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REPORT

Red Sea Dead Sea Water Conveyance Study

Environmental and Social Impact Assessment (Updated) - Main Report

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List of Abbreviations

ABO	Aqaba Bird Observatory
ACT	Aqaba Container Terminal
ADC	Aqaba Development Corporation
APA	Aqaba Ports Authority
APC	Arab Potash Company
ASEZ	Aqaba Special Economic Zone
ASEZA	Aqaba Special Economic Zone Authority
CBOs	Community Based Organizations
CDM	Clean Development Mechanism
CRS	Critically Endangered Species
DSP	Desalination plant
DSW	Dead Sea Works
DZC	Development Zones Commission
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EN	Endangered
EPP	Enhanced Productivity Program
ESA	Environmental and Social Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EQA	Environment Quality Authority (PA)
FS	Feasibility Study
GHG	Greenhouse Gas
GoA	Gulf of Aqaba
GOJ	Government of Jordan
GOI	Government of Israel
GSI	Geological Survey of Israel
HEP	Hydro Electric Power Plant
HGV	Heavy goods vehicle
HPP	Hydropower plant
IBA	Important Bird Area
IBRCE	International Birding & Research Centre in Eilat
IEMA	Institute of Environmental Management and Assessment
IFC	International Finance Corporation
IOLR	Institute of Oceanographic & Limnologic Research
IUED	Israeli Union for Environmental Defence
IUI	Inter University Institute (for Marine Science at Eilat)
JAB	Jordanian and Israeli Joint Administration Board
JEEC	Joint Environmental Experts Committee
JICA	Japanese International Cooperation Agency
JMA	Jordan Maritime Authority
JPMC	Jordan Phosphate Mining Company
JREDS	Jordan Royal Marine Conservation Society
JUST	Jordan University of Science and Technology
JVA	Jordan Valley Authority
LC	Least Concern
MEP	Ministry of Environmental Protection (Israel)
MoE	Ministry of Environment (Jordan)

MoMA	Ministry of Municipal Affairs (Jordan)
MoPAD	Ministry of Planning and Administrative Development (Jordan) (formerly MoPIC)
MoSD	Ministry of Social Development (Jordan)
MPWH	Ministry of Public Works and Housing (PA)
MSBs	Migratory Soaring Birds
NGO	Non-governmental organization
NIPs	National Implementation Plans
NPA	National Parks Authority
NRA	Nature Reserves Authority
NT	Near-threatened
PA	Palestinian Authority
PCCP	Public Consultation and Communications Plan
PERSGA	Regional Organization for Conservation of Environment of the Red Sea and Gulf of Aden
PESAR	Preliminary Environmental and Social Assessment Report
PM	Passage Migrant
POPs	Protocol on Persistent Organic Pollutants
PWA	Palestinian Water Authority
R	Resident, breeds
RB	Resident breeders
RfP	Request for Proposals
RSCN	Royal Society for the Conservation of Nature
RSDS	Red Sea Dead Sea Project (Phase I, II and III)
RSMS	Red Sea Modelling Study
SB	Summer Breeders
SCAs	Special Conservation Areas
SIZ	Southern Industrial Zone
SoA	Study of Alternatives
SPNI	Society for the Protection of Nature in Israel
SRO	Seawater Reverse Osmosis
STD	Sexually Transmitted Disease
STI	Sexually Transmitted Infection
SV	Summer visitor, breeds
SWM	Solid Waste Management
TBM	Tunnel Boring Machines
ToR	Terms of Reference
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
UNRWA	United Nations Relief and Works Agency
VU	Vulnerable
WAI	Water Authority of Israel
WB	West Bank
WMP	Waste Management Plan
WV	Winter Visitor

1 NON-TECHNICAL SUMMARY

The major objective of the Red Sea Dead Sea project is to augment drinkable water supply of Jordan. Phase I of the Red Sea Dead Sea Project comprises abstracting 300 million cubic metres (MCM) per year from the Red Sea, desalinating a portion of this (65 MCM) and then conveying a mix of the waste brine and the remaining seawater balance (235 MCM) to the Dead Sea. Freshwater will be supplied to Aqaba and the southern part of Israel respectively. This project will also be used as a pilot to determine the impacts on the Red Sea and Dead Sea in order to inform the design of the next phase how the Project may be increased to a installed capacity of 700 MCM per year.

The RSDS Phase 1 Project includes delivery of potable water through an Israeli Water Pipeline from the Treated Water Tank at the Desalination Plans to the Border Delivery Point; and delivery of potable water to a Jordan Water Delivery Point adjacent to this Treated Water Tank. It is foreseen that a Jordan Water Pipeline will be constructed from the Jordan Delivery Point to the Aqaba High Terminal Reservoir under a separate contract.

This draft Environmental and Social Impact Assessment Report (ESIA Report) is an update of the existing Environmental and Social Assessment for the Red Sea – Dead Sea Water Conveyance Study, issued in draft in 2011 and finalised in 2014 by ERM and partners for the World Bank [lit 13]. The purpose of this ESIA is to address the gaps of this previous environmental and social assessment Environmental and Social Assessment in the context of the current Project Phase I design. Key changes of the current RSDS Phase I outline compared to the 2014 ESA report are:

1. Location of the intake: which moved to the northern part of the Gulf of Aqaba and Eilat
2. Location of the Desalination Plant from the Dead Sea region to a location directly north of Aqaba
3. Location of related booster pumping stations, reservoir and three hydropower stations along the pipeline route
4. Slight alterations of the pipeline route through Wadi Araba / Arava Valley
5. Location of the Dead Sea Discharge point

The Government of Jordan is in the process of issuing a tender for a BOT contract for the design, built, operate, co-finance and transfer of the RSDS Phase I project. The outcomes of this ESIA, including the implementation of the related environmental and social management plan, shall be incorporated by the shortlisted consortia in their final bids. The final and approved ESIA and ESMP shall form the basis for the Jordanian Ministry of Environment (MoEnv) and the Aqaba Special Economic Zone Authority (ASEZA) to issue an Environmental Permit for the RSDS Phase I project. This permit will likely include a series of specific conditions that the assigned BOT Contractor shall meet, following its final designs for the project and related construction and operational plans.

The following complementary studies and activities were performed to update the ESA of 2014:

- A site drive over on the 12th of February 2017 along the entire pipeline route to establish any constraints which might affect the construction and operation of the Project and that may have an adverse environmental and/or social impact, including particular topographical features, land use conditions and ecological features;
- A Marine ecology surveys to establish the presence / absence of sensitive habitats and species at the proposed Red Sea intake location. The survey includes a dive survey to determine the species associated with the seagrass beds down to a maximum of 25m

- Interviews with fishermen and marine experts (e.g. ASEZA, Marine Science Station (MSS) were conducted in Aqaba and with the Israel Oceanographic and Limnologic Research institute (IOLR) in Haifa and the Interuniversity Institute For Marine Sciences In Eilat. In view of all studies and water modelling currently being done for larvae the Consultant assumed that any kind of modelling will not be needed.
- Terrestrial ecology surveys were done during February and March to include the re-validation of previous surveys and an assessment of formerly unstudied areas due to the changes in alignment and Project components, with particular focus on Important Bird Areas (IBAs), soaring birds, and seasonal avifauna.
  The Cultural Heritage surveys consisted of a desk based analysis, re-validation of previous findings, collaboration with the Jordanian Department of Antiquities and detailed site walkovers to confirm the presence/absence of areas of cultural importance.
- Land use and socio-economic surveys for any settlements/activities in the vicinity of the Project and its infrastructure as input for land expropriation and resettlement action plan have been conducted.
- Stakeholder consultation events with key stakeholder groups, including a scoping workshop for the ESIA update in the Mövenpick Hotel in Aqaba on the 6th of April 2017.

The RSDS Phase I project includes the following components:

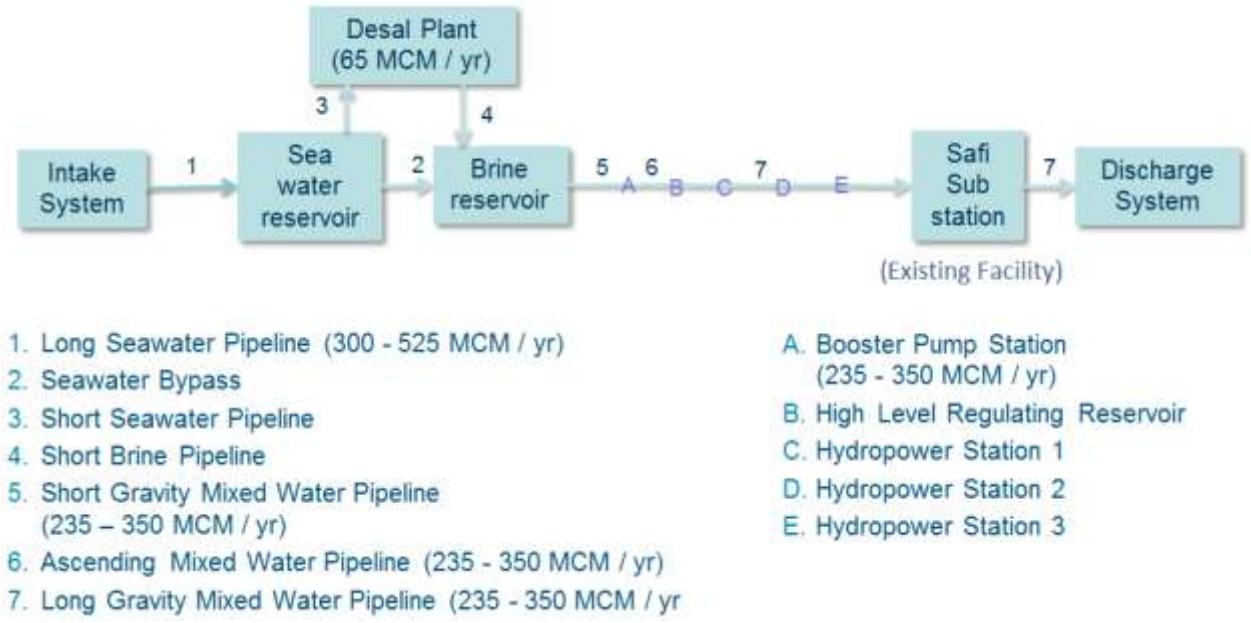

Figure 1 – RSDS Phase I Project Components

Intake:

- A submerged intake about 1.8 kilometres from the northern shore of the Gulf of Aqaba at a depth of 140 metres with a minimal nominal design capacity of 700 MCM/year and at least 25 m above seafloor. The three HDPE pipes with a 2.5 metre diameter will be laid at the sea bed, except for a short run adjacent to the shore line where they need to be buried with at least 1m cover;
- A land-based pumping station to be located at the northern shore of the Gulf of Aqaba with

a minimal nominal design capacity of 300 MCM/year (Phase I), but civil engineering works for a 700 MCM/year pumping station capacity to cater for Phase II;
- On land pipes to be laid in a dedicated corridor next to the airstrip and adjacent to the Ayla development for about 2 kilometres

The MWI assigned Technical Advisors to the RSDS Phase I project through a Joint venture of Dar Al-Handasah Consultants (Shair and Partners) Beirut – Lebanon S.A.L, Dar Al-Handasah (Jordan) Consultants, Lazard Frères SAS, and Gide Loyrette Nouel A.A.R.P.I. , herein after referred as Dar-Al-Handasah and partners. The key design changes to the project in relation to the Red Sea Intake System compared to the final ESA of 2014 [lit 13], as presented in the Conceptual Design by Dar Al-Handasah and partners, 2017) [lit 8] are:

- **Intake location changed** from 'Eastern Location' to the previously identified 'Northern Location', which is on the north side of the Gulf of Aqaba / Eilat immediately adjacent to the Jordanian / Israeli border (on the Jordanian side);
- **Intake amount has been reduced** from 2,100 Million Cubic Metres (MCM)/year for the full project to 300MCM/year for Phase 1 (though the intake components will have a capacity of 700MCM/year for future phases);
- **Number of intakes** increased from one to three to account for the reduced velocity flow of 0.15 metres / second; and
- **Update to the environmental baseline data** required to ensure that it is relevant to the changed location and provides recent site-specific data, as the previous Red Sea Studies (Thetis SpA *et al*., 2013) are now between 5 and 7 years old.

Figure 2 – Location of Intake in northern part of Gulf of Aqaba / Eilat

Desalination Plant:

- A seawater reservoir (525 MCM / yr) to allow flow to the desalination plant through a short seawater pipeline. Any future Phase II new desalination plant shall also be connected to this reservoir. The reservoir is furthermore connected to a seawater bypass (see also below)

- A Sea water reverse osmosis (SWRO) plant with an annual capacity of 65 MCM/year extendable to 80 MCM/year. The daily capacity shall meet the combined Jordanian and Israeli demands on a monthly base (+/- 8%), with a maximum flow in July (224,000 m3 / day), and a minimum flow in February (140,700 m3 / day). The potable water will be disinfected and will contain 0.1 to 0.5 mg/l residual chlorine
- The Product water will be stored on site in the Treated Water Storage Reservoir with a minimum active storage of 50,000 m3;
- A Brine reservoir collecting brine from the Desalination Plant through a short brine pipeline, and collecting seawater that will bypass the plant;
- Power Supply of about 75 MW will be provided by NEPCO. However, the power generated by the Hydropower plants (about 32 MW) will reduce the net demand;
- The product potable water will be discharged through the Israeli Desalinated Water Pipeline to the Israeli Border Water Delivery Point and to the Jordanian Water Delivery Point adjacent to the Desalination Plant

Environmental Pipeline:

- The Environmental Pipeline starts off with a 2 km long Ayla pipeline and an 18km long seawater pumping main. The section along the Aqaba Airport will be buried 2 metres deep along a 60 m wide strip east of the airport. The design capacity will be 525 MCM / yr (using 300 MCM / yr during phase I)
- A short Seawater pipeline bypassing the Desalination Plant, between the Seawater Reservoir and the Brine reservoir
- A short gravity mixed water pipeline, through which the combined brine and seawater flows freely from the brine reservoir to a Booster Pump Station.
- A Booster Pump Station with a capacity of 350 MCM – yr (using 235 MCM / yr during phase I)
- An ascending mixed pressured water pipeline from the Booster Pump Station to the High Level Regulating Reservoir
- A High Level Regulating Reservoir on the highest point along the environmental pipeline
- A Long Gravity Mixed Water Pipeline from the high reservoir down to the Dead Sea with a capacity of 350 MCM – yr (using 235 MCM / yr during phase I)
- Altogether the environmental pipeline will consist of a buried steel pipeline with a length of 214 km from the intake at the Red Sea to the Dead Sea, more or less following the route of Highway 65.

Figure 3 – Middle section of Environmental Pipeline route along Wadi Araba

Hydro-electric Power Plants:

- Three hydropower plants (HPPs) will be located along the long gravity mixed water pipeline.
- Integration will necessitate constructing by of a new 33/132 kV line from HPP3 to the existing Safi HV Collection Substation to transfer the generated loads. The BOT Contractor will construct the transmission system until the HV Collection Substation. NEPCO will install the HV transmission line from the HV Collection Substation to their Ghor Safi Substation. From here the power will be connected to the national Jordanian electricity grid.

Dead Sea Discharge:

- The mixed seawater / brine discharge point will consist of a concrete basin, allowing to collect accurate measurements of flow, water quality, water pressure and transient conditions;
- A short gabion lined section will be constructed towards the Dead Sea
- From here the water will find its own way to the Dead Sea. However, near the gabion the free flow of water may cause erosion of soils, which could eventually destabilise the gabion. This needs to be prevented pro-actively during the operations.

Summary

Figure 4 – Mixed brine and seawater discharge point

This draft ESIA includes a description of the strategic alternatives considered to save the Dead Sea from further deterioration and at the meanwhile generate potable water and energy for the benefit of Jordan, Israel and the Palestinians, as such also building a symbol of peace and co-operation for the Middle East. It was decided that the Red Sea Dead Sea Alternative is to be preferred, also for reasons of implementing the pilot project.

The overall very positive impacts of the RSDS Phase I project include clearly the augmented potable water supply for Aqaba and the South of Israel in the context of the severe water scarcity that Jordan and the region are facing. Secondly the RSDS Phase I project will contribute to a reduction in the decline of the Dead Sea due to the foreseen brine / seawater discharge. This is beneficial to the Dead Sea heritage, but also to the industry, tourism, and stakeholders and affiliated public that depend on the Dead Sea. Thirdly, the RSDS Phase I project caters for water sharing arrangement among Jordanians, Israelis and Palestinians, and therefore contributes to more efficient co-operation and more favourable conditions for reaching eventually a final peace settlement. These positive impacts associated to the RSDS Phase I Project are highly significant with far reaching scales and magnitude.

With regard to the intake project component, potential impacts relate to the sediment dynamics and marine ecology, including the sensitive issue of coral larvae circulation. It is recommended to consider reducing seawater flow velocities from 0.3 m/s to 0.15 m/s as per IFC guidance at the mouths of the intake facilities, and use advanced / BATNEEC technologies at the intake to diffuse the effect of the intake on water circulation.

Land and visual impacts will relate to the permanent project facilities as listed above and daily traffic related to the operations. In this respect it has been advised to realise a buffer zone of 10 - 20 metres including a natural visual barrier consistent with the local ecology, for instance consisting of (palm) trees and vegetation around the desalination Plant, the pumping station, the high level reservoir, the three hydropower plants and the Dead Sea discharge point.

One of the key Dead Sea related impacts, separate from the overall positive impact in terms of restoration of the Dead Sea, relates to potential chemical and biological alterations of the Dead Sea water due to Red Sea water and brine discharge. This could change the unique chemical composition of the Dead Sea, and could cause biological blooming and increased turbidity. The two latter may change

the appearance of the Dead Sea as well as its heat balance. This would have impacts on tourism and the Dead Sea potassium and bromine production industries.

Recommendations in terms of monitoring of the Dead Sea during phase I have been elaborated in annex 11, including a monitoring program that has been developed with support from and close cooperation of the Geological Survey of Israel (GSI). It consists four phases: Phase I, an baseline initial campaign in summer 2017; a baseline survey in phases II a+b from January 2018 until December 2021; and monitoring works starting with the RSDS operations in phase III. Furthermore, the establishment of an international research centre (IRC) in Jordan is proposed in phase II b to complement the activities of the Israeli side and to establish better international cooperation. Staffing, office space, sea and road transport facilities and a list of lab equipment have been suggested in this annex 11 as well.

Key impacts with regard to the terrestrial ecology along Wadi Araba relate to the proximity of the Aqaba Bird Observatory and sensitive flora and fauna along the pipeline route. To minimize disruptions it is proposed to set up an ecological monitoring program prior to the construction of pipeline on intervals of 10 km, in order to prevent ecological damage and provide ecological clearance. It is also advised to consider changing the pipeline route closer to the existing road along two sections to avoid the threats to these vulnerable trees and important desert breeding bird's nests. See details in figure 43.

Key impacts related to archaeology relate to sites that have been classified as high risks are located within 50 m from the pipeline route. It is proposed to set up an archaeological site monitoring and clearance program for each section of 10 km in advance and 50 m wide of the actual construction works. This can be executed in parallel with the proposed ecological clearance program.

The Project is located in an active seismic zone associated to the Dead Sea Fault System. This requires that special arrangements should be applied where the facilities and pipe crosses these fault areas, including the use of special flexible couplings which allow deflection and elongation of the structures and pipes during a seismic event. This may include site response studies at all construction sites (i.e. hydroelectric power plants, RO plant, and pumping station) to determine the local potential ground acceleration and potential liquefaction (mainly at the intake station). This information should then be included in the design of the structures following international accepted building/design codes for earthquakes. It is advised to apply EN Eurocodes or similar international design codes. These are a set of European standards dealing with extreme loads such as earthquakes. It should be noted however that the current preliminary RSDS Phase I design already allows for deflection and elongation of the pipeline couplings to mitigate the consequences of seismic risks.

The northern parts of Aqaba are vulnerable for flood hazards. However, the Aqaba Special Economic Zone Authority (ASEZA) has committed to address and manage the risk of flooding by providing protection against Wadi Yutum through the Aqaba Development Company. However, the BOT contractor is requested to confirm that the appropriate and timely measures have been taken in terms of effectiveness. If not, the BOT contractor is advised to prepare for the required measures well in advance of the construction and operational phases.

The project is developed in a politically turbulent region; however security threats in Jordan are very well managed. It is advised that adequate security management measures are taken, including preventing uncontrolled public accessibility to the key project infrastructure facilities, to be managed by the competent Jordanian security authorities in co-operation with the BOT Contractor and operator. It is noted however that most of the pipeline route, up until the third hydropower station, is located in the existing Jordanian security area along the border with Israel.

In terms of climate change, the project area is subject to increasing droughts and flooding risks. Various adaption and mitigation measures are proposed, including considering the use of sustainable non-fossil energy resources, such as the use of solar parks to meet part of the project's power demands.

Risks in terms of seawater and brine leakages are among the major potential impacts of the project. It will be of utmost importance to minimise risks of groundwater pollution due to seawater leakage, incidental or as result of for instance earthquakes. Several means to eliminate, reduce and control leakage of seawater the conveyance pipeline have already been incorporated into the preliminary scheme design. In addition, Posch and Partners (PAP, August 2017, see annex 10) suggest the provision of emergency butterfly valves, which close automatically in case of pressure drop, as part of an overall emergency leakage control device set. The economic optimal spacing for the northern pipeline section would be 9 km, and for the southern section this would be 6.8 km. Totally 12 emergency devices are suggested by Posch and Partners, some of which could also serve as isolation valves on either side of a sensitive geological fault line crossing.

These emergency valves would be connected to an instrumentation and control system that immediately identifies any abnormal changes in flow or pressure and shuts the isolation valves in such an event. In addition, it is advised to establish of a number of monitoring wells at strategic locations along the seawater conveyance, in both Jordan and Israel.

In case of a catastrophic failure of the pipeline substantial volumes of seawater or brine would still be discharged into the Wadi Araba aquifer system, which would mix with the relative fresh natural groundwater. Practically it will be very difficult to clean up the polluted soil and groundwater systems.

In addition to groundwater monitoring, an Emergency Response Plan should be designed in conjunction with the design and operational procedures of the Scheme. This plan would be implemented if such major leakage of seawater from the system is suspected due to operational failures, or major accidents such as earthquakes or sabotage.

The total number of households living in the communities along the scheme as of December 2015 is 11,160 composed of 64, 371 family members of which 33,904 are males and 30,467 are females. If the pipeline buffer zone is assumed 100 m wide, then the total land take for the RSDS Phase I project will be around 2,100 ha (21,000 dunum) and the total number of affected parcels would reach to about 1000. Once constructed, the permanent land take of the RSDS Phase I project is estimated to be around 880 ha (8,800 dunum). The project will require the preparation and implementation of a Resettlement and Compensation Action Plan (RAP) according to Jordanian and international (IFC, EU) standards.

Residual impacts of the RSDS Phase I project relate to the Red Sea marine environment as result of the seawater abstraction; the continuing, although reduced decline of the Dead Sea water level, the permanent land take and land use changes caused by the project, and the GHG and climate change related impacts caused by the fossil generated power consumption during operations of the project. However, a major residual environmental risk relates to seawater leakage into the Wadi Araba groundwater system in case of catastrophic failure of the pipeline. Residual impacts after the lifetime of the RSDS would relate to remaining project facilities, stockpiles and any soil or groundwater pollution near the project sites. Final decommissioning of the project would require dismantling and removal of the surface and subsurface structures, reuse of recycling of waste materials, rehabilitation of any soil or groundwater pollution and landscaping and replanting after decommissioning. However dismantling of

the 220 km buried pipeline would not be required due to low associated residual risks and high rehabilitation costs.

This report includes an elaborated Environmental and Social Management Plan for the pre-design, construction and operational phases of the project, including monitoring, presented in sections 8 and 9. The key elements of the ESMP related measures include land expropriation, compensation, leakage control, two pipeline diversions suggested by the ESIA Consultants; and buffer zones with an estimated total investment of about 45 – 49 M€. See details in section 9.4. In addition, the ministries of Water and Irrigation, Environment, Antiquities and MAIA shall ensure that sufficient staff, capabilities and operational budgets are available to ensure monitoring, enforcement and co-operation with the BOT contractor in accordance with all BOT Contract and ESMP related requirements.

2 INTRODUCTION

2.1 Purpose of the terms of reference

The European Investment Bank (EIB) procured the services of Royal HaskoningDHV in December 2016 to undertake an updated Environmental and Social Impact Assessment (ESIA) for Phase 1 of the Red Sea Dead Sea Project (RSDS Project). This report presents the draft final ESIA and related Environmental and Social Management Plan (ESMP). A list of reference literature and bibliography is presented in Annex 3 [lit 1 to 37]

The purpose of the Terms of Reference for this assignment is completing an Environmental and Social Impact Assessment Report (ESIA Report) to update the existing Environmental and Social Assessment for the Red Sea – Dead Sea Water Conveyance Study issued in draft in 2011 and finalised in 2014 by ERM and partners for the World Bank [lit 13]. This updated ESIA Report draws on this 2011 ESA and information gathered from previous, concurrent and future studies to be carried out for the Red Sea Dead Sea Project, including feasibility, engineering and environmental surveys with an emphasis on any potential material changes in expected environmental and social impacts as a result of the current Project design.

The purpose of this draft final ESIA Report is to address the gaps of the previous environmental and social assessment (ESA) performed by ERM under the World Bank Study (final report 2014) in the context of the current Project Phase I design. The need for an updated ESA Report arises from the following considerations:

- The concept design under the current Project differs from the preferred design option assessed under the 2011 ESA (final report issued 2014) [lit 13];
- Since the 2011 ESA was carried out on preliminary designs under the Feasibility Study some aspects were not sufficiently defined in order to carry out a full assessment, e.g. land take and associated impacts;
- Much of the fieldwork under the 2011 ESA was completed in 2010 and 2011, meaning that it is now five years old or more; e.g., ecology and socio-economic surveys;
- The ToR for the 2011 ESA did not specify obtaining an environmental license and as such none were sought.

Dar Al-Handasah and partners prepared an Addendum Report to the 2011 ESA (2016 ESA) based on the Phase I project design and on previous studies and reports [lit 9]. This 2016 ESA has been performed without performing additional field surveys and data collection necessary to meet the requirements of International Financing Institutes (IFIs) for Environment Category A type projects. The 2016 ESA has been made available and has been used to set the scope of work for the current ESIA.

Within the framework of the current ESIA, the Consultant advises the Promoter about those issues that are likely to negatively affect IFIs attitude to the Project and discuss with the Promoter potential mitigation measures.

Within the framework of the current assignment, the Consultant has:

- Finalised the current ESIA Report (ESIA 2017) for the Project upon comments of the competent environmental authorities and key stakeholders of the project in line with national regulations, the EIB and EU environmental standards, the WB/IFC Standards, as well as applicable IFC/WB Environmental and Social Policies and Guidelines;

- Liaised with the Promoter, its advisors and representatives as identified by the Promoter, relevant government authorities, communities, identified Project donors/investors and other key stakeholders;
- Managed the entire process of the ESIA Report up to the finalisation and public disclosure of the findings;
- The Jordanian and Israeli Joint Administration Board (JOB) for the Red Sea Dead Sea Project acted as the platform to deliver any comments to the Consultant on the Draft ESIA on behalf of both parties

As part of the current assignment, the Consultant shall obtain the environmental permit for the final ESIA from the relevant Jordanian competent environmental authorities on behalf of the Jordanian Ministry of Water and Irrigation.

2.2 Identification of the development project to be assessed

In the context of the urgent need for potable water in the Hashemite Kingdom of Jordan and the need for saving the Dead Sea from further environmental degradation, the current 'Red Sea Dead Sea Project Phase I aims to meet four primary objectives of the Government of Jordan (GoJ):

- Establish a secure and affordable water supply for Jordan while saving the Dead Sea from extinction;
- Support widespread economic growth in Jordan;
- Provide for a potential regional water supply for Jordan, Palestinian Authority, and Israel; and
- Facilitate private and public financing and partnership by implementing the project based on a Public Private Partnership (PPP) scheme.

Phase I of the RSDS Project comprises abstracting 300 million cubic metres (MCM) per year from the Red Sea, desalinating a portion of this (65 MCM) and then conveying a mix of the waste brine and the remaining seawater balance (235 MCM) to the Dead Sea. Freshwater will be supplied to Aqaba and the southern part of Israel respectively. This project will also be used as a pilot to determine the impacts on the Red Sea and Dead Sea in order to inform the design of the next phase that will see the RSDS Project increase its capacity to 700 MCM per year. Final decisions and detailed outlines for the next phases have not yet been made, and their environmental and social impacts fall out of the scope of this ESIA for the RSDS Phase I.

The RSDS Phase 1 Project includes delivery of potable water through an Israeli Water Pipeline from the Treated Water Tank at the Desalination Plans to the Border Delivery Point; and delivery of potable water to a Jordan Water Delivery Point adjacent to this Treated Water Tank. It is foreseen that a Jordan Water Pipeline will be constructed from the Jordan Delivery Point to the Aqaba High Terminal Reservoir under a separate contract. This will require a separate ESIA procedure, beyond the scope of this current ESIA.

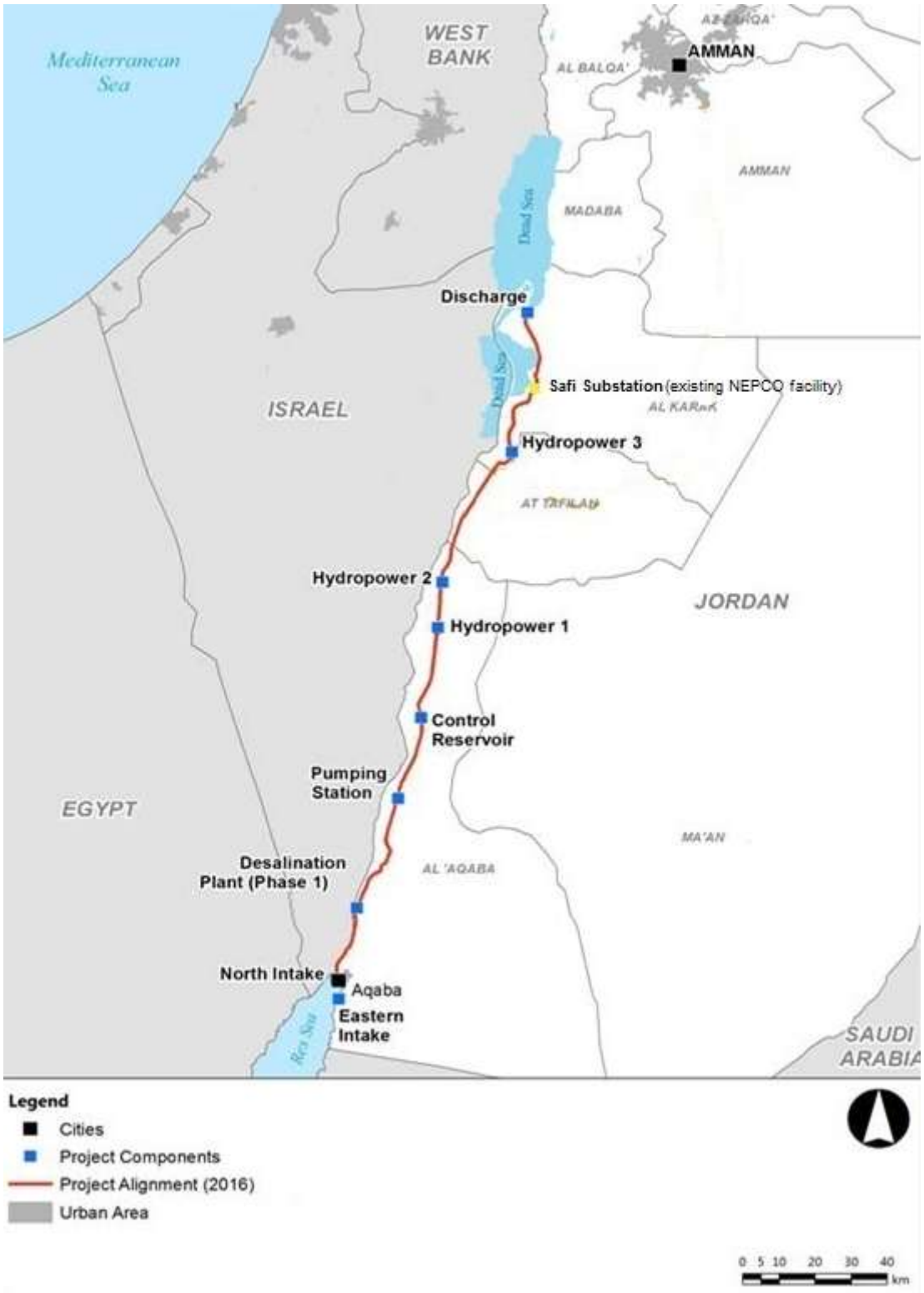

Figure 5 – Project Layout RSDS Project Phase I (total length: 210 km)

The capacities of some of the Phase I Project components will also take into account the expected Phase II flows as follows:

- The intake system will be designed to abstract 700 MCM/year from the Gulf of Aqaba;
- The long seawater pipeline will be designed to transfer 525 MCM/year of seawater from the Intake System to the Desalination Plant (Sea water reverse osmosis)
- The mixed water pipelines will be designed to transfer 235 MCM/year from the Desalination Plant to the Dead Sea Discharge point, and may be extended to 310 MCM / year under phase II
- The Dead Sea discharge point will be designed to discharge 235 MCM/year into the Dead Sea, and may be extended to 310 MCM / year under Phase II

The design capacity of the Desalination Plant will only cater for the Phase I supply to Aqaba and southern Israel, meaning that a new Desalination Plant should be constructed to produce the additional phase II potable water flows. For now it is foreseen that the additional phases II, III and IV potable water production will be conveyed to Amman.

The mixing of large amounts of seawater and brine from a desalination plant with water of the Dead Sea has been a major point of attention in the Word Bank studies. Extensive studies were done on this subject and the findings are included in the “Dead Sea Study” report of Tahal et al of August 2011. The main concerns are: i) whether the bay follows the main water body in its meromictic (stratified) and holomitic (mixed) periods or not; ii) potential alga blooms and growth of red halophilic archae-bacteria (reddish colour) caused by massive fresh water inflow and availability of phosphate; and iii) possible “whitening” of the Dead Sea caused by calcium carbonate, as mixing the SO42--rich seawater with DS water is bound to result in gypsum precipitation; however, the rate of nucleation and number of nuclei from any mixture with seawater and/or brine is unknown.

The study concludes that brine/seawater inflows in excess of 400 MCM/year pose the possibility for disturbance of the Dead Sea conditions. The study does not further elaborate on the brine quality requirements, other than that this originates from the Red Sea. So the first phase of the DSRS project should stay below this limit and extensive monitoring should be done in the Dead Sea to study the effects of mixing and to be able to predict effects caused by higher inflows in a later phase.

Annex 11 presents a monitoring program developed by Posch and Partners with support of the Geological Survey of Israel (GSI) consisting of four phases: Phase I includes a baseline initial campaign in summer 2017; Phase II a/b include a baseline survey from Jan. 2018 until Dec. 2021; and Phase III presents the monitoring requirements at the start of the RSDS Phase I operations.

The total Phase I flow of mixed seawater and brine into the Dead Sea will not exceed 400 MCM / yr, in line with the maximum acceptable threshold flow identified during the World Bank Studies.

The Government of Jordan is in the process of issuing tenders for five shortlisted international consortia for a contract for the design, built, operate, co-finance and transfer of the RSDS Phase I project. Preliminary design and tender documents for the Phase I project have been prepared by the engineering firm Dar Al-Handasah and partners on behalf of the Ministry of Water and Irrigation (MWI). The aim of the BOT contract is to:

- Form a RSDS Project Company,
- Carry out detailed designs for all components of the RSDS Phase I project
- Offer prices for the construction and operating costs
- Jointly finance the capital expenditures (CAPEX) of the RSDS Phase I Project (about 400 MUSD public finance and 700 MUSD private finance might be required),

- Fully finance the operational expenditures (OPEX) of the project
- Collect revenues from the sales of potable water and Dead Sea water discharge. Unit prices shall be offered in their bids.
- The power generated by the hydropower plants will be offset against purchased power from NEPCO.
- Secure the necessary approvals;
- Supply equipment for all Project Components,
- Construct, test and commission the Project Components,
- Operate and maintain the Project Phase I for a period of 25 years
- Transfer the project operations after completion of the 25 year period

The outcomes of the final ESIA (the Draft ESIA is presented in this report), including the implementation of the related environmental and social management plan shall be incorporated by the shortlisted consortia in their final bids.

Other projects will be executed to monitor the effect of the abstracting seawater from the Red Sea and discharges of mixed brine and seawater into the Dead Sea. The data generated through the Phase I project will be used to calibrate existing models and to examine the effect of increasing abstractions from the Red Sea and the effects of discharges into the Dead Sea in the medium to long term.

2.3 Arrangements for the environmental and social assessment

2.3.1 General Arrangements

The Promoter of the RSDS Phase I project and the formal applicant for the current ESIA is the Jordanian Ministry of Water and Irrigation (MWI). The competent authority for this environment and social assessment is the Jordanian Ministry of Environmental Affairs. Reference to the Jordanian legal requirements is provided further in this report.

The Joint Jordanian - Israeli Administration Board (JAB) includes representatives from the key authorities of both countries and is responsible for taking decisions concerning the RSDS Phase I Project, including the selection of the BOT concessionaire. As such it is responsible for coordinating all project aspects including the transboundary aspects of the project, such as the interventions in the Red Sea and Dead Sea as shared water bodies. It was decided that feedback from the Israeli environmental authorities on the draft ESIA will be channelled to the Consultant through the JAB.

The RSDS programme furthermore include a water exchange arrangement between Israel and Jordan, where Israel will purchase part of the potable water produced by the Phase I Desalination Plant near Aqaba, and in return will provide a similar amount of raw water to Jordan from Lake Tiberius in the north. In addition, the RSDS programme includes a water agreement between the Israel and the Palestinian Authority, under which potable water will be sold and delivered by Israel to the West Bank.

The Agence Française de Développement (AFD) has been appointed the Lead Transaction advisor to the MWI for the Red Sea-Dead Sea Project/Phase I to be implemented under the above Public-Private Partnership (PPP) arrangements. For this purpose, AFD, MWI and the European Investment Bank (EIB) have entered into a Cooperation Agreement for the implementation of a technical assistance (TA) operation for the provision of technical studies of the Project, including the current ESIA a well a separate Brine Study performed by Posch and Partners (Switzerland) and an Economic study performed by ICEA (France).

This environmental and social assessment has been performed by the following team of experts:

Ecological /Birds Expert:	Mr. Adnan BURIERI
Socio-economic Expert:	Dr. Amer JABARIN
Cultural Heritage Specialist:	Dr. Mohammed WAHEEB
Baseline / GIS Expert:	Dr. Samer TALOZI
Social Specialist:	Mrs. Margriet HARTMAN
Desalination Specialist:	Mr. Jan THERON
Key Expert 2 / Marine Specialist:	Dr. Elizabeth JOLLEY
Key Expert 1 / Project Manager:	Mr. Jeroen KOOL

This environmental and social assessment has been performed through the following arrangements.

2.3.2 Review of previous studies related to the project

An in-depth literature review has been conducted to obtain an initial understanding of the environmental and social issues influencing the Project. This has been reported in the Inception Report.

The Consultant has analysed all data information gathered and have identified the gaps between the 2011 ESA and the current RSDS Phase I project. For the remainder of the project the Consultant kept systematic track on the gaps that has been observed and the changes that have been made in this ESIA report.

2.3.3 Inception Phase

The Consultant prepared an Inception Report to detail the work methodology, approach and detailed work plan for the updated ESIA and the results of the scoping phase. As part of the scoping phase, the Inception Report presented a detailed review of the 2011 ESA in the context of its validity to the current design changes under the RSDS Phase I Project.

The Inception Report:

- identified any potential material changes to Project impacts as a result of design alterations;
- verified and validated existing baseline data, studies, surveys and relevant impact analysis (in terms of methodology, coverage and date);
- checked the credibility and comprehensiveness of the data, validity of technical assumptions and constraints;
- Where any gaps were identified, additional data collection, surveys, studies, consultation, validation and/or impact analysis have been conducted as part of this environmental and social assessment.

During the Inception Phase the following meetings were conducted:

Donor Conference Dead Sea, 1 December 2016
The Consultant participated in the Donor Conference on the 1st of December 2016 headed by the Ministry of Water and Irrigation, during which various presentations and updates on the RSDS Phase I project were provided by the Minister of Water and Irrigation H.E. Dr. Hazim El Naser and key staff of the Ministry in Jordan, as well as representatives of Israel, the Palestinian Authorities, as well as representatives of the USA, EU member states, the EIB, the World Bank, and the AFD.

Kick Off Meeting for ESIA and Brine Studies in Luxembourg, 22 December 2016
The Consultant participated in the Kick Off Meeting for the ESIA and Brine studies at the EIB Head Quarters in Luxembourg on the 22nd of December 2016. During this meeting roundtable presentation were provided by all participants;

ESIA Team Kick Off Meeting in Amman, 23 January 2017
The Jordanian and international ESIA Team member met in Amman on the 23dr of January to discuss the project specifics and individual responsibilities during the Inception Phase and beyond. Related contractual issues were clarified and detailed planning was discussed;

Follow-up meetings in Amman and Israel
Follow up meetings with the AFD, the MoEnv and the MWI and with various marine and environmental parties in Israel took place to discuss a variety of project issues in the period from 24 to 31 January 2017

Inception Workshop, 8 February 2017
A Draft Inception Report was issued on the 1st of February and next discussed at the Kempinski Hotel at the Dead Sea on 8 February among participants from the EIB, AFD, Dar Al-Handasah and partners, the MWI, Aseza, the Geologivcal Survey of Israel, the MoEP of Israel, the MoEnv of Jordan, USAID, Posch and Partners.

After comments received, the final Inception Report was issued on 24 March 2017.

2.3.4 Complementary Studies

The following complementary studies and activities were performed to address the information gaps identified:

Site Drive and Walkover
A site drive and partly walkover were performed on the 12th of February along the entire pipeline route to establish any constraints which might affect the construction and operation of the Project and that may have an adverse environmental and/or social impact, including particular topographical features, land use conditions and ecological features;

Marine ecological Survey
A Marine ecology surveys to establish the presence / absence of sensitive habitats and species at the proposed Red Sea intake location. The survey includes a dive survey to determine the species associated with the seagrass beds down to a maximum of 25m

Interviews in the Aqaba Region
Interviews with fishermen and marine experts (e.g. ASEZA, Marine Science Station (MSS) were conducted in Aqaba and with the Interuniversity Institute For Marine Sciences In Eilat. In view of all studies and water modelling currently being done for larvae the Consultant assumed that any kind of modelling will not be needed.

Terrestrial Ecological Survey
Terrestrial ecology surveys were done during February and March to include the re-validation of previous surveys and an assessment of formerly unstudied areas due to the changes in alignment and Project components, with particular focus on Important Bird Areas (IBAs), soaring birds, and seasonal avifauna.

Cultural Heritage Survey

The Cultural Heritage surveys consisted of a desk based analysis, re-validation of previous findings, collaboration with the Jordanian Department of Antiquities and detailed site walkovers to confirm the presence/absence of areas of cultural importance.

Socio-economic Survey
Land use and socio-economic surveys for any settlements/activities in the vicinity of the Project and its infrastructure as input for land expropriation and resettlement action plan have been conducted.

2.3.5 Consultations with Key Stakeholders

The objective of the stakeholder consultation events with key stakeholder groups were twofold, they serves for: (1) reaching consensus on the Promoter's, Lenders' and Consultants' approach to Environmental and Social issues during preparation, construction and operationalisation of the Project; and (2) for preventing communicative issues later on in the Project and to identify missing Environmental and Social issues.

In order to assure the involvement of key stakeholders in the Project, first of all key stakeholders have been identified by the Consultant in collaboration with MWI, AFD, EIB and the Jordanian Ministry of Environment (MoEnv). The following meetings were conducted:

- Meeting with the Aqaba Special Economic Zone Authority (ASEZA) to discuss the baseline and key challenged for the Red Sea and Aqaba region (Aqaba, 12 February 2017)
- Meeting with the Marine Science Station in Aqaba to discuss the marine surveys required under this ESIA (Aqaba, 12 February 2017)
- Meeting with the Israeli Oceanographic and Limnological Research Center (IOLR) to discuss the Israeli view on particularly the Red Sea project component (Haifa, 28 March 2017)
- Meeting with the Israeli Ministry of Environmental Protection / Marine Environmental Protection Division, conducted in Haifa with Mr, Rani Amir, head of division and Dr. Dror Zurel, Marine Ecologist and Monitoring and Research Coordinator, March 2017
- Meeting with the Jordan Marine Conservation Society (Aqaba, 2 April 2017)
- Meeting with the Aqaba Fisher Organisation (Aqaba, 3 April 2017)
- Various meetings with the MWI, MoEnv, city councils in Wadi Araba and the JVA (March, April, 2017)

A Stakeholder Engagement Plan for the RSDS Project Phase I has been prepared by Posch and Partners as part of their assignment by the European Investment Bank. See annex 1.

2.3.6 ESIA Scoping Workshop

The consultant organised a scoping workshop for the ESIA update in the Mövenpick Hotel in Aqaba on the 6th of April 2017. The list of participants and minutes of this workshop are included in annex 2. The objective of this workshop was to present and discuss the key environmental and social impacts that have been identified during the baseline survey of this ESIA, and to provide an outlook to the potential mitigation measures. Feedback received through this workshop has been used to further prepare the current Draft ESIA Report.

The Scoping Workshop was opened by H.E. Eng. Saad Abu Hammour, Secretary General of the Jordan Valley. Next an introduction on the position of the European Investment Bank was given by Mr. Juan Bofill, followed by an introduction to the RSDS Phase I project by the Consultant's team leader and a presentation of the Draft Stakeholder Engagement Plan by Mr. Rami Salameh of Posch & Partners. The

ESIA Team next presented the key impacts and potential mitigation measures for the different fields, including for the Gulf of Aqaba; terrestrial ecology; cultural heritage and socio-economics.

The afternoon session included a round table discussion with the participation, chaired by Mr. Nabil Zoubi, Project Director of the RSDS Project at the MWI. The workshop was officially closed by H.E. Eng. Saad Abu Hammour.A second Consultation Workshop, following the completion of the current draft ESIA, is scheduled for the 11th of June 2017 in Amman.

2.4 Background information of the proposed project

2.4.1 Back ground and History of the RSDS Phase I Project

This section provides back ground information and a brief description of the major components of the RSDS Phase I project.

The Red Sea-Dead Sea project concept was first promoted in the late 1990s by Jordan, Israel and the Palestinian Authority. The peace treaty signed between Jordan and Israel in 1994 marked next an important step for regional cooperation on water projects. It allowed for water sharing and details the potential to provide additional reliable and cost efficient water resource from desalination, including the allocation of water resources between Jordan and Israel from Yarmouk and the Jordan River, and from cross-boundary aquifers. The treaty also called for the need to implement joint water projects to offset the need in both countries.

During the Johannesburg World Summit (2002), and the third World Water Forum in Kyoto (2003), the parties recognized the need for a plan to save the Dead Sea from environmental degradation, to provide desalinated water, to generate energy at affordable prices and to build a symbol of peace and cooperation in the Middle East. Based on this, two separate studies were undertaken in order to assess the feasibility of a Red Sea-Dead Sea development scheme.

World Bank Studies
The first separate study was initiated in 2005 by Israel, Jordan and the Palestinian Authority through a joint request to the World Bank to sponsor a feasibility study and an environmental and social assessment of a RSDS project, which would convey water from the Red Sea to the Dead Sea and desalinate some of the seawater.

The objectives were to stabilize the water level and prevent further environmental degradation of the Dead Sea, supply fresh water to Jordan, Israel and the Palestinian Authority and to serve as a model for regional cooperation. The Red Sea-Dead Sea Study Program was conducted between 2008 and 2013 and included a Feasibility Study performed by Coyne et Bellier and partners [lit 7]; an Environmental and Social Assessment performed by ERM and partners [lit 13]; and the Dead Sea Study by Tahal and the , Geological Survey of Israel [lit 26]. Various additional sub-studies were executed as well.

The World Bank sponsored Study Program concluded that the project was technically and economically feasible. It also concluded that it would be justified to implement a first stage pilot project to examine in more detail the environmental and social impacts, particularly in and around the Red Sea and the Dead Sea. This pilot phase I project would lead the way to a larger, expanded project, which would provide additional desalinated water and clean electric energy. The related seawater and brine flows would be sufficient to save the Dead Sea from complete eventual extinction.

Studies by the Government of Jordan
The second separate study was launched in 2008 by the Government of Jordan under the name of the Jordan Red Sea Project (JRSP) and executed by MWH and partners. It aimed at providing further details on the brine disposal management options; additional development projects to offset the cost of the water project; and recommendations on project phasing and associated costs.

RSDS Phase I Project
Based on the conclusions these studies, Israel and Jordan agreed on the definition of the legal concepts and parameters of the RSDS Project Phase 1 in the context of the bilateral agreement signed in February 2015 (the "Bilateral Agreement").

According to the Bilateral Agreement the Project will be executed by a BOT concessionaire, selected through an international tender. The Joint Administration Board (JAB) was established and Jordan and Israel agreed to nominate two project co-managers jointly responsible for the day to day management of the Project. Furthermore both sides hired experts for the various technical, legal and financial aspects of the project.

In addition, the AFD and the European Investment Bank (EIB) entered in April 2016 into a Cooperation Agreement with the MWI for the implementation of a technical assistance (TA) operation for the provision of technical studies of the Project, including the current ESIA, a separate Brine Study and an Economic Impact Study. These studies are financed through the EU Neighbourhood Investment Facility.

It was furthermore agreed that any formal decision by the JAB, such as the Call for Prequalification, the selection of the short list and the selection of the BOT concessionaire, shall be issued for approval to the Jordanian Special Tender Committee (STC) in accordance with Jordanian Law and the recommendations of the JAB.

2.5 Statement for the project need and objectives it is intended to meet

Jordan is considered one of the ten most water scarce countries in the world (about 92 percent of the country is desert) and its municipal water deficit is estimated to have recorded a 310% increase in the last 15 years. High population growth, the depletion of groundwater reserves and the impact of climate change are likely to further aggravate the situation in the future. Water scarcity in Jordan is also exacerbated by the influx of refugees as a result of conflicts in neighbouring countries. At the moment, it is estimated that some 1.3 million registered and non-registered Syrian refugees reside in Jordan.

It is estimated that more than 90 percent of the Jordan River has been diverted, thus considerably decreasing the flow of fresh water into the Dead Sea. In addition, potash industry ponds, located on the Jordanian and Israeli shore of the Dead Sea, evaporate a further 250 – 300 MCM per annum. As a result, the level of the Dead Sea has been rapidly declining at a rate of over 1 m per year and the Sea's surface area has shrunk by from 960 km² to 620 km² over the last 50 years.

In the context of the urgent need for potable water in the Hashemite Kingdom of Jordan (Beneficiary country) and the need for saving the Dead Sea from further environmental degradation, the Red Sea Dead Sea Phase I Project aims at meeting four primary objectives of the Government of Jordan (GoJ): establishing a secure and affordable water supply for Jordan while saving the Dead Sea from extinction; support widespread economic growth in Jordan; provide for a potential regional water supply for Jordan, Palestinian Authority, and Israel; and facilitate private and public financing and partnership by implementing the project based on a Public Private Partnership (PPP) scheme.

2.6 Project implementation strategy

Phase I of the RSDS project will be implemented through a PPP concept, where the contractor shall establish a special purpose company for the design, built, (co-)finance, operate (25 years) and eventually transfer the project to the Government of Jordan. To date, potential grant funding to the project has been proposed by USAID, and by the EIB and ADF in terms of a mixed loan and grant facility, an in kind contribution through the Japanese Government, a Partial Risk Guarantee from the World Bank and grant funding from the government of Italy.

Phase I of the project also serves as a pilot to monitoring and study the impacts of abstracting seawater from the Red Sea and discharging a mix of seawater and brine into the Dead Sea. This will enable the Government of Jordan and its partners through the JAB to calibrate the next phases of the RSDS project.

Under Phase II the RSDS project aims to withdraw around 700 MCM of seawater per year from the Gulf of Aqaba and Eilat and produce a total of 390 MCM / yr of potable water. This requires a new Desalination Plant to be constructed later during the RSDS program in the Dead Sea basin. However, the details of the next phases are yet to be determined pending the results of the pilot Phase I project.

This augmented potable water supply would mainly benefit Amman (up to 560 MCM / yr), but also Aqaba (30 MCM), Israel and the Palestinian Authority (60 MCM) an about 170 MCM still to be allocated. Supplying potable water to Amman from the RSDS project would require a 150 km buried pipeline from the second desalination plant to the outskirts of Amman and related pumping station.

The final ESA of 2014 [lit 13] indicated that an inflow of maximum 400 MCM / yr of seawater into the Dead Sea would be a threshold in terms of limited and acceptable impacts on the water quality and physical characteristics of the Dead Sea. Further monitoring and studies will be required to determine whether more water might be discharged into the Dead Sea within acceptable environmental and socio/economic impact margins.

Pending the Phase I pilot and Dead Sea monitoring results, the RSDS Project might eventually reach a discharge 1,150 MCM / yr of mixed seawater and brine into the Dead Sea. As stated before, this depends however on the assurance that this will not have unacceptable physical or chemical impacts on the Dead Sea. The discharge flow would be more or less similar to the original inflow of water from the Jordan River into the Dead Sea (about 1,200 MCM / yr) around 70 years ago. The net balance of the Dead Sea is currently estimated to be 700 MCM / yr (total evaporation minus total inflow), meaning that the proposed 1,150 MCM discharge would lead to stabilisation of the Dead Sea water level, and even a slow increase of the Dead Sea level towards the water levels around 70 years ago.

2.7 Project alternatives considered

In the environmental and social assessment performed under the World Bank studies program a study on alternatives has been performed by an independent team of experts (ref 13: ESA Main Report Mar 2014).

The key challenges for the alternatives were to address saving the Dead Sea from further deterioration and at the meanwhile generate potable water and energy for the benefit of Jordan, Israel and the Palestinians, as such also building a symbol of peace and co-operation for the Middle East. Comparison of the alternatives was done in terms of economic, environmental, technical and financial considerations.

A no-alternative option was elaborated in terms of taking no actions, to see what consequences this would have on the future Dead Sea and the people depending on it, as well as on regional water scarcity and regional co-operation. Under this option it was assumed that the population growth rates remain constant, and the Dead Sea would continue to deplete from a current volume of 125 km3 down to 89 km3 by 2070.

A large series of alternatives have been considered under the Works Bank ESA work to safe to Dead Sea and augment the regional water supply at the same time, including restoring the historic fresh water inflow through the Jordan River into the Dead Sea combined with heavy water demand reduction programs, or transferring seawater and desalinating seawater from the Mediterranean instead of from the Red Sea, or transferring water from the Euphrates River or from Turkey by pipelines of ship. The assessment showed that only the transfer of water from the Red Sea or the Mediterranean would be able to save the Dead Sea from environmental degradation and meanwhile produce substantial amounts potable water, meanwhile generating electricity at affordable prices.

A third main alternative, which combines desalination at Aqaba and the Mediterranean Sea, Water Importation from Turkey and Water Recycling and Conservation would need at least thirty years to work out, and would be complex in terms of co-operation among the three Core Parties as well as Turkey.

It was decided that the Red Sea Dead Sea Alternative is to be preferred, also for reasons of implementing the pilot project. Next alternative configurations have been studied and compared within the Red Sea Dead Sea project in terms of Seawater intake; pipeline configuration and location of related reservoirs; hydropower stations, desalination stations and outflow locations into the Dead Sea. These alternatives are discussed and compared in more detail in section 4 below.

2.8 Current Project status and timetable

Preliminary designs for RSDS Project Phase I and tender documents for the BOT tender have been completed on behalf of the Ministry of Water and Irrigation and the Joint Administration Board by Dar Al-Handasah and partners in April 2017.

The Government of Jordan is in the process of issuing tenders to five shortlisted international consortia for the design, built, operate, co-finance and transfer of the RSDS Phase I project. The current ESIA, as well as the parallel Brine Studies and Economic Studies have been assigned by the European Investment Bank late 2016 and are currently underway. Draft reports will be presented and discussed with key stakeholders in Amman in the 11th of June 2017.

The Brine Study included a section describing the impacts of operational water leakages from the environmental pipeline on the Wadi Araba aquifer systems, as well as risks of large accidental leakages associated to potential seismic events or sabotage attacks and proposed mitigation measures. This

section will be incorporated in the draft ESIA. The Brine study will furthermore include a separate Stakeholder Engagement Plan for the RSDS Phase I project.

The final ESIA including ESMP is foreseen late 2017, however depending on the evaluation and approval of the competent environmental authorities in Jordan and in Israel through the JAB. Based on the final and approved ESIA / ESMP the competent authorities will issue the Environmental Permit for the RSDS Phase I project.

The conclusions and actions presented in the final and approved ESIA and ESMP shall be incorporated in the bids of the shortlisted Consortia. Within 6 to 12 months the winning Consortium shall be notified and assigned to the project following successful completion of the contract negotiations with the preferred bidder. The winning Consortium shall establish a Project Company to initiate all Design and Works necessary to achieve final completion of the Project Components in accordance with the periods set out in the tender documents time schedule and the provisions set in Volume 2F of these tender documents. This shall include all pre-commissioning activities, including testing of Equipment prior to introduction of water into the conveyance.

When the Project Company has successfully commissioned the Project Components in accordance with the requirements and procedures of the approved Commissioning Programme and performance testing has demonstrated that the Project Components meet the performance requirements of this Tender, then the Project Company may submit a notice to the Client requesting a Construction Completion Certificate.

Upon approval by the Client of the Project Company's start-up plan, start-up schedule and start-up procedures and subject to the approval by the Client of the Project Company's request to commence operational testing, the Project Company shall proceed with start-up of the Project Components in accordance with the approved plan. The Project Company shall be commissioned to operate the project for a 25 years period and then handing over the Project Components to the Client in a condition that will ensure operation of all equipment and facilities for the next 25 years.

2.9 Associated Projects

One project are directly associated to the current RSDS Phase I project relates to conveyance of the produced potable water from the Jordanian Delivery Point near the from the RSDS Phase I Desalination Plant to the Aqaba High Terminal Reservoir.

2.10 General Scope of ESIA and related Studies.

The overall objective of this Environmental and Social Impact Assessment is completing an ESIA Report to update the existing Environmental and Social Assessment for the Red Sea – Dead Sea Water Conveyance Study issued in draft in 2011 and finalised in 2014 by ERM and partners for the World Bank [lit 13]. The updated ESIA Report will draw on this 2011 ESA and information gathered from previous, concurrent and future studies to be carried out for the Red Sea Dead Sea Project, including feasibility, engineering and environmental surveys with an emphasis on any potential material changes in expected environmental and social impacts as a result of the current Project design.

The scope this ESIA is to address the gaps of the previous environmental and social assessment (ESA) performed by ERM under the World Bank Study (final report 2014, ref 13) in the context of the current Project Phase I design. The need for an updated ESA Report arises from the following considerations:

- The concept design under the current Project differs from the preferred design option assessed under the 2011 ESA (final report issued 2014);
- Since the 2011 ESA was carried out based on the preliminary designs under the Feasibility Study some aspects were not sufficiently defined in order to carry out a full assessment, e.g. land take and associated impacts;
- Much of the fieldwork under the 2011 ESA was completed in 2010 and 2011, meaning that by 2017 the data are six years old or more; e.g., ecology and socio-economic surveys;
- The ToR for the 2011 ESA did not specify obtaining an environmental license and as such none were sought.

Under a separate contract with the Promoter of the Project, the Ministry of Water and Irrigation of the Hashemite Kingdom of Jordan (MWI), an Addendum Report to the 2011 ESA has been prepared by Dar Al-Handasah and partners (2016 ESA) based on the Phase I project design and on previous studies and reports. The 2016 ESA has been performed without performing additional field surveys and data collection necessary to meet the requirements of International Financing Institutes (IFIs) for Environment Category A type projects. The 2016 ESA has been made available and has been used to set the scope of work for the current ESIA.

Within the framework of the current ESIA, the Consultant will advise the Promoter immediately if the study identifies any issues that are likely to negatively affect IFIs attitude to the Project and discuss with the Promoter potential mitigation measures.

As part of the current scope, the Consultant will:

- Complete an updated ESIA Report (ESIA 2017) for the Project in line with national regulations, the EIB and EU environmental standards, the WB/IFC Standards, as well as applicable IFC/WB Environmental and Social Policies and Guidelines;
- Liaise with the Promoter, its advisors and representatives as identified by the Promoter, relevant government authorities, communities, identified Project donors/investors and other key stakeholders;
- Manage the entire process of the ESIA Report up to the finalisation and public disclosure of the findings;
- It is understood that the Jordanian and Israeli Joint Administration Board (JOB) for the Red Sea Dead Sea Project will act as the platform to deliver any comments to the Consultant on the Draft ESIA on behalf of both parties
- Obtain the environmental permit for the final ESIA on behalf of the Jordanian Ministry of Water and Irrigation from the relevant Jordanian competent environmental authorities.

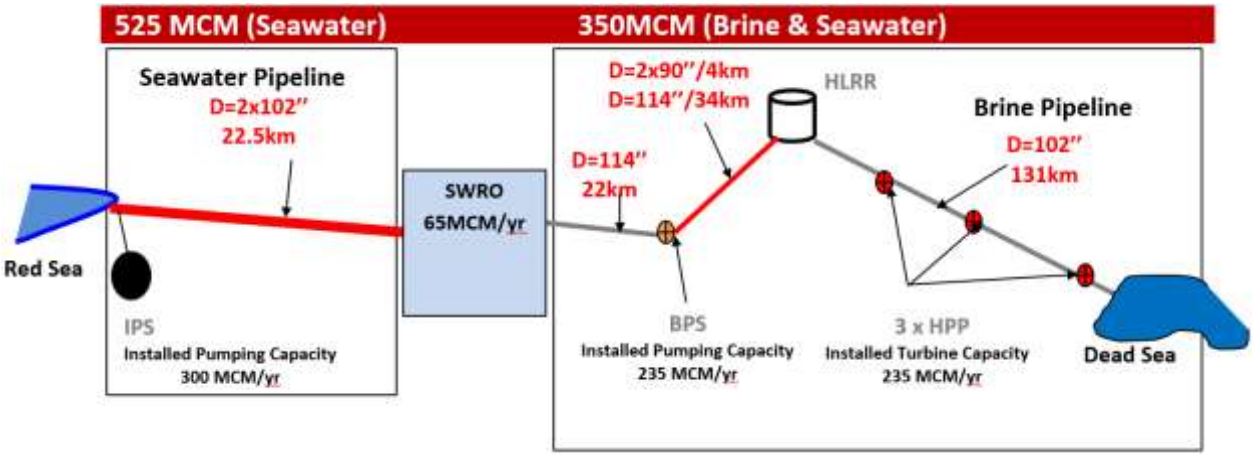

Figure 6 – Scope of the Red Sea Dead Sea Project Phase I

The length of the route of the RSDS Phase I project from Red Sea to Dead See will be around 210 km.

The following prior studies have been taken into consideration. Annex 3 provides the full list of literature.

The Consultant has collated and undertaken a preliminary review of the relevant published and, where possible, unpublished project materials to characterise the baseline marine environment of the study area. A review of the RSDS pipeline and desalinization project documents has included the following:

The Red Sea Dead Sea Water Conveyance (RSDSC) Study Program headed by the World Bank: During 2005, Israel, Jordan and the Palestinian Authority signed, as beneficiary parties, a joint request to the World Bank to sponsor a feasibility study and an environmental and social assessment of a project which would convey water from the Red Sea to the Dead Sea and desalinate some of the seawater. The World Bank Project Program was conducted between 2008 and 2014 and included the following studies:

- Feasibility Study (Coyne & Belier et al, 2014) – an examination of three different project scenarios against the defined objectives of the RSDS scheme. The scenarios assessed were a i) no project scenario ii) a base case scenario to stabilize the Dead Sea only, and iii) a base case plus scenario to stabilize the Dead Sea, desalinate water and generate hydroelectricity [lit 7].
- Red Sea Study (Thetis SpA et al, 2013) – an extensive study to determine the existing environmental conditions of the Gulf of Aqaba, the effects of abstracting seawater on the most important environmental components and identifying the best option for the red sea intake in terms of design and location [lit 27].
- Dead Sea Study (Tahal Group et al, 2011) – an analysis of the feasibility of discharging seawater and/or reject brine from the desalinated Red Sea water into the Dead Sea in an effort to chart the physical, chemical and biological impact on the Dead Sea and its environs [lit 26].
- Environmental and Social Assessment (2011 ESA, final report in 2014) – an assessment of environmental and social impacts based on the RSDS Scheme design and associated technical as part of the Feasibility Study [lit 13].
- Study of Strategic Alternatives (J Allen et al, 2012) – a comparative analysis of alternatives to the RSDS Scheme that would meet the strategic objectives of the RSDS Phase 1 Project [lit 24].

Deltares undertook an independent Review of Red Sea Studies [lit 10] on compliance of the Sea Water Intake Concept with environmental performance standards (2016), [lit10]

Dar Al-Handasah and partners - Tendering of Red Sea – Dead Sea Project Phase I – Interim Environmental and Social Assessment (2016 ESA), including appendices on Marine Sediment Samples,

Field Survey Notes, Environmental and Social Management Plan, GIS report and a Videography Report (2016) [lit 8]

MWI - RSDS Phase I Preliminary Technical Information Memorandum for Donors and International Financial Institutions (April 2016). This report presents the challenges which the Project is looking to address, describes the Project, as well as the key issues associated with its development. It also covers the envisaged contractual structure and governance of the Project, its environmental & social aspects, key financing issues, the on-going tendering process, as well as the envisaged next steps with the donors community [lit 21].

Red Sea – Dead Sea Project Phase 1 Cohesive Report: In December 2015, the Proponent issued a report defining the Phase 1 Project in terms of objectives, key components and alignment. It was issued to key stakeholders such as donors, funding agencies, NGOs and other interested parties.

Red Sea – Dead Sea Project Information Memorandum: Prior to the Technical Conference held in Aqaba on 9th May 2016 an Information Memorandum was issued to attendees including potential donors, funding agencies, NGOs and Government Departments. Similarly to the Inception Report the Information Memorandum provided details of the Phase 1 concept design [lit21].

Red Sea – Dead Sea Project Inception Report: In August 2016, a Project Inception Report was finalized. The Report, compiled by the Technical Advisers of Dar Al-Handasah and partners on behalf of the Proponent, sets the concept design and the basis upon which bidders will compile their offers. It will also be used to inform any materials issued to key Project stakeholders [lit 9].

As stated in the Terms of Reference for this ESIA there is much work that has already been undertaken over the last five (5) years, and though some of this is now considered out of date and also not in the right location due to the position of the intake at the Red Sea changing, or is not extensive enough, it is still of use to provide historic context in the general area, and also to understand if the requirements of the new intake should be the same as stipulated for the new intake location. The new survey data from the North Location on the larval modelling, videography seagrass survey, grab survey and water quality sampling has been reviewed, and where second seasons are required that are not already planned these have been identified.

Our review, and the subsequent work undertaken to fill any gaps, will reduce the potential risk of delay to get environmental clearances and funding due to data gaps or weak areas of knowledge remaining for the Pilot Project. We will report to the EIB and the MWI any further studies required and documents needed to get environmental clearance of the project.

A desk top study was conducted in January 2017 reviewing the different literature resources related to flora and fauna of Wadi Araba, Aqaba and Dead Sea basin. Such literature resources were from Jordan universities and research institutes, RSCN publications, IUCN, Birdlife international, World Bank electronic websites, ERM ESA studies 2011, 2014 the following ecological features were found at the DSRS project area:

The Royal Society for the Conservation of Nature developed a detailed studies over the rift valley area and specifically Qatar, Fifa, Jabal Masuda, and Yarmouk on fauna and flora. Studies included species account, distribution and threats.

Jordan networks on protected areas were proposed after John E. Clarke during 1977-1978, who identified 12 sites as important natural habitats for wildlife species in Jordan to be established as protected areas to ensure conserving 4% of Jordan entire vegetation types. Clarke proposal yielded the establishment of six

sites, these are: 1) Shaumari Wildlife Reserve, 2) Azraq Wetland Reserve, 3) Ajloun Forest Reserve, 4) Mujib Nature Reserve, 5) Dana Nature Reserve and 6) Wadi Rum Protected Area.

A second review for Clarke network on protected areas was performed over the period of 1997 and 2000 by RSCN, aimed to assess the ecological, social and economic values of Clarke's network on protected areas. This review was needed since Jordan witnessed tremendous growth of population size, which affected protected areas network (RSCN 1998). Accordingly, Qatar was proposed to be established as a protected area within the Jordan Rift Valley.

Through the preparations of the Integrated Ecosystem Management and Conservation in the Jordan Rift Valley Project (IEM-JO) in 2005, a second review on protected areas network that is located in the Jordan rift valley was performed using a set of criteria's by the RSCN. In consequence, four sites were of high priority to be established as protected areas along the Jordan rift valley were proposed to be established. The IEM-Jo project was launched in 2007 and aimed to apply the integrated ecosystem management in Jordan Valley area and to insure the management and conservation of ecological, social and economic needs of this area.

In 1973, a publication titled as "Geobotanical Foundation of the Middle East" was produced by Zohary and is considered a major reference to the Middle East floral species. This publication included extensive information about the plant bio-geographical regions, and the major plant groups and formation in the whole area.

Al-Eisawi (1982), published the List Vascular Plants in Jordan, where more than 2000 species were recorded. Since then extensive number of papers related to the flora and biodiversity have been published. The first paper related to the vegetation of Jordan was presented in 1983 during the Conference of Jordan through History, present, past and future, which was held in Amman.

The same work Al-Eisawi (1985), was edited by Haddidi, and published as a book of the proceedings. Later on this was developed into a major reference as book published by UNESCO under the title Vegetation of Jordan, Al-Eisawi (1996).

Disi et al. 2001 provided a comprehensive description for the reptiles and amphibians of Jordan in the atlas and field Guide: "Amphibians and Reptiles of the Hashemite Kingdom of Jordan". This guide provides extensive information about Herpetofaunal species, their bio-geographical affinity, systematic and a distribution map for each species was provided.

This guide was followed by a second guide on reptiles and amphibians of Jordan produced by Disi, 2002, which described more species reported from Jordan and highlighted information about their status, distribution and systematic. This guideline includes notes on bio-geographical affinity of reptilian and amphibian's species of Jordan.

Bats faunal diversity was described by Qumsiyeh et al. 1998 where he illustrated bay faunal diversity and their bio-geographical affinities. Amr and Disi (1988) published a report on the Jordanian Mammals Acquired by the Jordan University Natural History Museum. The report includes species, their status and the distribution in Jordan.

Amr and Disi (1988) published a report on the Jordanian Mammals Acquired by the Jordan University Natural History Museum. The report includes some bats species, their status and the distribution in Jordan. As well, it included information about species bio-geographical affinities.

Benda et al. (2010) published the most comprehensive and up to date manuscript on the bats of Jordan, including distributional data, ecology, echolocation, ectoparasites and zoogeographical analysis. This manuscript provided a detailed list of bat species inhabiting Jordan.

3 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 Permits required for construction and operations

The Project Company requires obtaining an environmental permit for the Project from the Jordanian Ministry of Environment (MoEnv) and the Aqaba Special Economic Zone Authority (ASEZA) and approval from the Israeli Authorities to be provided through the JAB. In addition, the Ministry of Health may conduct health inspections and issue related HSE permits to the Project Company.

The Project Company needs to receive the construction and operational permits through and Ministry and Irrigation and the Ministry of Energy and Mineral Resources. It shall furthermore be registered the Ministry of Industry and Trade, including obtaining a tax identification number and VAT registration. The Project Company may further require a registration at the Chamber of Commerce for sales and deliverance of produced water and electricity.

An overview of all relevant governing authorities in Jordan is provided in Table 1.

Table 1 – Governing Authorities in Jordan

Governing Body	Responsibility / Description
National	
Ministry of Environment (MoEnv)	National body responsible for the protection of the environment through the development of legislation and ensuring it is enforced.
Ministry of Water and Irrigation (MWI)	Official body responsible for the overall monitoring of the water sector, water supply and wastewater system and the related projects, planning and management and the formulation of national water strategies and policies. The Ministry is comprised of two government entities: the Water Authority and the Jordan Valley Authority.
Water Authority of Jordan (WAJ)	Regulatory arm of the MWI responsible for water and sewage systems.
Ministry of Agriculture (MoA)	Responsible for the management of public rangelands and pastures and protecting soils found in the RSDS Phase 1 Project Area.
Ministry of Planning and International Cooperation (MOPIC)	Coordination and formulation of social and economic development plans and key stakeholder engagement to maximise the foreign assistance, including financing.
Ministry of Municipal and Rural Affairs	Plan urban and rural areas (zoning), provide construction licenses and collect solid waste.
Ministry of Municipal Affairs (MOMA)	Responsible for the monitoring and management of the financial, administrative and organisational performance of governorates.

Governing Body	Responsibility / Description
Ministry of Energy and Mineral Resources	Responsible for the provision of statutory legislation and policies in relation to the exploration, development and management of energy and mineral resources.
National Resources Authority (NRA)	Responsible for issuing permits and licences and the management of matters related to natural resources.
Ministry of Foreign Affairs	The Ministry seeks to realise Jordanian foreign policy and to protect national interests.
Ministry of Health	The Ministry is the competent authority accountable for the protection of public health in the country. It is also responsible for monitoring the water to ensure its safety and adequacy for human consumption.
Royal Society for the Conservation of Nature (RSCN)	A recognised environmental NGO, the RSCN establishes and manages protected areas under the supervision of the MoE.
The Higher Planning Council (HPC)	A subsidiary of MOMA, the HPC are responsible for the approval of regional planning proposals and the licensing of land development.
Jordanian Armed Forces	The military owns some of the land through which the RSDS Phase 1 Project alignment runs. It is also responsible for security of the Jordan-Israel border.
Regional	
Governorate of Aqaba Governorate of Tafilah Governorate of Karak	The RSDS Phase 1 Project spans three (3) Jordanian administrative divisions, or governorates, that are responsible to the national government.
Aqaba Special Economic Zone Authority (ASEZA)	Autonomous administration for the management, regulation and development of the Aqaba Special Economic Zone (ASEZ).
Jordan Valley Authority (JVA)	Government agency tasked with the socio-economic development of the Jordan Valley.
Local	
Municipal Councils and Villages	Both municipal and village councils exist within the RSDS Phase 1 Project Area (such as Aqaba). Municipalities have a set agenda of competencies within their boundaries including; issuing building permits and licenses, implementing the land acquisition actions and expropriation and resettlement.

3.2 Environmental and Social Safeguard Policies

The Jordanian Environmental and Social Safeguard legislation and regulations relevant for the current ESIA as listed below.

Table 2 – Jordanian Environmental and Social Regulations

Legislation	Description
Environmental Protection Law No. 52 of 2006.	Overarching principles and management framework for the protection of the environment.
Environmental Impact Assessment Regulations No. 37 of 2005.	Prescriptive document outlining the processes and requirements for EIA in Jordan.
Law No. 18 of 1988 Water Authority Law (and amendments 2001).	Established by the MWI, the Law describes the mandate for research, development and management and protection / use of national water resources (excluding irrigation).
Law No. 19 of 1988 Jordan Valley Development Law.	Pursuant to Law 18 of 1988, the law makes provision for the JVA enforcing full authority of the valley including the control and protection of water resources.
Regulations No. 28 of 2005 Regulations for the Protection of the Air.	Facilities shall ensure that all leaks and/or emissions (during construction and operation) do not exceed the permissible limits described therein.
Regulations No. 25 of 2005 Soil Protection Regulations.	The regulation empowers both the MOE and MOA to establish 'zones' for the protection, development and sustainability of soils for the purposes of maintaining and/or enhancing soils.
Regulations No. 26 of 2005 Protecting the Environment from Pollution in Emergency Situations Regulations.	All facilities are required to designate a dedicated monitoring officer responsible for presenting and implementing contingency plans. All facilities are to meet prescribed protection requirements.
Regulation Concerning Solid Waste Management No. 27 of 2005.	The regulation seeks to ensure that solid waste is managed in way that promotes environmental protection and public health. It includes responsibilities and monitoring of the generator and the handler.
Regulation Concerning Hazardous Waste Management and Handling No. 43 of 1999.	Outlines general procedures for hazardous waste generators and handlers for the storing, handling, collection, transportation and disposal of hazardous wastes.
Groundwater Control Regulation No. 85 of 1988.	Confirmation that groundwater is owned and controlled by the state and that abstraction and use is otherwise prohibited except by licences issued under the Regulation.
ASEZ Law No. 32 of 2000.	Establishes the legal basis for the establishment of ASEZ and ASEZA and empowers ASEZA with the ability to control economic activities, levy taxes and duties and control coastal and land development to protect the environment. Article six (6) stipulates national law shall be respected unless superseded by stronger ASEZA regulation.
ASEZ Environmental Protection Regulation No. 21 of 2001.	It contains provisions regarding pollution, the use of seawater and protection of the environment. It further grants ASEZA the responsibility for regulation and monitoring of groundwater resources and the right to call for EIA of new projects.
ASEZ Regulation for the Aqaba Marine Park No. 22 of 2001	Prevents activities that may result in adverse impacts on Aqaba Marine Park.

Legislation	Description
The Antiquities Law No. 1988 (as amended by Law No. 23 of 2004).	Seeks to protect archaeological finds and sites. Permits and procedures for fieldwork are approved by the Department of Antiquities.
Regulations No. 29 of 2005 Natural Reserves and National Parks Regulations.	The MOE may consider and declare any site as an area for protection. Subject to the provisions of the MOE, it is unlawful, without obtaining prior consent, to engage in any activities within the boundary of a natural reserve or national park (including exploiting natural resources in it).
Decree 12 of 1987: the 'Land Acquisition Law'.	All potential land acquisition must be undertaken in accordance with the Decree and its amendments and must be approved by the Council of Ministers. The Council requires a demonstration of the public interest, evidence of the capacity for payment and agreement between both parties on the issue of compensation.
Land Use Planning Regulation No. 6 of 2007.	Outlines that no entity can change or transfer the status of any land in accordance with instructions issues by the Council of Ministers.
Jordan Standard 202/2007 for Industrial Wastewater	The standards seek to regulate the discharge of wastewater ensuring it does not lead to a negative impact on the environment, human health and/or social and economic development. This standard defines the quality for final discharge of industrial wastewater to water bodies or irrigation.

There are numerous relevant national regulation (legislation, policy and guidance) to the Red Sea that will need to be included in the detailed review stage. This will include Jordanian and Israeli national regulation and any bilateral agreements, as though the project is in Jordan, the Red Sea and Dead Sea are water bodies which border more than just the Jordanian coastline, and therefore the transboundary issues / impacts / implications need to be considered in relation to the relevant national legislation.

Preliminary assessment provides the following pertinent pieces of regulation relating to the marine environment.

Jordan

- Aqaba Special Economic Zone (ASEZ) Environmental Protection Regulation No. 21 (2001);
- ASEZ's Marine Park Regulation No. 22 (2001); and
- National Vision and Strategy (2015-2015);
- National Strategy and Action Plan for Sustainable Consumption and Production (2016-2025)

Israel

- There is no single environmental framework or law, instead each of the Ministries retains partial responsibility for regulating areas of their own mandate. Environmental regulation principally reflects the European Union Environmental Directives; and
- Protection of the Coastal Environment Law (2004).

Once the final ESIA and related ESMP has been approved by the Jordanian ASEZA and the MoEnv, the environmental permit for the project will be provided. This permit will be issued to the promoter of the project, which is the organization (MWI) that applied for the ESIA approval and permit. This permit will allow the promoter to proceed as planned, including seawater abstraction, conveyance etc.

However, this environmental permit may include specific conditions the MWI needs to meet, such as:

- Updating some aspects of the ESIA, based on the actual detailed designs
- Preparing and implementing a resettlement / compensation action plan (RAP) according to IFC / WB / EU standards
- Preparation of a detailed Construction Environmental and Social Management Plan (CEMP) based on the ESMP and the detailed designs / work plans
- Planning and implementing detailed environmental (seawater, GW, etc.) monitoring plans during construction and operations
- Getting the CEMP approved by the environmental authorities prior to construction
- Assigning of an independent Environmental Control Officer during the commissioning, construction and initial operation phases of the project to oversee implementation of the approved ESMP and CEMP

3.3 Relevant International ESIA Standards

The relevant international environmental and social safeguard principles, standards and guidelines relevant for this ESIA are the following:

World Bank (IBRD and IFC)

The World Bank has identified ten key policies that are critical to ensuring that potentially adverse environmental and social consequences are identified, minimized, and mitigated. These are:

- OP 4.01 on Environmental Assessment;
- OP 4.02 on Environmental Action Plans;
- OP 4.04 on Natural Habitats;
- OP 4.07 on International Waterways;
- OP 4.09 on Pest Management;
- OP 4.10 on Indigenous Peoples;
- OP 4.11 on Physical Cultural Resources;
- OP 4.12 on Involuntary Resettlement;
- OP 4.36 on Forests;
- OP 4.37 on Safety of Dams;
- OP 7.50 on International Waterways;
- OP 7.60 on Disputed Areas; and
- BP 17.50 Public Disclosures.

The IFC has identified the following Performance Standards (PS):

- PS 1: Assessment and Management of Environmental and Social Risks and Impacts
- PS 2: Labour and Working Conditions
- PS 3: Resource Efficiency and Pollution Prevention
- PS 4: Community Health, Safety, and Security
- PS 5: Land Acquisition and Involuntary Resettlement
- PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- PS 7: Indigenous Peoples
- PS 8: Cultural Heritage

Other relevant WB / IFC documents are:

- World Bank IFC Guidance Notes;
- World Bank Group Environmental, Health and Safety (EHS) Guidelines:

It should be noted here that the previous World Bank sponsored ESA has gone through the World Bank due diligence and was approved by the Board. However, whilst a considerable amount of consultation and involvement of the above mentioned authorities took place during the World Bank Studies, its scope did not specify obtaining an environmental permit and as a result, none were sought or issued yet.

Equator Principles

In addition, the Equator Principles are a set of voluntary standards that have been developed based on the IFC performance standards, and have been adopted by the major international financial institutions. These principles apply to any project worth over U$ 10 Million and loan facilities will only be made available if the Equator Principles are fully met. These principles are the following:

- EP1: Review and Categorization;
- EP 2: Social and Environmental Assessment;
- EP 3: Applicable Social and Environmental Standards;
- EP 4: Action Plan and Management Systems;
- EP 5: Consultation and Disclosure;
- EP 6: Grievance Mechanism;
- EP 7: Independent Review;
- EP 8: Covenants;
- EP 9: Independent Monitoring and Review; and
- EP 10: EPFI Reporting.

EU / EIB

Finally, this ESIA will be performed in accordance with the EU and EIB environmental and social standards (2013). The EIB Environmental and Social Handbook provides an operational translation of those standards grouped across 10 thematic areas. However, in order to achieve sustainability objectives, the EIB relies to a large extent on activities undertaken by their clients, including borrowers and project promoters. These 10 thematic areas include:

1. Assessment and management of environmental and social impacts and risks
2. Pollution prevention and abatement (applied the EU REACH Directive, more stringent than PS 3)
3. Biodiversity and ecosystems
4. Climate-related impacts
5. Cultural Heritage
6. Involuntary resettlement
7. Rights and interests of vulnerable groups
8. Labour standards
9. Occupational and public health, safety and security
10. Stakeholder engagement

It will be necessary to conduct a detailed comparison of the specific IFC and EIB standards in relation to the marine elements of the Project for this ESIA to ensure that the most stringent standards are applied. This is particularly important for the surveys that will need to be conducted to gather further information to ensure that these will meet with these standards.

Dar Al-Handasah and partners (2016 ESA) stated that *“a key difference between the EIB ESS 3 and IFC PS 6 is the management of critical habitats once a vulnerable or endangered species has been identified. The IFC prescribes the use of ‘discrete management units’ which defines a boundary within which ‘the biological communities and/or management issues have more in common with each other than they do with those adjacent areas. By contrast, the EIB recommends an ecosystem services approach and does not prescribe the use of DMUs“.*

This is applicable to the marine habitats present at the Red Sea Intake site, and will be discussed in further detail where applicable.

3.4 Relevant International Environmental Conventions

There are a suite of relevant International requirements that need to be considered in the ESIA, and which will be reviewed in detail. In relation to the marine and terrestrial environment these will include (but not limited to):

- Convention on Biological Diversity (1993);
- Convention to Combat Desertification;
- Convention on the Conservation of Migratory Species of Wild Animals (200);
- Convention for the Protection of New Varieties of Plants;
- Ramsar Convention on Wetlands (1997)
- International Convention for the Prevention of Pollution from Ships (MARPOL), 1978.
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention), 1996.
- Israel Jordan Peace Treaty (Article 6. Annex II and IV), 1994.
- Red Sea Marine Peace Park Cooperative Research, Monitoring and Management Programme (RSMPP), 1997.
- Memorandum of Understanding: Joint monitoring programme for the Gulf of Aqaba, 2003.

These conventions will be particularly relevant for the ecological components of the ESIA. Also applicable to the ecological theme is the IFC Performance Standard 6: Conservation of Biodiversity, which requires that, with regard to terrestrial ecology, the main objectives that must be taken into consideration into the project are:

- Meeting all the environmental and ecological legal requirements of the three beneficiary countries;
- Protecting and conservation of biodiversity; and
- Promoting sustainable management and use of natural resources through the adoption of practices that integrate conservation needs and development priorities.

The main legislation that applies specifically to international marine waters and deals with the issues likely to be relevant to the RSDS Phase I development is as follows:

- The International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78). Known as the 'MARPOL Convention', this is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes.
- The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention 1972): The London Convention contributes to the international control and prevention of marine pollution. It prohibits the dumping of certain hazardous materials, requires a prior special permit for the dumping of a number of other identified materials and a prior general permit for other wastes or matter.

Jordan and Israel have ratified these conventions and incorporated their provisions into national law.

In addition, Jordan has signed the Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment 1982, and associated Protocol 1982. This reinforces many issues also addressed in the international Conventions identified above, and obliges members to share information about any activities that may affect the Red Sea.

3.5 Requirements and scope of the ESIA

The scope this ESIA is to address the gaps of the previous environmental and social assessment (ESA) performed by ERM under the World Bank Study (final report 2014) in the context of the current Project Phase I design.

The need for an updated ESA Report arises from the following considerations:

- The concept design under the current Project differs from the preferred design option assessed under the 2011 ESA (final report issued 2014);
- Since the 2011 ESA was carried out on preliminary designs under the Feasibility Study some aspects were not sufficiently defined in order to carry out a full assessment, e.g. land take and associated impacts;
- Much of the fieldwork under the 2011 ESA was completed in 2010 and 2011, meaning that it is now five years old or more; e.g., ecology and socio-economic surveys;
- The ToR for the 2011 ESA did not specify obtaining an environmental license and as such none were sought.

The Consultant shall perform any additional data collection and surveys required for completing the ESIA Report, as identified in the Inception Report, including:

- A site drive over along the entire pipeline route to establish any constraints which might affect the construction and operation of the Project and that may have an adverse environmental and/or social impact. This may include for example particular topographical features, land use conditions and ecological features;
- Marine ecology surveys to establish the presence / absence of sensitive habitats and/or species at the proposed Red Sea intake location. This work should be carried out in coordination with the separate studies and surveys being done;
- Terrestrial ecology surveys to include the re-validation of previous surveys and an assessment of formerly unstudied areas due to the changes in alignment and Project components. Since the conveyance pipeline crosses a number of Important Bird Areas (IBAs) and is in a flyway of importance for soaring birds, seasonal avifauna surveys will be required.
- Cultural Heritage surveys consisting of a desk based analysis, re-validation of previous findings, collaboration with the Jordanian Department of Antiquities and site walkovers to confirm the presence/absence of areas of cultural importance; and
- Land use and socio-economic surveys for any settlements/activities in the vicinity of the Project and its infrastructure and completion of a land acquisition and resettlement action plan as required.

Separate studies and surveys are foreseen in the following areas and will be made available to the Consultant for inclusion in own work carried out under the scope of this ESIA:

- A follow-up study to the original Red Sea Study that will include oceanographic modelling and biological evaluation using the same criteria as the original Red Sea Study. These depths are provisionally set at 25 m, 50 m, 100 m and 150 m for abstraction rates of 300, 500 and 700 MCM/year. The follow-up study will also consider whether the selected depth for the 300-700 Mcm/year abstractions is suitable for the ultimate 2,100 Mcm/year abstraction. The objective of the Study is to determine whether the intake depth can deviate from the previously recommended depth of 140 m on the basis of a reduced abstraction and the availability of a longer period of monitoring data to inform the modelling exercise;
- Grab surveys at 25 m intervals up to 250 m depth for sediment analysis and sea bed identification;

- Videography survey of the intake corridor out to 150 m depth for habitat identification;
- Red Sea water quality data taken from the National Monitoring Programme provided by Aqaba Special Economic Zone Authority (ASEZA); and
- A Brine Study to outline a brine disposal monitoring programme in the Dead Sea to be implemented by the Governments of Jordan and Israel as well as proposing a monitoring programme to assess the impact of leakage from the Environmental Pipeline.

3.6 Regional Development Planning

The RSDS Phase I project will be constructed in Wadi Araba. In 2016 the Jordan Valley Authority completed the Wadi Araba Integrated Development Master Plan (WAIDMP) as a guiding document for the Jordan Valley Authority and other related institutions in providing required infrastructure serving two purposes: to improve the quality of life of the local communities through providing a high quality of services and through increasing jobs opportunities; and to direct capital investments in Wadi Araba to stimulate the regional economy and create opportunities for public and private sectors. The Wadi Araba Planning boundaries and related planning sectors are presented below.

Due to very limited human pressure, the environment is almost intact in the vast majority of Wadi Araba. It is a focal point for old civilizations east to west (e.g. Incense Road) and north to south, including rich historical and archaeological assets and Bedouin culture and traditions. It has a very attractive natural landscape, great sceneries of unspoiled nature with massive sand dunes and mountains, which seem superbly suited for niche tourism; nature, soft adventure, cultural, historical and wilderness experiences.

The area is subject to various investments in irrigation and agriculture by JVA and other agencies, and provides potential for the mining sector and development of renewable energies, particularly solar and hydropower (RSDS Project). The Dead Sea-Wadi Araba Highway ensures optimum connection to the Dead Sea and Amman in the North to the Aqaba in the south. Most settlements receive water supply and electricity services.

On the other hand Wadi Araba is faced with challenges in terms of its arid and dry climate and climate change. Water shortage is the primary factor limiting the development of the planning area, including for agriculture, industry, and households. There is a lack of proper treatment facilities for solid waste and of wastewater, causing various environmental problems. The region faces a risk in terms of loss of biodiversity due to lack of protection of some ecological hotspots. In addition the area faces risks of loss of cultural assets, due to limited planning and protection.

The goals of the WAIDMP are reducing poverty and improving the living conditions of the local communities and putting Wadi Araba “on the map” of Jordan as a region that contributes to the overall well-being of the Country. It aims to reach these goals through the following three planning objectives:

Environmental objective: to conserve the Wadi Araba heritage for future generations
The environmental objective is to conserve the almost intact environment, the very attractive natural landscape of unspoiled nature, the precious water resources, and the rich archaeological and cultural assets of Wadi Araba for the benefit of future generations through the protection of the environment and of the landscape, the mitigation of environmental risks, a sustainable water management strategy, and the conservation and development of heritage resources.

Economic objective: to unleash the economic development potential of Wadi Araba
The economic objective is to unleash the economic development potential of Wadi Araba, thus contributing to increased employment opportunities and reduction of poverty, for the benefit of local

communities and of the whole Kingdom, in coherence with Jordan Vision 2025, by developing sustainable economic activities based on the local resources of Wadi Araba, including an innovative agricultural and livestock value-chain, a responsible tourism economy and the development of economic catalyst sites, attracting external investment in economic development projects, creating appropriate supporting infrastructure and enabling environment.

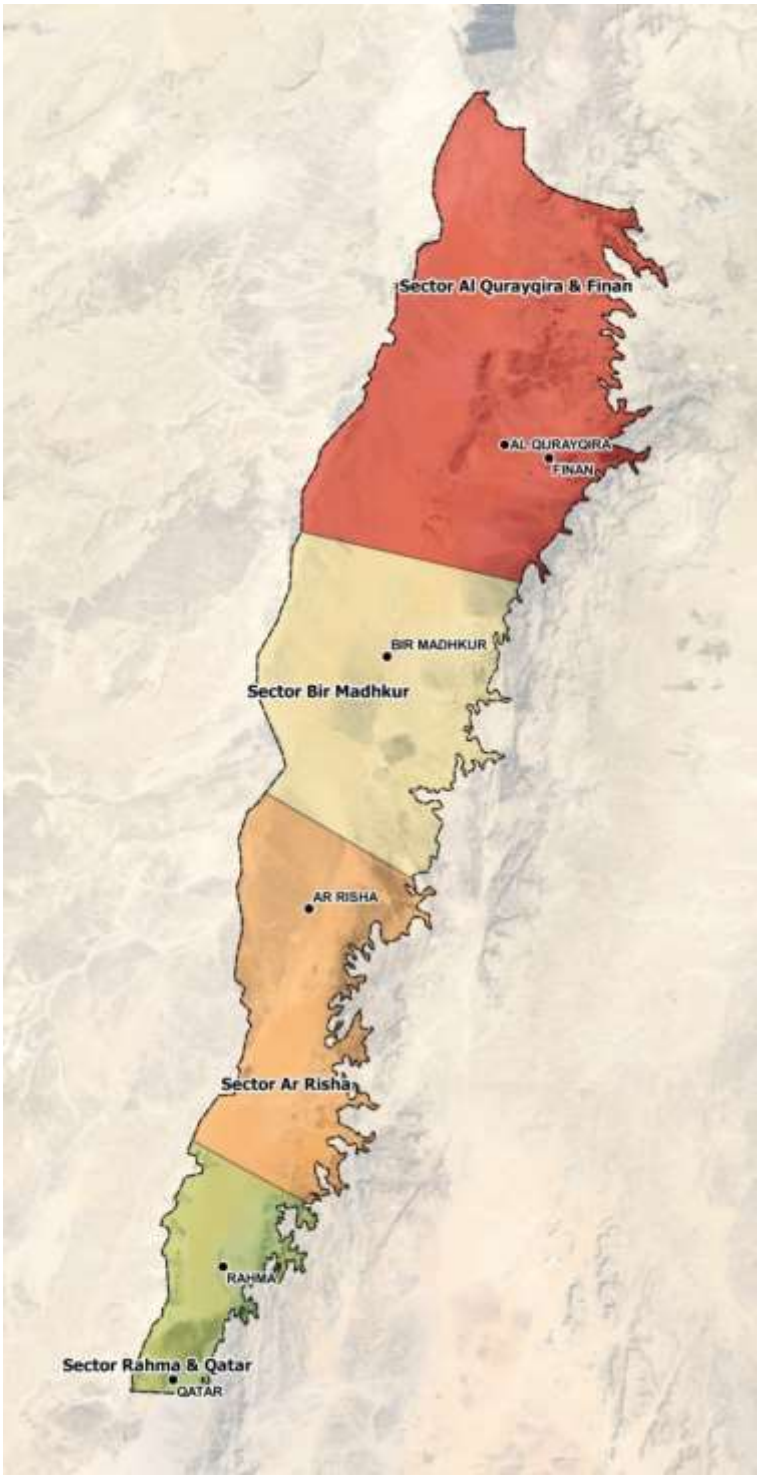

Figure 7 – Wadi Araba Integrated Development Planning Sectors (2016)

Social objective: to improve the living conditions of local communities

The social objective is to improve the living conditions and the opportunities for human development of local communities living in Wadi Araba, by improving the habitat and the public space, introducing concepts of sustainable housing, delivering regional scale and settlement scale public facilities (health, education, vocational training, recreation, public parks, etc.), and improved urban infrastructure (water, sanitation, energy); and to ensure the overall social sustainability of WAIDMP by designing and implementing appropriate social support and awareness measures.

The expected outcomes of the implementation of the WAIDMP include:

- protection of fragile environmental assets, natural reserves, landscape and archaeological and cultural assets;
- development of sustainable economic activities;
- attraction of investment through increased participation of the private sector and appropriate enabling environment;
- increased employment opportunities;
- improvement of settlements and in general of the living conditions for the local communities;
- Development of infrastructural networks that will support the development of Wadi Araba and contribute to the economic growth of the whole Country.

4 DESCRIPTION OF THE PROPOSED PROJECT

4.1 Project Infrastructure and phasing

The RSDS Phase 1 Project footprint stretches from Aqaba on the Red Sea to the Dead Sea, 214 km to the north, and is situated entirely within the borders of Jordan. It spans the three Governorates of Aqaba, Tafilah and Karak, In addition it is governed by the Aqaba Special Economic Zone Authority (ASEZA) and the Jordan Valley Authority with regard to Wadi Araba and Dead Sea Basin. The project lay out is presented in above *Figure 5 – Project Layout RSDS Project Phase I (total length: 210 km)*. Section 3.2 presents the main infrastructure components.

Table 3 provides an overview of the foreseen phasing of the project components

Table 3 – Project Phasing

A	***Pre-design Phase***
a1	Preparation of preliminary and functional specifications for RSDS Phase I
a2	Preparation of PPP Operational, Finance, Institutional, Legal issues
a3	Completion of Land Acquisition and Resettlement Plans
a4	Stakeholder Engagement Planning (SEP)
a5	Preparing BOT Tender Documents
a6	ESIA / ESMP preparation
a7	Tendering, tender evaluation and contract awarding of the BOT Contract
B	***Design, Built Phase***
b1	Pre-design fields surveys (geotechnical, topographic, seismic / rupture investigations)
b2	RSDS Phase 1 Project Engineering Design
	* Submarine Pipeline
	* Intake Pumping Station
	* Ayla Pipeline
	* Long Seawater pipeline
	* Mixed water section
	* High Level Regulating Reservoir
	* Dead Sea Discharge Structure
	* Seawater Bypass
	* Booster Pumping Station
	* Hydroelectric Power Plants
	* Short Seawater Pipeline
	* Desalination Plant)SWRO)
	* Israeli Water Pipeline
	* Connection to Jordan Delivery Point
	* Short Brine Pipeline
	* Ancillary Works (O, S &M and monitoring Facilities, Client Facilities, Access Roads, communication system)
b3	Preparing Construction Environmental / Social Management Plan, including traffic plans
b4	Hiring Construction labour force and subcontractors
b5	Mobilization of Construction Vehicles and Equipment
b6	Provision of water, power and control facilities
b7	Setting up construction offices, yards and facilities
b8	Procurement, mobilisation, storing of all construction materials and equipment

b9	Implementing Construction Environmental / Social Management Plan
b10	Implementing Stakeholder Engagement Plan (SEP)
b11	Excavation and ground works for pipeline trench and other components
b12	Design, supply and installation of appurtenant structures (valves, washouts, access points etc.)
b13	Design, supply and installation of corrosion / cathodic protection systems
b14	Construction of intake and submarine pipeline
b15	Construction of on-shore pipelines, pumping stations and reservoirs
b16	Construction of Desalination Plant, Hydropower plants and Dead Sea Discharge Facility
b17	Setting up O&M Organization and Logistics, including start-up planning and schedules, electricity supply, operating staff and resources, HSE aspects, and all related technical, financial, organization and legal operational preparations and manuals, including ESMP
b18	De-commissioning, Testing and Handing over Construction Works to O&M Organization, including final review with Client
b19	Demobilization Construction Equipment, office, facilities and workers

C	***Operational Phase***
c1	Implementing O&M Organization (education, qualifications, instructions, HSE, labour contracts)
c2	Mobilizing and Training Operation Staff and Resources
c3	Start up of Water intake, conveyance and production
c4	Operate, maintain, repair, refurbish, renew and replace all facilities in accordance with requirements
c5	Financial and Administrative operations, including billing and external relations
c6	O&M Monitoring and Reporting (seawater and brine flows, potable water flows, water quality, energy generation, energy use
c7	Environmental and Social Monitoring and Reporting according to ESMP and additional (Brine / intake) studies, including HSE

D	***Transfer and Decommissioning Phases***
d1	Inspection prior to handover (after 25 years)
d2	Components, Equipment and Spare parts Inventory and checklist (after 25 years)
d3	Transfer / hand over of all facilities to Client / new operator (after 25 years)
d4	Decommissioning of project components after project lifetime (> 50 years?)
d5	Rehabilitation of soil, waste and groundwater if any (>50 years?)
d6	Landscaping and replanting (>50 years?)
d7	Final Decommissioning and land rehabilitation reporting (>50 years?)
d8	Transfer of land ownership if needed (> 50 years?)

4.2 Main Project Components

4.2.1 Red Sea Water Intake

A seawater intake system, including pipelines and a land-based pumping station is foreseen at the northern shore of the Gulf of Aqaba, adjacent to and east of the border between Jordan and Israel. The installed capacity of the intake structure and the pipeline to be laid beneath the Ayala Development Area in Aqaba will be 700 MCM / yr. This capacity will cater for both phases I and II of the RSDS project, while 300 MCM / yr will be abstracted during Phase I. At the mouths of the intake the flow velocity should be preferably 0.15 m / sec with a maximum of 0.3 m / sec. Bar-screens of 100 mm are recommended at the intake head to prevent large objects from entering the conveyance.

The intake structure will be placed 140 m below sea level and 25 m above the sea bed, at a distance of about 1.8 km from the coastline, however this is subject to further modelling and environmental studies to assess the possibility of placing the intake at a shallower depth.

In the near shore zone, the pipes profile shall be at least 3m below sea level and the trench bottom at about -6m below sea level. The pipeline shall be designed to protect against wave and current hydrodynamic actions; external hazards such as anchors and with minimisation of the adverse impact on the Ayla Intake discussed above.

The submerged offshore pipeline will enter the shoreline directly west of the Ayla Development project described above. The civil works of the intake pumping station will be designed for a capacity of 525 MCM / year, while the MEICA components will be designed for phase I (300 MCMC / year) only. The on-shore pipeline will next follow a corridor of approximately 60 m wide between the Jordan/Israel borders immediately to the west of the Ayla area.

Figure 8 – Northern Intake under RSDS Phase I

A pre-treatment process will be employed to reduce the silt density of the water in advance of the desalination stage. The pre-treatment process will likely include two stage dual or multi-media filtration process using sand or a combination of granular media to reduce the amounts of silt in the water. The media filters can be large open top chambers through which the seawater will flow by gravity. This phase has significant space requirements. Membranes are beginning to replace granular media for pre-treatment, but their use or not will depend on the BOT Contractor's design. Any further pre-treatment will be dependent on water quality.

The first segment of the conveyance system originates at the northern location (see Figure 8 – Northern Intake under RSDS Phase I (see Figure 8), including a twin buried steel pipe alongside Aqaba Airport in a direct line to the new Desalination Plant, about 20 km to the north at an altitude of 100 m above msl. It is planned to construct the first 2.5 km of this pipeline for 700 MCM / yr and for 525 MCM / year thereafter.

4.2.2 Desalination Plant

A Reverse Osmoses desalination plant is foreseen just outside the ASEZA in Aqaba in the south serving water supply for both Aqaba and Eilat. This plant will consist of a seawater feed supply pipeline from the Conveyance System pipeline to the desalination system; a seawater reverse osmosis desalination system, including seawater feed pre-treatment and desalinated water post-treatment systems. The system will have an annual desalinated water output of 65 MCM. However, it will be sized to generate up to 25% above the daily, monthly and seasonal average, or about 220,000 m3 / day to meet the seasonable water demands in both Jordan and Israel. Finally, the site will include a desalinated water storage reservoir.

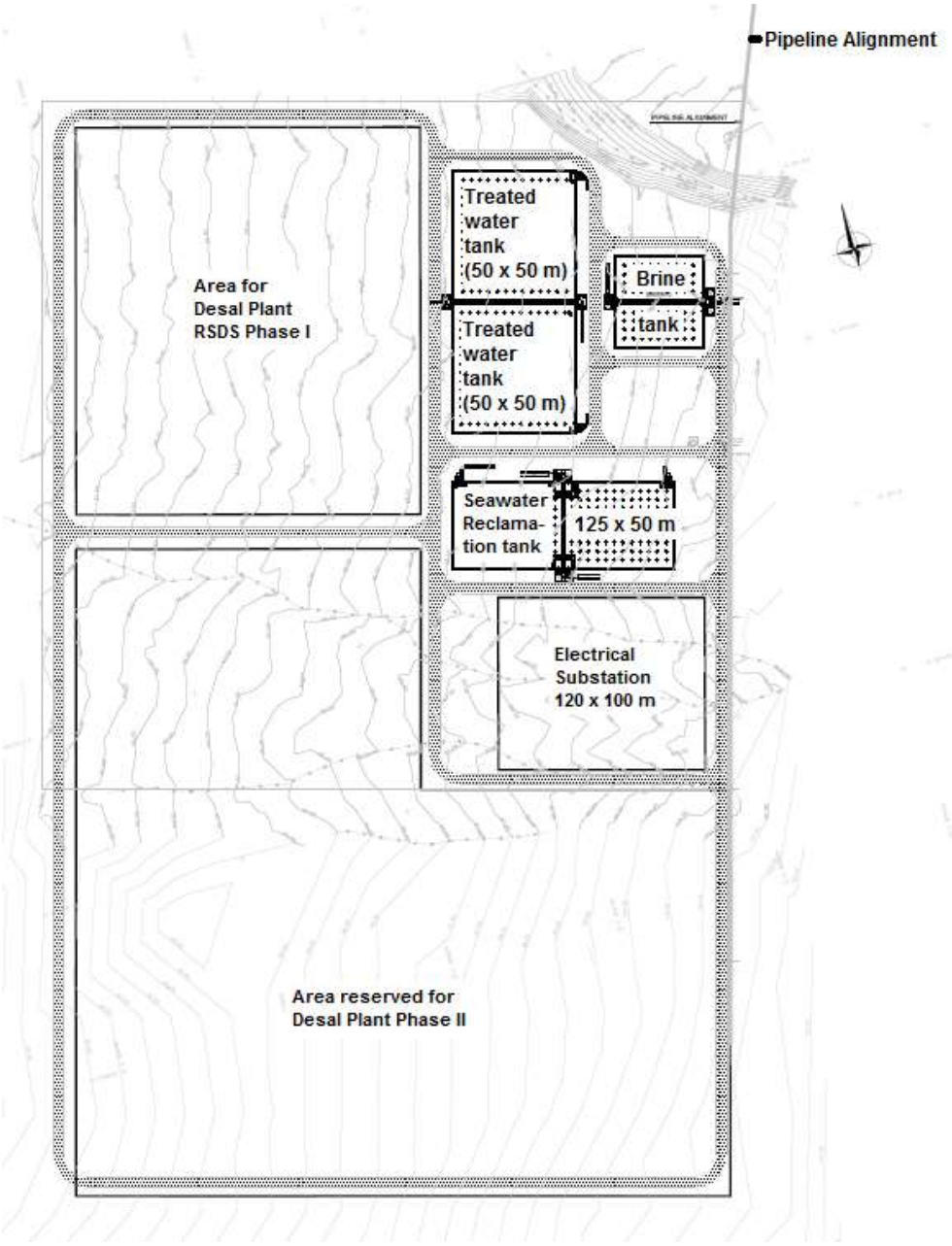

Figure 9 – Site Plan for the Phase I Desalination Plant

Figure 9 provides an outline sketch of the foreseen desalination plant. Updates shall be provided in the BOT tender documents ref: J15135-0100D-PD-ENV-GN-302. As described by Dar Al-Handasah and

partners in the 2016 ESA Report, the Phase 1 plant will be configured as a two-pass design to deliver a product which meets the stricter water quality requirements of both Jordanian and Israeli Drinking Water standards, as well as quality requirements related to its agricultural use (the knock on post- treatment phase must be considered). The first pass reduces the saline content, while the second reduces the boron levels. There may be a need for remineralisation of the water to increase the calcium carbonate content. A disinfection stage is then required, using chlorine, ozone or UV treatment, or a combination (chlorination is the most likely).

It is expected that the desalination plant will include the following components:

1. A raw water supply system from seawater feed tank (which is part of the Conveyance System);
2. A feed water pre-treatment system (possible unit operations: flocculation, dissolved air flotation, media filtration/ultra-filtration, micron filtration, chemicals injection);
3. The desalination system (A two pass reversed osmosis plant – a sea water reverse osmosis section followed by a brackish water reverse osmosis section, booster pumps, high pressure pumps, energy recovery system and all required instrumentation and controls);
4. A product post-treatment system (limestone reactors, chemicals injection);
5. Auxiliary systems (clean in place, flushing, air supply, electrical substation, motor control centre rooms);
6. Infrastructures (buildings, constructions, pipe racks, trenches, drainage, roads, chemicals and spare parts storage areas, a maintenance shop); and
7. An operational reservoir for the desalinated water.

The electric power to the Plant shall be supplied by the Authorities to the boundaries of the Station site at the HV Supply Substation.

The product potable water will be discharged through the Israeli Desalinated Water Pipeline to the Israeli Border Water Delivery Point and to the Jordanian Water Delivery Point adjacent to the Desalination Plant.

In addition there will be a second Booster pumping station on the north end of a short seawater gravity pipeline coming from the Desalination Plant, pumping the mix of brine and seawater towards the High Level Regulating Reservoir, on the highest point towards the Dead Sea. The civil works of the Booster Pumping Station will be designed for a capacity of 350 MCM – year, while the MEICA works of this Booster Station will have a capacity of 235 MCM / yr during phase I, expandable to 310 – 350 MCM / yr during phase II. Figure 9 provides an indicative layout of the Phase 1 desalination plant.

The Desalination Plant must allow for the possibility that in the future it may be expanded to be capable of producing 80 MCM/year. Furthermore, a second phase desalination plant, currently sized to generate 150 MCM/year, is expected to be built alongside and in close proximity to the Phase I Plant. This second desalination plant will also derive its seawater feed from the Environmental Pipeline and discharge its brine reject to it, downstream, in the same manner as the Phase I Desalination Plant. Though the second phase desalination plant will most likely be contracted through a new BOT tender, it may be possible to share co-utilize infrastructures, auxiliaries and common project facilities with the current Phase I Plant.

4.2.3 Conveyance Pipeline

For Phase 1 the conveyance pipeline will carry 300 MCM of seawater from the intake to the desalination plant at which point 65 MCM will be desalinated and the reject brine mixed with the seawater balance and conveyed up to the Dead Sea. The pipeline from the Desalination Plant to the Dead Sea will have a capacity of 235 MCM / yr during phase I, expandable to 310 – 350 MCM / yr during phase II. The

conveyance pipeline is entirely on the Jordanian side and runs northwards from the Red Sea intake in close proximity to the Dead Sea Highway for approximately 214 km.

The Conveyance will comprise the following sections:

- The Ayla pipeline of 2 km through a strip of 54 m wide.
- An 18 km on-land long twin seawater pipeline from the Ayla Pipeline to the seawater reservoir of the Desalination plant. The 18 km section between the Border and the Aqaba Airport will be buried 2 metres deep along a 60 m wide strip east of the airport. The design capacity will be 525 MCM / yr (using 300 MCM / yr during phase I)
- A short Seawater pipeline bypassing the Desalination Plant, between the Seawater Reservoir and the Brine reservoir
- A short gravity mixed water pipeline, through which the combined brine and seawater flows freely from the brine reservoir to a Booster Pump Station.
- A Booster Pump Station with a capacity of 235 MCM / yr for phase I, expandable to 310 - 350 MCM – yr for phase II
- An ascending mixed pressured water pipeline from the Booster Pump Station to the High Level Regulating Reservoir
- A High Level Regulating Reservoir on the highest point along the environmental pipeline with a capacity of 20,000 m3
- A Long Gravity Mixed Water Pipeline from the high reservoir down to the Dead Sea with a capacity 235 MCM / yr during phase I, expandable to 310 – 350 MCM / yr during phase II
- Altogether the environmental pipeline will consist of a buried steel pipeline with a length of 214 km from the intake at the Red Sea to the Dead Sea, more or less following the route of Highway 65.

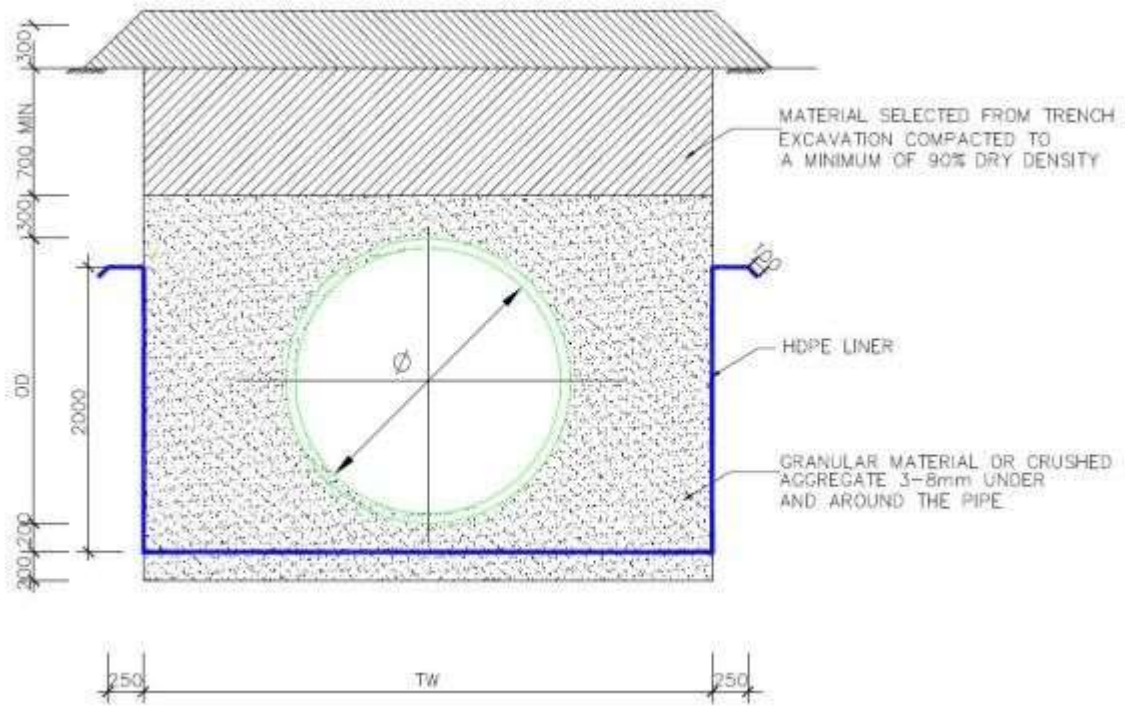

Figure 10 – Cross section of buried steel pipeline

Underground divers / culverts will be required when the environmental pipeline passes critical wadi systems in Wadi Araba. Details are provided in the preliminary design of Dar Al-Handasah and partners ref drawing J15135-0100D-DEN-PD-ENV-DT-503. The pipelines will be provided with a trench lining system underneath to collect background leakage from the pipelines and convey this to suitable collection tanks at washouts/low points along the pipeline. These tanks shall be emptied and disposed of at the project reservoirs. All background leakage shall be monitored using a leak detection system and observation standpipes/ wells if leakage rates will exceed the Guaranteed Maximum Background Leakage rate, mitigation measures shall be proposed and implemented by the Contractor.

The lengths and flow designs of the various pipeline sections are presented in Table 4

Table 4 – RSDS Phase I Conveyance Sections

Conveyance Section	Length (km)	Flow Design (MCM / yr)	Technical Specification
Intake to Desal Plant	22.5	300	Twin 102'' PN16 pipes
Desal Plant to Pumping Station	22	2350	114 '' diameter PN16 pipe
Pumping Station to HL Reservoir	4	235	Twin 90'' PN12 pipes
	34	235	114'' diameter PN 16 pipe
HL Reservoir to Dead Sea via HPPs	131	235	102'' diameter PN16 pipes

Several means to eliminate, reduce and control leakage of seawater the conveyance pipeline have been incorporated into the Scheme design, as follows:

- Steel pipes will have internal lining made of polyurethane / epoxy; and will be externally coated with a three layers polyethylene / polyurethane to isolate from the external corrosive environment.
- Steel pipes will be provided with cathodic protection to prevent corrosion.
- The pipe trench will be lined with an impervious synthetic membrane to collect potential background leakage and convey it into collection chambers located at low point on the pipeline profile.
- Special arrangements will be applied where the pipe crosses fault areas, including the use of special flexible couplings which allow deflection and elongation of the pipe during a seismic event. In fault areas, the pipes will be installed in concrete boxes to allow for easy inspection and access.
- The pipes will be buried at a minimum of 2 m under the surface to reduce both wilful and accidental damage.

The works to complete the 214 km pipeline conveyance in Phase I will be carried out in sections by separate teams the programming of which will be decided by the BOT Contractor on the basis of a number of variables including material sourcing, construction method, environmental constraints etc. Given the two to two and a half years allocated for construction and an estimated 40 m per day pipe laying rate, it is likely that the BOT contractor will adopt six / seven teams to complete the works.

Each team will comprise approximately 50 personnel split into the following roles:

- Route surveying, set out and ground preparation: surveyors will put out flags and stakes to mark the route, while bulldozers and graders will clear away the topsoil and stockpile in windrows at the edge of the working width.

- Trench digging: backhoe excavators will dig out 5 m wide trench that will be dug to a depth of 5 - 6 m, allowing 2 m burial depth from top of pipe. Where the pipeline crosses Wadi Channels or fault lines a deeper trench will be dug. Bulldozers will then push excavated material to form windrows (approximately 5 m high x 20 m wide).Bulldozers will level the bedding in the base of the trench. Pipe transporters will simultaneously deliver a steady stream of pipe alongside the working width.
- Pipe laying and installation: side booms and cranes will lower large pipe sections and manoeuvre them into place. Two or three pipe sections of standard length will be welded together outside the trench and lowered into trench. Some welding needs to be done in the trench to join the sections together. Welds will be x-rayed and the pipe will be subject to hydro-testing as per specification.
- Back filling: Earth moving equipment will be used to backfill over the pipeline. Crushed stone will be used up to 30 cm above pipe crest. Surplus materials from trench excavation will be spread over the pipeline
- Right of way restoration: Dozers and/or graders will spread the reinstated material above the pipeline and blend the material into the natural contours.

4.2.4 Hydropower Plants

A total of three hydropower plants (11 MW each) have been proposed for the RSDS project phase 1 along the line from the HC Reservoir to the Dead Sea, where there is a total of 550 m of hydrostatic head. See also Figure 6 and Figure 11. The civil works of the HHPs will be designed for a capacity of 350 MCM / yr. The MEICA works will be designed with a capacity of 235 MCM / yr during phase I, expandable to 350 MCM / yr during phase II.

The first plant will be constructed approximately 140 m below the HCR and then each plant will be installed at a similar interval thereafter. The plants will be designed to withstand brine or a mixture of seawater and brine. The following factors have been taken into account in the hydraulic design:

- Density: Potable water 1 ton/m3; Sea water 1.027 ton/m3 (40 g/l salinity); Brine, 1.059 ton/m3;
- Design allowance: Design for flow to be carried in 95% of period;
- Minimum installed capacity: two turbines will be used each with 65 % of total capacity required.
- Efficiency (combined turbine and generator): 85.35%

The HPPs will be integrated with the grid at 132 kV level via the HV Collection System of NEPCO. This integration will necessitate constructing a new 33/132 kV line step up substation near HPP3 (the existing Safi HV Collection Substation) to transfer the generated loads. Land reservation of 100x120 m will be provided to accommodate the new substation. This new 33/132 kV substation will be connected to the nearest 132 kV overhead transmission line which is Al-Karak – Ghor Safi via the HV Collection Line.

4.2.5 Dead Sea Outfall

The submerged environmental pipeline down to the Dead Sea will be constructed until the entrance of the Dead Sea outfall. The mixed seawater / brine discharge point will consist of a concrete basin, allowing collecting accurate measurements of flow, water quality, water pressure and transient conditions. A short gabion lined section will be constructed, below the target top water level of the Dead Sea. From here the water will find its own way to the Dead Sea. The outfall will be design for a capacity of 325 MCM / yr for phase I, expandable to 350 for phase II. See Figure 12.

It should be noted that near the gabion the free flow of water may cause erosion of the sediments, and eventually destabilise the gabion. This needs to be prevented actively during the operations.

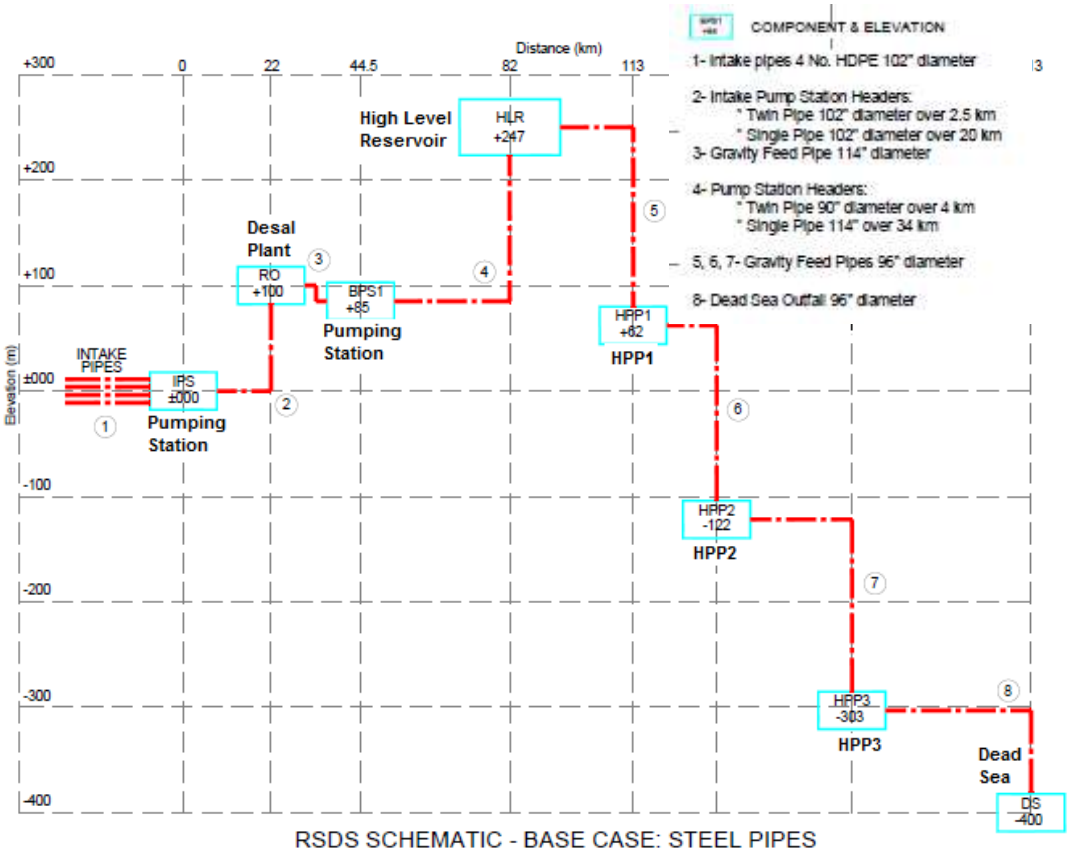

Figure 11 – Relative locations of Hydropower Plants

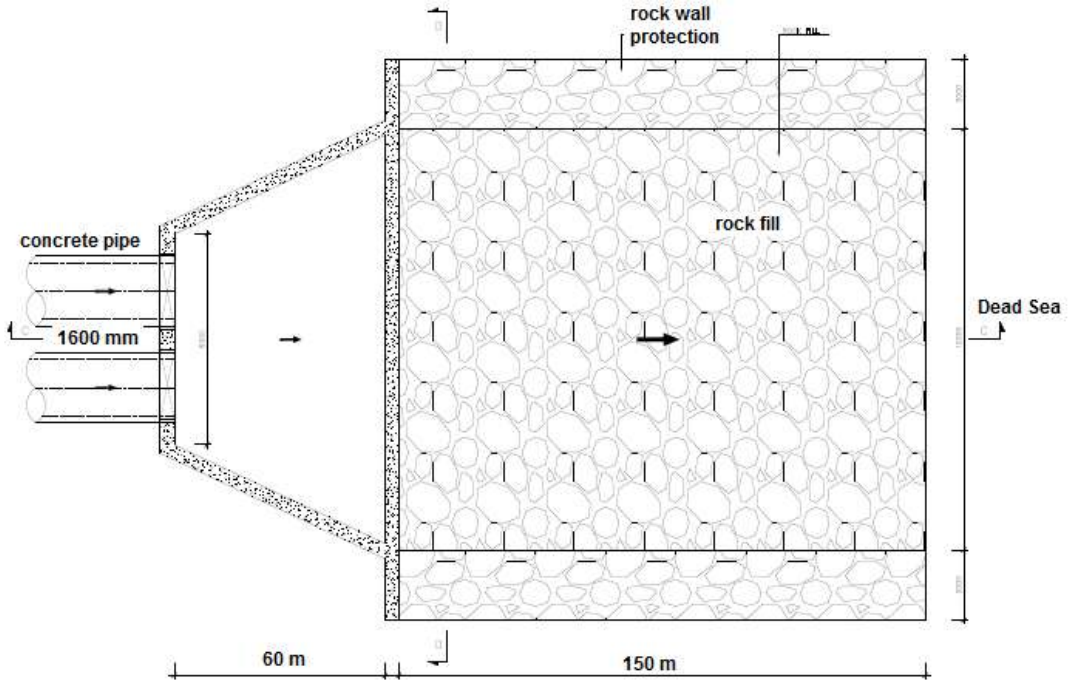

Figure 12 – Dead Sea Outfall details

4.3 Project objective and strategic approach

The Dead Sea Phase I Project has four primary objectives formulated of the Government of Jordan (GoJ): (1) establishing a secure and affordable water supply for Jordan while saving the Dead Sea from extinction; (2) support widespread economic growth in Jordan; (3) provide for a potential regional water supply for Jordan, Palestinian Authority, and Israel; and (4) facilitate private and public financing and partnership by implementing the project based on a Public Private Partnership (PPP) scheme.

4.4 Prioritization methodology and technical design

Preliminary designs for RSDS Project Phase I and tender documents for the BOT tender have been completed on behalf of the Ministry of Water and Irrigation and the Joint Administration Board by Dar Al-Handasah and partners in April 2017. Section 3.1 provides a summary.

Detailed designs of all project components will be elaborated by the selected BOT contractor. As a result, the detailed construction arrangements and their associated prioritization methods for the RSDS Phase I project cannot be presented yet.

Once the detailed designs have been completed by the contractor, the exact equipment needs, sites, and physical characteristics of the work areas will be known. Within the tender conditions, the successful BOT bidder will have some leeway to select the working methods and equipment that they will use based on their own preferences as well as price and availability at the time the contract is let.

Some general principles and approaches that will guide the construction of the RSDS Phase I Project have been set out in the preliminary design, and have been used to indicate the likely nature and extent of the main environmental and social impacts in this ESIA. The outcome of this ESIA, including related Environmental and Social Management Plan shall then be incorporated into the bidding documents and the contractual conditions for the construction.

The construction methods being applied depends on the winning BOT bidder, however they will be in accordance to those outlined in the Final Environmental and Social Assessment (ESA) Report under the Red Sea Dead Sea Water Conveyance Study Program, performed issued by the World Bank in 2014 [lit 13], with the exception of the deviations in the conveyance outlined in the preliminary designs summarised in section 3.1. Main deviations relate to the location of intake and outfall, and locations of the desalination plant, other main facilities along the pipeline route and small deviations of the pipeline route itself.

Under the preferred scheme in the ESA Report of 2014 a tunnel around Aqaba was the chosen option whilst at the Dead Sea basin a canal was opted for over a pipeline. In both cases, a shallow buried steel pipeline (< 5m) contained within a protective lined concrete trench is now preferred in the Phase I concept design for both sections.

4.5 Description of the pre-design phase

The study and pre-design phase included the implementation of the Feasibility Study, the Environmental and Social Assessments and related activities under the World Bank Studies implemented between 2008 and 2013.

Based on the conclusions of these studies, Israel and Jordan agreed on the definition of the legal concepts and parameters of the RSDS Project Phase 1 in the context of the bilateral agreement signed in February 2015. According to this Agreement the Phase I Project will be executed by a BOT concessionaire, responsible for the design, built, operations, PPP finance and transfer of the project. A Joint Administration Board (JAB) was established and a reference design, functional specifications and tender documents were prepared by Dar Al-Handasah and partners on behalf of the Ministry of Water and Irrigation. The preparatory work further included preparing the PPP operational, financial, institutional and legal arrangements for the project.

The project will further require the preparation and implementation of a Resettlement Action Plan (RAP) according to World Bank Operational Procedures OP 4.12 on Involuntary Resettlement, the IFC Project Standard PS 5 on Land Acquisition and Involuntary Resettlement and relevant EU guidelines by an independent consultant. Despite the fact that preparing this RAP is not part of the current ESIA, the Consultant has identified and confirmed the land ownership situation along the alignment of the project, including land use and private ownership of each plot along the alignment and related assets, and it will identify potential compensation in terms of land expropriation, land assets and other relevant compensation issues as input for such a Resettlement Action Plan.

The pre-design phase furthermore includes completion of the current ESIA and ESMP and obtaining the required environmental permits for the project, and well as the tendering of the BOT contract, evaluation of the bid and awarding the contract to the preferred BOT contractor.

4.6 Description of Design and Construction Phase

The awarded contractor will start with updating information on the project area as input for the detailed designs. This will include geotechnical surveys, topographic surveys, seismic and rupture investigations and more.

The field surveys, together with the BOT contract conditions, pre-design documents and the current ESIA / ESMP, will provide input for the detailed designs by the contractor. This design will include all project components: intake structure; Submarine Pipeline; Intake Pumping Station; Ayla Pipeline; Long Seawater pipeline; Mixed water section; high Level Regulating Reservoir; Dead Sea Discharge Structure; Seawater Bypass; Booster Pumping Station; Hydroelectric Power Plants; Short Seawater Pipeline; Desalination Plant; Israeli Water Pipeline; Connection to Jordan Delivery Point; Short Brine Pipeline; Ancillary Works for operations, repair, storage, maintenance, monitoring, client supervising facilities, access roads, communication system. The detailed designs will be shared with the Promoter and his consultants and evaluated against the contract conditions, and will be the basis for the construction works.

The Contractor shall also elaborate a Construction Environmental / Social Management Plan (CEMP), including construction traffic and safety planning, which will describe all environmental and social safeguard activities during the construction period in accordance with the approved ESIA / ESMP and the Environmental Permit for the project.

The Environmental Authorities may decide to require the assignment of an Environmental Control Officer (ECO) to monitor the efficient and effective application of the required ESMP / CEMP safeguard measures during the commissioning, construction and initial operation phases of the project.

During the commissioning phase, the Environmental Authorities may need to hire the ECO directly. During the construction and initial operational phases, the Environmental Control Officer could be hired directly by the contractor. However, the ECO should play an independent role to both the contractor and the client. Logically, and this person should have the appropriate qualifications.

The next preparatory steps will include hiring construction labour force and subcontractors; mobilization of construction vehicles and equipment; provision of water, power and control facilities for the construction works; setting up construction offices, constructions yards and facilities. Next the contractor will procure, mobilise and store all construction materials and equipment, including spare parts. As part of the construction preparatory works a framework for implementing both the CEMP and the Stakeholder Engagement Plan (SEP) shall be put in place.

The Construction works will then be initiated with excavation and ground works for the pipeline trench and other project components; design, supply and installation of appurtenant structures such as valves, washouts, access points as well as pipeline corrosion / cathodic protection systems. Next the intake and submarine pipelines will be constructed, as well as all other terrestrial project components.

Meanwhile the Operations and Maintenance organisation and logistics shall be established, including start-up planning and schedules, O&M electricity supply, assignment and training operating staff and resources, arranging HSE aspects and all related technical, financial, organization and legal operational preparations and manuals, including the operational components of the ESMP.

Upon completion of the construction, the works shall be decommissioned, tested and handed over to the internal O&M Organization, including final review of the construction works and O&M plans by the Client. Finally, the construction equipment, office, facilities and workers will be demobilised and the construction yards will be cleared and rehabilitated.

4.7 Description of the Operational and Maintenance Phase

The Operational and Maintenance phase will include managing the O&M Organization, including capacity management, education, instructions, HSE management, labour contracts. The start/up of the project will include the gradual activation of the water intake, conveyance and production facilities, meanwhile testing the real time performance of all project components. Particularly testing the environmental protection components will be important, such as the seawater leakage control and mitigation measures along the pipelines.

The operational phase will include operate, maintain, repair, refurbish, renew and replace all facilities in accordance with contract requirements. It will furthermore include financial, administrative and environmental operations, including billing, external relations, O&M Monitoring and Reporting (seawater and brine flows, potable water flows, water quality, energy generation, energy use' and Environmental and Social Monitoring and Reporting according to the Environmental Permit and ESMP including HSE issues and additional (Brine / intake) studies.

4.8 Description of the Transfer and Decommissioning Phase

Upon completion of the 25 year O&M contract, the works and O&M reports will undergo inspection by the client, including an inventory of equipment and spare parts. Next the facilities will be handed over to the Client, or otherwise to an operator who will be assigned by the Client next.

During the life span of the project different components shall be replaced at regular intervals. Generally it may be assumed that civil works and pipes need to be replaced every 40 years; pumps and moving components every 20 years and electrical components every 10 years.

When, at a certain stage in the further future it will be decided to dismantle RSDS project facilities altogether, the decommissioning of the project shall include activities such rehabilitation of soil, waste and groundwater, landscaping and replanting and transfer of land ownership if needed.

4.9 Project schedule and life span

The foreseen project schedule is the following:

Date	Activity
2017/2018	Five shortlisted international consortia submitting their bids
2018	Within 6 to 12 months the winning Consortium shall be notified and assigned to the project following successful completion of the contract negotiations with the preferred bidder.
2018	Preparatory field surveys by contractor
2019	Completion of Detailed designs Phase I, start of construction works
2023 - Mid	Completion of Construction works and start-up of operations Phase I
2048 - Mid	Completion of 25 years operational concession period Phase I

4.10 Staffing during construction and operation.

The Contractor that will be assigned to the project will be responsible for planning and implementing the construction and operation, which may include appointing sub-contractors for certain project components or specialist elements. The contractor shall ensure that all sub-contractors meet the RSDS Phase I Project contract requirements, including those of the construction environmental management plan (CEMP) and Project Code of Conduct.

The preferred contractor, and consequently the number of workers required during construction cannot be determined yet. However, based on the preliminary design performed by Dar Al-Handasah and partners the total number of construction staff might be around 625, including a crew 25 for the intake and submarine works; 100 crew for the hydropower plants; 100 crew for the desalination plant; 350 crew for the conveyance pipeline construction and 50 crew for the Jordanian and Israeli fresh pipeline components. The precise staff numbers shall be determined by the BOT Contractor.

Similarly, the number of staff required for the operations cannot be determined yet. A general estimate however is that this could be somewhere between 100 and 200 staff, including 5 -10 staff for the intake

and submarine works; 30 – 50 staff for hydropower plants, 50 – 100 staff for the desalination plant and 15 - 40 for the pipeline operations.

4.11 Temporary support and offsite facilities and service

Again, a detailed description of the required support facilities will be provided by the contractor and cannot be provided at this stage. Below provides a preliminary assessment of these facilities based on the preliminary designs:

- Batching plant for concrete production, likely to be located at the Desalination plant construction site, and one of two near the HPP constructions sites
- A pipe manufacturing plant, likely located in or near Aqaba
- Precast concrete plants, likely located in Aqaba
- A Dredger in the Gulf of Aqaba
- A floating barge for the construction of the water intake pipeline
- Construction yards and parking lots for heavy machineries near all major construction sites, , staff accommodation and utilities, fences, and HSE facilities
- Access roads to all construction sites and support facilities. These roads will also be used during the operations
- About 20 bulldozers
- About 10 heavy excavators
- About 250 spoil removal trucks
- 20 heavy lift cranes
- 40 excavators
- 8 rock breakers

The detailed list of equipment required shall be provided by the BOT Contractor.

4.12 Institutional arrangement proposed

The overall governing bodies will be the of the Project are the Jordanian Government, represented by the Ministry of Water and Irrigation, and the Joint Jordanian Israeli Administration Body which is the entity that has the power to take decisions and bind both the Governments of Jordan and of Israel.

The project will be set up as a Public – Private Partnership The BOT contractor will establish its own operating company, which will be responsible for all technical ,operational, administrative, financial, PR, environmental and human resources related staff and departments.

The contracting authority of the Project will be the GoJ. The Minister of Water and Irrigation will sign the BOT Contract on behalf of the GoJ in accordance with a resolution of the Council of Ministers. The JVA will be MWI□s executing agency. The BOT Contractor will refer to the Project co-managers, one nominated by Jordan and one by Israel.

The Project will be governed by one global Build Operate Transfer agreement with a single contracting authority and one BOT Contractor responsible for the entire scope of the Project, including design and build obligations; operate and maintain obligations; finance the portion of the Project which has not been funded through the governments; rights to payments for both availability and production, and to the MWI Contribution; change in law compensation rights; termination rights and compensation.

The Hydropower Stations may be organized as an IPP contract between the contractor as power producer and the Jordanian off-taker.

5 ANALYSIS OF ALTERNATIVES

5.1 Introduction

This section will describe and summarize alternatives that were examined and studied in the course of developing the proposed project, including identifying any potential material changes to alternatives studied as a result of design alterations. The concept of alternatives extends to siting, design, technology selection, construction techniques and phasing, and operation and maintenance procedures. It will compare alternatives in terms of potential environmental and social impacts and suitability under local conditions. This includes, for example, alternative ways of meeting the electricity demand, alternative technologies, alternative fuels, engineering and pollution control equipment alternatives, etc.

The section will include the following:

- Current Situation (“No Action” option)
- Alternative siting and alignments to avoid/minimize damage to environmentally sensitive areas.
- Alternative siting and alignments for associated facilities (to improve public safety as well as to reduce public interference on such facilities).

In the environmental and social assessment performed under the World Bank studies program a study on alternatives has been performed by an independent team of experts (ref: ESA Main Report Mar 2014, ref 13).

The key challenges for the alternatives were to address saving the Dead Sea from further deterioration and at the meanwhile generate potable water and energy for the benefit of Jordan, Israel and the Palestinians, as such also building a symbol of peace and co-operation for the Middle East. Comparison of the alternatives was done in terms of economic, environmental, technical and financial considerations.

5.2 No Action Option

A no-action option was elaborated in terms of taking no actions, to see what consequences this would have on the future Dead Sea and the people depending on it, as well as on regional water scarcity and regional co-operation.

Under this no-action option it has been assumed that the population growth rates remain constant, and that the population in 2035 would be around double the current size of today, equally divided between the three parties. By 2060 the total population in Jordan, Israel and Palestine would be greater than 64 million.

The Dead Sea today witnesses a natural inflow of around 450 MCM / yr, mainly due to surface runoff and groundwater drainage, and a total outflow of about 1150 MCM / yr, including 750 MCM evaporation from the surface of the Dead Sea, and 400 MCM abstractions (and also evaporation) by the Chemical Industries from the Dead Sea. This leads to a negative balance of about 700 MCM / yr, or about 1 metredecline of the sea water level per year.

Under the Zero Alternative this depletion will continue, leading to a Dead Sea having:

- A surface level of minus 470 m by 2070 against minus 425 m today
- A surface area of 509 km2 by 2070 versus 605 km2 today

- A total volume of 89 km3 by 2070 versus 114 km3 today

The depleting Dead Sea will impact the depending tourism and chemical sectors heavily. It will also increase the gradient of surface runoff into the Dead Sea leading higher erosion levels of the sediments around the Dead Sea and lowering groundwater levels. Collapse sinkholes around the Dead Sea appeared in the 1980s due to lowering groundwater levels and reduced soil stability. This will continue until the Dead Sea level and surrounding groundwater levels have stabilised. These sinkholes will lead to more damages of roads, bridges, and drainage channels on the Dead Sea perimeter.

Under the Zero Alternative the shortage of fresh water in Jordan will be about 611 MCM / year in 2020, based on a consumption of 79 m3 water per person per year and a total population of 7.71 million. By 2060 this shortage will increase to 736 MCM/year if no major new sources of potable water will be developed, leading to severe problems in terms of per capita water availability and related social, economic and maybe political risks.

5.3 Alternative Strategic Solutions

A large series of alternatives have been considered under the Works Bank ESA work to safe to Dead Sea and augment the regional water supply at the same time, including restoring the historic fresh water inflow through the Jordan River into the Dead Sea combined with heavy water demand reduction programs, or transferring seawater and desalinating seawater from the Mediterranean instead of from the Red Sea, or transferring water from the Euphrates River or from Turkey by pipelines of ship.

Various sub-options and optimisation have been elaborated within these alternatives, such as new technologies for the Chemical industries requiring smaller evaporation rates; implementing wider and better wastewater treatment and reuse strategies, including grey water use; reduction and changing agricultural water demands through the introduction of new irrigation technologies, other less water demanding (cash) crops, and or introduction of more efficient water pricing policies. Many of these suggestions seem sensible in all cases, regardless of the main alternative solution selected.

An overview of all alternative transfer options considered is presented below. The reader is kindly referred to these final ESA studies issued in 2014 [lit 13] for full coverage of assessments of the alternative solutions. A brief summary of the results is presented here.

Both the Red Sea–Dead Sea Water Conveyance options and the Mediterranean–Dead Sea Conveyance options would be require large hydraulic structures, and both could restore the level of the Dead Sea without imposing unacceptable ecosystem costs. Uncertainties remain in terms of impacts on the Dead Sea as result of mixing of seawater from Red Sea or Mediterranean Sea with the Dead Sea. The related Desalination components in both options would allow for substantial capacities to produce potable water for Jordan, Israel and Palestine. Desalination is seen as basically the only option to augment drinking water in the region. Both options would also allow for additional power generation using the gravity flow towards the low Dead Sea.

The assessments show that restoring the historic flows of the Jordan River and meanwhile introducing drastic water demand reduction measures could not be sufficient, within a realistic water management scenario, to stabilize the Dead Sea level, nor to bridge the projected water shortage gap. The same counts for transferring water from Turkey by tankers or submarine pipelines.

Various combination alternatives have been assessed as well in the final ESA of 2014 [lit 13], such as:

- desalinating water in Aqaba, importing water from Turkey and improved water recycling and conservation;
- Decreasing water extraction from the Dead Sea by the chemical industries plus increased wastewater recycling for irrigation
- Partly restoration of the Jordan River flows, in combination with desalination of water at Aqaba and more efficient irrigation strategies.

However, assessments showed that these combinations under the best circumstances could only partly stop the degradation of the Dead Sea, and only partly bridge the water deficit gap projected for the next 30 years.

The final ESA issued in 2014 [lit 13] concluded that only the transfer of water from the Red Sea or the Mediterranean would be able to save the Dead Sea from environmental degradation and meanwhile produce substantial amounts potable water, meanwhile generating electricity at affordable prices.

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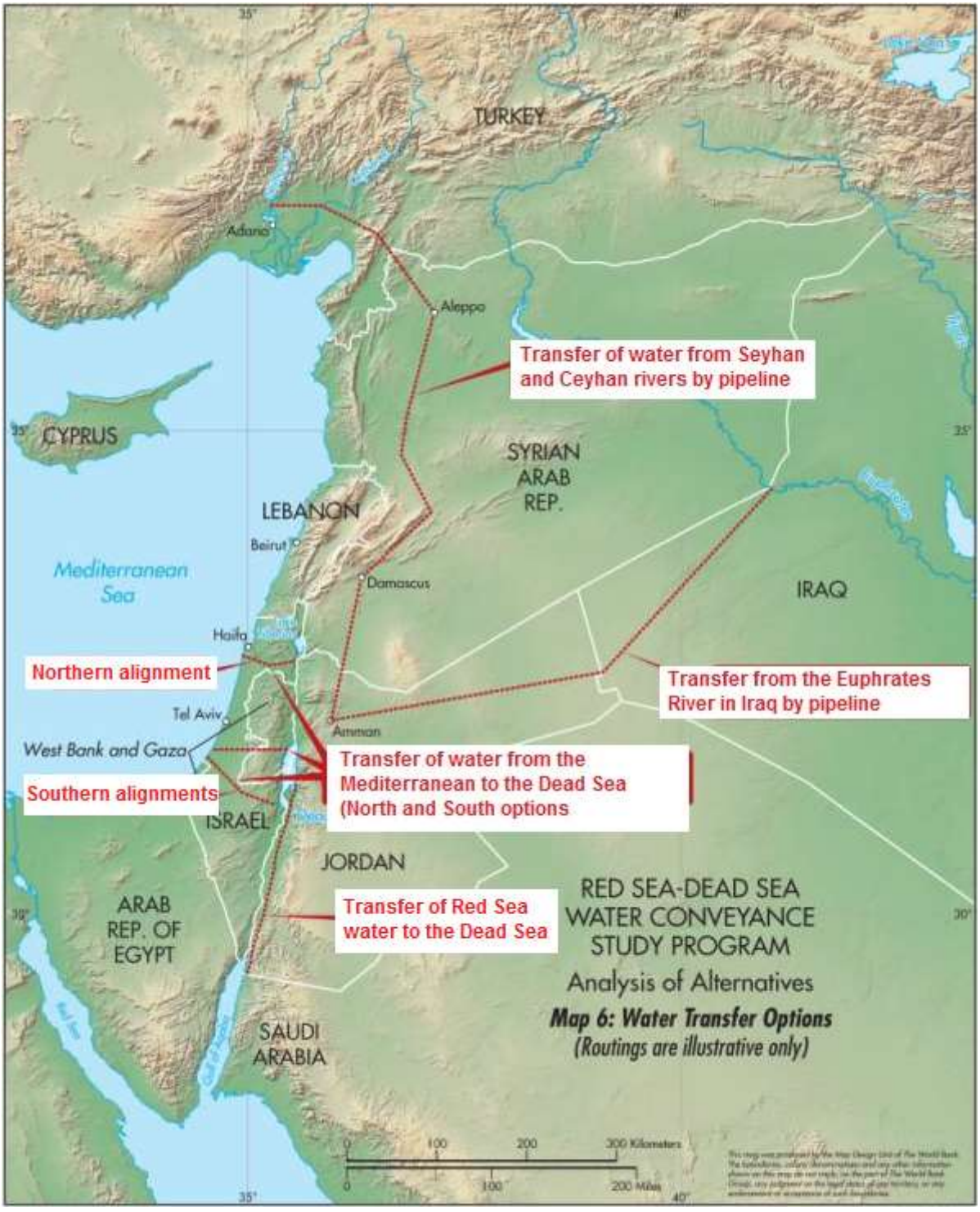


Figure 13 – Alternative Transfer Options considered in the World Bank ESA Study [lit13]

An advantage of the Red Sea intake alternative over the Mediterranean intake alternative is that the former enables to develop and construct first a small pilot phase to test the performance of the various project components prior to full scale development of the project. The pilot investments of the red Sea intake pilot project could next be integrated into the full scale development.

The Mediterranean intake alternative would not allow for such a pilot phase that could be integrated later in the full scale development of the project. This relates to the requirement of the construction of a relative extensive tunnelled pipeline through the West Bank mountain ridge. The added pilot cost for the Mediterranean intake alternative would therefore be much larger. In addition, the Mediterranean intake alternative may prove to be significantly more challenging to set in place the necessary multiple Israeli – Palestinian – Jordanian cooperative agreements necessary to gain support for and implement this alternative. These co-operation agreements are much simpler for the Red Sea intake alternative, since all marine and terrestrial project infrastructure components are located on Jordanian soil.

A third main alternative, which combines desalination at Aqaba and the Mediterranean Sea, Water Importation from Turkey and Water Recycling and Conservation, could also save the Dead Sea, meet potable water needs and promote cooperation. However, the time scale to get tangible results with this alternative would be thirty years or more, and the international cooperation aspects of this alternative would be very complex, since it would not only include the three Core Parties, but also Turkey as large-scale water exporter.

As a result, Israel and Jordan agreed in February 2015 to select the Red Sea Intake alternative as the preferred option, and to jointly define the legal concepts and parameters of the critical components for the Pilot Phase I of the Red Sea Dead Sea Project.

5.4 Alternative RSDS Project Configurations

The overall purpose of the RSDS Phase 1 Project is to take seawater from the Red Sea and carry it north to the Dead Sea basin so that it can be used to alleviate the declining water level in the Dead Sea as well as encompassing desalination to supply potable water to the Beneficiary Parties.

Key decisions with regard to the layout of the RSDS Project Phase I project include:

1. Precise location and configuration of the seawater intake
2. High level control reservoir
3. Lining of the pipeline through Wadi Araba
4. Locations of key project components along the pipeline route, including Desalination Plant, Pumping stations, hydropower stations
5. Location of Dead Sea discharge point

Reference is made to Annex I of the Environmental and Social Assessment (ESA), Dar Al-Handasah and partners, 2016 [lit 9] for an elaborated description and evaluation of the alternatives for the RSDS Phase I project components. A summary is provided hereafter.

Red Sea Water Intake

Three types of intake were considered:

1. a submerged intake with a velocity cap;
2. an offshore intake with enclosed breakwater: The breakwater forms an enclosed basin for the intake, and water is conveyed through the breakwater through pipes buried in the embankment; or
3. an open channel intake, located at the shoreline: Water is taken in directly through the channel, while screens limit infiltration of debris. The intake can be further protected by an offshore breakwater if necessary.

The approach for each option is largely influenced by the location. Where differences in component design occur; cost, distance to other components, access, depth, general disturbance and impacts on the marine environment are the foremost considerations.

The general elements of the each intake are as follows:

- a submerged offshore seawater inlet with pipes through which the sea water will flow by gravity along the sea bed and to the mouth of the conveyance;
- facilities for pre-treatment and control of water entering the conveyance, including a system for dosing sea water with anti-fouling agents, mesh screens to prevent large solid objects from entering the conveyance and control gate(s) to allow the flow to the conveyance to be reduced and/or shut off;
- other infrastructure including administration and office facilities (likely be housed in a low-level single story building), facilities for receiving and storage of anti-fouling chemicals and fuel, a backup-generator for low level power (e.g., mixing, control gates, emergency failsafe lighting, etc., but not sufficient to supply power for water pumping), parking and vehicle access areas;
- a pumping station to pressure water in the conveyance and deliver water to the holding reservoir; and a road access into the site.

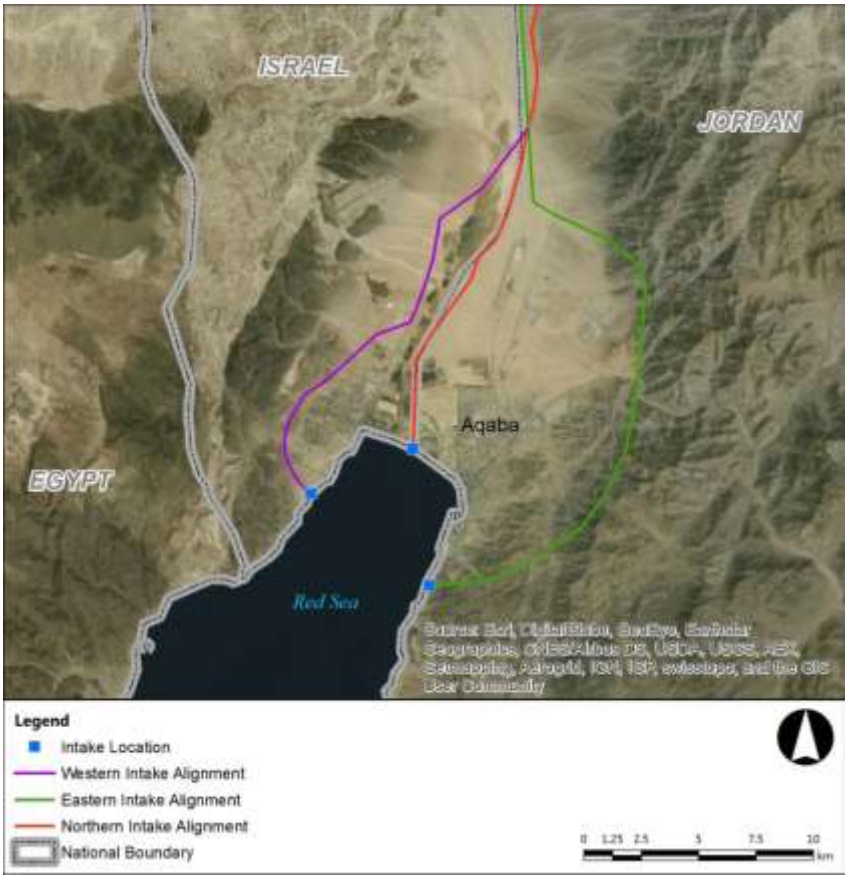


Figure 14 – Alternative intake locations considered

The North Intake location is situated in a confined area of the Jordanian coastline between the border with Israel and the Ayla Project, currently under construction. The site is characterised by a smoothly sloping, fine sand beach, suitable either for a surface intake at the shoreline or a submerged intake at some distance from the shore.

The site for the Eastern Intake is located at the site of the old Aqaba Thermal Power Plant, around 5 km south of Aqaba. The identified site is around a hectare in area, which will be ample for the site facilities, including the pumping station, which will be located at the same site. The shoreline here is steeply sloping and rocky, but the site itself is a flat area carved out of the mountains, bounded on all sides by the mountains except to the west where the main Aqaba port road runs between the site and the shoreline.

The West Intake alternative is situated on the Israeli coast, about 4 km south of Eilat, between the North and South oil terminals, and could accommodate a submerged intake at about 20m depth. The area is reported to present rock foundation conditions. This intake location was rejected by the Feasibility Study due to its environmental impacts, land availability problems, and its close proximity to an active oil terminal with inherent risks of pollution and contamination.

A comparison was made between the environmental impacts from each of the three alternative intake sites. The analysis indicated major negative impacts associated with the western intake related to: i) visual impact on the coastline; ii) engineering difficulties; iii) land availability; iv) vulnerability to pollution; v) impacts on coral reefs; and vi) impact on tourism.

The relative impacts of both the northern and eastern sites were reported to be less than the western site. The only major issue reported for the northern site was related to visual impacts from the intake pipeline, although the report notes that neither seismic risk nor flood risk was taken into account. The eastern intake would require a longer and more expensive bypass through the centre of Aqaba, or around the city of using a tunnelling option. The northern intake site was consequently selected as part of the preferred project scheme.

With regard to position of the inlet, depth and distance from the shore, it was concluded that further marine ecological monitoring and Red Sea hydrodynamic modelling would be required. Initial assessments by Thetis SpA in 2013 concluded that based on the range of the photic layer depth, chlorophyll-a concentrations and the objective of avoiding withdrawal of water from the 60-120 m layer, where coral reefs larvae are common, it would be best to locate the intake at a depth of at least 140 m (bottom depth of 165 m). In so doing it was expected that only a negligible proportion of the larvae reaching the region upstream of the intake will be removed. A somewhat higher proportion of those larvae (but still less than 1%) would be removed during the winter, when the water column is vertically mixed, and the water is abstracted from a thicker layer. Such values are at least one order of magnitude smaller than the present inter-annual fluctuations of the populations of corals and invertebrates at the local reefs.

This resulted in a preferred intake at a depth of 140 m below sea level, well below the photic layer, and at least 25 m above the bottom. It should be noted however that such a deep intake has never been realized before and might pose high costs and efforts in terms of construction and maintenance.

This ESIA assumes the realization of a 140 m deep intake only. However, further studies to the technical, environmental and financial feasibility of the proposed deep intake versus a shallower intake are underway in a complementary study, which are scheduled to be completed by September 2017. This complementary study will include marine surveys and an updated hydrodynamic and tracking model of the Gulf of Aqaba and Eilat. The studies aim enabling a well-founded decision by the promoter and finance partners to:

- include a Shallow Intake Concept (with appropriate mitigation measures) into the BOT Tender; and/or
- maintain the Deep intake (140 m deep, 2.5 km from the shoreline, possibly 30 – 40 MUSD more expensive) as part of the BOT Tenders; or

- leave it up to the bidding contractors to go either way, provided adequate mitigation measures are proposed by them

High Level Control Reservoir

The hydraulic system of the RSDS project requires the construction of a control reservoir on the highest level along the conveyance route. Such as reservoir shall buffer seawater and brine pumped through the system and shall provide the flow requirements needed for the hydropower generation along the downstream section of the route.

Hydraulic calculations showed that the footprint of the Control Reservoir shall be around 50 ha with a static drop of approximately 550 m between the reservoir and the Dead Sea. As shown below, three options for locating the High level reservoir and related pipeline routes were considered:
1. East of Rishi (green line);
2. Central Rishi (red line); and
3. West of Rishi (blue line).

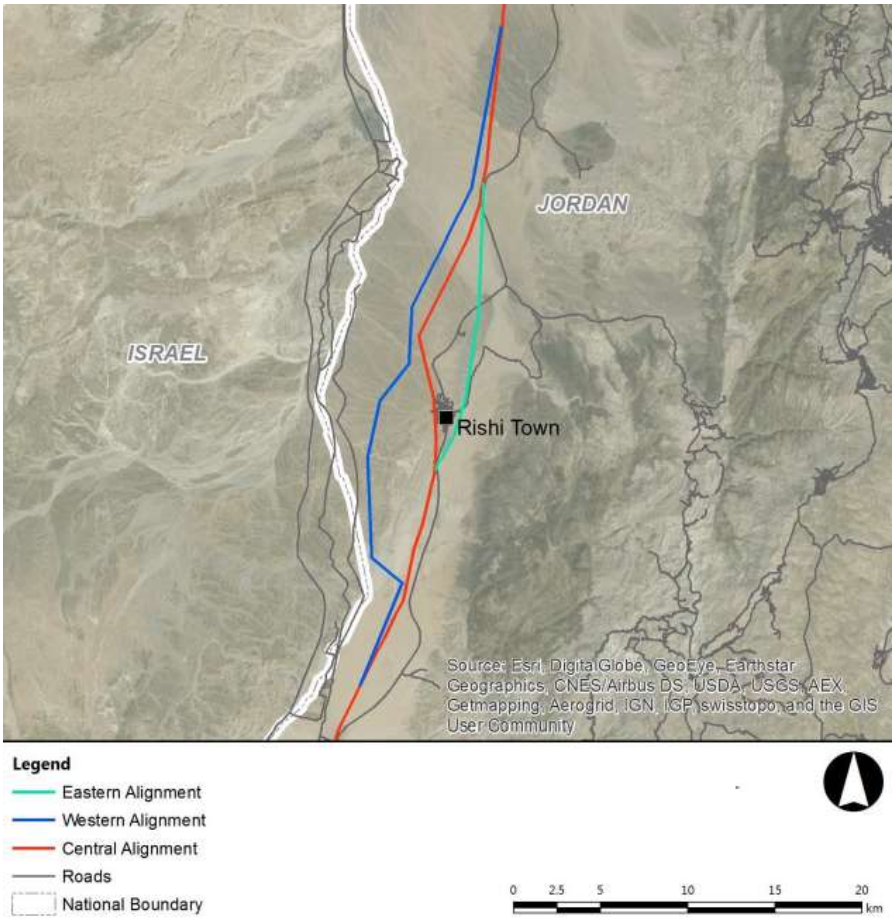


Figure 15 – Alternative High Level Reservoirs considered

No significant adverse environmental impacts are anticipated on the local environment for any of the three locations. The analysis indicated adverse impacts associated with land availability and eviction of settlers, the local geography and concerns regarding the access and the safety of the component. On the whole, the relative impacts of both the western site (Option 3) are thought to be bigger than those of the eastern

(Option 1) and central (Option 2) sites. As such, Option 3 was dismissed on the grounds of safety, accessibility and additional costs related to the increase in distance of the pipeline.

The Eastern location also presents further costs as a result of increased distance and the more difficult terrain is needs to pass. The Central location presents minor concerns over the proximity of inhabitants / dwellings under construction. The land is owned by JVA. Should however the project affect legally dwelling communities, it is likely that compensation needs to be paid. Eventually, for the reasons of ease of construction and cost, the more direct Central location (red line) was selected as part of the preferred project scheme.

Desalination Plant

The RSDS project at large foresees in a number of desalination plants to provide full capacity of the required potential water production. It has been decided to put the phase I plant just north of Aqaba to provide desalinated water to Aqaba and Southern Israel Arava Valley. The locations of subsequent plants have not been established but they could be either at the southern or northern end of the conveyance, depending on how desalinated water will be conveyed to Amman.

The Desalination Plant for Phase 1 will serve Aqaba and southern Israel. It will be constructed at a location about 22 km north of the Gulf of Aqaba in close proximity to Highway 64 in the Wadi Araba. This location has been selected on the basis of the availability of land, topography, and proximity to the water delivery points for Jordan and Israel. According to the information available to the Consultant, no alternative locations have been considered during the feasibility assessment of phase I.

Dead Sea Discharge Point

Three) alternative alignments and discharge points into the Dead Sea have been considered, both to the east and to the west of the chemical company evaporations ponds and also between the two sets of ponds (see Figure 16), these are::

1. Eastern Option via the towns of Ghor Safi, Ghor Fifa and Ghor Mazrala towards the Dead Sea (Red);
2. Central Option via Arab Potash Company and the Lisan Peninsula (Green), this was the preferred studies alternative in the final ESA of 2014 [lit 13]
3. Western Option via Ein Bokek (Purple).

Concerns were raised in the World Bank Feasibility Study [lit 7] that locating the discharge in the vicinity of western Option 3 could have serious adverse impacts on the operations and profitability of the chemical abstraction companies. Option 2 would have impacts for the chemical industries a well, since the pipeline would pass through the evaporation ponds. It would furthermore pass along the border with Israel raising particular security concerns. It was concluded that the alignment to the east via the towns of Ghor Safi, Ghor Fifa and Ghor Mazrala is to be preferred (option 1), also for reasons of border security, access and minimum disturbance during construction.

Figure 16 – Alternative Dead Sea Discharge Locations considered

Alignment of the Pipeline

Figure 17 provides an overview of the suggested pipeline route under the final ESA of 2014 [lit 13] versus the preferred route under the RSDS Phase I project.

The preferred locations along the intake near the Red Sea and towards to discharge point at the Dead Sea has already been discussed above. The alignment of RSDS Phase I between these sections, along Wadi Araba, largely coincides with the suggested alignment under the final ESA of 2014. Optimizations of the route have been made during 2015 and 2016 based on additional field checks and surveys. The details of the current route of the RSDS Phase I pipeline as prepared by Dar Al-Handasah and partners are presented in annex 4.

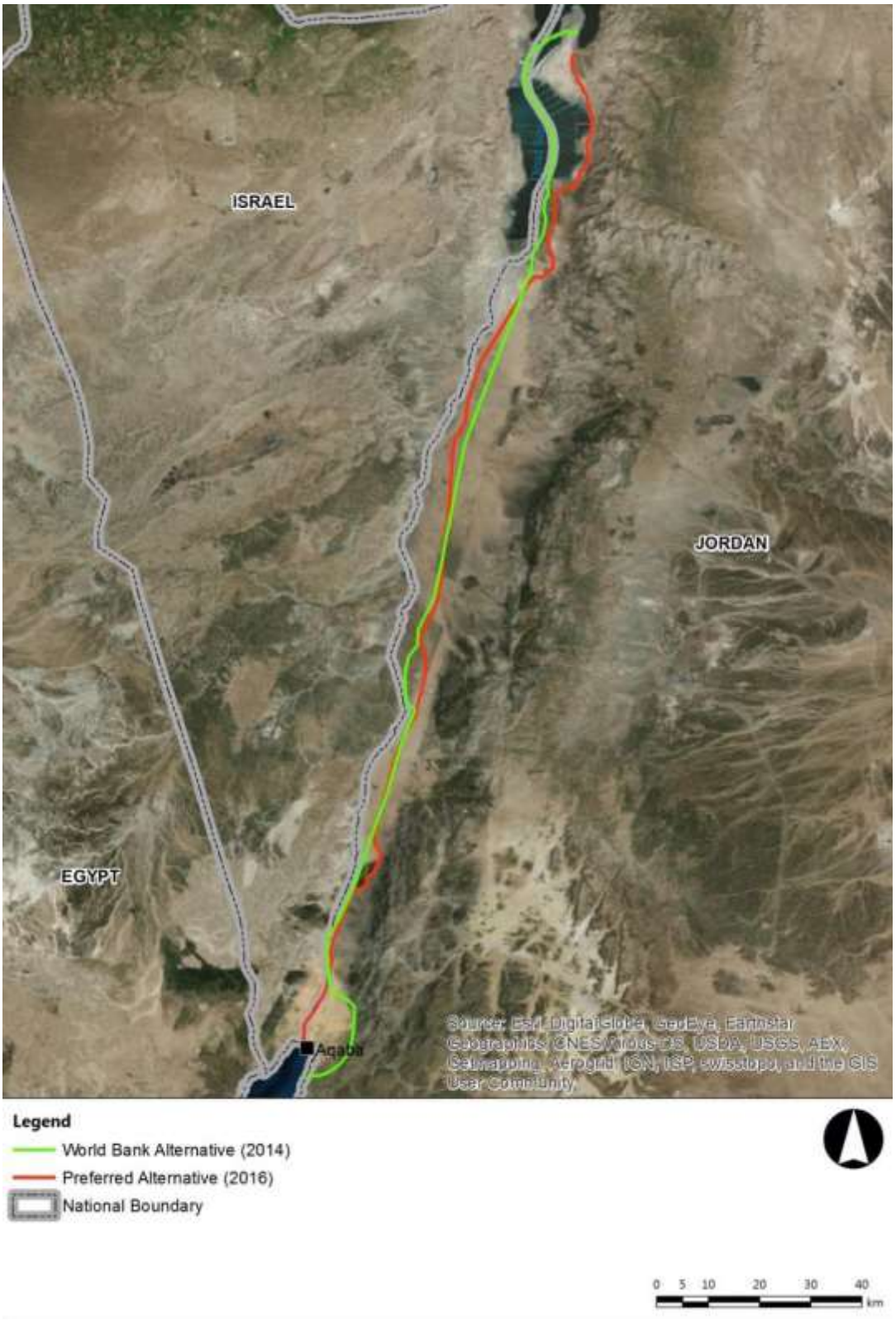


Figure 17 – Considered Alignment in final ESA of 2014 [lit 13] versus preferred RSDS Phase I alignment

6 ENVIRONMENTAL AND SOCIAL BASELINE

6.1 Introduction

This section assembles and evaluates the baseline data on the environmental and social characteristics of the project areas. It includes information on any changes anticipated before the project commences, including physical, biological and socio-cultural environments. The presented data is relevant and commensurate to the scope of the project.

The current ESIA is an update of the earlier Environmental and Social Assessment performed under the World Bank Studies [lit 13], considering the updated configuration of the RSDS Project phase I. To those baseline conditions that have not been changed since the ESA, reference shall be made to the baseline data already presented in the final ESA of 2014 [lit 13].

Field surveys and baseline updates under this ESIA have been made particularly for:

The Marine ecological baseline (Annex 5)
A Marine ecology surveys was done to establish the presence / absence of sensitive habitats and species at the proposed Red Sea intake location. The survey includes a dive survey to determine the species associated with the seagrass beds down to a maximum of 25m. Annex 5 provides a full description of the Marine baseline, project related impacts and proposed mitigation measures

Interviews in the Aqaba Region (Annex 5)
Interviews with fishermen and marine experts (e.g. ASEZA, Marine Science Station (MSS) were conducted in Aqaba and with the Interuniversity Institute For Marine Sciences In Eilat. In view of all studies and water modelling currently being done for larvae the Consultant assumed that any kind of modelling will not be needed.

Terrestrial Ecological Baseline (Annex 6)
Terrestrial ecology surveys were done from February to May to include the re-validation of previous surveys and an assessment of formerly unstudied areas due to the changes in alignment and Project components, with particular focus on Important Bird Areas (IBAs), soaring birds, and seasonal avifauna. Annex 6 provides a full description of the Terrestrial ecological baseline, project related impacts and proposed mitigation measures

Cultural Heritage Baseline (Annex 7)
The Cultural Heritage surveys consisted of a desk based analysis, re-validation of previous findings, collaboration with the Jordanian Department of Antiquities and detailed site walkovers to confirm the presence/absence of areas of cultural importance. Annex 7 provides a full description of the Archaeological and Cultural Heritage baseline, the project related impacts and proposed mitigation measures

Social and Socio-economic Baseline (Annex 8)
Land use and socio-economic surveys for any settlements/activities in the vicinity of the Project and its infrastructure as input for land expropriation and resettlement action plan have been conducted. Annex 8 provides a full description of the Socio-economic baseline situation, project related social and socio-economic impacts and the proposed compensation and mitigation measures. This annex is particularly

relevant as input for the preparation and implementation of a Resettlement / Compensation Action Plan (RAP), which is not part of this ESIA.

6.2 Land use and Landscape

The stretch of land between the Gulf of Aqaba and the Dead Sea basin is known as the Wadi Araba in Jordan, and in Israel as the Arava Valley. Being geologically part of the Jordan Rift Valley, it consists of a valley running approximately north-south, which separates ranges of sandstone hills to the east and west. The valley floor is characterized by a sandy dune-field over much of its length, which becomes more stony in some areas, with varied vegetative cover. Most parts of the area consists of uncultivated desert area with scattered settlements including some land cultivation, while the northern part of Wadi Araba / Arava, around the proposed Seawater Discharge point, is used more intensively for agriculture and domestic purposes.

As indicated in the 2011 ESA, the majority of the valley area comprises a combination of dunes, shrubs, sand, cliffs and distant mountains is noted as being of moderate to high sensitivity recognising its unique features, and its potential value for its landscape features which are recognised internationally. However, this is not a pristine landscape: as it is already being developed in areas which are linked to transportation networks and supporting infrastructure.

Within this desert landscape there are a number of areas that are proposed for protection for ecological reasons, and sites valued for tourism related largely to the views of the wider Wadi Araba / Arava area. These include the Dana Biosphere Reserve, and the proposed protected areas at Qatar, Jabal Mas'uda and Fifa which may achieve protected status in the future.

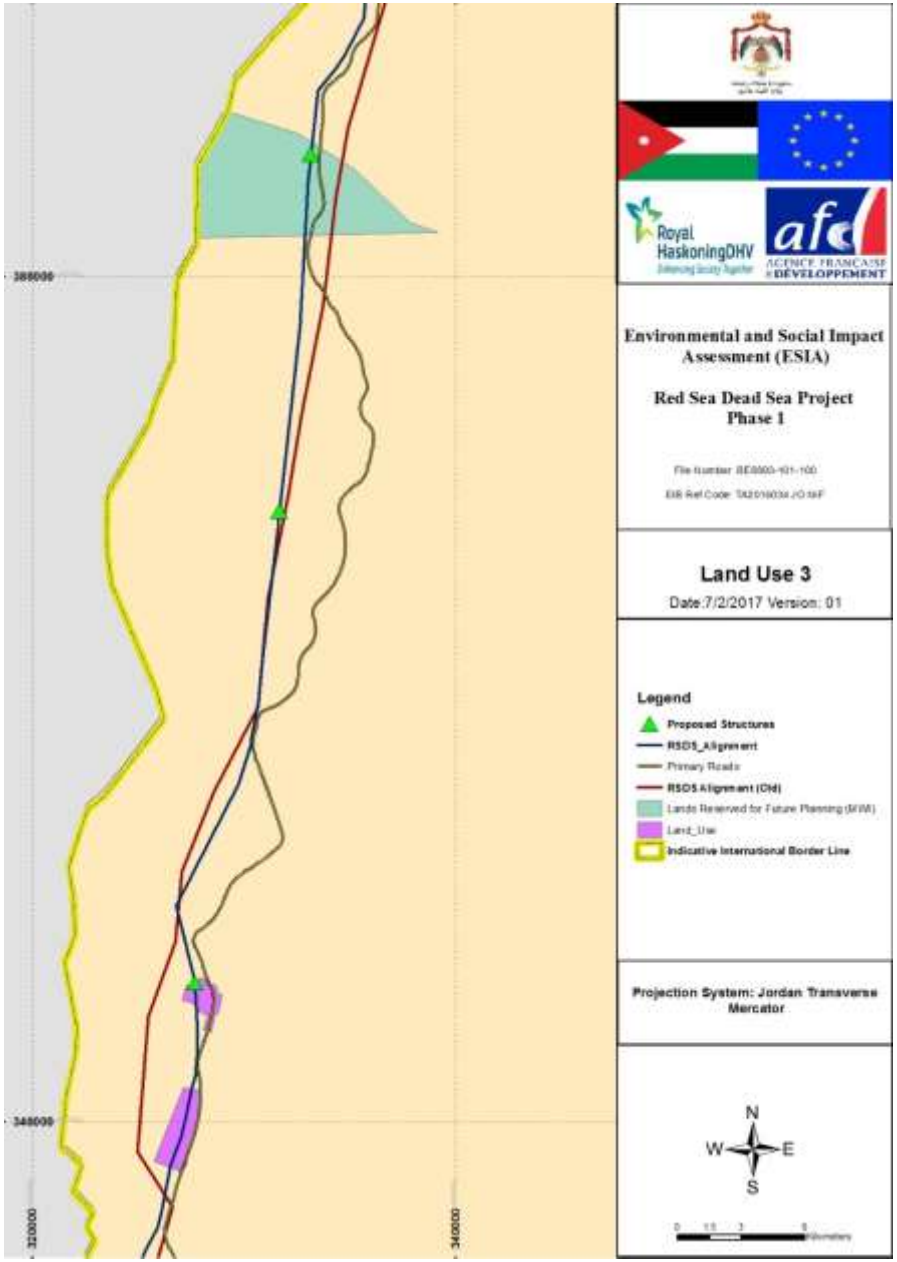
The key tourist sites in the area include Masada, Lot's Cave and Bir Mathkour. The proposed ecologically protected areas may become developed for ecotourism, and their visual attributes will become more relevant. One area noted as being potentially important for possible future ecotourism development is Wadi Heimer.

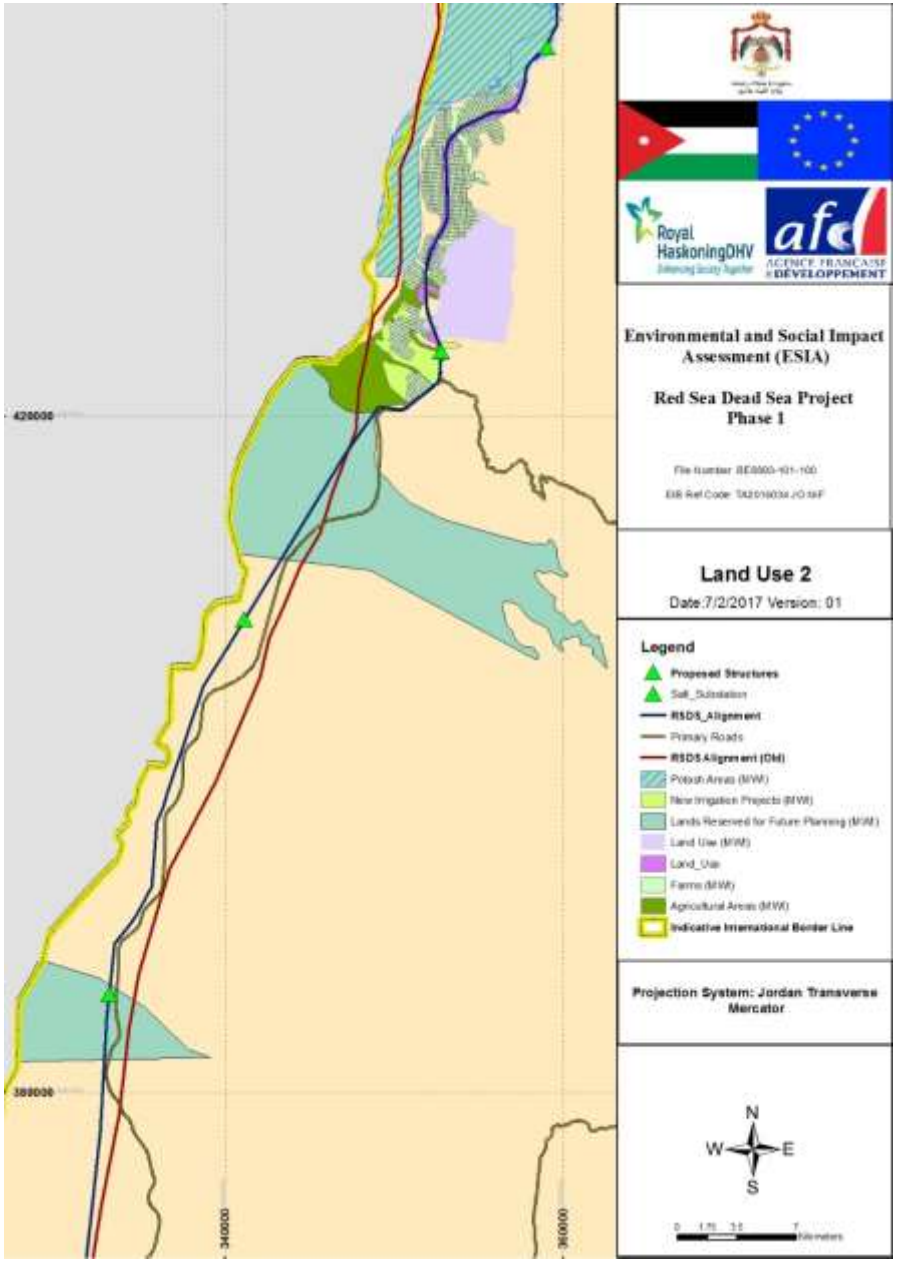
The typical visual receptors in the area include the communities living in villages throughout the Wadi Araba / Arava, ourists travelling by road and visiting specific locations either in the Wadi Araba or elsewhere such as Petra, Karak, the Dead Sea, Masada.

An overview of the current land use of the project area is provided in the following maps.


Israel Water Delivery
Aqaba Existing Water Reservoir
Environmental and Social Impact Assessment (ESIA)
Red Sea Dead Sea Project Phase 1
Land Use 5
Date:7/2/2017 Version: 01
Legend
Existing_Aqaba_Water_Delivery_Point
Israel_Water_Delivery
Proposed Structures
RSDS_Alignment
Aqaba_Water_Pipeline
Israel_Water_Pipeline
Primary Roads
RSDS Alignment (Old)
Land_Use
Airport
Wadi_Yutum_Drainage_Detention_Basin
Aqaba_Gulf
Indicative International Border Line
Projection System: Jordan Transverse Mercator
N
W
E
S


Environmental and Social Impact Assessment (ESIA)
Red Sea Dead Sea Project Phase 1
Land Use 4
Date:7/2/2017 Version: 01
Legend
Proposed Structures
RSDS_Alignment
Primary Roads
RSDS Alignment (Old)
Land_Use
Indicative International Border Line
Projection System: Jordan Transverse Mercator
N
W
E
S


Environmental and Social Impact Assessment (ESIA)
Red Sea Dead Sea Project Phase 1
Land Use 3
Date:7/2/2017 Version: 01
Legend
Proposed Structures
RSDS_Alignment
Primary Roads
RSDS Alignment (Old)
Lands Reserved for Future Planning (MW)
Land_Use
Indicative International Border Line
Projection System: Jordan Transverse Mercator
N
W
E
S


Environmental and Social Impact Assessment (ESIA)
Red Sea Dead Sea Project Phase 1
Land Use 2
Date:7/2/2017 Version: 01
Legend
Proposed Structures
RSDS_Alignment
Primary Roads
RSDS Alignment (Old)
Indicative International Border Line
Projection System: Jordan Transverse Mercator
N
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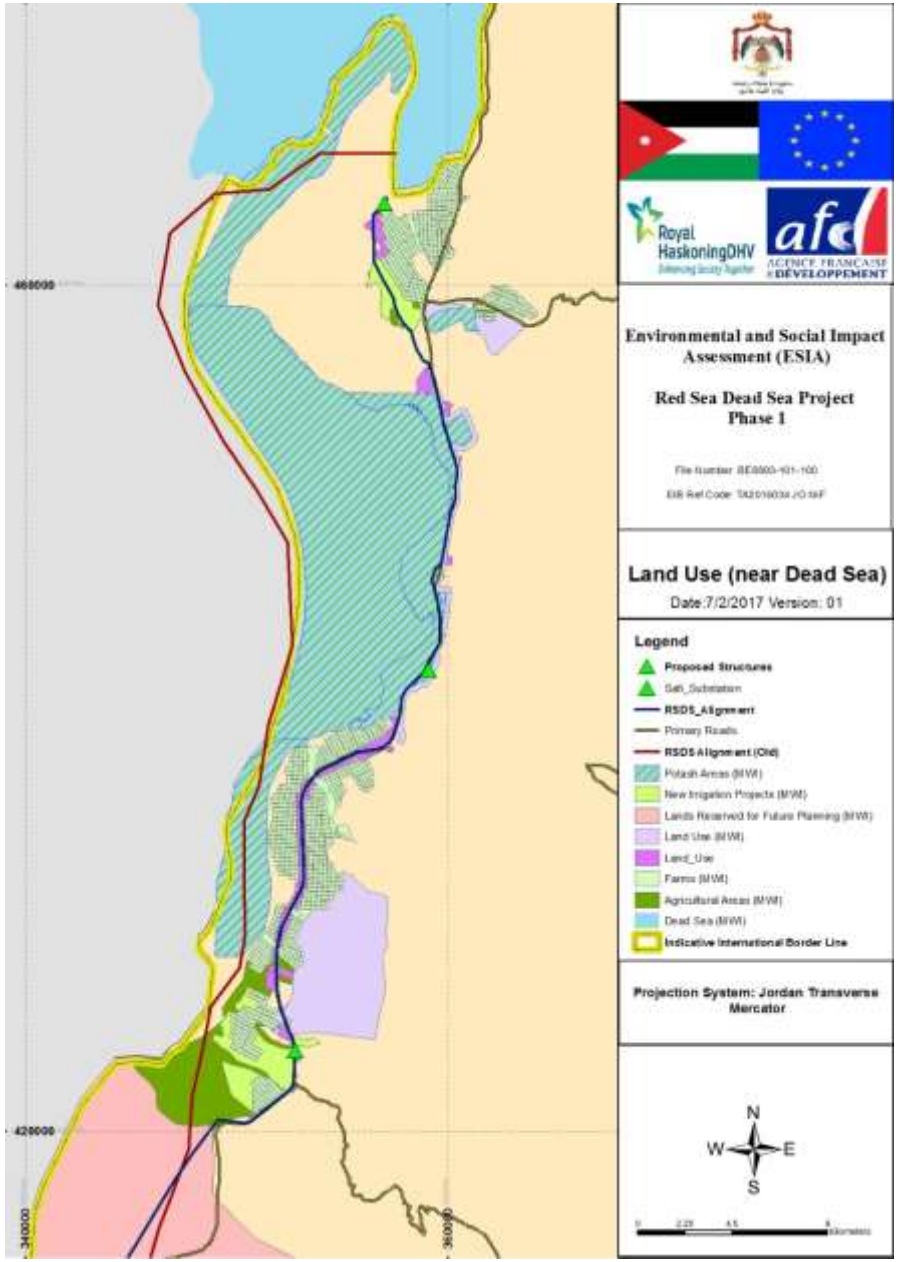

Figure 18 – Land Use Maps of the RSDS Phase I Project Area

In the south, the cities of Aqaba and Eilat are located along the Gulf of Aqaba and represent major urban centres with a thriving industry. Both cities include major port facilities, whereas Aqaba's port is significantly larger and more important to Jordan. Aqaba also has two industrial zones, one of which serves the fertilizer industry. The Aqaba Special Economic Zone (ASEZ) is a separate governance entity, sitting within the Aqaba Governorate. It was established in 2001 and is administered by the Aqaba Special Economic Zone Authority (ASEZA). Within the Zone, ASEZA has the authority of a municipality, as well as being the regulator for investment permitting.

Wadi Araba / Arava Valley is sparsely populated, with a number of small villages and Bedouin settlements on the Jordanian side and some more developed intensive agricultural settlements on the Israeli side. Some of the Jordanian side wadis along Wadi Araba are used for informal agriculture by local Bedouin as well. The Desert Highway is the predominant infrastructure through the project area. The alignment of the proposed RSDS Phase I pipeline largely follows this highway.

The main communities situated along the RSDS pipeline route from south to north are: Qatar; Rahma; Gharandal; Resheen, Bir Madkhur; Al Ammer; Al Qurayqira and Fenan; Khnaizeer, Safi and on the northern side Al Lassan next to the proposed Dead Sea Outfall. There locations are presented below.

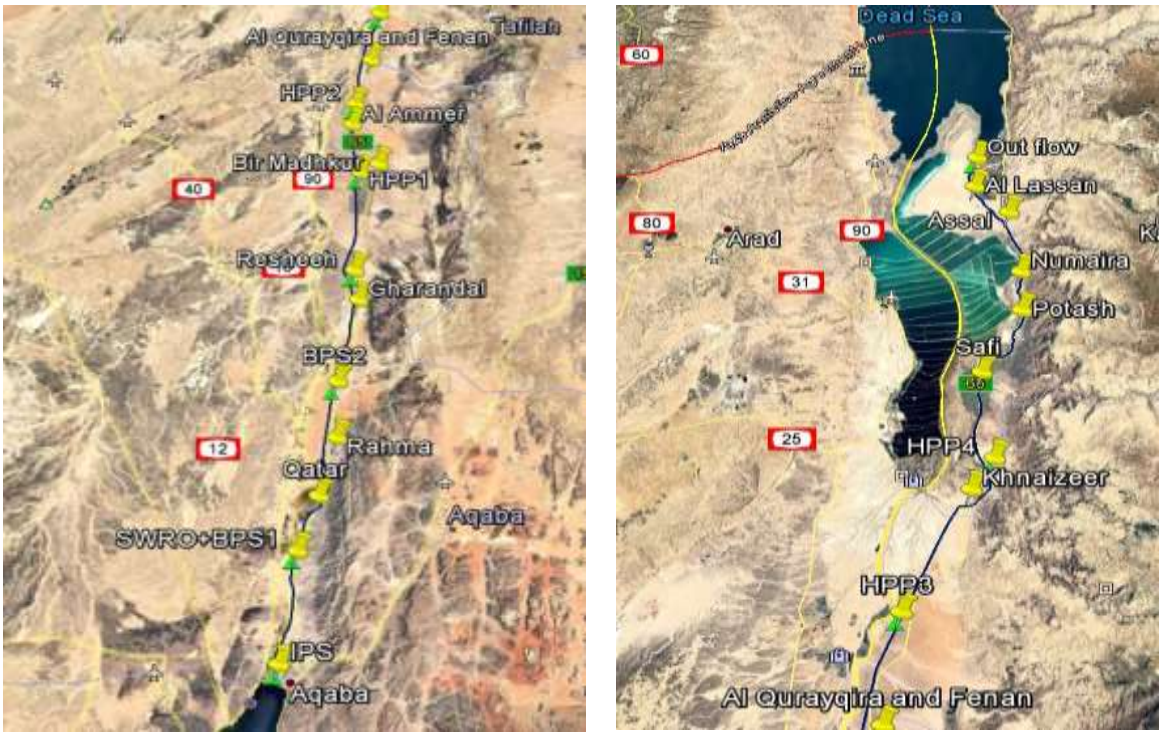

Figure 19 – Main communities along the RSDS Phase I Scheme

Land use in Aqaba City (point of intake site)

As shown in the map of section L1 and the maps from DLS, the path of the scheme is not expected to affect the private lands around the corridor since all works are expected to be conducted within the right of the way.

The section on the right-hand side of the road from the intake point until the wastewater treatment plant, is owned by Ayla. According to the DLS cadastral maps there are 26 parcels located at the right-hand side (within Ayla premises) of the expected pipeline route. The construction of the pipeline is not expected

to have any direct permanent negative impacts on these parcels. However, some temporary impacts are expected such as dust, noise, and access during the construction period.
The rest of the route until the RO desalination plant will All of the agricultural activities within or around of this community are away from the route of the scheme. No compensation or land acquisition is expected within this community.

Land use in Qatar
Land is allocated through JVA. Currently 0.5 to 1 dunum are zoned. The most recent cadastral maps of DLS shows that 890 zoned land parcels all located to the right of the Wadi Arab highway as show in the map. The maximum price of land in this village based on the DLS estimates is 8,000 JD/dunum, however usually the prices are higher than these estimates. The ERM study estimated the price of the dunum at JD 10,000 in non-zoned areas. The high price for lands in Qatar is attributed to its proximity to Aqaba. As shown in the map of section L1 and the maps from DLS, the path of the scheme is not expected to affect the private lands in the village. The corridor of the pipeline will pass from parcel No. 00017, which is a JVA public land. since all works are expected to be conducted within the right of the way.

No compensation or land acquisition is expected within the community of Qatar village.

Land use in Rahma and Resheed
Land is allocated through JVA. As indicated in the most recent cadastral maps of DLS, all zoned land parcels all located to the right of the Wadi Arab highway as show in the map. The maximum price of land in this village based on the DLS estimates is 8,000 JD/dunum, however usually the prices are higher than these estimates. The ERM study estimated the price of the dunum at JD 10,000 in non-zoned areas. As shown in the map of section L1 and the maps from DLS, the path of the scheme is not expected to affect the private lands in the village. The corridor of the pipeline will pass through parcel No. 00021, which is a huge un-zoned JVA public land.

No compensation or land acquisition is expected within the community of Rahma since the pipeline will pass through the parcel No. 00021 behind Al Haq farms in the empty lands close to the boarders.

Land use in Bir Mathkour
As indicated in the most recent cadastral maps of DLS, the majority of the zoned land parcels are all located to the right of the Wadi Arab highway and few are to the left of the road as show in the map. The maximum price of land in this village based on the DLS estimates is 8,000 JD/dunum, however usually the prices are higher than these estimates. The ERM study estimated the price of the dunum at JD 10,000 in non-zoned areas. The high land price in Bir Mathkour is attributed to the fact that it is the only town in the middle part of Wadi Araba with rest accommodation for travellers. As shown in the map of section L4 and the maps from DLS, the path of the scheme is about 3.5 km away from the village and the highway passing through JVA land and is not expected to affect the private lands in the village. The corridor of the pipeline will pass through parcel No. 0008 (Um Mathla), which is a huge un-zoned JVA public land.

No compensation or land acquisition is expected within the community of Bir Mathkour since the pipeline will not pass through village's lands as shown in the map of section L4 and the map from DLS, the scheme will not affect the private lands of Bir Mathkour community and will not have any direct negative impacts. All of the agricultural activities within or around of this community are away from the route of the scheme.

Land use in Gwiebeh
As indicated in the most recent cadastral maps of DLS, the majority of the zoned land parcels are all located to the right of the Wadi Arab highway as show in the map. The maximum price of land in this village based on the DLS estimates is 8,000 JD/dunum, however usually the prices are higher than these estimates. As shown in the map of section L5.1 and the maps from DLS, the path of the scheme is about more than 1 km away from the village and the proposed pump station is at least 4 km away from the village. The corridor of the pipeline will pass through parcel No. 00015 of the Gwiebeh lands, which is a huge un-zoned JVA public land.

No compensation or land acquisition is expected within the community of Gwiebeh since the pipeline will not pass through village's lands as shown in the map of section L5.1 and the map from DLS, the scheme will not affect the private lands of Gwiebeh community and will not have any direct negative impacts.

Land use in Safi Ghors
Land granted for agricultural use may be owned by JVA and granted for use, or may be owned privately. Various factors qualify land to be supplied with irrigation water at special subsidized rates. Since the Southern Ghors area is a known poverty pocket in Jordan, efforts are made by JVA to keep agricultural supplies up, even in drought conditions. According to the JVA laws and regulations, land has been allocated to the households in the Southern Ghors at around 25-40 dunum for use by each household, giving them rights to farm the land and pass it on as inheritance

As indicated in the most recent cadastral maps of DLS and the provided pipeline route and the locations of the schemes by Dar Al-Handasah and partners, most of the construction work will be conducted within the "right of the way" in a corridor of 80 metres as indicated in all of the maps in the ERM report. However, discussion with JVA technicians and other stakeholders believe that the construction impacts would appear within a wider buffer range. The JVA team calculated the number of land parcels within buffer zones of 300 metre and 150 metre from the pipeline, for the purpose of understanding the extent of the potential directly and indirectly project affected people.

The number of affected land parcels and the level of impact should be more accurate once the final design in completed based on the facts on the ground and other technical details by the implementing company. However, the estimated number of affected parcels at this point is based on assuming a buffer zone of 150. Using the most recent DLS's cadastral maps and field visits, the consultant estimated the land parcels of different types that might be impacted by the project in the Safi.

6.3 The Dead Sea

The Dead Sea is a globally recognised as a unique site at the lowest place on earth, being the saltiest natural body of water on earth and the scenery of many ancient cultures and today's religions. However, water levels declined drastically during the last 70 years as result of diversion of the original inflow into the Dead Sea through the Lower Jordan River. The decline is caused mainly by evaporation of water from the surface, and is today about 1 per year. The Dead Sea and its decline have been studied extensively in the World Bank Studies, including the final ESA of 2014 [lit 13] and the Feasibility Study [lit 7] related documents and forms the core of the current RSDS Phase I project design.

Its mineral make up has been associated with health and wellness, and tourism – health, cultural and religious - makes a very important contribution to the economies of the area. The mineral content of the Dead Sea has led to the development of industries that extract and export large amounts of minerals – such as Potash and Bromine – from the Dead Sea. These revenues together with the employment

provided make these industries significant contributors to the economies of Jordan and Israel. A view of the changes of the surface of the Dead Sea over time is presented below.

During the last 70 years its surface area has shrunk from 960 km² to 620 km². The decline of the Dead Sea and related groundwater levels triggered the occurrence of many sink holes around it, as well as environmental degradation and damage to industry and infrastructure. Due to the globally recognised intrinsic importance of the Dead Sea, this decline also entails various intangible impacts and costs.

As described in section 4.2, this depletion will continue If no actions are taken. By 2070 the Dead Sea would have a surface level of at minus 470 m below sea level (minus 425 m today); a surface area of 509 km2 by (versus 620 km2 today) and a total volume of 89 km3 (versus 114 km3 today).

The depleting Dead Sea impacts tourism and chemical sectors alike. It will also lead to higher erosion rates around the Dead Sea and lowering groundwater levels towards the Dead Sea. As mentioned, collapsing sinkholes have already been a problem for some time, and would continue to lead to more damages of roads, bridges, and drainage channels on the Dead Sea perimeter.

Recommendations in terms of Dead Sea monitoring during phase I have been elaborated in annex 11. A monitoring program has been outlined with support and close cooperation of the Geological Survey of Israel (GSI) and consists of four phases. Phase I concerns a baseline initial campaign in summer 2017, a baseline survey in phases II a+b is foreseen from January 2018 until December 2021, and monitoring works will start with the RSDS operations in phase III. Furthermore, the establishment of an international research centre (IRC) in Jordan is proposed in phase IIb to complement the activities of the Israeli side and to establish better international cooperation. Staffing, office space, sea and road transport facilities and a list of lab equipment has been suggested in this annex 11 as well.

The investment costs for the IRC including all facilities and equipment have been estimated to cost M€ 2.8. The monitoring activities of phases I and IIa+b were estimated to cost M€ 1.8. The annual monitoring of the RSDS operation in phase III was estimated at M€ 0.8 per year.

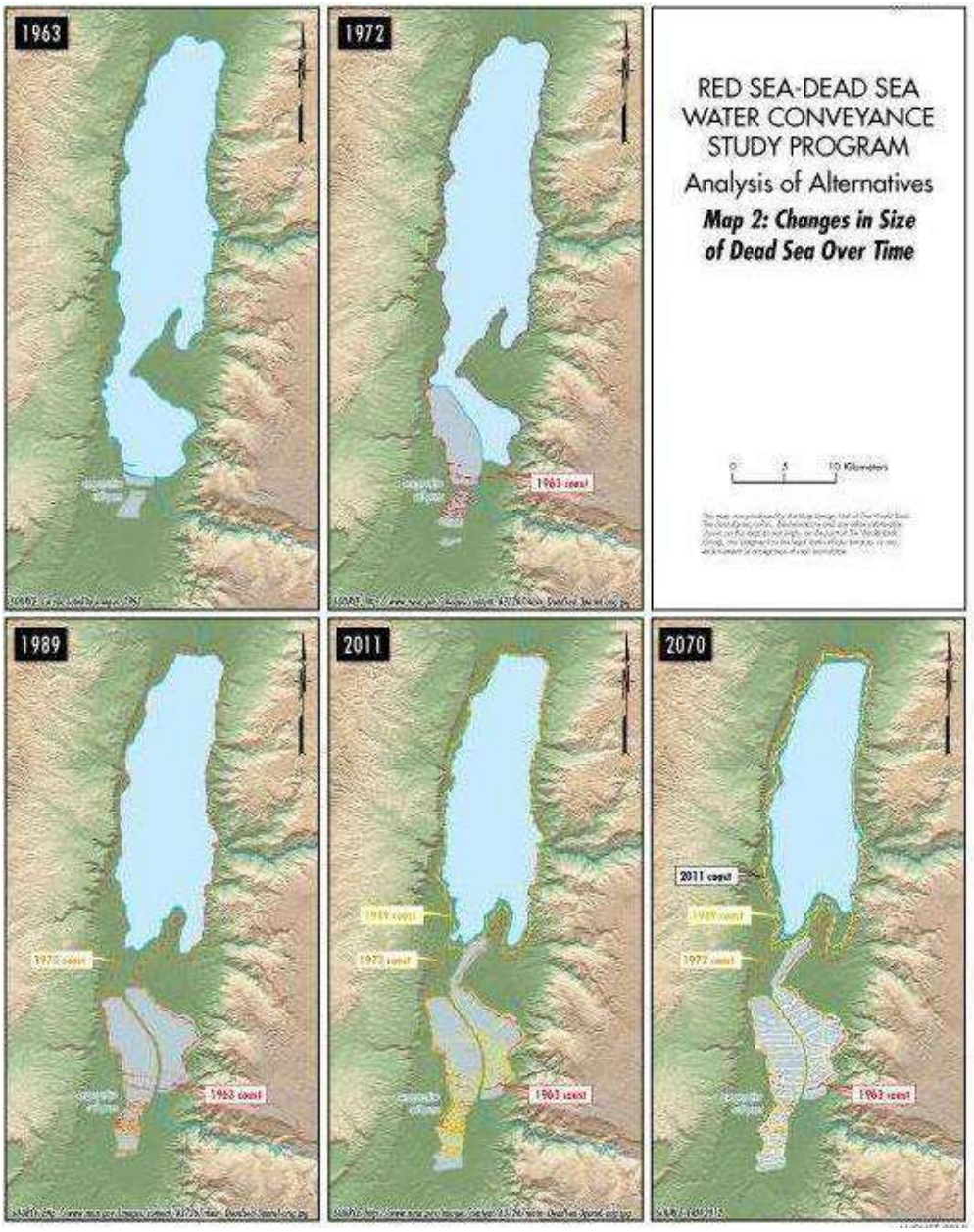

Figure 20 – Decline of the Dead Sea (ref ERM 2011)

6.4 The Red Sea / Gulf of Aqaba and Eilat

For a full description of the marine environmental baseline of the Gulf of Aqaba and Elat is provided in annex 5.

The Gulf of Aqaba/Eilat, which is part of the Great Rift Valley, is a long (180 km), narrow (5 -25 km), and deep (average 800 m, maximum 1800 m) northward extension of the Red Sea. The Gulf is orientated in a North-North-East (NNE) – South-South-West (SSW) direction and is flanked by mountains and desert on both the east and west sides. The southern end of the Gulf is separated from the Red Sea by a shallow sill (maximum depth 270m) at the Straits of Tiran.

Figure 21 – Gulf of Aqaba and Eilat

The bathymetry and bottom morphology of the northern part of the Gulf of Aqaba represent the transition from the Eilat Deep (~900m Water Depth to Wadi Araba / Arava Valley and are marked by the influence of active tectonic processes.

The water movement in Gulf of Aqaba / Eilat is driven predominately by large-scale thermohaline circulation. In addition, there are two other processes: (1) the wind-driven circulation - and associated up welling and down welling; (2) internal tides generated at the Strait of Tiran that propagate northward along the Gulf and possibly reflect from the steep slope of the northern end of the Gulf. The sea level in the northern part of the Gulf fluctuates during the year by up to one metre.

Like much of the world's ocean, the Gulf of Aqaba exhibits a seasonal cycle of stratification formation in spring, maintenance of a shallow thermocline in summer, and subsequent deepening of the thermocline to produce deep mixed layers in winter with water temperature at depths greater than 500m hardly change.

The waters of the Gulf are among the most saline in the world. The lack of regular fresh water input and the high evaporation rate contribute heavily to the particularly saline conditions within the Gulf. The

bottom sediments of the Gulf of Aqaba are loose, unconsolidated materials originating from marine living organisms (reefs, calcareous algae, fragmented solid biogenic material, skeletal remains) or from land (fragmented rocks or faecal materials), which are transported to the Gulf through wind, water runoff or floods. High calcium carbonate concentrations in the surface bottom sediment indicate the presence of the famous coral reefs more to the south along the shorelines of Jordan and Israel.

In past decades, the Red Sea has been known for its outstanding corals, home to hundreds of varieties of fish and other marine life, many of them unique to the region. These spectacular coral reefs represent the northernmost latitude for coral reefs in the western Indo- Pacific region. But, today the reefs, like most corals worldwide, are showing signs of degradation. The Gulf's corals are particularly threatened due to their isolation from oceanic processes of flushing and circulation, but also due to pressures from tourism, fishing (including aquaculture), and extensive landside development on the shores of the Gulf's bordering countries: Israel, Jordan, Saudi Arabia and Egypt. To protect these features, Jordan, Israel and Egypt have designated a series of marine protected areas in the Gulf of Aqaba

The key water sensitive receivers in the vicinity of the submarine pipelines include Seagrass habitat (critical habitat); sedimentary habitats; and the Ayla seawater intake. There are no intakes in close proximity to the -140m deep RSDS intake, and the nearest seagrass beds are ca. 1.5 km inshore, and the nearest coral reefs are over 1km away both to the east and west, the only sensitive water quality receiver is the adjacent soft sedimentary habitats.

The Aqaba New Port is located along the eastern shore of the Gulf of Aqaba, about 20 km south of Aqaba City. This new main port aims at turning Aqaba into a regional maritime hub. It incorporates a general cargo and roll-on, roll-off terminal, as well as grain and ferry terminals.

A bottom sediment and videography study was undertaken by the Marine Science Station on behalf of Dar. Nine sampling stations at depths of 2, 25, 50, 75, 100, 125, 150, 75 and 200 m were subject of bottom sediment collection by using Grab sampler – an illustration of the locations in relation to the proposal pipeline route is illustrated below.

Within the framework of the current ESIA, The Marine Science Station (MSS) performed an additional survey, including to describe the seagrass beds encountered at a depth of 33 m toward the sea shoreline until 5m depth.

The survey study estimated the percentage (%) cover of seagrass and other benthos down to 33 m depth. Estimation of % cover was restricted to the path way of the proposed three pipelines (which are ca. 3m wide). The length of pipeline pathway/corridor down to 33 m is about 500 m. This depth represents the deepest margin of grass along through the corridor.

Estimates were made of the associated benthos, including mobile and sessile species. Divers undertook survey transects along the length of the three pipelines (one common transect) from 2m to 33m (ca. 500m distance). These transects cover a reasonably large area, and provide information to create a seagrass habitat map

A total of 20 x 1m2 quadrates and 100 sub quadrates (25 cm) were subject of camera shots in order to utilize it for data generation on seagrass and other benthic fauna cover estimation.

Control sites were considered for similar survey method, and shots were taken only for the 1m2 quadrates without sub quadrates at the extension in front of SARAYA

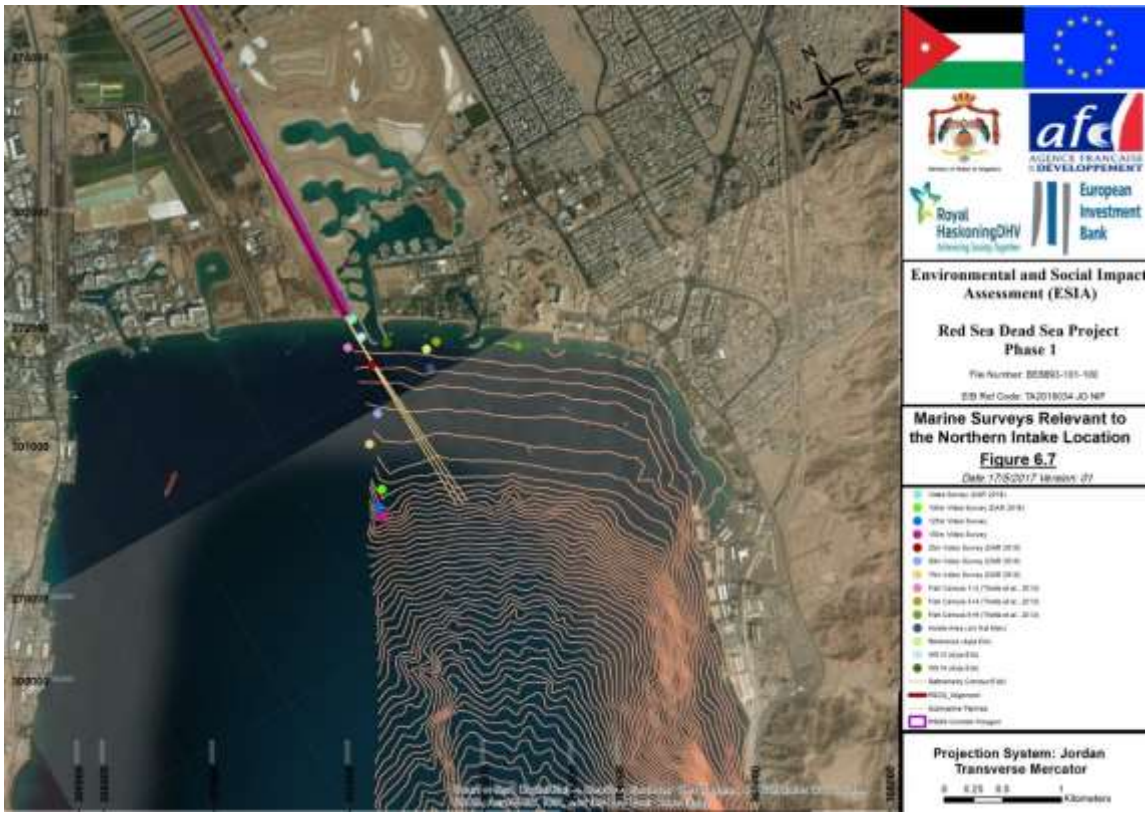

Figure 22 – Marine Surveys relevant to the Northern Intake Location

A full description of the marine ecological baseline condition is provided in Annex 5.

6.5 Terrestrial Ecology in Wadi Araba / Arava

6.5.1 Baseline

The terrestrial ecological baseline situation has been described extensively in the 2011 ESA. To update the baseline for the current project configuration and for any changes that may have occurred since then, the consultant executed field surveys along Wadi Araba from January – April 2017. Details are presented in Annex 6.

This updated Terrestrial Ecological Impact Assessment has been performed in accordance with the IFC Performance Standard 6 (PS 6) regarding biodiversity conservation and the sustainable management of ecosystem services and living resources. The following classification is used to describe any Critical Habitat in accordance with IFC PS 6:
Crit 1: Critically Endangered and/or Endangered Species
Crit 2: Endemic and/or Restricted-range Species
Crit 3: Migratory and/or Congregatory Species
Crit 4: Regionally unique and/or highly threatened ecosystem
Crit 5: Key Evolutionary Processes

To obtain an appropriate baseline situation a flora and fauna desk top study was conducted to collect, review and update the previous ecological data about the project area. Collected data included those published either in previous report done by ERM and others, scientific papers, journals, reports, Masters and PhD theses. In addition, data was collected by conducting meetings with experts at different ecological fields who have previous and current experience with the ecology of the project area.

In addition, a flora and fauna baseline field work was conducted in Jordan in 2017 from the end of January until the end of April. The detailed results are presented in chapter 8. Perennials which might have instant and cumulative impacts due to the proposed project activities were the target for this survey. The objectives of the floral baseline were to; describe the vegetation types and habitats, enquire on the presence and absence of plant species, and prepare the plant species checklists and its status for each site, identify flora hotspots, and assess threats on species and habitats. The results are presented in Annex 6, chapter 7 – Ecological Survey Results, tables 1 to 20.

Transects were conducted in different parts along Wadi Araba to cover different slopes, aspects, altitudes, habitats and ecosystems. All species noticed were recorded, many plants were identified in the field and the remainder classified using taxonomy references. In addition, a flora and fauna desk top study was conducted to collect, review and update the previous ecological data about the project area. Collected data included those published either in previous report done by ERM and others, scientific papers, journals, reports, Masters and PhD theses. In addition, data was collected by conducting meetings with experts at different ecological fields who have previous and current experience with the ecology of the project area.

These studies confirm that Wadi Araba, including the shores of the Dead Sea and the oasis in its vicinity preserve a rare blend of desert biota and bio-geographic relicts, which have survived in isolation of the surrounding desert. Several species have been separated from their species' gene pool long enough to evolve into subspecies, and even local endemic species. The 2005 Environmental Sustainability Index ranked Jordan as one of the top-tier countries in biological diversity.

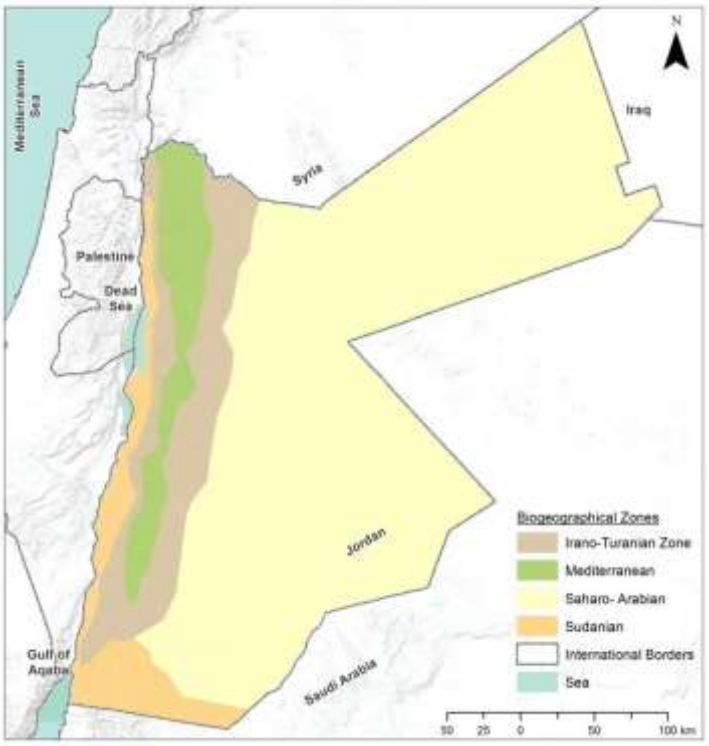

Figure 23 – Biogeographic zone in Jordan and the RSDS Project Area

The region is characterized by very hot summer and warm winter with mean annual rainfall of 50 mm or less. Vegetation is dominated by Acacia species in the low-altitude region and scattered shrubs and Juniper in the high-altitude region.

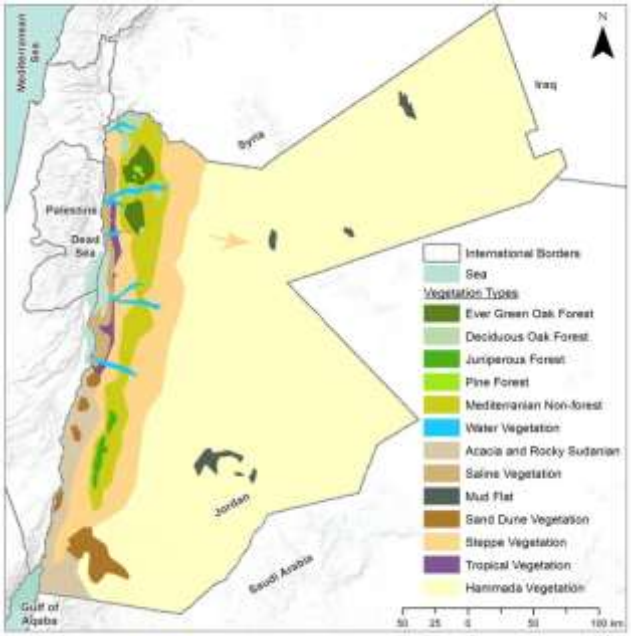

Figure 24 – Vegetation types in Jordan and the Project Area

The various components of the route pass through some of the 13 major vegetation types found in Jordan. The following summarizes the three main ecological zones that may be distinguished along the project route:

1. Aqaba-Rahma: Acacia and Sudanian rocky vegetation confined to the granite mountain bases and to the rocky part of Wadi Araba, Aqaba and Wadi AL-Yutm in the Sudanian region. Acacia trees are scattered through Wadi Araba but they get denser toward the hard rock's of the mountain bases until they form a pure stand of Acacia woodland especially 20-40 km. before Aqaba. Within the same habitat and on the hilly ground covered with Hammada a special type of plant grows, with the following species: Acacia raddiana, Acacia tortilis, Anabasis articulate, Haloxylon scopira, Zygophyllum dumosum and Fagonia spp;

2. Wadi Araba, belonging to the Acacia and Rocky Sudanian vegetation type, it covers the northern parts of the area. Wadi Araba is a desert habitat that extends from the south of the Dead Sea until the Gulf of Aqaba which makes it part of the Jordan Rift Valley. Altitude of this habitat in the study area ranges between sea level and 200m a.s.l. This habitat is characterized by sandy soil and wide gravel-stony wadis that flow from Aqaba mountains westward to the main wide wadi flowing south in Wadi Araba, which is Wadi El-Jeeb. The vegetation of this habitat is dominated by Haloxylon persicum, Retama raetam and Acacia tortilis.

3. The Dead Sea basin, belonging to three different vegetation types around the sea, which are: Saline Vegetation, Water vegetation and Rocky vegetation. The Dead Sea shores has unique habitat that do not occur anywhere else in the world. It represents the lowest spot on earth (-420 m), characterized by having dry, hot condition and saline soil. Due to that it is a unique water body in not having living organisms, such as fish or algae. It is recorded that some types of halophytic bacteria were isolated from the water.

The study area has furthermore been divided into four Discrete Management Units (A-D) in accordance with the IFC PS 6. See also Figure 27. These are:

Aqaba-Rahma (DMU A):
This unit includes three major surveying localities which are the southern intake at Aqaba Birds Observatory, near Aqaba airport, and at Qatar. The area is situated within the Acacia and Sudanian rocky vegetation, in the Sudanian region. The area is dominated by *Acacia raddiana, Acacia tortilis, Haloxylon scopira, Zygophyllum dumosum* and *Fagonia* spp. A total of 12 species were recorded including six equally mammalian and reptilian species as indicated in Tables (1-20) in chapter 7I

Wadi Araba; Rahma-Beer Mathkour (DMU B)
This unit includes three major surveying localities which are the southern parts of Qatar, Rahma, western Masuda region, Risha, Beer Mathkour. The area is situated within the Sudanian region, and three major soil types are present in Wadi Araba and these are: saline soils, sandy soils with some places of sand dunes and Hamada especially in the elevated areas. It is dominated by *Acacia tortilis* with other bushes or low shrubs like *Anabasis articulata*, *Lycium shawii* and Hammada spp. A total of 14 species were recorded where six mammals and eight reptiles and as follows.

Wadi Araba; Beer Mathkour- Wadi Salamani (DMU C)
It includes Wadi Um Mathla Ashamali, Hamad al Jarida, Madhya Fidan al Janubi, and Wadi Salamani. It is composed of a complex system of Wadis and mountains with variation in elevations, two major vegetation types are found in the northern part of Wadi Araba: Sand dune desert at low elevation and

Acacia sub-tropical vegetation at high lands. A total of 10 species were recorded with six and four mammals and reptiles species respectively. The following tables show recorded species within study areas

Dead Sea Area; Wadi Salamani- Alisan (DMU D)
This unit includes Dahl, Wadi Khnizerh, Wadi Fifa, Ghor Safi, and Ghor Assal. It is characterized by a tropical vegetation occurs in the Sudanian region which extends from Dair 'Alla in the north down to Aqaba Gulf in the south but it is concentrated more in the regions close to the Dead Sea, lower Jordan Valley, as in Ghor Fifa. A total of six mammals were recorded, and nine reptiles.

The full checklist of the flora in the study area is presented in annex 6, including the vulnerable Halyxolon Persicum and the critically endangered Maerua Crassifolia.

Figure 25 - Halyxolon Persicum

Figure 26 - Maerua crassifolia (Critical Endangered) at Dead Sea Area- Fifa-Ghor Issal

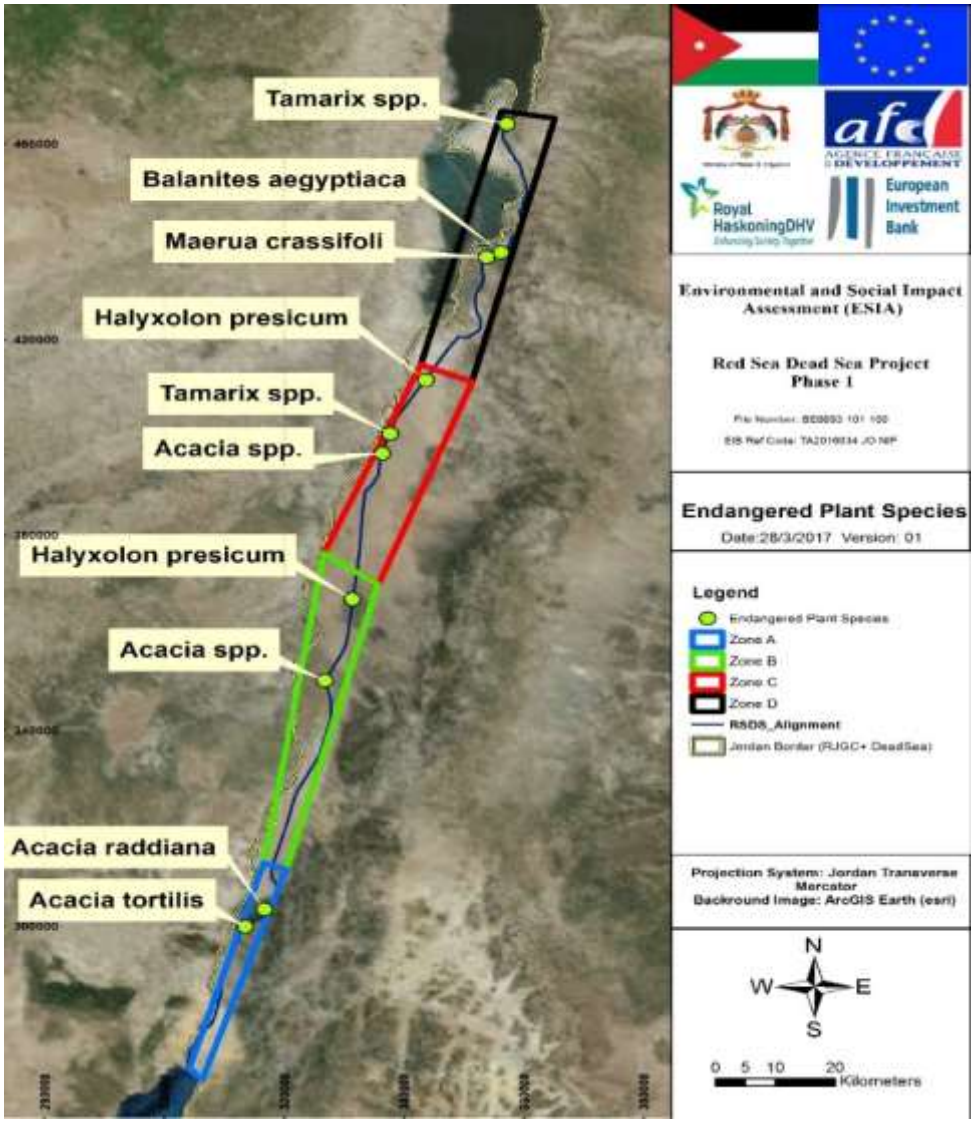

Figure 27 – DMU´s and Endangered flora along the pipeline route

Table 5 provides a summary in term of particular sensitive locations along the project route.

Table 5 – Particular ecologically sensitive locations along the pipeline route

Flora Impact	Location	Coordinates
A negative impact will be expected on the Vulnerable Acacia forest through cutting the trees to establish the pipeline at the western part of the main road	Point 4 - DMU A Point 5 – DMU A	700137E, 3299372N 703191E, 3303039N
Destruction of habitats within the wadi, through the construction works, especially as the vegetation there depends on the seasonal flow of water.	Point 4 – DMU B Point 4 - DMU B	711597E, 3350178N 715668E, 3366951N

Flora Impact	Location	Coordinates
Temporary blocking seeds from the top of the mountains into the Wadi+.	Point 3 - DMU C Point 4 – DMU C Point 5 – MDU C	719571E, 3396987N 720650E, 3401064N 726261E, 3412225N
Remove the topsoil as a result of excavation and construction, which may lead to reduction of seed bank and organic matter, especially at sand dune areas	At all locations	
The toxic effect of potential heavy machinery oils leaks on soil and water pollution within the wadis.	At all locations	
Impact on Vulnerable *Halyxolon presicum* plant community that grows on the sand dunes, by cutting them and encourage growth of other plants such as Tamarsk trees, as result of the degradation and salinity	Point 3 - MDU C Point 4 – MDU C Point 5 – MDU C	719571E, 3396987N 720650E, 3401064N 726261E, 3412225N
Flow cut wadis to the west	Point 3 - MDU C Point 4 – MDU C Point 5 – MDU C	719571E, 3396987N 720650E, 3401064N 726261E, 3412225N
A relative dense forest coverage, so that a negative impact will be expected on the forest there from cutting the trees, especially endangered and rare species, like *Salvadora persica*	Point 4 – MDU D	737861E, 3438835N
Some negative impact will be expected on the Critical Endangered plant *Maerua crassifolia* through cutting trees to establish the pipeline at the western part of the main road	Point 3 - MDU D Point 4 – DMU D Point 5 – DMU D	737861E, 3438835N 735483E, 3437739N 740813E, 3354671N
A negative impact will be expected on the Critical Endangered plant *Balanites aegyptiaca* by cutting trees to establish the pipeline at the western part of the main road	Point 3 - DMU D Point 4 – DMU D Point 5 – DMU D	737861E, 3438835N 735483E, 3437739N 740813E, 3354671N
Most of the plant diversity is concentrated inside the wadis, it was found that the percentage of rare and endangered plants is equal to one third of the number of plants recorded; therefore, it is advised to remove human activity from wadis flow.	In terms of At all locations especially DMU B and DMU C	

In terms of fauna, recorded reptiles in the Aqaba area (A) include a total of 12 species, including six equally mammalian and reptilian species. In Wadi Araba (B) a total of 14 species were recorded, including six mammals and eight reptiles. In the Dead Sea area (C) a total of six mammals were recorded and nine reptiles. Table 6 lists particularly the more endangered species along the project route.

Table 6 – Endangered Fauna along the pipeline route

Reptile Species name	Common name	DMU	IUCN Status	IFC PS 6*
Egyptian Spiny-tailed Lizard	*Uromastyx aegyptia*	A,B,C	VU	Criterion 1
Desert Monitor	*Varanus griseus*	B, C	VU	Criterion 1
Mammal Species name	*Common name*	DMU	IUCN Status	IFC PS 6
Striped Hyena	*Hyaena hyaena*	B, C	VU	Criterion 1
Dorcas gazelle	*Gazella dorcas*	B, C	VU	Criterion 1

* Criterion 1 for Critical Habitats: Critically Endangered and/or Endangered Species

In terms of avifauna, Jordan has a wide diversity of bird habitat types due to its varied topography and climate and its biogeographical location. More than 363 bird species have been recorded in Jordan, of which more than 141 species are breeding birds and this number might increase with the continuous research.

Jordan lies on the main route of bird's migration between Africa, Asia and Europe. Millions of birds are migrating over Jordan each year, among which the majority of the Jordanian avifauna is belonging. The huge number of migrant birds that visit Jordan twice a year has made the country of a great importance for the global avifauna. Entire population of some species passes through the area twice a year. Many of these species are listed as globally threatened by the International Union for the Conservation of Nature (IUCN).

Figure 28 – Major migration flyways across the region and the project area

The Mediterranean/Black Sea Flyway is one of three Palaearctic-African flyways connecting Europe with Africa. Collectively, these constitute the world's largest bird migration system. The scale of the avian movement is truly awesome with over 2 billion passerines and near-passerines, 2.5 million ducks and two million raptors migrating from their breeding grounds in Europe and central and western Asia to winter in tropical Africa.

The Red Sea-Dead Sea pipeline passes through different topographical regions of Jordan that support a large numbers of birds' species. The following bird species were recorded along the route of the conveyance pipeline.

Table 7 – Important Breeding Birds along the pipeline route

Family	Scientific Name	Common Name	IUCN Status	IFC PS 6
Otididae	*Chamydotis undulata*	Houbara Bustard	Globally Threatened	Crit 1, 3
Accipitridae	*Aegypius monachus*	Black Vulture	Globally Threatened	Crit 1, 3
Phasianidae	*Francolinus francolinus*	Black Francolin	Regionally Threatened	Crit 1
Accipitridae	*Gypaetus barbatus*	Lammergeier	Regionally Threatened	Crit 1
Accipitridae	*Torgos tracheliotus*	Lappet-faced Vulture	Regionally Threatened	Crit 1
Passeridae	*Passer moabiticus*	Dead Sea Sparrow	Restricted to Middle East	Crit 1, 2
Fringillidae	*Corpodacus synoicus*	Sinai Rosefinch	Nationally Threatened	Crit 1, 4
Paridae	*Parus caeruleus*	Blue Tit	Nationally Threatened	Crit 1, 4

Table 8 – Important Migrant birds along the pipeline route

Family	Scientific Name	Common Name	Status	IFC PS 6
Ardidae	Botaurus stellaris	Great Bittern	Globally Threatened	Crit 1,3
Accipitridae	*Aquila heliaca*	Imperial Eagle	Globally Threatened	Crit 1,3
Rallidae	*Crex crex*	Corn Crake	Globally Threatened	Crit 1,3
Accipitridae	*Buteo buteo*	Buzzard	Significant Proportion of the World Population	Crit 1
Accipitridae	*Pernis apivorus*	Honey Buzzard	Significant Proportion of the World Population	Crit 1
Accipitridae	*Aquila nipalensis*	Steppe Eagle	Significant Proportion of the World Population	Crit 1
Accipitridae	*Accipiter brevipes*	Levant Sparrowhawk	Significant Proportion of the World Population	Crit 1

The RSDS intake location is located within the Aqaba Important Bird Area (RSCN – Birdlife 2000). This IBA is includes both the coast line and the mountain range of Aqaba, which serves as a bottle neck through which millions of global bird migrate, while hundreds of thousands of these birds stopover in Aqaba for resting and feeding during their long trip between Europe and Africa and vice versa.

Table 9 – Important bird species recorded at Aqaba (RSCN, Birdlife, 2000)

Family	Scientific Name	Common Name	Status	IFC PS 6
Rallidae	*Crex crex*	Corn Crake	Globally Threatened	Crit 1,3
Laridae	*Larus leucophthalmus*	White-eyed Gull	Globally Threatened	Crit 1,3
Accipitridae	*Aquila heliaca*	Imperial Eagle	Globally Threatened	Crit 1,3
Ardeidae	*Ardea cinerea*	Grey Heron	1% or more of world population	Crit 1,3
Ciconiidae	*Aythya nyroca*	Ferruginous Duck	Regionally Threatened	Crit 1,2
Accipitridae	*Accipiter brevipes*	Levant Sparrow hawk	Regionally Threatened	Crit 1,2
Accipitridae	*Pernis apivorus*	European Honey Buzzard	Regionally Threatened	Crit 1,2
Falconidae	*Falco cherrug*	Saker	Regionally Threatened	Crit 1,2
Ciconiidae	*Ciconia ciconia*	White Stork	Regionally Threatened	Crit 1,2
Strigidae	*Strix butleri*	Hume's Tawny Owl	Species Restricted wholly or largely to Middle East	Crit 1,4
Turdidae	*Oenanthe monacha*	Hooded Wheatear	Species Restricted wholly or largely to Middle East	Crit 1,4
Timaliidae	*Turdoides squamiceps*	Arabian Babbler	Species Restricted wholly or largely to Middle East	Crit 1,4
Sturnidae	*Onychognathus tristramii*	Tristram's Grackle	Species Restricted wholly or largely to Middle East	Crit 1,4
Passeridae	*Passer moabiticus*	Dead Sea Sparrow	Species Restricted wholly or largely to Middle East	Crit 1,4

Table 10 – Migratory soaring birds during the Dead Sea area

No	Family	*Scientific Name*	Status	IFC PS 6
1	Common Crane	Grus grus	PM	Crit 1,3
2	Black Stork	*Ciconia nigra*	PM, WV,	Crit 1,3
3	White Stork	*Ciconia ciconia*	PM, WV	Crit 1,3
4	European Honey-buzzard	*Pernis apivorus*	PM	Crit 1,3
5	Black Kite	*Milvus migrans*	PM, WV	Crit 1,3
6	White-tailed Eagle	*Haliaeetus albicilla*	PM, WV	Crit 1,3
7	Egyptian Vulture	*Neophron percnopterus*	PM, WV, SV	Crit 1,3
8	Eurasian Griffon Vulture	*Gyps fulvus*	resident, PM, WV	Crit 1,4
9	Short-toed Eagle	*Circaetus gallicus*	PM, WV, SV	Crit 1,3
10	Western Marsh-Harrier	*Circus aeruginosus*	PM, WV,)	Crit 1,3
11	Hen Harrier	*Circus cyaneus*	PM, WV	Crit 1,3
12	Pallid Harrier	*Circus macrourus*	PM, WV	Crit 1,3
13	Montague's Harrier	*Circus pygargus*	PM, WV	Crit 1,3
14	Eurasian Sparrowhawk	*Accipiter nisus*	PM, WV, SV	Crit 1,3
15	Levant Sparrowhawk	*Accipiter brevipes*	PM	Crit 1,3
16	Common Buzzard	*Buteo buteo*	PM, WV,	Crit 1,3
17	Steppe Buzzard	*Buteo buteo vulpinus*	PM	Crit 1,3
18	Long-legged Buzzard	*Buteo rufinus*	resident, PM, WV	Crit 1,4
19	Lesser Spotted Eagle	*Aquila pomarina*	PM,	Crit 1,3
20	Greater Spotted Eagle	*Aquila clanga*	1) PM, 2) WV	Crit 1,3
21	Steppe Eagle	*Aquila nipalensis*	PM, WV	Crit 1,3
22	Booted Eagle	*Hieraaetus pennatus*	PM, WV	Crit 1,3
23	Osprey	*Pandion haliaetus*	PM,	Crit 1,3
24	Lesser Kestrel	*Falco naumanni*	PM, WV, 3) SV	Crit 1,3
25	Merlin	*Falco columbarius*	PM, WV	Crit 1,3
26	Eurasian Hobby	*Falco subbuteo*	PM, SV	Crit 1,3
27	Peregrine Falcon	*Falco peregrinus*	PM, WV	Crit 1,3
28	Imperial Eagle	*Aquila heliaca*	PM, WV	Crit 1,3
29	Red-footed Falcon	*Falco vespertinus*	PM	Crit 1,3
30	Eleanora's Falcon	*Falco eleonorae*	PM	Crit 1,3
31	Sooty Falcon	*Falco concolor*	PM, SB	Crit 1,3
32	Lanner Falcon	*Falco biarmicus*	4) resident, PM, WV	Crit 1,4
33	Saker Falcon	*Falco Cherrug*	PM, WV	Crit 1,3

The conveyance system will pass through or adjacent to various ecologically sensitive areas, including Protected Areas, Important Bird Areas, and Special Conservation Areas. An overview of these areas is provided hereafter. It is advised to minimize construction works here during the critical bird's migration season particularly in spring.

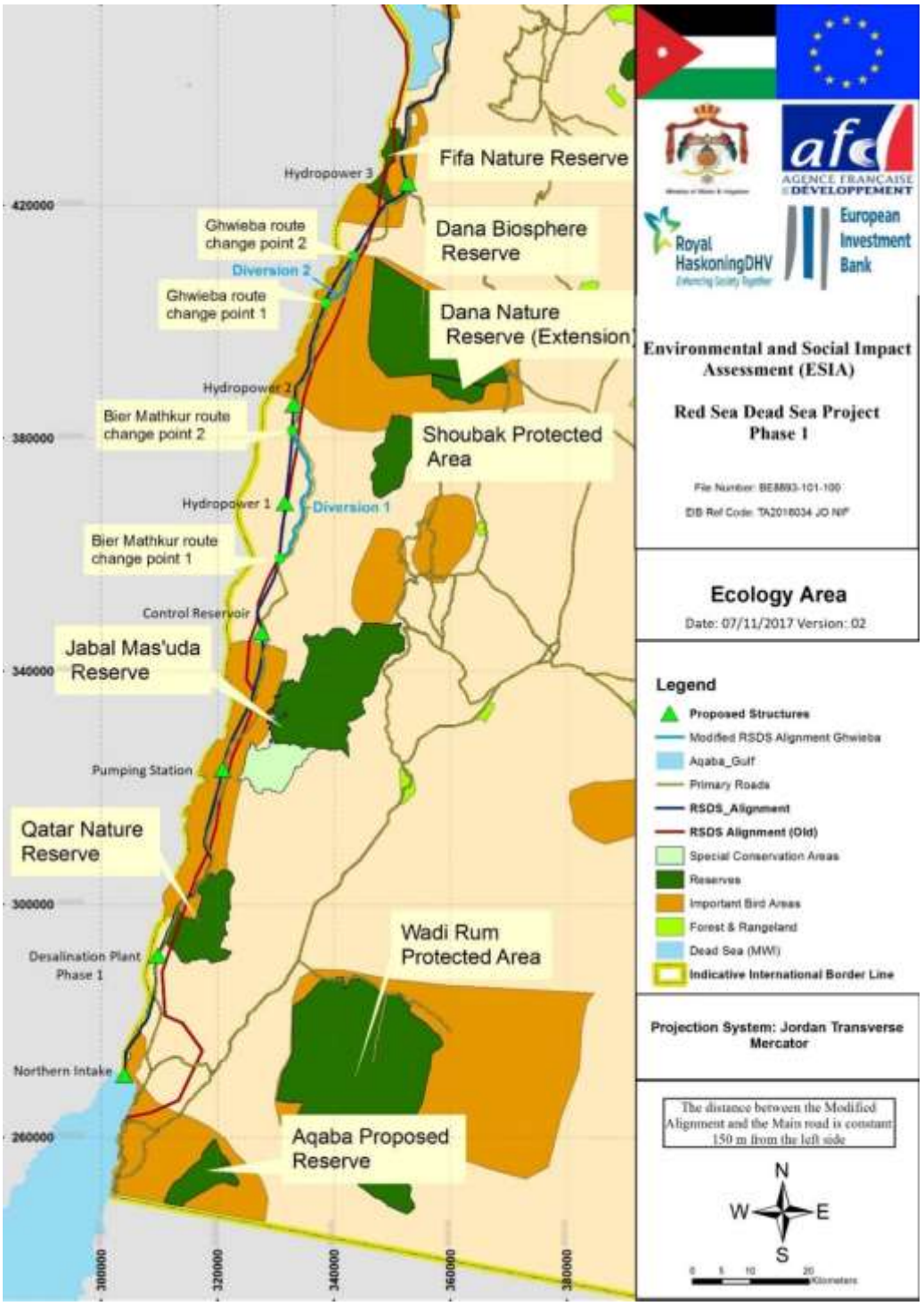

Figure 29 – Ecologically sensitive areas within the project region

6.5.2 Critical Habitats

Critical habitat, as defined in IFC PS6, is an area of high biodiversity value in which proposed development may be associated with particularly high biodiversity risks.

For the purposes of this report, terms are based on the descriptions in PR6 and are defined as follows:

- Priority biodiversity features: Biodiversity features that are particularly irreplaceable or vulnerable. These include:
    - Threatened habitats.
    - Vulnerable species.
    - Significant biodiversity features identified by a broad set of stakeholders or governments.
    - Ecological structure and functions needed to maintain the viability of priority biodiversity features.

- Critical habitats: The most sensitive biodiversity features, which comprise:
    - Highly threatened or unique ecosystems.
    - Habitats of significant importance to endangered or critically endangered species.
    - Habitats of significant importance to endemic or geographically restricted species.
    - Habitats supporting globally significant migratory or congregatory species.
    - Areas associated with key evolutionary processes; or ecological functions that are vital to maintaining the viability of the biodiversity features described in the preceding bullet points.

The results of the field and desk-based assessments were used to:

- Identify the presence of potentially important habitats and species;
- Assess the significance of the habitats; and
- Determine whether they can be defined as critical habitats or priority biodiversity features in accordance with the specific criteria set out above and in Paragraphs 12 and 14 of PR6.

Spatial distribution of critical habitats

The extent of each critical habitat and priority biodiversity feature in the study area was highlighted based on field survey results. It was not possible to established clearly defined boundaries in an ecologically coherent manner due to the sparse availability of data.

The areas of each critical habitat or priority biodiversity feature that could potentially be impacted by the RSDS Phase 1 development (as opposed to the local or regional extent of these habitats) were then identified. In defining a critical habitat, the area of influence was considered.

- The zone of direct proposed development impacts (i.e. the areas of each habitat type that would be directly affected by the development).
- The zone of anticipated indirect impacts, especially in relation to habitat connectivity and areas outside the proposed development boundary. These were defined according to the sensitivity of receptors in each habitat type.

It is important to note here that the pipeline rout does not pass through any protected areas or KBAs or nationally adopted nature reserve areas listed in the Biodiversity Country study. The majority of the pipeline route is located adjacent to the international road. The route passes also through urban areas and farm lands with a buffer zone of 100 meters, with 50 meters on each zone. **Error! Reference source not found.** shows the different zones and areas of influence of the project on the Terrestrial ecology of the project.

Table 11 – Critical Habitats and associated species within Wadi Araba Terrestrial ecosystems

Ecosystem Habitat	Principle species	Conservation status IUCN	IFC PS 6	Associated Species	Conservation status	Impact	Magnitude of Impact
Aqaba	Aqaba IBA	Bottleneck Migratory species IBA	Urban and Natural habitats (iv) Biodiversity priority BR migratory route	Tables 5,6	GT, VU GT, LC	Indirect impact disturbance of migratory species	Major
Aqaba Rahma	Aqaba Foot Hills alluvial fans	Acacia spp.	Biodiversity priority areas Semi natural Habitat (ii) Habitats of significant importance to endangered or critically endangered species	Dorcas Gazelle Spiny tailed Lizard Local Breeding birds Table 4	VU VU GT, LC	Direct cutting of acacia trees Direct impact on breeding birds' nests using Acacia trees	Moderate
Rahma Bier Mathkur	Rama Sand Dunes	Haloxylon Sp.	(i) Highly threatened or unique ecosystems Semi Natural Habitat Vunrubal species	Dorcas Gazelle Desert Monitor Breeding birds	LC VU	Direct cutting of Acacia species through cut and fill process for route of pipeline Direct impact on nest of breeding birds in sand dunes and alluvial fans and wadi beds	Small
Fidan to Dead Sea basin	Acacia trees and wood lands	VU	(iii) Habitats of significant importance to endemic or geographically restricted species Semi Natural Habitat	Acacia Spp.	Table 4 Breeding birds	Direct impact on Acacia spp.	Small
Fifa	*Salvadora*	NT	iv) Habitats	Migratory	Table 6,7	Indirect impact	Small

Ecosystem Habitat	Principle species	Conservation status IUCN	IFC PS 6	Associated Species	Conservation status	Impact	Magnitude of Impact
	persica		supporting globally significant (concentrations of) migratory or congregatory species Urban	birds		from construction activities in cutting of trees and top soil	
Dead Sea Lissan	*Maerua crassifolia* *Balanites aegyptiaca*	CR CR	iv) Habitats supporting globally significant (concentrations of) migratory or congregatory species Urban	Migratory Birds	Table 7	Indirect impact on migratory species by disturbance from construction activities	large

6.6 Archaeology and Cultural Heritage in Wadi Araba / Arava

6.6.1 Introduction

Within the framework of updating the baseline situation in terms of archaeology and cultural heritage, the following activities have been undertaken.

Literature study
The available resources for the data were investigated in Jordan or outside the country, including previous conducted surveys, excavation, limited studies, preliminary reports, old maps or any written document about the selected project. Information has been gathered from foreign or national libraries, such as at the Department of Antiquities of Jordan, previously the Jordan Antiquates Database and Information system; the Library of the American School of Oriental Research (ACOR); the library of the British council for Research in Levant (BCRL), the German institute of the holy land and the Jordan Universities libraries.

Field Investigation
Based on earlier inventories of actual and potential sites, a systematic validation investigation was conducted during the months of January – May 2017. These field visits covered the entire project area. For sites already known and/or described sufficiently no additional work was done. For other / new sites diagnostic cultural remains were investigated, such as s archaeological remains, pottery shreds and lithic tools scattered over the surface.

The architectural remains were properly evaluated, and few samples were checked in field to get more accurate dating in coordination with DAJ, however this analyses was outside the scope of this ESIA.

Mapping
All discovered sites were located on the topographic map sheet using grid coordinates. During the survey, these maps were used with a scale of 1:25,000 (UTM or PG).

Photographing
Different kinds of photographs were used in order to record and understand the conditions of the site, including normal photographs and aerial photographs. Photos have been included in this ESIA either within the text or as separated illustration attached. The photos revealed several important issues like size, extent, location and nature of the site. Also old photographs related to the surveyed areas were revisited.

Rapid Reporting
A rapid final report included the essential data for each site provided at the end of the field investigations the following descriptions:

- I.D number assigned in the field
- UTM or PG coordinates, modern or old name of site (if known) -
- Description of the found remains,
- Date of the found remains started from the Palaeolithic, Neolithic, Chalcolithic , Bronze , Iron, Hellenistic, Roman, Byzantine Islamic and Recent Periods

All baseline related research data are presented in detail in annex 7. A summary of the archaeological and cultural heritage status of the project area is described hereafter.

6.6.2 Baseline

The internationally recognized World Heritage values of the Aqaba, Wadi Araba and Dead Sea regions are strongly related to its unique geographic features and its historic, religious, cultural and archaeological values. The area attracted human habitation for thousands of years and is referred to as the most ancient inhabited area of human history. Archaeological sites date back to the pre-historic era. The remains of more than 20 successive human inhabited areas were found around the Dead Sea, the first of which is Tel Es-sultan, located at the north west of Jericho, and dates back 10,000 years (8000 BC) and is known as the “oldest city in the world”. Other sites distributed through the project area date from different eras of history, from the Pre-Pottery Neolithic age, the Bronze age, the Hyksos period, the Canaanite period, the Persian, Hellenistic and Roman periods, and the Byzantine and Ottoman periods.

Around 100,000 years ago the Red Sea extended north to the area of modern Lake Tiberius. Then a combination of geological uplifts and a declining rainfall caused this inland gulf of water to retreat. 20,000 years ago a 220 kilometre-long lake named Lisan (‘tongue’ in Arabic) extended all along Wadi Araba / Arava. The increasingly arid climate caused the level of the lake to fall until, by 12-10,000 years ago, the Dead Sea as seen today were formed. The Jordan River flowed into the Dead Sea, and was fed by many wadis (small rivers in Arabic) from the west and east, created by perennial fresh water springs. These springs were part of the natural ground water system until they were exposed in deep chasms produced by the creation of the Rift Valley. These fresh water sources have enabled a rich environment of plant and animal life to flourish as well as attracting a burgeoning human population.

Early expeditions in the RSDS project area were characterized by massive excavations on major archaeological sites (tells). This started in the late 19th century and continued through the first half of the 20th century, mainly conducted by German and British scholars. They managed to identify a few important sites that are partially related to biblical history of the region, as well as the Hellenistic-Roman and Byzantine periods. In the first half of the 20th century, archaeologists made some important discoveries that go back to the prehistoric periods.

Studies have shown that the southern part of the Wadi Araba /Arava floor is covered with a variety of deposits from the Holocene to Pleistocene alluvial fans at the mouths of wadis composed of sediments that have washed down from the mountains including mudflats and sand dunes. The arid climate of today has been less severe at various times in the past. There are very few sites from the Palaeolithic to Neolithic times so far recorded.

Studies in the south-eastern Valley have shown that Chalcolithic to Early Bronze Age sites are relatively frequent, as are sites from the Nabataean / Roman period, suggesting that in these periods the climate was more humid and cooler than at other times. A few of the sites from these periods suggest permanent settlement associated with agriculture using water harvesting techniques. This suggests more rainfall compared to today.

Field research activities of survey and excavations in Wadi Araba concentrated around major sites such as Feinan, Fedan, Ghuweir, Bir-Madthkur and Gharandal, around ancient copper mines, where raw materials were processed and where ancient trade routes passed, including trade in incense.

Still, it is believed that many remains of various prehistoric periods are still resting untouched below the ground surface, and new findings and additional sites may be uncovered in the years ahead.

Ancient water well

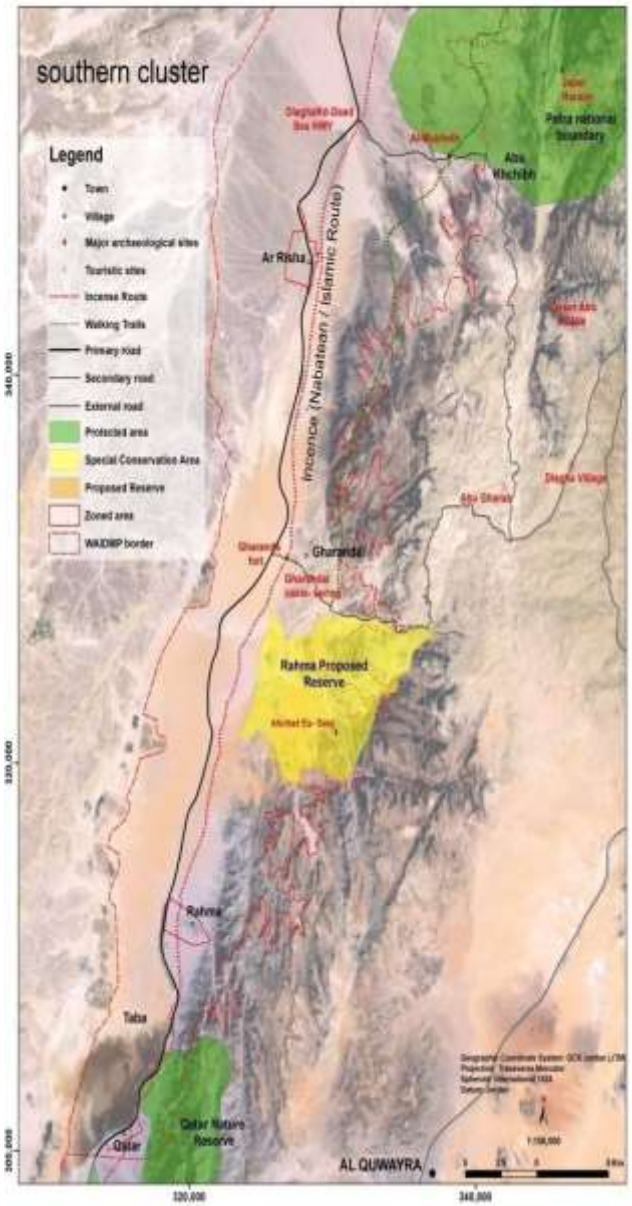

Figure 30 – Historic Incense Route passing by Aqaba and through Wadi Araba / Arava

The field work and investigations in Aqaba and Wadi Araba suggest that large parts of southern Jordan are immensely rich in archaeological remains. Most of those identified are certainly pre-Islamic and probably several thousand years old.

Detailed interpretation of the so called Feinan Complex in the middle of Wadi Araba forms the basis for suggesting how copper ores have been exploited and helped shape the human landscape. Some 240 sites have been identified and registered by earlier Jadis/Mega program, while field survey conducted by RSCN in Jabal Masuda from November 2008 until January 2009 revealed an additional 57 archaeological sites. Recent archaeological field survey of DSRSP revealed another 137 new sites and 69 individual graves throughout Wadi Araba. The results together show clear representation of all periods and many

types of sites, ranging from flint and sherd scatters, stone circles and enclosures to towers and agricultural installations, and many cemeteries.

Under the current ESIA our archaeological team had the privilege of gaining access, with military permission and escort, to areas along the border with Israel in the southern part of Wadi Araba, which were not surveyed systematically before. This revealed again a series of new sites, albeit small ones, in terms of graves and cemeteries, small groups of structures, ancient campsites with fireplaces, and prehistoric flint quarry sites.

An overview of the locations of all identified archaeological and cultural-heritage sites along or near the RSDS Phase I pipeline route is presented below.

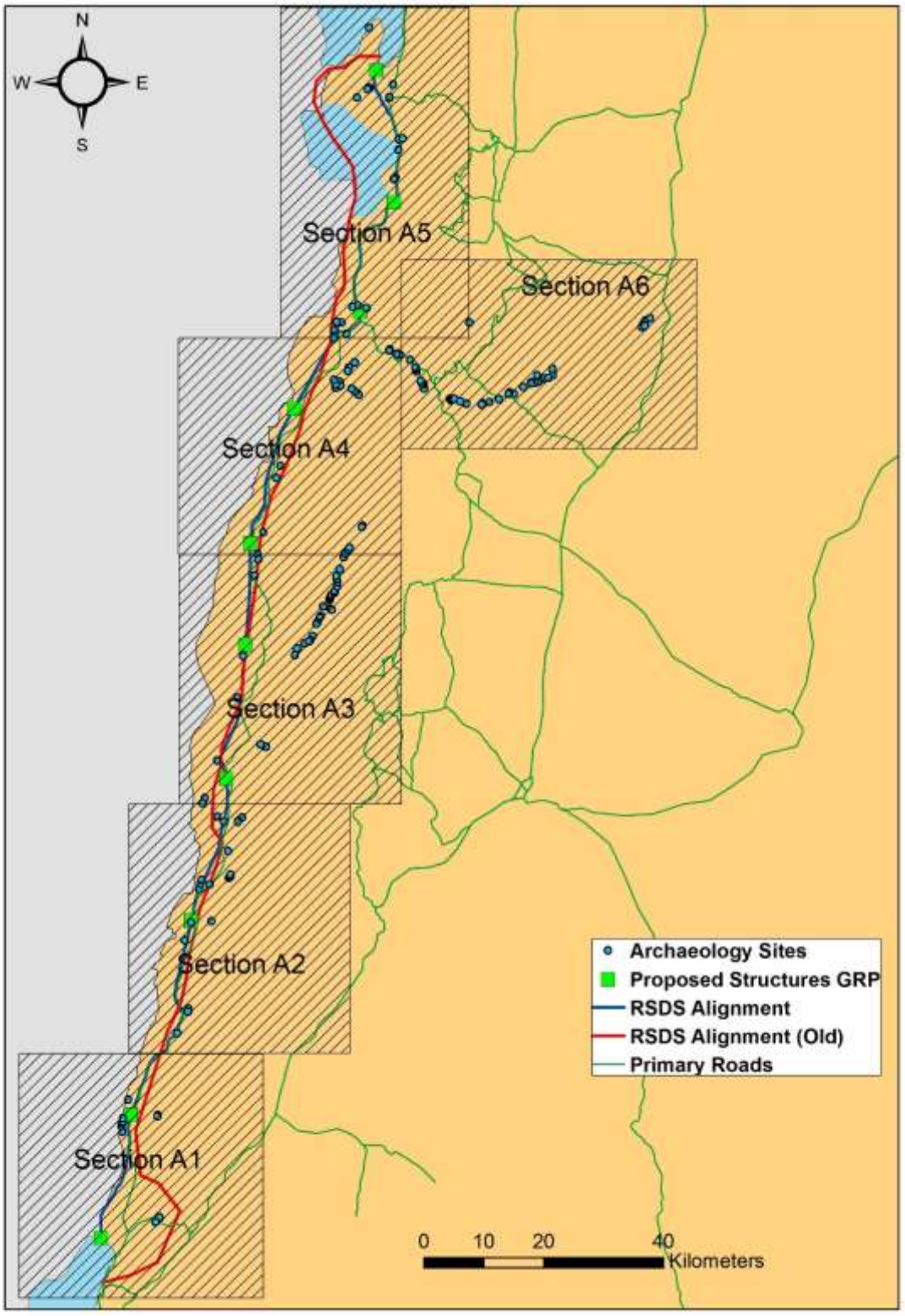

Figure 31 – Archaeological Sites along proposed RSDS Alignment (details in annex 7)

To assess potential impacts of the RSDS project on these sites, a distinction has been made between sites that are located:

- Within 50 metres from the boundaries of the RSDS Phase I project footprint (Category I); these sites might be impacted directly during construction works or during the operations
- Between 50 and within 250 metres from the boundaries of the RSDS Phase I footprint (Category II). These sites might be impacted indirectly due to distortion during the construction and operation phases

An overview of the category I sites is provided hereafter. These sites need particular attention during preparation, construction and operations of the project. Detailed maps of the investigated areas and locations of the classified archaeological sites are presented in annex 7.

Table 12 – Archaeological sites identified within 50 m from the RSDS Phase I footprint

No	Section	Site No	Site name	Size	Source	Description
1	A2	105	Al jidar	1x40 m	Isab and eve survey 2012	A wall of 1m wide and 40 m long, running across a shallow dip between dunes in the bottom of Wadi Araba . Made of local granite and sandstone boulders.
2	A2	106	Al nughrah (1)	5x5m	Isab and Eve survey 2012	Two fireplaces consisting of small heaps of burnt cobbles with at least three pot drops of Chalcolithic pottery, between dunes in the bottom of Wadi Araba
3	A2	107	Al nughrah (2)	30x30m	Isab and Eve survey 2012	Five fireplaces consisting of small heaps of burnt cobbles, ca 1 m diameter, and one small circle of stones. Also a few flakes found around, between dunes in the bottom of Wadi Araba.
4	A2	108	Al nughrah (3)	35x35m	Isab and Eve survey 2012	Five or more fireplaces of small heaps of burnt cobbles, and few pottery sherds
5	A2	150	Al thoghwy	50x50m	Field assessment	The site located on a flat area close to Bir Mathkur area on the western side of the asphalt road. It consist of a 30*30m square building, built of well-cut limestone ashlars , robber pits revealed a sub structures of unknown walls. The site possibly served as a station for trade caravan toward the west where a cistern of water was found during the investigation process. A lot of pottery shreds were scattered on the surface indicated a classical period (Roman – Byzantine).
6	A2	151	Ain Qatar	30x30 m	Field assessment	Remains of few stones built near an old spring called Ain Qatar, the site consist of two cement bricks pits used as water catchment, on the eastern side of the paved road. Few recent Bedouin graves were dug to the eastern side of the spring. Most of the remains were covered by alluvial and accumulated over the remains as a result of seasonal erosion. Very few classical pottery shreds were noticed near the spring.
6	A4	110	N.N	30x30m	Isab and eve survey 2012	Thin pottery scatter, with at least five different pots (Nabataean / Roman / Byzantine), and one flint

No	Section	Site No	Site name	Size	Source	Description
						flake. Possible grave nearby. Located on the very edge of drop down to Dead Sea basin , there are stunning views northwards to the Dead Sea basin
7	A4	148	Rujum khnezera	30x30m	Maz	The site located on a high hill overlooking the southern Ghor. The nearby site such as Khirbet Feifa are visible from here. The tower Segment of the site stands (5-6 m high). There are walls visible on the N.E side of the site where the slope is not eroded. They appear to consist of three levels progressing in a step-like fashion to the summit.
8	A5	139	Khirbet feifa	2 x 1 km	Waheeb 1995	A structure called Qaser Feifa located on top of a medium hill east of the existed paved road, to the east is a large cemetery of thousand mostly robbed oval lined stone tombs. The site dated to different occupational phases from Byzantine and Islamic periods. Most of the cemetery dated to Early Bronze Age 3200-2000 B.C. The cemetery covers an area dissected by many small wadies of at least 1.0 x 0.5 km.

Detailed locations of these sites can be found on the maps of the investigated areas presented in annex 7. The six critical sites on map A2 are also presented in Figure 32.

The Category II sites, located within 50 to 200 metres from the project footprint, need particular attention in terms of precaution during construction works and operations.

These category II sites are the following:

Section 1 - sites: 71,72,73, 77,89,90,91,92, 93,94,149
Section 2 – sites: 72,74,75,76,78,80, 81,82,83, 95,109,152
Section 3 – sites: 40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,58,59, 60,61,62,63, 64, 65,66,67 68,69,70, 85,86,87
Section 4 – sites: 24, 25,26,28,30, 31,32,33,34,35, 37,38,39,55,56, 57, 96,97,98,99,153
Section 5 – sites: 16,17,37, 111,140,154,157,176,180,181, 82,183,184,185

An overview of the sections A1 to A6, including locations of above listed category I and II sites are presented in annex 7.

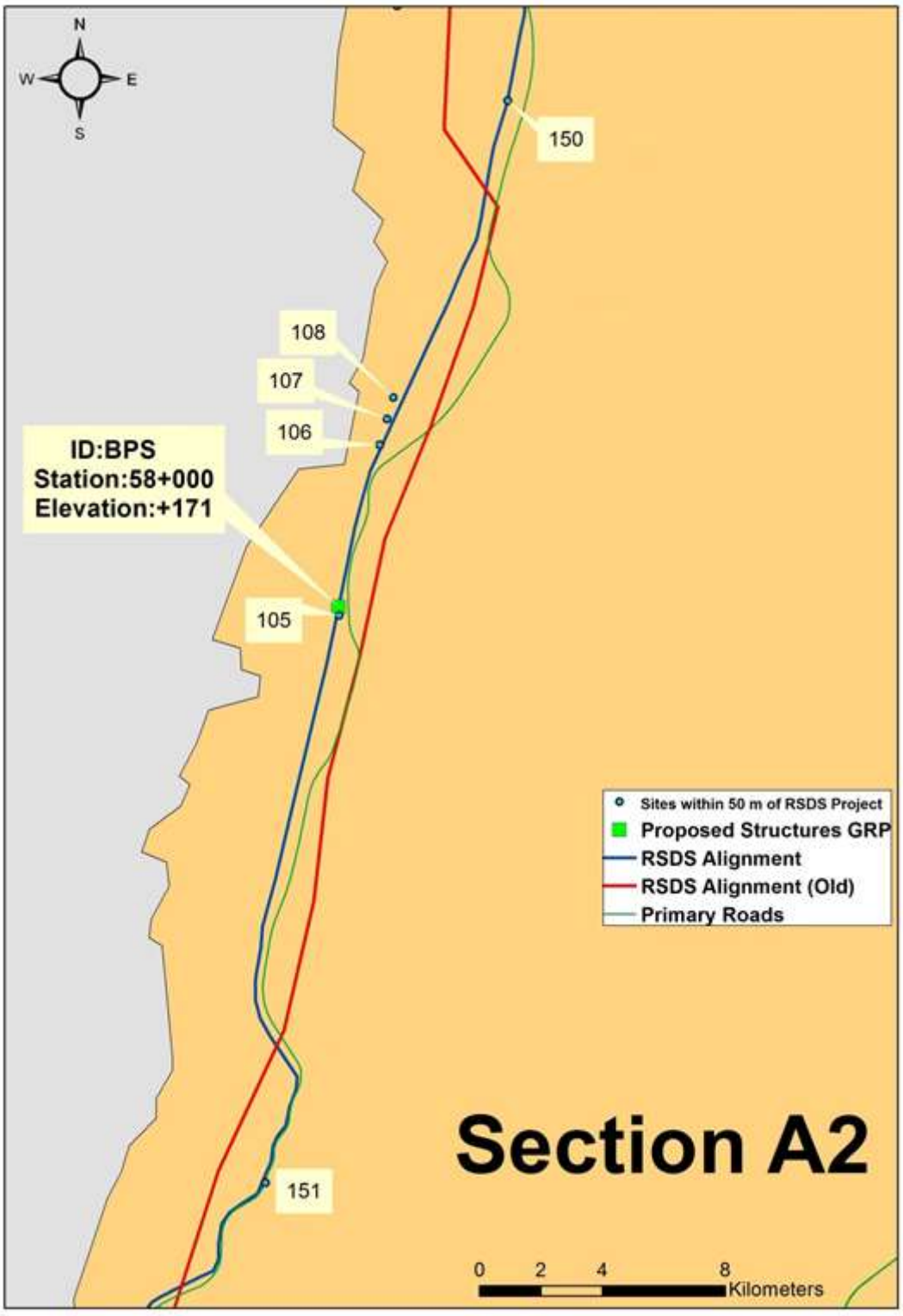

Figure 32 – Critical Archaeological Sites within 50 m of RSDS Project in Section A2

6.7 Geology and Seismology

During the preparation of this ESIA additional seismological literature assessments have been done in addition to the work under the 2011 ESA and based on the Geotechnical Report prepared by Dar Al-Handasah and partners (ref: J15135-0100D-RPT-GE-03). However, the location of the northern intake with the current RSDS Phase I project may alter the risk profile associated to seismology, in comparison to the originally preferred RSDS alignment under the final ESA of 2014 [lit 13]. This relates to the fact that the Dead Sea Transform fault (DST) system is the major tectonic feature controlling the stratigraphic and structural evolution of the project area region, and is the main cause of seismic risks. The location of this Dead Sea Transform fault line is presented below, running right under the Gulf of Aqaba / Eilat and the city of Aqaba. The northern intake site is very close to a branch of the DST fault.

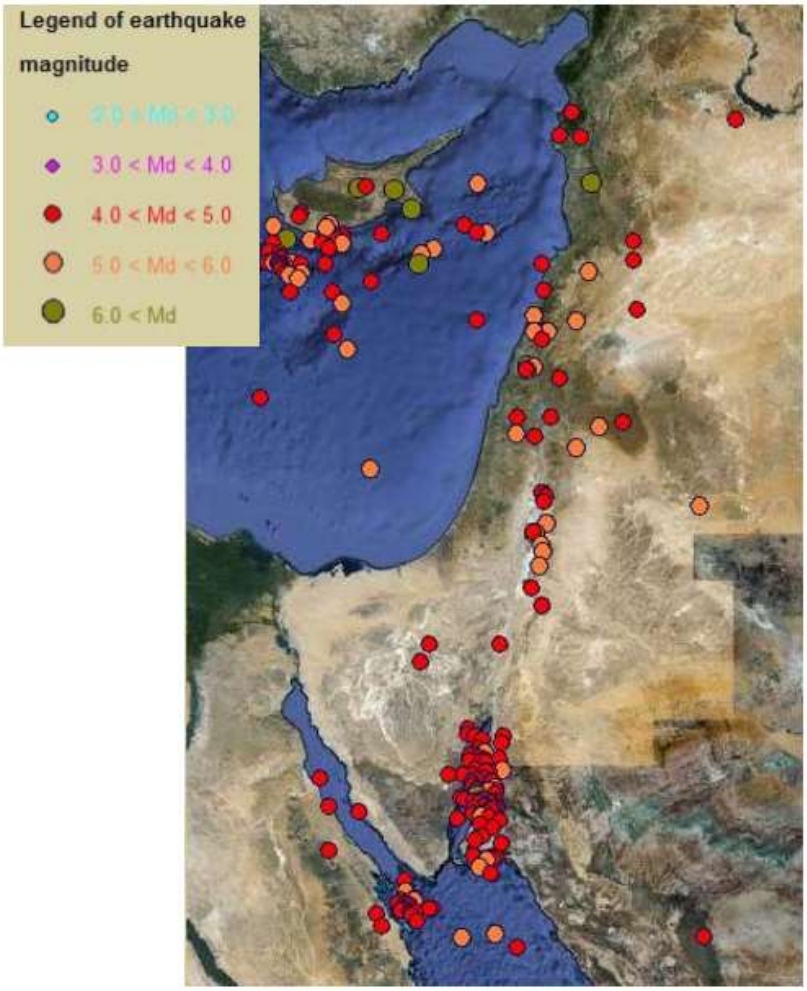

Figure 33 – Earthquake events in project area with magnitude > 4.5

Figure 33 shows the earthquake events of magnitudes greater than 4.5 (Richter Scale) during the period of 1900 – 2008. The data were retrieved from the catalogue of the Geophysical Institute of Israel (www.gii.co.il)

The rift valley faulting within the study area is characterised by two main faults trending approximately north-south and numerous associated echelon faults mostly trending approximately east-west As a result of this active fault zone, which is basically a tectonic plate boundary, regional uplift and basaltic volcanism are main characteristics of Wadi Araba and the Red Sea region. More than 3 km uplift is believed to have taken place in the Red Sea since the Oligocene. In the Dead Sea region uplift has been in the order of 1-2 km.

The relevance of this fault zone in terms of earthquake risks was again underlined in the year 1995, when a the Nuweiba earthquake occurred in the middle of the Gulf of Aqaba on November 22 with a registered force of 7.3 on the Richter scale. Its epicentre was located in the central segment of the Gulf. At least 8 people were killed and 30 were injured. This earthquake was the strongest tectonic event measured in the region and was thought to have remotely triggered a series of small to moderate earthquakes 500 kilometres to the north as well.

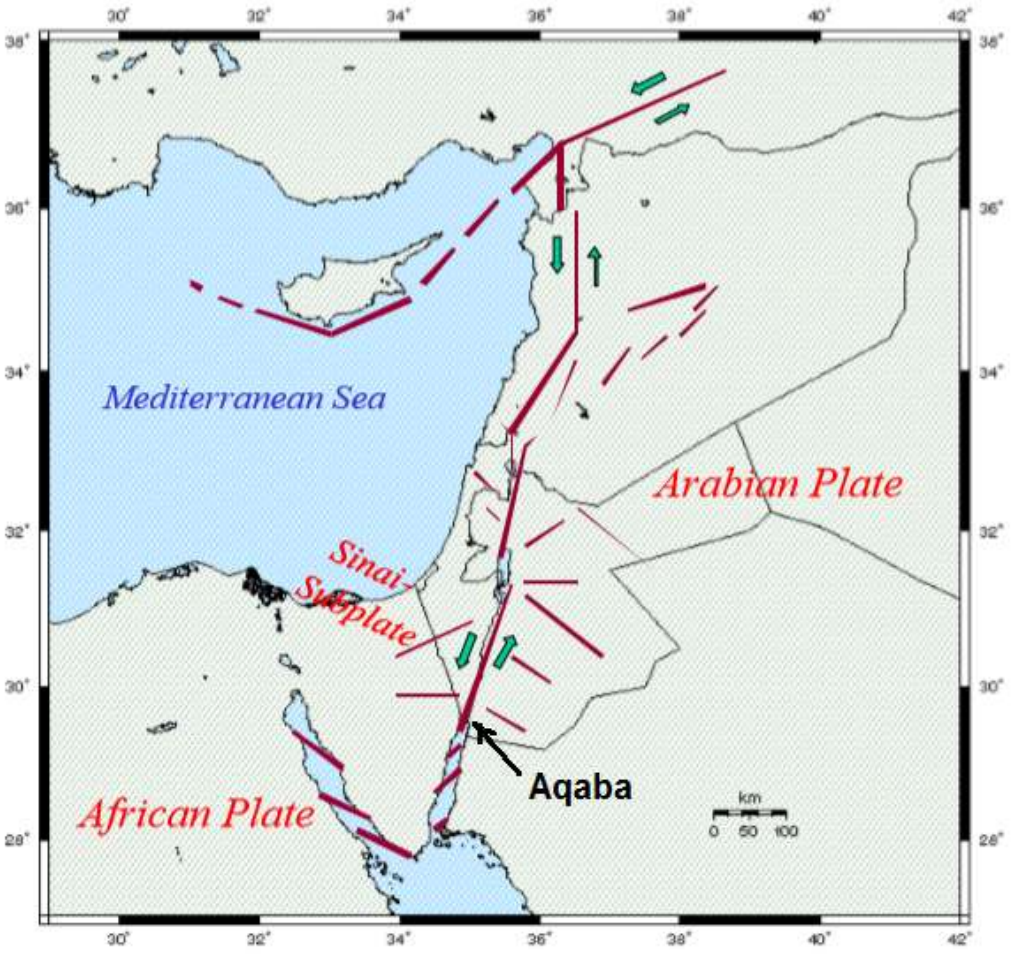

Figure 34 – Location of Dead Sea Transform Fault System through Aqaba

In terms of assessment of seismic risks under the current project reference is made to below map, which indicates the expected different levels of gravity of earthquakes that will occur with a 10% chance within the next 50 years. This gravity is expressed as in terms of expected Peak Ground Acceleration (source: Global Seismic Hazard Assessment Program - GSHAP). This map shows that the seismic risks throughout the project area, as well as both shorelines of the Gulf of Aqaba, have been classified as 2.4%, which is similar to for instance the areas of main land Turkey outside the key earthquake risks zones.

The floor of the Wadi Araba itself rises gradually to 250 m above sea level from the Gulf of Aqaba up to the central Wadi. Then the floor decreases gently northwards to the surface of the Dead Sea, at 392 m below the sea level. Unconsolidated sediments of Quaternary and older clastic sediments occupy most of the Wadi Araba floor.

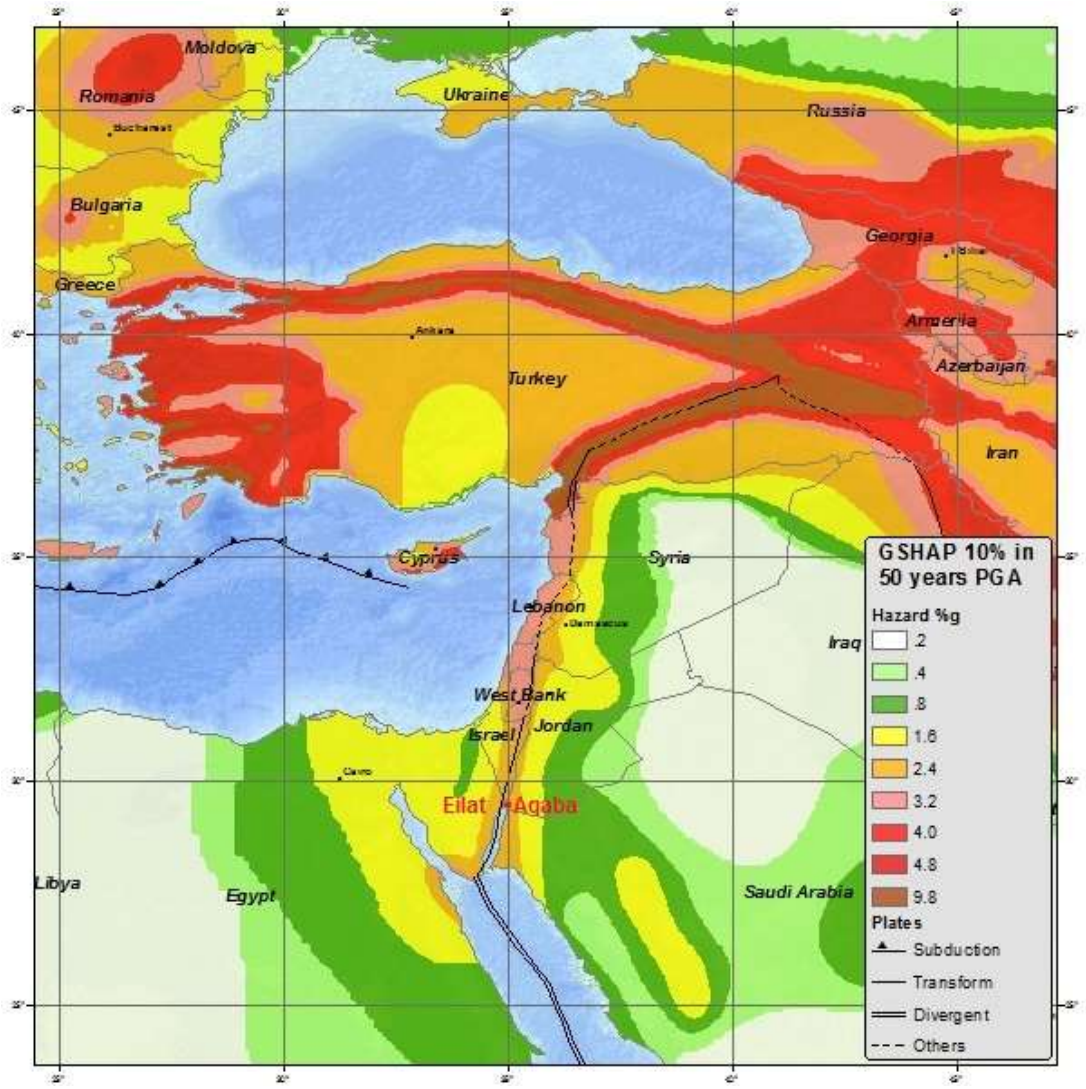

Figure 35 – Seismic Risk Map of the Middle East (ref: Global Seismic Hazard Assessment Program – GSHAP)

6.8 Climate, Air Quality an Noise

6.8.1 Climate Change

During the preparation of this ESIA some additional climate change, air quality and noise related assessments have been done next to the work already done under the 2011 ESA. The 2011 ESA confirms that a Mediterranean-type climate characterised by a hot, dry summer and cool winter with short transitional seasons predominates in the northern, central and western parts of the region. The eastern and southern parts of the region have a semi-arid to arid climate. Annual rainfall decreases from north to south and from west to east, and exceeds 800 mm in the far north of Israel, dropping to less than 50 mm in the Dead Sea basin, Negev desert and Wadi Araba.

Different statistical methods are usually applied to calculate the projected changes of these parameters for a certain region. For instance GLOWA applied an advanced non-statistical hierarchical cluster analysis to classify the climate in 13 different clusters in the Middle East. The results for the years 1901 – 1915 are presented in Figure 36..

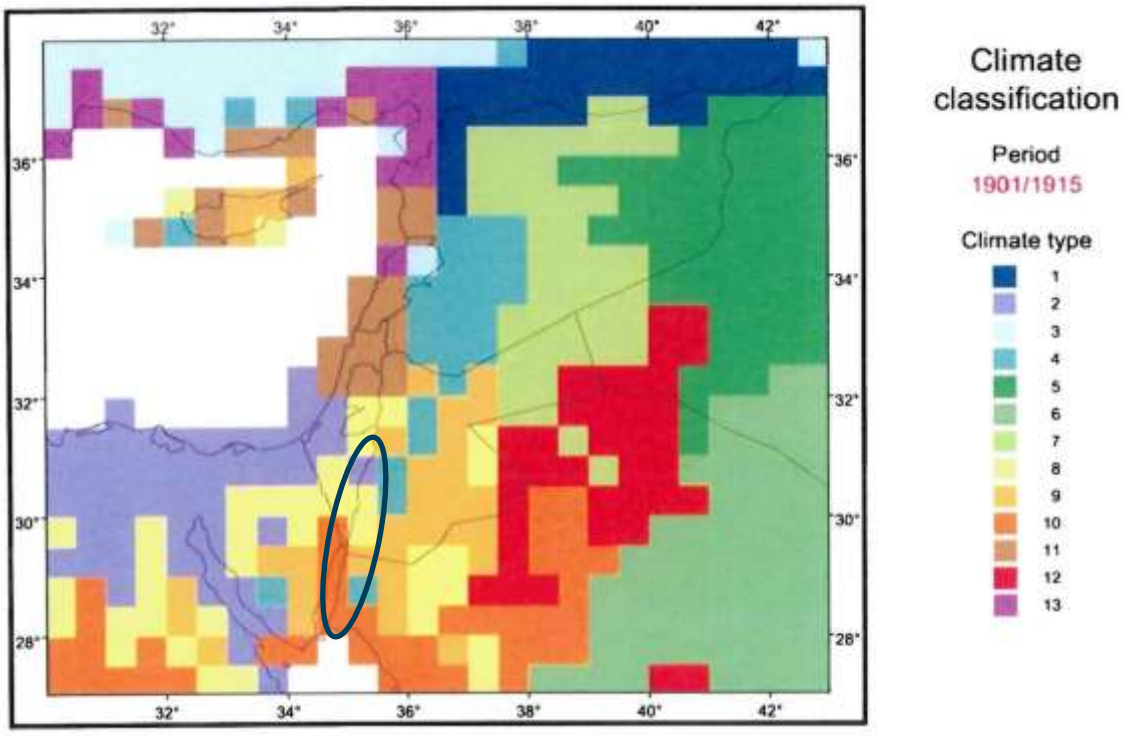

Figure 36 - GLOWA Classification of Climate Change into 13 Cluster until 1915

The black circle in above figure indicates the current RSDS study area. As indicated here, the climate was classified as type 2 for the northern part and type 10 near Aqaba and Eilat. Figure 37 provides a region classification again, this time for the years 1989-2003.

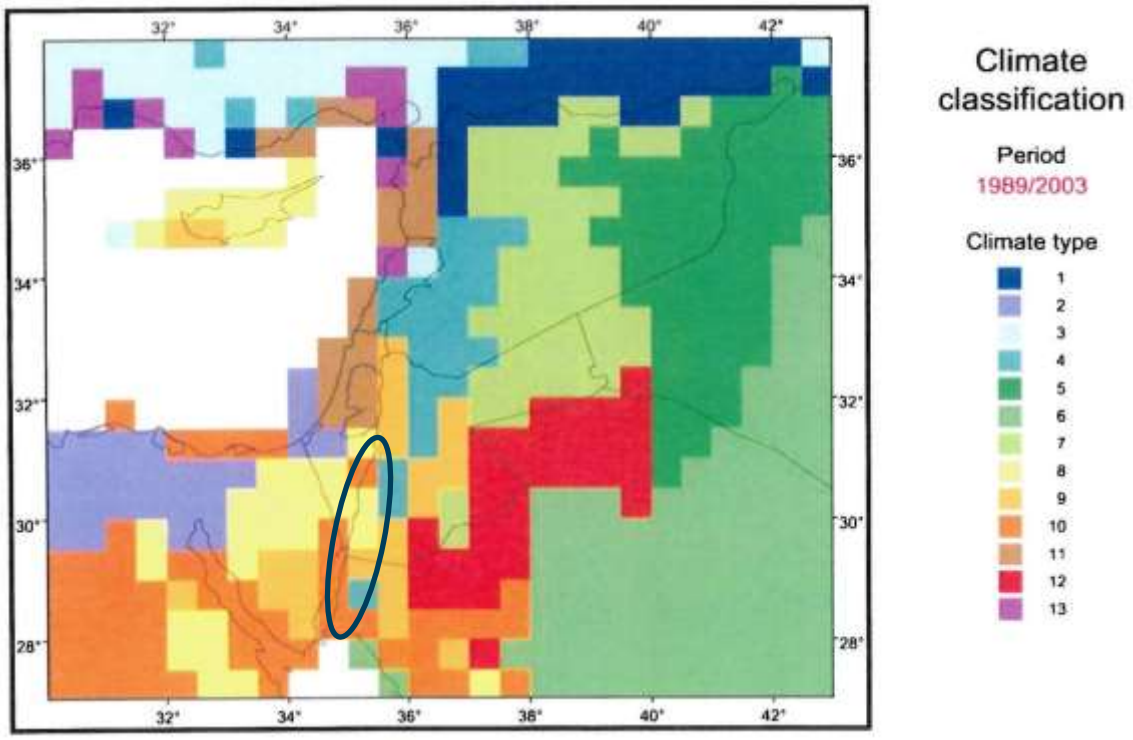

Figure 37 - GLOWA Classification of Climate Change into 13 Cluster until 2003

Comparison of the two figures shows that particularly the northern part of the study area will see a deterioration of the climatic conditions.

Overall, the climate change predictions indicate that rainfall in the region will reduce by 10 – 30% by 2100, that run off will decline by 10 – 30% by 2050 and by 20 – 50% by 2100. The resolution of the prediction 2011 ESA models in the area however is insufficient to identify detailed impacts in specific areas such as the Dead Sea Basin or Wadi Araba. However, it is likely that in addition to the decline in precipitation, the main rainfall events will be heavier and more intense, with longer periods between them.

These foreseen climate change related impacts in the project area underline two key elements of the RSDS Phase I project:

1. The level of water stress and limitations in terms of conventional water availability in Jordan will become even more stringent in the coming years, underlining the great importance of the RSDS project as potential and major provider on non-conventional potable water resources to the country;
2. The fragile groundwater resources in Wadi Araba will become under even greater stress due to climate change, making it even more important to protect these resources against any type of pollution, including any potential seawater leakages from the RSDS project under all circumstances.

6.8.2 Air Quality

Wadi Araba is predominantly a pristine region, where air quality levels do not exceed natural back ground levels. However, some extended ozone concentrations have been noticed associated with the desert conditions and some slightly extended pollutions levels along the highway from Aqaba to the north and at the industrial areas near to the Dead Sea.

During an intensive air quality measurement study performed in November 2007 through USAID, fixed ambient air quality stations were positioned on the Jordanian side of the border in Aqaba and on the Israeli side of the border in Eilat. The stations measured ozone and other trace gases, along with meteorological parameters.

The results indicate the air pollution episodes are highly dependent on wind direction. Southerly winds carry local transportation (i.e., ship, trucks) and possibly some industrial emissions towards the north end of the Gulf of Aqaba and Eilat, while northerly winds are associated with the transport of regional ozone. Elevated NO levels due to local mobile sources were observed during rush hour periods. High NO levels lead to a titration of NO3 and ozone.

6.8.3 Noise

Elevated noise levels in Wadi Araba / Arava are generated mainly by traffic along the main highway from Aqaba to the Dead Sea and Amman. In addition, the city and Port of Aqaba contains several noise sources in various sectors with different characteristics. Sources include traffic, ferries, ships and trade operations, industrial and shipyards as well auxiliary services.

These baseline elevated noise levels have an impact on the environment of the surrounding area and, as a consequence, local population, port workers and tourists as well as both terrestrial and marine ecosystems.

6.9 Groundwater, Surface Water and Flood risks

The climate along Wadi Araba / Arava is mostly hyper-arid, with annual average rainfall in the valley bottom below 50 mm. The average annual rainfall in the region is presented below.

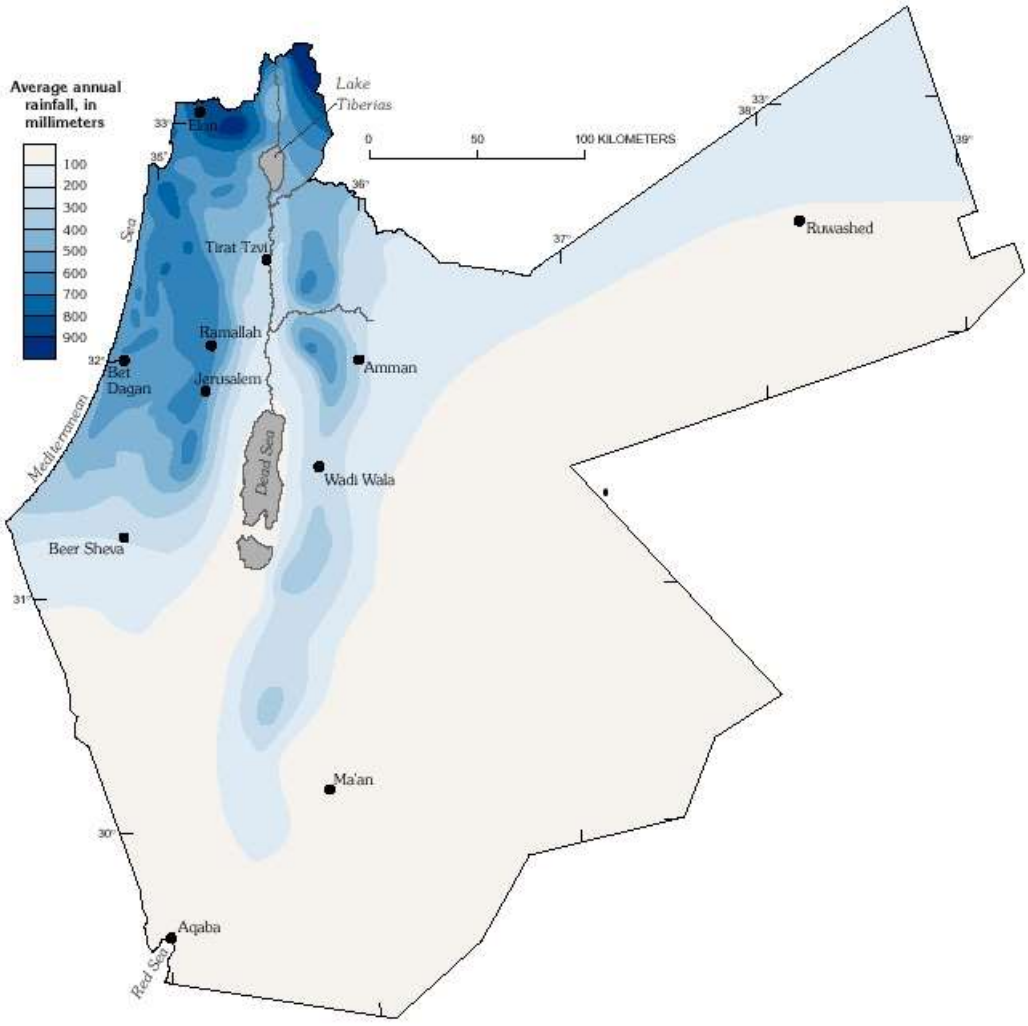

Figure 38 – Average annual rainfall (ref: exact-me.org)

Wadi Araba / Arava includes a watershed along the highest elevated point near to the proposed location of the High Level Reservoir under the RSDS Phase I project. Rainwater recharges to the south of this watershed and drain from east and west directly into the Gulf of Aqaba. Rainwater recharge to the north of this watersheds drains towards the Dead Sea. At certain points in the central and southern Araba / Arava groundwater occasionally rises to the surface, where it is collected in basins.

The groundwater aquifers in Wadi Araba mainly consist of limestone, which are recharged by the winter rainfall. The boundaries of the commonly understood groundwater basins follow largely the catchment areas shown below.

Much of the region's agriculture and potable water is taken from these groundwater resources through wells that exist all over the study area. However, it is estimated that over 60% of the wells are over pumped at rates exceeding their sustainable yield, resulting in a lowering of the water table throughout the project area and increasing salinity levels of some aquifers. According to the 2011 ESA the Dead Sea, North Wadi Araba and South Wadi Araba basins have 426, 31 and 54 operating wells, and are over pumped at rates of 148%, 138%, and 151% of the safe yield respectively.

Due to the high dependence of these already very fragile groundwater resources in the region it will be of utmost importance to avoid any risk of groundwater pollution due to seawater leakage or otherwise by the RSDS Phase I project under all circumstances.

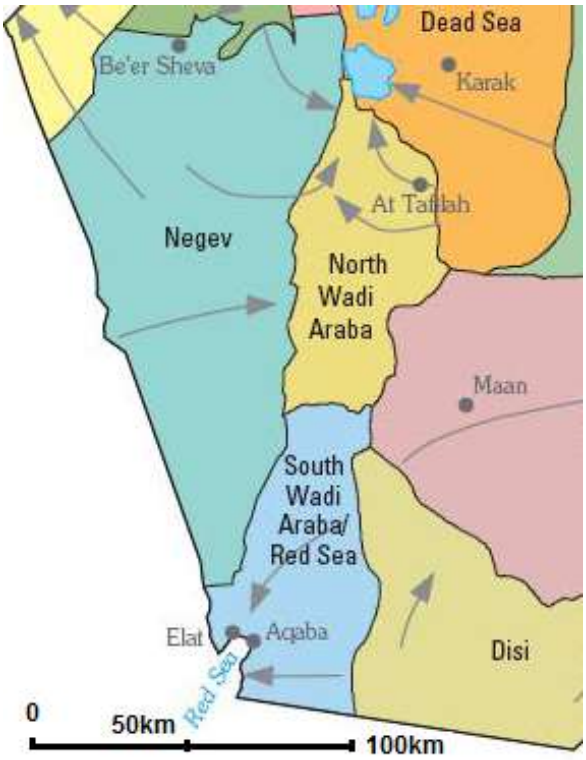

Figure 39 – Southern and Northern Wadi Araba Catchments

The Southern Wadi Araba catchments include some major wadi's that occasionally collect substantial amounts of rainwater, leading to floods in the direction of Aqaba. For instance, Wadi Yutum, north east of Aqaba, gave rise to a significant flood event on 12th February 2006 that inundated large parts of the city. Several people were drowned and the Aqaba wastewater treatment plant was put out of operation for several weeks. It has been estimated that the flood peak was about 550 m3/s (ref 2011 ESA).

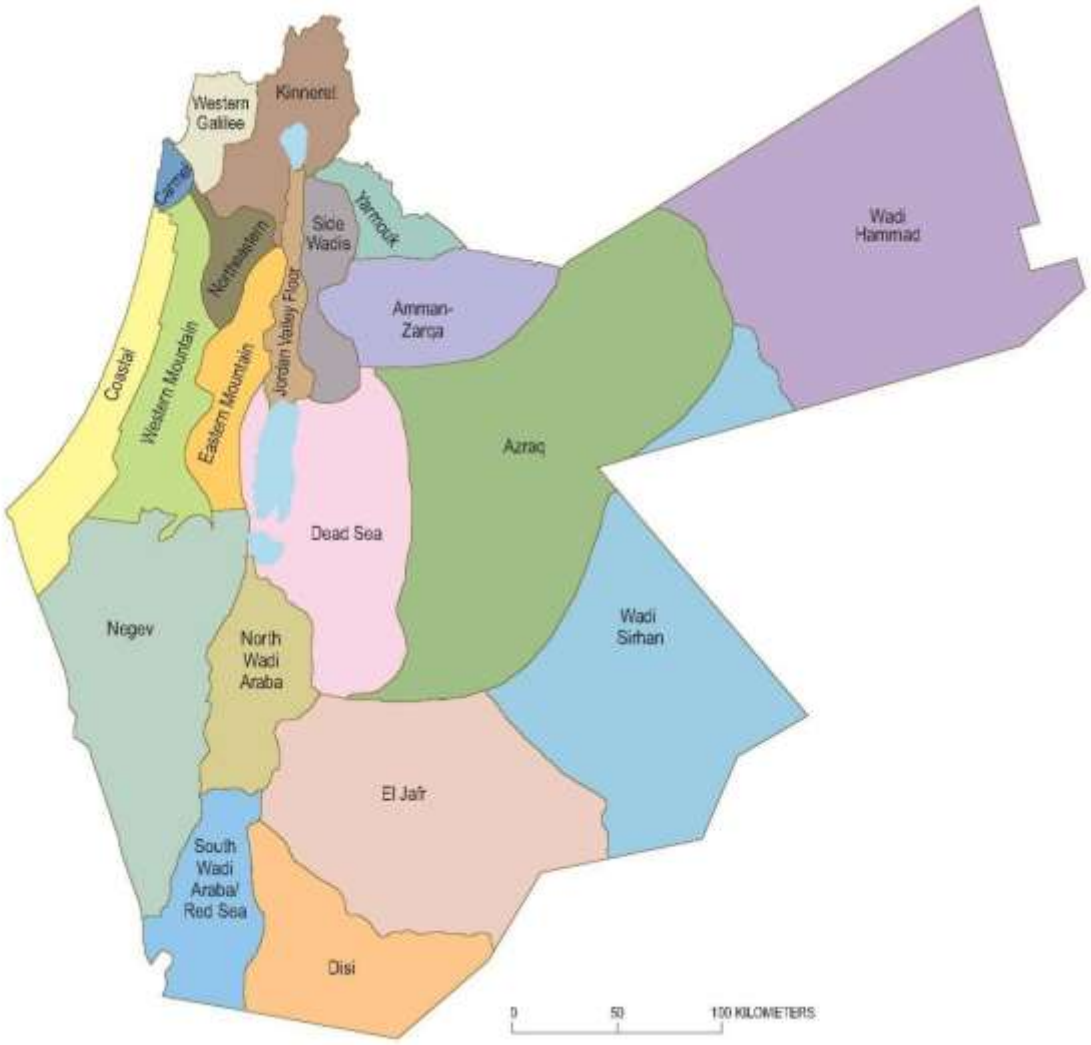

Figure 40 - Groundwater Aquifer Systems in the Region [ref: EXACT-ME]

6.10 Social Environment

6.10.1 Introduction

Annex 8 provides a detailed and updated description of the social and socio-economic baseline, including potential social impacts caused by the project and a framework for mitigation and compensation of these impacts as input for the Resettlement and Compensation Action Plan (RAP) that will be developed and implemented by the MWI as promoter of the project and one of the major land owners within the project area.

Due to the changes in the Phase I scheme's alignment, the socioeconomic survey along the pipeline route in Wadi Araba and Southern Ghores has been updated using the most recent DOS census conducted at the end of 2015. Above Figure 19 shows the main communities along the scheme in Wadi Araba.

The total number of households living in the communities along the scheme as of December 2015 is 11,160 composed of 64,371 family members of which 33,904 are males and 30,467 are females. Table 1 (annex 8) shows that 88% of the total population are Jordanians and the remaining 12% are non-Jordanians (mainly Egyptians working in the farms). About half of the population in Wadi Araba is living in the northern Safi area (52%), while the remaining living in Ghawr Almazra'a (33%) and in the remaining Wadi Araba (15%).

The data also show that 70% (majority) are urban despite the fact that much of the area located in the southern Wadi Araba are agricultural lands focused on vegetable production and smaller amount on growing fruit trees. Many communities are located along the alignment of the pipeline and next to the pump stations, the hydropower stations, the RO desalination plan, the intake point and the high reservoir.

Annex 8 includes a series of social 'constraints maps' for the present RSDS project, based on the route alignment provided by DAR. Cadastral maps from the Department of Lands and Survey (DLS), digitized maps provided by JVA and field visits to the sites along the alignment were furthermore used to verify the land ownership and the expected socioeconomic impacts of the project.

6.10.2 Aqaba

The Aqaba Special Economic Zone (ASEZ) is a separate governance entity, sitting within the Aqaba Governorate. It was established in 2001 and is administered by the Aqaba Special Economic Zone Authority (ASEZA). Within the Zone, ASEZA has the authority of a municipality, as well as being the regulator for investment permitting.

Other public institutions in Aqaba that play a crucial role in the economics of the city include the following:

- Aqaba Development Cooperation (ADC);
- Jordan Maritime Authority (JMA); and
- Aqaba Ports Authority (APA)

There are also a number of NGOs working in and around Aqaba city including:

- The Jordan River Foundation;
- Beir Sabei Charity, Aqaba;
- Aqaba Islamic Charity;
- Al-Thagher for the Mentally Handicapped;
- Women of Aqaba or Aqaba Women's Welfare Society;
- Quoairah Charity; and
- The United Nations Industrial Development Organization (UNIDO)

The total number Aqaba's population amounted to 188,160 at the end of 2015 representing 2% of the total population of Jordan (DOS censes 2015). About half of the population in Aqaba are under the age of 20 years and approximately 28% of the population are non-Jordanian. Aqaba has a diverse population and includes many foreigners and their families (highlighted by the fact that there is an international school), as well as a significant number of foreign single male labourers (mostly Egyptian) who work in the industrial areas. The Jordanian residents of Aqaba are mostly of tribal backgrounds, from various tribes, although the Huwaitat are the original tribe in southern Jordan.

Gender plays a crucial role in determining employment distribution per occupation. Women are generally either employed in elementary occupations or as professionals and managers while men are distributed among all categories concentrating slightly in technical and skilled work.

Even though Aqaba is one of Jordan's smallest regions, it used to have a high economically active population, after Amman. However, the latest DOS data for the year 2013 shows that the economic activity rate for males over 15 years of age in Aqaba went down from 81.0% in 2007 to 64% in 2013, and for females which used to be 19.2% in 2007 to 12.1% in 2013. The unemployment rate in Aqaba City used to be the second lowest in Jordan (after Amman), at 6.9% for males and 24.7% for females in the year 2007 but in 2013 the unemployment rate increased to 14.1% for males and decreased to 21.3% for females in 2013.

6.10.3 Qatar

Qatar is little village located approximately 12 KM to the north of the desalination plant and the booster pump station. Qatar's total population amounted to 166 at the end of 2015 (DOS censes 2015) of which 90 are males and 76 are females. Compared to the baseline conducted in 2010, the number of residents has decreased from 212 residents to 166 in 2015. The reduction in the population of the residents could be due to movements of the Bedouin tribes who used to come to the region based on the season. As in the other areas of Wadi Araba, most people in the area work in agriculture, animal rearing and in the public sector. The Wadi Araba region is still one of the pockets of poverty in the country with a high poverty rate.

6.10.4 Rahma and Resheed

Rahma and Resheeh are two communities located on the route of the pipeline in section L 2. The total population of the two communities amounted to 3,825 at the end of 2015 (DOS censes 2015) of which 1,984 are males and 1,841 are females.

As in the other areas of Wadi Araba, most people in the area work in agriculture, animal rearing and in the public sector. The Wadi Araba region is still one of the pockets of poverty in the country with a high poverty rate. In Rahma village, the main economic activities is linked to Al-Haqq farms were the farms are cultivated with date palms and vegetables in greenhouses. It is expected that more land will be put under cultivation by Al-Haqq farms in this village.

6.10.5 Bir Mathkour

The village of Bir Mathkour was first inhabited by the Al-Sa'aidiyyeen tribe when residential areas were set up in the area by Prince Hassan Bin Talal in the 1970s. These areas provided housing units, services, proximity to the main road and the presence of a school. Due to the increase in population, additional land parcel were zoned for the different types of uses. The main tribes of Beir Mathkour Al-Sa'aidiyyeen, Iyal Mfarraj, Iyal Nasser, Iyal Ghnaim Al-Zawaydeh, Iyal Mar'I, Amarat, Nawawghah, and Shama'leh and Abu Rumman. People who tend to migrate from Beir Mathkour often head to Greigera and Risha where better services are provided and for working opportunities at Al-Haq farms.

Population has doubled since the first baseline in 2010. There are currently 851 residents in the Beir Mathkour area (424 males and 427 females). Family size in Wadi Araba decreased a little bit from an average of 6.46 in 2010 to 5.7 in 2015. All of the population is considered rural according to DOS and part of its size is nomadic.

According to the recently prepared Wadi Araba master plan, the Bir Madhkur community started to grow since the development of Al-Haqq farms (550 dunums were developed for agriculture and more lands will

be cultivated) and is producing dates, grapes, vegetables and other seasonal vegetables and fruits. The village is famous for the only service station on the way to Aqaba. The master plan concluded that this strategic site could be developed to be a hub for cultural heritage and tourism. It will be developed as the hub for the Central TDZ, linking to all tourist sites through a main tourist information and interpretation centre. It is ideally situated for a specialized archaeological research centre and could attract scholars and students from all over the world coming to visit the Wadi Araba and conduct their research. Furthermore, as part of the agriculture and livestock value chain, it is the ideal location for a camel development centre and related industry.

6.10.6 Gwiebeh and Safi

There are currently 1,305 residents in Gwiebeh area of which 660 are males and 645 are females. Family size in this village is 7.4. Most of the population is considered rural

In Safi there are currently 32,203 residents composed of 17,168 male and 15,035 female. There are five main communities located along the route of the pipeline namely Khnazeer, Safi, Faifa, Mamorah and Salmani. The most populated part is Safi where more than 80% of the population is found. About 13% of the population are non-Jordanian mainly Egyptian and Pakistani agricultural workers.

Safi Ghors in one of the major agricultural production areas in Jordan, especially for early winter crops. The main crops produced in the Southern Ghors are tomato, eggplant, green pepper and cantaloupe, mainly between November to May. Piped water supplied by JVA is the main source of irrigation water across the whole region. There are some large commercial farms in the Southern Ghors area who tend to market their produce to the larger centres, such as Amman and export markets. These farms are owned by investors outside of the area who then employ local people to work on the farms. Outside of these farms, most cultivated land is allocated in plots by the Jordan Valley Authority that ranges in size between 25-40 dunum.

Key challenges for agricultural activities in the Southern Ghors remained the same as in the baseline of 2010. These challenges are natural resource limitations such as water and poor soil. There is also limited funding availability for agricultural activities and so the potential for expansion is low.

Unlike Wadi Araba, the economy in Southern Ghors is focused on agriculture while livestock raising is not so important for the local economy here.

The mining industry is a major source of employment in Safi Ghors. There are three major factories sited on the Dead Sea that process potash, magnesium and bromine. Total production for 2016 was 2,003,500 tonnes which is equal to 101.7% of the revised annual production plan of 1,970,000 tonnes. In 2016, the total number of employees amounted to 2,240 of which 1,788 employees in Ghore Al Safi and the rest in Amman and Aqaba.

There are no updates on the poverty situation in Safi Ghors. However, the conducted field visits to the area validate that the poverty pockets study conducted in 2008 and conclude that Safi is still one of the pockets of poverty in the country with a high poverty rate.

7 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

7.1 Introduction

The section provides an update of the 2011 ESA on significant positive and negative environmental and socio-cultural impacts, for both the construction and operation phases. Recommendations will be provided for ways to enhance any potential project benefits, and avoid or mitigate negative impacts following the proposed mitigation hierarchy.

The Environmental and Social Impact Assessment presented here is based on the 2011 ESA developed under the final ESA of 2014 [lit 13], supplemented by the preliminary designs prepared for the RSDS Phase I project and the additional field surveys and literature analysis performed since January 2017.

7.2 Area of Influence and Impact Matrix

The RSDS Phase I project has a physical impact directly on those areas that will be used for constructing the various project components, including the social related impacts. In addition, it will have a direct influence on a wider region around these areas as shown below.

The project will influence directly a strip of land adjacent to the pipeline route and project facilities, as well as the Red Sea in terms of seawater abstraction and the Dead Sea in terms of discharge of a combination of brine and seawater. For certain aspects the impacts might go beyond this area in influence, for instance in case major ecological disturbances or seawater leakages would pollute groundwater systems. The socio-economic impacts, both positively and negatively, will also reach much further, either regional or global.

The impacts of the project have been linked to the various phases of the project as presented in Table 3. An overview of the impacts is presented in the Impact Matrix in Table 14. The individual impacts have been numbered corresponding to the significant environmental impacts described in the next section, and to the environmental and social management plans following afterwards.

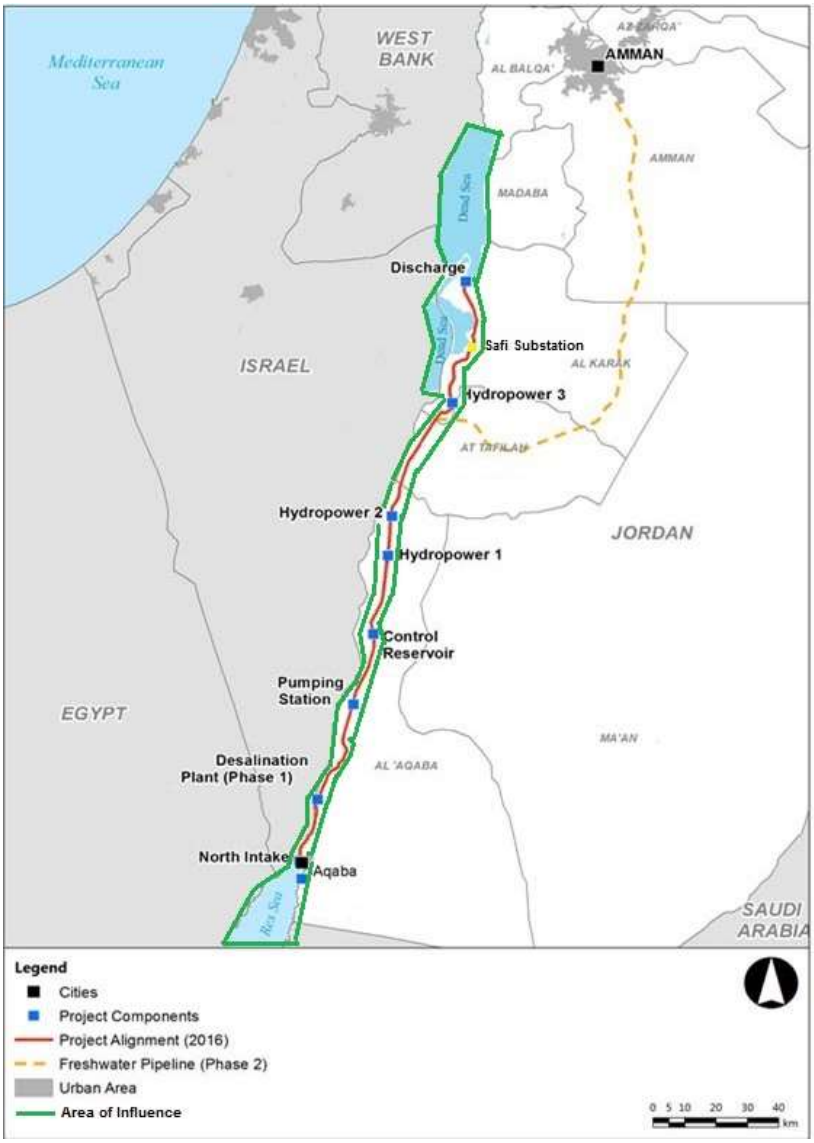

Figure 41 – Area of Influence

The below Impact matrix provides characteristics of each impact, including its relative significance. It contains the following information:

1. Project phase related activity, as described in section 3.1
2. Resources and causes of the impacts, such as the locations of project components
3. Sources of impacts, such as land take or construction works
4. Short description of impacts and related risks
5. Receptor of the potential impacts, like the communities, the ecosystem, groundwater
6. Direction of the impact: positive, neutral or negative;
7. Duration of the impact: temporary or permanent;
8. Scale of the impact: the geographical extent of the impact: local, regional or global;;
9. The Likelihood of the impact in terms of unlikely, possibly or likely
10. The overall Significance (in terms of combined direction, duration, scale and likelihood) is expressed as: major positive significance; minor or moderate significance; or major negative significance.

The significance (10) of the impacts is expressed as follows:

Table 13 - Definition of Significance Classification

Nature	Significance	Description
Positive	Major	Very substantial improvement to existing resources
Positive	Moderate	Appreciable improvements or will sustain resources
Positive	Minor	Some benefits
Negative	Minor	Acceptable negative effects
Negative	Moderate	Effects cause serious concerns. Mitigation measures should be considered.
Negative	Major	Unacceptable effects unless appropriate mitigation measures are included in the design, construction and / or operations of the project

Table 14 – Impact Matrix

No	Activity	Resources / Causes	Source of impacts	Impacts and risks	Receptor	Direction	Duration	Scale	Likelihood	Significance
						Positive		*Local*	*Unlikely*	*Major (Positive)*
						Neutral	*Temporary*	*Regional*	*Possible*	*Minor / Moderate*
						Negative	*Permanent*	*Global*	*Likely*	*Major (Negative)*
	Overall									
	The Proposed RSDS Phase I Project aims at enabling the international community to assess the environmental viability of discharging desalination plant brine and seawater into the Dead Sea (The World Bank Dead Sea Study indicated that 400 MCM/year of brine could be discharged into the Dead Sea safely). It furthermore aims at providing potable water to Aqaba and Southern Israel from a desalination plant north of Aqaba; transfer the waste brine from the desalination plant together with seawater from the Gulf of Aqaba to the Dead Sea, and generate electricity through connected Hydropower Plants.	seawater	potable water	Augmented potable water supply for Aqaba and the South of Israel in the context of the severe water scarcity that Jordan and the region are facing	Local residents in Aqaba and South of Israel, and indirectly residents in wider Jordan since Aqaba will become less dependent of the Disi water source	+	*Permanent*	*Regional*	*Likely*	*Major*
		gravity water	Energy	Non-fosile Hydropower generation	Residents of Aqaba through NEPCO	+	*Permanent*	*Regional*	*Likely*	*Moderate*
		seawater / brine	Seawater / brine	Reduced decline of the Dead Sea due to brine / seawater discharge	Dead Sea heritage, industry, tourism, stakeholders and affiliated public	+	*Permanent*	*Regional*	*Likely*	*Major*
		Regional water sharing arrangements	potable water	the project caters for water sharing arrangement among Jordanians, Israelis and Palestinians	Residents and governments of three core parties	+	*Permanent*	*Global*	*Likely*	*Major*
		Seawater abstraction	Disturbance	Impacts on Red Sea sediments turbity, habitat and coral / larvee	Gulf of Aqaba / Eilat marine ecology, fishery and tourism sectors	-	*Permanent*	*Regional*	*Likely*	*Major*
		Flooding	Flood waters	Risks of breaches in project facilities due to flooding in southern Wadi Araba area	Desalination Plant, Pumping station	-	*Temporary*	*Local*	*Likely*	*Major*
		Construction Works	Destruction / disturbance	Potential disturbance of archeological sites adjacent to the project area	Cultural Heritage, tourism, affiated / professional stakeholders	-	*Permanent*	*Local*	*Likely*	*Major*
		Project footprint	Land take	expropriation, land use / access limitations	Land owners, economically / socially dependent people	-	*Permanent*	*Local*	*Likely*	*Moderate*
		Project footprint	Land take / disturbance	Disturbance of terrestial ecology, (migratory) birds an sensitive habitats during construction works and partly during operations	terrestial ecology, (migratory) birds an sensitive habitats	-	*Permanent*	*Regional*	*Likely*	*Major*
		Seawater / brine pipelines	Operational or catastrophic leakages of pipelines through Wadi Araba	salinination and pollution of soil and aquifers along pipeline route, including catastrophic impacs due to earthquakes or sabotage	Soil, groundwater, project affected people depending on groundwater	-	*Permanent*	*Regional*	*Possibly*	*Major*

A	Pre-tendering Phase	Resources / Causes	Source of impacts	Impacts and risks	Receptor	Direction	Duration	Scale	Likelihood	Significance
a1	Preparation of preliminary and functional specifications for RSDS Phase I	Northern intake instead of eastern intake	Physical disruption of marine environment during construction and operations, also based on deep vs shallow intake analysis	Changes to current circulation and sedimentary pathways, and negative impacts to benthic and pelagic ecology, commercial fishing, navigation and other infrastructure.	Benthic ecology (seagrass beds and sedimentary habitats), pelagic ecology (plankton (incl coral larvae), fish communiities), fishermen, Ayla, Navy vessels.	-	*Permanent*	*Regional*	*Likely*	*Major*
		Alignment of terrestrial pipeline	Land take, construction and operations related impacts	Impacts in terms of groundwater, cultural heritage, project affected people, landscape, ecology	Project Affected People, environment, ascology, cultural heritage	-	*Temporary*	*Regional*	*Likely*	*Moderate*
		Locations of Pumping station, desalination plant, reservoir, hydropower plants	Land take, construction and operations related impacts	Risk for pumping station In terms of flood risks, cultural hetritage, project affected people, landscape, ecology,climate impacts	Project Affected People, environment, ascology, cultural heritage	-	*Permanent*	*Regional*	*Likely*	*Moderate*
		Dead Sea Discharge facilities	Land take, discharge of sea / brine into Dead Sea	Dead sea water level, water quality, smell, color	Industry, tourism, intrinsic values of Dead Sea	+ / -	*Permanent*	*Regional*	*Possibly*	*Moderate*
a2	Preparation of PPP Operational, Finance, Institutional, Legal issues	Contractual PPP Arrangements	Sustainability of Operations	Reliability of water and energy deliverance and environmental management during operations,	Project Affected People, the environment	-	*Temporary*	*Regional*	*Possibly*	*Moderate*
a3	Completion of Land Acquisition and Resettlement Plans	Land take for all project components	Livelihood of people using the land of the RSDS Phase I project (including agriculture) may be affected.	Negative impacts on affected people due to land take shall be compensated according compensation principles and expropriation / resettlement process	Project Affected People	-	*Permanent*	*Regional*	*Likely*	*Major*
a4	Stakeholder Engagement Planning (SEP)	Project Affected People, Stakeholders	Engagement of PAP's and stakeholders	Opportuninities for stakeholders to be involved in the project preparation process resulting in a more widely supported and better project	all stakeholders	+	*Permanent*	*Regional*	*likely*	*Major*
		Project Affected People, Stakeholders	Engagement of PAP's and stakeholders	Empowerment of communities by engagement process	Local residents	+	*Permanent*	*Local*	*Likely*	*Moderate*
a5	Preparing DBOFT Tender Documents	Project configuration, tender conditions	Construction and Operational Environmental and Social Management Planning	Social and Environmental Management Measures during construction and operations to be elaborated by contractor, based on ESIA and ESMP	PAPs, marine, terrestrial and dead sea environment	+	*Permanent*	*Regional*	*Likely*	*Major*
a6	ESIA / ESMP preparation	RSDS Phase I Project Preliminary Design	Construction and Operations of RSDS Phase I Project	Described in this current ESIA / ESMP. Mitigation, management and monitroing actions to be incorporated in DBOT bids	PAPs, marine, terrestrial and dead sea environment	+	*Permanent*	*Regional*	*Likely*	*Major*
a7	Tendering, tender evaluation and contract awarding of DBOFT Contract	DBOT bids	Proposed Construction and Operational ESMPs by DBOT bidders	Compliance of DBOT bids with required ESMP during construction and operations	PAPs, marine, terrestrial and dead sea environment, government	+/-	*Permanent*	*Regional*	*Likely*	*Moderate*

Impact Assessment

B	Design, Built, Finance Phase	Resources / Causes	Source of impacts	Impacts and risks	Receptor	Direction	Duration	Scale	Likelihood	Significance
						Positive		*Local*	*Unlikely*	*Major (Positive)*
						Neutral	*Temporary*	*Regional*	*Possible*	*Minor / Moderate*
						Negative	*Permanent*	*Global*	*Likely*	*Major (Negative)*
b1	Pre-design fields surveys (geotechnical, marine, topographic, seismic / rupture investigations)	Transport means, field equipment	Dust, noise, fume, soil and GW distortion, marine ecology	Minor distortion of land, marine people and ecology during sampling and test drilling	project area	-	*Temporary*	*Local*	*Likely*	*Minor*
b2	RSDS Phase 1 Project Engineering Design									
b2a	** intake structure*	*Northern intake instead of eastern intake, including deep vs shallow intake analysis*	*Physical disruption of marine environment during construction and operations*	Changes to current circulation and sedimentary pathways, and negative impacts to benthic and pelagic ecology (direct), commercial fishing (indirect), navigation and other infrastructure (direct).There is one 'critical habitat' within the area of the intake footprint (i.e. seagrass habitats) that will be impacted by the construction activities and also the presence of the pipelines, and also there are coral reefs, another 'critical habitat', that could be impacted indirectly through the abstraction of coral larvae.	Benthic ecology (sedimentary habitats), pelagic ecology (plankton (incl coral larvae), fish communiities), fishermen, Navy vessels.	-	*Permanent*	*Local*	*Likely*	*Major*
b2b	*Seawater / mixed water Pipelines*	*Earth quakes or acts of sabotage*	*catastrophic seawater / mixed water leaks in pipeline*	if major leakage of seawater from the system occurs due to major accidents such as earthquakes or sabotage, this will have a direct impact on the groundwater systems below	Wadi Araba / Arava Aquifer Systems	-	*Permanent*	*Local*	*Possible*	*Major*
b2c	** Submarine Pipeline*	*Alignment of Submarine pipeline, deep or shallow*	*Physical disruption of marine environment during construction and operations*	Changes to current circulation and sedimentary pathways, noise impacts on marine life and negative impacts to benthic and pelagic ecology (direct), commercial fishing (indirect), navigation and other infrastructure (direct).There is potential for fishermen to be indirectly impacted if fish resources are affected by any impacts on the seagrass beds, which is an important habitat for fish nursery and spawning activities, and also the abstraction fish larvae.	Benthic ecology (seagrass beds and sedimentary habitats), pelagic ecology (plankton (incl coral larvae), fish communiities), fishermen, Ayla, Navy vessels.	-	*Permanent*	*Regional*	*Likely*	*Major*

B	Design, Built, Finance Phase	Resources / Causes	Source of impacts	Impacts and risks	Receptor	Direction	Duration	Scale	Likelihood	Significance
b2d	* Intake Pumping Station	Location of Pumping station	Land take, construction and operations related impacts	Negative Impacts in terms of flood risks, project affected people, landscape, climate impacts	Project Affected People, environment, ascology, cultural heritage	-	Permanent	Local	Likely	Minor
b2e	* Ayla Pipeline	Alignment of Ayla pipeline	Land take, construction and operations related impacts, including leakage	Negative impacts in terms of groundwater, cultural heritage, accidental and incidental seawater leakage	Ayla and Airport, environment, cultural heritage	-	Permanent	Local	Possibly	Moderate
b2f	* Long Seawater pipeline	Alignment of long seawater pipeline	Land take, construction and operations related impacts, including leakage	Negative impacts in terms of groundwater, cultural hetritage, project affected people, landscape, ecology, accidental and incidental seawater leakage	Project Affected People, environment, ecology, including vulnerable and critically endangered flora, cultural heritage	-	Permanent	Regional	Possibly	Moderate
b2g	* Mixed water section	Alignment of mixed water pipeline	Land take, construction and operations related impacts, including leakage	Negative impacts in terms of groundwater, project affected people, landscape, ecology, accidental and incidental seawater leakage	Project Affected People, environment, ecology, including vulnerable and critically endangered flora, cultural heritage	-	Permanent	Local	Possibly	Moderate
b2h	* High Level Regulating Reservoir	Locations of Reservoir	Land take, construction and operations related impacts	Negative impacts in terms of groundwater project affected people, landscape, ecology,climate impacts	Project Affected People, groundwater, environment, ecology,	-	Permanent	Local	Possibly	Moderate
b2i	* Dead Sea Discharge Structure	Dead Sea Discharge facilities	Land take, discharge of sea / brine into Dead Sea	Dead sea water level will be impacts. Water quality, smell, color impacts could be impacted	Industry, tourism, intrinsic values of Dead Sea	+/-	Permanent	Regional	Possibly	Moderate
b2j	* Seawater Bypass	Alignment of seawater bypass	Land take, construction and operations related impacts, including leakage	Negative impacts terms of groundwater, landscape, ecology, accidental and incidental seawater leakage	Environment, environment, ecology, cultural heritage	-	Permanent	Local	Possibly	Moderate
b2k	* Booster Pumping Station	Locations of Boster Pumping Station	Land take, construction and operations related impacts	Negative impacts in terms of flood risks, landscape, ecology, climate impacts	Project Affected People, environment, ecology, climate	-	Permanent	Regional	Likely	Moderate

B	Design, Built, Finance Phase	Resources / Causes	Source of impacts	Impacts and risks	Receptor	Direction	Duration	Scale	Likelihood	Significance
b2l	** Hydroelectric Power Plants*	*Locations of Hydroelectric power plants*	*Land take, construction and operations related impacts*	*Negative impacts in terms of cultural heritage, project affected people, landscape, ecology,climate impacts*	*Project Affected People, environment, ascology, cultural heritage*	-	*Permanent*	*Regional*	*Likely*	*Moderate*
b2m	** Short Seawater Pipeline*	*Alignment of short seawater pipeline*	*Land take, construction and operations related impacts*	*Negative impacts in terms of groundwater, cultural heritage, project affected people, landscape, ecology*	*Project Affected People, environment, ecology, cultural heritage*	-	*Permanent*	*Local*	*Possibly*	*Moderate*
b2n	** Desalination Plant (SWRO)*	*Locations of Desalination Plant*	*Land take, construction and operations related impacts*	*Appearance of large Plant in Wadi Araba; Negative impacts in terms of flood risks, plandscape, ecology,climate impacts*	*Environment, ecology, climate*	-	*Permanent*	*Regional*	*Likely*	*Moderate*
b2o	** Israeli Water Pipeline*	*Alignment of Israeli water pipeline*	*Land take, construction related impacts*	*Minor distortion of land, people and ecology during construction*	*pipeline area*	-	*Temporary*	*Local*	*Possibly*	*Minor*
b2q	** Connection to Jordan Delivary Point*	*Alignment of short pipeline to Delivery Point*	*Land take, construction related impacts*	*Negative impacts in terms of land take, construction related impacts*	*Minor distortion of land, people and ecology during construction*	-	*Temporary*	*Local*	*Possibly*	*Minor*
b2r	** Short Brine Pipeline*	*Alignment of short brine pipeline*	*Land take, construction and operations related impacts*	*Negative impacts in terms of groundwater, project affected people, landscape, ecology*	*Project Affected People, environment, ecology, cultural heritage*	-	*Temporary*	*Regional*	*Likely*	*Moderate*
b2s	** Acsillary Works (O, S &M and monitoring Facilities, Client Facilities, Access Roads, communication system)*	*Locations of works*	*Land take, construction and operations related impacts*	*Negative impacts in terms of flood risks, groundwater, cultural hetritage, project affected people, landscape, ecology,climate impacts*	*Project Affected People, environment, ecology, cultural heritage*	-	*Permanent*	*Regional*	*Possibly*	*Minor*
b3	Preparing Construction Environmental / Social Management Plan, including traffic plans	Construction Works - environment	Pollution, dust, fume, noise, waste	Implementing the CEMP will mitigate the identified environmental impacts during construction works	Project Affected people, GW, environment quality, climate	+	*Temporary*	*Regional*	*Likely*	*Major*
		Construction Works - traffic	Risks for traffic congestion and accidents	Traffic congestion and accident risks along main road from Aqaba to the construction sites	General Public	-	*Temporary*	*Local*	*Possible*	*Moderate*
b4	Hiring Construction labor force and subcontractors	labour force	Health and Safety	Occupational health and safety risks	labour force	-	*Temporary*	*Regional*	*Possible*	*Moderate*
		Local community	Labour opportunities	Job opportunities for local residents	Potential employees	+	Temporary	*Regional*	*Likely*	*Moderate*
		Migrant work force	Presence of migrant work force	Impacts of Migrant workforce on local community (nuisance, HIV risks)	Local Community	-	Temporary	*Regional*	*Likely*	*Moderate*
b5	Mobilization of Construction Vehicles and Equipment	transportation, traffics, parking, fuel, temporary storage	Dust, noise, risk of fuel spill, traffic and safety issues	transport and parking logistics and related traffic safety issues are to be considered, including fuel storage issues	Traffic	-	*Temporary*	*Regional*	*Possibly*	*Moderate*
b6	Provision of water, power and control facilities	Construction, water and energy	construction, water and energy use	construction impacts, water use, GHG emissions	Environment, climate	-	Temporary	*Regional*	*Likely*	*Minor*
b7	Setting up construction offices, yards and facilities	soil, air, water, affected people	Land take, Dust, noise, exhaust fume, waste, soil, runoff / soil	impacts relate to preparing and placing field equipment, fences, local traffic impacts, access roads, soil works, temporary storage	Project Area, Projected Affected people	-	Temporary	*Local*	*Likely*	*Minor*

B	Design, Built, Finance Phase	Resources / Causes	Source of impacts	Impacts and risks	Receptor	Direction	Duration	Scale	Likelihood	Significance
b8	Procurement, mobilisation, storing of all construction materials and equipment, including spare parts									
b8a	*Materials - environment*	*Materials*	*environmental impacts of material use*	*Relevant is whether materials can be purchased locally, nationally, or have to be purchased abroad; also LCA, transportation impacts and reuse options are to be considered*	*Resource areas, local environment and traffic*	**+/-**	*Temporary*	*Regional*	*Likely*	*minor*
b8b	*Materials - economic*	*Materials*	*Local economic impacts*	*Local opportunities for supply chain in construction materials, but also food&beverage for workforce*	*Businesses and private entrepreneurs*	**+**	*Temporary*	*Regional*	*Likely*	*Moderate*
b8c	*Supply Chains*	*Supply chain*	*Local social impacts*	*Risks of environmental and/or social negative impacts in service and goods supply chain, like poor labour conditions, unsustainable quarrying*	*Labour and environmental resources*	**-**	*Temporary*	*Regional*	*Possible*	*Moderate*
b8d	*Materials - GHG*	*Energy Use*	*GHG Emissions*	*Although quantitative estimates for the construction related emissions cannot be made at this point, generally these GHG emissions could reach up to 5000 ton CO2 equivalents for major projects such as this one, where transport related emission would count for around one-third, and material related emission for about two-third of the total.*	*Climate*	**-**	*Temporary*	*Global*	*Likely*	*Moderate*
b9	Implementing Construction Environmental / Social Management Plan	Construction Activities	Pollution, dust, fume, noise, waste, social aspects	Implementing the CESMP will mitigate the identified social and environmental impacts during construction works	Project Affected people, environment, ecology, cultural heritage	**+**	Temporary	*Regional*	*Likely*	*Major*
b10	Implementing Stakeholder Engagement Plan (SEP)	Construction activities	Engagement of PAP's and stakeholders during construction	Opportuninities for stakeholders to be involved in and get informed about the progress of the construction works	all stakeholders	**+**	Permanent	*Regional*	*likely*	*Major*
b11	Excavation and ground works for pipeline trench and other components	Excavation works	Soil excavation, storage and transport	soil and GW impacts, dust, noise, traffic, fuel spill risk, waste, energy, GHG	Excavation area and surrounding	**-**	Temporary	*Regional*	*Likely*	*Moderate*
b12	Design, supply and installation of appurtenant structures (valves, washouts, access points etc.)	Materials	environmental impacts of material use	Relevant is whether materials can be purchased locally, nationally, or have to be purchased abroad; also LCA, transportation impacts and reuse options are to be considered	Resource areas, local environment and traffic	**+/-**	Temporary	*Regional*	*Likely*	*minor*
b13	Design, supply and installation of corrosion / cathodic protection systems	Materials	Corrosion / protection of materials used	Corrosion risks	Lifetime / maintenance of materials	**+**	Permanent	*Local*	*Likely*	*Moderate*
b14	Construction of intake and submarine pipeline	Construction works	Physical disruption of marine environment during construction	Risks In terms of Sediment circulation, plankton, fish and coral larvae	Marine ecology, coral reefs (potentially), fishery sector	**-**	Permanent	Regional	*Likely*	Major
b15	Construction of on-shore pipelines, pumping stations and reservoirs	Construction works	Physical disruption of terrestrial environment during construction	soil and GW impacts, dust, noise, traffic, fuel spill risk, waste, energy, GHG, public nuisance	Project Affected People, environment, ecology, including vulnerable and critically endangered flora, cultural heritage	**-**	Permanent	*Regional*	*Possibly*	*Moderate*

B	Design, Built, Finance Phase	Resources / Causes	Source of impacts	Impacts and risks	Receptor	Direction	Duration	Scale	Likelihood	Significance
b16	Construction of Desalination Plant, Hydropower plants and Dead Sea Discharge facility	Construction works	Physical disruption of terrestrial environment during construction	soil and GW impacts, dust, noise, traffic, fuel spill risk, waste, energy, GHG, public nuisance	Project Affected People, environment, ecology, cultural heritage	-	Permanent	*Regional*	*Possibly*	*Moderate*
b17	Setting up O&M Organization and Logistics, including start-up planning and schedules, electricity supply, operating staff and resources, HSE aspects, and all related tecnical, financial, organization and legal operational preparations and manuals, including ESMP	Preparing for Operations	Human resources, energy and related operational aspects	Setting up the O&M operations enables to incorporate all relevant ESMP and HSE related actions from the start	Project Affected People, Employees, environment, ecology, climate	+	Permanent	*Regional*	*Likely*	*Major*
b18	De-commisioning, Testing and Handing over Construction Works to O&M Organization, including final review with Client	Preparing for Operations	System performance, including related environmental and social aspects	Final testing by Client enables to evaluate all relevant environmental and social system performance indicators before start of operationsstart	Project Affected People, Employees, environment, ecology, climate	+	Permanent	*Regional*	*Possibly*	*Moderate*
b19	Demobilization Construction Equipment, office, facilities and workers, rehabilitation of construction sites	transportation, traffic, fuel, waste, pollution	Dust, noise, risk of fuel spill, traffic and safety issues, waste materials, employmers	transport logistics and related traffic safety issues are to be considered, including fuel use and reuse / recycling of old equipment / materials / waste, and rehabilitation of construction sites, and completion of labor contracts	Traffic, environment, landscape, waste, climate	-	Temporary	*Regional*	*Likely*	*Moderate*

C	Operational Phase	Resources / Causes	Source of impacts	Impacts and risks	Receptor	Direction	Duration	Scale	Likelihood	Significance
						Positive		*Local*	*Unlikely*	*Major (Positive)*
						Neutral	*Temporary*	*Regional*	*Possible*	*Minor / Moderate*
						Negative	*Permanent*	*Global*	*Likely*	*Major (Negative)*
c1	Implementing O&M Organization (education, qualifications, instructions, HSE, labour contracts)	Operational Staff	Daily operations	Staff instructions shall include all environmental and social management and monitoring actions described in ESMP	Project Affected People, environment, ecology, cultural heritage	+	*Permanent*	*Regional*	*Likely*	*Moderate*
c2	Mobilizing and Training Operation Staff and Resources	Operational Staff	Daily operations	Environmental Staff shall be trained in and assigned to related environmental and social management and monitoring actions described in ESMP	Project Affected People, environment, ecology, cultural heritage	+	*Permanent*	*Regional*	*Likely*	*Moderate*
c3	Start up of Water intake, conveyance and production	Physical Operations	Potential system failures during start up	Environmental Monitoring shall be performed during start up, including leakages of seawater and impacts in Red Sea and Dead Sea	Marine and terrestrial environment	+	*Temporary*	*Regional*	*Possible*	*Moderate*
c4	Operate, maintain, repair, refurbish, renew and replace all facilities in accordance with requirements	Physical Operations	Potential system failures during operationsup	ESMP and Environmental Monitoring shall be have positive impacts on operations, including reduction of leakages of seawater, avoidance of non-phosphate antiscalants in RO and impacts on Red Sea and Dead Sea	Marine and terrestrial environment	+	*Temporary*	*Regional*	*Possible*	*Major*
			Hydrodynamics (water circulation and currents)	Presence of the pipeline could interrupt water movements causing localised eddies and scouring. Abstraction of large quantities could change water movements around the intake.	Physical and Chemical Marine Environment	-	*Permanent*	*Local*	*Likely*	*Major*
			Trenching, filling and anti-fouling	Trenching and infilling activity will increase suspended sediments (which could be contaminated) in the surrounding area thus temporarily affecting water quality. The intake infrastructure will require anti-fouling which could result in discharge of chemicals into the marine environment.	Physical and Chemical Marine Environment	-	*Temporary*	*Local*	*Likely*	*Moderate*
c5	Financial and Administrative operations, including billing and external relations	Administrative Operations	Finance	Risk of financial / administrative problems shall be avoided, particularly when environmental monitoring is at stake	Marine and terrestrial environment, including Dead Sea	-	*Temporary*	*Regional*	*Unlikely*	*Moderate*

C	Operational Phase	Resources / Causes	Source of impacts	Impacts and risks	Receptor	Direction	Duration	Scale	Likelihood	Significance
c6	O&M Monitoring and Reporting (seawater and brine flows, potable water flows, water quality, energy generation, energy use	Seawater intake, leakage and discharge	related marine, terrestrial and Dead Sea impacts	RSDS Phase I shall be considered a Pilot that will be used to determine the impacts on the Red Sea and Dead Sea as input into the design of the next phases of the project	Red Sea and Dead Sea Environment, climate	-	*Permanent*	*Regional*	*Likely*	*Major*
c7	Environmental and Social Monitoring and Reporting according to ESMP and additional (Brine / intake) studies, including HSE	Operational	Operational impacts	The DBOT Contractor will be tasked with implementing the relevant components of the ESMP	Marine and terrestrial environment, including Dead Sea	+	*Permanent*	*Regional*	*Possible*	*Moderate*
		Verification	Operational Impacts	The Promoter / MWI will commission independent third party to provide assurance and technical advice on the effective implementation of the ESMP and the GW / RS / DS monitoring program.	Marine and terrestrial environment, including Dead Sea	+	*Permanent*	*Regional*	*Possible*	*Moderate*
		Regulatory	Operational Impacts	The Government of Jordan will set up an oversight body to ensure that implementation of the Project Scheme, including implementation of the ESMPs, meets all legal and regulatory requirements.	Marine and terrestrial environment, including Dead Sea	+	*Permanent*	*Regional*	*Possible*	*Moderate*

D	Transfer and Decommissioning Phases	Resources / Causes	Source of impacts	Impacts and risks	Receptor	Direction	Duration	Scale	Likelihood	Significance
						Positive		*Local*	*Unlikely*	*Major (Positive)*
						Neutral	*Temporary*	*Regional*	*Possible*	*Minor / Moderate*
						Negative	*Permanent*	*Global*	*Likely*	*Major (Negative)*
d1	Inspection prior to handover (after 25 years)	Preparing for handover	System performance, including related environmental and social aspects	Final inspection and testing by Client enables to evaluate all relevant environmental and social system performance indicators before hand over of the operations after 25 years	Project Affected People, Employees, environment, ecology, climate	+	Permanent	*Regional*	*Possibly*	*Moderate*
d2	Compenents, Equipment and Spareparts Inventory and checklist (after 25 years)	Preparing for handover	Components inventory including related environmental monitoring equipment	Final inventory by Client enables to evaluate all relevant environmental monitoring equipment before hand over of the operations after 25 years	Project Affected People, environment, ecology, climate	+	Permanent	*Regional*	*Possibly*	*Moderate*
d3	Transfer / hand over of all facilities to Client / new operator (after 25 years)	Transfer of operations	transfer of operations shall include all ESMP related responsibilities, likely including making an update of the ESMP	New operator (after 25 years) shall be responsible for implementing all environmental and social monitoring and management activities described in the (updated) ESMP	Project Affected People, environment, ecology, climate	+	Permanent	*Regional*	*Possibly*	*High*
d4	Decommissioning of project components after project lifetime (> 50 years?)	Demolition and removal of project components, and related facillities, excludin burried pipelines	Dust, noise, exhaust fume, risk of fuel spill, GHG, traffic congestions and safety issues	depending of destination of equipment and materials, transport logistics and related traffic safety issues are to be considered, including reuse / recycling of waste materials	Project Affected People, environment, ecology, climate	+	Temporary	*Locally*	*Likely*	*Moderate*
d5	Rehabilitation of soil, waste and groundwater if any (>50 years?)	Decommissioning	pollution risks	Any soil or groundwater pollution shall be rehablitated before decommissioning of the Project	soil, groundwater, waste	+	Permanent	*Local*	*Likely*	*Minor*
d6	Landscaping and replanting (>50 years?)	Decommissioning	soil, water quality, ecology	Landscaping and replanting will be required after decommissioning	Project area	+	Permanent	*Local*	*Likely*	*Moderate*
d7	Final Decomissioning and land rehabilitation reporting (>50 years?)	Decommissioning	soil, water quality, ecology	Final Decomissioning and land rehabilitation report shall be legalised, enabling legal transfer of land ownership, ensuring Indemnity of project promoter / MWI against environmental claims	Project area	+	Permanent	*Local*	*Likely*	*High*
d8	Transfer of land ownership if needed (> 50 years?)	Transfer of Ownership	soil, water quality, ecology	New owner shall arrange for environmental and social safeguards and permits related to new land use plans, also considering remaining burried pipelines	Project area	+	Permanent	*Local*	*Likely*	*Moderate*

7.3 Overall Positive Impacts

The Proposed RSDS Phase I Project aims at enabling the international community to assess the environmental viability of discharging desalination plant brine and seawater into the Dead Sea (The World Bank Dead Sea Study indicated that 400 MCM/year of brine could be discharged into the Dead Sea safely). It furthermore aims at providing potable water to Aqaba and Southern Israel from a desalination plant north of Aqaba; transfer the waste brine from the desalination plant together with seawater from the Gulf of Aqaba to the Dead Sea, and generate electricity through connected Hydropower Plants.

The overall very positive impacts of the RSDS Phase I project include the augmented potable water supply for Aqaba and the South of Israel in the context of the severe water scarcity that Jordan and the region are facing. This will directly benefit the local residents in Aqaba and South of Israel, and indirectly residents in wider Jordan. As result of the RSDS Phase I project, Aqaba will become independent of the DISI water source. It is likely that this DISI water will be reallocated to Amman instead.

It should be noted that the RSDS Phase I water supply does not need to be combined with expansion of wastewater collection and treatment facilities in Aqaba, since this water will replace the current DISI water source.

Secondly the RSDS Phase I project will contribute to a reduction in the decline of the Dead Sea due to the foreseen brine / seawater discharge. This is beneficial to the Dead Sea heritage, but also to the industry, tourism, and stakeholders and affiliated public that depend on the Dead Sea.

Thirdly, the RSDS Phase I project caters for water sharing arrangement among Jordanians, Israelis and Palestinians, and therefore contributes to more efficient co-operation and more favourable conditions for reaching eventually a final peace settlement. These positive impacts associated to the RSDS Phase I Project are highly significant with far reaching scales and magnitude.

7.4 Land Use, Landscape and Visual Impact

The RSDS Phase I Project infrastructure will be sited at various locations, some of which will be exposed and visible. Major visual impacts will be noticeable during the construction phase in terms of traffic movement, construction sites and activities, stored materials and excavated spoil.

Permanent visual impacts will be associated to the on-land intake facilities in Aqaba, the Desalination Plant, the booster pumping station, the high level reservoir, the three hydropower plants and the Dead Sea discharge point. Since the pipeline and some structures will be buried underground, these will not cause permanent visual impacts, however they will pose some traffic and movements restrictions along the alignment.

Land use change and related social-economic impacts and compensation requirements are further described in section 6.12.

Typical landscape and visual impacts during the construction phase will include:

- Land take for construction yards, storage and construction works
- Excavation and construction works
- Workers accommodations
- Traffic and transport components, such as trucks, equipment, waste storage

Part of these construction related impacts may be mitigated by strategic siting of the construction facilities, and putting visual barriers or screens around the key construction related sites and facilities, and adopted construction traffic time planning.

Typical landscape and visual impacts will relate to the permanent project facilities as listed above and daily traffic related to the operations. In this respect it is advised to realise a buffer zone of 10 - 20 metres including a natural visual barrier consistent with the local ecology, for instance consisting of (palm) trees and vegetation around the Desalination Plant, the pumping station, the high level reservoir, the three hydropower plants and the Dead Sea discharge point. Such natural buffer zone would act as:

1. A visual barrier and preservation of the aesthetic landscape
2. Soil stabilisation and prevention of erosion and soil flows during flood events
3. A Physical barrier / fence could be incorporated in such a buffer zone

7.5 Dead Sea related Impacts

The impacts of the first and later phases of the foreseen RSDS Project on the Dead Sea have been studied extensive during the Word Bank program, including the various subject investigations that have been performed and are listed in Annex 3.

The key impacts, separate from the overall positive impact in terms of restoration of the Dead Sea, relate to potential chemical and biological alterations of the Dead Sea water due to Red Sea water and brine discharge with risks in terms of composition, colour and smell, and indirectly in terms of risks for tourism and the Dead Sea potassium and brome production industries.

Water mixing issues in the Dead Sea may generate algae blooms due to phosphorus concentration in the Red Sea water and brine discharge. Avoiding the risk of algae blooms may require reducing the phosphorus concentration in the water. In addition, when Red Sea water is mixed with Dead Sea water gypsum (CaSO4) may precipitate throughout the water column. Larger gypsum crystals will sink to the Dead Sea bottom, where they may enter the potash industry's intake pipes. Smaller gypsum crystals may float to the Dead Sea surface, causing "whitening". The World Bank RSDS Feasibility Study (2014) concludes that up to 400 MCM/year of seawater/reject brine should have no discernible effect on the limnology of the Dead Sea, as the salinity of the upper layer of the Dead Sea would still not decrease below the threshold needed to enable any algal or bacterial bloom. However, the report recommends that further monitoring and research is required to determine the effects of higher inflow volumes. Annex 11 of this ESIA describes the details of the suggested Brine Disposal Monitoring Program, including related organisational aspects

Consequently, the final ESA of 2014 [lit 13] suggested a threshold discharge flow of 400 MCM / year to keep foreseeable risks at an acceptable level.

The nature of the RSDS Phase I project is that of a pilot to study these Red Sea and Dead Sea aspects and impacts in more details. Dedicated monitoring activities and organisations will be established for this purpose, and will be reported and implemented separately from this ESIA. It is obvious however, that the related monitoring devices required shall be adequately incorporated in the design of the Dead Sea Discharge facility under this RSDS Phase I.

The preliminary design of the Desalination Plant made by advisors of the Government of Jordan forms the basis for the current impact assessment. See details in annex 12. It shall be noted that the detailed design

and operational plans for the Desalination Plant made by the BOT contractor requires the provision of additional information needed to fully quantity and mitigate any potential impact on the Dead Sea

The critical information and confirmations needed in respect of the RSDS Phase 1 desalination plant design and operations can be summarized as follows:

- Confirmation of plant sizing including raw water, product water storage in relation to water demand projections and security of supply needs.
- Confirmation of availability of bulk electrical supply to the plant and detail of any infrastructure development which may impact on the ESIA and feasibility, including necessary confirmations and agreements with NEPCO.
- Inclusion of feed water sampling and quality testing as part of the detailed design to identify and assess possible risks and mitigation through process design.
- Confirmation of the desalination plant detail and technology and approval of visual and noise impacts prior to construction.
- Inclusion of detailed risk assessments and performance specifications based on relevant raw water and product water parameters as part of detailed design, construction and operation agreements.
- Confirmation of details and configuration of product water storage and monitoring as well evaluation of impact of blending existing supplies with desalinated water.
- Confirmation of configuration of brine treatment and discharge into seawater pumping main and provision of adequate storage. The brine is likely to be treated for nutrient removal, especially phosphate which may originate from poly-phosphonate additives. This would be required to prevent unwanted algal blooms in the Dead Sea.
- Confirmation of the desalination plant waste and wastewater stream volumes and composition to determine impact on the receiving seawater conveyance system and discharge into the Dead Sea. This includes washing of post treatment systems, which may result in waste water rich with total suspended solids, which also need to be removed prior to discharge into the Dead Sea
- Consideration and inclusion of best available techniques and best environmental practices (BAT and BEP).

The operations of the foreseen RO Desalination Plant in the RSDS Phase I project will require the use of antiscalants to prevent fouling of the membranes. Different solvents may be applied for this purpose. However, phosphate/phosphonate free antiscalants are recommended to prevent negative impacts on the environment, including algal blooms in the Dead Sea.

In addition, water quality monitoring and reporting of the product water will be required at the Desalination plant. This includes the composition of the brine, which needs to be in line with the allowable discharge quality into the Dead Sea. The monitoring reports will be important for the analysis of the Dead Sea Monitoring Activities and should therefore be provided to the Dead Sea monitoring team and the JAB.

The RO monitoring reports shall include at least the following:

- Total brine, from all sources – cubic metres per hour (max), cubic metres per day (max), cubic metres per year
- Brine from reverse osmosis membranes – cubic metres per hour (max), cubic metres per day (max), and cubic metres per year.
- Water from preliminary treatment (sand filters backwash/else) – cubic metres per hour (max), cubic metres per year.

- Water from washing limestone reactors (supplementary treatment) – cubic metres per hour (max), cubic metres per year.
- Water from treatment facility (pre-treatment backwash, limestone washing, else) – including water from backwash sand filters and water from limestone reactors - cubic metres per hour (max), cubic metres per day (max), cubic metres per year.
- Water from membranes washing (inorganic) –cubic metres per batch, cubic metres per year (max).
- Pumping seawater – cubic metres per hour (max), cubic metres per day (max), cubic metres per year.
- Water product (Capacity) - cubic metres per hour (max), cubic metres per day (max), cubic metres per year.
- Water Treatment Facility data (Pre-treatment Backwash and Washing Limestone Reactors)
- Operation reports of water treatment facility, including chemicals used in each source/stream and flow rate of each source/stream and total flow (cubic metres per hour (max), cubic metres per day (max), and cubic metres per year).

7.6 Gulf of Aqaba and Eilat

7.6.1 Construction related impacts on the physical environment

On review of the construction activities, the following activities were deemed highly unlikely to have any effect on the bathymetry, coastal hydrodynamics and sediment transport pathways and have therefore not been assessed in any more detail:

- Trenching and burying activities associated with the burial of the submarine pipeline from 0-15m water depth – these activities may have some very localised effect on the currents in and around the trench during construction prior to it being infilled that may result in some increase in the suspended sediments, however this will be highly localised and the effect will not be noticeable alongside the effect of suspended sediments caused by the trenching activities themselves;
- Laying pipeline on the seabed using the ‘float and sink’ method – as this is assumed to occur over a 1-2 week period and involves the sinking of long lengths of pipeline it is deemed insignificant on both spatial and temporal scales; and
- Installing the ‘chain’ to secure the intake associated with the end of the submarine pipeline – this activity is again assumed to be a short-term activity in only three locations at the pipeline intakes, and therefore predicted the effect would be insignificant on both spatial and temporal scales.

Construction activities that could have an effect are:

- Deeper trenching and burying activities
- The pipeline laying on the seabed using the ‘float and sink’ method – this activity results in the relatively slow sinking of the pipelines onto the seabed, and therefore the potential effect on water quality from the very localised suspended sediment that will result as the pipeline lays on the surface is likely to be minimal and be constrained to within 1m either side of the pipelines.
- Installing the ‘chain’ to secure the intake associated with the end of the submarine pipeline - this will require some disturbance to the bottom sediment, but the effect from disturbance of the sediments to marine water and sediment quality will very localised and extremely short term.
- During the construction and installation of the intake system, there is the risk of accidental spillage or leaks of liquids and other substances as a result of equipment malfunction and marine traffic. These have the potential to contaminate the marine environment

The potential effects on water and sediment quality associated with the above activities include:

- Increase in suspended sediments during trenching / infilling
- Temporary change in water quality within close vicinity (ca. 50m) of the dredging activities. This decrease in water quality has the potential to directly and indirectly impact a number of sensitive receptors, particularly seagrass beds, corals, fish species and the Ayla intake. Mitigation measures can be put in to minimise these water quality impact by employing silt curtains during construction. For more detailed information, please see annex 5, page 103 and further.

The coastal defence rock armour that is currently protecting the military lookout post will need to be removed in order to allow the laying the pipelines from the onshore Intake Pumping Station (IPS) to the marine environment. This could lead to:

- increased erosion of the foreshore once the rock armour is removed;
- decrease in the marine water quality as a result of disturbed sediments; and
- release of anoxic sediments / heavy metals / contaminants from the sediments underlying the rock armour resulting in a reduction in water quality.

7.6.2 Operations and Maintenance related impacts on the physical environment

Seawater Abstraction

The key operational and maintenance activity that has the potential to have an effect on the physical and chemical parameters is the seawater abstraction of 300 MCM/year at a depth of 140m. This will impact the marine water circulation, water levels and water quality. It is foreseen that the water abstraction will not have an impact on bathymetry and sediment transport and sediment quality, but may have potentially a direct or indirect impact on a number of sensitive receptors, particularly seagrass beds, corals, fish species.

In order to fully understand the local effects of the abstraction on water circulation numerical modelling is required. This was previously undertaken for the previously chosen ‘Eastern Location Based on the fact that ERM (2014) concluded that the effect of a 2,000 MCM/yr seawater abstraction volume at 25m water depth at the eastern location on the marine water circulation was ‘slight’, and that the magnitude of the impact has now been reduced almost 10-fold to an abstraction quantity of 300 MCM/yr it is considered that the potential for a significant effect will be minor.

The abstraction related impacts on water quality depends on seasonal variations. During April – November there is clear stratification and recycled nutrients from the deep reservoir (ca. >250 – 500m) are prevented from entering the photic zone. This implies that abstraction from less than -250m (i.e. at -140m) in the summer months will likely have little effect on water quality.

During February and March however, deep convective mixing down to about 300 - 500m results in nutrient enrichment of the open and coastal surface water, and the water around the intake will have relatively high nutrient and chlorophyll-a concentrations. The euphotic zone depth (1% of light at surface) is around 80 - 115 m (ERM, 2014) and depends on the mixing and blooms. Taking into account these elements, the potential significance of this effect is minor (winter) to negligible (summer).

Impact of submarine pipeline of water circulation

The presence of three 2.8m diameter submarine pipelines on the seabed for a length of ca. 1.86km has the potential to affect the local currents and sediment transport (mobility), resulting in localised accretion

and erosion, which in turn could affect the water quality in terms of increased suspended sediments, and thus decreased dissolved oxygen.

Control / mitigation measures
It is recommended to consider the following when undertaking the detailed design of the intakes:

- In order to reduce suction of small fish and organisms into the mouth of the intake facility, it is recommended to reduce the average seawater flow velocities to 0.15 m/s with a maximum of 0.3 m/s at the level of the 100 mm bar-screen, as per IFC guidance (in particular in winter months when water quality can be affected more); This can be realised by enlarging the sign of the screens at the bell mouths from 3.25m to about 4.6.;
- Use advanced / BATNEEC technologies at the intake to diffuse the effect of the intake on water circulation.

Monitoring
It is recommended that the impacts to water circulation (i.e. currents) and water quality be monitored to ensure that negative effects are mitigated and avoided where possible, in particular to avoid planned and accidental pollution events occurring. Sediment quality monitoring shall be carried out during the trenching and pipeline burial activities in order to ensure that changes in contaminant levels do not occur as this could lead to the requirement for a revised assessment should levels reach the higher sediment quality guideline levels detailed in this assessment The required monitoring is presented in section 9.4.2.

Detailed Construction and Operational Management Plans shall be developed prior to the commencement of each of these project stages and shall include a Monitoring Plan. These Plans shall be submitted to the relevant environmental authorities for approval prior to implementing the plan, and it shall ensure it incorporates any consenting requirements and mitigations measures provided in this ESIA.

7.6.3 Coastal and Marine Ecological Impacts

The Gulf of Aqaba is unique as it contains significant percentage of the world's natural marine biodiversity. The area is of interest because it hosts an ecological system that includes coral reefs and other tropical biota that are unique in such high latitudes (Ahmed *et al*., 2012).

Our assessment concerns marine benthic habitats and species and evaluates how they might be affected by the RSDS Phase 1 construction and operation. Annex 5 provides baseline information on the key marine and coastal habitats and the flora and fauna associated with them. It also includes pelagic species, including fish, plankton, marine mammals, turtles and other megafauna.

The area over which potential changes to benthic habitats and associated species can occur is informed by the extent over which changes to water and sediment quality, and hydrodynamics are anticipated both locally and regionally. Therefore, the primary area of focus is within the proposed pipeline corridor, with the secondary area of focus within the wider area in the north of the Gulf. In terms of receptors in the pelagic environment, which are highly mobile, the study area considers the Gulf of Aqaba and extends to the Red Sea where necessary. Baseline conditions are described at the regional level and refined to a more local level where required and data is available.

In past decades, the Red Sea has been known for its outstanding corals, home to hundreds of varieties of fish and other marine life, many of them unique to the region. These spectacular coral reefs represent the northernmost latitude for coral reefs in the western Indo- Pacific region. But, today the reefs, like most corals worldwide, are showing signs of degradation. The Gulf's corals are particularly threatened due to their isolation from oceanic processes of flushing and circulation, but also due to pressures from tourism, fishing (including aquaculture), and extensive landside development on the shores of the Gulf's bordering countries: Israel, Jordan, Saudi Arabia and Egypt (Portman, 2007).

To protect these features, Jordan, Israel and Egypt have designated marine protected areas in the Gulf of Aqaba, which are listed below;

- Aqaba Marine Park (Jordan)
- Coral Beach Nature Reserve (Israel)
- Abu Ghalum Protected Area (Egypt)
- Nabq Protected Area (Egypt)
- Ras Muhammad National Park (Egypt)

An elaborated description of the marine ecological baseline in the subtidal and pelagic environments is presented in in Section 6.4.2 of Annex 5. The key groups are summarised briefly below.

Seagrass Habitats

A recent site specific seagrass survey has demonstrated that the benthic habitat within the vicinity of the proposed RSDS pipeline corridor and intake has largely been characterised as barren sandy substrate from the intertidal area down to about 3-4m, after which there is a reasonably dense seagrass meadow down to ca. 33m (MSS, 2017), which is interspersed with sandy pockets. Three sea grass species *Halodule uninervis*, *Halophila stipulacea* and *Halophila ovalis* were reported along the Jordanian coast. *H. stipulacea* is the dominant species known to inhabit the northern coast (MSS, 2014). Coastal development can locally affect seagrass beds, as can poor water quality. However, the species *H. stipulacea* is a prolific seeder and is fast-growing, and therefore it can expand rapidly from small populations. It is ephemeral with rapid turn-over (Malm, 2006 as cited in Short, 2010) and is well adapted

to high levels of disturbance. More information about regeneration of seagrass in affected areas is provided in annex 5, impact table 6.1 (page 173) and further.

Coral Reefs

The Red Sea's geographical location and geological history make for unique conditions that have direct bearing on the development of reefs along the coasts. While the total number of species is generally higher in other tropical Indo Pacific reefs, the local, within-habitat diversity in the Red Sea is higher than in the Great Barrier Reef (Thetis SpA et al., 2013).

The Jordanian Gulf of Aqaba coast supports a relatively small total coral reef area, composed entirely of narrow and steep fringing reefs. At greater depths, down to at least 65-70 m, coral carpets covering marginal slopes are abundant. Growth of deep reefs is facilitated by water clarity that allows light penetration to a depth of ~100m. Below 100 m the reef becomes patchy, sand stretches increase, and the corals are less diverse (Thetis SpA et al., 2013)

There is low coral cover in the areas surrounding the proposed northern intake, however there were colonies found at locations the eastern coast of the northern Gulf during Jordanian National Monitoring in 2015. Corals are also found to extend from Eilat's north beach knolls (at the NW corner) south to the border with Egypt.

Plankton and Larvae

Community structure and percentage of the meroplanktonic invertebrate larvae and fish egg and larvae at each depth interval will play an important role in confirming the key of depth at which the intake abstraction will be designed.

In order to provide information on the distribution of fish and invertebrate larvae across the northern Gulf of Aqaba, a survey was undertaken during different months and at different depths (Thetis SpA et al., 2013). The abundance of fish larvae varied considerably across the months analysed, but consistently peaked at depths of between 25 and 75m. Of the total abundance within the upper 140m, only a small fraction was found in the 100 to 140m depth strata; especially in the summertime when the water column is stratified. Across the north beach, abundances of fish larvae were similar along the Jordanian (eastern) and Israeli (western) sections (Thetis SpA et al., 2013). Larvae of molluscs (gastropods and bivalves) were by far the most dominant group, conversely, planulae (larvae of corals and other cnidarians) were extremely rare.

Due to the length of time since the survey, an update has been commissioned and this information will be provided in an addendum to this report.

Fish Communities

The Jordanian coast hosts 507 fish species which accounts for about 40% of the Red Sea fishes' diversity (ERM, 2014). The majority of the species (82.8%) inhabit benthic habitats while the rest are true pelagic fish (MSS, 2015). Among the benthic habitats, a majority are hosted by high biodiversity value habitats: coral and boulders (51.1% of the Jordan's fish diversity) and seagrass meadows (8.3% of the Jordan's fish diversity) (MSS, 2015).

The results presented in the 2015 Annual National Monitoring Report (MSS, 2015) show that the Hotel Area site (the site closest to the proposed scheme location) was characterised by fish that inhabit the seagrass and sandy seabed communities. These seagrass meadows constitute a critical habitat as they serve as important nursery ground for the larvae and juveniles of a wide diversity of (pelagic and) reef-associated fish species, and foraging area for some endangered and endemic species.

Although the coral reefs in the northern gulf of Aqaba are not pristine, they support a high number and diversity of reef fish (as surveyed by MSS, 2015) and as such can also be classified as a critical habitat. The marine related impacts of the RSDS Phase I project have been elaborated extensively in annex 5. A summary is provided hereafter.

Impacts during construction

Construction activities have the potential to have impacts on coastal and marine ecological receptors, the key impacts are as summarised here:

- Trenching and burying activities *(*this has been assessed in further detail in Section 6.6.2 of Annex 5 as there is potential for a number of effects and it is important to understand the level of effect and required mitigation measu*res and monitoring requirements);*
    - Direct loss / destruction of seagrass beds (and associated species) and benthic communities within the footprint of the pipeline burial, and adjacent where the dredged sediments will be stockpiled;
    - Indirect impact on seagrass beds and mobile species (e.g. plankton and fish) from a temporary increase in turbidity, and therefore temporary decrease in water quality (i.e. decrease in DO, increase in suspended sediments);
    - Smothering impacts to nearby seagrass beds, soft sediment communities and coral species due to a temporary increase in sedimentation resulting from the dredging;
    - Direct noise impacts on fish and megafauna (e.g. sharks, marine mammals and turtles);
    - Direct and indirect impacts from accidental spills and leaks
- Pipeline laying on the seabed using the 'float and sink' method on benthic communities – this activity results in laying of pipelines on the seabed and will have a direct impact on benthic communities and has been assessed in further detail in Section 6.6.3 of Annex 5.
- Accidental spillages during marine construction activities on all marine ecological communities – though there will be limited effect for if such an accident were to occur as the carrying capacity of oil / diesel of the marine plant will be relatively limited compared to large shipping vessels in the nearby vicinity

Impacts during Operations

The current design of the underwater pumping station will consist of three pipes, whose distal end will be inclined with no coverage due to maintenance purposes, some 20 m in height. In is recommended however, to avoid near-surface vortices above the suction point, that the mouth will be covered with a large 'roof' so that the water will be drawn from the sides (ie originating in a rather narrow depth stratum).

The operational activities that have the potential to have impacts on coastal and marine ecological receptors are as follows:

- Abstraction of seawater on phyto- and zoo-plankton, coral, invertebrate and fish larvae, fish and macro-invertebrates (direct and indirectly by impacts on larvae), coral reefs (indirectly from the impact on coral larvae), planktivorous fisheries (indirectly by removal of plankton), and marine protected areas (indirectly by impacts to coral reefs and associated species like fish) - this has been assessed in further detail in Section 6.7.2 below as there is potential for a number of impacts and it is important to understand the level of impact and required mitigation measures and monitoring requirements.
    - Impingement occurs when organisms sufficiently large to avoid going through the screens are trapped against them by the force of the flowing source water – i.e., algae, plankton and bacteria are not exposed to impingement.
    - Entrainment occurs when marine organisms enter the desalination plant intake, are drawn into the intake system, and pass through to the treatment facilities.
- Presence of the three pipelines – on the seabed will have a direct impact on benthic communities and has been assessed in further detail in Section 6.7.3 on Annex 5.

Entrainment of marine life, from phytoplankton to larvae and small vertebrates can become an environmental concern, particularly those in association with coral reefs, considered as critical habitats that are vulnerable to a suite of anthropogenic and natural impacts, that cumulatively have the potential to diminish the health of the reefs and their ability to maintain their health (particularly through larval colonisation). A further issue of potential concern is the removal of particulate matter from the water column, where it is a significant source of food for other species.

The likelihood and significance of these impacts are being thoroughly assessed by detailed modelling. Where the current ESIA assumes the implementation of the deep (140m) intake, the results of this separate Intake Alternatives Study will be provided in a separate addendum.

7.7 Terrestrial Ecology related Impacts

7.7.1 General

Impacts have been assessed throughout the area of influence of the Aqaba- Wadi Araba-South Dead Sea basin. The extent and boundaries of this area vary depending on the type of impact being considered, but in each case, it is defined to include all that area within which it is considered that significant impacts could occur. Annex 6, chapter 4 provides a detailed overview.

Potential major impacts of the RSDS Phase I project on flora and fauna are related to the construction phase mainly. Permanent impacts are only expected when vulnerable trees, such as acacia trees would be removed. This would have a direct impact on these trees (flora) as well as on the birds depending on these trees for feeding and nesting (fauna).

The Potential project impacts during construction on the flora are summarized below.

Table 15 - Ecological impacts on plants and their locations within the pipeline route

Ecological Impact	Location / DMU	Coordinates	IFC PS 6
A negative impact will be expected on the Vulnerable **Acacia forest** through cut the trees to establish pipeline at the western part of the main road	Point 4 - Zone A Point 5 – Zone A	700137E, 3299372N 703191E, 3303039N	Crit 1, 3
Destruction of habitats within the wadi, through the work of exploration, especially as the vegetation there depends on the seasonal flow of water.	Point 4 – Zone B Point 5 - Zone B	711597E, 3350178N 715668E, 3366951N	
Blocking the way to the arrival of seeds from the top of the mountains to be able to grow later inside the wadi.	Point 3 - Zone C Point 4 – Zone C Point 5 – Zone C	719571E, 3396987N 720650E, 3401064N 726261E, 3412225N	
Remove the topsoil as a result of excavation and construction, which leading to reduce of seed bank and organic matter, especially at sand dune areas	At all locations		
In case of leakage, toxic effect of heavy machinery oils on soil and table water within the wadis.	At all locations		
Impact on Vulnerable ***Halyxolon presicum*** **plant community** that grows on the sand dunes, by cutting them and encourage growth of other plants such as Tamarsk trees, as	Point 3 - Zone C Point 4 – Zone C Point 5 – Zone C	719571E, 3396987N 720650E, 3401064N 726261E, 3412225N	Crit 1,3

Ecological Impact	Location / DMU	Coordinates	IFC PS 6
result of the degradation and salinity			
Flow cut wadis to the west	Point 3 - Zone C Point 4 – Zone C Point 5 – Zone C	719571E, 3396987N 720650E, 3401064N 726261E, 3412225N	
A dense forest up to 75% coverage I located here, so that a negative impact will be expected when cutting the trees, especially Endangered and rare species, like ***Salvadora persica***	Point 4 –Zone D	737861E, 3438835N	Crit 1,3
A negative impact will be expected on the Critical Endangered plant ***Maerua crassifolia*** when removed to construct the pipeline at the western part of the main road	Point 3 - Zone D Point 4 – Zone D Point 5 – Zone D	737861E, 3438835N 735483E, 3437739N 740813E, 3354671N	Crit 1,3
A negative impact may be expected on the Critical Endangered plant ***Balanites aegyptiaca*** to establish the pipeline at the western part of the main road	Point 3 - Zone D Point 4 – Zone D Point 5 – Zone D	737861E, 3438835N 735483E, 3437739N 740813E, 3354671N	Crit 1,3

7.7.2 Intake pumping station and Desalination Plant

It shall be noted that a narrow corridor between the border and the Ayla project is already disturbed and degraded from adjacent works. Clearly, any remaining vegetation will be lost. It is advised to reseed area with natural plants of the area.

The proposed route is close (about 300 m) to the Aqaba Bird Observatory (ABO, next to the pipeline route, about 10 km from the Desalination Plant). More than 200 different species of birds have been recorded at the Aqaba Birds Observatory site, where birdwatchers can observe more than 70 different bird species during the optimum season.

The ABO is characterized by its unique ecological setting that utilizes treated water to create artificial wetlands to attract different species of birds. Since early 2012, the Aqaba Bird Observatory, managed by the Royal Society for Conservation of Nature, has paid great efforts to ensure the sustainability of these unique habitats.

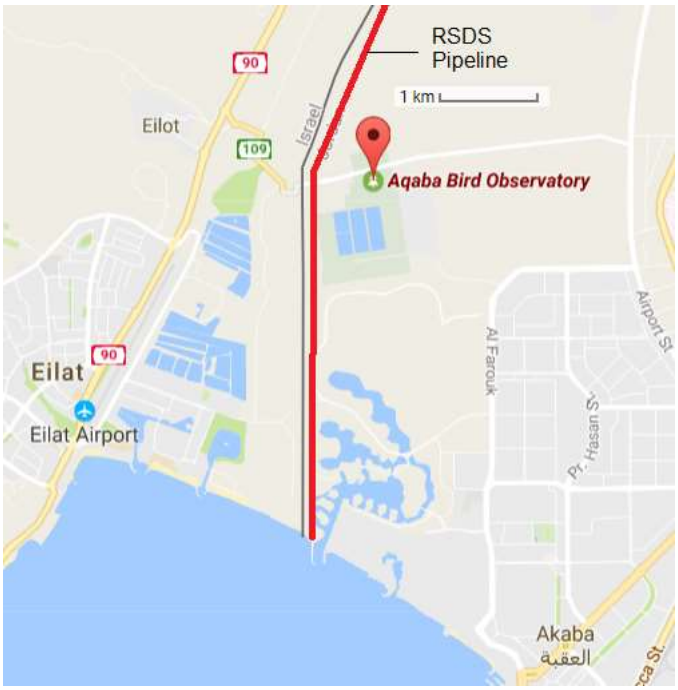

Figure 42 – Aqaba Bird Observatory relative to RSDS Pipeline Route

Construction activities may disturb birds at the ABO both resident and migrant. This site is a hotspot and very important for migratory birds to refuel and rest where no close alternative habitats exists at the northern tip of the Gulf of Aqaba. Desert ground nesting birds that breed at the area and other migrant passerines that use the small desert shrubs for feeding will be disturbed.

The development of the observatory's habitats is attracting more migratory birds to stop and rest, with an estimated 150 different species stopping over at ABO during the spring season (ref: Jordan Times, June 01, 2015). It is advised to implement very restrictive and low-nuisance construction methods while passing by the area between about 250 m north and south of the boundaries of the ABO, including reduction of noise, vibrations and related nuisance where possible, and avoiding construction works during the critical bird's migration seasons in spring.

7.7.3 Pipeline through Wadi Araba

Disturbance of habitats may be expected at the alluvial fans between the airport and the Qatar sand dune areas near from establishment of work sites, construction of the pipeline, cut and fill activities, transportation of spoil, workers' activity and movements at the workers' camps.

Wadis and alluvial fans contain a healthy climax population of Halyxolon persicum and Acacia spp, which is important for sand dunes fixation, and also for creation of micro habitats for the decreasing sand gerbils in the Wadi Araba area.

It is advised to disturb these habitats as minimal as possible, such as by

- Ensuring that access roads leading to the worksites and camps, workshops and pipeline are as narrow as possible and to use one access road as much as possible.
- Incorporate a post-construction restoration program to restore all wadis, wadi openings, alluvial fans, work sites, camps and access roads to their pre-construction state.

- Also a programme to restore the habitats in the wadis and wadi mouths, and monitor after construction;
- Maintain the natural flow of unpolluted rain and seasonal flooding and spring water along all wadis during the Construction period;
- Identify appropriate locations for the dumping of spoil produced by cut and fill activities, and prohibit disposal outside these sites;
- Protect and preserve all Haloxylon and acacia trees and as much as possible shrubs in the wadis, wadi openings and alluvial fans around work sites

Particular attention shall also be given to implementing low-nuisance construction methods while passing by the following two nature areas:

Dana Nature Reserve: one of the protected areas in Jordan that was declared in 1988 (Jordan Protected Areas Net Work, 2008). Since then, Dana Nature Reserve has become the first Man and Biosphere Area in Jordan (UNESCO, 1998). The reserve extends from Edom Mountains down to the Jordan Valley at the north tip of Wadi Araba. The pipeline section passing the reserve is about 10 km long.

Proposed Qatar Reserve: this area was proposed to become protected in 1998 after a review for protected areas has been performed. In 2007, and through a World Bank (GEF) funded project named Integrated Ecosystems Management at the Jordan Rift Valley, Qatar officially joined the national protected areas network and is expected to become established as a protected area in the near future. The Qatar area is located in the southern parts of Wadi Araba, located within subtropical bio-geographic zone but also composed of a variety of vegetation types. The pipeline section passing the Qatar reserve is about 10 km long. See also Figure 29 – Ecologically sensitive areas within the project region.

Other nature areas in the region include:

Wadi Araba Important Bird Area (IBA): This IBA has a total area of 383 km² extending from Qa' As Sa'idyin south to Qatar. It has been designated as an IBA due to its location on the migration route of migratory birds.

Dana IBA: Confined to the area from the rugged Sharah mountains at 1,200m down to the rift valley floor at sea level, containing scenically beautiful wadi Dana in addition to set of wadis.

Proposed Fifa Protected Area: This site includes also in important birds area and is located along the Dead Sea , to the west of Fifa village, the PA is named according to Ghour Fifa.Fifa Protected Area is located between Wadi Um Jufna in the north and Wadi Dahel in the south. This area represents ecological values and diversity..

During construction there may be disruption of east-west movement of small mammals and reptiles, caused. This is particularly important opposite Rahma, Risha Bier Mathkour and Finan areas, the area midway between Bier Mathkour and Risha, and opposite Ghwieba Wadi Finan.

This will cause a truncation effect on the mobile faunal wildlife, where severance related to excavation of the pipeline effectively confines or truncates the land area available to certain species, rendering them at more risk from predators. Animals used to crossing the floor of the Araba would be prevented from doing so for certain stretches during parts of the construction phase.

To minimize ecological disruptions it is required to set up an ecological monitoring program prior to the construction of pipeline on intervals of 10 km, in order to prevent ecological damage and provide ecological clearance during construction. The monitoring requirements are described in full detail in annex

6, and include 1) Wadi banks for at least 100m from either side of the proposed access and egress points; 2) Effectiveness of wadi bed rehabilitation, including: Monitoring compliance with the required management plan and comparing site conditions with those established prior to site commencement; Assessing reinstatement works; as per criteria defined in the Management Plan; 3) Alluvia fans; 4) Vegetation Stands Subject to a Management Plan

Furthermore it is required to restrict the linear length of construction works to a maximum of 10 km intervals of open trenches, and allow unexcavated gaps of 50 m each 3 km to allow crossing of the wildlife, or otherwise backfilling the open trenches soon after completion of the works.

7.7.4 Suggested Pipeline Alterations

The sensitive ecological areas relative to the pipeline route are presented in below map 40. In this map two alterations of the proposed pipeline route are suggested (in blue, diversions 1 and 2).

Diversion 1 relates to the presence of many vulnerable Acacia spp. trees in the Bir Mathkour area, were the proposed route would cut directly through this area. It is recommended to change the pipeline route closer to the existing road to minimize the threats to these vulnerable trees. The coordinates of the beginning and end of this modified section starts at 30 21 30 48 N 35 14 34 19 and ends at 30 33 15 33 N 35 15 28 41 E. If decided not to adopt this route change, it is advised at least to implement local diversions of the pipeline route around individual Acacia trees that are encountered.

Diversion 2 relates to the importance of Finan-Ghieba area for breeding desert birds, were the proposed route would cut directly through that area. It is recommended to change route closer to the existing road to minimize the threat to the desert breeding bird’s nests. The coordinates of the beginning and end of this modified section start at 30 44 52 41 N 35 19 01 41 E and ends at 30 49 22 32 N 35 21 48 93 E. If decided not to adopt this route change, it is required to avoid construction during the main breeding and nesting season from March until May.

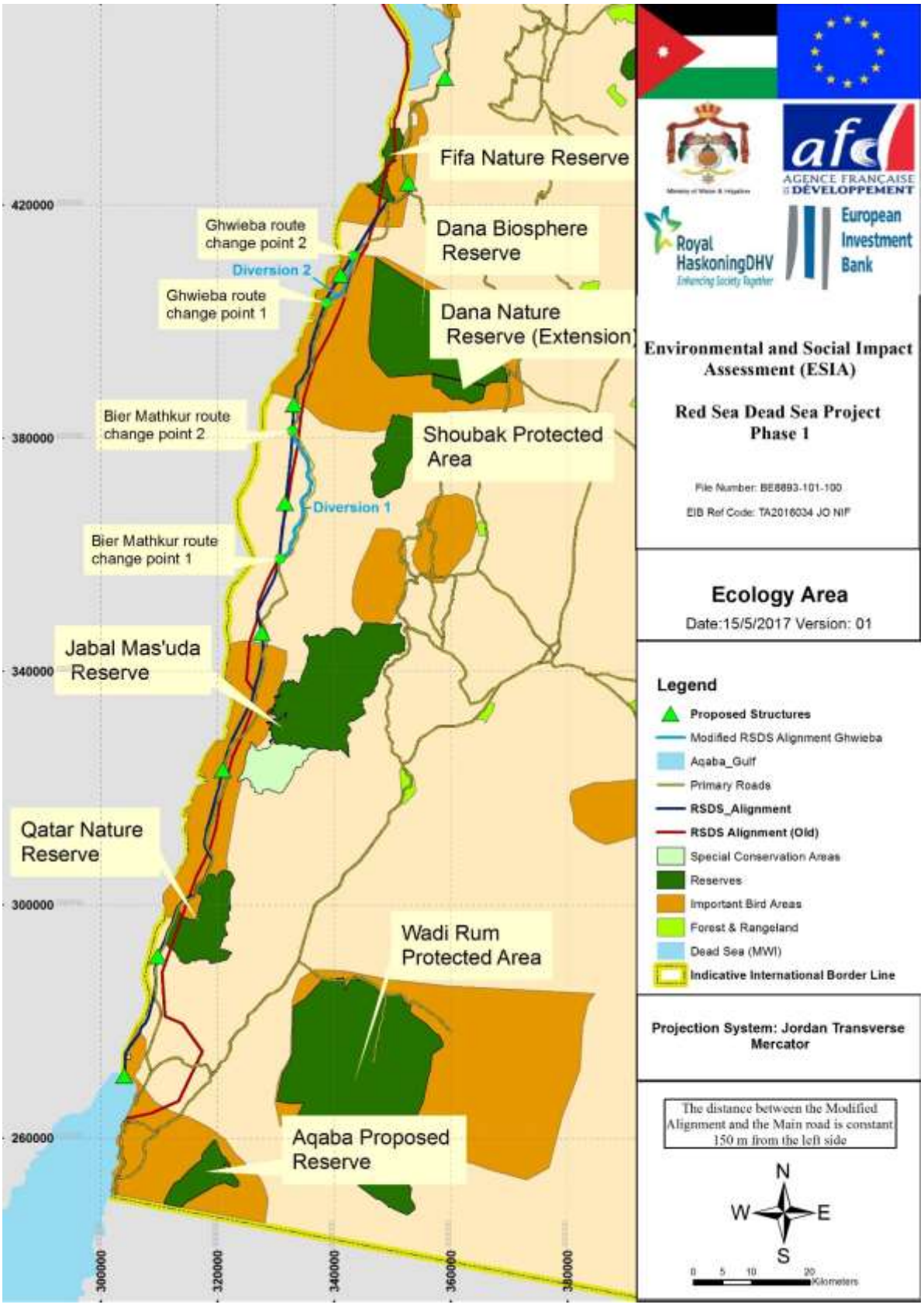

Figure 43 – Nature areas relevant to RSDS Pipeline Route

7.8 Archaeology and Cultural Heritage

The impacts of the project in terms of archaeology and cultural heritage have been elaborated extensively in annex 7. A summary it provided here.

A map of the potential RSDS construction corridor was transmitted to the Department of Antiquities along with a request for information regarding all known archaeological sites in those areas and statements of their relative cultural and historical significance.

On the basis of these maps the Consultant identified the known sites that may be affected. Some 187 sites were defined. The related Mega (Previous JADIS) report for each site is provided annex 7.

The sites and related risk levels have been classified in the following three categories:

- High Risk :These sites should be protected and avoided during any construction work.
- Medium Risk: The site should be investigated in more detail prior to construction works.
- Low Risk: The site could be removed prior to construction works.

These sites include sherds and lithic scatters, watchtowers, enclosures, camps water installations and others. An overview of the High Risk sites is provided ion Table 16.

Relevant archaeological sites identified during the ESIA related field surveys are presented in Table 12. Particularly two sites that have been classified as high risks are located within 50 m from the pipeline route. Map 3 in Annex 7 – Archaeology show the exact locations of these sites. The size of these sites, and thus the related construction restriction areas, are mentioned in Table 16.

Table 16 – High Risk Archaeological Sites along RSDS Pipeline

No	Section (see annex 7)	Site No	Site name	Size	Source	Description
1	A5	139	Khirbet feifa	2 x 1 km	Waheeb 1995	Located directly along the proposed pipeline (see Section A5 in annex 7), this structure called Qaser Feifa is located on top of a medium hill east of the existed paved road, to the east is a large cemetery of thousand mostly robbed oval lined stone tombs. The site dated to different occupational phases from Byzantine and Islamic periods. Most of the cemetery dated to Early Bronze Age 3200-2000 B.C. The cemetery covers an area dissected by many small wadies of at least 1.0 x 0.5 km.
2	A2	150	Al thoghwy	50x50m	Field assessment	Located directly along the proposed pipeline (see Section A2 in annex 7), this site is located on a flat area close to Bir Mathkur area on the western side of the asphalt road. It consist of a 30*30m square building, built of well-cut limestone ashlars , robber pits revealed a sub structures of unknown walls. The site possibly served as a station for trade caravan toward the west where a cistern of water was found during the investigation process. A lot of pottery shreds were scattered on the surface indicated a classical period (Roman – Byzantine).

Other sites with potentially medium to low risks located in the direct proximity to the RSDS pipeline route are (see also annex 7):
Section 1: sites 143, 151
Section 2: sites 105, 106, 107, 108, 151
Section 4: sites 110, 148
Section 5: sites 141, 142, 144, 146, 147

Design Phase:
During the detailed design phase of the RSDS project an overlay of the final design lay out with the list of potential affected archaeological sites in annex 7 shall be made, to confirm that none of these sites overlap with the foot print of the project within 50 m. This should include areas directly affected during the construction works. Particularly emphasis shall be given to the locations of the high risk sites 139 and 150, since they are located within the 50 m zone of the project and the medium/low risk sites mentioned above.

In case an overlap with any of these sites cannot be avoided during the design phase, planning for archaeological rescue excavations for high risk sites shall be performed, or planning for further investigations or removal of artefacts for medium of low risk sites shall be prepared in coordination with the Ministry of Tourism and Antiquities and implemented.

Construction Phase:
During the construction period it is proposed to set up an archaeological site monitoring and clearance program for each section of 10 km in advance and 50 m wide of the actual construction works. This can be executed in parallel with the proposed ecological clearance program. This shall again be executed in co-operation with the Ministry of Tourism and Antiquities, as well as with the Ministry of Religious Affairs (MAIA).

This program aims at identifying any site along the way of the excavation route not yet known. When significant archaeological sites would be found during this preparatory construction phase, but also during the actual excavation works, salvage excavations or removal are to be prepared and implemented in co-operation with the Ministry of Tourism and Antiquities.

During all construction works a map with all known relevant archaeological sites within a distance of 100 m from the construction works should be kept at the site, to avoid any unnecessary disturbance of these site in terms of soil stability, vibrations, dust, waste or traffic during the construction works

For practical application of the Cultural Heritage clearance program, reference is also given to the Cultural Resources Management Plan prepared and implemented during the construction of the DISI Pipeline Project in Jordan. Details of this plan have been provided in June 2017 by the ESIA Consultants to the MWI and Dar-Alhandasah and Partners.

7.9 Disasters and Seismic risks

7.9.1 Disasters

The National Disaster Response Master Plan (NDRMP) of Jordan identified in 2004 the following main hazards as potential threats to Jordan: earthquakes, flash floods, drought, locusts, and weather emergencies (snowstorms, frost), as well as human-made disasters such as fires, chemical dangers (industrial releases, hazardous materials transportation accidents, etc.), chemical, biological, and

radioactive contamination, armed conflict, and mass population migration. Table 17 provides an overview of the major disasters during the last 100 years.

Table 17 – Major Disasters in Jordan over the past 100 years

Disaster	Date	Affected people	Deaths
Earthquake	1927	Unknown	242
Flooding Aqaba	1963	Unknown	25
Flooding Aqaba	1965	500	0
Flooding Aqaba	1966	5792	295
Drought, Jordan	1966	180,000	0
Epidemic	1981	715	4
Flooding Aqaba	1987	29	9
Flooding Aqaba	1991	18,000	8
Earthquake	2004	19	0
Terror attack, Amman	2005	100	60
Flooding Aqaba	2006	35	6

Flooding evens in Aqaba represent the majority of disasters that occurred, next to earthquakes. Both types of events are predominantly centred around Aqaba.

7.9.2 Seismic Risks

As indicated in section 5.7, the location of the northern intake with the current RSDS Phase I project may alter the risk profile associated to seismology, in comparison to the originally preferred RSDS alignment under the final ESA 2014 [lit 13], due to the fact that the northern intake site is very close to a branch of the DST fault system. In addition, the pipeline crosses various fault areas as has been described in the 2011 ESA (ERM) and the 2016 ESA.

Under the RSDS Phase I Project a further Seismic Risk Assessment was completed. It was concluded that no major concerns that could not be mitigated beyond the application of effective design measures and operational monitoring (ref Dar Al-Handasah and partners, 2016 ESA, page 86) .

This requires that special arrangements should be applied where the facilities and pipe crosses these fault areas, including the use of special flexible couplings which allow deflection and elongation of the structures and pipes during a seismic event. This may include site response studies at all construction sites (i.e. hydroelectric power plants, RO plant, and pumping station) to determine the local ground acceleration and liquefaction potentials due to earthquakes, as well as the probability of such earthquake events. The results of these studiers could next be incorporated into the design of the structures. It is furthermore advised to apply EN Eurocodes or similar international design codes dealing with extreme loads such as earthquakes. In fault areas, the terrestrial facilities shall be installed in concrete boxes to allow for easy inspection and access.

Fault crossing information has been further detailed by Dar Al-Handasah and Partners in report J15135-0100D-PD-EN-V-WV-506.

In the preliminary design of Dar Al-Handasah and partners, the submarine pipelines are prescribed as continuous welded HDPE pipes. The detailed designs shall enable sufficient deflection and elongation of the marine structures and pipes that may be caused by earthquake inflicted local ground acceleration. The design shall also enable reliable accessibility to all intake and marine pipe components.

This is particularly important for the currently proposed deep intake structure (140 m deep), since this would be substantially below the depth accessible for regular deep sea inspection divers (which is about maximum of 70 m deep). This would pose particular challenges during inspection or repair works, also after an earthquake occurred.

The BOT contractor would be advised also to consider in their designs the EN Eurocodes or similar international codes. These are a set of European standards which provide common rules for the design of construction works, to check their strength and stability against live and extreme loads such as earthquakes.

The seawater leakage risks and related groundwater monitoring and mitigation associated with seismic risks will be discussed in section 6.11

7.9.3 Flood risks

As described in section 5.9, the Southern Wadi Araba catchments includes some major wadi's that occasionally collect substantial amounts of rainwater, leading to floods in the direction of Aqaba. Hydrological analysis of the flood from Wadi Yutim (Febr 2006) indicated that this event could have an average return period of somewhere between 10 and 20 years, making it likely that such a major flood could again occur during the lifetime of the RSDS project. See also Table 19.

The northern parts of Aqaba are the most vulnerable regions for flood hazards. These areas contain all the town residential expansion area, the Aqaba International Industrial Estate, the King Hussein International Airport, and all the northern light industries and logistics areas. To address these hazards, a rain water diversion flood channel has been constructed along the northern Aqaba airport parallel highway which connects with Dead Sea-Aqaba road.

Figure 44 – A Flood Diversion Channel in Northern Aqaba

Also in the Northern Wadi Araba catchment typical flood risks occur, mainly connected to the numerous side wadi's crossing this section of Wadi Araba. These floods may be characterised as having peak flows of about 75 to 100 m3 /sec every 10 years, up to 150 – 200 m3 / sec every 50 years.

Flood management related actions under the RSDS project may include:

- Preserve flood management conditions of existing wadi drainage channels,
- If needed, construction of additional site drainage measures or even flood retention walls around key facilities in the Aqaba region
- Planting soils adjacent to key facilities to prevent erosion and sediments flows during floods
- Prevention of fuel or lubricant leakages during floods;
- Protection of storage areas for all fuel or chemical storage facilities
- Training and equipping relevant staff in safe storage and handling

In addition, the Aqaba Special Economic Zone Authority (ASEZA) has committed to address and manage the risk of flooding by providing protection against Wadi Yutum through the Aqaba Development Company. However, the BOT contractor is requested to confirm that the Aqaba Development Company has indeed taken the appropriate and timely measures in terms of effectiveness. If not, the BOT contractor is advised to propose the required measures well in advance of the construction and operational phases. See also letter below.

MINISTRY OF WATER AND IRRIGATION
Jordan Valley Authority

Ref. JVA/18/7/9863
Date 19/10/2016

The Joint Venture of:
Dar Al-HandasahConsultants (Shair and partners), Lazard Freres SAS, Gide LoyretteNouel, and Dar Al-Handasah (Jordan) Consultants
Fax +961 (0)1 869 026, +962 6 590 3040
P.O. Box: 11-7159, Beirut 1107 2230 Lebanon
E-mail: Jordan@dargroup.com

Project: The Red Sea – Dead Sea Water Project (Phase 1)

Subject: RSDS components Flood Protection

Dear Sirs,

Reference is made to ASEZA letter ref. no. 17224 dated on 10th Sep. 2016 concerning the above mentioned subject.

Please be advised that Aqaba Special Economic Zone Authority had already carried out the necessary preventive measures through Aqaba Development Company to limit the sudden risk of flood in the northern area which includes the corridor and the project intake pumping station, and you are requested to coordinate with Aqaba Development Company to check whether the measures taken by them are appropriate or not, otherwise to propose any additional measures necessary under the Red – Dead Project Scope of work to be included in the RFP documents.

Sincerely yours,

Acting Secretary General/ JVA
Eng. Fuad Eijilat

Figure 45 – Confirmation Letter regarding Flood Management in Aqaba

7.9.4 Human threats

The project is developed in a politically turbulent region, however security threats in Jordan are very well managed leading to considerable lower risks for events like sabotage compared to some of the neighbouring countries.

Nevertheless, considering the Middle East peace dividend foreseen under this project, this aspect might attract extremist groups aiming to commit sabotage. However not further elaborated in this ESIA, this aspect remains important in terms of security management and preventing uncontrolled public accessibility to the key project infrastructure facilities, to be managed by the competent Jordanian security authorities in co-operation with the BOT Contractor and operator.

It should be noted however that the majority of the pipeline will be located in the Jordanian security area policed by the Security Services, where people need permits to enter the area. Current measures also include anti-intruder sensors associated with fibre optic cables.

7.10 Climate and Air Quality

7.10.1 Climate impacts

Climate Adaptation

Section 5.8.1 indicates that the foreseen climate change related impacts in the project area underline the great importance of the RSDS project as potential and major provider on non-conventional potable water resources to the country. It also stresses that it climate change will make it even more important to protect the fragile groundwater resources in Wadi Araba against any type of pollution, including any potential seawater leakages from the RSDS project under all circumstances.

Climate adaptation also relates to the potential sea-level rise in the Red Sea during the lifetime of the RSDS project. Based on historic global IPPC sea level data (see Figure 46), this may be somewhere between 0.5 and 1 metre during the next hundred years, or up to 0.25 metres during the next 25 BOT concession years. The BOT contract is advised to include related adaptation measures in the design of the coastal intake facilities.

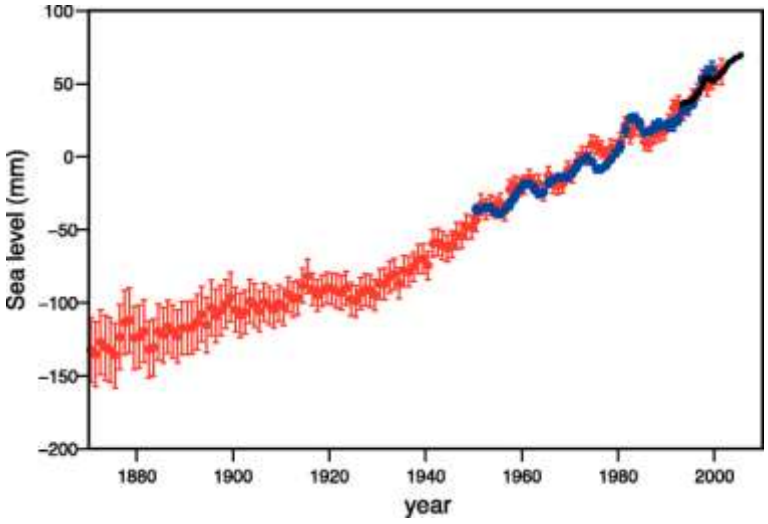

Figure 46 – Annual Average Sea level Rise (IPPC, 2007)

Climate Mitigation

The EIBs climate standards require that it's financing is aligned with EU climate policy. The EIB stipulates that climate change considerations should be taken into account at all stages of the RSDS Phase I Project cycle, in particular during the pre-appraisal and appraisal stage. When appraising the economic case for a project which results in a significant change in GHG emissions, as may be the case with energy, industry or transport projects, the EIB incorporates an economic cost of carbon.

The central value for a tonne of CO2-equivalent is currently approximately €30 per tonne (for an emission in 2013), rising to nearly €50 in 2030.

For Investment Loans and fully appraised allocations under Framework Loans, an assessment of the GHG emissions produced as a result of the RSDS Phase I Project, based on proprietary sector-specific methodologies, is systematically carried out and reported for projects emitting more than 100kt CO2eq/yr in absolute terms or leading to an emission variation of more than 20kt CO2eq/yr."

Type of GHG Emissions
Below figure illustrates the types of GHG related emissions that generally apply for major projects.

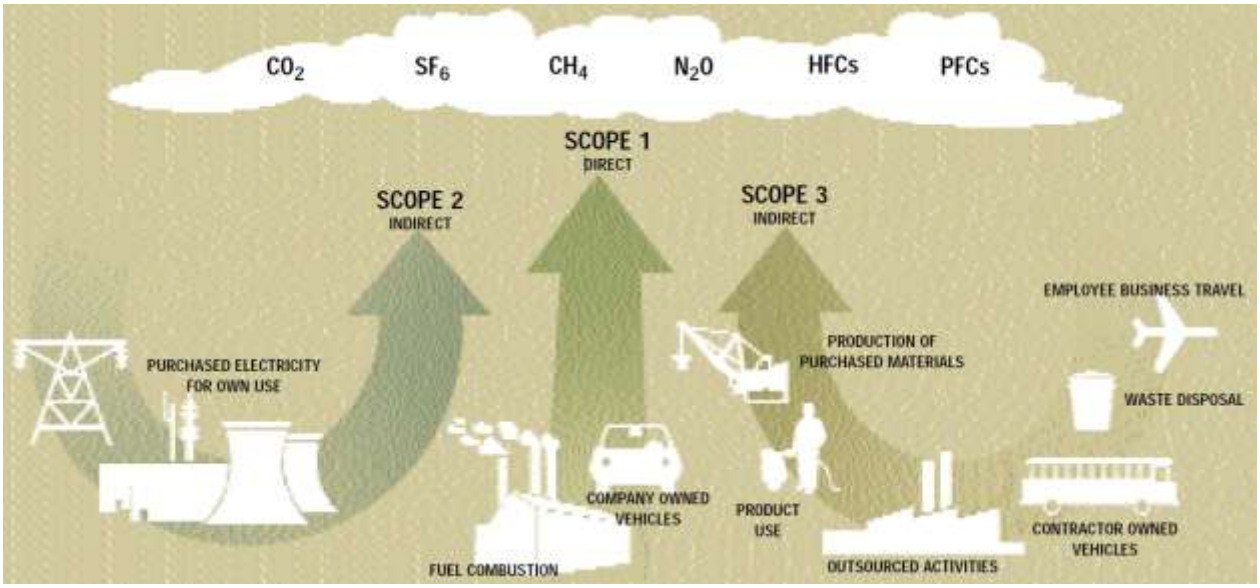

Figure 47 – Types of GHG emissions across a value chain (World Resources Institute)

Scope 1 relates to direct emissions from the construction or operation of the project, and includes for instance combustion, use of vehicles, furnaces and boilers. Scope 2 accounts for indirect GHG emissions from the generation of purchased electricity. These emissions occur at the plants where the electricity is generated. Scope 3 relates to other indirect emissions, such as related to the fabrication of purchased construction materials, use of externally produced items and services.

Scope 1 Direct Emissions

As the RSDS Phase I project's energy source will be electricity provided by NEPCO, there will be no direct emissions resulting from combustion of fuels in stationary sources, such as fossil fuelled turbines. The hydropower electricity will be generated from the kinetic energy of the flowing piped seawater, and will not subject to emissions either. However, there will be direct emissions as result of the combustion of fuels for transportation by ships, trucks and cars mainly during the construction phase of the project.

The total volume of materials to be transported for the construction of the RSDS Phase I project has not yet been determined; however the Bill of Quantities that will be prepared by the BOT contractor should give some indications.

In terms of steel pipelines, however, a reliable estimate of the total length to be constructed can already be provided (see figure 6). In total 240 km of steel pipes with diameters varying from 90 to 114 inch shall be provided to the project. Assuming one pipe section of about 15 m per truck load, this would require 16,000 truck movements between the Port of Aqaba to the project location with an average distance of about 200 km forth and back, or 3,2 Million km in total. This requires about 1 Million litres of diesel, generating about 4 Kton CO2eq emissions.

Consequently, measures to reduce these direct GHG related emissions during construction might include minimization of road transport requirements and related diesel consumption

Scope 2 Indirect Emissions

For the RSDS Phase I project, the purchased electricity represents one of the largest sources of GHG emissions and the most significant opportunity to reduce these emissions. The key source of GHG

emissions of the project during operations relates to the net power demand of the project, and to what extend the power will be generated by fossil energy sources.

Table 18 – Operational Power Demand RSDS Phase I Project

RSDS Project Component	Annual Water Flow	Power Demand
Intake pumping station	300 MCM / yr	17.0 MW
Booster pumping station	235 MCM / yr	20.0 MW
Desalination Plant	90 MCM / yr	32.0 MW
Power recovery HHPs (3x)	675,600 m3 / day	(minus) 33 MW
Total RSDS Phase I		**36 MW**

NEPCO will provide the power through the national grid, which is generated by a series of gas and oil fuelled power plants. Assuming full time (100%) operations of the above facilities against an emission of 703 gr CO2 / KWh, this leads to a total emission of 220 Kilo ton CO2eq/ yr in terms of GHG emission for the RSDS Phase I project.

The project design has not explicitly considered alternative non-fossil energy generation, such as the use of solar energy, which is an abundant energy source in Wadi Araba. However, the MWI expressed to be in the process of planning to construct a solar energy project in Wadi Araba covering an area of 800 dunum. Assuming for example a target of 30% sustainable energy supply under the RSDS Phase I project, using solar panels with an average generation of 120 KWh per m2 per year, this would require the development of about 78 ha (780 dunum) of solar parks adjacent to the project area.

Scope 3 Indirect Emissions
Scope 3 relates to other indirect emissions, such as to fossil fuel or electricity needed for the fabrication of purchased construction materials. This depends on the life cycle assessment of these products. Generally, these types of emissions can be reduced by recycling construction materials after their lifetimes. For instance demolition concrete, steel, asphalt and stone materials may be crushed and reused in the construction sector again. Particularly reusing of cement provides benefits, since one ton of cement production generates about 900 kg equivalent CO2 emissions.

7.10.2 Air Quality

The Jordanian 2005 regulation No 28 regulates the protection of air, as part of the 2003 Environmental Protection Law No. 1. Under this regulation, any Facility shall be obligated, when conducting its activities, to guarantee that there is no emission or leakage of Air Pollutants at a level that exceeds the maximum permissible level in accordance the Technical Standards.

The Ministry shall classify the facilities from which the Air Pollutants are emitted according to the type and quantity of the emitted pollutants and their effect on the Environment and public health, and shall also determine the areas subject to air pollution and the required monitoring programs, and the necessary procedures to control or prevent environmental damage. The location of a project must be suitable for the activity of the Facility such that it does not exceed the maximum permissible Air Pollutant emissions, and in all cases, the total amount of Air Pollutants resulting from the aggregate Facilities in a given area must exceed the limits permitted in accordance with the Technical Standards.

The RSDS Phase I project, during its operations, does not entail particular air emission related activities, which would lead to risks for surpassing the Jordanian ambient air quality standards. During the construction however, there are various risks associated to air emissions and pollution, which are addressed in below Construction Environmental and Social Management Plan.

7.11 Groundwater and Surface Water and Flood Risks

7.11.1 Groundwater impacts and protection

As discussed in section 5.9, the groundwater aquifers in Wadi Araba mainly consist of limestone, which are recharged by the winter rainfall. The boundaries of the commonly understood groundwater basins follow largely the surface catchment areas. According to the 2011 ESA the Dead Sea, North Wadi Araba and South Wadi Araba basins have 426, 31 and 54 operating wells, and are over pumped at rates of 148%, 138%, and 151% of the safe yield respectively. Due to the high dependence of these already very fragile groundwater resources in the region it will be of utmost importance to avoid any risk of groundwater pollution due to seawater leakage, incidental or large scale accidental, by the RSDS Phase I project under all circumstances.

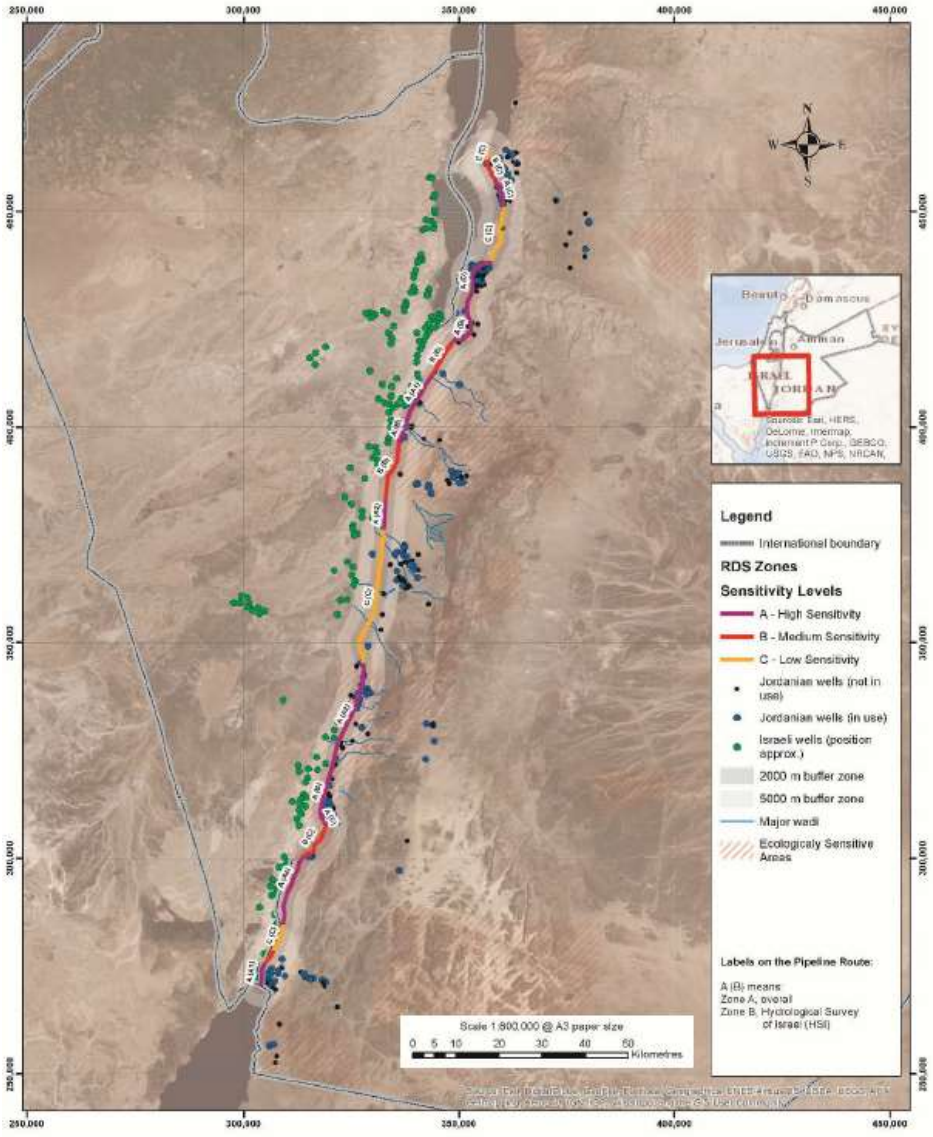

Figure 48 – Hydrogeologically sensitive zones along the Pipeline Route (Posch and Partners, annex 10)

Posch and partners analyses the occurrence of sensitive zones in terms of aquifers risks along the pipeline route and distinguished three different categories (see Figure 48):

- High Sensitivity zone (A2) – 45km (21%): Corridor infrastructure directly on alluvial sediments above the active aquifer, relatively close distance to active production wells downgradient. Pipe leak or burst will have direct influence.
- Medium Sensitivity zone (B) – 52.5km (25%): Corridor infrastructure directly on alluvial and clay sediments above the active aquifer, relatively far distance to active production wells downgradient. Pipe leak or burst will probably not have an immediate influence.
- Low Sensitivity zone (C) – 97.5km (45%): Corridor infrastructure directly on clayey alluvial sediments with no active aquifer, relatively far distance to active production wells downgradient. Pipe leak or burst will probably not have an immediate influence.

Several means to eliminate, reduce and control leakage of seawater the conveyance pipeline have already been incorporated into the preliminary scheme design, including:

- Steel pipes will have internal lining made of polyurethane / epoxy; and will be externally coated with a three layer polyethylene / polyurethane to isolate from the external corrosive environment.
- Steel pipes will have built in cathodic protection to prevent corrosion.
- The pipe trench will be lined with an impervious synthetic membrane to collect potential background leakage and convey it into collection chambers located at low point on the pipeline profile.
- Special arrangements will be applied where the pipe crosses fault areas, including the use of special flexible couplings which allow deflection and elongation of the pipe during a seismic event. In fault areas, the pipes will be installed in concrete boxes to allow for easy inspection and access.
- To prevent leakage to the subsoil, the pipes will be buried in a trench under a cover of 2 m of backfill materials. The trench will be lined with an impervious synthetic membrane. At regular intervals and preferably at topographically low points, any leakage that accumulates inside the trench liner will be reintroduced into the conveyance system. Any rainwater or surface water that accumulates inside the trench will be pumped out and may either be discharged to the ground surface or may be introduced into the conveyance system in a similar manner to any leakage.
- In addition, there will be operational rules to avoid transient pressure fluctuations which might cause a breach.

To limit the effects of this type of leakage the pipeline will be divided into sections, by the provision of in-line valves at regular intervals. These valves will be connected to an instrumentation and control system that immediately identifies any abnormal changes in flow or pressure and shuts the isolation valves in such an event.

In addition, Posch and Partners (annex 10) propose the following protective measures:

- Install a trench lining system for the entire conveyor system to reduce as much as possible the long term deterioration in groundwater quality in the alluvial aquifer, even in sections which are currently classified as C; including the section between Km 165 and Km 211.
- Install plastic drains in the lined pipe trench with slots of say 2 mm slot width to keep out the fines from the granular fill. The key advantages of drains are:
  - The head of the brines over the HDPE liner will be minimized, thereby reducing losses through the liner.
  - The outside of the pipeline will not be submerged in brine and thereby reduce corrosion risks.

7.11.2 Groundwater monitoring

A separate Hydrogeological study by Posch and Partners has been performed (annex 10) to assess whether above protection measures are sufficient to protect the sensitive groundwater aquifers in Wadi Araba adequately. The study formulates additional measures, including related monitoring requirements.

In terms of groundwater monitoring the following is suggested:

- *Well Set Up:* Establishment of a number of monitoring wells at strategic locations along the seawater conveyance, in both Jordan and Israel, to be determined following the Hydrogeological Study. The existing wells used for abstraction on both the Jordanian and Israeli sides of the border could be included in this Plan.
- *Well Locations*: Locations to be determined following the Hydrogeological Study. Posch and Partners suggest monitoring wells to be established every 5 km along the pipeline route, or approximately 40 wells in total (annex 10).
- *Parameters:* Monitoring of groundwater levels, quality, salinity and Sulphate levels: the balance of Sulphate ions in the Red Sea water may be different than in the groundwater and may act as a tracer to determine the ingress of seawater into the aquifer

- *Frequency:* Samples to be taken monthly, unless there are indications of seawater leakage
- *Responsibility:* The Project Owner (MWI) should commission this, possibly through the BOT Contractor / Operator.
- *Reporting:* The data should be made available to the Environmental Regulator and local stakeholders, such as agricultural communities in the area.
- *Phasing:* Monitoring should commence before construction and be carried out during and after construction. Ideally, pre-construction monitoring should begin several years before construction, to provide an adequate baseline. Pre-construction monitoring can be linked with the Hydrogeological Study.

Posch and Partners furthermore suggest installing ultrasonic flow meters and pressure loggers along the pipeline. The smaller the spacing, the higher is the probability of determining the location of leaks (see next chapter). Ideally, they are installed in distances of about 10-15 km. Certainly they are needed at every facility (IPS, SWRO, BPS, HLRR, HPP 1, 2 and 3 and DC). The disadvantage is that they need power supply. The sensors shall be connected to the SCADA system. It is recommended to use 4-channel flow meters (having 4 sensors attached to the pipe) which allows achieving an accuracy of 0.5% if the sensors are professionally installed, calibrated and optimally linked and correlated to each other. Data recording should be in 50 millisecond intervals.

7.11.3 Emergency Response Planning for Seawater Leaks

In addition to above groundwater monitoring, an Emergency Response Plan should be designed, based on the Hydrogeological Study, and in conjunction with the design and operational procedures of the Scheme. This plan would be implemented if major leakage of seawater from the system is suspected due to operational failures, or major accidents such as earthquakes or sabotage.

The plan should include the following measures, to be adopted where appropriate:

- A procedure for shut down of the pump and closure of valves along the pipeline;
- investigations to determine source of leaks, possibly involving pipeline inspections or injection of tracer to the pipeline;
- immediate isolation of parts of the conveyance where leakage is thought to have originated;
- means to hydraulically isolate sensitive areas of ground, e.g. by pumping from wells and discharging back into conveyance; and
- Means to remove polluted groundwater –by installing wells to pump out contaminated water and control further migration.
- The Plan should also define responsibilities and reporting protocols.
- Responsibility: The BOT Contractor / Operator should commission this in co-operation with the Project Owner (MWI) and the Ministry of Environment (MoEnv)

In addition, Posch and Partners suggest a series of technical emergency devises and measures to mitigate catastrophic seawater / mixed water leaks, which have been elaborated in annex 10. These include the application of Butterfly emergency valves; spring/loaded air valves; dismantling piece; plunger valve for pressure relief and discharge pipe to the brine collection pond; earthquake mitigation instrumentation; a storage pond with stilling function for brine ejected from the plunger valve and related manhole accommodations (see details in section 4.3.3, annex 10),

However, it should be noted that residual risks and impacts on the groundwater systems cannot be avoided. Posch calculated, based on a combination of technical and economic considerations, that the optimum spacing of the emergency valves would be 6.8 km for the South section, corresponding to a spill volume of 62,000 m³. In case of a catastrophic failure, the estimated damage caused would be about

M€11.2 in this southern section. The economic optimum spacing of the emergency valves for the Northern section of the pipeline would be 9.0 km, corresponding to a spill volume of 45,000 m³. In case of a catastrophic failure, the estimated damage caused is about M€ 14.5 in this northern section.

In case of such a catastrophic failure, the mentioned spill seawater would be discharged into the Wadi Araba aquifer system, which would mix with the relative fresh natural groundwater. Due to the high salinity levels of the spilled seawater and/or brine water, PAP calculated a groundwater contamination factor of 133 for brine and 70 for seawater. Considering the current salinity levels in 158 wells located within 20 kilometres of the pipeline axis, this means that one cubic metre of brine would effect on average 133 m3 of groundwater to the extent that it could no longer be used for its current irrigation purpose.

Theoretically, about 250,000 m3 of fresh water may be needed to flush the polluted groundwater in order to re-establish more or less the original groundwater quality. However, this will pose a series of technical constraints that will be difficult to overcome. The total cost for groundwater rehabilitation could be up to 15 M€, and will likely take some years before completed. Afterwards, still pockets of saline groundwater may be expected in geological sub-formations with low permeability. These costs do not take into account the compensation required to farmers and other users of the groundwater system who will not be able to continue pumping during the rehabilitation period.

This ESIA therefore concludes that the risks and impacts of a catastrophic seawater leak will remain an integral aspect of the RSDS project.

7.11.4 Flood Risks

Hydrological data and analysis of the flood that originated in Wadi Yutum and flooded Aqaba on the 12th of February 2006 indicated that this event could have an average return period of somewhere between 10 and 20 years, making it likely that such a major flood could again occur during the lifetime of the RSDS project. Further analysis under the 2011ESA resulted in the following calculated return periods for different types of floods in Aqaba.

Table 19 – Indicative return periods of different floods in Aqaba

Estimated Flood Peak Flow	Return Period in years
100 m3 / sec	2
350 m3 / sec	5
500 m3 / sec	10 - 20
1100 m3 / sec	50
1500 m3 / sec	100

Also in the Northern Wadi Araba catchment typical flood risks occur, mainly connected to the numerous side wadi's crossing this section of Wadi Araba and the suggested RSDS pipeline route from east to west. In addition, the northern part of the valley, near to the Dead Sea Discharge point, may be affected by large floods emanating from the Wadi Araba / Arava flowing northwards towards the Dead Sea. These floods may be characterised as having peak flows of about 75 to 100 m3 /sec every 10 years, up to 150 – 200 m3 / sec every 50 years.

Flood management related actions under the RSDS project may include:

- Preserve flood management conditions of existing wadi drainage channels,
- If needed, construction of additional site drainage measures or even flood retention walls around key facilities
- Green Planting adjacent to key facilities to prevent erosion and sediments flows during floods. Planting should be consistent with existing ecosystems, and will require water supply and transport
- Prevention of fuel or lubricant leakages during floods;
- Protection of storage areas for all fuel or chemical storage facilities
- Training and equipping relevant staff in safe storage and handling during flood events

7.12 Socio-Economics, Quality of Life, Values

7.12.1 Socio-economic impacts

Section 5.10 presented the social baseline relevant to the RSDS Phase I project. Figure 19 shows the main communities located along the scheme of the RSDS Phase I Project. Annex 1 provides the stakeholder Engagement Plan for the RSDS Phase I project prepared by Posch and Partners. Annex 8 includes a full description of the socio-economic assessments and related compensation and mitigation framework performed by the Consultants since January 2017. Annex 9 presents the principles of the proposed Land Acquisition and resettlement Policy Framework, as well as the draft policy framework prepared by Dar Al-Handasah and partners (2016 ESA).

The total number of households living in the communities along the scheme as of December 2015 is 11,160 composed of 64, 371 family members of which 33,904 are males and 30,467 are females. Table 20 also shows that 88% of the total population are Jordanians and the remaining 12% are non-Jordanians (mainly Egyptians working in the farms). The data also show that 70% (majority) are urban despite the fact that much of the area located in the southern Ghors is agricultural lands specialized in vegetable production and smaller amount of fruit trees.

Table 20 – Total population along the scheme of the RSDS Phase I Project

District	Locality	Male	Female	Total	Households
Nationality	Jordanians	28,265	28,197	56,462	11,160
	Non-Jordanians	5,639	2,270	7,909	
Total	Total	**33,904**	**30,467**	**64,371**	
Urban vs Rural	Urban	23,417	21,325	44,742	
	Rural	10,450	9,179	19,629	
Total				**64,371**	

Table 21 shows a detailed updated population numbers and social profiles of all of the communities along the project alignment, including their socio-economic situation. This table shows that about one-half of the population is living in Safi area (52%), while the remaining living in Ghawr Almazra'a (33%) and in Wadi Araba (15%).

Table 21 – Characteristics of population along RSDS Phase Project in Wadi Araba / Aqaba Governorate

District	Sub-District	Locality	Male	Female	Total	Households
Aqaba	Wadi Araba	Reisheh	1,309	1,162	2,471	445
		Qraiqreh	2,071	1,880	3,951	722
		Rahmah	675	679	1,354	270
		Beir Mathkoor	424	427	851	153
		Qatar	90	76	166	38
		Fienan	328	289	617	123
		Badou Abu Khushibeh	54	40	94	19
Total			4,951	4,553	**9,504**	1,770
Nationality		Jordanians	3,777	3,681	7,458	
		Non-Jordanians	1,174	872	2,046	
Total		Total			**9,504**	
Urban vs Rural		Urban	-	-	-	
		Rural	4,951	4,553	9,504	
Total					**9,504**	

*Table 22 – Characteristics of population along RSDS Phase Project in Ghawr Safi until Salmani **/2015***

District	Sub-District	Locality	Male	Female	Total	Households
Aghwar Janoobiyah (South Ghwars)	Safi	Ghawr Safi	14,478	12,826	27,304	4,715
		Ghawr Faifa	1,587	1,407	2,994	485
		Mamorah	1,071	778	1,849	371
		Salmani	32	24	56	11
		Gwiebeh	660	645	1,305	177
Total			17,828	15,680	**33,508**	5,759
Nationality		Jordanians	14,886	14,822	29,708	
		Non-Jordanians	2,979	821	3,800	
Total		Total			**33,508**	
Urban vs Rural		Urban	14,478	12,826	27,304	
		Rural	3,350	2,854	6,204	
Total					**33,508**	

Table 23 – Characteristics of population along RSDS Phase Project in Ghawr ALmazra' a until Blaidt Hadiethah

District	Sub-District	Locality	Male	Female	Total	Households
Aghwar Janoobiyah (South Ghwars)	Ghawr Almazra'a	Ghawr Almazra'a	6,338	6,028	12,366	2,103
		Ghawr Hadiethah	2,601	2,471	5,072	846
		Ghawr Dra'	1,083	912	1,995	374
		Ghawr Assal	299	279	578	95
		Blaidt Almazra'a	202	1	203	5
		Blaidt Hadiethah	565	580	1,145	208
Total			11,088	10,271	**21,359**	3,631
Nationality		Jordanians	9,602	9,694	19,296	
		Non-Jordanians	1,486	577	2,063	
Total					**21,359**	
Urban vs Rural		Urban	8,939	8,499	17,438	
		Rural	2,149	1,772	3,921	
Total					**21,359**	

As shown in Figure 19, there are many communities located along the alignment of the pipeline and the in the schemes that will be constructed such as the pump stations, the hydropower stations, the RO desalination plan, the intake point and the high reservoir. Identify and confirm the land ownership situation along the alignment of the project.

JVA experts has provide the study team with their estimates of affected land parcel along the scheme's new alignment. The BOT Contractor will elaborate the detailed designs within dedicated buffer zone assigned for the pipeline and related facilities. The JVA calculated the impacts of different buffers for the project: 150m including permanent and temporary land take, as well as rights of way:

- If the buffer zone is assumed 100 m wide, then the total land take for the RSDS Phase I project will be around 2,100 ha (21,000 dunum) and the total number of affected parcels would reach to about 650.
- If the buffer zone is assumed 150 m wide, then the total land take for the RSDS Phase I project will be around 3,200 ha (32,000 dunum) and the total number of affected parcels would reach to about 1000.
- If the buffer zone is assumed 300 metre wide, then the total land take for the RSDS Phase I project will be around 6,400 ha (64,000 dunum) and the affected parcels number would increase to 1471.
- Once constructed, the permanent land take of the RSDS Phase I project is estimated to be around 880 ha (8,800 dunum) according to Dar Al-Handasah and partners (2016 ESA).

Table 24 - Affected parcels by the RSDS Phase I project (source: JVA)

Assumed RSDS Impact zone (m)	Streets (#)	Residential plots (#)	Agricultural Plots (#)	Other private plots (#)
300 m	241	805	335	90
150 m	152	565	206	80

Annex 1 presents the project affected people in terms of communities, groups and individuals subject to land acquisition and potential economic displacement by the Project that will be directly affected by the project; and residents, businesses, officials who may be indirectly affected by the infrastructure development, or potentially negative environmental impacts related to the intake at the Red Sea, the aquifer monitoring or the discharge in the Dead Sea.

The stakeholder identification in annex 1 also targets vulnerable groups of the local communities. Vulnerable groups are project specific and depend on a range of issues which must be understood such as project location, socio-economic and demographic context, as well as the nature of the development and type of impacts anticipated. The identified vulnerable groups are the following:

- Women in Wadi Araba who have low education levels, limited livelihood options and normally no land ownership (particularly female headed households with no land ownership, and who because of cultural norms in local rural communities hold limited participation in decision-making;
- Landless poor in parts of Aqaba who do not own the land they live on and experience high unemployment rates and poverty;
- Farmers in the Southern Ghors area who face challenges associated with seasonal variability of rainfall and have few alternative livelihood options;
- Youth and unemployed in Wadi Araba;
- Syrian refugees in host communities within the project area.

The full list of governmental and non-governmental stakeholders who may participate in the implementation of the project are listed here as well, including their potential concern or interest in the project and proposed communication tools. The Stakeholder Engagement Program is presented in table 6-1 of annex 1.

A series of social ‘constraints maps’ have been produced (see annex 8) for the present project based on the route alignment provided by DAR. Cadastral maps from the Department of Lands and Survey (DLS), digitized maps provided by JVA and field visits to the sites along the alignment were used to verify the land ownership and the expected socioeconomic impacts of the project. The key socio-economic impacts associated with the RSDS Phase I project are, separate from the land take and related expropriation and compensation aspects, are the positive impacts in terms of employment opportunities during construction and operations. Impacts on local marine livelihoods during construction will be limited since the pipeline route inside the sea is very close to "sea border" which is a closed area. An overview of the anticipated socio-economic impacts is provided in Table 25.

Table 25 – Socio-economic impact table

Social and socioeconomic Impacts	Measures	Organisation / Management Plan	Responsi-bilities	Planning /timing	Costs
Keeping stakeholders informed	Communications and Engagement Strategy for the Scheme. The focus of this should be on prior information about the Scheme, its components, potential impacts and proposed mitigation and enhancement measures.	Social Management Plan for the Scheme	Construction Contractor and Project Owner	Prior to construction and then throughout the life of the project.	No incremental cost
Potential benefits of local employment in the Scheme area	The contractor(s) will clearly communicate the recruitment plan for the construction and operations of the RSDSC, using methods such as adverts in daily papers, adverts in local municipalities and CBO offices or notice boards in local recruitment/job centers. In order to ensure more marginalized groups are provided with employment opportunities the SEP needs to contain clear measures to consult directly with these groups.	Social Management Plan for the Scheme and Procurement Policy	Construction Contractor and Project Owner	Prior to construction and then throughout the life of the project.	No incremental cost – part of recruitment process
Complaints, enquiries and concerns regarding the Scheme.	Grievance mechanism: The contractor(s) will have a clear mechanism in place to manage all grievances including those related to employment, marine livelihood, workers conduct, impacts on herding along the alignment, compensation payments for negatively affected people due to physical damages including leakage from the scheme.	The Public Consultation and Communication Plan	Construction Contractor	Throughout the life of the project.	No incremental cost – part of stakeholder engagement activities

Social and socioeconomic Impacts	Measures	Organisation / Management Plan	Responsi-bilities	Planning /timing	Costs
Potential access issues for fishermen and other boat operators around the planned intake works.	Information on planned works and scheduling will be made available to local stakeholders in advance of construction works. Information will be made available in publically accessible places (e.g. in daily newspapers, in local municipalities and CBO offices or notice boards close to the proposed construction site)	The Public Consultation and Communication Plan	Construction Contractor	Prior to construction	No incremental cost – part of stakeholder engagement activities
Concerns about leakage from the conveyance and impacts on groundwater.	The construction contractor will have early engagement with the local communities to clearly explain the mechanisms built into the design to prevent leakage in the pipeline or tunnel, as well as the additional monitoring programme that will be in place to check for leakage. The results of this programme will be communicated to the local communities on a regular basis using methods such as community meetings, information pamphlets distributed within the communities etc.	The Public Consultation and Communication Plan	Construction Contractor	Prior to construction	No incremental cost – part of stakeholder engagement activities

7.13 Noise and Vibration

Expected impacts in terms of noise and vibration have been described adequately in the final ESA 2014 [lit 13]. However, a major source of noise was considered to be generated by the tunnel construction, which does not form part of the current RSDS Phase I project. No particular noise or vibration emissions are foreseen during the operational phase.

Noise and vibrations will be produced by the various construction plant and operations, including: transport and delivery of personnel, plant, equipment and material at ports, by road, and at the various worksites and at the various; workers' camps; fabrication of equipment and infrastructure; desalination plant site; hydropower plant sites, pumping stations and reservoir; manufacture of materials, including pipeline manufacturing plant, concreting plants, pipelaying and spoil disposal.

As described in sections 6.7 and 6.8 above, it will be crucial to limit noise and vibration impacts particularly near to sensitive ecological and bird areas and near to archaeological sites. Furthermore the contractor will be required to use 'best practicable means' (BPM) approach to minimise nuisance from noise and vibration in general. Reference is made also to the UK EPA, which defines "best practicable means" as follows: (a) 'practicable' means reasonably practicable having regard to local conditions and circumstances, to the current state of technical knowledge and to the financial implications; (b) the means to be employed include the design, construction and operation of project facilities, including buildings and structures.

7.14 Traffic, Communications and other Infrastructure

The construction works, especially of the pipelines, desalination plant, booster power station, hydropower plants and Dead Sea discharge will likely impact the traffic in Aqaba and access roads considerably. Traffic congestion may hamper the flow of vehicles through the city of Aqaba and near to the construction sites along the Highway.

The transportation and use of construction equipment and material by heavy vehicles over public roads creates health & safety risks for the communities. The risk of traffic accidents between construction vehicles and local traffic is not imaginary. The construction works, especially for the above facilities takes place on open work yards and will temporarily change the local traffic situation, increasing a risk of traffic accidents, as people are not familiar with the changed situation.

It will be required that the contractor will develops an adequate construction traffic management plan, dealing with these issues, which will likely have to be approved by the competent authorities. As described in sections 6.7 and 6.8 above, it will be crucial to limit traffic related impacts particularly near to sensitive ecological and bird areas and near to archaeological sites. In addition, construction vehicles will only be allowed to use local roads where they are paved, have sufficient capacity and where it has been shown that local users will not be unduly inconvenienced.

Additional infrastructure required during the construction works include: Workers accommodation; Access roads (will also be used during operations) and site access; Construction sites incl. storage and parking; and temporary infrastructure, such as pipeline manufacturing plant, administrative offices, wells, and batching plants.

As stipulated in the 2016 ESA, the location of construction sites can usually be adjusted to accommodate any environmental or social constraints there may be in the surrounding area. In general, locations will be

preferred that comprise undeveloped and unused land, mainly desert or mountainous terrain, and are owned by the Government.

However, in circumstances where land will be needed that is currently in use arrangements will be made to preserve essential access and rights of way during the construction period and to compensate owners and users for any economic losses they may suffer.

After use for construction, most sites will be restored to their original condition. Exceptions may be accepted where, after consultation with the relevant authorities and stakeholders and within the existing security regulatory framework, a decision is made to hand over the facility (for example a road, well, or building) to be maintained for the use of the local population.

In terms of communication, the BOT Contractor is advised to be courteous at all times when dealing with the neighbouring community and their rights need to be respected at all times. A complaints register should preferably be kept on site and the Contractor must attend to any public complaints as soon as possible. No interruptions other than those negotiated shall be allowed to any essential services, including access to water sources and local infrastructure.

Damage to local infrastructure shall not be tolerated and any damage shall be rectified immediately by the Contractor. A record of all damages and remedial actions shall be kept on site. Where possible, job vacancies should be provided to local community members, in order to transfer employment skills. The Contractor will need to engage with the municipal local Councillors or other community leaders to assist with the recruitment of the local unskilled labour when required.

7.15 Solid Waste Management

The impacts and principles of solid waste management related to the RSDS Phase I Project have been accurately described in the final ESA 2014 [lit 13].

Waste generated during construction is classified into four categories for disposal as shown below. Appropriate measures for the handling, storage and disposal of wastes will be the responsibility of the BOT Contractor.

The following waste categories shall be considered:

- *Inert construction wastes:* These include any earth (not including excavated material, which is destined to be backfilled when the area is restored), building rubble, unused construction material etc. generated during preparation and restoration of worksites. These wastes poses no risk of pollution, but may be unsightly and need to be disposed of at a controlled disposal site. Dredged material from the area of the Gulf of Aqaba selected for the seawater intake may be inert sand or gravel or may be contaminated due to past pollution. Such waste will be classified when it is generated, either as inert construction waste or special waste. It is noted however that the RFP assumes that any excess material created by the trench excavation shall be spread over the pipeline reserve with the ‘topsoil’ spread over the top.
- *Domestic waste:* The offices and administration buildings associated with the worksites (as well as the workers’ camps) will generate small amounts of ‘domestic’ type of waste (i.e. food waste, paper and packaging etc.). This will be transported to a controlled municipal waste disposal site.
- *Oily and special (e.g. hazardous) wastes:* There will inevitably be wastes generated during construction that need special handling and treatment. These will include the oily wastes associated with vehicle maintenance (waste oil, material collected from waste water interceptors

etc.); unused or waste chemicals, paints and solvents); and, any other wastes, sludge's or debris that are unsuitable for disposal in a municipal type landfill. Such wastes will be carefully segregated for collection and disposal by specialist contractors at sites that are equipped and approved for such wastes.

- *Wastewater:* Typically around 30 m3/day of wastewater will be generated by a workers camp of about 200 persons. Given the indicative location of the camps, it is anticipated package sewage treatment plans (STPs) or septic tanks/leaching fields will most likely be established to collect wastewater at all locations. At the end of construction drainage / removal of the septic tanks will be undertaken by licensed waste handlers and disposed of appropriately.

7.16 Community Health

Part of the construction works will take place in the public space, especially the construction of the pipelines, desalination plant, booster power station, hydropower plants and Dead Sea discharge. The areas of the intake, desalination plant, booster power station, hydropower plants and Dead Sea discharge will need to be fenced off from public access to avoid people falling into holes, pools or ditches or face collisions with construction equipment.

In addition, the BOT Contractor is advised to coordinate and implement an awareness campaign on HIV and Aids, Ebola and other potential sicknesses within the project area, also as result of contacts between the construction work force and the neighbouring communities. The campaign should aim at sensitizing the construction workers and neighbouring communities to potential health risks and regulating behaviour. The consumption of alcohol and drugs by construction workers and employees must be prohibited on and surrounding the construction areas.

7.17 Occupational Health and Safety

Throughout the construction phase there are important health & safety risks for the workers, such as risk in the use of heavy equipment for digging, lifting or transportation, and related accidents. Transportation of construction material and equipment poses another risk. Part of the works take place in the public space, where normal vehicles pass by and where risks of accidents arise.

A health and safety plan shall be drawn up by the BOT Contractor to ensure the safety of workers. Contractors shall ensure that all equipment is maintained in a safe operating condition. A record of health and safety incidents shall be kept on site. Any health and safety incidents shall be reported to the Employer immediately. First aid facilities shall be available on site at all times. Workers have the right to refuse work in unsafe conditions. Material stockpiles or stacks shall be stable and well secured to avoid collapse and possible injury to site workers.

Personal Protective Equipment (PPE) shall be made available to all workers and use of PPE shall be made compulsory. The minimum PPE includes:

- Hard hat
- Safety shoes
- Overalls
- Gloves

7.18 Transboundary Impacts

Transboundary impacts of the RSDS Phase I project relate to groundwater impact in case of major contamination due to seawater leakages, all impacts related to the Red Sea and Dead Sea as a transboundary World Heritage, potential climate and GHG related impacts and potential impacts on migratory birds and trespassing fauna in Wadi Araba. These impacts have all been described previously in the various subject sections in this chapter.

Rules and guidelines for management of these impacts have been included in the:

- Berlin Rules on Water Resources, 2004;
- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991);
- Regional Convention for the Conservation of the Red Sea and the Gulf of Aden (Jeddah, 1982);
- Convention on Biological Diversity (UNCBD, 1992);
- Convention of Migratory Species (Bonn); and
- Framework Convention on Climate Change (UNFCCC, 1992).

7.19 Cumulative Impacts

The cumulative impacts for the RSDS Phase I project have been adequately described in the final ESIA 2014 [lit 13], particularly in section B8.

Two projects that could potentially lead to cumulative impacts in conjunction with the RSDS Phase I project are the: Ayla Development Project in Aqaba, located directly east of the proposed RSDS intake locations; and a separate project that shall be developed to convey the produced potable water from the Jordanian Delivery Point near the from the RSDS Phase I Desalination Plant to the Aqaba High Terminal Reservoir. See also section 1.9.

The Ayla project is particularly important since it involved abstraction of large quantities of seawater from the Gulf of Aqaba and Eilat as well, leading to potential cumulative impacts in terms of marine sediments and ecology.

Consequently the BOT contractor is advised to involve Ayla during the design stage of the structures intake, marine pipelines, pump station and discharge pipes, and the equipment mobilisation and earthmoving stages to avoid any negative impact on the Ayla Development Project and to avoid any potential claims by Ayla during and following the construction stage.

It is furthermore advised to inform Ayla on the mitigation measures taken to avoid sediment settlement that would affect Ayla's existing pumping station and discharge pipelines that are parallel to the RSDS pipelines. For example, using sheet piles during construction of the pumping station and parts of the pipeline and intake lines could mitigate potential concerns.

It shall be noted that the foreseen RSDS Phase I water supply for Aqaba will not need extension of wastewater treatment capacities in Aqaba, since the RSDS water will replace the current DISI water supply, which will be transferred to Amman after completion of the RSDS Phase Project.

7.20 Residual Impacts

Residual impacts following the implementation of all suggested mitigation measures relate to limited residual impacts on the Red Sea marine environment as result of the seawater abstraction; the continuing, although reduced decline of the Dead Sea water level, the permanent land take and land use changes caused by the project, and the GHG and climate change related impacts caused by the fossil generated power consumption during operations of the project.

However, a major residual environmental risk relates to seawater leakage into the Wadi Araba groundwater system in case of catastrophic failure of the pipeline. As explained in section 6.11.2 about 80,000 m3 of seawater would be discharged into the Wadi Araba aquifer system. It would require the immediate action and flushing of the polluted groundwater system using about 250,000 m3 of fresh water. The total cost for groundwater rehabilitation would be at least 15 M€, and will likely take some years. Afterwards, still pockets of saline groundwater may still be expected in geological sub-formations with low permeability. These costs do not take into account the compensation (economically, alternative water supply) for farmers and other users of the groundwater system who will not be able to continue pumping during the rehabilitation period.

Residual impacts after the lifetime of the RSDS would relate to remaining project facilities, stockpiles and any soil or groundwater pollution near the project sites. In this respect the final decommissioning phase of the project would have to include the following:

- Dismantling and removal of surface and subsurface structures and materials associated to the RSDS project. However dismantling of the 220 km buried pipeline would not be required due to low associated residual risks and high costs.
- This would preferable include crushing, reuse and recycling of construction materials, such a used steel and concrete. This would reduce the overall climate and GHG impacts of the RSDS project in retrospect
- Any soil or groundwater pollution shall be rehabilitated before decommissioning of the Project
- Landscaping and replanting after decommissioning
- Final decommissioning and environmental rehabilitation report shall be made and legalised. This enables legal transfer of land ownership while ensuring Indemnity of project promoter / MWI against environmental claims due to the decommissioned RSDS project
- Any new landowner shall arrange for environmental and social safeguards and permits related to new land use plans

Significant terrestrial residual impacts would be any impacts in terms of flora and fauna that cannot be mitigated after construction and during operations of the RSDS Phase I project. Particularly any destruction and removal of acacia trees in the sensitive Bir Mathkour area would be a significant impact to be compensated.

Another sensitive area that the pipeline passes is the Finan-Ghieba area, which is a crucial area for desert birds to breed. It has been advised in this ESIA to change the pipeline route closer to the existing road to minimize the threat to the desert breeding bird's nests. If decided not to adopt this route change, it is required as a minimum to avoid construction and disrupting activities during the main breeding and nesting season from March until May. However, if neither of the measures would be implemented during the project and construction implementation, another significant terrestrial residual impact would be created that requires compensation.

In terms of marine residual impacts, this ESIA concludes that the potentially a significant marine ecological impacts may occur due to disruption of the seagrass along the coastline near Aqaba during construction of the marine intakes, since seagrass plays a crucial role in the biological reproduction of marine flora and fauna.

To what extend the entrainment of vertebrate and invertebrate fish larvae's by the intake heads shall be considered significant or not have extensively been studied and described in the separate Intake Alternatives Study Report, which was issued in draft in November 2017. Potential offset measures are discussed in below section 7.21

7.21 Offsetting Residual Ecological Impacts

7.21.1 Introduction

In accordance with IFC Performance Standard 6 on Biodiversity Conservation and the Sustainable Management of Ecosystem Services and Living Resources, biodiversity offsets are to be identified as measurable conservation outcomes resulting from actions designed to compensate for significant residual impacts arising from project development that persist after appropriate avoidance, minimization and restoration measures have been taken. Offset measures generally do not need to be implemented within the project site.

This section proposes offset measures for both the terrestrial and marine ecological and residual impacts as described in detail in annexes 5 and 6 of the ESIA.

7.21.2 Offsetting Terrestrial Ecological Impacts

A terrestrial ecological offsetting strategy is required where compensation is the only viable option to address impacts to natural heritage features. It will be the responsibility of the developer or proponent to develop and implement this strategy. The strategy must demonstrate how the loss of natural heritage feature will be compensated for and that this offset will result in a "net gain" of natural heritage features.

Particular any destruction of acacia trees along the pipeline route, or other deep-routed vegetation is significant, due to the fact that these type of trees require many years to reach their stable deep root structure, often more than 30 m deep in Wadi Araba, to allow them to sustain in an arid environment. This is also the reason why replanting existing trees is not a feasible option. Realistic offset measure would therefore be to plant news acacia trees in relevant part of Wadi Araba, about 5 trees for any existing tree removed, and water them artificially at least some years to enable their roots to reach sufficient deep depth.

Acacia requires full sunlight and grows in soil that is highly alkaline or acidic. Although acacia prefers well-drained soil, it tolerates muddy soil for short periods of time. During the first year, the replanted trees require orchid fertilizer every three to four weeks. After that time, the trees need general purpose fertilizers once every year, and require small amounts of water only. The trees may need occasional pruning during the dry summer months. Although the acacia tree is generally disease-resistant, it can sometimes be affected by a fungal disease known as anthracnose. Additionally, watch for pests such as aphids, thrips, mites and scale will also be required and treated. It is estimate that offset costs may reach around 100,000 JD, however depending on the number of trees involved.

If required, bird augmentation may be required if significant construction works are implemented during the breeding season from March until May, particularly in the Finan-Ghieba area. If required, nest boxes should be added to trees once that have reached a sufficient size, to accommodate a suite of fauna species that occur in the reference woodlands. A full set of monitoring and compensation measures may cost up to 421,000 JD as a first estimate, as specified below.

Table 26 – Cost estimates of Offsetting Residual Terrestrial Ecological Impacts

Offset Action	Monitoring and research	Phase	Responsivity	Duration	Cost in JOD
Habitat landscape rehabilitation CH1-7	Habitat rehabilitation monitoring	Post construction	JVA Consultant	5years	50k
	Seed Collection and storage	Pre-construction	EIB Consultant	3months	5k
Landscape and ecosystem services rehabilitation	Site rehabilitation and soil resettling monitoring	Post-construction	JVA	1 month	35k
Reseeding and planting of area with natural plants CH2-7	Site tree and Seed Planting monitoring	Post-construction	JVA	5 years	100k
Improve and enhance ecosystem services and ecotourism and birdwatching activities after rehabilitation at offset Ch1	Migratory Bird recovery monitoring	Post-construction	EIB Consultant	3 years	18k
Monitoring of migratory birds Dead Sea Area CH 7	Migratory bird recovery monitoring	Post-construction	EIB Consultant	3 years	18k
Improve bird and wildlife protection of site CH 2-7	Breeding birds monitoring	Post construction	EIB consultant	3 year	45k
Improve ecosystem services CH5	Establishment of bird watching center in the area	Post construction	JVA	1 year	150k
Total					**421k**

7.21.3 Offsetting Marine Ecological Impacts

The Intake Alternatives Study Report, issued in draft November 2017 concludes that there will be no significant impact on the coral reefs as a result of larvae entrainment by the three intake alternatives considered at -50m deep, -70m deep and -165m deep. However the study suggests that if opting for shallow intake heads at -50m deep instead of the -165m deep intake assumed in this ESIA, it shall be designed to be adaptable to allow for extension of the pipes to the -165m depth in the future if needed.

For the seagrass beds it is concluded that the intake pipes are to be constructed underneath (not on the seabed) by trench and backfill method within and just beyond the seagrass beds. Next it will be required to monitoring the seagrass to see whether these would recolonise naturally. In case no re-colonisation occurs within two years then the affected seagrass areas shall be replanted, using existing vegetation from areas of high density seagrass coverage.

In addition, as an offset measure we suggest continued marine surveys to further fine tune the understanding of seasonal / annual larvae concentrations at the intake head locations and beyond. If these surveys indicate that significant impacts would be present after all, then the following is proposed: (1) further technical research to look for opportunities to enhance survival rates for the remaining larvae; (2) shallow intakes (if opted for) to be extended to deeper water depths.

Related offset costs may be as follows:

- 2 years dive monitoring of seagrass beds (4 times): 80,000 JD
- If needed re-colonising sea beds along the trenches: 200,000 JD
- Continued marine larvae surveys (2 times): 120,000 JD
- Further scientific and technical research to enhance larvae survival rates: 200,000 JD

Other potential / alternative offset measures that could be thought of are:

- Establish or fund a research foundation for coral and marine biology for the Gulf of Aqaba, including laboratory and testing facilities dedicated to researching biofouling and seawater membranes and a coastal oceanographic survey boat;
- Establish a nursery or hatchery within the area
- Enshrine into the BOT contract longer term in-situ measurement and monitoring programs
- Establish a COPERNICUS collaborative ground segment in the Region. See: https://sentinels.copernicus.eu/web/sentinel/missions/collaborative

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Introduction

This chapter presents the Environmental and Social Management Plan (ESMP) for the Red Sea Dead Sea Project Phase I.

It has been composed in line with the EIB performance standards and that of the IFC, particularly:

- PS 1: Assessment and Management of Environmental and Social Risks and Impacts
- PS 2: Labour and Working Conditions
- PS 3: Resource Efficiency and Pollution Prevention
- PS 4: Community Health, Safety, and Security
- PS 5: Land Acquisition and Involuntary Resettlement
- PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- PS 7: Indigenous Peoples
- PS 8: Cultural Heritage

This ESMP is an integral part of the Environmental and Social Impact Assessment as presented in the previous chapters. It provides all mitigation measures to be implemented during the pre-construction, construction and post-construction / operational phases of the project. In additional, this ESMP provides details, guidelines and procedures for the implementation of these mitigation measures. The mitigation measures presented are in line with the project phasing presented in the ESIA in Table 3 and the impact matrix presented in Table 14. The measures are also in line with the recommendations presented in ESIA chapter 6.

The purpose of this ESMP is to ensure that the social and environmental safeguards are effectively considered by Promoter and the BOT contractor during detailed design, construction and operation of the RSDS Phase I Project. This ESMP framework also builds upon the ESMP presented in Part D of the final ESA 2014 [lit 13].

This Environmental and Social Management Plan includes prevention or minimization of any potential adverse environmental and social impacts of the Project that have not already been identified in chater 7 of this ESIA in accordance with good international practices. This ESMP together with the separately to be developed Resettlement Action Plan (RAP) by an independent consultant aims to define certain aspects of the BOT Tender Documents and the Contractor's Design, Construction and Operational plans for the RSDS Phase I project. The proposed measures of this ESMP have been differentiated for the pre-design, design and construction, operation and decommissioning phases for the Project to achieve compliance with all relevant Jordanian, EIB and related international requirements.

This ESMP also includes a monitoring program to provide information on the environmental and socio-economic impacts of the project and on the effectiveness of mitigation and enhancement measures. This ESMP also includes an organization structure and a framework for associated operational policies, procedures and practices, including organisation that are responsible for operation, supervision, monitoring and enforcement, remedial action, financing, reporting and capacity-building.

This ESMP also presents a framework for compensation for affected parties. Details in terms of expropriation and compensation shall be elaborated and implemented through a separate Resettlement

and Compensation Action Plan (RAP). The MWI will take up this task. Finally, this ESMP includes an estimate of the required costs and funding sources.

Upon approval of this ESIA and ESMP and issuing of the Environmental Permit for the RSDS Project Phase I by the competent Jordanian authorities, the BOT contractor shall update and detail this ESMP based on the final design of the Scheme and having these reviewed and approved by the MWI and the regulatory authorities. The structure of this ESMP has been designed so that it can be issued also as a separate document, for instance as part of the final tender documents for the BOT contract of the RSDS Phase 1.

8.2 Environmental Control Officer

The BOT contractor will be tasked with detailed elaboration and implementing the relevant components of the ESMP. The MWI shall commission an independent third party assurance and technical advice on the effective implementation of the ESMP during the construction phase. This shall be done through assigned an Environmental Control Officer (ECO). The ECO shall play an independent role to both the contractor and the promoter. This person shall have the appropriate qualifications.

The role of the ECO shall be to:

1. Ensure that the environmental and social mitigation and monitoring measures are adequately safeguarded during the commissioning phase (prior to design and construction)
2. monitor the compliance of the construction works with the Environmental Permit, ESMP and CEMP;
3. monitoring the compliance of the initial operational phase with the Environmental Permit and ESMP
4. Report to the contractor about deviations noticed so that the contractor can make timely corrections;
5. Escalate towards the Client / Promoter in case of serious and continuous mismatch between construction works and environmental requirements, and to the Jordanian and Israeli regulators through the JAB in case of potential transboundary impacts;
6. Prepare progress reports to be shared with the key stakeholders, including the Jordanian and Israeli environmental authorities.

During the construction and monitoring phases, the ECO will have regular communication with the Jordanian and Israeli regulators. Real-time monitoring data (like the turbidity monitoring) needs to be available in real time for the related regulators, including the MWI and the Israeli Ministry of Environmental protection.

Also copies of all reports regarding the Red Sea and Dead Sea monitoring and environmental management reports are to be sent to the MWI and the Israeli JAB members.

Finally it is suggested that an independent Environmental Control Officer will carry out annual audits and review of compliance of the activities and monitoring results with the provisions of this ESMP.

If the ECO would be hired temporary through the contractor, this shall be included in the pricing of their BOT bids.

8.3 Pre-construction ESMP

The mitigation measures that are required during pre-design and tendering phase are presented in Table 27, including the main responsible party for elaboration and implementation. In addition, the requirements in terms of preparing and implementing the Resettlement Action Plan shall be addressed adequately by the Promoter. Section 8.7 and annex 9 provide further details and guidance.

Table 27 – Mitigation measures during Pre-construction Phase

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
6.2	A2	Pre-design	Reliability of water and energy deliverance and environmental protection of RSDS Phase I project	Ensure that PPP operational finance, institutional, environmental and legal contractual issues are well embedded in BOT tendering and contract documents	Promoter
6.2	A7	Pre-design	Overall Environmental and Social Impacts	Assess compliance of BOT bids with ESIA / ESMP requirements	Promoter
6.2	B1	Pre-design	Impacts due to pre-design field surveys	Ensure only minor distortions of land, marine and ecology during pre-design field surveys, and rehabilitation afterwards	Contractor
7.7.3	B2e	Pre-design	The sensitive ecological areas relative to the pipeline route are presented in below map 40. In this map two alterations of the proposed pipeline route are suggested (in blue, diversions 1 and 2).	Diversion 1 relates to the presence of many vulnerable Acacia spp. trees in the Bir Mathkour area, were the proposed route would cut directly through this area. It is recommended to change the pipeline route closer to the existing road to minimize the threats to these vulnerable trees. The coordinates of this modified section starts at 30 21 30 48 N 35 14 34 19 and ends at 30 33 15 33 N 35 15 28 41 E. If decided not to adopt this route change, it will be required to implement local diversions of the pipeline route around individual Acacia trees that are encountered.	Promoter
7.7.3	B2e	Pre-design		Diversion 2 relates to the importance of Finan-Ghieba area for breeding desert birds, were the proposed route would cut directly through that area. It is recommended to change route closer to the existing road to minimize the threat to these desert breeding bird's nests. The coordinates of this modified section start at 30 44 52 41 N 35 19 01 41 E and ends at 30 49 22 32 N 35 21 48 93 E. If decided not to adopt this route change, than construction activities much not take place between these locations during the breeding and nesting season from March until May	Promoter

Environmental and Social Management Plan

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
6.12	A3	Pre-design	Socio-economic impacts: Land take	Elaboration and implementation of Resettlement and compensation Action Plan, focused on physical displacement (resettlement) and economic displacement (when people continue to reside in the same place but their (agricultural) livelihood activities could be affected.	Promoter

8.4 Construction ESMP

8.4.1 Design and Construction Phase

Table 28 present the environmental and social mitigation, monitoring and enhancement measures throughout the design and construction and immediate post-construction phase of the proposed RSDS Phase I Project. The successful implementation of the CEMP is dependent on the effective management of the environmental aspects and impacts associated with the construction works.

The CEMP shall be developed by the Contractor based on its final design and shall include the mitigation, monitoring and management measures as listed in Table 28. This CEMP shall be a dynamic document which can be updated as required on a continuous basis by the Contractor to ensure environmental best practice. Any amendments made, must be submitted to the Promoter / MWI and related environmental authorities for approval prior to the amendments being implemented.

The Contractor shall detail the measures mentioned the CEMP for all activities and locations (including transportation routes) into practical rules, responsibilities, timelines, training and awareness raising, communication, costs and supervision. The plan needs approval from the Promoter and environmental authorities. The CEMP needs to be dynamic, and cover unforeseen issues that appear during the construction and operations of the project, including good online coordination with the Jordanian and Israeli side.

As explained in section 8.2, the ECO should play an independent role in monitoring the implementation of the CEMP to the contractor, promoter and the Jordanian and Israeli regulators.

Table 28 – Mitigation measures during Design and Construction Phase

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
4.3.3	B2	Design and Construction	Catastrophic seawater leakage and related groundwater impacts	A series of technical emergency devises and measures are required to mitigate catastrophic seawater / mixed water leaks, which have been elaborated in annex 10. These include the application of Butterfly emergency valves; spring/loaded air valves; dismantling piece; plunger valve for pressure relief and discharge pipe to the brine collection pond; earthquake mitigation instrumentation; a storage pond with stilling function for brine ejected from the plunger valve and related manhole accommodations (see details in section 4.3.3, annex 10)	Contractor
6.2	A6, B3 B9, B11 B17	Construction and operations	Overall Environmental and Social Impacts	Implement ESMP and CEMP	Contractor
6.2	B12	Construction	Materials LCA and transportation impacts	Maximise life cycle minimise and (long) transport related impacts of construction materials	Contractor
6.2	B13	Construction / operations	Corrosion of pipe materials	Apply corrosion / protection measures for pipelines	Contractor
6.4	B3	Construction	Visual Impacts: Typical landscape and visual impacts during the construction phase	Visual impacts shall be mitigated by strategic siting of the construction facilities, and putting visual barriers or screens around the key construction related sites and facilities, and adopted construction traffic time planning.	Contractor
	A1	Design	Typical landscape and visual impacts during the operation phase will relate to the permanent project facilities as listed above and daily traffic related to the	A visual barrier and 15m wide buffer zones comprising natural vegetation is required around all major surface structures, including the Desalination Plant, the pumping station, the high level reservoir, the three hydropower plants and the Dead Sea discharge point. It shall be planted with (palm) trees or other vegetation in line with the local ecosystems.	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
			operations.	Such natural buffer zone would act as: 4. A visual barrier and preservation of the aesthetic landscape 5. Soil stabilisation and prevention of erosion during flood events 6. A Physical barrier / fence could be incorporated in such a buffer zone	
6.5	A1 B2	Design	Dead Sea: key impacts relate to potential chemical and biological alterations of the Dead Sea water due to Red Sea water and brine discharge with risks in terms of composition, colour and smell, and indirectly in terms of risks for tourism and the Dead Sea potassium and brome production industries.	The related monitoring devices required shall be adequately incorporated in the design of the Dead Sea Discharge facility under this RSDS Phase I.	Contractor
6.6	A1 B2	Pre-tendering and Design	Gul of Aqaba	The intake shall consist of three pipes with a cylindrical intake head where the sea water enters through the side openings of the head structure. The Intake velocity (head) cap shall be designed to create a horizontal flow path (no vertical vortex) into the intake to protect fish and sediments from being drawn into the system. The openings to the intake head (windows) shall be sized to limit the maximum intake velocity to 0.3 m/s at a maximum flow of 7.33 m3/s per intake pipe. When positioning the location of the intake heads at 25m above the seabed, the the intake head needs to be either built from solid foundations on the seabed so the pipe can be connected or elevated above the seabed by creating a buoyant structure that is anchored to the seabed.	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				From an ecological point of view, the major benefits are: • a reduced impact on open water larvae and organisms; • limited suction of benthic organisms; and • no suction disturbance of the nearby bottom community.	
6.6	B14	Construction	Intake: Marine sediment and ecological impacts	As there will be a moderately significant effect on water quality and there are a number sensitive receptors close to the dredging works that could subsequently be impacted, it is required that the following mitigation measures are implemented: • The intake pipes shall be constructed underneath (not on) the coastal seagrass by trench and backfill method within and just beyond the seagrass beds • Choose trenching / backfilling plant carefully to increase the retention of suspended sediments during the dredging activities e.g. a suction dredger would be preferable to a backhoe dredger; • Turbidity monitoring will be used are there are sensitive areas close by e.g. seagrass beds and the Ayla intake. • Turbidity tolerance limits will be established by expert advice and will need to take into account the time of year using historic baseline data for the area and if exceeded, the dredging rates will be modified accordingly. • This monitoring will compare the seawater particulate contents, up- and down-current of the works and will involve adaptive management techniques. • Such modifications will typically include a decrease in the rate of dredging or, in more extreme cases, the use of silt curtains around the dredging head to contain the spread of suspended matter. • Use of silt curtains around the dredging head when within 20-25m of the Ayla intake to contain the spread of suspended matter, this is particularly important when the micro-currents are moving from west to the east.	

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
	B14	Construction	Marine pollution due to accidental Spillage	• Bulk storage of lubricants and fuels will be permitted only within a bund designed to contain the entire contents of the container(s) in question (whether on a vessel or at the Port of Aqaba); • Disposal of waste oils and fuels to the sea or drains will be forbidden; • At the Port of Aqaba, any accidental spill in the pipeline laydown area is assessed to be limited to spill of oil products (as diesel, hydraulic oil etc.); • Impact from an accidental spill of these products is assessed to be restricted to contamination of the soil where the spill happens. However, observance of preventive measures will reduce the probability of a spill occurring.	
6.7.1	B2	Construction	Aqaba: The proposed Ayla pipeline route is close to the Aqaba Bird Observatory (ABO, next to the pipeline route, about 10 km from the Desalination Plant).	It is advised to implement very restrictive and low-nuisance construction methods while passing by the ABO, including reduction of noise, vibrations and related nuisance where possible, and avoiding construction works during the critical birds migration seasons in spring.	Contractor
6.7.2	B2	Construction	Disturbance of habitats may be expected at the alluvial fans between the airport and the Qatar sand dune areas near from establishment of work sites, construction of the pipeline, cut and fill activities, transportation of spoil, workers' activity and movements at the workers' camps.	It is advised to disturb these habitats as minimal as possible by: • ensuring that access roads leading to the worksites and camps, workshops and pipeline are as narrow as possible and using one access road as much as possible. • Incorporate a post-construction restoration program to restore all wadis, wadi openings, alluvial fans, work sites, camps and access roads to their pre-construction state. • Monitor and restore affected habitats in the wadis and wadi mouths after construction; • Maintain the natural flow of unpolluted rain and seasonal flooding and spring water along all wadis during the Construction period;	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				• Identify appropriate locations for the dumping of spoil produced by cut and fill activities, and prohibit disposal outside these sites; • Protect and preserve all Haloxylon and acacia trees and as much as possible shrubs in the wadis, wadi openings and alluvial fans around work sites Particular attention shall also be given to implementing best available low-nuisance construction methods while passing by the relevant nature areas of Dana Nature Reserve and the Qatar Reserve	
	B2	Construction	During construction there may be disruption of east-west movement of small mammals and reptiles, caused. This is particularly important opposite Rahma, Risha Bier Mathkour and Finan areas, the area midway between Bier Mathkour and Risha, and opposite Ghwieba Wadi Finan.	To minimize ecological disruptions it is required to set up an ecological monitoring program prior to the construction of pipeline on intervals of 10 km, in order to prevent ecological damage and provide ecological clearance during construction. The monitoring requirements are described in full detail in annex 6, and include 1) Wadi banks for at least 100m from either side of the proposed access and egress points; 2) Effectiveness of wadi bed rehabilitation, including: Monitoring compliance with the required management plan and comparing site conditions with those established prior to site commencement; Assessing reinstatement works; as per criteria defined in the Management Plan; 3) Alluvia fans; 4) Vegetation Stands Subject to a Management Plan Furthermore it is required to restrict the linear length of construction works to a maximum of 10 km intervals of open trenches, and allow unexcavated gaps of 50 m each 3 km to allow crossing of the wildlife, or otherwise backfilling the open trenches soon after completion of the works.	Contractor
6.8	B2	Design	Relevant archaeological sites	During the detailed design phase of the RSDS project an overlay	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
			identified during the ESIA related field surveys are presented Table 12. Particularly two sites that have been classified as high risks are located within 50 m from the pipeline route: 139 and 150	of the final design lay out with the list of potential affected archaeological sites in annex 7 shall be made, to confirm that none of these sites overlap with the foot print of the project within 50 m. This should include areas directly affected during the construction works. If heritage artefacts, graves or human remains are uncovered on site, work in the immediate vicinity must be stopped immediately. The Contractor must take reasonable precautions to prevent any person from removing or damaging any such artefacts or human remains and must immediately, upon discovery thereof, inform the authorities of such discovery whom in turn must contact the authorities or a registered archaeologist. Work may only resume once clearance is given in writing by the archaeologist or relevant Authority.	
6.8	B2	Construction		Prior to construction the Contractor shall implement an archaeological site monitoring and clearance program for each section of 10 km in advance and 50 m wide of the actual construction works, as described in annex 7. This shall be executed in parallel with the proposed ecological clearance program. This shall be executed in co-operation with the Ministry of Tourism and Antiquities, as well as with the Ministry of Religious Affairs (MAIA).	Promoter, Contractor
6.9.1	B2	Design	Seismic risks leading to damage leakages	To minimise risk of damages the BOT contractor shall prepare their designs in accordance with the EN Eurocodes or similar international codes. These are a set of European standards which provide common rules for the design of construction works, to check their strength and stability against live and extreme loads such as earthquakes.	Contractor
				Special arrangements shall be applied where the facilities and pipe crosses seismic fault areas, including the use of special	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				flexible couplings which allow deflection and elongation of the structures and pipes during a seismic event. This shall include site response studies at all construction sites (i.e. hydroelectric power plants, RO plant, and pumping station) to determine the local potential ground acceleration and potential liquefaction (mainly at the intake station). This information should then be included in the design of the structures following international accepted building/design codes for earthquakes. The terrestrial facilities shall be installed in concrete boxes to allow for easy inspection and access. Also with regard to the marine intake facilities, the detailed design requires flexibility to allow deflection and elongation of the marine structures and HPDE pipes, and as well reliable accessibility to all intake and marine pipe components. This is particularly important for the currently proposed deep intake structure (140 m deep), since this would be substantially below the depth accessible for regular deep sea inspection divers (which is about maximum of 70-90 m deep). This would pose particular challenges during inspection or repair works, also after an earthquake.	
6.9.2	B2	Design	Flood risks: the Southern Wadi Araba catchments includes some major wadi's that occasionally collect substantial amounts of rainwater. Also in the Northern Wadi Araba catchment typical flood risks occur, mainly connected to the numerous	• Preserve flood management conditions of existing wadi drainage channels, • If needed, construction of additional site drainage measures or even flood retention walls around key facilities • Planting soils adjacent to key facilities to prevent erosion and sediments flows during floods	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
			side wadi's crossing this section of Wadi Araba. These floods may be characterised as having peak flows of about 75 to 100 m3 /sec every 10 years, up to 150 – 200 m3 / sec every 50 years.		
	B2	Design		The BOT contractor is requested to confirm that the Aqaba Development Company has indeed taken the appropriate and timely flood prevention measures in terms of effectiveness. If not, the BOT contractor is advised to propose the required measures well in advance of the construction and operational phases.	Contractor
6.10.1	B2	Design	Climate Adaptation: Red Sea level rise may be somewhere between 0.5 and 1 metre during the next hundred years, or up to 0.25 metres during the next 25 BOT concession years	The BOT contract is advised to include related climate adaptation measures in the design of the coastal intake facilities.	Contractor
6.10.1	B2	Design	Climate Mitigation	Considering alternative non-fossil energy generation for part of the energy needs, such as through a 10 MW solar park in Wadi Araba suggested by the MWI	Promoter, Contractor
	C4	Construction	Climate mitigation	measures to reduce GHG related emissions during construction shall include minimization of road transport requirements and related diesel consumption; and minimised / optimised use of construction materials, particularly the use of cement, as one ton of cement production generates about 900 kg equivalent CO2 emissions.	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
6.10.2	A5	Construction	Air Quality	During the construction there are various risks associated to air emissions and pollution, which shall be addressed in the Contractor's Construction Environmental and Social Management Plan (CEMP).	Contractor
6.11.1	B2	Design	Groundwater protection	Several means to eliminate, reduce and control leakage of seawater the conveyance pipeline have already been incorporated into the preliminary scheme design, including coated steel pipes, continuous leakage detection and intruder detection systems. This has already been included in the BOT tender documents	Contractor
	B2	Design	Groundwater protection	In addition, about every kilometre along the alignment, an inspection structure shall be constructed in which the conductivity of the water in the liner will be measured on a regular basis. In areas downstream of large wadi catchments, special arrangements will be made to prevent flood flows from being collected in the trench. These shall include wrapping the liner over the top of the trench, and the placement of well compacted impervious materials on top of the trench. This has already been included in the BOT tender documents	Contractor
	B2	Design	Groundwater protection	To limit the effects of leakage the pipeline will be divided into sections, by the provision of totally 12 in-line emergency valves at regular intervals. These valves shall be connected to an instrumentation and control system that immediately identifies any abnormal changes in flow or pressure and shuts the isolation valves in such an event. The location of the required inline isolation valves to mitigate the impacts of catastrophic failure are provided in Table 4-7 and Figure 4-14 of Annex 10.	Contractor
6.11.2	B15 B16	Design and operations	Groundwater	Implement additional aquifer protection measures as described by Posch and partners, including groundwater monitoring wells and monitoring parameters, monitoring frequencies, reporting	Promoter

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				and phasing. See annex 10	
6.11.4	B2	Design and construction	Flood control: RSDS project	Preserve flood management conditions of existing wadi drainage channels, and implement green planting adjacent to key facilities to prevent erosion and sediments flows during floods	Contractor
			Flood control: Aqaba and Dead Sea	Construction of additional site drainage measures or even flood retention walls around key facilities; Prevention of fuel or lubricant leakages during floods; Protection of storage areas for all fuel or chemical storage facilities	Contractor
	A3	Design / construction	Socio-economic impacts: Grievance mechanism	MWI: Grievance Mechanism: how to address people's complaints needs to be effectively communicated to people prior to preparing and implementing the RAP. Establish a Project Resettlement and Compensation Committee at municipal level with a mandate to receive and register grievances, organise meetings to resolve them, and address all received complaints. Grievance Management reporting to Investors shall include a summary on: registered cases/complaints, grievances resolved in a timely manner and cases referred to the next level of the complaints and/or courts.	Promoter
	A4 B10	Construction / operations	Socio-economic impacts: Stakeholder Engagement	Implement communication and engagement of key stakeholders during construction and operations, including public information	Promoter Contractor
	B4	Construction / operations	Socio-economic impacts: employment opportunities	Implement recruitment planning/ hiring local workforce for the construction and operations of the RSDSC, focused on local employment opportunities	Contractor
	C4	Construction / operations	Socio-economic impacts:	Develop a grievance mechanism including those related to employment, pipeline, marine livelihood, payments, workers conduct, impacts on herding along the alignment, compensation payments for negatively affected people due to physical	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				damages, including potential leakage from the scheme and related groundwater impacts.	
6.13	B5 B15 B16	Construction	Soil, noise, dust and Vibrations	Limit soil, noise, dust and vibration impacts particularly near to sensitive ecological and bird areas and near to archaeological sites. Furthermore the contractor will be required to use 'best practicable means' (BPM) approach to minimise nuisance from noise and vibration in general, such as in according with UK EPA regulations. Cement or asphalt mixing must take place on impermeable/ protected surfaces. Use of ready mixed cement/asphalt will require the establishment by the Contractor of proper truck and equipment wash bays with an impermeable floor layer. Used paint tins/brushes must be disposed of as hazardous waste and paint washings collected in receptacles for later safe disposal. Paint must not be washed into storm water drains on site. Construction works related noise levels must be kept within acceptable limits. The noise and sound generated shall adhere to the Jordanian noise standard specifications and take account of nearby residents when work is performed at night. No sirens and hooters may be utilized except where required or in emergencies. The playing of loud music at the construction yard is prohibited. The Contractor should keep the local community informed of unavoidable noisy activities and their duration.	Contractor
6.14	B5 B15 B16	Construction	Traffic	Construction traffic management plan, dealing with traffic accident risk reduction, which will likely have to be approved by the competent authorities. It will be crucial to limit traffic related impacts particularly near to sensitive ecological and bird areas and near to archaeological sites. In addition, construction	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				vehicles will only be allowed to use local roads where they are paved, have sufficient capacity and where it has been shown that local users will not be unduly inconvenienced. The Contractor shall elaborate a Traffic Management Plan, which shall be coordinated with the Client and relevant traffic authorities and the police. This plan shall be approved prior to the start of the construction works, and will include: • Traffic routes for construction equipment and building materials, including foreseen timing and frequency of traffic movements • Identify critical traffic safety and accident risk locations along the route, and propose related mitigation measures, including speed control and road signs • Timing and access of construction material delivery vehicles to site should be strictly controlled to avoid the disturbances to the local community. • Appropriate traffic signage must be erected on site by the Contractor to alert other road users to construction activities. • The Contractor should strategically position the site entry and exit points to ensure that there is minimum impact to the traffic flow on neighbouring areas • A low speed limit shall be adhered to on construction site • Construction vehicles must utilise existing main road and access roads and not create new unauthorised access roads. • The Contractor must ensure that local access roads are not damaged by construction vehicles. If damage does occur, it needs to be attended to immediately to avoid long term problems. • Lighting used to facilitate construction at night should not disturb neighbouring residents. Down lighting should be employed where practicable.	

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				• Accessibility of public buildings (among others offices, hospitals, schools, universities, businesses and culturally important sites) needs to be guaranteed during normal working hours. Specific attention shall be given to accessibility for people with disabilities	
	B5			Where land will be needed that is currently in use arrangements shall be made to preserve essential access and rights of way during the construction period and to compensate owners and users for any economic losses they may suffer.	Contractor
6.14	B5 B6 B7 B8	Construction	Construction accommodation	Construction sites can usually be adjusted to accommodate any environmental or social constraints there may be in the surrounding area. In general, locations shall be selected that comprise undeveloped and unused land, mainly desert or mountainous terrain, and are owned by the Government. The contractor shall provide construction staff accommodation in compliance with the International Labour Organisation compliance ILO Regulations for staff accommodation, including safe drinking water to its employees, meanwhile avoiding wastage and timely repaid of leakages. The Contractor shall install mobile toilets on the site and place them in a bunded area. The Contractor need to establish hand washing facilities and soap to maintain good hygiene on site. Staff shall be sensitised to use these facilities at all times. Ablution facilities shall be within 100m from workplaces. The Contractor should arrange that the toilets are serviced regularly by the service provider.	Contractor
	B6			Minimize use of water and energy during construction works to reduce environmental and GHG impacts	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
	C4	Post construction	Rehabilitation	After use for construction, most sites shall be restored to their original condition, including reseeding the natural vegetation. Exceptions may be accepted where, after consultation with the relevant authorities and stakeholders, a decision is made to hand over the facility (for example a road, well, or building) to be maintained for the use of the local population. Topsoil removed from the construction footprint shall be stored separately for usage during the rehabilitation process. The topsoil stockpiles shall be stored, shaped and sited in such a way that they do not interfere with the flow of storm water and cause soil erosion. Stockpiles of topsoil shall not exceed a height of 2 metres. Areas not forming part of the construction footprint should not be disturbed by the Contractor. Soils compacted during construction work should be deeply ripped to loosen compacted layers and be regraded to even levels and then re-vegetated upon completion of construction activities. Wind screening and storm water control shall be undertaken to prevent soil loss from the site by the installation of diversion berms, sandbags and silt traps, where necessary. The use of a geotextile cover is particularly important where there is a slope, or where the soils are likely to remain exposed for any period of time while the new vegetation establishes itself.	Contractor
				Damage to local infrastructure shall not be tolerated and any damage shall be rectified immediately by the Contractor. A record of all damages and remedial actions shall be kept on site. Where possible, unskilled job opportunities should be afforded to local community members in order to transfer employment skills. The Contractor shall engage with the municipal local Councillors or other community leaders to assist with the recruitment of the local unskilled labour when required.	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
6.15	C4	Construction	Solid waste management	Adequate management of inert construction waste, domestic waste, oily and solid wastes, wastewater	Contractor
6.16	C4	Construction	Community health	The areas of the intake, desalination plant, booster power station, hydropower plants and Dead Sea discharge shall be fenced off from public access to avoid people falling into holes, pools or ditches or face collisions with construction equipment.	Contractor
				Design, coordinate and implement an awareness campaign on HIV and Aids, Ebola and other potential sicknesses within the project area, in relation to contacts between the construction work force and the neighbouring communities.	Promoter Contractor
6.17	B17	Construction	Occupational Health and Safety	The operator needs to provide staff accommodation in compliance with the International Labour Organisation compliance ILO.	Contractor
				A health and safety plan shall be drawn up by the BOT Contractor to ensure the safety of workers, including personal protective equipment. Contractors shall ensure that all equipment is maintained in a safe operating condition. A record of health and safety incidents shall be kept on site. Any health and safety incidents shall be reported to the Employer immediately. First aid facilities shall be available on site at all times. Workers have the right to refuse work in unsafe conditions. Material stockpiles or stacks shall be stable and well secured to avoid collapse and possible injury to site workers.	
				Personal Protective Equipment (PPE) shall be made available to all workers and use of PPE shall be made compulsory. The minimum PPE includes: Hard hat; Safety shoes; Overalls; Gloves.	

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				The consumption of alcohol and drugs by employees must be prohibited on and surrounding the construction area. The Contractor shall have operational fire-fighting equipment available on site at all times. The level and capacities shall be sufficient to address any major firs outbreak open fires shall be prohibited on the site.	
6.19	C4	Construction / operations	Cumulative impacts	The BOT contractor shall involve Ayla during the design stage of the structures intake, marine pipelines, pump station and discharge pipes, and the equipment mobilisation and earthmoving stages to avoid any negative impact on the Ayla Development Project and to avoid any potential claims by Ayla during and following the construction stage.	Contractor
				The Contractor shall inform Ayla on the mitigation measures taken to avoid sediment settlement that would affect Ayla's existing pumping station and discharge pipelines that are parallel to the RSDS pipelines. For example, using sheet piles during construction of the pumping station and parts of the pipeline and intake lines could mitigate potential concerns.	Contractor

8.4.2 Post-construction Rehabilitation

Immediately following the completion of the construction works, the following post-construction actions shall be implemented by the Contractor:

- The construction yard is to be checked for spills of substances such as oil, paint, chemicals, other types of waste, and these shall be cleaned up.
- The Contractor must arrange for the cancellation of all temporary services, e.g. chemical toilets.
- All areas where temporary services were installed are to be rehabilitated to the satisfaction of the local authorities and the Independent Engineer, if assigned.
- Surfaces are to be checked for waste products from activities such as concreting/asphalting and cleared accordingly.
- All surfaces hardened due to construction activities are to be ripped and concrete/asphalt material removed.
- Topsoil must be replaced back to disturbed surfaces and used to re- vegetate disturbed areas.
- The use of a geotextile cover is particularly important where there is a slope, or where the soils are likely to remain exposed for any period of time while the new vegetation establishes itself.
- All construction waste and rubble is to be removed from the site and disposed of to the municipal or recognised/approved landfill site.
- The sites are to be cleared of all litter and temporary cabins and structures should be dismantled.
- Fences, barriers and demarcations associated with the construction footprint are to be removed from the site.
- All residual stockpiles must be removed from the site.
- The Contractor must repair any damage that the construction works has caused to neighbouring properties
- Quarries used for sourcing construction material must be rehabilitated accordingly.

8.4.3 Public Information to prepare for Construction Works

The Project Affected People and general public shall be informed through the MWI about the type and duration of the upcoming construction works, as well as during these works. This shall include information on the timing and planning of the construction works, the impacts on roads and traffic such as road closures and rerouting of vehicle and pedestrian traffic, potential temporary environmental nuisance and temporary traffic signs and warnings.

8.4.4 Contractor Management and Filing Process

Figure 49 - Diagram Illustrating the Contractor Management Process

During the construction works procurement process an environmental and social briefing is required that alerts the Contractor to the environmental management expectations during the project, as illustrated above.

The appointed Contractor is required to develop construction method statements indicating how he will implement and ensure compliance with the conditions of the CEMP. The method statement documents must be approved by the Client and by relevant authorities before the Contractor mobilises.

The following documentation must be kept on site by the Contractor in order to record compliance with the CEMP:

- An Environmental File including:
- Copy of the CEMP;
- Copy of all other licenses/permits;
- Copy of all rehabilitation plans;
- Copy of the storm water management plans;
- Environmental Policy of the Contractor;
- Environmental Construction Method statements compiled by the Contractor;
- Non-conformance reports;
- Environmental register, which shall include:
    1. Communications register – including records of complaints, and, minutes and attendance
    2. Registers of all environmental meetings.
    3. Monitoring results – including environmental monitoring reports, register of audits, non-conformance
    4. Reports (NCRs).
    5. Incident book – including copies of notification of emergencies and incidents and how these were closed out; this must be accompanied by a photographic record.
    6. Safe disposal certificate for all types of waste disposed of site;
    7. Environmental training records;
    8. Waste disposal receipts or records;

9. Material Safety Data Sheets for all hazardous substances used and stored on site;
10. Dust suppression register;
11. Water quality monitoring reports;
12. Written corrective action instructions;
13. Construction Method Statements; and
14. Notification procedures and contact numbers for emergencies and incidents.

When the construction activities have been completed, the proposed Environmental Control Officer (ECO) is required to conduct a site inspection in order to sign off the site prior to the Contractor leaving the site.

8.4.5 Environmental Monitoring during Construction Works

A monitoring program should be in place not only to ensure compliance with the CEMP throughout the period of the construction activities, but also to monitor any environmental issues and impacts which may have not been accounted for in the CEMP that are, or could result in significant environmental or social impacts for which corrective action is required. A monitoring program should be implemented for the duration of the construction phase of the project, and includes the following aspects:

This program may include:

- Site visits and monitoring must be conducted by the Environmental Control Officer (ECO) to ensure daily implementation of the CEMP conditions and provide corrective actions where required. Monthly site audits must also be conducted by the ESA and monthly audit reports produced;
- Site audits, as agreed with the Client, must be conducted by an external independent Environmental auditor during the construction phase (it is proposed one in month 2 and one as construction ends), and be reported to REMA and the Client;
- Site audits by Client's representative; and
- Compilation of external independent environmental audit reports after the aforementioned site audits by the ECO that document findings and recommend any corrective actions to be taken.

The final report will provide feedback on whether any previous non-conformances raised have been resolved, thereby ensuring continual improvement of the site's environmental performance.

In case of non-compliance by the Contractor, a Non-Conformance Report (NCR) will be issued to the Contractor as a final step towards rectifying a failure in complying with a requirement of the CEMP. This will be issued by the Client to the Contractor in writing. Preceding the issuing of an NCR, the Contractor must be given an opportunity to rectify the non-conformance issues. Should the Client assess an incident or issue and find it to be significant (e.g. non-repairable damage to the environment), it will be reported to the relevant Authorities and immediately escalated to the level of a NCR.

The following information should be recorded in the NCR:
Details of non-conformance;

- Any plant or equipment involved;
- Any chemicals or hazardous substances involved;
- Work procedures not followed;
- Any other physical aspects;
- Nature of the risk;

Agreed timeframes by which the actions documented in the NCR must be carried out; and the Promoter / MWI should verify that the agreed actions have taken place through an independent environmental auditor

by the agreed completion date; when completed satisfactorily; the auditor on behalf of the Client should sign the close-out portion of the non-conformance record and file it with the contract documentation.

8.5 Operational ESMP

Error! Reference source not found. presents the measures required to mitigate the identified negative environmental and social impacts, some of which have already been mentioned elsewhere. This table focuses on the mitigation and enhancement measures during the operational phase.

It is recommended that the Contractor move towards implementing an Environmental Management System (EMS) that is, or comparable to, the ISO 14001 standard. The ISO 14001 standard allows for environmental performance to be continuously monitored and audited, thereby identifying areas that require improvement. The ISO 14001 standard requires the adoption and implementation of a range of environmental management techniques in a systematic manner that can contribute to optimal outcomes for all interested parties during the operational phase.

The Contractor is also required to develop an environmental policy for the RSDS Phase I project, including assignment of environmental management staff at the project. Such a policy defines how the environmental objectives set for the operational organization are managed and monitored. The policy should be seen as the vehicle for the implementation of guiding principles regarding the environment that are specified in the policy. The ISO 14001 standard is based on the methodology known as “Plan-Do-Check-Act” (PDCA).

The following documentation must be kept on site by the Contractor in order to record compliance with the ESMP and the Environmental Policy during the operations:

The required Environmental Filing components are listed in section 8.2.4.

Table 29 – Mitigation measures during Operational Phase

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
4.2.5	C4	Operations	Destabilisation of gabion at Dead Sea	Near the gabion the free flow of brine and seawater towards the Dead Sea may cause erosion of the sediments, and eventually destabilise the gabion. This shall be prevented actively during the operations by the Contractor by managing the flow channel that will form downstream of the gabion. The length of the flow channel will change depending on the future gradually Dead Sea water levels.	Contractor
6.2	A6, B3 B9, B11 B17	Operations	Overall Environmental and Social Impacts	Implement ESMP	Contractor
6.2	B13	Operations	Corrosion of pipe materials	Apply corrosion / protection measures for pipelines	Contractor
6.6	C4	Operations	Marine ecological impacts due to Seawater intake	Manage seawater inflow to maximum 0.3m/s as per IFC guidance, and ensure a horizontal flow path (no vertical vortex) into the intake to protect fish and sediments from being drawn into the system. Implement diving inspections of the intake heads twice a year during the first 5 years of operations A two year monitoring (totally 4 times) shall be done to see whether the seagrass will recolonise naturally along the trenches. In case no re-colonisation occurs within two years then the affected areas shall be replanted, using existing vegetation from areas of high density seagrass coverage	Contractor
6.9.2	C4	Operations	Flooding	• Prevention of fuel or lubricant leakages during floods; • Protection of storage areas for all fuel or chemical storage facilities against flooding	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				• Training and equipping relevant staff in safe storage and handling	
6.9.3	C4	Operations	Risk related to extremist groups aiming to commit sabotage	Security management and preventing uncontrolled public accessibility to the key project infrastructure facilities, to be managed by the competent Jordanian security authorities in co-operation with the BOT Contractor and operator.	Promoter, Contractor
	B2	Operations	Groundwater protection	Every kilometre along the alignment, an inspection structure will be operated in which the conductivity of the water in the liner will be measured on a regular basis.	Contractor
6.11.2	B15 B16	Operations	Groundwater	Additional aquifer protection measures suggested by Posch and partners, including groundwater monitoring wells and monitoring parameters, monitoring frequencies, reporting and phasing. See annex 10	Promoter
6.11.3	C4	Operations	Groundwater: Emergency Seawater leakages and groundwater rehabilitation	• A procedure for shut down of the pump and closure of valves along the pipeline; • investigations to determine source of leaks, possibly involving pipeline inspections or injection of tracer to the pipeline; • immediate isolation of parts of the conveyance where leakage is thought to have originated; • means to hydraulically isolate sensitive areas of ground, eg by pumping from wells and discharging back into conveyance; and • means to inform affected well users and plan for alternative water provisions Rehabilitation: seawater leakage into the Wadi Araba groundwater system in case of catastrophic failure of the pipeline. As explained in section 6.11.2 about 80,000 m3 of seawater could be discharged into the Wadi Araba aquifer	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				system. It would require the immediate flushing of the polluted groundwater system using about 250,000 m3 of fresh water. The total cost for groundwater rehabilitation could be at least 15 M€, and will likely take some years. Afterwards, pockets of saline groundwater may still be expected in geological sub-formations with low permeability (like clay / silt). These costs do not take into account the compensation (economically, alternative water supply) for farmers and other users of the affected groundwater system who will not be able to continue pumping during the rehabilitation period. It is concluded that such rehabilitation may not be effective, and that the risks of soil and groundwater pollution shall remain an integral aspect of the RSDS project.	
6.11.4	B2	Operations	Flood control: RSDS project	Preserve and maintain flood management conditions of existing wadi drainage channels and greeneries adjacent to key facilities to prevent erosion and sediments flows during floods	Contractor
	C4	Operations		Training and equipping relevant staff in safe storage and handling during flood events	Contractor
6.17	B17	Operations	Occupational Health and Safety	A health and safety plan shall be drawn up by the BOT Contractor to ensure the safety of workers, including personal protective equipment. Contractors shall ensure that all equipment is maintained in a safe operating condition. A record of health and safety incidents shall be kept on site. Any health and safety incidents shall be reported to the Employer immediately. First aid facilities shall be available on site at all times. Workers have the right to refuse work in unsafe conditions. Material stockpiles or stacks shall be stable and well secured to avoid collapse and possible injury to site workers. The consumption of alcohol and drugs by employees must be prohibited on and surrounding the construction area The Contractor shall have operational fire-fighting equipment	

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				available on site at all times. The level and capacities shall be sufficient to address any major firs outbreak open fires shall be prohibited on the site.	
	A4 B10	Operations	Socio-economic impacts: Stakeholder Engagement	Communication and engagement of key stakeholders during operations, including public information	Promoter Contractor
	B4	Operations	Socio-economic impacts: employment opportunities	recruitment planning/ hiring local workforce for the and operations of the RSDS Phase I Project, focused on local employment opportunities, including in the supply chain	Contractor
	C4	Operations	Socio-economic impacts:	Implement grievance and compensation mechanism including those related to employment, pipeline, marine livelihood, payments, workers conduct, impacts on herding along the accessible sections of the alignment, compensation payments for negatively affected people due to physical damages, including potential leakage from the scheme and related groundwater impacts.	MWI - JVA
	B5	Operations	Land use – rights to way	where land will be needed that is currently in use arrangements will be made to preserve essential access and rights of way during operations to compensate owners and users for any economic losses they may suffer.	Contractor
6.19	C4	Operations	Cumulative impacts	It is advised to coordinate with Ayla on any mitigation measures during operations to avoid sediment settlement that would affect Ayla's existing pumping station and discharge pipelines that are parallel to the RSDS pipelines.	Contractor
7.5	C4	Operations RO Plant	Red Sea impacts	The operations of the foreseen RO Desalination Plant in the RSDS Phase I project will require the use of antiscalants to prevent fouling of the membranes. Different solvents may be applied for this purpose. However, phosphate/phosphonate free antiscalants are recommended to prevent negative impacts on	Contractor

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				the environment, including algal blooms in the Dead Sea. Water quality monitoring and reporting of the product water will be required at the Desalination plant. This includes the composition of the brine, which needs to be in line with the allowable discharge quality into the Dead Sea. The monitoring reports will be important for the analysis of the Dead Sea Monitoring Activities and should therefore be provided to the Dead Sea monitoring team and the JAB. The RO monitoring reports shall include at least the following: • Total brine, from all sources – cubic metres per hour (max), cubic metres per day (max), cubic metres per year • Brine from reverse osmosis membranes – cubic metres per hour (max), cubic metres per day (max), and cubic metres per year • Water from preliminary treatment (sand filters backwash/else) – cubic metres per hour (max), cubic metres per year. • Water from washing limestone reactors (supplementary treatment) – cubic metres per hour (max), cubic metres per year. • Water from treatment facility (pre-treatment backwash, limestone washing, else) – including water from backwash sand filters and water from limestone reactors - cubic metres per hour (max), cubic metres per day (max), cubic metres per year. • Water from membranes washing (inorganic) –cubic metres per batch, cubic metres per year (max). • Pumping seawater – cubic metres per hour (max), cubic metres per day (max), cubic metres per year. • Water product (Capacity) - cubic metres per hour (max), cubic metres per day (max), cubic metres per year. • Water Treatment Facility data (Pre-treatment Backwash and	

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
				Washing Limestone Reactors) • Operation reports of water treatment facility, including chemicals used in each source/stream and flow rate of each source/stream and total flow (cubic metres per hour (max), cubic metres per day (max), and cubic metres per year).	

8.6 Emergency Response Planning

The Contractor shall be responsible for preparing and maintaining emergency response plans, which would encompass all stages and aspects of the project. This plan would be approved by the ECO. This plan will particularly address:

- Major operational accidents, including fire or explosions
- Catastrophic accidents, including earthquakes and sabotage actions, with emergency actions for all key project components, including the seawater intake, environmental pipeline and Dead Sea discharge
- Guidelines for swift preparation of groundwater rehabilitation response actions in case of catastrophic seawater leakages

In terms of potential seawater leakages from the seawater pipeline, the plan should include the following measures, to be adopted where appropriate (see also section 7.11.3):

- A procedure for shut down of the pump and closure of valves along the pipeline;
- investigations to determine source of leaks, possibly involving pipeline inspections or injection of tracer to the pipeline;
- immediate isolation of parts of the conveyance where leakage is thought to have originated;
- means to hydraulically isolate sensitive areas of ground, e.g. by pumping from wells and discharging back into conveyance; and
- Means to remove polluted groundwater –by installing wells to pump out contaminated water and control further migration.
- The Plan should also define responsibilities and reporting protocols.
- Responsibility: The BOT Contractor / Operator should commission this in co-operation with the Project Owner (MWI) and the Ministry of Environment (MoEnv)

8.7 ESMP Monitoring Program

8.7.1 Dead Sea Monitoring

The requirements in terms of monitoring of the impacts of the RSDS Phase I project are part of the key performance indicators of the project. Details for the Dead Sea, including proposed institutional arrangements are presented in annex 11. Details for the Red Sea are further elaborated in annex 5.

The objectives of the Dead Sea monitoring are to:

- Establish a baseline situation with regards to chemical and physical characteristics of the south-eastern bay (east of Lisan peninsula) of the Dead Sea near the proposed discharge point; and relate this to the conditions of the Dead Sea main body, which are well established and continuously monitored by the GSI+IOLR. This is achieved by an initial survey plus monitoring during the construction period.
- Monitor the impact of discharging Red Sea water mixed with brine into the Dead Sea water; during the RSDS Phase I operation period
- Project the impact of discharging more than 400 MCM of Red Sea water mixed with brine into the Dead Sea and propose mitigation measures, as needed.

For this purpose four monitoring phases are suggested:

- Phase I – Initial campaign in summer 2017: This comprises an initial survey campaign in summer 2017, for the lake (main body of the Dead Sea) and the bay (east of Lisan peninsula).

- Phase IIa – Baseline survey part a: covers the monitoring after the initial survey campaign i.e. from Jan. 2018 till beginning Dec. 2019, when the BOT contractor has been selected, has completed site installations and started constructions.
- Phase IIb – Baseline survey part b: comprises the monitoring period from Jan. 2020 till the end of the construction period, scheduled for Dec. 2021;
- Phase III – Monitoring RSDS Phase I operation: covers the period of Phase I operation, starting from commissioning of the RSDS system.

It is furthermore suggested to establish an International Research Centre (IRC) for the monitoring of the Dead Sea in Jordan, whereas the monitoring from the Israeli side shall be performed through existing institutions, with the Geological Survey of Israel (GSI) being their lead institution.

The Red Sea and Dead Sea monitoring activities during the RSDS Phase I Project is not the responsibility of the Contractor. However, the contractor shall take into account in to the design and construction of the Red Sea Intake and Dead Sea Discharge the civil structures that are required to enable these monitoring activities.

Algae Blooming

One exception in terms of Contractor responsibility relates to a situation where the mixing of brine and seawater from the Red Sea with the Dead Sea water would cause algae blooms in the Dead Sea. This could particularly happen if phosphorus concentration in the discharged water would be too high. As already mentioned in above table 25, phosphate / phosphonate **free** antiscalants are therefore recommended in all cases for the cleaning of the membranes in the Desalination Plant.

It should be noted that Phase I of the RSDS project has been dimensioned to particularly prevent these type of algae bloom risks. However, if algae blooming in the Dead Sea are noticed, the following actions are recommended:

1. *Immediate* reporting of the situation by the IRC and/or the ECO (Environmental Control Officer) to the JB and the Jordanian and Israeli environmental regulators;
2. *Immediate* execution of field measurements of phosphate / phosphonate concentrations in the environmental pipeline water (both seawater and brine), and the Dead Sea water near to the algae bloom occurrence
3. *Immediate* meeting of the JAB to discuss the situation
4. If agreed by the JAB, *immediate* termination of the RSDS discharge of brine and seawater through the Environmental Pipeline into the Dead Sea
5. Further assessing the situation and causes of the algae bloom
6. Mitigating the problems,
7. Once the problems have been mitigated, the JAB is to decide about continuation of the RSDS discharge as planned
8. ICO and the Environmental Compliance Officer shall jointly prepare and submit an evaluation report for JAB and the environmental regulators

8.7.2 Red Sea Monitoring

The proposed Red Sea physical and chemical monitoring is presented below:

Table 30 - Monitoring requirements by the BOT Contractor for the physical environment

Parameter	Project Stage	Location	Objective	Notes
Water circulation	Pre-construction baseline & operation	Intakes	Establish water current movements in location of the intakes before and during operation.	This would need to factor in seasonal changes
Water quality	Pre-construction baseline and operation	Pipeline burial area	Establish the site-specific baseline of suspended sediment concentrations around the proposed dredge footprint to use for adaptive dredge management techniques and real time effective monitoring.	Use existing data to understand temporal changes in SSC in area.
Water quality	Pre-construction and Operation	Intakes	Monitor to see that the abstraction has no effect on water quality. If no effect after 2 years, then stop monitoring.	Very precautionary given the assessment. Needs to be seasonal at least.
Sediment quality	Pre-construction & post dredging	Pipeline burial area	Establish if any contaminated sediments with footprint of trenching.	Very precautionary given the assessment

An appropriate sediment and water quality baseline survey (to include an assessment of the water and sediment contamination levels) should be undertaken in the pipeline corridor (mainly where any dredging works / serious disturbance of the sediments) and any working areas adjacent to the pipelines. This is to ensure that if there are any contaminated sediments (unlikely but possible) then this can be addressed before the work commences. These surveys shall be undertaken upon completion of the Final Design by a suitably qualified environmental company with access to appropriate laboratories to undertake the required testing on behalf of the BOT Contractor.

In addition, it is recommended that the impacts of accidental pollution events occurring during both construction and operation shall be monitored.

Also turbidity monitoring will be required, which shall be used as there are sensitive areas close to where the dredging activity will be undertaken to bury the pipelines e.g. seagrass beds, Eilat / Aqaba beaches, Ayla intake, corals on coral nursery in Israel. The criteria for the turbidity monitoring are as follows:

- A detailed turbidity monitoring plan (part of a wider ‘Dredge Monitoring Plan’) shall be drawn up by an approved and experienced third-party organisation that is suitably qualified and has been employed by the BOT Contractor. The plan shall include the monitoring methods, equipment, location, duration, frequency, and “acceptable levels” and actions to be taken should the levels be exceeded.
- Acceptable turbidity tolerance limits will be established taking into account the time of year using historic baseline data for the area, and an up to date turbidity monitoring prior to construction. If exceeded, the dredging rates will be modified accordingly.
- The Monitoring Plan needs to ensure that the turbidity monitoring provides the data needed in order to take immediate mitigation action and should be planned accordingly. The data / observations should be recorded in real time and be openly available online to environmental regulators on both the Jordanian and Israeli sides.
- This monitoring will compare the up- and down-current influences of the works and will involve adaptive management techniques, such as a decrease in the rate of dredging or, the use of silt curtains around the dredging head to contain the spread of suspended matter (e.g. when working close to the Ayla Intake).
- Detection of management thresholds in water quality (i.e. suspended sediments and turbidity) using the baseline so that if triggered, certain management actions are implemented (e.g.

temporary cease in dredging, tidal restrictions) to prevent or minimise ecological impacts from smothering;
- Publication of real-time monitoring data online so that authorities from both Israel and Jordan can monitor the situation;
- Meeting(s) with regulator authorities (from both Jordan and Israel) to discuss the management and monitoring plan and any preventative measures; and
- Third party neutral auditing to ensure that the plans are being implemented accordingly.

Furthermore it will be required to monitoring the seagrass along the inflicted pipeline trenches to see whether these would recolonise naturally. In case no re-colonisation occurs within two years then the affected seagrass areas shall be replanted, using existing vegetation from areas of high density seagrass coverage.

In addition it is suggested to perform continued larvae surveys around the marine pipelines to further fine tune the understanding of seasonal / annual larvae concentrations at the intake head locations and beyond. If these surveys indicate that significant impacts would be present after all, then the following is proposed: (1) further technical research to look for opportunities to enhance survival rates for the remaining larvae; (2) shallow intakes (if opted for) to be extended to deeper water depths.

8.7.3 Noise Monitoring

It is likely that noise emissions will lead to some nuisance during the operations. However, in case of complaints from neighbouring villages, noise levels should be identified. If these measurements prove impacts on settlements, measures for noise abatement may have to be elaborated.

8.7.4 Ecological Monitoring

As described in section 6.7 it will be require minimizing terrestrial ecological disruptions during the construction, and setting up a monitoring program prior to the construction of pipeline on intervals of 10 km, in order to implement ecological clearance. Furthermore it is proposed to restrict the linear length of construction works to a maximum of 10 km intervals of open trenches, and allow unexcavated gaps of 50 m each 3 km to allow crossing of the wildlife.

8.7.5 Archaeological Monitoring

As described in section 6.8 it is proposed to set up an archaeological site monitoring and clearance program during the construction period for each section of 10 km in advance and 50 m wide of the actual construction works. This can be executed in parallel with the proposed ecological clearance program. This shall again be executed in co-operation with the Ministry of Tourism and Antiquities, as well as with the Ministry of Religious Affairs (MAIA).

8.7.6 Pipeline and Groundwater Monitoring during operations

Pipeline Monitoring

As described in section 6.11 it is advised to install ultrasonic flow meters and pressure loggers along the pipeline to monitoring any potential leakage of salt water from the pipelines. In addition, about every

kilometre along the alignment, an inspection structure shall be constructed in which the conductivity of the water in the liner will be measured on a regular basis. In areas downstream of large wadi catchments, special arrangements will be made to prevent flood flows from being collected in the trench. These will include wrapping the liner over the top of the trench, and the placement of well compacted impervious materials on top of the trench.

Groundwater Monitoring and Compensation

Once a major pipeline leakage would occur, and the seawater/brine would reach the aquifer, it will start to mix with the groundwater. This will increase the Total Dissolved Solids (TDS) of the groundwater to levels which may make it unusable as a source of drinking or irrigation water. Assuming for instance seawater leakage with a TDS concentration of 35,000 mg/L mixing with groundwater with a TDS of 1,000 mg/L, this means that 1 m3 of leaked seawater could increase salinity of 70 m3 groundwater to the maximum drinking water limit of 1,500 mg/L .

Immediately when a major leakage occurs, it will be required to start monitoring the ground water quality (TDS) in the direct surroundings of the leak, both upstream and downstream, to assess the gravity and extent of the groundwater contamination. Existing abstraction wells on both the Jordanian and Israeli sides of the border could be included for this purpose. This monitoring will enable to authorities to inform groundwater well users in the direct vicinity about this new pollution threat and to take appropriate actions accordingly:

1. Assess extent of salt groundwater pollution based on leakage data and GW monitoring results
2. Assess those GW abstraction wells that will be impacted by the leak in the short and long term
3. Terminate GW abstractions of potentially impacted wells within the vicinity of the leak in co-operation with users
4. Compensate GW users with alternative fresh water supply
5. If compensation in terms of fresh water is not feasible, financial compensation for social and economic losses caused by the leak shall be done in accordance with the IFC compensation principles for project affected people (PAP)
6. The level and duration of this compensation shall be determined and implemented in accordance with these IFC compensation principles.

In addition, Posch and Partners suggests monitoring wells to be established every 5 km along the pipeline route throughout the period of operations, or approximately 40 wells in total (annex 10).

- ***Parameters:*** Monitoring of groundwater levels, quality, salinity and Sulphate levels: the balance of Sulphate ions in the Red Sea water may be different than in the groundwater and may act as a tracer to determine the ingress of seawater into the aquifer
- ***Frequency:*** Samples to be taken monthly, unless there are indications of seawater leakage
- ***Responsibility:*** The Project Owner (MWI) should commission this, possibly through the BOT Contractor / Operator.
- ***Reporting:*** The data should be made available to the Jordanian and Israeli Environmental Regulators, and local stakeholders, such as agricultural communities in the area.
- ***Phasing:*** Monitoring should commence before construction and be carried out during and after construction. Ideally, pre-construction monitoring should begin several years before construction, to provide an adequate baseline. Pre-construction monitoring can be linked with the Hydrogeological Study.

8.7.7 HSE Monitoring

In accordance with the ILO Standards, the HSE aspects shall be integrated with the overall management of the RSDS Phase I project into a separate Occupational Health and Safety Management System (OH&M). This system shall be elaborated by the operator, and shall focus on monitoring all relevant impacts on health and safety during the operations of the plans, including:

- Relevant routine and non-routine activities;
- All persons on the workplace (including contractors and visitors);
- hazards created in the vicinity of the workplace by work-related activities under the control of the
- organization;
- infrastructure, equipment and materials at the workplace, whether provided by the organization or
- others;
- OH&S organization, its activities, or materials;
- Any modification to the OH&S management system, including temporary changes, and their
- impacts on operations, processes, and activities;
- Legal obligations relating to risk assessment and implementation of necessary controls
- Design of work areas, processes, installations, machinery/equipment, operating procedures and
- work organization, including their adaptation to human capabilities.

8.8 Compensation for Affected Parties

Annex 9 provides an overview of the main requirements of the EIB's Involuntary Resettlement-Standard 6 and the World Bank Involuntary Resettlement OP 4.12. In addition, all potential land acquisition must be undertaken in accordance with the Jordanian Decree 12 of 1987 – The Land Acquisition Law. The decree requires a demonstration of the public interest, evidence of the capacity for payment and agreement between both parties on the issue of compensation.

The market value for the land along the project scheme varies from around a minimum of 10,000 JD per ha in the Ghor Fifa area to a maximum of around 265,000 in the Jiza area. Considering an average land price of about 3,800 JD per dunum, the total land value of the RSDS Phase I footprint would be:

- For a buffer zone of 100m (21,330 dunum): 81.3 Million JD
- For a buffer zone of 150m (32,000 dunum): 122 Million JD
- For a buffer zone of 300m (64,000 dunum): 244 Million JD

An assessment of private land to be expropriated was made. Particularly along the northern section of the pipeline route this would be required. See below.

Figure 50 – Land to be considered for expropriation

This land is currently used for agriculture and represents a total of approximately 300 dunum, assuming a buffer zone of 100 m wide. This may represent a value of approximately 550,000 JD. The precise compensation required shall be set in the RAP. This shall include mechanisms for compensation, such as offering alternative plots, to farmers who current lease the land from JVA, and could not continue with their activities following the completion of the construction works.

Preliminary Estimates of Project Affected People and the Resettlement Implementation Budget
Other sections of the pipeline route cut through a total of approximately 20 km of agricultural land. However, these plots are predominantly governmentally owned and leased to famers. See details in annex 4. Appropriate compensation in terms of loss of livelihood shall be arranged in accordance with Jordanian legal requirements. Based on the socio-economic surveys' results and a number of visits to the project area, this relates to around 565 residential plots and 206 agricultural plots.

Temporary compensation for land use and right to way during construction shall be arranged on the basis of the detailed construction plans, including the location of construction yards, storage and staff facilities and construction roads.

Compensation in case of catastrophic seawater leakages

Compensation shall be provided in terms of economic losses and provision of alternative water supply for farmers and other users of the affected groundwater system who will not be able to continue pumping during the groundwater rehabilitation period following major pipeline leakage accident.

RAP Key Principles
They key principles in terms of expropriation and compensation are the following:

- As far as possible, ensure that involuntary resettlement and land acquisition is avoided or where it is unavoidable, is minimised, by exploring all viable alternatives;
- Where involuntary resettlement and land acquisition is unavoidable, resettlement and compensation activities must be implemented by providing early planning and sufficient investment resources according to the Jordanian Regulations;
- Minimising the number of Project Affected People (PAPs) to the extent possible;
- Strictly following a compensating strategy under the project, to be elaborated in a detailed Resettlement and Compensation Action Plan (RAP), to be agreed by the MWI and MoEnv;
- Ensuring resettlement and compensation assistance as needed, to address impacts on PAPs livelihoods and their well-being.

However, this number needs to be verified later, upon the completion of the Final Design, which will confirm the exact location and the footprint of all facilities and pipeline and the related future Resettlement and Compensation Action Plan (RAP). The estimated 2,260 people will be affected mainly through economic displacement (when people continue to reside in the same place but their (agricultural) livelihood activities could be affected.

As part of the disclosure process, a Grievance Mechanism of the MWI and how they will address people's complaints needs to be effectively communicated to people prior to preparing and implementing the RAP. This aspect is further elaborated I section 9.3 and annex 1. It is advised to establish a Project Resettlement and Compensation Committee at municipal level with a mandate to receive and register grievances, organise meetings to resolve them, and address all received complaints. The effectiveness of addressing grievances shall be monitored during the resettlement implementation. Information on the grievances and complaints shall be collected by the MWI, which will be likely required to report information on the grievances management to all Investors, including the EIB. Grievance Management reporting to Investors should include a summary on: registered cases/complaints, grievances resolved in a timely manner and cases referred to the next level of the complaints and/or courts.

8.9 Decommissioning Phase Management Plan

The environmental mitigation measures required after the lifetime of the RSDS project, during Decommissioning Phase, and listed in Table 31

Table 31 – Mitigation measures during Decommissioning Phase

Section	Impact No.	Project Phase	Impact	Mitigation	Responsible Party
	D4	Decommissioning	Climate mitigation	Additional GHG benefits can be obtained by recycling construction materials after their lifetimes. For instance demolition concrete, steel, asphalt and stone materials may be crushed and reused in the construction	Contractor
6.20	D1 to D8	Decommissioning	Soil, groundwater, landscape	• Dismantling and removal of all surface and subsurface structures and materials associated to the RSDS project, except the buried pipelines • This would preferable include crushing, reuse and recycling of construction materials, such a used steel and concrete. This would reduce the overall climate and GHG impacts of the RSDS project in retrospect • Any soil or groundwater pollution shall be rehabilitated before decommissioning of the Project • Landscaping and replanting after decommissioning • Final decommissioning and environmental rehabilitation report shall be made and legalised. This enables legal transfer of land ownership while ensuring Indemnity of project promoter / MWI against environmental claims due to the decommissioned RSDS project • Any new landowner shall arrange for environmental and social safeguards and permits related to new land use plans	Promoter

8.10 ESMP related Cost and Sources of Funds

Capital cost estimates for the RSDS Phase I project at large have been estimated by the MWI in its 2016 Preliminary Technical Information Memorandum for Donors and International Financial Institutions [lit 21] as follows:

1.	Red Sea intake (140 m) and pumping station:	150 – 160 MUSD
2.	Pipeline Conveyer and related assets	550 – 620 MUSD
3.	Desalination Plant and related assets:	275 – 300 MUSD
4.	Hydropower plants:	100 – 120 MUSD
	TOTAL (excluding contingencies and overhead):	1,050 - 1,130 MUSD

The ESMP relates costs for all phases shall be elaborated in the BOT bids of the shortlisted Contractors, and will be subject to the bidding evaluation process by the Promoter / MWI / JAB. For this reason, this ESIA report cannot provide detailed cost estimates. However, below some directions in terms of cost and finance are provided. The tender evaluators are advised to assess whether the proposed ESMP measures by the Contractor have been priced realistically to ensure their proper implementation.

Cost of the pre-design mitigation measures for which the Promoter / MWI shall be responsible are supposed to be incorporated in the current governmental budgets for the RSDS Phase I project. This includes compliance checks of the BOT bids with the ESIA and ESMP, and inclusion of any change suggested in the design concept such as the two suggested diversions of the environmental pipeline for ecological reasons.

Also the preparation and implementation of the Resettlement Action Plan and related compensation shall be incorporated in the governmental budget for the project. As indicated in section 7.3 this will involve any expropriation of private land required for the pipeline. Assuming this would be approximately 450 dunum this may represent a value of approximately 700,000 – 900,000 €. Compensation of loss of livelihood due to public agricultural land take shall be assessed in the RAP as well, and may be related to around 565 residential plots and 206 agricultural plots directly affected by the project, estimated to be around 1 – 2 M€.

Costing of the leakage control and groundwater protection measures along the pipeline route shall be incorporate in the BOT Contractor budgets. The investment costs for the required Trench line has been assessed by Posch and Partners (annex 11) at around 12.5 M€, for the required drainage system at 5.8 M€, for the integrated leak detection and pipeline monitoring system at 1 M€. The cost for the optimized emergency valve sets has been estimated at 14.8 M€. The cost for installing the required groundwater monitoring wells along the pipeline is an estimated 1.3 M€. The total estimated costs for leakage control and groundwater protection are around 39 M€.

Proposed diversions 1 and 2 (Figure 43) are closer to the existing road to minimize the threats to vulnerable trees and the desert breeding bird's nests. It is estimated that these bypasses would require a maximum of about 2 km extra pipeline, representing a maximum additional investment of around 5-6 M€ (ref: construction of a 1 km pipe with 2.4 m diameter would cost around 3 MUSD).

If it would be decided to implement local diversions of the pipeline route around individual Acacia trees that are encountered, and to avoid construction during the main breeding and nesting season, than the additional investments would be lower.

The cost for realizing a buffer zone around the key project facilities shall be incorporated in the BOT Contract budget as well. It has been advised to realise a buffer zone of 10 - 20 metres including a natural visual barrier consistent with the local ecology, for instance consisting of (palm) trees and vegetation around the Desalination Plant, the pumping station, the high level reservoir, the three hydropower plants and the Dead Sea discharge point. Assuming a total land take of 50 - 100 dunum for this purpose, the total investment costs might be around 1 to 2 M€

The construction phase related mitigation measures shall be incorporated in the Contractor's Construction Environmental and Social Management Plan (CEMP), and shall be budgeted within the BOT regular Contract budget. This includes required mitigation measures in terms of air, noise, dust, waste emissions, as well as public health, traffic safety and HSE related measures. This shall also relate to the terrestrial and archaeological precaution measured described in this ESIA, including the 10 km pre-construction clearance program to be coordinated with the Ministry of Environment, Ministry of Antiquities and MAIA.

The proposed seismic risk adaption design measures shall also be incorporated in the BOT Contract budget. This includes the use of flexible couplings to allow deflection and elongation and design / construction methods according to the EN Eurocodes or similar international codes to ensure strength and stability against earthquakes. Also flood protection measures shall be incorporated in the BOT Contract budget, such as preservation of flood management conditions of existing wadi drainage channels; any construction of additional site drainage measures or even flood retention walls around key facilities in the Aqaba region; and protection of storage areas for all fuel or chemical storage facilities against flooding. However, this shall be coordinated with the Aqaba Special Economic Zone Authority (ASEZA), who has committed to address and manage the risk of flooding in the Aqaba region by providing protection against Wadi Yutum through the Aqaba Development Company.

Security and climate related measures shall also be incorporated in the BOT Contract budget, such as monitoring and management of public access restrictions; incorporation of any non-fossil energy sources such as solar panels within the project, or any of the other proposed climate adaptation and mitigation measures.

Meanwhile the ministries of Water and Irrigation, Environment, Antiquities and MAIA shall ensure that sufficient staff, capabilities and operational budgets are available to ensure monitoring, enforcement and co-operation with the BOT contractor in accordance with all BOT Contract and ESMP related requirements.

Summarising, the key elements of the ESMP related measures would represent more or less an investment of:

1.	Land expropriation	0.5 - 0.7	M€
2.	Compensation	1 - 2	M€
3.	Leakage control (Posch)	39	M€
4.	Pipeline Diversions 1 and 2:	5 – 6	M€
5.	Buffer zones around facilities:	1 – 2	M€
	TOTAL	46 – 50	M€

8.11 Institutional Arrangements

This section provides a description of institutional arrangements in terms of who should be responsible and when, for carrying out the mitigation and monitoring measures.

The Promoter shall assign an Environmental Control Officer at the project, who shall be responsible for monitoring the implementation of this ESMP during construction and operations, including the ESMP monitoring program..

The MoEnv / ASEZA and the Israeli Ministry of Environment (for trans-boundary issues) shall be the environmental authorities responsible. They shall be responsible for overseeing the environmental and social monitoring activities and evaluating the environmental monitoring reports that shall be issued on a monthly basis by the Environmental Control Officer.

The Contractor shall be responsible for the operational activities of the RSDS Phase I Project, and shall be responsible for managing and monitoring all financing aspects of the ESMP as part of the operational financial budget for the project. The Contractor shall also be responsible for overseeing all communication with the stakeholders and manage the complaints filing unit for the project as part of their overall Public Relations department.

9 CONSULTATION AND DISCLOSURE

9.1 Consultation

As described in section 1.3, the following consultation meetings were conducted during the Inception Phase of this ESIA:

- Donor Conference Dead Sea, 1 December 2016: The Consultant participated in the Donor Conference on the 1st of December 2016 headed by the Ministry of Water and Irrigation, during which various presentations and updates on the RSDS Phase I project were provided by the Minister of Water and Irrigation H.E. Dr. Hazim El Naser and key staff of the Ministry in Jordan, as well as representatives of Israel, the Palestinian Authorities, as well as representatives of the USA, EU member states, the EIB, the World Bank, and the AFD.
- Inception Workshop, 8 February 2017: A Draft Inception Report was issued on the 1st of February and next discussed at the Kempinski Hotel at the Dead Sea on 8 February among participants from the EIB, AFD, Dar Al-Handasah and partners, the MWI, Aseza, the Geological Survey of Israel, the MoEP of Israel, the MoEnv of Jordan, USAID, Posch and Partners.

Various consultation events were set up with key stakeholder groups in order to reach consensus on the Promoter's, Lenders' and Consultants' approach to Environmental and Social issues during preparation, construction and operationalisation of the Project; and to ensure that all key environmental and social issues were addressed in the current ESIA:

- Meeting with the Aqaba Special Economic Zone Authority (ASEZA) to discuss the baseline and key challenged for the Red Sea and Aqaba region (Aqaba, 12 February 2017)
- Meeting with the Marine Science Station in Aqaba to discuss the marine surveys required under this ESIA (Aqaba, 12 February 2017)
- Meeting with the Israeli Oceanographic and Limnological Research Center (IOLR) to discuss the Israeli view on particularly the Red Sea project component (Haifa, 28 March 2017)
- Meeting with the Israeli Ministry of Environmental Protection / Marine Environmental Protection Division, conducted in Haifa with Mr, Rani Amir, head of division and Dr. Dror Zurel, Marine Ecologist and Monitoring and Research Coordinator, March 2017
- Meeting with the Jordan Marine Conservation Society (Aqaba, 2 April 2017)
- Meeting with the Aqaba Fisher Organisation (Aqaba, 3 April 2017)
- Various meetings with the MWI, MoEnv, city councils in Wadi Araba and the JVA (March, April, 2017)

The consultant organised a scoping workshop for the ESIA update in the Mövenpick Hotel in Aqaba on the 6th of April 2017. The list of participants and minutes of this workshop are included in annex 2. The objective of this workshop was to present and discuss the key environmental and social impacts that have been identified during the baseline survey of this ESIA, and to provide an outlook to the potential mitigation measures. Feedback received through this workshop has been used to further prepare the current Draft ESIA Report. The draft Stakeholder Engagement Plan for the RSDS Project Phase I was presented during this workshop as well. See annex 1.

A second consultation workshop has been scheduled for the 11th of June 2017 in Amman for the governmental and non-governmental key stakeholders of the project. The purpose of this workshop will be

to present the current draft ESIA and ESMP and receive feedback. For this purpose, the draft ESIA report will be disclosed though the websites of the MWI and the MoEnv.

One of the major stakeholders engaged in ESIA is the Jordanian EIA Technical Committee, which will review all ESIA related reports. The Committee is involved in Stakeholders' identification in coordination with all concerned parties, it assessing and eventually approval the ESIA and ESMP.

The final approved ESIA and ESMP will be disclosed on the website of the EIB, the MWI and the MoEnv. Ongoing process for Public Consultation and Disclosure during construction and operation will be organised through the BOT Contractor.

9.2 Stakeholder Consultation and Engagement

Section 6.12 and Annex 1 presents the project affected people in terms of communities, groups and individuals subject to land acquisition and potential economic displacement by the Project that will be directly affected by the project; and residents, businesses, officials who may be indirectly affected by the infrastructure development, or potentially negative environmental impacts related to the intake at the Red Sea, the aquifer monitoring or the discharge in the Dead Sea.

The stakeholder identification in annex 1 also targets vulnerable groups of the local communities. Vulnerable groups are project specific and depend on a range of issues which must be understood such as project location, socio-economic and demographic context, as well as the nature of the development and type of impacts anticipated. The identified vulnerable groups are the following:

- Women in Wadi Araba who have low education levels, limited livelihood options and normally no land ownership (particularly female headed households with no land ownership, and who because of cultural norms in local rural communities hold limited participation in decision-making;
- Landless poor in parts of Aqaba who do not own the land they live on and experience high unemployment rates and poverty;
- Farmers in the Southern Ghors area who face challenges associated with seasonal variability of rainfall and have few alternative livelihood options;
- Youth and unemployed in Wadi Araba;
- Syrian refugees in host communities within the project area.

The full list of governmental and non-governmental stakeholders who may participate in the implementation of the project are listed here as well, including their potential concern or interest in the project and proposed communication tools. The Stakeholder Engagement Program is presented in table 6-1 of annex 1.

9.3 Public Consultation, Disclosure and Grievance Procedures

Management of grievances is a vital component of stakeholder engagement and an important aspect of risk management for the project. Grievances can be an indication of growing stakeholder concerns (real and perceived) and can escalate if not identified and resolved. Identifying and responding to grievances supports the development of positive relationships between the project, communities and other stakeholders. Monitoring of grievances shall signal any recurrent issues, or escalating conflicts and disputes.

For the purpose of this project, MWI will establish a specific grievance mechanism for any concerns and complaints to be handled in a systematic way and ensure that it is responsive to any concerns and

complaints particularly from affected stakeholders and communities. Contractors will be requested through the Statement of Work to define and implement a grievance mechanism for construction activities undertaken as part of this project.

MWI/JVA will monitor the way in which grievances are being handled by their staff and Contractors and ensure they are properly addressed within deadlines specified below. MWI will keep a grievance log of all grievances including those received and addressed by the Contractors, based on which annually grievance management reports will be produced and published on the RSDS Project web-site.

All comments and complaints will be responded to either verbally or in writing, in accordance with the preferred method of communication specified by the complainant.
The following timeframe will apply:

- Acknowledgement of receipt of the grievance: within 7 days of receiving the grievance
- Proposed resolution: within 30 days of receiving the grievance.

Individuals who submit their comments or grievances have the right to request that their name be kept confidential. At all times, complainants are also able to seek legal remedies in accordance with the laws and regulations of Jordan. Information on the grievance mechanism will be distributed together with other project information (see Annex 1, table 7-1).

During the construction phase, all communication on grievances from the public will be channelled through the JVA offices in the different project areas to the Liaison Officer in the RSDS Project Unit in JVA, in MWI. The intention is that any problems and complaints arising during the construction period as well as concerns or complaints related to the operation of the project will be handled by the same team. The unit will handle communication in Arabic and English. The grievance mechanism should be accessible for all stakeholders including project affected persons and workers, whether internally employed or contractor workers.

The grievance mechanism to be applied is described in Annex 1, figure 8-1.. All grievances will be registered, along with the status of the investigation into the problem and its resolution, as appropriate. Keeping the timeframes for response to complaints, as shown in Annex 1, figure 7-1; will be the criteria used to assess whether the grievance mechanism is implemented successfully.

Two Committees will be set-up to handle the received grievances:

A Local Grievance Committee
To receive, register and evaluate received grievances and make recommendations to the Central Grievance Committee. The Committee will include a member each of the following organisations:

1. Representative of the RSDS project unit (public relation officer)
2. Representative of JVA offices in the different areas in Jordan Valley
3. Representative of implementation/operation consultant
4. Representative of respective Governorates/Municipalities

A Central Grievance Committee
To validate the recommendation from the Local Grievance Committee and make the final decision for actions regarding received grievances. The Committee will include a member each of the following organisations:

1. Representatives of the RSDS project unit (project manager and public relation officer)
2. Representative of legal department in MWI/JVA
3. Representative of lands directorate in JVA
4. Representative of implementation/operation consultant

The Committee will coordinate with other governmental, NGOs and private institutions – when needed – to resolve grievances.

The MWI/JVA shall ensure that there is an independent, objective appeal mechanism and shall inform the stakeholders about the grievance process in the course of engagement activities, and report regularly to the public on its implementation, protecting the privacy of individuals.

The grievance process will follow the following key steps:

1. Stakeholders wanting to lodge a grievance should be able to use the following channels: Telephone hotlines and on-line grievance forms provided at the RSDS Project web-site; Lodge a grievance directly at the JVA offices in the project areas; At the offices of the Governorates, or the Municipality offices (grievance boxes can be located in these offices for example near a community information board).
2. Identification of grievance issue through personal communication with the liaison officer by phone, letter, grievance form, during meetings, or any other channel. Grievances will be recorded on the Grievance Form and then collected in Grievance Record which will be held at the RSDS Project Unit, at MWI office. Complaints submitted directly at Governorate or Municipal level will be redirected to the RSDS Project office.
3. Grievance procedure starts with formal acknowledgement through a personal meeting, phone call, or letter, as appropriate, within 7 days of submission. If the grievance is not well understood or if additional information is required. Clarification will be sought from the complainant during this step.
4. A response is going to be developed by the Grievance Committee which will have frequent meetings to review the received complaints, required actions are implemented to deal with the issue and completion of these is recorded on the grievance record.
5. The response is signed-off by the RSDS project manager. This sign-off may be a signature on the grievance log or in correspondence which should be filed with the grievance.
6. The response to the complainant is recorded to help assess whether the grievance is closed or whether further action is needed.

A sample of the Project Public Grievance Form is provided in Annex 1. A workers' grievance mechanism will be established for the employees of the contractors as a separate system. The grievance mechanism should guarantee confidentiality. Workers will be given the possibility to lodge grievances both through workers' representatives and unions and independently, personally, regardless of the matter of the complaint. Anonymous lodging will also be made possible (grievance boxes). The grievance procedure will be free, open and accessible to all and comments and grievances will be addressed in a fair and transparent manner. In particular, all workers will be informed of the Grievance Process and new workers will be informed when they join the Project. Information on Contact Points will be posted on on-site information boards. The details of this type of grievance mechanism will be established before commencement of any construction work.

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ANNEX 1 – Stakeholder Engagement Plan

ANNEX 2 – Minutes of the Scoping Workshop for this ESIA

MINUTES OF MEETING

Meeting: **First ESIA Consultation Workshop**
Date: 06 April 2017
Time: 11h00 – 14h30
Place: Mövenpick Hotel - Aqaba
Status: Final

The Project:

The Red Sea to Dead Sea Project Phase I comprises abstracting 300 million cubic metres (MCM) per year from the Red Sea, desalinating a portion of this (65 MCM) and then conveying a mix of the waste brine and the remaining seawater balance (235 MCM) to the Dead Sea. Freshwater will be supplied to Aqaba and Eilat in the south of Jordan and Israel respectively. This project will also be used as a pilot to determine the impacts on the Red Sea and Dead Sea in order to inform the design of the next phase that will see the Project increase to proposed installed capacity of 700 MCM / year.

Objective of this Workshop:

The objective of this workshop is to present and discuss the key environmental and social impacts that have been identified during the baseline survey of this ESIA, and to provide an outlook to the potential mitigation measures. Your feedback will be highly appreciated to further prepare the Draft ESIA Report, which is due for late May 2017.

Agenda:

1. Registration and coffee
2. Opening by H.E. Eng. Saad Abu Hammour, Secretary General of the Jordan Valley Authority
3. Introduction by Juan Bofill, European Investment Bank
4. Presentation of the Stakeholder Engagement Plan by Rami Salameh of Posch & Partners
5. Introduction to RSDS Phase I project ESIA by Jeroen Kool (RHDHV)
6. Gulf of Aqaba: Baseline and Key Impacts by Dr. Elizabeth Jolley of RHDHV
7. Terrestrial Ecology: Baseline and Key impacts by Mr. Adnan Budieri of RHDHV
8. Cultural Heritage: Baseline and Key Impacts by Dr. Mohammed Waheeb of RHDHV
9. Socio-economics: Baseline and Key Impacts by Dr. Amer Jabarin of RHDHV
10. Outlook to Mitigation Measures by Jeroen Kool of RHDHV
11. Round table discussion and feedback, chaired by Nabil Zoubi of MWI
14. ESIA Workshop Conclusions by Jeroen Kool of RHDHV
15. Concluding Remarks by Eng. Nabil Zoubi, Project Director of the RSDS Project at the MWI
16. Closing by H.E. Saad Abu Hammour, SG of the JVA

Participants

ORGANIZATION	NAME	POSITION / Role in RSDS	EMAIL
EIB	Francesco Totaro	PPP Expert	f.totaro@eib.org
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RHDHV	Jeroen Kool	ESIAKey Expert I - TL	jeroen.kool@rhdhv.com
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RHDHV	Elizabeth Jolley	ESIA Key Expert II Marine	elizabeth.jolley@rhdhv.com

Minutes:

No.	Subject	Actions
1	Introduction in Arabic and English by H.E. Eng. Saad Abu Hammour, SG of JVA, stressing the importance of the RSDS Phase I Project for Jordan and the region and this workshop, and emphasising the many studies and stakeholder events performed earlier under the World Bank studies	
2	Introduction by Juan Bofill (EIB) ○ EIB /AFD are offering a multi-million loan / grant package to the project to either the government of Jordan, or the private contractor or a combination of both ○ Aware of importance of the project in the region ○ Needs to be in compliance with the best standards and the compliance of the donors / financiers to ensure a smooth financial close. ○ Requested that everyone raises questions and concerns so they can be raised and discussed and taken on board.	
3.	**Stakeholder Management Plan (Rami Omar)** • HE asked for a round room introduction – this was then undertaken. • Mr. Rami provided a summary of the draft Stakeholder Engagement Plan developed by Posch and Partners. It was emphasised that the final and approved plan shall be incorporated in the further project preparation and implementation process for the RSDS Phase I	
4.	**Introduction to the ESIA (Jeroen)** • **Jeroen Kool** provided an introduction to the RSDS Phase I project outline and the key environmental impacts • **H.E. Eng. Saad Abu Hammour:** asked why RHDHV presenting the technical details on the project. Mr. Kool replied that all stakeholders need to have a proper understanding of the details of the project prior to providing feedback on its impacts. • **Nabil:** Questioned presenting intake design details that could change e.g. 140m depth as the final option in this meeting if this is not the final measure as the BOT contractor needs to determine what is to be done. • **Francesco Totaro:** explained that is not the final engineering solution, and that the EIB intend to finance an alternative options study for the red	

No.	Subject	Actions
	sea intake. The ToR is about to be launched to its framework contractors– in about 4 months the results of the study should be determined. This may include undertaking surveys and if a shallow solution is an option. • **Jeroen:** explained that RHDHV are developing the ESIA based on the project as presented by Dar Al-Handasah and partners in the Conceptual Design to be given to the BOT Contractors. Changes / reassessments will have to be made to the ESIA / EMP if changes to the project design occur.	
5.	**Gulf of Aqaba / Eilat: Baseline and Key Impacts (Elizabeth)** • **Elizabeth Jolley** provided a presentation about the key marine aspects and impacts of the project • **Maritime Services:** Questioned if any bathymetry has been undertaken for the project, as the previous bathymetry is 10 years old now and could well be out of date, particular as the presence of any pipeline could cause sediments to move deeper and thus change the bathymetry of the wider area and impact on anchoring of vessels in the wider area. Also any bathymetry that is taken should be registered with the Maritime Services in order to verify it. ○ Dar Al-Handasah and partners advised that they have taken bathymetry of the proposed pipeline corridor. • **Maritime Services:** raised that in the winter when the weather is poor, that vessels that are anchored often drift and pull their anchors with them or have to emergency anchor – this is also the case in Israeli waters. Therefore, the pipeline will need to be appropriately marked (buoys, lights, published on admiralty charts) to prevent the pipeline from being damaged. ○ **RHDHV:** advised that marine navigation and anchoring is being considered within the ESIA and these comments are very useful and will be factored into the reporting. • **Maritime Services:** also advised that discussions are underway with ASEZA and Israel to allow certain vessels to navigate from Jordan to Israel and vice versa. This needs to be understood and factored into the project, as any anchoring by these vessels could again damage the pipeline.	**Dar** Al-Handasah to provide the bathymetry survey data to Maritime Services. **RHDHV:** to request more information from ASEZA / Maritime Services. **RHDHV:** Issue or recommend issuing a short project update focused to the fishermen in Arabic – discuss with Posch.

No.	Subject	Actions

- **RHDHV:** this is welcome information and was unknown until now, and will need further discussion and consideration to ensure the appropriate control / mitigation measures are documented and implemented.

- **Fishermen Cooperative:** concerned about the pipeline location and whether this would impact the area that they are fishing in.
- **GOI (Dror):** Advised that that studies (i.e. engineering assessment / modelling) are required to understand changes in currents (hydrodynamics) that can result in erosion and destabilisation of the pipeline and its integrity not just from the ecological perspective.
  - **RHDHV:** responded that this is correct, which is why we are advising that the additional studies are required by the BOT contractor, and that this is being factored and assessed into the ESIA.
- **MWI/JAV:** questioned why the pipeline should be so deep, and are there any other worldwide that are as deep as this.
  - **RHDHV** responded that there are pipelines of this length (2km) but there are none of this depth, the deepest being ca. 90m deep.
- **MWI/JAV:** asked about maintenance of the pipeline at 140m / 25m off the seabed, and that this will be difficult. RHDHV responded that this might be indeed a major challenge, but this is not within the ESIA scope but rather an engineering consideration that the BOT contractor will need to consider, but the health and safety elements associated would be considered.
  - **EIB** responded that they are issuing a tender to look at the alternative options as also raised by RHDHV during the Inception Stage of this ESIA project, as an alternative feasibility assessment is required under international standards to understand what other options have been considered. It will include assessment of the engineering and environmental implications, including the cost-benefit analysis.
- **MWI/JAV** questioned about burying the pipeline completely under the seagrass beds and if this is completely necessary as the pipelines are not

No.	Subject	Actions
	small and this would incur extra costs and do not want to incur costs if it was really necessary. ○ **RHDHV** advised that this is not a 'final' decision, but an option that is currently being considered, and that consideration of the design and construction impacts will need to be determined first, followed by any control / mitigation measures. Particularly, as burying the pipeline also have significant impacts, and such a measure would be need to first weigh up which option (i.e. burying or laying on the seabed_ would have the least impact in the long term taking into account the importance of seagrass beds, which are a 'critical habitat', and are of international conservation importance. • **Ayla:** raised the fact that their area is so close to the pipeline, and therefore it is imperative that the BOT contractor has close consultation with Ayla in relation to their intake, as the construction activities may have an impact on their intake. ○ **RHDHV** responded that this will be stipulated in the ESIA as already presented that 'Utilities' have to be considered. Furthermore, that control measures will also be considered, such as holding 'consultation / workshop meetings' between Ayla / BOT / MWI to establish communication methods during the construction phase, discussing control measures such as periodic temporary shut downs of the Ayla intake, ensuring that the shut downs are not during April / May when benthic algae and dissolved oxygen levels are at their highest, and therefore any intake shutdown would worsen any eutrophication. • **Ministry of Env:** idea of having a 'flexible floating' intake option that can go up and down? • RHDHV responded that, if so, this should be considered by the technical teams (Dar Al-Handasah and partners. Contractor) •	
6	**Terrestrial Ecology (Adnan Budieri)** • Adnan Budieri provided a presentation on the terrestrial ecological aspects and impacts • N**ature conservation society:** happy with the	RHDHV: reference to Ramsar Status of Wadi Araba

No.	Subject	Actions
	consideration of terrestrial ecology and that the ESIA tries to avoid related impacts it. Mentioning about proposed Ramsar status of Wadi Araba	
7	**Cultural Heritage (Mohammed Waheeb)** • **Dr. Mohammed Waheeb** provided a presentation about the archaeological and cultural heritage related aspects and impact	
8	**Socio-economic (Amer Jaberin)** • Dr. Amer Jabarin provided a presentation about the social and socio-economic aspects and impacts **Other:** • **Maritime Services:** will any study been done on the Dead Sea, now it is supplied by fresh water not sea water – so will this have an impact on the dead sea? • Jeroen Kool explained that this has been a key aspects of the previous World Bank studies and current project design, including dedicated monitoring activities foreseen during phase I	
9	Indicative Mitigation Measures were presented by Jeroen Kool	
10	Discussions and Questions **Closing Remarks by H.E. at 14.10pm.** **Remarks by Nabil –** almost finished the RfP document, proud to have completed the concept design in less than 14 months starting in Jan 2016, which includes agreeing with Israel. This is a real accomplishment. This will shortly be given to the bidders, who will be given 6 months to prepare their tenders. We will start the monitoring of the dead sea Also proud of the finance elements, joint contribution of GOI and GOJ for 100 million, and the remaining part will be financed by the BOT contributor – received interest from other IFIs, and for WB, EIB, AfD, IBRD for their financing to get to this point. In order to get the financing need to extend the studies in the Red Sea and the monitoring of the Dead Sea. Been a huge accomplishments to complete these milestones.	
11	Closing of Workshop by H.E. Saad Abu Hammour at 14h30	
12	ESIA Workshop Discussion and Conclusions (after lunch):	

No.	Subject	Actions
	• WB, USAID, EIB, AfD, RHDHV present only • WB: use the Water User Associations (ca. 160) to help implementing the stakeholder engagement. • WB: Hydrodynamics (thermo) needs to be discussed in the ESIA • The ESIA is based on the current conceptual design and the final ESIA could change depending on the intake, desalination. Going to suggest how to provide an 'Annex' or other document in order to get the project permitted…..need to agree on this. • Two weeks to comment on these minutes. • AfB: How long to get approval from the MoEnv etc. The previous phase was the initial phase, the current workshop is the Scoping Workshop, the next step will be to submit the draft, then the National Committee will review the ESIA – a month (likely to take longer). There are exceptions with the approval, where the MoE will give conditions. • Risk Assessment – likely that the Ministry of Environment will not stop the project and that with the meeting next week with the MWI they will agree on a method to update the changes. • Strategic project – pressure to make sure this goes ahead, so unlikely to be a risk. • EIB: Asked if we will assess the shallow intake. RHDHV: We will not be assessing the shallow intake as part of the current ESIA assignment – we know that this will may take place through a tender with the EIB framework contractors • Dar: Needs guidance from the MWI to include a couple of paragraphs that a Med5P project (alternatives study – 4 months) is being done. • RHDHV: Need to advise in the ESIA / EMP that an alternatives study is being undertaken and the Contractor will have to review this and undertake this. • Alternatives study – would need approval from the JAB on such a study if there are any changes, which includes the Israel representation from the Ministry of Environment. • Coral settlement monitoring / Funding of Joint Iniative. • Cumulative impact re sanitation capacity in the future with future development of the Eilat and Aqaba. How will they deal with treat / reuse water, will that result in more water being deposited into the Red Sea.	Posch: include WUA's in Stakeholder Engagement Plan RHDV: Sanitation impacts due to augmented Aqaba water supply will be included in ESIA

No.	Subject	Actions
	• Next steps in terms of the workshop: ○ Need stakeholders 1 week to review the ESIA ○ EIB's view: Ramadan needs to be considered. It would be good to have a meeting before the issuing the Draft ESIA and then include in the Final Draft ESIA – then we will take on board. Then distribute to a small group e.g. EIB/WB/AfD/MWI. ○ Need to give warning that report is coming. ○ Preference to do the meeting before Ramadan (MWI) opinion. ○ Could provide an input paper into the workshop. ○ EIB's concern is to avoid strong opposition to the text and way to avoid is to have the preliminary comments ○ Have a workshop before 25th May?? ○ Location of the workshop will be in Amman. ○ Cannot separate consultation. ○ Stakeholders need to receive the ESIA 15 days before the consultation workshop under Jordanian law. ○ Need to have a final draft, then need a workshop 15 days (min) later – get the report on the 24th and then do the workshop during Ramadan as a short sessions, no breaks, or in the evening. ○ EIB / AfD / WB 3-4 days before we issue to others. ○ EIB to circulate meeting / review times. ○ RHDHV to issue deviations of the pipeline (terrestrial considerations) to Dar.	

Comments provided after the Workshop:

From: mohammed salem [mailto:msalem@ayla.com.jo]
Sent: Sunday 9 April 2017 15:35
To: Jeroen Kool
Cc: Sahl Dudin; Chris White; Hala Araj; nidal majali
Subject: RE: ESIA RSDS Phase I Project - Aqaba Workshop 6 April 2017

Dear Mr. Kool,

It has been our pleasure to participate in the first consultation Workshop for the ESIA of the RSDS Phase I project, and we would like to thank you and the team for your invitation and all the efforts made for engaging stakeholders in such an event and we look forward to see this project live very soon.

In view of the above and the data presented in the subject workshop, kindly find hereunder our respective comments;

- It seems that the location of the intake is not yet finalized; however, it is very important to consider that Ayla Project is live and its intake structure is very critical due to the fact that seawater is being pumped to swimmable lagoons 24/7, and stopping the pumping will cause deterioration to the lagoons` water quality, not to mention the negative effect that might result from sediments disturbance in the surrounding.
- It will be highly appreciated if the design of the intake structure, pipelines, and the pump station is shared with Ayla to be reviewed by our consultants to advise on the effect of the same on Ayla and recommend mitigation measures.
- In order to avoid potential claims with the successful contractor, provisions should be made in the tender documents to mitigate any negative effects on Ayla's operations during construction including close coordination with Ayla.
- During the dredging activities for the pipelines and intake structure, the Contractor shall;
    - Install turbidity curtain around areas of operation.
    - Install turbidity curtain at areas of discharge.
    - Consider all other Environmental Measures of ASEZA.
    - Consider continuous [daily] monitoring to sedimentation/turbidity levels at Ayla intake locations to be compared with Ayla records for the same area. In case the turbidity levels exceeded Ayla baseline, dredging operations has to be stopped.
    - Further mitigation & control measures would be advised on a later stage.
- We would like also to confirm that Ayla is happy to assist as required and to provide your team with our monitoring records and modeling reports.

Best regards,
Ayla Project
Mohamed Salem

Comments by Ministry of Environment:

Comments on the First Consultation Workshop for RSDS Phase 1 Project

1- For many impacts how can the mitigation measures suggested before carry out detailed assessment?
2- For appropriate consultation with different stakeholders the language should be their language in order to enable them to present their concerns and to provide their feedback.

3- The presentations should focus on the positive impacts (benefits) of the project in all aspects rather than sitting mitigation measures of negative impacts.
4- It seems that the implementation of Stakeholders Engagement Program will take more time considering the large number of stakeholder and the limited time given to submit the draft ESIA
5- Some issues are presented in details (i.e. Terrestrial Ecology, Cultural Heritage) while others are generally presented.
6- One of the major stakeholders engaged in ESIA is the EIA Technical Committee which will review the reports. The Committee should be involved in early stages of the study.
7- Stakeholders' identification should be done in coordination with all concerned parties.

ANNEX 3 – List of Literature

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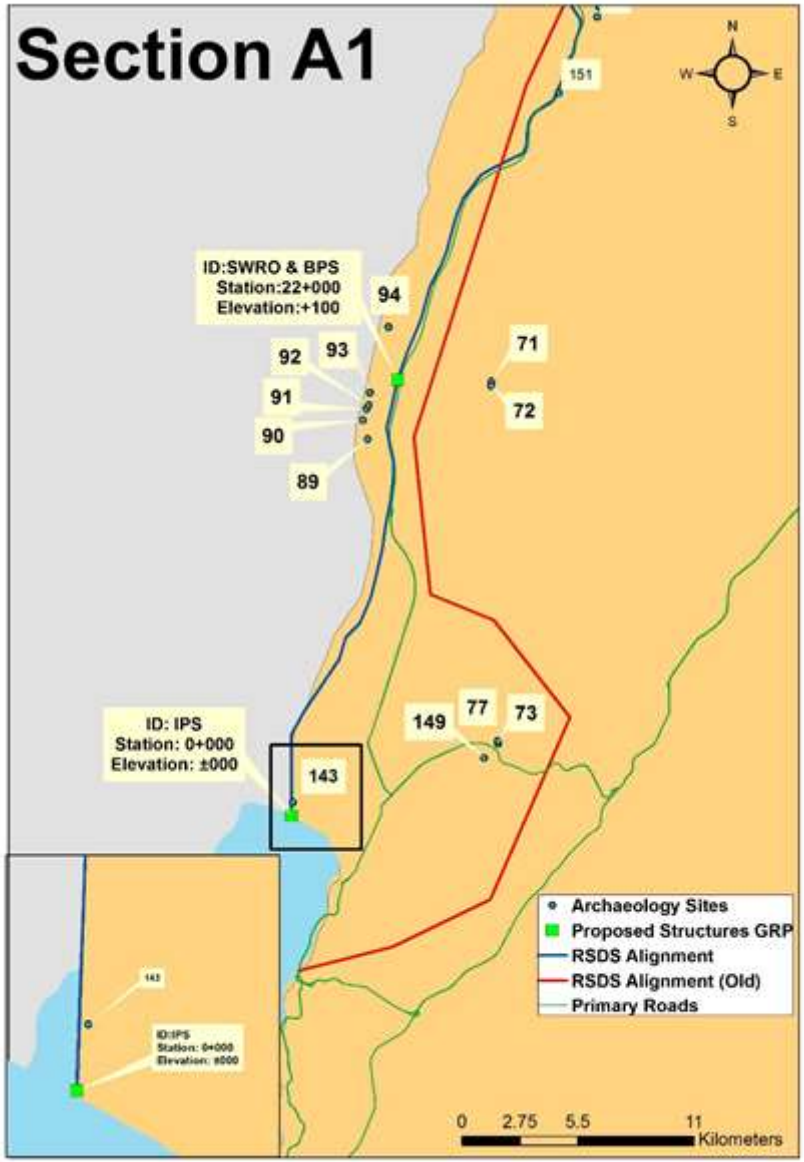
ANNEX 4 – RSDS Phase I Pipeline Route

ANNEX 5 – Marine Baseline, Impacts and Mitigation

ANNEX 6 – Terrestrial Ecological Baseline, Impacts and Mitigation

ANNEX 7 – Archaeology and Cultural Heritage related Baseline, Impacts and Mitigation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92
93
91
90
89
71
72
149
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73
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Archaeology Sites
Proposed Structures GRP
RSDS Alignment
RSDS Alignment (Old)
Primary Roads
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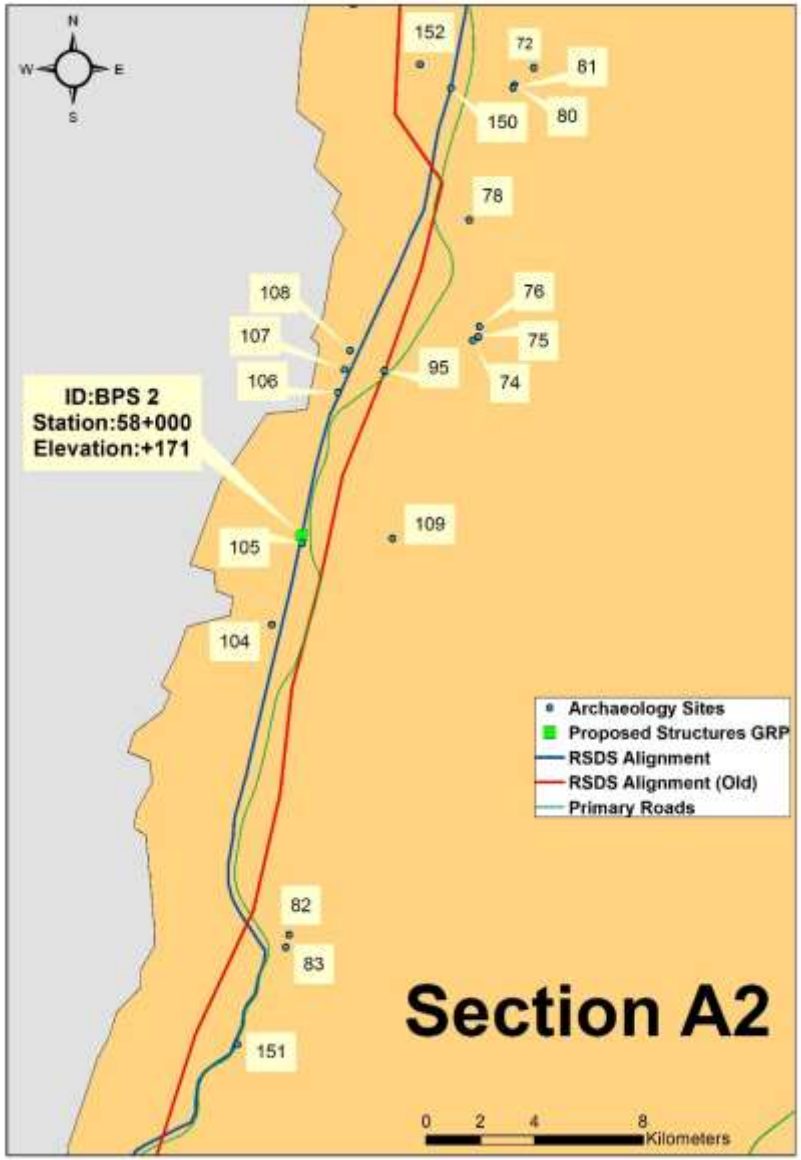
Kilometers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RSDS Alignment (Old)
Primary Roads
Section A2
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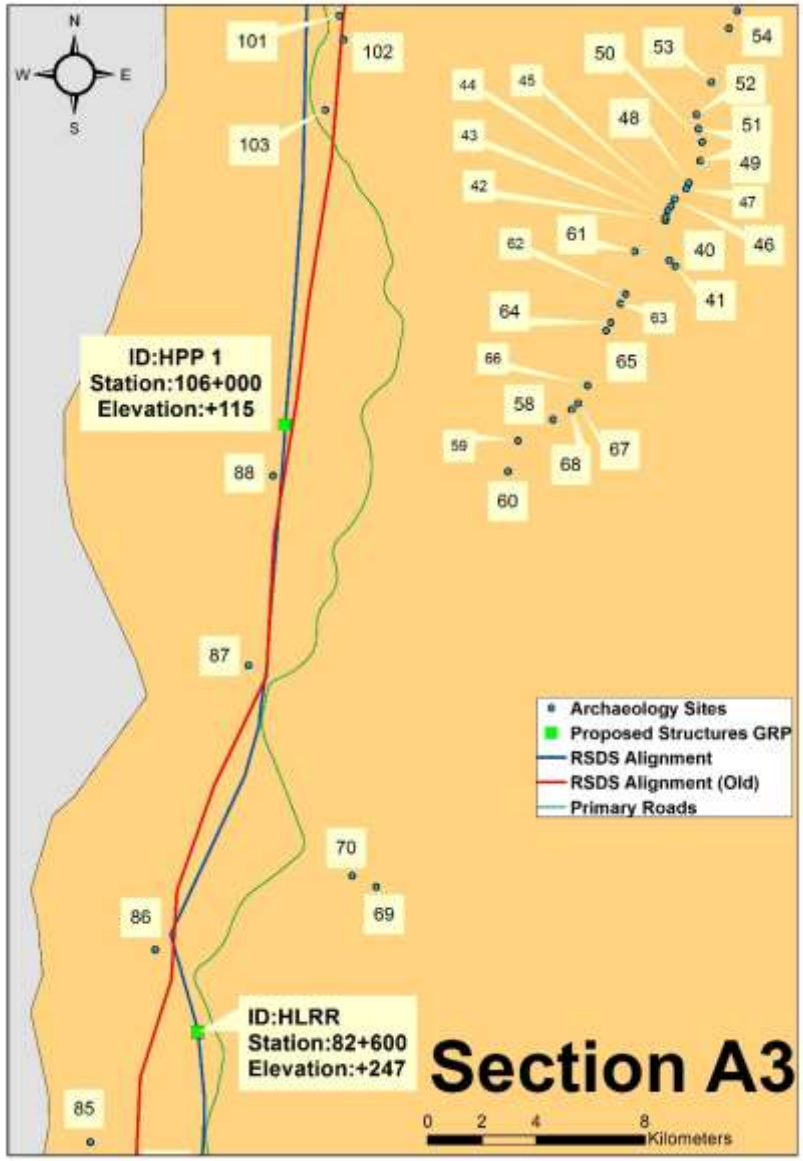
Kilometers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RSDS Alignment (Old)
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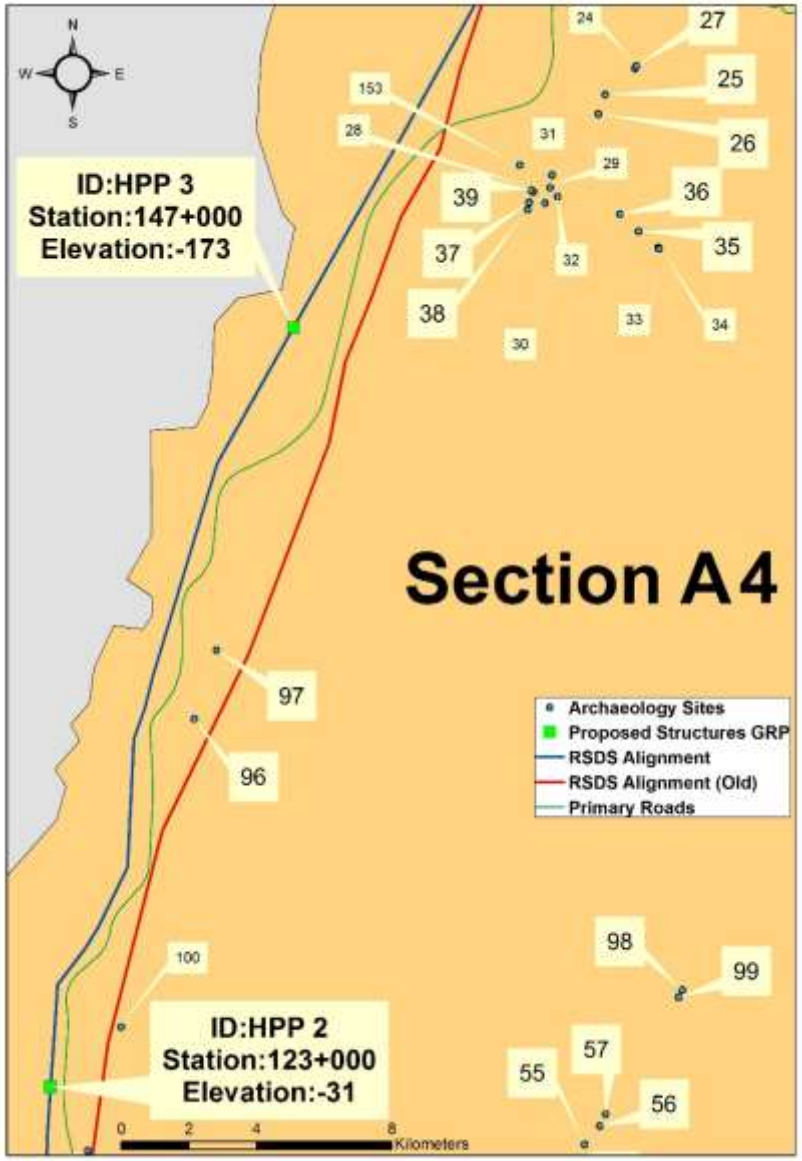
Kilometers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RSDS Alignment (Old)
Primary Roads
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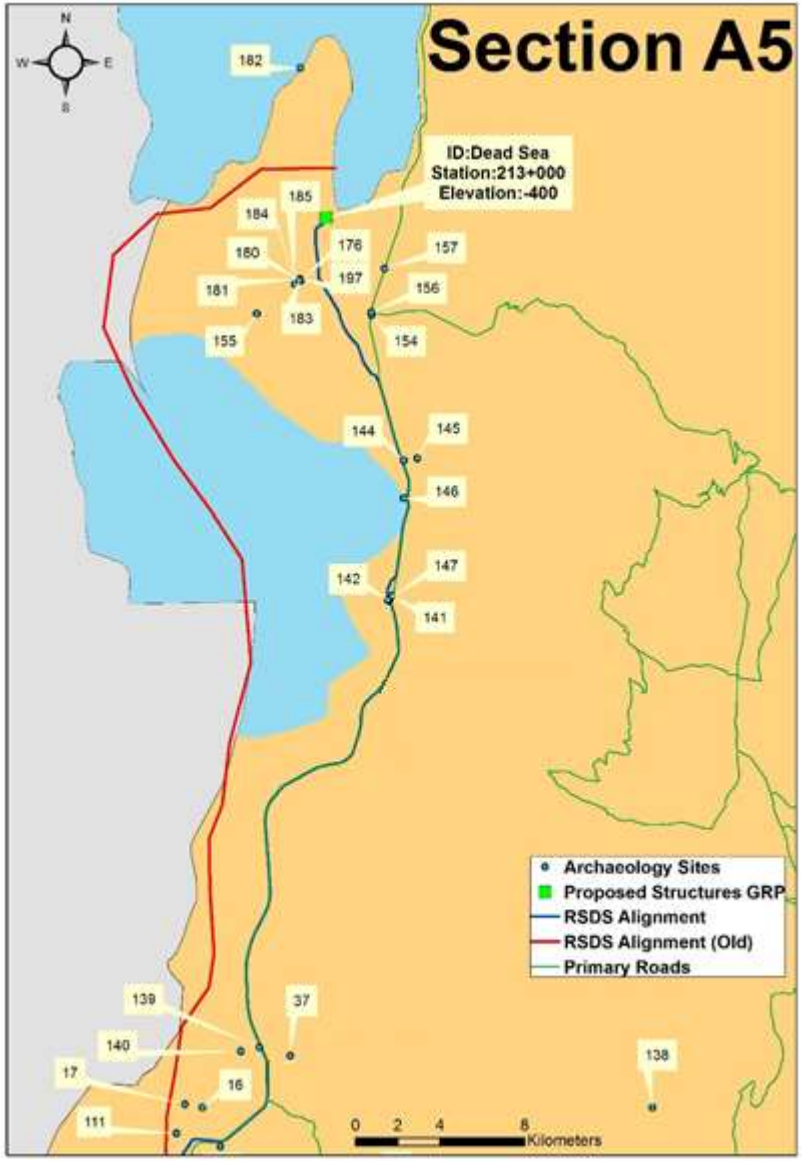
Kilometers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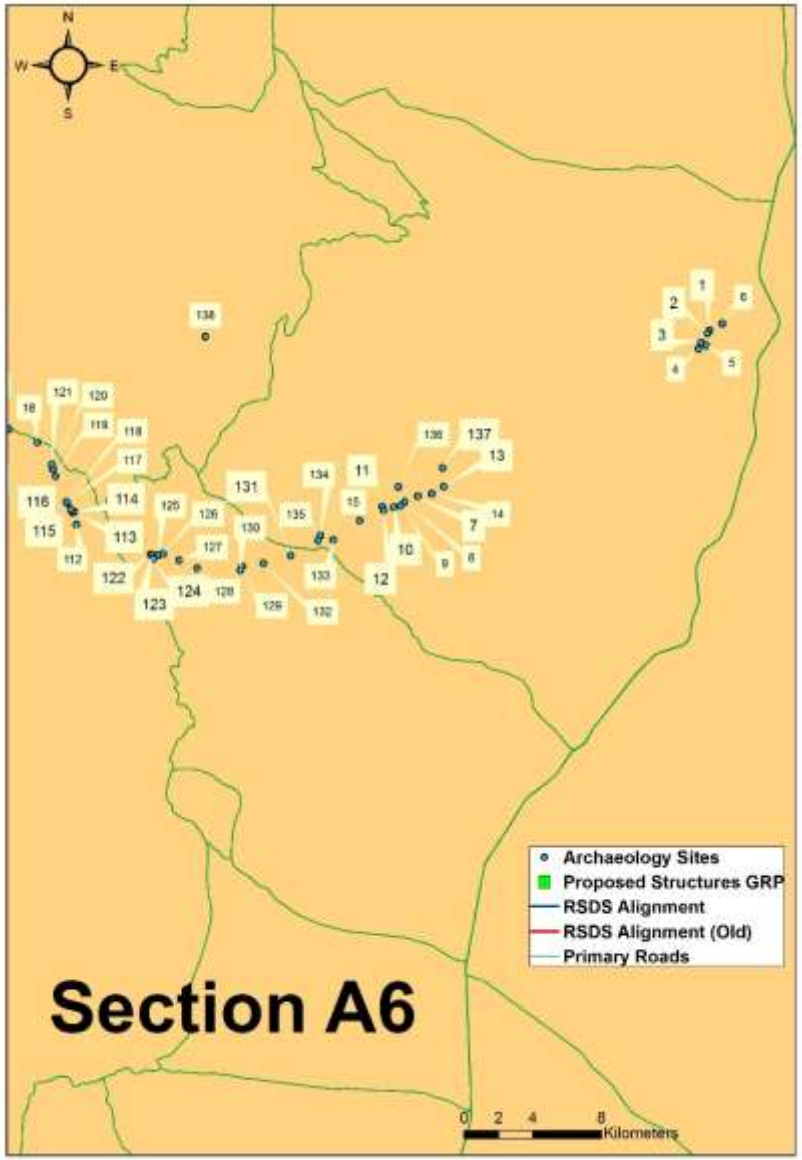
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Primary Roads
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Continuation of Annex 7 - Archaeology

ANNEX 8 – Social and Socio-economic Baseline, Impacts, Mitigation and Compensation

ANNEX 9 – Land Acquisition and Resettlement Policy Framework

The RSDS project is supported by the European Investment Bank (EIB) which required that a resettlement policy framework should be prepared for the Project in compliance with the Bank's social standards and the World Bank's OP.4.12 on Involuntary Resettlement.

The EIB requires the preparation of Resettlement Policy Framework ("RPF") for the RSDS Project, which will guide all future Resettlement and Compensation Action Plans' ("RAPs") preparation and implementation. It will be based on the GOJ's strategies and the Bank's standards to effectively assess the scale of and responsibilities for addressing all adverse impacts of resettlement and maintenance and improvement of the living standards of those affected by land acquisition and any other resettlement effects of the project. The project is guided by the EIB Standard on Involuntary Resettlement and the World Bank (WB) Operating Principles 4.12 on Involuntary Resettlement (OP 4.12).

The impacts of Involuntary Resettlement from development projects may cause loss of shelter, income and business among the affected communities by affecting their assets and livelihoods. Based on the preliminary project design, the development of the RSDS Phase I project may involve land acquisition and therefore WP OP 4.12 and EIB Standard 6 will be triggered, as well as Standard 7 (Rights and Interests of Vulnerable Groups) and Standard 10 (Stakeholder Engagement).

This Resettlement Policy Framework establishes the principles and procedures which will govern the land acquisition process, and compensation entitlements for loss of land or other fixed assets as a result of the project implementation. The RPF was prepared based on World Bank Operational Policy 4.12, EIB Standard 6 and the relevant Jordanian laws and regulations, and will form the basis for all future resettlement planning.

The objectives of such a Resettlement Policy Framework are to reduce potential adverse impacts on project affected people (PAPs) and to define the planning, preparation and implementation of the resettlement process on this project. This includes:

- avoid and minimise potential adverse impacts which include involuntary resettlement caused by land acquisition;
- develop measures to mitigate the adverse impacts if they cannot be avoided, to adequately compensate PAPs and to restore their livelihoods;
- ensure that no impoverishment of people shall result as a consequence of land acquisition, or acquisition of assets for purposes of implementing the RSDS Project;
- ensure that all PAPs are aware about grievance mechanism that is easily accessible; and,
- set up a consultative, transparent and accountable Involuntary Resettlement process that the Project Promoter will be committed to.

During the implementation of the RSDS project, the MWI is advised to follow the following principles on involuntary resettlement and land acquisition:

1. Resettlement and land acquisition will be minimised as much as possible. Where land acquisition is unavoidable, the project designed will be reviewed (where possible) to minimise adverse impacts on residents in the project area.

2. PAPs will be compensated, relocated and their livelihood restored, so as to improve their standard of living and income earning capacity, or at least to restore them to pre-project levels.

3. All people residing in, or using land, or having rights over resources within the project area (on the date of the census survey) will be entitled to compensation for their losses which will be documented through the future census and asset inventory survey.

4. Moving allowance and (if needed) assistance with relocation will be provided to vulnerable individuals. The lack of legal rights or title with regard to an asset(s) affected by the project (be it land, crops/trees or structures) will not preclude the PAP from receiving compensation and relocation assistance as per the objectives of the EIB Standard 6 and WB OP 4.12.

5. Compensation strategy for land, structures, crops/ trees affected or damaged by the project, involves compensation at full replacement cost, which is: market value plus all relevant administrative fees and transaction taxes.

6. Vulnerable groups of affected people will also receive the suggested appropriate livelihood restoration assistance to compensate for loss of livelihood.

7. PAPs who are subject to physical displacement (and therefore will have to relocate and therefore who lose their shelter), will receive a Moving Allowance, in addition to compensation fairly due to them for their affected assets, such as land, structures, crop/trees. Those PAPs who are subject to economic displacement (where they do not need to move but their livelihood is affected) will be compensated for affected assets.

8. Where the total amount of agricultural land acquired is less than 20% of the PAP's farm land for those with holdings more than 1 ha, and 10% of land for those with holdings less than 1 ha, cash compensation may be paid in lieu of land-for-land compensation provided that a PAP receives full replacement value for the land and all assets on it, without any deductions for depreciation. In other cases, where the amount of the affected non-farm land exceeds 10% of the cultivated area, will need to be allocated alternative land nearby as land-for-land compensation.

9. Resettlement plans will be implemented following consultations with the project affected people, and with their endorsement (through documented public consultations and discussions). Financial and physical resources for resettlement and rehabilitation will be made available as and when required.

10. Resettlement and livelihood restoration measures planning and implementation will be aligned with the project schedule which might need to be revisited to accommodate smooth implementation of the resettlement and land acquisition process;

11. Adequate arrangements for effective and timely internal and external monitoring should be made to check the implementation of all resettlement and livelihood restoration measures.

Below of an overview of the main requirements of the EIB's *Involuntary Resettlement-Standard 6* in comparison with the World Bank *Involuntary Resettlement OP 4.12*

Table 32 - EIB and WB Involuntary Resettlement requirements

EIB's Involuntary Resettlement-Standard 6	WB Involuntary Resettlement OP 4.12
Involuntary Resettlement Principles Avoid or, at least minimise, project-induced resettlement whenever feasible through exploring alternative project designs, avoid and/or prevent forced evictions; Ensure that any eviction which may be exceptionally required is carried out lawfully, respects the rights to life, dignity, liberty and security of those affected who must have access to an effective remedy against arbitrary evictions; Respect right to property of all affected people and communities and mitigate any adverse impacts arising from their loss of assets, or access to assets and/or restrictions of land use, whether temporary or permanent, direct or indirect, partial or in their totality; Assist all displaced persons to improve, or at least restore, their former livelihoods and living standards and adequately compensate for incurred losses, regardless of the character of existing land tenure arrangements (including title holders and those without the title) or income-earning and subsistence strategies; Ensure that resettlement measures are designed and implemented through the informed and meaningful consultation and participation of the project-affected people throughout the resettlement process. In addition, the EIB is committed to upholding the Aarhus Convention, which emphasises the citizens' rights to justice, to be consulted and to enjoy access to information on projects and plans and programmes that will have environmental and social impacts on them, their assets and their lives. Forced evictions shall not take place. Evictions during land acquisition and expropriation must be carried out lawfully, only in exceptional circumstances and in full accordance with relevant national laws, international human rights and humanitarian law. Planning and managing involuntary resettlement properly as early as possible in the project life cycle, in consultation with all key stakeholders is of paramount importance.	Involuntary resettlement should be avoided where feasible, or minimised, exploring all viable alternative project designs. Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits. Displaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs. Displaced persons should be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher

EIB's Involuntary Resettlement-Standard 6	WB Involuntary Resettlement OP 4.12
Project Affected People *Project-affected people (PAPs)* cover all persons impacted by the involuntary resettlement, including all members of a household (women, men, girls, boys, incl. several generations in the case of extended households); the owner and employees of a business; members of an ethnic minority group; tenants; land owners and sharecroppers; informal settlers (i.e. lacking formal titles); holders of customary land-rights; informal business-operators and their employees/assistants. Eligible PAPs may be in any of the following situations: have formal legal rights to the land/structure they occupy; do not have formal legal rights to land, but have a claim to land that is recognised or recognisable under the national laws (e.g. ancestral, traditional lands); are dependent on the impacted land for their livelihood by way of customary access to natural resources; have no recognisable legal right or claim to the land or structure they occupy; and/or economically displaced persons who face loss of assets or access to assets. It is important to note that PAPs are not household units and different individuals will be differently impacted by the resettlement. Gender dynamics need to be duly observed and taken into account throughout the process.	*People, covered by physical or economic displacement (or both)* can be classified in one of the following three groups: those who have formal legal rights to land (including customary and traditional rights recognised under the laws of the country); those who do not have formal legal rights to land at the time the census begins but have a claim to such land or assets--provided that such claims are recognised under the laws of the country or become recognised through a process identified in the resettlement plan, and those who have no recognisable legal right or claim to the land they are occupying. Persons covered by (a) and (b), are provided compensation for the land they lose, and other assistance. Persons covered under (c) are provided resettlement assistance in lieu of compensation for the land they occupy, and other assistance, as necessary, if they occupy the project area prior to a cut-off date established by the project developer. Persons who encroach on the area after the cut-off date are not entitled to compensation or any other form of resettlement assistance. All persons included in (a), (b), or (c) are provided compensation for loss of assets other than land.
Indigenous Peoples and other Vulnerable Groups *EIB's Standard 7, Rights and Interests of Vulnerable Groups is* applied in synergy and cross-reference with EIB Standard 6. Indigenous peoples are defined as a distinct social and cultural group, possessing the following characteristics : Self-identification as indigenous; A shared experience of oppression or colonisation; Collective entitlement and/or attachment to ancestral lands, territories and natural resources in their habitats and use thereof; Distinct social, economic and political systems; Distinct languages, spiritual traditions, culture, beliefs and knowledge Vulnerable groups may be excluded from political decision-making, and may therefore face a higher risk of impoverishment and social exclusion. Hence, the resilience levels of such groups to adverse impacts are lower. Such	*World Bank's OP 4.10 Indigenous Peoples is* applied in synergy and cross-reference with WB OP 4.12. The term "Indigenous Peoples" is used in a generic sense to refer to a distinct, vulnerable, social and cultural group possessing the following characteristics: self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and an indigenous language, often different from the official language of the country or region. Ascertaining whether a particular group is considered as

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groups may include ethnic, religious, cultural, linguistic minorities, indigenous groups, female-headed households, children and youngsters, the elderly, persons with disabilities, and the poor. In conflict zones and post-conflict contexts, certain groups may suffer further (e.g. women and children lacking the capacity to claim heritage from missing parents) and new categories may appear such as refugees, returnees and internally displaced people in need of economic and social reintegration into society.	"Indigenous Peoples" may require a technical judgment. Particular attention will be paid to the needs of vulnerable groups among those displaced, especially those below the poverty line, the landless, the elderly, women and children, indigenous peoples, ethnic minorities, or other displaced persons who may not be protected through national land compensation legislation.
Evaluation of Impacts The promoter is required to carry out a census and a socio-economic baseline survey to establish the number of people to be displaced, livelihoods affected, and property to be compensated. The census date is usually also a cut-off date for eligibility claims. The cut-off date may also be the date of the project area delineation, prior to the census, but only following an effective and documented public information dissemination, and continuous dissemination to prevent further population influx. The socioeconomic baseline survey is done through a sample survey and is critical in identifying the current socio-economic, cultural and political profile of the affected persons; their levels of overall resilience or vulnerability to establish degrees and sorts of impacts. The census and the baseline survey are ideally done in parallel. Where this is not possible, the socioeconomic survey is done at the preliminary project design stage and the census by the time of the final detailed design[1]. A cut-off date determines the eligibility for compensation of project-affected persons. The cut-off date represents the actual date that the project-affected persons' assets and infrastructure at a particular site were recorded during the census survey. Assets (land, structures and other assets) created, encroached or acquired by individuals or groups after the cut-off date, will not be eligible for compensation. Setting a cut-off date requires clear, public and accessible disclosure of the imminent project activities on the site concerned and their relevant implications for peoples' lives.	In the early stages of a project preparation, project developer should carry out a census to identify the persons who will be affected by the project, to determine who will be eligible for assistance, and to discourage inflow of people ineligible for assistance. The cut-off date is the date the census begins. The cut-off date could also be the date the project area was delineated, prior to the census, provided that there has been an effective public dissemination of information on the area delineated, and systematic and continuous dissemination subsequent to the delineation to prevent further population influx. For evaluation and planning of resettlement, different planning instruments are used, depending on the type of project: a Resettlement Action Plan (RAP) or abbreviated resettlement plan is required for all operations that entail involuntary resettlement. The scope and level of detail of the RAP can vary with the magnitude and complexity of resettlement. The RAP is based on up-to-date and reliable information about (a) the proposed resettlement and its impacts, and (b) the legal issues involved in resettlement; a Resettlement Policy Framework is prepared where it is necessary to clarify resettlement principles, organisational arrangements, and design criteria to be applied to the project's components; and a Process Framework is prepared for projects involving restriction of access to land. The borrower is responsible for preparing and implementing a RAP or an RPF, as appropriate which presents a strategy to

[1] *Para 30, EIB Environmental and Social Handbook, Standard 6 "Involuntary Resettlement"*

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As the cut-off date is specified in a RAP, it is discussed, agreed and established with the EIB during the RAP preparation process[2].	cover all aspects of the proposed resettlement.
Based on the socioeconomic/baseline survey results, any needs for expropriation, land acquisition and leasing and/or involuntary movement of people and likely restrictions on access to land, shelter and/or livelihood and subsistence strategies will be identified and communicated to EIB.	The borrower informs potentially displaced persons at an early stage about the resettlement aspects of the project and takes their views into account in project design.
The promoter will provide the EIB with adequate documentation in relation thereto, namely an acceptable Resettlement Policy Framework (RPF) or Resettlement Action Plan(s) (RAP). No work activities shall commence before the promoter has addressed the involuntary resettlement in a manner consistent with the principles and standards presented here and satisfactory to the EIB.	
Compensation Principles All affected persons will be paid fair compensation in good time for expropriated assets. Compensation should be provided for any loss of personal, real or other property, goods or assets, including rights or interests in property, for instance, land plots and house structures, contents, infrastructure, mortgage or other debt penalties. Where land has been taken, affected persons should be compensated with land of commensurate quality, size and value, or better.	Payment of cash compensation for lost assets may be appropriate where (a) livelihoods are land-based but the land taken for the project is less than 20% of the production area of the affected asset; and (b) active markets for land, housing, and labour exist; or (c) livelihoods are not land-based. Cash compensation levels should be sufficient to replace the lost land and other assets at full replacement cost in local markets.
The promoter is required to offer to the affected persons an informed choice of either compensation in kind (land-for-land; land plot and house to replace affected land plot and house) or monetary compensation at the beginning of the project. The promoter is expected to comply with the preferences expressed by the affected persons.	"Replacement cost" is the method of valuation of assets that is sufficient to replace lost assets and cover transaction costs, depreciation of structures and assets should not be taken into account.
The value of any improvements to the land, business losses, equipment, inventory, livestock, trees, crops and lost wages or income must also be compensated, along with economically assessable damage, including: property or interests in property, goods, assets, use-rights or rights of access to natural resources, loss of life or limb; physical or mental harm; lost opportunities, including employment, education and social benefits: material damages and loss of earnings, including loss of earning potential; moral damage; costs required for legal or expert assistance, medicine and medical services, and psychological and social services; and costs of salvage and transport.	For land in urban areas, it is the pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services, plus the cost of any registration and transfer taxes. For houses and other structures, it is the market cost of the materials to build a replacement structure with an area, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labour and contractors' fees, plus the cost of any registration and transfer taxes. Where national law does not offer full replacement cost, compensation under national law is supplemented by additional measures to meet the replacement cost standard.

[2] *Para 31, EIB Environmental and Social Handbook, Standard 6 "Involuntary Resettlement"*

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To enable affected persons to make productive use of cash compensation, it should be paid in its entirety and in a timely manner. In cases of loss of housing, replacement housing offers must satisfy criteria of adequate housing. Compensation for houses and other structures should be equivalent to replacement cost plus relocation costs. Depreciation of assets or the value of salvage materials shall not be deducted from the value of replacement cost. Where the option of cash compensation or alternative accommodation is provided, the cost estimates for providing alternative accommodation could be used for calculating cash compensation payable. For movable structures, such as kiosks or stalls, comparable replacement sites should be offered. A good practice is to calculate replacement cost for such structures as the cost of alternative sites, the cost of replacing improvements (such as foundations), and relocation expenses or other transaction costs. The promoter is required to pay by check or deposit the amount beforehand (as per valuation undertaken) to an individual or joint account for the affected person's access. The promoter must ensure that compensation and income restoration measures are implemented without discrimination based on gender, race, ethnicity, religion, disability or other prohibited grounds. The promoter must ensure equal treatment of women during compensation and income restoration processes, especially with regard to women's rights and interests in land, property, assets, and compensation and relocation assistance, even where these are not recognised in formal law. The project affected people should be: • provided prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project; • provided assistance (such as moving allowances) during relocation; • provided with residential housing, or housing sites, or, as required, agricultural or business sites for which a combination of productive potential, locational advantages, and other factors is at least equivalent to the advantages of the old site (in exceptional cases when this is not possible, adequate compensation must be provided); • offered compensation for loss of income for a transition	For losses of access to public services, customers, and suppliers; or to grazing, or forest areas), attempts should be made to establish access to equivalent and culturally acceptable resources and earning opportunities. If the residual of the affected asset is not economically viable (the so-called orphan land), compensation and other resettlement assistance are provided as if the entire asset had been taken. Where the promoter has offered to pay compensation to an affected person in accordance with an approved resettlement plan, but the offer has been rejected, the taking of land and related assets may only proceed if the promoter has deposited funds equal to the offered amount plus 10% to an escrow account, and has an established mechanism for resolving the dispute about compensation in a timely and equitable manner.

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period as a form of support after resettlement, based on a reasonable estimate of the time likely to be needed to restore their livelihood and standards of living. Compensation for loss of income is initially advised for the first three (3) months; only a singular repetition of this period is foreseen, not exceeding a total of six (6) months whereby loss of income may be compensated for; • offered assistance for livelihood restoration or improvement through provision of training, credit, job placement, and/or other types of assistance; and, • offered an appropriate grievance mechanism that will allow prompt response to specific concerns related to compensation and resettlement by affected people and host communities.	
Public Consultation, Participation and Disclosure Resettlement is a process that involves project-affected people, host communities, the promoter, community-based organisations (CBOs), non-governmental organisations (NGOs) and a multitude of governmental agencies, national and local. It is crucial that the promoter identifies and consults with all persons and communities involved in the resettlement process, including the host communities who will receive those who are resettled. All relevant stakeholders must participate in the decision-making process to mitigate adverse project impacts and ensure that potential benefits of resettlement are sustainable. Consultation will continue in accordance with Standard 10 on Stakeholder Engagement and during the implementation and monitoring of the resettlement process. Dialogue and consultation must cover women, vulnerable and marginalised groups, in accordance with Standard 7. It is therefore important to also hold separate consultations with women only, possibly broken down by different age groups. Effective and meaningful engagement and consultation is a two-way process to be guided by the following general principles: be initiated by the promoter early in the project during the identification of environmental and social risks and potential adverse impacts and continue throughout the project life cycle as risks and impacts arise; be inclusive of the affected communities, and accessible to any vulnerable groups within, and differentiated by various segments; be inclusive, beyond the affected parties, of any groups or	Disclosure of information about eligibility to compensation also includes provisions for meaningful consultations with affected persons, communities and local authorities. Consultations on mitigation of adverse impact of resettlement, should cover: A dialogue with host communities and local governments. RPF should include a description of mechanisms for consultations with, and participation of, displaced persons in planning, implementation, and monitoring; a summary of the views expressed and how these views were taken into account in preparing the resettlement plan; a review of the resettlement alternatives presented and the choices made by displaced persons regarding options available to them, including choices related to forms of compensation and resettlement assistance.

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individuals who have been identified as other interested parties; and, be adequately documented both in substance and process. Factors such as literacy, unequal gender relations and access to sources of project information need to be carefully considered by the promoter when pursuing an effective disclosure and information dissemination campaign.	
Grievance Mechanism The promoter shall set up and maintain a grievance mechanism that is independent, free and will prompt address specific concerns about compensation and relocation from the affected people and host communities and other directly involved entities. The mechanism should be easily accessible, culturally appropriate, widely publicised, and well integrated in the promoter's project management system. It should enable the promoter to receive and resolve specific grievances related to compensation and relocation by affected persons or members of host communities, and use the grievance log to monitor cases and improve the resettlement process.	The Borrower must communicate to affected parties their rights to national arrangements by which displaced people can communicate their concerns to project authorities throughout planning and implementation, and measures to ensure that such vulnerable groups as indigenous people, ethnic minorities, the landless, and women are adequately represented. Affordable and accessible procedures for third-party settlement of disputes arising from resettlement; such grievance mechanisms should take into account the availability of judicial recourse and community and traditional dispute settlement mechanisms.
Monitoring and Evaluation The promoter's obligations to implement a RAP and to report to the EIB on its implementation are to be defined in the project's legal agreements. The promoter shall set up necessary systems (i.e. resources, staff, and procedures) to monitor the implementation of a RAP on a regular basis and take corrective action as necessary. Affected persons will be consulted as part of the monitoring activities. The implementation and effectiveness of the resettlement action plan shall be subject to monitoring and review by qualified resettlement specialists and/or other independent third parties as appropriate and commensurate to the scale and risks involved in the resettlement. Implementation of a RAP will be considered completed when the adverse impacts of resettlement have been addressed in a manner that is consistent with the relevant plan and requirements outlined in Standard 6. The promoter should present EIB with a report upon the completion of the RAP implementation, prepared by an external party. The resettlement audit will include, at a minimum, a review of the mitigation measures implemented by the promoter, a comparison of implementation outcomes against agreed objectives, and a conclusion as to whether any follow-up	A RPF should also cover arrangements for monitoring the resettlement process by the implementing agency and by independent parties to ensure complete and objective information. This will allow to assess the impact of resettlement for a reasonable period after all resettlement and related development activities have been completed; using the results of resettlement monitoring to guide subsequent implementation.

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actions and further monitoring are needed.

Ref: 2016 ESA (Dar Al-Handasah and partners: J15135_0100D_ESA_ENV-02_REV3)

A copy of the proposal draft Resettlement Policy Framework prepared by Dar Al-Handasah and partners (2016 ESA and 2011 ESA) is enclosed here. However, it is advised to finalise the RAP based on the principles described above.

ANNEX 10 – Analysis and Terms of Reference for an Aquifer Monitoring Programme (Posch and Partners)

ANNEX 11 – Pre-Feasibility Study on Dead Sea Monitoring and Research Centre (Posch and Partners)

ANNEX 12 – Impacts and considerations about the Reverse Osmosis Plant