

Part 2 – Employer’s Requirements, Section VI

**1 SCOPE OF WORKS (SOW)**

The purpose of this document is to provide the Scope of Works (SOW) for the Contractor for the procurement of the Rolling Stock. A detailed description of the SOW is provided in the Bidding Documents, Part 2 Works Requirements, Section VI Employer’s Requirements which is subdivided into the General Requirements (ERG) and Technical Requirements (ERT). Should there be any discrepancies between the SOW and the ERT, the provisions specified in the ERT shall prevail.

**1.1 General**

The SOW of the Contractor is to provide a Rolling Stock fleet of Thirty (30) 8-car train sets, which comprise of a total of 240 vehicles.

The SOW includes the following:

- 1) Implementation planning for the provision of vehicles;
- 2) Technical design of vehicles;
- 3) Driver’s Cab Mock-Up (including a part of saloon);
- 4) Train Operation Simulator;
- 5) Manufacturing;
- 6) Procurement of materials, components and subsystems;
- 7) Delivery of Rolling Stock and Simulator to the Site;
- 8) Testing and Commissioning of the vehicles;
- 9) Provision for spare parts and special tools for the Rolling Stock maintenance;
- 10) Provision of Rolling Stock Operation and Maintenance (O&M) Manuals;
- 11) Training of personnel;
- 12) Providing “As-Built” documentation for the vehicles;
- 13) Prepare and issue the Asset register as part of the System handover to O&M requirement.
- 14) Providing engineering service during the Defects Notification Period (DNP);  
and
- 15) Providing six (6) couplers and delivering them to the CP106 Contractor.

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**Table B.2: Split Responsibility in Special Tools for Rolling Stock and Depot Equipment**

<b>ITEM</b>	<b>DESCRIPTION</b>	<b>SUPPLY</b>
<b>1</b>	<b>Workshop Facilities</b>	
1.1	Turn table for bogie	CP101
1.2	Lifting jack for car body	CP106
<b>2</b>	<b>Testing Equipment</b>	
2.1	Portable test unit for traction controller (with software)	CP107
2.2	Portable test unit for auxiliary power supply equipment (with software)	CP107
2.3	Portable test unit for air conditioning unit (with software)	CP107
2.4	Portable test unit for brake control unit (with software)	CP107
2.5	Portable test unit for TMS (with software)	CP107
2.6	Test equipment for ACU	CP107
2.7	Test equipment for brake control unit	CP107
2.8	Testing equipment for relays	CP107
2.9	Testing equipment for magnetic valves	CP107
<b>3</b>	<b>Jigs/Test Stands</b>	
3.1	Test stands for bogie	CP107
3.2	Lifting jig for ACU	CP107
3.3	Test stand for ACU	CP107
<b>4</b>	<b>Machining Tools</b>	
4.1	Wheel re-profiling machine	CP106
4.2	Wheel lathe	CP106
<b>5</b>	<b>Tools for Maintenance Work</b>	
5.1	Refrigerant retainer	CP106
5.2	Not used.	-
5.3	Window glass lifting fixture (vacuum)	CP106
5.4	Crimping tool for electric connector (for each equipment <i>if needed</i> )	CP107
5.5	Wrenches	CP106
5.6	Power supply for testing electrical equipment	CP106
5.7	Welding machine	CP106
5.8	Soldering iron	CP106
<b>6</b>	<b>Cleaning Facilities</b>	
6.1	Train washing plant	CP106
6.2	Parts washer	CP106
<b>7</b>	<b>Measuring Tools</b>	
7.1	Digital multi-meter	CP106
7.2	Ohmmeter	CP106
7.3	Wheel diameter measuring equipment	CP107
7.4	Back gauge measuring equipment	CP107
7.5	Wheel profile gauge	CP107
7.6	Coupler head wear gauge	CP107
7.7	Leak detector for refrigerant	CP107
7.8	Tension gauge for measuring upward force of pantograph	CP107
7.9	Vacuum pump for refrigerant	CP106
<b>8</b>	<b>Transportation Equipment</b>	
8.1	Shunting vehicle	CP106
8.2	Truck for transporting air conditioning unit	CP107

## **6 VEHICLE INTERIOR**

### **6.1 General**

The interior of the vehicles shall be aesthetically pleasing, and the arrangement and materials used shall reflect the current best industry practice and standards. All materials used must meet the fire safety requirements of Clause 23.8 - Fire Safety - of this ERT. The interior arrangement shall allow for easy maintenance, and all edges shall be rounded to the extent possible to preclude passengers, train crew and maintenance personnel injury and to facilitate cleaning.

The Contractor shall provide a selection of colored artist’s renderings for review by the Engineer. Using these as a basis, the Contractor shall work with the Engineer to supply a final set, which shall be used for the color and configuration of the interior arrangements of each type of vehicle.

Visible fasteners in the passenger saloon and the driver’s cabs shall be avoided. Fasteners shall be of the tamper-resistant type, manufactured from stainless steel.

The Contractor shall also provide design drawings and passenger seating and flow analysis of a floor plan incorporating the use of longitudinal seats for review by the Engineer.

The train shall be designed to transport all sectors of the population, including children, passengers with luggage, senior citizens, slightly disabled people, blind or deaf people, handicapped persons, including non-ambulatory persons in wheelchairs.

*Fire and smoke detectors shall be installed in each passenger saloon for smoke and fire detection, with auditable and visible alarms displayed in all driver’s cab/s.*

### **6.15 Driver's Cab**

#### **6.15.1 General**

A driver’s cab shall be provided at each end of the train. The driver’s cab shall be equipped with an interior door and two side doors. Each door can be locked inside and outside by a key. The doors shall be manufactured as provided for in Sub-Clause 8.2 - Cab Doors - of this ERT.

*Fire and smoke detectors shall be installed in each driver cab for smoke and fire detection, with auditable and visible alarms displayed in all driver’s cab/s.*

As part of the design process, the Contractor shall manufacture a full sized, fully equipped cab mock-up for evaluating the design.

The driver's cab layout shall be agreed between the Contractor and the Engineer.

The Contractor shall finish the driver's cab in neutral tones to create a pleasant environment without visual distractions and it shall be designed to reduce glare and the effects of sunlight at low angles on screens. Low gloss levels shall be provided in the design of the driver's cab console.

The layout shall comply with the requirements of international standards, including but not limited to:

- 1) MLIT Article 72 Ergonomic principles in the design of work systems;
- 2) ISO 9241 (parts 2, 5 and 11) Ergonomic requirements for office work with visual display terminals (VDTs) or equivalent; and
- 3) JIS Z 8502 Ergonomic principles related to mental workload.

Driver cab shall be designed taking into consideration that some equipment is necessary for each line individually. So, the Contractor shall design the arrangement in the cab from point of view of easing through-operation, expecting some equipment is needed individually, regarding to following equipment at least;

- 1) Signaling systems;
- 2) Radio systems; and
- 3) Train protection radios.

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**APPENDIX H.**

Sample data of run-curve simulation for considering the capacity of Propulsion System (Station data for MMSP)

**Bicutan – East Valenzuela**

Forward			Return		
Station	Distance (m)	Dwell-time(sec)	Station	Distance (m)	Dwell-time(sec)
Bicutan	0	*	East Valenzuela	0	*
FTI	1785	30.00	Quirino Highway	2722	30.00
Senate	5683	30.00	Tandang Sora	4429	30.00
Lawton	7387	30.00	North Ave	6510	30.00
Bonifacio Global City	9616	30.00	Quezon Ave.	7939	30.00
Kalayaan Ave.	10690	30.00	East Ave.	9660	30.00
Ortigas South	12798	30.00	Anonas	11752	30.00
Ortigas North	14078	30.00	Katipunan	13394	30.00
Katipunan	17153	30.00	Ortigas North	16469	30.00
Anonas	18795	30.00	Ortigas South	17749	30.00
East Ave.	20887	30.00	Kalayaan Ave.	19857	30.00
Quezon Ave.	22608	30.00	Bonifacio Global City	20931	30.00
North Ave.	23969	30.00	Lawton	23160	30.00
Tandang Sora	26106	30.00	Senate	24864	30.00
Quirino Highway	27825	30.00	FTI	28762	30.00
East Valenzuela	30547	*	Bicutan	30547	*

**Terminal 3 – East Valenzuela**

Forward			Return		
Station	Distance (m)	Dwell-time(sec)	Station	Distance (m)	Dwell-time(sec)
Terminal 3	0	*	East Valenzuela	0	*
Senate	2291	30.00	Quirino Highway	2722	30.00
Lawton	3995	30.00	Tandang Sora	4429	30.00
Bonifacio Global City	6224	30.00	North Ave	6510	30.00
Kalayaan Ave.	7298	30.00	Quezon Ave.	7939	30.00
Ortigas South	9406	30.00	East Ave.	9660	30.00
Ortigas North	10686	30.00	Anonas	11757	30.00
Katipunan	13761	30.00	Katipunan	13394	30.00
Anonas	15403	30.00	Ortigas North	16469	30.00
East Ave.	17495	30.00	Ortigas South	17749	30.00
Quezon Ave.	19216	30.00	Kalayaan Ave.	19857	30.00
North Ave.	20577	30.00	Bonifacio Global City	20931	30.00
Tandang Sora	22714	30.00	Lawton	23160	30.00
Quirino Highway	24433	30.00	Senate	24864	30.00
East Valenzuela	27155	*	Terminal 3	27155	*

(\*) Turnaround time is 180 sec at terminal station.

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**APPENDIX I.**

Sample data of run-curve simulation for considering the capacity of Propulsion System (Speed limit and Curvature Radius for MMSP)

**East Valenzuela – Bicutan (South direction)**

The speed limit is applied from BTC to ETC.

South Bound Line	TCL(m)	R(m)	Kilometrage	Length(m)	V(km/h)
			BP(extend)		
			Straight section	-2km857m.0000	
			Straight section	-2km769m.1100	
Scissors Turnout			BP	-2km594m.0030	
			EP	-2km506m.2240	
IP.01S		45	BTC	-2km483m.7770	80
			BCC	-2km438m.8510	
		45	ECC	-2km289m.6670	
			ETC	-2km244m.7400	
			Straight section		
Turnout 10# 11B			BP	-2km209m.6143	
			EP	-2km141m.3371	
			Straight section		
IP.02S		75	BTC	-1km855m.5580	80
			BCC	-1km780m.7740	
		75	ECC	-1km702m.6280	
			ETC	-1km628m.0790	
			Straight section		
IP.02-1S		30	BTC	-1km573m.9620	80
			BCC	-1km543m.9790	
		30	ECC	-1km518m.5700	
			ETC	-1km488m.5700	
			Straight section		
IP.03S		40	BTC	-1km381m.4060	80
			BCC	-1km341m.4070	
		40	ECC	-1km312m.7950	
			ETC	-1km273m.0320	
			Straight section		
IP.04S		60	BTC	-0km929m.1060	80
			BCC	-0km869m.3990	
		60	ECC	-0km767m.7130	
			ETC	-0km708m.0050	
			Straight section		
IP.05S		55	BTC	-0km530m.5950	80
			BCC	-0km475m.3990	
		55	ECC	-0km367m.4700	
			ETC	-0km312m.1780	
(Quirino Highway Sta.)			Straight section		
IP.06S		90	PRT	0km273m.6280	75
			BCC	0km364m.4650	
		90	ECC	0km595m.5930	
			ETC	0km686m.3650	
			Straight section		
IP.07S		80	BTC	2km269m.2160	80
			BCC	2km148m.6770	
		80	ECC	2km456m.5000	
			ETC	2km535m.9740	
			Straight section		
IP.08S		90	BTC	2km648m.1660	80
			BCC	2km738m.7660	
		90	ECC	2km792m.7480	
			ETC	2km883m.3480	
			Straight section		
IP.09S		40	BTC	2km915m.9930	80
			BCC	2km956m.1020	
		40	ECC	3km050m.6510	
			ETC	3km090m.7600	
			Straight section		
IP.10S		90	BTC	3km174m.6540	75
			BCC	3km265m.4430	
		90	ECC	3km403m.7500	
			ETC	3km494m.2100	
			Straight section		
Turnout North A 10#			BP	3km609m.0320	
			EP	3km724m.2600	
			Straight section		

-2k722m East Valenzuela station, 0k000m (Quirino Highway Sta.)

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	BP	Straight section			
IP.08S	BTC	50	3km904m713		
	BCC		3km954m896		
			500		60
	ECC	50	4km017m472		
	PRT		4km068m831		
		Straight section			
IP.09S	PRT	50	4km068m831		
	BCC		4km118m817		
			500		60
	ECC	50	4km188m882		
	ETC		4km237m837		
		Straight section			
IP.10S	BTC	90	4km569m201		
	BCC		4km659m208		
			260		60
	ECC	90	4km819m493		
	ETC		4km909m148		
		Straight section			
IP.11S	BTC	50	4km929m203		
	BCC		4km979m418		
			500		60
	ECC	50	5km016m859		
	ETC		5km066m846		
Br		Straight section			
IP.12S			5km335m000		
			5km273m061		
	BTC	55	5km288m061		
	BCC		5km343m054		
			800		80
ECC	55	5km375m163			
PRT		5km430m134			
		Straight section			
IP.13S	PRT	55	5km430m134		
	BCC		5km485m134		
			800		80
	ECC	55	5km517m317		
	ETC		5km572m317		
		Straight section			
IP.14S	BTC	90	5km833m109		
	BCC		5km923m048		
			500		80
	ECC	90	6km214m887		
	ETC		6km304m378		
		Straight section			
IP.15S	BTC	40	7km121m725		
	BCC		7km161m629		
			1200		80
	ECC	40	7km201m477		
	ETC		7km241m402		
		Straight section			
IP.16S	BTC	90	7km500m537		
	BCC		7km591m206		
			450		80
	ECC	90	7km826m469		
	ETC		7km917m491		
		Straight section			
IP.17S	BTC	90	9km225m871		
	BCC		9km316m788		
			500		80
	ECC	90	9km458m320		
	ETC		9km548m304		

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			length (TCL)	R (m)		length (m)	velocity (km/h)	
		BP	straight		10k672m			Katipunan St
		Brm			10k900m			
					10k836m			
		BTC	90		10k961m			
		BCC			11k052m			
	IP. 17S			500			80	
		ECC	90		11k142m			
		ETC			11k233m			
			straight					
		BTC	90		11k402m			
		BCC			11k494m			
	IP. 18S			500			80	
		ECC	90		11k525m			
		ETC			11k616m			
			straight					
		BTC	90		11k660m			
		BCC			11k750m			
	IP. 19S			500			80	
		ECC	90		11k945m			
		ETC			12k035m			
			straight					
		BTC	90		12k234m			
		BCC			12k324m			
	IP. 20S			500			80	
		ECC	90		12k759m			
		ETC			12k850m			
			straight					
		BTC	90		13k270m			
		BCC			13k360m			
	IP. 21S			320			65	
		ECC	90		13k524m			
		ETC			13k612m			
			straight					Ortigas north
		BTC	50		14k037m			
		BCC			14k088m			
	IP. 22S			500			80	
		ECC	50		14k126m			
		ETC			14k176m			
			straight					
		BTC	50		14k201m			
		BCC			14k251m			
	IP. 23S			500			80	
		ECC	50		14k288m			
		ETC			14k338m			



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			straight					
		BTC	80		14k600m			
		BCC			14k681m			
	IP. 24S			300			65	
		ECC	80		14k811m			
		ETC			14k892m			
			straight					Ortigas south
		BTC	90		15k171m			
		BCC			15k260m			
	IP. 25S			300			65	
		ECC	90		15k397m			
		ETC			15k486m			
			straight					
		BTC	90		15k514m			
		BCC			15k605m			
	IP. 26S			400			75	
		ECC	90		15k668m			
		ETC			15k758m			
			straight					Kalayaan
		BTC	90		17k384m			
		BCC			17k474m			
	IP. 29S			260			60	
		ECC	90		17k572m			
		ETC			17k660m			
			straight					
		BTC	90		17k660m			
		BCC			17k753m			
	IP. 30S			260			60	
		ECC	90		17k858m			
		ETC			17k950m			
			straight					BGC
		BTC	90		18k356m			
		BCC			18k445m			
	IP. 32S			270			60	
		ECC	90		18k637m			
		ETC			18k731m			
			straight					
		BTC	90		18k850m			
		BCC			18k939m			
	IP. 33S			400			75	
		ECC	90		19k262m			
		ETC			19k351m			
			straight					
		BTC	60		19k351m			
		BCC			19k411m			
	IP. 34S			700			80	
		ECC	60		19k954m			
		ETC			20k014m			
			straight					Lawton

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		BTC	30		20k639m				
		BCC				20k669m			
	IP. 35S			1400			80		
		ECC	30		20k704m				
		ETC				20k734m			
			straight						
		BTC	15		20k759m				
		BCC				20k774m			
	IP. LE01S			2500			80		
		ECC	15		20k805m				
		ETC				20k820m			
			straight						
		BTC	30		21k247m				
		BCC				21k277m			
	IP. LW01S			1600			80		
		ECC	30		21k304m				
		ETC				21k334m			
			straight						
		BTC	30		21k383m				
		BCC				21k413m			
	IP. LW02S			1600			80		
		ECC	30		21k439m				
		ETC				21k469m			
			straight						
		BTC	30		21k832m				
		BCC				21k862m			
	IP. LW03S			1400			80		
		ECC	30		21k892m				
		ETC				21k922m			
			straight						
		BTC	30		21k922m				
		BCC				21k952m			
	IP. LW04S			1400			80		
		ECC	30		21k982m				
		ETC				22k012m			
			straight						Senate
		BTC	90		22k358m				
		BCC				22k448m			
	IP. 36S			455			80		
		ECC	90		23k270m				
		ETC				23k359m			
			straight						
		BTC	60		23k443m				
		BCC				23k503m			
	IP. 36-1S			700			80		
		ECC	60		23k537m				
		ETC				23k597m			
		EP	straight		24k400m				

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			length (TCL)	R (m)		length (m)	velocity (km/h)		
		BP	straight		24k400m				
		BTC	60		24k681m				
		BCC			24k741m				
	IP. 37S			400			75		
		ECC	60		24k789m				
		ETC			24k848m				
			straight						
		BTC	50		25k060m				
		BCC			25k110m				
	IP. 38S			500			80		
		ECC	50		25k153m				
		ETC			25k203m				
			straight						
		BTC	20		25k288m				
		BCC			25k308m				
	IP. 39S			500			80		
		ECC	20		25k424m				
		ETC			25k444m				
			straight						
		BTC	70		25k640m				
		BCC			25k709m				
	IP. 40S			650			80		
		ECC	70		25k738m				
		ETC			25k807m				
FTI			straight		26k040m				FTI
12#			straight		26k171m				
		BTC	15		26k197m				
		BCC			26k212m				
	IP. 41S			2500			80		
		ECC	15		26k232m				
		ETC			26k247m				
			straight						
		BTC	15		26k267m				
		BCC			26k282m				
	IP. 42S			2500			80		
		ECC	15		26k303m				
		ETC			26k318m				
			straight						
		BTC	30		26k608m				
		BCC			26k638m				
	IP. 43S			1200			80		
		ECC	30		26k658m				
		ETC			26k688m				
			straight						
		BTC	25		26k989m				
		BCC			27k014m				
	IP. 44S			1400			80		
		ECC	25		27k039m				
		ETC			27k064m				
			straight						
		BTC	15		27k544m				
		BCC			27k559m				
	IP. 45S			1500			80		
		ECC	15		27k590m				
		ETC			27k605m				
			straight						
		BTC	25		27k629m				
		BCC			27k654m				
	IP. 46S			1200			80		
		ECC	25		27k675m				
		ETC			27k700m				
Bicutan			straight		27k825m				
		EP	straight		27k935m				

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**Senate – T3**

		straight	0k000m. 000	22k142m. 000			Senate
	BTC	50	0k196m. 943	22k338m. 943			
	BCC		0k246m. 745	22k388m. 745			
IP. T01S		900				80	
	ECC	50	0k275m. 063	22k417m. 063			
	ETC		0k324m. 866	22k466m. 866			
		straight					
	BTC	90	0k346m. 641	22k488m. 641			
	BCC		0k437m. 524	22k579m. 524			
IP. T02S		350				70	
	ECC	90	0k611m. 768	22k753m. 768			
	ETC		0k702m. 704	22k844m. 704			
		straight					
	BTC	90	0k931m. 369	23k073m. 369			
	BCC		1k020m. 471	23k162m. 471			
IP. T03S		480				80	
	ECC		1k789m. 358	23k931m. 358			
	BCC		1k789m. 358	23k931m. 358			
IP. T04S		260				60	
	ECC	90	1k956m. 958	24k098m. 958			
	ETC		2k046m. 153	24k188m. 153			
		straight	2k291m. 559	24k433m. 559			T3 station

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**East Valenzuela – Bicutan (North direction)**

North Bound Line		TCL(m)	R(m)	Kilometrage	Length(m)	V(km/h)
	BP(extend)			Straight section	-2km857m.0000	
	BP CP101			Straight section	-2km769m.1100	
Scissors Turnout	BP				-2km591m.5756	
	EP				-2km503m.7967	
IP.01N	BTC	45			-2km481m.8220	
	BCC				-2km436m.7400	
			650			80
	ECC	45			-2km287m.7620	
ETC				-2km242m.6940		
				Straight section		
Turnout 10# 10B	BP				-2km135m.3371	
	EP				-2km067m.0598	
				Straight section		
IP.02N	BTC	75			-1km872m.4250	
	BCC				-1km797m.3030	
			600			80
	ECC	75			-1km697m.0910	
ETC				-1km621m.9100		
				Straight section		
IP.03N	BTC	40			-1km381m.8240	
	BCC				-1km341m.8250	
			1100			80
	ECC	40			-1km313m.2080	
ETC				-1km273m.1340		
				Straight section		
IP.04N	BTC	60			-0km930m.6710	
	BCC				-0km870m.3870	
			700			80
	ECC	60			-0km766m.7240	
ETC				-0km706m.4410		
				Straight section		
IP.05N	BTC	55			-0km520m.6830	
	BCC				-0km465m.9550	
			800			80
	ECC	55			-0km359m.9350	
ETC				-0km305m.1610		
				Straight section		
<b>(Quirino Highway Sta.)</b>						
IP.06N	PRT	90			0km278m.5560	
	BCC				0km367m.6600	
			400			75
	ECC	90			0km589m.9170	
ETC				0km679m.0490		
				Straight section		
IP.07N	BTC	80			2km265m.0570	
	BCC				2km145m.5570	
			550			80
	ECC	80			2km461m.6000	
ETC				2km542m.0650		
				Straight section		
IP.08N	BTC	90			2km650m.1020	
	BCC				2km739m.4900	
			500			80
	ECC	90			2km792m.0240	
ETC				2km881m.4120		
				Straight section		
IP.09N	BTC	40			2km916m.7420	
	BCC				2km956m.6290	
			1200			80
	ECC	40			3km050m.1240	
ETC				3km090m.0110		
				Straight section		
IP.10N	BTC	90			3km169m.8080	
	BCC				3km259m.1250	
			400			75
	ECC	90			3km393m.5130	
ETC				3km482m.9270		
				Straight section		

-2k722m East Valenzuela station, 0k000m (Quirino Highway Sta.)

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North Bound Line		TCL(m)	R(m)	Kilometrage	Length(m)	V(km/h)
IP.08N	BP	Straight section				
	BTC	60		3km960m270		
	BCC			4km021m150		
			700			80
	ECC	60		4km089m977		
ETC	4km149m966					
		Straight section				
IP.09N	BTC	55		4km176m686		
	BCC			4km231m685		
			800			80
	ECC	55		4km340m296		
	ETC			4km395m289		
		Straight section				
IP.10N	BTC	90		4km569m201		
	BCC			4km659m208		
			260			60
	ECC	90		4km819m493		
	ETC			4km909m148		
		Straight section				
IP.11N	BTC	50		4km929m203		
	BCC			4km979m418		
			500			60
	ECC	50		5km016m859		
	ETC			5km066m846		
Br		Straight section		5km335m000		
IP.12N	BTC	55		5km273m061		
	BCC			5km288m061		
			800			80
	ECC	55		5km343m054		
	PRT			5km375m163		
				5km430m134		
IP.13N	PRT	55		5km430m134		
	BCC			5km485m134		
			800			80
	ECC	55		5km517m317		
	ETC			5km572m317		
		Straight section				
IP.14N	BTC	90		5km812m789		
	BCC			5km902m814		
			500			80
	ECC	90		6km199m059		
	ETC			6km289m761		
		Straight section				
IP.15N	BTC	40		7km121m254		
	BCC			7km161m350		
			1200			80
	ECC	40		7km201m759		
	ETC			7km241m833		
		Straight section				
IP.16N	BTC	90		7km508m070		
	BCC			7km596m980		
			450			80
	ECC	90		7km824m981		
	ETC			7km913m928		
		Straight section				
IP.17N	BTC	90		9km226m135		
	BCC			9km315m469		
			500			80
	ECC	90		9km452m070		
	ETC			9km541m620		

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			length (TCL)	R (m)		length (m)	velocity (km/h)	
		BP	straight		10k672m			Katipunan St
		Brm	straight		10k900m			
			straight		10k836m			
		BTC	90		10k952m			
		BCC			11k042m			
	IP. 17N			500			80	
		ECC	90		11k129m			
		ETC			11k219m			
			straight					
		BTC	90		11k404m			
		BCC			11k494m			
	IP. 18N			500			80	
		ECC	90		11k525m			
		ETC			11k614m			
			straight					
		BTC	90		11k657m			
		BCC			11k748m			
	IP. 19N			500			80	
		ECC	90		11k947m			
		ETC			12k038m			
			straight					
		BTC	90		12k244m			
		BCC			12k333m			
	IP. 20N			500			80	
		ECC	90		12k756m			
		ETC			12k846m			
			straight					
		BTC	90		13k264m			
		BCC			13k357m			
	IP. 21N			320			65	
		ECC	90		13k527m			
		ETC			13k617m			
			straight					Ortigas north
		BTC	50		14k038m			
		BCC			14k088m			
	IP. 22N			500			80	
		ECC	50		14k125m			
		ETC			14k175m			
			straight					
		BTC	50		14k200m			
		BCC			14k251m			
	IP. 23N			500			80	
		ECC	50		14k289m			
		ETC			14k339m			

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			straight					
		BTC	80		14k605m			
		BCC			14k684m			
	IP. 24N			300			65	
		ECC	80		14k808m			
		ETC			14k887m			
			straight					Ortigas south
		BTC	90		15k165m			
		BCC			15k257m			
	IP. 25N			300			65	
		ECC	90		15k400m			
		ETC			15k491m			
			straight					
		BTC	90		15k516m			
		BCC			15k606m			
	IP. 26N			400			75	
		ECC	90		15k666m			
		ETC			15k755m			
			straight					
		BTC	55		16k643m			
		BCC			16k698m			
	IP. 27N			800			80	
		ECC	55		16k723m			
		ETC			16k778m			
			straight					
		BTC	55		16k778m			
		BCC			16k833m			
	IP. 28N			800			80	
		ECC	55		16k857m			
		ETC			16k912m			
			straight					Kalayaan
		BTC	90		17k384m			
		BCC			17k474m			
	IP. 29N			260			60	
		ECC	90		17k580m			
		ETC			17k669m			
			straight					
		BTC	90		17k669m			
		BCC			17k761m			
	IP. 30N			260			60	
		ECC	90		17k871m			
		ETC			17k960m			
			straight					BGC
		BTC	90		18k361m			
		BCC			18k450m			
	IP. 32N			270			60	
		ECC	90		18k632m			
		ETC			18k722m			
			straight					



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		BTC	90		18k842m			
		BCC			18k933m			
	IP. 33N			400			75	
		ECC	90		19k267m			
		ETC			19k358m			
			straight					
		BTC	60		19k358m			
		BCC			19k418m			
	IP. 34N			700			80	
		ECC	60		19k949m			
		ETC			20k009m			
			straight		20k639m			Lawton
		BTC	30					
		BCC			20k669m			
	IP. 35N			1400			80	
		ECC	30		20k704m			
		ETC			20k734m			
			straight					
		BTC	15		20k862m			
		BCC			20k877m			
	IP. LE01N			2500			80	
		ECC	15		20k908m			
		ETC			20k923m			
			straight					
		BTC	30		21k247m			
		BCC			21k277m			
	IP. LW01N			1600			80	
		ECC	30		21k304m			
		ETC			21k334m			
			straight					
		BTC	30		21k383m			
		BCC			21k413m			
	IP. LW02N			1600			80	
		ECC	30		21k439m			
		ETC			21k469m			
			straight					
		BTC	30		21k832m			
		BCC			21k862m			
	IP. LW03N			1400			80	
		ECC	30		21k892m			
		ETC			21k922m			
			straight					
		BTC	30		21k922m			
		BCC			21k952m			
	IP. LW04N			1400			80	
		ECC	30		21k982m			
		ETC			22k012m			
			straight					Senate
		BTC	90		22k351m			
		BCC			22k441m			
	IP. 36N			445			80	
		ECC	90		23k275m			
		ETC			23k364m			
			straight					
		BTC	60		23k434m			
		BCC			23k493m			
	IP. 36-1N			700			80	
		ECC	60		23k528m			
		ETC			23k588m			
		EP	straight		24k400m			

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			length (TCL)	R (m)		length (m)	velocity (km/h)	
		BP	straight		24k400m			
		BTC	60		24k703m			
		BCC			24k763m			
	IP. 37N			400			75	
		ECC	60		24k810m			
		ETC			24k870m			
			straight					
		BTC	50		25k035m			
		BCC			25k085m			
	IP. 38N			500			80	
		ECC	50		25k119m			
		ETC			25k169m			
			straight					
		BTC	10		25k318m			
		BCC			25k328m			
	IP. 39N			400			75	
		ECC	10		25k402m			
		ETC			25k412m			
			straight					
		BTC	70		25k646m			
		BCC			25k716m			
	IP. 40N			650			80	
		ECC	70		25k744m			
		ETC			25k814m			
FT1			straight		26k040m			FT1
12#		P	straight		26k171m			
		BTC	15		26k197m			
		BCC			26k212m			
	IP. 41N			2500			80	
		ECC	15		26k232m			
		ETC			26k247m			
			straight					
		BTC	15		26k267m			
		BCC			26k282m			
	IP. 42N			2500			80	
		ECC	15		26k303m			
		ETC			26k318m			
			straight					
		BTC	30		26k606m			
		BCC			26k636m			
	IP. 43N			1200			80	
		ECC	30		26k656m			
		ETC			26k686m			

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			straight					
		BTC	40		26k738m			
		BCC			26k778m			
	IP. 43-1N			800			80	
		ECC	40		26k801m			
		ETC			26k841m			
			straight					
		BTC	25		26k972m			
		BCC			26k997m			
	IP. 44N			1400			80	
		ECC	25		27k023m			
		ETC			27k048m			
			straight					
		BTC	15		27k544m			
		BCC			27k559m			
	IP. 45N			1500			80	
		ECC	15		27k590m			
		ETC			27k605m			
			straight					
		BTC	25		27k644m			
		BCC			27k669m			
	IP. 46N			1200			80	
		ECC	25		27k690m			
		ETC			27k715m			
Bicutun			straight		27k825m			
		EP	straight		27k935m			

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**Senate – T3**

		straight		0k000m. 000	22k142m. 000				Senate
	BTC	50		0k196m. 326	22k338m. 326				
	BCC			0k246m. 522	22k388m. 522				
IP. T01N			900				80		
	ECC	50		0k275m. 287	22k417m. 287				
	ETC			0k325m. 483	22k467m. 483				
		straight							
	BTC	90		0k353m. 159	22k495m. 159				
	BCC			0k442m. 179	22k584m. 179				
IP. T02N			350				70		
	ECC	90		0k608m. 935	22k750m. 935				
	ETC			0k697m. 936	22k839m. 936				
		straight							
	BTC	90		0k910m. 796	23k052m. 796				
	BCC			1k001m. 378	23k143m. 378				
IP. T03N			476				80		
	ECC			1k803m. 571	23k945m. 571				
	BCC			1k803m. 571	23k945m. 571				
IP. T04N			260				60		
	ECC	90		1k981m. 892	24k123m. 892				
	ETC			2k072m. 287	24k214m. 287				
		straight		2k291m. 559	24k433m. 559				T3 station

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**APPENDIX J.**

Sample data of run-curve simulation for considering the capacity of Propulsion system  
(Gradient for MMSP)

Point Name	Change Point Kilometrage	Intersection Point Elevation(m)	Gradient (%)	VCR (m)
PIVC-0	-2km857m.0000	124.600		
			0.00	
BVC	-2km036m.8071			
PIVC-2	-1km985m.8071	124.600		3000
EVC	-1km934m.8071		-34.00	
BVC	-1km156m.2083			
PIVC-3	-1km100m.2083	94.490		3000
EVC	-1km044m.2083		3.00	
BVC	-0km685m.0000			
PIVC-4	-0km640m.0000	95.872		3000
EVC	-0km595m.0000		33.00	
BVC	-0km243m.9883			
PIVC-5	-0km193m.9883	110.590		3000
EVC	-0km143m.9883		0.00	
BVC	0km000m.0000			
PIVC-6	0km000m.0000	110.590		0
EVC	0km000m.0000		0.00	
BVC	0km137m.0000			
PIVC-7	0km140m.0000	110.590		3000
EVC	0km143m.0000		2.00	
BVC	0km908m.0000			
PIVC-8	0km916m.0000	112.142		3000
EVC	0km924m.0000		-3.00	
BVC	1km535m.0000			
PIVC-9	1km540m.0000	110.270		3000
EVC	1km545m.0000		0.00	
BVC	1km888m.0000			
PIVC-10	1km900m.0000	110.270		3000
EVC	1km912m.0000		-8.00	
BVC	2km571m.0000			
PIVC-11	2km580m.0000	104.830		3000
EVC	2km589m.0000		-2.00	
BVC	2km975m.0000			
PIVC-12	3km004m.0000	103.982		3000
EVC	3km033m.0000		17.00	
BVC	3km518m.4706			
PIVC-13	3km544m.4706	113.170		3000
EVC	3km570m.4706		0.00	
PIVC-14	4km069m.0000	113.170		

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Point Name	Change Point Kilometrage	Intersection Point Elevation(m)	Gradient (%)	VCR (m)
PIVC-1	3,886.000	113.170		
			0.00	
BVC	4,014.000			
PIVC-2	4,062.000	113.170		4000
EVC	4,110.000		-24.00	
BVC	4,398.500			
PIVC-3	4,428.500	104.374		3000
EVC	4,458.500		-4.00	
BVC	5,071.000			
PIVC-4	5,077.000	101.780		3000
EVC	5,083.000		0.00	
Br	5,335.000	101.780		
			0.00	
Br	5,273.061	101.780		
			0.00	
BVC	5,306.000			
PIVC-5	5,312.000	101.780		4000
EVC	5,318.000		3.00	
BVC	6,020.000			
PIVC-6	6,060.000	104.024		4000
EVC	6,100.000		23.00	
BVC	6,720.000			
PIVC-7	6,755.000	120.009		3000
EVC	6,790.000		0.00	
BVC	7,088.000			
PIVC-8	7,093.000	120.009		3000
EVC	7,098.000		3.00	
BVC	7,970.000			
PIVC-9	7,979.000	122.667		3000
EVC	7,988.000		-3.00	
BVC	8,881.000			
PIVC-10	8,886.000	119.946		3000
EVC	8,891.000		0.00	
BVC	9,167.000			
PIVC-11	9,173.000	119.946		3000
EVC	9,179.000		4.00	
BVC				
PIVC-12	9,655.000	121.874		
EVC			5.00	
BVC	10,507.000			
PIVC-13	10,515.000	126.174		3000
EVC	10,523.000		0.00	
PIVC-14	10,810.500	126.174		

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Point Name	Change Point Kilometrage	Intersection Point Elevation (m)	Gradient (%)	VCR (m)
BP	10k672m. 000	126. 168		
			0. 00	
BVC	10k825m. 000			
2	10k849m. 000	126. 168		3000
EVC	10k873m. 000			
Brm	10k900m. 000		-16. 00	
	10k835m. 809			
BVC	11k848m. 500			
3	11k876m. 500	108. 701		4000
EVC	11k904m. 500			
			-2. 00	
BVC	12k260m. 500			
4	12k268m. 500	107. 917		4000
EVC	12k276m. 500			
			2. 00	
BVC	12k926m. 000			
5	12k940m. 000	109. 260		3000
EVC	12k954m. 000			
			11. 00	
BVC	13k528m. 000			
6	13k550m. 000	115. 970		4000
EVC	13k572m. 000			
			0. 00	
BVC	13k992m. 000			
7	13k995m. 000	115. 970		3000
EVC	13k998m. 000			
			2. 00	
BVC	14k497m. 000			
8	14k503m. 000	116. 986		3000
EVC	14k509m. 000			
			-2. 00	
BVC	14k893m. 000			
9	14k896m. 000	116. 200		3000
EVC	14k899m. 000			
			0. 00	
BVC	15k155m. 000			
10	15k219m. 000	116. 200		4000
EVC	15k283m. 000			
			-32. 00	
BVC	15k940m. 800			
11	15k945m. 800	92. 942		3000
EVC	15k950m. 800			

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**METRO MANILA SUBWAY PROJECT PHASE 1**

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			-35.00	
BVC	16k222m.400			
12	16k272m.400	81.511		3000
EVC	16k322m.400			
			-2.00	
BVC	16k392m.000			
13	16k446m.000	81.164		3000
EVC	16k500m.000			
			34.00	
BVC	16k515m.700			
14	16k563m.700	85.166		3000
EVC	16k611m.700			
			2.00	
BVC	16k756m.300			
15	16k804m.300	85.646		3000
EVC	16k852m.300			
			34.00	
BVC	16k913m.700			
16	16k964m.700	91.100		3000
EVC	17k015m.700			
			0.00	
BVC	17k297m.000			
17	17k300m.000	91.100		3000
EVC	17k303m.000			
			2.00	
BVC	17k310m.000			
18	17k342m.000	91.184		3000
EVC	17k374m.000			
			23.00	
BVC	17k999m.000			
19	18k034m.000	107.100		3000
EVC	18k069m.000			
			0.00	
BVC	18k342m.000			
20	18k348m.000	107.100		3000
EVC	18k354m.000			
			-4.00	
BVC	18k827m.000			
21	18k833m.000	105.160		3000
EVC	18k839m.000			
			-8.00	
BVC	20k266m.000			
22	20k278m.000	93.600		3000
EVC	20k290m.000			
			0.00	
BVC	20k585m.000			
23	20k605m.000	93.600		3000
EVC	20k625m.000			
			-13.00	
BVC	21k078m.000			
24	21k090m.000	87.295		3000



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Part 2 – Employer’s Requirements, Section VI

EVC	21k102m.000			
			-5.00	
BVC	21k961m.000			
25	21k969m.000	82.900		3000
EVC	21k977m.000			
			0.00	
BVC	22k282m.000			
26	22k285m.000	82.900		3000
EVC	22k288m.000			
			2.00	
BVC	23k635m.000			
27	23k655m.000	85.640		3000
EVC	23k675m.000			
			15.00	
EP	24k400m.000	96.815		

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Part 2 – Employer’s Requirements, Section VI

Point Name	Change Point Kilometrage	Intersection Point Elevation (m)	Gradient (%)	VCR (m)
27	23k655m. 000	85. 640		
EVC	23k675m. 000			
			15. 00	
BVC	24k444m. 000			
28	24k459m. 000	97. 700		3000
EVC	24k474m. 000			
			5. 00	
BVC	25k089m. 000			
29	25k099m. 000	100. 900		4000
EVC	25k109m. 000			
			0. 00	
BVC	25k597m. 000			
30	25k615m. 000	100. 900		3000
EVC	25k633m. 000			
			12. 00	
BVC	25k796m. 000			
31	25k820m. 000	103. 364		4000
EVC	25k844m. 000			
FTI	26k040m. 000		0. 00	
BVC	26k144m. 500			
32	26k146m. 000	103. 364		3000
EVC	26k147m. 500			
			-1. 00	
BVC	26k317m. 500			
33	26k370m. 000	103. 140		3000
EVC	26k422m. 500			
			34. 00	
BVC	27k456m. 000			
34	27k507m. 000	141. 800		3000
EVC	27k558m. 000			
Bictun	27k825m. 000		0. 00	
EP	27k935m. 000			

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**Senate-T3**

Senate	0k000m.000	22k142m.000	-24.800	0.00	
BVC	0k190m.000	22k332m.000			
1	0k193m.000	22k335m.000	-24.800		3000
EVC	0k196m.000	22k338m.000			
				2.00	
BVC	0k447m.000	22k589m.000			
2	0k473m.000	22k615m.000	-24.240		4000
EVC	0k499m.000	22k641m.000			
				15.00	
BVC	1k505m.500	23k647m.500			
3	1k525m.500	23k667m.500	-8.453		4000
EVC	1k545m.500	23k687m.500			
				5.00	
BVC	1k880m.000	24k022m.000			
4	1k890m.000	24k032m.000	-6.630		4000
EVC	1k900m.000	24k042m.000			
T3	2k291m.559	24k433m.559		0.00	
BVC	2k666m.000	24k808m.000			

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**East Valenzuela – Bicutan (North Direction)**

Point Name	Change Point Kilometrage	Intersection Point Elevation(m)	Gradient (%)	VCR (m)
PIVC-0	-2km857m.0000	124.600		
			0.00	
BVC	-2km036m.8071			
PIVC-2	-1km985m.8071	124.600		3000
EVC	-1km934m.8071		-34.00	
BVC	-1km156m.2083			
PIVC-3	-1km100m.2083	94.490		3000
EVC	-1km044m.2083		3.00	
BVC	-0km685m.0000			
PIVC-4	-0km640m.0000	95.872		3000
EVC	-0km595m.0000		33.00	
BVC	-0km243m.9883			
PIVC-5	-0km193m.9883	110.590		3000
EVC	-0km143m.9883		0.00	
BVC	0km000m.0000			
PIVC-6	0km000m.0000	110.590		0
EVC	0km000m.0000		0.00	
BVC	0km137m.0000			
PIVC-7	0km140m.0000	110.590		3000
EVC	0km143m.0000		2.00	
BVC	0km908m.0000			
PIVC-8	0km916m.0000	112.142		3000
EVC	0km924m.0000		-3.00	
BVC	1km535m.0000			
PIVC-9	1km540m.0000	110.270		3000
EVC	1km545m.0000		0.00	
BVC	1km888m.0000			
PIVC-10	1km900m.0000	110.270		3000
EVC	1km912m.0000		-8.00	
BVC	2km571m.0000			
PIVC-11	2km580m.0000	104.830		3000
EVC	2km589m.0000		-2.00	
BVC	2km975m.0000			
PIVC-12	3km004m.0000	103.982		3000
EVC	3km033m.0000		17.00	
BVC	3km518m.4706			
PIVC-13	3km544m.4706	113.170		3000
EVC	3km570m.4706		0.00	
PIVC-14	4km080m.0000	113.170		

-2k722m East Valenzuela Station

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Point Name	Change Point Kilometrage	Intersection Point Elevation(m)	Gradient (%)	VCR (m)
PIVC-1	3,886.000	113.170		
			0.00	
BVC	4,028.000			
PIVC-2	4,062.000	113.170		4000
EVC	4,096.000		17.00	
BVC	4,236.000			
PIVC-3	4,260.000	116.536		4000
EVC	4,284.000		5.00	
BVC	4,474.200			
PIVC-4	4,504.200	117.757		3000
EVC	4,534.200		-15.00	
BVC	5,026.000			
PIVC-5	5,056.000	109.480		4000
EVC	5,086.000		0.00	
Br	5,335.000	109.480		
			0.00	
Br	5,273.610	109.480		
			0.00	
BVC	5,284.000			
PIVC-6	5,330.000	109.480		4000
EVC	5,376.000		23.00	
BVC	5,610.000			
PIVC-7	5,640.000	116.610		3000
EVC	5,670.000		3.00	
BVC	6,768.000			
PIVC-8	6,773.000	120.009		3000
EVC	6,778.000		0.00	
BVC	7,088.000			
PIVC-9	7,093.000	120.009		3000
EVC	7,098.000		3.00	
BVC	7,970.000			
PIVC-10	7,979.000	122.667		3000
EVC	7,988.000		-3.00	
BVC	8,881.000			
PIVC-11	8,886.000	119.946		3000
EVC	8,891.000		0.00	
BVC	9,167.000			
PIVC-12	9,173.000	119.946		3000
EVC	9,179.000		4.00	
BVC				
PIVC-13	9,655.000	121.874		
EVC			5.00	
BVC	10,507.000			
PIVC-14	10,515.000	126.174		3000
EVC	10,523.000		0.00	
PIVC-15	10,810.500	126.174		

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**Part 2 – Employer’s Requirements, Section VI**

Point Name	Change Point Kilometrage	Intersection Point Elevation (m)	Gradient (%)	VCR (m)
BP	10k672m. 000	126. 168		
			0. 00	
BVC	10k825m. 000			
2	10k849m. 000	126. 168		3000
EVC	10k873m. 000			
Brm	10k900m. 000		-16. 00	
	10k835m. 809			
BVC	11k848m. 500			
3	11k876m. 500	108. 701		4000
EVC	11k904m. 500			
			-2. 00	
BVC	12k260m. 500			
4	12k268m. 500	107. 917		4000
EVC	12k276m. 500			
			2. 00	
BVC	12k926m. 000			
5	12k940m. 000	109. 260		3000
EVC	12k954m. 000			
			11. 00	
BVC	13k528m. 000			
6	13k550m. 000	115. 970		4000
EVC	13k572m. 000			
			0. 00	
BVC	13k992m. 000			
7	13k995m. 000	115. 970		3000
EVC	13k998m. 000			
			2. 00	
BVC	14k497m. 000			
8	14k503m. 000	116. 986		3000
EVC	14k509m. 000			
			-2. 00	
BVC	14k893m. 000			
9	14k896m. 000	116. 200		3000
EVC	14k899m. 000			
			0. 00	
BVC	15k155m. 000			
10	15k219m. 000	116. 200		4000
EVC	15k283m. 000			
			-32. 00	
BVC	15k940m. 800			
11	15k945m. 800	92. 942		3000
EVC	15k950m. 800			

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			-35.00	
BVC	16k222m.400			
12	16k272m.400	81.511		3000
EVC	16k322m.400			
			-2.00	
BVC	16k392m.000			
13	16k446m.000	81.164		3000
EVC	16k500m.000			
			34.00	
BVC	16k913m.700			
14	16k964m.700	98.800		3000
EVC	17k015m.700			
			0.00	
BVC	17k266m.000			
15	17k314m.000	98.800		3000
EVC	17k362m.000			
			32.00	
BVC	17k495m.000			
16	17k531m.000	105.744		4000
EVC	17k567m.000			
			14.00	
BVC	17k768m.000			
17	17k818m.000	109.762		4000
EVC	17k868m.000			
			-11.00	
BVC	18k043m.000			
18	18k060m.000	107.100		3000
EVC	18k077m.000			
			0.00	
BVC	18k342m.000			
19	18k348m.000	107.100		3000
EVC	18k354m.000			
			-4.00	
BVC	18k827m.000			
20	18k833m.000	105.160		3000
EVC	18k839m.000			
			-8.00	
BVC	20k266m.000			
21	20k278m.000	93.600		3000
EVC	20k290m.000			
			0.00	
BVC	20k585m.000			
22	20k605m.000	93.600		3000
EVC	20k625m.000			
			-13.00	
BVC	21k078m.000			
23	21k090m.000	87.295		3000
EVC	21k102m.000			
			-5.00	
BVC	21k961m.000			
24	21k969m.000	82.900		3000
EVC	21k977m.000			
			0.00	
BVC	22k282m.000			
25	22k285m.000	82.900		3000
EVC	22k288m.000			
			2.00	
BVC	23k635m.000			
26	23k655m.000	85.640		3000
EVC	23k675m.000			
			15.00	
EP	24k400m.000	96.815		

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Point Name	Change Point Kilometrage	Intersection Point Elevation (m)	Gradient (%)	VCR (m)
27	23k655m. 000	85. 640		
EVC	23k675m. 000			
			15. 00	
BVC	24k444m. 000			
28	24k459m. 000	97. 700		3000
EVC	24k474m. 000			
			5. 00	
BVC	25k089m. 000			
29	25k099m. 000	100. 900		4000
EVC	25k109m. 000			
			0. 00	
BVC	25k597m. 000			
30	25k615m. 000	100. 900		3000
EVC	25k633m. 000			
			12. 00	
BVC	25k796m. 000			
31	25k820m. 000	103. 364		4000
EVC	25k844m. 000			
FTI 駅中心	26k040m. 000		0. 00	
BVC	26k144m. 500			
32	26k146m. 000	103. 364		3000
EVC	26k147m. 500			
			-1. 00	
BVC	26k317m. 500			
33	26k370m. 000	103. 140		3000
EVC	26k422m. 500			
			34. 00	
BVC	27k456m. 000			
34	27k507m. 000	141. 800		3000
EVC	27k558m. 000			
Bictun	27k825m. 000		0. 00	
EP (	27k935m. 000			



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**Senate – T3(North direction)**

Senate	0k000m.000	22k142m.000	-24.800	0.00	
BVC	0k190m.000	22k332m.000			
1	0k193m.000	22k335m.000	-24.800		3000
EVC	0k196m.000	22k338m.000			
				2.00	
BVC	0k447m.000	22k589m.000			
2	0k473m.000	22k615m.000	-24.240		4000
EVC	0k499m.000	22k641m.000			
				15.00	
BVC	1k505m.500	23k647m.500			
3	1k525m.500	23k667m.500	-8.453		4000
EVC	1k545m.500	23k687m.500			
				5.00	
BVC	1k880m.000	24k022m.000			
4	1k890m.000	24k032m.000	-6.630		4000
EVC	1k900m.000	24k042m.000			
T3	2k291m.559	24k433m.559		0.00	
BVC	2k666m.000	24k808m.000			

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**APPENDIX K**    Not used