expected to function in perfect condition until after year 2050. Routine checks and maintenance activities should be undertaken to maintain the facilities. If any failure takes place, specific measurements will be taken. However the project facilities are expected to stay operational for as long as the structure is in a good condition to provide water supply and sanitation services for the Project area.

3.ESIA Approach and Methodology

The following text briefly describes the methodology adopted in this Preliminary Environmental Impact Assessment prepared as part of the FS for the Dair Alla and Al-Karamah water supply and sanitation project. In summary, the following is provided: (1) brief summary for the project description based on input from the FS Team – this should be read in conjunction with the FS report; (2) assessment of baseline conditions (3) identification of anticipated impacts; (4) identification of mitigation measures and/or Minimum Technical Requirements for subsequent studies; (5) identification of monitoring requirements; and (6) compilation of an Environmental Management Plan (EMP).

Project Description

The preliminary ESIA provided a brief summary of the project and the proposed activities expected to take place.

Baseline Assessment Analysis

The project components proposed under this FS are still in the concept phase and further analysis for the micro-siting of the facilities shall be undertaken in the subsequent detailed engineering and full ESIA phase. For this reason, this preliminary ESIA is only undertaken as part of the FS and this analysis did not include any onsite baseline measurements. Status quo within the project boundary was described based on review of available data and discussions with involved stakeholders.

In addition, several site visits and assessments were undertaken as part of the site selection process for the wastewater and sanitation project including the WWTP locations in order to propose potential sites that would be acceptable from a technical perspective but also to screen out to the extent possible any E&S issues that may be considered as "red flags" and that would not allow obtaining the required permits at a later stage. Nevertheless, the area in general is considered as an agricultural area and the final location of sites proposed will still require further assessment and surveys and most importantly consultations. This will be provided in the subsequent detailed assessments and surveys that are not within the framework of this FS.

The baseline findings are outlined in the baseline report previously submitted by the FS Team. This report only includes the description of the general area selected for the WWTP locations.

The table below provides a brief summary of the approach for baseline assessment:

Table 3-1: Attributes and Baseline Assessment Methodology

Attribute	Baseline Assessment Methodology
Landscape and Visual Characteristics	Based on the previous site assessments of the general conditions within the Project site, the surrounding landscape and topographical conditions were characterized. In addition, based on consultations with relevant entities (such as MoEnv, Ministry of Agriculture (MoA), etc.), any nearby sensitive visual receptors which may be affected by the Project were identified.
Land Use	Formal land use review and assessment was undertaken through the available secondary data from relevant governmental authorities such as the MoMA, MoEnv, MoA, etc. to

	<p>determine the assigned planning and land use context for the area and whether any conflict exists with the proposed Project.</p> <p>In addition, based on consultations with Municipalities and Mutasarrifates, any informal land use of the area was assessed and documented</p> <p>Finally, the environmental team participated in the various visits carried out in order to identify suitable locations for the WWTPs. During these visits a rapid assessment of the land use in the vicinity of these sites was carried out.</p>
Geology, Hydrology and Hydrogeology	<p>The geological, hydrological and hydrogeological patterns of the Project site were presented based on secondary data available from the MWI and the available literature. This data included the existing hydrological and hydrogeological sources available within the Project area, well locations and profiles, water quality statistics, the current management of these water sources and the underlying geological formations.</p>
Biodiversity	<p>Relevant studies and previous records available for the area in published scientific papers or previous assessments were collected and reviewed to provide a geographical-representative ecological baseline. This included flora, fauna, and avi-fauna habitats in the area.</p> <p>The assessment also included consultations with experts which are considered specialists in relation to the subject matter in order to further understand the biodiversity of the area and its importance. This included consultations with the following: (i) BirdLife International; and (ii) The Royal Society for the Conservation of Nature (RSCN).</p> <p>In addition, the Atlas prepared by RSCN for importance of floral/faunal species in Jordan was considered as part of the baseline assessment.</p>
Archaeology and Cultural Heritage	<p>Review of available secondary data and literature on the Project area and its surroundings from the Department of Antiquities (DoA) which includes archives, publications, studies, and the official register and database of all archaeological/cultural sites of Jordan known as (MEGA Jordan).</p>
Socio-Economic Conditions	<p>Secondary data available on local socio-economic indicators which were collected mainly from the Department of Statistics (DoS) and the relevant Mutasarrifates and Municipalities. This data was used to characterise and assess the socio-economic conditions in terms of demographic dynamics, population characteristic, income distribution, unemployment and poverty, etc.</p>

Identification and Assessment of Environmental and Social Impacts

This section discusses the anticipated environmental and social impacts from the project throughout its various phases, including the construction and operation phases. To the extent possible, this preliminary ESIA identifies: Sensitivity of Receiving Environmental Parameter, Nature, Magnitude, Effect, Duration, Reversibility, and Significance.

Implementation of the project may give rise to several potential positive and negative impacts on certain environmental attributers, all of which are assessed in the subsequent sections. In addition, there are clear major benefits at national level related to the implementation of the Project which are also presented.

In summary, the key environmental receptors which are likely to be impacted are listed below, correspondingly divided into the design and construction impacts and the operation impact.

Design and Construction Impacts:

- 1) *Biodiversity*: these impacts occur from initial work on-site throughout the construction period and operational period. These impacts can be reduced or eliminated with proper standards of work and proper management and monitoring of the workforce.
- 2) *Archaeology and Cultural Heritage*: the construction activities may uncover important archaeological sites and a specific "chance find" procedure is required as per the Antiquities Law (Law of Antiquities No. 21, 1988 and its amendments) from the General Department of Antiquities and these shall be provided to the contractor to avoid negative impacts.
- 3) *Land Acquisition* - both temporary and permanent: this FS proposed several water supply and wastewater and sanitation project components and proposed alignments, routes, and sites for these at the concept level. These facilities may result in permanent land acquisition and resettlement that will need to be completed prior to tendering. In addition, there is a risk of sites not being made available or being delayed due to land right issues or other events such as delays in obtaining the related permits due to community complaints and rejection for siting the WWTP in their vicinity.

A detailed design phase, that is not part of this FS, will follow; this subsequent phase should include detailed site assessments and surveys in order to confirm the proposed sites if possible or propose relocation opportunities based on findings of the detailed surveys. In order to provide specific land acquisition and resettlement impacts and identify the specific plots and receptors that will be affected by the siting and the construction of the project components, thorough consultation with the stakeholders and land use and ownership assessment should be undertaken. This shall also include a Resettlement Policy Framework and Action plan. The laws and process need to be settled with the Land Acquisition Department and form agreements about compensations that will be granted to the land and property owners. This shall be undertaken at a later stage in agreement with WAJ.

- 4) *Roads and Traffic*: open-cut and jacking activities as well as some construction adjacent to or under paved roads might affect road conditions and traffic congestion and flows. Part of the civil works will be along dirt roads, and others along primary roads, especially main road 65. The specific location of these works cannot be identified at this phase. This preliminary ESIA identifies the general overarching related impacts but the subsequent detailed engineering and ESIA should specify these locations and properly identify types of impacts, location and timings of impacts, and identification of proper mitigation measures which would largely reduce such impacts.
- 5) *Employment*: although contractors generally bring their own workers, some work opportunities may be opened. The overarching impact is considered positive but this process needs to be well-managed in order to avoid any negative impacts such as disruption of community by workers, worker rights and contracts, gender mainstreaming and fair employment if any, potential influx of foreign labour should be avoided, housing of workers...etc.
- 6) *Gender*: generally, due to cultural setting, such projects provide limited work opportunities for women. Nevertheless, some measures could be proposed to enhance female employment opportunities in order to ensure aligned gender management;

7) *Other Related Impacts:* (e.g. geology and hydrology, health and safety, dust and noise abatement). Such impacts need to be managed and mitigated via construction contract documents for implementing the planned infrastructure improvements.

- a. *Geology and Hydrology:* possible contamination of ground water and soil quality due to inappropriate management of waste disposal (solid waste, hazardous waste, spills, etc.). However, with proper handling of materials and proper standards of work, the impact can be reduced or eliminated.
- b. *Air Quality and Noise:* the community and the workers may be exposed to dust and noise emissions, which may have a temporary negative impact on their health. This must therefore be carefully managed during the construction phase.
- c. *Health and Safety:* construction personnel and the general public may be negatively impacted owing to the absence of proper safety measurements, lack of on-site supervision and irresponsible behaviour at the construction areas.

Operational Impacts:

1) *Opportunities:*

- a. Support Widespread Economic Growth in Jordan
- b. Water Security and Improved Water Supply Services
- c. Contribute to improving services through ensuring consistency in water supply and supply duration to customers as well as improving access to water services
- d. Solve serious environmental, health, and social issues resulting from the use of cesspits and septic tanks at the household level
- e. Provide solutions in WW collection and treatment, including the installation of a proper sanitation system aimed at reducing leakage from septic tanks and cesspits;
- f. Illegal disposal by vacuum trucks in wadis will be significantly reduced.
- g. Increasing Water Flowing Downstream to Farmers to be used in Agriculture
- h. Provide additional water for irrigation use from the treated waste water resulted from additional new resources.
- i. GHG emission reduction is achieved.
- j. Establishing additional WWTPs to reduce the operational load on the existing Tal Almantah WWTP
- k. Utilizing gravitational flow, hydraulic power and energy efficient pumping technologies, where possible, for enhanced climate resilience
- l. Repair pipe leakages from the current water supply system for reduced NRW.

- 2) *Hydrology and Hydrogeology*: Abstraction of additional water quantities from existing wells or establishing new wells may have potential impacts on groundwater basin to include water supply, environmental conditions and characteristics of water quality.
- 3) *Air Quality*: potential air emissions and odour problems due to the WWTP operations and the sludge drying and reuse facilities.
- 4) *Risk of discharge of substandard effluent from the WWTP causing environmental and health issues downstream*: In principle this is well-mitigated by the design of the WWTPs. However, this should be validated throughout operation by means of regular measurements of the effluent.
- 5) *Pest Nuisance*: there are already large populations of insects and flies in the JV area and this is a reflection of the existing nature of activities. There may be additional sources of pest nuisance from the proposed WWTP and sludge reuse facilities. However, these may not be significant given the design specifications proposed in this FS. This should be properly managed and mitigated in order to ensure these facilities are not another source of such nuisance.
- 6) The FS proposes that the sludge will not be stored onsite and will instead be sent to a proper facility for disposal (for the Dair Alla WWTP only, not for the three others) Since the stabilised and dried sludge will only be stored onsite for a one week period, potential odour, nuisance, pests, health, and soil/groundwater pollution are controlled. However, ‘*what to do with the sludge and where to dispose of it*’ remains an issue that needs to be solved. The final destination for the sludge could be the Al Ekaider landfill in the north of Jordan. There may also be an opportunity to reuse the sludge, especially for the Dair Alla WWTP, by means of addition of lime to sludge in order to enhance its stabilization; however, this should be investigated in further detail based on a market study, consultation, and willingness survey. This shall be verified and discussed in detail once the final design for the WWTP and the sludge reuse facilities is confirmed based on the quality and the dryness of the sludge.

Identification of Mitigation Measures and MTRs

For identified impacts appropriate Minimum Technical Requirements (MTR) and recommendations for further assessment to be carried out during subsequent detailed engineering and full ESIA shall be provided. The purpose of these mitigation measures and MTR recommendations are to mitigate negative environmental outcomes. To the extent possible within the framework of this FS, these recommendations will include feasible and cost effective measures that will prevent impacts from occurring or reduce them to acceptable levels. Such measures could involve technical and design requirements, recommendations, guidelines or procedures and practices to be implemented during the detailed engineering or the subsequent development phases of the Project.

Identification of Monitoring Requirements

Recommendations for suitable monitoring requirements will be proposed to ensure that the identified mitigation measures are taken into account, implemented properly, and are sufficient measures for the protection of environmental resources.

4. Baseline Assessment analysis

The FS Team has submitted an intensive baseline report (Conceptual design) including a comprehensive section on environmental and social parameters within the Project area. This has been based on a review of available secondary data and consultation with related stakeholders. For detailed baseline information, please refer to this report.

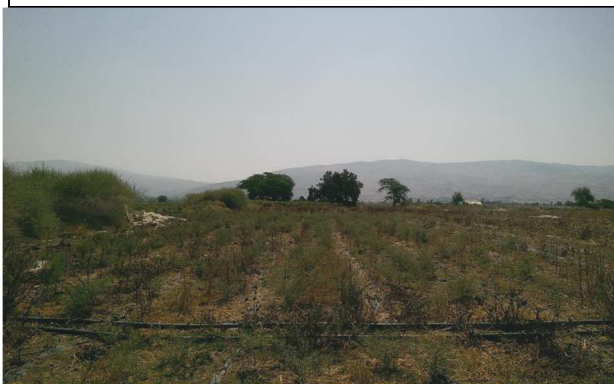

The text below provides the baseline setting in the vicinity of the sites proposed for the four WWTPs and this description is based on a one-day site visit carried out on 4 July 2018 by an EIB representative, the FS Team including the environmental team, and a WAJ representative.

Site Specific Land Use for WWTPs

This section provides an assessment of the proposed WWTPs locations that aim to serve a number of different localities within the boundary of the Project area. The baseline conditions for each site and surroundings were assessed in relation to informal/customary land use. Site selection was based on natural contouring to utilize gravitational flow, thus reducing the need for pumping stations and thereby reducing energy consumption and any associated expenses.

The table below provides a summary on the land use baseline in the vicinity for the proposed WWTP locations:

Table 4-1: Description of land use settings for the proposed site for the Dair Alla WWTP

Dair Alla WWTP	
<p>The proposed site (Ref N°377) is located near the undulating formation which stretches North-South of the Project area. Observations suggest that the parcel is vacant from any structures but is/was used for agriculture practices and irrigated using drip irrigation. Nevertheless, the lack of crop cultivation may suggest the land has been abandoned.</p> <p>An irrigation channel runs in conjunction with the land plot and extends continuously alongside the access road. The adjacent site is used for growing courgettes. The proposed parcel is subject to the appropriate land acquisition requirements, as it is privately owned. The proposed location adequately meets the 1 km buffer requirement from the nearest organized municipal boundary.</p>	
	
View towards the east	View towards the west



View towards the north



View towards the south

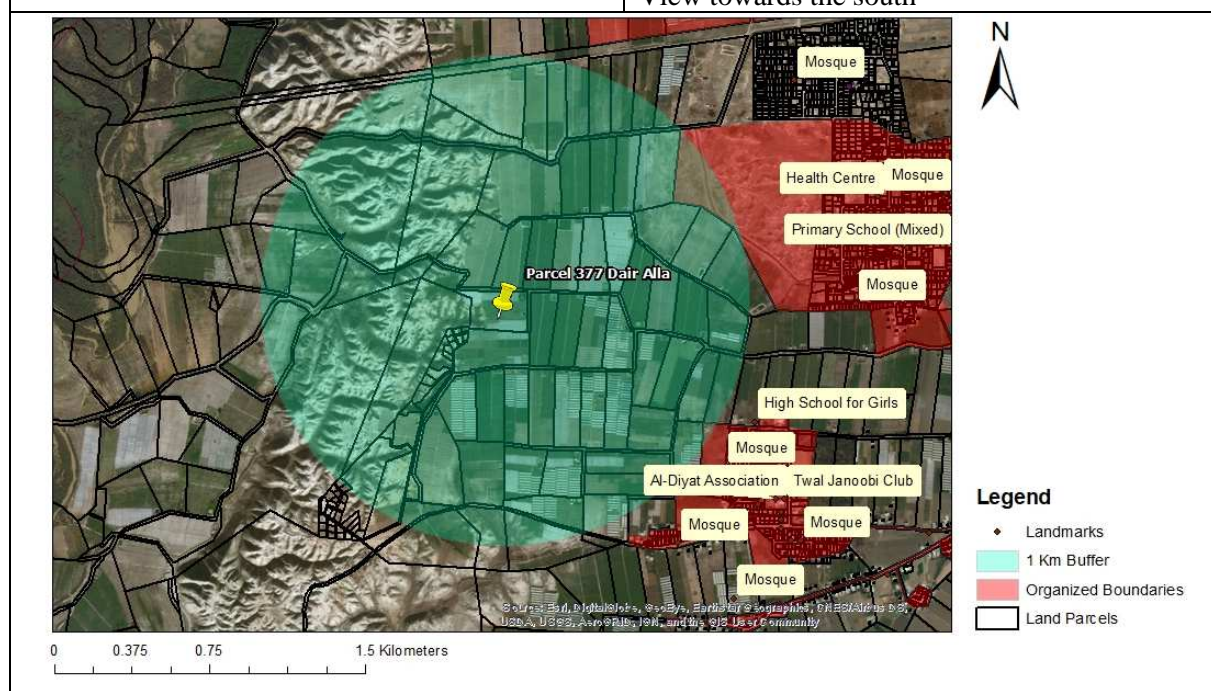



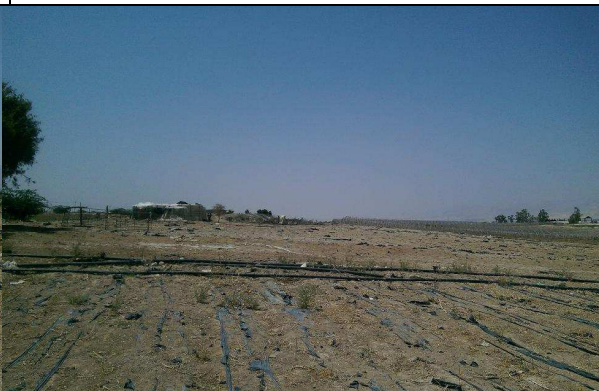


Table 4-2: Description of land use settings for the proposed site for the Fannosh WWTP

Fannosh WWTP	
<p>Parcel 493 belongs to a private owner</p> <p>Black plastic film and discarded drip irrigation pipes were seen onsite, indicating that the land has been used for agricultural purposes (as seen in the westward figure).</p> <p>A livestock fence was observed nearby, which may suggest grazing activities have been taking place; however, the size of the enclosed area implies that these activities were not extensive in nature.</p> <p>Towards the east are rows of arching greenhouse structures, aligned perpendicular to the access road and partially grown with what was observed to be tomatoes.</p> <p>A water lagoon and pump were seen nearby and is expected to supply irrigation needs of the surrounding area.</p> <p>After considering the minimum distance between the suggested plot and nearest dwelling (to the north), the prospective WWTP was relocated South, in respect to the geological contour lines. Despite the cluster of residences within the 1 km buffer zone, the proposed location remains adequately distant from the Dair Alla municipal boundaries. The administrative/organized boundary that defines Maisarat Fannosh is not currently available.</p>	
	
View towards the east	View towards the west
	
View towards the north	View towards the south

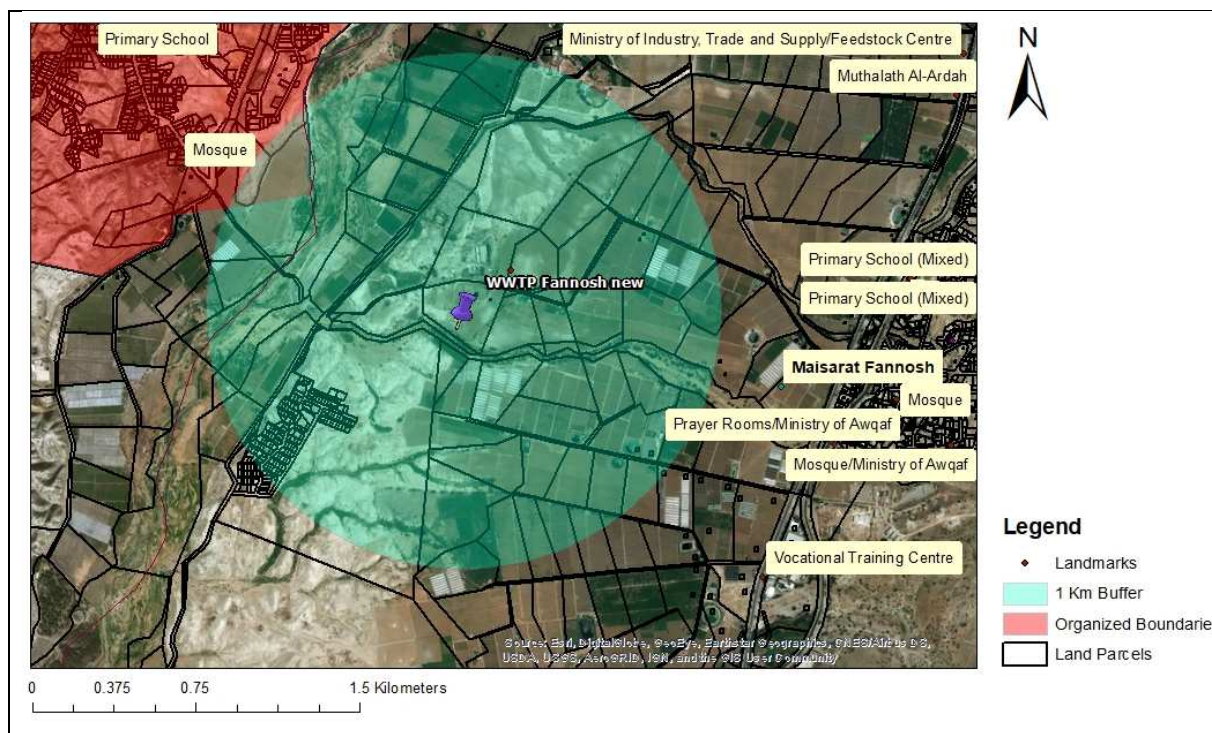



Table 4-3: Description of land use settings for the proposed site for the Dhahret Erramel WWTP

Dhahret Erramel WWTP	
A site visit to Dhahret Erramel was not scheduled. This site has been previously visited by the FS Team. The reference number is 9a.	
It is located on a private plot heavily cultivated and currently occupied by plastic houses.	
	

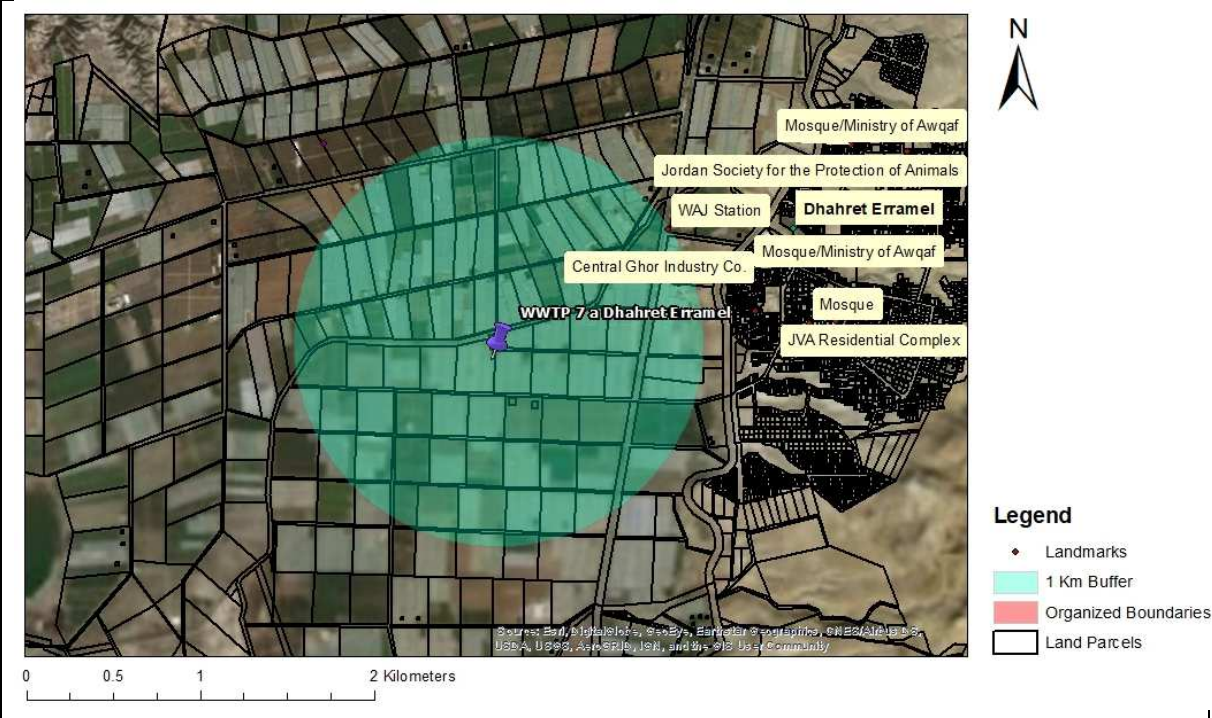


Table 4-4: Description of land use settings for the proposed site for the Karamah WWTP

Karamah WWTP	
<p>The reference number of this parcel is 282.</p> <p>The suggested plot was seen to be freshly ploughed.</p> <p>West of the proposed site, and directly adjacent, was a field of grown mint. Further west was a fence lined with mature olive trees. Immediately to the eastern side of the suggested plot is a date farm fenced with barbed wire. The southern borders of the site would appear to house a livestock barn, hut and two water tanks.</p> <p>The area seems agriculturally intensive and surrounds several privately owned establishments. In terms of accessibility, the road is only suitable for one-way traffic.</p>	
	
View towards the east	View towards the west
	
View towards the north	View towards the south

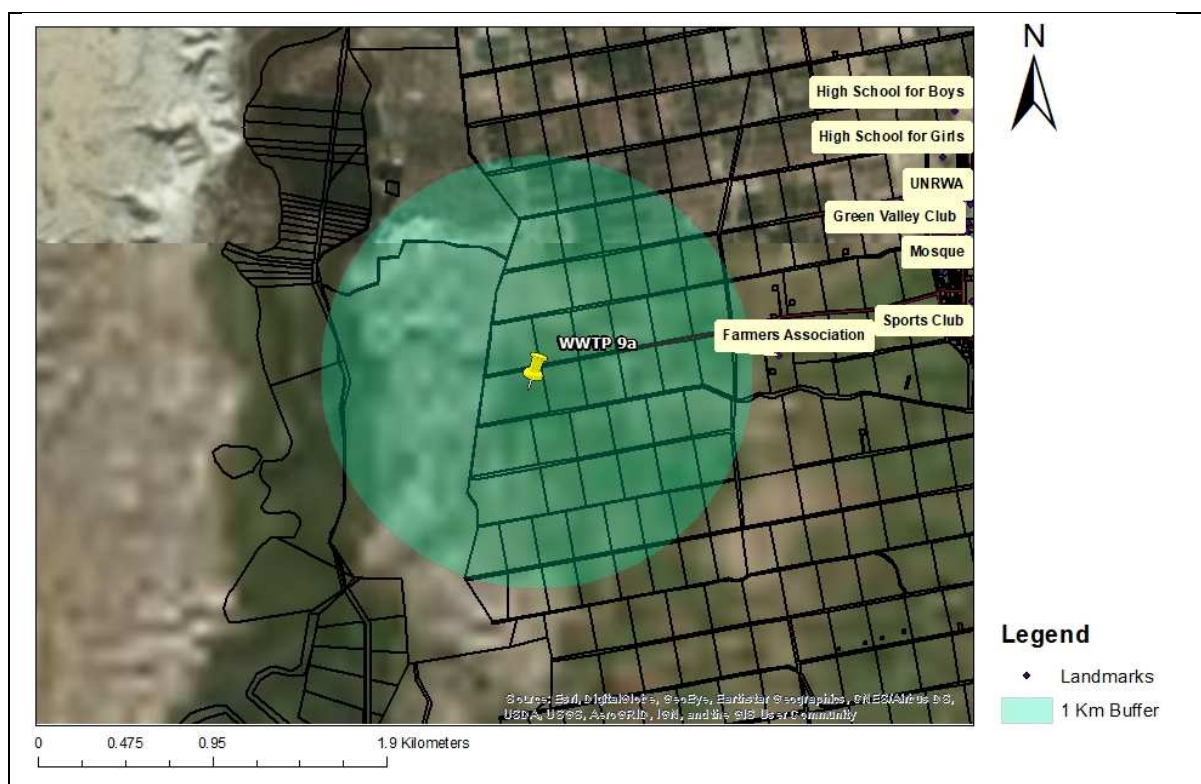


Table 4-5: Summary of land planning challenges for the WWTP proposed sites

Site	Challenges
General	<ul style="list-style-type: none"> ▪ Social license to operate is still unclear and will unfold as part of the environmental permit requirements. ▪ Community acceptance and ensuring no opposition that may cause risks to the Project ▪ There is a risk that site not made available or delayed due to land right issues or other events such as delay in obtaining the relative permits due to community complaints and rejection for siting the WWTP in their vicinity ▪ Transportation through residential areas.
Dair Alla WWTP	<ul style="list-style-type: none"> ▪ Privately owned property, expected to have higher values since agriculturally developed. ▪ Potential risk of pollution to wadis flowing to the West (but limited pollution because of the high level of treatment) ▪ Twal An-Janoobi is typically downwind, with risk of nuisance such as odour if not properly managed.
Fannosh WWTP	<ul style="list-style-type: none"> ▪ Dwellings outside organized boundaries may experience nuisance as a result of odors, mosquitoes, and pests. ▪ Requires the most land preparation in terms of excavation
Dhahret Erramel WWTP	<ul style="list-style-type: none"> ▪ Dhahret Erramel is downwind most of the time, which may cause odour nuisance and constrain residential expansion in the North.
Karamah WWTP	<ul style="list-style-type: none"> ▪ Considered a prime-property for future developments. ▪ Access road only suitable for one-way traffic. ▪ Is surrounded with private establishments.

As indicated above, the sites are mainly proposed based on technical and topographic features. To the extent possible, environmental siting factors have been taken into account but not intensively as this will have to be undertaken as part of the detailed engineering and full ESIA phase. This exercise would require site assessments, consultations, and land use and ownership analysis.

5.Consultation

Session Overview

The aim of this local community consultation was to focus on the local community groups that are most likely to be affected by the Project development including Deir Alla, Al Rwaiha, Derar, Khazma, Al-Tewal Alsamaly, Al-Tewal Aljanoubi, Abu Obaida and Balawneh.

This was undertaken through a consultation session which was held on 13 September 2018 in the Al Hilal Al Khaseeb Cooperative (local Community Based Organisation) located in Dair Alla.

Generally, such a consultation session aimed to take into account their thoughts and concerns on the Project development, while allowing the discussion to focus on slightly different angles from more of a first-hand experience/practical, less-technical perspective. Eco Consult Team documented all records of the consultation session to include list of participants and attendees, comments and so on. Selected photos from the session are shown in the figure below.

List of invitees, list of attendees, and Synthesis of Comments are detailed below. (Names of individuals have been removed for publication purposes - text inserted by EIB).



Figure 5-1: Photos documenting local consultation session dated 13 Sep 2018 in Dair Alla

List of Invitees

Table 5-1: List of invitees to the local consultation session dated 13 Sep 2018 in Dair Alla as provided by the Dair Alla municipality

Entity	Name	Position
Deir Alla Municipality	Name removed	Head of local council
	Name removed	Member of local council
	Name removed	Member of local council
	Name removed	Member of local council
	Name removed	Member of local council
Al-Rwaiha Municipality	Name removed	Head of local council
	Name removed	Member of local council
	Name removed	Member of local council
	Name removed	Member of local council
	Name removed	Member of local council
Derar Municipality	Name removed Al-	Head of local council
	Name removed	Member of local council
	Name removed	Member of local council
	Name removed	Member of local council
	Name removed	Member of local council
Khazma Municipality	Name removed	Head of local council
	Name removed	Member of local council
	Name removed	Member of local council
	Name removed	Member of local council
	Name removed	Member of local council
Al-Tewal Municipality AlShamaly	Name removed	Head of local council
	Name removed	Member of local council
	Name removed	Member of local council

	Name removed	Member of local council
	Name removed	Member of local council
Al-Teway Aljanobi municipality	Name removed	Head of local council
	Name removed	Member of local council
	Name removed	Member of local council
	Name removed	Member of local council
	Name removed	Member of local council
Abu Obidah and Balawneh Municipality	Name removed	Head of local council
	Name removed	Member of local council
	Name removed	Member of local council
	Name removed	Member of local council
	Name removed	Member of local council

List of Attendees

Table 5-2: List of attendees to the local consultation session dated 13 Sep 2018 in Dair Alla

No.	Entity	Name	Position
1	Ministry of Interior	Name removed	Mayor
2	Public Security Directorate	Name removed	-
		Name removed	Security Centre Assistant
		Name removed	-
3	Jordan Valley Authority	Name removed	Manager
4	Dair Alla Municipality	Name removed	Head of Local Council
		Name removed	Head of Local Council
		Name removed	Head of Local Council
		Name removed	Local Council Member
		Name removed	Manager

		Name removed	Head of Local Council
		Name removed	Head of Local Council
		Name removed	Local Council Member
		Name removed	Local Council Member
5	Dair Alla Water Directory	Name removed	Manager
6	Maadi Municipality	Name removed	Engineer
		Name removed	Head of Local Council
		Name removed	Head of Maadi Municipality
7	ECO Consult	Name removed	Consultant
		Name removed	Analyst

Synthesis of comments

- In principle the stakeholders are all aware that this project is crucial for them and there were no objections or negative comments. In terms of the land acquisition process, they recommended that a site investigation should be done and discussions with the land owners in order to get their opinion
- The stakeholders think that there should be intensive consultations with the community and related stakeholders
- The community wanted to know if the site allows for a safe buffer with the residential areas
- They do not agree with returning the treated water to KAC
- They want to know what is the outcome quality and what type of crops could be irrigated
- They prefer if the site is moved further to the west in order to use for irrigating barley and fodder crops as well as trees for wood production. However this was encountered by a comment from the WAJ Dair Alla Manager who indicated that this would cause political transboundary issues. There were several comments from the stakeholders regarding finding another location to the west or in other areas that are less occupied.
- They do not want to pay for the treated wastewater and should get it for free.
- The Dair Alla Mayor spoke and said that this is an initial no objection on the project but further investigations on the ground and with the land owners should be done in order to confirm the location. He also suggested that we prepare a project brief and send it to them in order to present it during their weekly municipal council meetings in order to allow municipal council members to discuss with the community and get back to us with comments and feedback. This could require around 20 days after we send them the summary.

Session Proceedings

Many comments and questions were also raised during the presentation. The table below is a summary of the different comments made throughout the session.

1.	<p><i>Name removed – New Dair Alla Municipality</i> What are the uses of the treated wastewater? <i>Name removed – Eco Consult</i> The treated wastewater will have the best quality as per the Jordanian standards and shall be suitable for the crops in the area such as trees and barley.</p>
2.	<p><i>Name removed – Jordan Valley Authority</i> Is it possible to move the location of the wastewater treatment plant to the west? <i>Name removed – Water Directory of Dair Alla</i> The location of the wastewater treatment plant was selected according to the topography of the area, and moving the treatment facility to the west is not preferred due to its proximity to the Jordan valley which will cause political issues</p>
3.	<p><i>Name removed – New Municipality of Dair Alla</i> What should be the minimum distance between the wastewater treatment plant and residential areas? <i>Name removed – ECO Consult</i> A buffer zone of one kilometre has been taken into account between the project site and residential, commercial or institutional developments. Discussions have been carried out with the MoEnv and they may require 1-2 km and this shall be confirmed throughout the location permit process. .</p>
4	<p><i>Name removed – Maadi Municipality</i> Will such a project charge residents of the area for additional costs? We do not want to pay for the reclaimed wastewater for reuse. <i>Name removed – Eco Consult</i> Based on community comments, the residents are already paying sewerage connection costs on their monthly bill. The connection costs are calculated by the WAJ and this shall be determined at a later stage. The length of network and location of the WWTP will not be the deciding factors for the costs Regarding reclaimed wastewater, your comment will be recorded and this will be decided by WAJ.</p>
5	<p><i>Name removed – New Dair Alla Municipality</i> What are the main crops that can be irrigated with treated wastewater? <i>Name removed – Jordan Valley Authority</i> Treated wastewater can be used for irrigating fodder crops, and fruit trees.</p>
6	<p><i>Name removed – Maadi Municipality</i> Wastewater treatment plants are considered as a major source of diseases and may constitute an important health risk for the surrounding inhabitants as the case in Kufranja. What measures did you take into account to avoid such problems? <i>Name removed – Eco Consult</i> Advanced wastewater treatment technologies will be used to mitigate these impacts and obtain the desired performance. In addition, a full ESIA will be carried out and all such issues will be covered in the study. Proper measures will be provided.</p>
7	<p><i>Name removed – New Dair Alla Municipality</i> I suggest that the priority should be given to the farmers of the nearby localities by providing them with the treated wastewater to use it for agricultural irrigation without getting charged. <i>Name removed – Eco Consult</i> Your comment will be taken into account, and it has to be discussed with the ministry of water and irrigation.</p>
8	<p><i>Name removed – New Dair Alla Municipality</i></p>

	<p>In order to provide a more solid feedback from the communities, I suggest providing them with brochures that discuss the main information about the project, in order to raise the awareness of the importance of the project, and allow them to raise any concerns they might have regarding the Project in general. This is an initial no objection on the project but further investigations on the ground and with the land owners should be done in order to confirm the location. He also suggested that we prepare a project brief and send it to them in order to present it during their weekly municipal council meetings in order to allow municipal council members to discuss with the community and get back to us with comments and feedback. This could require around 20 days after we send them the summary. So it seems he wants to play it safe with his area and he still needs more work to be done.</p> <p><i>Name removed – Eco Consult</i></p> <p>Your suggestion will be taken into account and discussed with the project parties involved. This shall be surely done within the ESIA phase.</p>
9	<p><i>Name removed – New Dair Alla Municipality</i></p> <p>Will Tall Al Mantah WWTP continue operating after the development of the new wastewater treatment plant?</p> <p><i>Name removed – Eco Consult</i></p> <p>The construction of the new wastewater treatment plant needs around three years. During that period, Tall Al Mantah WWTP will continue receiving the wastewater. In addition, the new sewer network will be constructed in phases, and each phase will cover a certain area. For this reason, the wastewater will continue being transmitted to Tall Al Mantah WWTP, while construction works are being carried out.</p>
10	<p><i>Name removed – New Dair Alla Municipality</i></p> <p>I suggest discharging the treated wastewater to Al-Karamah Dam?</p> <p><i>Name removed – Eco Consult</i></p> <p>Al-Karamah dam is far from the suggested location of the new WWTP, therefore the transmission of the treated wastewater will need pumping. In addition the treated water can be directed toward fulfilling certain purposes such as agricultural irrigation, however your suggestion will be taken into account</p>

Other meetings and discussions undertaken with the main stakeholders for the purpose of this Feasibility study are provided and summarised in Annex I-Consultation diary.

6. Overview of the Strategic Environmental and Economic Opportunities of the Project

The Project shall result in significant and crucial positive environmental and economic opportunities on the strategic and national level, given the current challenges in Jordan's water and environmental sectors. Anticipated positive environmental and economic opportunities on the strategic level are highlighted in Table 6-1: below.

Table 6-1: Overview of the Strategic Environmental and Economic Opportunities (ECO Consult, 2018)

Development Opportunity	Description	Project Contribution
Jordan 2025: A National Strategy and Vision	The national strategy and vision highlights the resources essential for driving national development; specifically water, land and natural resources. Given the low capita share of available water resources, innovative and practical approaches to water procurement have become fundamental. Demand of non-traditional resources, groundwater sustenance, and optimal use of surface water by building dams (water harvesting) are considered as interventions of most interest to the struggling water sector. Additionally, the strategy articulates the need for improved financial efficiency by reducing costs associated with energy consumption, water theft and leakages. It also expresses the importance of expanding on the sanitation and purification of domestic and industrial WW and infrastructure for irrigation. Moreover, the strategy prioritizes the restructuring of water transport and distribution networks to ensure services are provided equally to all governorates.	Consistent with the 2025 national strategy and vision, the Project is expected to support water resource development and its conservation by firstly reducing water leakages through the rehabilitation of existing water networks; subsequently increasing financial efficiency and water resilience. The Project will also apply non-traditional water procurement techniques through the reuse of WW, in turn relieving groundwater basins from over abstractions and inefficient use of surface water. This will be achieved through the expansion of sanitation and purification capacities of the current system. Finally, the installation of a prospective sanitation network will improve groundwater quality and prevent WW infiltration. The contribution of this Project is cross-cutting to the many opportunative development clusters identified within this strategy.
Support the National Water Strategy 2016-2025	The main objective of the strategy is to: strengthen the resilience of the water sector; make safe, affordable and adequate water supply and sanitation accessible for all Jordanian citizens; encourage efficient and productive water usage and cost recovery; encourage Integrated Water Resources Management (IWRM) principles; adapt to the increase in population and economic development; encourage usage of innovative and efficient technologies; facilitate partnerships in infrastructure; form a target oriented and viable legal and regulatory framework; build towards a climate change adaptation plan as well as a humanitarian WASH sector coordination system, and synergize with relevant national priorities and development plans. Consequently, this will create a sector with better preparedness, encourage different and more efficient	In line with the strategy, this development allows for greater sustainability and shows the commitment of Ministry of Water and Irrigation (MWI) in materialising the strategic objectives underlined within the National Water Strategy 2016-2025, specifically those relating to improved water supply and sanitation, climate adaptation, and avoidance of NRW. Moreover, the feasibility study will envelope a 2050 outlook, beyond the eventual 2025 vision stipulated within the National Water Strategy. Considering the previous studies undertaken for this Project, this feasibility study will expand on the 2020 vision set by the Japanese International Cooperation Agency (JICA) for this water supply and sanitation development.

	business conduct, add value to national development in line with socioeconomic sustainability initiatives, engage in institutional reform, and improve inter-sectoral linkages to magnify efforts in health and economic well-being nationwide.	
Improved Water Resilience	Jordan is considered as one of the countries with the lowest level of water availability per capita in the world. The influx of Syrian refugees has added more stress to the water sector demands, in addition to the expected national population increase to reach double numbers by 2047. Fulfilling water needs and demands has become more critical and is ranked amongst the highest of national priorities.	The Project is expected to increase water security through reducing water system leakages, prevent interception of pollutants into groundwater as a result of septic seepage, and manage water resources efficiently by facilitating WW reuse for irrigation purposes.
Economic Benefits	The MWI has developed a Capital Investment Plan (CIP) covering 2016-2025. The plan requires a total investment of JOD 3.5 billion for water projects and JOD 1.9 billion for WW projects. This also encompasses energy projects, amounting to a total investment equivalent to JOD 6 billion. Whilst NRW is evaluated to be greater than 60%, and considering that the annual cost of each Syrian Refugee on the water sector is equivalent to JOD 440 (DoS, 2015), as well as unforeseeable budgetary constraints related to public expenditure on water and sanitation, it is vital that there is necessary expenditure undertaken for preventive and periodic maintenance to ensure a robust and sustainable water and sanitation service. Moreover, water virtually feeds into all industrial processes, acting as the lifeline for day-to-day products and services; therefore, water scarcity and poor sanitation raise economic threats within the Project area, especially relating to the agricultural and tourism sectors. Furthermore, the infrastructure plays a key role in managing water resources and WW efficiently, which as a result elongates the service lifetime of road networks and the relevant infrastructure components.	The Project components will contribute to several economic virtues. Within the JV, WW reuse for agricultural purposes is estimated to save costs associated with a reduction of freshwater acquisition of 75 MCM/year by 2020. Additionally, as part of the climate change adaptation strategy of the Project, reductions in energy costs will be considered through the application of improved efficiency of pumpage. According to the MWI, planned actions of improving pumping efficiency can create national cost savings of JOD 15,923 million. Moreover, the Project is located adjacent to the Jordan River (JR), a touristic area regarded as one of the Jordan's most treasured national assets. The effluent discharge and depletion of water quality can cause detrimental depreciation to this asset and its surrounding touristic establishments.
Reduction in Greenhouse Gas (GHG) Emissions	Within the Project area, approximately all the population relies on septic systems for the treatment of WW. These systems are typically comprised of septic tank and soil infiltration system. Organic matter stored in septic tanks is partially converted into methane (CH ₄) and carbon dioxide (CO ₂). Given the wide use of this system, there is a potential for significant emissions of GHGs. Moreover, the transport of these wastes via septic tank trucks to WWTP potentially adds a further emission of 0.304 kg CO ₂ (direct)/t*Km (Edwards-Jones et al., 2008) with regards to the frequency and mileage	The project aims to improve the current sanitation system and provide a proper sanitation management plan which will potentially examine the installation of a WW network. Over and above cutting emissions from transportation of septage, decommissioning septic tanks may significantly reduce CH ₄ , CO ₂ , and N ₂ O emissions by approximately 10.7, 335, and 0.2 g capita ⁻¹ day ⁻¹ (Diaz-Valbuena <i>et al.</i> , 2011). Moreover, according to a study conducted by GIZ and WAJ, the application of energy efficient pumping technologies in Jordan, such as that potentially examined in

	<p>travelled. There are more energy efficient processes for sludge treatment which will be investigated as potential design options. These include a 2-stage activated sludge treatment process which dries sludge at two different intervals with a low energy intensity. Also, there is room for considering bio-gas generation as a carbon-neutral source of energy. In terms of water supply, inefficient pumping technologies may consume high amounts of fossil-based fuels compared to new energy efficient pumping technologies which have the potential to reduce the embodied GHG emissions in water distribution.</p>	<p>this study, may reduce CO₂ emissions by 30,637 ton/year (IWA, 2015).</p>
Environmental protection	<p>Seepage of pollutants and WW from cesspits and septic tanks has the potential to contaminate soil. This is especially concerning, since the Project Area is highly dependent on agricultural income. Moreover, lack of sanitary systems promotes foul odours which consequently cause public nuisance, and alter the human experience in the natural and built environment. Additionally, the increase of organic material from infiltrating waste water left untreated, in what is considered an agricultural intensive area, may cause ecological imbalances, such as increase in algae growth which potentially initiates the biological phenomena known as eutrophication.</p>	<p>The Project is expected to proactively address these issues through the design of alternative sanitation systems. In the short term, it is expected that cesspits and septic tanks will still be in use until the establishment of the prospective WW conveyor lines. As such, the proper mitigation measures for environmental impacts as a result of the current system adoption will be recommended. This will be implemented as part of the legislative obligations of the developer to abide to necessary environmental compliances throughout all project phases. This will improve the environmental management of this system en route to its decommissioning. The Long term system will eliminate the adverse impacts directly associated with the application of cesspits and septic tanks through the installation of a fully-fledged WW network.</p>
Public health benefits	<p>Outbreaks of water-borne diseases, specifically hepatitis, typhoid, cholera and dysentery are expected to increase due to the influx of Syrian refugees. Together with the deteriorating environmental health conditions due to water resource mismanagement and WW leakages into public water courses, outbreaks are inevitable. Between 2000 and 2010, incidence rate of diarrhoea has increased; partially due to the large number of diarrheal causing organisms which some might be endemic with no preventive methods to counteract them. Contrarily, there has been a major decrease in hepatitis A, which aligns with the public policy for controlling this disease through children vaccination; however, with greater risk of such water-borne diseases as a result of poor sanitation, demand for these vaccinations may spike. (Polimeni <i>et al</i>, 2016)</p>	<p>The Project will address the environmental health conditions which are the key medium of interaction between the local community and water-borne diseases thriving in poor sanitary conditions. As a result, the efforts to installing a WW network, implies higher hygiene levels and lower risks of exposure to these life threatening diseases. Therefore, the project essentially contributes to the overall objectives set out in the national WASH services undertaken by the Project beneficiary, MWI.</p>

7. Summary of Anticipated Impacts

Tables below present a summary of the anticipated impacts during the planning & construction and operational phase of the Project. The information in these tables includes:

- Key and generic environmental attributes (e.g. air quality, noise);
- Impact (textual description);
- Nature of impact (negative or positive);
- Duration (long-term or short-term);
- Reversibility (reversible or irreversible);
- Magnitude (high, medium, low);
- Sensitivity (high, medium, low);
- Significance (major, moderate, minor, or not significant);
- Management action – this describes whether impact can be mitigated or not. In addition, for positive impacts, recommendations have been provided which aim to enhance the impact. The latter are collectively referred to as management measures (mitigation and recommendations); and
- Residual significance after management actions are implemented (major, moderate, minor, or not significant).

It is important to note that these potential impacts have been identified based on the project details available as part of this FS, the baseline context outlined depending on secondary data, and also based on previous experience of similar projects. After the detailed engineering and designs as well as the micro-siting surveys to be undertaken by the full ESIA team, these potential impacts may be modified.

Table 7-1: Summary of Anticipated Impacts during Planning and Construction Phase

Environmental Attribute	Likely Impact – Planning and Construction Phase	Impact Assessment							
		Nature	Duration	Reversibility	Magnitude	Sensitivity	Significance	Management Action	Residual Significance
Hydrology and Hydrogeology	Site preparation activities will disturb soil exposing it to increased erosion during rainfall. If onsite erosion and runoff are not controlled, they can result in siltation of surface water	Negative	Short Term	Reversible	Low	Medium	Minor	Mitigation available	Not Significant
Land Use and Land Acquisition	The land acquisition of the various project components could result in physical displacement, economic displacement and/or disrupt other land use activities onsite (grazing, nomadic settlements, etc.)	Negative	Long Term	Reversible	Medium	High	Moderate	Mitigation available	Not Significant
Public Health and Safety	Public health and safety concerns during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater, etc.	Negative	Long Term	Reversible	Medium	High	Moderate	Mitigation available	Not Significant
Biodiversity	Site preparation activities could disturb existing habitats of any threatened or endangered species which might be present within the Project site.	Negative	Long Term	Could be irreversible	Medium	Low	Minor	Mitigation available	Not Significant
Archaeology and Cultural Heritage	Site preparation activities could damage or disturb archaeological remains present within the Project site.	Negative	Short Term	Could be irreversible	High	Medium	Moderate	Mitigation available	Not Significant
Infrastructure and Utilities	Site preparation activities could damage or disturb existing infrastructure and utility elements within the Project site such as irrigation canals and network, water supply, primary and agricultural roads, electrical network...etc.	Negative	Short Term	Reversible	Medium	High	Moderate	Mitigation available	Not Significant
Air Quality and Noise	Construction activities will likely result in an increased level of dust and particulate matter emissions which in turn will directly impact ambient air quality.	Negative	Short Term	Reversible	Medium	Low	Minor	Mitigation available	Not Significant
	Possible noise emissions to the environment from the construction activities which will likely include the use of machinery and equipment such as generators, hammers and compressors and other activities.	Negative	Short Term	Reversible	Medium	Low	Minor	Mitigation available	Not Significant
Landscape and Visual	Site preparation activities would create a temporary effect on the visual quality of the site and its surroundings	Negative	Short Term	Reversible	Medium	Low	Minor	Mitigation available	Not Significant
Socio-economic	The Project is expected to provide some job opportunities for local communities. This, to some extent, could contribute temporarily to enhancing the living environment for its inhabitants, elevate their standard of living, and bring social & economic prosperity to the local community.	Positive	Not applicable.						
Occupational Health and Safety	There will be some generic risks to workers' health and safety from working on construction sites, as it increases the risk of injury or death due to accidents.	Negative	Short Term	Could be irreversible	Medium	Medium	Minor	Mitigation available	Not Significant

Table 7-2: Summary of Anticipated Impacts during Operation Phase

Environmental Attribute	Likely Impact – Operation Phase	Impact Assessment							
		Nature	Duration	Reversibility	Magnitude	Sensitivity	Significance	Management Action	Residual Significance
Hydrology and Hydrogeology	Abstraction of additional water from existing wells or newly-established wells and its potential impacts on groundwater basin to include water supply, environmental conditions and characteristics of water quality.	Negative	Long Term	Reversible	Medium	Low	Minor	Mitigation available	Not Significant
Soil/ Public Health/Hydrology and Hydrogeology	Breakdown of Sewerage system and discharge of raw sewage into the receiving environment	Negative	Long Term	Could be Irreversible	Medium	High	Moderate	Mitigation available	Not Significant
Air Quality emissions	Odour and air quality emissions caused by emissions of methane, hydrogen sulphide, and ammonia from the WWTP operations and from the sludge treatment facilities	Negative	Long Term	Reversible	Medium	High	Moderate	Mitigation available	Not Significant
Soil/ Public Health/Hydrology and Hydrogeology/Water quantity and quality	<ul style="list-style-type: none"> Water Security and Improved Water Supply Services Contribute to improving services through ensuring consistency in water supply and supply duration to customers as well as improving access to water services. Solve serious environmental, health, and social issues due to the use of cesspits and septic tanks at the household level Provide solutions in WW collection and treatment, including the installation of a proper sanitation system aimed at reducing leakages from septic tanks and cesspits; Illegal disposal by vacuum trucks in wadis will be significantly reduced. Increasing Water Flowing Downstream to Farmers to be used in Agriculture Provide additional water for irrigation use from the treated waste water resulted from additional new resources. Establishing additional WWTPs to reduce the operational load on the existing Tal Almantah WWTP Repair pipe leakages from the current water supply system for reduced NRW. 	Positive	Not applicable						
Public Health and Safety	Public health and safety concerns from quality of water delivered to customers and overall water treatment process.	Negative	Long Term	Reversible	Low	High	Minor	Mitigation available	Not Significant
	Public health and safety concerns during the various operation activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater, etc.	Negative	Long Term	Reversible	Medium	High	Moderate	Mitigation available	Not Significant
Biodiversity	Improper management of the site (improper conduct and housekeeping practices) could disturb and affect the biodiversity of the site.	Negative	Long Term	Could be Irreversible	Low	Low	Not Significant	Mitigation available	Not Significant
Archaeology and Cultural Heritage	Improper management of the site (improper conduct and housekeeping practices) could disturb or damage archaeological remains present within the Project site.	Negative	Long Term	Could be Irreversible	Medium	Medium	Minor	Mitigation Available	Not Significant
Electricity consumption	The overall electricity consumption levels of the Project are expected to be high especially in the Dair Alla WWTP and the pumping stations and this electricity will be sourced from the national grid	Negative	Long Term	Reversible	Medium	Low	Moderate	Mitigation available	Not Significant
Occupational Health and Safety	There will be some generic risks to workers' health and safety from working on water supply and wastewater treatment sites, as it increases the risk of injury or death due to accidents.	Negative	Long Term	Could be Irreversible	Medium	Medium	Minor	Mitigation available	Not Significant

8. Identification of Mitigation Measures, Monitoring Requirements, and MTRs

This section includes:

- Recommendations for further planning and siting for the final WWTP sites at the detailed assessment phase (note: it is advisable to carry out this assessment for the remaining project components even though the level of restraint applied to pipelines is less than it is applied for others. Some of the siting requirements below will be also applicable for the RO treatment facilities and the pumping stations).
- A list of mitigation measures proposed by the FS Team to mitigate the identified impacts of the Project during the construction and operation phases of the Project and also identifies a list of appropriate Minimum Technical Requirements and recommendations for further assessment to be carried out during subsequent detailed engineering and full ESIA as well as others to be implemented by the Contractor/operator of the system. Such measures could involve technical and design requirements, recommendations, guidelines or procedures and practices to be implemented during the detailed engineering or the subsequent development phases of the Project.
- In addition, the section identifies recommendations for suitable monitoring requirements to ensure that the identified mitigation measures are taken into account, implemented properly, and are sufficient measures for the protection of environmental resources.

Table 8-1: Recommendations for Further Planning and Micro Siting for the Final WWTP Sites and Other Project Components to be Followed at the Detailed Engineering and Full ESIA Phase

Criteria	Background	Finding/Recommendation
Areas of Critical Environmental Concern	<ul style="list-style-type: none"> The Project could potentially conflict with the use of current or planned nearby specially designated areas such as wilderness areas, areas of critical environmental concern, and/or special recreation management areas. The Ministry of Environment (MoEnv) has the responsibility of establishing natural reserves, national parks, and any site of special environmental significance for protection and management. However, the MoEnv delegates such responsibilities to the Royal Society for the Conservation of Nature (RSCN). In accordance with the above, the RSCN has designated four (4) categories for areas of environmental concern as highlighted below. Those have been assigned based on detailed reviews prepared by the RSCN and which include: (i) “National Network of Protected Areas in Jordan” and (ii) “Important Bird Areas of the Hashemite Kingdom of Jordan”. <ul style="list-style-type: none"> Established Reserves: in accordance with the “National Network of Protected Areas in Jordan” the RSCN has established a number of reserves which have been announced as protected areas and are currently managed and operated by the RSCN; Proposed Reserves: areas proposed within the “National Network of Protected Areas in Jordan” as protected areas but have not been announced as reserves yet and currently are not managed or operated by the RSCN; Reserves Under Establishment: areas proposed within the “National Network of Protected Areas in Jordan” as protected areas and are announced as so, but are still underway to be established, operated, and managed by the RSCN; and Important Bird Areas (IBA’s): areas proposed within “Important Bird Areas of the Hashemite Kingdom of Jordan”. 	<ul style="list-style-type: none"> As noted in the baseline report, no areas of critical environmental concern exit within the boundaries of the Project areas. Based on information from the “Information Bank for Dair Alla District for the Year 2017” as explained in the baseline report, there are some areas identified within the area as Forest Land, Natural forests (Jordan River banks), Man-made Forests, and Grazing Reserves. <u>Subsequent full ESIA study shall assess this in detail and ensure no conflict between the final project selected sites and the RSCN/MoEnv planning context.</u>
MoEnv site selection requirements	<ul style="list-style-type: none"> The environmental clearance and permitting legislations issued by the MoEnv do not provide specific required distance for WWTPs from sensitive receptors, regularised land use boundaries, and communities. This is generally decided by the technical committee within the Ministry of Environment on a case by case basis. Based on discussion with the MoEnv, it was understood that for small WWTP (less than 50m³ per day) they require 1 km distance and for larger they require 2 km distance from residential areas, hospitals, schools...etc. In the same time, for production of organic fertilizers (aerobic), a 3km distance from residential areas and 1 km from any main road is required. For areas outside regularised land use boundaries, sensitive receptors are identified by the MoEnv as community settlements and sensitive areas such as schools and hospitals and mosques and archaeological sites. The “Instruction for Site Selection of Development Projects for the year 2018” Instruction identifies community settlements as 7 dwellings (housing structures) or more located within a circle with a diameter of 500m. This MoEnv siting and distance criteria was generally taken into account in the siting of the WWTPs as the FS Team applied a 1-km buffer from what was considered as sensitive receptors (e.g. houses) in order to avoid such agglomeration. However, in general, the area is known for its agricultural land use and many of the plots and houses on the western side of main road 65 where the WWTPs are proposed are outside regularised land use boundary. Notwithstanding the above, and based on recent proposed developments in several areas in Jordan, even while conforming to such siting and distance criteria, community opposition had great power and was successful in cancelation of many development projects. 	<ul style="list-style-type: none"> <u>At a later stage, once further details are available, an official location permit application should be submitted to the MoEnv in order to get an official final decision from the MoEnv. This application is done by the Developer; i.e. WAJ.</u> <u>It is important to undertake thorough site assessments and study land use and ownership. This shall also include consultations with project affected groups in order to manage community opinion that may negatively affect the Project. This should be carried out as part of the detailed engineering and full ESIA process.</u>
Ministry of Agriculture (MoA) – Rangelands / Grazing Reserves and Forest Lands	<ul style="list-style-type: none"> The Project might conflict with current or proposed planning policies of the Ministry of Agriculture (MoA) for the general area. The most important planning issues that must be investigated include potential conflict with grazing reserves and forest lands. 	<ul style="list-style-type: none"> Based on information from the “Information Bank for Dair Alla District for the Year 2017” as explained in the baseline report, there are some areas identified within the area as Forest Land, Natural forests (Jordan River banks), Man-made Forests, and Grazing Reserves. <u>Subsequent full ESIA study shall assess this in detail and ensure no conflict between the final project selected sites and the MOA planning context.</u>

Ministry of Municipal Affairs – Land Use Planning	<ul style="list-style-type: none"> ▪ The Project might conflict with the allowed land use set for the area by the Ministry of Municipal Affairs (MoMA), which designates specific land uses in Jordan where only certain activities are allowed. ▪ The “Law for the Organization of Cities, Villages and Buildings No. 79 for 1966” issued by MoMA designates specific land uses for areas in the Kingdom that are within organized boundaries (urban areas) and the “Land Use Planning Regulation No. 6 of 2007” regulates land use for those areas outside of organized boundaries and to divide territories by using zoning cryptography as follows: <ul style="list-style-type: none"> - Agricultural areas sector, identified by the symbol (A); - Rural areas sector, identified by the symbol (B); - Marginal areas sector, identified by the symbol(C); - Desert areas sector, identified by the symbol (D); and - Forest areas. 	<ul style="list-style-type: none"> ▪ <u>Subsequent full ESIA study shall assess this in detail and ensure no conflict between the final project selected sites and the MOMA Landuse designation for the areas</u>
Department of Antiquities - Archaeology	<ul style="list-style-type: none"> ▪ Jordan Valley is rich with multi-period archaeological sites from the earliest periods of human settled life. ▪ There are numerous identified archaeological sites within the boundary of the Project area. These are based on the MEGA Jordan database. ▪ This does not necessarily mean that a survey was done within the area to be used for the Project components 	<ul style="list-style-type: none"> ▪ <u>Subsequent full ESIA study shall assess this in detail and undertake a detailed archaeological survey to assess whether any signs or archaeological sites are seen on top of the ground. This shall be done in coordination with the DOA through an official application process. After undertaking the required site assessment, the DOA issues an official letter including their decision.</u> ▪ <u>If no archaeological sites are found then they would approve the site conditional applying a chance find procedure during construction activities, providing specific requirements if some sites are found within the Project sites, or disapproving any of the sites where some important archaeological sites are found. In the latter case some shifting in the rejected site may be required.</u>
WAJ and Department of Land and Survey	<ul style="list-style-type: none"> ▪ The institutional and administrative framework that governs land acquisition in Jordan is the “Land Acquisition Law No. (12) for the Year 1987”. The Law states that any land use acquisition process must be undertaken by the Government of Jordan represented by a governmental entity (WAJ in the case of this Project). The Law on broad terms requires that all land acquisitions that take place for any project must be for the public benefit, and must be undertaken through fair and just compensation measures. The Law sets a framework for the land acquisition process. ▪ The Project components mainly run through agricultural areas. All such areas that are privately owned shall be subject to land acquisition. 	<ul style="list-style-type: none"> ▪ <u>Subsequent full ESIA study shall assess this in detail and undertake Subsequent full ESIA study shall assess this in detail and undertake a thorough investigation of the plots and routes proposed for the Project components and their land ownership, land use, value...etc in order to decide in any direct or indirect land resettlement will be triggered. Accordingly a Resettlement Policy Framework and Action Plan may be required.</u> ▪ <u>The Detailed Engineering shall to the extent possible avoid or reduce going through such areas that require a thorough land acquisition process (e.g. if the land has many owners)</u>

Table 8-2: Proposed Mitigation Measures, Monitoring Requirements, and MTRs to be implemented during the Construction Phase

Environmental Attribute	Likely Impact – Planning and Construction Phase	Proposed Mitigation Measures and MTRs	Monitoring and Reporting Requirements
Hydrology and Hydrogeology	Site preparation activities will disturb soil, exposing it to increased erosion during rainfall. If onsite erosion and runoff are not controlled, they can result in siltation of surface water	<ul style="list-style-type: none"> Stabilize the soils directly after completion of each stage of works. Fill should use well-graded materials, avoid pockets of segregated materials, be compacted to recognized standards. Avoid executing excavation works under aggressive weather conditions. Place clear markers indicating the limits of the construction trenches and stockpiling area of excavated materials to restrict equipment and personnel movement, thus limiting the physical disturbance to land and soils in adjacent areas. Erect erosion control barriers (i.e. sandbags) around work site during site preparation and construction to prevent silt runoff to roadways and wadis where applicable. Return beds and surfaces disturbed during construction to their original (or better) condition. Return drainages disturbed during construction to their original (or better) condition. Revegetate exposed soil in areas disturbed during construction. 	<ul style="list-style-type: none"> Inspection for erosion and runoff control to include inspections for implementation of mitigation measures.
Land Use and Land Acquisition	The land acquisition of the various project components could result in physical displacement, economic displacement and/or disrupt other land use activities onsite (grazing, nomadic settlements, etc.)	<p>Subsequent full ESIA study shall assess this in detail and undertake a thorough investigation of the plots and routes proposed for the Project components and their land ownership, land use, value...etc in order to decide in any direct or indirect land resettlement will be triggered. Accordingly a Resettlement Policy Framework and Action Plan may be required.</p> <p>In case a Land Acquisition and Compensation Framework (LACF) is required, then the LACF should describe the land acquisition process carried out for plots on which the Project components will be established and identify gaps in the process including an entitlements matrix covering entitlements for eligible Project Affected Persons (PAPs) subject to physical and/or economic displacement. The LACF shall include a specific resettlement implementation procedure.</p> <p>The Detailed Engineering shall to the extent possible avoid or reduce going through such areas that require a thorough land acquisition process (e.g. if the land has many owners).</p> <p>Discussed below is the high level framework for development and implementation of the land acquisition and compensation plan which takes into account the requirements of the “Land Acquisition Law No. (12) of the year 1987 and its amendments”. The land acquisition law stipulates requirements for consultation, disclosure, advertising, fair compensation, grievance and dispute, etc. which in general are considered best practice for land acquisition</p> <ul style="list-style-type: none"> Based on the completion of the detailed design, the private lands which must be acquired and compensated for loss of land should be identified. In addition, for those and where relevant, it must be determined whether they will also be compensated for economic loss (i.e. agricultural lands); In accordance with the Article [4] of the “Land Acquisition Law”, WAJ is then responsible for announcing in at least two official daily newspapers of its intention to apply to the Council of Ministers for the acquisition of the final selected lands. WAJ must then submit an application to the Council of Ministers with the selected lands for acquisition along with a preliminary budget required for compensation. Once the Council of Ministers decides that such a Project is for the public benefit and ensures that WAJ is financially capable of compensation measures, the Council of Ministers will announce in an official newspaper that the lands which are to be acquired are indeed for the public benefit; In accordance with the Article [6] of the “Land Acquisition Law”, WAJ is then responsible to submit the application with the approval of the Council of Ministers to the Department of Lands and Survey. After that an inspection will take place on the lands that will be acquired – this must also take into account an inspection on economic losses. Inspections will be undertaken through a Committee to be formed by WAJ. The Committee will determine an appropriate and fair compensation in accordance with specific requirements stipulated in the Law (specified in Article 10 and which requires that compensation is equivalent to its market price amongst other conditions); In accordance with the Article [9] of the “Land Acquisition Law”, WAJ is then required to announce in at least two official daily newspapers a brief on the land acquisition process, to include a description of the property and name of the owner and require that he/she report to WAJ within thirty days to negotiate compensation. Upon agreement, the compensation is paid to the owner after approval by the Minister of Finance; and Dispute and grievance procedures are set according to Articles 10-14 of the Law and these are expected to be adhered by WAJ if necessary. In summary, in the event that the land owner and WAJ do not agree on a compensation value for any reason, then WAJ or the land owner can submit an application to the Court whom will assign the compensation value. Such compensation value must be fair and based on, amongst other conditions, market price, value of nearby properties, etc. 	<ul style="list-style-type: none"> Monitor the implementation of the mitigation measures and the outcomes of the consultation process. The LACF should describe the land acquisition process in detail and this should be implemented by the WAJ in coordination with the Department of Land and Survey. The process should be clear and transparent to avoid any issues. "Red flags" and especially community opposition should be highlighted and managed by WAJ to avoid any obstruction to the Project implementation.
Public Health and Safety	Public health and safety concerns during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater, etc.	<ul style="list-style-type: none"> Coordinate with the related municipality for the collection of solid waste from the site to the municipal approved dumpsite (potentially the North Shuna Waste Transfer Facility); Prohibit fly-dumping of any solid waste to the land; Distribute appropriate number of properly contained litter bins and containers properly marked as "Municipal Waste"; During construction, distribute a sufficient number of properly contained containers clearly marked as "Construction Waste" for the dumping and disposal of construction waste. Where possible, the Contractor must seek ways to reduce construction waste by reusing materials; Implement proper housekeeping practices on the construction site at all times; Maintain records and manifests that indicate volume of waste generated onsite, collected by contractor, and disposed of at the landfill. The numbers within the records are to be consistent to ensure no illegal dumping at the site or other areas. 	<ul style="list-style-type: none"> Inspection of waste management practices onsite; Review of records and manifests for volume of waste generated to ensure consistency; Regular environmental reporting on implementation of the waste management practices onsite.
		<ul style="list-style-type: none"> Coordinate with the related municipality to hire a private contractor for the collection of wastewater from the site to the closest WWTP (Tal Al Mantah WWTP); Prohibit illegal disposal of wastewater to the land; Maintain records and manifests that indicate volume of wastewater generated onsite, collected by contractor, and disposed of at the WWTP. The numbers within the records are to be consistent to ensure no illegal discharge at the site or other areas; 	<ul style="list-style-type: none"> Inspection of wastewater management practices onsite; Review of records and manifests for volume of

		<ul style="list-style-type: none"> Ensure that constructed septic tanks during construction and those to be used during operation are well contained and impermeable to prevent leakage of wastewater into soil; Ensure that septic tanks are emptied and collected by wastewater contractor at appropriate intervals to avoid overflowing. 	<p>wastewater generated to ensure consistency;</p> <ul style="list-style-type: none"> Regular environmental reporting on implementation of the wastewater management practices.
		<ul style="list-style-type: none"> Coordinate with the MoEnv and hire a private contractor for the collection of hazardous waste from the site to the Swaqa Hazardous Waste Treatment Facility; Follow the requirements for management and storage as per the 'Instructions for Hazardous Waste Management and Handling of the Year 2003' of the MoEnv; Prohibit illegal disposal of hazardous waste to the land; Possibly contaminated water (e.g. runoff from paved areas) must be drained into appropriate facilities (such as sumps and pits). Contaminated drainage must be orderly disposed of as hazardous waste; Ensure that containers are emptied and collected by the contractor at appropriate intervals to prevent overflowing; Maintain records and manifests that indicate volume of hazardous waste generated onsite, collected by contractor, and disposed of at the Swaqa Facility. The numbers within the records are to be consistent to ensure no illegal discharge at the site or other areas. 	<ul style="list-style-type: none"> Inspection of hazardous waste management practices onsite; Review of records and manifests for volume of hazardous waste generated to ensure consistency; Regular environmental reporting on implementation of the hazardous waste management practices onsite.
		<ul style="list-style-type: none"> Ensure that hazardous materials are stored in proper areas and in a location where they cannot reach the land in case of accidental spillage. This includes storage facilities that are of hard impermeable surface; flame-proof, accessible to authorized personnel only, locked when not in use, and prevents incompatible materials from coming in contact with one another. The provisions of the Jordanian Standard 431/1985 – General Precautionary Requirements for Storage of Hazardous Materials must be adhered to; Maintain a register of all hazardous materials used and accompanying Material Safety Data Sheet (MSDS) must present at all times. Spilled material should be tracked and accounted for; Incorporate dripping pans at machinery, equipment, and areas that are prone to contamination by leakage of hazardous materials (such as oil, fuel, etc.); Regular maintenance of all equipment and machinery used onsite. Maintenance activities and other activities that pose a risk for hazardous material spillage (such as refuelling) must take place at a suitable location (hard surface) with appropriate measures for trapping spilled material; Ensure that a minimum of 1 000 liters of general purpose spill absorbent is available at hazardous material storage facility. Appropriate absorbents include zeolite, clay, peat and other products manufactured for this purpose; If spillage on soil occurs, spill must be immediately contained, cleaned-up, and contaminated soil disposed as hazardous waste. 	<ul style="list-style-type: none"> Inspection for storage of hazardous materials to include inspections for potential spillages or leakages; Report any spills and the measures taken to minimize the impact and prevent from occurring again.
Biodiversity	Site preparation activities could disturb existing habitats of any threatened or endangered species which might be present within the Project site.	<ul style="list-style-type: none"> Implement proper management measures to prevent damage to the biodiversity of the site. This could include establishing a proper code of conduct and awareness raising / training of personnel and good housekeeping which include the following: <ul style="list-style-type: none"> Prohibit hunting and collection of floral species at any time and under any condition by construction workers onsite; Ensure proper storage, collection, and disposal of waste streams generated Restrict activities to allocated construction areas only, including movement of workers and vehicles to allocated roads within the site and prohibit off-roading to minimize disturbances; 	<ul style="list-style-type: none"> Inspection of the works should be carried out at all times.
Archaeology and Cultural Heritage	Site preparation activities could damage or disturb archaeological remains present within the Project site.	<p>Subsequent full ESIA study shall assess this in detail and undertake a detailed archaeological survey to assess whether any signs or archaeological sites are seen on top of the ground. This shall be done in coordination with the DOA through an official application process. After undertaking the required site assessment, the DOA issues an official letter including their decision.</p> <p>If no archaeological sites are found then they would approve the site conditional applying a chance find procedure during construction activities, providing specific requirements if some sites are found within the Project sites, or disapproving any of the sites where some important archaeological sites are found. In the latter case some shifting in the rejected site may be required.</p> <ul style="list-style-type: none"> The final detailed design should avoid sitting any of the project components within such delineated areas of archaeological importance including the buffer area required by the DoA. Exact coordinates of these areas shall be provided by the DOA Team for WAJ to take into account during the detailed design of the project. Before commencement of any construction activities, the identified sites must be properly delineated and marked (e.g. flags/stakes and /or mesh plastic fence as appropriate) with appropriate signage in both Arabic and English language so that the sites are clearly visible to all workers during construction. Properly plan construction activities which take into account the identified archaeological locations to ensure they are protected from any potential damage. This could include for example proper movement of vehicles and machinery into/out of the site to avoid those areas, ensure that all vehicles are on established roads and prohibit off-roading, prohibit movement of vehicles near those areas during the various construction activities, etc. Ensure that the Code of Conduct, awareness raising, and training developed for construction workers and personnel involved in the construction phase of the project to emphasizes the presence of archaeological locations in the area - this could include providing information on their locations, prohibit any improper conduct which could disturb/ damage those locations, etc. Implement appropriate chance find procedures. Throughout the construction phase and as the case with any project development that entails such construction activities there is a chance that potential archaeological remains in the ground are discovered. It is expected that appropriate measures for such chance find procedures are implemented which are standard requirements by the DoA as required by the "Antiquities Law No. 21 for 1988 and its amendments No. 23 for 2004". Those mainly require that the following is implemented: <ul style="list-style-type: none"> Any worker or staff member who encounters any archaeological or cultural resources during the construction phase or suspected remains will immediately notify the Site Manager of the Contractor. The Site Manager will inspect the site and confirm whether the site is considered an archaeological and cultural heritage site and/or a suspected site. 	<ul style="list-style-type: none"> Inspections of construction activities to ensure that archaeological locations are avoided throughout the construction activities and proper code of conduct is enforced. Inspection of actions taken in case of chance finds, including fencing, limiting access to site, and contacting the DoA. Report should be prepared and submitted to the DoA in such a case. In addition, formal letter from the DoA for commencement of construction activities should be provided.

		<ul style="list-style-type: none">- Should this be the case, construction activities within the area will be immediately stopped along with a 25m radius from the boundary of the discovered site as required by the “Antiquities Law No. 21 for the year 1988”. This distance may be reduced following inspections to be undertaken by the DoA as detailed below.- It is important to note that construction activities outside of the discovered area (including its 25m radius) are allowed to take place.- The discovered area (along with the 25m radius) will be delineated and marked using flags/ stakes and/or mesh plastic fence as appropriate. In addition appropriate signage will be installed in both Arabic and English Language.- The Site Manager will notify the DoA within a maximum of 10 days as required by the “Antiquities Law No. 21 for the year 1988”.- The DoA will send a representative whom will inspect the site and undertake an assessment to determine the appropriate measures to be implemented.- Construction work within the discovered area will only resume when permission is given from the DoA after the decision is made. The permission will be provided in a formal letter by the DoA.																						
Infrastructure and Utilities	Site preparation activities could damage or disturb existing infrastructure and utility elements within the Project site such as irrigation canals and network, water supply, primary and agricultural roads, electrical network...etc.	<ul style="list-style-type: none">▪ As part of the detailed design to be prepared at a later stage, it is expected that a detailed topography survey will be undertaken. As part of the topography survey, all infrastructure and utility elements within the Project site will be mapped. The Contractors are expected to avoid such elements and take into account the additional requirements as provided by the entities managing such infrastructure and utility elements (detailed in the table below).▪ Once the detailed design is prepared, it has to be submitted to the entities below along with demonstrating how additional requirements have been taken into account. Based on that, it is required that the Contractor obtain official non-objection letters from these entities.▪ Additional Requirements to be considered for Infrastructure and Utility Elements: <table><tr><th>Element</th><th>Managing Entity</th><th>Additional Requirements</th></tr><tr><td>Telecommunication infrastructure</td><td>Zain, Orange and Umniah</td><td>Buffer distance of at least 6m from the metal fence of the broadcasting towers Buffer distance of at least 40cm from the fibre optic cables</td></tr><tr><td>Military Infrastructure</td><td>Jordanian Armed Forces</td><td>Avoid broadcasting tower.</td></tr><tr><td>Jordan Seismological Observatory</td><td>Ministry of Energy and Mineral Resources</td><td>No further requirements.</td></tr><tr><td>Electricity networks</td><td>Electricity Distribution Company (EDCO)</td><td>Based on the “Safety Clearance Instruction No. (1) Of 2003” issued in accordance with the “Electricity Law No. (64) For the year 2002” a 3m horizontal buffer distance from any existing electricity line is required. To be confirmed with EDCO.</td></tr><tr><td>Water networks</td><td>MWI/WAJ</td><td>Construction activities should avoid the pipeline systems along with an appropriate buffer. To be confirmed by MWI/WAJ.</td></tr><tr><td>Irrigational Channels and Network</td><td>JVA</td><td>To be confirmed and agreed with the JVA</td></tr></table>	Element	Managing Entity	Additional Requirements	Telecommunication infrastructure	Zain, Orange and Umniah	Buffer distance of at least 6m from the metal fence of the broadcasting towers Buffer distance of at least 40cm from the fibre optic cables	Military Infrastructure	Jordanian Armed Forces	Avoid broadcasting tower.	Jordan Seismological Observatory	Ministry of Energy and Mineral Resources	No further requirements.	Electricity networks	Electricity Distribution Company (EDCO)	Based on the “Safety Clearance Instruction No. (1) Of 2003” issued in accordance with the “Electricity Law No. (64) For the year 2002” a 3m horizontal buffer distance from any existing electricity line is required. To be confirmed with EDCO.	Water networks	MWI/WAJ	Construction activities should avoid the pipeline systems along with an appropriate buffer. To be confirmed by MWI/WAJ.	Irrigational Channels and Network	JVA	To be confirmed and agreed with the JVA	<ul style="list-style-type: none">▪ Submission of non-objection letters from the above entities.
Element	Managing Entity	Additional Requirements																						
Telecommunication infrastructure	Zain, Orange and Umniah	Buffer distance of at least 6m from the metal fence of the broadcasting towers Buffer distance of at least 40cm from the fibre optic cables																						
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Water networks	MWI/WAJ	Construction activities should avoid the pipeline systems along with an appropriate buffer. To be confirmed by MWI/WAJ.																						
Irrigational Channels and Network	JVA	To be confirmed and agreed with the JVA																						
Air Quality and Noise	Construction activities will likely result in an increased level of dust and particulate matter emissions which in turn will directly impact ambient air quality.	<ul style="list-style-type: none">▪ Based on inspections and visual monitoring undertaken, if dust or pollutant emissions were found to be excessive due to construction activities, the source of such emissions should be identified and adequate control measures must be implemented;▪ Comply with the Occupational Safety and Health Administration (OSHA) requirements and the Jordanian Codes to ensure that for activities associated with high dust levels, workers are equipped with proper Personal Protective Equipment (e.g. masks, eye goggles, breathing masks, ear muffs, etc.);▪ Apply basic dust control and suppression measures which could include:▪ Regular watering of construction active areas for dust suppression;<ul style="list-style-type: none">- Proper planning of dust causing activities to take place simultaneously in order to reduce the dust incidents over the construction period.- Proper management of stockpiles and excavated material (e.g. watering, containment, covering, bundling).- Proper covering of trucks transporting aggregates and fine materials (e.g. through the use of tarpaulin).- Adhering to a speed limit of 15km/h for trucks on the construction site.▪ Develop a regular inspection and scheduled maintenance program for vehicles, machinery, and equipment to be used throughout the construction phase for early detection of issue to avoid unnecessary pollutant emissions.▪ Mud pits must be banked and lined with plastic seal sheets to minimize ingress to the groundwater and movement of fluids along any surface water courses. In addition, upon completion of drilling of each well, ensure that associated mud pit is properly covered with excavated topsoil from the area.	<ul style="list-style-type: none">▪ Inspection and visual monitoring of the works should be carried out at all times. In addition, periodic inspections should be conducted at nearby sites (e.g. road/village) to determine whether harmful levels of dust from construction activities exist; and▪ Reporting of any excessive levels of pollutants/dust or noise and the measures taken to minimize the impact and prevent it from occurring again.																					
	Possible noise emissions to the environment from the construction activities which will likely include the use of machinery and equipment such as generators, hammers and compressors and other activities.	<ul style="list-style-type: none">▪ As per the “Instruction for Reduction and Prevention of Noise for the year 2003” highest noise level construction activities should not be undertaken between 8pm and 6am;▪ If noise levels were found to be excessive, construction activities should be stopped until adequate control measures are implemented;▪ Apply adequate general noise suppressing measures. This could include: (i) the use of well-maintained mufflers and noise suppressants for high noise generating equipment and machinery where applicable such as compressors, electric motors, machines, etc. (ii) developing a regular maintenance schedule of all vehicles, machinery, and equipment for early detection of issues to avoid unnecessary elevated noise level, etc. (iii) turn off any equipment, machine or vehicle not in use; (iv) All equipment, machineries and vehicles shall have a valid maintenance and inspection certificate and relevant servicing records shall be maintained▪ In areas where noise levels exceed 85 Decibels (e.g. excavation and grinding activities and/or workers exposed to excessive noise generating equipment and machinery), appropriate hearing protection shall be provided to all employees – this will be based on noise levels and location but can include ear plugs, semi-insert ear plugs or ear protection or ear muffs. It must be ensured that such hearing protection is worn by all affected personnel at all times. Ear plugs or ear muff should have a Noise Reduction Rating (NRR) of at least 20 to 30 Decibels to ensure compliance with limits set within the table above.▪ Safety signs must be installed in areas where noise is expected to be greater than 85 dB to alter operators and to require the use of appropriate Personal Protective Equipment (PPE) (i.e. hearing protection).	<ul style="list-style-type: none">▪ Inspection of the works should be carried out at all times; and▪ Reporting of any excessive levels of noise and the measures taken to minimize the impact and prevent from occurring again.																					
Landscape and Visual	Site preparation activities would create a temporary	<ul style="list-style-type: none">▪ Ensure proper general housekeeping and personnel management measures are implemented which could include:<ul style="list-style-type: none">- Ensure the construction site is left in an orderly state at the end of each work day.	<ul style="list-style-type: none">▪ Inspections of the works should be carried out at all																					

	effect on the visual quality of the site and its surroundings	<ul style="list-style-type: none"> - To the greatest extent possible construction machinery, equipment, and vehicles that are not in use should be removed in a timely manner and kept in locations to reduce visual impacts to the area. - Ensure proper storage, collection, and disposal of waste streams generated 	times to ensure measures are implemented.																				
Socio-economic	The Project is expected to provide some job opportunities for local communities. This, to some extent, could contribute temporarily to enhancing the living environment for its inhabitants, elevate their standard of living, and bring social economic prosperity to the local community.	<ul style="list-style-type: none"> ▪ As the impacts discussed are mainly positive, no mitigation measures have been identified. This provides recommendations which aim to enhance such positive impacts anticipated from the Project throughout the construction and operation phases to the greatest extent possible. ▪ From the onset of the Project, it is recommended that a community communication plan is implemented. The table below provides the recommended community communication plan to be implemented which demonstrates how the local communities will be involved and integrated in the Project. The plan takes into account the following: <ul style="list-style-type: none"> - Ensure timely and continuous communication and dissemination of information with the local community. - Present transparent recruitment procedures for the local community, to be adopted and implemented in the various construction and operation contracting arrangements. - Present transparent procurement procedures for the local community, to be adopted and implemented in the various construction and operation contracting arrangements - The implementation of a well-established and formal community grievance mechanism to ensure any issues by local communities is properly managed. ▪ Local Community Communication Plan <table> <tr> <th>Item</th><th>Description</th><th>Responsibility</th><th>Timeline</th></tr> <tr> <td>Project Updates</td><td>Ensure timely and continuous communication and dissemination of information and updates on project development with the local community members to alleviate potential sense of social marginalization and improve their understanding and perception of the benefits associated with development. 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			<p>The response will be reviewed/signed-off by an authorized representative from WAJ. All grievances will be responded to within 20 working days.</p> <ul style="list-style-type: none"> - Response of the complainant is recorded within the grievance log to help assess whether the grievance is closed or whether further action is needed. 			
Occupational Health and Safety	There will be some generic risks to workers' health and safety from working on construction sites, as it increases the risk of injury or death due to accidents.	<ul style="list-style-type: none"> ▪ The Contractor has not been selected at this stage for the Project. However, at a later stage, and prior to commencement of any construction activities, the Contractor shall be required to prepare an Occupational Health and Safety Plan (OHSP) regarding the Project's construction, installation and commissioning works as well as the general construction site operations. (In addition, the before commencement of the operation phase, the DBO Contractor must develop an OHSP tailored to the Project's operation phase.) ▪ The objective of the OHSP is to ensure the health and safety of all personnel in order to concur and maintain a smooth and proper progress of work at the site and prevent accidents which may injure personnel or damage property. ▪ The OHSP for the construction (and operation phase) should be Project and site specific and must take into account the national requirements mainly the "Labour Law No.(8) for the year 1996 and its amendments", including Chapter IX, Occupational Safety & Health and the associated regulations and standards. ▪ In general, the OHSP should address the following components: <ul style="list-style-type: none"> - Job safety planning and analysis and OHS risk assessment; - Identify roles and responsibilities of the personnel involved within the Project to include the EHS manager, construction manager, supervisor, and other subcontractors responsibilities; - Identify in details information related to monitoring, training, reporting and non-compliance requirements. This should include but not limited to formulation of safety committees, communication protocols, occupational health and safety culture, emergency preparedness and response, quality system, reporting requirements, competence and job safety training, safety inspections, recruitment procedures, safety audits, etc.; - Identification of OHS procedures to be implemented to control risks according to the ALARP principle (As Low As Reasonably Practicable). This should include requirements for Personal Protective Equipment (PPE), precautionary measures, and other as appropriate. ▪ The Contractor is expected to adopt and implement the provisions of the OHSP throughout the Project construction (and operation) phase. ▪ It is not clear at this point whether there will be any onsite accommodation for workers. Nevertheless, the Contractor must ensure that workers are provided with a decent accommodation which meets the basic worker's needs. Specifically, such accommodation must conform to the national requirements – mainly the "Instructions for Prevention of Health Nuisances from Workers Accommodation No. (1) for the year 2013" which is issued in accordance with "Public Health Law No. (47) of the year 2008". The Instruction specifies requirements for the siting of the accommodation as well as its various facilities to include sleeping rooms, kitchen, lavatories, dining areas, water requirements and storage, wastewater disposal, solid waste disposal, first aid requirements, firefighting requirements, etc. 				<ul style="list-style-type: none"> ▪ Inspection to ensure the implementation of the provisions of the Occupational Health and Safety Plan and assess compliance with its requirements; ▪ Regular Reporting on the health and safety performance onsite in addition to reporting of any accidents, incidents and/or emergencies and the measures undertaken in such cases to control the situation and prevent it from occurring again; and ▪ Inspection on workers accommodation (if applicable) to ensure its compliance with the requirements of "Instructions for Prevention of Health Nuisances from Workers Accommodation No.(1) for the year 2013"

Table 8-3: Proposed Mitigation Measures, Monitoring Requirements, and MTRs to be implemented during the Operation Phase

Environmental Attribute	Likely Impact – Operation Phase	Proposed Mitigation Measures and MTRs	Monitoring and Reporting Requirements
Hydrology and Hydrogeology	Abstraction of additional water from existing wells or newly established wells and its potential impacts on groundwater basin to include water supply, environmental conditions and characteristics of water quality.	<ul style="list-style-type: none"> Undertake a groundwater flow model and risk assessment of the groundwater basin. The main objectives of this study are to improve the understanding and appraisal of the Jordanian aquifer systems, both in terms of quantity and quality. The work carried out as part of this study is to improve the groundwater resources assessment and long term management of the Basin. All recent geological and hydrogeological information data shall be collated to provide and update aquifer layers and hydraulic parameters for the 3-D groundwater flow model. Applying this model to identify the most promising in terms of as yet unexploited resources as well as to forecast and manage the long term water resources in the Basin. Taking the above into account, as part of the predictive scenarios of the groundwater model, the study shall determine the effects of abstractions from the proposed wellfields to utilize the model drawdowns to assist in the overall well design and specification of the Project. This assessment shall further verify the specific impacts expected on water resources in the area. This shall be done as part of the detailed engineering and full ESIA phase. It is recommended that dedicated monitoring wells are developed at a sufficient distance away from production wells to effectively monitor regional drop in water levels at the wellfield to include at least two monitoring wells upstream of the ground flow and 1 downstream of the wellfield. If this is not possible, then as a less suitable alternative, WAJ could rely on the standby wells to monitor groundwater levels as long as these wells are located at the extremities of the wellfield. In addition, as the wells become operational, it is important to incorporate the data from the monitoring wells into the groundwater flow model and re-run the scenarios to include the water abstraction quantities over the lifetime of the Project (2025, and 2050) to verify the outcomes and also determine effects on the long term. 	<ul style="list-style-type: none"> Reporting by the detailed engineering and the full ESIA team and revise impacts as required Reporting and monitoring by WAJ
Soil/ Public Health/Hydrology and Hydrogeology	Break down of Sewerage system and discharge of raw sewage into the receiving environment	<ul style="list-style-type: none"> The Contractor/DBO Contractor shall prepare an Emergency Response Plan (ERP) which provides detailed information and procedures for the planned handling of emergency situations particularly for power cut events, pollution events, peak flow events above design flow, flooding event, emergency discharge to wadis, failure of main equipment, firefighting and break down of the biological process. In the event of any sewerage system failure which would result of discharge of wastewater to the washouts, the ERP must take into account the following measures for management and handling of such washout events: <ul style="list-style-type: none"> A proper emergency pond must be constructed (instead of direct discharge into the Wadis) that is appropriately lined in order to protect the groundwater resources in the area. The emergency pond must have sufficient capacity to handle the maximum amount of wastewater anticipated in any washout event; Emergency ponds must be properly fenced to prevent public access with appropriate warning and informative signage; During any washout event, wastewater should be allowed to discharge into the emergency ponds after which it should be stabilized and disinfected (e.g. through the use of Sodium Hypochlorite) and also treated with insecticides for insect control (type of insecticides must be those approved by Jordanian Regulations). To the greatest extent possible, wastewater should be pumped into tankers to transfer it back to Tal Al Mantah WWTP or the operating WWTP at that time. After such a washout event, the emergency ponds should be appropriately cleaned and all waste and sludge removed and disposed accordingly; Once such events occur, announcements must be made to the local communities and downstream users through appropriate media platforms and in coordination with local municipalities and other authorities. Announcements must aim to inform the affected communities about the situation and its cause, potential risks and their anticipated duration (e.g. potential for odours generation), and how the situation will be handled. 	<ul style="list-style-type: none"> Inspections to ensure ERP requirements are implemented Report detailing outcomes of the above
Air Quality emissions	Odour and air quality emissions caused by emissions of methane, hydrogen sulphide, and ammonia from the WWTP operations and from the sludge treatment facilities	<ul style="list-style-type: none"> Irrespective of the technology used, the detailed engineering, full ESIA, and the operator shall guarantee the required odour, noise and air quality emissions as per the national legislations. Except for aerated zones in the aeration tanks, all odour producing process units such as inlet works, treatment tanks, storage tanks or sludge storage and dewatering facilities shall be covered or enclosed and extracted air shall be treated through odour control units. This shall be assessed in detail in the full ESIA and proper mitigation measures provided. The existing baseline in the vicinity of the final selected sites for the WWTPs shall be measured. Detailed engineering shall provide suitable options for air treatment. Further odour limits at site boundaries shall not exceed the limits given in “Pollutants – Ambient Air Quality Standards No 11401/2006”. This restricts H2S concentrations to no more than 0.03ppm at the site boundary. The detailed engineering shall consider measures to manage odour issues such as: <ul style="list-style-type: none"> Processes and/or operational improvements over and above the minimal requirements; Total enclosure of odour sources; 	<ul style="list-style-type: none"> Inspections to ensure requirements are implemented Report detailing outcomes of the above

		<ul style="list-style-type: none">- Covers for tanks;- The use of enclosure and venting (including ventilated buildings) – with end-of-pipe treatment (i.e. dilute/disperse or abatement), and- The installation of “best practice” odour monitoring equipment capable of detecting and reporting emissions in excess of the Odour Limits. <ul style="list-style-type: none">▪ The WWTP DBO Contractor (especially for the Dair Alla WWTP) shall provide as part of its Proposal a detailed Odour Management Plan for the Facilities, including technical details of the proposed odour treatment and monitoring equipment and associated capital expenditure and operational expenditure cost estimates.▪ The supplied Odour Management Plan must include the results of air quality dispersion modelling to establish guideline emission standards, certified by an appropriately qualified person that demonstrates that the proposed odour control strategy will ensure no noxious or offensive odours will be detected at the boundaries of the Sites.▪ The format of the Odour Management Plan should provide sufficient detail to allow operation and maintenance staff to understand clearly the operational procedures for both normal and abnormal conditions. The Odour Management Plan should also include sufficient feedback data to allow Site management (and environmental/regulatory inspectors) to audit Site operations. Examples of relevant issues include:<ul style="list-style-type: none">- A summary of the Facilities odour sources and the location of receptors;- Details of the Site management responsibilities and procedures for reporting faults, identifying maintenance needs, replenishing consumables and the complaints action procedure;- Odour operation and management procedures (e.g. correct use of process, materials, checks on Plant performance, maintenance and inspection);- Operative training;- Maintenance and inspection (both routine and emergency response);- Spillage management procedures;- Record keeping – format, responsibility for completion and location of records; and- Emergency breakdown and incident response planning including responsibilities and mechanisms for liaison with WAJ.▪ The Odour Management Plan should also indicate the frequency for regular reviews of the Odour Management Plan throughout the term of the DBO Contractor operation (minimum 2 years) and details of any productive screening assessments to be undertaken of the Facilities operations to identify any potential odour problems.▪ The following odour limits shall be considered to achieve zero odour at the applicable Site boundary of the Facilities<table><tr><td>Indicator</td><td>Level at Site boundary</td></tr><tr><td>H2S</td><td>5 ppb</td></tr><tr><td>Odour Units</td><td>2.5 measured as a 99.5% compliance with an average time of 2-5 minutes</td></tr></table>▪ Measure air quality on a regular basis. Monitoring parameters should be included in the full ESIA based on a discussion with the MoEnv and will include NH3, H2S, TSS, PM10...etc and this shall be done every three months. Frequency of measurements shall also be agreed with the MoEnv.▪ DBO Contractor and WAJ shall implement Local Community Communication Plan which is detailed in the table ‘Proposed Mitigation Measures, Monitoring Requirements, and MTRs to be Implemented during the Construction Phase’ above	Indicator	Level at Site boundary	H2S	5 ppb	Odour Units	2.5 measured as a 99.5% compliance with an average time of 2-5 minutes																																					
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Soil/ Public Health/Hydrology and Hydrogeology/Water quantity and quality	<ul style="list-style-type: none">▪ Water Security and Improved Water Supply Services▪ Contribute to improving services through ensuring consistency in water supply and supply duration to customers as well as improving access to water services.▪ Solve serious environmental, health, and social issues due to the use of cesspits and septic tanks at the household level▪ Provide solutions in WW collection and treatment, including the installation of a proper sanitation system aimed to reduce leakages from septic tanks and cesspits;▪ Illegal disposal by vacuum trucks in wadis will be significantly reduced.▪ Increasing Water Flowing Downstream to Farmers to be used in Agriculture	<ul style="list-style-type: none">▪ Monitor the operation of the Project components on a regular basis to ensure full realisation of the positive impacts of this Project.▪ Proposed monitoring of the Wastewater and Treated Sewage Effluent and Compost during test periods (especially in Dair Alla WWTP):<ul style="list-style-type: none">- Inlet and outlet manual sample scheme<table><tr><th>Parameter</th><th>Inlet</th><th>Outlet</th></tr><tr><td>BOD₅, mg/l</td><td>Yes</td><td>Yes</td></tr><tr><td>BOD₅, kg/d</td><td>Yes</td><td>Yes</td></tr><tr><td>COD_{Cr}, mg/l</td><td>Yes</td><td>Yes</td></tr><tr><td>COD_{Cr}, kg/d</td><td>Yes</td><td>Yes</td></tr><tr><td>SS, mg/l</td><td>Yes</td><td>Yes</td></tr><tr><td>SS, kg/d</td><td>Yes</td><td>Yes</td></tr><tr><td>Total N, mg/l</td><td>Yes</td><td>Yes</td></tr><tr><td>Total N, kg/d</td><td>Yes</td><td>Yes</td></tr><tr><td>NH₄-N, mg/l</td><td>Yes</td><td>Yes</td></tr><tr><td>NH₄-N, kg/d</td><td>Yes</td><td>Yes</td></tr><tr><td>Total P, mg/l</td><td>Yes</td><td>Yes</td></tr><tr><td>Total P, kg/d</td><td>Yes</td><td>Yes</td></tr><tr><td>Total P, filt, mg/l</td><td>Yes</td><td>Yes</td></tr></table>	Parameter	Inlet	Outlet	BOD ₅ , mg/l	Yes	Yes	BOD ₅ , kg/d	Yes	Yes	COD _{Cr} , mg/l	Yes	Yes	COD _{Cr} , kg/d	Yes	Yes	SS, mg/l	Yes	Yes	SS, kg/d	Yes	Yes	Total N, mg/l	Yes	Yes	Total N, kg/d	Yes	Yes	NH ₄ -N, mg/l	Yes	Yes	NH ₄ -N, kg/d	Yes	Yes	Total P, mg/l	Yes	Yes	Total P, kg/d	Yes	Yes	Total P, filt, mg/l	Yes	Yes	<ul style="list-style-type: none">▪ Inspections to ensure requirements are implemented▪ Report detailing outcomes of the above
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	<ul style="list-style-type: none">Provide additional water for irrigation use from the treated waste water resulted from additional new resources.Establishing additional WWTPs to reduce the operational load on the existing Tal Al Mantah WWTPRepair pipe leakages from the current water supply system for reduced NRW.	<table><tr><td>Total P, filt, kg/d</td><td>Yes</td><td>Yes</td></tr><tr><td>VSS, mg/l</td><td>Yes</td><td>Yes</td></tr><tr><td>VSS kg/d</td><td>Yes</td><td>Yes</td></tr><tr><td>SV30 ml/l</td><td>Yes</td><td>Yes</td></tr><tr><td>ISV ml/g</td><td>Yes</td><td>Yes</td></tr></table> <p>- Inlet and outlet manual sample scheme for the sludge dewatering facility</p> <table><tr><td>Parameter</td><td>Inlet</td><td>Outlet</td></tr><tr><td>DS %</td><td>yes</td><td>Yes</td></tr><tr><td>DS kg/d</td><td>yes</td><td>Yes</td></tr><tr><td>LOI %</td><td>yes</td><td></td></tr></table> <p>- Inlet and outlet manual sample scheme for the Sludge Dewatering Phase</p> <table><tr><td>Parameter</td><td>Inlet</td><td>Outlet</td></tr><tr><td>DS sludge %</td><td>yes</td><td></td></tr><tr><td>DS sludge kg/d</td><td>yes</td><td></td></tr><tr><td>pH</td><td></td><td>Yes</td></tr><tr><td>Conductivity</td><td></td><td>Yes</td></tr><tr><td>Heavy metals (As, Cu, Co, Pb, Hg, Ni, Sn, Zn)</td><td></td><td>On demand</td></tr><tr><td>Pathogens (fecal coliforms, salmonella, enteric viruses, viable helminth eggs)</td><td></td><td></td></tr><tr><td>Maturity/Stability</td><td></td><td></td></tr></table> <ul style="list-style-type: none">The DBO contractor shall monitor (test) the Wastewater, Treated Sludge Effluent (TSE), and the Sludge for compliance with the standards (especially in Dair Alla WWTP). The parameter to be tested and the frequency of these tests shall be governed by Reclaimed domestic wastewater standards 893/2006 or EU Council Directive 91/271/EEC but shall at least comply with the below tables. However, the testing frequency indicated below represents the minimum number of samples tested and shall be adapted if needed to the plant operational requirements and as per discussion with the MoEnv. This shall be outlined in the full ESIA. <table><tr><td>Parameter</td><td colspan="3">Frequency of tests</td></tr><tr><td></td><td>Daily</td><td>Weekly</td><td>Monthly</td></tr><tr><td>1. Wastewater</td><td></td><td></td><td></td></tr><tr><td>pH</td><td>Y</td><td></td><td></td></tr><tr><td>Turbidity</td><td>Y</td><td></td><td></td></tr><tr><td>BOD₅</td><td>Y</td><td></td><td></td></tr><tr><td>COD</td><td>Y</td><td></td><td></td></tr><tr><td>TSS</td><td>Y</td><td></td><td></td></tr><tr><td>Total Nitrogen – N</td><td>Y</td><td></td><td></td></tr><tr><td>NH₃-N</td><td>Y</td><td></td><td></td></tr><tr><td>TP</td><td>Y</td><td></td><td></td></tr><tr><td>Oil and grease</td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td>2. TSE</td><td></td><td></td><td></td></tr><tr><td>pH</td><td>Y</td><td></td><td></td></tr><tr><td>Turbidity</td><td>Y</td><td></td><td></td></tr><tr><td>BOD₅</td><td>Y</td><td></td><td></td></tr><tr><td>COD</td><td>Y</td><td></td><td></td></tr><tr><td>TSS</td><td>Y</td><td></td><td></td></tr><tr><td>Total Nitrogen – N</td><td>Y</td><td></td><td></td></tr><tr><td>NH₃-N</td><td>Y</td><td></td><td></td></tr><tr><td>TP</td><td>Y</td><td></td><td></td></tr><tr><td>Oil and grease</td><td>Y</td><td></td><td></td></tr><tr><td>Fecal Coliform (E.Coli)</td><td>Y</td><td></td><td></td></tr><tr><td>Helminth Eggs</td><td>Y</td><td></td><td></td></tr><tr><td>Parasitic helminth</td><td>Y</td><td></td><td></td></tr><tr><td>3. Sludge *</td><td></td><td></td><td></td></tr><tr><td>dry matter (%)</td><td></td><td></td><td></td></tr><tr><td>Total Coliform</td><td></td><td></td><td></td></tr><tr><td>Fecal Coliform</td><td></td><td></td><td></td></tr><tr><td>Salmonella</td><td></td><td></td><td></td></tr><tr><td>Helminth Eggs</td><td></td><td></td><td></td></tr><tr><td>Metals</td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>	Total P, filt, kg/d	Yes	Yes	VSS, mg/l	Yes	Yes	VSS kg/d	Yes	Yes	SV30 ml/l	Yes	Yes	ISV ml/g	Yes	Yes	Parameter	Inlet	Outlet	DS %	yes	Yes	DS kg/d	yes	Yes	LOI %	yes		Parameter	Inlet	Outlet	DS sludge %	yes		DS sludge kg/d	yes		pH		Yes	Conductivity		Yes	Heavy metals (As, Cu, Co, Pb, Hg, Ni, Sn, Zn)		On demand	Pathogens (fecal coliforms, salmonella, enteric viruses, viable helminth eggs)			Maturity/Stability			Parameter	Frequency of tests				Daily	Weekly	Monthly	1. Wastewater				pH	Y			Turbidity	Y			BOD ₅	Y			COD	Y			TSS	Y			Total Nitrogen – N	Y			NH ₃ -N	Y			TP	Y			Oil and grease								2. TSE				pH	Y			Turbidity	Y			BOD ₅	Y			COD	Y			TSS	Y			Total Nitrogen – N	Y			NH ₃ -N	Y			TP	Y			Oil and grease	Y			Fecal Coliform (E.Coli)	Y			Helminth Eggs	Y			Parasitic helminth	Y			3. Sludge *				dry matter (%)				Total Coliform				Fecal Coliform				Salmonella				Helminth Eggs				Metals								
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		<p>* Parameters for sludge must be tested at least every six months</p> <ul style="list-style-type: none"> ▪ Daily, weekly, and monthly reports detailing the test results and compliance checks, as well as conformity with environment, health, and safety requirements should be submitted. The monthly report should also list any grievances or incidents encountered during the preceding month. ▪ In the event that any measured parameter, in respect of Effluent, Sludge and Wastewater is found to be outside the specified limits, the test shall be repeated within twelve (12) hours, and in the event that the measurement continues to be outside the agreed limits, the DBO Contractor shall inform the WAJ as soon as practicable, but in any event no later than twelve (12) hours. The DBO Contractor shall collect the necessary effluent and/or sludge and/or influent samples, as the case may be, whether the sample is outside the agreed parameters or not, or when the facilities are not performing as expected. ▪ The water quality in the KAC is monitored by WAJ Laboratory and the data received from January 2017 to September 2018 shows compliance with the Irrigation Water Quality Guideline JS 1766:2014. The detailed studies to be undertaken at a later stage should define if the treated water has to be reuse directly on the closest fields of the WWTP or to be discharge in the KAC. This should be discussed in consultation with the end users as well in order to agree on the approach going forward. In any case, the tertiary phase from the treatment process is mandatory. This should be assessed and studies in detail in the detailed design phase and in the detailed ESIA ▪ The plant will not have any capacity to store the quantity of sludge produced. The sludge will be taken by trucks. Currently, in Jordan, there is no suitable disposal or treatment means for stabilised sludge. Suitable solutions and final destination should be considered in the final detailed studies and designs. 	
Public Health and Safety	Public health and safety concerns from quality of water delivered to customers and overall water treatment process.	<ul style="list-style-type: none"> ▪ Obtain Permit from Ministry of Health before the water is pumped into the network (i.e. before operation of the Project). ▪ Submit a detailed design which must ensure that JS 286:2015 standards are met. The detailed design must be approved by WAJ and MoH. ▪ Prepare a water monitoring plan based on the JS 286:2015 Drinking Water requirements. ▪ Undertake an awareness campaign that provides information in non-technical language on the project to include its objective, rationale, project target area, water quality, treatment process and monitoring requirements. Such awareness campaigns could be announced through the MWI/WAJ website and local newspapers. 	<ul style="list-style-type: none"> ▪ Inspections to ensure requirements are implemented ▪ Report detailing outcomes of the above
	Public health and safety concerns during the various operation activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater, etc.	<ul style="list-style-type: none"> ▪ Same as provided in the table 'Proposed Mitigation Measures, Monitoring Requirements, and MTRs to be Implemented during the Construction Phase' above 	<ul style="list-style-type: none"> ▪ Same as provided in the table 'Proposed Mitigation Measures, Monitoring Requirements, and MTRs to be Implemented during the Construction Phase' above
Biodiversity	Improper management of the site (improper conduct and housekeeping practices) could disturb and affect the biodiversity of the site.	<ul style="list-style-type: none"> ▪ Implement proper management measures to prevent damage to the biodiversity of the site to include: (i) prohibiting hunting and collection of floral species, (ii) ensuring proper storage, collection, and disposal of waste streams, (iii) restricting activities to allocated construction areas only, etc. 	<ul style="list-style-type: none"> ▪ Inspections to ensure requirements are implemented ▪ Report detailing outcomes of the above
Archaeology and Cultural Heritage	Improper management of the site (improper conduct and housekeeping practices) could disturb or damage archaeological remains present within the Project site.	<ul style="list-style-type: none"> ▪ Properly plan operation and maintenance activities to take into account the identified archaeological locations to ensure they are protected from any potential damage (e.g. Proper movement of vehicles and machinery into/out of the site to avoid those areas). ▪ Ensure that the Code of Conduct, awareness raising, and training developed for workers and personnel involved in the operation phase of the project to emphasizes the presence of archaeological locations in the area 	<ul style="list-style-type: none"> ▪ Inspections to ensure requirements are implemented ▪ Report detailing outcomes of the above
Electricity consumption	The overall electricity consumption levels of the Project are expected to be high especially in the Dair Alla WWTP and the pumping stations and this electricity will be sourced from the national grid	<ul style="list-style-type: none"> ▪ The detailed engineering phase shall consider measures to reduce electricity consumption and assess the possibility of integrating a solar PV Power system that offsets part of the electricity obtained from the national grid. 	<ul style="list-style-type: none"> ▪ Report detailing outcomes
Occupational Health and Safety	There will be some generic risks to workers health and safety from working on water supply and wastewater treatment sites, as it increases the risk of injury or death due to accidents.	<ul style="list-style-type: none"> ▪ Prepare an Occupational Health and Safety Plan, adopt and implement the recommendations/provisions of the Occupational Health and Safety Plan. 	<ul style="list-style-type: none"> ▪ Inspection to ensure implementation ▪ Reporting of any accidents and measures undertaken to control situation

Environmental Management Plan

Each Bidder shall provide an outline of its management and mitigation strategy for dealing with any solid, liquid, and/or gaseous emissions and spills, including its proposed documentation procedures and emergency management policies. The detailed engineering and full ESIA team shall liaise with MoEnv in order to define the final design solution and to prepare the final ESIA report.

In order to address potential environmental impacts related to the construction and operation of the Facilities, the Contractor/DBO Contractor shall prepare an ESMP comprising the necessary remedying actions to be implemented during the Construction Period. The ESMP shall be prepared as required by ISO 14000 / ISO 14001. This will include (amongst other things) working hours, noise levels, odour nuisance, work related traffic and cleanliness of main roads off Site and tidiness of the Site itself. The DBO Contractor Company shall also prepare a second phase of the ESMP which will be in place during the post-construction period (i.e. during the entire O&M period under their contract). The ESMP shall particularly address the required odour control measures.

9. Requirements for Environmental Clearance Process

According to MoEnv regulations, *“all government, joint, private parties and others should carry out studies of the environmental impacts of their projects prior to executing them or when introducing modifications or expansions to the existing projects”*. Further, the EIA study *“will deal with the direct or indirect outcome that would lead to environment pollution, natural imbalance, impact on public hygiene, or how they may have an effect on life, enjoyment, private or public properties, natural biological and non-biological resources in permanent way, and how they may have effects on historical, cultural, natural territories and the game parks”*.

Under Jordanian law, proponents of such projects shall be required to file a study in accordance with the standards set forth by MoEnv for the pollution caused by such a project in the environment and the control procedures they are required to take.

As part of the environmental permitting process for the Project components, the Ministry of Environment shall most probably request a comprehensive ESIA.

The study will include creating a detailed impacts assessment matrix and ESMP for the Project. This shall be further discussed and agreed with the MoEnv once the final decision is made in terms of Project components and a final design and plan for the Project are available.

ESIA approval is a permitting requirement, and leads to an ‘environmental clearance’, which then complements other non-environmental permitting requirements such as the construction license.

The annexes of EIA Regulation provide screening criteria and list the types of projects, which require a comprehensive EIA or a PEA study, and those for which neither is needed. For Category 1 projects, as in the case of water supply and treatment facilities as well as wastewater treatment plants, a public scoping hearing is required to set the ToR, the project and environmental baseline to be described, impacts to be assessed, and mitigation measures to be developed. ESIA report shall be submitted to the MoEnv and all related deliverables in Arabic Language.

This process can be launched by MWI/WAJ once the final details and designs are available.

The process for environmental clearance and obtaining the environmental permit for this Project as required by the MoEnv is stipulated by the “Environmental Protection Law No. 52/2006”, “Environmental Impact Assessment Regulation No. 37/ 2005”, and the “Instructions for Site Selection of Development Projects for the year 2018”.

Generally, the environmental clearance process, as governed by the MoEnv, is a two (2) step process. First, the developers of the Projects, and prior to commencement of the ESIA study, must apply for a site approval permit in accordance with the “Instructions for Site Selection of Development Projects of 2018”. The second step involves undertaking the ESIA study for the Project in accordance with the “Environmental Impact Assessment Regulation No. 37/2005”.

It is important to liaise with the MoEnv at the detailed engineering phase and during the final micro-siting exercise in order to ensure alignment with the required site selection requirements and eventually getting approval prior to finalising the selected locations. Undertaking this decision independent of the MoEnv may delay the process and conclusion of the results.

An environmental license shall be obtained for the Project components after completing the detailed design and micro-siting of the Project components as well as preparing the full ESIA in accordance with the applicable rules and procedures and with the requirements of MoEnv.

The Environmental Consultant should be responsible for conducting a detailed final EIA report and liaise with WAJ. The Environmental Consultant should prepare and submit for the reviewing and written approval of by MoEnv the following documents:

- Environmental evaluation report
- Environmental Management Plan (EMP) for the Construction Period
- Environmental Management Plan (EMP) for Operation

APPENDIX 1: CONSULTATION DIARY

Consultation Diary

Meetings

Meeting	Reason	Description	Entities/Participants	Date
Site Visit	Collection of Socio-economic data	<p>The team visited several governmental entities to collect data regarding the current socio-economic conditions. This includes:</p> <ul style="list-style-type: none"> The current status of projects for the month of November 2017 within the study area Economic and Social Situation of Shoonah Janoobiyah District Economic and Social Situation of Dair Alla District – Data Bank (2017) 	<p>Balqa Governorate Head of Projects Directorate Shoonah Janoobiyah Mutasarrifate Assistant Dair Alla Municipality Mayor Engineer Dair Alla Mutasarrifate Advisers</p>	21 st December 2017
Site Visit	<ul style="list-style-type: none"> Acquaint the WW treatment expert with the sanitary baseline conditions of the study area. ECO Consult to gain a better on-the-ground understanding of the area. 	<p>The team visited several governmental entities, in the following sequence: WAJ Balqa à Balqa Governorate à WAJ Dair Alla. The team was escorted by a local expert to different sites of interest, including: 2 wells opposite side of Karamah, the RO plant at Karamah dam, Tal Al-Mantah WWTP and Abu Ezzighan RO plant.</p>	<p>SAFAGE/SUEZ Consulting: Eng. ECO Consult: Names removed WAJ Balqa: Director Balqa Governorate: Head of Directorate/Projects WAJ Dair Alla:</p>	22 nd January 2018

			<p>Area Supervisor Staff Tal Al-Mantah WWTP: WWTP operator Abu Ezzighan RO plant: Plant Operator Karamah RO Plant – AquaTreat</p>	
Meeting @ WAJ	Update session on the viable design alternatives for both the water supply and sanitation system to be considered as part of the conception report.	<p>Several topics were addressed, including:</p> <ul style="list-style-type: none"> ▪ Serviced population and projected growth; ▪ Possible alternative designs; ▪ Parameters to be used as part of the design criteria; and ▪ Potential locations of the associated facilities and its implications. 	<p>SAFAGE/SUEZ Consulting: Names removed ECO Consult: Names removed Water Authority of Jordan (WAJ):</p> <ul style="list-style-type: none"> ▪ Eng. WAJ SG Assistant – Operations and Governments ▪ Eng. Water Director ▪ Eng. Director of Studies and Design Department – Wastewater and Sanitation Affairs- WAJ ▪ Eng. Director of Studies and Design Department – Water Affairs- WAJ ▪ Eng. Project Manager – PMU 	23 rd January 2018

Contacts List

Name	Arabic	Position	Telephone	Fax	Mobile Phone 1	Mobile Phone 2	E-mail
Balqa Governorate							
Name removed		Head of Directorate/Projects					
Name removed		Projects Directorate					
Name removed		Decentralisation Unit/ Assistant Director					
Dair Alla Municipality							
Name removed		Engineer					
Dair Alla Mutasarfiate							
Name removed		Mutasarrif					
Name removed		Advisor					
Name removed		Local Development Unit					
Shoonah Janoobiyah Mutasarrifate							
Name removed		Assistant					
Ministry of Education/ Shoonah Janoobiyah Directorate							
Name removed							
WAJ Amman							

Name removed		WAJ SG Assistant – Operations and Governments					
Name removed		Project Manager – PMU					
EIB -MeHSIP							
Name removed		Environmental Expert					
WAJ-Balqa Directorate							
Name removed		Director					
Name removed		Director's Office Manager					
Name removed		Manager of Balqa WWTP					
WAJ-South Shouneh							
Name removed							
WAJ-Dair Alla							
Name removed		Manager					
Name removed		Area Supervisor					
Name removed		Staff					
Abu Zaighan Desalination Plant							

Name removed		Plant Operator					
Name removed		WWTP operatpr					

Minutes of Meeting

21 st December 2017 - Socio-economic Data Collection and Consultations				
Entity	Contact Person	Points of Discussion	Documents provided	Prospective Support
Balqa Governorate	Head of Projects Directorate	<ul style="list-style-type: none"> Pointed out the decentralization of the institutional framework, and the formation of a larger and more interdisciplinary local development unit (at a Governorate level) consisting of six different departments. Offered to facilitate communication with the subsidiary institutions for project support. Expressed lack of sanitation services in nearby project areas such as Zai. Facilitated the subsequent meetings with the mutasarrifates and municipality. 	<ul style="list-style-type: none"> The current status of projects for the month of November 2017, which is a list of socio-economic developments within the Dair Alla and Shoonah Janoobiyah districts. Salt WWTP details 	<ul style="list-style-type: none"> Will facilitate future meetings
Shoonah Janoobiyah Mutasarrifate	Assistant to Mutasarrif	<ul style="list-style-type: none"> Expressed that the population is dominantly Jordanian of Palestinian origins, where some are Non-Jordanian passport holders. 	<ul style="list-style-type: none"> Economic and Social Situation of Shoonah Janoobiyah District 	-
Dair Alla Municipality	Mayor Engineer	<ul style="list-style-type: none"> Consultations on the current WWT system of the area. 	<ul style="list-style-type: none"> A proposal containing detailed information of the 	<ul style="list-style-type: none"> Updated information (2017) on the current socio-economic conditions of the area

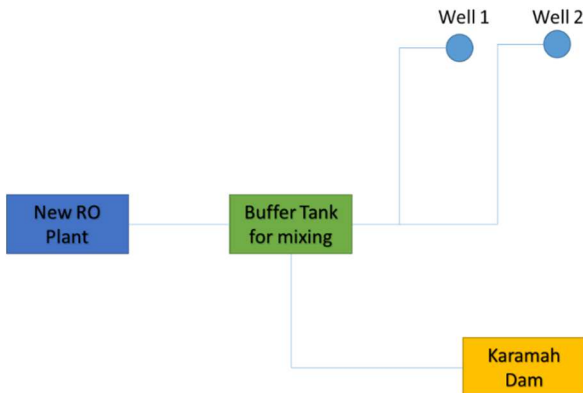
		<ul style="list-style-type: none"> Discussed the current works of JICA (installation of water reservoir) and the need for a proper WWT scheme. Specific concern was given on Tal Al-Mantah effluent discharge into the Jordan River and Baptism Site. Pressed on the snow ball effect of environmental issues concerned with the current status quo 	Socio-economic conditions of the area.	
Dair Alla Mutasarrifate	Names removed	<ul style="list-style-type: none"> Pressed on the need of implementing this project. Discussed the lack of support for M'addi Municipality after disruptions in trade with Syria and Iraq. As a result, the municipality is severely resource-constrained and under-capacitated. 	<ul style="list-style-type: none"> Economic and Social Situation of Dair Alla District (2017) – Bank of Data. 	<ul style="list-style-type: none"> Support has been offered for any further inquiries. ECO Consult team will be provided with an official authorization letter to easily access administrative support.

22 nd of December – Site Visit to Dair Alla and Karamah	
Site/Observation	Description
Landscape	<ul style="list-style-type: none"> Greenhouses and open field agriculture are the most prevalent visual and landscape characteristic of the study area Alongside the main spinal road connecting the localities together, Highway #65 is mostly surrounded by <i>acacia nilotica</i> and date-palm trees. There are street vendors displaying yearlong and/or seasonal produce at several locations on either side of the main highway. Mini-markets and garages are equally seen distributed along the highway. Due to the intensive and frequent use of this highway, the surrounding area is seen to be heavily littered.

	<ul style="list-style-type: none"> In the east, there is a mountainous view with urbanized clusters at the base. The reducing gradient continues south west. The area is relatively flat especially parallel to the main highway; however, undulates increasingly towards the east (Jordan River) and west (mountainous landscape).
2 Wells located near Dharet Ramel	<p>There are two wells considered as possible water supply sources. Well 1 is out of operation, whereas well 2 is in full operation with a productivity of 140 m³/day, and an actual productivity of 100 m³/day. It was observed that the electrical infrastructure of well 2 was stolen.</p>
Tal Al-Mantah	<ul style="list-style-type: none"> The WWTP is located on an elevation of approximately -320. The road to the plant seemed to be unsuitable to accommodate both septage tankers and road users. The road is eroded from the edges and has sharp curves. Sample tests are not conducted in-house, nor at regular intervals. Samples usually occur twice a month at both the inlet and outlet. The plant was established under a Canadian grant and contracted to the service provider CEDA. The plant is oversized to treat industrial wastewater. (COD 4,000 mg/L, BOD 2,000 mg/L and TSS 5,000 mg/L). Truckers have to pay a fee of 20 JOD per month per truck load. Septage truck sizes accommodated are between 15,000 liters and 10,000 liters. The trucks are registered upon entry and are fitted with a GPS device that is monitored and supervised by the MoEnv. During the unloading of the septage, the screen was observed to be broken. No H&S procedures present onsite. Pumps are very heavy and cause challenges during maintenance work, especially with their transport. WWTP manager is suggesting to have an open roof with small cranes to assist in the transportation of these pumps. The pumps sending effluent to the trickling filters have been stopped, due to issues with sedimentation and blockages of trickling nozzles. Filters range from 0.7, 0.5 and 0.3. The plant has faced issues with broken filters due to this accumulation. There are very high levels of sludge concentrations that are not undergoing the necessary extraction process, hence producing very poor quality of treated water, and are detrimental to the entire plant. WW is discharged into the surrounding wadis and water courses, and is also used for irrigation.

Complaints on the Shoona Janoobiya Water System	<ul style="list-style-type: none"> Weak water supply Lack of connectivity to those residing outside organized boundaries
Karamah Dam as a water source	The dam will be considered as a water source. To increase recovery from 40% to 60%, the 2 wells mentioned above will be mixed with the saline water coming from Karamah in a collection tank/mixing buffer tank. The location of this tank was speculated to alongside Highway #65, slightly after the Karamah intersection. This is adjacent to the JVA pumping station.

23 rd December 2017 – Update Session with WAJ		
Topic	Comments	Actions
Population projections under the three growth scenarios estimated by DoS.	<p>SUEZ/SEFAGE Consulting:</p> <p>A “High Scenario” will be considered, which will support a conservative approach to population inclusiveness. Based on this, the consultant is to take into account for:</p> <ul style="list-style-type: none"> <u>120,000 inhabitants in 2025</u> (derived from the 2050 projection of a “Medium Scenario”, thus assuming a larger value than actually estimated in the “High Scenario” projection for 2025); and <u>180,000 inhabitants in 2050.</u> <p>Water Authority Jordan (WAJ):</p> <ul style="list-style-type: none"> WAJ is expecting more future settlement of refugees in North Ghor and is accordingly planning for increased population. 	WAJ wants to refer back to DoS on the growth rates provided in the “Population Projections for the Kingdom’s Residents during the Period 2015-2050” report.
Energy consumption reductions in wastewater treatment	<p>SUEZ/SEFAGE Consulting:</p> <p>There are more energy efficient processes for sludge treatment which will be investigated as potential design options. These include a 2-stage activated sludge treatment process which dries sludge at two different intervals with low energy intensity. Also, there is room for consideration regarding bio-gas generation and</p>	

	incineration. This will prove to be expensive with high technical difficulty for operation.	
Exploiting Karamah Dam as a potential water supply source.	<p>SUEZ/SEFAGE Consulting:</p> <ul style="list-style-type: none"> Intentions to exploit Karamah Dam through a new desalination plant. Need for a new buffer tank to be constructed in order to blend desalinated water from the Dam with water coming from nearby wells in Dharet Ramel. Schematic:  <pre> graph LR A[New RO Plant] --> C[Buffer Tank for mixing] D[Karamah Dam] --> C C --> E[Well 1] C --> F[Well 2] </pre> <ul style="list-style-type: none"> Eng. Bernard was not made aware that the Karamah RO plant is currently being dismantled. <p>Water Authority Jordan (WAJ):</p> <ul style="list-style-type: none"> WAJ welcomed the idea of using Karamah Dam. WAJ pointed out that salinity readings for Karamah Dam differ seasonally due to evaporation rates, and should be clearly defined as such with water quality readings. 	The consultant is to define seasonality of the water quality data.

Other available sources	Water Authority Jordan (WAJ): WAJ has asked to consider 3 wells located in Rajeb as potential water resources.	The consultant is to consider the applicability of Rajeb wells as potential water resource
Three design alternatives for WW management - including a forth alternative similar to 3 but with a small WWTP solely serving Karamah Locality	Water Authority Jordan (WAJ): <ul style="list-style-type: none"> Alternative 1: not fully accepted by WAJ because it does not solve the existing problems of septic tanks. Alternative 2: WAJ deems this alternative unsuitable due to issues of management & public rejection. Alternative 3 & 4: are generally better but the Consultant needs to minimize the number of pumping stations as possible. WAJ requested maps of the locations for each alternative and a comparison that shows the pros and cons for each proposal. 	The consultant is to study wind direction in order to locate WWTPs in areas with the least odor transmission.
Consultant is following the local standard set at 80 litres per capita per day	WAJ argued that water consumption in the Jordan Valley is greater than in other areas due to the higher temperatures. Therefore the standard is below the average and needs adjustment at 120 litres at least. This was later agreed to be set as a range rather than a fixed value.	WAJ is to discuss this internally.
Sludge use	<ul style="list-style-type: none"> WAJ noted that treated WW from Tal Al-Mantah is currently used for irrigation. Lagoons will not be the best method to sludge treatment, considering the spatial need. Intensive approach to treatment is preferred. 	<ul style="list-style-type: none"> The consultant needs to check with JVA on the possibility of discharging treated wastewater into KAC. The consultant needs to study how to connect the proposed WWTP with the already existed transmissions used for irrigation.

Expanding water resources beyond project boundary.	WAJ is interested in drilling new wells and rehabilitating the already existing ones at areas beyond south of Karamah.	<ul style="list-style-type: none"> ▪ The consultant will restrict the SOW to the areas shown in the ToR. It is not possible to look beyond Karamah area. ▪ The consultant cannot advice on locating new wells.
Prospective projects within the area	<ul style="list-style-type: none"> ▪ Red Cross pipeline rehabilitation project of a 14 km pipeline. ▪ New financial proposal for the construction of a reservoir and installation of pumps 	Eng. Riham to provide a copy of the proposal to Eng. Bernard.