ENVIRONMENTAL IMPACT STATEMENT

for

PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE

for

MINISTRY OF COMMERCE, INDUSTRY AND ENVIRONMENT

FINAL

APRIL 2018

Project Proponent:

PELICAN

[illegible]

Environmental Consultant:

ASPEC

[illegible]

ASPEC

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Note: *Submitted to Pelican Paradise Holdings Timor-Leste for further action.

Version	Report	Date	Prepared	Checked	Approved
Final	EIS	18 April 2018	Phinie Heng Lee Lee (Manager)	Dr Jamie Chong Li Yean (Director)	Dr Low Kwai Sim (Director)

Preamble

PREAMBLE

The Draft Environmental Impact Statement (EIS) and Environmental Management Plan (EMP) for the **Proposed Pelican Paradise Development, Tibar-Tasi Tolu, Timor-Leste** was submitted to the Ministry of Commerce, Industry and Environment (MCIE) on 24 August 2017.

The Public Consultation with relevant stakeholders was conducted on 18 January 2018 and the technical comments regarding the Draft EIS and EMP were forwarded by Director General of Environment to the Project Proponent (PP), vide letter dated 26 February 2018 [Ref: 64/DGA-MDHOA/II/2018].

Clarifications and responses to the technical comments and issues raised during the Public Consultation are summarised in **Attachments 1 and 2** of this Preamble and also incorporated into the various Chapters of this Final EIS Report.

The letter from Director General of Environment is appended in **Attachment 3** of this Preamble.

ATTACHMENT 1: RESPONSES TO WRITTEN COMMENTS FROM DIRECTOR GENERAL OF ENVIRONMENT

The responses and clarifications to the written comments from the Director General of Environment for the Draft Environmental Impact Statement (EIS) for the Proposed Pelican Paradise Development, Tibar-Tasi Tolu, Timor-Leste, are tabled below alongside with the corresponding responses.

No.	Pages	Sections	Ratings	Comments	Responses
1.	13	Executive Summary	C	Sub section 1.7, first paragraph the proposed project will cause climatic change during deactivation phase is right?	There is no deactivation phase in this integrated mixed development, which focuses on long-term development. All writings on the deactivation phase henceforth will be deleted in this Final EIS and EMP. Section 1.7 has been revised, refer to page 1-13.
	15-16			Sub section 1.9.1, scope of the assessment, the significant positive and negative impact during activation phase is right?	Sub section 1.9.1 has been revised, refer to page 1-15.
	17			Table 1.9.1, summary of the positive and negative impact of the project also would be encompass of deactivation phase?	**Table 1.9.1** has been revised, refer to page 1-16.
	2			Table 1.9.2, summary of potential environment impact and mitigation measures during construction phase should be include the cost mitigation, sampling location and limit value or environmental quality standard.	**Table 1.9.2** has been revised, refer to pages 1-17 to1-24.

No.	Pages	Sections	Ratings	Comments	Responses
				Table 1.9.3, summary of potential environmental impact and mitigation measures during the operation should be rectify which consist of activity, potential impact, mitigation measures, cost mitigation, sampling location, parameter to be monitoring, limit value or environmental quality standard, frequency of monitoring, responsibility of monitoring. The mitigation of potential impact is responsibility by proponent, not the government Institution.	**Table 1.9.3** has been revised, refer to pages 1-25 to 1-30.
2.	2	Detail of the project proponent	A	Sub section 2.2, description of the project proponent identity generally are complete.	Noted.
3.	1-6	Details of the EIA consultants who carried out the study and prepared the EIS	A	Description of the EIA consultant to design the EIS such as ASPEC, qualification and experience of each personal generally are complete.	Noted.
4.	8	Description of the project	C	Table 4.3.1, development component, no information of the project cost of each development component that would be constructed. Tables 4.3.3 – 4.3.5, several of the development component drawings are not enclosed. It should be provide and enclosed.	The estimated Project cost has now been included in **Table 4.3.1**, refer to page 4-8. The development component layouts are shown in **Figures 4.3.7 – 4.3.9, 4.3.10 (c) – (g), 4.3.11, 4.3.14 (a) – (c),** refer to pages 4-40 to 4-54.
5.	1-9	Policy, legal and institutional framework	A	Description of International and National legislation, regulation and guidelines that relevant with the proposed project and intent to comply generally are complete.	Noted.
6.	1-218	Description of the environmental	A	Description of environment component that existing within and surrounding project site, enclose of pictures and outcome analysis of the environment component generally are complete.	Noted.

No.	Pages	Sections	Ratings	Comments	Responses
7.	10	Climate change	C	Sub section 7.5, implication of the proposed project/description of the climate change is general, it should be depicted the climate change that generated by proposed project during construction, operation and method mitigation or adaptation.	**Section 7.5:** Implications for the Proposed Project have been revised as shown in pages 7-10 to 7-12. The mitigation can be found in **Section 7.6:** Adaptation Measures, pages 7-12 to 7-14.
8.	1-11	Alternatives	A	Details provide.	Noted.
9.	1	Impact assessment and mitigation measures	C	First paragraph examination of significant impact would be include in deactivation stages?	There is no deactivation phase in this integrated mixed development, which comprises resort and recreational, commercial, institutional and environment components under long-term development. All writings on the deactivation phase have been deleted in this Final EIS. **Section 9.1** has been revised, refer page 9-1.
	2			Table 9.1.1, significant of environmental impact would be include deactivation stages?	**Table 9.1.1** has been revised, refer to page 9-3.
	17			Sub section 9.1.6, the project development would be include deactivation stages?	**Section 9.1.6** has been deleted, refer to pages 9-17 to 9-19.
	17-19			Table 9.1.9 and 9.1.10, depicted of project activity and potential environmental impact during the deactivation stages is part of construction stages?	**Tables 9.1.9 and 9.1.10** have been deleted, refer to pages 9-17 to 9-19.
	43-44,46			Sub section 9.3.5 potential impact (soil erosion) during deactivation stages are not include because the operation stages are not limited.	**Section 9.3.5** has been deleted, refer to page 9-44.
	47			Table 9.3.11, summary of soil erosion impact during deactivation stages should be omitted.	**Table 9.3.11** has been revised, refer to page 9-47.

No.	Pages	Sections	Ratings	Comments	Responses
9.	51	Impact assessment and mitigation measures	C	Sub section 9.4, first paragraph, potential of water quality during deactivation stages should be omitted.	**Section 9.4** has been revised, refer to page 9-51.
	59-60			Section 9.4.4, potential impact and mitigation during deactivation should be omitted.	**Section 9.4.4** has been deleted, refer to pages 9-59 to 9-60.
	71			Section 9.5.4, potential impact and mitigation during deactivation should be omitted.	**Section 9.5.4** has been deleted, refer to page 9-71.
	72			Section 9.5.6, deactivation stages should be omitted.	**Section 9.5.6** has been revised, refer to page 9-72.
	73			Table 9.5.2, summary of air quality at deactivation stages should be omitted.	**Table 9.5.2** has been deleted, refer to page 9-73.
	79			Sub section 9.6.4, potential impact of hydrology and mitigation measures during deactivation process should be omitted.	**Section 9.6.4** has been revised, refer to pages 9-79 to 9-80.
	81			Table 9.6.1, summary of hydrology impact at deactivation stages should be omitted.	**Table 9.6.1** has been deleted, refer to page 9-82.
	93			Sub section 9.7.4, noise potential impact and mitigation measure at deactivation stages should be omitted.	**Section 9.7.4** has been deleted, refer to page 9-94.
	95			Table 9.7.6, summary of noise impact during activation stage should be omitted.	**Table 9.7.6** has been revised, refer to page 9-96.
	108-109			Table 9.8.1, summary of impact to marine ecology during deactivation stage should be omitted.	**Table 9.8.1** has been revised, refer to page 9-112.
	122			Table 9.9.1, summary of impact to terrestrial ecology during deactivation stage should be omitted.	**Table 9.9.1** has been revised, refer to page 9-125.
	135			Sub section 9.10.4, potential impact to lake ecology and mitigation should be omitted.	**Section 9.10.4** has been deleted, refer to pages 9-139 to 9-140.

No.	Pages	Sections	Ratings	Comments	Responses
9.	138 148	Impact assessment and mitigation measures	C	Table 9.10.1, summary of impact to lake ecology during deactivation stage should be omitted. Sub section 9.11.4, potential impact and mitigation measures to structure facilities and utilities should be omitted.	**Table 9.10.1** has been revised, refer to page 9-142. **Section 9.11.4** has been deleted, refer to pages 9-152 to 9-153.
10.	18	Social impact assessment	B	Sub section 10.5.4, depicted of social impact and socio economic issues during the activation is not be included, because the operation stage is long term or not limited.	**Section 10.5.4** had been deleted in this Final EIS, refer to page 10-18.
11.	1-10	Economic Assessment	A	The economic assessment such as positive and negative impact that generated by proposed project and mitigation measures of negative impact generally are good.	The projected developmental cost of USD310 – 400 million, has since been revised to USD710 million, refer to **Table 11.4.1** in page 11-5. Lake A will be maintained as saline lake, refer **Section 11.4.1 (f)** in pg11-8.
12	10 16	Summary of Environmental Management Plan	B	Table 12.2.3, summary of potential impact during deactivation stage should be omitted, because the operation stages is long term or not limited. Table 12.4.3 Environmental monitoring and surveillance during deactivation stage should be omitted, because the operation stage is long term and not limited.	**Table 12.2.3** had been deleted in this Final EIS, refer to pg12-10. **Table 12.4.3** had been deleted in this Final EIS, refer to pg12-19.
13	1-18	Public consultation and information disclosure	A	Summary of public consultation such enclosure of participant pictures, comment, response and institution relevant, community leader, local leader and NGOs who has consulted generally are complete.	The public consultation held on 18 January 2018 had been included in this Final EIS. Refer **Section 13.4** in page 13-5; **Figure 13.4.3** in page 13-10; **Table 13.6.3** in pages 13-19 to 13-22.
14	1	Difficulties encountered	A	Summary of difficulties encountered during design the EIS such as lack of information from Government institution related to the proposed project generally is good.	Noted.

No.	Pages	Sections	Ratings	Comments	Responses
15	1-9	Conclusion and recommendation	B	Conclusion and recommendation should be rectify base to the EIS revision.	Writing on deactivation phase and conversion of Lake A to freshwater lake had been deleted in Final EIS. Refer **Section 15.2** in pages 15-3 to 15-6.
16	1-7	Non-technical summary	C	Non-technical summary should be rectify base to the EIS revision. Provide in both language (*tetum* and English) version.	Conversion of Lake A to freshwater lake had been deleted in Final EIS, refer to **Section 16.6** in page 16-2. Writing on deactivation phase had been deleted in Final EIS, refer **Table 16.9.1** in pages 16-4 to 16-5.
17	-	EIS	C	Should be revise the EIS based on technical comment of participant of the public consultation that conducted in December 2017 and January, 2018.	The Final EIS has been revised accordingly.

ATTACHMENT 2: RESPONSES TO ISSUES RAISED DURING THE PUBLIC CONSULTATION

The responses and clarifications to the comments from various stakeholders during the Public Consultation held on 18 January 2018 for the Draft EIS and EMP for the *Proposed Pelican Paradise Development, Tibar-Tasi Tolu, Timor-Leste*, are tabled below alongside with the Consultants' corresponding responses.

No.	Comment By	Question/ Comment/ Concern	Response
1.	Mr Shyam Paudel [Chief Technical Advisor of United Nations Development Programme (UNDP) Timor-Leste]	(i) Concerned on the relocation/resettlement of the residents within the Project site.	(i) The relocation plan is under the jurisdiction of the Government of Timor-Leste as stated in **Chapter 10:** Social Impact Assessment, page 10-1.
		(ii) Queried on the mangrove area to be reserved and location for the mangrove replanting.	(iia) The existing mangroves around the Project site had long been destroyed even before the PP incepted the Project, refer to **Section 6.11:** Mangrove, page 6-82. (iib) The PP has plans to rejuvenate and conserve any mangroves that are left, and to replant mangroves where there are none, especially at the perimeter of Tasi Tolu Lakes. The seeds of remnant mangroves in the Tasi Tolu area would be collected for replanting.
		(iii) Asked on the types of plants that will be included in the reforestation plan.	(iii) The types of some potential plants for reforestation were shown to the stakeholders during the consultation. The PP has started to cultivate the plants in a nursery for reforestation. Refer to **Figure 9.9.5** in **Section 9.9:** Impacts on Terrestrial Ecology and Mitigation Measures, page 9-130.
2.	Sr Carlos Ximenes (Senior Staff in General Directorate of Environment)	(i) Concerned on the conversion of Lake A to a freshwater lake as the Lake is known as an important area for migrating birds and also considered as a sacred area to the public.	(i) Lake A is now maintained as a saline lake; refer to amendment in **Section 4.3.5:** Lake Rehabilitation, pages 4-23 and 4-24.

No.	Comment By	Question/ Comment/ Concern	Response
		(ii) Suggested to construct an additional lake within the golf course area for freshwater storage and to maintain the three Lakes as saltwater lakes.	(ii) The three Lakes are maintained as saltwater lakes, refer to amendments in **Section 4.3.5:** Lake Rehabilitation, pages 4-23 to 4-25.
		(iii) Curious on lake restoration and the lake water parameters that would be improved through the restoration (fresh sea water circulation).	(iii) The technical restoration of Tasi Tolu Lakes is to circulate the lake water to improve the water quality of the lakes, which are already in a semi-eutrophication condition. Basically this is done by channelling in fresh seawater via an underground piping system into Lake C during high tide. The water from Lake C will then flow into Lake B via an opening between two lakes; which subsequently will discharge back into the sea through overflow. In addition, foam jets and air stations will also be installed for aeration to improve the water quality. For more details, refer to **Section 4.3.5:** Lake Rehabilitation, pages 4-23 to 4-25.
		(iv) Asked if the public could access to the Lakes after Project completion.	(iv) The public can access to the Lakes after Project completion.
		(v) Expressed that Timorese are supporting the Project development but also concerned on the environmental impacts caused by the Project.	(v) Noted. The environmental impacts caused by the Project had been stated in **Chapter 9:** Impact Assessment and Mitigation Measures, pages 9-1 to 9-205.
3.	Sr Adilson da C. (La'o Hamutuk)	(i) Concerned on the disruption/disturbance of habitat during the construction phase.	(i) The mitigation measures on ecology can be found in **Section 9.8:** Impacts on Marine Ecology and Mitigation Measures; **Section 9.9:** Impacts on Terrestrial Ecology and Mitigation Measures; and **Section 9.10:** Impacts on Lake Ecology and Mitigation Measures, in pages 9-99 to 9-146.

No.	Comment By	Question/ Comment/ Concern	Response
3.		(ii) Concerned on involvement of local communities in the Project development. (iii) Wished that the PP would protect/maintain the Tasi Tolu area (especially the lakes) while having the new development.	(ii) Priority on employment will be given to the local communities. This is stated in **Section 10.6.1:** Employment Opportunities, page 10-18. However, it depends on the types of jobs available; the working skills of the locals and most important, is the willingness to work amongst the local communities. (iii) It is because of the environmental qualities and the lakes that the PP had decided to develop the Project in the area. Hence, all the mitigation measures to protect the lakes have been keenly taken into consideration. See **Section 9.10:** Impacts on Lake Ecology and Mitigation Measures, pages 9-131 to 9-146.
4.	H.E. Arq. Abrao Gabriel Santos Oliveira (Vice Minister of Housing Development, Urban Planning and Environment)	(i) Rejected the option to convert the Lake A into a freshwater lake as it is a sacred and historical site. (ii) Emphasised on public access to the Tasi Tolu area once the Project is completed. (iii) Mentioned that the settlements within the Project site would definitely be relocated with or without the development. (iv) Emphasised that all investors must take care of the environment and comply with the conditions of the environmental license.	(i) Noted. Refer to amendments in **Section 4.3.5:** Lake Rehabilitation, pages 4-23 and 4-24. (ii) Noted. The public will have access to the Tasi Tolu area once the Project is completed. (iii) Noted. Refer to **Chapter 10:** Social Impact Assessment, page 10-1. (iv) Noted.
5.	Sr Anibal A. Soares [Professional Technique (EIA), Department of Environmental Impact Assessment]	(i) Rejected the idea of covering Lake A with solar panels. (ii) Expressed the importance of Tasi Tolu Lakes to the locals.	(i) Noted on the rejection of covering Lake A with solar panel. Refer to amendments in **Section 4.3.5:** Lake Rehabilitation, pages 4-23 and 4-24. (ii) Noted, the lakes will be maintained as saline lakes.

No.	Comment By	Question/ Comment/ Concern	Response
5.		(iii) Concerned on the impact to the migratory birds during Project development. (iv) Concerned on the impact from the construction of the floating jetty.	(iii) The impact on the migratory birds had been stated in **Section 9.10:** Impacts on Lake Ecology and Mitigation Measures, pages 9-131 to 9-146. (iv) The mitigations can be found in **Section 9.8.2 (d) (ii):** Mitigations for Construction of the Floating Jetty, page 9-104.
6.	General Directorate of Environment	(i) Appreciated the effort of PP in planning the Project. (ii) Expressed that the Tasi Tolu Lakes are historical sites and must be conserved.	(i) Noted. (ii) Refer to **Section 9.10:** Impacts on Lake Ecology and Mitigation Measures, page 9-136.
7.	Sr José Paulo Pinto (Ministry of Public Work)	(i) Informed that the Government of Timor-Leste is currently upgrading the existing Rua Terra Santa. (ii) Requested that the proposed drainage plan (including lakes water circulation plan) to be incorporated with the Master Drainage Plan of the upgraded road. (iii) Suggested PP to meet with related departments for further coordination on the drainage plan. (iv) Emphasised that the National Sewerage Plan must be incorporated in the Project planning, if there is a sewage treatment plant and sewerage system in Tasi Tolu area.	(i) Noted. (ii) Pelican Paradise Holdings Timor-Leste would consult with the relevant agencies on the drainage plan. (iii) Noted. The PP would consult with the relevant agencies on the drainage plan. (iv) PP also took note that the National Sewerage Plan when planning for the sewerage system for the Project.
8.	Ms Trudiann Dale (Country Director, Conservation International)	(i) Mentioned that the Dili Rock is one of the popular dive sites in Timor-Leste; it should be included as a tourism site in EIS.	(i) Dili Rock as a dive site has been included in **Figures 6.24.2 and 6.24.3**, pages 6-187 and 6-188.

No.	Comment By	Question/ Comment/ Concern	Response
8.		(ii) Emphasised that the Tasi Tolu is a marine protected area as the seagrass bed in this area is the habitat for dugong.	(ii) Refer to **Section 6.14:** Protected Areas and National Park for the status of Tasi Tolu coastal area, page 6-113. The seagrass bed and dugong have been included in **Section 6.15.4:** Marine Mammals, page 6-124, and **Section 9.8:** Impacts on Marine Ecology and Mitigation Measures, page 9-101.
		(iii) Concerned on the impact of the discharge of circulated lake water to the seagrass bed.	(iii) The impact of the discharge of circulated lake water to the seagrass bed has been included in **Section 9.8:** Impacts on Marine Ecology and Mitigation Measures, pages 9-102 to 9-105.

Attachment 3

Ministerio do Desenvolvimento
e Reforma Institucional

Gabinete do Vice Ministro
Desenvovimento Para
Habitação, Ordenamento e
Ambiente

Direcção Geral do Ambiente
Fomento Building, Rua D. Boa Ventura, Dili, Mobile: 3311473, 77327062

Dili, 26th of February, 2018

Ref. Num: 64 /DGA-MDHOA /II/2018

Mr. Jeremiah Chan,
Executive Director of Pelican Paradise Holdings Timor – Leste

Cc : 1. **His Excellency Prime Minister and Minister of Development and Institutional Reform, Mr. Mari Bim Amude Alkatiri**

2. **His Excellency Vice Minister of Development for Housing, Spatial Planning and Environment, Mr. Abrão Gabriel Santos Oliveira**

Subject : Technical Comments of Environment Impact Statement (EIS) and Environmental Management Plan (EMP) Draft

Reference:

1. Pelican Paradise. Project document submission, 7th of November. 2016,
2. Pelican Paradise. Project document revision submission, 16th December, 2016;
3. DNCPIA, issued of the category project, 20th of December 2016, classify as category A project;
4. DNCPIA, reason of the Pelican Paradise Development categorize as a project category A is pursuant to annex one of Decree Law number 5/2011 on Environmental License, Tourism Sector (Hotel construction) scale of the project activity is ≥ 100 rooms, categorize as a project A;
5. Pelican Paradise, ToR draft submission, 30th of December, 2016,
6. DNCPIA, issue of the ToR technical comment, 19th of January, 2017;
7. Pelican Paradise, ToR revision resubmission, 2ed of February, 2017;
8. DNCPIA, approval of the ToR, 24th February 2017;
9. Pelican Paradise, Environmental Impact Statement (EIS) and Environmental Management Plan (EMP) submission, 24/8/2017;
10. Pelican Paradise, EIS and EMP public consultation in December 2017 and January, 2018;
11. DNCPIA; review of the EIS and EMP, 25th of August 2017 to 26th of February 2018.
12. DNCPIA, issued of the EIS and EMP technical comment.

Dear Mr. Jeremiah Chan,

Referring to the EIS and EMP draft for the Pelican Paradise Development project submitted to the National Directorate of Pollution Control and Environmental Impact (NDPCEI) dated 24th of August 2017. The Environmental Impact Assessment (EIA) technical of NDPCEI, under the Directorate General of Environment (DGE), Vice Ministry of Development for Housing, Spatial Planning and Environmental (VMDHSPE), Ministry of Development of Institutional Reform has reviewed the documents and found several sections of the EIS and EMP draft version are incomplete.

Therefore, we request the proponent to revise the EIS and EMP based on technical comments and resubmit to the VMDHSPE, DGE, DNAC, DNPRB and NDPCEI in hard and soft copy. Parts of the revision should be highlighted to facilitate the review. For your information please see enclosure of technical comments.

Yours sincerely,

João Carlos Soares

Director General for Environment

REPÚBLICA DEMOCRÁTICA DE TIMOR-LESTE
DIRECÇÃO ... DO AMBIENTE
RDTL

Technical Comments of the EIS

Num	Pages	Sections	Ratings	Comments
1.	13 15-16 17-19 20-22	Executive Summary	C	***Sub section 1.7, first paragraph the proposed project will cause climatic change during deactivation phase is right?*** ***Sub section 1.9.1, scope of the assessment, the significant positive and negative impact during deactivation phase is right?*** ***Tbl 1.9.1, summary of the positive and negative impact of the project also would be encompass of deactivation phase?*** ***Tbl. 1.9.2, summary of potential environmental impact and mitigation measures during construction phase should be include the cost mitigation, sampling location and limit value or environmental quality standard.*** ***Tbl. 1.9.3, summary of potential environmental impact and mitigation measures during operation phase should be rectify which consist of activity, potential impact, mitigation measures, cost mitigation, sampling location, parameter to be monitoring, limit value or environmental quality standard, frequency of monitoring, responsibility of monitoring. The mitigation of potential impact is responsibility by proponent, not the government Institution.***
2.	2	Details of the project proponent	A	Sub section 2.2, Description of the project proponent identity generally are complete.
3.	1-6	Details of the EIA consultants who carried out the study and prepared the EIS	A	Description of the EIA consultant to design the EIS such as ASPEC, qualification and experience of each personal generally are complete.
4.	8 17-24	Description of the project	C	***Tbl 4.3.1, development component, no information of the project cost of each development component that would be constructed.*** ***Tbl, 4.3.3 – 4.3.5, several of development component drawings are not enclosed. It should be provide and enclosed.***
5.	1-9	Policy, legal and institutional framework	A	Description of International and National legislation, regulation and guidelines that relevant with the proposed project and intent to comply generally are complete.
6.	1-218	Description of the Environmental	A	Description of environment component that existing within and surrounding project site, enclose of pictures and outcome analysis of the environment component generally are complete.
7.	10-	Climate change	C	***Sub section 7.5, implication of the proposed project/description of the climate change is general, it should be depicted the climate change that generated by proposed project during construction, operation and method mitigation or adaptation.***
8.	1-11	Alternatives	A	Details provide.

9.	1	Impact assessment and mitigation measures	C	*First paragraph, examination of significant impact would be include deactivation stages?*
	2			*Tbl. 9.1.1, significant of environmental impact would be include deactivation stages?*
	17			*Sub section 9.1.6. the project development would be include deactivation stages?*
	17-19			*Tbl 9.1.9 and 9.1.10, depicted of project activity and potential environmental impact during deactivation stages is part of construction stages,*
	43-44, 46			*Sub section 9.3.5 potential impact (soil erosion) during deactivation stages are not include because the operation stages are not limited.*
	47			*Sub section 9.3.11, summary of soil erosion impact during deactivation stages should be omitted.*
	51			*Sub section 9.4, first paragraph, potential of water quality during deactivation stages should be omitted.*
	59-60			*Section 9.4.4, potential impact and mitigation during deactivation should be omitted.*
	71			*Section 9.5.4, potential impact and mitigation during deactivation should be omitted.*
	72			*Deactivation stages should be omitted.*
	73			*Tbl. 9.5.2, summary of air quality at deactivation stages should be omitted.*
	79			*Sub section 9.6.4 potential impact of hydrology and mitigation measures during deactivation stages should be omitted.*
	81			*Tbl. 9.6.1, summary of hydrology impact at deactivation stages should be omitted.*
	93			*Sub section 9.7.4, Noise potential impact and mitigation measures at deactivation stages should be omitted.*
	95			*Tbl 9.7.6, summary of noise impact during deactivation stage should be omitted.*
	108-109			*Tbl 9.8.1, summary of Impact to marine ecology during deactivation stage should be omitted.*
	122			*Tbl. 9.9.1, summary of Impact to terrestrial ecology during deactivation stage should be omitted.*
	135			*Sub section 9.10.4, potential impact to lake ecology and mitigation should omitted.*
	138			*Tbl 9.10.1, summary of Impact to lake ecology during deactivation stage should be omitted.*

	148			*Sub section 9.11.4, potential impact and mitigation measures to structure facilities and utilities should omitted.*
10.	18	Social impact assessment	***B***	***Sub section 10.5.4, depicted of social impact and socio economic issues during deactivation is not be included, because the operation stage is long term or not limited.***
11.	1-10	Economic assessment	A	The economic assessment such as positive and negative impact that generated by proposed project and mitigation measures of negative impact generally are good.
12.	10 16	Summary of Environmental Management Plan	***B***	***Table 12.2.3, summary of potential impact during deactivation stage should be omitted, because the operation stage is long term or not limited.*** ***TBL 12.4.3. Environmental monitoring and surveillance during deactivation stage should be omitted, because the operation stage is long term or not limited.***
13.	1-18	Public consultation and information disclosure	A	Summary of public consultation such enclosure of participant pictures, comments, responses and institution relevant, community leader, local leader and NGOs who has consulted generally are complete.
14.	1	Difficulties encountered	**A**	Summary of difficulties encountered during design the EIS such as lack of information from Government institution related to the proposed project generally is good
15.	1-9	Conclusion and recommendation	***B***	***Conclusion and recommendation should rectify base to the EIS revision.***
16.	1-7	Non technical summary	***C***	***Non technical summary should be rectify base to the EIS revision. Provide in both language (tetum and English) version.***
17	-	EIS	***C***	***Should be revise the EIS base on technical comment of participant of the public consultation that conducted in December 2017 and January, 2018.***

Technical Comments of the EMP

No	Pages	Sections	Ratings	Comments
1.	9, 13 16 26	Executive Summary	C	*Tbl. 1.8.1, 18.2, summary of potential significant environmental impact and mitigation measures during construction and operation phase should be rectify which consist of activity, potential impact, mitigation measures, cost mitigation, sampling location, parameter to be monitoring, limit value or environmental quality standard, frequency of monitoring, responsibility of monitoring.* *Tbl. 1.8.3, summary of potential significant environmental impact and mitigation measures during deactivation stage should omitted.* *Tbl. 1.10.3, environmental monitoring and surveillance during deactivation stage should omitted.*
2.	1	Details of the project proponent	A	Description of project proponent identity such as company name, chairs, contact number and email address generally are complete.
3.	1-5	Details of the EIA consultants who carried out the study and prepared the EMP	A	Description of the EIA consultant to design the EMP such as ASPEC, qualification and experience of each personal generally are complete.
4.	1-19	Description of the project	C	*Need to be alter base to the EIS alteration.*
5.	1-9	Legal requirement	A	Description of legal requirement such as regulation, standard and guidelines related to the environmental and social aspect that the proponent intend to comply during lifecycle of the project generally are complete.
6.	4	Institutional roles and responsibilities	B	*Tbl. 6.2.1, Roles and responsibility of developer and institutional at deactivation stage should be omitted, because the operation stage of this project is for long term/not limited.*
7.	1 3	Summary of impacts	C	*Tbl. 7.2.1, Summary of several impact during construction and operation stage will not be affected the mangrove, protected are, etc need to be alter. Decommissioning column should be omitted.* *Sub section 7.3, summary of social impact at deactivation stage should be omitted*
8.	1-8 9-10	Description of proposed mitigation measures	C	*Tbl . 8.2.1, 8.2.2, The proposed mitigation measures of impact during construction and operation stage need to be rectify that encompass of activity, potential impact, mitigation measures, cost mitigation, sampling and monitoring location, parameter to be monitoring, limit value or environmental quality standard, frequency of monitoring, responsibility of monitoring.* *Tbl 8.2.3, The proposed mitigation measures of impact during deactivation stage should be omitted.*
9.	1-3	Governing parameters	C	*Tbl. 9.2.1, description of all key performance indicator at each stage should be appear the threshold of each aspect. Not indicated in other section, and deactivation stage should be omitted.*
10.	2-5	Monitoring program	C	*Tbl. 10.1.1, 10.1.2, environmental monitoring and surveillance during construction and operation phase, column of compliance requirement should be completed the limit value/benchmark of each aspect (environmental component), not indicated in other section.*

	6-7			*Tbl. 10.1.3, environmental monitoring and surveillance during deactivation phase should be omitted.*
11.	3	Reporting requirements	*B*	*Sub section 11.4, environmental monitoring report during deactivation phase should be omitted.*
12.	8-9	Responsibilities for mitigation and monitoring	*B*	*Sub section 12.4, responsibility for mitigation during deactivation stage should be omitted.*
13.	9	Emergency plan	*B*	*Sub section 13.5, emergency response plan during deactivation stage should be omitted.*
14.	1-3	Decommissioning plan	*B*	The operation stage of this project is for long term. Therefore deactivation plan should be omitted
15.	1-2	Capacity development and training	A	Description of capacity development and training such as type of the training, trainer, objective, participant and schedule of the training generally are provide.
16.	1-15	Public consultation and information disclosure	*B*	*Need to summarize the public consultation of EIS and EMP draft that has been conducted in January, 2018.*
17	1-3	Complaints and grievances mechanisms	*C*	*The mechanism to resolve of any complaints should be split at each stage and appear any complaints related to environmental and social issue.*
18	1 9	Work plan and implementation schedule	 *C*	*Sub section 18.4, work plan and implementation schedule at deactivation stage should be omitted.* *Tbl. 18.2.2 (a), (b) and (c) the work plan and implementation schedule should be specific activity of the EMP of each aspect during construction and operation.*
19	1	Cost estimates	*D*	*Should be provide the cost mitigation measures base to each aspect in section 18 above.*
20	2	Review of the EMP	*B*	*Sub section 20.5, review of the EMP at deactivation stage should be omitted,*
21	1-10	Non-technical summary	*C*	*Non technical should be revise base to the EMP revision, provide in both, English and tetum version.*
22	-	EMP	*C*	*Should be revise the EMP base on technical comment of participant of the public consultation that conducted in December 2017 and January, 2018.*

Rating scale:

A – Excellent : General is good, no need to revise;

B – Good : General is good and satisfies, some part mistake but very few;

C – Sufficient : Satisfied but need to completed some part;

D – Not good : Some part is not complete, must be consider, not satisfied;

E – Poor : All is not complete and not satisfied;

NA : The review section is not applicable.

Technical review

Francisco Poto
Head of EIA Department

Acknowledgements

ACKNOWLEDGEMENTS

Asia Pacific Environmental Consultants Sdn Bhd (ASPEC) gratefully acknowledges the following Government agencies, private companies and public for the support and information provided during the preparation of the Environmental Impact Statement (EIS):

1. MINISTRY OF STATE, COORDINATOR OF ECONOMIC AFFAIRS AND MINISTER OF AGRICULTURE AND FISHERIES
2. MINISTRY OF HOUSING DEVELOPMENT, URBAN PLANNING AND ENVIRONMENT
3. MINISTRY OF COMMERCE, INDUSTRY AND ENVIRONMENT
4. GENERAL DIRECTOR OF ENVIRONMENT
5. NATIONAL DIRECTORATE OF POLLUTION CONTROL AND ENVIRONMENTAL IMPACT
6. DEPARTMENT OF ENVIRONMENTAL IMPACT ASSESSMENT
7. TRADELNVEST TIMOR-LESTE
8. NATIONAL DIRECTORATE OF LAND, PROPERTY AND CADARSTRAL SERVICES
9. NATIONAL DIRECTORATE OF ROADS, BRIDGES AND FLOOD CONTROL
10. NATIONAL DIRECTORATE OF WATER AND SANITATION
11. NATIONAL DIRECTORATE OF METEOROLOGY AND GEOPHYSICS
12. NATIONAL DIRECTORATE OF TOURISM ENTERPRISE, ACTIVITIES AND PRODUCTS
13. NATIONAL DIRECTORATE OF TOURISM MARKETING AND INTERNATIONAL RELATIONS
14. NATIONAL DIRECTORATE OF AQUACULTURE AND FISHERIES
15. GENERAL DIRECTOR OF FOREST, COFFEE AND INDUSTRIAL PLANTS
16. NATIONAL DIRECTORATE OF FORESTRY AND WATERSHED MANAGEMENT
17. NATIONAL DIRECTORATE OF NATURE CONSERVATION
18. NATIONAL DIRECTORATE OF ECONOMICS AND SOCIAL STATISTICS
19. NATIONAL DIRECTORATE OF CARTOGRAPHIC STATISTICS
20. NATIONAL DIRECTORATE OF COMMUNITY HEALTH SERVICES
21. DEPARTMENT OF SANITATION CONTROL AND ENVIRONMENTAL HEALTH
22. DEPARTMENT OF HEALTH MANAGEMENT AND INFORMATION SYSTEM
23. DEPARTMENT OF POLICY AND STRATEGIC PLANNING
24. UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP) TIMOR-LESTE
25. MUNICIPALITY OF LIQUICA
26. POST ADMINISTRATION BAZARTETE
27. SUCO COMORO
28. SUCO TIBAR
29. VILLAGERS FROM KG GOLGOTA
30. VILLAGERS FROM KG FATUNIA
31. VILLAGERS FROM KG LIBAULELO
32. VILLAGERS FROM KG 30 DE AGUSTO
33. VILLAGERS FROM KG MORIS FOUN
34. VILLAGERS FROM KG TERRA SANTA
35. VILLAGERS FROM KG FOMENTO I
36. VILLAGERS FROM KG FOMENTO II
37. VILLAGERS FROM KG FOMENTO III
38. VILLAGERS FROM KG LEMCARI
39. VILLAGERS FROM KG METIN I
40. LA'O HAMUTUK
41. LUTA HAMUTUK
42. CONSERVATION INTERNATIONAL

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ENVIRONMENTAL IMPACT STATEMENT
FOR
PROPOSED PELICAN PARADISE DEVELOPMENT,
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LIST OF APPENDICES

ABBREVATIONS

-	negative
&	and
~	Approximately
<	Less than
>	greater than
≤	Less than or equal to
≥	Greater than or equal to
3D	Three dimension
AC	Aircond
ADB	Asian Development Bank
ADSL	Asymmetric digital subscriber line
ADT	Average daily traffic
AIDS	Acquired Immune Deficiency Syndrome
am	Ante meridiem
APHA	American Public Health Association
ARB	Antibiotic-resistant Bacteria
ASEAN	Association of Southeast Asian Nations
ASPEC	Asia Pacific Environmental Consultants Sdn Bhd
Attn	Attention
AWWA	American Water Works Association
BMPs	Best Management Practices
BOD/BOD_5	Biochemical Oxygen Demand
BQ	Bill of Quantities
C&D	Construction and Demolition
C&S	Civil and Structural
CGM	Complaints and grievances mechanism
COD	Chemical Oxygen Demand
Cont'	Continue
CRC	Community Relations Committee
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSR	Corporate Social Responsibility
DC	Decommissioning Contractor
DD	Data Deficient
DENR	Department of Environment and Natural Resources
dia	diameter
DO	Dissolved Oxygen
DOE	Department of Environment
Dr	Doctor
DRTL	Democratic Republic of Timor-Leste
DWT	Dead Weight Tonnage
E	East
E.coli	Escherichia Coli
e.g.	Example given
EA	Environmental Assessment
EBL	Decree-Law No.26/2012 on Environmental Basic Law
EBRD	European Bank for Reconstruction and Development
ECB	Environmental Cost and Benefit
EDTL	*Electricidade de Timor-Leste*
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ELL	Decree-Law No.5/2011 on Environmental Licensing Law
EMCP	Environmental Management Compliance Plan
EMIS	Education Management Information System
EMP	Environmental Management Plan
EMR	Environmental Management Reports

EMT	Environmental Management Team
EN	Endangered
EnvA	Environmental Auditor
EnvMC	Environmental Monitoring Consultant
EO	Environmental Officer
EPA	Environmental Protection Agency
EQR	Environmental Quality Report
ES	Environmental Scoping
ESCP	Erosion and Sediment Control Plan
ESS	Environmental Significant Scores
et al.	Et alia
etc.	Et cetera
F&B	Food and beverage
Fax	Facsimile
F-FDTL	Timor-Leste Defence Force
FGD	Focus Group Discussion
FOA	Food and Agriculture Organisation of United Nations
GDP	Gross Domestic Product
GDS	General Directorate of Statistics
GHG	Greenhouse Gas
GIS	Geographical Information System
GPS	Global Positioning System
H’	Shannon Weaver Diversity Index
HCM	Highway Capacity Manual
HDPE	High Density Polyethylene
HIV	Human Immunodeficiency Virus
HPU	Highway Planning Unit
HSSC	Hotel service support centre
i.e.	id est
IBA	Important Bird Area
IDP	Military Police Internally Displaced Person
IFC	International Finance Corporation
INTERFET	International Force for East Timor
IPCC	Intergovernmental Panel on Climate Change
Ir	Ingenieur
ISCST3	Industrial Source Complex - Short Term Version 3 Model
IT	Information Technology
IT-1	Interim target 1
IT-2	Interim target 2
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resource Management
JICA	Japan International Cooperation Agency
JKR	Public Works Department Malaysia
Kg	*Kampung*/ Village/ Aldeia
L_{10}	Ten percentile level
L_{50}	Fifty percentile level
L_{90}	Ninety percentile level
L_{Aeq}	Equivalent A-Weighted Continuous Sound Level
LC	Least Concern
LED	Light-emitting Diode
L_{eq}	Equivalent Continuous Sound Level
LIT	Line Intercept Transect
L_{max}	Maximum A-Weighted Continuous Sound Level
L_{min}	Minimum A-Weighted Continuous Sound Level
LOS	Level of Service
M&E	Mechanical and Electrical
MAAQS	Malaysian Ambient Air Quality Standards
MAF	Ministry of Agriculture and Fisheries

Max	maximum
MBAS	Methylene Blue Active Substances
MBR	Membrane bioreactor
MBR-RO	Membrane bioreactor reverse osmosis
MC	Main Contractor
MCIE	Ministry of Commerce, Industry and Environment
MM	Modified Mercalli
MOM	Minutes of meeting
Mr	Mister
MRT	Mass Rapid Transit
MSL	Mean sea level
MWQCS	Malaysia Marine Water Quality Criteria and Standards
NAPA	National Adaptation Plan of Action
NASA	National Aeronautics and Space Administration
NATA	National Association of Testing Authorities
NCR	Non-compliance report
ND	Not Detected
NDDM	National Directorate for Disaster Management
NDE	National Directorate of Environment
NDPCEI	National Directorate of Pollution Control and Environmental Impact
NDWSS	National Directorate for Water and Sanitation Service
NE	Northeast/ Not Evaluated
NEQ	Northeast Quadrant
NGO	Non-government Organisations
NIST	National Institute of Standards and Technology
NN	Not necessary
NNW	north-northwest
no.	Number
NP	Not Protected
NT	Nearly Threatened
NWQ	Northwest Quadrant
NWQS	National Water Quality Standards for Malaysia
O&G	Oil and grease
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
OEC	Organization for Economic Co-operation
P.E.	Population Equivalent
PCCSP	Pacific Climate Change Science Program
PCU	Passenger Car Unit Equivalent
PD	Project Document
pm	post meridiem
PM	Project Manager
PM_{10}	Particulate Matter 10 micrometre
$PM_{2.5}$	Particulate Matter 2.5 micrometre
PNMB	Percetakan Nasional Malaysia Berhad
PP	Project Proponent
PPE	Personal Protective Equipment
PPHTL	Pelican Paradise Holdings (Timor-Leste)
PVC	Polyvinyl Chloride
Ref	Reference
RH	Relative Humidity
RIAM	Rapid Impact Assessment Matrix
RL	Reduced Level
RO	Reverse osmosis
RUSLE	Revised Universal Soil Loss Equation
S	South
SC	Sub-contractors
Sdn Bhd	*Sendirian Berhad*
SDP	Strategic Development Plan

SEA	Strategic Environment Assessment
SEIS	Simplified Environmental Impact Statement
SEQ	Southeast Quadrant
SHE	Safety, Health and Environment
SI	Soil Investigation
SIA	Social Impact Assessment
SIDRA	Signalised or Unsignalised Intersection Design and Research Aid
SOP	Standard Operating Procedures
SOPAC	Secretariat of the Pacific Community Applied Geoscience and Technology Division
sp./spp.	Species
SPC	Secretariat of the Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
STP	Sewage Treatment Plant
SWQ	Southwest Quadrant
SWRO	Seawater Reverse Osmosis
TCU	True Colour Unit
TDS	Total Dissolved Solids
Tel	Telephone
TOR	Terms of Reference
TP	Totally Protected
TSS	Total suspended solid
TV	Television
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNTAET	United Nations Transitional Administration in East Timor
US	United States
USA	Unisted State of America
USACE	United State Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
v/c	Degree of saturation
v/s	Average delay
VU	Vulnerable
WEF	Eater Environment Federation
WHO	World Health Organisation
WTO	World Tourism Organisation
x	times/multiply
ZOI	Zone of Impact

CHEMICALS

AN	Ammoniacal Nitrogen
As	Arsenic
Cd	Cadmium
CN	Cyanide
CO	Carbon Monoxide
CO_2	Carbon dioxide
Cr	Chromium
Cr^{6+}	Chromium Hexavalent
Cu	Copper
Fe	Iron
H_2S	Hydrogen Sulphide
H_2SO_4	Sulphuric Acid
HCl	Hydrochloric acid
HFC	hydrofluorocarbons
Hg	Mercury
HNO_3	Nitric acid
Mn	Manganese
NaOH	Sodium hydroxide
NH_3	Ammonia
NO_2	Nitrogen Dioxide
NO_2^-	Nitrite
NO_3^-	Nitrate
O_3	Ozone
P	Phosphorus
PAHs	Polycyclic Aromatic Hydrocarbon
Pb	Lead
PCB	Polychlorinated biphenyl
PCDD	Polychlorinated dibenzo-p-dioxins
PCE	perchloroethylene
Se	Selenium
SO_2	Sulphur Dioxide
TBT	Tributyltin
Zn	Zinc

UNITS

%	Percentage
′	Minute
°	Degree
°C	Degree Celsius
µg/L	Microgramme per litre
$\mu g/m^3$	Microgramme per cubic metre
ac	acres
cells/mL	Cells per mililitre
CFU/100 mL	Colony Forming Unit per one hundred millilitre
cm	centimetre
dB	Decibel
dB(A)	Decibel A-weighted
ha	Hectare
hr	Hour
ind./L	Individuals per litre
kg	Kilogramme
km	Kilometre
km/h	Kilometre per hour
km^2	Square kilometre

kV	Kilovolt
kVA	Kilovolt-ampere
kW	kilowatt
kWh	Kilowatt per hour
L/s	Litre per second
m	Metre
m/s	Metre per second
m^2	Square metre
m^3	Cubic metre
m^3/day	Cubic metre per day
m^3/hr	Cubic metre per hour
mg/L	Milligramme per litre
mg/m^3	Milligramme per cubic metre
MJ.mm/ha.hr.yr	Megajoule. Milligramme per hectare. hour.year
mL	mililitre
MLD	Million litre per day
mm	Millimetre
mm/s	Millimetre per second
mm/yr	Millimetre per year
MPN/100 mL	Most probable number per one hundred millilitre
ms/cm	milli-Siemens per centimetre
MW	Megawatt
PCU	Platinum-Cobalt units
ppm	Parts per million
ppt	Parts per trillion
sec	Second
t/ha/yr	Tonne per hectare per year
t/hr/MJ.mm	Tonne per hour per Mega joule per millimetre
USD	United States Dollars
yr	Year
μm	Micrometre

Chapter 1

Executive Summary

CHAPTER 1: EXECUTIVE SUMMARY

1.1 PROJECT BACKGROUND

- The title of this Project is:

  ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE

- The Project is an integrated mixed development with a focus on resort living comprising recreational, commercial, institutional and environment components. It is supported by infrastructure and utilities.

- The Project encompasses 563.04 ha across Post Administration Dom Aleixo, Municipality of Dili, and Post Administration Bazartete, Municipality of Liquica. The site is located ~8 km west of Dili, the capital, and ~2 km southwest of Presidente Nicolau Lobato International Airport. It can be easily accessed via Rua Terra Santa connecting from Dili and Liquica.

- Presently, the Government of the Democratic Republic of Timor-Leste (DRTL) has leased the land to Pelican Paradise Holdings (Timor-Leste), the Project Proponent (PP), for 99 years under a Lease Agreement of State Property, dated 16th September 2009 (Contract No. 530 00932). This has since been superseded by a new Lease Agreement, dated 5th August 2010 for the development (Contact No 530.01018).

- The Government will deliver the land free of all encumbrances for commencement of development since 2017. The resettlement of any persons living within the Project site and the resettlement plans, are outside the scope of this Environmental Impact Statement (EIS) and Environmental Management Plan (EMP).

- An earlier Environmental Impact Assessment (EIA) Report submitted by Asia Pacific Environmental Consultants Sdn Bhd (ASPEC) in July 2010 was approved on 4th May 2012 by the National Directorate for Environment, State Secretariat for Environment, Ministry for Economy and Development, DRTL.

- As the Environmental License has lapsed (two years from the date of Notification in the Schedule), and because of amendments to the Project Masterplan Layout, the PP is now re-submitting a fresh EIS and EMP for an Environmental License as per the developmental requirements of the National Directorate of Pollution Control and Environmental Impact (NDPCEI), DRTL.

- Pelican Paradise Holdings (Timor-Leste), the PP, intends to implement the Project in 2017 and had commissioned ASPEC, the Environmental Consultants, to proceed with the EIS and EMP.

1.2 DETAILS OF THE PROJECT PROPONENT

- The Project Proponent (PP) is Pelican Paradise Holdings Timor-Leste (PPHTL):

Pelican Paradise Holdings Timor-Leste
Suite 333B, Timor Plaza
Rua Presidente Nicolau Lobato
Comoro, Dom Aleixo
Dili, Timor-Leste

Tel: +670 7310 7777
E-mail: enquiries@pelican-paradise.com
Website: www.pelican-paradise.com
Attn: Mr Ravi Kathiravelu (Director)
Dr Jeremiah Chan Kin Meng (Executive Director)

1.3 DETAILS OF EIA CONSULTANTS

- The appointed Environmental Consultant:

Asia Pacific Environmental Consultants Sdn Bhd (ASPEC)
30-2, Jalan 9/125D
Taman Desa Petaling
57100 Kuala Lumpur
Malaysia

Tel: +603 9057 4392
Fax: +603 9057 3943
E-mail: Lkspec@gmail.com
Website: www.aspec.com.my
Attn: Dr Low Kwai Sim (Director)
Dr Jamie Chong Li Yean (Executive Director)

1.4 DESCRIPTION OF THE PROJECT

1.4.1 Identification of Project

- **Figure 1.4.1** shows the Project area and the coordinates of the Project boundary.

1.4.2 Category of the Project

- The NDPCEI had categorised the Project under Category A, vide letter [ref: 353/DNCPIA/XXII/2016 dated 20 December 2016], which requires an Environmental Assessment (EA) that involves the preparation of an EIS and EMP, which is the subject of this submission.

1.4.3 Brief Description of the Project

- The Project advocates for an eco-friendly development with the following design aspirations:

  (i) Good access.
  (ii) Efficient and sustainable use of natural resources.
  (iii) Strong economic, social and cultural interactions.
  (iv) Urban and environmental enrichment.
  (v) Sufficient utilities and amenities.

- The Project has four major components:

  (i) Commercial component: comprises an 18-hole golf course, hotels, service apartments, residential units and commercial centres.

  (ii) Institutional component: comprises a youth development and community centre, a school and a hospital.

  (iii) National and environmental component: comprises parks and hill areas which will be reforested.

  (iv) Infrastructure and utility component: comprises a utility centre, sewage treatment plant (STP) and water recycling plant.

- **Table 1.4.1** and **Figure 1.4.2** showed the land usage in the 13 Plots within the Project area. A total of 62.94% will remain as hill forests, which is the largest component; followed by commercial (26.95%) and residential development (8.09%); institutions (1.46%); and infrastructure and utilities (0.56%).

- The Project does not include the areas under Plot 12, which is for a large iconic national public park to be developed by the Government separately.

- The Project will be developed in three phases over six years with overlapping development over the three phases.

- The 2nd hotel (Plot 10) will be developed earlier or later depending on the expansion of the Presidente Nicolau Lobato International Airport and growth of tourism in the country.

Table 1.4.1: Development Components

No	Development	Area (ha)	Percentage (%)
Commercial Component			
1	Plot 1: 5-Star Hotel (464-room)	27.15	4.82
2	Plot 2: 18-Hole Championship Standard Golf Course	98.19	17.44
3	Plot 3: Service Apartments (117 units)	5.91	1.05
4	Plot 7: Commercial Centre 1	9.25	1.64
5	Plot 8: Residential Units	14.56	2.58
6	Plot 9: Residential Units	31.00	5.51
7	Plot 10: 2nd Hotel	9.68	1.72
8	Plot 13: Commercial Centre 2	1.55	0.28
	Sub-total	**197.29**	**35.04**
Institutional Component			
9	Plot 5: School	3.00	0.53
10	Plot 6: Hospital	3.04	0.54
11	Plot 14: Youth Development and Community Centre	2.17	0.39
	Sub-total	**8.21**	**1.46**
National and Environmental Component			
12	Plot 11: Forest Reserve Area (Reforestation)	354.38	62.94
	Sub-total	**354.38**	**62.94**
Infrastructure and Utility Component			
13	Plot 4: Hotel Service Support Centre (Utility Centre)	3.16	0.56
	Sub-total	**3.16**	**0.56**
	Grand Total	**563.04**	**100**

Note: The acreage of public park (Plot 12 – 58.80 ha) which will be developed by the Government of Timor-Leste is not included in the total area of Project site (563.04 ha).

1.4.4 Justification and Need for Project

- The need to develop the Project is altruistically predicted on a number of strategic factors underpinning the scope of works (see **Chapter 4:** Description of the Project) as follows:

  (i) Promote and expand tourism activities in Timor-Leste.
  (ii) Integrated development planning for the present and future growth.
  (iii) Socio-economic development.
  (iv) Conserve and rehabilitate the environment.

1.5 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

- **Table 1.5.1** provides the environmental policies, legislations and regulations for the preparation of the EIS and EMP. Standards and guidelines for environmental quality benchmarking from the World Health Organisation (WHO), Malaysia and other Association of Southeast Asian Nations (ASEAN) countries will be referred to when there is a lack thereof in Timor-Leste.

Table 1.5.1: Legislations, Regulations, Guidelines and Standards Related to the Project

Components	Legislation, Regulation, Standard and Guidelines
Environmental Assessment	**Legislations** • Decree-Law No.26/2012 on Environmental Basic Law (EBL) • Decree-Law No.5/2011 on Environmental Licensing Law (ELL) **Regulations and Guidelines** • Guidelines on Ministerial Diploma on Regulation on Detailed Requirements for Screening, Scoping and the Terms of Reference, Environmental Impact Statements and Environmental Management Plans for Environmental Assessment • Guidelines on Ministerial Diploma for Regulations on Status and Rules of Procedures for Evaluation Committee for Managing the Environmental Assessment Procedure for Category A Projects • Guidelines on the Ministerial Diploma for Regulations on Impacts and Benefits • Ministerial Diploma for Regulation on the Public Consultations Procedures and Requirements during the Environmental Assessment Project
Biodiversity and Protected Areas	**Legislations and Regulations** • UNTAET Regulation No.2000/19 on Protected Places • UNTAET Regulation No.2000/17 on the Prohibition of Logging Operation and Export of Wood from East Timor • Draft Decree-Law on Biodiversity • Draft Decree-Law on Forest Management, Draft 6
Fisheries and Aquaculture Legislation	**Legislation** • Decree-Law No.6/2001 on General Bases of the Legal Regime for Management and Regulation of Fisheries and Aquaculture
Environmental Management	**Standards and Guidelines** • International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability • World Bank Environmental, Health, and Safety General Guidelines (EHS Guidelines) • IFC Workers' Accommodation: Process and Standards • World Health Organisation (WHO) Guidelines for Community Noise • WHO Air Quality Guidelines
Environmental Quality	**Standards and Guidelines** • **Marine Water Quality:** Malaysian Marine Water Quality Criteria and Standard (MWQCS) • **Lake Water Quality:** Malaysian National Water Quality Standards (NWQS) • **Groundwater Quality:** Decree-Law No.5/2009 Licensing Regulations, Sale and Quality of Drinking Water and Malaysian Drinking Water Quality Standard • **Effluent:** Malaysian Sewerage Industry Guidelines • **Air Quality:** WHO Air Quality Guidelines • **Noise Level:** WHO Guideline Values for Community Noise in Specific Environments

1.6 DESCRIPTION OF THE ENVIRONMENT

<table>
<tr><th>Components</th><th>Description</th></tr>
<tr><td colspan="2">(A) Physical Environment</td></tr>
<tr><td>Climate and Implications of Climate Change</td><td>
Average Annual Climatic Statistics (2011 – 2015):
<table>
<tr><td>Rainfall</td><td>Highest rainfall: 1,045.1 mm (2013)
Lowest rainfall: 646.6 mm (2015)</td></tr>
<tr><td>Temperature</td><td>3-hr mean temperature: 28.9 to 29.2°C</td></tr>
<tr><td>Relative Humidity</td><td>3-hr mean relative humidity: 62% to 77%</td></tr>
<tr><td>Surface Winds</td><td>Mostly from northeast (23.4%)
2.1% under calm condition</td></tr>
</table>
Natural climatic hazards experienced are: Infrequent tropical cyclones; seismicity; and frequent prolonged droughts.
Climate change: Over a period of 20 years (1986 – 2005), Timor-Leste experienced the following changes:
(i) Average surface temperature change of between 0.5 to 1.0°C.
(ii) 10% reduction in average precipitation.
(iii) Sea level increased ~0.4 to 0.5 m.
</td></tr>
<tr><td>Topography and Slope</td><td>The general terrain is undulating to flat towards the coast.
Background hills with highest elevation of 395 m above MSL.
Most slopes (86.36%) are <35°.</td></tr>
<tr><td>Geomorphology and Geology</td><td>Four main geological units are found: Contemporary Beach, Coastal Deposits, Alluvial Fan Sediments and the Alieu Formation.
Alluvial Fan Sediments overlies a thick sequence of Coastal Deposits, whilst the hilly terrain consists of meta-sedimentary bedrock of the Alieu Formation.
Groundwater in the Coastal Deposits and the Alieu bedrock is difficult to abstract, except at the Alluvial Fan Deposits where the aquifers are shallower and could yield more water, but the area could be subject to saltwater intrusion.</td></tr>
<tr><td>Soil</td><td>Soils were derived from coastal marine materials and weathered base rocks.
Generally, the soils have very little organic materials and infertile.</td></tr>
<tr><td>Water Quality</td><td>Two sets of lake and seawater samples were collected: (i) 28 September and 20 October 2016; and (ii) 13 January 2017. Due to inconsistencies, the results from the first set were discarded.
Presently, there are no marine water quality standards in Timor-Leste. The lake and seawater results were compared to the limits of Class 2 (for marine life, fisheries, coral reefs, recreational and mariculture), and Class E (for mangroves, estuarine and river mouth water), under the Malaysian Marine Water Quality Criteria and Standards (MWQCS), respectively.
Lake Water:
(i) Water quality standards used: Class E of MWQCS (estuarine and inland).
(ii) TSS: All complied with Class E limits of MWQCS.
(iii) Heavy metals: All complied with Class E limits of MWQCS, except for Lead (Pb) at LW2 (Tasi Tolu Lake B); Copper (Cu) at all points, and Zinc (Zn) at LW3 (Tasi Tolu Lake A).
(iv) Nitrate (NO_2^-) and Nitrite (NO_3^-): All samples exceeded MWQCS Class E limits.
(v) Tasi Tolu area: Brackish aquifers where the water contains high salinity and total dissolved solid (TDS).</td></tr>
</table>

<table>
<tr><th>Components</th><th>Description</th></tr>
<tr><td>Water Quality (Cont')</td><td>• Seawater:
(i) Water quality standards used: Class 2 of MWQCS (recreation).
(ii) Oil and Grease (O&G): Level high at SW4 with 3.7 mg/L exceeding the Class 2 limits of MWQCS.
(iii) Heavy metals: All complied, except Pb at SW3 and SW4; Cu at all points; and Zn at SW2.
(iv) NO_2^- and NO_3^-: All samples exceeded MWQCS Class 2 limits.</td></tr>
<tr><td>Air Quality</td><td>• Baseline air quality measurements were carried out on 18 – 21 October 2016.
• Results: All complied with WHO Air Quality Guidelines and Malaysia Ambient Air Quality Standards (MAAQS) except:
(i) $PM_{2.5}$ at A1 exceeded WHO standards (25 μg/m^3).
(ii) $PM_{2.5}$ at A2 exceeded both WHO standard (25 μg/m^3) and MAAQS standard (75 μg/m^3).
(iii) PM_{10} at A3 exceeded WHO standards (50 μg/m^3).</td></tr>
<tr><td>Hydrology and Drainage</td><td>• The Project site is located within the Tasi Tolu basin.
• It captures waters from the range of hills during the wet season via the small ephemeral streams and drain into the three lakes.
• There is no direct outlet to the sea except at the man-made culvert near the Dili Rock, to discharge previous treated sewage to the sea.
• The Project site is not flood-prone but is vulnerable to occasional storm surge and half yearly droughts.</td></tr>
<tr><td>Noise Level</td><td>• The baseline noise levels at N1, N3 and N4 all exceeded the permissible limits of 55 dB(A) of both WHO and the Department of Environment (DOE) Malaysia.</td></tr>
<tr><td colspan="2">(B) Ecological Environment</td></tr>
<tr><td>Wetlands and the Three Lakes</td><td>• The three Tasi Tolu Lakes within the Project site are saline, semi-eutrophicated and devoid of much of its lake organisms.
• The lake baseline planktons survey showed the following:
(i) <u>Phytoplankton and Zooplankton</u>:
<table>
<tr><th></th><th>No. of Genera</th><th>No. of Phylum</th><th>Cell Density</th><th>Diversity (H')</th></tr>
<tr><td>Phytoplankton</td><td>13</td><td>4</td><td>Lake B > C > A</td><td>Lake A > C >B</td></tr>
<tr><td>Zooplankton</td><td>2</td><td>1</td><td>Lake C > B > A</td><td>Lake C > A > B</td></tr>
</table>
(ii) <u>Fish</u>: Tasi Tolu Lakes have very low fish diversity and only one fish species (Tilapia or Oreochromis sp.) was observed during site investigations.
(iii) <u>Overall</u>: Low level of primary food causing low fish population.</td></tr>
<tr><td>Mangroves</td><td>• Mangroves along the shores of the Tasi Tolu Lakes have largely been depleted. Largest patch was observed north of Lake C.
• Two dominant species of mangroves were the Grey Mangrove (Avicennia marina) and the White-flowered Black Mangrove (Lumnitzera racemosa).</td></tr>
</table>

Components	Description
Corals	• Coral surveys (on 19 – 22 October 2016) at four locations comprising two transects each, using Line Intercept Transect (LIT) and Visual Quadrat methods. • Result of LIT showed: (i) The deeper sea transects had lower coral coverage than shallower ones. (ii) Transects east of Dili Rock have poorer coral coverage than in the west. (iii) T7, the shallower transect in front of Plot 3 and 2nd hotel (Plot 10), had most live hard and soft corals (39.65% and 42.40% respectively). (iv) T1, the shallower transect at the proposed jetty (Plot 1) had most coral rubbles and less live corals. (v) T2, the deeper transect had mostly sand (58%) and rubble (40%), only 2% is algae. • Result of Visual Quadrat: (i) This concurred with the results of T7with highest diversity of 10 coral genus. (ii) Quadrats from T1, T2 and T4 had the lowest coral diversity. • **Overall:** The reefs west of Dili Rock are healthy and diverse. East of Dili Rock where the future jetty will be sited has lower coverage and more coral rubbles.
Fisheries	• The dominant fishes at the northern coast of Timor-Leste are mostly pelagic; whereas the southern coast has more diverse fishery resources of greater commercial value according to the fishermen.
Protected Areas and National Parks	• Tasi Tolu Lake areas have been gazetted as an Important Bird Area (IBA) by BirdLife International as it satisfies two criteria: (i) inhabited by Globally Threatened (A1) and Restricted-range (A2) species; and because (ii) the rare Timor Sparrow (*Lonchura fuscata*) and the Slaty Cuckoo Dove (*Turacoena modesta*) were found in the area.
Marine Ecology	• **Invertebrates:** 11 genera of invertebrates along the eight survey transects, from six phylum: Annelidian, Cnidarian, Crustacean, Molluscs, Echinoderm and Chordata, were mostly of LC status by IUCN. • **Phytoplankton:** Three locations (B1 – B3) have in total, 16 genera from three phyla. B3 west of Plot 3, has the highest cell density and diversity. B1 at the breakwater of Presidente Nicolau Lobato International Airport, had the lowest density and diversity. • **Zooplankton:** Zooplankton from the same location as phytoplankton, comprises 15 genera from six groups: Arthropoda, Mollusca, Cnidaria, Chordata, Chaetognatha and Annelida. The density and diversity of zooplankton is highest at B1. • **Marine Mammals:** A total 15 species of marine megafauna was sited at the coastal region of Timor-Leste (from sight and literature review), which included whales, dolphins and dugongs. Among the 15 species, three of them are listed as Endangered under the IUCN; two are Vulnerable - dugongs and sperm whale; and the rest are listed as Least Concern and Data Deficient. • **Overall:** The sea is rich in marine life although the primary producers vary from place to place.

Components	Description
Terrestrial Ecology	• There are three distinct ecological habitat types in Project site: (i) E1 – Tasi Tolu Lakes; (ii) E2 – Tasi Tolu coastline; and (iii) E3 – the hills around Tasi Tolu. • **Flora:** Four floristic types: (i) Degraded scrubland around Tasi Tolu Lakes. (ii) Remnant mangroves at the shores of Tasi Tolu Lakes. (iii) Coastal vegetation along the shores and coasts. (iv) Open woodlands on the hills. • A total of 46 plant species were observed in all three habitats, comprising common and hardy invasive species of little to no conservational importance. • No rare or endangered plant species were encountered during the survey. • The habitats have been altered from its natural state, as invasive plants had already spread widely in the native landscape. • **Avifauna:** A total of 30 species of avifauna were observed. Several birds of conservational importance, Timor Sparrow, Sunda Teal (*Anas gibberifrons*), Red-necked Stint (*Calidris ruficollis*) and Black-tailed Godwit (*Limosa limos*), are listed as Near Threatened status by IUCN. Literature review indicated 79 species recorded in and around the Project site, which makes the area an IBA. • **Herpetofauna:** The diversity of amphibians was low and only recorded at E1, but the abundance was relatively high. The reptile diversity was also poor in the and only five species of reptiles were observed. All species found were hardy colonisers of low conservational value. They were tolerant to disturbance and often found near human habituations. However, two taxons recorded in the survey were not properly described (*Feyervarja* sp. and *Cyrtodactylus* sp.) and it is possible that these species may be endemic to the island of Timor. • **Mammal:** Most mammals observed were domesticated ones such as pig, buffalo, banteng, dog, etc. kept either as pets or lifestock. The banteng (*Bos javanicus*) however is listed as Endangered status by IUCN.
Coastal Beaches and Resources	• The coast of Tasi Tolu Beach can be separated into three zones: (i) West of Dili Rock: Divided into a 2 – 3 m vegetation zone (shrubs, beach grass, and medium sized trees); and a 3 – 5 m short sandy intertifal beach zone with rocky outcrops. (ii) Dili Rock: This rocky outcrop terminates directly into the sea and is a favourite diving spot. The Dili Rock comprises a large tower boulder with small boulders interspersed with the sandy beach. (iii) East of Dili Rock: This comprises a long stretch of unbroken sandy beach with a vegetation zone (mainly shrubs and bushes), sandy beach with grass patches and an intertidal zone with pebbles, gravels, shells, and dead corals.
(C) Economic Environment	
Employment Sectors	• Based on the Timor-Leste Labour Force Survey 2013, the total active working-age population was only 27.3%; the rest were inactive (69.4%) and persons who did not have permanent jobs, looking for job or waiting for reply to a job application (3.3%). • Among those employed, most of them were in the services sector (45.1%), following by agriculture sector (40.5%) and industry sector (12.7%). • From the socio-economic survey within the 3-km Zone of Impacts (ZOI), 73.4% of the respondents (total = 203) were actively employed; most of them were in the government services (30.5%), followed by agriculture (12.8%)

Components	Description
Infrastructure Facilities	• **Electricity:** Electricity supply within the Project site will be sourced from the national grid supplied by *Electricidade de Timor-Leste* (EDTL). The Project will require ~650 kVa during construction and ~29,098 kW for the operational phase. • **Water supply:** Water supply is managed by National Directorate for Water and Sanitation Service (NDWSS). The Project will require ~0.6 MLD during construction and 7.251 MLD during the operational phase. • **Telecommunication:** Telecommunication is currently serviced by three mobile network operators: Timor Telecom, Telemor and Telkomsel. There is access to mobile internet and landline internet services. • **Roads:** The Project site can be accessed via Rua Terra Santa connecting Presidente Nicolau Lobato International Airport and Dili in the east and Tibar, west of the Project site. The main form of public transport within Dili areas is by microlets, buses and taxis. • **Sewerage:** The nearest STP to the Project site is Tibar STP. Presently, the settlement in the Project site uses the pour flush system. • **Solid Waste Management:** Solid waste collection service in Dili is served by the Municipalities of Dili, under the Ministry of State Administration. Waste is collected by private contractors and disposed off at the Tibar Landfill, which is the nearest landfill from the Project site.
Landuse	**<u>Within the Project Site</u>** • The only settlement within the Project site is Kg 12 De Outubro with ~3,803 persons, who will be resettled by the Government in 2017. • Other landuses presently occupying the Project site include: remnant houses of the Timor-Leste Defence Force (F-FDTL) and Military Police Internally Displaced Person (IDP) camp; an off-dock yard; a depot for abandoned cars; former race track; a line of used clothing stalls; make-shift market; and the bus terminal area. **<u>Within 3-km ZOI</u>** • **Northeast Quadrant (NEQ):** It is the most built-up and densely settled quadrant. It comprises 23 settlements with a residential population of 43,565 persons or 6,707 households. This NEQ has factories, workshops, sand mining, commercial and retail outlets, etc. • **Southeast Quadrant (SEQ):** SEQ is described as the rural hinterland at the fringes of the Dili urban region, where there are only four settlements with the population of 3,708 persons, mostly at the northern section of the quadrant. • **Southwest Quadrant (SWQ):** There are two settlements with total 249 households and a population of 1,340 persons. Apart from residential landuse, it has fish farms and patches of mangroves along the shores of Tibar bay. The higher slopes of SWQ comprise degraded forests. • **Northwest Quadrant (NWQ):** NWQ only has a small portion of land under salt pans and patches of mangroves. The largest settlement is Kg Fatunia, which straddles both NWQ and SWQ.
Use of Forest and Other Natural Resources	• Some communities in Timor-Leste are dependent on forest resources for their livelihood: (i) Fuel for cooking and lighting; (ii) For building materials; and (iii) As a source of incomes from sales of firewood, fruits, medicinal plants, etc. • Within 3-km ZOI, same families harvest timber, bamboo, palms, etc. to supplement their incomes. • Timor-Leste has rich deposits of oil and natural gas, contributing 80.9% of the total export (2014). No oil and gas have been recorded within the Project site. • There were no records of mineral resources mined at the Project area although Timor-Leste has metallic minerals such as gold, copper, manganese, etc. • The common non-metallic minerals are sand, shale, slate and gravel etc. No mining activities were observed within the Project.

Components	Description
Fishery Resources	• Fishery activities in Timor-Leste are mainly coastal fishing, characterised by artisanal and small-scale fishing operations. • There were 633 and 319 fishermen recorded in the Municipalities of Dili (including Atauro) and Liquica respectively within 2013 – 2015. • There were no fisheries activities along the coastal area fronting the Project site; only recreational fishing. • Some families living within the Project site rely on limited fisheries resources of the Tasi Tolu Lakes to supplement their income, but the catch has dwindled considerably.
Agriculture	• **Crop-growing Activity:** Common crops grown in Timor-Leste are staple foods, root crops and cash crop. Most of the crops harvested are kept for domestic consumption except for cash crop (coffee); 83% of harvested coffee is exported. There is no agriculture activity within the Project site. However, some households grow vegetables/fruit trees in their yards for consumption or sometimes for sale. • **Non-crop Agriculture Activity:** The common livestock are pigs and chicken, generating ~40% of the incomes for the households.
Tourism and Recreation	• The tourist arrivals in Timor-Leste have steadily increased from 2010 to 2015. Compared to 2006 data, there was a 67.6% increase in tourist arrivals in 2015, which is a positive sign for the tourism sector. • The tourism sites in and around the Project area are the Tasi Tolu Lakes, St Paul's Holy House, Pope Monument and Dili Rock. • There are some medium-sized hotels catering to the tourists but none are of international class. These include Hotel Timor, Timor Plaza, Novo Turismo and Hotel The Ramelau. Hotel 1 will be the largest when completed.
Other Industries	• Traditional arts, craft and handiworks have contributed to the national economy. The common traditional handicraft is Tais, weaved by Timorese women to supplement their income. In recent years, the traditional Tais products have been modernised (scarves, bags, etc.) to cater to the tourist market. • Rock quarrying and coffee drying factories are found within 3-km ZOI but none at the Project site.
(D) Social Environment	
Population and Communities	• The 2015 Timor-Leste Census showed: (i) Total population: 1,167,242. (ii) Population growth: ~2.69%, from 2010 to 2015. (iii) Gender composition and ratio: 588,561 males and 578,681 females, with a gender ratio of 102:100 respectively. (iv) Household size: average ~6 persons. (v) Population density: 78 persons/km^2. (vi) Rural-Urban distribution: 328,281 urban and 838,961 are rural.
Health Profiles	• Through self-reporting, the communities within the 3-km ZOI, considered their health as good. • They or their family members only occasionally suffered from common illnesses, such as flu, sinusitis, respiratory infection, dengue, malaria, diarrhoea, etc.
Institutions, Schools and Health Facilities	• The 2015 data from the Education Management Information System (EMIS), showed there were 1,523 schools in Timor-Leste for basic education. • Up to 2011, there were four accredited universities and seven accredited institutes in Timor-Leste to provide higher education. • There were six public hospitals in Timor-Leste; the nearest one is Dili National Hospital, located ~9 km from the eastern boundary of the Project site. • A number of clinics were recorded in the Municipality of Dili, mostly NGOs-supported and private clinics.

Components	Description
Community and Family Structures	• **Community Structure:** In general, the local communities paid good respects to their leaders, who are also chiefs in the settlements and often act as their mediators. Community structure is hierarchical and tight. • **Family Structure:** Most households in Timor-Leste are headed by the males of the family.
Land Ownership	• Presently, the Project land is under state property with a lease of 99 years for commercial development to the PP.
Any Types of Common or Individual Rights on Natural Resources	• **Mining Code:** The Mining Code (approved in August 2016) encompasses all mining activities, both inland and offshore. Any mining activities in the country would require a mining license issued by the government authority responsible for mineral resources. • **UNTAET Regulation No.2000/17:** UNTAET Regulation No.2000/17 on the Prohibition of Logging Operations and the Export of Wood from East Timor prohibits any logging operation in Timor-Leste, except for (i) pharmaceutical and cosmetic industry; (ii) producing wood for traditional farming and other domestic, traditional or cultural uses; (iii) construction of traditional houses and religious buildings; and (iv) handicrafts exported individually as personal household effects.
Traffic	• The main arterial road access to the Project site is Rua Terra Santa, which is bi-directional. The road conditions are poor with large potholes in some places, and lack of traffic guard rails at the seaward edge. • The Signalised and Unsignalised Intersection Design and Research Aid (SIDRA) simulation showed the through traffic from Dili town and other residential areas to the Project site had a LOS of 'A' during the morning, afternoon and evening peak hours, indicating smooth traffic flow without much time delay.
(E) Cultural Environment	
Cultural Heritage	• Timor-Leste has a strong and unique culture reflecting their history. • **Language:** Tetum-Prasa with strong influence from the Portuguese language is widely used in Timor-Leste. The other official language is Portuguese. There are 31 indigenous dialects spoken in different Municipalities throughout the country. • **Religion and Beliefs:** 96.9% of the people are Roman Catholic. There are still people deep in their belief in animism, but no animistic sites were found at the Project site.
Archaeological Sites	• There is no record of any archaeological sites within the Project site.
Historic Sites	• The nearest historic sites are St Paul's Holy House and the Pope Monument. Both of these historic are also considered religious sites, built to commemorate the contributions of Pope John Paul II to Timor-Leste's Independence.
Sacred Sites	• The Tasi Tolu Lakes are believed to be sacred sites by the people of Timor-Leste as a reminder of their sad history during the Indonesian occupation, 1975 – 1999. • St Paul's Holy House adjacent to Project site is also known as a sacred site by some the local community. • No cemetery is found within the Project site.
Unique Landscape	• Tasi Tolu, where the Project site is located, has a unique landscape. It is scenic with a range of hills as a background and a broad flat coastal plain that merges to the sea.

1.7 CLIMATE CHANGE

- The Project is unlikely to cause any climatic change during the construction and operational phases. The Project of 563.04 ha (5.63 km^2) within a country of 15,000 km^2 is too small to affect the global, and indeed, even the regional synoptic climatic conditions.

- On the other hand, the regional and global climate change will cause an impact on the Project and the country such as sea level rise, extreme rainfall and oceanic acidity; all of which will cause hardships to the communities in Timor-Leste. These include increasingly low productivity of marine resources and therefore less food and incomes for the families and economy, who depended on them. Consistent monitoring of the climatic conditions of the surrounding seas in Timor-Leste will be necessary to prepare for any eventuality.

1.8 ALTERNATIVES

- The choice of the Project site is *sine qua non,* as the location has already been approved by the Government of Timor-Leste to the PP. This effectively foregoes any other alternative sites for development. There is thus no need to review alternative locations for the Project in this EIS.

- The focus of alternatives in the EIS would be on landuse compatibility; development components; technology and construction methods; and environmental significance (see **Chapter 8**).

1.8.1 Project Design Concept

- The Project is an integrated mixed development comprising hotels, golf-course, commercial centres, hospital, school, residential building and nature area. The design follows the eco-friendly, green conservational concept but with a focus on developmental potentials for tourism and services as the country lacks good tourism products such as good accommodation and facilities for conventions, meetings and exhibitions (see **Chapter 4**).

1.8.2 New Technology and Method

- Due to climatic constraints, the PP has adopted specific environmental options to enhance the Project. These include

  (i) Water Resource Options: To overcome water deficit due to prolonged drought, various options have been considered such as:

    (a) Utilise existing water supply from the network.
    (b) Utilise groundwater.
    (c) Utilise existing surface water.
    (d) Recycling and treatment of sewage.
    (e) Desalination plant.
    (f) Alternative water supply, i.e. rainwater harvesting.

(ii) Lake Rehabilitation: The conversion of Lake A to freshwater is a necessary option to meet water demands for the Project. As the option has been rejected during the Public Consultation on 18 January 2018, the PP has thus decided for Lake A to remain saline. Lakes B and C, will remain saline, but improvements including Lake A, have been proposed for the Government to make them viable and productive again to form the best physical touristic features in and around the public parks.

(iii) Coastal Management: To least disrupt marine life and their communities, soil erosion will be controlled at source, containing all the silt and sediments within the Project site.

(a) Floating Jetty: The jetty will be slated in areas with least corals and least disruption to sea and land traffic and the communities. Technology wise, a floating jetty will not cause a heavy toll on the corals and marine life as compared to a permanent jetty.

(b) Intake and Outlet of the Desalination Plant: There are two options: first option is to place it east of the Dili Rock where there are more coral rubbles and less healthy corals; while the second option is to lay them near to the jetty. Both options are now under detailed investigations at the time of this EIS.

(c) Drainage Outlet of Lakes B and C: To create a healthy lake environment and improve its capability to sustain a higher diversity and density of aquatic/marine and avian life, a series of engineered lake system is proposed to provide better water exchange to recharge Lakes B and C. The system includes a pump house to supply saline water from the coast into Lake C to recharge the waters. The water will flow into Lake B through a channel and finally, discharge to the coastal sea through an overflow culvert. The outlet of the culvert is sited adjacent to the floating jetty to minimise further disruptions to marine life.

(iv) Re-afforestation of the Hill Areas: The reforestation of the hills will improve the aesthetics, capture rain and atmospheric moisture as well as lessen erosion and provide a more conducive habitat for the fauna.

(v) Zero Discharge of Sewage: All sewage will be treated for reused to irrigate the golf course and/or the effluent will undergo further polishing that can be used in the aircond cooling towers, etc. The sludge will be used as materials for soil enrichment.

1.8.3 'No Project' Option

- The 'No Project' Option is *status quo* option where no development will take place. Since the 'With Project' Option will provide more benefits than in its present condition, the 'No Project' Option is not recommended.

1.9 IMPACT ASSESSMENT AND MITIGATION MEASURES

1.9.1 Scope of the Assessment

- The environmental impact assessment features the significant positive and negative impacts that are direct, indirect or cumulative within the short-, medium- and long-term during the pre-construction, construction and operational phases.
- The impacts are described to the level where the consulting engineers can take over to prepare the mitigation measures to abate the adverse impacts.
- Deactivation/decommissioning is unlikely to occur in an integrated mixed development as the Project with a focus on resort living comprising recreational, commercial, institutional and environment components are meant for long-term development. Thus, the impact assessment for deactivation/ decommissioning phase is generally unwarranted and will not be included in this EIS.

1.9.2 Methodology and Approach

- A Rapid Impact Assessment Matrix (RIAM) was used to assess the cause-effect relationships between various Project activities on the physical, ecological, economic, social and cultural environmental components.
- The environmental components with significant/adverse impact were further assessed individually, for which mitigation measures were recommended to abate the negative impacts.

1.9.3 Impacts and Significance of the Identified Impacts

- The positive and negative impacts to its environs are summarised in **Table 1.9.1**.
- Respectively, the potential significant impacts from Project activities during the construction, operational and deactivation/decommissioning phases are shown in **Tables 1.9.2 – 1.9.4**. The details can be referred to **Chapter 9:** Impact Assessment and Mitigation Measures.

Table 1.9.1: Summary of Positive and Negative Impacts from the Project

Impacts		Description
Pre-construction Phase		
Significant Impacts		• No significant negative impacts ascertained. • **Result:** No mitigations needed.
Construction Phase		
Significant Negative Impacts	Major	• Soil erosion and sedimentation. • Marine and lake water quality deterioration. • Air pollution. • **Result:** Mitigations required. • **Time Period:** Short to mid-term.

<table>
<tr><th colspan="2">Impacts</th><th>Description</th></tr>
<tr><td></td><td>Minor</td><td>• Alteration of hydrological system.
• Displacement of fauna through loss of habitat.
• Increased noise.
• Landuse change.
• Traffic congestion.
• Social conflicts.
• Result: Intermittent mitigations required.
• Time Period: Short to mid-term.</td></tr>
<tr><td colspan="2">Significant Positive Impacts</td><td>• More jobs and business opportunities.
• Multiplier effects on the local economy.
• Result: Need only enhancements.
• Time Period: Short to long-term.</td></tr>
<tr><td colspan="3">Operational Phase</td></tr>
<tr><td rowspan="2">Significant Negative Impacts</td><td>Major</td><td>• Water pollution by sewage effluents.
• Increased traffic volume.
• Result: Mitigation measures required.
• Time Period: Short to mid-term.</td></tr>
<tr><td>Minor</td><td>• Air pollution.
• Increased noise level.
• Increased peak flow discharges.
• Result: Intermittent mitigation measures required.
• Time Period: Short to mid-term.</td></tr>
<tr><td colspan="2">Significant Positive Impacts</td><td>• Aesthetic improvements to Tasi Tolu area.
• Enhanced terrestrial and lake ecology.
• Generation of jobs and business.
• Land value appreciation.
• Increase in housing, commercial and institutional development.
• Improvements in standard of living.
• Increased Gross Domestic Product (GDP) of the country.
• Increased tourist arrival.
• Result: Need only enhancements.
• Time Period: Short to long-term.</td></tr>
</table>

Table 1.9.2: Summary of Potential Significant Environmental Impacts and Mitigation Measures during Construction Phase

<table>
<tr><th>Project Activity</th><th>Potential Significant Environmental Impact</th><th>Mitigation Measures</th><th>Mitigation Cost (USD)</th><th>Sampling Location/ Monitoring Parameters/ Limits</th><th>Monitoring Frequency/ Responsibility</th><th>Mitigation Responsibility</th></tr>
<tr><td rowspan="2">• Mobilisation by contractors
• Labour recruitment
• Setting up base camp and site office
• Mobilisation of construction equipment and machinery
• Construction of the jetty
• Land clearing
• Biomass removal
• Demolition of remnant squatter houses
• Earthwork and platform formation
• Earthworks, sculpturing and shaping the golf course
• General piling and structural works
• Final finishing and landscape</td><td><u>Geology</u>
• Disturbance to the natural slopes through excavations and other such activities may cause slope slumping and failure, depending on the local geological strikes and dips of the Alieu Formations at the site.</td><td><u>Geomorphology and Geology</u>
• Spraying of shotcrete to control rock falls, surface erosion, progressive disintegration of exposed bedrock and infiltration of surface water into the rock cut.
• Concrete buttresses to support overhanging rock blocks.
• Potentially loose blocks to be secured by applying various reinforcement techniques such as the installation of dowels, rock bolts of rock anchors.
• Removal of unstable rock areas and replacement with reinforced wall.
• Surface water to be diverted away from the cut slopes.
• Horizontal or inclined subsurface drains drilled into the slope cuts will reduce the groundwater level within and prevent build-up of excess water pressure.</td><td>$100,000</td><td>• No sampling required.</td><td>• Weekly inspection by Environmental Officer (EO).</td><td>• Contractor</td></tr>
<tr><td><u>Soil Erosion</u>
• Soil erosion has been identified as important during earthworks and construction, which may affect water quality in the lakes and sea.</td><td><u>Soil Erosion and Sedimentation</u>
• Minimise earthworks during the rainy season.
• Implement best management practices (BMPs) in Erosion and Sediment Control Plan (ESCP).
• Turfing to stabilise exposed areas.
• Runoff control including earth drain, check dam, temporary berm drain and temporary slope drain to be constructed and well-maintained.
• Erosion control including use of covers, such as plastic sheets, turfing and planting, buffer strips and surface roughening.
• Sediment control includes building the long bund, check dams, silt fence, silt traps and wash trough to be constructed before commencement of the construction phase.
• Monitoring total suspended solid (TSS) and turbidity at discharge points of silt traps.</td><td>$20,000</td><td>• Condition of stockpile area.
• BMPs implemented.
• Water to be sampled monthly at the outlets of silt traps. The parameters to be analysis and its limits are as shown below:<table><tr><th>Parameter</th><th>Limits</th></tr><tr><td>Total Suspended Solid (TSS)</td><td><50 mg/L</td></tr><tr><td>Turbidity</td><td><250 NTU</td></tr></table></td><td>• Daily inspection by Environmental Officer (EO).
• Monthly discharge sampling by Environmental Officer (EO).
• Quarterly inspection by Environmental Monitoring Consultant (EnvMC).</td><td>• Contractor</td></tr>
</table>

<table>
<tr><th>Project Activity</th><th>Potential Significant Environmental Impact</th><th>Mitigation Measures</th><th>Mitigation Cost (USD)</th><th>Sampling Location/ Monitoring Parameters/ Limits</th><th>Monitoring Frequency/ Responsibility</th><th>Mitigation Responsibility</th></tr>
<tr>
<td>• Mobilisation by contractors
• Labour recruitment
• Setting up base camp and site office
• Mobilisation of construction equipment and machinery
• Construction of the jetty
• Land clearing
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• Demolition of remnant squatter houses
• Earthwork and platform formation
• Earthworks, sculpturing and shaping the golf course
• General piling and structural works
• Final finishing and landscape
(Cont'd)</td>
<td><u>Water Quality</u>
• Silt and sediment have been identified as the main pollutants.
• Accidental leaks and spills from new and used oil, fuel and chemical storage sites affect the aquatic resources and groundwater.
• Inadequate waste management could also cause water pollution.</td>
<td><u>Water Pollution</u>
• Implement all mitigation measures proposed for soil erosion.
• Stockpile of fine materials to be sited away from any watercourses and lakes.
• Piling works at proposed jetty to be carried out carefully to minimise sediment plume effect.
• Manage all chemicals, fuel, machine oil and scheduled wastes on-site within proper storage spaces.
• Adequate construction and domestic waste bins to be provided.
• All solid wastes to be disposed off at a designated waste disposal area within the Project site before being taken to a designated landfill.
• Waste segregation to be carried out and clearly labelled.
• Prohibit disposal of waste generated on-site into drains and the lakes.
• Temporary sanitary facilities to be provided at the base camp(s), site office and other strategic locations within the working area(s) and to be de-sludged regularly.
• Kitchens or canteens to be fitted with oil and grease traps with regular maintenance.
• All scheduled wastes to be managed properly e.g. collected in durable containers with proper labels for neutralisation or treatment.
• Conduct regular water quality monitoring.</td>
<td>$30,000</td>
<td><u>Ambient Water Quality (for Tasi Tolu Lakes)</u>
• Water sampling points:
Lake Water Sampling
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>LW1 (Lake C)</td><td>S8.56623° E125.51079°</td></tr>
<tr><td>LW2 (Lake B)</td><td>S8.56587° E125.50720°</td></tr>
<tr><td>LW3 (Lake A)</td><td>S8.56198° E125.49990°</td></tr>
</table>
• As the lake water quality will take some time to stabilise even with rehabilitation measures, it is recommended that the lake water shall be comply with the baseline water quality during construction phase.
• Monitoring parameters/limits (baseline):
<table>
<tr><th rowspan="2">Parameter[i]</th><th colspan="3">Limits (Baseline)[ii]</th></tr>
<tr><th>Lake A (LW3)</th><th>Lake B (LW2)</th><th>Lake C (LW1)</th></tr>
<tr><td>Temperature</td><td>37.0</td><td>37.8</td><td>36.5</td></tr>
<tr><td>Total Suspended Solid (TSS)</td><td>23</td><td>66</td><td>31</td></tr>
<tr><td>Dissolved Oxygen (DO)</td><td>6.3</td><td>4.7</td><td>5.1</td></tr>
<tr><td>pH</td><td>7.99</td><td>8.48</td><td>8.40</td></tr>
<tr><td>Salinity</td><td>35.0</td><td>48.7</td><td>50.2</td></tr>
<tr><td>Conductivity</td><td>41</td><td>51</td><td>54</td></tr>
<tr><td>Oil and Grease (O&G)</td><td>ND (<0.5)</td><td>ND (<0.5)</td><td>ND (<0.5)</td></tr>
<tr><td>Phenol</td><td>ND (<1.0)</td><td>ND (<1.0)</td><td>ND (<1.0)</td></tr>
<tr><td>Faecal Coliform</td><td>Absent</td><td>Absent</td><td>Absent</td></tr>
<tr><td>Mercury (Hg)</td><td>ND (<0.8)</td><td>ND (<0.8)</td><td>ND (<0.8)</td></tr>
<tr><td>Cadmium (Cd)</td><td>ND (<2.0)</td><td>ND (<2.0)</td><td>ND (<2.0)</td></tr>
<tr><td>Chromium (VI) (Cr^{6+})</td><td>ND (<5.0)</td><td>ND (<5.0)</td><td>ND (<5.0)</td></tr>
<tr><td>Copper (Cu)</td><td>24</td><td>28</td><td>12</td></tr>
<tr><td>Arsenic (As)</td><td>ND (<1.0)</td><td>ND (<1.0)</td><td>ND (<1.0)</td></tr>
<tr><td>Lead (Pb)</td><td>ND (<10.0)</td><td>18.7</td><td>ND (<10.0)</td></tr>
<tr><td>Zinc (Zn)</td><td>150</td><td>42</td><td>18</td></tr>
<tr><td>Cyanide (CN)</td><td>ND (<10.0)</td><td>ND (<10.0)</td><td>ND (<10.0)</td></tr>
<tr><td>Ammonia</td><td>64.0</td><td>64.4</td><td>35.5</td></tr>
<tr><td>Nitrite (NO_2^-)</td><td>69.3</td><td>135</td><td>69.7</td></tr>
<tr><td>Nitrate (NO_3^-)</td><td>361</td><td>140</td><td>283</td></tr>
<tr><td>Total Phosphorus</td><td>ND (<90)</td><td>104</td><td>282</td></tr>
<tr><td>Turbidity</td><td colspan="3">-</td></tr>
<tr><td>Phosphate[iii]</td><td colspan="3">75 µg/L</td></tr>
</table>
Note:
(i) Parameters shown in the table above are to be analysed for ambient lake water quality.
(ii) Limits values shown in the table above to be comply with the baseline findings.
(iii) Limits values shown in the table above are adopted from Class 2 of Malaysia Marine Water Quality Criteria and Standards (MWQCS).</td>
<td>• Quarterly monitoring by EnvMC</td>
<td>• Contractor</td>
</tr>
</table>

<table>
<tr><th>Project Activity</th><th>Potential Significant Environmental Impact</th><th>Mitigation Measures</th><th>Mitigation Cost (USD)</th><th>Sampling Location/ Monitoring Parameters/ Limits</th><th>Monitoring Frequency/ Responsibility</th><th>Mitigation Responsibility</th></tr>
<tr>
<td>• Mobilisation by contractors
• Labour recruitment
• Setting up base camp and site office
• Mobilisation of construction equipment and machinery
• Construction of the jetty
• Land clearing
• Biomass removal
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• Earthwork and platform formation
• Earthworks, sculpturing and shaping the golf course
• General piling and structural works
• Final finishing and landscape
(Cont'd)</td>
<td><u>Water Quality</u>
• Silt and sediment have been identified as the main pollutants.
• Accidental leaks and spills from new and used oil, fuel and chemical storage sites affect the aquatic resources and groundwater.
• Inadequate waste management could also cause water pollution.
(Cont'd)</td>
<td><u>Water Pollution</u>
• Implement all mitigation measures proposed for soil erosion.
• Stockpile of fine materials to be sited away from any watercourses and lakes.
• Piling works at proposed jetty to be carried out carefully to minimise sediment plume effect.
• Manage all chemicals, fuel, machine oil and scheduled wastes on-site within proper storage spaces.
• Adequate construction and domestic waste bins to be provided.
• All solid wastes to be disposed off at a designated waste disposal area within the Project site before being taken to a designated landfill.
• Waste segregation to be carried out and clearly labelled.
• Prohibit disposal of waste generated on-site into drains and the lakes.
• Temporary sanitary facilities to be provided at the base camp(s), site office and other strategic locations within the working area(s) and to be de-sludged regularly.
• Kitchens or canteens to be fitted with oil and grease traps with regular maintenance.
• All scheduled wastes to be managed properly e.g. collected in durable containers with proper labels for neutralisation or treatment.
• Conduct regular water quality monitoring.
(Cont'd)</td>
<td>$30,000
(cont'd)</td>
<td><u>Ambient Water Quality (for Coastal)</u>
• Water sampling points:
Coastal Water Sampling
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>SW1</td><td>S8.54759° E125.51584°</td></tr>
<tr><td>SW2</td><td>S8.55638° E125.50647°</td></tr>
</table>
Lake Water Sampling
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>SW3</td><td>S8.55572° E125.48918°</td></tr>
<tr><td>SW4</td><td>S8.55505° E125.49918°</td></tr>
</table>
• Monitoring parameters/limits:
<table>
<tr><th>Parameter[i]</th><th>Limits[ii]</th></tr>
<tr><td>Temperature</td><td>≤2°C increase over maximum ambient</td></tr>
<tr><td>Total Suspended Solid (TSS)[iii]</td><td>50 mg/L (25 mg/L) or ≤10% increase in seasonal average, whichever is lower</td></tr>
<tr><td>Dissolved Oxygen (DO)</td><td>5 mg/L</td></tr>
<tr><td>pH</td><td>-</td></tr>
<tr><td>Salinity</td><td>-</td></tr>
<tr><td>Total phosphorus</td><td>-</td></tr>
<tr><td>Conductivity</td><td>-</td></tr>
<tr><td>Turbidity</td><td>-</td></tr>
<tr><td>Oil and grease (O&G)</td><td>0.14 mg/L</td></tr>
<tr><td>Phosphate</td><td>75 µg/L</td></tr>
<tr><td>Phenol</td><td>10 µg/L</td></tr>
<tr><td>Faecal Coliform[iii]</td><td>100 MPN/100 mL (70 MPN/100 mL)</td></tr>
</table>
<table>
<tr><th>Parameter[i]</th><th>Limits[ii]</th></tr>
<tr><td>Mercury[iii] (Hg)</td><td>0.16 (0.04) µg/L</td></tr>
<tr><td>Cadmium[iii] (Cd)</td><td>2 (3) µg/L</td></tr>
<tr><td>Chromium (VI) (Cr^{6+})</td><td>10 µg/L</td></tr>
<tr><td>Copper (Cu)</td><td>2.9 µg/L</td></tr>
<tr><td>Arsenic[iii] (As)</td><td>20 (3) µg/L</td></tr>
<tr><td>Lead (Pb)</td><td>8.5 µg/L</td></tr>
<tr><td>Zinc (Zn)</td><td>50 µg/L</td></tr>
<tr><td>Cyanide (CN)</td><td>7 µg/L</td></tr>
<tr><td>Ammonia</td><td>70 µg/L</td></tr>
<tr><td>Nitrite (NO_2^-)</td><td>55 µg/L</td></tr>
<tr><td>Nitrate (NO_3^-)</td><td>60 µg/L</td></tr>
</table>
<u>Ambient Water Quality (for Jetty only)</u>
• Water sampling points:
Coastal Water Sampling
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>JW1</td><td>S8.55577° E125.50344°</td></tr>
<tr><td>JW2</td><td>S8.55526° E125.50543°</td></tr>
</table>
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>JW3</td><td>S8.55703° E125.50587°</td></tr>
<tr><td>JW4</td><td>S8.55743° E125.50388°</td></tr>
</table>
• Monitoring parameters/limits:
<table>
<tr><th>Parameter[i]</th><th>Limits[ii]</th></tr>
<tr><td>Total Suspended Solid (TSS)[iii]</td><td>50 mg/L (25 mg/L) or ≤10% increase in seasonal average, whichever is lower</td></tr>
</table>
Note:
(i) Parameters shown in the table above are to be analysed for ambient marine water quality.
(ii) Limits values shown in the table above are adopted from Class 2 of Malaysia Marine Water Quality Criteria and Standards (MWQCS).
(iii) MWQCS value in parenthesis are for coastal and marine water where seafood for human consumption is applicable.</td>
<td>• Quarterly monitoring by EnvMC</td>
<td>• Contractor</td>
</tr>
</table>

<table>
<tr><th>Project Activity</th><th>Potential Significant Environmental Impact</th><th>Mitigation Measures</th><th>Mitigation Cost (USD)</th><th>Sampling Location/ Monitoring Parameters/ Limits</th><th>Monitoring Frequency/ Responsibility</th><th>Mitigation Responsibility</th></tr>
<tr><td rowspan="2">• Mobilisation by contractors
• Labour recruitment
• Setting up base camp and site office
• Mobilisation of construction equipment and machinery
• Construction of the jetty
• Land clearing
• Biomass removal
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• Earthwork and platform formation
• Earthworks, sculpturing and shaping the golf course
• General piling and structural works
• Final finishing and landscape
(Cont'd)</td>
<td><u>Air Quality</u>
• Temporary and localised dust and air pollution from construction activities, transportation, material handling and stockpile materials.
• Minor and offensive odour caused by unsanitary conditions such as dirty toilets and uncollected wastes.</td>
<td><u>Air Pollution</u>
• As the Project area is dry for at least half the year, wet suppression is the best method. These include: water bowsing on untarred roads; having wash troughs at the egress and ingress junctions; and sand stockpile areas.
• For other stockpile areas, to cover the materials on-site with tarpaulin/plastic sheet.
• Immediate turfing of bare soils after site clearing and earthworks.
• Compact the bare and loose soil surfaces immediately after clearing.
• Provision of temporary hoarding or barriers.
• Tree planting and landscaping at the buffer areas to serve as dust screens.
• Proper schedule for solid waste collection to avoid stench production.
• Large scale land clearing for golf course development to be planned properly to reduce dust.
• Practise good standard operating procedures (SOP) such as:
(i) Turn off idle machinery or vehicles to reduce gaseous emissions.
(ii) Carry out regular maintenance and frequent servicing of construction vehicles.
(iii) Cover vehicles transporting earth materials by tarpaulin.
(iv) Transport of earth to be scheduled to non-peak hours.
(v) Spoils spilled on public roads to be immediately cleared.
(vi) Impose speed limit.
(vii) Provision of personal protective equipment (PPE) to the workers.
(viii) Burning of wastes is strictly prohibited.
• Address all public complaints.
• Carry out regular air quality monitoring.</td>
<td>$50,000</td>
<td><u>Ambient Air Quality</u>
• Air quality measurement points:
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>A1</td><td>S8.56014° E125.51417°</td></tr>
<tr><td>A3</td><td>S8.55946° E125.49766°</td></tr>
<tr><td>A5</td><td>S8.56853° E125.51466°</td></tr>
</table>
• Monitoring parameters/limits:
<table>
<tr><th>Parameter[(i)]</th><th>Limits[(ii)]</th></tr>
<tr><td>$PM_{2.5}$</td><td>25 $\mu g/m^3$ over an averaging time of 24 hour (99th percentile)</td></tr>
<tr><td>PM_{10}</td><td>50 $\mu g/m^3$ over an averaging time of 24 hour (99th percentile)</td></tr>
</table>
Note:
(i) Parameters shown in the table above are to be analysed for ambient air quality.
(ii) Limits values shown in the table above are adopted from WHO Air Quality Guidelines for Particulate Matter.</td>
<td>• Quarterly monitoring by EnvMC.</td>
<td>• Contractor</td></tr>
<tr><td><u>Hydrology and Drainage</u>
• Localised ponding may occur because of earthworks and rehabilitation of the lakes.</td>
<td><u>Hydrology</u>
• Provide temporary drainage systems to divert high flows to detention ponds or the lakes when they are yet to be rehabilitated.
• Silt traps and earth drains to be constructed before earthwork commencement.</td>
<td>$10,000</td>
<td>• No sampling required.</td>
<td>• Weekly inspection by Environmental Officer (EO).</td>
<td>• Contractor</td></tr>
</table>

<table>
<tr><th>Project Activity</th><th>Potential Significant Environmental Impact</th><th>Mitigation Measures</th><th>Mitigation Cost (USD)</th><th>Sampling Location/ Monitoring Parameters/ Limits</th><th>Monitoring Frequency/ Responsibility</th><th>Mitigation Responsibility</th></tr>
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<td rowspan="2">• Mobilisation by contractors
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• Demolition of remnant squatter houses
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• Final finishing and landscape
(Cont'd)</td>
<td><u>Noise Level</u>
• Minor noise impact to the nearest tourism sites (i.e. St Paul's Holy House and the Pope Monument) is expected due to use of machinery and traffic.
• Effects of loud noises to the workers carrying out construction activities could be a problem.</td>
<td><u>Noise Level</u>
• Noise is a pulse and goes off immediately once it is sounded. However, as many machinery will be used at different times, the din may affect visitors to the tourism and religious sites. The mitigation measures include:
(i) Phase out development or schedule construction works, (if possible no work on Sundays).
(ii) Erect hoardings and noise reducing barriers along the perimeter of the Project site.
(iii) Retain vegetative buffers around the Project site as natural noise attenuators.
(iv) Confine construction work to day time.
(v) Maintain all vehicles and machinery at optimum operating conditions.
(vi) Provide workers with PPE i.e. ear mufflers and abide by World Health Organisation's (WHO) publication on Occupational Exposure to Noise: Evaluation, Prevention and Control.
(vii) Work in high noise environment to be done in shifts.
(viii) Implement traffic management and traffic control measures
• Address all public complaints.
• Carry out regular noise monitoring.</td>
<td>$100,000</td>
<td><u>Noise Level</u>
• Noise level measurement points:
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>N1</td><td>S8.56014° E125.51417°</td></tr>
<tr><td>N3</td><td>S8.55946° E125.49766°</td></tr>
<tr><td>N5</td><td>S8.56853° E125.51466°</td></tr>
</table>
• Monitoring parameters/limits:
<table>
<tr><th>Parameter[i]</th><th>Limits[ii]</th></tr>
<tr><td>L_{eq}</td><td>outdoor living area environment category with a limit of L_{Aeq} of 55 dB or 50 dB during day and evening with a time base of 16 hours</td></tr>
<tr><td>L_{10}, L_{50}, L_{90}, L_{min}, L_{max}</td><td>-</td></tr>
</table>
Note:
(i) Parameters shown in the table above are to be analysed for noise level.
(ii) Limits values shown in the table above are adopted from WHO Guideline Values for Community Noise in Specific Environments.</td>
<td>• Quarterly monitoring by EnvMC.</td>
<td>• Contractor</td>
</tr>
<tr>
<td><u>Marine Ecology</u>
• Land clearing, earthworks and construction of the floating jetty will cause re-suspension of silt in the seabed and erosion from the beaches that can affect the corals.
• Anchors from shipping vessels could destroy the corals.
• Spilled/leaked oil and chemicals could contaminate the seawater.
• Leaking sewage and sullage may cause algal blooms.
• Disposal of solid waste in the sea may lead to water pollution and death of large sea animals if ingested.
• Collection of corals and marine organisms could cause damage.</td>
<td><u>Marine Ecology</u>
• Implement all mitigation measures proposed for soil erosion, water quality and waste generation.
• Provision of silt traps and silt curtain on land to reduce silt from flowing into the sea.
• Use silt curtains around piling works during jetty construction to help control the spread of re-suspended silt.
• Loading and unloading of materials and equipment to be done with care, so as not to disturb unnecessarily large areas of the beach.
• Materials spilled onto the Rua Terra Santa have to be taken away immediately.
• For shipping vessels, to ensure they dock only at certain areas away from any corals areas.
• Spill kits to be kept on floating jetty.
• Penalties such as fines to be imposed to dissuade workers from littering.
• Workers are prohibited from fishing and hunting at the nearshore waters.</td>
<td>$50,000</td>
<td><u>Marine Ecology</u>
• Marine ecology monitoring points:
Coral Reef Sampling
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>T1</td><td>S 8.55743° E 125.50452°</td></tr>
<tr><td>T2</td><td>S 8.55678° E 125.50447°</td></tr>
<tr><td>T3</td><td>S 8.55722° E 125.50043°</td></tr>
<tr><td>T4</td><td>S 8.55588° E 125.50070°</td></tr>
<tr><td>T5</td><td>S 8.55450° E 125.48945°</td></tr>
<tr><td>T6</td><td>S 8.55477° E 125.48993°</td></tr>
<tr><td>T7</td><td>S 8.55547° E 125.49722°</td></tr>
<tr><td>T8</td><td>S 8.55527° E 125.49807°</td></tr>
</table>
Phytoplankton and Zooplankton
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>B1</td><td>S8.54759° E125.51584°</td></tr>
<tr><td>B2</td><td>S8.55638° E125.50647°</td></tr>
<tr><td>B3</td><td>S8.55572° E125.48918°</td></tr>
</table>
• No specific compliance limits/standard for the marine ecology monitoring. The monitored marine components will be compared to the baseline findings.
• The analysis or observation to be conducted for marine ecology during monitoring are:
<table>
<tr><th>Marine Component</th><th>Analysis/Observation[i]</th></tr>
<tr><td>Phytoplankton and Zooplankton</td><td>• Density.
• Species Diversity.</td></tr>
<tr><td>Coral Reef</td><td>• Percentage cover of live corals, dead coral, rock, sand and rubble.
• Observation on coral bleaching, broken or damaged corals.</td></tr>
</table></td>
<td>• Half yearly monitoring by EnvMC.</td>
<td>• Contractor</td>
</tr>
</table>

Project Activity	Potential Significant Environmental Impact	Mitigation Measures	Mitigation Cost (USD)	Sampling Location/ Monitoring Parameters/ Limits	Monitoring Frequency/ Responsibility	Mitigation Responsibility
• Mobilisation by contractors • Labour recruitment • Setting up base camp and site office • Mobilisation of construction equipment and machinery • Construction of the jetty • Land clearing • Biomass removal • Demolition of remnant squatter houses • Earthwork and platform formation • Earthworks, sculpturing and shaping the golf course • General piling and structural works • Final finishing and landscape (Cont'd)	<u>**Terrestrial Ecology**</u> • Although the terrestrial habitat is not rich with low numbers of wildlife, nevertheless, removal of scrub vegetation will cause some disruptions to the wildlife that is still there. • Destruction of existing habitat with removal of plants and food sources. • Disturbance caused by construction noise. • Poaching and human-wildlife conflicts.	<u>**Terrestrial Ecology**</u> • Any major wildlife displaced or encountered shall be recorded and immediately contact the relevant authority to relocate them to safe areas. • The hills at the background will be reforested. • Replant native vegetation around the Project site. • Provide hoardings wherever necessary. • Signages and posters placed at the worker camps to inform workers not to harass the animals.	$500,000	• No sampling required. • Limits in terms of biodiversity management are not provided as no limits were seen in the following laws and regulation, however compliance will be based on it: (i) UNTAET Regulation 2000/19 on Protected Places. (ii) Decree Law No. 26/2012 Environmental Basic Law, Article 27. (iii) UNTAET Regulation 2000/17 on the Prohibition of Logging Operations and the Export of Wood from East Timor. (iv) Draft Decree Law on Biodiversity dated March 2012. (v) Draft Decree Law on Forest Management, Draft 6. (vi) National Biodiversity Strategy and Action Plan (2011 – 2012). (vii) Forestry Sector Policy Goal Objective and Strategy.	• Half yearly inspection by EnvMC.	• Contractor
	<u>**Lake Ecology**</u> • Excavated materials from Lakes A and C may contain heavy metals. • Lake rehabilitation will improve the aesthetic value of the Project area.	<u>**Lake Ecology**</u> • Implement all mitigation measures proposed for soil erosion and water quality • Re-stocking the lakes with appropriate organisms and fish to restore the ecological balance.	-	• No sampling required, already covered under ambient water quality. • Limits in terms of lake management are not provided as no limits were seen in the following laws and regulation (however compliance will be based on it): (i) UNTAET Regulation 2000/19 on Protected Places. (ii) Decree Law No. 26/2012 Environmental Basic Law, Article 27. (iii) Draft Decree Law on Biodiversity dated March 2012. (iv) National Biodiversity Strategy and Action Plan (2011 – 2012).	• Half yearly inspection by EnvMC.	• Contractor
	<u>**Infrastructure and Utilities**</u> • Road damage and congestion due to heavy equipment, construction materials transport. • Increase demand for electricity and potable water.	<u>**Infrastructure and Utilities**</u> • Repair damaged roads immediately. • Place proper signage to inform other road users of construction occurring ahead. • Regular road cleaning of spilled dirt to be carried out at the roads. • Impose maximum load limit.	$10,000	• No sampling required.	• Monthly inspection by Environmental Officer (EO).	• Contractor • PP
	<u>**Landuse**</u> • Increased pressures on existing infrastructure and services especially at the northeast quadrant (NEQ) of Zone of Impact (ZOI). • Possible difficulties of access to religious, recreational or residential houses, will cause distress.	<u>**Landuse**</u> • Ensure good traffic management at all times. • Rapid response to mishaps, accidents, damage to property and even road rage. • Provide alternative transport routes if needed. • Provision of alternative ingress/egress for scheduled entry to religious, recreational and residential houses.	$5,000	• No sampling required.	• Monthly inspection by Environmental Officer (EO).	• Contractor • PP

Project Activity	Potential Significant Environmental Impact	Mitigation Measures	Mitigation Cost (USD)	Sampling Location/ Monitoring Parameters/ Limits	Monitoring Frequency/ Responsibility	Mitigation Responsibility
• Mobilisation by contractors • Labour recruitment • Setting up base camp and site office • Mobilisation of construction equipment and machinery • Construction of the jetty	<u>**Tourism**</u> • Disruptions to tourist areas.	<u>**Tourism**</u> • Provision of alternative entries into the religious and tourist sites if needed (e.g. St Paul's Holy House and the Pope Monument) because of heavier traffic flow causing congestions. • Provide areas for sea vessels to anchor and berth away from dive spots, and areas of active works for the jetty. • Signages, sea buoys, routing and markers for construction vessels to be provided. • Implement BMPs for air, noise, ecology and land and sea traffic to reduce the general impact on the land and marine environmental quality, so as not to disrupt the tourists using the beach and dive areas.	$5,000	• No sampling required.	• Monthly inspection by Environmental Officer (EO).	• Contractor • PP
• Land clearing • Biomass removal • Demolition of remnant squatter houses • Earthwork and platform formation • Earthworks, sculpturing and shaping the golf course • General piling and structural works • Final finishing and landscape (Cont'd)	<u>**Traffic**</u> • Occasional traffic congestion. • Higher risk of traffic accidents.	<u>**Traffic**</u> • Plan, schedule and control trips of road loaders, tractors, etc. to avoid peak road hours. • Positioning flagmen at suitable locations to indicate traffic diversion, if any. • Minimum of two flagmen at suitable locations or temporary traffic lights to be installed to control traffic movement.	$1,000	• No sampling required.	• Monthly inspection by Environmental Officer (EO).	• Contractor

<table>
<tr><th>Project Activity</th><th>Potential Significant Environmental Impact</th><th>Mitigation Measures</th><th>Mitigation Cost (USD)</th><th>Sampling Location/ Monitoring Parameters/ Limits</th><th>Monitoring Frequency/ Responsibility</th><th>Mitigation Responsibility</th></tr>
<tr>
<td>• Mobilisation by contractors
• Labour recruitment
• Setting up base camp and site office
• Mobilisation of construction equipment and machinery
• Construction of the jetty
• Land clearing
• Biomass removal
• Demolition of remnant squatter houses
• Earthwork and platform formation
• Earthworks, sculpturing and shaping the golf course
• General piling and structural works
• Final finishing and landscape
(Cont'd)</td>
<td><u>Waste Generation</u>
Biomass
• Left to decompose naturally but not in contact with water, which will cause leaching of organic compounds.
Spoils from the Site
• Exposed spoils may result in windblown dust.
• Spoil materials may contain heavy metals and nutrients. They have to be tested before used as refined fills.
Construction and Demolition (C&D) Wastes
• Rusted steel and decomposed wood may contaminate runoff.
• They are also hazards in working areas, and have to be disposed off properly.
Scheduled/Hazardous Wastes
• Water pollution may occur if discharged directly into water bodies.
• Workers may be exposed via direct contact due to improper handling or storage.
Municipal Solid Wastes
• Improper management of wastes may lead to water pollution, odour and public health impacts.
• Uncollected solid waste may attract pest/scavengers.
• Open burning may trigger air pollution and health problems.
Sewage
• Untreated sewage may contaminate runoff and water bodies.
• Faecal coliform contained in sewage may spread water-borne diseases to humans.</td>
<td><u>Waste Generation</u>
Biomass
• Generally sold if there is commercial value.
• Unsold biomass to be stored on-site at designated stockpile areas to decompose naturally.
• Burning of biomass is prohibited.
Spoils
• Excess spoils to be used for landscaping and reforestation works.
Construction and Demolition (C&D) Wastes
• All C&D wastes to be segregated and stored at designated temporary storage area(s) on-site.
Scheduled/Hazardous Wastes
• Disposal of scheduled/hazardous wastes into water bodies is strictly prohibited.
• Scheduled/hazardous wastes to be stored in containers which are compatible, durable and able to prevent spillage and leakage.
• The storage area to be built away from water bodies.
• Scheduled/hazardous waste containers to be clearly labelled with date generation, contact details of waste generator and waste characteristics.
• Bunded storage area containing scheduled/hazardous wastes to be designed, constructed and maintained adequately to prevent spillage or leakage and to be sheltered or roofed or covered with suitable material.
• Scheduled/hazardous waste management to be carried out by trained personnel.
• An accurate and up-to-date inventory of scheduled/hazardous wastes to be prepared and kept for a period of three years.
• The hazardous wastes to be disposed off at a secured landfill or facility approved by the local government.
• PPE to be provided for the personnel handling the hazardous wastes.
• Emergency spill kits to be provided on-site to facilitate clean-up. Contaminated materials to be treated as hazardous wastes.
Municipal Solid Waste
• Adequate bins to be provided at strategic locations in Project site.
• Waste to be disposed off at the Tibar Landfill.
• Regular housekeeping at workers quarters and construction site.
• Prohibition of open burning of solid waste.
Sewage
• Provision of temporary sanitary facilities at strategic locations within working area(s).
• Regular desludging and maintenance of sanitary facilities.</td>
<td>$20,000</td>
<td>• No sampling required. However, site inspection will be conducted:
<table>
<tr><th>Component</th><th>Observation</th><th>Inspection Location</th><th>Compliance</th></tr>
<tr><td>Solid Waste Management</td><td>• General cleanliness.
• Number of bins provided and adequacy.</td><td>• At base camp, site office and active work areas.</td><td>Decree Law No.26/2012 Environmental Basic Law Article 39.</td></tr>
<tr><td>Biomass and Spoil Management</td><td>• Condition of stockpile area(s).
• BMPs implemented.</td><td>• At designated stockpile areas.</td><td>-</td></tr>
<tr><td>Hazardous/ Scheduled Waste Management</td><td>• Waste disposal at designated scheduled waste disposal area.
• Visual inspection of storage condition.
• Signs of oil spill.</td><td>• At storage areas for scheduled wastes.
• At active work areas.</td><td>Decree Law No. 26/2012 Environmental Basic Law, Article 42.</td></tr>
<tr><td>Sanitation Facilities</td><td>• Adequacy of toilet facilities.
• Treatment system installed with effluent discharge limits:
(i) Biochemical Oxygen Demand (BOD): 50 mg/L
(ii) TSS: 100 mg/L</td><td>• At the base camp and site office.</td><td>• Decree Law No. 26/2012 Environmental Basic Law, Article 41.
• Malaysian Sewerage Industry Guidelines.</td></tr>
</table></td>
<td>• Daily inspection by EO
• Quarterly inspection by EnvMC</td>
<td>• Contractor</td>
</tr>
</table>

Table 1.9.3: Summary of Potential Significant Environmental Impacts and Mitigation Measures during Operational Phase

<table>
<tr><th>Project Activity</th><th>Potential Significant Environmental Impact</th><th>Mitigation Measures</th><th>Mitigation Cost (USD)</th><th>Sampling Location/ Monitoring Parameters/ Limits</th><th>Monitoring Frequency/ Responsibility</th><th>Mitigation Responsibility</th></tr>
<tr>
<td>• Project operations
• Maintenance of the golf course and landscape features
• Maintenance of lakes
• Maintenance of infrastructure, utilities and facilities</td>
<td><u>Water Pollution</u>
Integrated Mixed Development
• Wastewater from operational activities will be the main source of water pollution.
• Brine from desalination plant may impact the sea organisms.
Golf Course Development
• Fertiliser and pesticide runoff in large amounts could leach and cause eutrophication of the lakes.
Hospital Development
• Hospital wastewater discharge without treatment will be a main concern as it contains antibiotic-resistant bacteria (ARB).
• Discharging harmful chemicals (i.e. x-ray contrast agents, disinfectants, etc.) will impact the aquatic ecosystem adversely.</td>
<td><u>Water Pollution</u>
Integrated Mixed Development
• Regular maintenance and inspection of all piping and wastewater treatment systems.
• Monitoring of sewage treatment plants' (STPs') effluent quality and performance.
Golf Course Development
• Implement pest management.
• Proper selection and use of chemicals with low leaching potential index and without organochlorines.
• Limit applications of fertilisers and pesticides and to ensure there is no direct release into water bodies.
• Record periods of fertilising, pest and weed control activities.
• Training given to employees on fertiliser and pesticide applications.
• Proper storage and management of pesticides and fertilisers.
• Provide only enough irrigation water to a depth just below the root system to minimise leaching.
• Select suitable turf grass to minimise application of fertilisers, pesticides and water.
• Use of weed-free plants.
• Conduct groundwater and surface water quality monitoring.
Hospital Development
• Conduct regular maintenance and inspection of hospital wastewater storage and piping system.
• Provision of a hospital wastewater treatment plant, if necessary.
• Provision of an on-site incinerator for clinical wastes.</td>
<td>$20,000</td>
<td><u>Ambient Water Quality (for Tasi Tolu Lakes)</u>
• Water sampling points:
Lake Water Sampling
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>LW1 (Lake C)</td><td>S8.56623° E125.51079°</td></tr>
<tr><td>LW2 (Lake B)</td><td>S8.56587° E125.50720°</td></tr>
<tr><td>LW3 (Lake A)</td><td>S8.56198° E125.49990°</td></tr>
</table>
• As the lake water quality will take some time to stabilise even with rehabilitation measures, it is recommended that the lake water shall be complied with the baseline water quality during the first three years of operational phase.

• Monitoring parameters/limits (baseline):
<table>
<tr><th rowspan="2">Parameter[i]</th><th colspan="3">Limits (Baseline)[ii]</th></tr>
<tr><th>Lake A (LW3)</th><th>Lake B (LW2)</th><th>Lake C (LW1)</th></tr>
<tr><td>Temperature</td><td>37.0</td><td>37.8</td><td>36.5</td></tr>
<tr><td>Total Suspended Solid (TSS)</td><td>23</td><td>66</td><td>31</td></tr>
<tr><td>Dissolved Oxygen (DO)</td><td>6.3</td><td>4.7</td><td>5.1</td></tr>
<tr><td>pH</td><td>7.99</td><td>8.48</td><td>8.40</td></tr>
<tr><td>Salinity</td><td>35.0</td><td>48.7</td><td>50.2</td></tr>
<tr><td>Conductivity</td><td>41</td><td>51</td><td>54</td></tr>
<tr><td>Oil and Grease (O&G)</td><td>ND (<0.5)</td><td>ND (<0.5)</td><td>ND (<0.5)</td></tr>
<tr><td>Phenol</td><td>ND (<1.0)</td><td>ND (<1.0)</td><td>ND (<1.0)</td></tr>
<tr><td>Faecal Coliform</td><td>Absent</td><td>Absent</td><td>Absent</td></tr>
<tr><td>Mercury (Hg)</td><td>ND (<0.8)</td><td>ND (<0.8)</td><td>ND (<0.8)</td></tr>
<tr><td>Cadmium (Cd)</td><td>ND (<2.0)</td><td>ND (<2.0)</td><td>ND (<2.0)</td></tr>
<tr><td>Chromium (VI) (Cr^{6+})</td><td>ND (<5.0)</td><td>ND (<5.0)</td><td>ND (<5.0)</td></tr>
<tr><td>Copper (Cu)</td><td>24</td><td>28</td><td>12</td></tr>
<tr><td>Arsenic (As)</td><td>ND (<1.0)</td><td>ND (<1.0)</td><td>ND (<1.0)</td></tr>
<tr><td>Lead (Pb)</td><td>ND (<10.0)</td><td>18.7</td><td>ND (<10.0)</td></tr>
<tr><td>Zinc (Zn)</td><td>150</td><td>42</td><td>18</td></tr>
<tr><td>Cyanide (CN)</td><td>ND (<10.0)</td><td>ND (<10.0)</td><td>ND (<10.0)</td></tr>
<tr><td>Ammonia</td><td>64.0</td><td>64.4</td><td>35.5</td></tr>
<tr><td>Nitrite (NO_2^-)</td><td>69.3</td><td>135</td><td>69.7</td></tr>
<tr><td>Nitrate (NO_3^-)</td><td>361</td><td>140</td><td>283</td></tr>
<tr><td>Total Phosphorus</td><td>ND (<90)</td><td>104</td><td>282</td></tr>
<tr><td>Turbidity</td><td colspan="3">-</td></tr>
<tr><td>Phosphate[iii]</td><td colspan="3">75 µg/L</td></tr>
</table>
Note:
(i) Parameters shown in the table above are to be analysed for ambient lake water quality.
(ii) Limits values shown in the table above to be comply with the baseline findings.
(iii) Limits values shown in the table above are adopted from Class 2 of Malaysia Marine Water Quality Criteria and Standards (MWQCS).</td>
<td>• Quarterly monitoring by EnvMC for one year only for the indemnity period</td>
<td>• PP</td>
</tr>
</table>

<table>
<tr><th>Project Activity</th><th>Potential Significant Environmental Impact</th><th>Mitigation Measures</th><th>Mitigation Cost (USD)</th><th>Sampling Location/ Monitoring Parameters/ Limits</th><th>Monitoring Frequency/ Responsibility</th><th>Mitigation Responsibility</th></tr>
<tr>
<td>• Project operations
• Maintenance of the golf course and landscape features
• Maintenance of lakes
• Maintenance of infrastructure, utilities and facilities
(Cont'd)</td>
<td><u>Water Pollution</u>
Integrated Mixed Development
• Wastewater from operational activities will be the main source of water pollution.
• Brine from desalination plant may impact the sea organisms.
Golf Course Development
• Fertiliser and pesticide runoff in large amounts could leach and cause eutrophication of the lakes.
Hospital Development
• Hospital wastewater discharge without treatment will be a main concern as it contains antibiotic-resistant bacteria (ARB).
• Discharging harmful chemicals (i.e. x-ray contrast agents, disinfectants, etc.) will impact the aquatic ecosystem adversely.
(Cont'd)</td>
<td><u>Water Pollution</u>
Integrated Mixed Development
• Regular maintenance and inspection of all piping and wastewater treatment systems.
• Monitoring of sewage treatment plants' (STPs') effluent quality and performance.
Golf Course Development
• Implement pest management.
• Proper selection and use of chemicals with low leaching potential index and without organochlorines.
• Limit applications of fertilisers and pesticides and to ensure there is no direct release into water bodies.
• Record periods of fertilising, pest and weed control activities.
• Training given to employees on fertiliser and pesticide applications.
• Proper storage and management of pesticides and fertilisers.
• Provide only enough irrigation water to a depth just below the root system to minimise leaching.
• Select suitable turf grass to minimise application of fertilisers, pesticides and water.
• Use of weed-free plants.
• Conduct groundwater and surface water quality monitoring.
Hospital Development
• Conduct regular maintenance and inspection of hospital wastewater storage and piping system.
• Provision of a hospital wastewater treatment plant, if necessary.
• Provision of an on-site incinerator for clinical wastes.
(Cont'd)</td>
<td>(Cont'd)</td>
<td><u>Ambient Water Quality (for Coastal)</u>
• Water sampling points:
Coastal Water Sampling
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>SW1</td><td>S8.54759° E125.51584°</td></tr>
<tr><td>SW2</td><td>S8.55638° E125.50647°</td></tr>
</table>
Lake Water Sampling
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>SW3</td><td>S8.55572° E125.48918°</td></tr>
<tr><td>SW4</td><td>S8.55505° E125.49918°</td></tr>
</table>
• Monitoring parameters/limits:
<table>
<tr><th>Parameter(i)</th><th>Limits(ii)</th></tr>
<tr><td>Temperature</td><td>≤2°C increase over maximum ambient</td></tr>
<tr><td>Total Suspended Solid (TSS)(iii)</td><td>50 mg/L (25 mg/L) or ≤10% increase in seasonal average, whichever is lower</td></tr>
<tr><td>Dissolved Oxygen (DO)</td><td>5 mg/L</td></tr>
<tr><td>pH</td><td>-</td></tr>
<tr><td>Salinity</td><td>-</td></tr>
<tr><td>Total phosphorus</td><td>-</td></tr>
<tr><td>Conductivity</td><td>-</td></tr>
<tr><td>Turbidity</td><td>-</td></tr>
<tr><td>Oil and grease (O&G)</td><td>0.14 mg/L</td></tr>
<tr><td>Phosphate</td><td>75 µg/L</td></tr>
<tr><td>Phenol</td><td>10 µg/L</td></tr>
<tr><td>Faecal Coliform(iii)</td><td>100 MPN/100 mL (70 MPN/100 mL)</td></tr>
</table>
<table>
<tr><th>Parameter(i)</th><th>Limits(ii)</th></tr>
<tr><td>Mercury(iii) (Hg)</td><td>0.16 (0.04) µg/L</td></tr>
<tr><td>Cadmium(iii) (Cd)</td><td>2 (3) µg/L</td></tr>
<tr><td>Chromium (VI) (Cr^{6+})</td><td>10 µg/L</td></tr>
<tr><td>Copper (Cu)</td><td>2.9 µg/L</td></tr>
<tr><td>Arsenic(iii) (As)</td><td>20 (3) µg/L</td></tr>
<tr><td>Lead (Pb)</td><td>8.5 µg/L</td></tr>
<tr><td>Zinc (Zn)</td><td>50 µg/L</td></tr>
<tr><td>Cyanide (CN)</td><td>7 µg/L</td></tr>
<tr><td>Ammonia</td><td>70 µg/L</td></tr>
<tr><td>Nitrite (NO_2^-)</td><td>55 µg/L</td></tr>
<tr><td>Nitrate (NO_3^-)</td><td>60 µg/L</td></tr>
</table>
Note:
(i) Parameters shown in the table above are to be analysed for ambient marine water quality.
(ii) Limits values shown in the table above are adopted from Class 2 of Malaysia Marine Water Quality Criteria and Standards (MWQCS).
(iii) MWQCS value in parenthesis are for coastal and marine water where seafood for human consumption is applicable.</td>
<td>• Quarterly monitoring by EnvMC for one year only for the indemnity period</td>
<td>• PP</td>
</tr>
</table>

<table>
<tr><th>Project Activity</th><th>Potential Significant Environmental Impact</th><th>Mitigation Measures</th><th>Mitigation Cost (USD)</th><th>Sampling Location/ Monitoring Parameters/ Limits</th><th>Monitoring Frequency/ Responsibility</th><th>Mitigation Responsibility</th></tr>
<tr>
<td rowspan="3">• Project operations
• Maintenance of the golf course and landscape features
• Maintenance of lakes
• Maintenance of infrastructure, utilities and facilities
(Cont'd)</td>
<td><u>Water Pollution</u>
Integrated Mixed Development
• Wastewater from operational activities will be the main source of water pollution.
• Brine from desalination plant may impact the sea organisms.
Golf Course Development
• Fertiliser and pesticide runoff in large amounts could leach and cause eutrophication of the lakes.
Hospital Development
• Hospital wastewater discharge without treatment will be a main concern as it contains antibiotic-resistant bacteria (ARB).
• Discharging harmful chemicals (i.e. x-ray contrast agents, disinfectants, etc.) will impact the aquatic ecosystem adversely.
(cont'd)</td>
<td><u>Water Pollution</u>
Integrated Mixed Development
• Regular maintenance and inspection of all piping and wastewater treatment systems.
• Monitoring of sewage treatment plants' (STPs') effluent quality and performance.
Golf Course Development
• Implement pest management.
• Proper selection and use of chemicals with low leaching potential index and without organochlorines.
• Limit applications of fertilisers and pesticides and to ensure there is no direct release into water bodies.
• Record periods of fertilising, pest and weed control activities.
• Training given to employees on fertiliser and pesticide applications.
• Proper storage and management of pesticides and fertilisers.
• Provide only enough irrigation water to a depth just below the root system to minimise leaching.
• Select suitable turf grass to minimise application of fertilisers, pesticides and water.
• Use of weed-free plants.
• Conduct groundwater and surface water quality monitoring.
Hospital Development
• Conduct regular maintenance and inspection of hospital wastewater storage and piping system.
• Provision of a hospital wastewater treatment plant, if necessary.
• Provision of an on-site incinerator for clinical wastes.</td>
<td>(Cont'd)</td>
<td><u>Groundwater Quality</u>
• Groundwater Water sampling points:
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>GW1</td><td>S8.55891° E125.50387°</td></tr>
<tr><td>GW2</td><td>S8.55854° E125.49889°</td></tr>
</table>
• Monitoring parameters/limits:
<table>
<tr><th>Parameter[i]</th><th>Limits</th></tr>
<tr><td>Enterococcus[ii]</td><td>0 Number/100 mL</td></tr>
<tr><td>Arsenic[iii] (As)</td><td>10 µg/L</td></tr>
<tr><td>Copper[iii] (Cu)</td><td>2.0 µg/L</td></tr>
<tr><td>Cadmium[iii] (Cd)</td><td>5.0 µg/L</td></tr>
<tr><td>Lead[iii] (Pb)</td><td>Up to 25 µg/L</td></tr>
<tr><td>Chromium[iii] (Cr)</td><td>50 µg/L</td></tr>
<tr><td>Mercury[iii] (Hg)</td><td>1.0 µg/L</td></tr>
<tr><td>Nitrate[iii] (NO_3^-)</td><td>50 µg/L</td></tr>
<tr><td>Total Pesticide[iii]</td><td>0.50 µg/L</td></tr>
</table>
<table>
<tr><th>Parameter[i]</th><th>Limits</th></tr>
<tr><td>Selenium[iii] (Se)</td><td>10 µg/L</td></tr>
<tr><td>Sulphate[iv]</td><td>250 mg/L</td></tr>
<tr><td>Total Coliform[iv]</td><td>0 MPN/100 mL</td></tr>
<tr><td>Manganese[iv] (Mn)</td><td>0.1 mg/L</td></tr>
<tr><td>Zinc[iv] (Zn)</td><td>3 mg/L</td></tr>
<tr><td>Iron[iv] (Fe)</td><td>0.3 mg/L</td></tr>
<tr><td>Conductivity[iv]</td><td>-</td></tr>
<tr><td>Chloride[iv]</td><td>250 mg/L</td></tr>
</table>
Note:
(i) Parameters shown in the table above are to be analysed for groundwater quality.
(ii) Sourced from Attachment I, Part A1, Microbiological Parameters of the Decree-Law No.5/2009, Licensing Regulations, Sale and Quality of Drinking Water.
(iii) Sourced from Attachment I, Part B2. Chemical Parameters of the Decree-Law No.5/2009, Licensing Regulations, Sale and Quality of Drinking Water.
(iv) Malaysia Environmental Quality Report (EQR) 2015, DOE, 2015.</td>
<td>• Quarterly monitoring by EnvMC for one year only for the indemnity period</td>
<td>• PP</td>
</tr>
<tr>
<td><u>Air Pollution</u>
Integrated Mixed Development
• Increased number of vehicles will produce more gaseous emissions.
• Sewage treatment plant (STP) failure may cause odours.
Hospital Development
• Proper disposal of clinical wastes needed.</td>
<td><u>Air Pollution</u>
Integrated Mixed Development
• Maintain green buffer areas between the residential areas as natural air filters.
• Implement traffic control.
• Ensure frequent monitoring of STPs to prevent odours.
• Ensure good solid waste management and housekeeping practices at all times.
Hospital Development
• Proper management of clinical waste.</td>
<td>$10,000</td>
<td>• No sampling required.</td>
<td>• Quarterly inspection by PP for one year only for the indemnity period</td>
<td>• PP</td>
</tr>
<tr>
<td><u>Noise Level</u>
• Increased noise from traffic and tourist activities.</td>
<td><u>Noise Level</u>
• Impose speed limits to all vehicles to/from the Project site.
• Implement traffic control.
• PP to keep a complaints log book and take action immediately.</td>
<td>$5,000</td>
<td>• No sampling required.</td>
<td>• Quarterly inspection by PP for one year only for the indemnity period</td>
<td>• PP</td>
</tr>
</table>

<table>
<tr><th>Project Activity</th><th>Potential Significant Environmental Impact</th><th>Mitigation Measures</th><th>Mitigation Cost (USD)</th><th>Sampling Location/ Monitoring Parameters/ Limits</th><th>Monitoring Frequency/ Responsibility</th><th>Mitigation Responsibility</th></tr>
<tr>
<td rowspan="2">• Project operations
• Maintenance of the golf course and landscape features
• Maintenance of lakes
• Maintenance of infrastructure, utilities and facilities
(cont'd)</td>
<td><u>Marine Ecology</u>
Integrated Mixed Development
• Sewage contamination may have detrimental effects on the coral reefs.
• Microalgal blooms in the sea may affect marine and human lives.
• Hypersaline water from the desalination plant may affect corals and disrupt the osmotic balance of marine flora and fauna, if the discharge pipeline is too short for proper mixing with seawater.
Golf Course Development
• Usage of fertilisers and pesticides may pollute groundwater and lake water.
Hospital Development
• Toxic chemicals and clinical wastes may poison marine flora and fauna if leaked to the sea.</td>
<td><u>Marine Ecology</u>
Integrated Mixed Development
• Regularly maintain and inspect the STPs to prevent leakages and functional failures.
• Brine to be discharged at a location far from coral reefs.
• Regular marine ecology monitoring.
Golf Course Development
• Implement integrated pest management measures, similar to the construction phase.
• Minimise use of fertilisers, pesticides and water.
Hospital Development
• Toxic chemicals to be treated in a designated wastewater treatment plant.
• Clinical solid wastes to have pre-treatment.</td>
<td>$5,000</td>
<td><u>Marine Ecology</u>
• Marine ecology monitoring points:
Coral Reef Sampling
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>T1</td><td>S 8.55743° E 125.50452°</td></tr>
<tr><td>T2</td><td>S 8.55678° E 125.50447°</td></tr>
<tr><td>T3</td><td>S 8.55722° E 125.50043°</td></tr>
<tr><td>T4</td><td>S 8.55588° E 125.50070°</td></tr>
<tr><td>T5</td><td>S 8.55450° E 125.48945°</td></tr>
<tr><td>T6</td><td>S 8.55477° E 125.48993°</td></tr>
<tr><td>T7</td><td>S 8.55547° E 125.49722°</td></tr>
<tr><td>T8</td><td>S 8.55527° E 125.49807°</td></tr>
</table>
Phytoplankton and Zooplankton
<table>
<tr><th>Points</th><th>Coordinates</th></tr>
<tr><td>B1</td><td>S8.54759° E125.51584°</td></tr>
<tr><td>B2</td><td>S8.55638° E125.50647°</td></tr>
<tr><td>B3</td><td>S8.55572° E125.48918°</td></tr>
</table>
• The analysis or observation to be conducted for marine ecology during monitoring are:
<table>
<tr><th>Marine Component</th><th>Analysis/Observation[i]</th></tr>
<tr><td>Phytoplankton and Zooplankton</td><td>• Density.
• Species Diversity.</td></tr>
<tr><td>Coral Reef</td><td>• Percentage cover of live corals, dead coral, rock, sand and rubble.
• Observation on coral bleaching, broken or damaged corals.</td></tr>
</table>
• Limits in terms of biodiversity management are not provided as no limits were seen in the following laws and regulation (however compliance will be based on it):
(i) UNTAET Regulation 2000/17 on the Prohibition of Logging Operations and the Export of Wood from East Timor.
(ii) Draft Decree Law on Biodiversity dated March 2012.
(iii) Draft Decree Law on Forest Management, Draft 6.
(iv) National Biodiversity Strategy and Action Plan (2011 – 2012).</td>
<td>• Half yearly monitoring by EnvMC for one year only for the indemnity period</td>
<td>• PP</td>
</tr>
<tr>
<td><u>Terrestrial Ecology</u>
Integrated Mixed Development
• Human-wildlife conflicts.
• Lights at night throughout the development may disturb nocturnal wildlife.
Golf Course Development
• Chemical pollution from fertilisers and pesticides usage may contaminate groundwater and lake water.</td>
<td><u>Terrestrial Ecology</u>
Integrated Mixed Development
• Signboards to be placed to warn and/or inform visitor on the existence of wildlife.
• Hunting, poaching and disturbing local wildlife are prohibited.
• Reforestation of hillslopes.
Golf Course Development
• Oversee turf maintenance and management such as mowing, soil aeration, topdressing with sand, and dethatching of the turf root zone.</td>
<td>$10,000</td>
<td>• No sampling required.
• Limits in terms of biodiversity management are not provided as no limits were seen in the following laws and regulation (however compliance will be based on it):
(i) UNTAET Regulation 2000/17 on the Prohibition of Logging Operations and the Export of Wood from East Timor.
(ii) Draft Decree Law on Biodiversity dated March 2012.
(iii) Draft Decree Law on Forest Management, Draft 6.
(iv) National Biodiversity Strategy and Action Plan (2011 – 2012).</td>
<td>• Half yearly inspection by EnvMC for one year only for the indemnity period</td>
<td>• PP</td>
</tr>
</table>

Project Activity	Potential Significant Environmental Impact	Mitigation Measures	Mitigation Cost (USD)	Sampling Location/ Monitoring Parameters/ Limits	Monitoring Frequency/ Responsibility	Mitigation Responsibility
• Project operations • Maintenance of the golf course and landscape features • Maintenance of lakes • Maintenance of infrastructure, utilities and facilities (cont'd)	**Lake Ecology** • Water pollutants from partially treated effluent, pesticides and fertilisers may be harmful to aquatic organisms in the lakes causing eutrophication.	**Lake Ecology** • Maintain the efficient functions of the mechanical aeration system to aid water circulation and oxygenation. • Implement mitigation measures and BMPs for water quality.	$5,000	• No sampling required. • Limits in terms of biodiversity management are not provided as no limits were seen in the following laws and regulation (however compliance will be based on it): (i) UNTAET Regulation 2000/17 on the Prohibition of Logging Operations and the Export of Wood from East Timor. (ii) Draft Decree Law on Biodiversity dated March 2012. (iii) Draft Decree Law on Forest Management, Draft 6. (iv) National Biodiversity Strategy and Action Plan (2011 – 2012).	• Half yearly inspection by EnvMC for one year only for the indemnity period	• PP • Golf Course Superintendent
	Infrastructure and Utilities **Integrated Mixed Development** • Increased traffic. • Demand for electricity and water may increase during operations of the Project. • Municipal waste will be disposed off at Tibar Landfill. **Golf Course Development** • Need for golf course irrigation water. **Hospital Development:** • Clinical wastes need to be incinerated and the ash disposed off to Tibar Landfill.	**Infrastructure and Utilities** **Integrated Mixed Development** • Maintain STPs for efficient treatment of sewage and sullage. • Upgrade the internal permanent road network wherever necessary. • Provisions of waste disposal bins. • Proper collection and disposal of residual oil and grease. **Golf Course Development** • Composting of green waste. **Hospital Development** • Proper disposal of clinical waste.	$5,000	• No sampling required.	• Half yearly inspection by EnvMC for one year only for the indemnity period	• PP • Contractor
	Tourism • Disruption to the birds and other avians by golf course activities and visitors to the lakes. • Possible eutrophication of Lakes B and C from the golf course fertiliser runoff. • Disruption to small fishing vessels by tourist boats and services. • Coral bleaching may occur if there are excessive leached pesticides and toxic chemicals.	**Tourism** • Sea and vessel traffic to be managed by the local authorities with the assistance of PP. • Berthing and anchoring of vessels to be demarcated clearly away from rich coral areas. • Adequate provisions of tourist facilities (e.g. toilets, bathing areas and waste bins). • Post signages and enforce strictly the prohibition to collect corals and marine life. • Maintain the reforested hillslopes to provide more habitats for resting and breeding of terrestrial fauna. • Proper irrigation management to maintain the golf course.	$10,000	• No sampling required.	• Half yearly inspection by EnvMC for one year only for the indemnity period	• PP

<table>
<tr><th>Project Activity</th><th>Potential Significant Environmental Impact</th><th>Mitigation Measures</th><th>Mitigation Cost (USD)</th><th>Sampling Location/ Monitoring Parameters/ Limits</th><th>Monitoring Frequency/ Responsibility</th><th>Mitigation Responsibility</th></tr>
<tr>
<td>• Project operations
• Maintenance of the golf course and landscape features
• Maintenance of lakes
• Maintenance of infrastructure, utilities and facilities
(cont'd)</td>
<td><u>Waste Generation</u>
Municipal Solid Waste
• Poor management produces leachate, odour and generation of disease vectors.
• Garbage can attract pests and scavengers.
Scheduled/Hazardous Waste
• Impact on water quality, aquatic life and occupational health.
Green Waste
• Leachates from decomposing green wastes may affect aquatic life if leached into the lakes.
Sewage
• Mainly generated from integrated mixed development.
• Poses problems to water quality and public health if the STPs fail.
Clinical Waste
• May cause pathogenic/ infectious diseases.
• Safety concerns due to sharps (from medical instruments).
• Improper chemical waste management may result in hazards to workers, public and patients.</td>
<td><u>Waste Generation</u>
Integrated Mixed Development
• Disposal of scheduled/hazardous wastes into drainage and sewerage systems is prohibited.
• Hazardous wastes generated to be stored properly with clear labelling for final disposal at a secured landfill or any facility approved by the local authority.
Golf Course Development
• Green waste to be collected, composted and used as soil conditioners for golf course maintenance.
Hospital Development
• Hazardous wastes to be stored in clearly marked waste bins with plastic liners.
• Sharps to be disposed off in puncture-proof containers, whilst chemical liquid wastes can be placed in amber disposal containers compatible with their hazardous characteristics.
• All containers containing hazardous wastes to be labelled appropriately with symbol of waste type and weight.
• PPE such as gloves, masks and appropriate footwear to be provided for personnel handling clinical wastes.
• General waste from hospital can be incinerated and disposed off at Tibar Landfill through usual waste collection.</td>
<td>$10,000</td>
<td><u>Solid Waste and Hazardous/Scheduled Waste</u>
• No sampling required. However, site inspection will be conducted:
<table>
<tr><th>Component</th><th>Observation</th><th>Inspection Location</th><th>Compliance</th></tr>
<tr><td>Solid Waste Management</td><td>• General cleanliness.
• Number of bins provided and adequacy.</td><td>• At base camp, site office and active work areas.</td><td>Decree Law No.26/2012 Environmental Basic Law Article 39.</td></tr>
<tr><td>Hazardous/ Scheduled Waste Management</td><td>• Waste disposal at designated scheduled waste disposal area.
• Visual inspection of storage condition.
• Signs of oil spill.</td><td>• At storage areas for scheduled wastes.
• At active work areas.</td><td>Decree Law No. 26/2012 Environmental Basic Law, Article 42.</td></tr>
</table>
<u>Sewage</u>
• Sample to be collected at the discharge point of treated effluent.
• Parameter to be analysed/limit:
<table>
<tr><th>Parameter(i)</th><th>Limits(ii)</th></tr>
<tr><td>Temperature</td><td>-</td></tr>
<tr><td>Ammoniacal Nitrogen (AN)</td><td>0.3 mg/L</td></tr>
<tr><td>Biochemical Oxygen Demand (BOD)</td><td>3 mg/L</td></tr>
<tr><td>Chemical Oxygen Demand (COD)</td><td>25 mg/L</td></tr>
<tr><td>Dissolved Oxygen (DO)</td><td>5 – 7 mg/L</td></tr>
<tr><td>pH</td><td>6 – 9</td></tr>
</table>
<table>
<tr><th>Parameter(i)</th><th>Limits(ii)</th></tr>
<tr><td>Oil and grease (O&G)</td><td>0.04 mg/L</td></tr>
<tr><td>Total Suspended Solid (TSS)</td><td>50 mg/L</td></tr>
<tr><td>Total Coliform</td><td>5,000 count/100 mL</td></tr>
<tr><td>Faecal Coliform</td><td>400 count/100 mL</td></tr>
<tr><td>Salinity</td><td>-</td></tr>
<tr><td>Lead (Pb)</td><td>0.05 mg/L</td></tr>
<tr><td>Zinc (Zn)</td><td>5 mg/L</td></tr>
<tr><td>Copper (Cu)</td><td>0.02 mg/L</td></tr>
<tr><td>Nitrate (NO_3^-)</td><td>7 mg/L</td></tr>
<tr><td>Phosphorus</td><td>0.2 mg/L</td></tr>
</table>
Note:
(i) Parameters shown in the table above are to be analysed for water quality after treatment.
(ii) Limits values shown in the table above are adopted from Class IIB of NWQS from Malaysia.</td>
<td>• Quarterly inspection by EnvMC for one year only</td>
<td>• STP Operator
• Golf Course Superintendent</td>
</tr>
</table>

1.9.4 Mitigation Measures

- The mitigation measures for the potential negative impacts identified during construction and operational phases, are described in **Tables 1.9.2 – 1.9.3** respectively.

1.9.5 Incorporation of Mitigation Measure into Project Design

- During the construction phases (see **Chapter 9** for details), the incorporated measures are:

  (i) Erosion and sediment control.
  (ii) Water pollution control.
  (iii) Dust dispersion control.
  (iv) Drainage control.
  (v) Noise pollution control.
  (vi) Ecology management.
  (vii) Traffic management.
  (viii) Waste management.
  (ix) Greenery features.

- During the operational phase, the main incorporated measures are:

  (i) Waste management:

    (a) Municipal solid waste.
    (b) Scheduled/hazardous waste.
    (c) Clinical waste.
    (d) Sewage.

  (ii) Water resource.

1.9.6 Residual Impacts

- The residual impacts that persist even after all mitigation measures have been implemented, may arise from:

  (i) Soil erosion from residual bare areas.
  (ii) Water quality at Tasi Tolu Lakes affected by garbage, leached fertilisers and pesticides.
  (iii) Water quality of coastal waters – same as (ii) above.
  (iv) Air quality: Only if outdoor burning is practised.
  (v) Marine ecology: Only if there is high capacity usage of the beach and sea that will destroy the corals and disturb the marine life.
  (vi) Terrestrial ecology: Only if reforestation is not successful.
  (vii) Tourism: Only if there is high density and usage in the area.
  (viii) Waste: All types of wastes that are indiscriminately thrown.

1.10 SOCIAL IMPACT ASSESSMENT

1.10.1 Introduction

- The Social Impact Assessment (SIA) of the Project is not a social research study *per se*. Hence, the scope of the SIA cannot follow exactly what has been prescribed in the *Ministerial Diploma Regulation on the Detailed Requirements for the Terms of Reference, Environmental Impact Statements and Environmental Management Plans for Environmental Assessment,* as the Government has already indicated that it will deliver the site free of all encumbrances for commencement of the Project.

- The Government will resettle the people now living at the Project site, and hence will be outside the scope of this EIS. The SIA will instead focus on the impacts to the local communities living within 3-km ZOI.

- A total of 11 settlements within the 3-km radius ZOI, with a total of 203 respondents representing 2.69% of the households (7,541) in 29 settlements located within the ZOI, were surveyed.

- Based on the survey results, the respondents perceived the development to have both positive and negative impacts on the socio-economy with most, being positive. The respondents felt that jobs and business would be created to help reduce the unemployment situation in the country and hence a majority of them, have no objections to the Project development.

1.10.2 Analysis of Key Social Impacts

- **Pre-construction Phase:** Discussions with the residents in Kg 12 De Outubro, indicated that they knew that they will be relocated by the Government before construction starts. However, they requested some form of compensation from the Government to help them in their relocation.

- **Construction Phase:** The residents within the 3-km ZOI are quite attuned to the fact that more jobs will be created. Based on the PP's projections, about 1,500 jobs will be created during the construction phase with the same numbers during the operational phase. With these jobs, unemployment will be reduced and there will be more money circulating in the economy, which will be a boon to business and the local communities. On the negative side, the influx of migrant workers will add pressures on the already limited public utilities and amenities; exceeding their current carrying capacities and causing unintended social tensions with the local communities. One of the pressures will be public health and safety arising from poor sanitation and congested living. Differences in way of life and cultures may also cause social conflicts with the local communities.

- **Operational Phase:** The operations of the Project will mainly provide positive impacts such as stimulating the growth in tourism-related businesses among aspiring local entrepreneurs. Many jobs will also be created, which will help obviate the high unemployment rate in the country. On the negative side, the tranquillity and way of life of the local communities may be affected with an influx of tourists, visitors and hotel employees from other areas or from other countries. Again, differences in social outlooks may cause tensions with the new comers and visitors.

1.10.3 Mitigation Measures and Strategies to Achieve Good Developmental Outcomes

- The mitigation measures proposed to ameliorate the social impacts include:

  (i) It is proposed that the PP, contractors and sub-contractors give first preference to the local communities living within the 3-km ZOI. A "labour desk" to be set up to facilitate employing local labour during construction.

  (ii) Continuous engagement between the PP and stakeholders shall be carried out throughout the construction phase. A Community Relations Committee (CRC) can be established as a communication channel between the PP and local community.

  (iii) The CRC can incorporate awareness campaigns and precautionary measures related to safety and health of the local residents and the construction workers.

  (iv) Provision of continuous training for semi-skilled locals to make them skilful in their jobs. The CRC can help find workers for the hotels and tourism-related business.

1.10.4 Management and Monitoring of Social Impacts

- Monitoring social impacts through the CRC is advocated. The CRC can be used as a platform for communities to voice and resolve any social concerns linked to the Project.

1.11 ECONOMIC ASSESSMENT

- The economic assessment is based on a relative cost and benefit; that is, gains and losses, and is not a financial cost and benefit study *per se*. The main quantifiable and non-quantifiable benefits that will potentially accrue to the Government and the local communities are in **Chapter 11**. These are summarised in the Table below:

Descriptions	Benefits/Gains	Costs/Losses
Economic development	/	
Employment generation	/	
Enhanced tourism activities	/	
Skills training and development	/	
Reforestation of degraded forest	/	/
Lake rehabilitation	/	/
Deterioration of environmental quality		/
Accidents, safety and health		/

1.12 ENVIRONMENTAL MANAGEMENT PLAN

- The main objective of the EMP is to provide a set of guidelines and procedures to protect the environment and its surrounding areas during the construction, operational and deactivation phases. The EMP comprises:
    - (i) Mitigation measures proposed to avoid, reduce or minimise the identified negative impacts.
    - (ii) Costs of the mitigation measures.
    - (iii) Monitoring requirements.
    - (iv) Institutional roles and responsibilities for implementing the EMP and monitoring activities.
    - (v) Identification of training and capacity building.
- Significant environmental impacts during the construction, operational and deactivation phases are summarised in **Tables 1.9.2 – 1.9.3**. The details of the EMP are in a separate volume as submitted together with this EIS.

1.12.1 Costs of Mitigation Measures

- The PP will provide sufficient allocations to undertake all environmental protection measures and monitoring works (refer **Tables 1.9.2 – 1.9.3**).

1.12.2 Monitoring Programmes

- Environmental monitoring and surveillance works shall start concurrently with construction works. The monitoring works shall include:
    - (i) Establishment of an in-house monitoring programme and standard environmental operating procedures (SOP).
    - (ii) Field inspection with contractor(s).
    - (iii) Confirmation of field sampling locations.
    - (iv) Field sample/data collection and analysis.
    - (v) Data documentation.
    - (vi) Feedback of result.
- The monitoring works shall be carried out throughout the construction phase and one year for the operational indemnity phase.
- The proposed monitoring programme is shown in **Tables 1.9.2 – 1.9.3** with the details in **Chapter 12:** Summary of Environmental Management Plan (see **Tables 12.4.1 – 12.4.2**).

1.12.3 Institutional Roles and Responsibilities to Implement the EMP

- Environmental management is a dynamic process, which evolves with time. All persons involved in any of the phases of development of the Project, shall ensure that adjustments be made to accommodate amendments for environmental protection works, plans, or programmes as, and whenever necessary. An Environmental Management Team (EMT) shall be formed with members from:

Phase	Key EMT Members
Pre-construction Phase	(i) National Directorate of Pollution Control and Environmental Impact (NDPCEI) (ii) Pelican Paradise Holdings (Timor-Leste) or PP (iii) Asia Pacific Environmental Consultant Sdn Bhd (ASPEC)
Construction Phase	(i) National Directorate of Pollution Control and Environmental Impact (NDPCEI) (ii) National Directorate of Land, Property and Cadastral Services (iii) National Directorate of Roads, Bridges and Flood Control (iv) National Directorate of Water and Sanitation (v) National Directorate of Aquaculture and Fisheries (vi) National Directorate of Sanitation Control and Environmental Health (vii) Department of Policy and Strategic Planning (viii) Suco Comoro and Tibar (iv) Pelican Paradise Holdings (Timor-Leste) or PP (ix) Main Contractor (MC) (x) Environmental Monitoring Consultant (EnvMC) (xi) Environmental Auditor (EnvA)
Operational Phase	(i) National Directorate of Pollution Control and Environmental Impact (NDPCEI) (ii) National Directorate of Water and Sanitation (iii) National Directorate of Forestry and Watershed Management (iv) Pelican Paradise Holdings (Timor-Leste) or PP (v) Environmental Monitoring Consultant (EnvMC) (vi) Environmental Auditor (EnvA)

1.12.4 Training and Capacity Building

- Environmental training for staff is aimed at creating competency and skill in environmental management throughout Project implementation. Environmental training programmes shall be customised to cater to different levels of employees to achieve environmental compliance with the regulations to prevent any environmental degradation by their actions within the Project.

- The training programmes shall be subjected to amendments when new procedures and directives from the NDPCEI or from any other relevant agencies are issued from time to time. The basic training programmes can be referred to in **Table 12.6.1** in **Chapter 12** of this EIS.

1.12.5 Environmental Audits

- Environmental audits are carried out half yearly during the constructional and operational phases. It will also be carried out once only during the deactivation period before final closure. The details of the environmental audit are found in **Chapter 12**, **Section 12.7:** Auditing Requirement, of this EIS.

1.13 PUBLIC CONSULTATION

- The main objectives of public consultation are to inform the stakeholders regarding the Project and to seek their perceptions/comments on the Project.

- For the formal consultations, a total of 16 group discussions had been conducted from September to October 2016 and two public consultations on 12 January 2017 and 18 January 2018.

- Questionnaire surveys and informal consultations were carried out on 12 – 13 October 2016 in 11 randomly selected settlements located within the 3-km ZOI.

1.13.1 Summary of Main Comments

- The main concerns of the stakeholders are summarised as follows:

  (i) Accessibility to St Paul's Holy House, which is usually used for celebration events.
  (ii) Impact(s) on air, noise and marine water quality during the construction phase of Project.
  (iii) Socio-economic issues, e.g. impact on livelihood, job opportunities, etc.

- During the public consultations, the concerns from the stakeholders were:

  (i) Concerns over negative impacts on their socio-economic development.
  (ii) Needed to clarify on the water sufficiency situation for the proposed golf course and public park.
  (iii) Concerns over electricity demands of the Project.
  (iv) The conversion of Lake A to freshwater as the lake is an important area for bird migration and an area of great importance to the citizens of Timor-Leste.
  (v) The relocation/resettlement of the residents within the Project site.
  (vi) The effects of construction on the disruption/disturbance of the surrounding habitats.
  (vii) Suggested all participants involved in the public consultations to form a committee to supervise the Project development.

- The questionnaire survey showed that most of the respondents supported the development because of the expected income benefits and employment.

- All comments/view/issues received from public consultation activities were taken into account in the EIS and EMP Study.

1.13.2 Public Acceptance or Opinions on the Project

- The findings showed that the majority of the stakeholders were in favour of the Project development as it could boost and attract investments as well as create job opportunities. They recommended that the Project give priority of employment to the local workers, and recommended that training be given to strengthen their working skills. The stakeholders, however, rejected the option to convert the Lake A into a freshwater lake as it is a sacred and historical site.

1.13.3 Recommendations for Future Consultations

- All stakeholders involved in the public consultation suggested that they be invited in future consultations.

1.14 DIFFICULTIES ENCOUNTERED

- Difficulties encountered in conducting the EIS are:

  (i) Information and Datasets: Insufficient updated information to assess the environment in the surrounding areas.

  (ii) Information from Government Agencies: Some relevant information were unavailable from government agencies, although there were indications that these datasets were collected but could be in raw form. The Consultants had to depend on literature reviews from limited past research and site investigations.

  (iii) Information on the Environment: There is insufficient research information in Timor-Leste to complement and validate the results of simulations and calculations based on the site investigation information.

1.15 CONCLUSIONS AND RECOMMENDATIONS

- There will be positive and negative impacts arising from the development of the Project during the construction and operational phases of the Project, more during construction than operations.

- **Chapter 9** has provided all the impacts, both positive and negative as well as the mitigation measures to abate the negative ones. These include:

  (a) Erosion and sediment control.
  (b) Water pollution control
  (c) Dust dispersion control.
  (d) Noise level control.
  (e) Traffic control.
  (f) Marine ecology management.
  (g) Terrestrial ecology management.
  (h) Lake ecology management.
  (i) Waste management.
  (j) Socio-economic management.

- The following general management practices are also recommended:

  (i) The proposed environmental mitigation measures and environmental management requirement in EIS, EMP and the conditions of the Environmental License, to be clearly stated and incorporated in the contracts between the PP and contractor(s).

  (ii) The proposed EMT in the EMP should be set up as soon as possible to serve as means for continuing public consultation and disclosure. There is already a recommendation by some Government agencies to form a committee to monitor the activities during the construction phase.

(iii) The PP may establish a complaint grievances mechanism (CGM) related to environmental and social issues arising during the construction, operational and deactivation/decommissioning phases.

1.16 NON-TECHNICAL SUMMARY

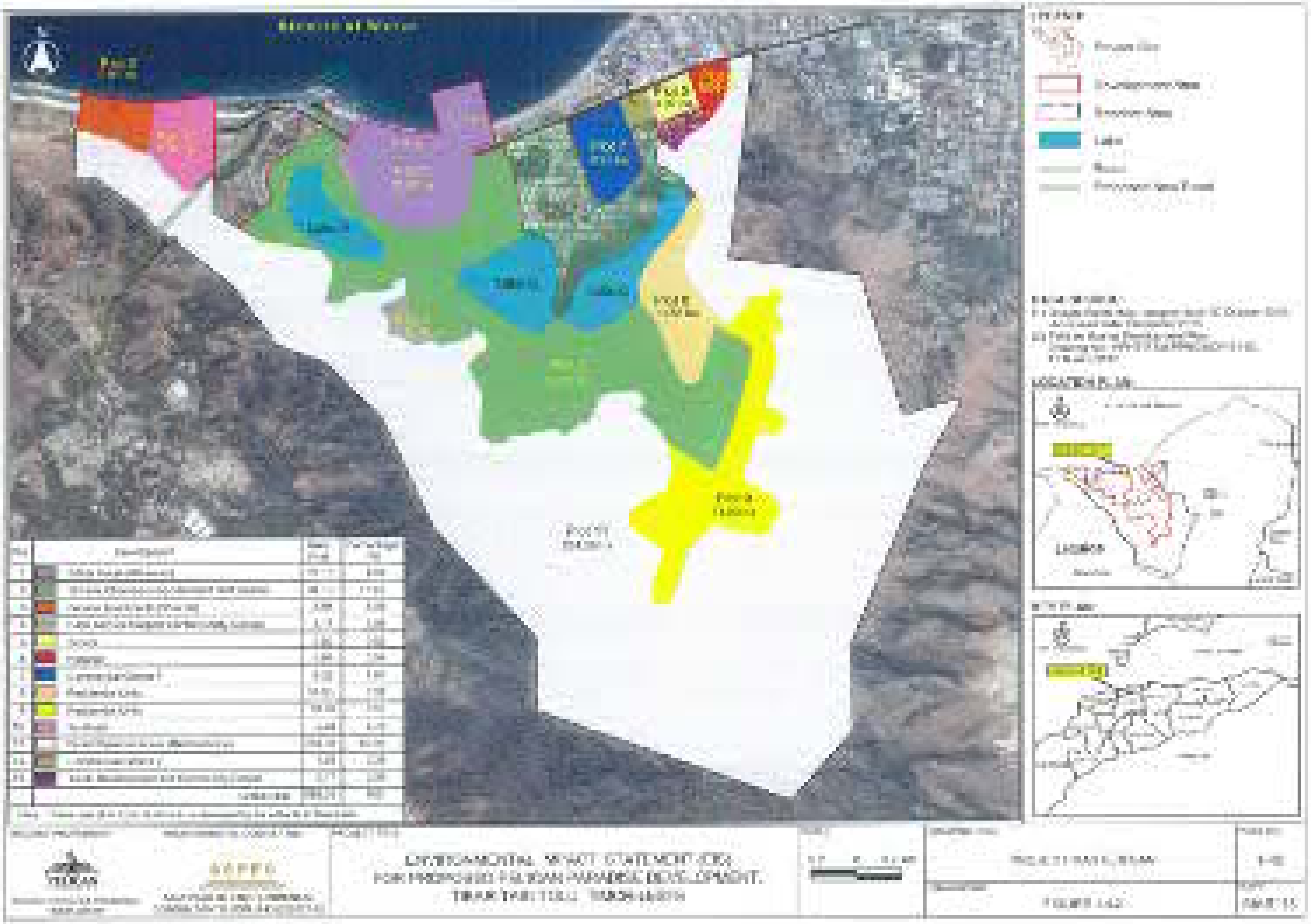
- A non-technical summary is attached in **Chapter 16** that summarises the main findings of the EIS presented in **Chapters 2 – 15** in simple language to enable non-technical readers to have a clear understanding of the environmental aspects of this Project.

Point	Coordinate Latitude (S)	Coordinate Longitude (E)
1	[illegible]	[illegible]
2	[illegible]	[illegible]
3	[illegible]	[illegible]
4	[illegible]	[illegible]
5	[illegible]	[illegible]
6	[illegible]	[illegible]
7	[illegible]	[illegible]
8	[illegible]	[illegible]
9	[illegible]	[illegible]
10	[illegible]	[illegible]

ASPEC

ENVIRONMENTAL IMPACT STATEMENT (EIS)
FOR PROPOSED PELICAN PARADISE DEVELOPMENT,
TIBAR-TASI TOLU, TIMOR-LESTE

PROJECT LOCATION WITH COORDINATE



Chapter 2

Background Information and Project Proponent

CHAPTER 2: BACKGROUND INFORMATION AND PROJECT PROPONENT

2.1 BACKGROUND INFORMATION

- The Project is an integrated mixed development with a focus on resort living comprising recreational, commercial, institutional and environment components. It is supported by infrastructure and utilities.

- The Project encompasses 563.04 ha across Post Administration Dom Aleixo, Municipality of Dili and Post Administration Bazartete, Municipality of Liquica. The site is located ~8 km west of Dili, the capital, and ~2 km southwest of Presidente Nicolau Lobato International Airport. It can be easily accessed via Rua Terra Santa connecting from Dili and Liquica.

- Presently, the Government of the Democratic Republic of Timor-Leste (DRTL) has leased the land to Pelican Paradise Holdings Timor-Leste, the Project Proponent (PP), for 99 years under a Lease Agreement of State Property, dated 16th September 2009 (Contract No. 530 00932). This has been superseded by a new Lease Agreement, dated 5th August 2010 for 99 years for the development (Contact No 530.01018).

- The Government will deliver the land free of all encumbrances for commencement of development in 2017. The resettlement of any persons living within the Project site and the resettlement plans, are outside the scope of this Environmental Impact Statement (EIS) and Environmental Management Plan (EMP).

- An earlier Environmental Impact Assessment (EIA) Report submitted by Asia Pacific Environmental Consultants Shd Bhd (ASPEC) in July 2010, was approved on 4th May 2012 by the National Directorate for Environment, State Secretariat for Environment, Ministry for Economy and Development, DRTL.

- As the Environmental License has since lapsed (two years from the Date of Notification in the Schedule), and because of amendments to the Project Masterplan Layout, the PP is now re-submitting a new EIS and Environmental Management Plan (EMP) for an Environmental License as per the requirements of the National Directorate of Pollution Control and Environmental Impact (NDPCEI), DRTL.

- Pelican Paradise Holdings Timor-Leste, the PP, intends to implement the Project by 2017 and has commissioned ASPEC, the Environmental Consultants, to proceed with the EIS and EMP.

2.2 PROJECT PROPONENT

- The Project Proponent is Pelican Paradise Holdings Timor-Leste (PPHTL). The principal contact persons in the PPHTL for this EIS are:

  Pelican Paradise Holdings Timor-Leste
  Suite 333B, Timor Plaza
  Rua Presidente Nicolau Lobato
  Comoro, Dom Aleixo
  Dili, Timor Leste

  Tel: +670 7310 7777
  E-mail: enquiries@pelican-paradise.com
  Website: www.pelican-paradise.com
  Attn: Mr Ravi Kathiravelu (Director)
  Dr Jeremiah Chan Kin Meng (Executive Director)

2.3 EXPERIENCE OF THE PROJECT PROPONENT

(a) Project Proponent

- Pelican Paradise Holdings Timor-Leste (PPHTL) was incepted and led by Datuk Dr Edward Ong who has a proven and noteworthy track record as a developer and hotel operator.

- As an accomplished contractor and developer, Datuk Dr Edward Ong through his OCK Group in Singapore, had completed numerous well-known projects in Singapore of which the Singapore General Hospital, Regency Park Condominium, etc. are good examples. Furthermore, the Group's operations have also covered many big projects in Malaysia, Burma and the Commonwealth of Northern Mariana Islands (Saipan and Guam). The list of his major projects is in **Table 2.3.1**.

- In the mid-90s, Datuk Dr Ong started the Sutera Habour Resort Project; both as the founder and developer of the resort that was designed as a world-class resort along the coastal belt of Kota Kinabalu, Sabah. This is now an iconic coastal resort in Sabah, offering two 5-star hotels that are complemented by a 27-hole golf course and a 104-berth marina.

- Datuk Dr Ong started on a new journey of faith with a passionate challenge to develop the Timor-Leste integrated mixed development (the Project) in Dili, comprising hotels and commercial areas, golf course, hillside residences, education facilities, youth facilities and hospital. His compelling aim is to create at least 1,500 jobs and more business opportunities for the local communities during the construction phase and similar opportunities during the operational phase to lessen the unemployment situation besetting Timor-Leste. The emphasis on facilities for youth development, education and health is part of his furtherance in corporate social responsibilities *in lieu* of the lack of opportunities in the country. He hopes that the local communities will benefit greatly from the Project that will eventually raise their standard of living and alleviating poverty in the country that he has come to appreciate, love and value dearly.

Table 2.3.1: Past Projects by Project Proponent

No.	Past Project	Description
Hotel & Resorts		
1.	Sutera Harbour Resort	Datuk Dr Edward Ong is the founder and developer of Sutera Harbour Resort, Kota Kinabalu. He is currently a major shareholder and sits on the board of directors.
	• Magellan Sutera Harbour	• A magnificent 5-star resort with 456 suites complete with a world class spa and facilities. • It has international convention facilities that can easily accommodate 1,200 people.
	• Pacific Sutera Harbour	• A luxurious 5-star hotel with 500 rooms. • It has 10 multipurpose and multi-sized meeting rooms including a ballroom for 700 people.
	• Sutera Harbour Golf and Country Club	• A 27-hole championship golf course designed by Graham March that has won numerous awards of distinction.
	• Sutera Harbour Marina and Country Club	• 104 berth marine. • Other facilities include a cinema, bowling alley, kids club, fitness centre with Jacuzzi and sauna, billiards room, Olympic sized pool, badminton courts, squash courts and tennis courts.
2.	Sutera Sanctuary Lodges	Datuk Dr Edward Ong and his team currently manage the Sutera Sanctuary Lodges. The Sutera Sanctuary Lodges consist of luxury villas on Manukan Island, Kinabalu Park and Poring Hotsprings.
	• Sutera Sanctuary Lodges Manukan Island Resort	A luxury private island resort with: • Single storey Hillside Chalets • Double storey Hillside Chalets • Single storey Beachside Chalets • Double storey Beachside Chalets
	• Sutera Sanctuary Lodges at Kinabalu Park	A UNESCO World Heritage Site with various types of luxury villas
Condominium/Apartments		
1.	Harbour View Towers	30-storey condominium towers in Singapore.
2.	Regency Park	A luxurious condominium project in Singapore consisting of a 25-storey tower and three 4-storey apartment blocks with pool and club facilities.
3.	Grace Garden, Grace Ville and Grace Square	Development in Kota Kinabalu, Malaysia.

No.	Past Project	Description
Civil Works		
1.	Tunnelling Works	3.6 km of tunnelling works for the Orchard Mass Rapid Transit (MRT) including the civil works for the Orchard MRT station in Singapore.
2.	Water & Sewerage Works	• 3.7 km sewer line and pump house in Guam. • 12.2 km of water line in Rota. • In Micronesia, a total of 52 km of water lines with ancillary facilities were laid by Datuk Dr Ong through the OCK group.
Shopping Complexes		
1.	Adelphi Shopping Centre and Offices	10-storey complex with five levels of basement (Singapore).
2.	Sultan Plaza	9-storey shopping and entertainment complex (Singapore).
Industrial Complexes		
1.	Industrial Complexes	Numerous factories and industrial complexes have been completed. One of the completed projects is the Richfield Industrial Centre in Singapore.
Hospital		
1.	Singapore General Hospital	This was a $150 million dollar project consisting of eight blocks of buildings.

(b) Management Team

- The management team of the Timor-Leste Project will be led by Mr Ravi Kathiravelu, a well-known hotelier in the hospitality industry.
- Mr Ravi Kathiravelu was formerly the General Manager at Magellan Sutera Habour, who led the team to win numerous Hospitality Asia Platinum Awards in 2014, and many other accolades in previous years. Currently, he is holding the position as General Manager for Sutera Sanctuary Lodges.

2.4 PROJECT PROPONENT'S ENVIRONMENTAL COMMITMENTS

- The PP is committed to the following in relation to the Project:

  (i) Ensure the Project complies with the local environmental assessment procedures from Project design planning to implementation.

  (ii) Ensure a top-down organisational commitment within the organisation for environmental compliance, including all outsourced engineering and EIA consultants, contractors and other relevant parties involved in the implementation of the Project.

  (iii) Adopt a pragmatic mitigative approach using best management practices (BMPs) to sustain:

    (a) Ecosystems.
    (b) Water quality and quantity.

(c) Air quality.

(iv) Appoint competent consultants to supervise the implementation of mitigation measures and BMPs.

(v) Include the conditions of Environmental Licensing as part of the terms of agreement in the tender contract documents to contractors and sub-contractors involved in the implementation of this Project.

(vi) Allocating sufficient funds for implementation of mitigation measures/ BMPs, and environmental monitoring and auditing programmes throughout the Project duration.

Chapter 3

Consultants and Specialists

CHAPTER 3: CONSULTANTS AND SPECIALISTS

3.1 ENVIRONMENTAL CONSULTANTS

- Asia Pacific Environmental Consultants Sdn Bhd (ASPEC) is the Lead Environmental Consultant to prepare the Project Document (PD), Terms of Reference (TOR), Environmental Impact Statement (EIS) and the Environmental Management Plan (EMP). The key personnel are listed in **Table 3.1.1**.

- ASPEC is a professional environmental consultancy firm established in 1991 in Malaysia and is managed by a core group of highly qualified and experienced specialists in the fields of natural and environmental sciences, hydrology, water resources and water chemistry as well as landuse, socio-economics, ecology and geographical information systems. To date, ASPEC has completed over 200 Environmental Impact Assessments (EIAs), EMPs, Environmental Management Reports (EMR), Environmental Management Compliance Plan (EMCP) as well as carried out many projects on environmental monitoring, auditing and integrated river basin and water resources management studies. It has work experiences in East Asian, Association of Southeast Asian Nations (ASEAN) and southern African countries.

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E-mail: Lkspec@gmail.com
Website: www.aspec.com.my
Attn: Dr Low Kwai Sim, FASc (Director)
Dr Jamie Chong Li Yean (Executive Director)

Table 3.1.1: Qualifications, Designation and Tasks of Key Personnel

Consultant	Qualification, Designation and Task
Dr Low Kwai Sim, FASc	(i) **Qualification:** Ph.D. Hydrology, University of Hull, U.K.; B.A. (Hons) Geography, Universiti Malaya, M'sia (ii) **Designation:** Environmental Specialist and Hydrologist (iii) **Task:** • Overall coordination of the study. • Carry out the scoping exercises and public consultation with government officers and all other relevant agencies to prepare the PD, the TOR, the EIS and the EMP. • Assist to carry out the environmental assessment through inputs in hydrology, water quality and soil erosion. • Final follow-ups after the EIS and EMP process.

Consultant	Qualification, Designation and Task
Dr Jamie Chong Li Yean	(i) **Qualification:** Ph.D. Chemical Engineering, University of Nottingham, U.K.; B.Eng. (Hons) Chemical Engineering, University of Nottingham, U.K. (ii) **Designation:** Air and Noise Modelling Specialist (iii) **Task:** • Conduct studies on air and noise quality and carry out modelling exercises to predict various scenarios as required for the Project site, to eventually provide the best mitigation measures to overcome any adverse problems that may arise during the construction and operations of the Project.
Dr C. N. Chong	(i) **Qualification:** Ph.D. Chemistry, Australian National University, Australia; B.Sc. Chemistry, University of New Brunswick, Canada (ii) **Designation:** Chemistry Specialist (iii) **Task:** • Review and provide specialist inputs to assess the water chemistry of the three lakes and seawater.
Datin Zaharah Bt Hj Mahmud	(i) **Qualification:** M.A. Geography, Universiti Malaya, M'sia; B.A. (Hons) Geography, Universiti Malaya, M'sia (ii) **Designation:** Landuse Specialist (iii) **Task:** • Conduct studies on the existing and committed landuse of the Project site based on various official and non-official reports pertaining to the area. • Select and input the information and data in the format required for the EIS and EMP Reports, based on landuse compatibility scenarios before and after construction of the Project. • Review the landuse in the adjacent areas including perception analysis regarding the Project.
Puan Sri Prof Dr Jahara Yahaya	(i) **Qualification:** Ph.D Fisheries Economics, Universiti Malaya, M'sia; M.A. Agriculture Economics, University of London, U.K.; B.A. (Hons) Rural Development, Universiti Malaya, M'sia (ii) **Designation:** Socio-Economist (iii) **Task:** • Evaluate the existing socio-economic conditions of the communities for baseline within and surrounding the Project. • Define and examine the socio-economic impacts of the Project on the communities directly affected by the Project. • Carry out the socio-economic surveys. • Recommend measures to reduce any negative impacts on the communities living in the vicinity of the Project area.
Prof John Kuna Raj	(i) **Qualification:** Ph.D Engineering Geology, Universiti Malaya, M'sia; M.Sc. Geomorphology, International Institute for Aerial Survey & Earth Sciences, Netherlands; B.Sc. (Hons) Geology, Universiti Malaya, M'sia (ii) **Designation:** Geologist (iii) **Task:** • Evaluate the existing geology within and surrounding the Project. • Define and examine the geological impacts of the Project. • Recommend measures to reduce any negative impacts.

Consultant	Qualification, Designation and Task
Phinie Heng Lee Lee	(i) **Qualification:** M.Eng. Environmental Technology Management, Universiti Putra Malaysia, M'sia; B.Sc. (Hons) Environmental Technology, Universiti Sains Malaysia, M'sia (ii) **Designation:** Erosion and Sediment Specialist (iii) **Task:** • Assist in overall coordination of the study. • Assist in scoping exercises and public consultations with government officers and all other relevant agencies to prepare the PD, the TOR, the EIS and the EMP. • Assist in follow-ups after the EIS and EMP process. • Assess the existing and potential erosion and sedimentation of the Project site. • Prescribe best management practices, structural and non-structural for their abatement as mitigation measures.
Kervin Chong Sim Chung	(i) **Qualification:** M.Sc. Aquaculture and Sea Farming, Universiti Sabah Malaysia, M'sia; B.Sc. (Hons) Marine Science, Universiti Sabah Malaysia, M'sia (ii) **Designation:** Terrestrial and Marine Ecologist (iii) **Task:** • Examine and provide terrestrial and marine biota and inventorise their ecosystems. • Assist to identify the types of corals and marine habitats in the coastal waters in front of the Project site. • Define their impacts and risks to them with the implementation of the Project. • Compilation and analysis of data. • Provide mitigations and rehabilitation measures if required.
Lye Pooi San	(i) **Qualification:** B.Sc (Hons) Environmental Science, Universiti Kebangsaan Malaysia, M'sia (ii) **Designation:** Water Quality Specialist (iii) **Task:** • Review and interpret all data and information pertaining to water quality and water chemistry on the riverine and marine ecosystems. • Determine the potential impacts of the Project on the water quality of the lakes and seawater.
Assistant Consultants	
Cheong Jie Ning	(i) **Qualification:** B.Sc (Hons) Environmental Science, Universiti Kebangsaan Malaysia, M'sia (ii) **Designation:** Landuse and Traffic Assessor (iii) **Task:** • Assist in scoping exercises and public consultations with government officers and all other relevant agencies to prepare the PD, the TOR, the EIS and the EMP. • Assist in follow-ups after the EIS and EMP process. • Assist in conducting the landuse and traffic surveys. • Compilation and analysis of data.

Consultant	Qualification, Designation and Task
Nureni Kase	(i) **Qualification:** M.A. Urban Geography, Universiti Malaya, M'sia; B.A. (Hons) Geography, Urban Studies and Planning, Universiti Malaya, M'sia (ii) **Designation:** Socio-economics and Tourism Assessor (iii) **Task:** • Assist in carrying out the socio-economic and tourism surveys. • Compilation and analysis of data.
Goh Chin Hui	(i) **Qualification:** B.Sc (Hons) Environmental Science, Universiti Kebangsaan Malaysia, M'sia (ii) **Designation:** Ecology Assessor (Aquatic) (iii) **Task:** • Assist to carry out the marine ecology surveys. • Compilation and analysis of data.
Steven Wong Siew Por	(i) **Qualification:** B.Sc (Hons) Environmental Management, Monash University, M'sia (ii) **Designation:** Ecology Assessor (Terrestrial) (iii) **Task** • Conduct marine (coral survey) and terrestrial ecology surveys (bird, herpetofauna and mammal survey). • Compilation and analysis of data.
Pang See Min	(i) **Qualification:** B.Sc (Hons) Environmental Science, Universiti Sabah Malaysia, M'sia (ii) **Designation:** Air Quality Assessor (iii) **Task** • Assist to carry out air quality assessment. • Compilation and analysis of data.
Tong Poh Ying	(i) **Qualification:** M.Eng Safety, Health and Environment, Universiti Malaya, M'sia; B.Sc (Hons) Environmental Science, Universiti Kebangsaan Malaysia, M'sia (ii) **Designation:** Environmental Management Plan (EMP) Coordinator (iii) **Task** • Preparation of EMP and incorporation of mitigation measures and regulations into the EMP.
Johan Ngeow Kin Voon	(i) **Qualification:** M.Sc Hydrology, Water Quality, Water Resources Management and Soil Erosion Studies, Universiti Putra Malaysia, M'sia; B.Sc. (Hons) Environmental Science, Universiti Putra Malaysia, M'sia (ii) **Designation:** Field Supervisor (iii) **Task** • Supervise the baseline monitoring team in conducting field sampling (air, noise and water).
Wan Nor 'Afifah Binti Wan Mohammad Nor	(i) **Qualification:** B.Sc (Hons) Environmental Health and Safety, Universiti Teknologi MARA, M'sia (ii) **Designation:** Health and Water Quality Assessor (iii) **Task** • Assist to carry out water quality assessment. • Compilation and analysis of data.

Consultant	Qualification, Designation and Task
Bryan How Fuh Yuan	(i) **Qualification:** B.Sc (Hons) Environmental Science, Monash University Clayton, Australia (ii) **Designation:** Traffic and Tourism Assessor (iii) **Task** • Assist to carry out traffic and tourism survey. • Compilation and analysis of data.
Norlaila binti Kamaruddin	(i) **Qualification:** B.Sc (Hons) Surveying Science and Geomatics, Universit Teknologi MARA, M'sia (ii) **Designation:** Geographic Information System (GIS) Specialist (iii) **Task** • Prepare all information and maps in GIS format.

3.2 SUPPORTING PROJECT CONSULTANTS

(a) Architect

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Singapore 039594

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(b) Civil & Structural Consulting Engineer

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Attn: Ir Wilson Voon Teck Seng (Managing Director)

(c) Mechanical & Electrical Engineers and Contractors

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93150 Kuching, Sarawak
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Tel: +6088 718 927

Fax: +6088 718 913
Website: www.remorris.com
Attn: Ir Choo C. Men (Principal)

(d) Golf Course Architect

Kruse Golf Pty Ltd
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China

Tel: 86- 755- 2600- 6380
Attn: Mr Harley Kruse (Director)

(e) Landscape Architect

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Attn: Mr Thun Kongsub (Associate)

(f) Quantity Surveyor

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Attn: Mr Lee Choong Hiong (Director)

(g) Advocate & Solicitor

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Attn: Mr Jonathan Lim (Director)

Chapter 4

Description of the Project

CHAPTER 4: DESCRIPTION OF THE PROJECT

4.1 IDENTIFICATION OF PROJECT

- **Nature of the Project:** The Project is an integrated mixed resort development comprising two hotels, an 18-hole golf course, residential housing, commercial areas, a hospital, a school, youth development and community centre, nature and forest areas.

- **Size of the Project:** The Project covers 563.04 ha, excluding the lands earmarked for a national public park, belonging to and will be developed by the Government of the Democratic Republic of Timor-Leste (DRTL).

- **Location:** The proposed development straddles Post Administration Dom Aleixo, Municipality of Dili, and Post Administration Bazartete, Municipality of Liquica. It is located ~2 km southwest of Presidente Nicolau Lobato International Airport and 8 km from the capital, Dili.

- The Project area is identified by Global Positioning System (GPS) readings given in **Table 4.1.1** and shown in **Figure 4.1.1**.

Table 4.1.1: Project Boundary Coordinates

Boundary Point	Coordinates	
	Latitude (°)	Longitude (°)
1	S8.554446	E125.516236
2	S8.562661	E125.515302
3	S8.563319	E125.520584
4	S8.568247	E125.524703
5	S8.581586	E125.520381
6	S8.584323	E125.517962
7	S8.580791	E125.507756
8	S8.569097	E125.501453
9	S8.559511	E125.489082
10	S8.556161	E125.489312

4.2 CATEGORY OF THE PROJECT

4.2.1 Category of Project

- The National Directorate of Pollution Control and Environmental Impact (NDPCEI), has categorised the **Proposed Pelican Paradise Development, Tibar-Tasi Tolu, Timor-Leste** (hereinafter known as 'the Project'), under Category A, vide letter [ref: 353/DNCPIA/XXII/2016 dated 20 December 2016]. This means that it must undergo an environmental assessment process that includes the preparation of an Environmental Impact Statement (EIS) and Environmental Management Plan (EMP), which is the subject of this submission.

- The developmental components for assessment are grouped as shown below:

Development Component	Area (ha)	Decree-Law No.5/2011 – Environmental Licensing Law	
		Related Annex	**Related Sector Criteria**
5-Star Hotel (Plot 1) 2nd Hotel (Plot 10)	27.15 9.68	Annex 1	Sector X: Tourism (No 2): Construction and expansion of hotels ≥100 rooms or ≥10 ha
18-Hole Championship Standard Golf Course (Plot 2)	98.19	Annex 1	Sector X: Tourism (No 4): Golf Course ≥10 ha
Service Apartments (Plot 3)	5.91	Annex 1	Sector X: Tourism (No 3): Construction of apartments and tourist apartment along the sea coast ≥100 locations
Commercial Centres (Plots 7 and 13)	10.80	Annex 1	Sector VI: Civil Construction (No 2): Commercial units of a size for a commercial centre ≥2 ha
Residential Units (Plots 8 and 9)	45.56	Annex 1	Sector VI: Civil Construction (No 3): Construction of multi-story building and apartments ≥2 ha
School, Youth Development and Community Centre (Plots 5 and 14)	5.17	Annex 1	Sector VI: Civil Construction (No 3): Construction of multi-story building and apartments ≥2 ha
Hotel Service Support Centre (Utility Centre) with Sewage Treatment Plant (Plot 4)	3.16	Annex 2	Sector VII: Sanitation (No 2): Wastewater Treatment Stations, <10,000 families/ eq.
Hospital (Plot 6)	3.04	Annex 1	Sector VII: Sanitation (No 6): Hospital ≥100 rooms
Forest Reserve Areas (Plot 11)	354.38	Annex 1	Sector XII: Location Factor (No 1): Sensitive or valuable ecosystem (beaches, mangroves, coral reef, protected area, marine areas) including the three saltwater lakes Sector XII: Location Factor (No 2): Unique and valuable landscape Sector XII: Location Factor (No 3): Archaeological and/or historic site Sector XII: Location Factor (No 5): Geographically sensitive area

4.2.2 Legal Requirements

- The legislations governing this EIS and EMP process are the Decree Law No.26/2012 on Environmental Basic Law; and the Decree-Law No.5/2011 on Environmental Licensing Law (ELL) under Article 5, wherein it is also required to submit a Project Document (PD) and the Terms of Reference (TOR) for approval before proceeding to submit the EIS and EMP.

- The PD and the TOR have been satisfactorily done and approved by the NDPCEI and Ministry of Commerce, Industry and Environment (MCIE) vide letters Ref.: 353/DNCPIA/XII/2016 dated 20 December 2016 and Ref.: 407/Gab.MCIA/III/2017 dated 6 March 2017 respectively (attached in **Appendices 4-A and 4-B**).

4.2.3 Environmental Assessment and Approval Process

- **Legislation:** Regulatory approval for developmental projects, such as this Project, is undertaken by the National Directorate of Pollution Control and Environmental Impact (NDPCEI) under the Decree-Law No.5/2011 on Environmental Licensing Law (ELL) that outlines the environmental licensing system for public and private projects likely to produce environmental impacts. The licensing system comprising procedures, roles and responsibilities, is shown in **Figure 4.2.1**.

- **Project Document (PD):** The draft PD was submitted to the NDPCEI on 4 November 2016 for review. The Final PD was submitted on 16 December 2016 and approved by NDPCEI on 20 December 2016 (**Appendix 4-A**). The Project has been classified as Category A project for which a Terms of Reference (TOR) has to be prepared for review by the NDPCEI (see **Figure 4.2.1**).

- **Terms of Reference (TOR):** The Draft TOR was submitted to the MCIE on 30 December 2016 and a Public Consultation with the relevant stakeholders was conducted on 12 January 2017 (refer **Chapter 13:** Public Consultation and Information Disclosure and **Appendix 13-B**). The technical comments regarding the Draft TOR were forwarded by MCIE to the PP, vide letter dated 19 January 2017 [Ref: 306/Gab. MCIA/I/2017]. The Final TOR was submitted on 30 January 2017 and approved by MCIE on 6 March 2017 vide letter Ref.: 407/Gab.MCIA/III/2017 (**Appendix 4-B**).

- **Draft EIS and EMP:** To comply with the Decree-Law No.5/2011 on Environmental Licensing Law and the TOR Approval letter (**Appendix 4-B**), the Draft EIS and EMP had been submitted to NDPCEI on 24 August 2017. A Public Consultation with the relevant stakeholders on the Draft EIS and EMP, was conducted on 18 January 2018. The concerns and comments from the stakeholders can be referred to in Chapter 13: Public Consultations, and in **Appendix 13-C**.

- The technical comments, from the General Directorate of Environment (DGE), Vice Ministry of Development for Housing, Spatial Planning and Environment (VMDHSPE), on the Draft EIS and EMP were forwarded to the Project Proponent (PP), vide letter dated 26 February 2018 [Ref: 64/DGA-MDHOA/II/2018, **Attachment 3** in Preamble].

- **Final EIS and EMP:** The response to concerns/comments from the Public Consultation and the General Directorate of Environment had been incorporated in this Final EIS and EMP. This Final EIS and EMP will be resubmitted to VMDHSPE, DGE, DNAC, DNPRB and NDPCEI.

- **Environmental License:** An Environmental License will be issued to the PP after the approval of the EIS and EMP. The License is likely to contain conditions of consent, requirements to implement the mitigation and monitoring measures embodied in the EIS and EMP.

4.2.4 Objectives and Contents of the EIS and EMP

- Under Article 7 of the *Regulation on the Detailed Requirements for the TOR, EIS and EMP for Environmental Assessment,* the main objective of an EIS is to satisfy the legislative requirements to address the potential impacts deemed relevant at different phases of Project development as per the approved TOR: for the pre-construction, construction and operational phases.

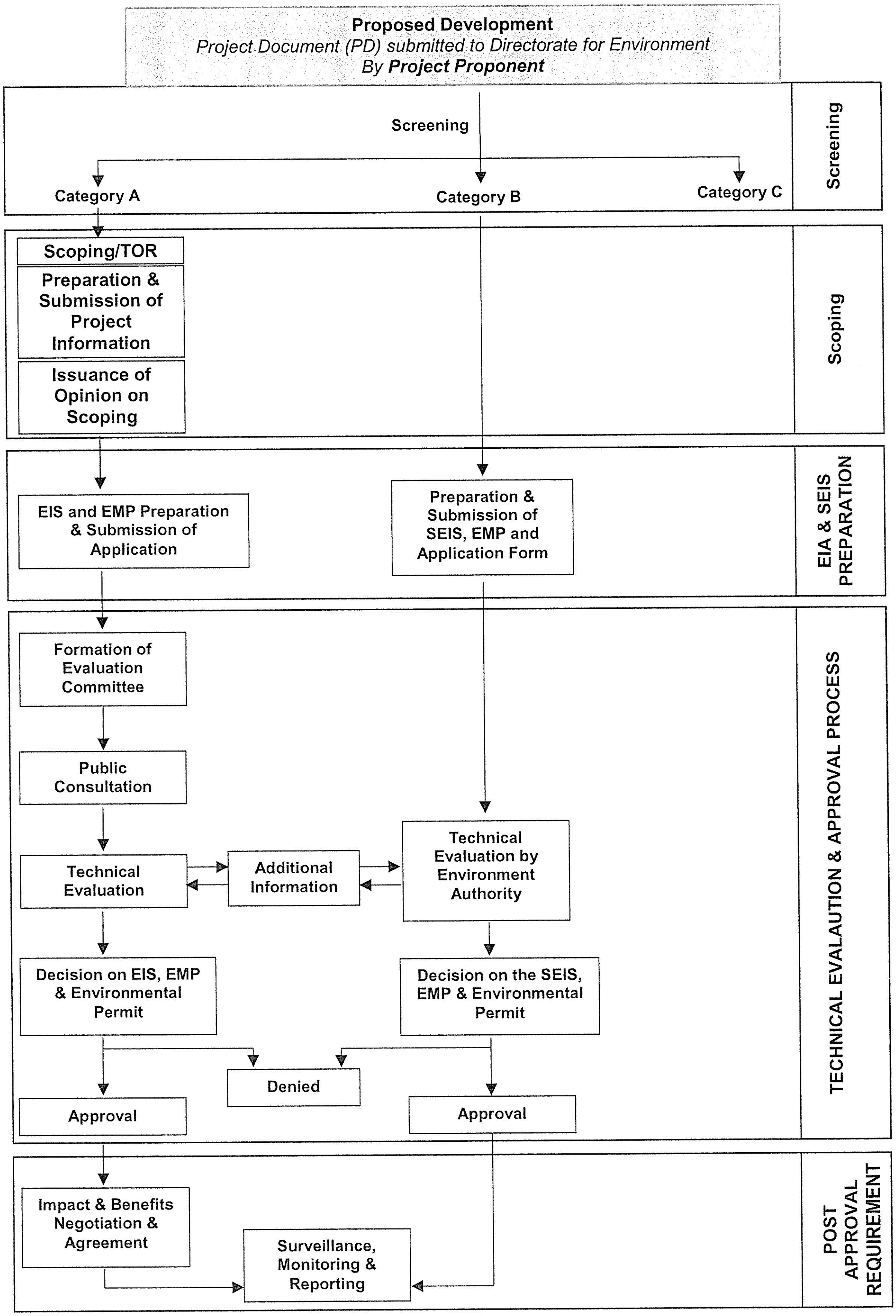
- Under Article 9 of the above said regulation, the main objective of the EMP is to ensure that the mitigations for negative impacts and enhancement of the positive impacts, are carried out effectively throughout the various phases of Project development: pre-construction, construction and operational phases.

- The general contents are elaborated on in the main text following closely Article 7 Annex 4 for the EIS; and Article 9 Annex 6 for the EMP; and the approved TOR.

- The contents under Article 7 of the EIS (to quote from Article 7 for EIS of the *Regulation on the Detailed Requirements for the TOR, EIS and EMP for Environmental Assessment,* are as follows:

  (i) *Information about the proposed project.*
  (ii) *Baseline information about the environmental, social and economic conditions in the area of the proposed project.*
  (iii) *Information on the potential impacts of the project.*
  (iv) *Information on the proposed measures to avoid, reduce or compensate any significant negative impacts.*
  (v) *Information on the main alternatives considered by the Project Proponent (PP), and the reasons for making his choice.*
  (vi) *The public consultations that have taken place so far, and the results of such consultations.*
  (vii) *Outline of the information required for the EMP.*
  (viii) *A non-technical summary.*

Figure 4.2.1: Timor-Leste Environmental Assessment and Licensing Process



4.3 BRIEF DESCRIPTION OF THE PROJECT

- Below is a descriptive sequence of the Project, which starts with the planning design concept leading to its inception for development.

4.3.1 Planning Design Concept

- The planning and developmental concept is based on the Project Masterplan (**Figure 4.3.1**) advocating the following eco-friendly planning aspirations:

  (i) Creation of a unique urban resort presence in close proximity to the sea with a golf course and parks and with a focus on green technology in the building designs.
  (ii) Provisions of high-end good service facilities to complement the resort and the commercial hub.
  (iii) Installation of smart urban technology that includes broadband cables, international communication, intelligent security and green strategies for energy and water savings.
  (iv) Emphasis on a green environment to complement the Tasi Tolu Lakes; conservation of water; reforestation of hilly degraded forests; recycling of stormwater for irrigation in the golf course; and preserving the coastal environment.
  (v) Provisions of capacity building and training leading towards more job and business opportunities for the benefit of the local communities.

- From the conceptual aspirations, the planning design guidelines are:

(a) Good Access

(i) Fast and efficient access to and from the Project with easy linkages to public roads to the surrounding areas in the Post Administration and Municipalities of Dili and Liquica.
(ii) Ease of movement within and around the Project site itself, with efficient transport to places of recreation, community centres, places of worship and parks.
(iii) Clear pedestrian walkways amidst a landscaped environment.

(b) Efficient and Sustainable Use of Natural Resources

(i) Smart use of topographical features based on geotechnical considerations in Project development.
(ii) Harmonisation of Project with local climate, traditions, culture and the surrounding environment.
(iii) Use of renewable energy such as solar power as much as possible.
(iv) Proper maintenance of integrated facilities such as drainage, and sewage and sullage treatment systems.
(v) Utilisation of rainwater for non-potable purposes such as for golf course irrigation and other components in the Project.
(vi) Enhance the Tasi Tolu Lakes for aesthetics and lake ecology.
(vii) Improved potential use of groundwater and water from small streams for portable purposes.

(c) Economic, Social and Cultural Interactions

(i) Provide employment opportunities through resort-centric types of businesses.
(ii) Use of telecommunication technology to support the development of localised knowledge and service-based businesses.
(iii) Promote closer community interactions through physical terrain designs such as people-friendly parks and landscapes.
(iv) Provide adequate facilities and amenities for tourists, local communities and the public by creating vibrant centres for recreation and leisure activities including golfing, yachting and nature clubs and community facilities.

(d) Urban and Environmental Enrichment

(i) Provide a peaceful and serene environment for work and leisure.
(ii) Create an environment to maximise enrichment in living with nature.
(iii) Maximise the use of natural assets of the environment such as lakes and green areas.
(iv) Provide a landscape with open spaces to serve multiple functions for recreation, ecology and aesthetics.
(v) Minimise earthworks and platforming to preserve the natural topography of the land.
(vi) Utilise the natural contours and depressions for small water retentions and/or wetlands to create a cool green environment.

(e) Sufficient Utilities and Amenities

(i) Maintain the efficiencies of infrastructure, utilities and amenities in line with world-class standards.
(ii) Linkage to all Information Technology (IT).

4.3.2 Description of Components in the Project

- The Project entails the development of a number of components that collectively will make the area into a mixed urban enclave. **Figure 4.3.2** shows the detailed layout of the Project. The details of each component may change depending on circumstances and market forces. Any change will be submitted to the authorities for approval prior to development.

- The Project can be separated into four major components as shown in **Figures 4.3.1** to **4.3.2**.

  (i) Commercial component: comprises an 18-hole golf course, two hotels, service apartments, residential units and commercial centres.

  (ii) Institutional component: comprises a youth development and community centre, a school and a hospital.

  (iii) National and environmental component: comprises parks and hill areas, which will be reforested.

  (iv) Infrastructure and utility component: comprises a utility centre, sewage treatment plants and water recycling plant, etc.

- As shown in **Table 4.3.1**, the Project site of 563.04 ha reserved for the forest environmental component (62.94%), the largest component; followed by commercial (26.95%); residential development (8.09%); institutional (1.46%) and infrastructure and utilities (0.56%).

- The whole Project area is divided into 14 plots of development of which Plot 12 (the public park), belongs to and will be developed by the Government. The built-up developmental density is less than 25 – 30% of the total land area, which is low. The rest of the land is for the golf course and forested areas excluding the public park in Plot 12. If included, the developmental density is even lower, at about 20%.

Table 4.3.1: Developmental Components

Plot	Development	Area (Ha)	Percentage (%)	Estimated Project Cost (USD)
1	5-Star Hotel (464-room)	27.15	4.82	310,000,000
2	18-Hole Championship Standard Golf Course	98.19	17.44	18,000,000
3	Service Apartments (117 units)	5.91	1.05	90,000,000
4	Hotel Service Support Centre (Utility Centre)	3.16	0.56	Included in no.1
5	School	3.00	0.53	20,000,000
6	Hospital	3.04	0.54	60,000,000
7	Commercial Centre 1	9.25	1.64	60,000,000
8	Residential Units	14.56	2.58	25,000,000
9	Residential Units	31.00	5.51	25,000,000
10	2nd Hotel	9.68	1.72	80,000,000
11	Forest Reserve Areas (Reforestation)	354.38	62.94	1,500,000
13	Commercial Centre 2	1.55	0.28	15,000,000
14	Youth Development and Community Centre	2.17	0.39	6,000,000
	Grand Total	**563.04**	**100**	**710,500,000**

Source: Pelican Paradise Holdings (Timor-Leste), 17 March 2017.
Note: *Public park (Plot 12) of 58.80 ha will be developed by the authority in Timor-Leste.

(a) Commercial Development

- The commercial development consists of a 464-room 5-star hotel with accompanying 13 villas, an 18-hole championship standard golf course, service apartments, residential units and commercial areas (**Table 4.3.2**). A second hotel will be added at a later stage possibly after the expansion of the Presidente Nicolau Lobato International Airport. The main objective of the commercial and business development is to create vibrancy, vitality, colour, dynamism and life within the Project and the surrounding areas of the Municipalities of Dili and Liquica.

Table 4.3.2: Commercial Development Components

No.	Development	Development Plot	Area (Ha)	Percentage (%)
1.	5-Star Hotel (464-room)	1	27.15	4.82
2.	18-Hole Championship Standard Golf Course	2	98.19	17.44
3.	Service Apartments (117 units)	3	5.91	1.05
4.	Commercial Centre 1	7	9.25	1.64
5.	Residential Units	8	14.56	2.58
6.	Residential Units	9	31.00	5.51
7.	2nd Hotel	10	9.68	1.72
8.	Commercial Centre 2	13	1.55	0.28
		Total	**197.29**	**35.04**

Source: Pelican Paradise Holdings (Timor-Leste), 17 March 2017.

(i) 5-Star Hotel (Plot 1)

- A total area of 27.15 ha has been allocated for the 5-star hotel including the 13 hotel villas as part of the hotel complex (**Figure 4.3.3**). This hotel will be the first international 5-star hotel in Timor-Leste, comprising 464 rooms, with accompanying 13 villas, six restaurants/cafés, a grand ballroom with a capacity of 1,300 persons. This ballroom can be partitioned to three smaller function rooms if needed.

- There will be a multi-function exhibition and convention hall located adjacent to the ballroom that provides flexibility for space extensions. It can hold all national, regional and international conventions and conferences that are presently lacking in Timor-Leste.

- The hotel will overlook the beautiful sandy beaches and clear blue seas with the backdrop against the ranges of hills in the background. The hotel will offer a unique hospitality experience whilst embracing the beauty of the Timorese landscape in a simple yet elegant setting.

- As part of the 5-star hotel, there is a floating jetty (6.05 ha) located at the northern section of the hotel fronting the Straits of Wetar. This waterfront area synergises with the commercial areas, and is designed for food and beverage outlets and a sea sports recreation centre to service the hotel requirements and the tourists.

- The proposed hotel is located 10 minutes by car from the Presidente Nicolau Lobato International Airport and approximately 15 minutes from Dili town. As most of the coastal developments are focused around Dili, this will be the first development located at the western side of the Presidente Nicolau Lobato International Airport towards the future new port at Tibar Bay.

(ii) 2nd Hotel (Plot 10)

- The 2nd hotel, covering 9.68 ha, is located on Plot 10 adjacent to Plot 3. This is a 4-star hotel, which will be developed pending the completion of the Presidente Nicolau Lobato International Airport expansion project, when it is foreseen that the tourism industry will expand exponentially once there is good access for the tourists. The details of this 2nd hotel have yet to be finalised.

(iii) 18-Hole Golf Course (Plot 2)

- This golf course is designed as a world-class 18-hole championship standard golf course covering a total area of 98.19 ha. It will be built surrounding the three Tasi Tolu Lakes and adjacent to the 5-star hotel (Plot 1) and residential units (Plots 8 and 9). **Figure 4.3.4** shows the layout plan and perspective of the golf course.

Golf Course Design

- As the land is flat, the golf course architects will be raising the tees, greens and fairways above the current seasonal lake flooding levels to render interesting 3D shapes into the land for a challenging golf. This will be carefully integrated with all the site elements and Project components surrounding the golf course.

- The philosophy of Kruse Golf's design is along the classic principles of golf course architecture. Holes are designed with wide fairways in a strategic way, which can be fun and enjoyable for the standard golfer, but still challenging for the lower handicap player to score well. An efficient use of hazards (water, bunkers, rough) is there to reward strategic play and not penalise the poorer golfer. At the same time the width will provide the better players a choice of play angles and risk reward type shots setting up for the approach shot to the green.

- **Routing:** The routing of the course has been done to create 18 very interesting and distinctly different and memorable golf holes. A balance of left to right and right to left doglegs and orientation of holes, means that holes will be played very differently with the prevailing winds and offer a great mix of shots. A study of the natural land shapes and dimensions has dictated green, fairway and tee locations. There is an interesting mix of terrain offering gentle uphill shots, downhill shots and shots playing over water hazards of wetlands and lakes.

- **Greens:** Greens will comprise a variety of sizes and orientated at different angles depending on the strategy and preferred approach shots. They will gently undulate in shape and the shapes will tie in harmoniously with the surrounding landforms.

- **Bunkers:** Bunkers will be large sand-faced bunkers akin to classic bunkering of courses such as Royal Melbourne, Augusta National and Cypress Point. Bunkers will have a distinct vertical lip to help define them and provide shadow line for striking and imposing appearance. Great emphasis will be placed on the development of appealing and intricate patterns of sand-faced bunkers as part of the visual appeal of each hole and the development of its strategy.

- **Grass:** A hybrid warm season grass will be used on the greens for superior putting speed. Fairways and short roughs to be a warm season hybrid grass types also with a level of saline tolerance – likely to be a Paspalum variety or a Bermuda. The irrigation system has been designed not to overthrow into the long roughs or landscape areas – a "hard edge system". The intent of this approach is to conserve precious water and to prevent the roughs getting too thick and lush and become the frustration of golfers.

- **Course Landscape:** The landscape of the course is of most importance and will use natural systems and an ecological approach. The golf course architects have gone to great measures to ensure that existing vegetation is protected and "no go zones" will be created at the beginning of construction to protect any existing landscape. The intent is to use all local plant species that exist on-site for course landscape so that it looks natural and be a part of nature from day one. Restoration of saline wetlands including mangrove species will be done. The approach here involves salvaging any possible plant materials during clearing and creating an on-site nursery.

- The philosophy and intent of the golf course landscape to use local plant species throughout the golf course will be an ecological approach that will restore the biodiversity of both flora and fauna to the site. The design allows for a large scale of ecological landscape restoration including:

  (a) Mangrove and saline wetland restoration.
  (b) Ephemeral wetland restoration and creation.
  (c) Sedge and grassland establishment.
  (d) Reafforestation of the lower hillsides and gullies.

- A programme of plant procurement will involve the propagation of many plant species for the golf course. Much planting works will be tied to the wet season timing; however the course irrigation supply will allow for watering in the dry season for plant establishment.

- **Fairways and Short Roughs:** Fairways and short roughs will be planted with 'warm season' grasses to be determined. The refined finishing and high level of maintenance of these areas will provide a stark and attractive contrast of both texture and colour with the preserved natural landscape in the outer roughs.

- **Irrigation:** Water supply for the golf course in the long-term will be a combination of harvested catchment yield, some of treated wastewater, and possibly a mix of fresh and sea water. Bores may also supplant this supply. A designated water storage pond will be used to receive the various supplies of water before it is pumped onto the course. There will be a separate mainline for the greens to allow for controlled application of fresh water independent of the tees and fairways, which may have a mix of saline, treated effluent or fresh water depending on the season.

- A significant feature in the golf course is the smart use of the Tasi Tolu Lakes in its natural setting as water retention areas for water storage, forming part of the golf course features. There will be zero discharge from the area and leached fertilisers will be retained within the Tasi Tolu Lakes where the water can be used partially to irrigate the golf course.

- With proper attention to detail in its design, construction and management, this golf course should become a course that the nation of Timor-Leste can be most proud of. It will be a fine test of golf, a memorable and challenging course and hopefully one of Asia's finest.

Turf Irrigation

- The key principle behind the design of the golf course is for it to source its own water from the Project site for turf irrigation purposes. The golf course will not use any potable town water in its irrigation. The golf course water supply will come from three key sources:

  (a) Stormwater Harvesting – A distinct dry season and wet season will require the harvesting runoff from both within the golf course, associated development and the surrounding landforms. Currently, this water runs off into the existing saline lakes or to the sea. The Project intends to harvest and store (in ponds and lakes) most of the harvested water so as to have sufficient water to irrigate the turf in the dry season.

  (b) Treated Wastewater – The golf course will also have the potential to use treated wastewater that will come from the hotels, residential and commercial areas.

  (c) Saline Water – The golf course turf types will have a degree of salt water tolerance and in periods of extreme dry weather, this will allow the flexibility of irrigating with a mixture of fresh and saline water so as to supplement the irrigation supply.

- **Water Conservation:** The use of the latest irrigation technologies with computer controlled valve in head sprinklers will mean water is precisely applied to turf surfaces only, and not wasted onto non-turf areas. Watering will take place at night to minimise evaporation and maximise infiltration into the turf root zone. These methods will ensure healthy turf growth and at the same time, conserve water.

- **Water Filtration and Nutrient Removal:** Turfgrass helps remove silt and nutrients from the water. The role of the golf course both turf and landscape revegetated areas (including seasonal streams and ponds), will be to filter suspended particles from the water to minimise silt and fine soil particles from entering the three lakes. Various small ponds around the golf course will also help to slow down storm flows, and when planted with aquatic plant species, will also perform a nutrient uptake role.

Earthworks and Soils

- The golf course has been laid out to make the best use of the local terrain and topography with many holes using the slope of the hills on the higher ground to the southern part of the site. There are also holes in the lower areas adjoining to the saltwater lakes. These holes will require for the landform to be raised above current wet-season flood levels to ensure the operation of golf is not affected by seasonal rains and to ensure damage to the golf course from flooding is kept to a minimum. There is also a need to keep the turf root zone above any saline water table in order for the turf grass to successfully grow.

- In the process of performing the earthworks on site, all materials will be sourced on site. Topsoil and sands are a precious resource and these will be scraped off and stockpiled for reuse on the course once the bulk earthwork construction is done.

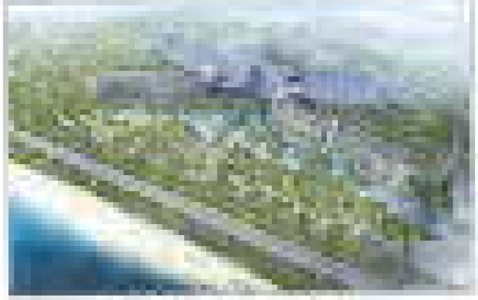
- At the time of the bulk earthworks, the main trunk drainage will be installed. The role of the drainage channel will be to collect stormwater runoff from (i) within the course, (ii) from surrounding hillsides and (iii) from associated development (e.g. hotel, roads, real estate areas). The drainage system has been carefully designed along with detention ponds for harvesting stormwater for irrigation purposes.

- Once shaping of the landform is done for the golf course, a final free draining sand cap layer of sand (sourced off site) will be spread to provide a great growing profile for the golf course turf.

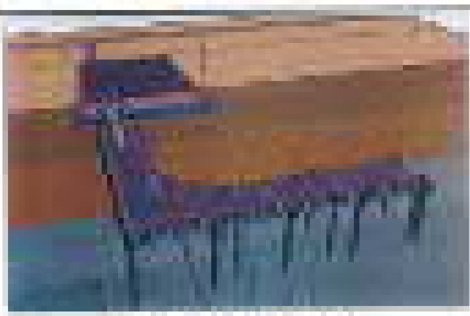
(iv) Service Apartments (Plot 3)

- These blocks of high-rise service apartments of six storeys each with a total of 117 units, will be constructed at Plot 3 covering 5.01 ha. It is strategically located near the foothills, west of 2nd hotel, fronting the Straits of Wetar. When completed, the service apartments will be the only high-end service apartments in Timor-Leste.

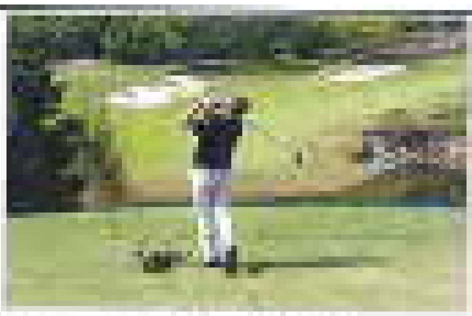
- **Figure 4.2.5** shows the proposed layout plan of the service apartments while the perspectives are provided below.



[illegible] (Plot 1)



Floating Jetty (Plot 1)


Golf Course (Plot 2)


Riverine Apartment (Plot 3)

Note: A perspective view of the design but will be subject to amendments

(v) **Commercial Centre 1 and 2 (Plots 7 and 13)**

- A total 9.29 ha of commercial centre 1 is planned adjacent to the main access road from [illegible]. The location is strategic as it has direct access to/from the major road linkages east and west of [illegible] and thence to other municipalities from [illegible].
- The commercial centre will house a shopping centre, shop lots for retail of products related to the tourism and service sectors such as electronic goods, high-end merchandise and offices for travel and marine agencies, ferries etc. The details of this commercial centre have yet to be finalised.
- Commercial centre 2 of 1.55 ha will be developed later to complement commercial centre 1.

(vi) **Residential Units (Plots 8 and 9)**

- Plots 8 (14.96 ha) and 9 (31.20 ha) comprise a total of 321 units of high-end bungalow-typed residential units, located on the higher terrain areas: (a) Plot 8: 108 lots, and (b) Plot 9: 213 lots.
- These high-end homes will be built according to the terrain to provide spectacular views of the 18-hole golf course, the public park as well as the Straits of Melaka, with a front view of the 5-star hotel (in Plot 1).
- **Figure 4.3.4** shows the layout plan of the hillside residential units, while a perspective is shown below.


Perspective View of Clusters of Residential Units 1 and 2

Note: A perspective view of the design but will be subject to detailed plan

(b) Institutional Components (Plots 5, 6 and 14)

- The institutional components (Table 4.3.3 and Figures 4.3.7 – 4.3.9) in the Tibar Plots comprise the following:

  (i) School: A total area of 3.00 ha land, covering Plot 5, is reserved and designated for a public school able to accommodate 1,000 students (Figure 4.3.7).

  (ii) Youth development and community centre: The youth development and community centre (Plot 14) on 2.17 ha of land (Figure 4.3.8), is reserved as a hub for human resources development and skills training. The intent is to provide leadership training to youths to enable them to become effective facilitators to provide relevant services to the community.

  (iii) Hospital: An international class hospital has been proposed on Plot 6 covering 3.04 ha (Figure 4.3.9), adjacent to the school/youth development and community centre (Plots 5 and 14) northeast of the Project site. The hospital is designed to tentatively accommodate 300 beds to cater for both the local and neighbouring communities.

Table 4.3.3: Institutional Development Components

No.	Development Component	Development Plot	Area (Ha)	Percentage (%)
1.	School	5	3.00	0.55
2.	Hospital	6	3.04	0.54
3.	Youth Development and Community Centre	14	2.17	0.39
		Total	8.21	1.48

Source: [illegible] March 2017.

Perspective View of Youth Development and Community Centre

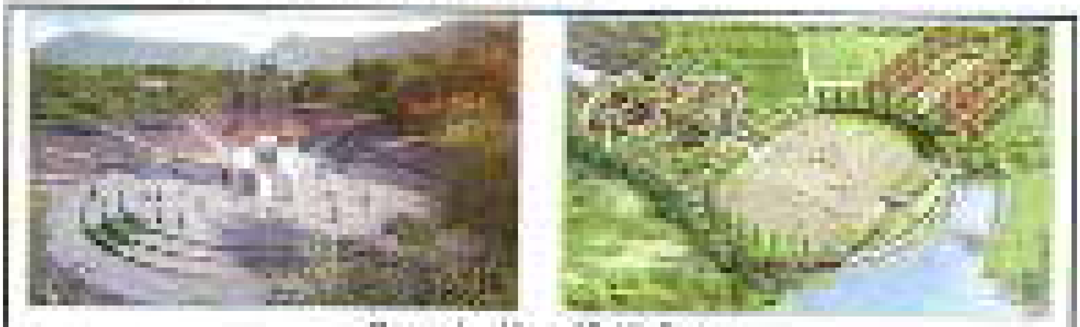
Note: A perspective view of the study [illegible] subject to [illegible]

(c) National and Environmental Components

(i) Public Park (Plot 13)

- The public park, covering 50.00 ha, will be a national public park to be developed by the Government. The PP has proposed various design perspectives of the national public park for the consideration of the Government of Timor-Leste.

- The design comprises perspectives of a national museum cum commemorative plaza, garden of [illegible], ceremonial parade square with heroes' memorial, playground, multipurpose lawn, [illegible] grove, boat club with seaside F&B, etc. The public park will not only become the most important national heritage and iconic site in the country and a focal point for all national celebrations. It will be an important tourism site in Timor. This national component will be developed by parties to be decided by the Government of Timor-Leste.



Perspective View of Public Park

Note: [illegible]

(3) **Forest Reserve Areas (Plot 11)**

- The range of hills is part of the Project area covering 654.38 ha, forming a backdrop to the Project site. They are important as they form the vital freshwater source areas for the small first and second order streams that drain into the three lakes of the Project site. For this reason and amongst others, these hill areas are classified as sensitive in the EIA since they will be reforested to capture rainwater and atmospheric moisture to maintain the flow of water and humidity in the Project area, especially during the dry season.

(4) **Infrastructure and Utilities**

- The central utility centre (Plot 4) is located at the golf course boundary area as shown in **Figure 4.3.2**. It will support and service the hotels and golf course areas (Table 4.3.4).

- The hotel service support centre (HSSC) houses all the essential services such as water treatment plant, steam boiler plant, [illegible], central laundry, sewage treatment plant (STP), desalination plant, etc. (see **Figures 4.3.18 (a) – (f)**). The [illegible] makeup tank, domestic water tanks and the second (AC) chillers are located on the roof of the utility building. Freshwater tanks and [illegible] (WBR) tanks are located under the building. The HSSC is strategically located at the back [illegible] of the [illegible] hotel.

- A system of connecting internal roads will be built to connect all the components within the Project and to connect the Project to Rua [illegible] through a signalised junction.

Table 4.3.4: Components within Utility Centre (Plot 4)

No.	Component	Area (m^2)	Layout Reference
1	Hotel Housekeeping Warehouse & Maintenance Depot	1,180.00	**Figure 4.3.10 (c)**
2	Hotel Service Support Centre (HSSC) (Laundry Plant , Aircond Plant, Water Plant, Desalination Plant, Sewage Treatment Plant, Power Substation)	3,203.70	**Figure 4.3.10 (b)**
3	Gold Course Maintenance and Workshop	1,484.80	**Figure 4.3.10 (d)**
4	Central Garbage Collection Building	694.82	**Figure 4.3.10 (e)**
5	Hotel Plant Nursery	3,547.00	**Figure 4.3.10 (f)**
6	Golf Course Turf & Plant Nursery	7,730.00	**Figure 4.3.10 (f)**
	Total	**17,840.32***	-

Source: R.E. Morris & Company, 21 November 2016.
Note: *The total area does not include the acreage of the service road and open space within the utilities centre.

4.3.3 Supporting Facilities

- The supporting facilities for the whole Project development include some of the components located within the utility centre (Plot 4).

(a) Electricity Demand and Supply

- **Demand:** The maximum projected demand for electricity for the Project is 29,098 kW (**Table 4.3.5**).

Table 4.3.5: Electrical Load Breakdown

No.	Component	Connected Load (kW)	Peak Load (kW)	Maximum Demand (kW)
1	5-Star Hotel	7,789	5,224	4,189
2	Hotel Service Support Centre	960	864	691
3	Serviced Apartment	2,618	2,088	1,857
4	School	1,581	1,054	878
5	Hospital	3,326	2,218	1,848
6	Youth Development and Community Centre	1,350	1,080	432
7	Public Park	1,465	1,025	308
8	Golf Course	1,455	582	408
9	Commercial Centre 1	14,719	12,182	10,151
10	Residential	9,856	6,702	4,692
11	2nd Hotel	3,872	2,341	1,830
12	Commercial Centre 2	3,266	2,268	1,814
	Grand Total	**52,257**	**37,628**	**29,098**

- **Supply:** The current electricity system in Dili is operated by the national electricity agency "*Electricidade de Timor-Leste*" (EDTL). Electricity supply will be made available through the proposed main intake station for connection to the Project development area.

- To meet all the electricity demands, two EDTL 20 kV main intake stations will be built, one each at the northeast and northwest of the Project site (Plots 10 and 14) to facilitate electricity provisions. A 4MW Solar PV power supply farm will also be established at the west of Plot 11 (**Figure 4.3.11**).

- Thirteen substations will be built for distribution of electricity supply to the consumers for the whole Project (**Figure 4.3.11**).

(b) Water Supply

- **Demand:** The development will require 7.251 MLD of potable water (**Table 4.3.6**). The water sources and storage in the Project are shown in **Table 4.3.7**.

Table 4.3.6: Daily Water Demand for the Development

Phase of Development	Water Demand (m^3/day)	Water Demand (MLD)
Phase 1 inclusive Plots 1 (jetty only) and 3	236	0.236
Phase 2 inclusive Plots 1, 2, 4, 8, 9 & 10	3,471	3.471
Phase 3 inclusive Plots 5, 6, 7, 13 & 14	3,476	3.476
Plot 12*	68	0.068
Total	**7,251**	**7.251**

Note: *Plot 12 (public park) will be developed by the authority in Timor-Leste.

Table 4.3.7: Water Storage for the Development

No.	Water Source	Storage Location	Plot	Capacity/ Area	Usage
1.	Government water supply	Storage Tank	Plot 8	400 m^3	Portable Water
		Pump House & Suction Tank	Plot 8	200 m^3	Portable Water
2.	Water Plant	HSSC	Plot 4	600 m^3	Portable Water
3.	Stormwater RO Plant	HSSC	Plot 4	1,000 m^3/day	Portable Water
4.	Stormwater Runoff	Lake D	Plot 2	32,240 m^2	Irrigation. Use of recycled water
		Lake E	Plot 2	11,221 m^2	Irrigation
		Lake F	Plot 2	15,255 m^2	Irrigation
		Lake G	Plot 2	4,387 m^2	Irrigation
		Lake H	Plot 2	2,442 m^2	Irrigation
		Lake I	Plot 2	577 m^2	Irrigation

No.	Water Source	Storage Location	Plot	Capacity/ Area	Usage
		Lake1	Plot 9	12,400 m^2	Irrigation
		Lake 2	Plot 9	12,375 m^2	Irrigation
5.	MBR-RO	HSSC	Plot 4	500 m^3/day	Recycle to feed cooling tower
		Hillside Villas/ Residences	Plot 8	300 m^3/day	
		Hotel 2	Plot 10	100 m^3/day	
6.	Desalination Plant (SWRO)	HSSC	Plot 4	1,000 m^3/day	Portable Water

- **Supply:** The Dili water supply comes from three treatment plants fed by intakes from the Bemori, Benmauc and Maioa Rivers as well as eight borehole sources at Comoro, Kuiuhun and Heraii.

- There is a shortage of treated water in Dili due to issues of power supply, chemicals for water treatment, turbidity and low flows in the rivers during the dry season and heavy rainfall in the wet season, and a high degree of leakage in the old reticulation system. As such, storage reservoirs are needed for water supply during the dry months with prolonged periods of low river flows.

- There is already a main pipeline along Rua Terra Santa in front of the Project site (**Figure 4.3.12**). The Project will have three connecting pipelines to this main pipeline in future – one in the eastern residential area (Plots 8 & 9), another in the middle Project site, east of the proposed 5-star hotel (Plot 1), and the last one, east of the proposed 2nd hotel (Plot 10). Water will be reticulated from these three connecting pipes to the various components within the Project.

- Stormwater runoff from the range of hills will be collected by cut-off drains and the water will be channelled to lakes/reservoirs, golf lakes, etc. (**Figure 4.3.13**).

(c) Desalination to Augment Water Shortage

- Desalination is one of the options proposed to augment potable and non-potable water when the area suffers from prolonged drought for half of the year. Although groundwater is also considered, it may be difficult to abstract due to seawater intrusions and hence a desalination plant has been proposed.

- Desalination removes dissolved minerals from seawater and brackish water. A number of technologies have been developed for desalination, including reverse osmosis (RO), distillation, electro-dialysis and vacuum freezing. Although various methods can be used to desalinate seawater, thermal (evaporative) and reverse osmosis (membrane based) are the two most matured and commonly used technologies.

- In this Project, the proposed desalination plant is located in the HSSC [**Figure 4.3.7 (b)**]. Seawater (directly pumped from offshore intakes) will be fed to the desalination plant to produce 1,000 m^3/day for eight hours per day using solar power. The solar panels will be mounted on Lake A's surface to reduce surface water evaporation.

- The desalinated water may be used in its pure form (e.g. for make-up water in steam boiler plant) or it may be mixed with less pure or recycled water for irrigation or other uses. The desalination plant is designed to ensure a very low intake water rate so that marine life will not be affected adversely at its inlet and outlet.

- At the desalination plant, fine particles will be removed during initial screening before the water passes through the RO membrane from the inlet. Once converted, the water from the desalination plant will be treated. The seawater concentrate will be discharged back into the sea through an underground and then undersea pipeline east of Dili Rock or near to the floating jetty. Both discharge options are now under consideration.

- The concentrate (or brine) is saltier than seawater but it will quickly revert back to seawater standard concentrations once discharged within a short distance, by dilution from the vast expanse of seawater. The discharge is through the discharge nozzles, which act as diffusers slowly releasing the brine. The placement of the discharge pipeline and outfall will be much further offshore so as not to contaminate the intake, and to ensure fast and adequate dilution to avoid any hyper-saline conditions that could affect marine life.

(d) Sewerage Facilities

- **Design Capacity:** The Project will involve the construction of three STPs located, one each (i) within the utility centre (Plot 4), (ii) residential units (Plot 8) and (iii) 2nd hotel (Plot 10) [**Table 4.3.8** and **Figure 4.3.14 (a)**].

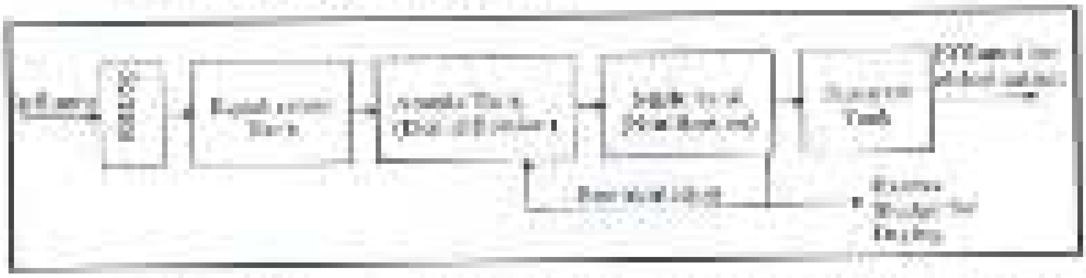
- They have a total design capacity of 2,250 m^3/day for the whole development.

Table 4.3.8: STP Locations and Capacity

No.	STP Location	Sewage Catchment	Design Capacity (m^3/day)	
			Sewage MBR	MBR-RO
1.	HSSC at Utility Centre (Plot 4)	5-star Hotel	1,000	500
2.	Utility Plot at Residential Units (Plot 8)	Residential Units, School, Youth Development and Community Centre, and Hospital	1,000	300
3.	Utility Plot at 2nd Hotel (Plot 10)	Service Apartment and 2nd Hotel	250 (expandable to 1,000)	100 (expandable to 300)

- **Sewage Treatment System:** The proposed three STPs will use the MBR system, which combines conventional biological treatment and membrane filtration process for biodegradation of organic pollutants in wastewater [**Figures 4.3.14 (b) – (c)**]. MBR technology is selected as it can support much higher biomass through effective aerobic biological treatment, generating less sludge with longer retention time.

- An overview of the MBR STP process flow is shown below. Pre-treatment involves influent flowing in for screening and equalisation. Coarse screen blocks followed by-pass sand are used for screening off the larger particles. Equalisation tanks will be used to balance the wastewater flow and to control loads before the wastewater is pumped to the next treatment process.

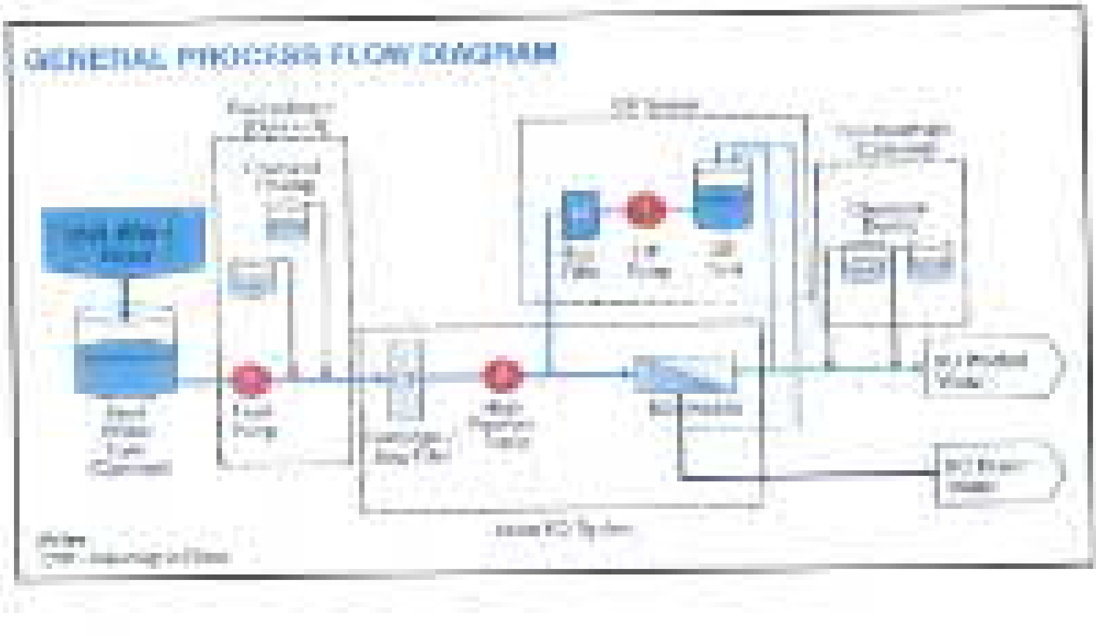


- During treatment, most of the Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and suspended solids in the wastewater would be removed by the membrane bioreactor process. The effluent is cleansed and contains almost no suspended solids, which is then allowed to be discharged to retention ponds or for further polishing for reuse.

- A sludge dewatering pack filter system will be deployed to capture the produced sludge for sludge drying. The dewatered and/or dried sludge can be used as fertilisers after stabilisation or sent for incineration or disposed off to help in composting.

- The MBR effluent water can be further improved with the RO systems to produce reusable water for more applications such as to feed the cement cooling towers and as boiler feed water, as well as other non-potable usage (e.g. cleaning toilets). The surplus MBR effluent water will be stored at retention pond for irrigation purpose.

- The final leftover materials can go into another process to turn it into bio-fertiliser, which is good for plants and turf. Hence, there is zero discharge to the sewage system in Tibet. An overview of the MBR RO process flow is shown below.



(e) Solid Waste Management

- A central garbage collection building has been designated west of the utility centre (Plot 4). All municipal solid wastes including garden wastes within the Project site are collected and stored at the central garbage collection building and disposed off at the Tibar Landfill, located about 4 km southwest of the Project site. Garden wastes will be collected and decomposed as fertilisers for the gardens and parks. Waste decomposer will be utilised to decompose food waste into fertilisers.

(f) Tele-communication

- The whole development will need ~1,200 to 1,500 direct lines. The tele-communication system will be connected through manholes associated with four-way underground ducts along an access road to various building blocks. Voice and data will be transported through fibre-optic or copper wiring, which will be available to all the buildings in the development and access road.

(g) Jetty (Plot 1)

- A substantial amount of construction materials and equipment will be brought into the Project site by barges. The existing Port of Dili is congested with a shortage of storage space that could delay the construction works. Moreover, the road leading to the Project site is very busy and narrow that will cause a lot of congestion and inconvenience to the population in Dili. Because of this, a floating jetty [**Figures 4.3.15 (a) – (b)**] is planned at the Project site (Plot 1) for unloading the construction materials and equipment.

- This floating jetty will be located northeast of the 5-star hotel (Plot 1) in front of St Paul's Holy House. When construction ends, this jetty will be upgraded to connect to the scenic waterfront recreational areas with food and beverage outlets and a sea sports recreation centre.

- Due to its iconic location, the jetty will blend in with the hotel and golf & country club environment during the operational phase. The jetty is intended to float with the rise and ebb of the tides; an experience by itself, and is unobtrusive to the eye.

- The floating jetty is "L-shaped" with a jetty head of 120 m long × 20 m wide, and an access jetty of 100 m long × 20 m wide. The jetty will have two operational areas capable of berthing 10,000 DWT container vessels and 5,000 DWT barges. An inner berth will be capable of berthing 2,000 DWT vessels. The floating jetty will be held in place by vertical steel piles with steel/teflon guides to allow the jetty to float up and down with the tide.

4.3.4 Reforestation Scheme

- The forest reserve areas (Plot 11), mainly the surrounding range of hills, are green from January to April each year during the rainy season. During the dry season, the area becomes parched and the landscape turns dry and dusty brown. Over the years with logging and deforestation, the hills are devoid of many trees facing the windward side. Only stunted trees, grasses and shrubs are found. The single peak monsoonal season does very little to help in natural reforestation.

- The flood plains of the Project site have hardly any trees of significance. Apart from the area in which infrastructure will be built on and the golf course area, Pelican Paradise Holdings (Timor-Leste) plans to reforest the hills as demarcated in the Masterplan (**Figure 4.3.1**).

- The difficulty in reforestation is the weathered Alieu soils with low organic matters and hardly any natural subsurface water storage and soil moisture. The small ephemeral streams emanating from the hills have very little freshwater even during the wet season. This makes reforestation of the hills difficult.

- The advantages of reforestation, besides increasing the water source areas, include the following:

  (i) Create a green environment.
  (ii) Create green areas to counter the heat island effect and to lower the high temperature in the dry season.
  (iii) Bring back flora and fauna to the Project site.
  (iv) Beautify the site.
  (v) Environmental enhancement and protection.
  (vi) To be an example of a 'green' development.

- Pelican Paradise Holdings (Timor-Leste) will engage with the Forestry Department and the landscape architects to explore the indigenous flora of Timor-Leste to reforest the area accordingly. Part of the reforestation is also to ensure that there is sufficient water to sustain the greenery in the Project throughout the year.

4.3.5 Lake Rehabilitation

- The Tasi Tolu Lakes, which were formerly bay areas that have been isolated when the coastal sand spit naturally enclosed the low-lying bay, have salinity much higher than the sea. The highly saline lakes are already in an anoxic condition that contains high amounts of organic matter, low dissolved oxygen (DO), and semi-eutrophicated, which are detrimental to aquatic lifeforms. The near absence of water weeds and food within and around the Tasi Tolu Lakes are also discouraging the local and migratory birds to rest and breed in the area. As such, the PP has decided to rehabilitate the lakes.

- Except for Lake A, the rehabilitation of the Tasi Tolu Lakes B and C will be carried out by the Governmental authorities as they are under the jurisdiction of the Governmental authorities in the public park. The PP however, through the consulting engineers, has proposed the method to rehabilitate the saline lakes.

(a) Tasi Tolu Lake A

- Lake A covers an area of 64,000 m^2. Lake A is located inside the golf course west of the hotel and will be preserved as a saltwater lake. The lake covers an area of 64,000 m^2 and the sides of the lake will be raised to match the levels of the golf course. The lake bottom will be excavated to RL-3.80 at the deepest section making the lake 5.0 m deep. The lake level will rise and fall with the tide (sea) but the depth of water will never be less than 3 m.

- Lake A can store 220,000 m^3 of water A total of 10 air stations comprising five units each of bottom diffusers will be needed to keep the lake aerated and oxygenated. This will help maintain the DO level and balance the BOD, Phosphorous and Nitrogen in the lake. Refer to **Figures 4.3.16 (a) and (b)** for the water circulation.

- A seawater inlet will be installed to allow inwards flow of seawater from the sea to Lake A as the tide rises and falls. A similar pipe will allow water to overflow from Lake A to Lake B and thus discharge to the sea [**Figure 4.3.16 (b)**].

- To restore the lake ecosystem, fish stocking will be carried out and suitable plants and mangroves will be planted at the lake perimeters (details refer to **Section 9.10**).

(b) Tasi Tolu Lake B

- Lake B will be preserved as a saline lake without lining. Presently, the lake has a surface area of 130,000 m^2 with a maximum depth of -15 m. This depth will be raised to -12 m. The Lake will be restored through destratification of the lake waters using bottom aeration as well as circulating fresh seawater into the lake and channelling the contaminated salt water back to the sea [**Figure 4.3.16 (c)**].

- Destratification would be achieved by positioning groups of air diffusers to produce minute air bubbles to (i) increase dissolved oxygen in the lower layers of the water and (ii) to churn the bottom water upwards, which in turn will draw the top oxygenated water layer to the bottom, in a circular motion. To do this, 30 air stations, each comprising five units of bottom diffusers, will have to be installed and running 24 hours daily. The lake will be filled with gravel to create a flat lake bottom platform for positioning the air stations. There will be one water jet shooting water 30 m high at 79.6 m^3/hr installed to promote aeration, and as a striking feature of the lake, as shown in **Figure 4.3.16 (d)**. Once the lake has been restored into a healthy state, destratification has to be continued as and when required in lake management.

- A lake overflow will be installed at the north of the lake to discharge overflows to the open sea via the HDPE pipe culvert to the west of the public park (Plot 12). An HDPE flap valve will be installed at the outfall to stop seawater flowing back to the lake. This pipe is normally dry and water only flow through from the lake to the sea during extreme rainfall.

- To restore the lake ecosystem, fish stocking will be carried out and suitable plants and mangroves will be planted at the lake perimeters to create wetlands for the fishlings to breed and the birds to roost (details refer to **Section 9.10**).

(c) Tasi Tolu Lake C

- Lake C covers a surface area of 120,000 m^2 with a varying depth up to 5 m. It will be preserved as a saline lake without lining [**Figure 4.3.16 (c)**]. Lake C can store 400,000 m^3 of water. A total of 12 air stations comprising five units of bottom diffusers will be needed to keep the lake healthy by aeration to maintain a balance of DO, BOD, Phosphorous and Nitrogen in the lake.

- A seawater inlet will be installed alongside the commercial centre 2 (western side) to allow exchange of seawater between the sea and the lake as the tide rises and falls. This pipe culvert is normally full of water where fishes can live in the culvert and migrate to the lakes. Fish traps can be installed in the culvert to allow fishes to swim to the lake but cannot exit from the lake.

- The culvert will feed fresh seawater to a pumphouse supplying 6,000 m^3/day north of Lake C. One water jet shooting 30 m high at 79.6 m^3/hr will be installed to promote further aeration and as a feature of the lake. The seawater will flow from an opening of 14.5 m wide from Lake C to Lake B, and thence, discharge back to the sea as shown in **Figure 4.3.16 (d)**].

- To restore the lake ecosystem, fish stocking will be carried out and suitable plants and mangroves will be planted at the lake perimeters (details refer to **Section 9.10**).

4.3.6 Developmental Phases

- The Project will be developed in three phases within six years (**Table 4.3.9** and **Figure 4.3.17**). The 2nd hotel will be developed based on the growth of the tourism industry and the expansion of the Presidente Nicolau Lobato International Airport, which will bring in a larger number of foreign tourists. The developmental components will likely overlap with the phases.

- As the Project is big, there could be unforeseen circumstances arising during development which may cause a delay in construction works. Any delays will be notified to the NDPCEI.

Table 4.3.9: Project Developmental Timeline

Phasing	Development Plot/ Component	2017	2018	2019	2020	2021	2022	2023
Phase 1	Plot 1 – Jetty Plot 3 – Service Apartment Plot 10 – 2nd Hotel (earthworks only)							
Phase 2	Plot 1 – 5-Star Hotel Plot 2 – 18-Hole Golf Course Plot 4 – Utility Centre Plots 8 & 9 – Residential Units (infrastructure works)*							
Phase 3	Plot 5 – School Plot 6 – Hospital Plot 7 & 13 – Commercial Centre 1 & 2 Plot 10 – 2nd Hotel Plot 14 – Youth Development and Community Centre Plot 11 – Forest Reserve Areas (Reforestation)							

Note: * Earth fill materials will be obtained from Plots 8 and 9 and other component parcels of land.

4.4 JUSTIFICATION AND NEED FOR PROJECT

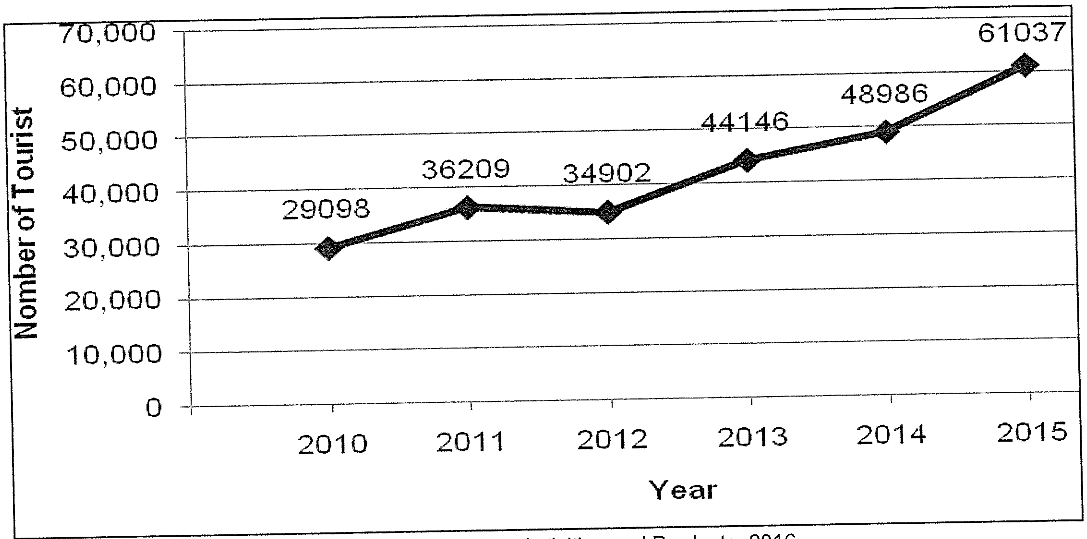
- The need to develop the Project is altruistically predicated on a number of strategic factors underpinning the scope of works as follows:

  (i) Promote tourism activities in Timor-Leste.
  (ii) Integrated development planning and future growth.
  (iii) Socio-economic development.
  (iv) Conserve and rehabilitate the environment.

4.4.1 Promote Tourism Activities in Timor-Leste

- Tourism is scoped as one of the major activities that will promote strong socio-economic growth in Timor-Leste. The total number of in-coming tourists and visitors (mainly foreign) is low although it showed yearly increments (**Figure 4.4.1**). This is seen as a positive factor for the local tourism industry and the economy since the country has the carrying capacity to take in more tourists. The development of the Project will be a strong pull factor to attract more tourists to the country.

Figure 4.4.1: Total Number of Tourist Arrivals (2010 to 2015)



Source: National Directorate of Tourism Enterprise, Activities and Products, 2016.

- In tandem with the above, adequate and quality accommodation will be required to cater for the short- and long-staying tourists. Quality accommodation is grossly lacking in Timor-Leste. The 5-star hotel in the Project will add a total of 464 quality hotel rooms and 13 hotel villas to the present stock of hotel units and accommodation in the country. This number of units will be increased later with the construction of 2nd hotel and residential units to expand the accommodation sector.

- The Project will help enlarge the economy when demands for related tourism facilities and services are also increased. Chief among these are services to cater for local, regional and international conferences, conventions, meetings and exhibitions, which presently are sorely lacking and limited. Adding to the opportunities in business and employment available to the people of Timor-Leste, are the foreseeable expansion of the food and cottage industries and transportation sectors to cater to the tourists, all of which are destined to increase the multiplier effects and increase the overall Gross Domestic Product (GDP) of the country.

4.4.2 Integrated Development Planning and Future Growth

- **Development planning:** Timor-Leste in the last 10 years has positioned itself for economic and developmental expansion after a period of consolidation in its politico-economic history. In terms of the environment, it has come up with very stringent legislations to ensure that the environment, its major natural asset, is not unduly compromised. The EIA process is therefore one of the tools to guide its future growth through a sustainable environment.

- **Integrated development:** The Project is largely an integrated mixed developmental project with a focus on tourism and conventions. Conceptually, it plans to integrate the developmental components of resort facilities, commercial, residential and recreational areas in an urban setting, seamlessly with environmental conservation as a basis to develop the Project. The Project will serve as a model that internalises modern technologies and innovations to maximise the limiting resources such as water through best management practices in water usage and wastewater management within an area that is well-known for its coastal and marine environmental assets.

- **Future prospects:** There will be many more projects to come in future in Timor-Leste by other investors and developers besides this Project, which so far, is the largest in the country. What is foreseen is that all future projects will likely be looking at this Project as a benchmark in terms of its designs and plans that integrate development with the environment to benefit the population and the country.

4.4.3 Socio-Economic Development

- **Confidence building:** Timor-Leste needs investors to help develop the country. This Project is slated to inject an estimated USD710 million directly to the development based on the preliminary developmental costs, and indirectly into the local economy. This will help immediately to boost the confidence of other future investors who are looking for opportunities to invest but are looking for someone to lead the way to start first. This Project will thus create a snow-ball effect, boosting the confidence of many other investors to bring in development that will be beneficial to the country's economy.

- **Employment:** In terms of employment, the Project has the propensity to generate more than 1,500 jobs in both its construction and operational phases. Most of these jobs created are in the service sectors such as hotels, service apartments, recreational areas, infrastructure, hospital, utilities and the golf course. This will be a significant boost to the local employment scenario, which presently, is low and jobs are scarce as seen in the Timor-Leste Labour Force Survey 2013 (General Directorate of Statistic, 2014).

- **Timor-Leste Labour Force Survey 2013 (by GDS, 2014):** Based on the survey, there is a large group of human resource that can be tapped from, in the country. The ratio between employment to active working population (those who can and are able to work) was only 27.3% amongst the age group of 15 years and above, in 2013. Using this information as a guide to fast forward to 2016, the implication is that unemployment and under-employment will remain very high; and if nothing is done, the trend may persist.

- **Table 4.4.1** showed a comparison of the employment scenario between 2010 and 2013, where there was not much change amongst the working age group, but the disparity in the number of employed versus unemployed seemed to have widened considerably to 23,400 in 2013 from 9,000 in 2010. Ameliorating this, the Project will be able to absorb a lot of this available labour by providing them with gainful employment during the construction and operational phases.

Table 4.4.1: Employment Statistic in Timor-Leste (2010 and 2013)

Year	Working-age Population[(a)]	Labour Force[(b)]	Employment[(c)]	Unemployment[(d)]	Inactive
2010[(i)]	627,000	261,000	252,000	9,000	366,000
2013[(ii)]	696,200	213,200	189,800	23,400	483,000

Source: (i) Timor-Leste Labour Force Survey 2010, National Directorate of Statistics, 2011.
(ii) Timor-Leste Labour Force Survey 2013, General Directorate of Statistics, 2014.

Note: (a) The population of Timor-Leste that age ranging from 15 to 64 years old.
(b) The Timor-Leste working-age population (15 – 64 years of age) that engages actively in the labour market, either by working or looking for works.
(c) The employed population in the labour force.
(d) The unemployed population in the labour force.

- From the above survey, it also appears that the types of jobs in the job market and the opportunities available, are very narrow for the employable youths, who mostly had secondary education (42.1% of the youth labour force). There are very few industrial and resource-based industries in the country to-date to widen this job band to absorb them. Hence most of the jobs available are in the informal service sectors with few job choices. Tertiary education is attained by only 1.4% amongst the population, who are obviously more employable and earn higher wages in the job spectrum.

- As indicated above, the Project will provide gainful employment to at least 1,500 employable persons or more, in both phases of development, or about ~6.4% of the 23,400 unemployed group. This is moderately high, especially when this future employed group in turn will generate other needed services when more money is seeped into the local and national economy in an escalating cycle of opportunities. The employable group will most probably be absorbed in administration, hotel catering and services, tourism product development, advertising, internal and external transportation services, repair and maintenance works.

- **Skills training:** To lessen the issue of a mismatch between employment and education as highlighted in the survey, the Project will provide job training through the youth development and community centre slated for construction on Plot 14 of the Project. Much of the training however will be on-the-job training related to hotel catering, administration and the services trade.

- The PP has proposed for a youth development and community centre within the Project site, where under-privileged, unskilled, semi-skilled, unemployed and under-employed persons will be given various forms of assistance to improve their employment opportunities and livelihood. These include skill training and practical work to allow them to earn their own living in future, or to work in the Project. Eventually the overall unemployment rate in the country will be reduced slowly but surely.

- **Spin-off effects:** The jobs created by this Project will be at all levels. There is an employment assurance agreement between the PP and the Government that preferences will be given to the locals in Timor-Leste. This future large working population will indirectly spin-off other job opportunities as well, such as the food and retail services to cater to the needs of the workers, and collectively, the livelihood of the whole local community will improve.

4.4.4 Conserve and Rehabilitate the Environment

- **Physical improvements:** The developmental design has taken into consideration the existing terrain and land attributes to minimise cut and fill and to maintain the natural environment as much as possible. The configuration of the three Tasi Tolu Lakes will be improved for aesthetic reasons to blend in seamlessly with the golf course, the public park and the other components in the Project. Water storages will be considered to harvest rainwater and from stream flows. Desalination has also been considered to augment water supplies. Re-foresting the bare areas will also be one of the main activities to re-create a natural sustainable water source area for freshwater capture. All these activities are measures incorporated into the planning designs to sustain and save water and to enhance the environment.

- **Reforestation:** The Project will feature a reforestation programme of the largely denuded hill areas to re-create an environment suitable for a water source area. *Inter alia* to this, the reforestation programme is also intended to improve the faunal population by providing food and shelter for their habitation.

- **Experiences gained:** The experiences gained will be invaluable to those involved in developing this large integrated mixed development Project. They will be able to help manage all other future development in Timor-Leste. The local government officials, counterparts and stakeholders including the workers will gain through transfer of knowledge and technology towards better management of the environment.

4.5 PROPONENT'S ENDORSEMENT OF EIS

I hereby declare that the entire EIS Report is the product of the qualified EIA Consultant engaged by my company and all the facts stated in the Report and the accompanying information are to the best of my knowledge and belief true and correct at the material time, and that I have not withheld or distorted any material facts. I agree and I undertake the responsibility to implement all the mitigation measures described in the EIS Report.

Name of Project Proponent : Dr Jeremiah Chan Kin Meng

Designation : Executive Director

Signature : **Date** : 17/4/2018

Company's stamp : Pelican Paradise Holdings Timor-Leste
Suite 333B Timor Plaza
Rua Presidente Nicolau Lobato

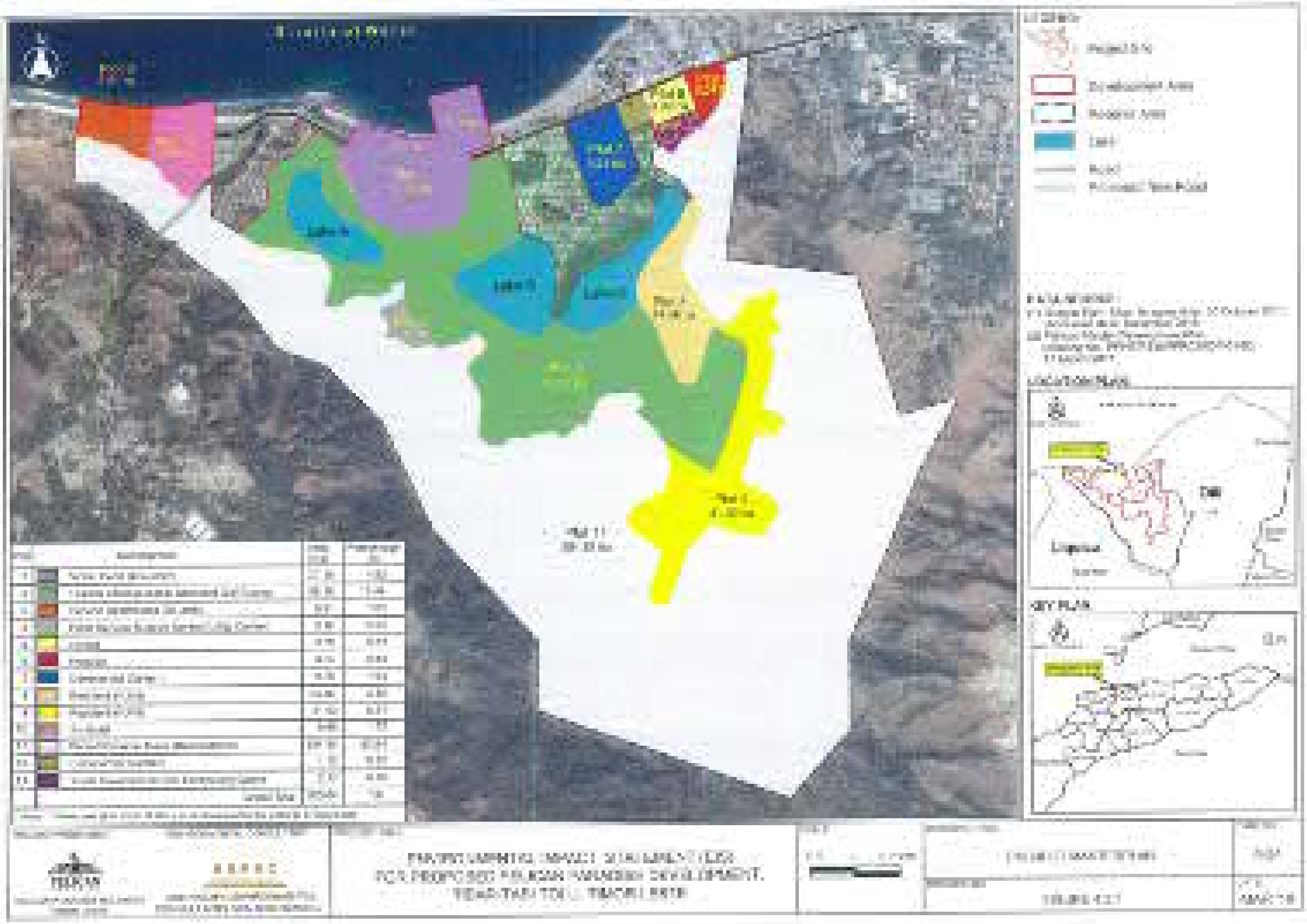
4.6 STRUCTURE OF EIS

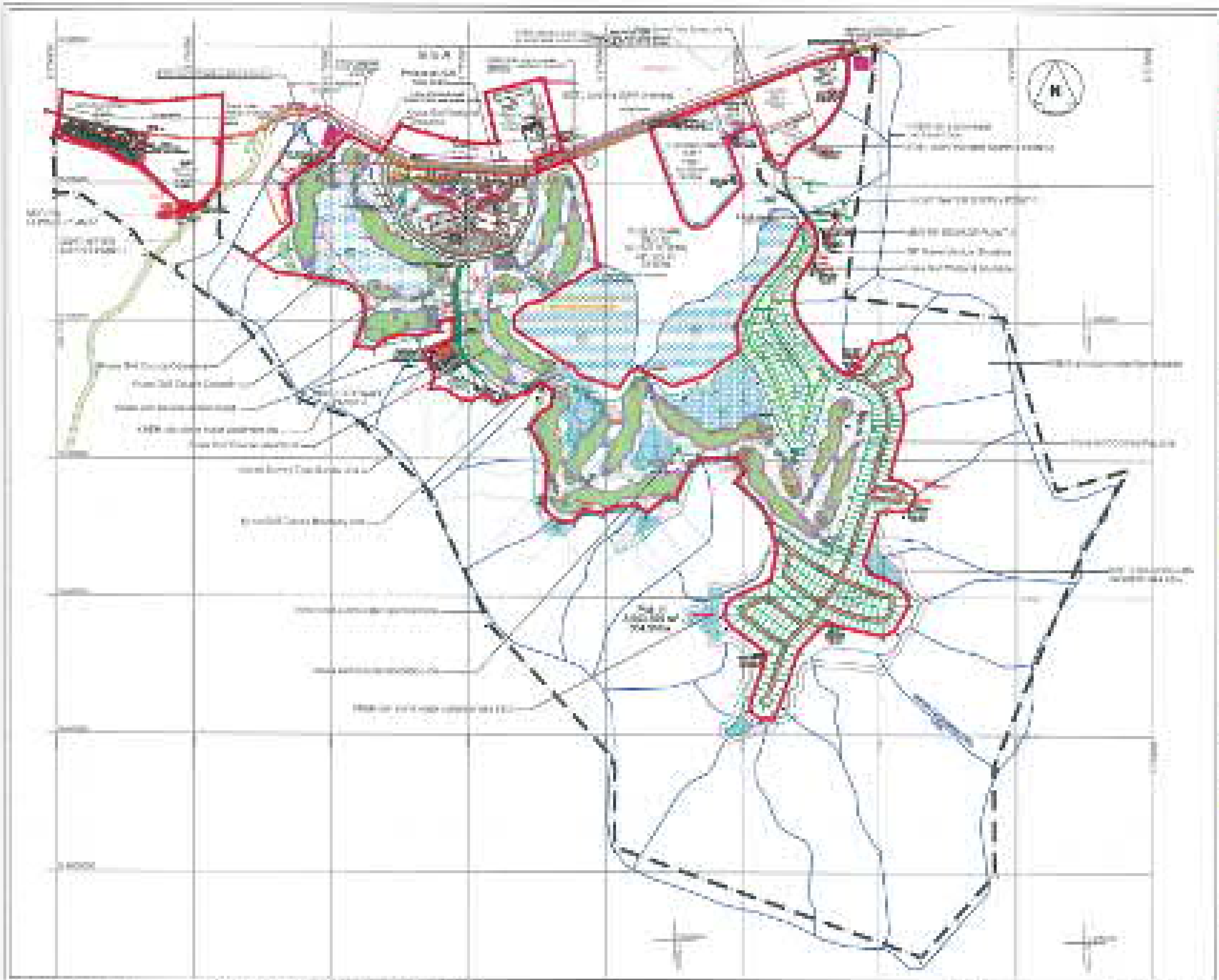
The structure of the EIS Report is shown in the Table below.

Chapter/ Title	Focus
Chapter 1: Executive Summary	Provides a summary of the key findings and conclusions of the EIS.
Chapter 2: Background Information and Project Proponent	Information on the PP.
Chapter 3: Consultants and Specialists	Information on the Engineering Consultant and Environmental Consultant.
Chapter 4: Description of the Project	Overall description of the Project concept, development phases, components as well as the need for the Project.
Chapter 5: Policy, Legal and Institutional Framework	Statutory requirements for the EIA.
Chapter 6: Description of the Environment	Describes the existing environment, classified into physico-chemical, biological and socio-economic as well as their individual components. Baseline data will be provided as a basis for subsequent assessment of impacts.
Chapter 7: Climate Change	Climate change considerations
Chapter 8: Alternatives	Assessment of different Project alternatives and options, based on environmental and social criteria to identify the most favourable options.
Chapter 9: Impact Assessment and Mitigation Measures	This Chapter describes and identifies all the major significant environmental and socio-economic impacts for which mitigation measures would be proposed.
Chapter 10: Social Impact Assessment	Describes the social impact assessment to the affected communities
Chapter 11: Economic Assessment	Provides the cost and benefits of environmental impacts.
Chapter 12: Summary of Environmental Management Plan	This Chapter presents the Environmental Management Plan which will have an Environmental Monitoring Programme and Audit Plan to ensure that all the significant parameters are monitored throughout the construction and operational phases of the Project.
Chapter 13: Public Consultation and Information Disclosure	This Chapter describes the public participation activities.
Chapter 14: Difficulties Encountered	This Chapter describes the difficulties on collecting or assessing the information presented in the EIS.
Chapter 15: Conclusions and Recommendations	The last chapter provides the conclusions drawn from this Study and recommendation for further action.
Chapter 16: Non-technical Summary	Summarises the key findings of the EIS in simple language.

Point	Coordinate	
	Latitude (S)	Longitude (E)
1	[illegible]	[illegible]
2	[illegible]	[illegible]
3	[illegible]	[illegible]
4	[illegible]	[illegible]
5	[illegible]	[illegible]
6	[illegible]	[illegible]
7	[illegible]	[illegible]
8	[illegible]	[illegible]
9	[illegible]	[illegible]
10	[illegible]	[illegible]

ENVIRONMENTAL IMPACT STATEMENT (EIS)
FOR PROPOSED PELICAN PARADISE DEVELOPMENT
TIBAR, TASI TOLU, TIMOR-LESTE





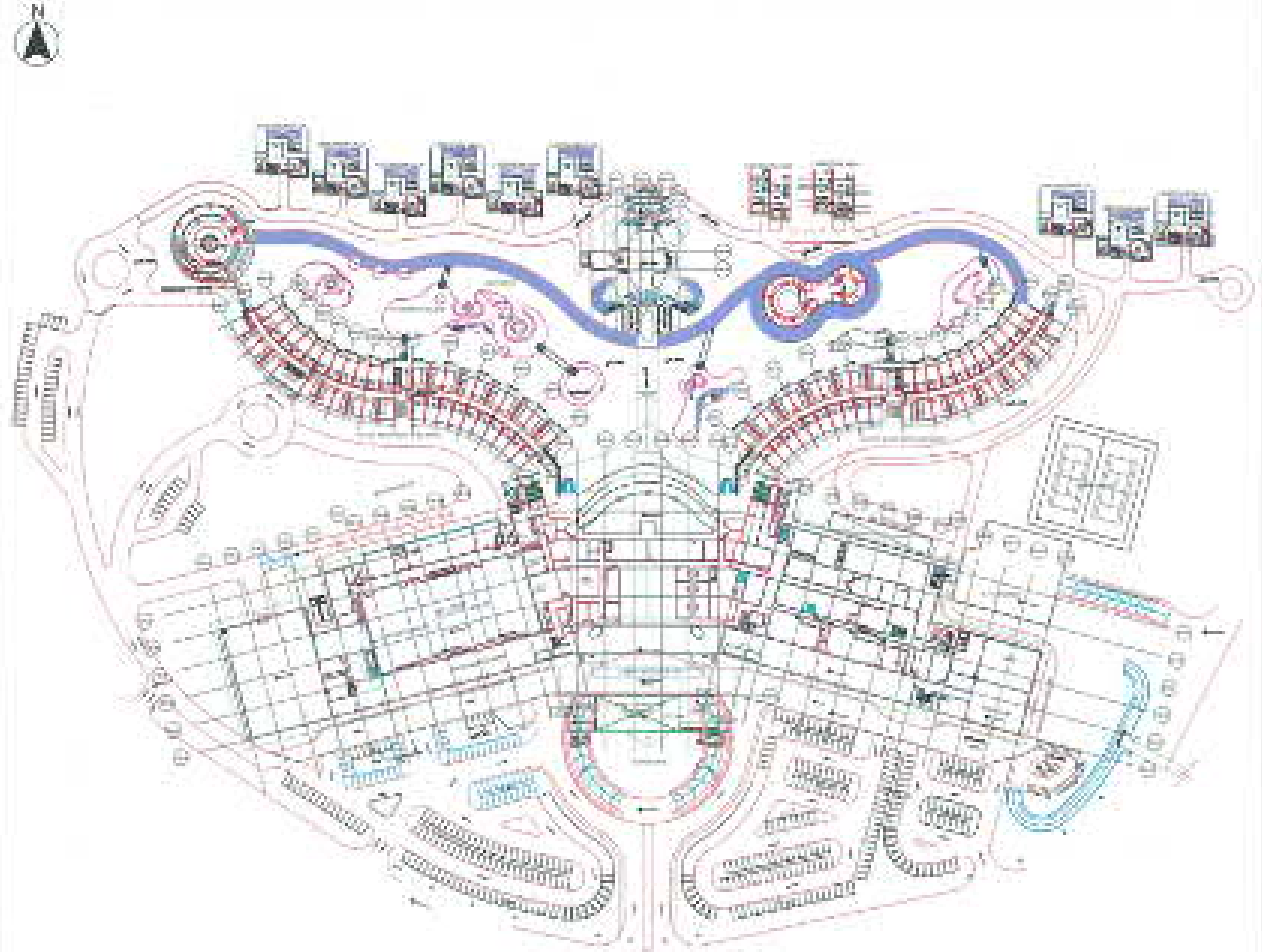
LEGEND:

- Project Site
- Development Area
- Reserve Area
- Road
- Proposed New Road
- Catchment Line

DATA SOURCE:

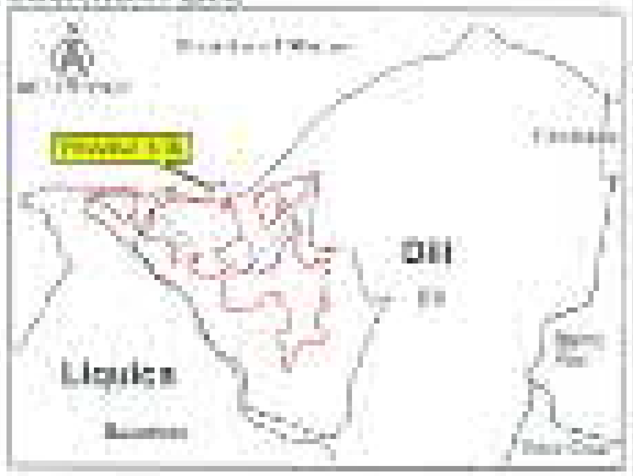
(1) Pelican Master Development Plan,

PROJECT PROPONENT	ENVIRONMENTAL CONSULTANT	PROJECT TITLE	SCALE	DRAWING TITLE	PAGE NO.
PELICAN	ASPEC	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR TASI TOLU, TIMOR-LESTE	NOT TO SCALE	PROJECT LAYOUT PLAN	4-35
				FIGURE 4.3.2	MAR '18



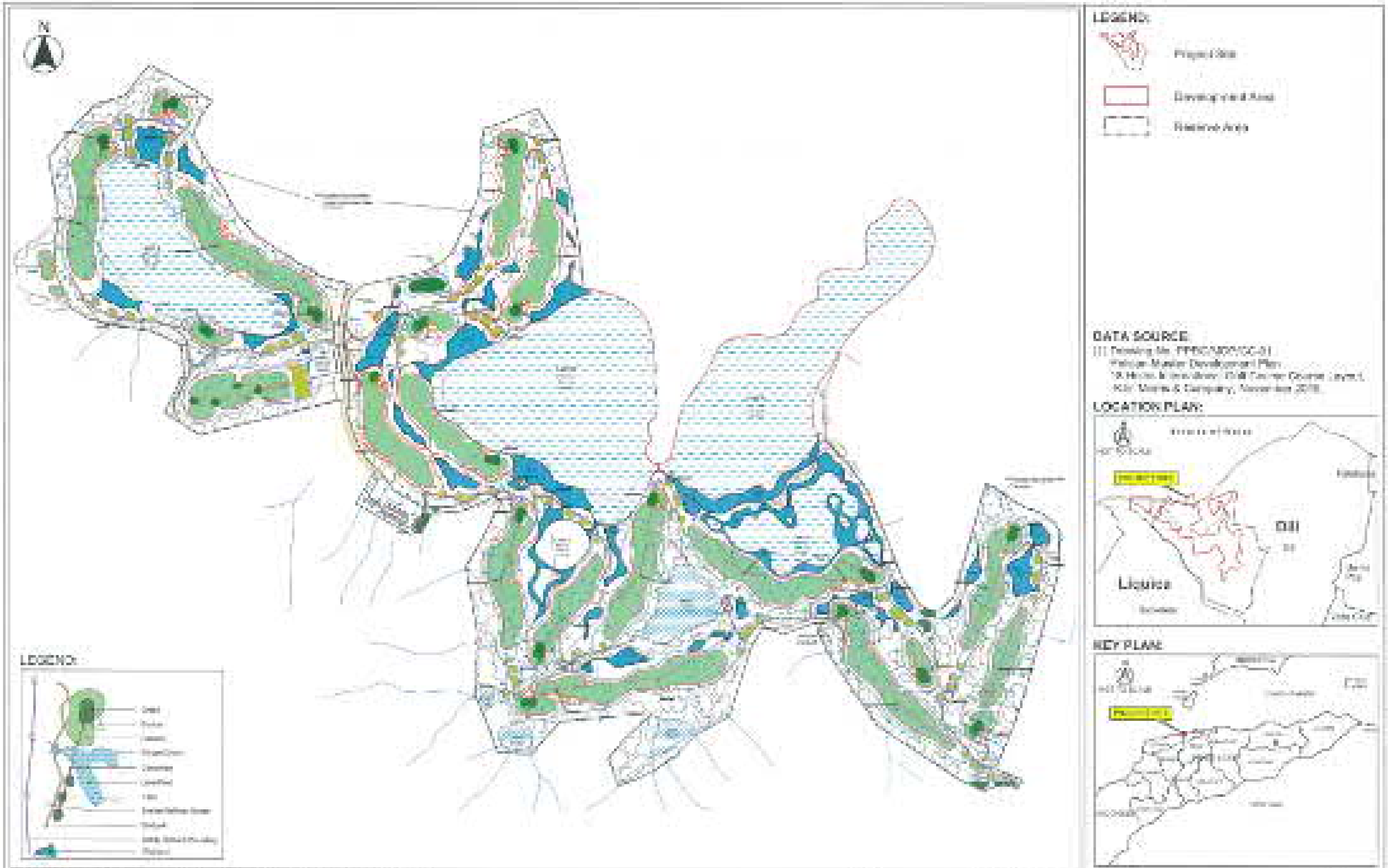
DATA SOURCE:

LOCATION PLAN



KEY PLAN

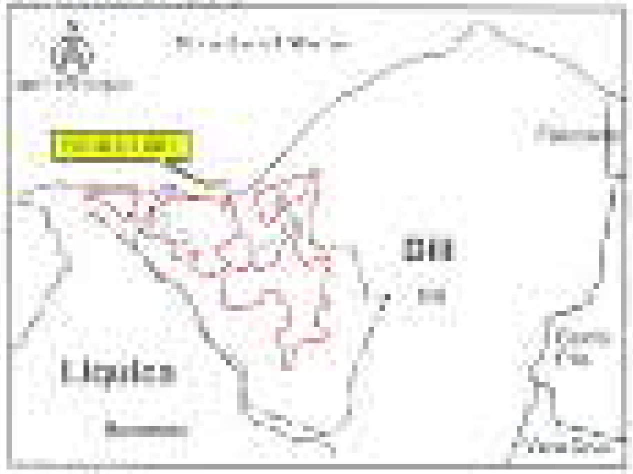
PROJECT PROPONENT	ENVIRONMENTAL CONSULTANT	PROJECT TITLE	SCALE	DRAWING TITLE	PAGE NO.
PELICAN PARADISE HOLDINGS, TIMOR-LESTE	ASPEC ASIA PACIFIC ENVIRONMENTAL CONSULTANTS	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	HOTEL LAYOUT PLAN	4-36
				DRAWING NO. FIGURE 4.3.7	DATE MAR '16



PROJECT PROPONENT: PELICAN	ENVIRONMENTAL CONSULTANT: ASPEC	PROJECT TITLE: ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	SCALE: NOT TO SCALE	DRAWING TITLE: GOLF COURSE LAYOUT PLAN	PAGE NO: 4-27
				DRAWING NO: FIGURE 4.3.4	DATE: MAR '18

DATA SOURCE:

LOCATION PLAN



KEY PLAN

ASPEC

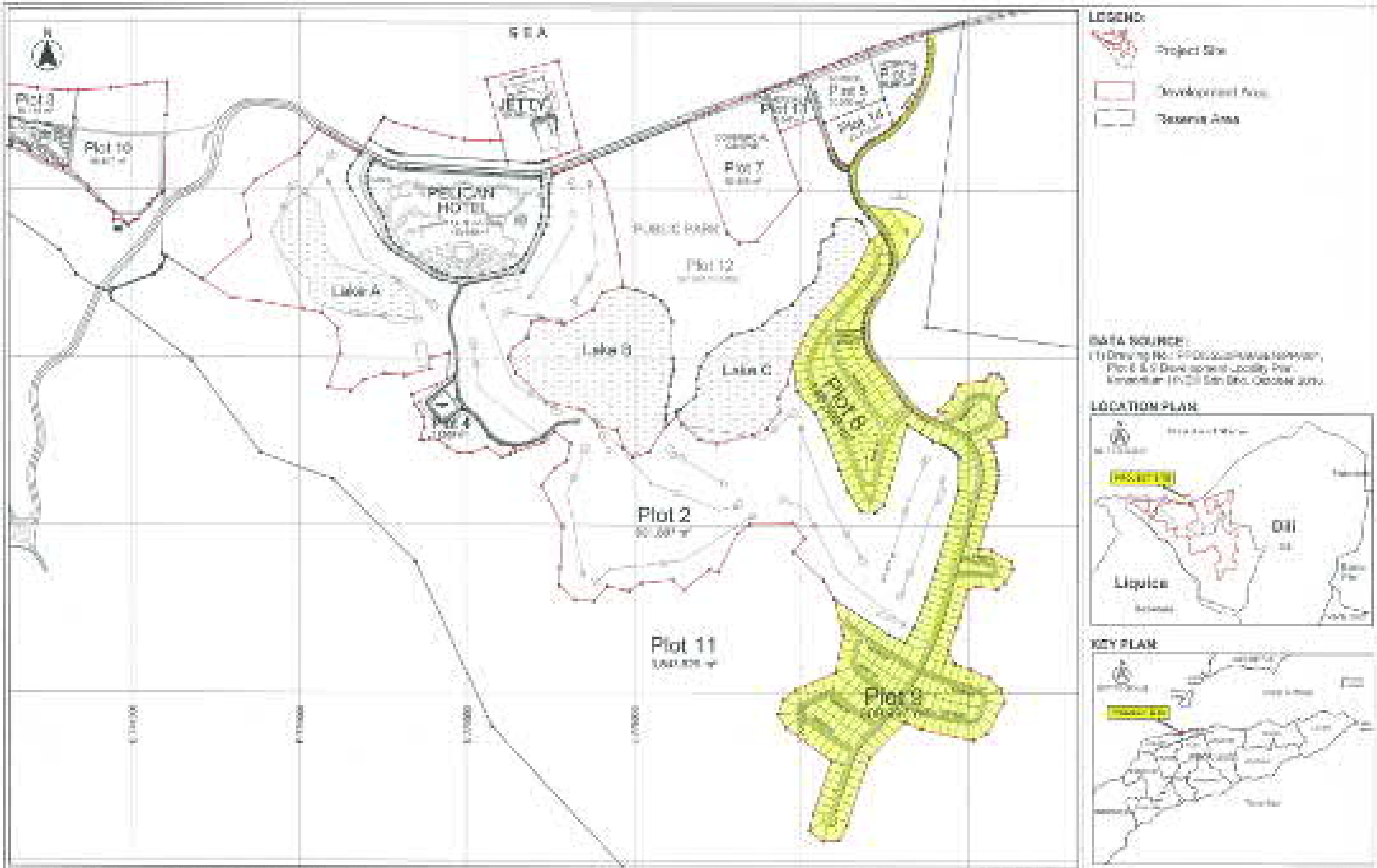
ENVIRONMENTAL IMPACT STATEMENT (EIS)
FOR PROPOSED PELICAN PARADISE DEVELOPMENT,
TIBAR-TASI TOLU, TIMOR-LESTE

SERVICE APARTMENTS LAYOUT PLAN

4-38

FIGURE 4.3.8

MAR '18



PROJECT PROPONENT	ENVIRONMENTAL CONSULTANT	PROJECT TITLE	SCALE	DRAWING TITLE	PAGE NO
PELICAN PARADISE	ASPEC	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	0.1 0 0.1 km	HILLSIDE VILLAS/RESIDENCES LAYOUT PLAN	4-39
				DRAWING NO: FIGURE 4.3.5	DATE: MAR '18

Figure 4.3.7: School Conceptual Plan

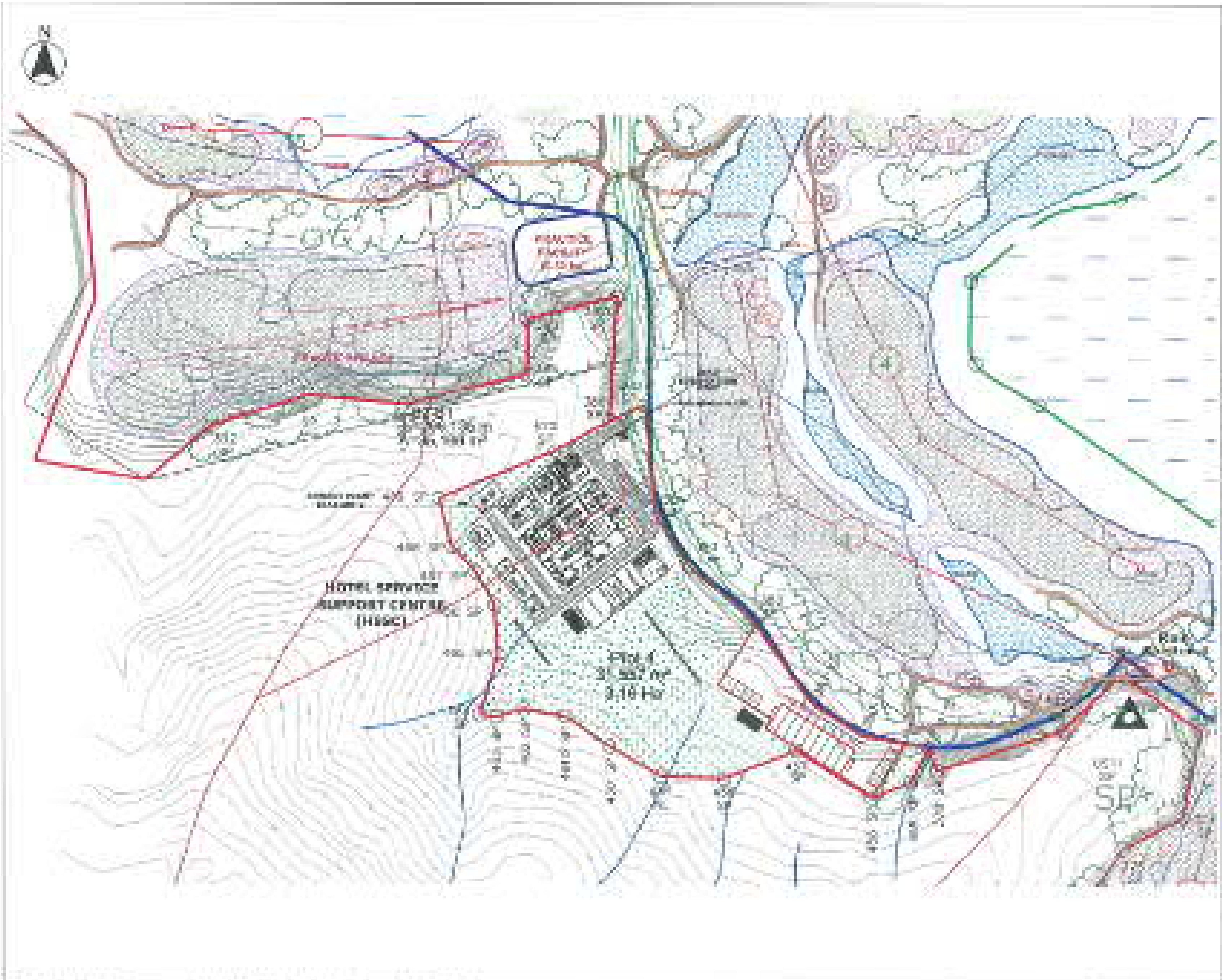
Source: Pelican Paradise Holdings Timor-Leste, 2019

Figure 4.9.9: Examples of Youth Development and Community Centre

Source: Pelican Paradise Holdings Timor-Leste, 2018

Figure 4.3.6: Hospital Conceptual Plan

Source: Pelican Paradise Holdings Timor Leste, 2016



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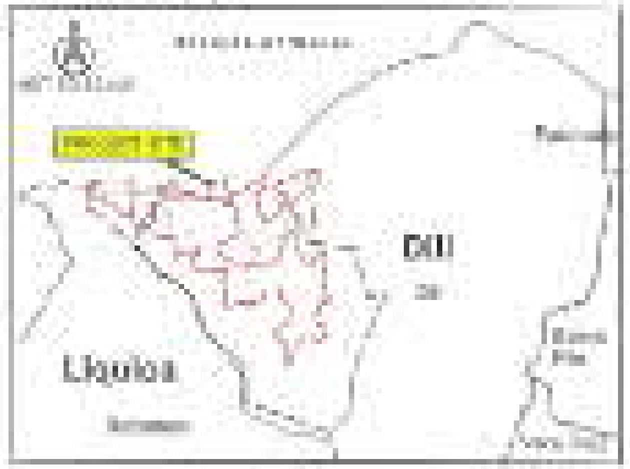
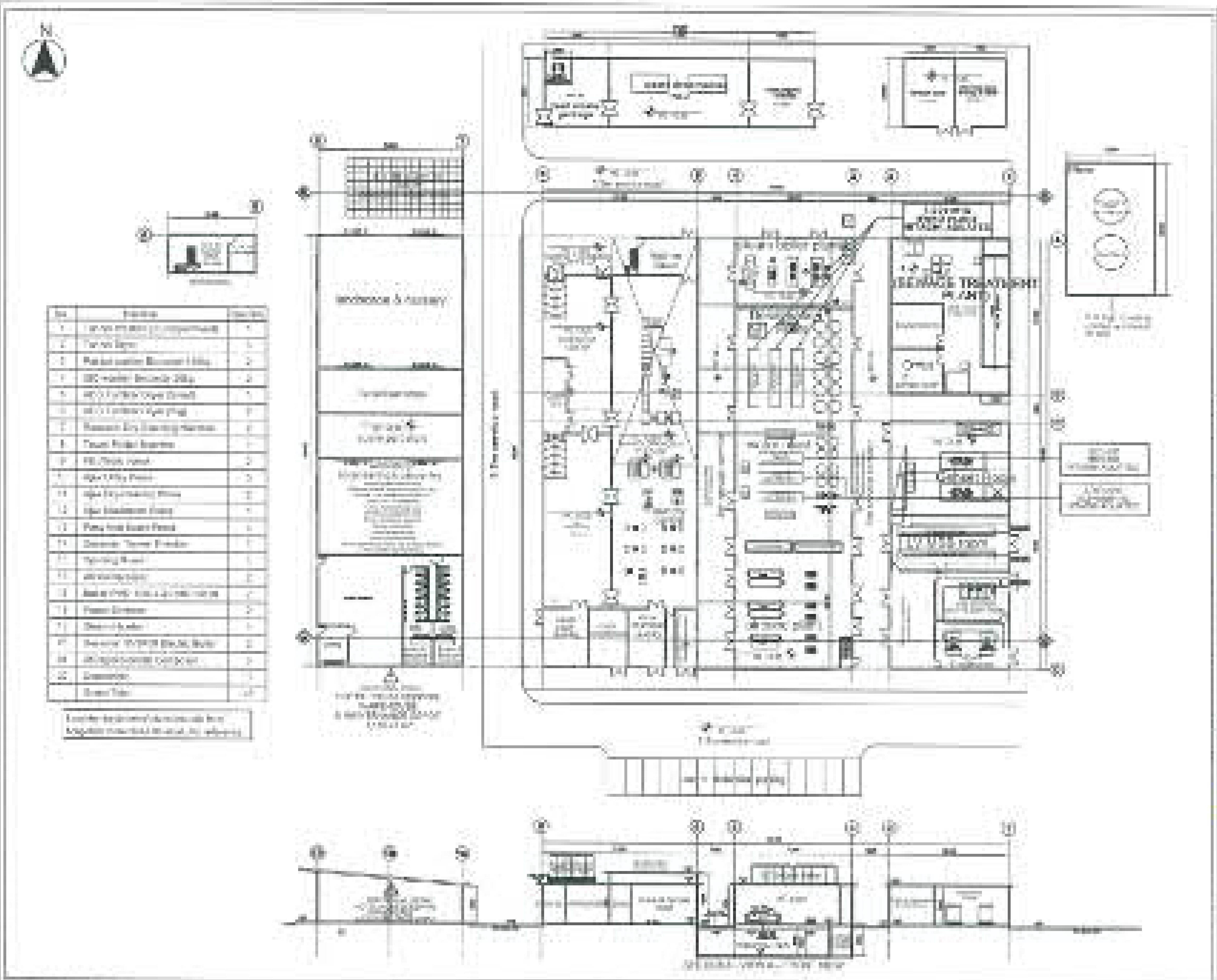
LOCATION PLAN:



KEY PLAN:

PROJECT PROPONENT	ENVIRONMENTAL CONSULTANT	PROJECT TITLE	SCALE	DRAWING TITLE	PAGE NO.
PELICAN	ABPEC	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	UTILITY CENTRE SITE LAYOUT	4-45
				FIGURE 4.3.16 (a)	DATE: MAR '16

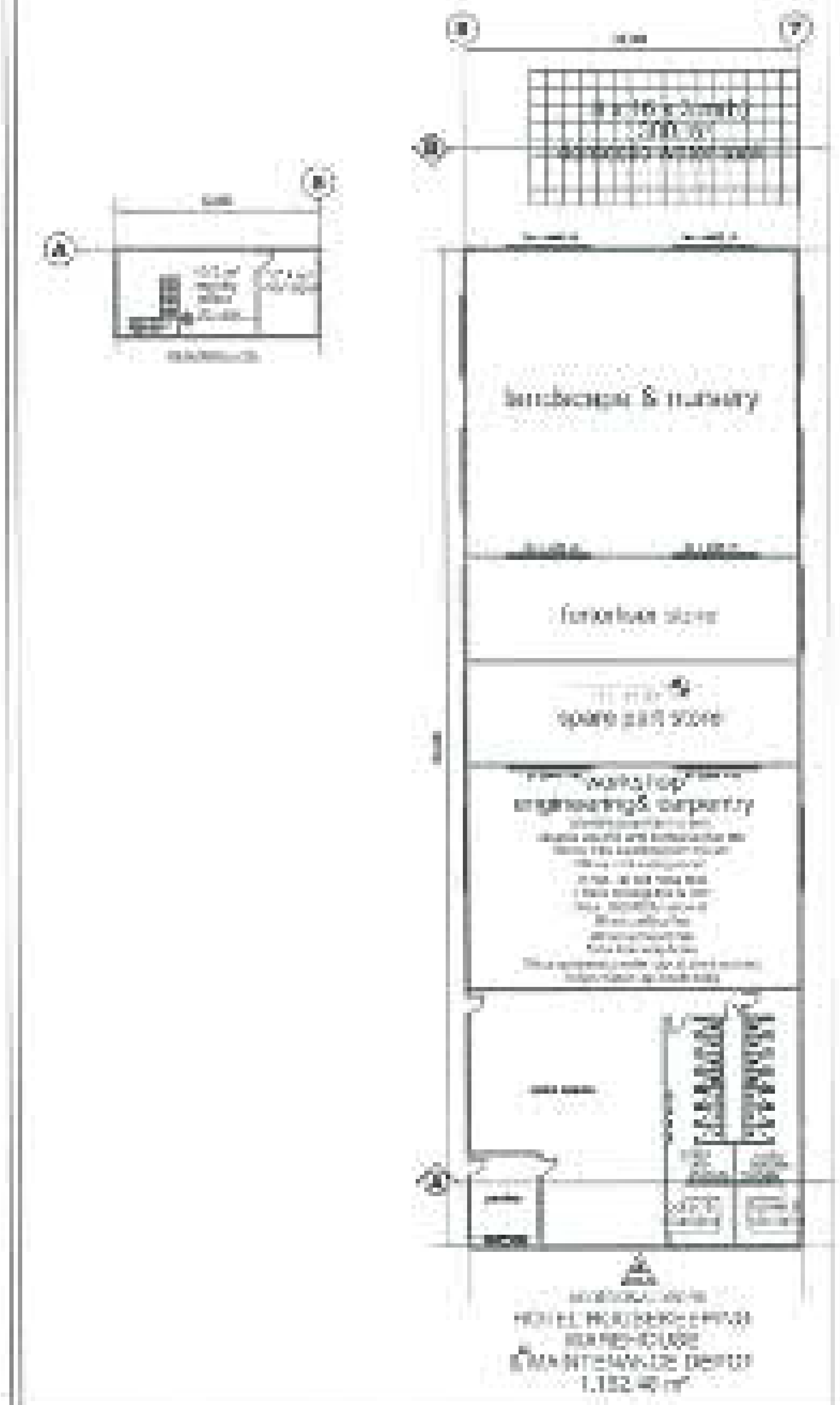


DATA SOURCE:

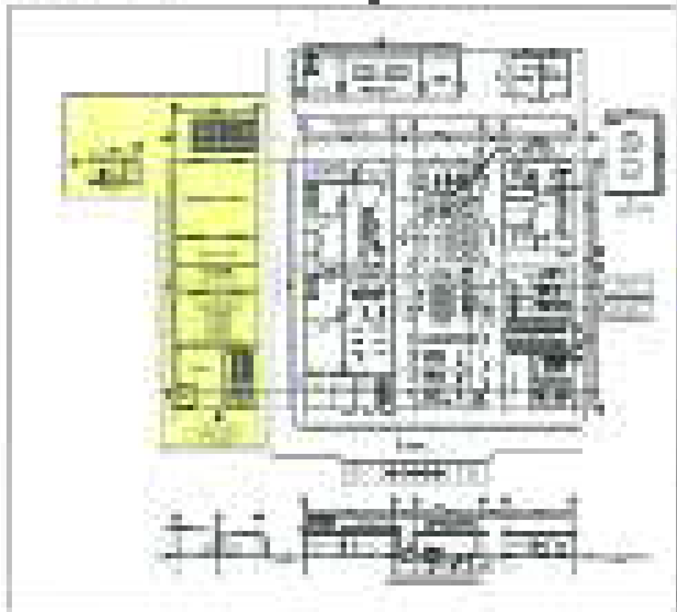
LOCATION PLAN:

KEY PLAN:

PELICAN	ASPEC	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	LAYOUT OF UTILITY CENTRE
				FIGURE 4.3.10 (i)
			4-44	MAR 18



INDEX PLAN



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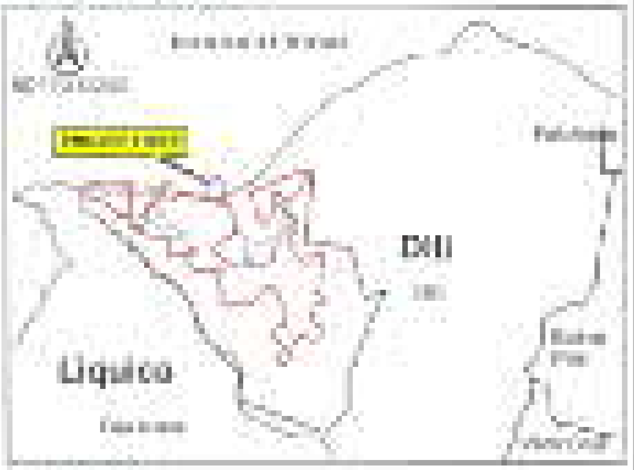
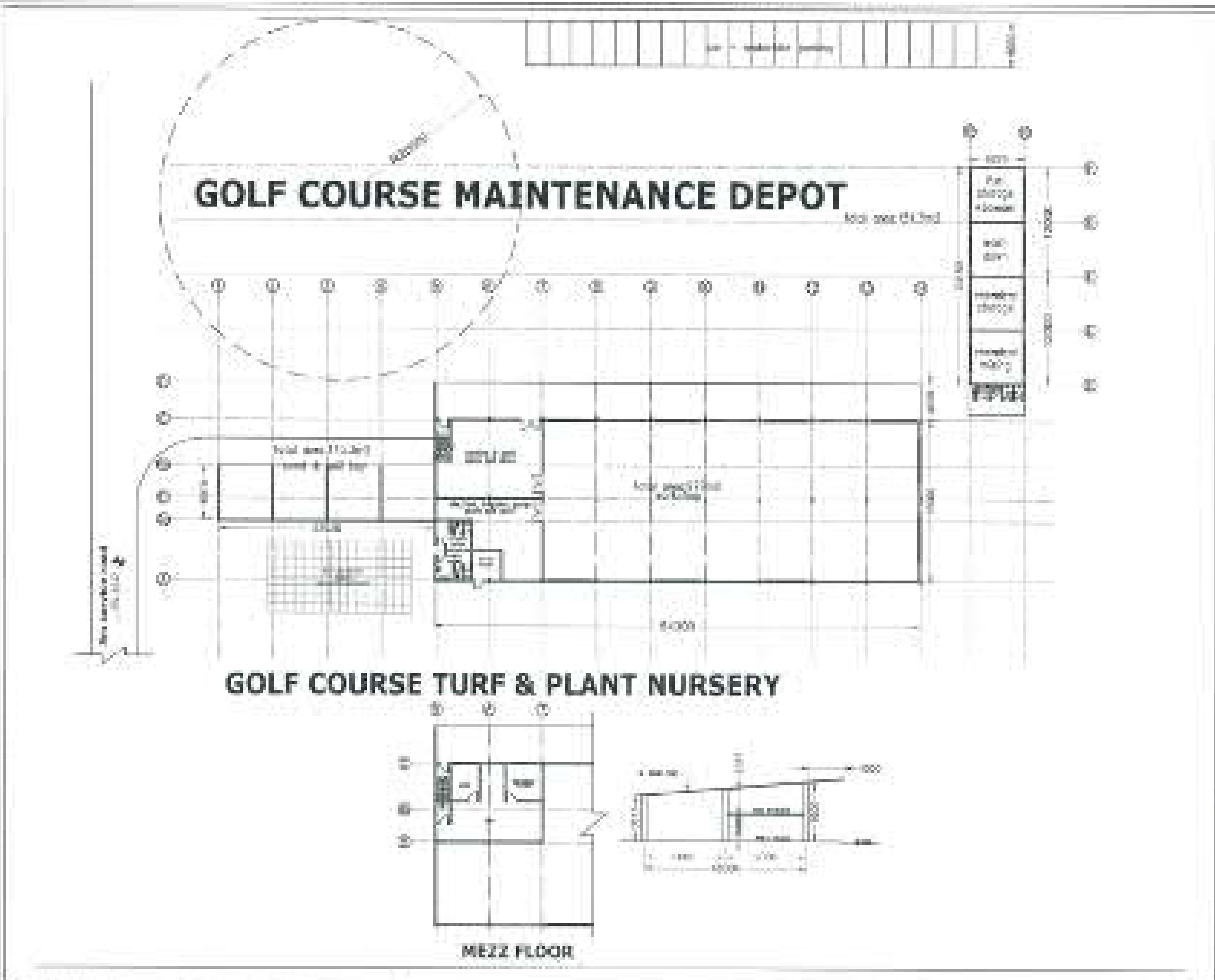


KEY PLAN:

PELICAN PARADISE & LEISURE	ASIA PACIFIC ENVIRONMENTAL CONSULTANTS	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	DRAWING TITLE: LAYOUT OF HOTEL HOUSEKEEPING WAREHOUSE & MAINTENANCE DEPOT	4-45
				FIGURE 4.3.10 (c)	MAR '18

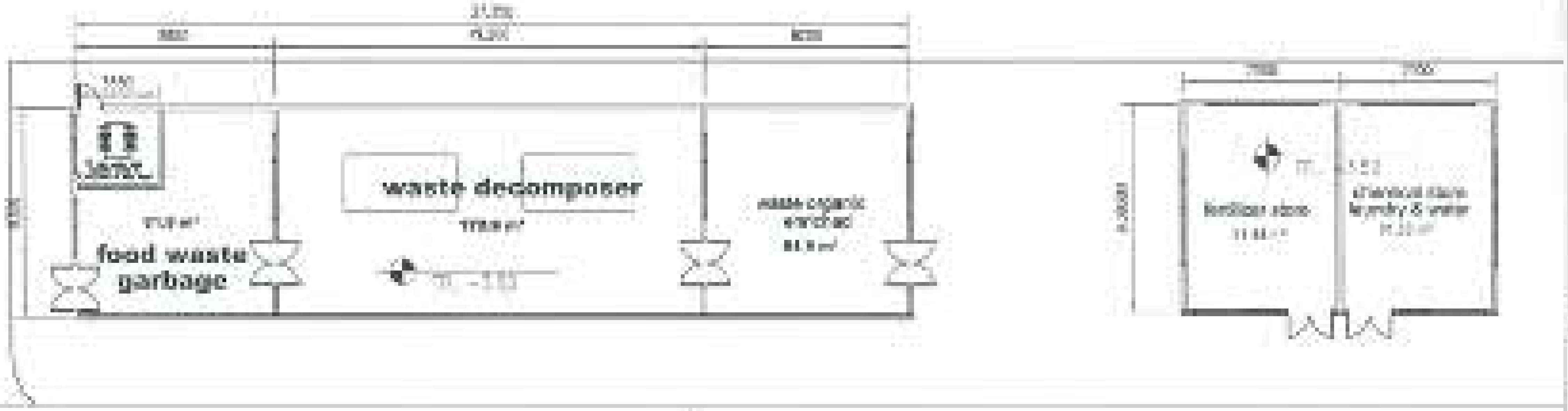


DATA SOURCE:

LOCATION PLAN:

KEY PLAN:

PELICAN PARADISE	ASPEC	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	LAYOUT OF GOLF COURSE MAINTENANCE AND WORKSHOP	4-48
				FIGURE 4.3.10 (d)	MAR 18



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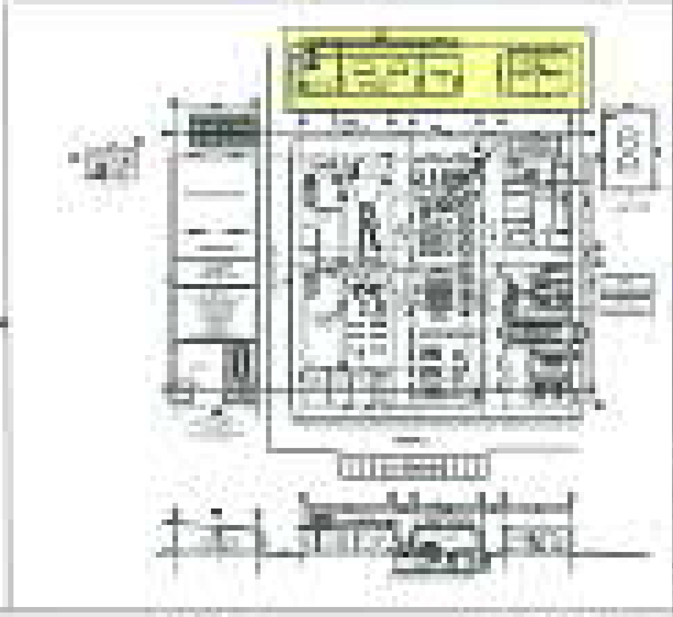

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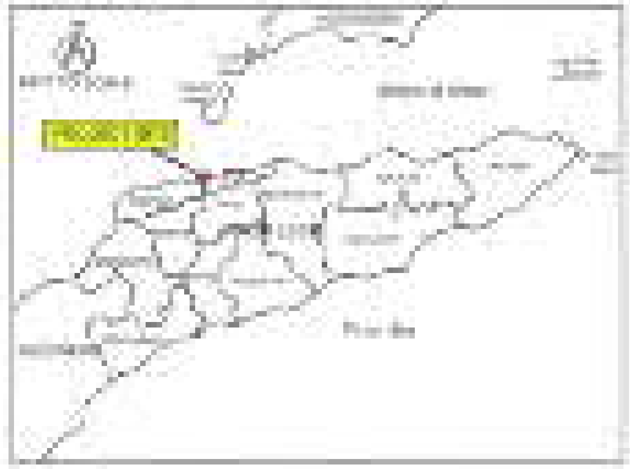
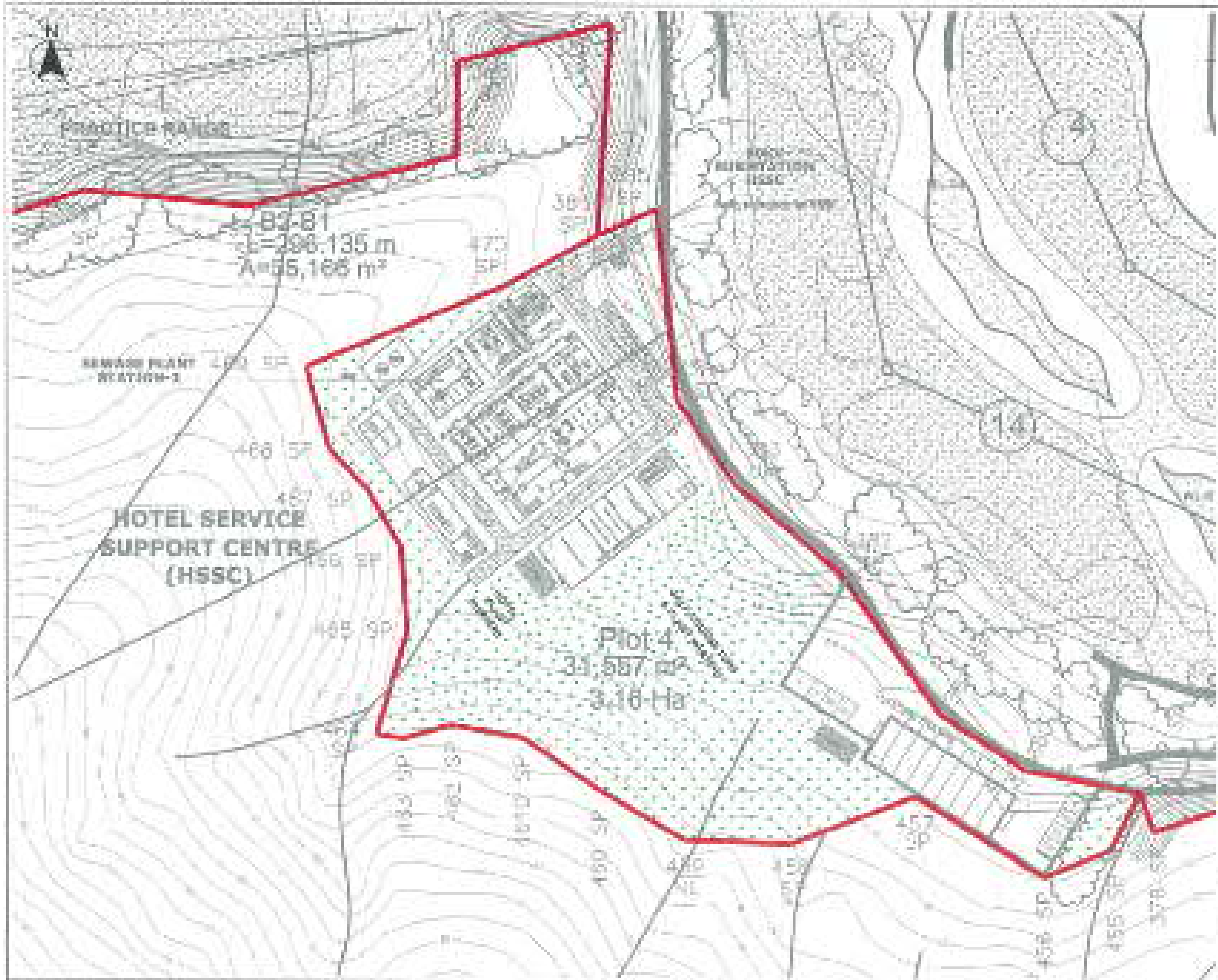
R.C. Monte & Company, March 2017

LOCATION PLAN:

KEY PLAN:



PROJECT PROPONENT	ENVIRONMENTAL CONSULTANT	PROJECT TITLE	SCALE	DRAWING TITLE	PAGE NO.
PELICAN	ASPEC	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	LAYOUT OF CENTRAL GARBAGE COLLECTION BUILDING	4-47
				FIGURE 4.3.10 (a)	MAR '18



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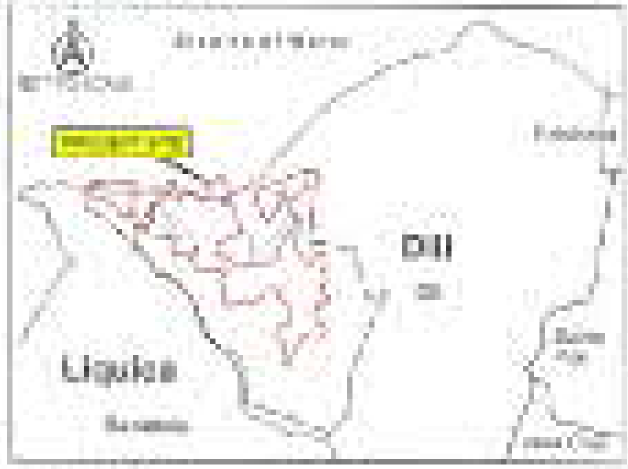
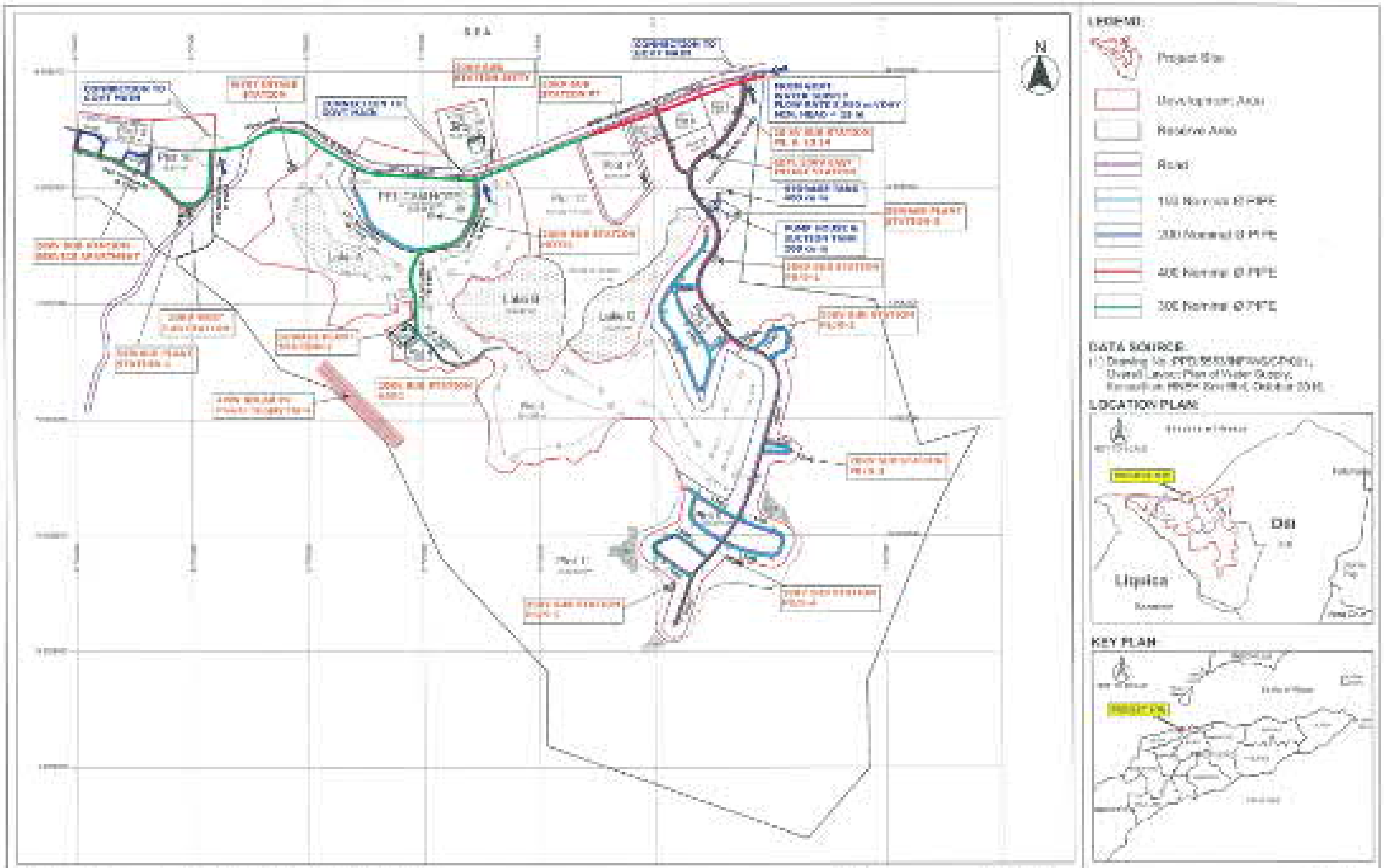


KEY PLAN:

PELICAN	ASPEC	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	LAYOUT OF HOTEL PLANT NURSERY AND GOLF COURSE TURF & PLANT NURSERY	4-48
				FIGURE 4.3.15 (f)	MAR 18



ASPEC

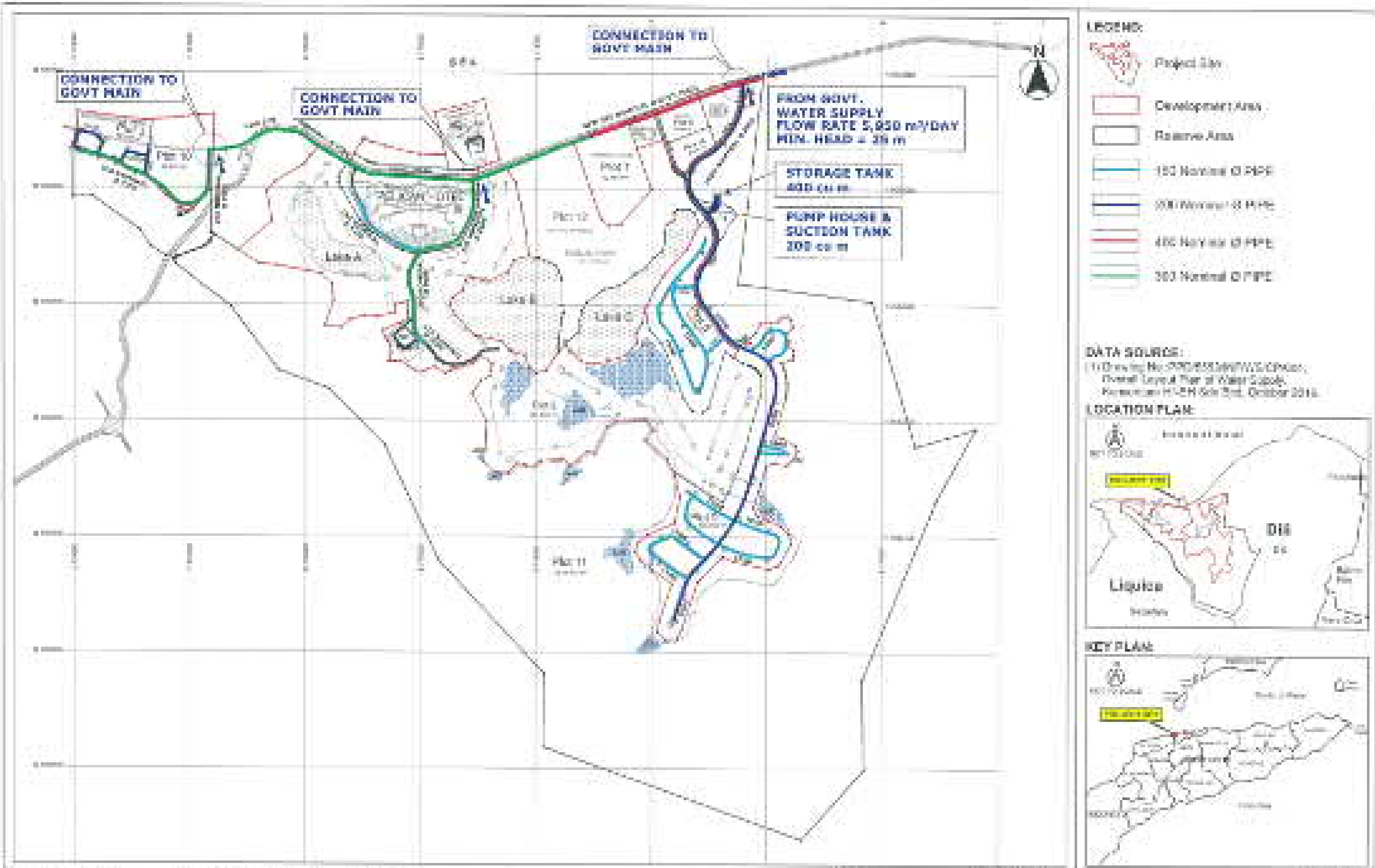
PELICAN

ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE

LAYOUT OF MAIN INTAKE STATIONS AND SUBSTATIONS

FIGURE 4.5.11

MAR 18



ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE

ASPEC

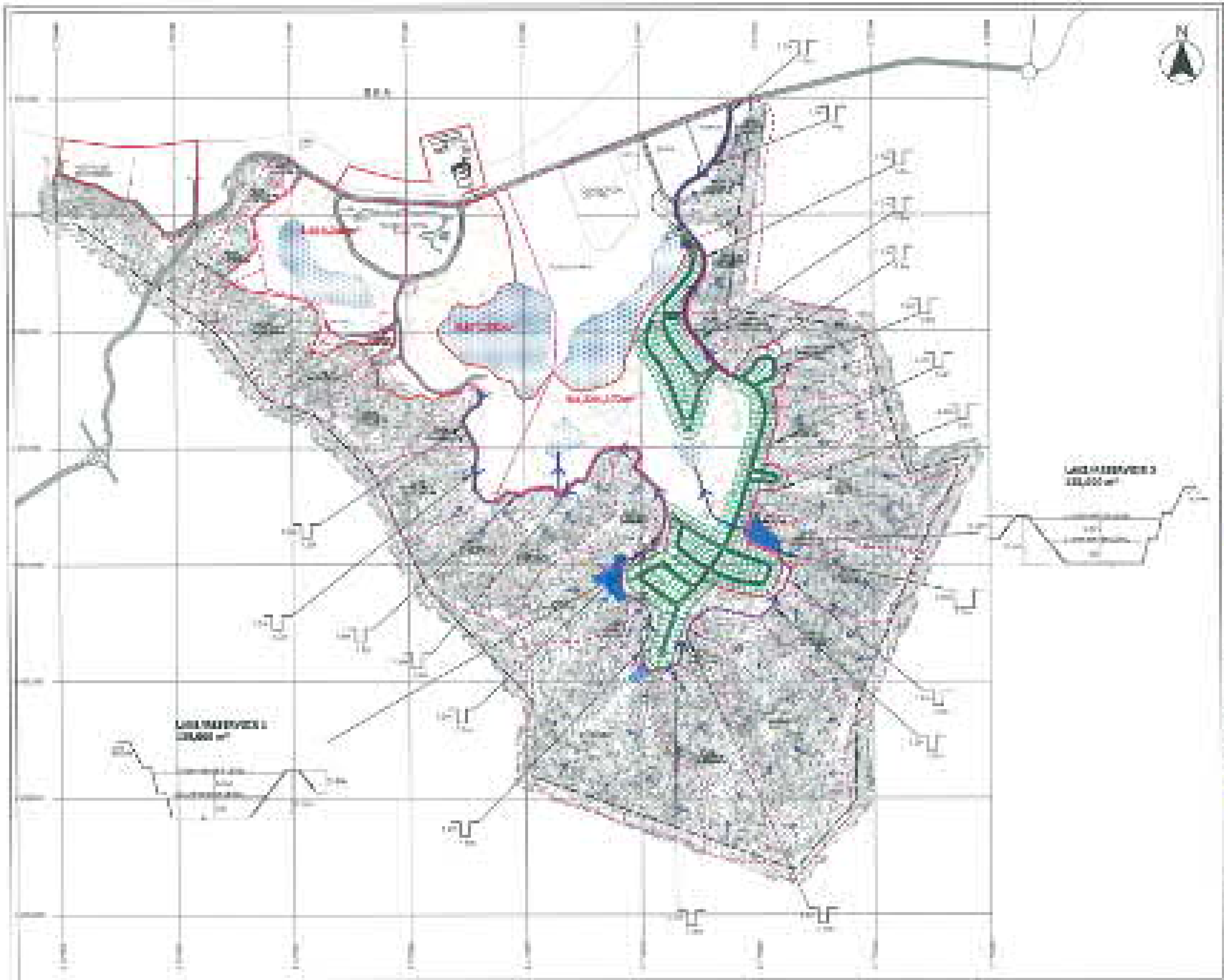
PELICAN

OVERALL WATER SUPPLY LAYOUT

4-60

FIGURE 4.3.10

MAR '18



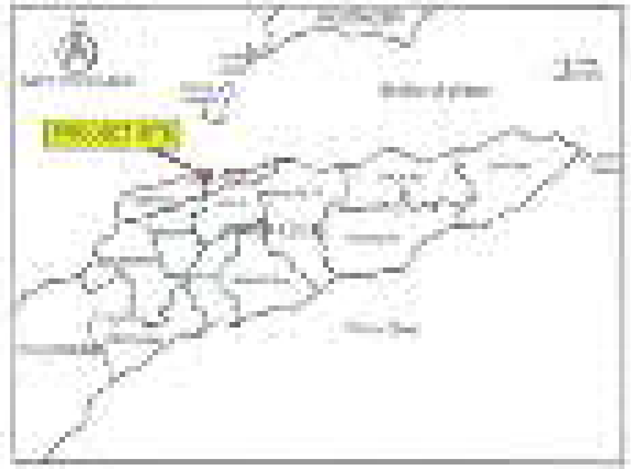
LEGEND:

- Project Site
- Development Area
- Reserve Area
- Catchment Line
- Cut-off Drain
- RC Drain

DATA SOURCE:

LOCATION PLAN:

KEY PLAN:



PROJECT PROPONENT:

PELICAN

ENVIRONMENTAL CONSULTANT:

ASPEC

ASIA PACIFIC ENVIRONMENTAL CONSULTANTS SDN BHD

PROJECT TITLE:

ENVIRONMENTAL IMPACT STATEMENT (EIS)
FOR PROPOSED PELICAN PARADISE DEVELOPMENT,
TIBAR-TASI TOLU, TIMOR-LESTE

DRAWING TITLE:

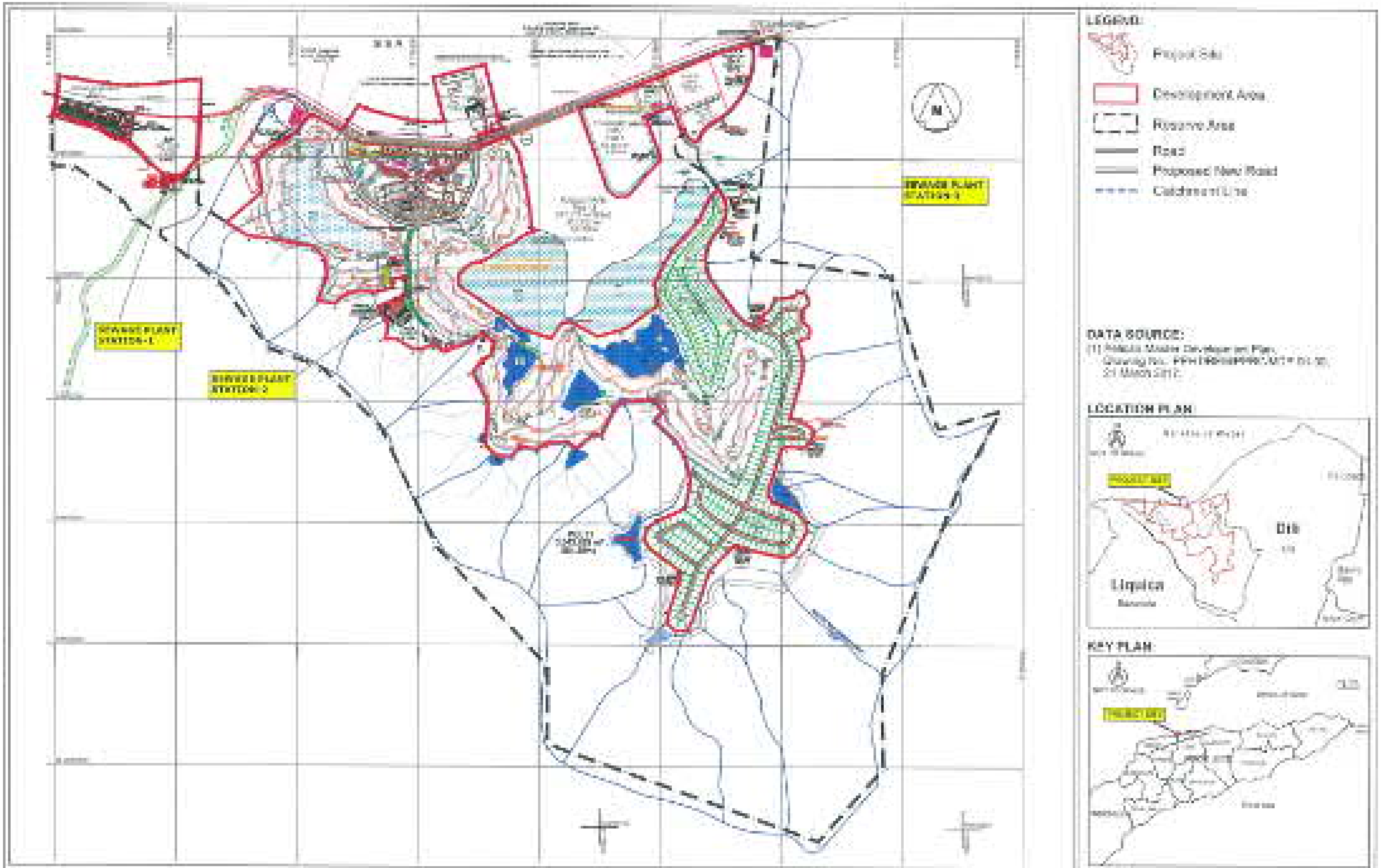
RAINWATER HARVESTING

DRAWING NO:

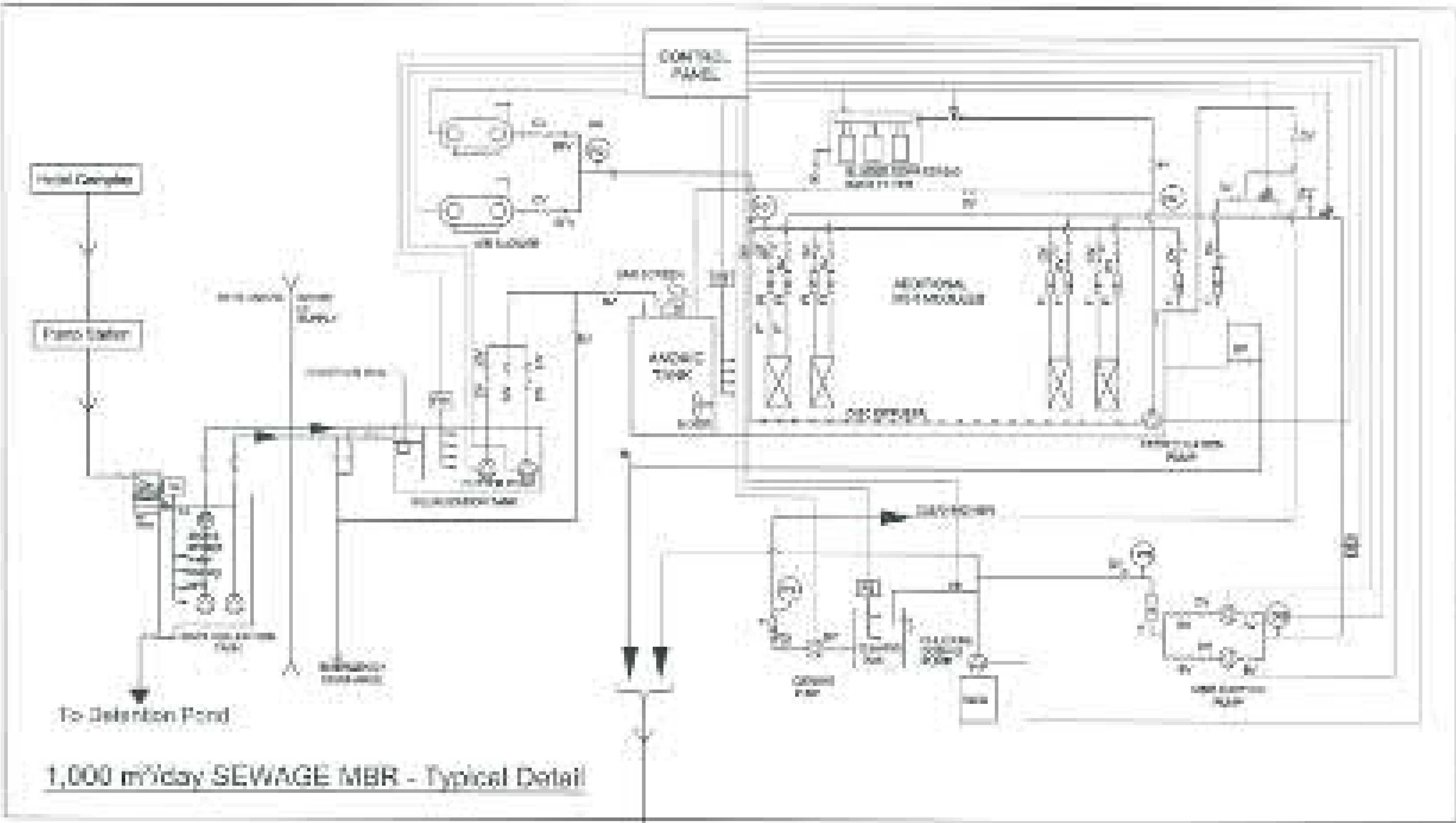
FIGURE 4.3.13

DATE:

MAR



PROJECT PROPONENT	ENVIRONMENTAL CONSULTANT	PROJECT TITLE	SCALE	DRAWING TITLE	FIGURE NO.
PELICAN	ASPEC	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	LOCATION OF SEWAGE TREATMENT PLANTS	4-62
				FIGURE 4.3.14 (a)	MAR '18



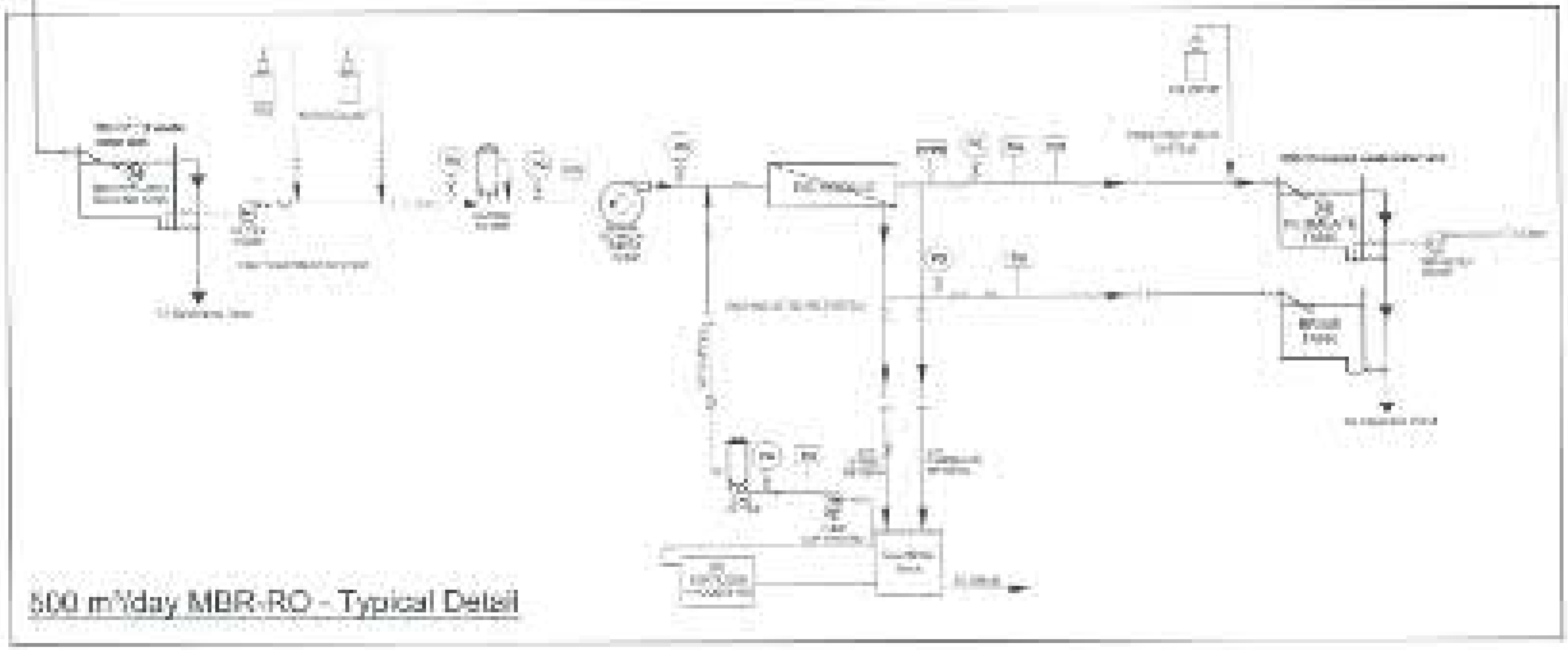
1,000 m³/day SEWAGE MBR - Typical Detail

DATA SOURCE:

LOCATION PLAN

KEY PLAN

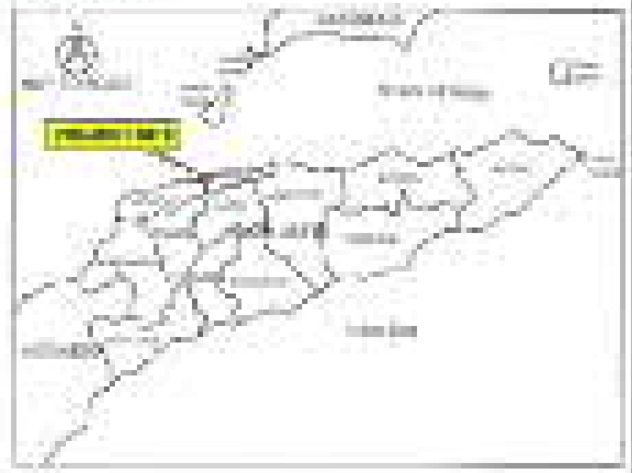
PROJECT PROPONENT:	ENVIRONMENTAL CONSULTANT:	PROJECT TITLE:	SCALE:	DRAWING TITLE:	PAGE NO:
PELICAN PARADISE HOLDINGS TIMOR-LESTE	ASPEC ASIA PACIFIC ENVIRONMENTAL CONSULTANTS	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	SEWAGE TREATMENT PLANT LAYOUT - MBR TYPICAL FLOW DIAGRAM	4-53
				FIGURE 4.3.14 (b)	MAR '18



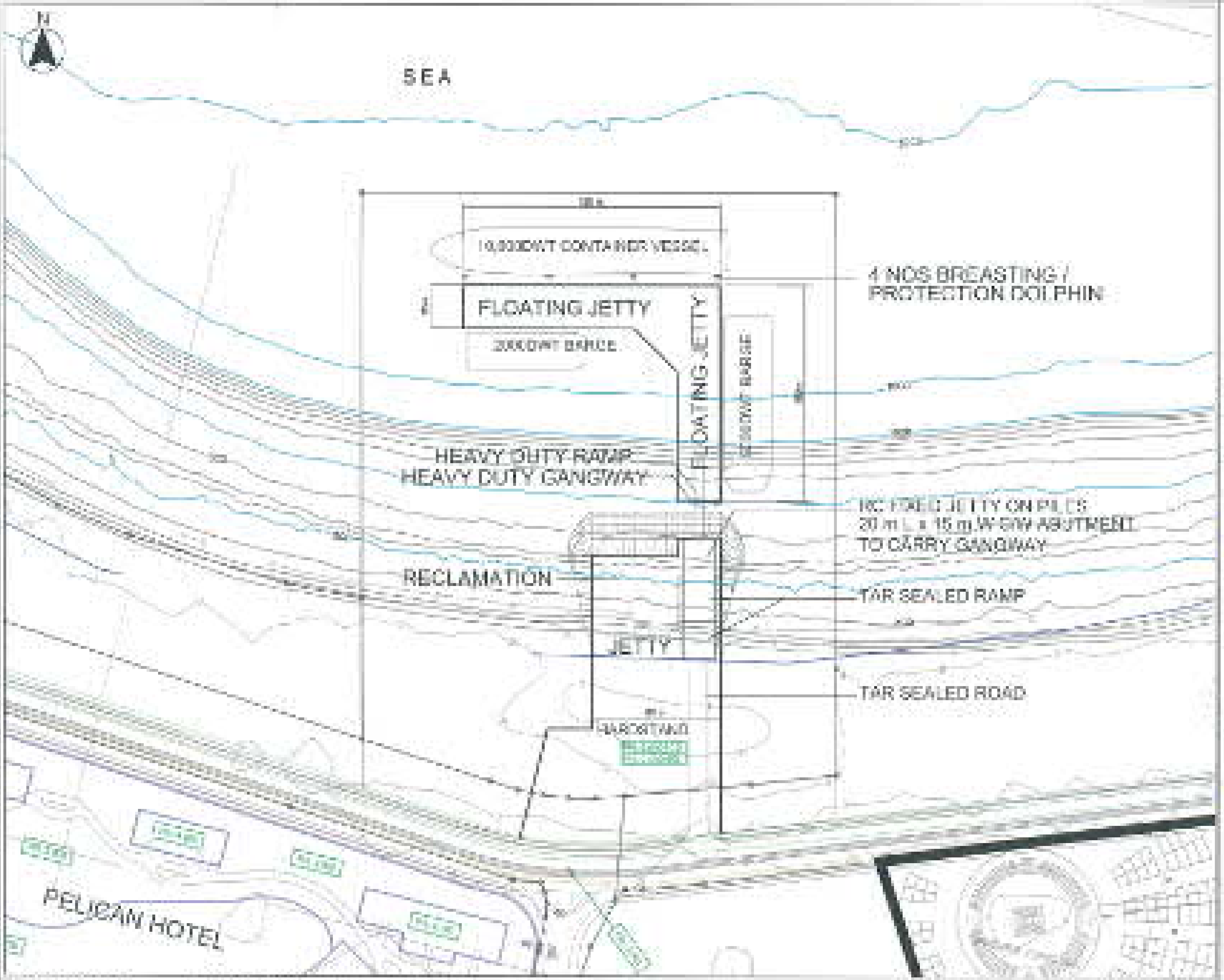
DATA SOURCE:

LOCATION PLAN:

KEY PLAN



PROJECT PROPONENT	ENVIRONMENTAL CONSULTANT	PROJECT TITLE	SCALE	DRAWING TITLE	PAGE NO.
PELICAN	ASPEC ASIA PACIFIC ENVIRONMENTAL CONSULTANTS SDN. BHD.	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	SEWAGE TREATMENT PLANT LAYOUT - MBR-RO TYPICAL FLOW DIAGRAM	4-64
				DRAWING NO. FIGURE 4.3.14 (c)	DATE MAR '18

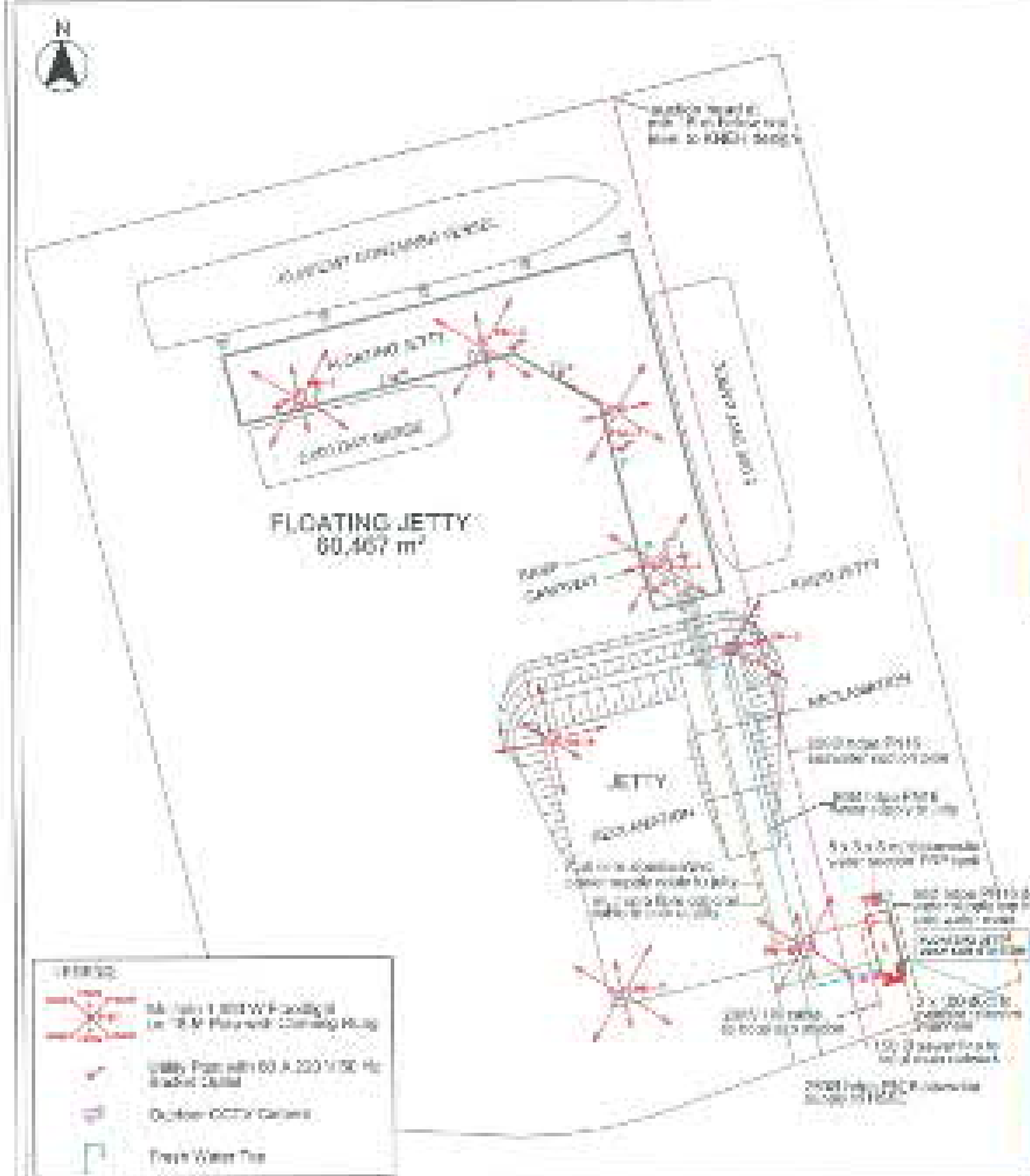


DATA SOURCE:

LOCATION PLAN:

KEY PLAN:

PROJECT PROPONENT	ENVIRONMENTAL CONSULTANT	PROJECT TITLE	SCALE	DRAWING TITLE	PAGE NO
PELICAN	ASPEC ASIA PACIFIC ENVIRONMENTAL CONSULTANTS SDN BHD	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	LAYOUT PLAN FOR FLOATING JETTY	4-95
				DRAWING NO.: FIGURE 4.3.15 (a)	DATE: MAR '18



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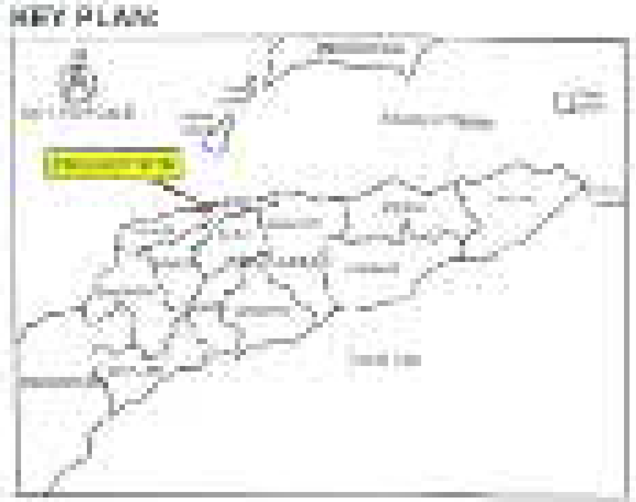
KEY PLAN:



PROJECT PROPONENT	ENVIRONMENTAL CONSULTANT	PROJECT TITLE	SCALE	DRAWING TITLE	PAGE NO
PELICAN	ASPEC	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	20 0 20 m	LAYOUT PLAN FOR FLOATING JETTY	4-76
				DRAWING NO: FIGURE 4.3.15 (b)	DATE: MAR '16

Figure 4.3.16 (a): Lake Rehabilitation for Lake A

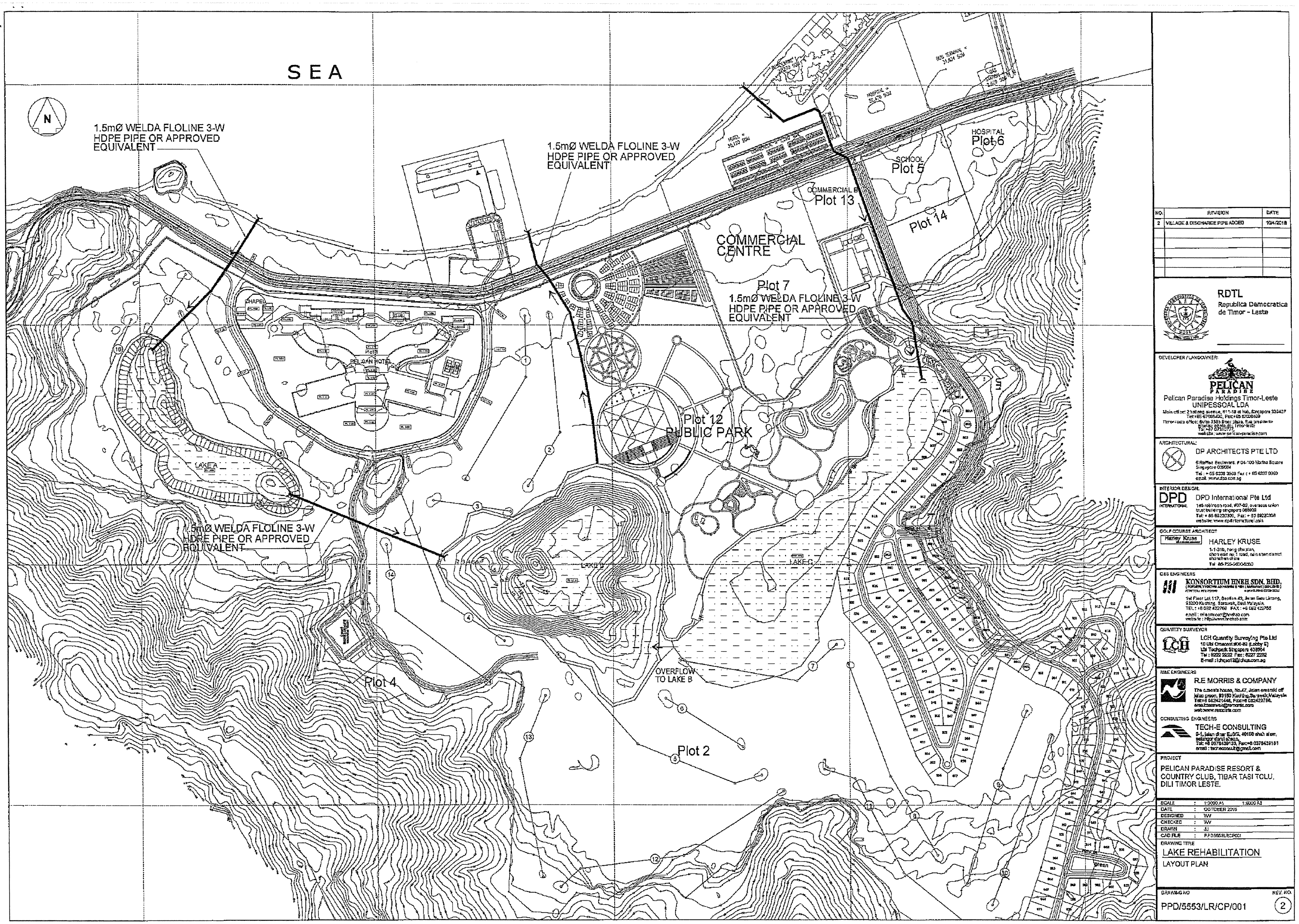
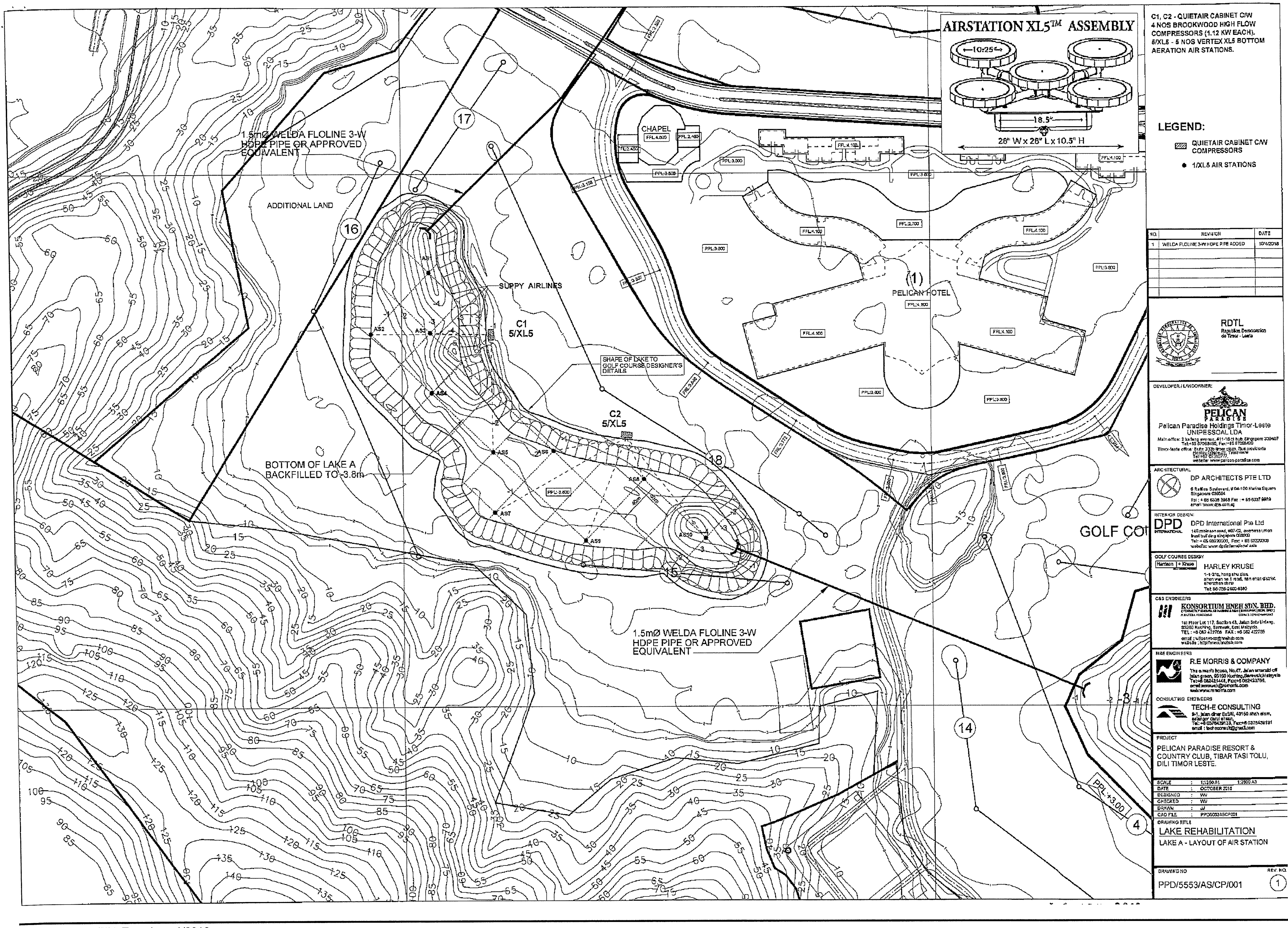
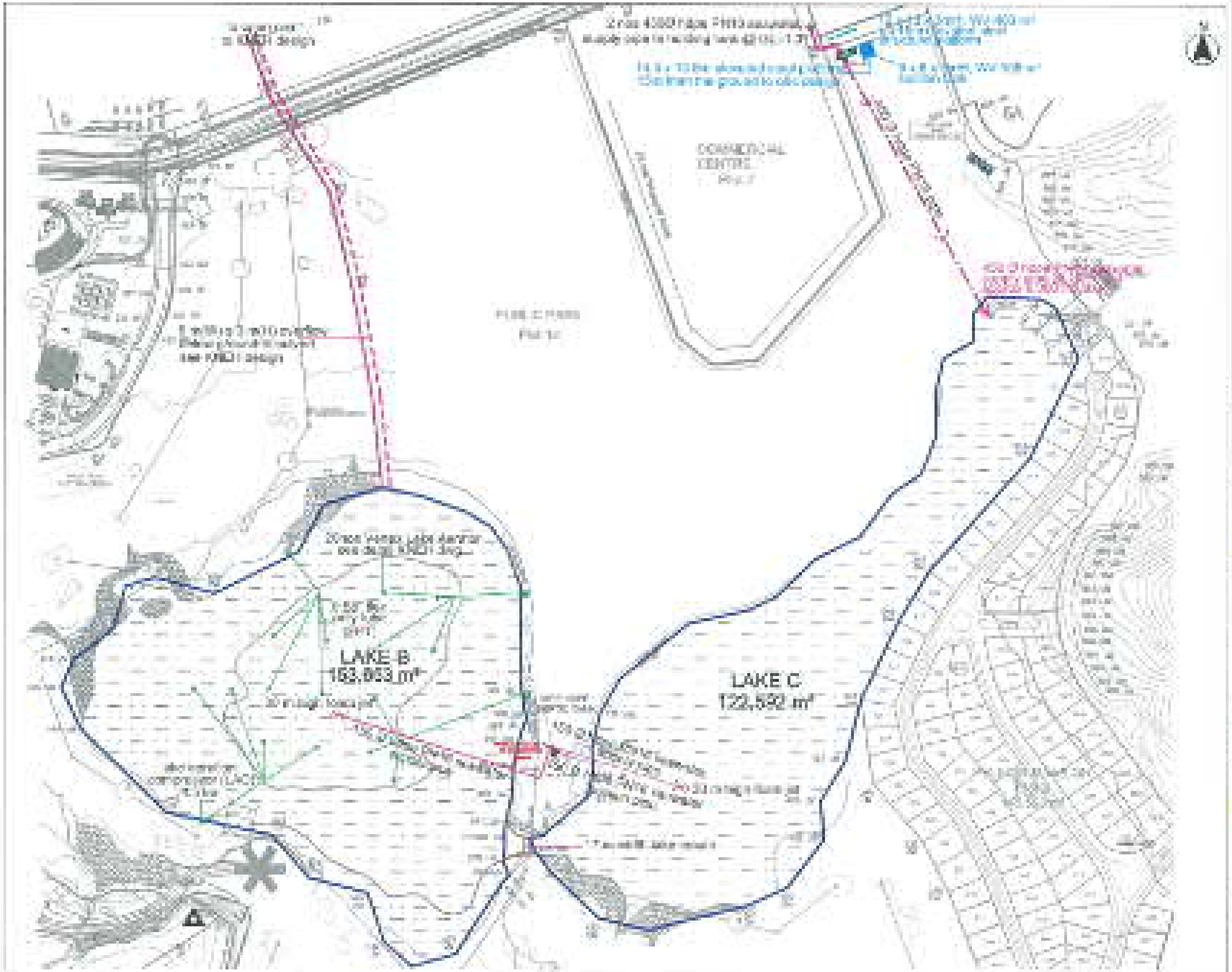


Figure 4.3.16 (b): Seawater Circulation for Lake A



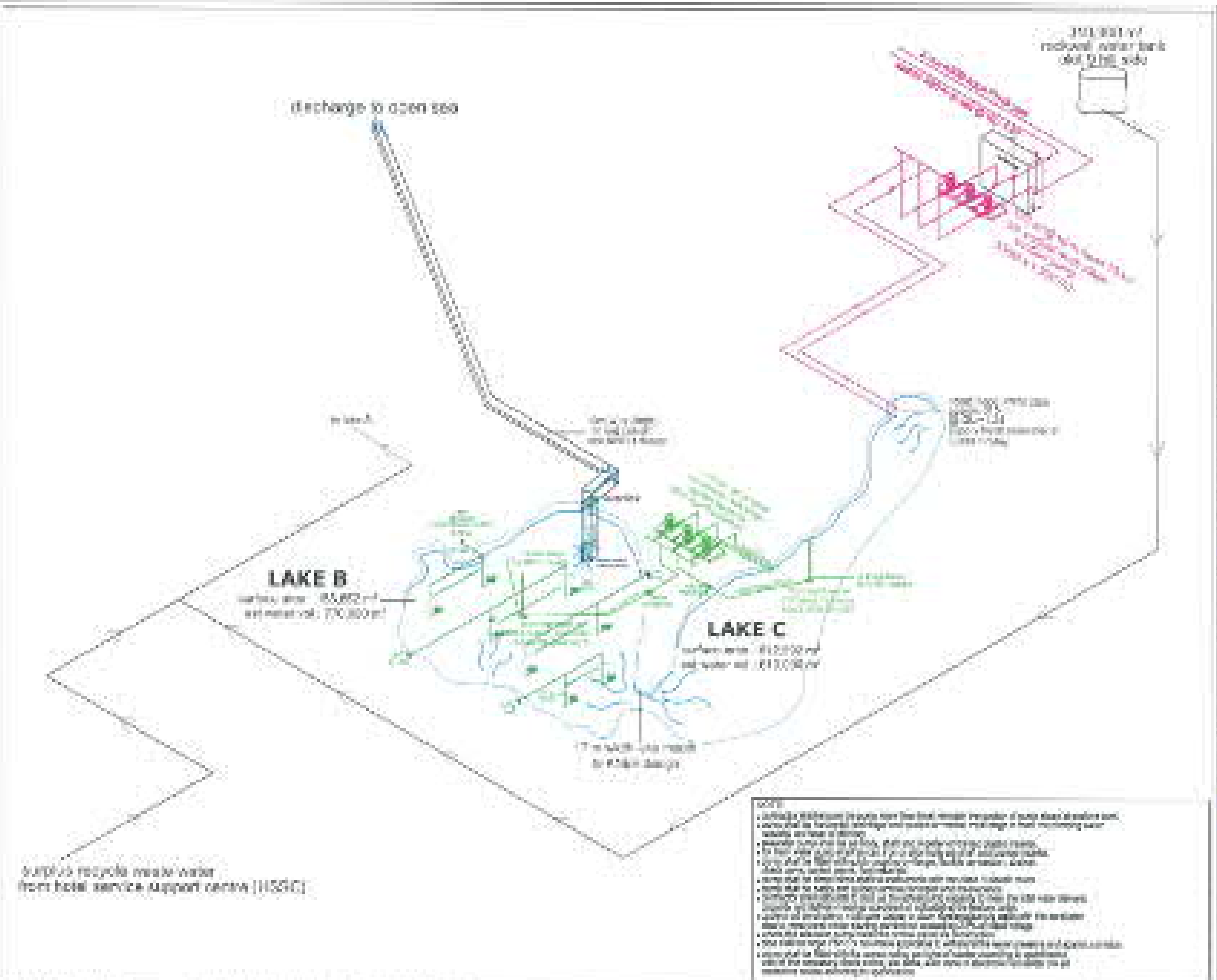


DATA SOURCE:

LOCATION PLAN:

KEY PLAN:

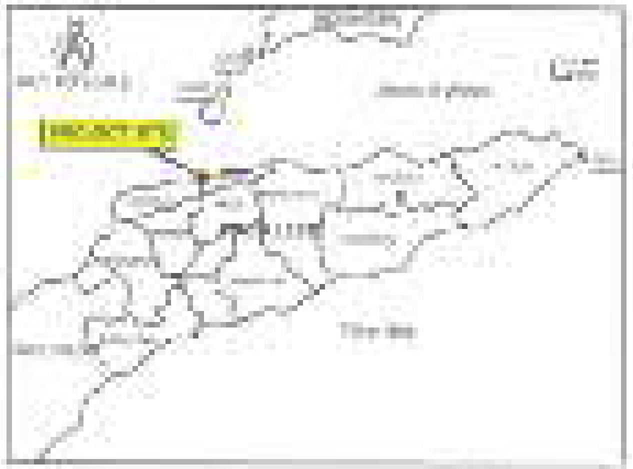
PROJECT PROPONENT	ENVIRONMENTAL CONSULTANT	PROJECT TITLE	SCALE	DRAWING TITLE	
PELICAN	ASPEC	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	50 0 50 m	LAKE REHABILITATION FOR LAKE B AND LAKE C	4-68
				FIGURE 4.3.16 (c)	MAR '15



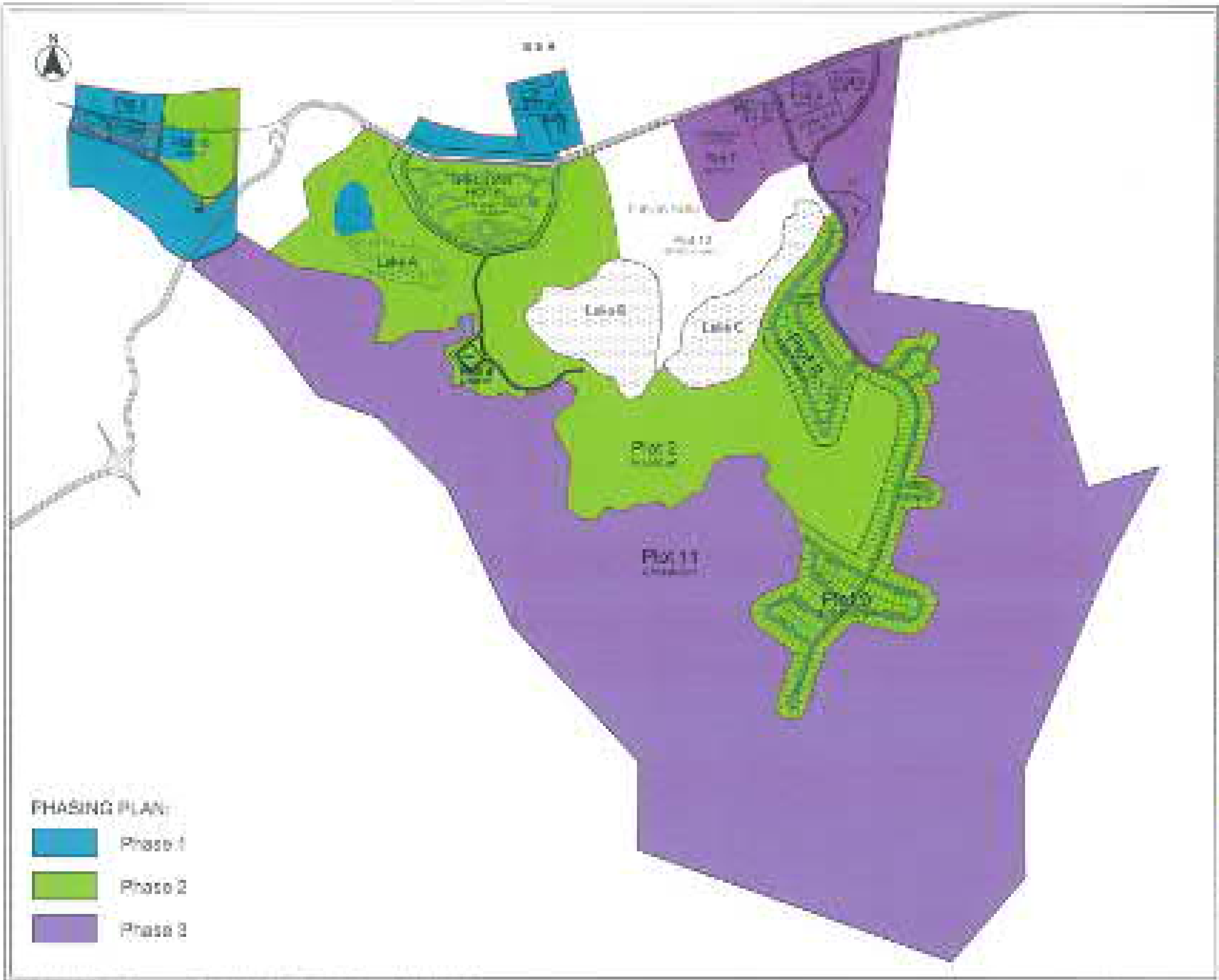
DATA SOURCE:

LOCATION PLAN

KEY PLAN



PROJECT PROPONENT	ENVIRONMENTAL CONSULTANT	PROJECT TITLE	SCALE	DRAWING TITLE	FIGURE NO.
PELICAN	ASPEC	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	SEAWATER CIRCULATION FOR LAKE B AND LAKE C	4-66
				FIGURE 4.3.16 (I)	MAR '18



LEGEND:

Project Site

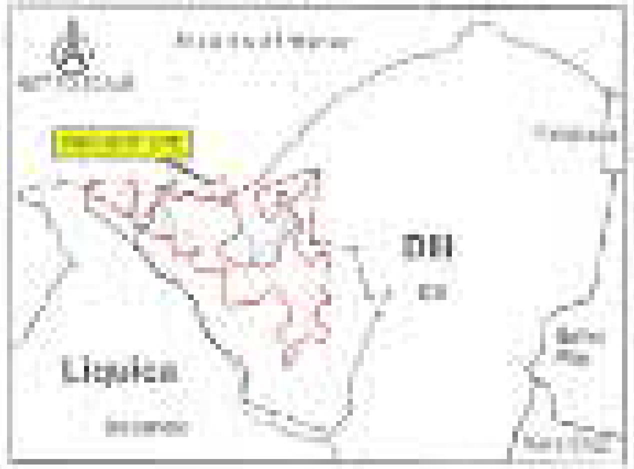
Development Area

Reserve Area

DATA SOURCE:

(1) Drawing No.: [illegible]
Pelican Paradise Resort & Country Club,
Tibar-Tasi Tolu, Dili Timor-Leste - Phasing Plan
Pelican Paradise Holdings (Timor-Leste)
March 2017

LOCATION PLAN:



KEY PLAN:

PROJECT PROPONENT	ENVIRONMENTAL CONSULTANT	PROJECT TITLE	SCALE	DRAWING TITLE	PAGE NO.
PELICAN PARADISE HOLDINGS TIMOR-LESTE	ASPEC ASIA PACIFIC ENVIRONMENTAL CONSULTANTS SDN BHD	ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED PELICAN PARADISE DEVELOPMENT, TIBAR-TASI TOLU, TIMOR-LESTE	NOT TO SCALE	PHASING PLAN	4-91
				DRAWING NO.: FIGURE 4.3.17	DATE: MAR '18

Chapter 5

Policy, Legal and Institutional Framework

CHAPTER 5: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

5.1 INTRODUCTION

- This Chapter provides the relevant legislations, regulations and guidelines governing the Environmental Impact Statement (EIS) for this Project to protect the environment.

5.2 THE CONSITUTION AND ENVIRONMENTAL POLICY

- Under Section 139(3) on _Natural Resources_ of the Constitution, there is a clear policy statement on the environment: "*The exploitation of the natural resources shall preserve the ecological balance and prevent destruction of ecosystem*".

- Because of its historical background and depleting natural resources, there are strong compelling reasons for the Government of the Democratic Republic of Timor-Leste (DRTL) to preserve its natural resources from further unwarranted exploitation and environmental degradation. Since independence in 2002, the Government has addressed this issue through advocacy of Article 61 of the Constitution, as follows:

  (i) *Everyone has the right to a humane, healthy and ecologically balanced environment and the duty to protect it and improve it for the benefit of the future generations.*

  (ii) *The State shall recognise the need to preserve and rationalise natural resources.*

  (iii) *The State should promote actions aimed at protecting the environment and safeguarding the sustainable development of the economy.*

- With a clear constitutional policy, all development projects classified as prescribed activities will have to take into consideration environmental conservation and sustainability. The policy itself is explicitly addressed in the Timor-Leste Strategic Development Plan (SDP) 2010 – 2030 to provide an environmental guide to protect and sustain the environment.

- **Reference to the Project:** The above policy underpins the Pelican Paradise Development Project in Timor-Leste.

5.3 LEGISLATIONS

5.3.1 Decree-Law No.26/2012 on Environmental Basic Law (EBL)

- The EBL or Environmental Framework Law provides a comprehensive framework to protect the environment in Timor-Leste. It is widely regarded as an over-arching legislation for environmental protection and sustainability.

- Articles 14, 15 and 16 hold the key information regarding the necessary instruments and procedures for environmental assessments; licensing; environmental standards; and environmental monitoring for Environmental Assessment (EA).

- **Reference to the Project:** The procedures have been followed judiciously in this Project (see **Chapters 6 to 11** of this EIS Report).

5.3.2 Decree-Law No.5/2011 on Environmental Licensing Law (ELL)

- The ELL provides a system of environmental licensing for both public and private projects likely to generate environmental and social impacts.

- It is based on an assessment of the degree and significance of potential impacts of projects relating to their nature, size, technical characteristics and location.

- Through Article 4, the Decree categorises all development projects according to three categories of A, B and C, with each category having its specific EA-types of requirements and procedures.

- **Reference to the Project:** From the above Decree, this Project has been categorised as a **Category A** Project. Because of this, the Project Document (PD) [ref: 353/DNCPIA/XII/2016] and the Terms of Reference (TOR) [ref: 407/Gab.MCIA/III/2017] have since been submitted and approved by the National Directorate of Pollution Control and Environmental Impact (NDPCEI) and Ministry of Commerce, Industry and Environment (MCIE) respectively. Subsequently, the completed Draft EIS and Environmental Management Plan (EMP) were submitted to the NDPCEI as per requirement of the above Decree. Public consultations had also been conducted (refer to **Chapter 13:** Public Consultation and Information Disclosure).

5.4 REGULATIONS AND GUIDELINES

5.4.1 Guidelines on Ministerial Diploma on Regulation on Detailed Requirements for Screening, Scoping and the Terms of Reference, Environmental Impact Statements and Environmental Management Plans for Environmental Assessment

- Though these guidelines are not formally adopted, they are currently used for development projects by the NDPCEI.

- They provide specific prerequisites for environmental screening and scoping; and requirements for submissions of the PD, TOR, EIS and EMPs in the EA process.

- **Reference to the Project:** Compliance has been achieved whereby specific procedural steps such as PD [ref: 353/DNCPIA/XII/2016] and TOR [ref: 407/Gab.MCIA/III/2017] were submitted and approved by the NDPCEI and MCIE respectively. The Draft EIS and EMP, conforming to the format of the said guidelines listed as Annex 6, had also been submitted to NDPCEI. This EIS accompanied with the EMP had been revised and resubmitted as Final, based on the technical comments from General Director of Environment (**Attachment 3** in Preamble).

5.4.2 Guidelines on Ministerial Diploma for Regulation on Status and Rules of Procedures for Evaluation Committee for Managing the Environmental Assessment Procedure for Category A Projects

- Similar to the Guidelines listed in **Section 5.4.1**, the guidelines, though not formally adopted, are currently being used by the NDPCEI.

- They detail the requirements regarding the status and rules of procedures for the Evaluation Committee in managing the EA procedures for Category A projects. The Evaluation Committee is set up by the NDPCEI to determine the veracity of the EIS after submission by the Project Proponent (PP).

5.4.3 Guidelines on Ministerial Diploma for Regulation on Impacts and Benefits Agreements

- These guidelines, though not formally adopted, are currently in use by the NDPCEI.

- They provide the requirements for impact and benefit agreements. The DRTL has leased the land to Pelican Paradise Holdings Timor-Leste, the PP, since 2009. The Government will deliver the land free of all encumbrances for commencement of the Project development in 2017. The issue of resettlement of any persons living within the Project site and the resettlement plan are outside the scope of this EIS.

5.4.4 Ministerial Diploma for Regulation on the Public Consultation Procedures and Requirements During the Environmental Assessment Process

- These guidelines, though not formally adopted, are currently in use by the NDPCEI.

- They detail the requirements, procedures and requirements for public consultations during the EA process.

- **Reference to the Project:** Compliance has been achieved through public consultations during the PD and TOR stages of work. A final consultation had been conducted after the submission concurrently of the Draft EIS and EMP Report (see **Chapter 13**).

5.5 OTHER LEGISLATIONS: BIODIVERSITY AND PROTECTED AREAS LEGISLATIONS

- There are several legislations related to ecological protection that EIS and EMP have made reference to. These are:

5.5.1 UNTAET Regulation No.2000/19 on Protected Places

- Though being a subsidiary legislation, it is still in force and used by the Forestry Department.

- It defines 15 existing protected areas (Article 2.1) as well as areas that may be defined as areas of exceptional natural importance (Article 2.2).

- Articles 2.3 and 2.4 define prohibited activities within these areas. Furthermore, Sections 3 and 4 respectively provide protection for endangered terrestrial and aquatic ecology, while Section 5 provides protection for wetlands and mangrove areas. Lastly, Section 6 provides protection for historic, cultural and artistic sites for the people of Timor-Leste.

- **Reference to the Project:** All the sensitive areas within and surrounding the Project were reviewed for compliance (see **Chapters 6** and **9**).

5.5.2 UNTAET Regulation No.2000/17 on the Prohibition of Logging Operation and Export of Wood from East Timor

- This legislation specifies the prohibition of cutting and removal of logging of wood from the land in Timor-Leste (Section 2) as well as the prohibition of burning or any other destruction of forest.

- **Reference to the Project:** No large-scale logging will be carried out at the Project site since the site is mostly devoid of trees except at the hill areas, where there is a programme by the PP to reforest the area. Clearing of underbrush vegetation will be carried out at the golf course and other areas within the Project. Approval will be obtained from the authorities prior to logging to comply with the above regulations and the Draft Decree-Law on Forest Management, draft 6.

5.6 DRAFT DECREE-LAW ON BIODIVERSITY

- This Decree states that the preparation of strategic environmental assessment (SEA), EIS, EMP or any other EA by the project proponent must include assessment of potential impacts of the proposal on biodiversity and biological resources.

- It also details five requirements that must be included in the assessment found in Article 41 – Biodiversity Consideration in Environmental Assessment.

- These five requirements are as follows:

  (i) Impacts on any natural ecosystems and habitats located within or near the proposed site, in particular the habitat of any protected species and critical habitat.

  (ii) Impacts on any legally protected areas, as well as any areas under the subject of cultural or traditional protection mechanism such as *Tara Bandu.*

  (iii) Impacts associated with invasive alien species on or near the proposed site.

  (iv) The sustainability of any proposed use of biological resources.

  (v) Proposed measures to avoid, minimise or mitigate identified impacts, and measures to offset or compensate for any affected biological resources and impacts on biodiversity.

- **Reference to the Project: Chapter 9** summarises the assessment of impacts on biodiversity based on the above requirements.

5.7 DRAFT DECREE-LAW ON FOREST MANAGEMENT, DRAFT 6

- The purpose of this Decree is to give credence to the State's constitutional obligations to conserve the natural resources of Timor-Leste while establishing the rights and procedures to promote community ownership and management of forest resources.

- It provides for sustainable use and management of forest resources of Timor-Leste to benefit all citizens.

- **Reference to the Project:** The range of hills covering 354.38 ha forms a backdrop to the Project site. The hills will remain relatively undeveloped as an important water source and reserve area that will be reforested to capture rainwater and atmospheric moisture to maintain the lakes and small streams in the Project area, especially for the dry season.

5.8 FISHERIES AND AQUACULTURE LEGISLATION

5.8.1 Decree-Law No.6/2004 on General Bases of the Legal Regime for the Management and Regulation of Fisheries and Aquaculture

- The main intent of this Decree is to establish principles and ground rules for the exploitation and regulation of fishing resources and aquaculture activities within the national waters and the high seas.

- It prohibits discharging of wastewaters originating from industrial or commercial activities into national waters if such wastewaters are likely to stun, poison or lead to destruction of fishing resources or any other aquatic species.

- **Reference to the Project:** This Project has opted for an environmentally-friendly zero discharge method; whereby on-site treated sewage effluent and wastewater will be recycled for potable and non-potable use within the Project. The residual sludge will be broken down and used as bio-fertilisers, for soil conditioners and planting mediums, following the green concept of recycle, reduce and reuse.

5.9 STANDARDS, GUIDELINES AND BEST MANAGEMENT PRACTICES

5.9.1 Environmental Management Standards and Guidelines

- Other than the guidelines on conducting EA mentioned in **Section 5.4**, the management standards and guidelines for environment, safety and health are largely found lacking in Timor-Leste.

- Some international standards and guidelines widely used in other countries have been adopted wherever relevant and necessary in the EIS and EMP.

(a) IFC Performance Standards on Environmental and Social Sustainability

- The Performance Standards on Environmental and Social Sustainability introduced by the International Finance Corporation (IFC) of World Bank (2012), provide guidance on how to identify risks and impacts on environmental and social aspects, as well as help to avoid, mitigate and manage impacts as a way to develop a project in a sustainable manner. The eight Performance Standards prescribed are.

    (i) Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts.
    (ii) Performance Standard 2: Labour and Working Conditions.
    (iii) Performance Standard 3: Resource Efficiency and Pollution Prevention.
    (iv) Performance Standard 4: Community Health, Safety and Security.
    (v) Performance Standard 5: Land Acquisition and Involuntary Resettlement.
    (vi) Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.
    (vii) Performance Standard 7: Indigenous Peoples.
    (viii) Performance Standard 8: Cultural Heritage.

- **Reference to the Project:** Most of the above standards have been taken into consideration except for items (ii) and (v) as they are outside the scope of the EIS and EMP. The rest of the items have been seamlessly weaved into the EIS and EMP.

(b) World Bank Environmental, Health, and Safety General Guidelines (EHS Guidelines)

- The World Bank EHS Guidelines provide the effective management practices, performance levels and measures covering: environment; occupational health and safety; community health and safety; construction and operation.

- This EHS Guidelines suggested that every project should prevent or minimise environmental quality impacts by ensuring that the emission or pollutant concentrations comply with national legislated standards, or in their absence, internationally recognised sources, such as World Health Organisation (WHO) Guidelines.

- **Reference to the Project:** Most of the above have been taken into consideration in the EIS and EMP.

(c) EBRD and IFC Workers' Accommodation: Process and Standards

- This document, published by European Bank for Reconstruction and Development (EBRD) and IFC, provides the processes and standards in planning, constructing and operating worker housing facilities, which should be applied to the provision of workers' accommodation at different stages of the project.

- **Reference to the Project:** This has been taken into consideration in the EIS and EMP.

(d) WHO Guidelines for Community Noise

- These guidelines address the adverse health effects of noise. The health-based guidelines on community noise for example, serve as a basis for noise management.

- **Reference to the Project:** This has been taken into consideration in this EIS (see **Sections 6.9** and **9.7**).

(e) WHO Air Quality Guidelines

- This WHO Air Quality Guidelines are designed to offer guidance in reducing the health impacts of air pollution. Based on a review of the accumulated scientific evidence, the guideline values for the most common air pollutants, such as particulate matter, ozone, nitrogen dioxide, sulphur dioxide, are presented in this document.

- **Reference to the Project:** This has been taken into consideration in this EIS (see **Sections 6.7** and **9.5**) and EMP.

5.9.2 Environmental Management Standards and Guidelines Proposed for the Project

- Environmental management standards and guidelines are not complete in Timor-Leste. Hence the Project will use the relevant standards from the Association of Southeast Asian Nations (ASEAN) or international countries for benchmarking the values for some environmental components, in particular, marine and lake water quality in the EIS and EMP for the construction and operational phases of the Project. This was agreed upon during our earlier discussions with officials from the NDPCEI.

- The environmental management standards and guidelines used in the Project for the EIS and EMP are given in **Table 5.9.1**.

Table 5.9.1: Reference of Legislations, Regulations, Guidelines and Standards in the EIS and EMP

Component	Legislations, Regulations, Standards and Guidelines			
	Timor-Leste/ WHO#/ World Bank*	Indonesia	Philippine	Malaysia
1. Environmental Quality				
(i) Ambient and Marine Water Quality	<u>Law and Regulation</u> • Decree Law No. 26/2012 Environmental Basic Law, Article 24 and 35. <u>Standards and Guidelines</u> • Not available yet.	<u>Standards and Guidelines</u> • Water Quality Criteria, under Government Regulation No 82/2001.	<u>Standards and Guidelines</u> • Water Quality Criteria for Conventional and Other Pollutants Affecting Aesthetics and exerting Oxygen Demand for Coastal and Marine Waters.	<u>Standards and Guidelines</u> • Malaysia Marine Water Quality Criteria and Standards. • National Water Quality Standards.
(ii) Air Quality	<u>Law and Regulation</u> • Decree Law No. 26/2012 Environmental Basic Law, Article 23 and 33. <u>Standards and Guidelines</u> • WHO, Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulfur Dioxide.#	<u>Standards and Guidelines</u> • Indonesia's National Ambient Air Quality Standards.	<u>Standards and Guidelines</u> • National Ambient Air Quality Guideline for Critical Pollutants.	<u>Standards and Guidelines</u> • Malaysian Ambient Air Quality Standards (MAAQS), DOE Notice 1/2015.
(iii) Noise Level	<u>Law and Regulation</u> • Decree Law No. 26/2012 Environmental Basic Law, Article 36. <u>Standards and Guidelines</u> • Guideline values for community noise in specific environments.#	<u>Standards and Guidelines</u> • Environmental Quality Standards for Ministerial Decree No.48/MENLH/ 11/1996 (1996) Noise Standards.	<u>Standards and Guidelines</u> • Environmental Quality Standards for Noise in General Areas, Rules & Regulations of National Pollution Control Commission (1978).	<u>Standards and Guidelines</u> • The Planning Guidelines for Environmental Noise Limits and Control, DOE 2007.
(iv) Effluent	<u>Law and Regulation</u> • Decree Law No. 26/2012 Environmental Basic Law, Article 41. <u>Standards and Guidelines</u> • Guidelines for the Safe Use of Wastewater, Excreta, and Greywater, Volume 2: Wastewater Use in Agriculture.#	<u>Standards and Guidelines</u> • Ministerial Decree No.52/MENLH/10/1995 (1995) Effluent Standard for Hotel.	<u>Standards and Guidelines</u> • Effluent Standards: Toxic and Other Deleterious Substances (Maximum Limits for the Protection of Public Health). • Effluent Standards: Conventional and other Pollutants in Protected Waters Category I and II and Inland Water Class C. • Effluent Standards: Conventional and Other Pollutants in Inland Waters Class D, Coastal Waters Class SC and SD and Other Coastal Water not yet Classified).	<u>Standards and Guidelines</u> • Malaysian Sewerage Industry Guidelines
(v) Solid Waste	<u>Law and Regulation</u> • Decree Law No. 26/2012 Environmental Basic Law, Article 39.	NN	NN	NN
(vi) Hazardous/Scheduled Waste	<u>Law and Regulation</u> • Decree Law No. 26/2012 Environmental Basic Law, Article 42. <u>Standards and Guidelines</u> • Chapter 1 of the World Bank Environmental, Health and Safety (EHS) Guidelines.*	NN	NN	NN

Component	Legislations, Regulations, Standards and Guidelines			
	Timor-Leste/ WHO#/ World Bank*	Indonesia	Philippine	Malaysia
2. Health and Safety	**Law and Regulation** • Decree Law No. 4/2012 Labour Code, Chapter III, Section IV. **Standards and Guidelines** • Workers' Accommodation: Processes and Standards. A guidance note by IFC and EBRD. • Chapters 2 and 4 of the World Bank Environmental, Health and Safety (EHS) Guidelines.*	NN	NN	NN
3. Biodiversity	**Law and Regulation** • UNTAET Regulation No.2000/19 on Protected Places. • Decree Law No. 26/2012 Environmental Basic Law, Article 27. • UNTAET Regulation No.2000/17 on the Prohibition of Logging Operations and the Export of Wood from East Timor. • Draft Decree Law on Biodiversity, dated March 2012. • Draft Decree Law on Forest Management, draft 6. **Strategic Plan** • National Biodiversity Strategy and Action Plan (2011 – 2012). • Forestry Sector Policy Goal Objective and Strategy.	NN	NN	NN
4. Protection of Protected Areas and Other Sensitive Areas	**Law and Regulation** • UNTAET Regulation No.2000/19 on Protected Places, Section 2. • Draft Decree Law on Biodiversity, dated March 2012. **Strategic Plan** • Timor-Leste Programme of Work on Protected Areas. **Standards and Guidelines** • International Finance Corporation's Performance Standards on Environmental and Social Sustainability.	NN	NN	NN
5. Protection of Vulnerable and Endangered Species	**Law and Regulation** • UNTAET Regulation No.2000/19 on Protected Places, Section 3. • Decree Law No. 26/2012 Environmental Basic Law, Article 28.	NN	NN	NN
6. Fisheries and Aquaculture	**Law and Regulation** • Decree Law 6/2004 General Basis of the Legal Regime for the Management and Regulation of Fisheries and Aquaculture.	NN	NN	NN
7. Landuse Control	**Strategic Plan** • Forestry Sector Policy Goal Objective and Strategy.	NN	NN	NN

Note: ☐ indicates the legislations, regulations, standards and guidelines that have been used in the EIA and EMP.
NN = Not necessary, as it is not applicable as legislation, regulation, standard or guidelines in Timor-Leste. The country already has these regulations and policies in place.

Chapter 6

Description of the Environment

CHAPTER 6: DESCRIPTION OF THE ENVIRONMENT

6.1 INTRODUCTION

- This Chapter provides a description of the environmental components: physical, ecological, economic, social and cultural environments of the Project site and its surrounding areas.

- The aim is to elicit issues that may arise with the development of the Project on the environment and, in turn, whether the environment will affect the Project.

- The information and baseline data in this Chapter were gathered from many primary and secondary sources. For the primary data, site investigations, surveys and samplings were carried out from September 2016 to January 2017. Secondary data were from various published literature.

- **Table 6.1.1** provides a list of environmental components that will be described systematically in the ensuing sections of this Chapter, while the impact assessment and proposed mitigation measures are provided in **Chapter 9**.

Table 6.1.1: Components of Existing Environment

Component	Description	Sub-section
Physical Environment		
i	Climate and implications of climate change	6.2
ii	Topography and slope	6.3
iii	Geomorphology and geology	6.4
iv	Soils	6.5
v	Water quality – surface water; groundwater; coastal water; marine water	6.6
vi	Air quality	6.7
vii	Hydrology and drainage	6.8
viii	Noise levels	6.9
Ecological Environment		
i	Wetlands	6.10
ii	Mangroves	6.11
iii	Corals	6.12
iv	Fisheries	6.13
v	Protected areas and national parks	6.14
vi	Marine ecology – flora and fauna	6.15
vii	Terrestrial ecology – flora and fauna	6.16
viii	Coastal beaches and resources	6.17
Economic Environment		
i	Employment sector	6.18
ii	Infrastructure and utilities	6.19
iii	Landuse	6.20
iv	Use of forests and other natural resources	6.21

Component	Description	Sub-section
v	Fisheries resources	6.22
vi	Agriculture	6.23
vii	Tourism and recreation	6.24
viii	Other industries	6.25
Social Environment		
i	Population and communities	6.26
ii	Health profiles	6.27
iii	Institutions, schools and health facilties	6.28
iv	Community and family structures	6.29
v	Land ownership	6.30
vi	Any types of common or individual rights on natural resources	6.31
vii	Traffic	6.32
Cultural Environment		
i	Cultural heritage	6.33
ii	Archaeological sites	6.34
iii	Historic sites	6.35
iv	Sacred sites	6.36
v	Unique landscape	6.37

(A) PHYSICAL ENVIRONMENT

6.2 CLIMATE AND IMPLICATIONS OF CLIMATE CHANGE

6.2.1 Introduction

- Timor-Leste lies in the tropical region where temperature varies within a narrow range throughout the year. The average temperature in coastal areas is around 27°C and around 22°C in the highlands (Wallace et. al., 2012). However, the daily temperatures vary widely during the day.

- The Northwest and Southeast Monsoons are two distinct monsoonal seasons that are experienced at the Project area. The former occurs from December to April and the latter from June to October. The periods between the monsoons, in the months of May and November, are commonly referred to as the inter-monsoons or transition periods, but are not distinct. Considering the location of the Project site on the northwest coast, it will be more exposed to the Northwest Monsoon.

6.2.2 Existing Meteorological Information

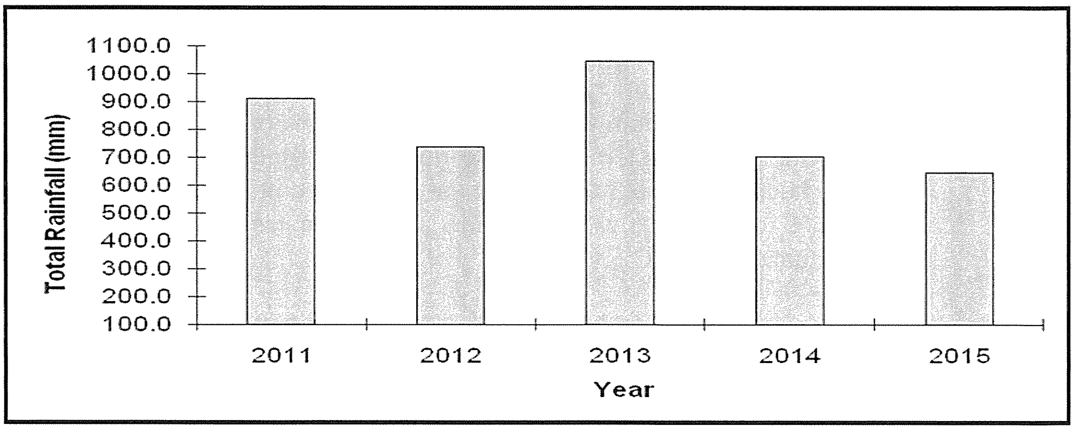
- Climatic data were obtained from the nearest weather station at Dili (Latitude 08° 38 S, Longitude 125° 31 E, 3 m above mean sea level) over a period of five years (2011 – 2015), which are considered representative of the Project site's weather conditions. The station is located ~5.4 km from the Project site.

6.2.3 Rainfall

(a) Annual Rainfall

- **Figure 6.2.1** shows the total annual rainfall at the Dili Weather Station over the period 2011 to 2015, averaging 809.2 mm, and fluctuated within a range of 646.6 mm (2015) to 1,045.1 mm (2013). These data suggested a fairly low annual rainfall at the Project site but could fluctuate widely depending on the synoptic climatic patterns and maritime influences of the sea.

Figure 6.2.1: Annual Rainfall (2011 – 2015)



Source: National Directorate of Meteorology and Geophysics, Ministry of Public Works, Transport and Communication, Democratic Republic of Timor-Leste, 2016.

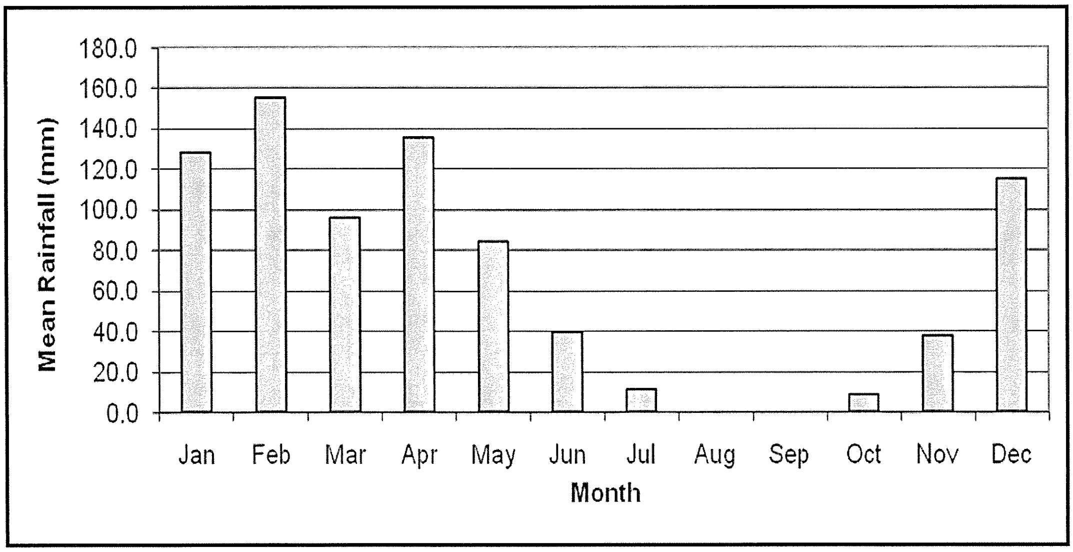
(b) Monthly Rainfall

- Dili experiences both wet and dry seasons over the year. The wet season is very marked from December to May, while the dry season is usually from June to November [Australian Bureau of Meteorology and Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2011].

- As shown in **Figure 6.2.2**, the maximum rainfall peaked in February, the wettest month of the wet season. In March, the rainfall recorded at the Dili Weather Station declined to <100 mm but increased to 135.2 mm in April. From the end of April, rainfall declined gradually to the dry season until December.

- Generally, there is a very pronounced dry season from May to November, with August and September being the driest months with hardly any rainfall recorded. **Figure 6.2.2** showed only 39.3 mm of rain was recorded during the wettest month (June) within the dry season.

Figure 6.2.2: Mean Monthly Rainfall (2011 – 2015)



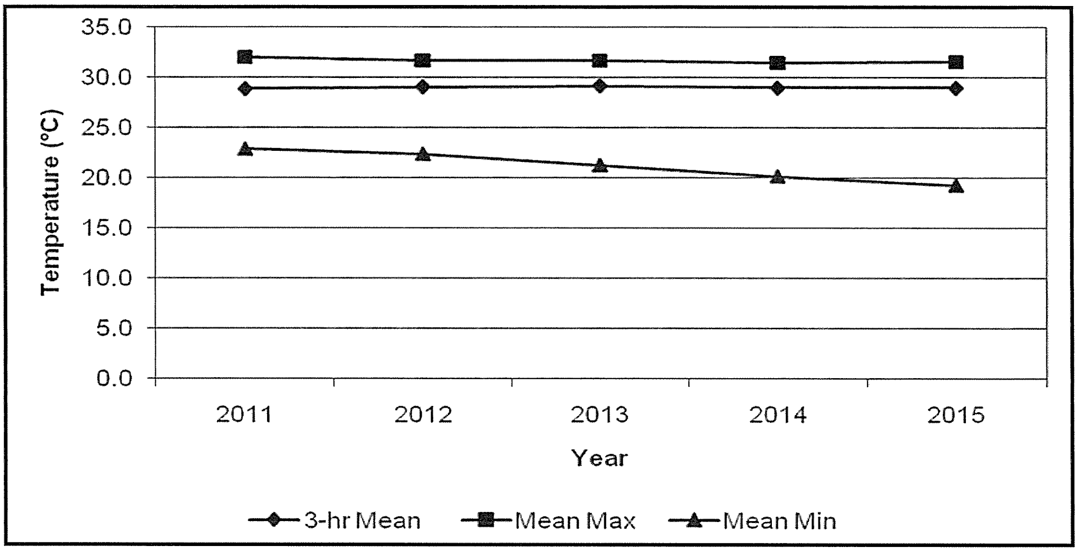
Source: National Directorate of Meteorology and Geophysics, Ministry of Public Works, Transport and Communication, Democratic Republic of Timor-Leste, 2016.

6.2.4 Temperature

- The Project site will have a relatively uniform warm temperature throughout the year if the trend from Dili Weather Station is taken as an indication. The recorded annual 3-hr mean temperature (**Figure 6.2.3**) ranged from 28.9 to 29.2°C, with a tiny fluctuation of 0.3°C. The annual mean maximum recorded was 31.5 – 32.0°C (0.5°C difference), while the annual mean minimum was 19.3 – 22.9°C with fluctuation of 3.6°C.

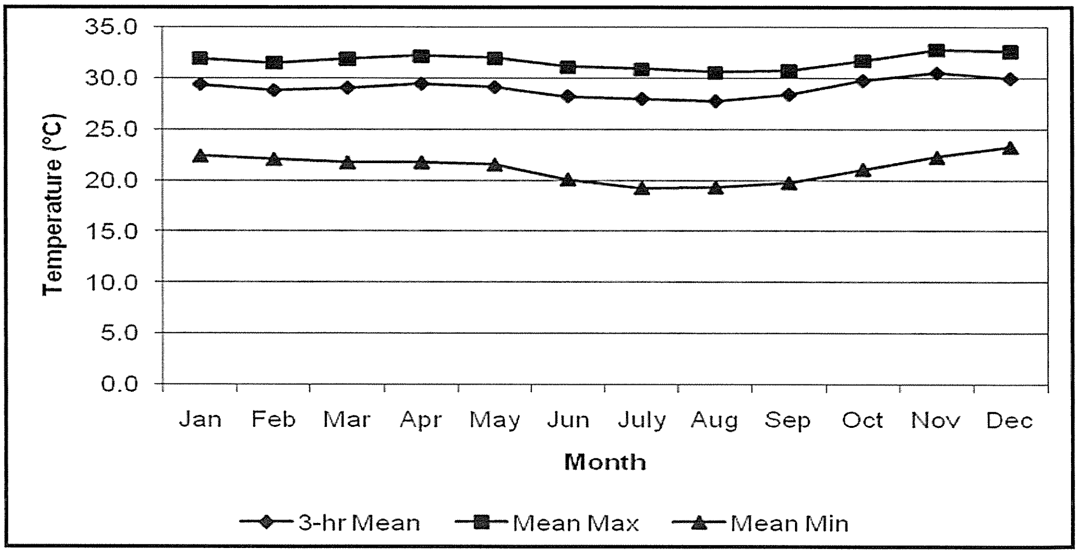
- The monthly 3-hr mean temperature (**Figure 6.2.4**) fluctuated only 2.7°C, peaking in November (30.5°C) with a low in August (27.8°C). The monthly mean maximum temperature fluctuated within 2.2°C difference, from 32.8°C (November) to 30.6°C (August). The monthly mean minimum temperature ranged from 19.3 (July and August) to 22.4°C (January), which fluctuated within a 3.1°C difference. These data could suggest a higher variation of temperature during the wet season and lower temperature during the dry season at the Project site.

Figure 6.2.3: Annual 3-hr Mean, Mean Maximum and Mean Minimum Temperatures (2011 – 2015)



Source: National Directorate of Meteorology and Geophysics, Ministry of Public Works, Transport and Communication, Democratic Republic of Timor-Leste, 2016.

Figure 6.2.4: Monthly 3-hr Mean, Mean Maximum and Mean Minimum Temperatures (2011 – 2015)



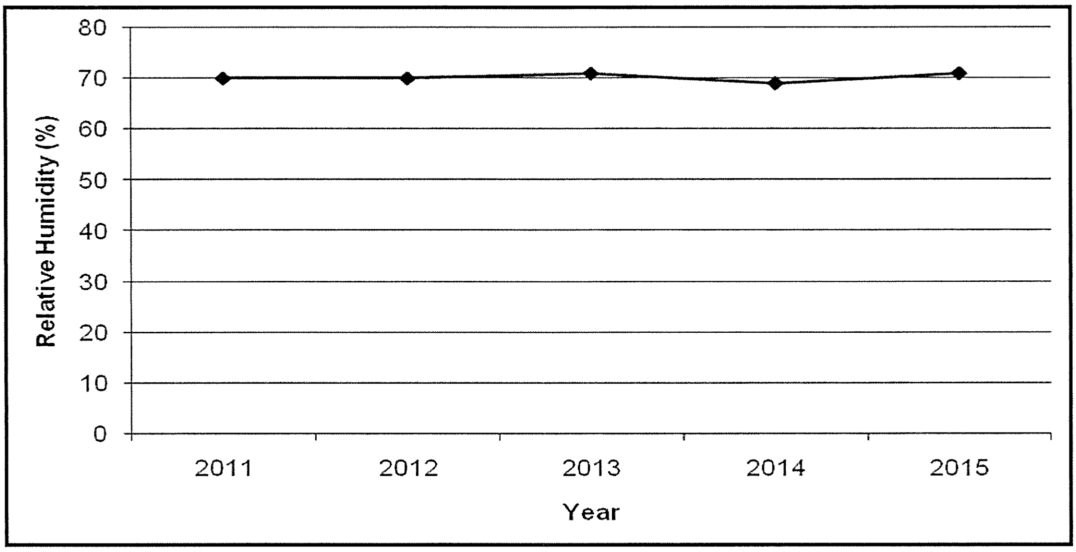
Source: National Directorate of Meteorology and Geophysics, Ministry of Public Works, Transport and Communication, Democratic Republic of Timor-Leste, 2016.

6.2.5 Relative Humidity

- **Figure 6.2.5** shows the annual mean 3-hr relative humidity that fluctuated with a small difference of 2%, from 69 to 71%. The lowest relative humidity was recorded in 2014, while the highest in both 2013 and 2015.

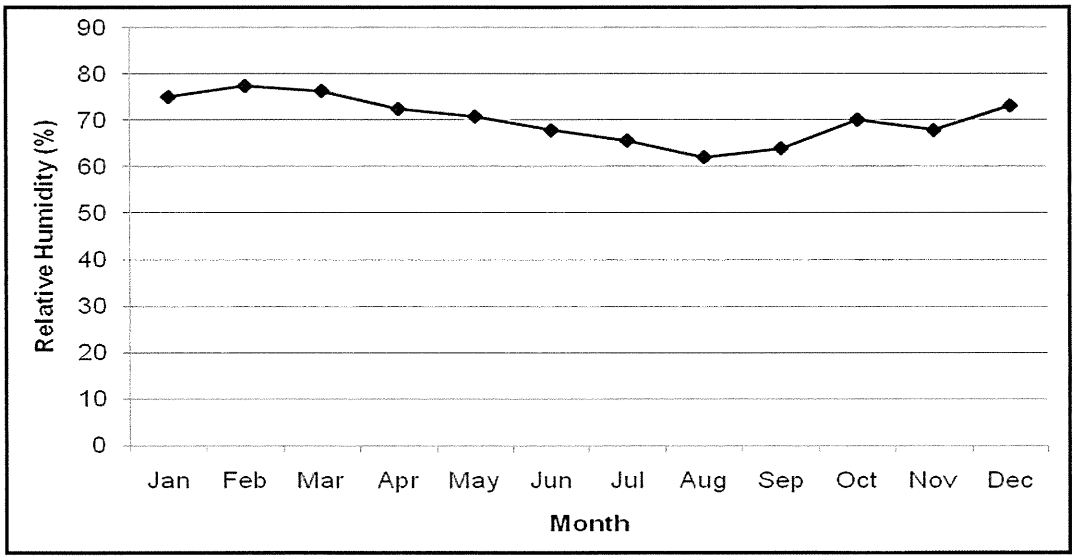
- The monthly mean 3-hr relative humidity ranged between 62% (August) and 77% (February), with a 15% difference of fluctuation (**Figure 6.2.6**). It is predicted that the Project site will also experience a higher fluctuating monthly mean relative humidity compared to the annual mean 3-hr relative humidity, possibly, more during the wet season and lower during the dry season because of maritime influences.

Figure 6.2.5: Annual 3-hr Mean Relative Humidity (2011 – 2015)



Source: National Directorate of Meteorology and Geophysics, Ministry of Public Works, Transport and Communication, Democratic Republic of Timor-Leste, 2016.

Figure 6.2.6: Monthly 3-hr Mean Relative Humidity (2011 – 2015)



Source: National Directorate of Meteorology and Geophysics, Ministry of Public Works, Transport and Communication, Democratic Republic of Timor-Leste, 2016.

6.2.6 Surface Winds

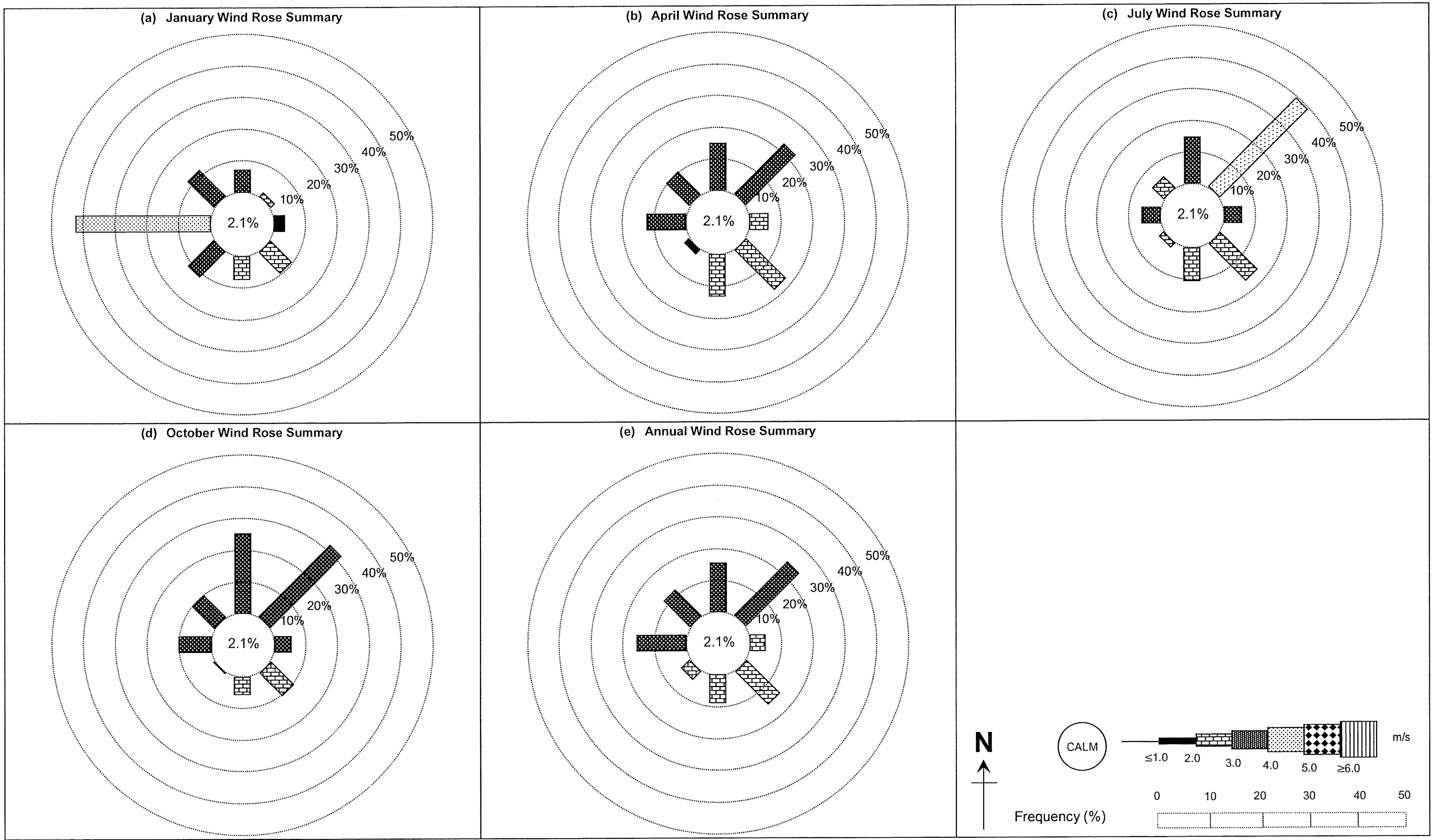
- Wind flow at the Project site is predominantly northerly to northwesterly. The local prevailing winds come from the northerly directions due to the local terrain with sea breezes dominating the wind patterns (Melody Higdon, 2005).

- Surface wind roses for January and April (Northwest Monsoonal season) are shown in **Figures 6.2.7 (a) and (b)**. During the Northwest Monsoon, afternoon sea breeze from the northerly directions is augmented by the northwest flows. Thus, the wind is generally blowing from the west and northerly directions.

- **Figures 6.2.7 (c) and (d)** show the surface wind roses for July and October (Southeast Monsoon). The wind flow during this period continues to come from the northerly directions. The light Southwest Monsoon wind flow is rather weak to cause much local effects in the area.

- **Figure 6.2.7 (e)** displays the annual wind rose summary for the wind conditions for the Project site. Wind is mostly expected to come from the northeast (23.4%) mainly in July, followed by west (15.5%), north (15.4%), southeast (14.6%) and northwest (11.6%). The occurrence of wind blowing from other directions is relatively rare (below 10%). Among all directions, the northwest wind blows with the highest velocity (3.6 m/s). On average, only 2.1% of the time is expected to be calm with no wind at the Project site.

Figure 6.2.7: Wind Rose Summary (2011 – 2015)



Source: National Directorate of Meteorology and Geophysics, Ministry of Public Works, Transport and Communication, Democratic Republic of Timor-Leste, 2016.

6.2.7 NATURAL HAZARDS

- The natural hazards that have been experienced in Timor-Leste are:

  (i) Tropical cyclones.
  (ii) Flood risk.
  (iii) Drought.
  (iv) Seismic activities (refer to **Section 6.4:** Geomorphology and Geology).

(a) Tropical Cyclones

- Natural climatic hazards, reflected in severe local weather patterns, are experienced in Timor-Leste, which will have a negative impact on the people and the environment. Timor-Leste is situated within the boundaries of the cyclonic belt and although it is generally sheltered by northern Australia, Papua New Guinea, Moluccas, Borneo and the eastern Indonesian islands from the full effects of any cyclonic or typhoon activities, it is prone to increased precipitation when tropical cyclones pass south through the Arafura and Timor Seas.

- During such times, the Comoro River and all the smaller rivers will experience a spate of high flows, flooding the low-lying areas in Dili. This will be accompanied by erosion resulting from a combination of heavy rains and the hilly topography.

(b) Flood Risk

- **Figure 6.2.8** shows the flood risk areas in Timor-Leste. Two types of flooding are discerned: (i) overbank flooding and, (ii) inundation from severe rainfall and storm surges. Historical data obtained from the National Directorate for Disaster Management (NDDM) for Timor-Leste dated 2001, showed the Dili Municipality and the Project site having a moderate to high risk of flooding due to tropical cyclones or high rainfall during the wet season (December to April).

- The above information seemed to contradict the information from the Tropical Storm Risk Zones published by United Nations Office for the Coordination of Humanitarian Affairs (OCHA) Regional Office for Asia Pacific, which indicated that Timor-Leste lies within the low risk zone of tropical cyclones, and is therefore classified as Zone 1 in the Saffir-Simpson Scale (118 – 153 km/h), with 10% probability of exceedance in 10 years (**Figure 6.2.9**).

- To resolve the issue, the National Directorate of Meteorology and Geophysics was consulted on 13 October 2016, which mentioned that no flooding event was recorded in the Tasi Tolu area, where the Project site is located (refer to **Appendix 13-A** for the Minutes of Meeting).

(c) Drought

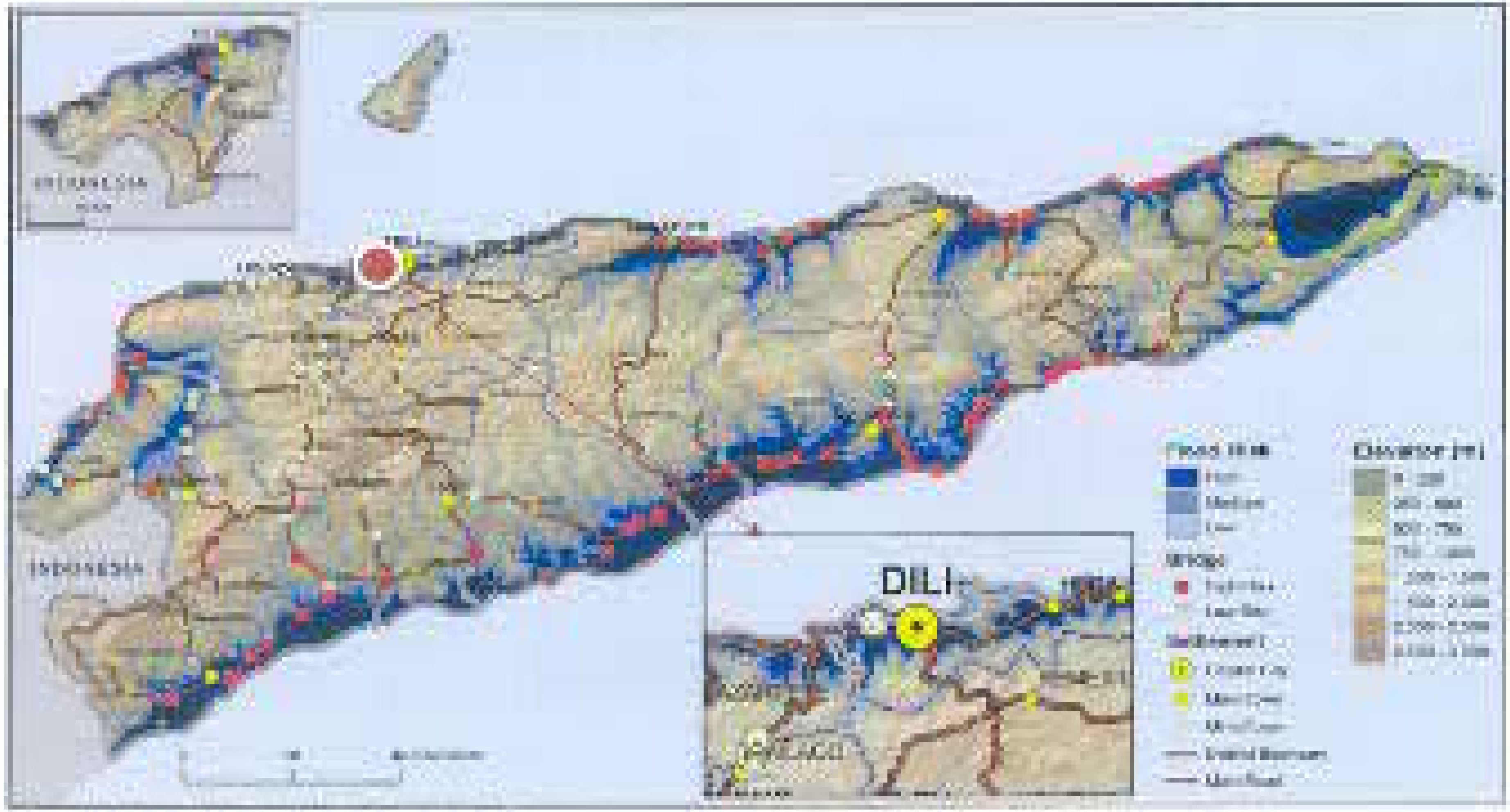
- Timor-Leste is prone to droughts resulting from its location with low rainfall for half of the year. However, it is vulnerable to the effects of the *El Nino*/Southern Oscillation climatic phenomenon (often called *El Nino*), which tends to intensify the drought situation when it occurs, usually within a five to seven years cycle (Stefano Fedele et al., 2006). This phenomenon will intensify the already dry weather condition causing very severe water shortages in the country.

- Associated with *El-Nino*, the seawater temperature around Timor-Leste is unusually cold (Ministry of Economy and Development, 2010), which disrupts the normal development of cloud cover. The cold water suppresses convective activity resulting in serious precipitation shortfalls, when the monsoon rains are cut short and drought settles in quickly.

- In terms of impacts, it was reported that there was a 30% drop in crop production in 2007 attributed to severe drought. The recent drought event intensified by *El-Nino* occurred in 2015/2016, which caused a 50% rainfall reduction as compared to normal years (Ministry of Agriculture and Fisheries, 2016).

- In terms of the Project, the need for water augmentation is real and urgent. This is because of the already low rainfall for most of the year and if the drought is intensified by the *El Nino* effect, water shortages will derail the future operations of the Project. Hence, desalination, recycling of the wastewater and converting Tasi Tolu Lake A to freshwater have been planned for the Project as stated in **Chapter 4:** Description of the Project.

Figure 6.2.8: Flood Risk at Timor-Leste



Source: United Nations Integrated Mission in Timor-Leste, 2008

Figure 6.2.8 Tropical Storm Intensity at Timor-Leste

6.2.8 IMPLICATIONS OF CLIMATE CHANGE

- Climate change refers to significant long-term change in the Earth's climate, including temperature, precipitation, wind strength, etc. due to both natural and anthropogenic causes.

- In 1700s, climate change could be explained by natural causes, e.g. volcanic eruptions, alteration in solar energy and natural increments of greenhouse gas (GHG) concentration [Intergovernmental Panel on Climate Change (IPCC), 2014; United States Environmental Protection Agency (EPA), 2016].

- Currently, the natural causes are blur and unable to explain most of the climate change causes. Instead, some of the causes were attributed to human activities, emissions of GHG, landuse change, etc causing global warming since the mid-20th century.

- **Figure 6.2.10** shows the change in surface temperature worldwide over a period of 20 years (1986 – 2005). The average change in surface temperature in Timor-Leste throughout the same period could be within the range of ~0.5 to 1.0°C.

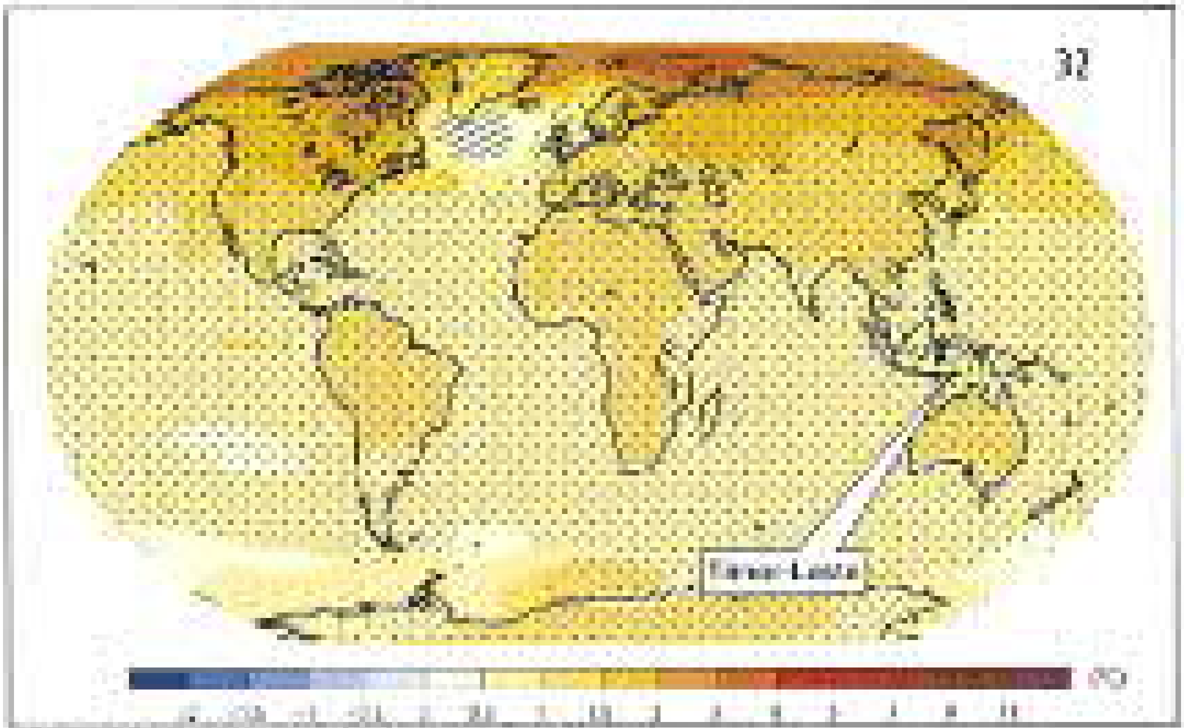
- Based on the analysis of global surface temperature by the National Aeronautics and Space Administration (NASA), the Earth's average temperature in 2013 had increased by about 0.6°C since mid-20th century, and as much as ~0.8°C since 1880.

- Worldwide precipitation (rainfall) also experienced a change from 1986 – 2005 (**Figure 6.2.11**), with a maximum ~10% reduction. It can be deduced from above that Timor-Leste may also experience a maximum 10% reduction in average precipitation over the 20-year period since 1989, because of this worldwide precipitation fluctuations.

- Global warming as a result of higher worldwide temperature, affects the average sea levels across the world. **Figure 6.2.12** shows that the average sea level worldwide has increased from 0.1 m up to 0.6 m within 20 years (1986 – 2015). The sea level surrounding Timor-Leste may have also increased by ~0.4 to 0.5 m since 1986 until 2015 respectively.

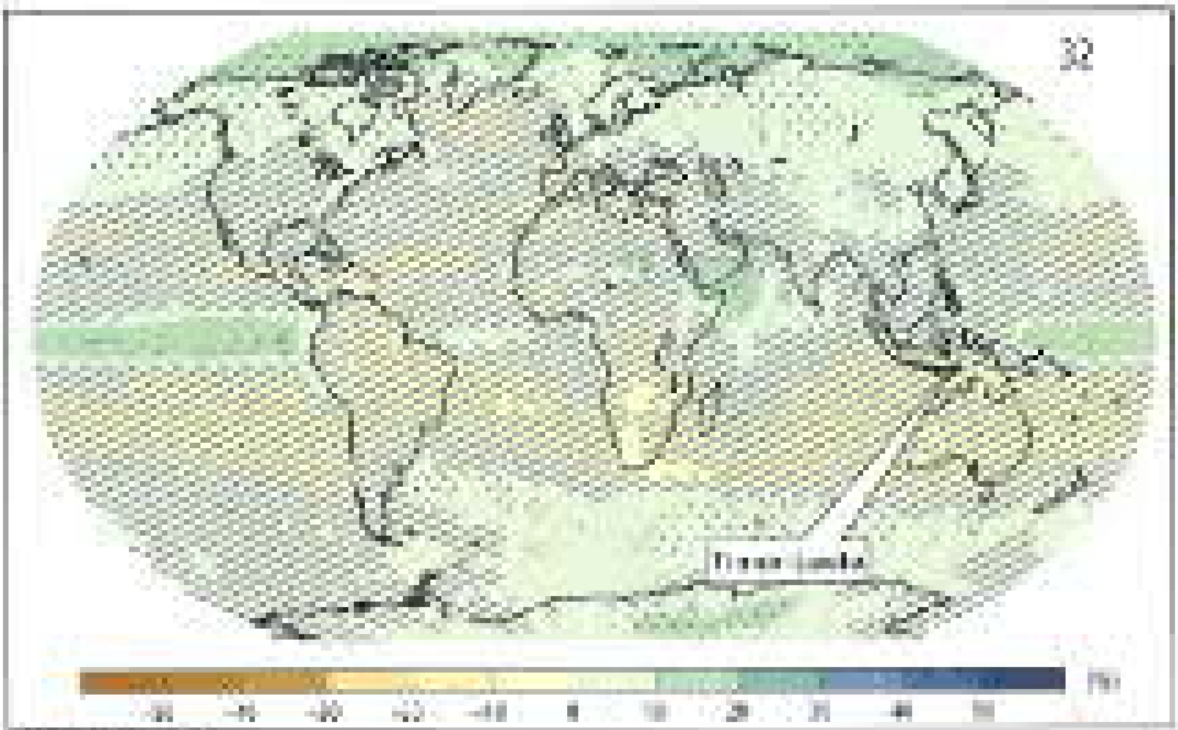
- As climate change is a natural worldwide phenomenon, some of the effects mentioned above may have ramifications on the environment in Timor-Leste, for which the country may have to adapt to the change, especially with regard to sea level rise and the effects on its local coastal population. This will be discussed in **Chapter 7:** Climate Change.

Figure 6.2.10: Change in Average Surface Temperature (1986 – 2005)



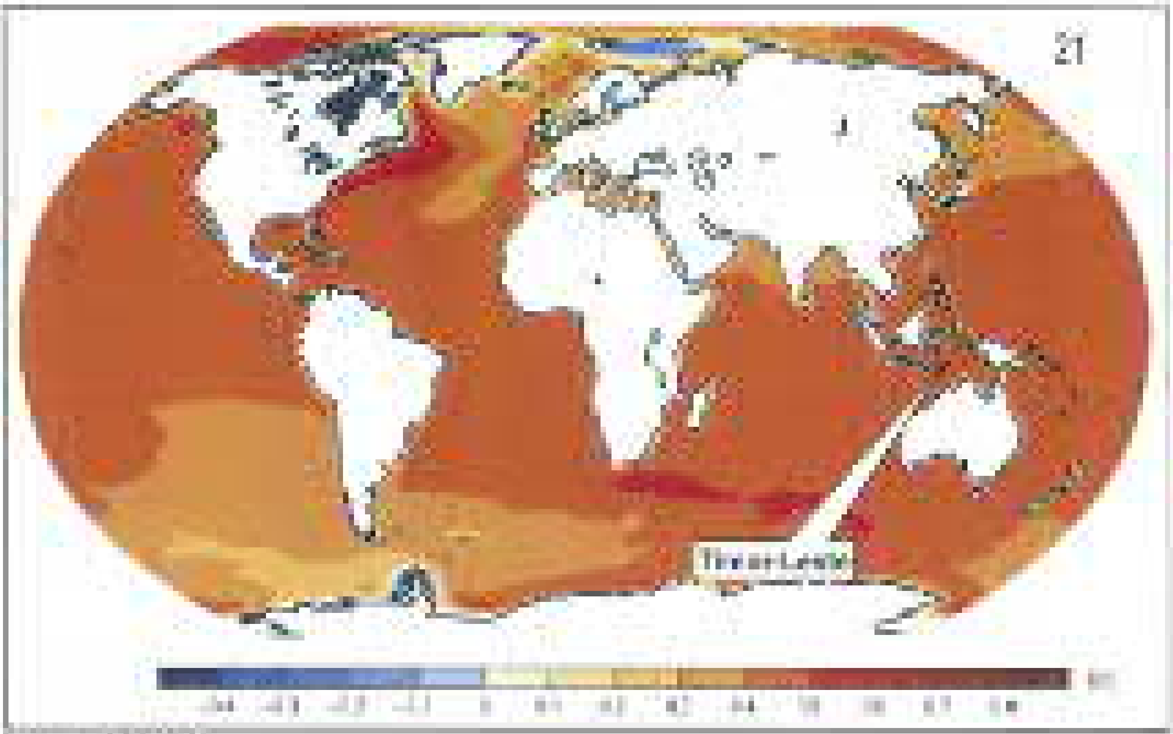
Source : Intergovernmental Panel on Climate Change (IPCC), 2014

Figure 6.2.11: Change in Average Precipitation (1986 – 2005)



Source : IPCC 2014

Figure 6.2.12: Change in Average Sea Level (1986 - 2005)



Source : IPCC, 2014

6.3 TOPOGRAPHY AND SLOPE

6.3.1 Introduction

- This Section provides a description of the general topography and slope distributions of the Project site based on land surveys conducted by United Surveyors Pte Ltd (2016).

6.3.2 Topography

- The 563.04 ha of Project site has a vast expanse of flat terrain of 0 to 55 m above mean sea level (MSL) facing the coast and is backed by a range of hills of more than 55 to 395 m above MSL (refer to **Figure 6.3.1**).

- The flat areas have been proposed for development of the golf course and all the other structural components. The higher terrain surrounding the flat terrain is proposed as reserve area, which will undergo reforestation.

6.3.3 Slope

- The Project site dominated by slopes of <35°, covering ~486.24 ha or 86.36% (**Table 6.3.1** and **Figure 6.3.2**). The Project development is mostly concentrated in areas with slopes less than 15°, such as for the hotels, service apartments, golf course, utility centre and residential units.

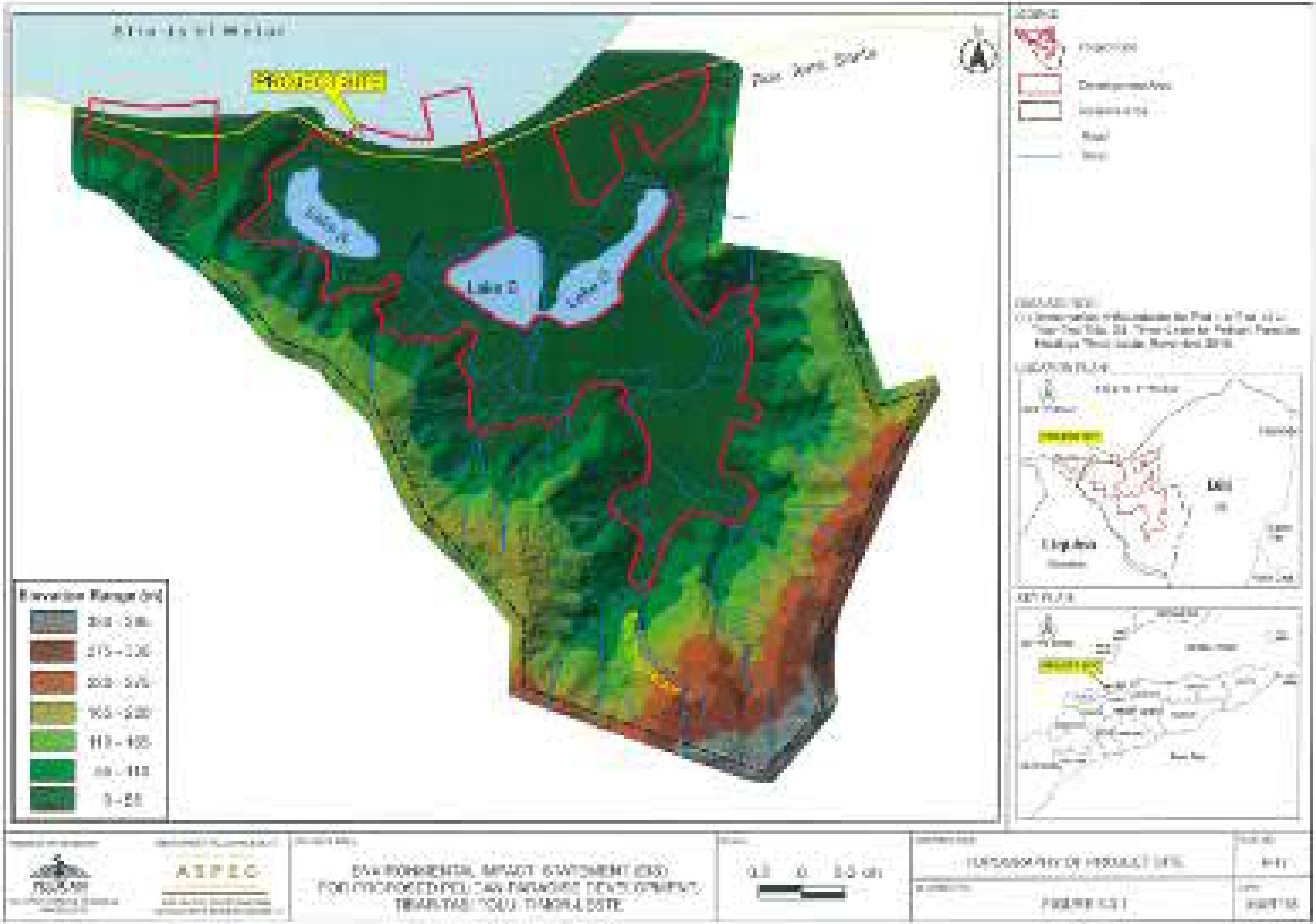
- Slopes of ≥15° at the undulating to hill areas will be under reserve areas.

- The three Tasi Tolu Lakes have elevations that reflect the mean sea level.

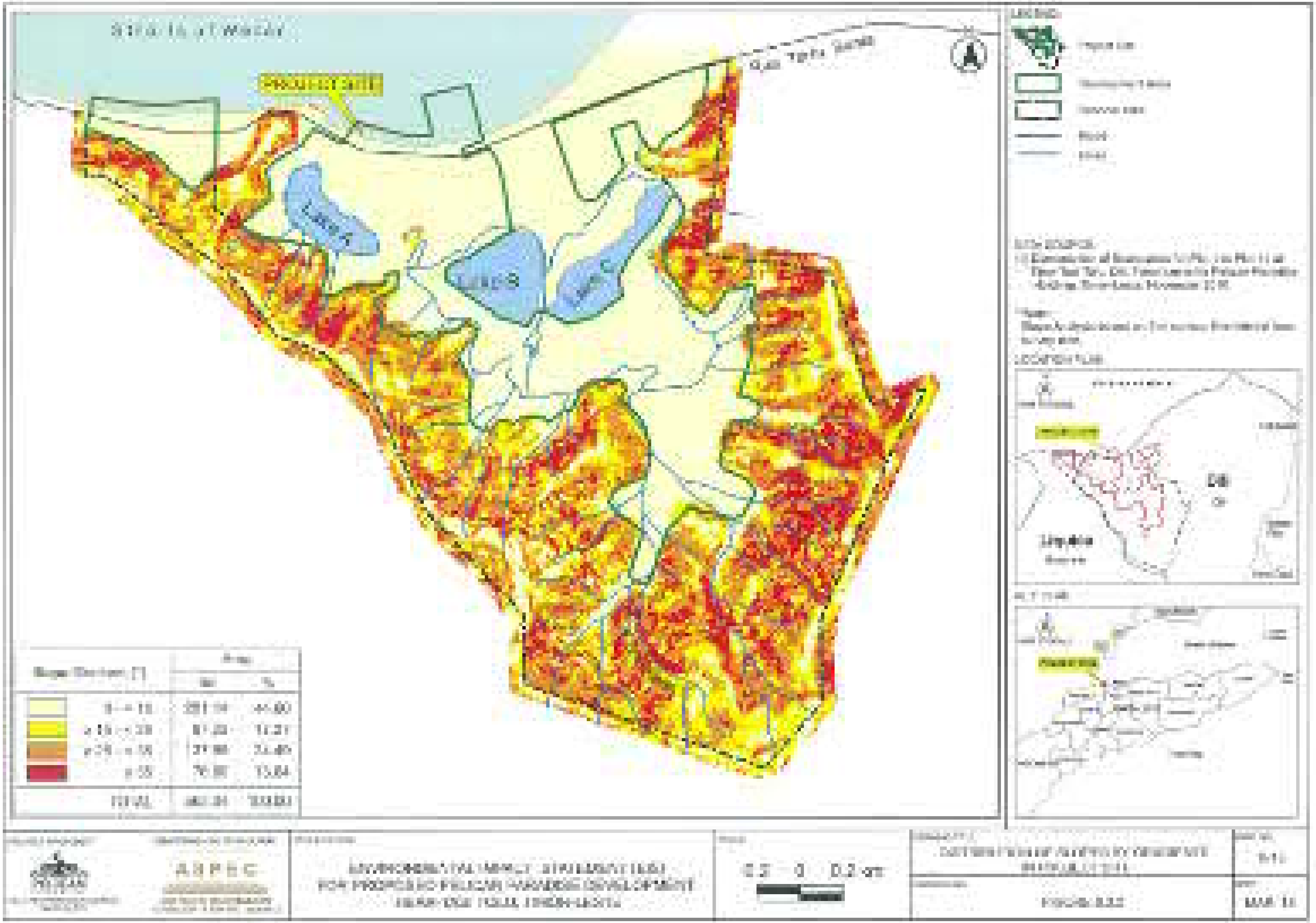
Table 6.3.1: Distribution of Slopes in Project Site

Slope Categories (°)	Area (ha)	% Project Area
0 – <15	251.14	44.60
≥15 – <25	97.22	17.27
≥25 – <35	137.88	24.49
≥35	79.80	13.64
Total	**563.04**	**100.00**

Source: United Surveyors Pte Ltd, 2016.



Lake 2
Elevation Range (m)
0 - 55
ASPEC
ENVIRONMENTAL IMPACT STATEMENT (EIS)
FOR PROPOSED PELICAN PARADISE DEVELOPMENT



PROJECT SITE
Lake A
Lake B
Lake C
TOTAL
ASPEC
0.2 0 0.2 km

6.4 GEOMORPHOLOGY AND GEOLOGY

6.4.1 Geomorphology

- The Project area covers the coastal plain that is backed inland by hilly terrain and separated into two sectors by a low, southwest-northeast trending ridge that rises to some 50 m above mean sea level (MSL) and on which is located the Pope Monument. The sector in the west where the service apartments (Plot 3) and 2nd hotel (Plot 10) are to be developed, is referred to as the Western Sector. The sector where the 5-star hotel (Plot 1), golf course (Plot 2) and residential units (Plots 8 and 9) are located, is referred to as the Eastern Sector.

(a) Western Sector

- The Western Sector comprises a narrow stretch of flat ground, some 100 to 400 m wide, that extends in an East-to-West direction for ~800 m in length. It is fronted to the north by the Straits of Wetar. This stretch of flat ground is bordered inland by a northwest-southeast trending belt of hilly terrain that rises to 100 m above MSL (refer **Figure 6.3.1** in **Section 6.3:** Topography and Slope and **Figure 6.4.1**, **Plate 1**). Low ridges rising to 50 m above MSL, mark the eastern and western borders of the flat ground and form headlands where they meet the coast. The low ridges and hilly terrain are developed over meta-sedimentary bedrock of the Alieu Formation, whilst the flat ground is underlain by coastal deposits.

- The inland limits of the flat ground are marked by the moderate to steep (>35°) slopes of the hilly terrain and low ridges, except to the southwest and south, where some alluvial fans with more gentle slopes (<15°) are found (refer **Figure 6.3.2** in **Section 6.3**). The flat terrain and surrounding hill slopes have limited vegetation covers; mainly shrubs, isolated trees and patches of grass, creepers and weeds, some of which appeared desiccated and/or burnt (**Figure 6.4.1**, **Plate 2**).

- The weathered materials are coarse-grained comprising angular to sub-angular phyllites and quartz blocks of pebbles of sizes 2 to 20 cm in a silty to gravelly matrix. Down-shape movement of these weathered materials by both soil creep and surface runoff (during periods of heavy rainfall) has resulted in scree accumulations at the foot of slopes along the edges of the flat terrain. Terracettes are seen upslope of the scree accumulations, which clearly indicate the presence of imperceptible soil creep (**Figure 6.4.1**, **Plate 3**). The steeper slopes (>45°) in the hilly terrain, such as the ridge on which the Pope Monument is located, also show signs of instability and breakage, with the occurrence of many small, block slides.

- In the hilly terrain surrounding the flat ground, knickpoints ('abrupt changes in slope angles') are seen in places that indicate on-going uplift of the general region. Sub-angular to rounded, brownish stained, quartz gravel on the ground surface close to the knickpoints furthermore, indicate that these may be planation surface (probably palaeo-beaches).

- At the coast is found the contemporary beach, where cemented coral, shell and rock fragments (beach rock) are seen close to the headlands at both ends of the Project site.

(b) Eastern Sector

<u>General</u>

- The Eastern Sector comprises a very broad stretch of flat to gently undulating terrain, some 200 to 1,200 m wide that trends in a general northwest-southeast direction for over 2 km and fronted to the north by the Straits of Wetar. The flat to gently undulating ground is bordered inland on all sides by hilly terrain that rises to some 400 m above MSL (**Figure 6.4.1**, **Plate 4**). A low, approximately southwest-northeast trending ridge (with the Pope Monument on its top) that rises to some 100 m above MSL marks the western edge of this Sector. This ridge and the surrounding hilly terrain are developed over meta-sedimentary bedrocks of the Alieu Formation, whilst the flat to gently undulating ground, is underlain by coastal deposits.

- The inland edges of the flat to gently undulating ground are mostly bordered by the moderate to steep (>35°) slopes of the hilly terrain and low ridges (<20°) (**Figure 6.4.1**, **Plate 5**). In places, such as to the southwest of Tasi Tolu Lakes A and B, the alluvial fans have coalesced to form a continuous, gently sloping surface known as a *bahada*. In the southeast, is the broad, gently sloping infilled valley of the Tasi Tolu River; the infill also largely resulting from deposition by alluvial fans. The flat terrain and surrounding hill slopes have sparse cover of vegetation, such as shrubs, isolated trees and patches of grass, creepers and weeds, some of which appear desiccated during the dry season. There is very little organic matter in these weathered soils to sustain vegetation. The gently sloping, infilled valley of the Tasi Tolu River, however, is more densely covered with vegetation such as mangroves and with several plots of palms and other garden trees.

- Down-slope movement of these weathered soil materials by both soil creep and surface run-off (during periods of heavy rainfall) has resulted in the built of of screes at the feet of some slopes along the edges of the flat ground. Terracettes are seen upslope of the scree accumulations that clearly indicate the presence of soil creep. Incision of stream channels into the alluvial fans also points to linear erosion by streams during periods of heavy rainfall. The steeper slopes (>45°) in the hilly terrain also appear to show of instability, with the occurrence of small, block slides.

- In the hilly terrain surrounding the flat to gently undulating ground, knickpoints ('abrupt changes in slope angles') are seen in places that indicate on-going uplift of the general region. Sub-angular to rounded, brownish stained, quartz gravels on the ground surface close to the knockpoints furthermore, indicate that these maybe planation surfaces (probably palaeo-beaches). Similar sub-angular to rounded, brownish stained quartz gravels are found on the southern, inland edges of Tasi Tolu Lake B that indicate the presence of a palaeo-beach.

- At the coast, is found the contemporary beach, which is some 5 to 10 m wide consisting of medium to coarse grained sands with shells as well as coral and shell fragments. Cemented coral, shell and rock fragments (beach rock) are seen in places close to the headlands at the west end of the site, whilst fringing coral reefs are found off-shore (**Figure 6.4.1**, **Plate 6**).

Tasi Tolu Lakes

- The Tasi Tolu Lakes refers to the three saline lakes, which are found in the Eastern Sector. The three lakes are labeled as Tasi Tolu Lakes A, B and C from west to east. Tasi Tolu Lake A (the smallest lake) is separated from Tasi Tolu Lake B by a low ridge, whilst Tasi Tolu Lakes B and C are inter-connected and only separated in part by a narrow strip of dry land (some 20 to 100 m wide), which during high tide, is drowned by the waters of the two lakes.

- The three Lakes show variable surface areas. They apparently dry out and shrink in the dry season. Evidence of shrinking was seen in the formation of a broad, concentric belt (up to 500 m wide) of powdery, white to grey, salt crystals (salt crust) around the edges of the Tasi Tolu Lakes (**Figure 6.4.1**, **Plate 6**). Other evidences were the decaying vegetation and exposed roots seen around the edges of the Lakes, as well as small pools of saline water with thin crusts of salt crystals, especially along the narrow strip of dry land between Tasi Tolu Lakes B and C, and along the edges of Tasi Tolu Lake B. In addition to the salt crust, shells of marine organisms and dead corals were also found; these 'fossils' clearly indicate the marine origin of the Lakes (**Figure 6.4.1**, **Plates 7 and 8**). The marine origin of the Tasi Tolu Lake is also seen in the sub-angular to rounded, brownish stained, quartz gravels on the southern, inland sides of Tasi Tolu Lake B, indicating the presence of a former beach (palaeo-beach).

- The marine 'fossils' as well as palaeo-beach, indicate that the entire Eastern Sector was a very large bay in relatively recent geological times (when MSL was higher than the present level). During that time, the sea (Straits of Wetar) covered the entire Eastern Sector to reach the edges of the present-day hilly terrain. Rivers that were present in the hilly terrain at that time discharged directly into the bay and developed alluvial fans at their mouths. The seaward edges of the bay, which were marked on both sides by headlands extending from the inland ridges, however, were gradually narrowed due to the development of coral reefs (from the headlands). Continued growth of these reefs and deposition of coastal sediments along the seaward edges (probably due to a drop in global MSL or uplift of the land) gradually resulted in closure of the bay and the formation of a large lagoon within the present-day Eastern Sector, that is now silted up to form part of the golf course and the hotel and commercial complex in the Project area.

- Vegetation, mainly mangroves, once developed along the edges of this lagoon; the vegetation being able to survive in a brackish water environment. The landward edges of this lagoon were very irregular with a distinct separation of the present-day Tasi Tolu Lake A from Tasi Tolu Lakes B and C. At this time, the lagoon was still connected to open sea, though continued deposition of coastal sediments on the seaward side gradually resulted in only narrow channels (outlets) through which sea water entered the lagoon. Continued deposition of coastal sediments then resulted in two smaller lagoons; one comprising the present-day Tasi Tolu Lake A, and the other comprising Tasi Tolu Lakes B and C. These lagoons were then still connected to open sea by narrow channels (outlets) located at the northwest ends of Tasi Tolu Lakes A and B. Closure of these outlets (channels) in very recent geologic times has reduced the influence of the sea and the creation of the three Tasi Tolu Lakes, which are now experiencing increasing salinity (due to evaporation) and appears to be shrinking, although they are still influenced by seawater seepage underground.

- Variations in the salinity of seawater (35 – 50 ppt) near the coast and that of the Tasi Tolu Lakes indicate no direct surface connections between them except through underground seepage. The differences in present-day salinity of the Tasi Tolu Lakes could be due to variations in lake depths, the extent of dilution by rain and in-flowing surface freshwater (non-saline), and subsurface seepage from the sea. The latter is reflected in fluctuations of the daily water levels of the lakes, largely depending on the tides.

- Tasi Tolu Lake A, which is shallow (5 m deep) has the lowest salinity (~35 ppt), whilst Tasi Tolu Lake B, being deep (15 m) has much higher salinity (~48 ppt). This does not seem to be the case when compared to Tasi Tolu Lake C, which has much inflow of surface freshwater (from the Tasi Tolu River) and is shallow (5 m deep), but has the highest salinity (~50 ppt). It is to be noted that these salinity measurements were determined during the drier part of the year and the values could fluctuate during the wet seasons when there is contribution from rainfall.

- In general, however, it is expected that Tasi Tolu Lake A will show an increasing salinity and decreasing volume of water with time; features that will also be shown by Tasi Tolu Lakes B and C, although variations in volume of in-flowing surface water (during subsequent wet seasons) may modify these values. Lake A has been chosen for conversion into a freshwater lake to augment water supply to the Project in case of prolonged drought because it is much smaller in size and shallower where the salinity is not so high compared to the other two lakes.

6.4.2 Geological Units

- Field mapping shows that the earth materials within the Project site can be separated into four main geological units on the basis of differences in age, lithology and deposition environment (**Figures 6.4.1** to **6.4.2**):

  (i) Contemporary Beach: sand, shells, shell and coral fragments.
  (ii) Coastal Deposits (Holocene): sands, shell and coral fragments. Locally salt crust, silts and clays with organic matter.
  (iii) Alluvial Fan Sediments (Holocene): gravels, sand and some boulders.
  (iv) Alieu Formation (Permian): phyllites, slate and shales.

(a) Contemporary Beach

- This unit comprises the medium to coarse grained sand, shells, shell and coral fragments found along the present-day coastline which is fronted by the Straits of Wetar. The sediments are not cemented or covered by vegetation and contain sub-rounded to angular gravels. The sediments extend all the way westwards from the mouth of the Comoro River to the east; their continuity only broken by the headlands that mark the ridge separating the Western Sector from the Eastern Sector.

(b) Coastal Deposits (Holocene)

- These sediments underlie the flat to gently undulating coastal plain in both the Western and Eastern Sectors and are considered to be of Holocene age as they were formed (deposited) during the Holocene global rise in MSL from about 22,000 years ago.

- In the Western Sector, the surficial Coastal Deposits consist predominantly of medium to coarse grained sands with abundant gravel sized shell and coral fragments as well as some organic matter. Boreholes in the area showed the subsurface Coastal Deposits to have a similar composition as that of the surficial deposits, though coral beds (layers) are also sometimes present (**Appendix 6-A**). The boreholes also showed the Coastal Deposits to increase in thickness seaward with a thickness exceeding 20 m at the present-day coastline. Some of the boreholes (BH#12 and #13) furthermore, showed the coastal deposits to overlie the Alluvial Fan Sediments up to 10 m thick that in turn overlie weathered bedrock of the Alieu Formation (**Appendix 6-A**). The nature of the surface and subsurface sediments here is unexpected given their origin as a result of deposition along a rocky coast facing the open-sea during the Holocene rise of MSL.

- In the Eastern Sector, the surficial coastal deposits comprise a variety of materials, including sands, silts, clays, shells and coral fragments as well as decaying organic matter. All around the edges of the Tasi Tolu Lakes, the surface material is a powdery, white to grey, salt crust, whilst the immediately underlying layer is a dark grey, silty clay with abundant decaying organic matter. Boreholes in the area showed the surficial Coastal Deposits to continue into the subsurface, though these subsurface Coastal Deposits are of variable thickness (**Appendix 6-A**). At the site of the proposed 5-star hotel (Plot 1), boreholes (BH#6, #7 and #8) showed the Coastal Deposits to be some 23.6 to 52.2 m thick; the thickness increasing towards the coastline. Boreholes (BH#6, #7 and #8) also showed similar Coastal Deposits overlying the Alluvial Fan Sediments (of some 6 – 9 m thick) that in turn overlie weathered bedrock of the Alieu Formation (**Appendix 6-A**). The nature of the surface and subsurface sediments here is also unexpected given their origin as a result of deposition along a rocky coast facing open-sea during the Holocene rise of MSL.

(c) Alluvial Fan Sediments (Holocene)

- At a number of sites along the edges of the flat to gently undulating terrain over the Holocene Coastal Deposits are found alluvial fans (and *bahada*) with gentle slopes that extend upslope into the hilly terrain. These alluvial fans consist of several layers (of variable thickness) of pebble to cobble sized (2 to 20 cm) materials, sub-rounded to angular blocks of phyllite and quartz in a silty to sandy and gravelly matrix (**Figure 6.4.1**, **Plate 9**). The sediments infill river valleys have approximately triangular cross-sections with thicknesses that increase down-valley. Uncased tube wells to the south of Tasi Tolu Lake B showed that the Alluvial Fan Sediments ranged in thickness from 3 m to more than 11 m. At the site of the proposed utility centre (Plot 4), boreholes (BH#10 and #11) showed the Alluvial Fan Sediments to be more than 13.5 m thick (**Appendix 6-A**). The said boreholes furthermore, showed the Alluvial Fan Sediments to comprise loose to very dense, brownish grey, gravel sized, sub-angular phyllite and quartz fragments in a bouldery to sandy matrix.

- The Alluvial Fan Sediments, which have developed through deposition of coarse grained materials transported by surface runoff along ephemeral rivers during periods of intense rainfall, are of a Holocene age as they are inter-bedded with the Coastal Deposits. In places, however, as at the proposed 5-star hotel (Plot 1) site, the Alluvial Fan Sediments may be slightly older as they underlie the Coastal Deposits.

(d) Alieu Formation (Permian)

- The hills and ridges surrounding the flat to gently undulating terrain at both the Eastern and Western Sectors are developed over meta-sedimentary bedrock that has been mapped as a part of the Alieu Formation. In its type-locality, in the area around Alieu, the Formation consists of a series of shales, phyllites, slates and occasional low-grade metamorphosed eruptive rocks; the succession generally being a monotonous series of light-coloured shales that weathered to a deep red. In this type-locality, blocky blue-grey and light-purple, well cleaved, slates and inter-beded quartz-phyllites are also seen locally (Audley-Charles, 1968).

- In the Project site, the Alieu Formation consists predominantly of phyllites with some slates and shales (**Figure 6.4.1**, **Plate 10**). This meta-sedimentary bedrock generally strikes southeast-northwest and is strongly deformed with several sets of joints and faults of variable strikes, dips and spacings. Quartz veins and pods of variable orientations are also frequently present within the bedrock.

6.4.3 Groundwater

- Within the flat to gently undulating terrain over the Coastal Deposits in both the Eastern and Western Sectors is found close to the ground surface, a thin zone of freshwater (unconfined aquifer) that has developed through infiltration of rain water over the years. This freshwater thin zone (aquifer) overlies saline water at variable depths and is generally of unknown thickness, though in the Eastern Sector close to the proposed site of the 5-star hotel (Plot 1), it is expected to show a lenticular cross-section, being absent along the coastline, and edges of Tasi Tolu Lake, but thicker away from them. In 2009, this unconfined aquifer was being exploited by four cased tube wells, located at the corners of the Timor-Leste Defence Force (F-FDTL) and Military Police Internally Displaced Person (IDP) Camp just northeast of Tasi Tolu Lake A. The groundwater table was then located about 4.0 m below the ground surface; the sampled water being slightly saline and not portable. Over-exploitation of freshwater from the unconfined aquifer in the past could have resulted in saline water intrusions. In view of the saline water at variable depth as well as limited recharge from seasonal rainfall, it is concluded that there is only very limited potential to develop non-saline groundwater for potable use within the Coastal Deposits.

- In the Alluvial Fan Sediments along the edges of the flat to gently undulating terrain, there are small zones of freshwater (unconfined aquifer) that have developed over the years through infiltration of rain water, infiltration of surface runoff from the surrounding hill slopes and infiltration of discharge from ephemeral streams. These small unconfined aquifers are found restricted to the valleys where the fans have developed and they (the aquifers) thus show approximately triangular cross-sections that are bordered by the relatively impermeable meta-sedimentary bedrock of the Alieu Formation. These unconfined aquifers will extend along the trend of river valleys; the groundwater table being located at depth in the uppers slopes, but relatively close to the surface towards the toes of the alluvial fans. Uncased tube wells in some of the Alluvial Fan Sediments showed the groundwater table to be located at depths ranging from about 2 to

11 m below the ground surface. These tube wells also showed that the groundwater is portable in most areas of the Alluvial Fan Sediments; although close to the Coastal Deposits, these well water is often saline.

- An unconfined aquifer is quite well developed within the broad, infilled valley of the Tasi Tolu River where several tube wells have been sunk and groundwater being extracted. This infilled valley of the Tasi Tolu River thus has the best potential for development of groundwater resources within the Project site, though the recharge potential and likely sources of contamination have to be investigated.

- The meta-sedimentary bedrock of the Alieu Formation is predominantly fine grained (phyllites) and thus relatively impermeable; factors that are inconducive to the development of aquifers (i.e. zones with groundwater that can be exploited). The thin soils and weathering profiles over the meta-sedimentary bedrock indicate that there is only limited infiltration (and thus recharge) during periods of rainfall as surface runoff will be the predominant process over the fractured meta-sedimentary bedrock where seepage may be locally present.

Figure 6.4.1: Photo Inventory for Geomorphology and Geological Condition in Project Site

Plate 1: Overall view of the Western Sector

Plate 2: Vegetation in the Western Sector

Plate 3: Steep slopes with [illegible] in Western Sector

Plate 4: Overall view of the Eastern Sector

Plate 5: View of the alluvial fan and [illegible] vegetation [illegible] Tasi Tolu [illegible]

Plate 6: View of Tasi Tolu Beach [illegible]

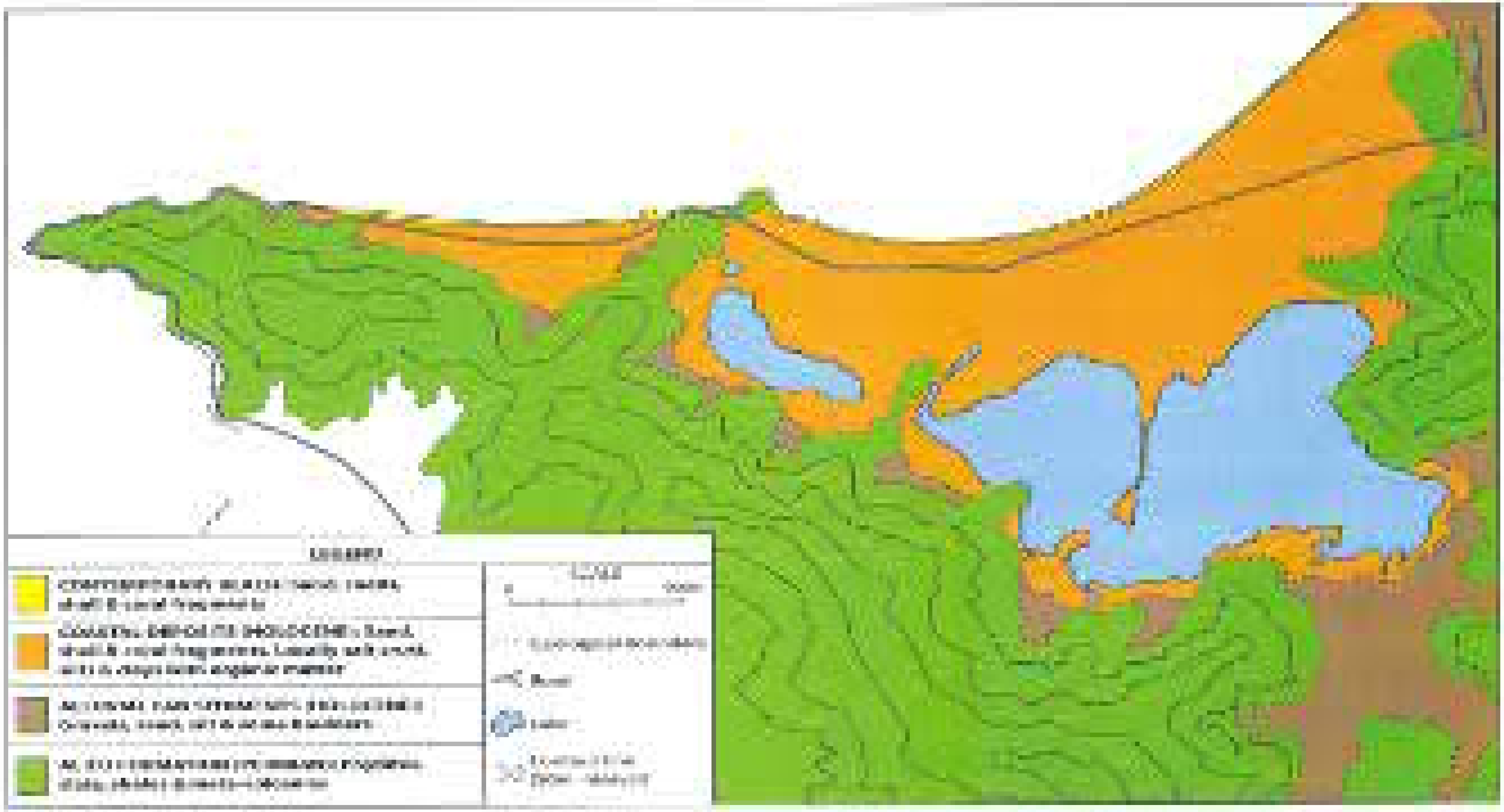
Plate 7: Salt crust on south side of Tasi Tolu Lakes [illegible]

Plate 8: Gravel, shale and salt crust on former lake floor between Tasi Tolu Lakes [illegible]

Plate 9: Alluvial Fan Sediments at southwest end of Tasi Tolu Lake [illegible]

Plate 10: Outcrop of phyllite of the [illegible] Formation south side of Tasi Tolu Lake [illegible]

Figure Geological Map of the Project Area



6.4.4 Seismicity

(a) Holocene Uplift

- There is extensive evidence for geologically recent uplift of the region in which the Project site is located; raised coral terraces at Atauro Island indicating an uplift rate of 0.47 m/1,000 year between 140,000 and 105,000 years ago. Raised reefs from three sites along the north coast of Timor-Leste indicate an uplift rate of 0.5 m/1,000 year, though a fourth site near Dili, indicates a much slower uplift rate of about 0.03 m/1,000 year (Chappell and Veeh, 2009).

- Late Cenozoic deposits in the Central Basin of west Timor-Leste indicate that the area was uplifted in two relatively short periods; the first period with rapid uplift of over 750 m occurring from some 2.2 to 2.0 million years ago, and the second period, which still seems to be in progress, starting about 0.2 million years ago. Calculated average rates of uplift for this second period vary from 5 to >10 mm a year (De Smet et al., 1990).

- In view of the on-going, although very slow, uplift, it can be expected that there will be continued incision of valleys by rivers in the Project site as well the downstream transport of sediments from slopes.

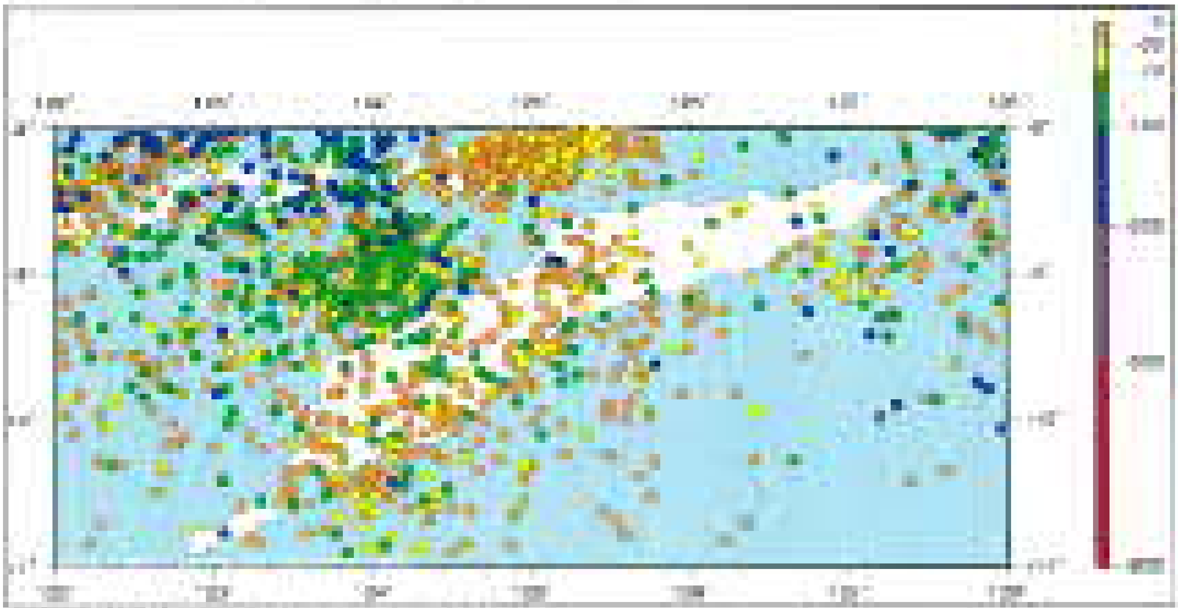
(b) Present-day Seismicity

- Several hundreds of earthquakes of variable magnitudes and depths have occurred in the general region in which the Project site is located (**Figure 6.4.3**). A detailed study of the spatial distribution of epicenters shows that the data can be explained by a simple model in which two lithospheric plates descend beneath the Banda Sea.

- The major plate descends beneath the Banda Sea from the south along the Banda Arc, whilst the second plate probably descends towards the southwest in the region of Seram. Fault-plane solutions in the contorted part of the subducted Banda Arc indicate that the slab is undergoing lateral compression, which maybe caused by bending. The continuity of the elements of the arc around the bend and the projection of the bend down the slab to depths of 600 km suggests that the convergence between the Indian-Australian plate and Southeast Asia in the vicinity of the Banda Sea has been along a north-northwest (NNW) direction, at least until the continent-arc collision (Nishimura and Suparka, 1986).

- As a result of this tectonic plate settling, earthquakes will continue to occur in the general region as well as relatively close to the Project site (**Figure 6.4.3**). In view of this, it will be necessary to consider the likelihood of ground shaking in the design of engineering structures for the Project. As many of the earthquake epicenters are located offshore, it will also be necessary to consider the possibility of tsunami impacting the coastal sites in the Project site.

Figure 6.4.2: Earthquake Epicenters (1973 to 2008) in and around, Timor Island



Source: United States Geological Survey (USGS), 2008

(c) Magnitude of Seismic Activities

- Seismic activities are often felt through earthquakes. The magnitude of an earthquake is the amount of energy it releases. Earthquakes with a magnitude <3.0 are generally not felt except by a very few sensitive persons. Earthquakes measured within 5.0 – 5.9 magnitude and depending on the depth of the epicentre, may cause damage to poorly constructed buildings, while magnitude of 6.0 – 6.9 may cause considerable damage to most buildings (United States Geological Survey (USGS), 2008). **Table 6.4.1** shows the Modified Mercalli Intensity Scale for the classification of seismic activity.

Table 6.4.1: Modified Mercalli Intensity Scale

Intensity	Verbal Description	Magnitude	Witness Observation	Approximate Richter Equivalent
I	Instrumental	1 – 2	Detected only by seismographs	<3.5
II	Feeble	2 – 3	Noticed only by sensitive people	3.5
III	Slight	3 – 4	Resembling vibrations caused by heavy traffic	4.2
IV	Moderate	4	Felt by people walking; rocking of free standing objects	4.5
V	Rather Strong	4 – 5	Sleepers awakened and bells ring	4.8
VI	Strong	5 – 6	Trees sway, some damage from overturning and falling object	5.4
VII	Very Strong	6	General alarm, cracking of walls	6.1
VIII	Destructive	6 – 7	Chimneys fall and there is some damage to buildings	6.5

Intensity	Verbal Description	Magnitude	Witness Observation	Approximate Richter Equivalent
IX	Ruinous	7	Ground begins to crack, houses begin to collapse and pipes break	6.9
X	Disastrous	7 – 8	Ground badly cracked and many buildings are destroyed. There are some landslides	7.3
XI	Very Disastrous	8	Few buildings remain standing; bridges and railways destroyed; water, gas, electricity and telephones out of action	8.1
XII	Catastrophic	>8	Total destruction; objects are thrown into the air, much heaving, shaking and distortion of the ground	>8.1

Source: The Geography Site, 2013.

- **Table 6.4.2** and **Figure 6.4.4** show the seismic activities around Timor-Leste recorded from January 2016 up to December 2016 (Earthquakes Zone, 2017). There are 95 seismic activities with a range between 4.0 and 6.7 of Richer Magnitude recorded within this period, which corresponded to moderate to destructive levels of earthquake.

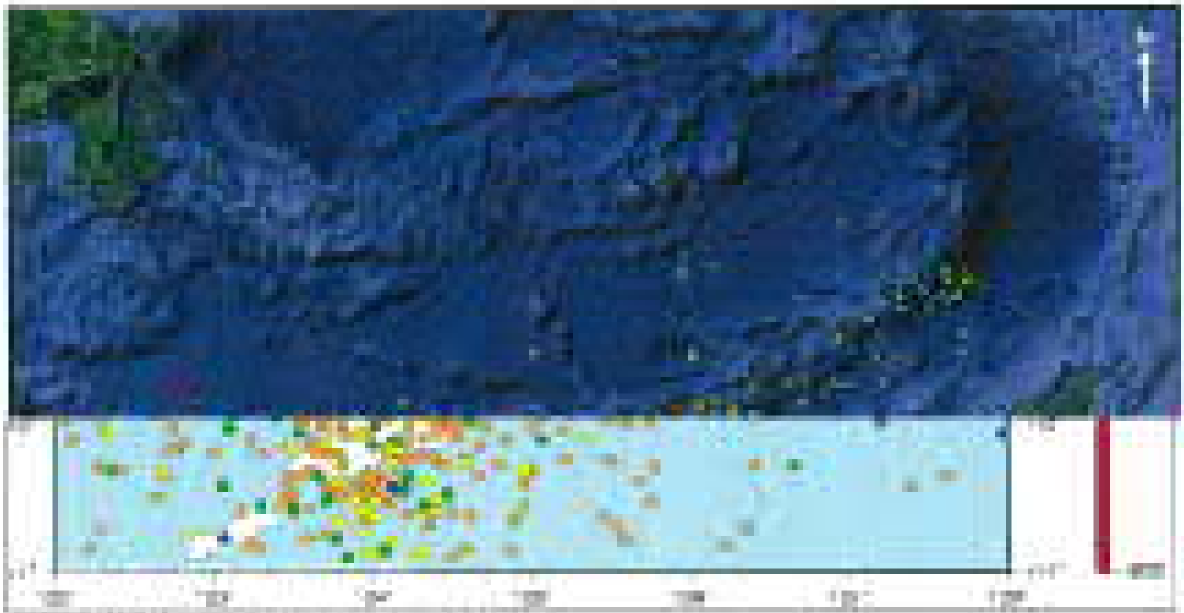
- The biggest earthquakes recorded with a magnitude of 6.7 occurred on 21 December 2016 with the epicentre ~278.46 km northeast from Dili (**Figure 6.4.4**).

Table 6.4.2: Recorded Earthquake around Timor-Leste in 2016

Month	Number of Hits	Ranges of Magnitude
January	10	4.2 – 4.5
February	No earthquake recorded	
March	No earthquake recorded	
April	9	4.3 – 5.7
May	10	4.3 – 5.1
June	5	4.4 – 5.2
July	10	4.4 – 5.9
August	11	4.3 – 5.4
September	11	4.3 – 5.1
October	7	4.3 – 5.0
November	9	4.0 – 5.7
December	13	4.3 – 6.7

Source: Earthquakes Zone, 2017.

Figure 6.4.4: Location of the Recorded Earthquake in Timor-Leste (2018)



Source: United States Geological Survey (USGS), 2018

Note: Scale at right is depth of focus (km).

(c) Magnitude of Seismic Activities

- Seismic activities are often felt through earthquakes. The magnitude of an earthquake is the amount of energy it releases. Earthquakes with a magnitude <3.0 are generally not felt except by a very few sensitive persons. Earthquakes measured within 5.0 – 5.9 magnitude and depending on the depth of the epicentre, may cause damage to poorly constructed buildings, while magnitude of 6.0 – 6.9 may cause considerable damage to most buildings (United States Geological Survey (USGS), 2018). **Table 6.4.1** shows the Modified Mercalli Intensity Scale for the classification of seismic activity.

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