



CHAPTER 5

PROJECT DESCRIPTION

5.1 Location

The Proposed Project site is located in Jelutong, bounded by The Light Development reclamation at the southern side and Sungai Pinang at the northern site. The Jelutong Landfill or TPSJ is located adjacent to Tun Dr. Lim Chong Eu Expressway.

Earlier **Figure 1.2** depicts the location of the existing Jelutong Landfill and the proposed site for the area to be reclaimed. **Table 5.1** provides the details of the land involved with Proposed Project. The TPSJ covers 90 acres belongs to the state. A copy of this confirmation by Pejabat Tanah & Daerah Timur Laut via letter reference PTTL/PST/303/2024(3) dated 17th October 2024 is provided in **Appendix A-001**.

Table 5.1
Details Of Land Involved With Proposed Project

No.	Item	Area (Acres)	Area (Hectares)	Owner
1.	Jelutong Landfill Rehabilitation	90	36.42	State Government
2.	Proposed Land Reclamation	70	28.33	State Government
	Total Area for Development	160	64.75	

Source: PLB Engineering Berhad

The site can be accessed by taking Tun Dr. Lim Chong Eu expressway linking to Lebuh Sungai Pinang entering Lebuh Sungai Pinang 1 and Persiaran Karpal Singh which is adjacent to the Proposed Project. The access to the Jelutong Landfill and proposed area to be reclaimed is shown in **Figure 5.1** and **Figure 5.2** provides the view of the new area to be reclaimed.



Source: Laporan Cadangan Pembangunan (LCP), 2022

Figure 5.1 Access To The Jelutong Landfill



Source: Laporan Cadangan Pembangunan (LCP), 2022

Figure 5.2 Proposed Reclamation Site

5.2 Project Concept

The scope of works to be undertaken by PLB Engineering Berhad for the Proposed Project involves the following:-

- Rehabilitation and development of the existing Jelutong Landfill with landmass of 36.42 Hectares (90 acres);
- Reclamation and development of a new landmass with an area of 28.33 Hectares (70 acres) adjacent to the Jelutong Landfill; and
- Construction of the entire infrastructure for the reclaimed land.

5.3 Project Features

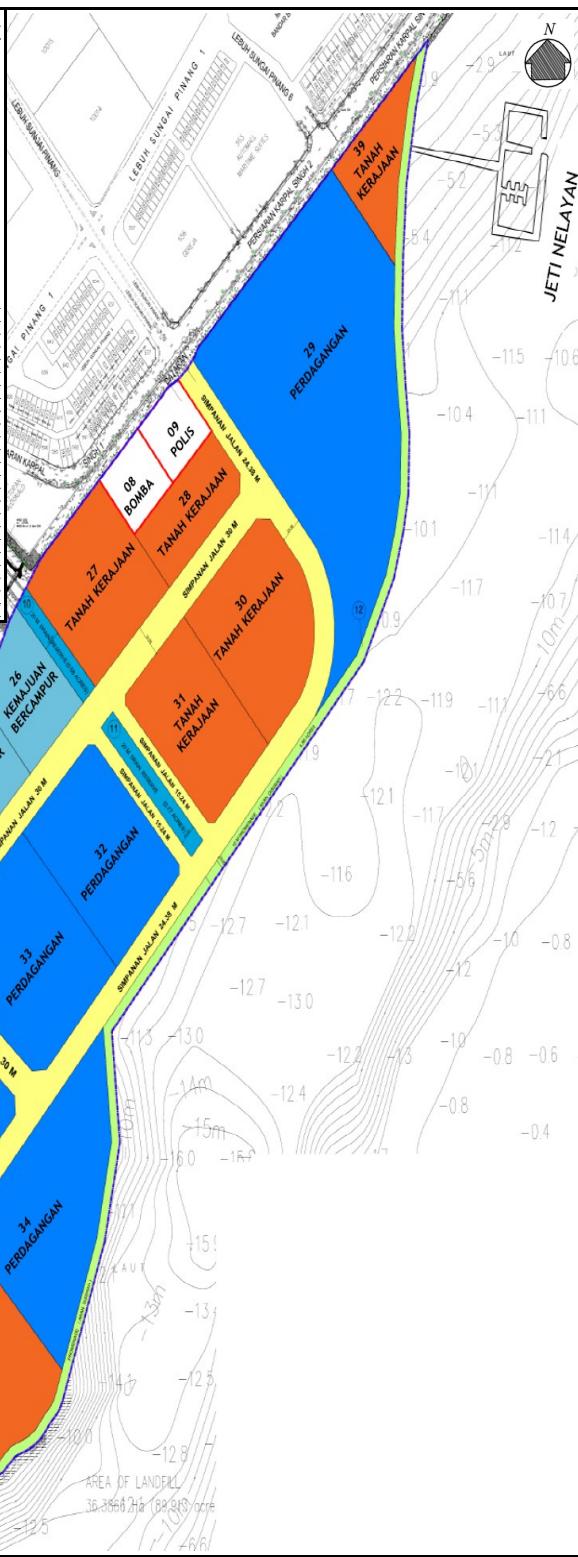
A. Components

The Proposed Project is divided into two development zones catering for a mixed development area and commercial area with a concept of 'Transit – Oriented Development' where part of the development will be handed to the State Government and for public use such as schools, mosque, open space and others.

Figure 5.3 provides the land distribution based on the master zoning plan for the Proposed Project with a full plan shown in **Appendix B-001**. The State Planning Committee via letter from JPBD (Jabatan Perancang Bandar dan Desa) reference JPBD/01/0701/31 dated 10th November 2022 has approved the master zoning layout plan for the Proposed Project. A copy of this letter is given in **Appendix A-001**. **Table 5.2** provides the development data for the Proposed Project.



C) DATA PEMBANGUNAN			PENGIRAAN KETUMPATAN MAXIMA (%) SECARA KESELURUHAN			
PELOT	KEGUNIAN	KELUASAN EKAR				
01	SEKOLAH RENDAH	3.00				
02	SEKOLAH MENENGAH	3.00				
03	KAWASAN PENGARAH BERPUASAT	2.00				
04	TANAH LUAS	1.00				
05	MASJID	3.00				
06	PMU	2.63				
07	RIBI	0.50				
08	BALAI BOMBIA	1.00				
09	BALAI POLIS	1.00				
10	SIMPANAN PARIT	0.58				
11	SIMPANAN PARIT	0.77				
12	PROMENADE	4.56				
13	REZAB JALAN	27.36				
JUMLAH KECIL (1)		50.40				
15		7.65				
27		3.92				
28		1.99				
30		4.44				
31		3.84				
35		6.30				
39		1.83				
JUMLAH KECIL (2)		30.00		UNITS	JENIS KEDIAMAN	PERDAGANGAN (K.P)
14		4.09	-	-	1748	25% RMM
16		3.24	3.24+28.31=	0.1144	60616	723.50
17		3.21	3.21+28.31=	0.1136	50916	676.54
18	KEMAJUAN	4.13	4.13+28.31=	0.1569	769.02	921.810
19	BERCAMPUR	3.14	3.14+28.31=	0.1109	581.84	700.899
20	DENGAN NILAIHAB	2.45	2.45+28.31=	0.0965	453.83	546.872
21	PELOT	2.52	2.52+28.31=	0.0990	466.79	562.497
22		2.06	2.06+28.31=	0.0728	381.58	459.819
24		2.75	3.25+28.31=	0.0971	509.40	613.838
25		2.47	2.47+28.31=	0.0872	457.53	551.336
26		2.34	2.34+28.31=	0.0827	433.45	522.318
JUMLAH KECIL (3)		32.40		1.00	6,992	6,319,162
23		3.97	5.97+47.19=	0.0841		1,175.776
29	PERDAGANGAN	14.32	14.32+47.19=	0.3035		4,024.773
32	DENGAN	4.51	4.51+47.19=	0.1777		1,383.000
33	NISBAH PELOT	5.60	5.60+47.19=	0.1229		1,714.837
34		6.30	6.30+47.19=	0.1335		1,862.668
36		4.06	4.06+47.19=	0.0860		1,200.386
37		4.05	4.05+47.19=	0.0858		1,197.429
38		4.08	4.08+47.19=	0.0865		1,206.299
JUMLAH KECIL (4)		47.19		1.00	6,992	13,952,268
JUMLAH BERSIH (2) + (3) + (4)		109.59				20,271,430
JUMLAH BESAR (1) + (2) + (3) + (4)		160.00				



Source: W.K. Khor Architect

Not To Scale

Figure 5.3 Master Zoning Plan For Proposed Project

Refer **Appendix B-001** for full plan

Table 5.2
Development Data For Proposed Project

Plot No.	Land Use	Acreage (Acres)	Calculation Of Overall Maximum Density (%)				
01	Primary School	3.00					
02	Secondary School	3.00					
03	Central Open Space	2.00					
04	Water Tank	1.00					
05	Mosque	3.00					
06	PMU	2.63					
07	RIBI	0.50					
08	Bomba Station	1.00					
09	Police Station	1.00					
10	Drainage Reserve	0.58					
11	Drainage Reserve	0.77					
12	Promenade	4.56					
13	Road Reserve	27.36					
	Sub Total (1)	50.40					
15	Government Land	7.68					
27		3.92					
28		1.99					
30		4.44					
31		3.84					
35		6.30					
39		1.83					
	Sub Total (2)	30.00					
Plot No.	Land Use	Acreage (Acres)			Units	Type Of Residence	Trade (K.P)
14	Mixed Development with Plot Ratio = 5:1	4.09	-	-	1748	25% RMM	T/B
16		3.24	$3.24 \div 28.31 =$	0.1144	600.16	75% Perumahan Biasa	723,210
17		3.21	$3.21 \div 28.31 =$	0.1134	594.60		716,514
18		4.13	$4.13 \div 28.31 =$	0.1459	765.02		921,870
19		3.14	$3.14 \div 28.31 =$	0.1109	581.64		700,889
20		2.45	$2.45 \div 28.31 =$	0.0865	453.83		546,872
21		2.52	$2.52 \div 28.31 =$	0.0890	466.79		562,497
22		2.06	$2.06 \div 28.31 =$	0.0728	381.58		459,819
24		2.75	$3.25 \div 28.31 =$	0.0971	509.40		613,836
25		2.47	$2.47 \div 28.31 =$	0.0872	457.53		551,336
26		2.34	$2.34 \div 28.31 =$	0.0872	433.45		522,319
	Sub Total (3)	32.40		1.00	6,992		6,319,162
23	Commercial with Plot Ratio = 5:1	3.97	$3.97 \div 47.19 =$	0.0841			1,173,766
29		14.32	$14.32 \div 47.19 =$	0.3035			4,233,873
32		4.61	$4.61 \div 47.19 =$	0.0977			1,363,000
33		5.80	$5.80 \div 47.19 =$	0.1229			1,714,837
34		6.30	$6.30 \div 47.19 =$	0.1335			1,862,668
36		4.06	$4.06 \div 47.19 =$	0.0860			1,200,386
37		4.05	$4.05 \div 47.19 =$	0.0858			1,197,429
38		4.08	$4.08 \div 47.19 =$	0.0865			1,206,299
	Sub Total (4)	47.19		1.00			13,952,268
	Total (2) + (3) + (4)	109.59				6,992	20,271,430
	Total (1) + (2) + (3) + (4)	160.00					



In general the components for the Proposed Project consists of the following:-

(i) Mixed Development

An area of 32.4 acres has been put aside to cater for mixed development with a plot ratio of 5:1. The mixed development will consist of residential and commercial plots. For this purpose 11 plots of land (Plot 14-Plot 16) has been put aside for the mixed development.

(ii) Commercial Land Use

An area of 47.19 acres has been aside for commercial land use involving 8 plots (Plot 23-Plot 38)of commercial land.

(iii) Government Land

An area of 30.0 acres of the Proposed Project will be handed over to the Penang State Government for government use which involves a total of 7 plots (Plot 15-Plot 39).

(iv) Public Facilities And Amenities

An area of 50.40 acres of land (Plot 1-Plot 13) has been put aside for public facilities and amenities which include the following:-

- Primary school;
- Secondary school;
- Mosque;
- RIBI;
- Open space;
- Area for police station;
- Area for BOMBA;
- Road reserves;
- Water tank;
- PMU/PPU;
- Drainage Reserves; and
- Promenade.

(v) Proposed New Fishermen's Jetty

Initially, a jetty will be constructed to the north of the Proposed Reclamation site to cater for the fishermen in the area especially fishermen from the Jelutong fishery administrative area which is shown in earlier **Figure 5.3**.

However during the focus group discussions with the fishermen's representatives during the SIA (Social Impact Assessment) survey, the locality of the jetty was found to be an issue to the local fishermen as the site is too far for the fishermen whereby the SIA report have addressed this issue.

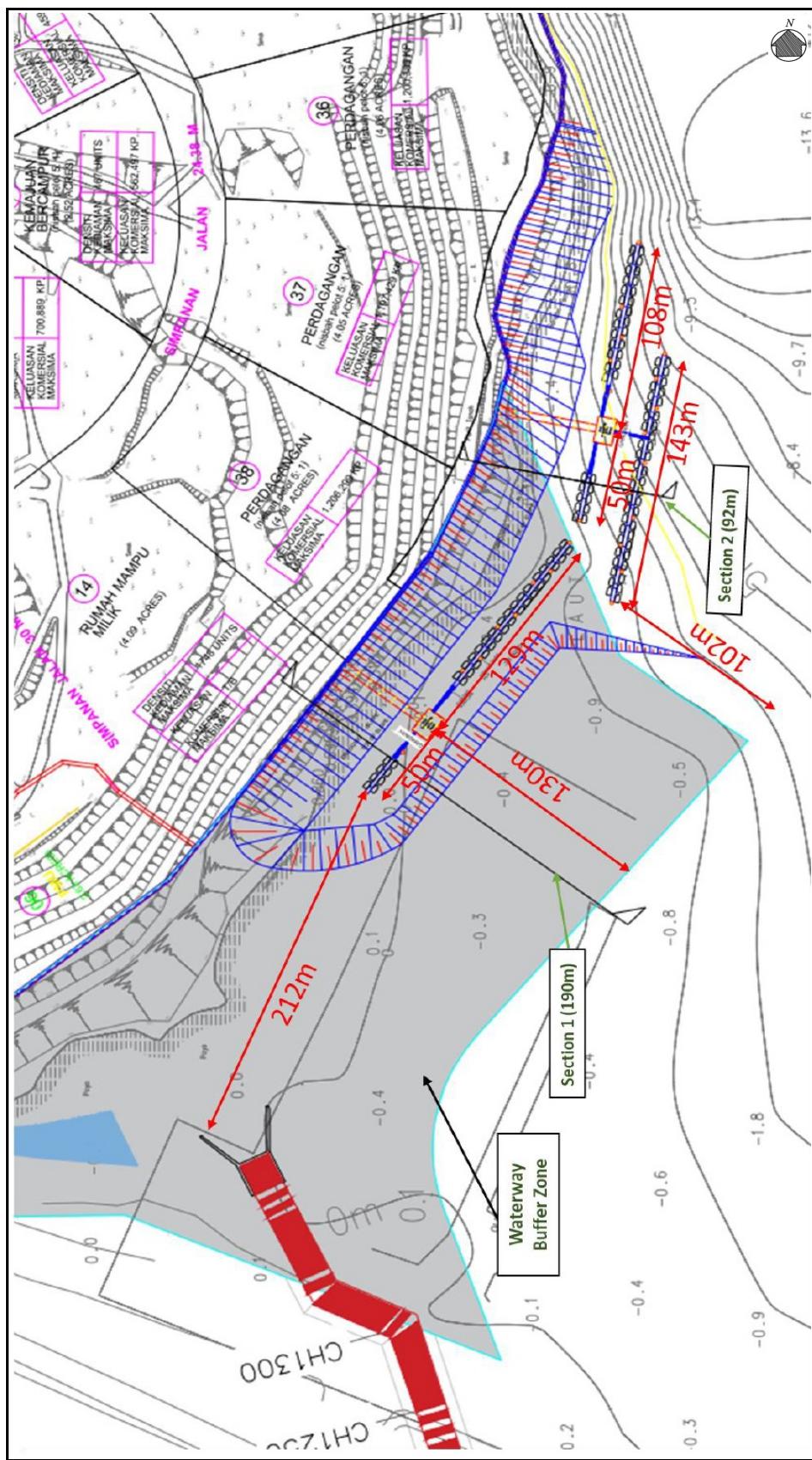
Due to this reason, PLB Engineering Berhad has proposed an alternative location for the proposed jetty which is outside the land reclamation area. Also the location of the proposed jetty has taken into consideration JPS's comments that the proposed jetty should not hinder the existing outlet for the flood mitigation for Sungai Pinang. The options and design for the proposed jetty has been submitted to JPS and JPS via letter Bil(60)dLM.JPSPP.SB 800-1/11 dated 18th August 2023 has approved the design and location of the new jetty. A copy of this letter is provided in **Appendix A-001**. The location of this new proposed jetty is shown in **Figure 5.4** which will be located adjacent to the proposed residential scheme in Plot 14. Detailed engineering drawings for the jetty including the building to be located will be submitted to JPS, Jabatan Perikanan and Pejabat Tanah & Galian for approval. A coastal hydraulic study will also be conducted and submitted to JPS (Pengurusan Pantai) to assess the impacts of constructing the proposed new jetty at this site once the design of the jetty is finalized.

B. Infrastructure And Utilities

The Proposed Project is estimated to house a PE of 93,578 during full occupancy as shown in **Table 5.3**. **Table 5.4** provides an estimation of the utility demands for the Proposed Project whilst **Table 5.5** provides the water demands calculation based on net capacity.

Table 5.3
Estimated Population For Proposed Project

Plot No.	Type Of Premises/ Establishment	Category	Unit	Quantity	PE Rate	Total PE	Proposed Treatment System
1	Sekolah Rendah	Day School	Student	500	0.2 per Student	100	Discharge to Public Sewer
2	Sekolah menengah	Day School	Student	500	0.2 per Student	100	Discharge to Public Sewer
3	Kawasan Iapan Berpusat	-	-	-	-	-	-
4	Tangki Air	-	-	-	-	-	-
5	Masjid	Mosque	Person	500	0.2 per person	100	Discharge to Public Sewer
6	PMU	Factory	Staff	10	0.3 per person	3	Discharge to Public Sewer
7	RIBI	Temple	Person	150	0.2 per person	30	Discharge to Public Sewer
8	Balai Bomba	Factory	Staff	50	0.3 per person	15	Discharge to Public Sewer



Source: W.K. Khor Architect

Figure 5.4 Location Of New Proposed Jetty

Table 5.3 (Continue)

Plot No.	Type Of Premises/ Establishment	Category	Unit	Quantity	PE Rate	Total PE	Proposed Treatment System
9	Balai Polis	Factory	Staff	50	0.3 per person	15	Discharge to Public Sewer
10	Simpanan Parit	-	-	-	-	-	-
11	Simpanan Parit	-	-	-	-	-	-
12	Promenade	-	-	-	-	-	-
13	Rezab Jalan	-	-	-	-	-	-
14	Kemajuan Bercampur	Residential	unit	1748	5 per unit	8740	Discharge to Public Sewer
15	Tanah Kerajaan	Factory	Staff	1536	0.3 per person	461	Discharge to Public Sewer
16a	Kemajuan Bercampur	Residential	unit	601	5 per unit	3005	Discharge to Public Sewer
16b	Kemajuan Bercampur	Commercial	Area (m ²)	67,223.00	3 per 100m ²	2017	Discharge to Public Sewer
17a	Kemajuan Bercampur	Residential	unit	595	5 per unit	2975	Discharge to Public Sewer
17b	Kemajuan Bercampur	Commercial	Area (m ²)	66,600.00	3 per 100m ²	1998	Discharge to Public Sewer
18a	Kemajuan Bercampur	Residential	unit	765	5 per unit	3825	Discharge to Public Sewer
18b	Kemajuan Bercampur	Commercial	Area (m ²)	85,689.00	3 per 100m ²	2571	Discharge to Public Sewer
19a	Kemajuan Bercampur	Residential	unit	582	5 per unit	2910	Discharge to Public Sewer
19b	Kemajuan Bercampur	Commercial	Area (m ²)	65,148.00	3 per 100m ²	1954	Discharge to Public Sewer
20a	Kemajuan Bercampur	Residential	unit	454	5 per unit	2270	Discharge to Public Sewer
20b	Kemajuan Bercampur	Commercial	Area (m ²)	50,832.00	3 per 100m ²	1525	Discharge to Public Sewer
21a	Kemajuan Bercampur	Residential	unit	467	5 per unit	2335	Discharge to Public Sewer
21b	Kemajuan Bercampur	Commercial	Area (m ²)	52,284.00	3 per 100m ²	1569	Discharge to Public Sewer
22a	Kemajuan Bercampur	Residential	unit	382	5 per unit	1910	Discharge to Public Sewer
22b	Kemajuan Bercampur	Commercial	Area (m ²)	42,741.00	3 per 100m ²	1282	Discharge to Public Sewer
23	Commercial	Commercial	Area (m ²)	109,103.00	3 per 100m ²	3273	Discharge to Public Sewer
24a	Kemajuan Bercampur	Residential	unit	510	5 per unit	2550	Discharge to Public Sewer
24b	Kemajuan Bercampur	Commercial	Area (m ²)	51,057.00	3 per 100m ²	1532	Discharge to Public Sewer
25a	Kemajuan Bercampur	Residential	unit	478	5 per unit	2390	Discharge to Public Sewer
25b	Kemajuan Bercampur	Commercial	Area (m ²)	51,247.00	3 per 100m ²	1537	Discharge to Public Sewer
26a	Kemajuan Bercampur	Residential	unit	434	5 per unit	2170	Discharge to Public Sewer
26b	Kemajuan Bercampur	Commercial	Area (m ²)	48,550.00	3 per 100m ²	1457	Discharge to Public Sewer

Table 5.3 (Continue)

Plot No.	Type Of Premises/Establishment	Category	Unit	Quantity	PE Rate	Total PE	Proposed Treatment System
27	Tanah Kerajaan	Factory	Staff	784	0.3 per person	235	Discharge to Public Sewer
28	Tanah Kerajaan	Factory	Staff	398	0.3 per person	119	Discharge to Public Sewer
29	Commercial	Commercial	Area (m ²)	393,543.00	3 per 100m ³	11806	Discharge to Public Sewer
30	Tanah Kerajaan	Factory	Staff	888	0.3 per person	266	Discharge to Public Sewer
31	Tanah Kerajaan	Factory	Staff	768	0.3 per person	230	Discharge to Public Sewer
32	Commercial	Commercial	Area (m ²)	126,627.00	3 per 100m ³	3799	Discharge to Public Sewer
33	Commercial	Commercial	Area (m ²)	159,314.00	3 per 100m ⁴	4779	Discharge to Public Sewer
34	Commercial	Commercial	Area (m ²)	173,048.00	3 per 100m ⁵	5191	Discharge to Public Sewer
35	Tanah Kerajaan	Factory	Staff	1260	0.3 per person	378	Discharge to Public Sewer
36	Commercial	Commercial	Area (m ²)	111,520.00	3 per 100m ⁵	3346	Discharge to Public Sewer
37	Commercial	Commercial	Area (m ²)	111,245.00	3 per 100m ⁶	3337	Discharge to Public Sewer
38	Commercial	Commercial	Area (m ²)	112,069.00	3 per 100m ⁷	3362	Discharge to Public Sewer
39	Tanah Kerajaan	Factory	Staff	366	0.3 per person	110	Discharge to Public Sewer
TOTAL POPULATION EQUIVALENT (PE)						93,578	

Source: Sri & Sri Associates Sdn. Bhd.

Table 5.4
Estimated Utility Demands

Utilities	Estimated Rate	Estimated Demand
Water	gpd/PE	28,642,086 L
Electricity	Overall	2000 kW [®]
Sewage	50 gals/PE/day	4.59 MGD
Domestic Wastes	0.8 kg/PE/day	73.4 tpd

Note: MGD – Million Gallons per day

tpd – ton per day

[®] For Rehabilitation & Reclamation

Table 5.5
Water Demands Calculation

Plot No.	Type Of Premises/Establishment	Category	Unit	Quantity	Average Daily Water Demand		Total Use
1	Sekolah Rendah	Day School	Student	500	50	per Student	25000
2	Sekolah Menengah	Day School	Student	500	50	per Student	25000
3	Kawasan Iapan Berpusat	-	-	-	-	-	-
4	Tangki Air	-	-	-	-	-	-
5	Masjid	Mosque	Person	500	50	per person	25000
6	PMU	-	-	-	-	-	-
7	RIBI	Temple	Person	150	50	per person	7500
8	Balai Bomba	Office	Area (m ²)	4046.86	1000/100 square metre		40468.6

Table 5.5 (Continue)

Plot No.	Type Of Premises/ Establishment	Category	Unit	Quantity	Average Daily Water Demand		Total Use
9	Balai Polis	Office	Area (m ²)	4046.86	1000/100 square metre	40468.6	
10	Simpanan Parit	-	-	-	-	-	-
11	Simpanan Parit	-	-	-	-	-	-
12	Promenade	-	-	-	-	-	-
13	Rezab Jalan	-	-	-	-	-	-
14	Kemajuan Bercampur	Low cost terrace house	unit	1748	1100	per unit	1922800
15	Tanah Kerajaan	-	-	-	-	-	-
16a	Kemajuan Bercampur	Residential	unit	600	1300	per unit	780000
16b	Kemajuan Bercampur	Commercial	Area (m ²)	67,188.00	1000/100 square metre	671880	
17a	Kemajuan Bercampur	Residential	unit	595	1300	per unit	773500
17b	Kemajuan Bercampur	Commercial	Area (m ²)	66,600.00	1000/100 square metre	666000	
18a	Kemajuan Bercampur	Residential	unit	765	1300	per unit	994500
18b	Kemajuan Bercampur	Commercial	Area (m ²)	85,645.00	1000/100 square metre	856450	
19a	Kemajuan Bercampur	Residential	unit	582	1300	per unit	756600
19b	Kemajuan Bercampur	Commercial	Area (m ²)	65,115.00	1000/100 square metre	651150	
20a	Kemajuan Bercampur	Residential	unit	454	1300	per unit	590200
20b	Kemajuan Bercampur	Commercial	Area (m ²)	50,806.00	1000/100 square metre	508060	
21a	Kemajuan Bercampur	Residential	unit	467	1300	per unit	607100
21b	Kemajuan Bercampur	Commercial	Area (m ²)	52,258.00	1000/100 square metre	522580	
22a	Kemajuan Bercampur	Residential	unit	382	1300	per unit	496600
22b	Kemajuan Bercampur	Commercial	Area (m ²)	42,720.00	1000/100 square metre	427200	
23	Kemajuan Bercampur	Commercial	Area (m ²)	109,048.00	1000/100 square metre	1090480	
24a	Kemajuan Bercampur	Residential	unit	509	1300	per unit	661700
24b	Kemajuan Bercampur	Commercial	Area (m ²)	57,028.00	1000/100 square metre	570280	
25a	Kemajuan Bercampur	Residential	unit	458	1300	per unit	595400
25b	Kemajuan Bercampur	Commercial	Area (m ²)	51,221.00	1000/100 square metre	512210	
26a	Kemajuan Bercampur	Residential	unit	433	1300	per unit	562900
27	Tanah Kerajaan	Commercial	Area (m ²)	15,863.68	1000/100 square metre	158637	
28	Tanah Kerajaan	Commercial	Area (m ²)	8,053.24	1000/100 square metre	80532	
29	Perdagangan	Commercial	Area (m ²)	393,340.00	1000/100 square metre	3933400	
30	Tanah Kerajaan	Commercial	Area (m ²)	17,968.04	1000/100 square metre	179680	
31	Tanah Kerajaan	Commercial	Area (m ²)	15,539.93	1000/100 square metre	155399	
32	Perdagangan	Commercial	Area (m ²)	126,627.00	1000/100 square metre	1266270	
33	Perdagangan	Commercial	Area (m ²)	159,314.00	1000/100 square metre	1593140	
34	Perdagangan	Commercial	Area (m ²)	173,140.00	1000/100 square metre	1731400	
35	Tanah Kerajaan	Commercial	Area (m ²)	25,495.20	1000/100 square metre	254952	
36	Perdagangan	Commercial	Area (m ²)	111,520.00	1000/100 square metre	1115200	
37	Perdagangan	Commercial	Area (m ²)	111,245.00	1000/100 square metre	1112450	
38	Perdagangan	Commercial	Area (m ²)	112,069.00	1000/100 square metre	1120690	
39	Tanah Kerajaan	Commercial	Area (m ²)	7,405.75	1000/100 square metre	74057	
Total Water Demand							28,642,086

Source: Sri & Sri Associates Sdn. Bhd.

The utility requirements are as follows:-

(i) Water Supply

The existing PBA (Perbadanan Bekalan Air Pulau Pinang) water main is located along Persiaran Karpal Singh whereby 326 mm diameter D.I pipe is already laid to supply water to the surrounding area which will be connected to the project site. Water storage tanks will also be provided for the Proposed Project according to PBA's requirements. Further discussions with PBA will be conducted prior to the construction of the land parcels to meet PBA's requirements.

(ii) Electricity Supply

Electricity supply will be connected to 11 kV substation which will be provided to individual block and also the main distributor or PPU as per TNB's requirements.

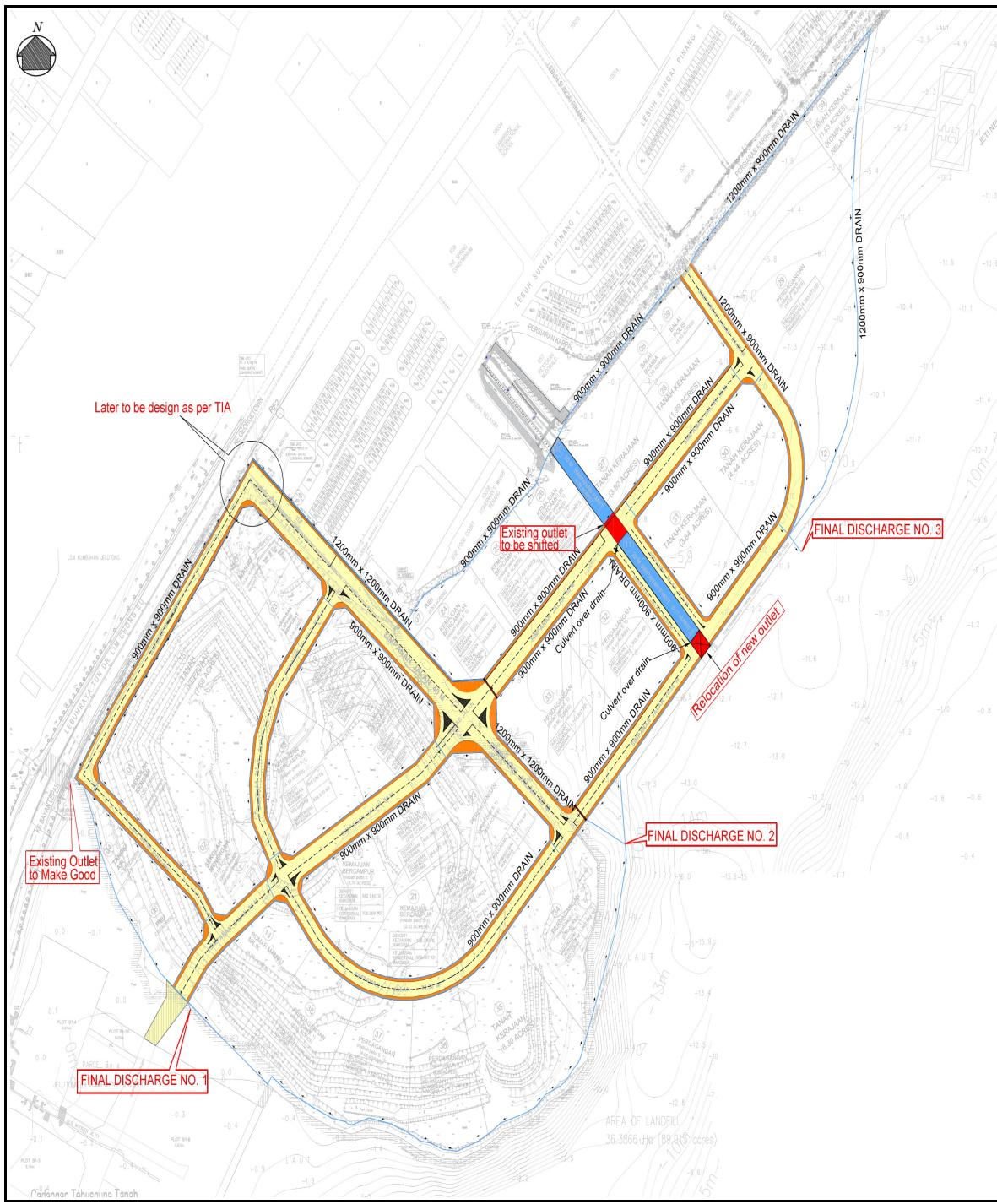
(iii) Telecommunication

Telecommunication networks have progressed rapidly in recent years, particularly since the advent of fibre optics, satellite communications and the privatization of TM (Telekom Malaysia Berhad). The telecommunications infrastructure for the Proposed Project will be connected through underground manhole and ducting connected to the nearest Telco company's manhole or network line.

(iv) Coastal Hydraulics And Drainage

For the reclamation area, Jabatan Pengairan dan Saliran via letter reference (6)dLM.PPS14/7/P50 dated 9th December 2022 has approved the coastal hydraulic study for the Proposed Reclamation Land area with conditions. Subsequently, the coastal hydraulic consultants applied for the extension of the validity of the coastal hydraulic study. A copy of the approval is provided in **Appendix A-001**.

Stormwaters from the Proposed Project will enter the proposed drainage system within the site which either drains into the external drains or discharges direct into the sea via 3 discharge outlets. The existing outlet which discharges stormwaters and treated effluent from the Jelutong RSTP into the sea will be shifted and extended further into the sea. For this purpose the road and drainage plan with hydraulic calculations for the drainage system has been designed by the Consulting Engineers according to MASMA. **Figure 5.5** provides the road and drainage plan for the Proposed Project and also provided in **Appendix B-002**.



Not To Scale

Figure 5.5 Road And Drainage Plan

Note: Refer Appendix B-002

(v) Traffic and Roads

A traffic master plan study is already conducted for the Proposed Project based on the proposed scale of development and the extract provided in **Appendix B-003**.

The Traffic Master Plan study is not meant to replace the individual TIA (Traffic Impact Assessment study) required for the application of the individual Planning Permission as it is carried out base on preliminary land use data which may be changed at the later stage. Individual TIA report shall be submitted to the local authorities as one of the condition to obtain the planning approval when the detailed layout plan is completed with confirmed information such as land use component, plot ratio, built up area etc. MBPP via letter reference JK(J)/PELB/182/15 dated 18th April 2023 has also approved the Traffic Master Plan Study for the Proposed Project. A copy of this letter is provided in **Appendix A-001**.

Based on the master plan study the Proposed Project is expected to attract 1246 pcu/hr during morning peak hour. During evening peak hour, the Proposed Project is estimated to attract 1512 pcu/hr as shown in **Table 5.6**.

Table 5.6
Trip Generation

Description	Trip Generation (phu/hr)			
	AM In	AM Out	PM In	PM Out
PLB Land (129.62 Acres)				
Total Trip Generation (1-Way)	8,679	13,284	13,494	13,576
Total Trip Generation (2-Way)		21,963		27,070
With 40% Public Transport	5,207	7,970	8,096	8,146
Total (2-Way)		13,178		16,242
With 30% Internal Trips	3,645	5,579	5,668	5,702
Total (2-Way)		9,224		11,369
Government Land (30.38 Acres)				
Total Trip Generation (1-Way)	1,209	1,759	1,853	1,889
Total Trip Generation (2-Way)		2,968		3,742
With 40% Public Transport	725	1,055	1,112	1,134
Total (2-Way)		1,781		2,245
With 30% Internal Trips	508	739	778	794
Total (2-Way)		1,246		1,572

Source: Perunding Trafik Bakti Sdn. Bhd.

All engineering designs outlined in the traffic report including the conditions imposed by MBPP as shown below shall be integrated in the Proposed Project:-

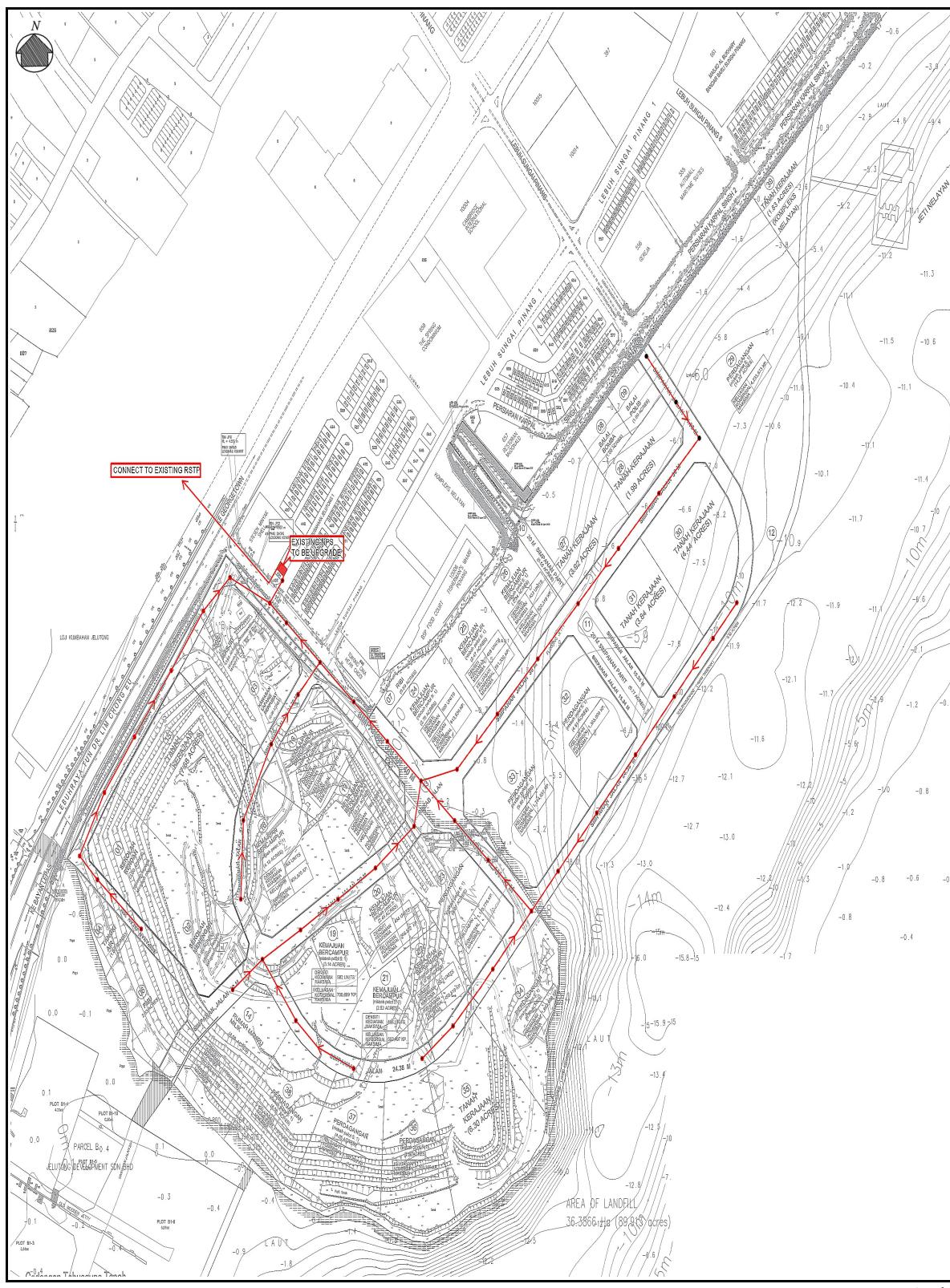
- The planning concept for this proposed development must meet the Transit Oriented Development Concept and must be in line with the Light Rail Transit Network project to be implemented by the Penang State Government;
- A multi-modal transport hub including cable cars and water taxis must be provided within the development site;
- A one-way ramp for one (1) lane crossing in front of the Jelutong Sewage Treatment Plant (from Tun Dr. Lim Chong Eu Expressway to Jelutong Industrial Road) should be provided on Tun Dr. Lim Chong Eu Expressway;
- A one-story U-turn with one (1) lane crossing in front of the Jelutong Sewage Treatment Plant must be built;
- Special routes for public transport should be provided within the site development;
- Continuous and safe bicycle, pedestrian and E-mobility routes should be provided within the development site; and
- The flow of traffic within the development site must follow the traffic flow planning shown in Traffic Master Plan Report.

(vi) Sewage

The PE (Population Equivalent) for the Proposed Project is estimated as shown in earlier **Table 5.3**. Thus, it is estimated that the Proposed Project will generate approximately 4.59 MGD of sewage. To cater for the treatment of sewage, sewage generated from the site will be collected via an internal sewage reticulation network which shall be connected to the existing pumping stations already available external to site which will be upgraded if need be for conveyance to the RSTP (Regional Sewage Treatment Plant) (IWK Asset No.: PEG 227) for treatment as shown in **Figure 5.6. and Appendix B-004**. The Regional Sewage Treatment Plant has a design PE of 1,200,000 and able to cater for the additional sewage loading from the Proposed Project. The Jelutong RSTP is designed to meet advanced treatment standards for biological nitrogen removal with the option of operating for enhanced biological phosphorous removal. The RSTP uses the cyclic activated sludge technology to treat sewage. The sewage reticulation network and upgrading of the existing pumping station shall be further discussed and approved by IWK (Indah Water Konsortium Sdn. Bhd.) prior to the implementation of the Proposed Project.

(vii) Domestic Wastes

Based on the solid waste generation of 0.8 Kg/person/day and an estimated population equivalent of 93,578 it is estimated that 73.4 tpd (ton per day) of domestic wastes will be generated which will be managed in a sound manner.



Not To Scale

Figure 5.6 Sewerage Reticulation Plan

Note: Refer **Appendix B-004**

Solid wastes generated from the Proposed Project will be collected by the licensed service provider for disposal at the approved landfill site in Pulau Burung. For this purpose, consultations shall be made with the service provider and MBPP for the management and disposal of solid wastes generated at site.

5.4 Implementation Schedule

Table 5.7 also shown in **Appendix B-005** depicts the proposed implementation schedule for the Proposed Project. Once the reclaimed land is completed and left to settle construction on the reclaimed land will commence for a period of 20 years.

5.5 Project Activities

The entire development generally can be summarized in three stages of project development i.e. pre-construction stage, construction stage and operation stage. In broad terms, the pre-construction stage usually include the activities of site investigations, soil investigations, EIA studies, land use studies and other forms of surveys, which is necessary for planning and design of the Proposed Project.

Significant but relatively short term environmental impacts normally arise during the construction stage from activities such as site clearance, earthworks, civil and structural works etc. associated to the nature of the project.

Once the Proposed Project enters into the operation stage, the day-to-day activities take over, with perhaps long term environmental implications, principally in relation to domestic wastewater discharges, solid waste generation and traffic. The major activities during the pre-construction, construction and operation stages are summarized in **Table 5.8**.

Table 5.8
List Of Project Activities Related To Proposed Project

Project Activities		Description
1. Pre Construction Stage	Land Surveys	Topographic survey of existing landmass and coastal area to demarcate site boundaries and location of main accesses, waterways and others.
	Hydraulic and hydrographic surveys	Measurement of currents, tides and waves pattern for hydrodynamic studies and bathymetric survey at site of reclamation area.
	Geotechnical/Soil Investigation	Soil sampling at existing landmass and future area
	Environmental Monitoring	Activities included water quality, air and noise monitoring as part of EIA requirement.



Table 5.7 Proposed Work Programme And Implementation For The Rehabilitation And Reclamation

Note: Refer **Appendix B-005**

Table 5.8 (Continue)

	Project Activities	Description
2.	Construction Stage	
	Mobilization and Temporary Occupation	Mobilization of plant and equipment and control of temporary access and site entrance an existing landmass. Construction of temporary buildings (for site office) and preparation of temporary site utilities (water, electricity, temporary drainage, sewage, canteen, solid waste disposal) and installation of recycling machine.
	Rehabilitation and Reclamation Works	Installation of double layer silt curtain, excavation to form working platform area, installation of instrumentation system, excavation layer by layer until required platform level, process dumpsite material, reclamation works according to phases. Seawall revetment built around reclaimed land consisting of a layer of geotextile material overlaid with rock armour.
	Construction on Reclaimed Land	The land parcels will be developed by individual owners based on the master zoning layout plan. Planning Permission and building plans will have to be submitted to the relevant authorities. EIA study to be conducted for building with more than 80 rooms within the new coastal area once approval has been obtained. Temporary workers' camp to be set up, facilities to include site office, machinery and material storage. Workers will be employed to cater for the construction period. Temporary septic tank to be installed for site office and workers' quarters. Equipment and machinery will be transported to the site to cater for the construction of buildings and facilities and other components identified for the reclamation area. Transportation of material to the site, construction of buildings, construction for amenities and utilities e.g. for electricity, telecommunication etc. construction of conduits for water supply, drainage, sewage collection and conveyance and solid waste disposal.
3.	Operation Stage	
	Occupation	Occupancy of various land use, maintenance of roads, drains, traffic, maintenance of facilities and others. Management of traffic, solid wastes and management of sewage generated.

A. Pre-Construction Stage

Activities undertaken during the pre-construction stage will include the following:-

(i) Surveys

Surveys will be conducted on the site to provide specific demarcation of the site boundaries relating to existing land, reclaimed area and others. The information derived from the soil investigations will be used by the civil consulting engineers for purposes of designing foundations and other subsurface provisions, which are integral to buildings and structures. Equipment used for soil investigations comprise specialized trailer-mounted drilling rigs as well as augers.

(ii) Other Studies

Other preliminary studies such as soil investigations, hydraulic studies and hydrographic surveys, geotechnical studies will also be conducted based on either primary or secondary information to be used as the engineering base information for the Proposed Project.

This study also forms part of the preliminary studies to be conducted at this stage of the project and on-site investigations comprise site reconnaissance as well as monitoring of environmental resources, which include water quality, air quality and ambient noise levels, documented in **Chapter 6** of this report.

Findings from the study would also be used at the planning and design stage where criteria and requirements would be defined. In general, the activities carried out during the pre-construction stage do not exert any significant environmental impacts.

B. Rehabilitation And Reclamation Works

(i) Rehabilitation Work

The existing Jelutong Landfill is located directly adjacent to Tun Dr. Lim Chong Eu Expressway and stretches approximately 800 m seaward. The existing level of the landfill is up to +37m NGVD at its highest and closer towards Tun Dr. Lim Chong Eu Expressway is +4m NGVD at its lowest further seaward and slopes into the sea. The landfill is to be rehabilitated and the dump materials removed to be used where suitable for the reclamation works which will be filled with sand to cater for ultimate final platform level of +4.35m NGVD. TPSJ will not receive any domestic wastes nor construction wastes after 3 months upon MBPP handing over the TPSJ site to PLB Engineering Berhad as per the agreement between MBPP and PLB Engineering Berhad.. Thus all domestic wastes generated on the island after the TPSJ closure date will be sent to the transfer station in Batu Maung prior disposal to the landfill site in Pulau Burong.

Any construction wastes can be sent direct to Pulau Burong with approval from MBPP.

Figure 5.7 and Appendix B-005 provides the rehabilitation and reclamation layout plan while **Figure 5.8** provides the reclamation cross section (Section A-A & Section B-B).

The following strategies will be used in carrying out the rehabilitation/reclamation plan:-

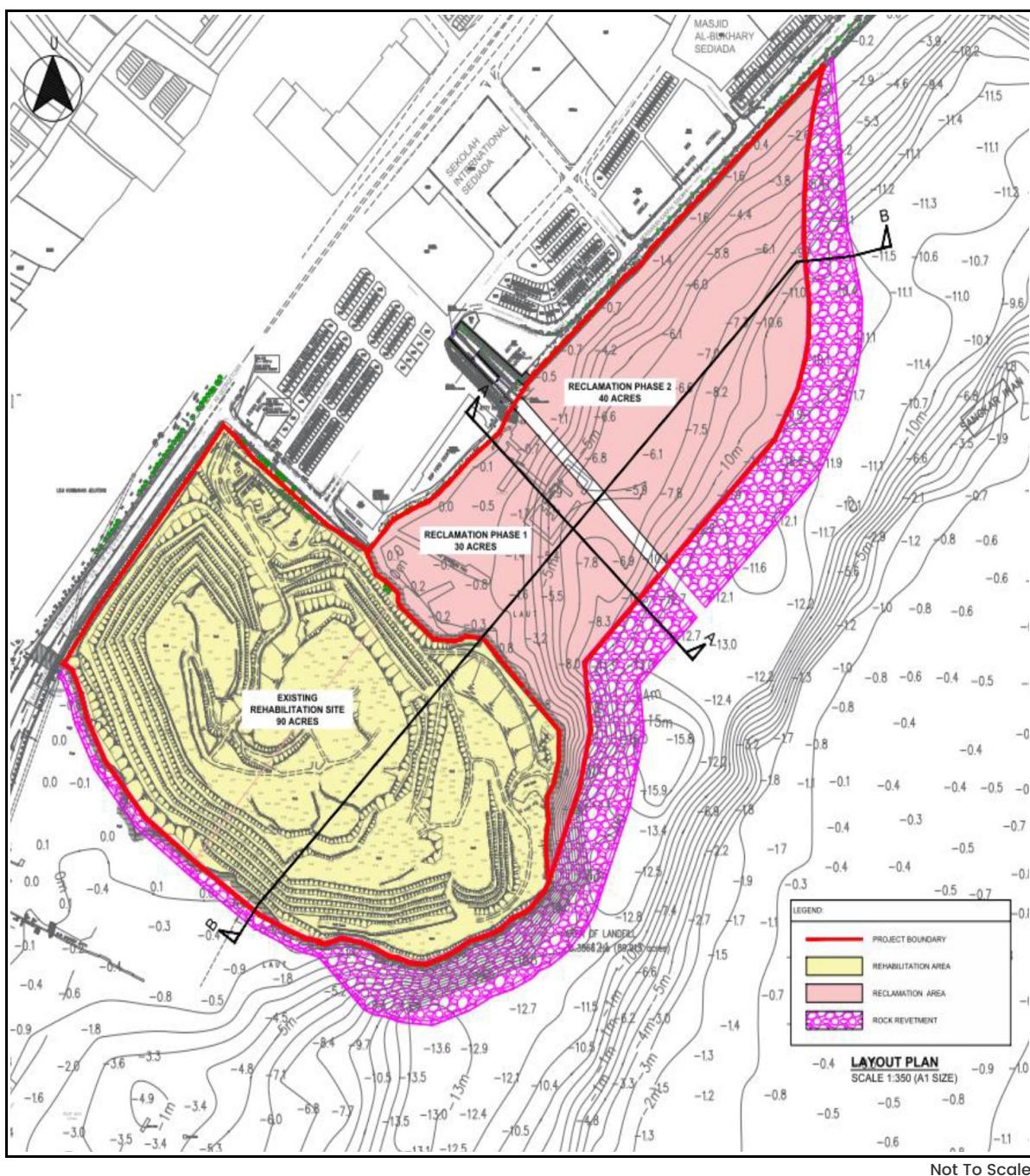


Figure 5.7 Rehabilitation And Reclamation Layout Plan

Note: Refer Appendix B-005

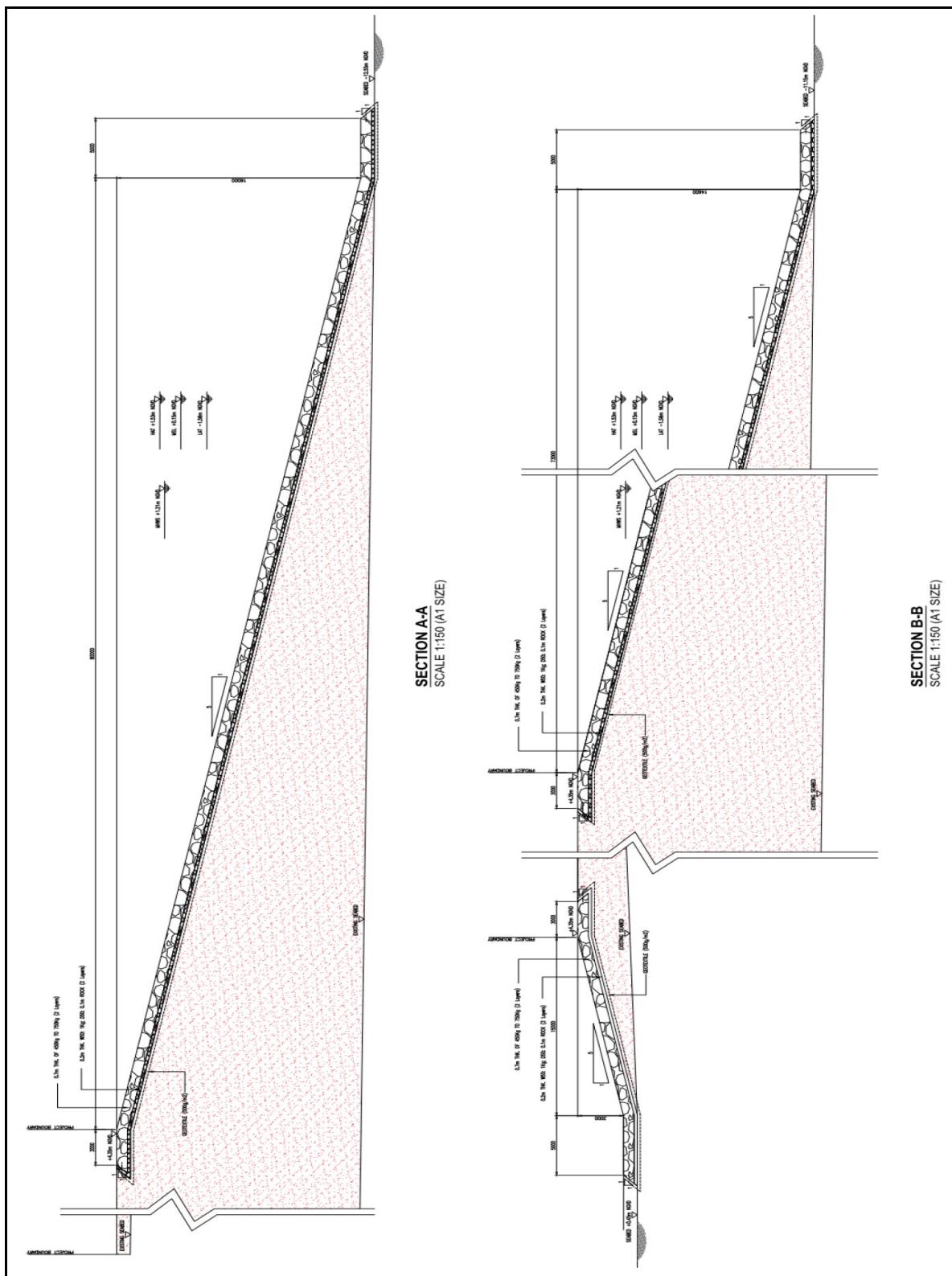


Figure 5.8 Reclamation Cross Section (Section A-A) & (Section B-B)

Note: Refer Appendix B-005

- The need to reduce waste heights to improve amenity and safety for surrounding communities. One of the key outcomes of the community consultation process is to provide some open space when Jelutong Landfill is rehabilitated. It is thus considered that some reshaping of the current waste profile is required in order to achieve this;
- In reducing the waste heights a large proportion of materials would be recovered, recycled and used to construct engineered fill development platforms within the Jelutong Landfill site and also along other sections of the coastline. This not only enhances the current dumpsite but would also provide additional land along the coastline; and
- In constructing an engineered fill development platform at Jelutong Landfill there is also a need to cap, contain and manage the solid waste within the Jelutong Landfill.

In order to rehabilitate the Jelutong Landfill, an adjacent 70 acres of land need to be reclaimed initially to be used as a working platform so that recycling equipment could be installed progressively to meet the schedule masterplan timeline and progressively suitable material from the TPSJ site be used for filling the reclamation area. Generally, the volumes involved at the TPSJ are shown in **Table 5.9**. The estimated volume of waste at TPSJ is based on records available at MBPP.

Table 5.9
Estimated Volume Of Wastes

No.	Volume
1.	Estimated Volume of waste at Rehabilitation Area = 11,329,285 m³ ^①
2.	Volume of suitable sand required at adjoining reclaimed site to fill up to an initial platform level of Mean High-Water Spring (MHWS) + 0.5 m, 1.63m NGVD = 2,520,000 m³
3.	Volume of recycled suitable material that is required to fill the 70 acres reclamation area from MHWS + 0.5 m until the surcharge height of 7 m = 3,350,000 m³
4.	Estimated volume that can be recycled to usable material for reclamation in Item 3 above is 55% = 0.55 x 11,329,285 = 6,225,828 m³
5.	Of the 6,225,828 m ³ , 3,844,450 m ³ would be utilised for Item 3 above and the balance could be sold as residual by product for usage downstream.

^① Based on estimated records from MBPP

* Based on observations from borehole logs in SI report

In total, 4 waste bulk construction material recycling machines will be installed progressively commencing from the only suitable site on the 90 acres Jelutong Landfill and the balance to be installed on the adjoining 70 acres reclamation site.

Each sorting line of recycling machines input/output and performance criteria is as shown in **Table 5.10**.

Table 5.10
Performance Criteria Of Recycling Machines

No.	Specification
a)	Design capacity for 1 sorting line is 173 m ³ /hr.
b)	Working operation for the machine is 10 hours.
c)	1 sorting line will need 5,000 m ² of drying area for lowering moisture of waste.
d)	25 days to finish installation of 1 sorting line.
e)	Working platform for 1 line will be about 55 m long, 22 m wide and 9 m high.
f)	Working platform for 1 line with another sorting line is 20 m.
g)	Estimated time for setting up 1 rehabilitation working platform to accommodate 2 recycling machines (2 sorting lines) is 4 months.
h)	Designed capacity for 1 sorting line is 173m ³ /hr
i)	Working operation for machine is 10hours
j)	Hence , $173\text{m}^3 \times 10\text{hr} = 1,730\text{m}^3/\text{day}/\text{line}$

The initial area (WPI) described and shown in the subsequent section would be near to the existing weigh-bridge office and current site office area. It is envisaged that during the process of rehabilitating the 90 acres Jelutong Landfill, there will be not be any ongoing waste dumping activities.

Therefore, coordination between all relevant parties involved is needed so that the rehabilitation activities can go on smoothly and the alternative site be used for the new waste dumping activity.

The excavated wastes at the Jelutong Landfill site mainly consist of C&D waste (cement, metals, wood, glass and others) including green waste and excavation wastes. However the bottom layers especially in the east consist of putrescible domestic wastes already decayed as the Jelutong Landfill used to collect domestic waste but closed for this purpose. According to a technical report title 'Jelutong Dumpsite, Penang – Preliminary Investigation & Conceptual Closure Options Appraisal' prepared for PDC in November 2014 an extract given in **Appendix B-006**, the TPSJ no longer took in domestic wastes since year 2001 as domestic wastes are sent to the transfer station in Batu Maung prior transporting to Pulau Burung, Daerah Seberang Perai Selatan with the use of barges in the earlier years until the barges cease operation with the construction of the Penang Second Bridge.

According to the same report, different waste streams are dumped at designated parts of the Jelutong Landfill. Domestic and household wastes, garden wastes and commercial wastes are tipped at the eastern part of the site. Construction and demolition wastes and excavated waste soils are tipped primarily at the southern portion of the Jelutong Landfill.

Bulk wastes and some waste soils and construction hardcore materials are tipped at the central section of the Jelutong Landfill where the highest waste platform is located. MBPP has also dedicated an area in the northwestern sector of the Jelutong Landfill where wood wastes are stockpiled after shredding. Besides these wastes, soil comprising of silt and sand clayey soil were used as cover material. However records to quantify the various type of waste and percentage of each wastes disposed at Jelutong Landfill since operation were unavailable as only records of waste disposal is available at MBPP.

Figure 5.9 provides the process flowchart for the recycling of the excavated waste at Jelutong Landfill during the rehabilitation works while **Table 5.11** provides the estimated quantity of recycled material to be used at the reclamation site.

Table 5.11

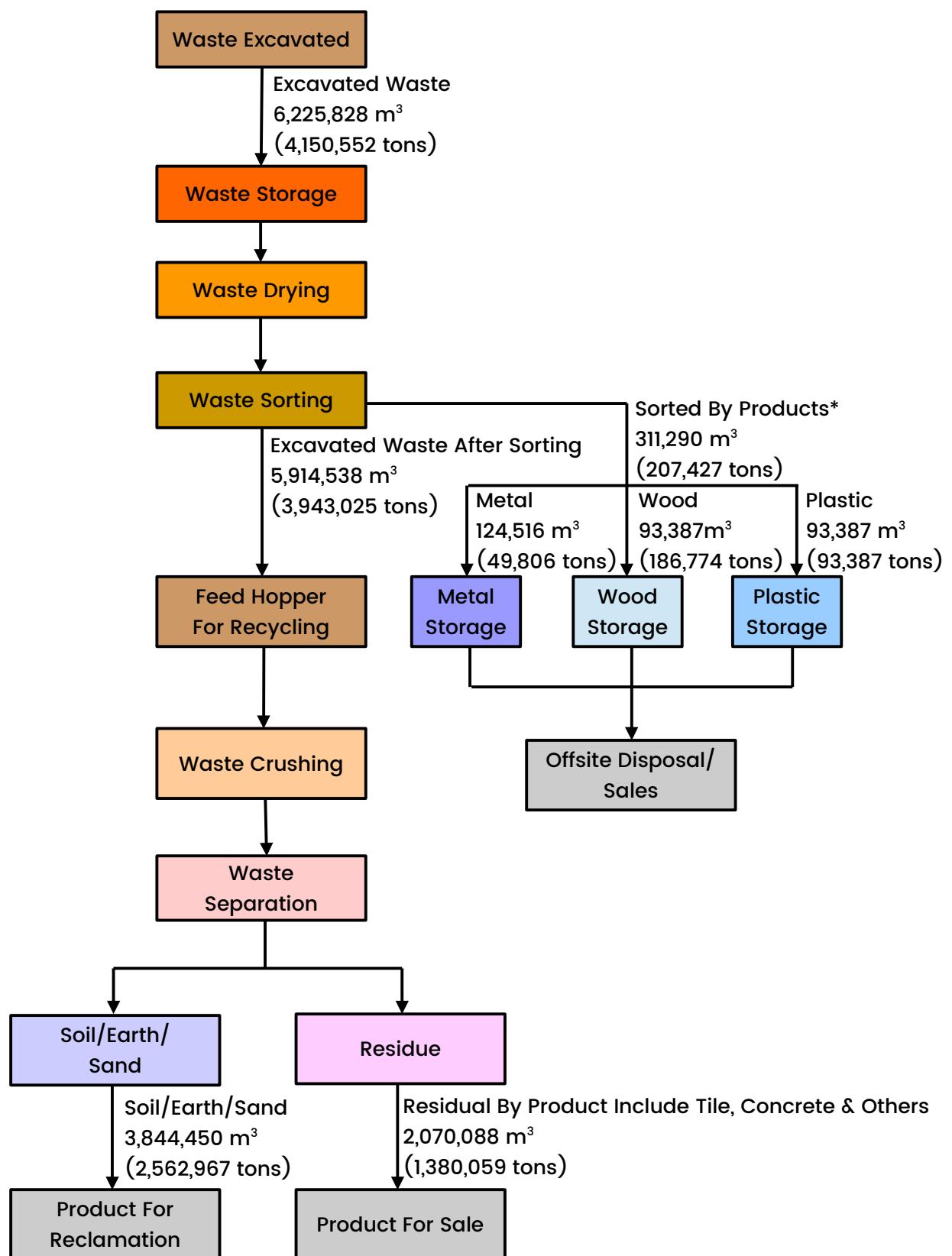
Estimated Quantity Of Reusable Material And Anticipated Rehabilitation Time Frame

Rehabilitation					Working Platform For Reclamation				
Zone	Acreage Area Involved (m ²)	Rehabilitation Work Volume (m ³)	Height MSL (m)	Residual Volume (m ³)	Zone	Acreage Area Involved (m ²)	65% Recycled Material (m ³)	Machine for Rehabilitation Work (unit)	Timeframe (days)
R1	-	T/B	37.00	6,225,828	WP1	-	T/B	2	120
R2	104,009	520,045	32.00	5,705,783	WP2	54,323	418,287	4	600
R3	126,709	760,254	26.00	4,945,529	WP3	39,117	301,201	4	120
R4	199,277	1,195,662	20.00	3,749,867	WP4	39,117	301,201	4	160
R5	232,402	1,394,412	14.00	2,355,455	WP5	31,002	238,715	4	120
R6	259,942	1,299,710	9.00	1,055,745	WP6	37,804	291,091	4 (2 from P1)	120
R7	290,764	1,055,745	3.35	-	WP7	77,427	596,188	T/B	150
Remaining Waste					Rehabilitation Area	363,866	1,200,758	T/B	160
							Total Machine (unit)	20	
The total duration of rehabilitation and reclamation work								1640 Days (4.5 Years)	

As mentioned earlier, the rehabilitation works involves excavating the waste at Jelutong Landfill at every 2 metres up to 34 m waste stratum with the total waste to be excavation for waste recycling amounting to 6,225,828 m³. Excavators will be used in this process. The excavated waste will be sent to the temporary stockpile area at the waste recycling area. The recycling process involves the following:-

i. Drying

At the temporary stockpile area the excavated waste is initially left to dry in the open sun prior to sorting. The drying process ensure better handling and subsequently recycling. To mitigate fugitive dust during the drying process screens will be provided to ensure fugitive dusts are not disperse to the atmosphere.



Note: If scheduled waste is found, it is required to handle as per SW Regulation requirement although it is rare at this ex land fill site

Figure 5.9 Process Flowchart Of Recycling Of Excavated Wastes

ii. Sorting

The waste are then sent for sorting by manual means to sort out the unsuitable material comprising of wood, metals and plastics. These wastes are kept in storage bins for offsite disposal to MBSP's dumpsite or for sales if the material can be reused for downstream activities. The suitable material consisting of soil, C&D wastes are then fed to the hopper of the recycling machine.

iii. Crushing

In the recycling machine, the suitable material undergo a crushing process to crush the C&D wastes to smaller aggregates.

iv. Separation

The crushed material by enclosed conveyor system are then sent for separation where by a rotating drum will separate the finer material (normally earth/soil/sand) which will then be discharged to the trucks on standby at the discharge outlet which will be transported for use at the reclamation area. The crushed C&D by product being larger diameter will be conveyed by enclosed conveyors to the discharge outlet whereby trucks will be made available on standby to received the by products. Once these trucks are full, the loaded material are transported to potential buyers for sales.

Table 5.12 and Table 5.13 shows the list of equipment to be used for rehabilitation works involving excavation while **Table 5.14** show the list of equipment to be used for rehabilitation owork involving waste recycling. Photographs of the material recycling machine provided in **Appendix B-005**.

Table 5.12
Crusher Equipment Specification

Items		Models & Specs	Quantity	Power (kw)
Main Equipment	Vibrating Feeder	ZSW300*90	1 set	7.5
	Jaw Crusher	PEW500*750	1 set	55
	Cone Crusher	CS75	1 set	75
	Vibrating Screen	3YA1548	1 set	15
Frame	Frame	Three axle ship type frame	1 set	
	Assmebly	Matched	1 set	
Belt Conveyor	Main Belt	B800 x 10m	1 set	7.5
	Belt above sieve	B800 x 60m	1 set	11
	Belt under sieve	B800 x 6.5m	1 set	5.5
	Finished belt	B500 x 4.6m	2 set	4
Hydraulic System	Hydraulic Station	Matched	1 set	
	Leg oil cylinder	Matched		
	Hydraulic			
	accesso			
Electrical system	Electrical cabinet, etc.		1 set	
	Cable set			

Table 5.13
Separation Equipment Specification

Model	VK-3 FI010
Main Equipment	PFS1010
Vibrating Feeder	ZSW300 x 90
Vibrating Screem	3YA1548
Permanent Magnetic Separator	RCYD(C)-8
Number of Axies	2
Capacity (t/h)	80-200
Overall Dimensions	15900x2600x3800
Hydraulic System	Hydraulic lifter
Belt Conveyor	6
Total Power	185.7

Table 5.14
List Of Other Equipment

Equipment	Operations
Excavator (5-10 units)	General excavations and spreading out materials into recovery plants
Tipper Truck (5-10 units)	Earth and waste transport within the landfill
Tractor-backpusher (5-10 units)	Road grading
Backhole-Loader (5-10 units)	Trenching, maintenance and shoveling
4WD Pick-Up Truck (5-10 units)	General transportation within the site, site supervision

Figure 5.10 to Figure 5.15 and Appendix B-005 provides the layout of the recycling work to be carried out according to the various working platforms. Whist **Figure 5.16** provides the typical recycling layout including the various stockpile areas required for the recycling process described earlier. Each recycling machine weighs about 1 ton and the stability analysis conducted by the Geotechnical Engineers has confirmed that the site is stable to cater for such load.

(ii) Reclamation Work

For the reclamation area, the following stages are proposed (as illustrated in **Figure 5.17**):-

- Stage 1 – Sand containment bund to be filled to 0.5 m above Mean Sea Level (MSL) (+0.65 mNGVD) and to form slope gradient of not steeper than 1V:7H on both sides;
- Stage 2 – To continue the reclamation filling works at inner area to 0.5 m above Mean High Water Spring (MHWS) (+1.63 mNGVD);

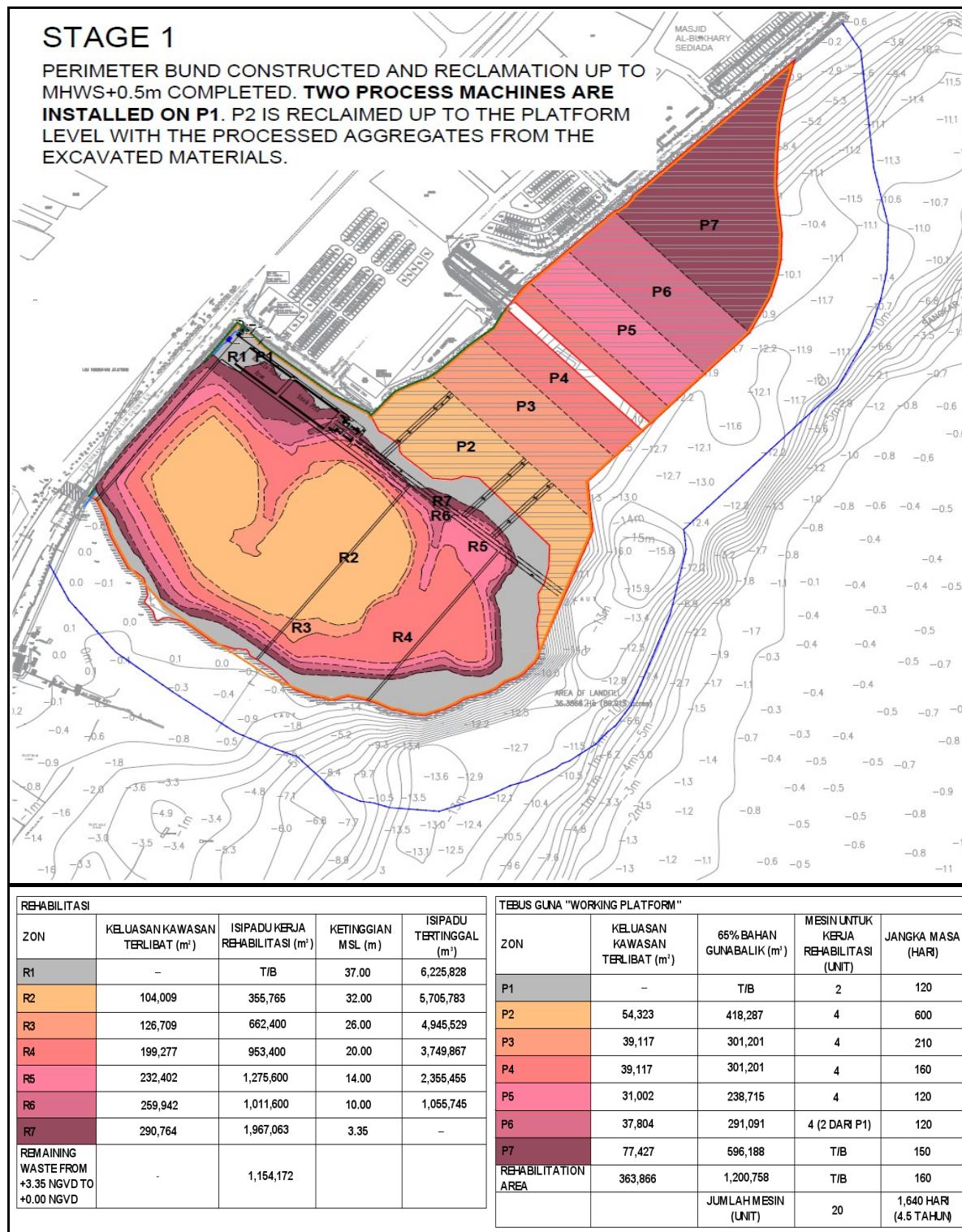


Figure 5.10 Layout Plan For Stage 1 Recycling Area On Jelutong Landfill

STAGE 2

FOUR PROCESS MACHINES ARE INSTALLED ON P2. P3 IS RECLAIMED UP TO THE PLATFORM LEVEL WITH THE PROCESSED AGGREGATES FROM THE EXCAVATED MATERIALS.

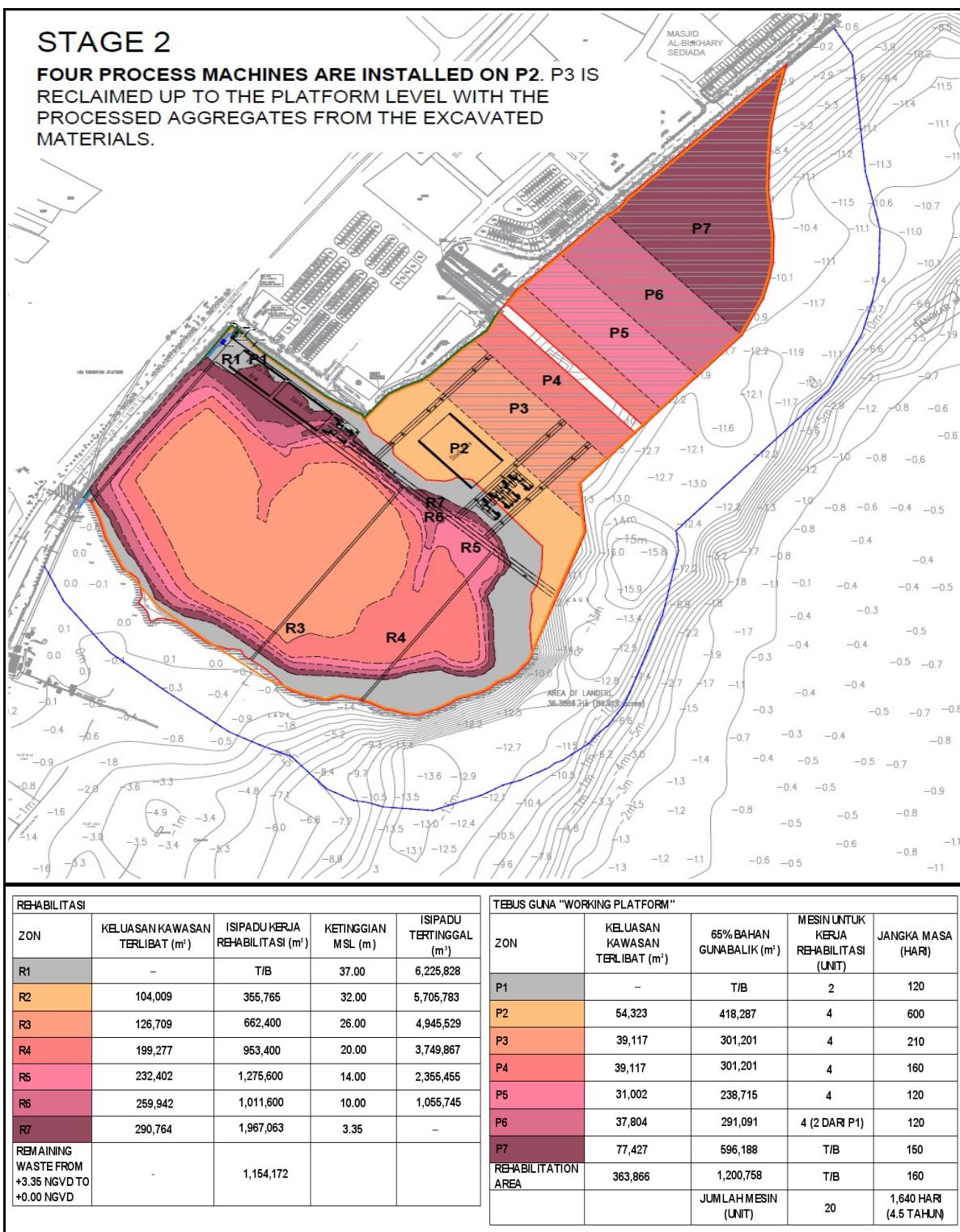


Figure 5.11 Layout Plan For Stage 2 Recycling Area On Jelutong Landfill

STAGE 3

FOUR PROCESS MACHINES ARE INSTALLED ON P3. P4 IS RECLAIMED UP TO THE PLATFORM LEVEL WITH THE PROCESSED AGGREGATES FROM THE EXCAVATED MATERIALS.

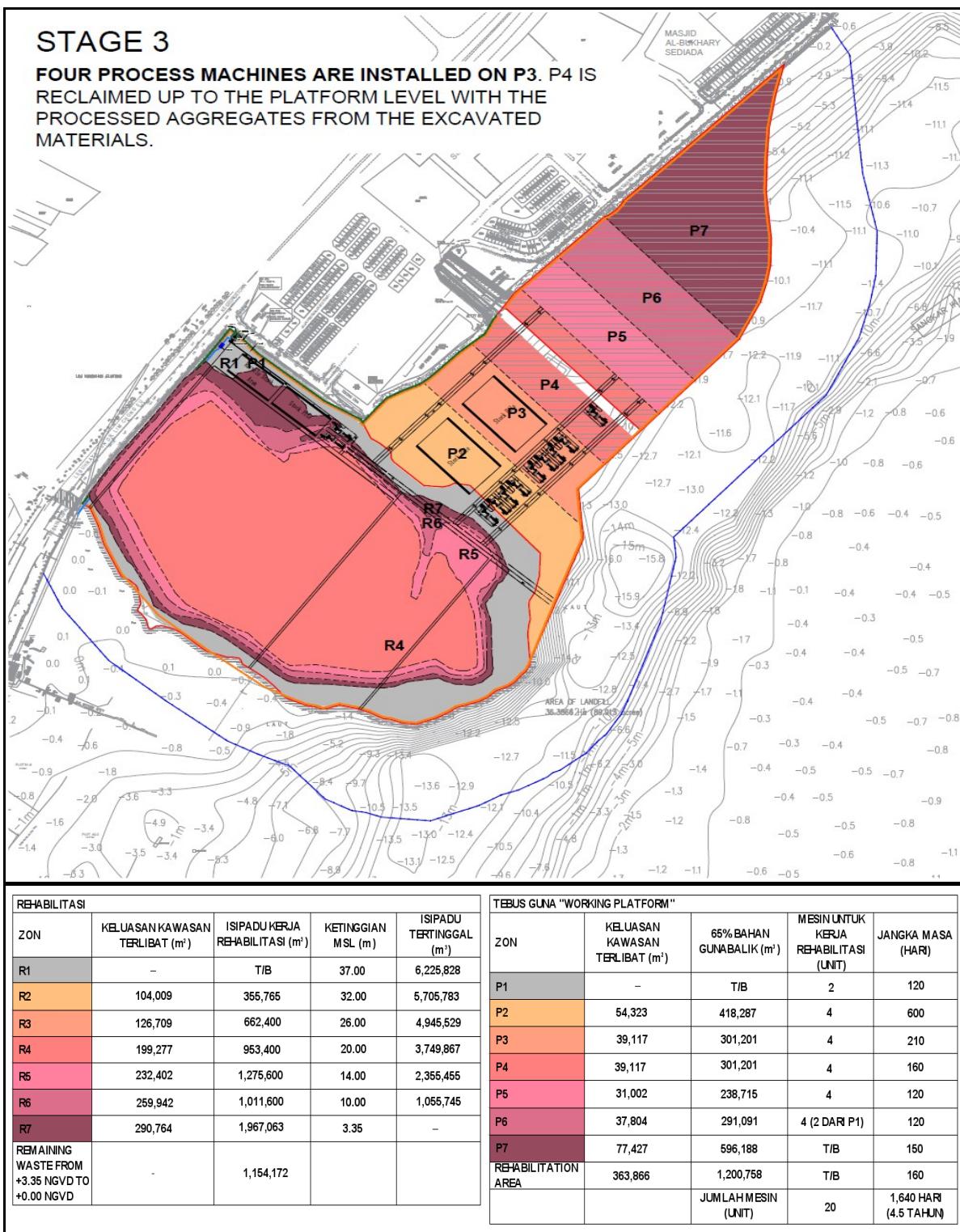


Figure 5.12 Layout Plan For Stage 3 Recycling Area On Jelutong Landfill

STAGE 4

FOUR PROCESS MACHINES ARE INSTALLED ON P4. P5 IS RECLAIMED UP TO THE PLATFORM LEVEL WITH THE PROCESSED AGGREGATES FROM THE EXCAVATED MATERIALS.

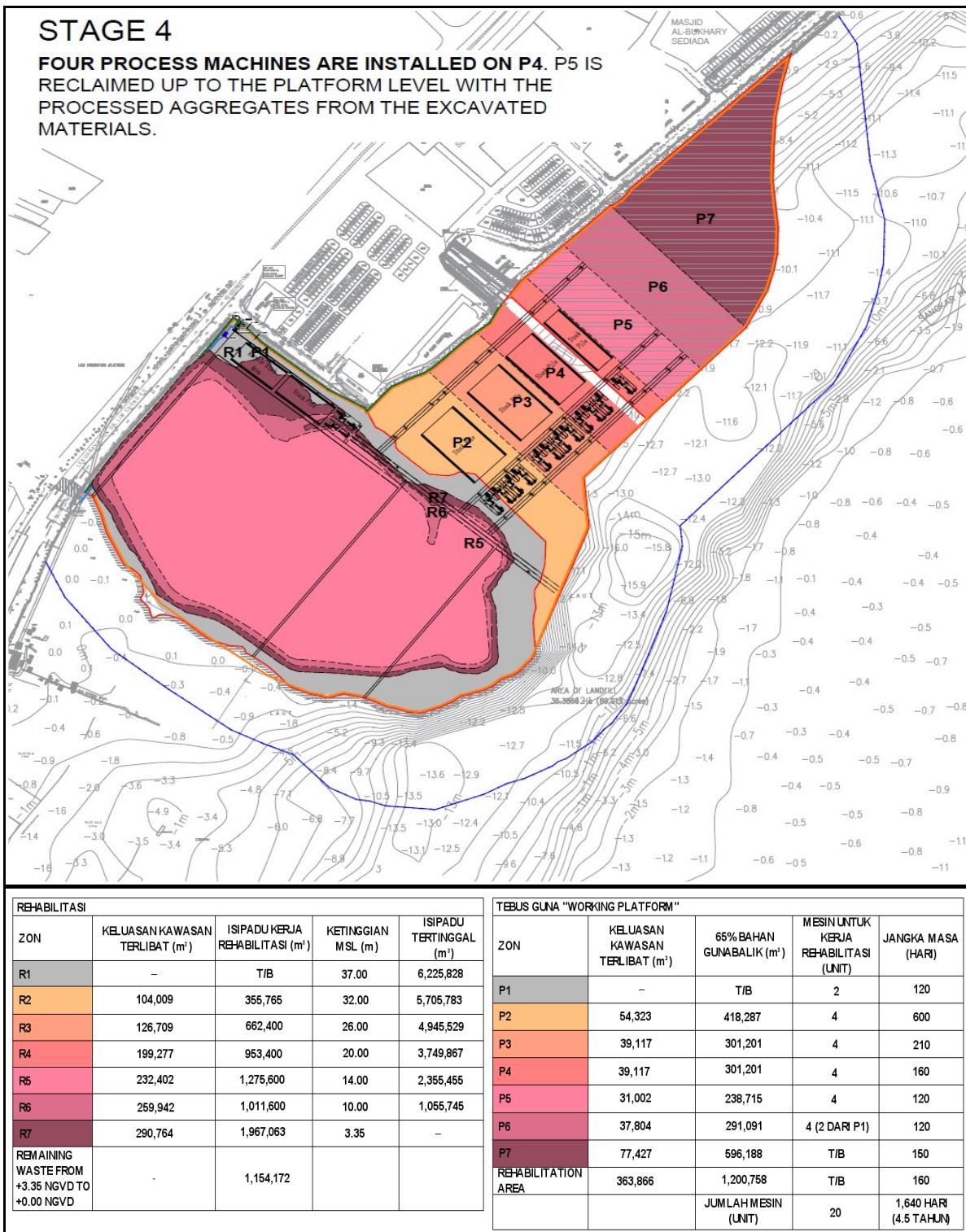


Figure 5.13 Layout Plan For Stage 4 Recycling Area On Jelutong Landfill

STAGE 5

FOUR PROCESS MACHINES ARE INSTALLED ON P5. P6 IS RECLAIMED UP TO THE PLATFORM LEVEL WITH THE PROCESSED AGGREGATES FROM THE EXCAVATED MATERIALS.

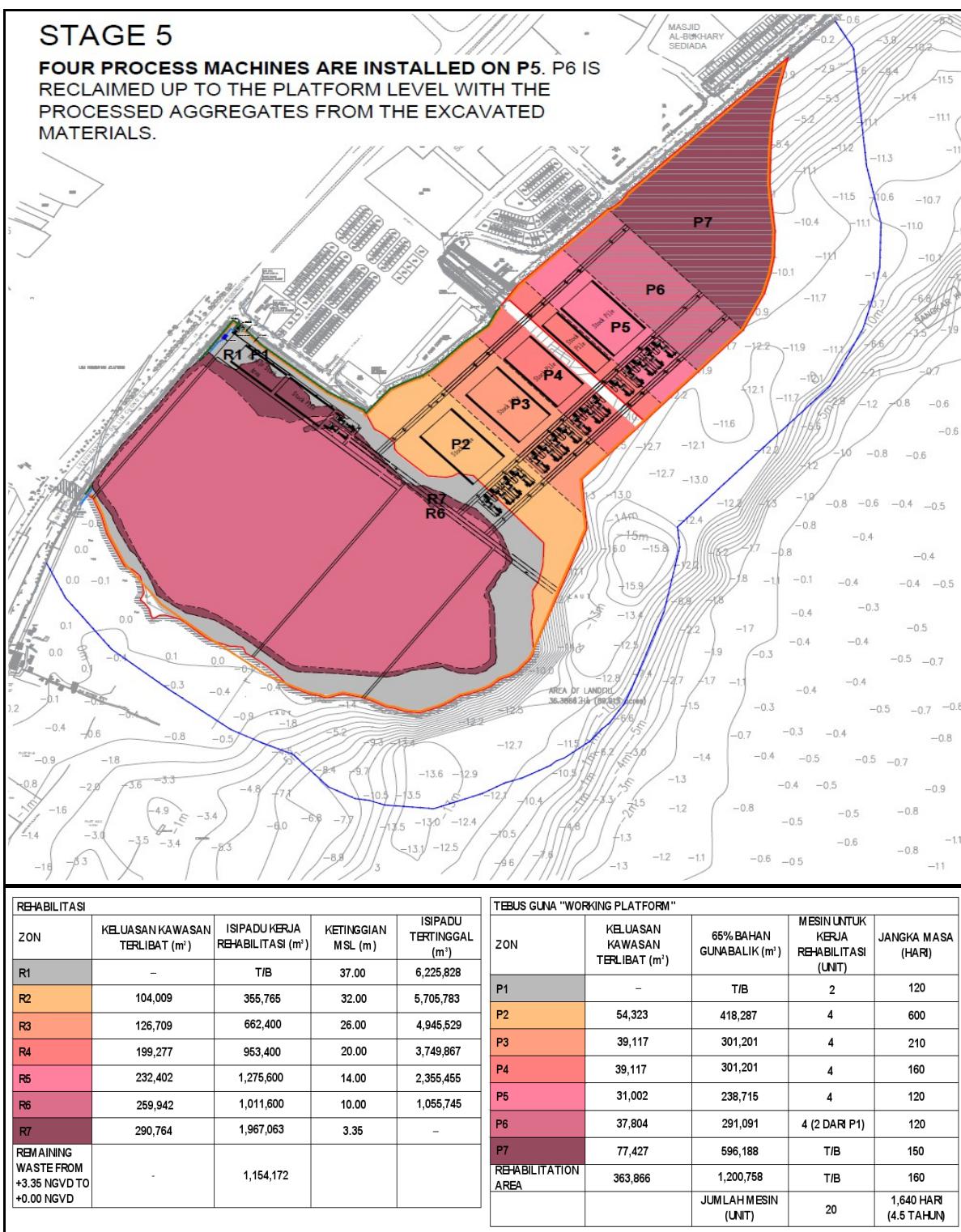


Figure 5.14 Layout Plan For Stage 5 Recycling Area On Jelutong Landfill

STAGE 6

FOUR PROCESS MACHINES ARE INSTALLED ON P6, TWO OF WHICH ARE THE TWO MACHINES REMOVED AND TRANSFERRED FROM P1. PROCEED TO RECLAIM P7 UP TO THE PLATFORM LEVEL.

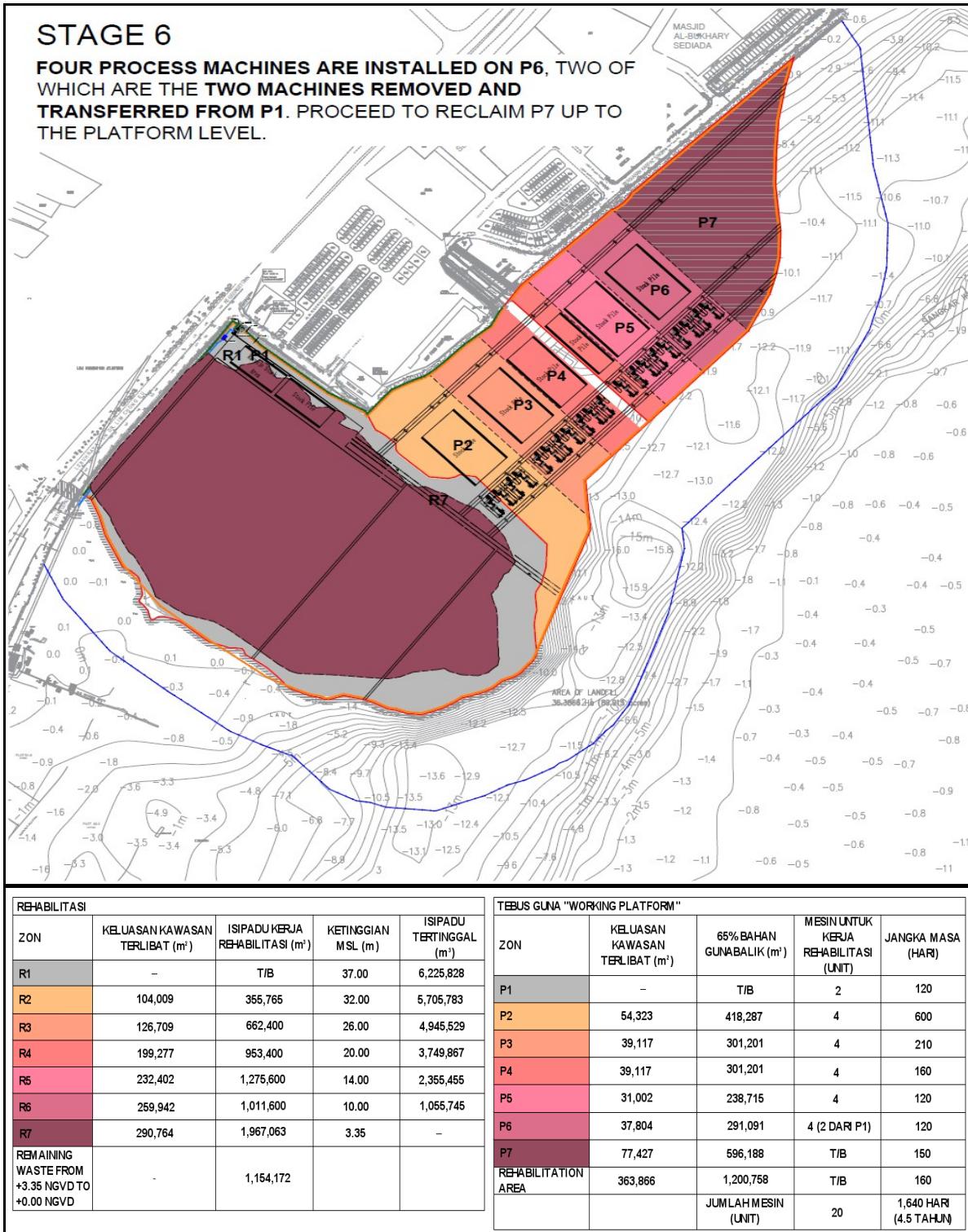


Figure 5.15 Layout Plan For Stage 6 Recycling Area On Jelutong Landfill

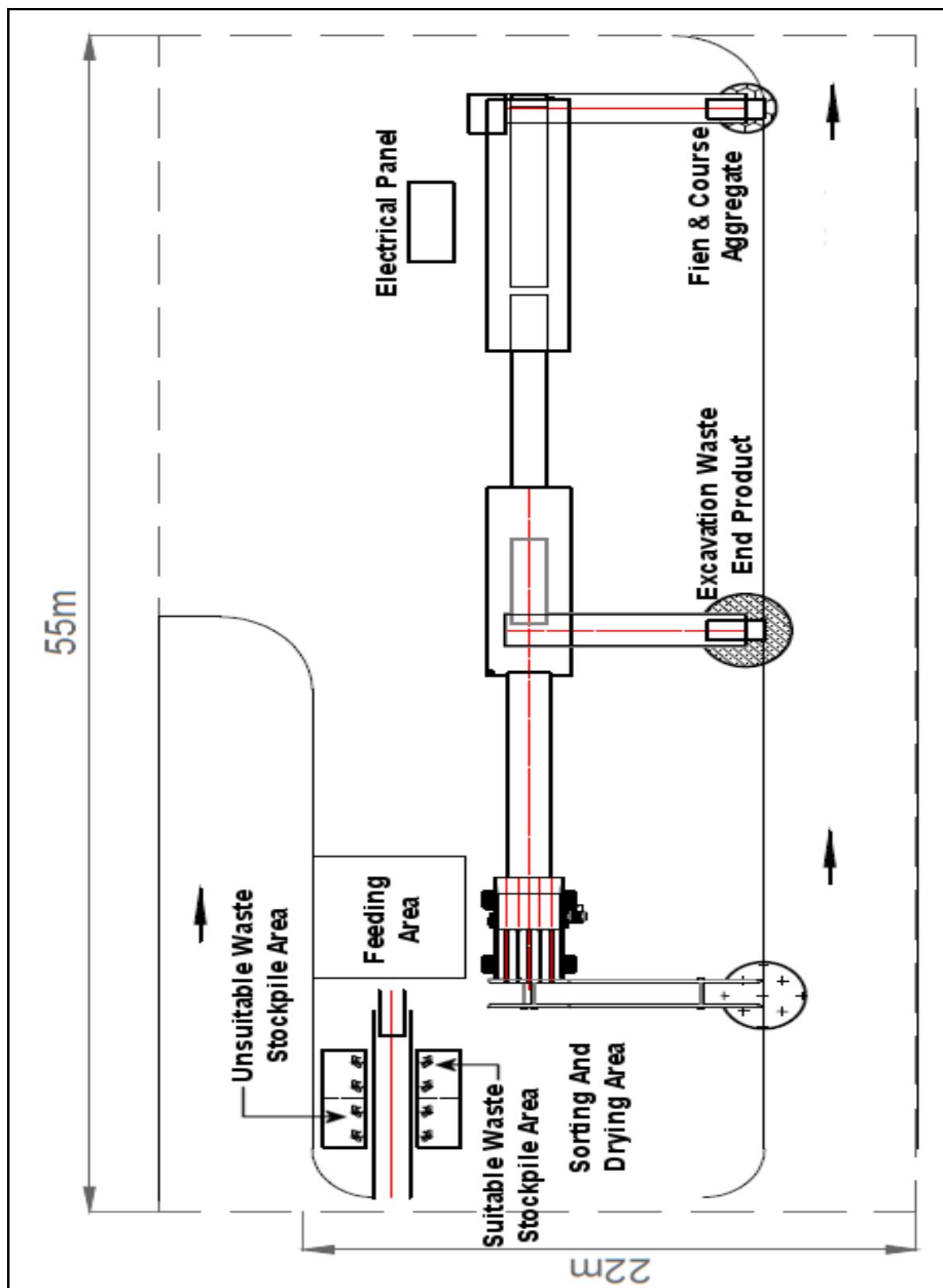


Figure 5.16 Typical Layout For Recycling Plant With Stockpile Areas

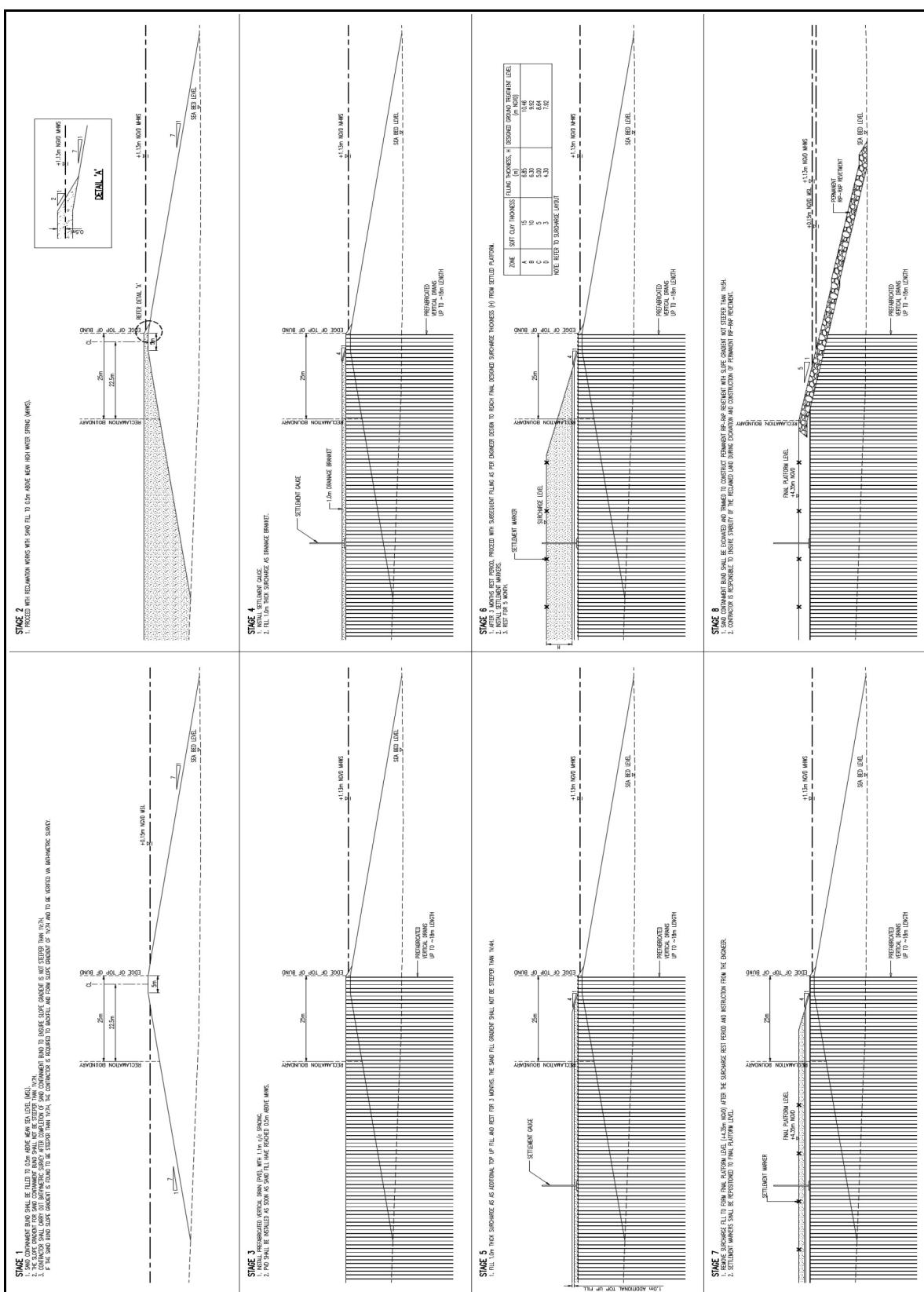


Figure 5.17 Reclamation Construction Stages

- Stage 3 – Install Prefabricated Vertical Drains (PVD) with 1.1 m c/c spacing as soon as fill has reached 0.5m above MHWS;
- Stage 4 – Install settlement gauges and fill 1.0m thick surcharge as drainage blanket;
- Stage 5 – Fill 1.0m thick surcharge as additional top up fill and rest for 3 months. The sand fill gradient shall not be steeper than 1V:4H;
- Stage 6 – After 3 months rest period, carry out subsequent filling of 4.3 to 6.85 m thick surcharge to reach final surcharge level and install settlement markers. Rest another 5 months;
- Stage 7 – Temporary surcharge shall be removed after resting period or as per Engineer's instruction to the proposed platform level (+4.35 mNGVD) and settlement markers are to be repositioned to the final platform level; and
- Stage 8 – Sand containment bund shall be trimmed to construct permanent rip-rap revetment with slope gradient not steeper than 1V:5H.

During the reclamation works, double layer silt curtains their locations as shown in **Figure 5.18** shall be provided to minimise the advection and dispersion of sediment plumes; and as there may be some construction works to be carried out from the landside, site access for heavy construction works vehicles and wash trough are also proposed. Further details are discussed in **Chapter 8** of this report.

The quantity of sand required for the reclamation site is shown in **Table 5.14**. A few sites has been identified for the supply of sand material which will be finalized prior to any reclamation works at site. The potential sand source most probably will be from licensed sand dredging operations in the Continental Shelf off the coast of Perak waters.

Table 5.15
Quantity Of Sand Required For Land Reclamation Area

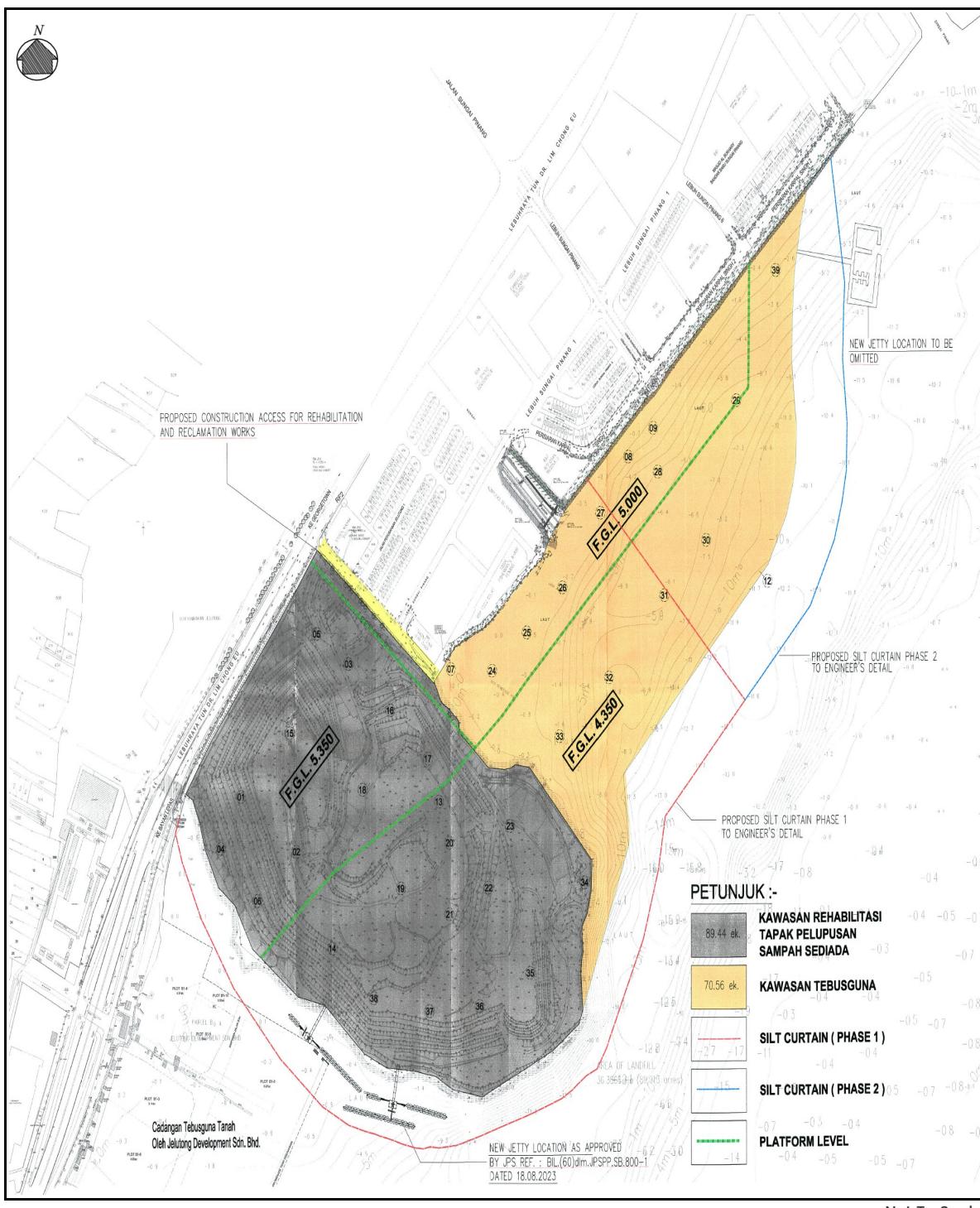
Material	'Estimated Volume (m ³)
Reclamation Fill (up to design ground treatment level)	4,920,000
Rip-Rap Revetment	321,000*

Note: ¹ Subjected to detailed estimation at later stage

* For whole site project boundary

(iii) Rehabilitation And Reclamation Work Plan

The overall workflow of the rehabilitation and reclamation plan is shown in **Figure 5.19** whilst **Figure 5.20** provides the rehabilitation and reclamation working platform diagram that will be planned for the Proposed Project.



Not To Scale

Figure 5.18 Location Of Double Layer Silt Curtains For Erosion And Sediment Control Plan

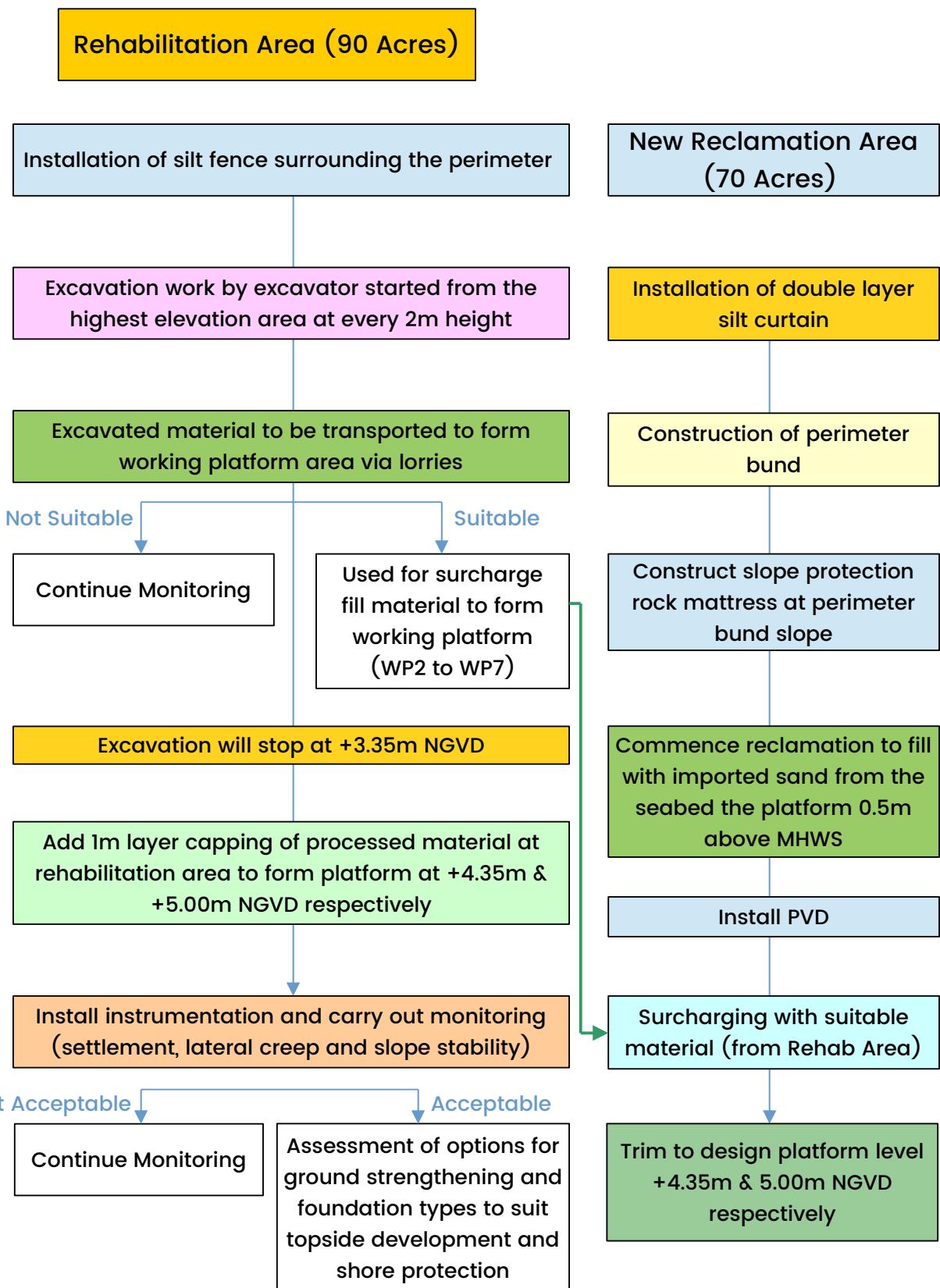


Figure 5.19 Overall Work Flow Of The Rehabilitation And Reclamation Plan

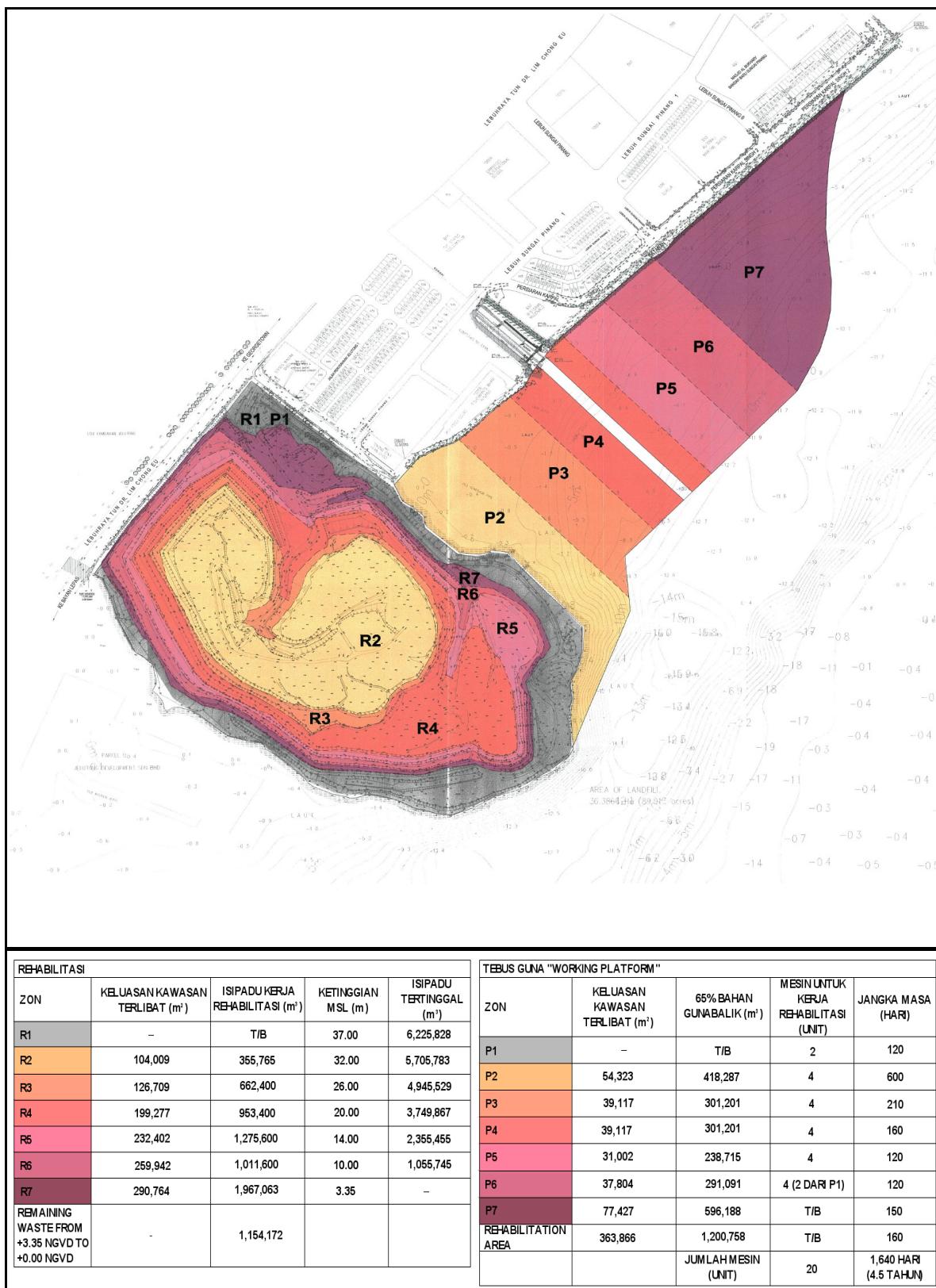


Figure 5.20 Working Platform Diagram



At the existing Jelutong Landfill, the excavation to be carried out by excavators will start from the highest elevation area and will be lowered layer by layer as shown in **Figure 5.21**, each layer being 2m height up to the platform level of +3.35m NGVD. The excavated material will be transported to Working Platform Area (WP1-WP7) via lorries. The landfill materials at respective WP1-WP7 will be processed and separated into two categories; not suitable or suitable for surcharge material. Suitable material will be reused as surcharge material and transported via lorries from Working Platform to WP2 to WP7. Unsuitable material will be disposed to the approved landfill site.

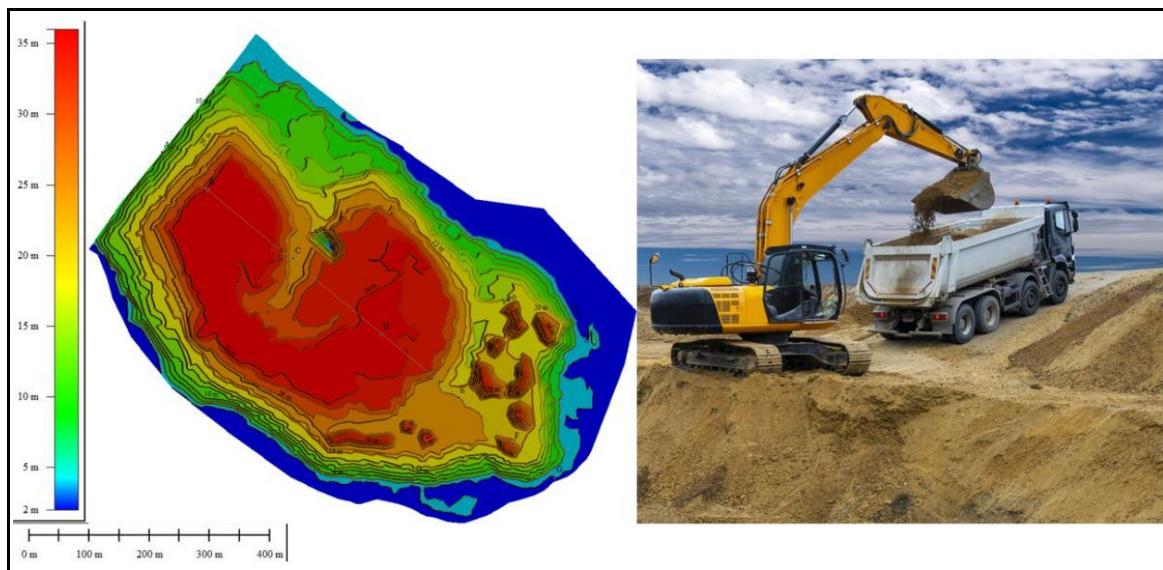


Figure 5.21 Layout Of Rehabilitation Area To Be Excavated Layer By Layer With Each Layer Being 2m In Height Up To Platform Level +3.35m NGVD

At the same time the reclamation works will be installed with double layer silt curtains around the Project Site to control sediment dispersion and protect the surrounding environment as shown in earlier **Figure 5.10**. Following that, the construction of a perimeter bund will take place, which shall serve as a barrier for the reclamation work. To reinforce the perimeter bund, a slope protection rock mattress will be laid along its slope. Once the perimeter bunds are almost complete, the reclamation phase will begin, involving the filling with imported sand from existing seabed levels to the designated platform level. The sand will be sourced from an approved sand source concession area and filled, raising the seabed level to a height of 0.5 m above MHWS. To enhance the ground's stability, PVD (Prefabricated Vertical Drains) are then installed. The next step involves surcharging the area with suitable materials obtained from the rehabilitation area. Finally, the platform is trimmed to achieve the desired design platform level, set at +4.35 m and +5.00m NGVD respectively.

The rehabilitation and reclamation phases and the reclamation sequence are described in more details in subsequent section.

(iv) Rehabilitation And Reclamation Phasing

The rehabilitation and reclamation are proposed to be carried in phases as shown in **Figure 5.22 to Figure 5.27**. During the reclamation phase, a temporary drain shall be provided to convey the upstream discharge from the existing outlet (Outlet 2) which caters for the discharges from the drains and RSTP to the sea through a new temporary outlet located further seaward as shown in **Figure 5.28**.

The open type temporary drain shall pass through the reclamation land for an estimated length of about 350m (measuring from the Outlet 2 to the temporary outlet). This outlet provides the boundary between Phase 1 and Phase 2.

Another outlet from the existing land mass is the outlet for Sungai Pinang which is located further north of the reclamation area which will not be hindered.

Earlier **Table 5.11** provides the summary of the estimated quantity of reusable material and the anticipated time frame for the rehabilitation works based on earlier **Figure 5.21** which is anticipated to complete in 3-4 years.

C. Post Rehabilitation And Reclamation Works

Prior to any topside development, post treatment SI (Subsurface Investigation) works are to be carried out upon reaching the final platform level to verify the efficiency of the ground treatment prior to future development. Post treatment SI works shall comprise of boreholes, vane shear, piezocone and collection of samples for lab tests at both reclamation and rehabilitation areas including testing the presence of methane at the rehabilitation site. The topside development involves the following. Also a separate Land Assessment Reporting after the remedial works according to the DOE's Contaminated Land Management and Control Guidelines shall be conducted and submitted to the DOE upon completion of the rehabilitated area which has reached its final platform level.

(i) Construction Of Infrastructure/Utility System

Once the reclaimed area is fully settled, the construction of the infrastructure for the entire area will commence. The infrastructure includes:-



- a) Setting up Rehab Working Platform (WP1) and install 2 nos. of recycling machines at WP1:
WP1 = 2 Nos
Total = $2 \times 400 \text{ m}^3/\text{day} = 800 \text{ m}^3/\text{day}$ (Suitable materials)
- b) Excavation at Rehabilitation Area via excavators and transport the material to WP1 via lorries.
- c) Process dumpsite materials for WP2 – 800 m³/day.
- d) Reclamation Phase 1
 - Construction of perimeter bund.
 - Lay rock mattress at slope of perimeter bund.
 - Sand filling up to 0.5 m above mean high water spring (MHWS).

Figure 5.22 Rehabilitation & Reclamation Phase For Year 0-1



- a) Excavation at Rehabilitation Area via excavators and transport the material to WP1 via lorries.
- b) Process dumpsite materials ($800 \text{ m}^3/\text{day}$).
- c) PVD Installation at Working Platform 2 (WP2).
- d) Subsequent surcharge filling for WP2.
- e) Setting out 4 recycling machines at ▲ WP2:
 - WP1 = 2 Nos
 - WP2 = 4 NosTotal = $6 \times 400 \text{ m}^3/\text{day} = 2,400 \text{ m}^3/\text{day}$ (suitable materials)
- f) Excavation at Rehabilitation Area via excavators and transport the material to WP1 & WP2 via lorries.
- g) Reclamation Phase 2
 - Construction of perimeter bund.
 - Lay rock mattress at slope of perimeter bund.
 - Sand filling up to 0.5 m above mean high water spring (MHWS).

Figure 5.23 Rehabilitation & Reclamation Phase For Year 1-2

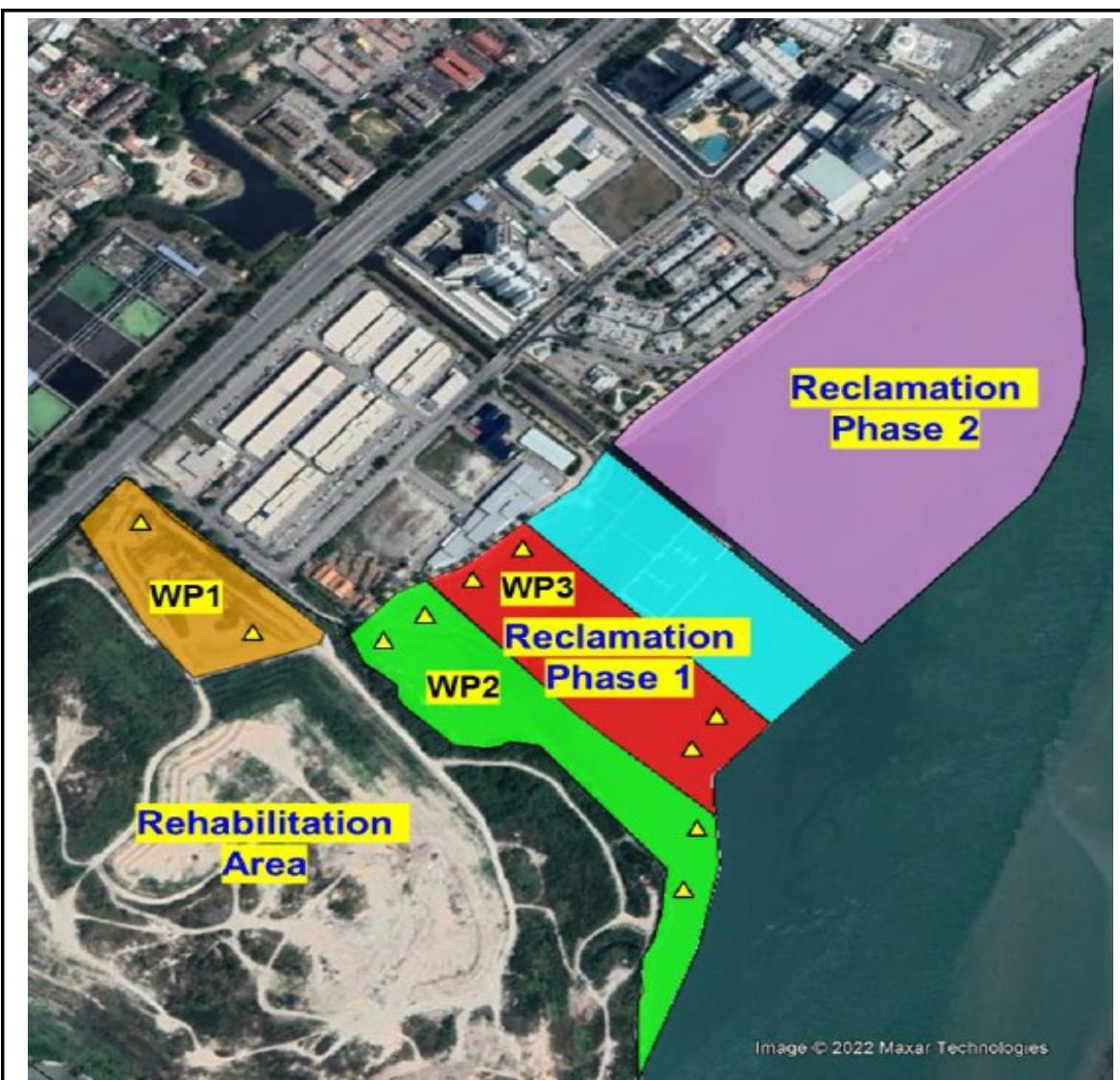
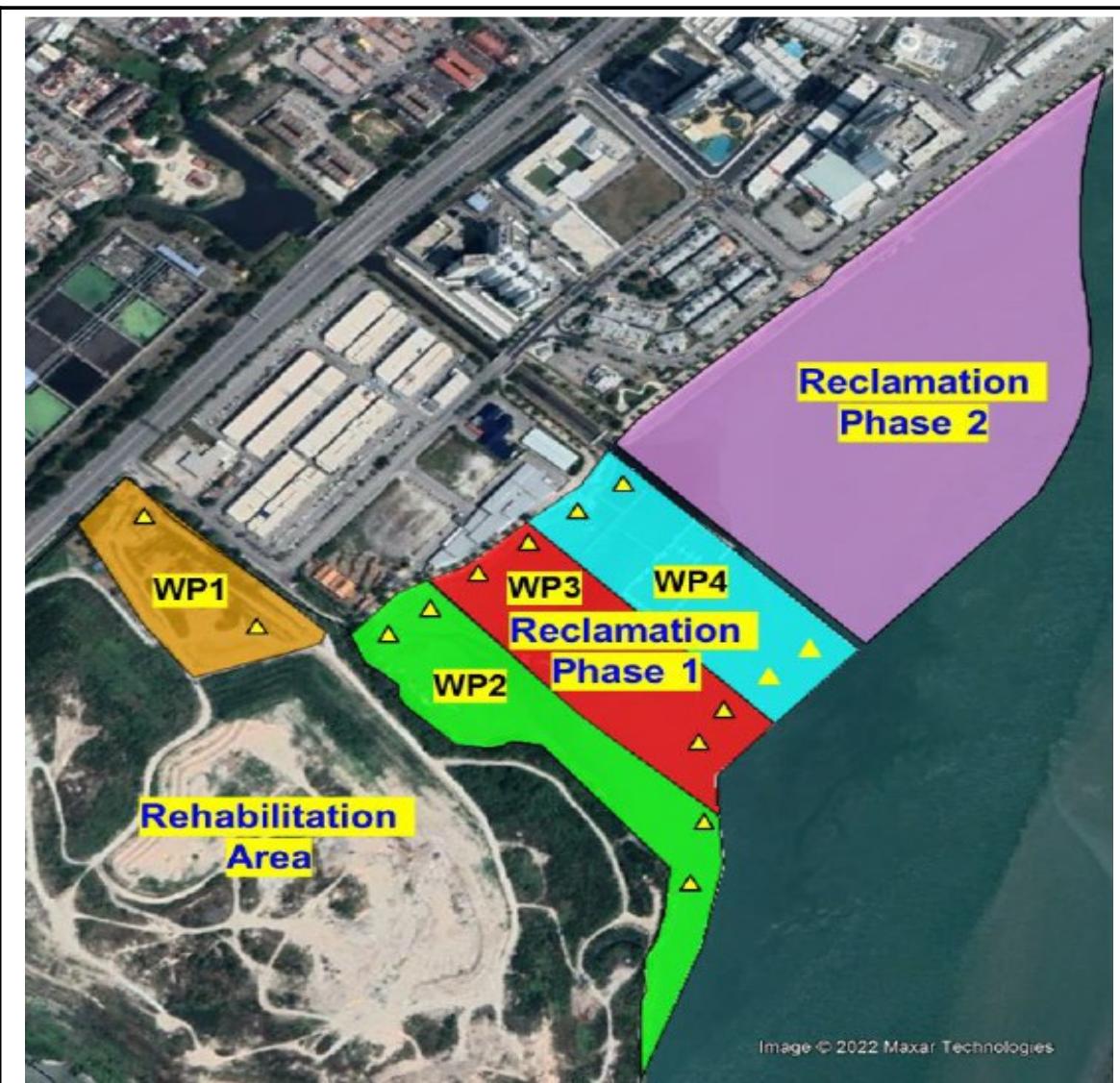


Image © 2022 Maxar Technologies

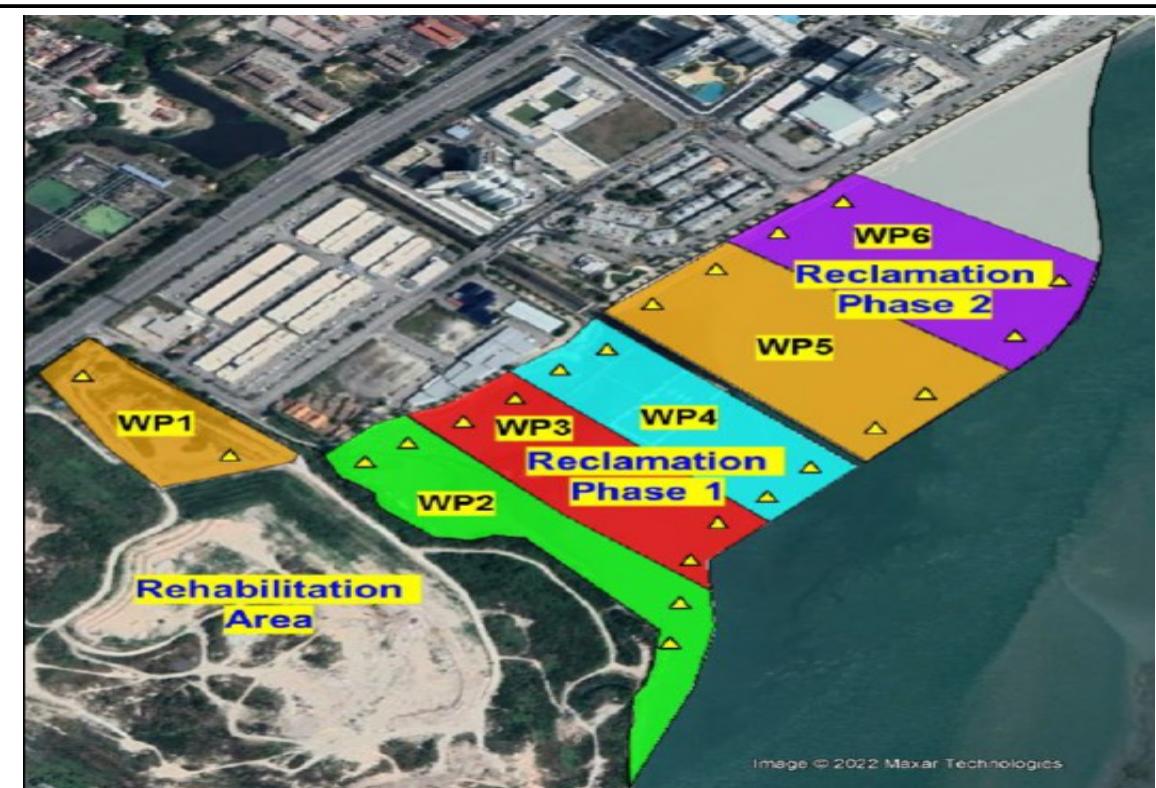
- a) Excavation at Rehabilitation Area via excavators and transport the material to WP1 & WP2 via lorries.
- b) Process dumpsite materials at WP1 and WP2 ($2,400 \text{ m}^3/\text{day}$).
- c) PVD installation & surcharge filling for Working Platform 3 (WP3).
- d) Setting out 4 recycling machines at ▲ WP3:
 - WP1 = 2 Nos
 - WP2 = 4 Nos
 - WP3 = 4 NosTotal = $10 \times 400 \text{ m}^3/\text{day} = 4,000 \text{ m}^3/\text{day}$ (Suitable materials)
Excavation at Rehabilitation Area via excavators and transport the material to WP1, WP2 & WP3 via lorries.
- e) Reclamation Phase 2
 - Construction of perimeter bund.
 - Lay rock mattress at slope of perimeter bund.
 - Sand filling up to 0.5 m above mean high water spring (MHWS).

Figure 5.24 Rehabilitation & Reclamation Phase For Year 1-2 (Continue)



- a) Excavation at Rehabilitation Area via excavators and transport the material to WP1, WP2 & WP3 via lorries.
- b) Process Dumpsite Materials at WP1, WP2 and WP3 ($4,000 \text{ m}^3/\text{day}$).
- c) PVD installation & surcharge filling for Working Platform 4 (WP4).
- d) Setting out 4 recycling machines at ▲WP4:
 - WP1 = 2 Nos
 - WP2 = 4 Nos
 - WP3 = 4 Nos
 - WP4 = 4 Nos
 Total = $14 \times 400 \text{ m}^3/\text{day} = 5,600 \text{ m}^3/\text{day}$ (Suitable materials)
- e) Excavation at Rehabilitation Area via excavators and transport the material to WP1, WP2, WP3 & WP4 via lorries.

Figure 5.25 Rehabilitation & Reclamation Phase For Year 2-3



- a) Excavation at Rehabilitation Area via excavators and transport the material to WP1, WP2, WP3 & WP4 via lorries.
- b) Process dumpsite materials ($5,600 \text{ m}^3/\text{day}$).
- c) Installation of PVD & surcharge filling for Working Platform 5 (WP5).
- d) Setting out 4 recycling machines each at \triangle WP5:
 - WP1 = 2 Nos
 - WP2 = 4 Nos
 - WP3 = 4 Nos
 - WP4 = 4 Nos
 - WP5 = 4 Nos

Total = $18 \times 400 \text{ m}^3/\text{day} = 7,200 \text{ m}^3/\text{day}$ (Suitable materials)
- e) Excavation at Rehabilitation Area via excavators and transport the material to WP1, WP2, WP3, WP4 & WP5 via lorries.
- f) Installation of PVD & surcharge filling for Working Platform 6 (WP6).
- g) Setting out 4 recycling machines at \triangle WP6 (2 nos moved from WP1 to WP6):
 - WP1 = 0 Nos
 - WP2 = 4 Nos
 - WP3 = 4 Nos
 - WP4 = 4 Nos
 - WP5 = 4 Nos
 - WP6 = 4 Nos

Total = $20 \times 400 \text{ m}^3/\text{day} = 8,000 \text{ m}^3/\text{day}$ (Suitable materials)
- h) Excavation at Rehabilitation Area via excavators and transport the material to WP1, WP2, WP3, WP4, WP5 & WP6 via lorries.

Figure 5.26 Rehabilitation & Reclamation Phase For Year 2-3 (Continue)



- a) Excavation at Rehabilitation Area via excavators and transport the material to WP1, WP2, WP3, WP4, WP5 & WP6 via lorries.
- b) Process dumpsite materials ($8,000 \text{ m}^3/\text{day}$).
- c) Surcharge filling for Working Platform 7 (WP7).
- d) Continue to process dumpsite materials until level +3.35 mNGVD.
- e) 1 m capping filling at rehabilitation area to level +4.35 mNGVD using processed materials.
- f) Install Instrumentation and carry out monitoring (settlement, lateral creep and slope stability)

Figure 5.27 Rehabilitation & Reclamation Phase For Year 3-4

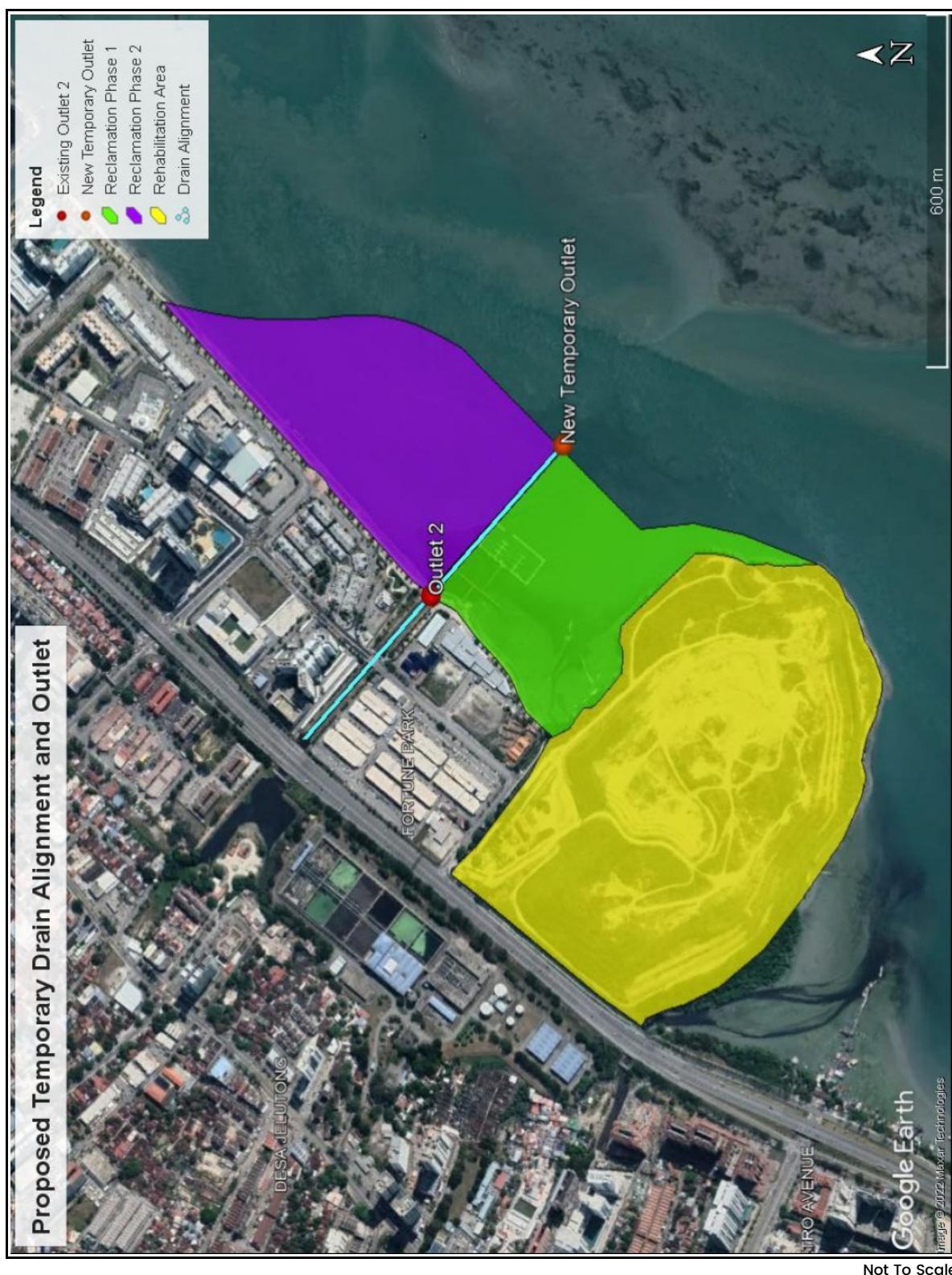


Figure 5.28 Proposed Temporary Drainage Alignment And Temporary Outlet During The Construction Phase

- Major roads and drainage;
- Man holes and pumping station for sewage connection;
- TNB's substations; and
- PBA's water storage reservoir.

The above activities are under the purview of PLB Engineering Berhad which shall be constructed and completed prior to other construction works on the reclaimed land. The scope of works in the development of infrastructure for the Proposed Project especially for the reclaimed land include the following:-

(a) Drainage

The main drainage system is already in place located adjacent to the site. Main drains within a developed or highly urbanized area are normally designed as lined channels to permit better hydraulic conveyance capacities within a limited reserve width. These are either of the form of pre-fabricated pre-cast 'U' or 'L' sections or as rubber-lined trapezoidal drains.

Thus, in line with the local authority's requirements, the internal drainage for the site will be given adequate attention. For this purposes, an internal drainage system will be provided taking into consideration of the need to cater for the stormwater discharges of the area so that the stormwaters after development will be maintained in its status quo. The design of the drains and adequacy will be based on the Guidelines in the Urban Stormwater Management Manual for Malaysia (Manual Saliran Mesra Alam Malaysia) issued by JPS (Department of Irrigation and Drainage).

(b) Sewage

Sewage generated from the Proposed Project will be channeled to the proposed manholes to be laid on the reclaimed land for connection to the new pump house which will channel sewage to the RSTP (Regional Sewage Treatment Plant) (IWK Asset No: PEG 227) operated by IWK with IWK's approval.

For this purpose, the design and engineering plans for the sewage reticulation network of the Proposed Project shall be submitted to IWK for approval prior to the construction of the Proposed Project.

(c) Water Supply

The water supply source for the Proposed Project will be obtained from the PBA water mains already available in the area. To ensure least disruption to supply, storage facilities would be provided for the Proposed Project meeting PBA's requirements.

The activities associated with the construction of water mains would similarly involve trenching, pipe bedding, laying and jointing of pipes as well as installation of the required valves, hydrants and associated appurtenances. Water storage tanks, on the other hand, will be integrated in the building and tank structures.

(d) Electrical Supply

Electrical supply and telecommunications are integral to the development. Electrical supply systems will be provided to meet the TNB (Tenaga Nasional Berhad) specifications, which will amongst others, include sub-stations, feeder pillars and cable ducts. Cables would also be laid along road shoulders with manholes provided at the required intervals for ease of inspection and maintenance. Cables are also planned to be on the opposite side of the road where water pipes are laid.

Similarly, as for the other line utilities described above, trenching and cable/duct laying would represent the major activities involved in the distribution whilst heavier forms of construction would prevail where main intake and sub-stations is concerned.

(ii) Construction Of Individual Land Parcel

The responsibility for the construction of the individual land parcels will rest on the land owner for the private land or the Government for the land that will be surrendered to the state. Thus the following are the requirements that will have to be adhered to for the individual land parcels to be developed:-

- A planning permission is to be obtained from JPBD or MBPP for each of the parcel to be developed on the reclaimed land;
- A separate EIA study is to be submitted to the DOE to meet the requirements under Section 34A, Environmental Quality Act 1974 for activities under the First Schedule, Activity 12(a) for the construction of any building or facilities with 80 rooms or more in coastal area. (Note: According to the DOE's guidelines coastal area is defined as the area within 200 m from the new coastline); and
- All other technical requirements such as the Geotechnical Report, Traffic Report and Erosion and Sediment Control Plan and others shall be submitted to the relevant authorities.

Nonetheless construction on the reclaimed land will proceed for each parcel or plot of development upon the approval of the planning permission, EIA report; including EMP and all plans and engineering designs by the relevant authorities and tenders have been awarded. The construction stage is normally the stage that exhibits significant environmental impacts.

The principal activities most likely to create environmental impacts for each development parcel are discussed below:-

(a) Mobilization And Temporary Occupation

Once all approval is obtained to develop the parcels or plots identified, the development of the intended parcel will be mobilized. Workers will be employed for the various activities required at site involving earthworks construction of the structures required for the various plots, equipment with the necessary.

Delivery of building materials for construction purposes will be over a longer duration commensurate with the inherently longer period required for building construction, generally over two to three years upon possession of building sites for construction purposes.

In any event, some form of traffic management will be necessary such as limiting the movement of vehicles during peak periods (i.e. during morning hours and lunch break) to ensure smooth traffic movement in the area.

Construction camps, if required will be set up on-site to house the construction workers whilst site offices are mainly intended for site supervisory personnel. The construction camps are generally wooden structures or cabin site offices are normally in the form of transportable cabins. The location of the construction camps will be according to the site formation outlined in the commencement of work which shall be issued to MBPP and DOE.

Water supply and sanitation facilities will be provided for the construction camps and site offices. The numbers of toilets to be provided, and the treatment facilities will be according to the IWK's requirements. Electrical supply will be tapped from the mains as electricity lines are already available in the area.

Official labor hire processes will be adhered to in order to eliminate any possibility of illegal workers on site if foreign labor is required. Safety measures and regulations in accordance to the DOSH (Department of Occupational Safety and Health) procedures will also form part of the Contractors' obligations.

Environmental impacts associated with worker's transit camps and site offices will be from the following activities:-

- Generation of sewage and sullage waters;
- Generation of solid wastes; and
- Public health and safety.

(b) Earthworks

Depending on the structures to be constructed at site for each plot, some earthworks will be required for the foundation system to be installed which is dependent on the geotechnical and civil & structural requirements.

It may be noteworthy to describe some of the environmentally pertinent aspects, which will be adopted when planning and designing the construction requirements for the project. Given the flat area at site, erosion and siltation from earthwork activities however is not very significant in the construction stage. Also LD-P2M2 and ESCP (Erosion and Sediment Control Plan) shall be in place to cater for erosion and sediment control.

Therefore, site planning would be consciously pursued in order to significantly reduce the nuisance and disturbance related with construction of the Proposed Project as a result of the site clearing and earthwork activities.

(c) Construction Of Buildings And Structures

Building construction will proceed upon approval of the building plans. The site will be handed over to building contractors. Construction works will involve construction of the building blocks and related infrastructure. For the reclaimed land, building construction will only proceed once the reclaimed land is settled and the necessary building approvals obtained.

Principal construction activities would comprise import to site of construction materials such as wooden form work, cement, sand and aggregate.

Depending on the soil conditions at site and the total and differential settlements allowed the foundation system to be adopted for the buildings will be determined by the Consulting Engineers.

Thus engineering consideration will therefore be focus on the structures to be made available at site.

Principal construction activities would comprise import to site of construction materials such as cement, sand, aggregate, wood and others. Delivery of the building material for construction purposes will be over a longer duration commensurate with the inherently longer period required for building construction.

Construction camps will be set up on site to house the construction works whilst site offices are mainly intended for site supervisory personnel.

The construction camps are generally cabin and/or wooden structures whilst site offices are normally in the form of transportable cabins.



Water supply and sanitation facilities will be provided for the construction camps and site offices. The numbers of toilets to be provided and the sewage treatment facilities will be according to the Health authorities and IWK's requirements. Electrical supply will be tapped from the mains as electricity lines are already available in the area.

Official labor hire processes will be adhered to in order to eliminate any possibility of illegal works on site if foreign labor is required. Safety measures and regulations in accordance to the DOSH (Department of Occupational Safety and Health) procedures will also form part of the contractors obligations.

Once the structures are completely constructed, the roads will be graded and landscaping of the area will commence according to the landscaping plan planned for the area.

D. Operational Stage

The operational stage involves activities from the occupancy of the various plots for development. Environmental implications from such activities include the following:-

- Increase in surface runoff of urban stormwaters;
- Generation of sewage;
- Generation of solid waste; and
- Increase in traffic.

(i) Urban Stormwaters

Urban stormwaters will be generated from the new landmass. Thus any changes in the hydrology regime will have to be catered for with the design of the internal drainage system.

(ii) Domestic Wastewater

Wastewater generated from the Proposed Project will be domestic in nature. Sewage will be connected to the RSTP (Regional Sewage Treatment Plant) already operational in the area in Jelutong which shall conform to the requirements of IWK.

(iii) Solid Waste

Domestic waste will be generated when the Proposed Project is developed. For this purpose a central refuse collection center will be provided for the condominium and commercial blocks as per MBPP's requirements.

Collection of solid wastes shall be done according to the schedules outlined by the service provider. The frequencies of collection shall be adequate in mitigating against possible adverse environmental impacts arising from the accumulation of solid wastes on the premises which would encourage proliferation by scavengers and disease vectors, odor problems as well as generation of leachate that could subsequently pollute the river and the sea. However, during peak periods, it is recommended that the frequency for the collection of solid wastes be increased accordingly. For this purpose a central refuse collection area will be provided to cater for the collection and disposal of solid wastes from the condominium blocks and commercial blocks. Solid wastes will be disposed off site according to MBPP's requirements.

(iv) Traffic And Roads

In order to cater for the traffic generated at site external roads are already in place design to meet MBPP's and JKR's requirements for the surrounding areas. The access arrangements for the Proposed Project and upgrading/modification of the existing junctions in the area will be conducted as proposed by the traffic consultants to cater for a good level of service in the area.

5.6

Comparison With Existing Project In Malaysia

The rehabilitation works to be conducted for the Jelutong Landfill is first of its kind in the country as the Jelutong Landfill site after rehabilitation will be developed due to its specific need. Land reclamation is quite common in Penang. Various land reclamation sites have been approved and presently developed or has been developed. The first reclamation area in Penang is the current Prai Industrial Park reclaimed in the early 1970's and subsequently the Bayan Lepas Industrial Park is also built on reclaimed land. Other reclaimed land in Penang includes IJM land in the north channel and Seri Tanjung Pinang further north near Tanjung Tokong, Mutiara Metropolis Sdn. Bhd. reclamation at Penang World City, Ideal Gim Sdn. Bhd. reclamation and construction activities in the south channel. Thus Penang has wide experiences related to reclamation activities and construction on reclaimed land.