BIODIVERSITY ACTION PLAN (OPERATION PHASE)

REV.	DATE (dd/mm/yyyy)	DESCRIPTION	PREPARED	CHECKED	APPROVED
2	30/08/2016	Update with Changed Plant Configuration	MFC Consortium	See attachment of reviewer's signature	
1	02/04/2015	Response LSP's Comments	ERM	See attachment of reviewer's signature	……
0	31/12/2014	Issue For Review	ERM	See attachment of reviewer's signature	……

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REVISION LOG

Rev.	Date (dd/mm/yyyy)	Revised Detail			
		Item	Page	Article	Description
0	31/12/2014	all	all	all	First Issue
1	02/04/2015	all	all	all	Response LSP's Comments
2	30/08/2016	1.2; 1.4; 4; Annex B			Update with Changed Plant Configuration

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ACRONYMS

BAP	Biodiversity Action Plan
BOC	Balance of Complex
CITES	The Convention on International Trade in Endangered Species of Wild Fauna and Flora
CTU	Central Utility Plant
EHS	Environmental, Health and Safety
ESIA	Environmental and Social Impact Assessment
ha	Hectares
HDPE	High Density Polyethylene Plant
HSE	Health, Safety and Environment
HSSE	Health, Safety, Security and Environment
IFC	International Finance Corporation
LEP	Law on Environmental Protection
LLDPE	Linear Low Density Polyethylene Plant
LSP	Long Son Petrochemicals Company Limited
m^3/year	Cubic meter per year
MFO	Marine Fauna Observer
mil	Million
PP	Polypropylene Plant
PSs	Performance Standards on Social and Environmental Sustainability
TBT	Tributyltin
Ton/year	Ton per year
UNCLOS	The United Nations Convention on the Law of the Sea
USD	United States Dollar
VCM	Vinyl Chloride Monomer Plant
VRA	Vessel Risk Assessment

DISCLAIMER

It is upon the Contractor to solicit, acquire and comply with all information, laws, rules, regulations, and Applicable Standards which is/are necessary and/or required for and applicable to the Contractor's performances of the works hereunder.

The Contractor hereby agrees and acknowledges that the Employer makes no representation or warranty, express or implied, regarding the accuracy or completeness of any or all information, laws, rules, regulations, and Applicable Standards which is/are necessary and/or required for and applicable to the Contractor's performances of the works hereunder. THE EMPLOYER HEREBY EXPRESSLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ALL RESPECTS, and the Contractor agrees that neither the Employer nor any of its affiliate(s), director(s), officer(s), employee(s), consultant(s), professional advisor(s), and duly authorised representative(s) shall have any liability to the Contractor or any of its affiliate(s), director(s), officer(s), employee(s), consultant(s), professional advisor(s), and duly authorised representative(s) in any way relating to those information, laws, rules, regulations, and Applicable Standards which is/are necessary and/or required for and applicable to the Contractor's performances of the works hereunder or the Contractor's or its affiliate(s)', director(s)', officer(s)', employee(s)', consultant(s)', professional advisor(s)', and duly authorised representative(s)' reliance thereupon and/or use thereof.

1 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this Biodiversity Action Plan (BAP) is to outline a set of management processes and procedures that enable the control and reduction of biodiversity impacts as identified in the project's Environmental and Social Impact Assessment (ESIA).

The development and implementation of this BAP, is designed to ensure continuous improvement in Long Son Petrochemicals Company Limited (LSP)'s biodiversity protection and enhancement.

The key objectives of this BAP are to:

- Recognise biodiversity performance management to ensure that they are among the highest corporate priorities;
- Establish and maintain strong, constructive relationships with internal and external stakeholders;
- Maintain information on legislative requirements and biodiversity values aspects associated with the organisation's activities;
- Assign clear accountability and responsibility for protecting and enhancing the biodiversity values of the project area and the vicinity;
- Facilitate biodiversity values related planning by all departments through the Project life cycle;
- Provide a process for achieving targeted performance levels;
- Provide appropriate and sufficient resources, including training, to achieve targeted performance levels on an on-going basis;
- Evaluate biodiversity performance against LSP's HSSE&S policy, objectives and targets and seek improvement where appropriate; and
- Establish a management process to audit and review the LSP BAP and to identify opportunities for improvement of the system and resulting biodiversity values protection and enhancement performance.

It should be noted the information in this Biodiversity Offsets Plan is based on relevant regulations, guidelines and standards at the time of review and update of the ESIA dated September 2016. Should onsite activities change or new regulations, guidelines or standards apply this Biodiversity Action Plan will need to be reviewed, and amended, where appropriate.

1.2 PROJECT OVERVIEW

The Long Son Petrochemicals Complex Project is located in Hamlet 2 and Rach Gia Hamlet, Long Son Commune, Vung Tau City, Ba Ria - Vung Tau Province, Vietnam. The Complex is spread over 464 ha, including area for its future expansion.

The Project will be comprised of two (2) main components:

1) The Petrochemical Plant, which consists of the following plants and units:

- Main Production Plants
    - Olefins Plant
    - High Density Polyethylene (HDPE) Plant
    - Linear Low Density Polyethylene (LLDPE) Plant
    - Polypropylene (PP) Plant
    - Supporting Units
    - Central Utility Plant (CTU) (contains a Steam Generation Unit and Water Plant)
    - Tank Farm
    - Common Infrastructure

2) The Seaport, which consists of the following components:

- Hydrocarbon Jetty - to transfer feedstock and product for the Petrochemical Plant
- Construction Jetty - to import construction materials, including heavy lift modules.

In addition to the above main components, the Project also comprises supporting facilities to facilitate the production. These include High Pressure (HP) Flare system, Low Pressure (LP) Flare system, warehouses, wastewater treatment system, solid waste handling system, as well as associated administration and support buildings.

1.3 POTENTIAL BIOVERSITY IMPACTS

The potential biodiversity impacts during the operation phase are as follows:

- Impacts from the maintenance dredging activities for jetty access and turning basins;
- Impacts of the alteration of the light environment from operational lighting and flaring;
- Impacts from waste discharges to the freshwater and marine environment;
- Impacts of the industrial plant on the lifecycles of species;
- Impacts from invasive species (pests and weeds); and
- Impacts to existing habitats onsite.

Summary of biological baseline data survey and potential biodiversity values impacts are shown in ***Annex A*** and ***Annex B***, respectively.

1.4 APPLICABLE STANDARDS, REFERENCES AND DOCUMENTS

The references, documents and applicable standards related to biodiversity values are as follows:

- Applicable Vietnamese regulations on biodiversity values and issues including:
    - Law No.55/2014/QH13 dated 23 June 2014 on Environmental Protection (LEP 2014) and relevant decrees including:
        - Decree *No. 18/2015/ND-CP* of February 14 2015 on Environmental Protection Planning, Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Plans.
    - Biodiversity Law (2008) and relevant decrees including:

- Decree *No. 160/2013/ND-CP* dated 12 November 2013 of the Government on the Criteria to determine species and the regime of managing species under the lists of endangered, precious and rare species prioritised protection

- Law on Forest Protection and Development (2004) and the relevant decrees and circulars including:

  - Decree No. 32/2006/ND-CP of March 2006 which stipulates the management and the list of endangered, precious, and rare wild plants and animals of Vietnam's forests;

  - Circular No. 34/2009/TT-BNNPTNT of June 2009, on Criteria for Forest Identification and Classification; and

  - Circular No. 24/2013/TT-BNNPTNT of May 2013 on which sets out the provisions for replacement afforestation, upon conversion of forest use purpose to other purposes.

- The Equator Principles (June 2013, Version III) as they apply to the Project;
- The IFC's Performance Standards on Social and Environmental Sustainability (IFC's PSs) (2012) (except PS7 since there are no indigenous peoples existing in the Project area);
- The United Nations Convention on Biological Diversity (1992);
- The Ramsar Convention on Wetland (1971);
- The International Union for Conservation of Nature and Natural Resources, Red List of Threatened Species (1964);
- The United Nations Convention on the Law of the Sea (UNCLOS) 1982/1994;
- The Protocol of 1978, Relating to the International Convention for the Prevention of Pollution from Ships 1973 (MARPOL) Annexes I and II; and
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITIES).

Where both Vietnamese and international standards are applicable, the Project will aim to apply the most stringent.

2 ROLES AND RESPONSIBILITIES

2.1 INTRODUCTION

Having an appropriate organizational structure in place, with all people having defined roles and responsibilities, is essential to ensuring the overall success of this Biodiversity Action Plan (BAP). This section provides details of LSP's organizational structure with regards to onsite delivery of the BAP, and the various roles and responsibilities of those people in relation to meeting its requirements.

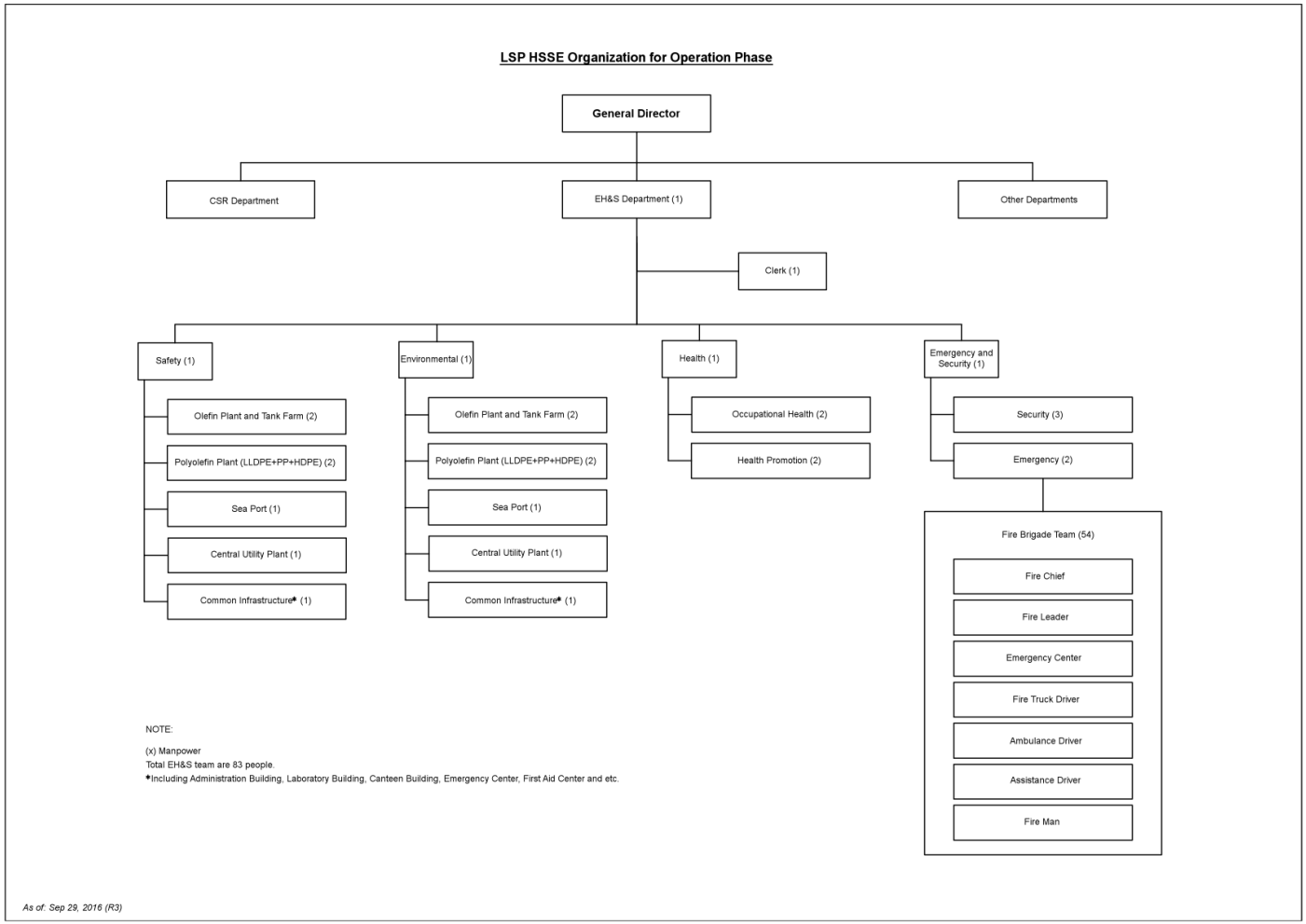
2.2 LSP OPERATION HSSE TEAM

LSP's operational health, safety, security and environmental (HSSE) team will lead the management of HSSE issues concerned with biodiversity values impacts. The LSP organizational chart to implement the requirements of this BAP is shown in the figure below.

2.2.1 HSSE Manager

It is the responsibility of the HSSE Manager to implement this BAP, whose roles and responsibilities includes:

- Ensure that LSP's corporate and project level policies are being applied by all workers on site, regardless of whether they are a LSP employee, contractor, subcontractor or visitor;
- Ensure that the necessary surveys are undertaken by suitably qualified personnel, at the appropriate times, and that the results are compared to the appropriate baseline in order to assess operational impacts to biodiversity;
- Review all monitoring reports, incident reports and annual review documents to assess the impact of the operational phase on biodiversity and, where, necessary evaluate, implement and monitor any corrective actions; and
- Lead, facilitate or assist with the investigation of HSE incidents and development and implementation of corrective and preventive actions that may impact biodiversity at the site during its operational phase.



3 MITIGATION/MANAGEMENT PROCEDURES

The mitigation/management procedures noted in this section provides the approach to managing sources of pollution that could potentially impact biodiversity values in relation to operation activities. LSP is committed to implementing the identified mitigation/management procedures in order to not cause exceedance of the applicable standards, and to avoid impacts on the local concerned habitats.

The mitigation/management measures that are relevant to onsite activities are shown in ***Table 0.1***.

The mitigation/management procedures were identified within the ESIA as being appropriate for the environmental impacts resulting from the anticipated operation activities. Should impacts to biodiversity values arise from LSPs activities, following the implementation of the procedures noted in ***Table 0.1***, LSP will review the need for additional measures to be taken and update this BAP accordingly.

Table 0.1 Mitigation / Management Procedures

Aspect, Potential Impact / Issue	Mitigation Reference	Mitigation and / or Management Procedures	LSP Responsibility	Contractors Responsibility	Related Plans
Impacts from the maintenance dredging activities for jetty access routes and turning basins	1.1	Strictly implement the dredging management plan.	HSSE Manager/Sea Port Manager	Maintenance Dredging Contractor	Dredging Management Plan (LSP-1S01-0020)
	1.2	Training of Vessel Masters in interaction procedures and specified crew as Marine Fauna Observer (MFO).	HSSE Manager	Maintenance Dredging Contractor	Dredging Management Plan (LSP-1S01-0020)
	1.3	Visual assessment by trained Marine Fauna Observer (MFO) (not distracted by other duties), prior to and during the dredging and spoil disposal activities during daylight operations. The outlines of marine fauna observation training program will be described in ***Annex J***.	HSSE Manager	Maintenance Dredging Contractor	Dredging Management Plan (LSP-1S01-0020)
	1.4	Dredge pumps will only be started when the drag head is closed to the seafloor. The dredge pump will be stopped as soon as possible after the completion of dredging.	HSSE Manager/Sea Port Manager	Maintenance Dredging Contractor	Dredging Management Plan (LSP-1S01-0020)
	1.5	Install and maintain screens on the overflow to aid in marine fauna entrainment identification.	HSSE Manager/Sea Port Manager	Maintenance Dredging Contractor	Dredging Management Plan (LSP-1S01-0020)
	1.6	Inspect overflow screen after every loading cycle to ensure that any and all benthic and pelagic species are reported.	HSSE Manager	Maintenance Dredging Contractor	Dredging Management Plan (LSP-1S01-0020)
	1.7	Install propeller guards on all vessels with propellers extending below the keel beam.	HSSE Manager/Sea Port Manager	Maintenance Dredging Contractor	Dredging Management Plan (LSP-1S01-0020)
	1.8	Develop and implement handling and storage procedures for entrained fauna. The outlines of the procedures will be described in ***Annex C***.	HSSE Manager	Maintenance Dredging Contractor	Dredging Management Plan (LSP-1S01-0020)
	1.9	Apart from above procedures, do not touch or handle live, injured or sick marine fauna unless advised by LSP's marine	HSSE Manager and LSP's Marine	Maintenance Dredging	Dredging Management Plan (LSP-1S01-0020)

Aspect, Potential Impact / Issue	Mitigation Reference	Mitigation and / or Management Procedures	LSP Responsibility	Contractors Responsibility	Related Plans
		biodiversity specialist. Qualification of the marine biodiversity specialist will be described in ***Annex K***.	Specialist	Contractor	
	1.10	In the event that observations to confirm the departure of marine fauna from observation zone (100-300 m.) and exclusion zone (50-100 m.) cannot be completed due to failing light, the MFO will utilize vessel searchlights and/or hand held spotlights to complete the observations and confirm the departure of fauna from the appropriate zones. Commencement or recommencement of dredging or spoil disposal must not occur until MFOs confirm the departure of the fauna or has not been seen for 10 minutes. Details of the procedure are described in ***Figure 3.1***.	HSSE Manager/Sea Port Manager	Maintenance Dredging Contractor	Dredging Management Plan (LSP-1S01-0020)
Impacts of the alteration of the light environment from operational lighting and flaring	**Measures for Night Lighting of Operational Site**				
	2.1	Where practicable, avoid the requirement for non-safety-essential lighting at night.	HSSE Manager/Plants Manager	n/a	
	2.2	Physically shield the lights and direct the lights onto work areas.	HSSE Manager/Plants Manager	n/a	-
	2.3	Lower the height of lights to reduce spill.	HSSE Manager/Plants Manager	n/a	-
	2.4	Reduce the amount of reflective surfaces through the use of matt paints on surfaces where practical.	HSSE Manager/Plants Manager	n/a	-
	2.5	Use motion detecting sensors and light timers.	HSSE Manager/Plants Manager	n/a	-
	2.6	Training of all employees regarding the significance of migratory birds and the importance of minimizing of their disturbance.	HSSE Manager	n/a	-

Aspect, Potential Impact / Issue	Mitigation Reference	Mitigation and / or Management Procedures	LSP Responsibility	Contractors Responsibility	Related Plans
	2.7	Modify lighting where any adverse impacts are recorded from the results of migratory bird monitoring.	HSSE Manager/Plants Manager	n/a	-
	2.8	Where light spillage is found to detrimentally affect migratory bird behavior, investigate addition mitigation option.	HSSE Manager	n/a	-
	Measures for LP and HP Flaring Sites				
	2.9	On a preliminary basis, it is anticipated that both HP and LP flare sites should use the sonic flare tips, sized to accommodate the maximum HP and/or LP flare system relief events. Sonic flare tips can reduce light discharge as well as noise and smoke relative to pipe tips.	HSSE Manager/Plants Manager	n/a	-
Impacts from waste discharges to the freshwater and marine environment	3.1	Strictly implement towards the proposed waste management plan for hazardous materials and waste management plan for non-hazardous wastes.	HSSE Manager	n/a	Waste Management Plan (Hazardous Materials) (LSP-1S01-0014); and Waste Management Plan (Non-Hazardous Wastes) (LSP-1S01-0015)
Impacts of the plants on the lifecycles of species	4.1	Strictly implement toward the proposed soil and groundwater management plan, surface water (terrestrial) management plan, surface water (marine) management plan, noise and vibration management plan, air quality management plan (point source), lighting and flaring management plan, dredging management plan and worker occupational health and safety management plan.	HSSE Manager	n/a	Soil and Groundwater Management Plan (LSP-1S01-0012); Surface Water Management Plan (Terrestrial) (LSP-1S01-0010); Surface Water Management Plan (Marine) (LSP-1S01-0011); Noise and Vibration Management Plan (LSP-1S01-0009); Air Quality Management Plan (Point Source) (LSP-1S01-0008); Lighting and Flaring Management Plan (Refer to Section 2.1-2.9); Dredging Management Plan (LSP-1S01-0020); and Worker Occupational Health and Safety

Aspect, Potential Impact / Issue	Mitigation Reference	Mitigation and / or Management Procedures	LSP Responsibility	Contractors Responsibility	Related Plans
					Management Plan (LSP-1S01-0019)
Impacts from invasive species (pests and weeds)	**Control and Protection from Imported Marine Pests**				
	5.1	Implement a Vessel Clearance Procedures for all vessels, including those engaged in maintenance dredging and spoil disposal activities should be undertaken including: • Vessel Risk Assessment (VRA) to be carried out by a competent person (qualified inspector approved by LSP) prior to mobilization to identify the risk of imported marine pests introduction; • VRA process will consider the known transmission vectors and the vessel operational and maintenance history to assess the overall risk status of a vessel. The VRA will consider the following: ○ Vessel type and inherent risk level based on the complexity and number of niches; ○ Fouling control systems both internal and external; ○ Vessel origin and proposed area of operation; ○ Ballast/ trim tank seawater origin; and ○ Recent vessel inspection and history. The VRA will be completed by a suitable qualified person who will classify a vessel as: ○ Low risk - requires no further management; and ○ High or uncertain risk - requires further management such as inspection or cleaning or treatment.	HSSE Manager/Sea Port Manager	Ship's Captain / Vessel Owner	-
		• VRA reports and supporting documentation demonstrating low-risk status will be submitted to LSP for approval prior to the commencement of works, with			

Aspect, Potential Impact / Issue	Mitigation Reference	Mitigation and / or Management Procedures	LSP Responsibility	Contractors Responsibility	Related Plans
		the final document provided to the relevant authorities (Ba Ria - Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA) and Ba Ria – Vung Tau Provincial People's Committee) for information. • All vessels classified as high or uncertain risks as determined by the VRA will undergo inspection prior to mobilization; • Vessel inspections to be carried out by qualified inspector and endorsed by LSP; and • Checking and, if required re-inspection of vessels after arrival.			
	5.2	All vessels must not apply anti-fouling and bio-fouling management including the exclusion of TBT-containing anti-fouling material whilst within the port.	HSSE Manager/Sea Port Manager	Ship's Captain / Vessel Owner	-
	5.3	Compliance with the regulatory requirements and IMO convention.	HSSE Manager/Sea Port Manager	Ship's Captain / Vessel Owner	-
	Marine Pests Inspection				
	5.5	Vessel inspection will be undertaken on high risk/uncertain risk vessels to determine the presence or absence of imported marine pests and marine species demonstrating invasive characteristics. These inspections will focus on confirming that the vessel (including any residual sediment) presents a low risk of introducing marine pests to the area. The inspections will be undertaken either in dry jetty or through in-water inspection with sufficient visibility using divers, remotely operated vehicles, etc. Inspections will be supervised by an approved inspector endorsed by LSP who is suitably experienced in undertaking imported marine pests	HSSE Manager/Sea Port Manager	Ship's Captain / Vessel Owner	-

Aspect, Potential Impact / Issue	Mitigation Reference	Mitigation and / or Management Procedures	LSP Responsibility	Contractors Responsibility	Related Plans
		inspections and the taxonomic identification of species of concern. Where applicable, the inspector will conduct a general inspection of the following: • Vessel hull and associated external niche areas (anodes, thrusters, sea chests); • Internal niches (seawater strainers and cooling systems, anchor lockers, etc.); • Immersible equipment; • Vessel deck; • Review of vessel's ballast-water logbook; • Review of the Bio-fouling Record Book; and • Review the chief engineer's logbook to determine evidence of bio-fouling within internal seawater systems. Photographs or video images will be taken during the inspection to demonstrate the degree of bio-fouling and overall risk status of the vessel. Inspection reports and supporting documentation demonstrating low risk status will be submitted to LSP for approval prior to the commencement of works, with the final document provided to the relevant authorities for information.			
	Corrective Actions				
	5.6	Notification of quarantine breach and/or identification of the potential imported marine pests to relevant authorities (Ba Ria - Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA) and Ba Ria - Vung Tau Provincial People's Committee) and confer on the appropriate actions to take.	HSSE Manager	Ship's Captain / Vessel Owner	-

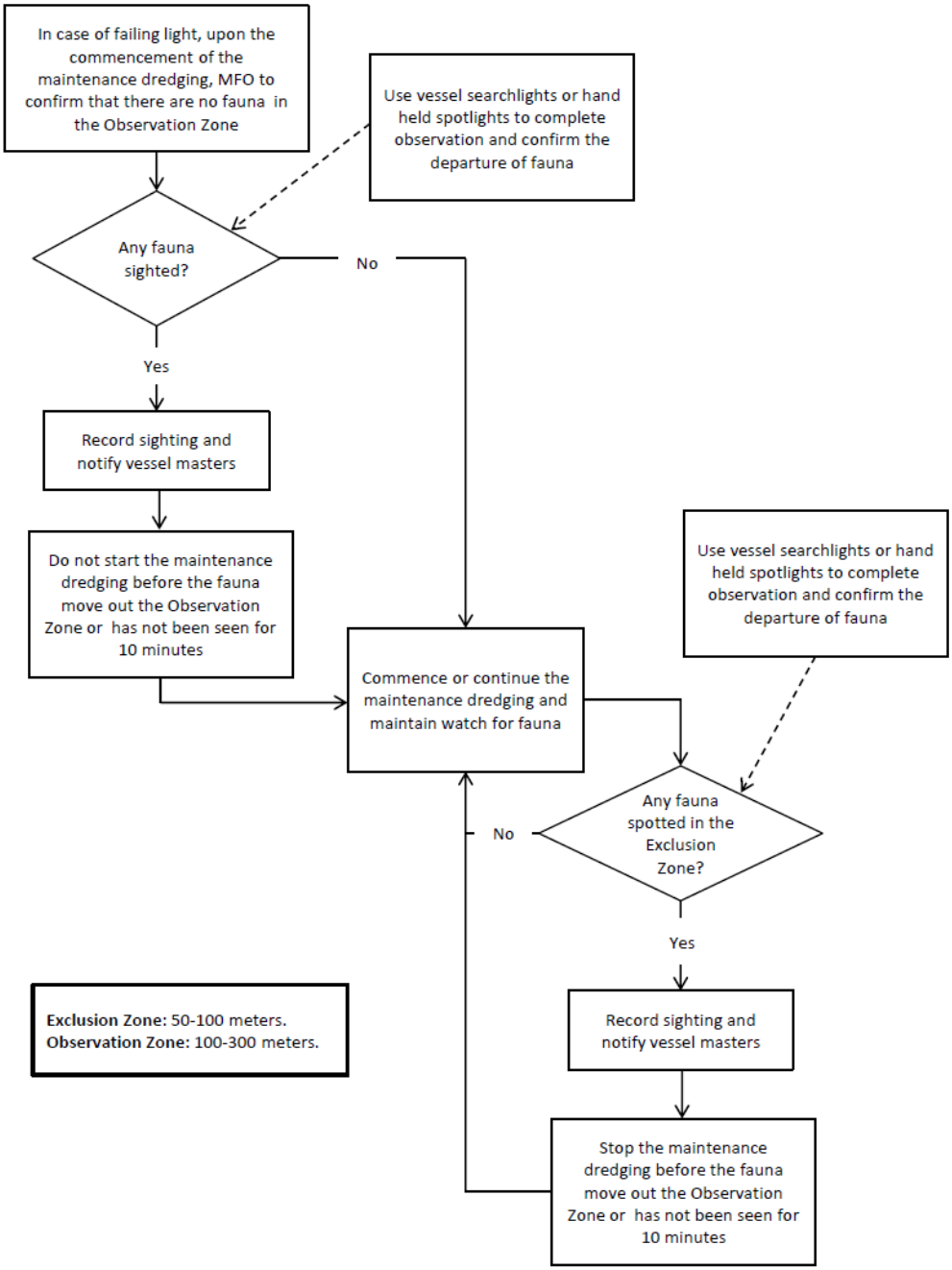
Aspect, Potential Impact / Issue	Mitigation Reference	Mitigation and / or Management Procedures	LSP Responsibility	Contractors Responsibility	Related Plans
	5.7	Move vessel as soon as reasonably practicable.	HSSE Manager/Sea Port Manager	Ship's Captain / Vessel Owner	-
	5.8	Investigation into cause of incident (including sampling to for identification where possible).	HSSE Manager	Ship's Captain / Vessel Owner	-
	5.9	Cleaning or isolation of equipment as appropriate.	HSSE Manager/Sea Port Manager	Ship's Captain / Vessel Owner	-
	5.10	Review of plans and procedures associated with the quarantine management.	HSSE Manager	Ship's Captain / Vessel Owner	-
	5.11	Refresher training or inductions for personnel.	HSSE Manager	Ship's Captain / Vessel Owner	-
	Control and Protection from Imported Terrestrial Weeds and Pests				
	Minimise Land Disturbance				
	5.12	Avoid disturbances of land where practicable within the project area, especially within weed-prone areas and encourage native vegetation growth.	HSSE Manager	n/a	-
	5.13	If invasive weed species are identified on site or within the vicinity of the project area, the following inspection and cleaning activities should be undertaken: • Vehicles are to be cleaned from bumper to bumper using appropriate methods which may include hosing down, vacuuming or compressed air blowers if vehicles are likely to contain transmissible weeds/pests; • Vehicle components that can harbor vegetative material are removed and cleaned. Particular attention is paid to carpets. Floor mats and seats within the vehicles cab; • The cleaning of vehicles should be done in a designated clean down facility. All effort is must to remove all contaminates from the vehicle before it leaves an	HSSE Manager	n/a	-

Aspect, Potential Impact / Issue	Mitigation Reference	Mitigation and / or Management Procedures	LSP Responsibility	Contractors Responsibility	Related Plans
		infested area; • LSP is obliged to take all necessary steps to ensure that no contaminates are attached to clothing including boots, laces, socks, trousers turnups, seams shirt cuffs or pockets; • Contaminated clothing to be removed, shaken out, cleaned and thoroughly inspected prior to leaving the site. Particular attention should be paid to storage areas on the vehicle including tool boxes; and • If necessary, the vehicle should be inspected by a third party to ensure that the risk of weed spread is reduced to an absolute minimum.			
	Minimize Access to Food Sources by pests				
	5.14	The following activities are to occur to prevent food sources for invasive pest species: • Appropriately dispose of food scraps – do not leave scraps lying down; • Cover putrescible waste storages to minimize vertebrate fauna access to food scraps; and • Educate personnel regarding the hazards of feeding vertebrate fauna.	HSSE Manager	n/a	-
	Managing Pests and Weeds				
	5.15	Develop and document procedures for managing new pest and weed infestations. The outlines of the procedures will be described in ***Annex D***.	HSSE Manager	n/a	-
	5.16	Advise and consult with relevant stakeholders (landowners, local government (Ba Ria – Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA) and Ba Ria – Vung	HSSE Manager	n/a	-

Aspect, Potential Impact / Issue	Mitigation Reference	Mitigation and / or Management Procedures	LSP Responsibility	Contractors Responsibility	Related Plans
		Tau Provincial People's Committee), Land Protection Officers) of infestation and proposed management, prior to implementation.			
	5.17	Ensure any chemical use undertaken to control pests and weeds is in accordance with any label requirements or permit conditions and applied by personnel trained in chemical application method.	HSSE Manager	n/a	-
	5.18	Removal or disposal of pests and weeds is site and species specific and is to be completed in accordance with the relevant local government recommendations (Decision No. 1896/QD-TTg on preventing and controlling invasive exotic creatures in Vietnam up to 2020 project).	HSSE Manager	n/a	-
	Prioritize Control Programs				
	5.19	Prioritize control programs throughout the Project area based on considerations of risk to factors such as environmental value, landholder concerns, seriousness of the pests or weeds, population size (i.e. can it be eradicated) and the potential to spread.	HSSE Manager	n/a	-
	5.20	Liaise/ coordinate pest management in accordance with local government (Ba Ria – Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA) and Ba Ria – Vung Tau Provincial People's Committee) pest control priority programs.	HSSE Manager	n/a	-
	Contain Spread of Pests and Weeds				
	5.21	Isolate infestations to prevent further spread and establish quarantine zones as necessary.	HSSE Manager	n/a	-
	5.22	Limit movement into or out of areas of infestation.	HSSE Manager	n/a	-
	5.23	Enforce the requirements for vehicle and equipment wash	HSSE Manager	n/a	-

Aspect, Potential Impact / Issue	Mitigation Reference	Mitigation and / or Management Procedures	LSP Responsibility	Contractors Responsibility	Related Plans
		down.			
	5.24	Maintain access tracks to be free of declared or significant weed species to avoid accidental contamination of vehicles and machinery.	HSSE Manager	n/a	-
Impacts to existing habitats onsite	6.1	Strictly implement soil and groundwater management plan, surface water management plan (terrestrial), surface water management plan (marine), waste management plan for hazardous materials, waste management plan for non-hazardous wastes, noise and vibration management plan, and lighting and flaring management plan.	HSSE Manager	n/a	• Soil and Groundwater Management Plan (LSP-1S01-0012); • Surface Water Management Plan (Terrestrial) (LSP-1S01-0010); • Surface Water Management Plan (Marine) (LSP-1S01-0011); • Waste Management Plan for Hazardous Materials (LSP-1S01-0014); • Waste Management Plan for Non-Hazardous Wastes (LSP-1S01-0015); • Noise and Vibration Management Plan (LSP-1S01-0009); and • Lighting and Flaring Management Plan (Refer to Section 2.1-2.9)

Figure 0.1 Vessel Interaction Management Flow Chart in case of Failing Light



4 MONITORING

The biodiversity values monitoring plan has been developed to track the effectiveness of the mitigation measures during operation phase.

LSP should undertake additional monitoring if the monitoring program records shows the significance deterioration of the concerned habitats or injury or death of the concerned species.

4.1 LSP HSSE TEAM

In order to assess the effectiveness of the mitigation / management measures and identify the need for further action, LSP's biodiversity values monitoring program outlined in Table 0.1 will be followed.

Should the monitoring program note any non-compliance with the BAP, corrective action will be taken to ensure the relevant activity returns to compliance in a timely manner and that any corrective action is appropriate and effective. Any corrective actions undertaken must be recorded and approved.

Table 0.1 Monitoring Programme

Aspect, Potential Impact / Issue	Reference of Relevant Mitigation Measure *	Sampling Location	Sampling Parameters	Sampling Frequency	Applicable Standards	Responsibility	Reporting
Impacts from the maintenance dredging activities for jetty access routes and turning basins	1.1	**Refer to the monitoring program as mentioned in the dredging management plan.					
	1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8,1.9 and 1.10	3 sampling sites at the maintenance dredging areas (as shown in ***Figure 4.1***)	Benthic and pelagic species and density	1 month before and 1 month after the dredging activities which is expected to be implemented every 2 years	Shannon-Weiner Diversity Index and Berger-Parker Dominance Index	Maintenance dredging sub-contractor	Annually in every 2 years (refer to ***Annex E*** for monitoring program detail)
Impacts of the alteration of the light environment from operational lighting and flaring	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8 and 2.9	3 observation points at the existing salt fields near the LP and HP flaring sites and the project facilities where the night lighting is needed. (as shown in ***Figure 4.2***)	• Migratory bird species and behaviour; • Salt field condition and evidence of predation; and • Photography and notation of presence	Annually between October-March	N/A-Visual interpretation	HSSE Manager	Annually (refer to ***Annex F*** for monitoring program detail)
Impacts from waste discharges to the freshwater	3.1	**Refer to the monitoring programs as mentioned in waste management plan (for hazardous materials), waste management plan (for non-hazardous wastes), surface water management plan and seawater management plan.					

Aspect, Potential Impact / Issue	Reference of Relevant Mitigation Measure *	Sampling Location	Sampling Parameters	Sampling Frequency	Applicable Standards	Responsibility	Reporting
and marine environment							
Impacts of the plants on the lifecycles of species	4.1	** Refer to the monitoring programs as mentioned in the soil erosion and soil contamination management plan, surface water management plan, seawater management plan, noise management plan, ambient air quality management plan, lighting and flaring management plan, dredging management plan and worker management plan.					
Impacts from invasive species (pests and weeds)	5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10 and 5.11	3 sampling sites at the same locations of benthic and pelagic survey (as shown in ***Figure 4.1***)	• Invasive marine pests species and density	To be undertaken as part of dredging monitoring programme, See 1.2 – 1.10	Shannon-Weiner Diversity Index and Berger-Parker Dominance Index	Maintenance dredging sub-contractor	Annually in every 2 years (refer to ***Annex G*** for monitoring program detail)
	5.12, 5.13, 5.14, 5.15, 5.16, 5.17, 5.18, 5.19, 5.20, 5.21, 5.22, 5.23 and 5.24	3 sampling sites near the internal road (as shown in ***Figure 4.3***)	• Visual internal road searches and photography; • Species of weeds and pests; • Population density of weeds and pests; and • Extent or boundary of weeds and pests distribution in each monitoring station.	Quarterly per year (or every 3 months) for only first five years of the operation phase.	Shannon-Weiner Diversity Index and Berger-Parker Dominance Index	HSSE Manager	Quarterly and annually (refer to ***Annex H*** for monitoring program detail)

Aspect, Potential Impact / Issue	Reference of Relevant Mitigation Measure *	Sampling Location	Sampling Parameters	Sampling Frequency	Applicable Standards	Responsibility	Reporting
Impacts to existing habitats onsite	6.1	3 sampling sites as representative of three different concerned remnant habitats (as shown in ***Figure 4.4***).	• Flora species and density; • Flora diameter and height; • Relative Abundance; • Fauna species and density; and • Fauna's footprint, nest, calls, fecal remains and burrows, signs and tracks. • Photography, noting and call records	Twice a year (wet and dry seasons)	Shannon-Weiner Diversity Index and Berger-Parker Dominance Index	HSSE Manager	Annually (refer to ***Annex I*** for monitoring program detail)

** See Table 3-1 for mitigation measure.*

Figure 0.1 Recommended Marine Benthic and Pelagic Species and Invasive Marine Pests Monitoring Locations

Remark: The recommended monitoring locations can be changed according to the opinion of marine biodiversity specialist

Figure 0.2 Recommended Migratory Bird Observation Points

Remark: The recommended observation points can be changed based on the opinion of an ornithologist or migratory bird specialist

Figure 0.3 Recommended Imported Terrestrial Pests and Weeds Monitoring Stations

Remark: The recommended monitoring locations can be changed according to the opinion of a terrestrial biodiversity specialist

Figure 0.4 Recommended Concerned Remnant Habitat Monitoring Locations

Remark: The recommended monitoring locations can be changed according to the opinion of a terrestrial biodiversity specialist

5 AUDITING AND REPORTING

An Auditing and Reporting Program is required to ensure that the mitigation / management measures are appropriate in controlling the identified biodiversity values impacts from diffuse sources.

5.1 LLSP HSSE TEAM

To ensure compliance with the requirements of this BAP, internal inspections and audits will be undertaken by LSP. The scope of the internal auditing and reporting programme to be undertaken by the LSP is shown in ***Table 5.1***.

The auditors will be the representatives from four (4) divisions of LSP HSSE Department (Safety, Environmental, Health and Emergency and Security) with LSP HSSE manager or representatives.

Table 0.1 Auditing and Reporting Programme

Inspection / Auditing Interval	Reference of Relevant Mitigation Measure*	Responsibility	Scope of Inspection / Audit	Report Submission / Record Keeping
On submission of the monitoring reports from maintenance dredging activities	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10 and 5.11	HSSE Manager	Review the submitted monitoring reports to assess the compliance status of relevant operations that may give rise to impacts to biodiversity values and provide support to identifying appropriate corrective actions and ensuring they are: introduced in a timely manner; appropriate; and effective	Archive Monitoring Report in an orderly manner for external auditing All reports are to be maintained at the site
On submission of the annual migratory bird monitoring report	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8 and 2.9	HSSE Manager	Review the submitted monitoring reports to assess the compliance status of relevant operations that may give rise to impacts to biodiversity values and provide support to identifying appropriate corrective actions and ensuring they are: introduced in a timely manner; appropriate; and effective	Archive Monitoring Report in an orderly manner for external auditing All reports are to be maintained at the site
Annual Management Review of operational activities or Incident Report	3.1 and 4.1	HSSE Manager	Review annual reports or incident report for: waste management (hazardous and non-hazardous); soil erosion and soil contamination management; noise management; air quality; lighting and flaring; surface water management; seawater management; and worker management to assess their impact on biodiversity values and provide support to identifying appropriate corrective actions and ensuring they are: introduced in a timely manner; appropriate; and effective	Archive Monitoring Report in an orderly manner for external auditing All reports are to be maintained at the site
On submission of the quarterly terrestrial invasive species monitoring report (first five years of operation only)	5.12, 5.13, 5.14, 5.15, 5.16, 5.17, 5.18, 5.19, 5.20, 5.21, 5.22, 5.23 and 5.24	HSSE Manager	Review the submitted monitoring reports to assess the compliance status of relevant operations that may give rise to impacts to biodiversity values and provide support to identifying appropriate corrective actions and ensuring they are: introduced in a timely manner; appropriate; and effective	Archive Monitoring Report in an orderly manner for external auditing All reports are to be maintained at the site
On submission of the twice yearly terrestrial habitat monitoring report	6.1	HSSE Manager	Review the submitted monitoring reports to assess the compliance status of relevant operations that may give rise to impacts to biodiversity values and provide support to identifying appropriate corrective actions and ensuring they are: introduced in a timely manner; appropriate; and effective	Archive Monitoring Report in an orderly manner for external auditing All reports are to be maintained at the site

** See Table 3-1 for mitigation measure.*

ANNEX A - SUMMARY OF BIOLOGICAL BASELINE SURVEY DATA

1 TERRESTRIAL AND MARINE BIODIVERSITY SUMMARY

1.1 HABITATS AND FLORA

Ten (10) different habitat types containing flora were identified in the Study Area. A total of 354 different plant species were recorded within the Study Area habitat during the surveys, dominated by 345 species in the Magnoliophyta taxon (representing 65 dicotyledon families and 12 monocotyledon families). Only nine species outside this group were recorded, eight (8) polypodiophta and one pinophyta. Overall, the Rural Village Area has the highest species diversity of all the identified habitats although about half of the species recorded were only recorded in sparse numbers in this habitat. In the Village Plantation, however, where the next highest number of different species was recorded, most of these were frequent, common or very common.

Flora in the area is associated with a number of provisioning ecosystem services: various plants produce edible products, such as the fruit trees Annona squamosa, Artocarpus heterophyllus, Averrhoa carambola, Carica papaya, Mangifera indica, Musa nan, Cocos nucifera, and Dimocarpus longan, as well as rice plants such as Oryza sativa, root vegetables such as Manihot esculenta, and herbs such as Centella asiatica. A number of plants are used for medicinal purposes, such as Streptocaulon juventas, Eurycoma longifolia and Phyllanthus urinaria, while trees such as the Acacia and Eucalyptus species as well as Bamboo species and some mangrove species (e.g. Rhizophora apiculata) are often harvested by locals for their wood.

1.2 WILDLIFE AND FAUNA

Avifauna

Overall 100 species of birds were recorded over the November 2013 and March 2014 surveys in the Project Study Area. Forty-five (45) species were recorded over both surveys, 31 species recorded in November 2013 were not recorded in March 2014 and 24 species were recorded in March 2014 that had not been seen in November 2013. Among the 100 bird species recorded in the Project Study Area, 42 species are considered migratory birds and most of the bird species found in the Salt Fields (where most birds were recorded) are considered migratory species, implying migratory species use this habitat for foraging.

The key habitats for birds in the Project Study area were Salt Fields and Mangroves and although these may be important foraging grounds for migratory species, the nearby Can Gio Reserve, with its protected status, showed a higher species richness

and abundance of birds, including migratory species. The only species of conservation concern recorded in the Project Study Area was the Painted Stork *Mycteria leucocephala* recorded in the November 2013 survey. This species is listed as Vulnerable in the Red Databook of Vietnam (2007) and Near Threatened in the IUCN Red List of Threatened Species (IUCN, 2013) whereas three additional species of conservation interest were recorded in the Can Gio Reserve.

Herpetofauna

A total of 12 herpetological species belonging to 8 families were recorded in the Study Area by direct observation (9 species) and through interviews (3 species). They are common species in Vietnam and local people consulted stated that there were no large reptiles in the Study Area.

The highest number of different herpetological species was observed in the Rice Fields where six species were recorded and the second highest number in the Village Area, where 3 species were recorded. Only one herpetofauna species was recorded in the Mangrove areas, that being a venomous sea snake (Aipysusrus sp. Đẻn biển), and no species were recorded in the Water Channels or Salt Fields.

Mammals

A total of 6 species of mammal belonging to 5 families were recorded in the Study Area, including House Mouse *Mus musculus*, Brown *Rat Rattus norvegicus*, Great Roundleaf Bat *Hipposideros arminger*, Cave Nectar Bat *Eonycteris spelaea*, Javan Pipistrelle *Pipitrellus javaniucs* by direct observation (5 species) and Indochinese Ground Squirrel *Menetes berdmorei* from interview (1 species). Only rat and bat species were observed during the night survey, although not many bats were seen, while in the Study Area mice were abundant in the Rice Fields.

1.3 SPECIES OF CONSERVATION INTEREST

Species that are considered of conservation interest and were recorded during the November 2013 and March 2014 surveys in the study area included two plant species (*Azima sarmentosa,* and *Hopea odorata*) and one wildlife/ fauna species (Painted Stork, *Mycteria leucocephala*). In addition, one bird species, Osprey *Pandion haliaetus*, is listed in Appendix II of CITES and an additional bird (Eurasian Curlew, *Numenius arquata*) is listed as Near Threatened on IUCN Red List. Also, six fish species are considered of conservation of interest, of which two species (Spiny/Thorny Seahorse, *Hippocampus histrix* and Leopard Shark, *Stegostoma fasciatum*) are listed as Vulnerable and four species (Pale-edged Stingray/Sharpnose Stingray, *Dasyatis zugei*; Spotted Eagle Ray, *Aetobatus narinari*; Malabar Grouper,

Epinephelus malabaricus and Spot-tail shark, *Carcharhinus sorrah*) are listed as Near Threatened on IUCN Red List. One fish species (Spiny/Thorny Seahorse, *Hippocampus histrix*) is listed in Appendix II of CITES.

1.4 MACROINVERTERBRATES

Intertidal Mudflat/ Mangrove Associated Macroinvertebrates

In November 2013, 1,178 individuals and 51 taxa of macroinvertebrates were collected from the intertidal mudflat and mangrove habitats, including the base of one water channel running among the salt fields and lined by mangroves. Species from the Polychaeta, Gastropoda and Crustacea classes were dominant.

All species collected in the mudflat/mangrove of the Study Area originated from estuaries and the coastal areas. The dominant species from the quantitative analysis *were Goniada sp., Maldane sarsi, Eudistylia polymorpha, Littoraria (Littorionopsis) undulata, Cerithidea (Cerithidea) quadrata, Amphioplus laevis,Corophium sp., Grandidierella lignorum, Tachaea sp.and Ocypode sp.*. A number of species that were commonly recorded in the Study Area are characteristic of those occurring in nutrient-rich conditions. These include the worms *Nephthys polybranchia, Diopatra neaplitana, Scoloplos armiger, Capitella capitata, Prionospio malmgreni, Polydora sp., Maldane sarsi, Asychis gotoi, Terrebelides stroemi and Eudistylia polymorpha*.

Subtidal Macroinvertebrates

In November 2013, 300 individuals from 30 taxa of subtidal benthic macroinvertebrates were collected from four sampling locations in the marine environment. Species from the Polychaeta class were dominant.

All species occur naturally in brackish and salt waters and a number of them that were commonly recorded in the Study Area are characteristic of those occurring in nutrient-rich conditions. These include the worms *Nephthys polybranchia, Diopatra neaplitana, Scoloplos armiger, Prionospio malmgreni, Polydora sp., Maldane sarsi, Asychis gotoi, Owenia fusiformis, Terrebelides stroemi, and Eudistylia polymorpha*.

1.5 FISH AND FISHERIES

From rapid consultations and direct observation within the Study Area, a total of 108 fisheries species have been listed, dominated by the pisces class. Most species recorded are listed as of Least Concern or Not Evaluated by the IUCN Red List with eight as Data Deficient. Two pisces species are listed as Vulnerable and five as Near Threatened. Spiny/Thorny Seahorse *Hippocampus histrix* is listed as Vulnerable on

the IUCN Red List (IUCN, 2013.2) and 'Data deficient' in the Red Databook of Vietnam and, like all *Hippocampus* spp., is listed on Appendix II of CITES meaning, since Vietnam is a signatory to the convention, that international trade in the species is officially regulated with permits required for all exports and a minimum size of 10 cm height of any specimens traded (CITES Decision 12.54). Leopard/Zebra Shark *Stegostoma fasciatum* is an oviparous species listed as Vulnerable on the IUCN Red List (IUCN, 2013.2). The Pale-edged Stingray, Sharpnose Stingray *Dasyatis zugei* is listed as Near Threatened but considered to be close to Vulnerable on IUCN Red List while Spotted eagle ray *Aetobatus narinari,* Malabar Grouper *Epinephelus malabaricus* and Spot-tail shark *Carcharhinus sorrah* are all listed as Near Threatened on the IUCN Red List. None of these species of conservation interest were observed directly during the surveys but during consultations with locals and fishermen were all named as species that were eaten.

1.6 OVERALL TERRESTRIAL AND MARINE BIODIVERSITY VALUES

The Project Site is situated in a coastal area on Long Son Island in southern Vietnam. Eleven (11) different habitat types were identified in the Study Area: mangrove patches, aquaculture mangrove ponds, mudflats, water channels, wooded hillside, village plantation, rice fields, developed residential area, rural village area, salt fields and marine. A relatively high number of plant species were recorded overall in the Study Area and a number of migratory bird species were recorded throughout the surveys, with birds observed feeding daily within the mangrove areas and on the mudflats but also within the salt fields. The diversity of avifauna in the Study Area was high with a total of 100 different species recorded over three days of surveys in November 2013 and a further two days in March 2014. Avifauna data collected indicates that the area may be a stopping point on the journey of migratory birds and of the 100 bird species recorded in the Project Study Area, 42 species are considered migratory birds although only one species of conservation interest, the Painted Stork, was recorded. No mammals or herpetofauna of significance were recorded during the surveys and overall no habitat is considered Critical Habitat (CH).

The overall results of fish and fisheries surveys showed a reasonably high number of species in the area (of which about half were directly observed and half were listed from rapid consultations with locals) and indicate that the coastal and marine habitats are heavily exploited for aquaculture as well as wild catch fisheries. The marine benthic survey also indicate that marine macroinvertebrates in the vicinity of the Project Site have very high diversity and are highly stable, which is in line with the high level of fish exploitation. Overall the marine habitat can be said to be supplying a relatively important provisioning ecosystem service due to the fisheries exploitation in the area, but this is not a unique ecosystem service to this area.

The diversity and stability of macroinvertebrate communities in the mudflat/mangrove habitats of the Study Area ranged from high to very high levels. The mangrove patches are considered predominantly natural habitat, while the aquaculture mangrove ponds are generally more disturbed and are considered modified habitat. Overall, it is considered that the mangrove habitats, encompassing both the Mangrove patches and the Aquaculture Mangrove Ponds, and the Mudflat habitats, have high biodiversity value. Both Mudflats and mangrove habitats are feeding ground for birds, providing crabs, snails and small fish as a good food source and supports some foraging by migratory birds. An additional Avifauna survey, however, showed that relative to the Can Gio Reserve nearby, the Project Site Mudflats (and Mangrove) habitat(s) support a lower diversity and abundance of bird species.

Habitats considered to have medium biodiversity value include Wooded Hillsides, Water Channels and Salt Fields. These are modified habitats which have been disturbed by local human activities such as silviculture, fishing, salt field creation and bund formation, etc. The Wooded Hillsides support a high diversity of flora and medium diversity of fauna and are not very fragmented where they occur. They provide important shelter and food for fauna such as birds in the area. The Water channel habitats encompass not only the more modified, straighter channels among the salt fields in the Study Area, but also a number of less modified tidal rivers. Some sections of rivers remain largely natural while the more modified water channels, which are generally more direct and straighter, are those among the salt fields. This habitat is an important shelter for fish and invertebrates and also an important link between the habitat further inland and the marine habitat. Although Salt Fields are man-made structures that are common in Vietnam, relatively young in this area and relatively easy to re-create, this habitat supported the highest abundance and diversity of birds over two separate surveys in November 2013 and March 2014 and this is a habitat where birds were seen to be foraging frequently. Given this habitat supports such avifauna diversity and may be a stopping point on the journey of migratory birds for them to forage, the overall biodiversity rating is considered to be medium.

The habitats considered to have low biodiversity value include Village Plantation, Rice Fields, Rural Village Areas and Developed Residential Areas.

Overall no habitats found within the Project Study Area meet the full requirements to be considered Critical Habitats.

2 PROTECTED AREAS

The main protected area located in proximity to the Project Site is Can Gio Biosphere Reserve. The reserve has a total area of 75,740 ha (of which the marine area is 4,370 ha). It fosters diverse habitats including mangroves, wetlands, salt marsh, mud flat and sea grasses. Reportedly there are 52 true and associate mangrove species, 200 animal species, hundred fish, crab or shrimp species and benthos. Over 40 bird species including shore birds and migratory species have been identified in this biosphere reserve.

ANNEX B - SUMMARY OF POTENTIAL BIODIVERSITY VALUES IMPACTS

1 IMPACTS FROM THE MAINTENANCE DREGING ACTIVITIES FOR JETTY ACCESS ROUTES AND TURNING BASINS

Maintenance dredging will be required to maintain the water depth in the access channels, where sedimentation occurs. Maintenance dredging material is in almost all cases recently deposited non-consolidated material that can be easily dredged. A Trailer Suction Hopper Dredger is the most common tool for carrying out the work and the volume of maintenance dredging is estimated to be 1.3 - 1.6 mill m^3/year. It is anticipated that maintenance dredging will be required every 2 years and the dredged material will be brought and disposed of at the approved disposal site, Area-A Vung Tau offshore area. However, it has possible impacts on wild capture fisheries resources through physical injury and/or harassment e.g. through entrainment of both pelagic and benthic species.

Possible impacts on wild capture fisheries resources through physical injury and/or harassment e.g. through entrainment of both pelagic and benthic species would be temporary in nature. Pelagic species are more mobile than benthic species and are considered to generally avoid any area of disturbance; although some species may be injured or entrained by the dredging works, it is assumed that this will not be in large enough numbers to affect fisheries resources. For the benthic communities however, the volume of dredged material is large. According to the baseline data, these communities are considered to be highly stable and diverse and although they may recover/ recolonize in less than one year generally, the impact could be more significant.

2 *IMPACTS OF THE ALTRERATION OF THE LIGHT ENVIRONMENT FROM OPERATIONAL LIGHTING AND FLARING*

The Project will be made up of two (2) main components, the Petrochemical Plant and the Seaport covering a land area of approximately 464 ha and a marine area broadly covering 194 ha including access routes and turning basins, although the actual footprint of the jetties will be under 6 ha. All these facilities, including the plants themselves, the plant associated buildings, jetties, roads within the site, etc. will have lighting, not least for safety requirements. In addition, at operation the Project includes one high pressure (HP) flare covering 1.76 ha area and one low pressure (LP) flare covering under half this area which will be used to burn the gas emissions from the process plant and tank farm and ensure safety during operation of the Project.

It is assumed that at operation there will be 24-hour illumination within the Petrochemical Complex and along the Seaport jetties.

Light and heat will also be emitted from the flaring systems. During normal operation, waste gas from the Tank Farm will be burned only intermittently at the LP flare. The HP flare will continuously burn waste gas relieved from the Polyolefins Plant during normally operation and will also dispose of emergency relief and waste gases from the Petrochemical plants; it will therefore produce a constant source of light and heat.

Activities of crepuscular (active primarily at dusk and dawn) and nocturnal wildlife/ fauna may be affected by changes in the light environment, including by causing increased changes of predation, reducing foraging time and/ or interfering with breeding activity. Exposures to moderately bright light can also shift circadian clocks for nocturnal animals. For birds, they can become disorientated by artificial lights, flying off course and this may be particularly relevant for any migratory species and seabirds flying at night. Equally, nocturnal bats may be disorientated and insects are known to be attracted to bright lights at night and if not killed by the light, then captured flying around it.

Artificial night lighting harms species directly by triggering unnatural periods of attraction or repulsion that lead to disruptions in reproductive cycles, by fixation, by disorientation, or by interfering with feeding and sustenance. Light pollution has been shown to disorient migratory birds, disrupt mating and reproductive behaviour in frogs. Disruptions such as degradation of habitat, creation of artificial and dangerous habitat, and energy waste that may lead to climate change can all be linked to excessive artificial night lighting.

Artificial light at night contributes to lack of food (starvation) by interfering with predator/prey relationships. Some species of predators, such as bats or birds that are not repelled by light, this disruption means a change in the concentration and location of their feed, which can lead to imbalances in predator/prey ratios.

Most impacted species will be the 42 species of migratory birds that will migrate to the salt fields for foraging in the Project area around October-March mostly. Some will migrate to inhabit the mangrove patches around March-August. Lists of the migratory bird are presented in ***Table B.1***.

Table B.1 Lists of migratory bird that were found in the study area

No.	Scientific Name	Common Name	Migration Period
1	*Acidotheres tristis*	Common Myna	March-August
2	*Actitis hypoleucos*	Common Sandpiper	October-January
3	*Aviceda leuphotes*	Black Baza	October-January
4	*Calidris alpina*	Dunlin	October- March
5	*Calidris ferruginea*	Curlew Sandpiper	October-March
6	*Calidris ruficollis*	Red-necked Stint	October-March
7	*Calidris subminuta*	Long-toed Stint	October-March
8	*Centropus sinensis*	Greater Coucal	October-March
9	*Charadrius alexandrinus*	Kentish Plover	October- March
10	*Charadrius mongolus*	Lesser Sand Plover	October-January
11	*Chandrius dubius*	Little Ringed Plover	October-March
12	*Ficedula mugimaki*	Mugimaki Flycatcher	October-January
13	*Gallinago stenura*	Pintail Snipe	October-January
14	*Hirundo rustica*	Barn Swallow	October-March
15	*Ixobrychus cinnamomeus*	Cinnamon Bittern	March-August
16	*Lanius cristatus*	Brown Shrike	October-January
17	*Lanius collurioides*	Burmese Shrike	October-January
18	*Musciapa dauurica*	Asian Brown Flycatcher	October-January
20	*Numenius arquata*	Eurasian Curlew	October-January
21	*Orthotomus atrogularis*	Dark-necked Tailorbird	March-August
22	*Pandion haliaetus*	Osprey	October-January
23	*Phylloscopus inornatus*	Inornate Warbler	October-January
24	*Pluvialis fluva*	Pacific Golden Plover	October-March
25	*Pluvialis squatarola*	Grey Plover	October-March
26	*Prinia flaviventris*	Yellow-bellied Prinia	March-August
27	*Prinia inornata*	Plain Prinia	March-August
28	*Pycnonotus aurigaster*	Sooty-headed Bulbul	October-March
29	*Pycnonotus blanfordi*	Streak-eared Bulbul	October-March
30	*Pycnonotus goiavier*	Yellow-vented Bulbul	October-March
31	*Rhipidura javanica*	Pied Fantail	October-March
32	*Saxicola torquatus*	Common Stonechat	October-January
33	*Stema hirunda*	Common Tern	October-January
34	*Streptopelia chinensis*	Spotted Dove	October-March
35	*Streptopelia tranquebarica*	Red-collared Dove	October-March
36	*Sturnus burmannicus*	Vinous-breasted Starling	March-August
37	*Todiramphus chloris*	Collared Kingfisher	October-March
38	*Tringa glareola*	Wood Sandpiper	October-March
39	*Tringa nebularia*	Common Greenshank	October-March
40	*Tringa ochropus*	Green Sandpiper	October-March
41	*Tringa stagnatilis*	Marsh Sandpiper	October-March
42	*Turnix suscitator*	Barred Buttonquail	October-March

3 IMPACTS FROM WASTE DISCHARGES TO THE FRESHWATER AND MARINE ENVIRONMENT

During the operation phase, the following wastes will be generated by the components of the facility:

Vessels and Port

- Hazardous solid wastes, including, oil cleaning paper; batteries, fluorescent lights;
- Hazardous liquid wastes including used lubricant from trucks, equipment and vessels; used chemicals and solvents; and clout and contaminated storm water;
- Non-hazardous liquid wastes including stormwater; domestic wastewater from sanitation within the port terminal; and
- Non-hazardous solid wastes including domestic solid waste from within the port terminal.

Petrochemical Plants

- Hazardous solid wastes including spent catalysts waste, spent absorbent materials, spent resins, contaminated fabrics, used insulation material, sludge waste, fluorescent tube, used batteries, contaminated drums;
- Hazardous liquid wastes including used chemicals, process wastewater contaminated with oil/chemicals, contaminated stormwater, lubricant/engine oils;
- Non-hazardous solid wastes including anthracite, fly ash, bottom ash, domestic solid waste, wood scrap, paper scrap, plastics, metals and putrescible wastes;
- Non-hazardous liquid wastes including domestic wastewater, clean stormwater, clean cooling water blowdown.

Impacts that may arise from the management of waste during the operation phase which can cause the potential consequence impacts to marine environment can be characterized as follows:

- Discharge of effluents from wastewater treatment facilities (about 9,784 m3/day during the operation phase) into Ganh Rai Bay, if the treated wastewaters from the CWWT do not meet the requirement of QCVN 40:2011/BTNMT, this will lead to the deterioration of seawater quality and cause major impacts on the marine environment especially on the macroinvertebrate communities in the mudflat/mangrove habitats of the Study Area which have diversity and stability ranging from high to very high levels. These areas are important feeding grounds for birds, providing crabs, snails and small fish as a good food source; and

- Management and disposal of solid and non-Hazardous solid by waste contractors, if the improper transport and management of wastes occur, these may cause major potential consequent impacts as follows;

    - Accidental leaks or spills of oil, fuel or other liquid and Hazardous solid wastes could potentially pollute surface waters and leads to the deterioration of surface water quality and potentially cause major impacts to the freshwater ecosystem;

    - Accidental leaks or spills of oil, fuel or other hazardous materials could potentially pollute seawater, leading to the deterioration of seawater quality and cause major impacts to the marine environment;

    - Soil may be contaminated by pollution from spills or leaks of fuel, oil and other hazardous liquid wastes leading to the deterioration of soil quality and cause major impacts to the terrestrial ecosystem; and

    - Potential harm to aquatic and terrestrial flora and fauna due to spills of oil, fuel, or other liquid and hazardous solid wastes entering watercourses or coming into contact with habitats.

4 IMPACTS OF THE PLANTS ON THE LIFECYCLES OF SPECIES

Species that are considered of conservation interest and were recorded during the November 2013 and March 2014 surveys in the study area included two plant species (Azima sarmentosa, and Hopea odorata) and one wildlife/ fauna species (Painted Stork, Mycteria leucocephala). In addition, one bird species, Osprey Pandion haliaetus, is listed in Appendix II of CITES and an additional bird (Eurasian Curlew, Numenius arquata) is listed as Near Threatened on IUCN Red List. Also, six fish species are considered of conservation interest, of which two species (Spiny/Thorny Seahorse, Hippocampus histrix and Leopard Shark, Stegostoma fasciatum) are listed as Vulnerable and four species (Pale-edged Stingray/Sharpnose Stingray, Dasyatis zugei; Spotted Eagle Ray, Aetobatus narinari; Malabar Grouper, Epinephelus malabaricus and Spot-tail shark, Carcharhinus sorrah) are listed as Near Threatened on IUCN Red List. One fish species (Spiny/Thorny Seahorse, Hippocampus histrix) is listed in Appendix II of CITES.

Any activities during the operation of the petrochemical plant which may cause the deterioration of air quality, soil quality, forestry, surface water quality, seawater quality or high levels of noise may cause major impacts on the lifecycles of the conservation interest species regarding food sources, habitat and mating and feeding behaviour.

Details of conservation status, key threats, risks, likelihood and significance of impacts for each species are summarised in ***Table B.2***.

TABLE B.1 SUMMARIES OF CONSERVATION STATUS, KEY THREATS, RISKS, LIKELIHOOD AND SIGNIFICANCE OF IMPACT FOR CONSERVATION INTEREST SPECIES

No.	Scientific Name (Common Name)	Conservation Status			Key Threats	Risks	Likelihood	Significance
		VN Redbook	CITES	IUCN				
Flora Species								
1	*Azima sarmentosa*	EN	-	LC	• Soil Pollution • Seawater Pollution	• Soil contamination from spills or leaks of oil, fuel and other hazardous liquid and solid waste; • Seawater contamination from accidental spills or leaks of oil, fuel or other hazardous materials.	**Medium** for both soil and seawater contaminations since the Project will propose the on-site control and management measures to mitigate the risk although these activities will continuously implement during 50 years of operation phase.	**High** since this flora species is considered as endangered status in Vietnam Redbook although it is listed as least concerned status of IUCN.
2	*Hopea odorata*	-	-	VU	• Soil Pollution • Invasive Species	• Soil contamination from accidental spills or leaks of oil, fuel and other hazardous liquid and solid waste; • Transportation of materials, oils and fuels from outside the project area.	• **Medium** for soil contamination since the Project will propose the on-site control and management measures to mitigate the risk although these activities will continuously implement during 50 years of operation phase. • **High** for invasive species since this species is found near the proposed transportation road.	**Medium** since this plant species is considered as vulnerable status in IUCN list.
Fauna Species								
3	*Mycteria leucocephala* (Painted Stork)	VU	-	NT	• Air Pollution • Noise Pollution • Water Pollution • Illegal	• CO, NO_x, SO_x, HCl, Cl_2, Fly Ash, Dioxin/Furan, Hexane, Methanol; • Disturbance noise; • Surface water and seawater contamination from accidental spills or	• **Medium** for air and noise pollutions since the expected ambient air quality and noise level summed with the background concentration meet the applicable standards and guidelines. • **Medium** for water contamination	**Medium** since this bird species is listed as vulnerable status in Vietnam Redbook and near threatened status of IUCN.

No.	Scientific Name (Common Name)	Conservation Status			Key Threats	Risks	Likelihood	Significance
		VN Redbook	CITES	IUCN				
					Hunting or Poaching	leaks of oil, fuel or hazardous liquid and solid wastes into the receiving waters; and • Illegal hunting or poaching for adults, eggs and nestlings by employees.	and illegal hunting and poaching since the Project will propose the on-site control and management measures to mitigate the risk	
4	*Pandion haliaetus* (Osprey)	-	Appendix II	LC	• Air Pollution • Noise Pollution • Water Pollution • Illegal Hunting or Poaching • Night Lighting	• CO, NO_x, SO_x, HCl, Cl_2, Dioxin/Furan, Hexane, Methanol; • Disturbance noise; • Illegal hunting or poaching for adults, eggs and nestlings by employees; • Disturbance and disorient of migration	• **Medium** for air and noise pollution since the expected ambient air quality and noise level summed with the background concentration meet the applicable standards and guidelines. • **Medium** for water contamination and illegal hunting and poaching since the Project will propose on-site control and management measures to mitigate the risk. • **High** for night lighting since it is assumed that the illumination of the Project would be 24-hour and flaring is also assumed to be constant from the HP flare and intermittent from the LP flare.	**Medium** since it is listed in Appendix II of CITES although it is listed as least concerned status of IUCN.
5	*Numenius arquata* (Eurasian Curlew)	-	-	NT	• Air Pollution • Noise Pollution	• CO, NO_x, SO_x, HCl, Cl_2, Dioxin/Furan, Hexane, Methanol; • Disturbance noise;	• **Medium** for air and noise pollution since the expected ambient air quality and noise level summed with the background concentration	**Medium** since it is listed as near threatened status of IUCN.

No.	Scientific Name (Common Name)	Conservation Status			Key Threats	Risks	Likelihood	Significance
		VN Redbook	CITES	IUCN				
					• Water Pollution • Night Lighting	• Surface water and seawater contamination from accidental spills or leaks of oil, fuel or hazardous liquid and solid wastes into the receiving waters; • Disturbance and disorient of migration	meet applicable standards and guidelines. • **Medium** for water contamination and illegal hunting and poaching since the Project will propose on-site control and management measures to mitigate the risk. • **High** for night lighting since it is assumed that the illumination of the Project would be 24-hour and flaring is also assumed to be constant from the HP flare and intermittent from the LP flare.	
6	*Dasyatis zugei* (Pale-edged Stingray/ Sharpnose Stingray)	-	-	NT	• Seawater Pollution • Maintenance Dredging	• Seawater contamination from accidental spills or leaks of oil, fuel or other hazardous materials • Increased turbidity from the maintenance dredging.	• **Medium** for seawater contamination since the Project will propose on-site control and management measures to mitigate the risk. • **Medium** for the maintenance dredging although a relatively small area of the seabed will have altered bathymetry, the seabed will remain soft-bottomed and able to be re-colonised by benthic communities and physical injury and/or harassment of marine resources will be short-term during dredging activities.	**Medium** since it is listed as near threatened status of IUCN.

No.	Scientific Name (Common Name)	Conservation Status			Key Threats	Risks	Likelihood	Significance
		VN Redbook	CITES	IUCN				
7	*Aetobatus narinari* (Spotted Eagle Ray)	-	-	NT	• Seawater Pollution • Maintenance Dredging	• Seawater contamination from accidental spills or leaks of oil, fuel or other hazardous materials • Increased turbidity from the maintenance dredging.	• **Medium** for seawater contamination since the Project will propose on-site control and management measures to mitigate the risk. • **Medium** for the maintenance dredging although a relatively small area of the seabed will have altered bathymetry, the seabed will remain soft-bottomed and able to be re-colonised by benthic communities and physical injury and/or harassment of marine resources will be short-term during dredging activities.	**Medium** since it is listed as near threatened status of IUCN.
8	*Epinephelus malabaricus* (Malabar Grouper)	-	-	NT	• Seawater Pollution • Maintenance Dredging	• Seawater contamination from accidental spills or leaks of oil, fuel or other hazardous materials • Increased turbidity from the maintenance dredging.	• **Medium** for seawater contamination since the Project will propose on-site control and management measures to mitigate the risk. • **Medium** for the maintenance dredging although a relatively small area of the seabed will have altered bathymetry, the seabed will remain soft-bottomed and able to be re-colonised by benthic communities and physical injury and/or harassment of marine resources	**Medium** since it is listed as near threatened status of IUCN.

No.	Scientific Name (Common Name)	Conservation Status			Key Threats	Risks	Likelihood	Significance
		VN Redbook	CITES	IUCN				
							will be short-term during dredging activities.	
9	*Carcharhinus sorrah* (Spot-tail shark)	-	-	NT	• Seawater Pollution	• Seawater contamination from accidental spills or leaks of oil, fuel or other hazardous materials	• **Medium** for seawater contamination since the Project will propose on-site control and management measures to mitigate the risk.	**Medium** since it is listed as near threatened status of IUCN.
10	*Hippocampus histrix* (Spiny/ Thorny Seahorse)	DD	Appendix II	VU	• Seawater Pollution	• Seawater contamination from accidental spills or leaks of oil, fuel or other hazardous materials	• **Medium** for seawater contamination since the Project will propose on-site control and management measures to mitigate the risk	**Medium** since it is listed as vulnerable status of IUCN and appeared in Appendix II of CITES list.
11	*Stegostoma fasciatum* (Leopard Shark)	-	-	VU	• Seawater Pollution	• Seawater contamination from accidental spills or leaks of oil, fuel or other hazardous materials	• **Medium** for seawater contamination since the Project will propose on-site control and management measures to mitigate the risk	**Medium** since it is listed as vulnerable status of IUCN.

Remark: EN : Endangered NT : Near Threatened DD : Data Deficient
VU : Vulnerable LC : Least Concerned

5 IMPACTS FROM INVASIVE SPECIES (PETS AND WEEDS)

Introduced species severely threaten some native flora and fauna communities, either directly or by modifying ecosystem process and functions (Gordon 1998; Hulme 2006; Vitousek *et al*. 1997). The introduction of non-native plants or animals has usually been deliberately facilitated by humans, and although most introduced species do not deleteriously affect ecosystems, a small proportion become invasive (Hulme, 2006). Introduced species that become invasive can have catastrophic effects on native biodiversity assets and ecological processes by altering nutrient levels, hydrological cycles, fire regimes and community composition, including the removal of keystone species (Brooks *et al*. 2004; D'Antonio and Vitousek 1992; Le Maitre *et al*. 1996; Vitousek and Walker 1989; Yurkonis *et al*. 2005).

The deleterious effects if weeds on the ecosystem they invade include changes in species richness, abundance or ecosystem function (Grice 2004; Vitousek *et al*. 1997). These impacts can be direct or indirect. Direct impacts include changes in structure, increased productivity and litter, different litter breakdown rates and altered nutrient regimes, hydrological cycles and fire regimes (Brooks *et al.* 2004; D'Antonio and Vitousek 1992; Le Maitre et al. 1996; Vitousek and Walker 1989; Yurkonis *et al*. 2005). Indirect impacts include detrimental associations with micro-organisms such as bacteria and mycorrhizae and flow-on effects for larger invertebrate and vertebrate fauna (Zedler and Kercher 2004).

Three mechanisms by which introduced pest animal species affect biodiversity are as follows:

Predation

Introduced predators affect species through direct predation, which can keep prey in a predator pit of low abundance (Pech *et al*. 1992), in which either the predation alone may cause extinction (over-harvesting), or other causes and interactions exacerbate the predation effect. Direct predation may also lead to changes in the habitat use of prey species, so that species become confined to refugia where the availability of dense vegetation and food provide some degree of protection and resilience (Kinnear *et al.* 1998).

Habitat Destruction

Habitat is degradation caused by introduced herbivores. Feral herbivores can degrade vast tracts of habitat; promote invasion by serious weeds, and pose an ongoing

threat to rare plants (such as *Azima sarmentosa, Delonix regia, Sindora siamensis, and Hopea odorata*) and animal (such as *Pandion haliaetus*).

Competition

Species in competition use one or more resources in common, and can suffer mutually depressed population sizes while seeking or using those resources (Dickman 2006). For species that are mobile, there is often competition for food, shelter or for habitats where these and other scarce resources can be found. Introduced pest species may out complete native fauna by either better exploiting resources required by native species for survival or by aggressively excluding native species from space and/or resources they would otherwise use (Stokes *et al.* 2009). Complete displacement of native species from preferred habitats may occur if there is high niche overlap (Stokes *et al*. 2009).

Lists of invasive species (pests and weeds) and the affected habitat type are shown in ***Table B.3***. 60 species of weeds and 34 species of pests would be expected to be found in the Project area. Most affected habitat types would be the Mangrove Patches, Aquaculture Mangrove Ponds, Village Plantations, Rice Fields and the Water Channels.

TABLE B.3 LISTS OF INVASIVE SPECIES AND THE AFFECTED HABITAT TYPE

No.	Invasive Species		Type of Affected Habitats								
	Scientific Name	Common Name	M	AqMP	Wood	Vil Plant	RiceF	SaltF	Vil.	MudF	W.Ch
Weeds											
1	*Abrus precatorius*	Precatory bean				S	S	S	S		
2	*Acacia farnesiana*	Sweet acacia				T,S	T,S	T,S	T,S		
3	*Acacia mangium*	Black wattle			T	T	T	T	T		
4	*Adenanthera pavonina*	Bead tree				T	T		T		
5	*Ageratum conyzoides*	Blue flowered groundsel	H	H	H	H	H	H	H		H
6	*Alpinia zerumbet*	Light galangal	H	H							
7	*Alternanthera sessilis*	Sessile joyweed	H	H	H	H	H	H	H	H	H
8	*Annona glabra*	Alligator apple	T	T					T		
9	*Ardisia crenata*	Australian holly			S				S		
10	*Azolla pinnata*	Water velvet	Aq	Aq					Aq		Aq
11	*Bidens pilosa*	Spanish needle	H	H	H	H	H	H	H		
12	*Caesalpinia decapetala*	Mauritius thorn			T,S	T,S	T,S	T,S	T,S		T,S
13	*Casuarina equisetifolia*	Australian beefwood	T	T					T	T	T
14	*Cardamine flexuosa*	Woodland bittercress	H	H		H	H	H			
15	*Cenchrus echinatus*	Hedgehog grass	G	G		G	G	G	G		
16	*Ceratophyllum demersum*	Common hornwort									Aq
17	*Chromolaena odorata*	Bitter bush			H	H	H	H	H		
18	*Cinnamomum camphora*	Camphor tree				T			T		
19	*Coccinia grandis*	Scarlet-fruited gourd			V,C	V,C	V,C		V,C		
20	*Commelina benghalensis*	Benghal dayflower				H	H	H	H		
21	*Colubrina asiatica*	Asian snakewood	S	S		S	S		S		
22	*Cynodon dactylon*	Bermuda grass	G	G							G
23	*Cyperus rotundus*	Brown nut sedge				Se	Se				Se
24	*Dioscorea bulbifera*	-							H,V,C		
25	*Eichhornia crassipes*	Water hyacinth	Aq	Aq		Aq	Aq		Aq	Aq	Aq

No.	Invasive Species		Type of Affected Habitats								
	Scientific Name	Common Name	M	AqMP	Wood	Vil Plant	RiceF	SaltF	Vil.	MudF	W.Ch
26	*Ficus microcarpus*	Chinese banyan				T	T	T	T		
27	*Gracilaria vermiculophylla*	-	Aq	Aq		Aq	Aq	Aq		Aq	Aq
28	*Hygrophila polysperma*	Indian swamp weed					Aq				Aq
29	*Leucaena leucocephala*	Wild tamarind			T	T	T	T	T		
30	*Ligustrum sinense*	Chinese liguster	S	S		T,S	T,S		T,S		T,S
31	*Limnophila sessiliflora*	Asian marshweed	H	H		H	H	H			H
32	*Lygodium japonicum*	Japanese climbing fern	V,C,F	V,C,F	V,C,F	V,C,F	V,C,F		V,C,F	V,C,F	V,C,F
33	*Lygodium microphyllum*	Small-leaf climbing fern	F	F	F	F	F		F	F	F
34	*Melastoma candidum*	Asian melastome	S	S					S		
35	*Mimosa pigra*	Catclaw	S	S	S	S			S		S
36	*Mimosa pudica*	Sensitive grass			H	H	H	H	H		
37	*Neyraudia reynaudiana*	Burma reed	G	G		G	G	G	G		
38	*Nypa fruticans*	Mangrove palm	P	P						P	
39	*Oxalis corniculata*	Clover sorrel	H	H		H	H	H	H		H
40	*Paederia foetida*	Chinese fever vine	V,C	V,C		V,C	V,C	V,C	V,C		
41	*Panicum repens*	Victorian grass									G
42	*Paspalum vaginatum*	Biscuit grass	G	G						G	G
43	*Passiflora foetida*	Mossy passionflower				V,C	V,C	V,C	V,C		
44	*Pistia stratiotes*	Water duckweed	Aq	Aq			Aq	Aq			Aq
45	*Prosopis spp.*	Mesquite/ Algarrobo			T,S	T,S	T,S	T,S	T,S		
46	*Prunus campanulata*	Bell-flower cherry				T			T		
47	*Psidium guajava*	Lemon guava				T,S	T,S		T,S		
48	*Pueraria montana var. lobata*	Japanese arrowroot			V,C	V,C	V,C	V,C	V,C		
49	*Pyrus calleryana*	Callery pear			T				T		
50	*Rhodomyrtus tomentosa*	Ceylon hill gooseberry	T,S	T,S		T,S	T,S			T,S	T,S
51	*Rottboellia cochinchinensis*	Sugarcane weed				G	G	G	G		
52	*Rubus moluccanus*	-	V,C,S	V,C,S	V,C,S	V,C,S	V,C,S	V,C,S	V,C,S		
53	*Rubus niveus*	Ceylon raspberry				S	S		S		

No.	Invasive Species		Type of Affected Habitats								
	Scientific Name	Common Name	M	AqMP	Wood	Vil Plant	RiceF	SaltF	Vil.	MudF	W.Ch
54	*Sagittaria sagittifolia*	Giant arrowhead				Aq	Aq	Aq			Aq
55	*Striga asiatica*	Asiatic witchweed				H	H	H	H		
56	*Terminalia catappa*	Barbados almond	T	T							
57	*Trapa natans*	European water chestnut	Aq	Aq			Aq	Aq			Aq
58	*Urochloa maxima*	Guinea grass				G	G	G	G		
59	*Zizania latifolia*	Manchurian water-rice	G	G			G	G			G
60	*Zostera japonica*	Dwarf eelgrass	Aq	Aq			Aq	Aq		Aq	Aq
Pests											
1	*Achatina fulica*	African land snail	Mol.	Mol.	Mol.	Mol.		Mol.	Mol.	Mol.	
2	*Aedes aegypti*	Yellow fever mosquito			In	In	In	In	In		
3	*Anoplophora chinensis*	Citrus longhorned beetle			In	In	In	In	In	In	
4	*Anoplolepis gracilipes*	Crazy ant			In	In	In	In	In		In
5	*Aristichthys nobilis*	Bighead carp		Fs			Fs				Fs
6	*Bellamya chinensis*	Asian apple snail		Mol.		Mol.	Mol.	Mol.	Mol.		
7	*Brontispa longissima*	Coconut hispid beetle			In	In	In		In		
8	*Carassius auratus*	Goldfish		Fs			Fs				Fs
9	*Cherax quadricarinatus*	Redclaw crayfish		Fs			Fs				Fs
10	*Cirrrhinus mrigal*	Mrigal carp		Fs			Fs				Fs
11	*Clarius gariepinus*	North African catfish		Fs			Fs				Fs
12	*Colossoma brachypomus*	Red pirapatinga		Fs			Fs				Fs
13	*Crocodylus rhombitfer*	Cuba crocodile		Rep			Rep				Rep
14	*Cyprinus caprio*	Common carp		Fs			Fs				Fs
15	*Hypophthalmichthys molitrix*	Silver carp		Fs			Fs				Fs
16	*Hypostomus punctatus*	Suckermouth catfish		Fs			Fs				Fs
17	*Labeo rohita*	Rohu		Fs			Fs				Fs
18	*Maconellicoccus hirsutus*	Pink Hibiscus mealybug			In	In	In	In	In		

No.	Invasive Species		Type of Affected Habitats								
	Scientific Name	Common Name	M	AqMP	Wood	Vil Plant	RiceF	SaltF	Vil.	MudF	W.Ch
19	*Monomorium floricola*	Brownish-red flower ant	In	In	In	In	In	In	In	In	In
20	*Myocastor coypus*	Nutria			Mam	Mam	Mam		Mam		Mam
21	*Oreochromis spp.*	Tilapia		F			F				F
22	*Oryctes rhinoceros*	Asiatic rhinoceros beetle				In	In	In			
23	*Paratrechina longicornis*	Hairy ant				In	In	In	In		
24	*Pomacea canaliculata*	Apple snail		Mol.		Mol.	Mol.	Mol.			Mol.
25	*Pomacea insularum*	Channeled apple snail		Mol.		Mol.	Mol.	Mol.			Mol.
26	*Pheidole megacephala*	Big-headed ant		In	In	In	In	In	In		
27	*Quadrastichus erythrinae*	Erythrina gall wasp			In	In	In	In	In		
28	*Rana catesbiana*	North American bullfrog	Amp	Amp		Amp	Amp				Amp
29	*Solenopsis geminata*	Fire ant			In	In	In	In	In		
30	*Tapinoma melanocephalum*	Tramp ant				In	In	In	In		
31	*Trachemys scripta elegans*	Red-eared slider terrapin		Rep			Rep				Rep
32	*Xanthomonas axonopodis pv.citri*	Citrus cranker							Mcr		
33	*Xylosandrus compactus*	Ambrosia beetle			In	In	In	In	In		
34	*Yersinia pestis*	Bubonic plague						Mcr			

Remark: Habitat Types

M	Mangrove Patches
AqMP	Aquaculture Mangrove Ponds
Wood	Wooded Hillside
Vil Plant	Village Plantation
RiceF	Rice Fields
SaltF	Salt Fields

Vil	Rural Village Areas
MudF	Mud Flats
W.Ch	Water Channels

Life-form Organisms

Aq	Aquatic Plants	Amp	Amphibians
C	Climbers	Fs	Fishes
F	Ferns	In	Insects
G	Grass	Mam	Mammals
H	Herbs	Mcr	Micro-organisms
S	Shrubs	Mol.	Molluscs
Se	Sedges	Rep	Reptiles
T	Trees	V	Vines

6 IMPACTS TO KEY EXISTING HABITATS ON SITE

Mangrove Patches, Aquaculture Mangrove Ponds and Mudflats are existing habitats located in the Study Area considered to have a high level of biodiversity value since they have low re-creativity, low fragmentation (in Mangrove patches and Aquaculture Mangrove Ponds) to no fragmentation (in Mudflats), high value as nursery and breeding ground and high ecological linkages.

Since significant areas of these three existing habitats will remain and are located near designated areas such as the dumping area, fire water pond, flaring sites and internal roads, accidental leaks or spills of fuels, oils, and other hazardous liquid wastes will cause the deterioration of environmental qualities of these areas. Therefore, mitigation measures and monitoring plans must be implemented for these existing habitats with the objectives to conserve, protect or mitigate the impacts to acceptable levels.

Details of key threats, risks, likelihood and significance of expected impacts on these key habitats are described in ***Table B.4***.

TABLE B.4 SUMMARIES OF KEY THREATS, RISKS, LIKELIHOOD AND SIGNIFICANCE OF EXPECTED IMPACTS ON KEY EXISTING HABITATS ONSITE

Key Existing Habitat Onsite	Level of Biodiversity Value	Nearby Designated Areas	Key Threats	Risks	Likelihood	Significance
Mangrove Patches	High	• Dumping Area • Fire Water Pond • Internal Roads	• Noise • Water Pollution • Soil Contamination	• Disturbance noise from the internal transportation activities • Accidental leaks and spills of hazardous and non-hazardous wastes into the nearby habitats	• **Medium** for noise since the expected noise level summed with the background concentration meet applicable standards and guidelines. • **Medium** for water pollution and soil contamination since the Project will propose the on-site control and management measures to mitigate the risk.	**High** since the mangrove patches are the natural habitats considered as high level of biodiversity value, high ecological linkage and high value of nursery/ breeding ground and have rare species which is hardly found in Vietnam and have the medium level of the diversity of flora and fauna and their locations are next to the designated areas.
Aquaculture Mangrove Ponds	High	• Dumping Area • Internal Roads	• Noise • ' Pollution • Soil Contamination	• Disturbance noise from the internal transportation activities • Accidental leaks and spills of hazardous and non-hazardous wastes into the nearby habitats	• **Medium** for noise since the expected noise level summed with the background concentration are met with the standards and guidelines. • **Medium** for water pollution and soil contamination since the Project will propose the on-site control and management measures to mitigate the risk.	**High** since the aquaculture mangrove ponds are the modified habitats considered as high level of biodiversity value, high ecological linkage, high value of nursery/ breeding ground and have rare species which is hardly found in Vietnam and have the medium level of the diversity of flora although they have low level of the diversity of fauna but their locations are next to the

Key Existing Habitat Onsite	Level of Biodiversity Value	Nearby Designated Areas	Key Threats	Risks	Likelihood	Significance
						designated areas.
Mudflats	High	• Dumping Area • Internal Roads • HP Flare Site • LP Flare Site	• Noise • Water Pollution • Soil Contamination • Night lighting	• Disturbance noise from the transportation activities • Accidental leaks and spills of hazardous and non-hazardous wastes into the nearby habitats • Disturbance and disorient of migration	• **Medium** for noise since the expected noise level summed with the background concentration are met with the standards and guidelines. • **Medium** for water pollution and soil contamination since the Project will propose the on-site control and management measures to mitigate the risk. • **High** for night lighting since it is assumed that the illumination of the Project would be 24-hour and flaring is also assumed to be constant from the HP flare and intermittent from the LP flare.	**Medium** since the mudflats are the natural habitats considered as medium to high level of biodiversity values, high ecological linkage, high value of nursery/ breeding ground but they have very low level of the diversity of flora and the medium to high level of the diversity of fauna and have very common species that can be found in Vietnam. However, they are located next to the designated areas.

*Any change in respect to employees, the contact details will need to amended as soon as the role has been reassigned.

[Note to Contractor: Insert a description of the responsibilities of each role, with regards to the management of EHS and Biodiversity. Delete roles that are not appropriate. Include additional roles where required.]

ANNEX C - OUTLINES OF HANDLING AND STORAGE PROCEDURES OF ENTRAINED FAUNA

Marine fauna strand for a variety of reasons. Strandings may be small-scale events involving a single animal, or larger-scale events involving dozens of animals. Strandings may be routine, caused by commonly seen injuries, diseases or malnutrition, or they may be extraordinary, caused by less common circumstances.

Although considered to be low risk, maintenance dredging can affect marine fauna directly by injury or mortality through entrainment or from vessel strikes by the dredging fleet.

1 PROCEDURES

Upon first locating any affected or possibly affected marine fauna, the finder will immediately contact the maintenance dredging contractor HSSE manager or delegate to coordinate the appropriate response.

The maintenance dredging contractor HSSE manager or delegate will ascertain if the response will be:

- Made by the Marine Fauna Observer (MFO); or
- Another vessel and crew available on that particular day and/or time.

In both cases the maintenance dredging contractor HSSE manager or delegate will contact LSP marine specialist and HSSE manager and seek the advice of Ba Ria – Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA) and Ba Ria – Vung Tau Provincial People's Committee. The advices from both local organizations must be adhered to by the recovery vessel/ personnel.

The handling of live animals should be done with care to the both handler and the animal. Gloves and eye protection shall be worn. It should be noted that dealing with live large, dangerous and /or venomous marine fauna should not be attempted. Handling dead animals should be done with strict personal hygiene kept in mind.

For each incident the following procedures will be followed, if an injured or stranded marine fauna is observed;

1) Immediately contact Ba Ria – Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA) and Ba Ria – Vung Tau Provincial People's Committee officers. For incidents that occur through the night ans that can be dealt with the next day, the call can be made the next morning. For example, keeping a dead or injured smaller animal overnight in a safe, quiet and dark situation is better for the animal;

2) Record the following as minimal information:

   - Confirmation of contact with Ba Ria – Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA) and Ba Ria – Vung Tau Provincial People's Committee officers and any directives given by the officers;
   - Date and time of incident or finding of marine fauna;

- GPS and geographical location details;
- Species, sex, age of animal, or whatever is known of such for each animal;
- Measurement of total length of marine fauna. Also weight if possible;
- Collect a small sample of flesh when practical from dead animals, for DNA purposes;
- Photos of marine fauna for identification and habitat/area of finding;
- Details and photos of injury/incapacitation; and
- Any other relevant comments related to the finding.

3) Where practical all injured/sick marine fauna will be the responsibility of BR-VT VEA officer;

4) Any decisions relating to euthanasia of animals will only be made and carried out by BR-VT VEA officer; and

5) All fresh (24 hours or less) dead marine fauna will be assessed and the responsibility of BR-VT VEA officer.

ANNEX D - OUTLINES OF PROCEDURES FOR MANAGING NEW PEST AND WEED INFESTATIONS

1 PETS AND WEEDS INVASION AND INDENTIFICATION

Recognising and identifying new pests and weeds is the first step in preventing the spread of pests and weeds. ***Table B.3*** in ***Annex B*** summarized lists of invasive pests and weeds and the potential affected habitat type.

All pest and weed infestations begin with an introduction phase. This can be a single point of introduction (one plant or one animal) or multiple. The introduced animals and plants will need to persist in the local area and survive through reproductive stage to be able to further invade the local area. Pest and weed maturity can take several years depending on the species. The further localized spread of pests and weeds to create large infestations can be facilitated by natural forces including wind, water or consumption and subsequent defecation by animals. However, the movement and transport of vehicles and equipment is a significant vector for the spreading of pests and weeds from infested areas to other locations. Once attached to a vehicle or its load, they can travel large distances (overseas, interstate and intrastate) in short periods of time and then start new infestations in previously clean areas.

2 PEST AND WEED HYGIENCE INSPECTORS

Only personnel who have completed the accredited training in vehicle inspection and cleaning are authorized to complete the relevant documentation (as described in Section - Pest and Weed Hygiene Inspection Documentation). A master list of all LSP personnel who have successfully completed the training is kept on file with the LSP HSSE department. It is best practice for the inspector to be a third person other than employees and/or cleaners.

3 TRACKING VEHICLE MOVEMENTS

Vehicle movements can be tracked within the Project area and along the transportation routes by completing a vehicle use register form or similar. It is the responsibility of LSP's each department to keep track of their vehicle movements. This is valuable to ensure that vehicles are following appropriate routes.

Light vehicles within a particular risk category are to be stickered identifying the vehicle's appropriate risk category. This is to be as follows; high risk (red), medium risk (orange) and low risk (green). These small stickers are to be placed on the windscreen of the vehicle and used to identify the vehicle as (a) being within the washdown program and (b) within the designated route allowed for that vehicle within its identified risk category. For example a vehicle identified as being low risk due to its use exclusively on roads, would not be expected off-road. Such a breach of protocol would be easily identified and corrective action taken.

LSP HSSE team is to be consulted regarding the allocation of the risk category to the vehicle. Stickers are to be provided to all LSP vehicles. If vehicles are rotated between departments with different work scopes and risk categories, more frequent washdown and pest and weed hygiene inspection will be required. Vehicles without stickers will automatically revert to a high risk category.

Table D.1 Summary of Washdown Requirements

Vehicle Risk Category	Area of Use Permitted	Minimum Frequency of Pest and Weed Hygiene Inspection
High - Red Sticker	Off-road	Two weekly interval
Medium - Orange Sticker	Operation areas	Every three months
Low - Green Sticker	Sealed roads, well maintained roads	Every six months

4 PROCEDURE FOR CLEANING AND INSPECTING VEHICLES

4.1 WASHDOWN PROCEDURES FOR VEHICLES

The following steps provide general guidance on conducting pest and weed washdowns; however, no procedure can list all the parts to consider during clean down of vehicles and equipment due to the various different models, modification, attachments and other conditions.

1) Examine the item for cleaning to determine the extent of mud, dust and plant material.

2) Identify areas that may require cleaning with compressed air rather than water. Do these first.

3) Identify any points that require specific attention or may be difficult to locate and access.

4) Remove necessary guards/belly plates to access areas for cleaning.

5) Toolboxes and storage compartments may also require cleaning.

6) The interior of the vehicle must be vacuumed to remove seeds or pests trapped in carpets, floor mats and door jams.

7) The engine compartment and radiator must be included in the clean.

8) Ensure the vehicle is not re-contaminated by material that has been washed off. Periodically wash any detached mud/plant material down appropriate drainage points of the wash down facility.

9) Check the machine for cleanliness prior packing up wash down equipment and proceeding to official inspection phase.

4.2 INSPECTION PROCEDURES FOR VEHICLES

A pest and weed hygiene inspection cannot guarantee that an item is free of pest and weed but seeks to minimize the possibility of spreading pest and weed b reducing the likelihood of transporting pests and weeds to the lowest reasonable level.

The process for inspections is as follows:

1) The LSP employee must contact the LSP HSSE team in advance to organize the inspection time and location.

2) The inspector (LSP HSSE officer) must use the seed and weed hygiene inspection report (as shown in **Figure 4.2-1**).

3) The standard kit for inspection includes; inspection report booklet, relevant PPE, torch if examining vehicles with enclosed spaces, tools to remove guards/plates if necessary.

4) An inspector may request employee to remove guards or standard inspection plates or to position moving components of the item as necessary to facilitate inspection.

5) Every relevant part listed on the inspection form must be checked to a sufficient degree to determine whether or not the part has been cleaned.

6) If the inspector is satisfied that all parts are sufficiently clean the inspection form can be signed off and given to the employee.

7) If the inspector is not satisfied with a part, the details should be noted on the form and returned to the employee for rectification. The vehicle has to be cleaned in this area again until the inspector is satisfied.

4.3 DRIVERS/EMPLOYEE HYGIENE

When working in the field, personnel are likely to come in contact with a range of materials capable of containing pest and weeds. This type of work may involve walking through general off road areas. The employee is obliged to take all necessary steps to ensure that no pests and weeds are attached to clothing including boots, laces, socks, trousers, shirt cuffs or pockets.

Contaminated clothing is to be cleaned and inspected. Removal of pests and weeds attached to clothing should take place regularly throughout the work to avoid transporting material long distances. This can be done when leaving areas of pest and weed infestation prior to entering clean areas. In particular, boots are to be kept clean and thoroughly free from all organic material (including seeds, grass, manure) and mud and dirt. LSP employees are to stay on access tracks and leases wherever possible. All personal equipment including bags, jackets, and other items have to be checked and cleaned thoroughly. Additionally, hand held equipment used in the field should be inspected for pests and weeds on a regular basis. High risk priority pests and weeds should be avoided if encountered in the field.

Figure 4.2-1 Example of Pest and Weed Hygiene Inspection Report

Inspection Report Number:_____

VEHICLE HYGIENE INSPECTION REPORT

Company Name:		Date:	
Company Address:			
Origin Location:		Washdown Location:	
Destination Location:		GPS point for washdown:	

Make/ Description of Heavy/ GET/ Other:	Model	Owner

Vehicle	Sedan/ Utility	4x4/ Commercial	Truck	Trailer	Dolly	Heavy-Specify	Other Specify
Rego or Chassis No.							

CHECKLIST - VEHICLE OR THING

	Not Yet Clean	Clean		Not Yet Clean	Clean
Interior			Side Steps		
Engine Bay			Chassis Rails		
Grill			Axels/ Diffs		
Radiator			Suspensions		
Wiper Recess			Fuel Tank Guards		
Wheels & Spares			Draw Bar		
Wheel Arches			Toolboxes		
Mud Flaps			Load*		
Tyre Rims			Other*		

*Description of Load/ Other:	

The vehicle detailed above has been inspected by an inspector and is deemed to be CLEAN when signed below

Inspection conducted at:			
Inspector Signature:		Inspector's Name:	
Clean Inspection Date:		Employee's Name:	
Employee's Signature:			

4.4 SAFETY

Washdown shall be conducted in a safe manner. Every person is responsible for their own safety and the safety of others. The instructions on the use of wash bay equipment, rules and safety regulations and are to be read, understood and followed at all times. The following safety measures must be followed:

- Machine is parked on stable, level ground. If using ramps to raise vehicle these need to be within specified weight limit requirements. Implements are lowered and moving parts secured;
- Machine is parked in gear or park and handbrake is on. Additionally chock the wheels;
- Remove keys and tag machine if necessary to ensure "lock out";
- Remove all trip hazards in immediate area;
- Ensure all electrical components are covered;
- Wear appropriate PPE. This typically consists of standard PPE (boots, long sleeve clothing, glasses) with the addition of face mask and gloves when operating high pressure water blasters;
- Do not direct spray nozzle at, or spray, any persons with high pressure water blasters or compressed air; and
- All potential hazards are to be reported to the LSP HSSE manager.

The washdown bay needs to be cleaned after each use. Waste/ rubbish removed from the vehicles is to be disposed of in bins and equipment stored in the appropriate manner.

5 DOCUMENTATION AND REPORTING

5.1 PEST AND WEED HYGIENCE INSPECTION DOCUMENTATION

The standard form for the collection of information during an inspection of a vehicle is the pest and weed hygiene inspection report (as shown in ***Figure 4.2-1***). This form has been created to collect as much information as possible on vehicle movement, washdown location, vehicle mode/ make, areas of inspection and employee/inspecting personnel. The form has been produced in triplicate and bound to produce a booklet. These booklets are numbered in a series run and are to be allocated to selected personnel. Typically this would include key personnel within each department who are responsible for the tracking and filling of these booklets.

5.2 REPORT COLLECTION AND AUDITING

Pest and Weed Hygiene Inspection Report booklets will be provided to LSP personnel. A register of Pest and Weed Hygiene Inspection Report booklets handed out will be kept LSP HSSE team.

The LSP HSSE officer is to provide the driver of the plant with the original (white) copy and second (yellow) copy of the completed pest and weed hygiene inspection reports.

The third copy (pink) of the completed weed hygiene inspection report is to remain with the booklet and held by the LSP HSSE officer. When completed the Pest and Weed Hygiene Inspection Report booklet (or pink copies) are to be sent back to the LSP HSSE Team for archiving.

The white copy is to be kept in the applicable vehicle at all times. This applies to all LSP vehicles. This copy is to be presented at the request of the inspector (LSP HSSE officer) to act as evidence of a pest or weed wash down record.

The yellow copy is to be kept on file for a minimum of five years for operation vehicles/ plant – LSP Department responsible for the work/ activity, including any sub-contractors.

Filed yellow copies may be audited at any time by LSP HSSE team.

ANNEX E - MARINE BENTHIC AND PELAGIC SPECIES MONITORING PROGRAM

In addition to the seawater quality and sedimentation monitoring plan (as described in the section of the environmental management plan of the EHSS management plan)a monitoring program for marine benthic and pelagic species is required and described as follows.

Marine Benthic Species Sampling

Sampling Stations and Methodology

Marine benthic sampling will be carried out to collect samples from three (3) locations in the marine environment, as illustrated in **Error! Reference source not found.** to indicate the:

- A - benthic profiles of the near shore marine environment which is located nearby the maintenance dredging of jetty routes and turning basins which may cause impacts on pelagic and benthic species;
- B - benthic profiles of the near shore marine environment where the turning basins will be dredged and may cause impacts on pelagic and benthic species; and
- C - benthic profiles further offshore from the Project Site where the jetty access route will be dredged and may cause impacts on pelagic and benthic species.

At each of the sampling locations, samples will be collected by deploying a Petersen grab to collect 0.1 m2 of sediment which was wet-sieved in situ. The benthic macroinvertebrates collected will be fixed by formalin solution (4%) in plastic bottles prior to further identification in the laboratory.

Frequency

Marine benthic monitoring shall begin 1 month prior to the commencement of dredging activities and 1 month after the maintenance dredging activities are finished.

Data Analysis

For the macroinvertebrates, samples collected at site and preserved in formalin will be then analysed both qualitatively and quantitatively in the laboratory. Bio-indices will be calculated from the benthic sampling as follows:

Shannon-Wiener Diversity Index

This diversity index will be used for samples taken during the benthic surveys and is calculated as follows:

$$H' = - \sum_{i=1}^{S} pi \ln pi \qquad \text{(Shannon \& Wiener, 1949)}$$

Where:

- H' is the value of the diversity index;
- ni is the number of individuals in species i (or the abundance of species i) in the sample;
- S is the number of species in a sample or species 'richness';
- N is the total number of all individuals in a sample; and
- pi is the relative abundance of each species, calculated as the proportion of individuals of a given species to the total number of individuals in the sample, i.e. ni /N.

A higher value of H' suggests more species richness and more even numbers of various species. The biodiversity assessment for a range of H' values are presented in **Table D.2**.

Table D.2 ***Score Range of the Shannon-Wiener Index and Implications Regarding Biodiversity***

Shannon–Wiener Index Result	Diversity Assessment
H' > 2	Very high diversity
2 > H' > 1.5	High diversity
1 < H' < 1.5	Low diversity
H' < 1	Very low diversity

Berger-Parker Dominance Index

This dominance index will be used for samples taken during the benthic surveys and is calculated as follows:

$$D = N_{max} / N \quad \text{(Berger and Parker, 1970)}$$

Where:

- N_{max} is the number of the dominant species in a sample; and
- *N* is the total number of all individuals in a sample.

The dominance index is linked to the stability of a community; if one species tends to dominate a community, that community will likely not be as stable. The stability and population assessment for a range of D values is presented in ***Table D.3.***

Table D.3 ***Score Range of the Berger and Parker Index and Implications Regarding Stability of a Species***

Shannon–Wiener Index Result	Stability Assessment
D < 0.3	Very high stability
0.3 < D < 0.5	High stability
0.5 < D < 0.7	Low stability
D > 0.7	Very low stability

Reporting

Results of marine benthic monitoring shall be presented as the number of species, Diversity Index (H') and Dominance Index (D) and shall compare before and after the commencement of the maintenance dredging activities.

Marine Fauna Observations

The dredging operator sub-contractor will undertake marine fauna observations and report all sightings to LSP. Furthermore, the sub-contractor will be providing awareness training to selected crew members to inform them about marine animals which are likely to occur within the dredging areas, to provide a description of the record form to be used for recording marine animal sightings before the start of work and to explain how to apply appropriate avoidance mitigation measures to minimise potential impacts.

The purpose of the training is to raise awareness, to provide information on avoidance mitigation measures, to encourage recording and reporting marine animal sightings. LSP will collate marine fauna observations undertaken by the sub-contractor and cartographically report the data every 2 years. The cartographic report will include:

- Individual species observed;
- Frequency of observations;
- Location of observations; and

- Timing of observations.

The objective of the cartographic reports is to identify potential interaction areas which will be incorporated by the sub-contractor into pre-starts, toolboxes, marine fauna awareness training, or other general awareness sessions as required.

Budget

Details of the annual budget for the implementation of this monitoring program are described in ***Annex L***.

Plan Review

This monitoring plan will be reviewed continuously where necessary throughout its implementation in response to monitoring results. In the event that new significant decreases of marine benthic or pelagic species are found when comparing the result to the before-commencement result, this monitoring plan will be subjected to an immediate review process, in consultation with the regulatory agencies (Ba Ria – Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA), Ba Ria – Vung Tau Provincial People's Committee, Vung Tau City District People's Committee, Hamlet 2 Village People's Committee, Rach Gia Hamlet Village People's Committee and Long Son Commune Village People's Commiittee), to consider whether additional mitigation measures are required to prevent further incidents.

ANNEX F - MIGRATORY BIRD MONITORING PROGRAM

This migratory bird monitoring program will be implemented to monitor migratory bird numbers, habitat utilization, habitat condition, and extent within the Project facilities where night lighting are needed and at the LP and HP flaring sites. Monitoring of the migratory bird numbers against the pre-disturbance baseline, together with incidental observations of migratory bird responses to operation activities, will provide the basis for assessing the net effect of Project activities on migratory bird use of habitat within Project area.

Observation Points

Migratory bird monitoring will be conducted at the existing salt fields within the Project Area and the vicinity as illustrated in ***Figure 4.2*** to indicate the:

- A - migratory bird profiles and behavior at the shoreline and near the Project facilities where the night lighting are needed that may impact on the migratory bird species;
- B - migratory bird profiles and behavior near the LP and HP flaring sites that may impact on the migratory bird species; and
- C - migratory bird profiles and behavior near the shoreline and the Project facilities where the night lighting are needed that may impact on the migratory bird species.

Methodology

- Migratory bird species counts within each monitoring station;
- Record of migratory bird behavior in response to operational night lighting and gas flaring;
- Record of the salt field condition and evidence of predation which means any other factors of significance to migratory bird habitat. This will include photographic records and notes; and
- Results to be reviewed annually and reported.

Frequency

This monitoring plan must be implemented annually between the months of October to March.

A minimum of four surveys for migratory birds during the period when the majority of migratory birds are presented in the Project area will be required. The time interval between each survey should be at least 1 month (for example, one survey in October, one survey in December, one survey in February and one survey in April). For each survey, at least a two-day survey should be conducted with a minimum of four hours (06.00-10.00 a.m.) at dawn and four hours (16.00-20.00 p.m.) at dusk will be required for adequate monitoring.

Reporting

Results of monitoring migratory bird numbers, including their behavior during night time hours in light spillage areas will be prepared and reported to the Environmental Manager for provision to the executive and regulatory authorities (Ba Ria – Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA), Ba Ria – Vung Tau Provincial People's Committee, Vung Tau City District People's Committee, Hamlet 2 Village People's Committee, Rach Gia Hamlet Village People's Committee and Long Son Commune Village People's Commiittee.). An ornithologist or migratory bird specialist is required to implement the bird counting and classify the migratory bird species. The qualification requirements of the ornithologist or bird specialist is described in **Annex K**.

Budget

Details of the annual budget for the implementation of this monitoring program are described in Annex L.

Plan Review

This monitoring plan will be reviewed continuously where necessary throughout its implementation in response to monitoring results. In the event that an incident occurs that causes injury to or death of a migratory bird, this monitoring plan will be subjected to an immediate review process, in consultation with the regulatory agencies (Ba Ria - Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA), Ba Ria - Vung Tau Provincial People's Committee, Vung Tau City District People's Committee, Hamlet 2 Village People's Committee, Rach Gia Hamlet Village People's Committee and Long Son Commune Village People's Committee), to consider whether additional mitigation measures are required to prevent further incidents.

ANNEX G - IMPORTED MARINE PESTS MONITORING PROGRAM

Monitoring Stations

The monitoring program has been designed to provide the earliest detection possible to trigger appropriate management response. Three (3) sampling sites will be the same locations of marine benthic and pelagic monitoring program (as described in ***Annex E*** and ***Figure 4.1***).

Within these sampling locations, the areas targeted for marine pest monitoring will include the following structures and substrata:

- Jetties, wharf pilings, pontoons, and other submerged structures;
- Rock revetments;
- Moorings and attached lines;
- Channel markers, especially chain and wooden markers;
- Boat ramps and slipways; and
- Areas of soft seabed.

Methodology

Methods for targeted monitoring surveys include the following:

- Underwater visual searches and/or underwater videography/photography;
- Benthic dredging (epibenthic dredge and/or beam trawl);
- Dinoflagellate cores or benthic grab sampling;
- Plankton netting;
- Trapping; and
- Visual shore searches (beach walks).

Lists of marine pests are provided in ***Table B.3*** of ***Annex B***.

Frequency

Monitoring activities will take place prior to the commencement of maintenance dredging and within one (1) month following completion of maintenance dredging activities in every 2 years of the maintenance dredging activities.

Reporting

Results of imported marine pests monitoring shall compare before and after the commencement of the maintenance dredging activities and will be prepared by the maintenance dredging's sub-contractors and submitted to LSP every 2 years.

Budget

Details of the annual budget for the implementation of this monitoring program are described in ***Annex L***.

Plan Review

This monitoring plan will be reviewed continuously where necessary throughout its implementation in response to monitoring results. In the event that new significant marine pests are found, this monitoring plan will be subjected to an immediate review process, in consultation with the regulatory agencies (Ba Ria – Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA), Ba Ria – Vung Tau Provincial People's Committee, Vung Tau City District People's Committee, Hamlet 2 Village People's Committee, Rach Gia Hamlet Village People's Committee and Long Son Commune Village People's Commiittee), to consider whether additional mitigation measures are required to prevent further incidents.

ANNEX H - IMPORTED TERRESTRIAL PESTS AND WEEDS MONITORING PROGRAM

Monitoring Stations

Three (3) sampling site will be illustrated in ***Figure 4.3*** and to indicate the:

- A - weeds and pests profiles of the mangrove patches where the internal road is located nearby and may be impacted by invasive terrestrial weeds and pests;
- B - weeds and pests profiles of the aquacultures mangrove ponds where the internal road is located nearby and may be impacted by invasive terrestrial weeds and pests; and
- C - weeds and pests profiles of the village plantations where the internal road is located nearby and may be impacted by invasive terrestrial weeds and pests.

Methodology

Methods for targeted monitoring surveys include the following:

- Visual internal road searches and photography;
- Species of weeds and pests;
- Population density of weeds and pests; and
- Extent or boundary of weeds and pests distribution in each monitoring station.

Lists of terrestrial invasive species (pests and weeds) are provided in ***Table B.3*** of ***Annex B.***

Frequency

Monitoring for imported terrestrial weeds and pests must be implemented quarterly per year (or every 3 months) for only first five years of the operation phase.

Reporting

Results of the imported terrestrial weeds and pests surveys must prepared as quarterly reports and annual report by the Environmental Division and submitted to LSP's HSSE Department.

Budget

Details of the annual budget for the implementation of this monitoring program are described in ***Annex L***.

Plan Review

Weeds and pests management is an integrated and evolving process and amendments to strategies must occur regularly as new information becomes available and new control techniques are developed. Weeds strategies also need to be amended when the pattern of weed infestation changes. It is proposed that in the event new significant weed species are discovered within the Project area or along associated access roads, these management strategies will be reviewed. Results of monitoring will assist in identifying ways to improve weeds and pests management.

ANNEX I - CONCERNED HABITATS ONSITE MONITORING PROGRAM

The monitoring programs for concerned remnant habitats are described as follows.

Monitoring Stations

The monitoring program will be carried out at three (3) locations as the representative of three remnant different location as illustrated in ***Figure 4.4*** to indicate the:

- A - the flora and fauna profiles of the remnant mangrove patches near the soil stock area;
- B - the flora and fauna profiles of the remnant aquaculture mangrove ponds near the dumping area and may be impacted from the accidental leaks or spills of both hazardous and non-hazardous wastes; and
- C - the flora and fauna profiles of the remnant mudflat adjacent to the dumping area and may be impacted the accidental leaks or spills of both hazardous and non-hazardous wastes.

Methodology

Flora Samplings

For location A and C, three line transects will be deployed from the seaward margin at right angles to the edges of the mangrove patches. At three points (low-, high-, and mid-tide) along each of the transects, a 10 x 10 m plot will be established. At location B, since the mangroves will be so narrow, three 20 m x 5 m plots will be established. Within each plot, each tree will be identified to the species level and recorded for estimation of the mangrove tree density. For each tree species recorded, the average as well as range of height and diameter (estimated at approximately 1.3 m above ground for big trees and at base for trees under 1.3 m height) of the trees will be estimated within each plot and their relative abundance noted.

Macroinvertebrate Benthic Samplings

Macroinvertebrate benthic samples will be collected from the mudflat and mangrove areas of all three (3) sample sites. At locations A and C samples will be collected at three plots at each of the low-, mid- and high- tide areas along one transect, using a 25 cm x 25 cm quadrat and wet-sieving the surface layer of sediment collected in situ, to obtain any organisms living on or in the surface sediment. Three transects will be sampled at each location. At location B, since the channel will be narrow with steep channels, only the mid and high tide areas will be sampled. For the low tide area,

replicate grab samples will be taken by boat during high tide. Further specimens will be collected along the mangrove plants and coastal areas and all macro-invertebrates collected from the mudflat and mangrove areas will be stored in plastic bottles and fixed with formalin solution (4%).

Macroinvertebrates will be identified to species level where possible and their abundance recorded to indicate animal density. Identification of gastropod and bivalve species mainly followed Brandt (1974), while identification of polychaete species mainly followed Fauvel (1953) and Day (1967) and for identification of amphipod and isopod species Dang et al (1980) will be mainly used.

Bird Surveys

Baseline surveys of bird populations will be undertaken using transect and point count methods. A point count location will be selected and to facilitate data analysis. Ten minutes will be spent at each point, with all birds seen or heard within 30 m being counted. Signs of breeding (e.g. nests, recently fledged juveniles) will also be recorded.

Nomenclature and protection of the bird species mainly followed Robson (2008).

Herpetofauna Surveys

Herpetofauna surveys will be conducted through direct observation and active searching in potential hiding places such as among leaf litter, inside holes, and under stones and logs. Auditory detection of species-specific advertisement calls will also be used to identify frogs and toads. During the surveys, all reptiles and amphibians sighted and heard will be recorded.

Nomenclature for toad and frog species mainly follows Bourret (1942), for snakes mainly follows Bourret (1936) and Campden-Main (1970) and for lizard species mainly follows Cox et al (1998).

Mammal Surveys

Mammal surveys will be conducted covering each habitat type through active searching along transects. If the mammals in the area occur at low densities, indicators of presence such as signs, tracks, faecal remains and burrows, and potential bat roost sites will be actively searched for.

Nomenclature for mammal species mainly follows Wilson & Reeder (1993), while identification follows Van Peenan (1969) and Corbet & Hill (1992) and Van Strien (1993) for identification of the footprints and tracks of mammals.

Frequency

This monitoring program must be implemented twice a year (wet and dry seasons) during the operation phase.

Reporting

Annual report on the remnant habitat monitoring results must be prepared and submitted to the Environmental Manager for provision to the executive and regulatory authorities (Ba Ria – Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA), Ba Ria – Vung Tau Provincial People's Committee, Vung Tau City District People's Committee, Hamlet 2 Village People's Committee, Rach Gia Hamlet Village People's Committee and Long Son Commune Village People's Commiittee). Comparison of the results of dry and wet season must be included in the annual report. Terrestrial Biodiversity experts or the experts in the field of forests, macroinvertebrates, birds, herpetofauna and mammals are required to implement the species counting and classify the taxonomy. Qualification requirements of the biodiversity expert is described in ***Annex K***.

Budget

Details of the annual budget for the implementation of this monitoring program are described in ***Annex L***.

Plan Review

This monitoring plan will be reviewed continuously where necessary throughout its implementation in response to monitoring results. In the event that an incident occurs that causes injury to or death of flora and fauna species, this monitoring plan will be subjected to an immediate review process, in consultation with the regulatory agencies (Ba Ria - Vung Tau Provincial Vietnam Environmental Administration (BR-VT VEA), Ba Ria - Vung Tau Provincial People's Committee, Vung Tau City District People's Committee, Hamlet 2 Village People's Committee, Rach Gia Hamlet Village People's Committee and Long Son Commune Village People's Commiittee), to consider whether additional mitigation measures are required to prevent further incidents.

ANNEX J - OUTLINES OF MARINE FAUNA OBSERVATION TRAINING PROGRAM

1 INTRODUCTION

The maintenance dredging contractor will undertake the marine fauna observations and report all sightings to LSP as laid down in the Biodiversity Action Plan (BAP) during the operation phase. Furthermore, the maintenance dredging contractor will be providing awareness training to selected crew members to inform them about the marine animals which are likely to occur in the Project site, to provide a description of the record form to be used for recording marine animal sightings before the start of works, and to explain how to apply appropriate avoidance mitigation measures to minimize potential impacts or collisions with marine animals.

2 OBJECTTIVES

The objectives of this training program are to:

- Raise awareness of the biodiversity values of marine animals;
- Provide information on avoidance mitigation measures;
- Encourage recording and reporting of marine animal sightings; and
- Emphasise the requirement to report stranded, injured or dead marine animals regardless of what caused the injuries or deaths.

3 RESPONSIBILITY

Design and implementation of the detailed marine fauna observation training program will be the responsibility of LSP's marine biodiversity specialist. Qualifications of marine specialist will be described in ***Annex K***.

4 TIME DURATION OF TRAINING PROGRAM

This training program will take at least four (4) days prior to the commencement of the maintenance dredging activities. Day 1-3 will provide the knowledge to work as Marine Fauna Observer (MFO) and Day 4 will be a practical assessment out at sea allowing the trainee to put all the theories they have been taught into practice.

Throughout the theory, the trainee will receive continuous assessment on each unit in order to make sure they have retained the information being taught correctly. This allows identifying areas that need attention making sure they are fully equipped in order to perform their role.

5. OUTLINES OF TRAINING PROGRAM

The following section will outline the contents of marine fauna observation training course with the minimum but not limited to as follows:

- Interaction history of marine animals within the Project area;
- Introduction to marine animals and physiology;
- Marine animals behavior;
- Monitoring methods and techniques for field observation;
- Introduction to species identification;
- Observation and reporting systems;
- Marine animals I.D. quiz;
- Monitoring, observation methods, form completion and role play;
- Individual review and feedback;
- LSP's BAP for the maintenance dredging activities during the operation phase.

ANNEX K - OUTLINES OF QUALIFICATIONS OF SPECIFIC SPECIALISTS

1. INTRODUCTION

The following section outlines the qualification requirements and roles, duties and responsibilities of three (3) specialists required for the implementation of the proposed LSP's Biodiversity Action Plan (BAP) during the operation phase.

2. MARINE BIODIVERSITY SPECIALIST

2.1 QUALIFICATIONS AND REQUIREMENTS

- He or she must graduate at least M.Sc. or Ph.D. in Marine Biology or Marine Biodiversity or related fields;
- He or she must have extensive experience with design and implementation of marine fauna observation and a protocol for stranded, injured or dead marine fauna management for LNG development project in Southeast Asia region for at least five (5) years;
- He or she must have minimum ten (10) years of international experience in relation to marine biodiversity conservation in developing countries. Vietnam-related experiences will be advantageous;
- He or she must have extensive knowledge and experience with EIA legislation and regulatory agencies in Vietnam;
- He or she must be familiar with the challenges developing countries face in marine biodiversity values issues;
- He or she must be familiar with the marine environment of Vietnam;
- He or she must have the ability to deliver quality technical reports within the given time;
- He or she must have strong interpersonal skills with demonstrated leadership abilities; and
- He or she must be excellent in coordination, planning and team work.

2.2 DUTIES AND RESPONSIBILITIES

- Design and implement the marine fauna observation training program to the vessel masters and selected crew members prior to the commencement of the maintenance dredging activities;
- Design and implement the imported marine pests monitoring program;
- Develop a protocol for stranded, injured or dead marine fauna management;

- Develop a protocol for the inspection of the imported marine pests during the maintenance dredging activities;
- Input into inductions on marine fauna observations and requirements;
- Undertake field inspection during the implementation of the maintenance dredging activities;
- Characterization of marine fauna species- and ecosystem level- biodiversity in the Project area, including invasive species;
- Proposal of indicators of the proposed plan contribution to the effectiveness of the training program and the conservation of marine biodiversity, for use in the program's results framework and monitoring and evaluation system, together with the methods, and responsibilities for their measurement and target values;
- Provide LSP with the cartographic reports regarding the observation and occurrence of marine fauna species encountered during the maintenance dredging activities; and
- Undertake a review of the implementation of the marine fauna observation and the imported marine pests monitoring program.

3. ORNITHOLOGIST OR MIGRATORY BIRD SPECIALIST

3.1 QUALIFICATIONS AND REQUIREMENTS

- He or she must graduate at least M.Sc. or Ph.D. in Ornithology or Conservation Biology or related fields;
- He or she must have extensive experience in the design of measures to mitigate the impacts on migratory bird species (i.e. impacts from night lighting, flare sites);
- He or she must have extensive experience in the design and implementation of migratory bird and shorebird monitoring programs in the Southeast Asian region and in developing protocols or guidelines for migratory birds and shorebirds for at least five (5) years;
- He or she must have minimum ten (10) years of international experience in relation to avifauna biodiversity conservation in developing countries. Vietnam-related experiences will be advantageous;
- He or she must have extensive knowledge and experience with EIA legislation and regulatory agencies in Vietnam;
- He or she must be familiar with the challenges developing countries face in avifauna biodiversity values issues;
- He or she must be familiar with the shoreline, mangrove, mud flat and salt field environments of Vietnam;
- He or she must have the ability to conduct fieldwork in remote locations and to work flexible hours as monitoring program requirements dictate;
- He or she must have the ability to deliver quality technical reports within the given time;
- He or she must have strong interpersonal skills with demonstrated leadership abilities; and
- He or she must be excellent in coordination, planning and team work.

3.2 DUTIES AND RESPONSIBILITES

- Comment on and incorporate in the detailed design appropriate measures to mitigate the impacts on migratory bird species (e.g. night lighting, flare sites);
- Design and implement the migratory birds or shorebirds training program;
- Develop a protocol for migratory birds and shorebirds management;
- Input into inductions on avifauna monitoring and requirements to the migratory birds or shorebirds monitoring team;
- Undertake field monitoring during the operation phase of the Project;
- Characterization of avifauna species- and ecosystem level- biodiversity in the Project area;
- Proposal of indicators of the proposed plan contribution to the effectiveness of the monitoring program and the conservation of avifauna biodiversity, for use in the program's results framework and monitoring and evaluation system, together with the methods, and responsibilities for their measurement and target values;
- Provide LSP with the migratory birds and shorebirds monitoring reports regarding the observation and occurrence of avifauna species encountered during the migration period in the operation phase of the Project; and
- Undertake a review of the implementation of the avifauna monitoring program.

4 TERRESTRIAL BIOVERSITY SPECIALIST

4.1 QUALIFICATION AND REQUIREMENTS

- He or she must graduate at least M.Sc. or Ph.D. in Terrestrial Biodiversity or Terrestrial Biology or Forestry or Conservation Biology or related fields;
- He or she must have extensive experience in the design and implementation of terrestrial biology monitoring program (including forest, mammals, birds, macroinvertebrates and herpetofauna) in the Southeast Asia region and in developing protocols or guidelines for terrestrial biology monitoring for at least five (5) years;
- He or she must have demonstrated knowledge of vegetation, mangrove and mudflat ecology, wildlife species taxonomy and plant identification;
- He or she must have minimum ten (10) years of international experience in relation to terrestrial biodiversity conservation in developing countries. Vietnam-related experiences will be advantageous;
- He or she must be familiar with the challenges developing countries face in terrestrial biodiversity values issues;
- He or she must have extensive knowledge and experience with forests and wildlife and EIA legislation and regulatory agencies in Vietnam;
- He or she must have the ability to conduct fieldwork in remote locations and to work flexible hours as monitoring program requirements dictate;
- He or she must have the demonstrated capability to undertake statistical analyses and selection of appropriate analytical techniques;
- He or she must have the ability to deliver quality technical reports within the given time;
- He or she must have strong interpersonal skills with demonstrated leadership abilities;
- He or she must have excellent verbal and written communication with demonstrated competency in technical writing; and
- He or she must excellent in coordination, planning and team work.

4.2 DUTIES AND RESPONSIBILITIES

- Design and implement the imported terrestrial pests and weeds monitoring program and the concerned habitats on-site monitoring program;
- Develop a protocol for the inspection of the imported terrestrial pests and weeds;
- Develop a protocol for terrestrial biology management (including forests, mammals, birds, macroinvertebrates and herpetofauna);
- Input into inductions on forests, mammals, birds, macroinvertebrates and herpetofauna monitoring and requirements to the terrestrial biology monitoring team;
- Undertake field monitoring during the operation phase of the Project;
- Characterization of forests, mammals, birds, macroinvertebrates and herpetofauna species- and ecosystem level- biodiversity in the Project area;
- Proposal of indicators of the proposed plan contribution to the effectiveness of the monitoring program and the conservation of terrestrial biodiversity, for use in the program's results framework and monitoring and evaluation system, together with the methods, and responsibilities for their measurement and target values;
- Provide LSP with the terrestrial biodiversity monitoring reports regarding the observation and occurrence of flora and fauna species encountered in the operation phase of the Project; and
- Undertake a review of the implementation of the imported terrestrial pests and weeds monitoring program and the concerned habitats on-site monitoring program.

ANNEX L - ESTIMATION OF ANNUAL BUDGET FOR BIODIVERSITY MONITORING PROGRAM

1 MARINE BENTHIC AND PELAGIC MONITORING PROGRAM

The estimation of annual budget of the marine benthic and pelagic monitoring program is presented in ***Table L.1***.

Table L.1 Estimation of Annual Budget of the Marine Benthic and Pelagic Monitoring Program

Details	Unit	Unit Cost (USD)	No. Station	Time per 2 years*	Annual Cost (USD) ***
1. Marine benthic and pelagic Sampling	Station	150	3	2	900
2. Analysis and Reporting	Time	1,000	-	2	2,000
3. Operation Cost	Time	500	-	2	1,000
4. Marine Biodiversity Specialist (estimated about 15 days)**	Man-day	350	-	-	5,250
Sub-total (1)					***9,150***

Remark: ** The marine benthic and pelagic monitoring program will be implemented one month before and one month after the commencement of the maintenance dredging activities which is expected to implement every 2 years during the operation phase.*

** This includes man-day for the supervision of marine fauna inspection and marine benthic and pelagic monitoring program and imported marine pests monitoring program implementations.

*** All figures are in $USD current as of April 2015.

2 MIGRATORY BIRD MONITORING PROGRAM

The estimation of annual budget of the migratory bird monitoring program is presented in ***Table L.2***.

Table L.2 ***Estimation of Annual Budget of the Migratory Bird Monitoring Program***

Details	Unit	Unit Cost (USD)	No. Station	Time per year	Annual ** Cost (USD)
1. Migratory bird observation (for 2-day observation per station)	Station	100	3	4	1,200
2. Analysis and Reporting	Time	650	-	4	2,600
3. Operation Cost	Time	500	-	4	2,000
*4. Ornithologist or Migratory Bird Specialist (estimated about 21 days)**	Man-day	450	-	-	9,450
Sub-total (2)					***15,250***

***Remark:** * This includes the man-day for the supervision of the migratory bird study, analysis and reporting.*

** All figures are in $USD current as of April 20

3 IMPORTED MARINE PESTS MONITORING PROGRAM

The estimation of annual budget of the imported marine pests monitoring program is presented in ***Table L.3***.

Table L.3 Estimation of Annual Budget of the Imported Marine Pests Monitoring Program

Details	Unit	Unit Cost (USD)	No. Station	Time per 2 years*	Annual Cost (USD)***
1. Imported Marine Pests Sampling**	Station	150	3	2	**
2. Analysis and Reporting	Time	550	-	2	1,100
*3. Operational Cost***	Time	500	-	2	**
4. Marine Biodiversity Specialist (estimated about 15 days)**	Man-day	350	-	2	**
Sub-total (3)					***1,100***

Remark: ** The marine benthic and pelagic monitoring program will be implemented one month before and one month after the commencement of the maintenance dredging activities which is expected to implement every 2 years during the operation phase.*

** This means it will share cost with the marine benthic and pelagic monitoring program since the sampling station, sampling methodology and frequency of monitoring will be conducted at the same time.

*** All figures are in $USD current as of April 2015

4 IMPORTED TERRESTRIAL PESTS AND WEEDS MONITORING PROGRAM

The estimation of annual budget of the imported terrestrial pests and weeds monitoring program is presented in ***Table 4***.

Table L.4 Estimation of Annual Budget of the Terrestrial Pests and Weeds Monitoring Program

Details	Unit	Unit Cost (USD)	No. Station	Time per year*	Annual Cost (USD)***
1. Terrestrial Pests and Weeds Observation	Station	100	3	4	1,200
2. Analysis and Reporting	Time	500	-	4	2,000
3. Operation Cost	Time	500	-	4	2,000
4. Terrestrial Biodiversity Specialist (estimated about 15 days)**	Man-day	450	-	-	6,750
Sub-total (4)					***11,950***

Remark: ** The imported terrestrial pests and weeds monitoring program will be implemented for only first five years of the operation phase.*

** This includes the man-day for the supervision of the observation of imported terrestrial pests and weeds, analysis and reporting.

*** All figures are in $USD current as of April 2015

5 CONCERNED HABITATS ON-SITE MONITORING PROGRAM

The estimation of annual budget of the concerned habitats on-site monitoring program is presented in ***Table L.5***.

Table L.5 Estimation of Annual Budget of the Concerned Habitats On-Site Monitoring Program

Details	Unit	Unit Cost (USD)	No. Station	Time per year	Annual Cost (USD)**
1. Flora and Fauna Profile	Station	1,500	3	2	9,000
2. Analysis and Reporting	Time	2,000	-	2	4,000
3. Operation Cost	Time	1,000	-	2	2,000
4. Terrestrial Biodiversity Specialist (estimated about 35 days)*	Man-day	450	-	-	15,750
Sub-total (5)					***30,750***

Remark: ** This includes the man-day for the supervision of the flora and fauna profile study, analysis and reporting.*

** All figures are in $USD current as of April 2015

6 SUMMARIZATION OF ANNUAL BUDGET FOR BIODIVERSITY MONITORING PROGRAM

Since each year of the operation phase requires different biodiversity management program, the following section will provide the budget estimation for each year of the operation phase.

6.1 ANNUAL BUDGET FOR THE FIRST YEARS OF OPERATION PHASE

6.1.1 Annual Budget for Years with the Maintenance Dredging Activities

For years with the operation of the maintenance dredging activities (Year2 and 4), the budget is estimated about 67,800 USD per year and can present in ***Table L.6***.

Table L.6 Estimation for Annual Budget for the Years with the Maintenance Dredging Activities

Required Biodiversity Monitoring Program	Annual Cost (USD)*
1. Marine Benthic and Pelagic Monitoring Program	9,150
2. Migratory Bird Monitoring Program	15,250
3. Imported Marine Pests Monitoring Program	1,100
4. Imported Terrestrial Pests and Weeds Monitoring Program	11,950
5. Concerned Habitats On-Site Monitoring Program	30,750
Total	***68,200***

*Remark: * All figures are in $USD current as of April 2015*

6.1.2 Annual Budget for Years without the Maintenance Dredging Activities

For years without the operation of the maintenance dredging activities (Year1, 3 and 5), the budget is estimated about 57,550 USD per year and can present in ***Table L.7***.

Table L.7 Estimation for Annual Budget for the Years with the Maintenance Dredging Activities

Required Biodiversity Monitoring Program	Annual Cost (USD)*
1. Migratory Bird Monitoring Program	14,850
2. Imported Terrestrial Pests and Weeds Monitoring Program	11,950
3. Concerned Habitats On-Site Monitoring Program	30,750

Total	***57,550***

Remark: * All figures are in $USD current as of April 2015

6.2 ANNUAL BUDGET FOR THE REMAINING YEARS OF OPERATION PHASE

6.2.1 Annual Budget for Years with the Maintenance Dredging Activities

For years with the operation of the maintenance dredging activities (Year 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48 and 50), the budget is estimated about 55,850 USD per year and can present in ***Table L.8***.

Table L.8 Estimation for Annual Budget for the Years with the Maintenance Dredging Activities

Required Biodiversity Monitoring Program	Annual Cost (USD)*
1. Marine Benthic and Pelagic Monitoring Program	9,150
2. Migratory Bird Monitoring Program	15,250
3. Imported Marine Pests Monitoring Program	1,100
4. Concerned Habitats On-Site Monitoring Program	30,750
Total	***56,250***

*Remark: * All figures are in $USD current as of April 2015*

6.2.2 Annual Budget for Years without the Maintenance Dredging Activities

For years without the operation of the maintenance dredging activities (Year 7, 9, 11, 12, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47 and 49), the budget is estimated about 45,600 USD per year and can present in ***Table L.9***.

Table L.9 Estimation for Annual Budget for the Years with the Maintenance Dredging Activities

Required Biodiversity Monitoring Program	Annual Cost (USD)*
1. Migratory Bird Monitoring Program	14,850
2. Concerned Habitats On-Site Monitoring Program	30,750
Total	***45,600***

*Remark: * All figures are in $USD current as of April 2015*