ANNEX F

ENVIRONMENTAL MANAGEMENT PLAN FOR POL STORAGE

THILAWA SEZ, MYANMAR

ABBREVIATIONS

AH	Affected Household
BPC	Bio-Physical and Chemicals
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
CE	Contractors' Engineer
DED	Detailed Engineering Design
EA	Environmental Assessment
ECC	Environmental Compliance Certificate
ECO	Environmental Control Officer
EIA	Environment Impact Assessment
EMP	Environment Management Plan
EMR	Environmental Monitoring Report
EERT	External Emergency Response Team
ERT	Emergency Response Team
ERTL	Emergency Response Team Leader
ESMU	Environment & Social Management Unit
ESIA	Environment and Social Impact Assessment
ESO	Environmental Site Officer
GoM	Government of Myanmar
O&M	Operation and Maintenance
PMU	Proponent's Management Unit
SEZ	Special Economic Zone
USD	United States Dollar

WEIGHTS AND MEASURES

km	Kilometre
kg	Kilogram
ha	Hectare
mm	Millimeter

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1 INTRODUCTION

1.1 Project Overview

In order to cope with the growth of seaborne traffic resulting from the market-oriented economic reformation and liberalization program of the country, port development has been carried out by inviting local and foreign investment at Yangon and the Thilawa Port area since 1990s.

Maritime transportation of Myanmar serves more than 85% of the country's exports and imports. Yangon Port, the premier port and a gateway for the export and import of the country, plays a vital role as the main sector for the economic development of Myanmar.

Since colonial days the port at Yangon (formerly called Rangoon) has been located next to the downtown on the banks of the Yangon River. That port has a depth of only 8 or 9 meters even with dredging, however, and there are two sandbars between the mouth of the river and the downtown that ships with that draft can cross only at high tide.

As a result, the port can accommodate only relatively small ships carrying up to 1,000 twenty-foot-equivalent (TEU) containers and it can take as many as two days for a ship to navigate from the sea up the river channel and across the sandbars to reach the port..

All vessels calling to Yangon Port and Thilawa Port have generally been sailing on flood tides and crossing to both the inner bar and outer bar at near high tide to assure sufficient water depths. In view of the natural conditions and meanderings of the Yangon River, Yangon Port is accessible to vessels of 167-meter LOA, 9-meter draft and 15,000 DWT, and Thilawa Port is accessible to vessels of 200-meter LOA, 9-meter draft and 20,000 DWT.

To cope with the growth of seaborne cargo traffic and to lessen the logistics cost in maritime trade by providing accessibility for bigger vessels to the ports, the Myanmar Port Authority (MPA) is taking initiatives to improve the Yangon River access channel, while development of Thilawa Port is a key solution.

To comply with the Thilawa Port plan, the Department of Human Settlement and Housing Development (DHSHD) under the Ministry of Construction tried to establish the Thilawa Industrial Zone in Yangon's Thanlyin Township in the early 1990s.

The Thilawa area was planned to be implemented as the first full foreign investment Special Economic Zone (SEZ) in Myanmar. Designed by Chinese experts, it covers an area of 12.8 km2 (3,200 acres) initially formulated and now it' s area is covered by 2665.39 acres .

In the 1990s the government started establishing a new port facilities and a free trade zone at Thilawa on the eastern bank of the Yangon River some 30 kilometers southeast of the downtown. The Thilawa is closer to the sea, avoids one of the two sandbars and has a depth of 9 meters, better than the downtown port but still far less than the 16 or more meters required by the biggest containerships capable of carrying 10,000 TEUs.

Hutchinson, a major international port operator based in Hong Kong, was given a concession to build and operate a container and general cargo terminal and a local company was given a concession to operate a palm oil terminal.

Hutchinson's terminal opened in 1998 just at the start of the Asian financial crisis.
Hutchinson has kept its facility open but handles less than 100,000 of the roughly 350,000 containers that pass through Yangon's various port terminals each year, although Hutchinson claims it has the berth capacity to handle 1,000,000 containers per year.

However, the plan was postponed up to 2010. According to the SEZ law of 27th January, 2011, Thilawa has potential for an SEZ as Chinese and Korean companies start investing.

But after SEZ Law and before Thilawa SEZ was fully developed yet ,Port extension area in front of the Thilawa SEZ was allocated to national private companies to plan and implement the area for POL storage and port facilities.

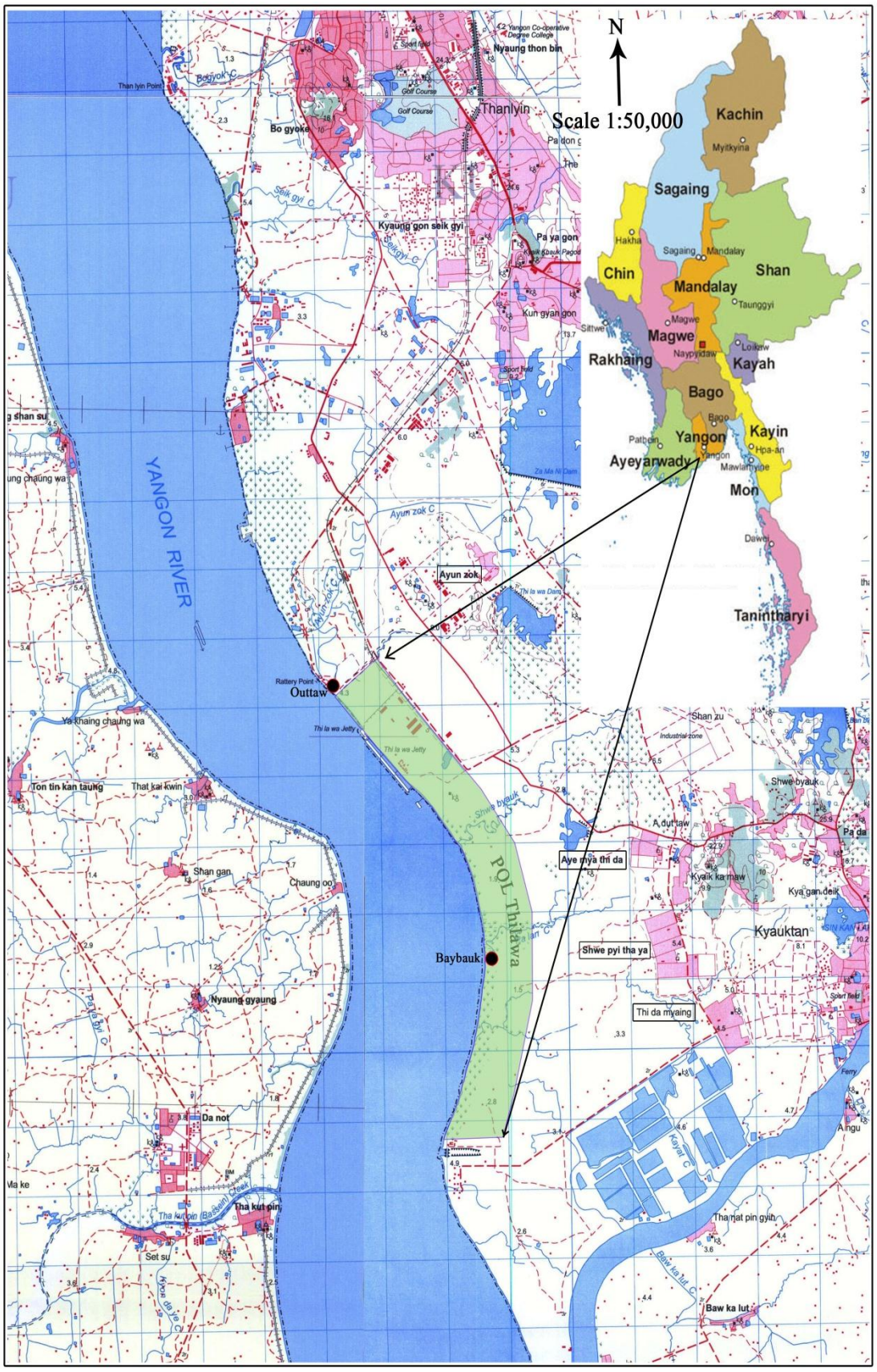


Figure 1: Project Location Map

1.2 Project Components

The general study area is located in Thanlyn and Kyauktan Townships, situated along the east bank of the Yangon River and is organized by eleven group of companies, which deals with designing, constructing POL storage and Port facilities for the Special Economic Zone (SEZ) for Thilawa Project. The names of the eleven group of companies are as follows in Table 1.

Table 1: Companies and areas included in the ESIA

Sr. No.	**Name of Company**	**Area (m^2) (hectre / acre)**
1.	Site 1: Myat Myitta Mon Co. ltd. (MMTM)	750m x 133m = 99750 m^2 (10 hectare / 24.6 acre)
2	Site 2: Apex Co. ltd. (AP)	750m x 133m = 99750 m^2 (10 hectare / 24.6 acre)
3	Site 3: Shwetaung Co. ltd. (ST)	750m x 133m = 99750 m^2 (10 hectare / 24.6 acre)
4	Site 4: Asia World Co. ltd (AW)	750m x 133m = 99750 m^2 (10 hectare / 24.6 acre)
5	Site 5: Denko Co. ltd. (DK)	750m x 133m = 99750 m^2 (10 hectare / 24.6 acre)
6	Site 6: Thuriya Co. ltd. (Dagon Int: Co. ltd. TRY)	750m x 133m = 99750 m^2 (10 hectare / 24.6 acre)
7	Site 7: New Day Co. ltd. (ND)	750m x 200m = 150,000 m^2 (15 hectare / 37.5 acre)
8	Site 8: IGE Co. ltd. (IGE)	750m x 133m = 99750 m^2 (10 hectare / 24.6 acre)
9	Site 9: Shwe Than Lwin Co. ltd. (STL)	750m x 133m = 99750 m^2 (10 hectare / 24.6 acre)
10	Site 10: Kaung Myanmar Co. ltd. (KM)	750m x 133m = 99750 m^2 (10 hectare / 24.6 acre)
11	Site 11: Padauk Shwewar Co. ltd. (PDSW)	750m x 200m = 150,000 m^2 (15 hectare / 37.5 acre)
	Total Area (m^2/hectare/acre)	750m x 133m = 99750 m^2 (10 hectare / 24.6 acre))

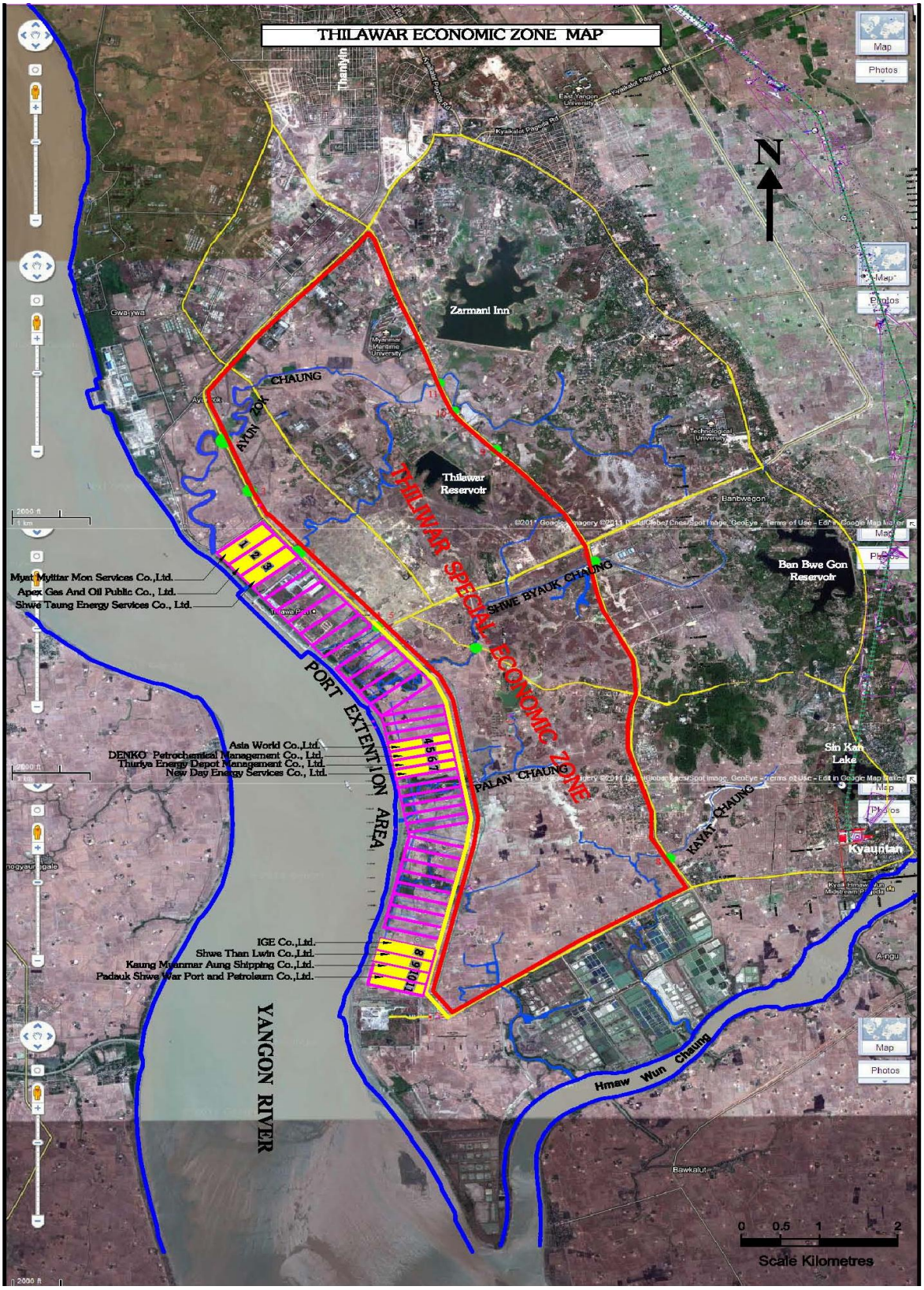


Figure 2: Location of Project Works

Table 2 : Lands use of Companies concerned for POL Storage and Port Facilities

Sr. No.	Name of Companies	Land Area (m^2)													Water Bodies (m^2)		Green Area (m^2)	
		Fuel Tank			Building			Road (m)			Concrete Pavement		Reserve area for future use		Ponds etc.,		Grass and Trees	
		No.	Are (m^2)	(%)	No.	Are (m^2)	(%)	length	Are (m^2)	(%)	Are (m^2)	(%)	Are (m^2)	(%)	Are (m^2)	(%)	Area	(%)
1	Myat Myinttar Mon Services Co.,Ltd	7	19626.79	66	10	2225.36	22	1732	11000.00	11	42000.00	42	3338.37	3	2725.84	12	18833.28	-
2	Apex Gas and Oil Public Co.,Ltd.	10	2708.14	7	17	7400.00	4	1180	4300.00	4.3	29925.00	30	51416.86	5	1000.00	1	3000.00	3
3	Shwe Taung Energy Srvices Co.,Ltd	3	2270.19	2	16	4591.73	8	1500	17540.09	18	26128.98	26	49219.01	30		1.1		-
4	Asia World Co., Ltd.	10	12888.14	13	14	9609.94	10	2024	9770.40	10	23194.95	54	29607.04	3	3075.00	3	11604.53	12
5	DENKO Petrochemical Management	10	5376.80	5	16	4845.81	5	1217.7	11128.16	12	53291.47	53	14750.00	-	-	-	12130.02	12
6	Thuriya Energy Depot Management	10	7276.00	7	12	2712.60	3	1349	10160.00	5	6467.80	9	55920.60	-	3781.00	4	13432.00	13
7	New Day Energy Services Co., Ltd.	3	1140.39	0.1	7	1900.00	-	1256	6000.00	4	102000.00	5	23959.61	-		-	15000.00	10
8	IGE Co., Ltd	10	2745.47	6	19	24605.37	2.5	2316	24937.50	25	25128.41	60	15556.16	-	2787.09	2	3990.00	4
9	Shwe Than Lwin Co.,Ltd.	4	779.94	1	21	7622.35	8	932	6340.32	6	22646.48	26	60822.77	58	1538.14	2		-
10	KMA Shipping Co., Ltd.	2	1344.86	1.5	7	10522.20	11	2286	27857.90	28	23000.00	23	32844.40	59	4180.64	4		-
11	Padauk Shwe War Port & Petroleum Co., Ltd	26	1654.05	-	2		-	-		-		-		-		-		-

1.3 Standards, Guidelines and Formal Requirements

Backgrounda information on environmental conservation in Myanmar relating to POL storage and jetty are from Port Act, enacted in 1908, Rangoon Port Act, enacted in 1905. They are observed throughout the years and are still at present active. Enclosed Myanmar Laws in regard to Ports, Water and Environment Conservation are as follows (Appendix xx):

(1) Law for Environmental Conservation, 2012
(2) Conservation of Water Resources & River Law, 2006
(3) Protection of Wild Animals, Wild Plants and Preservation of Natural Areas Laws, 1994
(4) Underground Water Act, 1930
(5) City of Rangoon Municipal Act, 1922
(6) Port Act, 1908
(7) Rangoon Port Act, 1905
(8) Rangoon Water Works Act, 1885
(9) Burma Municipal Act, 1898
(10) The SEZ (Special Economic Zone) Law of Myanmar, 2011

1.3.1 Design Criteria

The Project safety distances are reported to be in accordance with local regulations and the following international codes:

- NFPA-30 (National Fire Protection Association-US)
- OSHA regulations (Occupational Safety and Health Administration -US)
- HSE 176 (Heath and Safety Executive -UK)
- COMAH regulation (Control of Major Accident Hazards -UK)
- Inflammable liquids and substances regulations 1953 – Mauritius

Table 3: Existing Distance Between Tank , Fencing And Interior Building

Sr No	Name of Companies	Spacing b/w Tank & building		Distance b/w tank & fencing		Distance b/w tank (Shell to shell)		Ø of Tank	
		Max	Min	Max	Min	Max	Min	Max	Min
1	Shwe Taung Energy Srvices Co., Ltd	300 m	200 m	350 m	20m	50 m		27 m	
2	Myat Myinttar Mon Services Co., Ltd	250 m	23 m	250 m	23 m	100 m	20m	4m	0.5m
3	DENKO Petrochemical Management	113.71 m	31.1 m	207.9 m	27.55 m	27.4 m	19.7 m	28 m	24.2 m
4	IGE Co., Ltd	221.3 m	6 m	12 m	230 m	73.17 m	18.3 m	34.44 m	12.2 m
5	New Day Energy Services Co., Ltd.	155 m	11.7 m	168.33 m	16.67 m	8.33 m		22 m	
6	Apex Gas and Oil Public Co., Ltd.		18 m		~ 15 m	15 m		40 m	10 m
7	KMA Shipping Co., Ltd.	385.3 m	34.14 m	407.2 m	20 m	34.1 m	12.2 m	29 m	0.055 m
8	Thuriya Energy Depot Management	218 m	47.8 m	292.5 m	32.84 m	26.87 m	12 m	28.6 m	11 m
9	Padauk Shwe War Port & Petroleum Co., Ltd.		-	700 m	30 m	5 m		9 m	
10	Asia World Co., Ltd.	178.13 m	14.1 m	198.8 m	13.13 m	15 m	7.4 m	44.82 m	31.5m
11	Shwe Than Lwin Co.,Ltd.	93 m	18 m	570 m	111 m	42 m	12 m	15.5 m	4 m

1.4 Main Activities Relevant To Environmental Aspect

(i) Pre-construction activities:
(a) Detailed design
(b) Environmental Approvals
(c) Land clearance for construction

(ii) Construction activities:
(a) Preparation of site, earthworks, access and drainage
(b) Perimeter fencing
(c) Construction of jetties
(d) Construction of Storage tanks for POL
(e) Construction of office buildings
(f) Installation of utilities

(iii) *Activities during Operational Phase:*
(a) Unloading of POL products from ship/barge
(b) Storage of POL products in tanks
(c) Loading of POL products on to road tankers/barges
(d) Site maintenance activities;

1.4.1 Construction Planning

The construction phase is estimated lasting for 24 months. The EMP should be implemented prior to construction as below.

Table 4: EMP Implementation Schedule

Activity	Indicative Time Frame
PROJECT IMPLEMENTATION	
Project Agreement Process	Year 1
Detailed Design & Bidding Documents	Year 1
Procurement	Year 1
Construction	Year 2 - Year 3
Operation	Year 4+
ENVIRONMENTAL MANAGEMENT	
Overall	
1. Project Management	Year 1 – Year 3
2. Submission of Environmental Monitoring Report (EMR)	Year 2 - Project Completion
- Monthly EMR for incorporation in Project's Monthly Progress Report	1st week after effective month
- Semi-annual EMR	1st week after effective 6th month
Prior to Construction	
1. Finalization of EMP	Year 1 - 2
2. EMP for inclusion in the bidding documents.	Year 1
3. Evaluation of Contractors' EMP	Year 1
4. review of bid evaluation results & review of Contractor's EMP	Year 1
5. Finalization of EMP by winning/selected Contractor	Year 1, Final EMP shall be submitted by winning Contractor for clearance,
6. Obtaining environmental clearance	Year 1
7. Community preparation for the	Year 1
8. Establishment of baseline environmental data	Year 1
9. Compensation/replacements due to land acquisition	Year 1
Construction Period	
1. Implementation of mitigation measures and conduct of environmental effects monitoring	Year 2 - Year 3

Activity	Indicative Time Frame
2. Submission of Contractor's Environmental Monitoring Report (CEMR)	Year 2 – Year 3
- Monthly CEMR for incorporation in the Monthly Construction Progress Report	At the end of each month
- Semi-annual CEMR for incorporation in overall Semi-Annual Project EMR	At the end of every 6 months
Operation Period 1. Implementation of mitigation measures & monitoring activities	Year 3 +
- EMR for incorporation in overall Semi-Annual project EMR	As required

2 SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

The impacts have been assessed according to four parameters. The four parameters are assigned a score from 1 to 3 based on a grading, which is illustrated in the table below; this then allows an assessment of overall significance to emerge.

Table 5: Impact assessment key

SCORE	Extent	Duration	Magnitude	Probability
1	Direct impact zone: Within the works/site area or immediate surroundings	Short: The impact is short term (0- 12 months) or intermittent	Low: No or negligible alterations to No or minimal change to socio-economic condition	Low
2	Locally: Effects measurable/noticeable outside the works area and immediate surroundings	Medium: Medium term (1-2 years)	Medium: Natural ecosystems are modified Changes are experienced to socio-economic	Medium
3	Wide Area: The activity has impact on a larger scale	Long: the impact persists beyond the construction phase for years or the operational life of the project and may be continuous	High: Environmental functions altered Socio-economic conditions highly modified Effects may be permanent or irreversible.	High

Based on the scores related to extent, duration, magnitude and probability of a specific impact, the significance of the impact is expressed as an indicator given by:

$$\text{Significance indicator} = (\text{Extent} + \text{Duration} + \text{Probability}) \times \text{Magnitude}$$

Impacts are negative unless indicated with shading in the impact matrix.

Table 6: Construction Phase Impacts for POL Storage and Port Facilities at Thilawa SEZ

Ref.	Impact/Issue	Extent	Duration	Magnitude /Intensity	Probability	Significance
Bio-Physical & Chemical						
BPC/1	Changes in surface water quality	1	1	1	2	low
BPC/2	Changes in groundwater quality	1	1	1	1	low
BPC/3	Changes to drainage patterns	1	2	2	3	medium
BPC/4	Changes in rates of erosion and siltation	1	1	1	3	low
BPC/5	Changes to air quality	2	2	1	3	low
BPC/6	Changes to ambient noise levels	1	1	1	3	low
BPC/7	Changes to aquatic biota	1	3	2	3	medium
BPC/8	Changes to terrestrial biota	1	3	1	3	low
BPC/9	Changes to disease vector populations	1	2	1	2	low
BPC/10	Changes to land cover	1	3	2	3	medium
BPC/11	Changes to areas of natural habitat	1	3	1	3	low
Socio-Economic & Cultural						
SEC/1	Changes involving loss of private assets	1	3	3	3	high
SEC/2	Changes involving loss of cultural heritage	1	1	1	1	low
SEC/3	Changes involving displacement of people	2	3	2	3	high
SEC/4	Changes to local traffic patterns	2	2	1	3	low
SEC/5	Changes to fisheries	1	2	1	2	low
SEC/6	Changes in local wage labour incomes/livelihood opportunities	2	2	1	2	low
SEC/7	Changes in local trade/commercial incomes/opportunities	1	2	1	2	low
SEC/8	Changes in visual amenity	1	1	1	3	low
SEC/9	Changes to public infrastructure/community resources	2	3	2	2	medium

Table 7: Operational Phase Impacts for POL Storage and Port Facilities at Thilawa SEZ

Ref.	Impact/Issue	Extent	Duration	Magnitude/Intensity	Probability	Significance
Bio-Physical & Chemical						
BPC/1	Changes in surface water quality	2	1	2	1	low
BPC/2	Changes in groundwater quality	1	1	1	1	low
BPC/3	Changes to drainage patterns	1	3	1	3	low
BPC/4	Changes in rates of erosion and siltation	1	3	1	3	low
BPC/5	Changes to air quality	2	1	2	1	low
BPC/6	Changes to ambient noise levels	2	1	2	3	medium
BPC/7	Changes to aquatic biota	1	3	1	2	low
BPC/8	Changes to terrestrial biota	0	0	0	0	low
BPC/9	Changes to disease vector populations	1	1	1	2	low
BPC/10	Changes to land cover	0	0	0	0	low
BPC/11	Changes to areas of natural habitat	0	0	0	0	low
Socio-Economic & Cultural						
SEC/1	Changes involving loss of private assets	0	0	0	0	low
SEC/2	Changes involving loss of cultural heritage	0	0	0	0	low
SEC/3	Changes involving displacement of people	0	0	0	0	low
SEC/4	Changes to local traffic patterns	2	3	2	2	medium
SEC/5	Changes to fisheries	2	3	1	3	low
SEC/6	Changes in local wage labour incomes/livelihood opportunities	2	3	1	2	low
SEC/7	Changes in local trade/commercial incomes/opportunities	2	3	2	2	medium
SEC/8	Changes in visual amenity	2	3	1	3	low
SEC/9	Changes to public infrastructure/community resources	2	3	2	2	medium

Figure 3 Consequence Diagram (Cause-Effect) – Water Quality Physical Environment (Construction Stage)

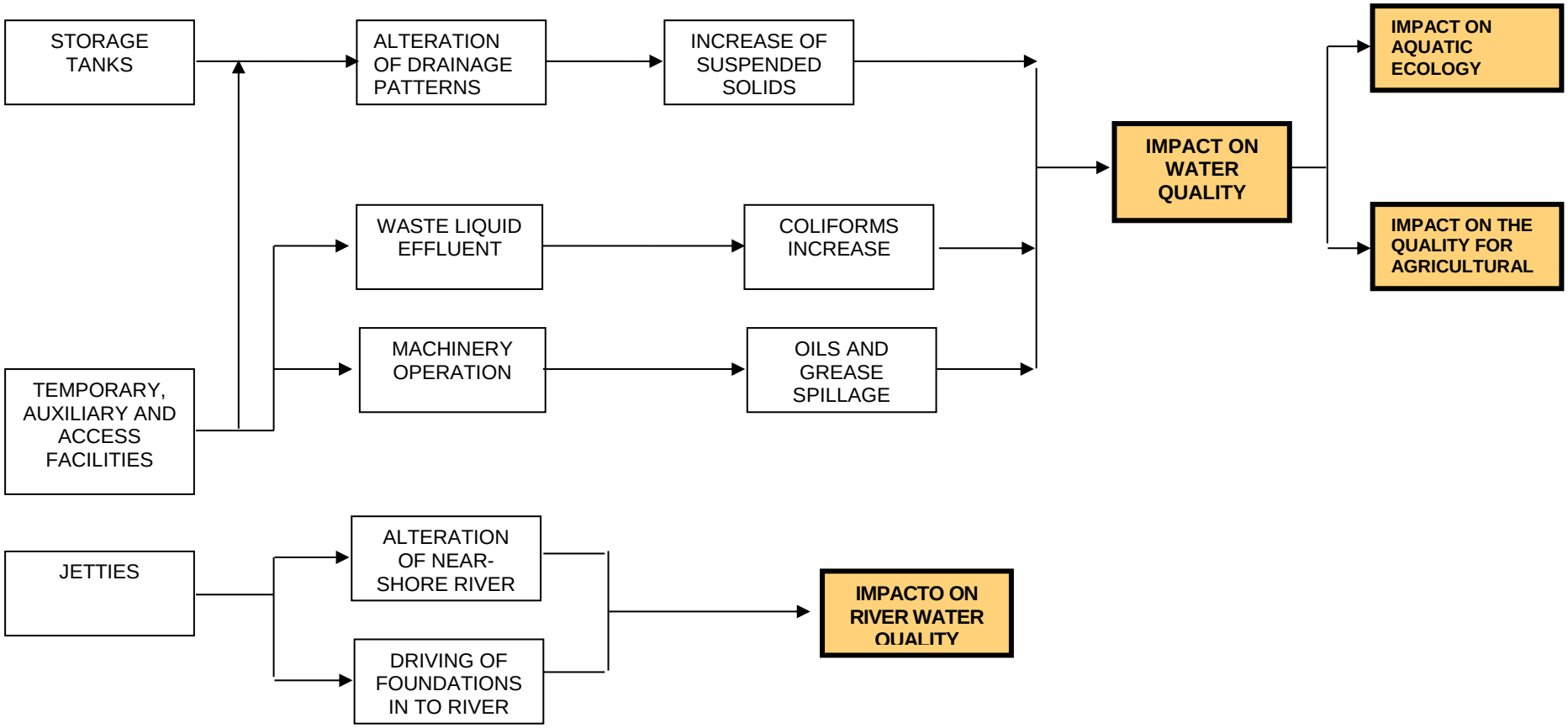


Figure 4 Consequence Diagram (Cause-Effect) - Physical Environment (Construction Stage)

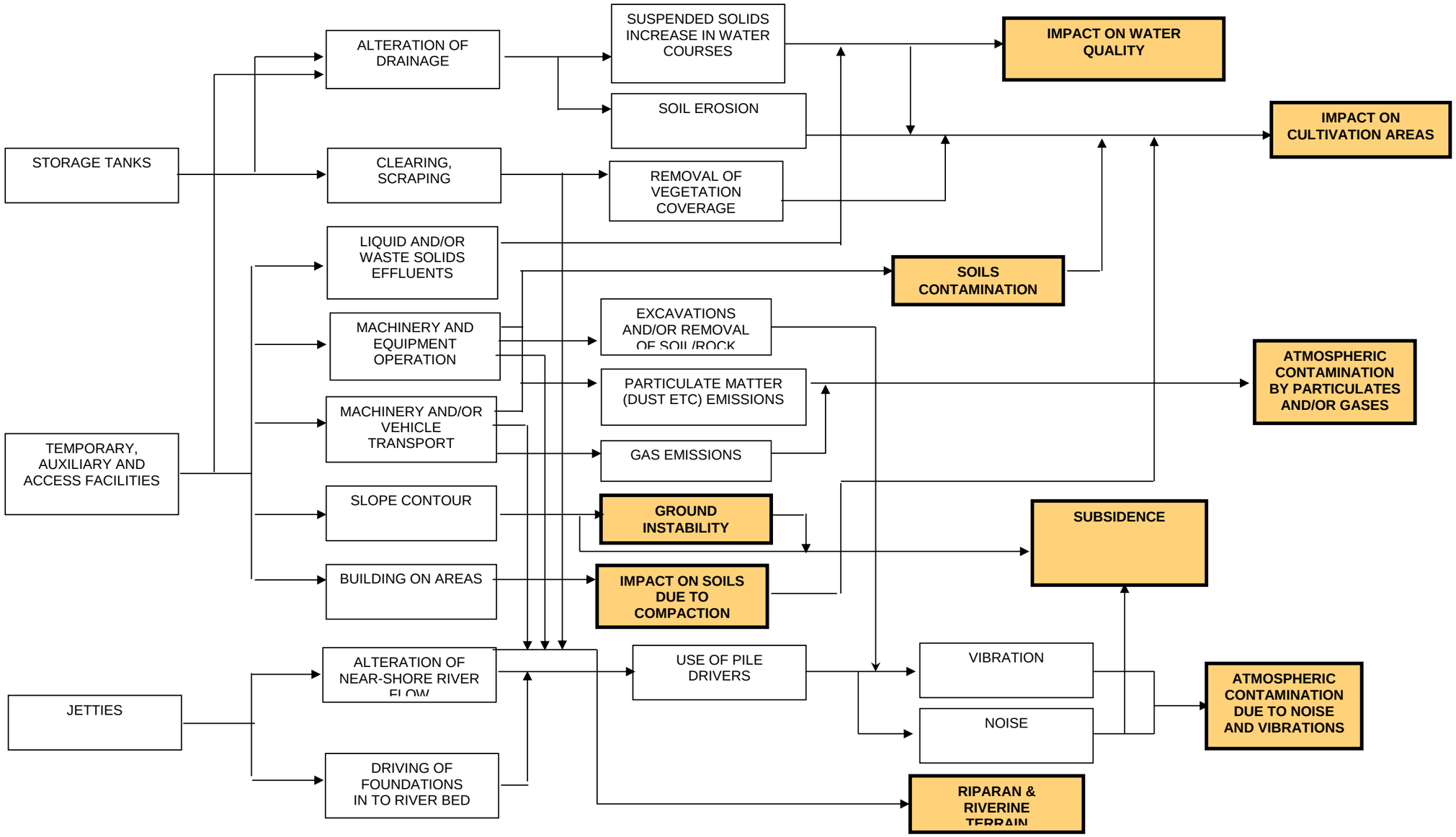


Figure 5 Consequence Diagram (Cause – Effect) – Flora and Fauna (Construction Stage)

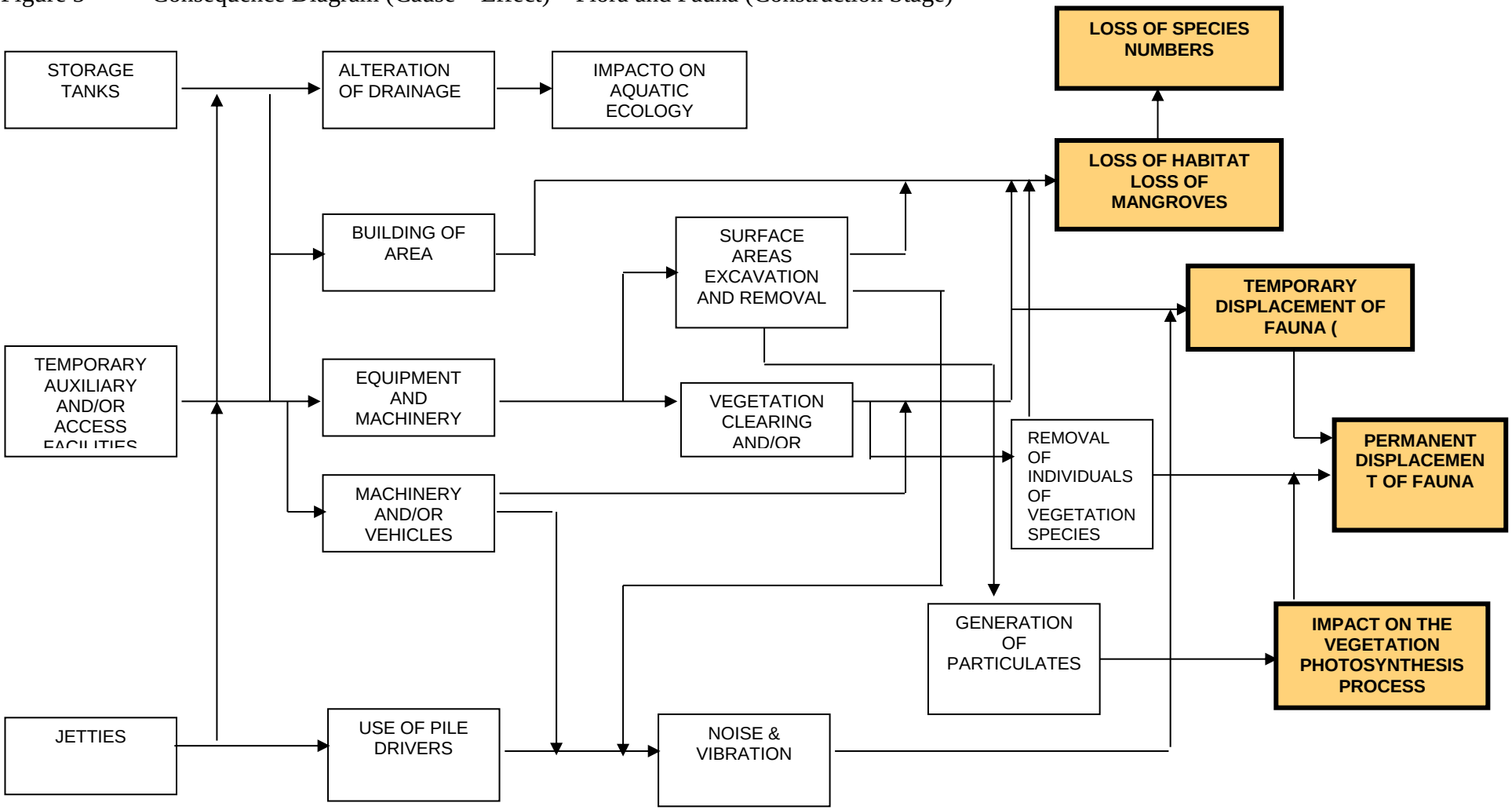


Figure 6 Consequence Diagram (Cause-Effect) – Aquatic Ecology (Construction Stage)

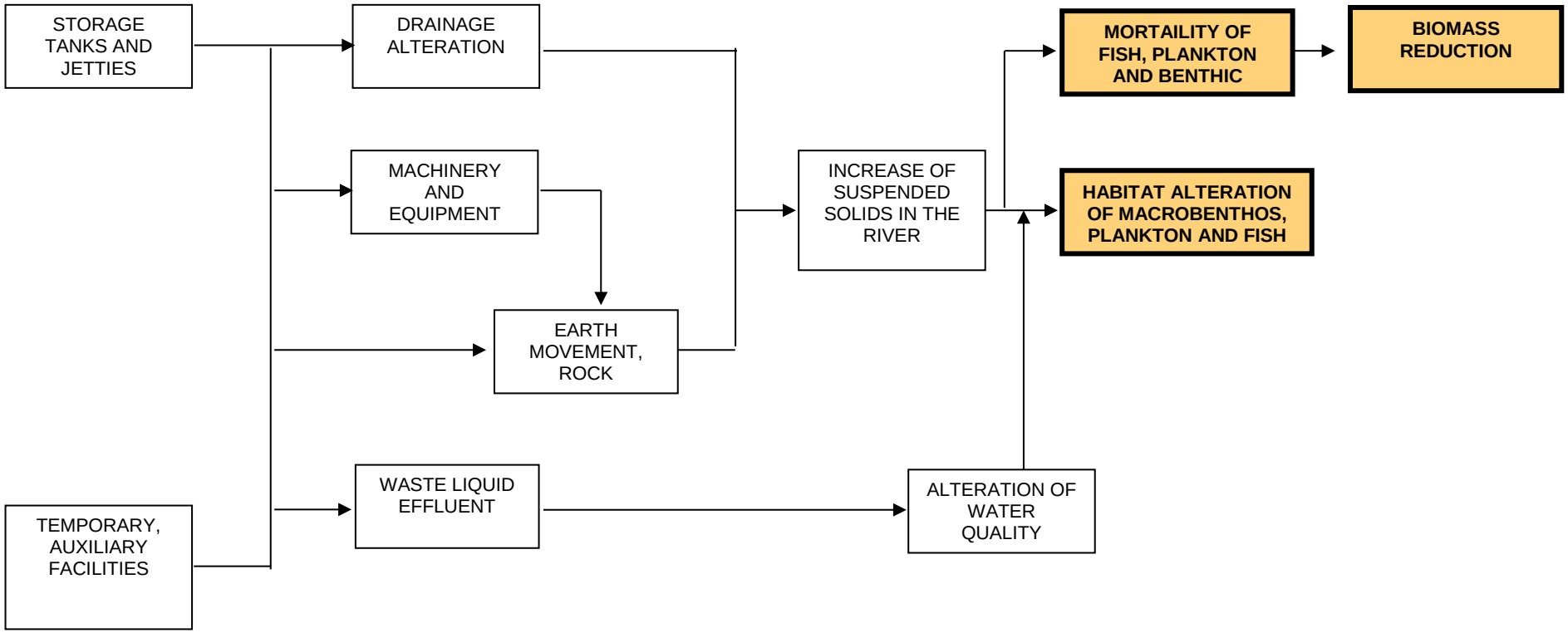


Figure 7 Consequence Diagram (Cause – Effect) – Socioeconomic and Cultural Environment (Construction Stage)

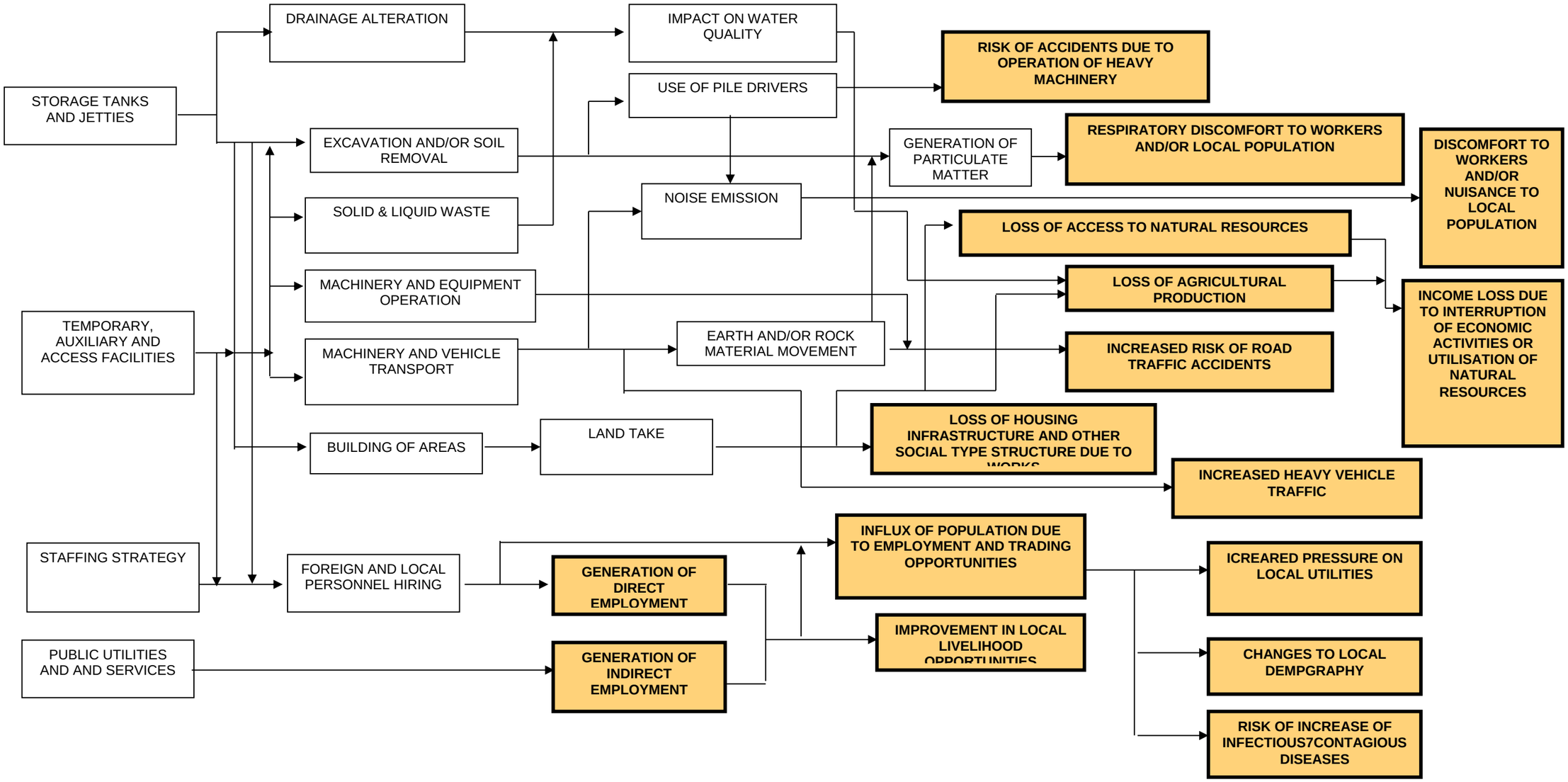


Figure 8 Consequence Diagram (Cause – Effect) – Water Quality Physical Environment (Operation Stage)

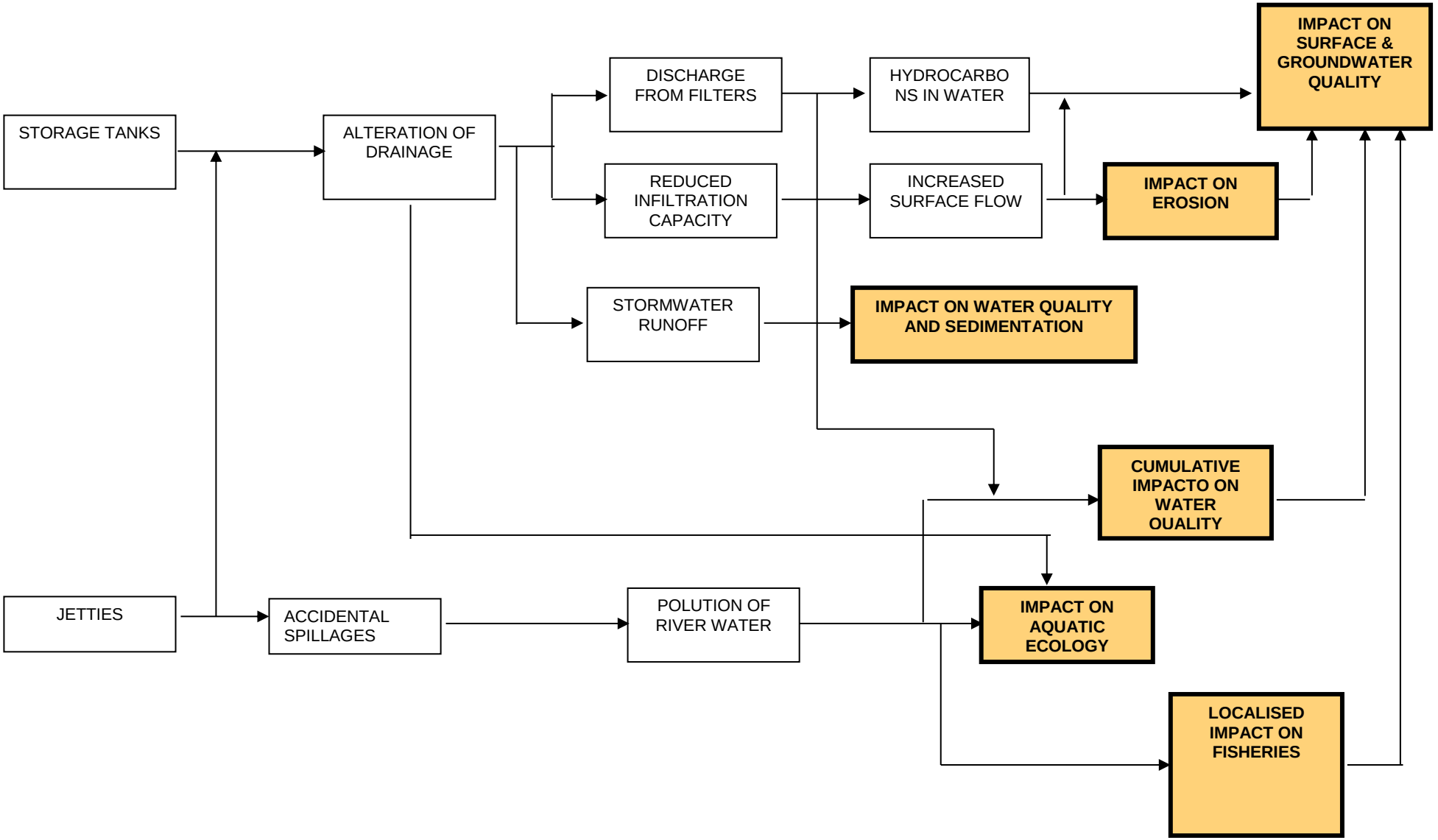


Figure 9 Consequence Diagram (Cause – Effect) – Physical Environment (Operation Stage)

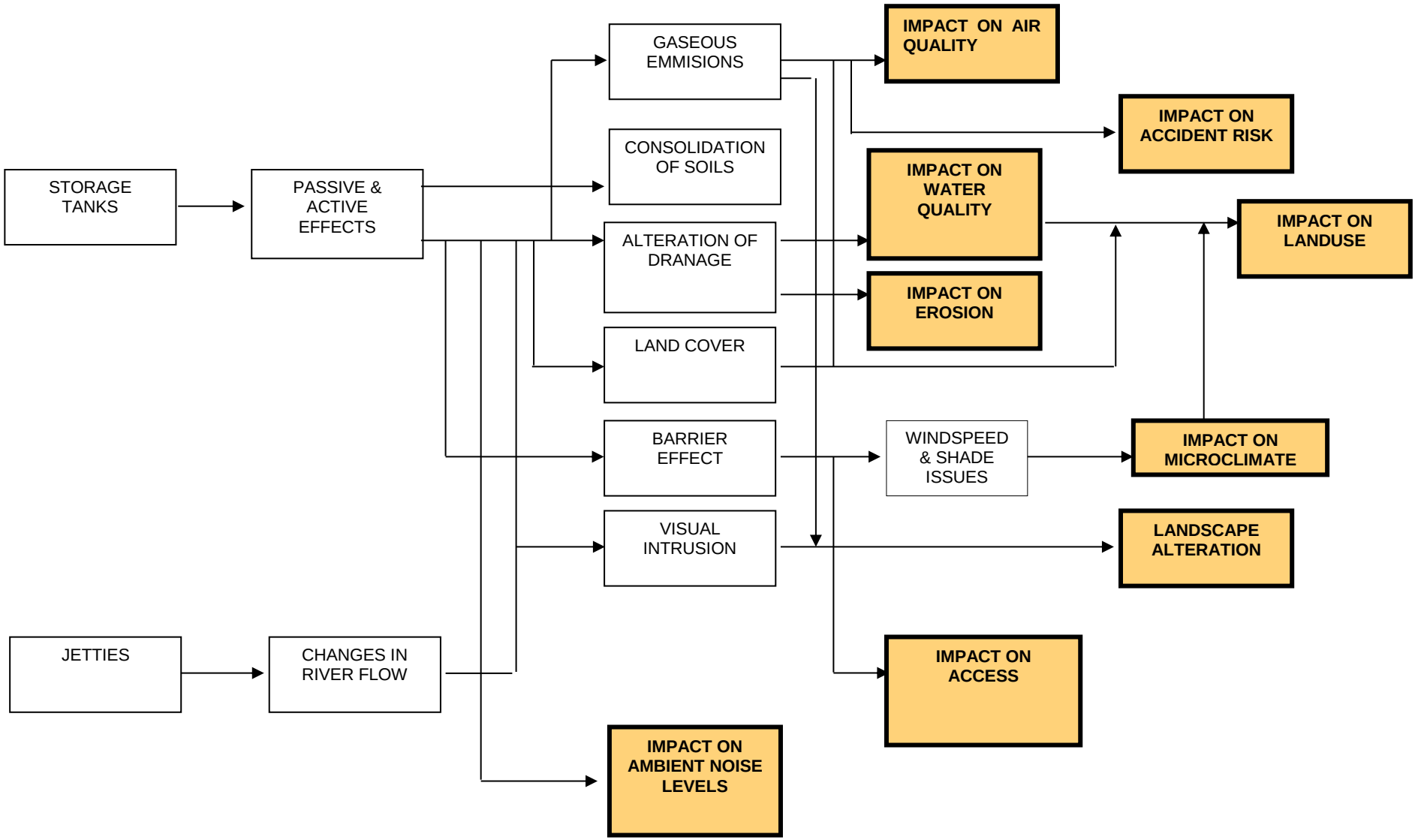


Figure 10 Consequence Diagram (Cause – Effect) – Flora and Fauna (Operation Stage)

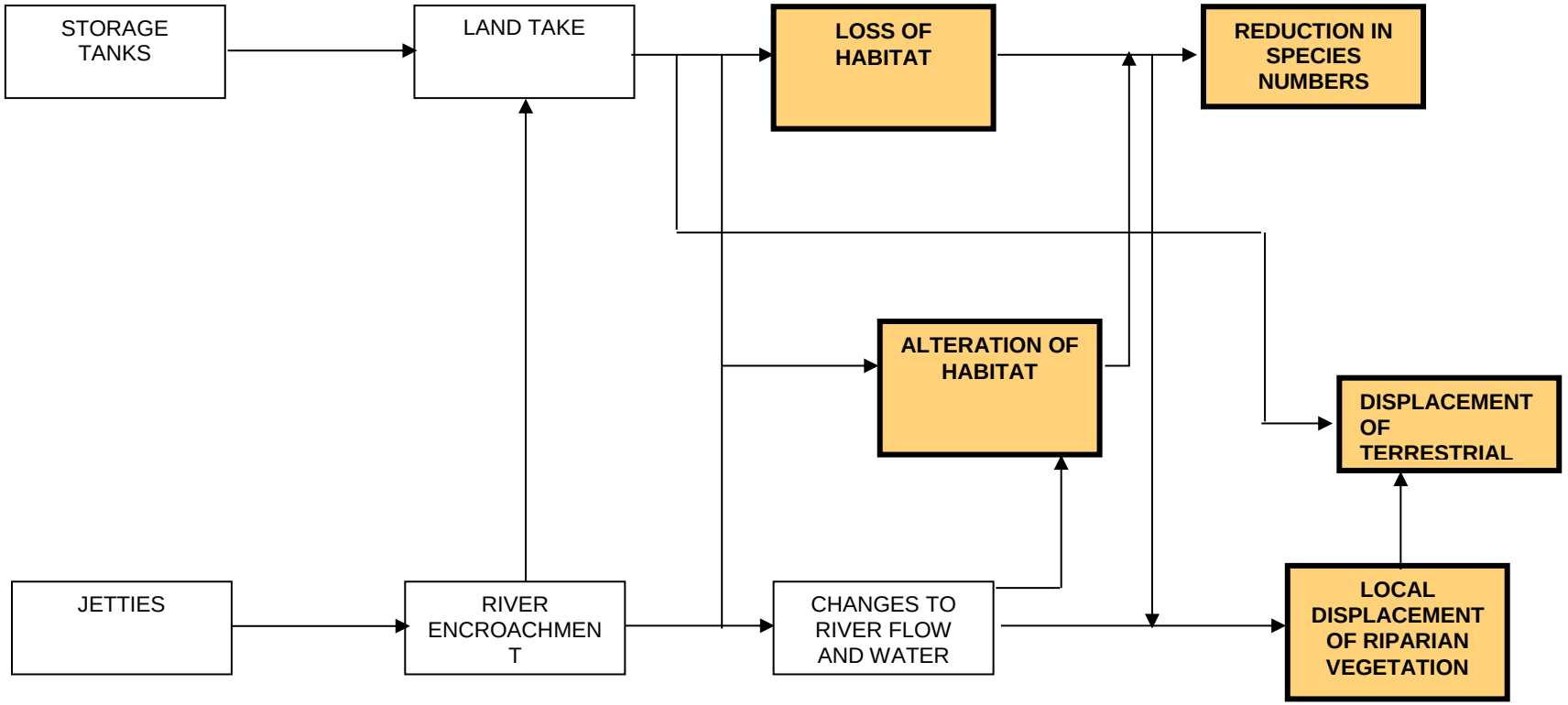


Figure 11 Consequence Diagram (Cause – Effect) – Aquatic Ecology (Operation Stage).

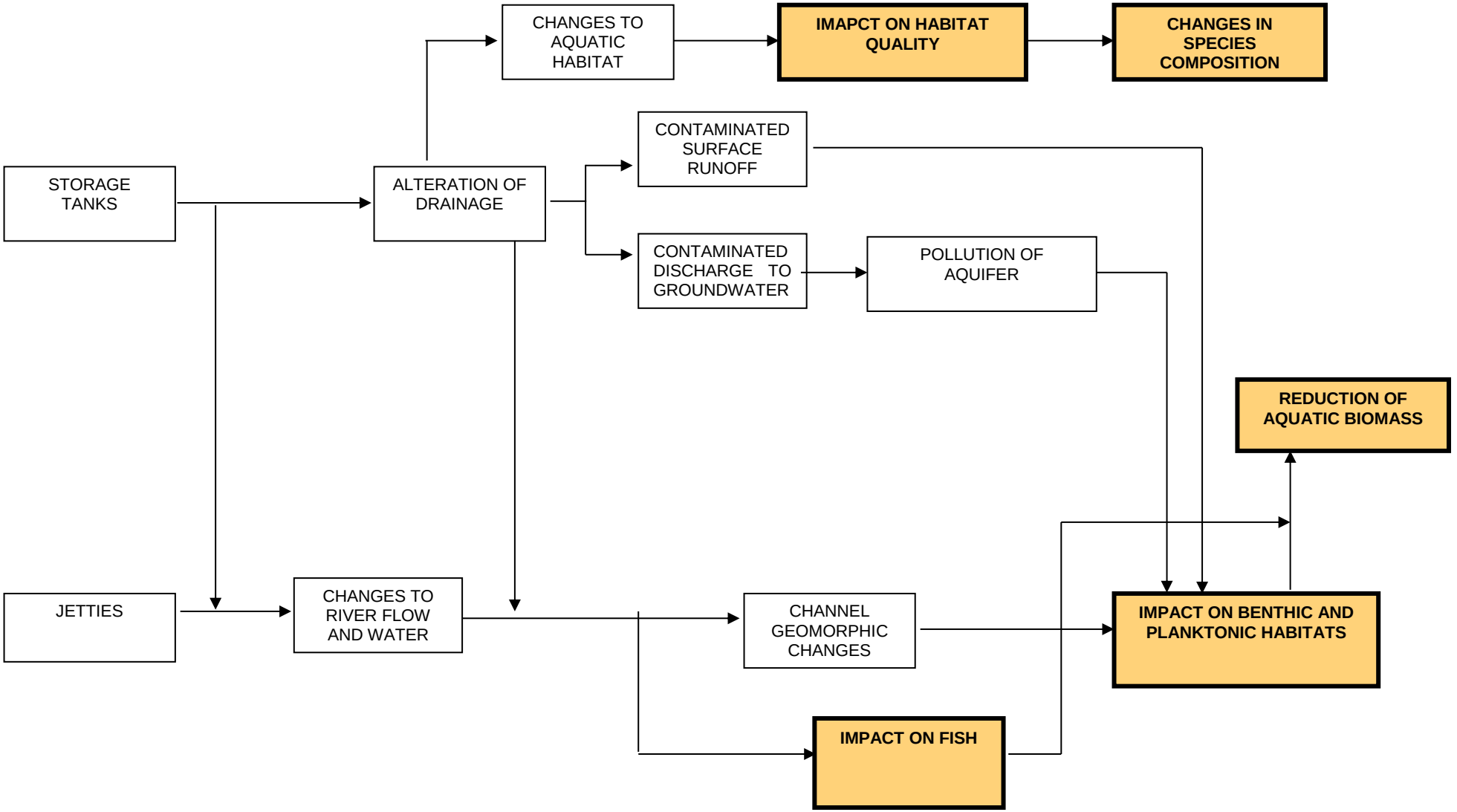
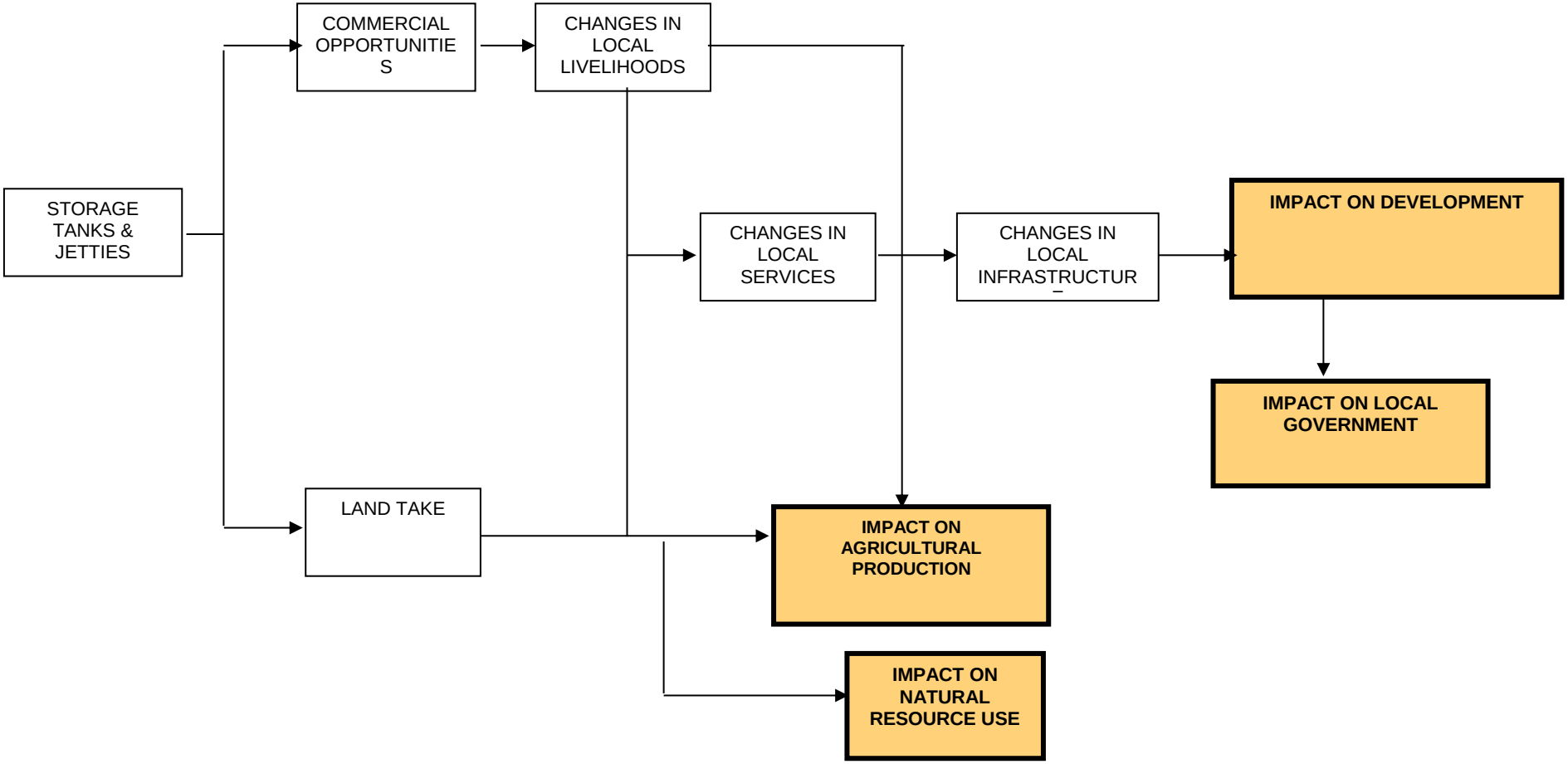


Figure 12 Consequence Diagram (Cause – Effect) – Socioeconomic and Cultural Environment (Operation Stage).



3 MITIGATION MEASURES

Mitigation measures are proposed for negative impacts identified in the EIA. Mitigation measures for construction phase shall be included in the bidding documents for the Contractor to implement. Most of the related costs would be borne by the Contractor - these costs will become part of the civil works contracts.

An environmental and social management unit (ESMU) formed by the Project proponent staff or as a sub-contracted entity/function should be established. An environmental control officer (ECO) will be nominated to manage the ESMU function. As a counterpart the Contractor's should have an environmental site officer (ESO).

3.1 Project Chance Finds

All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care and authority of the ECO. The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.

DESCRIPTION OF MEASURE	MONITORING
Construction activities will be undertaken in a manner to avoid any physical effect on known sites of cultural or religious significance.	ECO/ESMU inspection of protection measures
Physical cultural resources will be defined as: i. remains left by previous human inhabitants ii. unique natural environmental features iii. graveyards	
The following steps will be implemented to protect any previously unidentified sites of potential cultural significance: iv. If a construction worker identifies a potential site or item of cultural significance, he/she will immediately notify the ESO. v. The ESO will contact the ECO who will determine whether the site/item has potential significance vi. If the site/item is considered to have significance, the ECO will immediately notify the relevant agencies	ESMU review
Temporary fencing or similar will be used to mark a 5 m radius from the site.	ECO site inspection

Table 8: Environmental Mitigation Plan

Design Mitigation Measures

	Mitigation Measures	Physical Environment			Socio-Economic Environment				
		Air Quality		Water Quality					
		Noise and vibration generation	Dust, vapour and exhaust emission	Impacts on water quality	Temporary flooding	Impacts on fisheries	Impact on access to natural resources	Impact on utilities	Public and Worker Health and Safety
1	Ensure adherence to GoM and international design and safety standards	▲	▲	▲	▲	▲		▲	▲
2	Ensure well designed access road	▲	▲					▲	
3	Ensure sufficient lighting							▲	▲
4	Ensure tank spacing according to international standards								▲
5	Ensure bunds for 100% containment of tank spillage			▲		▲			▲
6	Provide for oil/grease traps			▲					
7	Specify appropriate trees and shrubs for the site (consider root characteristics, growth height and speed, density of foliage, deposition of leaves and branches, water requirements, indigenous vs. exotic, etc)	▲	▲	▲	▲				▲
8	Minimise river bank and channel disturbance	▲		▲	▲	▲			
9	Ensure drainage is sufficiently dimensioned to avoid/minimize blockages			▲	▲				
10	Identify all quarry and borrow areas at detailed design and assess for environmental impacts	▲	▲	▲	▲		▲	▲	▲
11	Siting and design of Contractors Camps (if required) The contractor will be required to negotiate the temporary use of land for his	▲	▲	▲			▲	▲	▲

Mitigation Measures	Physical Environment			Socio-Economic Environment				
	Air Quality		Water Quality					
	Noise and vibration generation	Dust, vapour and exhaust emission	Impacts on water quality	Temporary flooding	Impacts on fisheries	Impact on access to natural resources	Impact on utilities	Public and Worker Health and Safety
camp with the Government, private individuals or local communities as applicable. All workers who are based on the construction site will be accommodated in either construction camps or other approved accommodation. The sanitation facilities will be designed to meet the GoM/WB effluent requirements. All construction work camps will include the following components: i. Residential accommodation for workers comprising one bed and 0.5m3 of personal storage space per person ii. Canteen and kitchen iii. Recreational areas iv. Potable water supply v. Sanitary facilities comprising a septic tank system with adequate capacity vi. Waste collection and management facilities vii. Suitable lighting for security and amenity viii. Emergency protection equipment including fire protection Temporary erosion and sediment controls during construction and stormwater drainage Preparation of site layout plans A site layout plan will be prepared prior to the commencement of construction; the plan will include information on the location of the components and will be based on the following principles: i. The use of cleared areas for locating construction camps will be maximised								

Mitigation Measures	Physical Environment			Socio-Economic Environment				
	Air Quality		Water Quality					
	Noise and vibration generation	Dust, vapour and exhaust emission	Impacts on water quality	Temporary flooding	Impacts on fisheries	Impact on access to natural resources	Impact on utilities	Public and Worker Health and Safety
ii. The retention of existing vegetation, especially large trees iii. Measures to minimise the potential for disease transmission within the constructions camps will be taken into account including provision of suitable drainage, water supply and sewage disposal methods iv. No components will be located within 5m of a watercourse , and all construction work within 20m of a watercourse will be minimised Buildings shall be sited within the existing topography to maximise screening of the camps from public vantage points Disease control, health and safety issues Medical, sanitary and disease prevention measures for each camp will be implemented Pesticide use in the camps and sub-camps will be carried out Waste generated at the construction camps will be managed Construction workers will be trained in health and safety issues relating to the camps Camp access Access to construction camps will be controlled in accordance with the requirements of a Site Security Plan. Potable water supply All potable water facilities will be designed to GoM/WB standards Camp rules and regulations A set of rules and regulations applicable to camps and sub-camps								

Mitigation Measures	Physical Environment			Socio-Economic Environment				
	Air Quality		Water Quality					
	Noise and vibration generation	Dust, vapour and exhaust emission	Impacts on water quality	Temporary flooding	Impacts on fisheries	Impact on access to natural resources	Impact on utilities	Public and Worker Health and Safety
will be developed Residents of the camps shall be provided with written information and training on camp rules and regulations. Camp rules and regulations will be prominently displayed Landscaping and erosion and sediment control Landscaping works for each camp will be developed and implemented Rehabilitation The contractor will be required to decommission the camp after construction and leave the site in equal or better condition than when first occupied								

Mitigation Measures for Impacts during Construction

	Mitigation Measures	Physical Environment			Socio-Economic Environment				
		Air Quality		Water Quality					
		Noise and vibration generation	Dust, vapour and exhaust emission	Impacts on water quality	Temporary flooding	Impacts on fisheries	Impact on access to natural resources	Impact on utilities	Public and Worker Health and Safety
1	Use modern and new construction machines	▲	▲	▲					▲
	Regularly maintenance of construction machinery	▲	▲						▲
	Stop transportation vehicles at night when nearby residential areas	▲							▲
	Inform about construction schedules and time;						▲	▲	▲
2	Applying the section-by-section construction method for drain installation;				▲				
	Manage Excavated soil		▲		▲	▲			
	Fine construction materials (cement) control		▲	▲					▲
	Spray water frequently for the construction sites and the surroundings, especially in dry and windy conditions;		▲						▲
	All trucks that transport soil, sand, and dispersible materials are covered		▲						▲
	Limit Speed truck pass residential areas.	▲							▲
3	Install dustbin and collect solid waste generated during construction.			▲					▲
	Ensure normal operation of existing utilities							▲	▲
4	Store all fuels, oils and chemicals on site in a covered area with an impermeable floor away from surface water resources			▲		▲			▲
	Use temporary ditches to adjust storm water flow out to construction area.				▲				

	Mitigation Measures	Physical Environment			Socio-Economic Environment				
		Air Quality		Water Quality					
		Noise and vibration generation	Dust, vapour and exhaust emission	Impacts on water quality	Temporary flooding	Impacts on fisheries	Impact on access to natural resources	Impact on utilities	Public and Worker Health and Safety
	Excavated soil must be intermediately transported to the landfill area.		▲	▲					
	Train workers in appropriate waste disposal practice and required locations.			▲					▲
	Any excavation areas must be quickly reinstated.		▲	▲			▲		
	Oil, grease or solid waste leaked must be cleaned immediately.			▲		▲			▲
	Job opportunities are encouraged for local people								▲
5	Solid waste and soil generated within construction site should be timely collected to temporary area before transporting to pre-defined areas;		▲	▲					
	Barrier and suction pump installed to pump water to the drainage in case of flooding;				▲				
	Regularly maintain normal operation status of existing drainages			▲	▲				
6	Mark the location of underground facilities							▲	
	Sewerage pipelines should be placed under water supply system.							▲	
	A plan for possible contingencies will be set up in which there is any broken facilities will be compensated by Contractor if any.								▲
7	Applying regulated vehicle weight	▲							▲
	Road surface should be fully surfaced	▲	▲						▲
	Proper compensation for any violation/damages to existing infrastructure.								▲
8	Check cable and electrical equipment, especially in rainy conditions								▲

Mitigation Measures		Physical Environment			Socio-Economic Environment				
		Air Quality		Water Quality					
		Noise and vibration generation	Dust, vapour and exhaust emission	Impacts on water quality	Temporary flooding	Impacts on fisheries	Impact on access to natural resources	Impact on utilities	Public and Worker Health and Safety
	Only qualified people are allowed to install and maintain electrical systems.								▲
	Upon construction completion, the Contractor is responsible to clean up this temporary power supply source								▲
9	The workers, including those of sub-contractors, must be provided with and use proper safety equipment								▲
	The construction sites shall be kept clean and tidy		▲	▲					▲
	Provide safe drinking water to workers for daily use								▲
	Provide and maintain lights, protection fences, signboards and guards								▲
	Provide safety and emergency response equipment.		▲	▲					▲
10	Institute an efficient EMP during construction	▲	▲	▲	▲	▲	▲	▲	▲

Mitigation Measures for Impacts during Operation

Mitigation Measures		Physical Environment			Socio-Economic Environment				
		Air Quality		Water Quality					
		Noise and vibration generation	Dust, vapour and exhaust emission	Impacts on water quality	Temporary flooding	Impacts on fisheries	Impact on access to natural resources	Impact on utilities	Public and Worker Health and Safety
	Periodically clear drainage				▲				
	Conduct public awareness raising on environment								▲
	Ensure River bank protection			▲		▲			
	Community safety monitoring							▲	▲
	Periodical checking of new jetty and tank structures	▲				▲		▲	▲
	Check no interference with private/public assets								▲
	Ensure emergency response plan								▲
	Prioritize loading and unloading during daylight hours	▲							▲
	Ensure vehicle and engine exhausts fully operational	▲							▲
	Implements Health & Safety routines for the site								▲
	Dispose of any dredged material out to sea			▲		▲	▲		
	Do not clean barge or ship tanks at jetty			▲		▲			
	Landfill or dispose of solid waste as appropriate			▲					▲
	Collect and treat any contaminated liquid run-off			▲		▲			

4 ENVIRONMENTAL MONITORING

Environmental monitoring activities of the Project include: (1) monitoring the project compliance, and (2) monitoring of environmental impacts caused by the project activities. Environmental impact monitoring will be implemented for all of the project phases, however, with major concentration on construction and operation phase.

(i) Environmental Performance Monitoring is conducted to evaluate compliance with standard operating procedures, national standards on environment and technical specifications. In most cases, monitoring results are evaluated against established performance criteria.

(ii) Environmental impact monitoring is conducted to evaluate the impacts by the Project activities on ambient environmental conditions.

4.1 The EMP and Project Phases

4.1.1 Pre- Construction

This phase covers the detailed design period until prior to awarding of contract for civil works. The Proponent's management unit (PMU), with technical advice, guidance and support of the ESMU function will:

(i) oversee the incorporation of EMP recommendations into the design/bid documents & O&M Manual, the finalization of the Project EMP;
(ii) ensure the procurement of an environmentally responsible contractor;
(iii) ensure that an Environmental Approval has been secured prior to the awarding of contract for civil works;
(iv) set up the baseline ambient air quality, noise and vibration levels, groundwater quality in the Project sites and baseline statistics on incidence of diseases in the villages concerned;
(v) conduct awareness campaign on health and safety impacts of Project implementation;
(vi) review the Final EMP of the winning/selected Contractor; and
(vii) prepare monthly inputs for incorporation into the Monthly Progress Report, and a semi-annual EMR.

4.1.2 Construction Period

The Construction period covers the period after awarding of contract for civil works until commissioning for operation. The ESMU/ECO will:

i) conduct inspections and spot checks to monitor the performance of the Contractor in implementing the EMP;
ii) review the results of monitoring conducted by the Contractor;
iii) oversee and monitor the management/resolution of grievances and effectiveness of the grievance redress mechanism;
iv) collect monthly EMRs from the Contractor, and prepare and submit a semi-annual EMR.

The Proponent will review submitted semi-annual EMRs. The Contractor will:

i) engage an environmental site officer (ESO) to manage the EMP implementation & reporting;
ii) implement all environmental mitigation and protection measures; conduct all environmental monitoring activities; and ensure preparedness for emergency response as provided in the EMP;
iii) observe the grievance redress mechanism in addressing complaints; and
iv) prepare monthly and a semi-annual Contractor's EMRs.

The GoM will conduct random monitoring in line with the Project Environmental Approval.

4.1.3 Operational Period

The Operation period commences at commissioning of the Project. During operation, the Proponent will be responsible for:

i) Managing the EMP implementation and reporting
ii) implementing mitigation and protection measures that will ensure sustained effectiveness of the completed Project
iii) preparing EMRs as required. The ECO will conduct inspections and spot checks to monitor the environmental performance of the completed Project.

Responsibilities and budget for environmental impact monitoring during construction and operation phases are identified as follows:

Construction phase:
The Contractor must be responsible for implementation of environmental mitigation measures included in the bidding documents and the budget for implementation is included in the construction contract.

Costs for quality monitoring of environmental components are borne by the Proponent.

Operation phase:
During the operation and maintenance phase, the Proponent/Owner shall maintain budget for implementation of mitigation measures and environmental monitoring as well as for capacity strengthening and staff salary.

4.2 Project Performance Monitoring

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timetable to check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible for PI supervision	Cost of Supervision
DESIGN & PRE-CONSTRUCTION PHASE								
1. Review of EMP	Environmental Management Plan (EMP) is reviewed	During detailed design (later monthly to cover any unidentified impacts)	By completion of detailed design.	All project alignments and works areas	Contractor	PMU ESMU	PMU ESMU / ADB	PMU ESMU staff cost
2. Social Impacts and Resettlement	Inventory of losses, Property acquisition, compensation and resettlement completed to RP requirements.	As required prior to commencement of construction	Before removal of houses and structures.	APs according to Resettlement Plan	GoM	GoM	GoM	GoM
3. Project disclosure	Design changes notified	During detailed design by DED Consultant and later by Contractor to cover any changes, additional landtake etc.	Completion of detailed engineering design.	All project alignments and works areas.	DED Consultant / ESMU / Contractor	Contractor cost	PMU & ESMU	PMU ESMU staff cost
4. Environmentally Responsible Procurement. (ERP)	Contract follows International Guidelines on ERP. Performance bond. Deposited Contractual clauses include implementation of environmental mitigation measures tied to a performance bond.	Once, before Contract is signed.	Before Contract is signed.	Method Statements include resources for mitigation measures.	PMU & ESMU.	Contractor cost	PMU ESMU	PMU ESMU staff cost
5. Waste disposal	Disposal options for all waste, residually contaminated soils, etc agreed with PMU ESMU and local authority.	Monthly or as required to identify sufficient locations for, recycling or disposal. 2. If necessary include in contracts for unit rates for re-measurement for disposal. 3. After agreement	1.Prior to detailed design stage no later than pre-qualification or tender negotiations 2. Include in contract.	Locations approved by local waste disposal authorities.	PMU ESMU with the design consultant.	PMU ESMU	PMU ESMU	PMU

Environmental concern	Performance indicator (PI)	Frequency to monitor	Timetable to check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible for PI supervision	Cost of Supervision
		with local authority, designate disposal sites in the contract and cost unit disposal rates accordingly.						
6. Noise and air quality mitigation in design.	Design changes included in EIA & EMP approved by PMU.	During detailed design by Contractor.	Completion of detailed design.	As defined in detailed design EMP.	PMU ESMU / Contractor	Contractor cost	PMU	PMU ESMU staff cost
7. Hydrological Impacts	Drainage Management plan.	During detailed design	One month before commencement of construction	All works areas	Contractor	Contractor cost	PMU / ESMU.	PMU ESMU staff cost
8. Temporary drainage and erosion control	Erosion Control and Temporary Drainage Plans completed.	During detailed design updated by Contractor monthly to cover any unidentified impacts.	One month before construction commences.	All low-lying areas, stream and river banks and where slopes indicate erosion will be a problem.	Contractor.	Contractor cost	PMU / ESMU.	PMU ESMU staff cost
9. Planning construction camps	Use of land agreed with surrounding residents & villages.	During detailed design updated by Contractor.	One month before construction commences.	Locations agreed by PMU ESMU in consultation with community and the Contractor.	Contractor (PMU ESMU facilitates).	Contractor cost	PMU / ESMU.	PMU ESMU staff cost
10.Traffic Condition	Temporary Traffic Management Plan agreed.	During detailed design updated by Contractor monthly to cover any unidentified impacts.	One month before construction commences.	Locations agreed with PMU ESMU in consultation with community and the Contractor.	Contractor	Contractor cost	PMU / ESMU.	PMU ESMU staff cost
11. Institutional strengthening and capacity building	1. Strengthening plan agreed for PMU 2. Project support consultant in place 3. Staffing of PMU ESMU completed 4. Training of PMU ESMU initiated.	1. Once, 2. Once 3. Once 4. Ongoing	1. As soon as practicable 2, 3, 4. No later than one month before Contract award.	All works areas	PMU ESMU.	PMU ESMU staff cost	PMU /ADB	PMU cost

	Performance indicator (PI)	Frequency to monitor	Timetable to check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible for PI supervision	Cost of Supervision
CONSTRUCTION PHASE								
1.Orientation for Contractor, and Workers	1. Contractor agreed to provide training to professional staff and workers. 2. Special briefing and training for Contractor completed. 3. Periodic progress review sessions.	1. Once 2. Ongoing 3. Ongoing	1. Before contract is signed 2. Before construction areas are opened up 3. Every six months	All Contractor staff members in all categories. monthly induction and six month refresher course	Contractor	Contractor cost	ESMU to observe and record results	PMU ESMU staff cost
2. Measures to control environmental impacts	1. Drainage managed 2. Temp. Pedestrian & Traffic managed, 3. Erosion Control & managed 4. Materials Management plan, 5. Waste managed; 6. Noise and Dust managed, 7. Safety Plan 8. Agreed schedule of costs for environmental mitigation	As required / ongoing.	One month before construction commences and thereafter as required during construction according to DED EMP.	All works areas	Contractor	Contractor cost	ESMU.	PMU ESMU staff cost
3. Water quality	Key parameters (pH, turbidity, EC, temperature, BOD, fecal coliforms, heavy metals, other as required) water quality monitoring up and downstream during construction.	Twice before construction begins and thereafter according to DED EMP.	During detailed engineering design by Contractor and update to cover any unidentified impacts.	All works areas near flowing or standing water	ESMU and experienced laboratory.	Contractor & PMU ESMU cost	PMU ESMU.	PMU ESMU staff cost
4. Water Resources	1. No disruption to community water supplies. 2. Measures established to minimize the water wastage during construction sites and at worker camps.	1. Monthly 2. Monthly	Prior to submission of progress reports.	All local water supply networks / resources.	Contractor	Contractor cost	PMU ESMU	PMU ESMU staff cost
5. Spoil disposal and construction waste disposal	1. Use of land agreed with surrounding residents & Villages. 2. Waste Management Plan implemented. 3 No open burning	Monthly (line item when opening up construction sites).	Prior to construction. Update monthly.	All works areas.	Contractor	Contractor cost	PMU ESMU	PMU ESMU staff cost
6. Noise	Noise mitigation measures implemented in line with EMP. Maximum allowable noise levels are 80dB(A)L_{EQ}.	Weekly or as required (line item when opening up construction sites).	Prior to construction (equipment check). Update monthly.	All works areas.	Contractor	Contractor cost	PMU / ESMU	PMU ESMU staff cost
7. Air quality	Noise and dust control plan implemented.	Monthly (line item when opening up construction sites).	Prior to construction. Update monthly.	All works areas.	Contractor	Contractor cost	PMU / ESMU	PMU ESMU staff cost
8. Soil &	Contractors workforce to	Monthly (line item	Prior to	All works areas.	Contractor	Contractor cost	PMU / ESMU	PMU ESMU staff

	Performance indicator (PI)	Frequency to monitor	Timetable to check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible for PI supervision	Cost of Supervision
Ground Contamination	instructed and train handling of chemicals	when opening up construction).	construction. Update monthly.					cost
9. Work Camp Location and Operation	1. Use of land agreed with surrounding residents & Villages. 2. Camp management Plan implemented in line with EMP.	Weekly or as required (line item when mobilising).	Prior to construction. Update monthly.	All works areas.	Contractor	Contractor cost	PMU / ESMU	PMU ESMU staff cost
10. Safety Precautions for Workers	OHS plan submitted by contractor	Once (update monthly as necessary)	One month before construction and update quarterly.	All works areas.	Contractor.	Contractor cost	PMU / ESMU	PMU ESMU staff cost
11. Social Impacts	1. Local labour is used as per recommendations. 2. Relevant gender measures adopted. 3. Complaints on construction nuisance or damages are responded to promptly by the Contractor. 4. Meetings with local communities for liaison purposes.	Monthly (line item when opening up construction sites).	During construction. Update monthly.	All affected areas.	Contractor	Contractor cost	PMU / ESMU	PMU ESMU staff cost
12. EMP	Contractor has followed guidance from EMP.	Weekly or as necessary	During construction and update quarterly.	All works areas	Contractor.	Contractor cost	PMU / ESMU	PMU ESMU staff cost
OPERATIONAL PHASE								
***1*. Air Quality**	*1. Dust*	1. as required	During operation.	.Affected areas	Operator	Operator cost	PMU / and PMU ESMU	PMU ESMU staff cost
2. Water Quality	1. Water does not stand in new drainage network	1) Quarterly	1) Throughout project operation	Affected areas	Operator	Operator cost	PMU / and PMU ESMU	PMU ESMU staff cost
3. Waste Management	1. garbage does not block new drainage network	1) Quarterly	1) Throughout project operation	Affected areas	Operator	Operator cost	PMU / and PMU ESMU	PMU ESMU staff cost
3. Communication Plan	Plan implemented	As per RP monitoring programme	1) Throughout project operation	Affected areas	PMU	PMU cost	ESMU	PMU ESMU staff cost
4. Site remediation	Contractor camp and disturbed areas returned to equal or better than pre-construction condition	Once on contractor demobilization Once in final audit during DLP	On Contractor demobilization and DLP	All works areas	Contractor	Contractor	PMU ESMU	PMU ESMU staff cost

Note: DED = detailed engineering design; OHS = occupational health and safety; DLP = defects liability period.

4.3 Public Consultation Process and Information Disclosure

The record of public consultation during the Feasibility Study is contained in the EIA, PSA and RP reports. Future consultations should focus on activities as below.

Table 9: Summary of Consultation Required

Activity	Expected Result	Schedule	Cost
Consult local managerial levels about conditions of construction sites	Information about the areas where may exist toxic substances, cultural heritages and underground structures	During design period	PMU Cost
Disseminate information to local community via public loudspeakers, announcements on radio/ television or articles in newspapers	Informing communities about construction activities, works schedules, potential negative impacts on environment, environmental management measures and how to use the community grievance line	During the construction phase	PMU Cost
Community redress mechanism is established.	PMU/ESMU and Contractors shall have to reply to all complaints, questions or concerns of local communities about the works.	During the construction phase	
Community redress mechanism is established by the works operation and management unit	Replying to questions, complaints or concerns of the communities on operation	During the operation phase	PMU Cost
Consult the local authorities	Agreeing with EMP mitigation measures	From the project operation	PMU Cost

5 IMPLEMENTATION OF MITIGATION MEASURES AND MONITORING REQUIREMENTS

Table 10: Responsible Agencies

Agency	Responsibilities for implementation of environmental management
ESMU	To coordinate environmental issues related to the Project and liaise with PMU
PMU/ESMU	Overall responsibility for EMP implementation during pre-construction and construction phases Ensure that contract documents include environmental requirements Ensure that staff are adequately trained in environmental issues Ensure that sufficient funds are available in project budget for EMP implementation Undertake inspections & monitoring of environmental issues during construction phase Assist Contractors in EMP implementation Make environmental report to summarize Project activities as required Allocate adequate resources for environmental requirements
ESMU/Consultants	Assist PMU in drafting: (i) environmental mitigation measures in the contract with Construction Contractor; (ii) environmental compliance criteria in the contract with Construction Supervision Consultant to ensure Contractor and CSC's responsibility and their participation in the Environmental Monitoring System. Periodical implementation of compliance monitoring to Construction Supervision Consultant and Construction Contractor by checking documentation and field site survey; Implementation of Environmental monitoring program by sampling methods Completing periodical environmental monitoring reports and send to PMU/ESMU
Consultants	Assist with capacity building within the ESMU and co-ordinate and support training activities. Provide environmental advice and specialist services as required.
PECO	Be responsible for environmental activities in operation phase including EMP implementation during operation Undertake inspections and monitoring of environmental issues during operation
Design consultant	Ensure that all designs and contract documents comply requirements under EMP Ensure that construction supervision activities are incorporated with environmental issues
Construction Supervision Engineer	Periodical implementation of on site compliance monitoring to Contractor; Periodically complete snap-shot reports on site EMP and send to ECO giving proposals for improvement.
Construction Contractor/ESO	Prepare detailed Site EMP to meet general requirements in EMP and train workers in environmental issues. Fulfil assigned tasks under the EMP and other issues related to EMP of the Project. If the Contractors find that mitigation measures in EMP are ineffective, they should recommend new or improved mitigation measures. Allocate adequate resources to meet requirements and obligations of Project's EMP.
PMU	Ensure EMP is implemented as part of environmental approval.
GoM Environment Staff	Provide support as requested during the process of Project implementation.

5.1 RESPONSIBILITIES FOR REPORTING AND REVIEW

Project phases	Type of report	Frequency	Responsibility	Submitted to whom
Pre-construction phase	No report required.			
Construction phase	**Site Environmental Performance Report** indicating the compliance with Site EMP and monitoring results (Refer to Annex for content)	Quarterly	Civil Works Contractor	PMU
	EMP Compliance Report indicating the compliance with Project's EMP and monitoring results (Refer to Annex for content)	Quarterly during construction time depending on construction duration	ESMU	PMU
	Project's Environmental Report describing overall Project environmental performance and EMP compliance	Twice a year during construction time and the completion of work construction	ECO	PMU
Operational phase	**EMP Compliance Report:** Work operation must be in compliance with Project's EMP commitments.	Once a year for the first two years of operation. Ongoing frequency is to be determined basing on evaluation results after 2 years.	ECO	PMU and GoM if requested

5.2 Environmentally Responsible Procurement Plan

5.2.1 Procurement of Equipment for EMP Implementation

No purchase of equipment for EMP implementation is needed. It is assumed that the Works contract has provision for purchase of necessary environmental protection and monitoring equipment to allow the Contractor to implement the EMP.

5.2.2 Integration of Environmental Considerations into the Procurement/Bidding Process

The method for ensuring integration of environmental considerations into the procurement process is described below.

Table 11: Environmentally Responsible Procurement Plan

International Competitive Bidding / National Competitive Bidding	
Steps in Procurement Process	Integration of Environmental Considerations
1. Draft bidding documents prepared	incorporate relevant environmental requirements from EMP and standard environmental bidding clauses into draft bidding documents.
2. Draft bidding documents submitted	verification that environmental requirements adequately and appropriately incorporated into bidding documents.
3. Preparation of bid evaluation report	bid evaluation process includes consideration of environmental criteria
4. No objection to bidding results	verification that environmental requirements have been considered in evaluation process
5. Contract awarded	contract contains relevant environmental requirements/specifications

5.3 Training

5.3.1 Environmental Control Officer (ECO)

A suitably qualified environmental control officer (ECO) should be nominated before construction begins. The ECO will be attached to an environmental and social management unit (ESMU) that is established for the project. The ECO may be the focal person in the ESMU.

The PMU, PIU, ESMU and ECO should ensure

- the EMP becomes part of the construction contract
- implementation of the EMP
- regular audits and site inspections
- Contractor abides by the EMP

The ECO should undertake regular site inspections and the results should be recorded and submitted to the relevant authorities as part of progress reporting.

5.3.2 Environmental Site Officer (ESO)

An ESO should be appointed/nominated by the Contractor from his site personnel to:

- Attend all construction site meetings.
- Undertake the activities required in the terms of the EMP.
- Brief workers before construction commences (and regularly reinforce).
- Undertake regular monitoring during construction.
- Submit reports to the ECO on the implementation of the EMP compliance with the conditions of approval and implementation of the mitigation measures in the EMP.
- Assist the ECO in placement of works etc in areas of least environmental sensitivity.
- Report to the ECO any departures from the EMP promptly with explanations for such.

Where the EMP defines the task and provides the management plan, the ESO is responsible for complying with the plan (hence the contract) on behalf of the contractor. On behalf of the PIU and PMU, the ECO is must check and evaluate the performance and effectiveness of the ESO.

6 EMERGENCY/INCIDENT RESPONSE PROCEDURES

The Project should develop emergency or incident response procedures during construction and operation.

The construction phase should ensure:

i) Emergency Response Team (ERT) of the Contractor as initial responder;
ii) the District and City fire and police departments, emergency medical service, the Department of Public Health (DPH), etc collectively referred to as the External Emergency Response Team (EERT), as ultimate responders.

The Contractor will provide and sustain the required technical, human and financial resources for quick response during construction.

Table 12: Roles and Responsibilities in Emergency/Incident Response

Entity	Responsibilities
Contractor Team (ERT)	- Communicates / alerts the EERT. - Prepares the emergency site to facilitate the response action of the EERT, e.g., vacating, clearing, restricting site. - When necessary & requested by the EERT, lends support / provides assistance during EERT's response operations.
External Emergency Response Team (EERT)	- Solves the emergency/incident
Contractor Resources	- Provide and sustain the people, equipment, tools & funds necessary to ensure Project's quick response to emergency situations. - Maintain good communication lines with the EERT to ensure prompt help response & adequate protection, by keeping them informed of Project progress.

The ERT will be led by the senior Contractor engineer (designated ERTL) on site with a suitably trained foreman or junior engineer as deputy. Trained first-aiders and security crew will be the core members of the ERT.

The Contractor will ensure that ERT members are physically, technically and psychologically fit for their emergency response roles and responsibilities.

Prior to the mobilization of civil works, the Contractor, through its Construction Manager, ERTL, in coordination with the PMU/PCU, will meet with the ultimate response institutions to discuss the overall construction process, including, but not limited to:

i) Project sites;
ii) construction time frame and phasing;
iii) any special construction techniques and equipment that will be used; i
iv) any hazardous materials that will be brought to and stored in the construction premise and details on their applications and handling/management system;
v) the Contractor's Emergency Management Plan
vi) names and contact details of the ERT members

The objective of this meeting is to provide the ultimate response institutions the context for:

i) their comments on the adequacy of the respective Emergency Management Plans
ii) their own assessment of what types, likely magnitude and likely incidence rate of potential hazards are anticipated
iii) the arrangements for coordination and collaboration.

To ensure effective emergency response, prior to mobilization of civil works, the Contractor will:

i) set up the ERT;
ii) set up all support equipment and facilities in working condition
iii) made arrangements with the EERT;
iv) conducted proper training of ERT members, and encouraged and trained volunteers from the work force; v) conducted orientation to all construction workers on the emergency response procedures and facilities, particularly evacuation procedures, evacuation routes, evacuation assembly points, and self-first response, among others; and vi) conducted drills for different possible situations.

To sustain effective emergency response throughout Project implementation an adequate budget shall be provided to sustain the capabilities and efficiency of the emergency response mechanism, the emergency response equipment, tools, facilities and supplies. Drills and reminders will take place regularly, the former at least every two months and the latter at least every month.

6.1 Alert Procedures

Means of communicating, reporting and alerting an emergency situation may be any combination of the following: i) audible alarm (siren, bell or gong); ii) visual alarm (blinking/rotating red light or orange safety flag); iii) telephone (landline); iv) mobile phone; v) two-way radio; and vi) public address system/loud speakers. Some rules relative to communicating/alerting will be:

(i) Whoever detects an emergency situation first shall immediately :
- call the attention of other people in the emergency site,
- sound the nearest alarm, and/or
- report/communicate the emergency situation to the ERT.

(ii) Only the ERTL and, if ERTL is not available, the Deputy ERTL are authorized to communicate with the EERT. Exceptional cases to this rule may be necessary and should be defined in the Emergency Management Plans.

(iii) When communicating/alerting an emergency to the EERT, it is important to provide them with at least: i) the type of emergency situation; ii) correct location of the emergency; ii) estimated magnitude of the situation; iii) estimated persons harmed; iv) time it happened; v) in case of a spill, which hazardous substance spilled; and vi) in case of fire and explosion, what caused it. Such details would allow the EERT to prepare for the appropriate response actions.

For an effective reporting/alerting of an emergency situation:

(i) The names and contact details of the relevant persons and institutions should be readily available in, or near to, all forms of communication equipment, and strategically posted (at legible size) in all Project sites and vehicles:
- Most relevant construction/operations staffs namely, the ERTL, Deputy ERTL, first-aiders, supervising engineers, foremen

- EERT institutions/organizations
- Concerned village authority/ies
- PMU Office, ESMU

(ii) All Project sites should have good access to any combination of audible and visual alarms, landline phones, mobile phones and two-way radio communication at all times.

(iii) Contractor's construction vehicles should also be equipped with the appropriate communication facilities.

6.2 Emergency Response Situations

The following tables suggest general procedures that will be refined in the final EMP during detailed design, and described in more detail in the Emergency Management Plans of the Contractor.

Table 13: Evacuation Procedure

Procedure	Remarks
▪ Move out as quickly as possible as a group, but avoid panic.	▪ All workers/staff, sub-contractors, site visitors to move out, guided by the ERT.
▪ Evacuate through the directed evacuation route.	▪ The safe evacuation shall have been determined fast by the ERTL/Deputy ERTL & immediately communicated to ERT members.
▪ Keep moving until everyone is safely away from the emergency site and its influence area.	▪ A restricted area must be established outside the emergency site, all to stay beyond the restricted area.
▪ Once outside, conduct head counts.	▪ Foremen to do head counts of their sub-groups; ERTL/Deputy ERTL of the ERT.
▪ Report missing persons to EERT immediately.	▪ ERTL/Deputy ERTL to communicate with the EERT.
▪ Assist the injured in evacuation & hand them over to the ERT first-aiders or EERT medical group	▪ ERT to manage injured persons to ensure proper handling.
▪ If injury warrants special care, DO NOT MOVE them, unless necessary & instructed/directed by the EERT.	▪ ERTL/Deputy ERTL communicates with EERT to get instructions/directions in handling the injured.

Table 14: Response Procedure During Medical Emergency

Procedure	Remarks
▪ Administer First Aid regardless of severity immediately.	▪ Fundamentals when giving First Aid: - Safety first of both the rescuer and the victim. - Do not move an injured person unless: - victim is exposed to more danger when left where they are, e.g., during fire, chemical spill - it would be impossible for EERT to aid victims in their locations, e.g., under a collapsed structure - instructed or directed by the EERT. ▪ First AID to be conducted only by a person who has been properly trained in giving First Aid.
▪ Call the EERT emergency medical services &/or nearest hospital.	▪ ERTL/Deputy ERTL or authorized on-site emergency communicator
▪ Facilitate leading the EERT to the emergency site.	▪ ERTL/Deputy ERTL to instruct: - an ERT member on- site to meet EERT in access road/strategic location. He/she shall hold orange safety flag to get their attention & lead them to site. - Other ERT members to clear access road for smooth passage of the EERT.
▪ If applicable, vacate site & influence area at once, restrict site, suspend work until further notice.	▪ Follow evacuation procedure.

Table 15: Response Procedure In Case of Fire

Procedure	Remarks
▪ Alert a fire situation.	▪ Whoever detects the fire shall immediately: - call the attention of other people in the site, - sound the nearest alarm, and/or - Foreman or any ERT member among the construction sub-group contacts the fire department (in this case it should be agreed on that it is alright for any ERT member in the sub-group to alert the fire department) - report/communicate the emergency situation to the ERTL/Deputy ERTL.
▪ Stop all activities/operations and evacuate.	▪ All (non-ERT) workers/staff sub-contractors, site visitors and concerned public to move out to safe grounds following the evacuation procedure.
▪ Activate ERT to contain fire/control fire from spreading.	▪ Guided by the training they undertook, ERT members assigned to mitigate the fire shall assess their own safety situation first before attempting to control fire spread.
▪ Call the nearest fire & police stations &, if applicable, emergency medical services.	▪ When alerting the EERT, ERTL will give the location, cause of fire, estimated fire alarm rating, any injuries.
▪ Facilitate leading the EERT to the emergency site.	▪ ERTL/Deputy ERTL to instruct: - an ERT member to meet the EERT in the access road or strategic location and lead them to the site. He/she shall hold the orange safety flag to get their attention and lead them to the site. - some ERT members to stop traffic in, & clear, the access road to facilitate passage of the EERT.
▪ ERT to vacate the site as soon as their safety is assessed as in danger.	▪ Follow appropriate evacuation procedure.

6.3 Cost Allocation

It is assumed that the Detailed Design Consultant will cost in additional mitigation measures associated with best practice engineering. The Construction Contractor is assumed to include the cost of compliance with the EMP in his bid. All other costs will be taken by the proponent/owner as appropriate.

Table 16: EMP Implementation

Activity	Integrated in to Construction and O&M Contract	Integrated in to Detailed Design Contract	PMU Budget
Environmental Mitigation			
A. Pre-Construction Phase			
A.1 Engineering mitigation measures		Design cost	
A.2 Preparation of GoM EIA & EIA		Design cost	PMU cost
A.3 ECC application		Design cost	PMU cost
A.4 Community awareness campaign			ESMU cost
A.5 Resettlement, compensation activities			GoM cost

Activity	Integrated in to Construction and O&M Contract	Integrated in to Detailed Design Contract	PMU Budget
B. Construction Phase			
B.1 Implementation of construction engineering best practice as mitigation measures	Project cost		
C. Operation Phase		-	-
C.1 Implementation of mitigation measures in design	Project cost		
C.2 Implementation of operational practices as mitigation measures	Project cost		
Environmental Effects Monitoring			
A. Pre-Construction Phase			
A.1 Establishment of baseline environmental data			ESMU cost
B. Construction Phase			
B.1 Monitoring of air, noise, vibration, water			ESMU cost
B.2 Monitoring of community & workers' health and safety			ESMU cost
C. Operation Phase			
C.1 Monitoring of air, noise, water (2 years)			ESMU cost
C.2 Monitoring of community health and safety (2 years)			ESMU cost
D. Performance Monitoring			
D.1 ESMU Audits			PMU Cost
D.2 Project Audits			ESMU Cost

ANNEXES

ANNEX 1: Terms of Reference for the Environmental Control Officer (ECO)

The ECO ensures all plans, procedures, approvals, and documentation are in place to ensure EMP compliance prior to commencement of any work. The ECO as part of the ESMU is responsible for monitoring, reviewing and verifying compliance with the EMP by the Contractor.

The ECO's duties will include the following:

- supervising preparation and maintenance of the EMP
- assisting the Construction Contract Managers to obtain all necessary environmental approvals prior to commencement of any work at a determined site
- monitoring and verifying that the EMP is adhered to at all times and taking action if the specifications are not followed;
- monitoring and verifying that environmental impacts are kept to a minimum;
- inspecting the site and surrounding areas regularly with regard to compliance with the EMP;
- reviewing and approving the Contractors environmental reporting regarding environmental activities
- coordinating with ESMU staff as appropriate
- coordinating with the PMU/PIU including requests for changes to the initial EMP (e.g. methods, areas)
- reporting on the environmental issues at routine meetings and other meetings that may be called regarding environmental matters;
- creation and supervision of records of all activities / incidents concerning the environment in the Database
- keeping a register of complaints and complaint resolution in relation to community comments or issues
- up-dating legal registers and EMP related documentation;
- monitoring the undertaking by the Construction Contractor of environmental awareness training for all new personnel coming onto site
- advising on the removal of person(s) and/or equipment not complying with specifications
- recommending the issuing of penalties (via the PIU/PMU) for contraventions of the EMP
- recommending to stop work in emergencies or if significant environmental impacts are apparent or imminent
- completing start up, monthly and site closure inspection forms etc
- preparing the background information as required for the Environmental Compliance Certificate
- keeping a photographic record of progress on sites from an environmental perspective
- preparing the environmental part of the Project audits
- participating, upon request by PIU(PMU in meetings

ANNEX 2: Terms of Reference for the Contractor's Environmental Site Officer (ESO)

The ESO will have the principal responsibility for observing construction activities and ensuring that those activities are in compliance with the EMP requirements.

To accomplish this, the ESO will be trained to understand the EMP and contract specifications.

The specific responsibilities of the ESO are to:

- •Monitor implementation of environmental measures by construction staff against contractual obligations by:

  - performing scheduled and regular monitoring activities
  - detecting non-conformance and approving corrective action (with advice from ECO if necessary)
  - evaluating Contractor environmental efforts and effectiveness
  - identifying circumstances requiring management decisions to evaluate variance or compliance issues.

- •Compile documentation of monitoring observations by:

  - collecting any specific data that the ESO is assigned to monitor;
  - interface with ECO and ESMU to assist in field interpretation of environmental requirements, provide advice regarding corrective actions and resolving non-compliance situations, and issue specific formal instructions to the workforce

- Interface with the construction manager to help communicate requirements, obtain a hands-on view of special problems so that implementation difficulties can be communicated to the ECO to aid in problem resolution especially in situations where adjustment of compliance requirements may be necessary, and to request consideration of work redirection of effort in the event that imminent potential for damage or a serious non-compliance situation is observed

- Communicate to ECO by:

  - Preparation of routine monitoring reports
  - interaction with ESMU as needed to define corrective action recommendation for any identified non-compliance situation

- Implementation of environmental controls and measures specified in the EMP

ANNEX 3: PROPOSED FORMATS FOR ENVIRONMENTAL REPORTING

SITE ENVIRONMENTAL PERFORMANCE REPORT (SEPR)

1. Introduction and Project Review

Name of Project:	
Location of Project:	
Reporting period:	
Last report date:	
Key Project activities since last report:	

2. Summary of Compliance with Site EMP Requirements

Site EMP Requirements	Compliance Attained (Yes, No, Partial)	Comments on Reasons for Non-Compliance	Issues for Further Action
1.			
2.			
3.			

3. Environmental Monitoring Results

Monitoring Parameters	Comparison to Relevant Standards/ Criteria	Comments on Incidences of Exceeded	Issues for Further Action
1.			
2.			
3.			

4. Issues for Further Action

Issue	Cause	Required Action	Responsibility	Timing	Resolution
Old Issues from Previous Reports					
1.					
2.					
New Issues from this Report					
1.					
2.					

5. Appendices

1. Correspondence
2. Monitoring Results
3. Etc.

EMP COMPLIANCE REPORT – CONSTRUCTION

1. Introduction and Project Overview

Name of Project:	
Location of Project:	
Reporting period:	
Last report date:	
Key Project activities since last report:	

2. Summary of Contractor's Site Environmental Performance Reports

Report No. and Date	Key issues Raised in Report	Comments on How Issues are addressed	Issues for Further Action

3. Compliance with Project EMP

Project EMP Requirements	Compliance Attained (Yes, No, Partial)	Comments on Reasons for Non-Compliance	Issues for Further Action
1.			
2.			
3.			

4. Environmental Inspection and Monitoring Results

Monitoring Parameters	Comparison to Relevant Standards/ Criteria	Comments on Incidences of Exceeded	Issues for Further Action
1.			
2.			

5. Issues for Further Action

Issue	Cause	Required Action	Responsibility	Timing	Resolution
Old Issues from Previous Reports					
1.					
2.					
New Issues from this Report					
1.					
2.					

6. Appendices

1. Correspondence;
2. Monitoring Results;
3. Etc.

PROJECT ENVIRONMENTAL REPORT – CONSTRUCTION COMPLETION

1. Introduction and Project Overview

Name of Project:	
Location of Project:	
Reporting period:	
Last report date:	
Key Project activities since the last report:	

2. Summary of EMP Compliance Reports

Report No. and Date	Key Issues Raised in Report	Comments on How Issues are addressed	Issues for Further Action
1.			
2.			

3. Issues for Further Action

Issue	Cause	Required Action	Responsibility	Timing	Resolution
1.					
2.					

4. Summary of Project Environmental Performance and Recommendations/ Lessons Learnt

1._____

2._____

3._____

5. Appendices

1. Correspondence
2. Supporting information
3. Etc.

Possible Draft Outline for the Semi-Annual Environmental Monitoring Report

Introduction
(Purpose of report; order of submission of the report e.g., first, second….nth report; period covered; preparer; and structure of the report)

Project Description
(Briefly describes the Project, its component activities and their size/scale, locations, its total cost and implementation schedule. Remains the same in every reporting, unless there are changes in scope, size or details, locations. Include map showing locations of components.)

Physical Progress of the Project
Previous Reporting Period
Current reporting period
(target and actual, for each Project component, and for Project overall)

Compliance with GoM Environmental Requirements

GoM Environmental Regulatory Requirements	Compliance Status

Compliance with the EMP

Implementation of Mitigation Measures

From EMP		Measures Undertaken				Necessary Corrective Action	Results
Impacts	Measures	What	When	How often	Effectiveness		

Conduct of Environmental Effects Monitoring

Monitoring Activity Stated in EMP	Undertaken?			Results	Remarks
	Yes	No	Date		

Observance of the Grievance Redress Mechanism

Complaint		Complainant		Action Taken	Result	Remarks
When Filed	What	Name	Address			

Performance Monitoring

Effectiveness of Instituted Mitigation Measures (suggested)

Assessment	Description	Scoring
Very Good	96-100% fully effective	5
Good	76-95% effective	4
Fair	51-75% effective	3
Poor	26-50% effective	2
Very Poor	0-25% effective	1

Performance in EMP Implementation (suggested assessment levels, descriptions & scoring)

A. Environmental Impact Mitigation

Assessment	Description	Scoring
Very Good	96-100% of the required mitigations carried out accordingly	5
Good	76-95% of the required mitigations carried out accordingly	4
Fair	51-75% of the required mitigations carried out accordingly	3
Poor	26-50% of the required mitigations carried out accordingly	2
Very Poor	0-25% of the required mitigations carried out accordingly	1

B. Environmental Effects Monitoring

Assessment	Description	Scoring
Very Good	96-100% of the required effects monitoring carried out accordingly	5
Good	76-95% of the required effects monitoring carried out accordingly	4
Fair	51-75% of the required effects monitoring carried out accordingly	3
Poor	26-50% of the required effects monitoring carried out accordingly	2
Very Poor	0-25% of the required effects monitoring carried out accordingly	1

Overall Environmental Performance of the Project

Impact (EMP)	Performance		Met Target Outcome?			Basis of Info	Remarks
	Indicator (EMP)	Value	Met	Failed			
				Frequency	Date/s		

Summary of Corrective/Follow Up Actions to be Taken

Lessons Learned

Conclusion