EXECUTIVE SUMMARY

INTRODUCTION

1. This Detailed Environmental Impact Assessment (DEIA) report has been prepared for the **Klang Valley Mass Rapid Transit (KVMRT) : Sg. Buloh – Kajang Line.** Hereinafter it will be known as "The Project" or the "SBK Line".

2. The Project involves the construction of a 51-km mass rapid transit line connecting Sg Buloh to Kajang **(Figure ES-1)**. The SBK Line will pass through the KL city centre and be integrated with the existing KTM Komuter, Ampang LRT Line and Kelana Jaya LRT Line. About 9.5 km of the SBK Line will be underground while 41.5 km will be elevated. The SBK Line will have 35 stations and 2 depots.

3. The SBK Line is the first among several lines that will eventually make up the entire KVMRT System. The KVMRT is a key Entry Point Project of the nation's Economic Transformation Programme.

4. The Project Proponent is **Syarikat Prasarana Negara Bhd**, a fully owned subsidiary of Ministry of Finance Incorporated. The Supervising Authority for the Project is **Suruhanjaya Pengangkutan Awam Darat. MMC-Gamuda Joint Venture Sdn Bhd** is the Project Delivery Partner (PDP). The Consultant undertaking the environmental impact assessment is **ERE Consulting Group Sdn Bhd**.

5. The Project is a prescribed activity under Activity 16 of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order of 1987 which stipulates that an Environmental Impact Assessment (EIA) is mandatory for the construction of mass rapid transport projects. The Terms of Reference for the DEIA was approved by the Department of Environment (DOE) on 19th November 2010.

STATEMENT OF NEED

6. The expanding population in KL has led to an urban sprawl which has put a tremendous amount of strain on the city's transportation infrastructure. The major highways and the ring roads around the city are already congested with peak hour travel speed under 10 km/hr. The major road systems which have been constructed, under construction or committed are unlikely to be able to satisfy Kuala Lumpur's needs even to 2020.

7. The main challenge facing the deteriorating urban transportation in the KL metropolitan area is the unsustainable growth in private transport demand. This problem is made worse by the declining public transport modal share from 34% in 1985 to 20% in 1997 and a further drop to 18% in 2009.

8. The population of the Klang Valley is expected to exceed 6 million in 2020. The higher-density areas such as Cheras (estimated density 9,300 persons/km^2) and Damansara (estimated density 6,600 persons/km^2) are currently not served by rail-based systems.

9. Kuala Lumpur's present rail network is only 15 km per 1 million population while most large global cities have over 40 km per 1 million population. In terms of spatial density, KL has a rail density of only 0.05 km/km^2 compared to 0.3 – 0.4 km/km^2 at other major cities in the world **(Figure ES-2)**. KL lags behind major global cities in terms of mass rapid transit.

10. KL's current rail network has only 8 interchange stations which make transfer from one line or mode to another difficult. Without sufficient interchange stations, each line or mode operates as a stand-alone system. The present transportation network offers poor intra-modal and inter-modal integration between the various public transport modes (i.e. lack of good interchange between lines and also bus service).

Public transport targets

11. The KL Local Plan calls for the public transport modal share be increased from the 18% to 40% by 2020. The KVMRT addresses the above problems by substantially expanding the rail network coverage and capacity; providing adequate connectivity between modes and rail lines; and running rail lines through high travel demand areas. In terms of connectivity, the SBK Line will have four interchange stations that would allow passengers to transfer between lines easily.

12. The KVMRT will create an economically efficient urban environment; improve productivity, social equality and quality of life in the Klang Valley. There will be travel time savings, reduction in vehicle operating costs and reduction in accidents (because rail is much safer than road). The reduction in vehicle emissions caused by shift from road to rail will be substantial. Other benefits such as economic growth, job creation and tax revenues to Government would accrue during the construction period.

National Economic Transformation Programme

13. The Economic Transformation Programme (ETP) is a major effort by the Malaysian Government to transform Malaysia into a high-income nation by 2020. There are 12 National Key Economic Areas (NKEAs) at the core of the ETP – the Greater KL/Klang Valley NKEA being one of them.

14. The Greater KL/KV NKEA's vision can be summarised as 20-20 - that is to be a city that simultaneously achieves a top-20 ranking in city economic growth while being among the global top-20 most liveable cities by 2020. The ETP aims to grow the Greater KL's GNI contribution from approximately RM258 billion to RM650 billion per year. Growth in Greater KL/KV economic activities will increase total employment from 2.5 million in 2010 to 4.2 million by 2020.

15. The KVMRT is the main Entry Point Project (EPP) for the Greater Kuala Lumpur initiative. The MRT is integral to the success of the Greater Kuala Lumpur/Klang Valley NKEA, which in turn is a key catalyst for the ETP overall.

PROJECT DESCRIPTION

Planning and Design Basis

16. The over-arching principle in the development of the KVMRT is improved network coverage, better entry into the city centre, siting of stations in densely populated areas and ability to sustain future expansion.

17. The year 2010 travel demand in the KL metropolitan area was about 8 million trips/day and is expected to increase to 10 million trips/day by 2020. With the targeted public transport mode share of 40%, this translates to 4 million trips/day using public transport in year 2020 compared to 1.4 million trips/day in year 2009. The mode share for rail in the Klang Valley is expected to increase 5-fold by 2020, from 400,000 trips/day (year 2009) to 2 million trips/day (year 2020). The SBK Line is expected to have a daily ridership of 442,000 on the opening year.

18. The selection of the SBK alignment was based on a number of factors such as:

(i) Network Planning Principles

- Holistic planning within a network
- Directness of route to city centre
- Balanced network coverage
- Rail line spacing along the corridor
- Efficiency of network scheme
- Journey time
- Modal interchange opportunity

(ii) Land Use

- Catchment distribution related to land uses
- Special generators (e.g. office complex, shopping centres)
- Land development opportunities
- Catchment constraints (e.g. adjacent freeways)
- Land acquisition requirements
- Land uses and changes proposed over time

(iii) Engineering

- Engineering constraints (geometric, clearances, topography)
- Risk associated with tunneling in tight corridors
- Requirement for special construction technique
- Cost implications

(iv) Social and Environmental Impacts

- Social disruption (noise, special land uses such as hospitals, etc)
- Amenity to surrounding area

Key Project Components

19. The key components of the Project are :

- SBK Line
- Stations
- Depots

SBK Line - Segment 1 : Sg Buloh Station to Semantan Station (22 km)

20. The SBK Line starts at the Sg Buloh Station (**Figure ES-3**) adjacent to the existing KTMB Sg Buloh Station. From the Sg Buloh Station, the line traverses southwards along Jalan Sg Buloh – Batu Tiga, passing along Kg Baru Sg Buloh and the Rubber Research Institute Malaysia (RRIM) area where a depot will be built. After the depot, the line traverses along the west side of Jalan Sg Buloh – Batu Tiga until Taman Industri Sg Buloh.

21. After the Taman Industri Sg Buloh Station, the line crosses over Jalan Sg Buloh – Batu Tiga to enter Kota Damansara, passing alongside Taman Sains Selangor. The line will follow Persiaran Surian after the Persiaran Mahogani - Persiaran Surian intersection near Taman Sains Selangor. From this point onwards, the line will run along Persiaran Surian until The Curve. Three stations, namely PJU5, Dataran Sunway and The Curve, will be built along Persiaran Surian.

22. From The Curve Station, the line will travel along the Bandar Utama side of Lebuhraya Damansara – Puchong (LDP) and crosses over to Taman Tun Dr Ismail (TTDI) after Seri Pentas. The SBK Line continues to travel along TTDI into Jalan Damansara. After TTDI, the line will traverse along the Sprint Expressway towards the Pusat Bandar Damansara. Stations will be built at One Utama, TTDI, Section 17, Section 16 and Pusat Bandar Damansara (PBD).

23. From the PBD Station, the line will traverse along the Sprint Expressway towards Jalan Semantan where the Semantan station will be built at the UOA Building. After the Semantan Station, the line will continue to run along Jalan Semantan before turning southeast into Jalan Duta.

SBK Line Segment 2 : Semantan Station to Maluri Station (8.6 km)

24. The underground section starts approximately 1.5 km after the Semantan Station. The line will run below Lebuhraya Mahameru (**Figure ES-4**) until the KL Sentral where a station is proposed. From the KL Sentral Station, the SBK Line will head towards Pasar Seni Station - running parallel to Jalan Tun Sambanthan and traversing below the KTM tracks and Sg Klang.

25. From the Pasar Seni Station, the alignment will run below Jalan Sultan near Jalan Petaling and Jalan Hang Jebat where a station is proposed to serve the Warisan Merdeka Development.

26. From the Merdeka Station, the alignment will head northeast towards Jalan Bukit Bintang. Stations will be built at Bukit Bintang West and Bukit Bintang East to serve the busy commercial district. From Bukit Bintang East Station, the SBK Line will head south-east towards Pasar Rakyat where a station will be built to serve the proposed Kuala Lumpur International Financial District.

27. After Pasar Rakyat, the line will move towards the Cochrane area and Taman Maluri where an interchange station will be built to to facilitate transfer of passengers between the existing Ampang LRT Line and the SBK Line.

SBK Line - Segment 3 : Maluri Station to Kajang Station (20.4 km)

28. After the Maluri Station, the SBK Line will resurface near Jalan Loke Yew and traverse along Jalan Cheras until Leisure Mall (**Figure ES-5**). After the Leisure Mall, the line will go southerly towards Plaza Phoenix and continue to run along the east side of Cheras – Kajang Highway (Besraya Highway) until Taman Cuepacs. Stations have been proposed at Taman Bukit Ria, Taman Bukit Mewah, Leisure Mall, Plaza Phoenix, Taman Suntex and Taman Cuepacs.

29. After Taman Cuepacs, the SBK Line will cross over to the west side of Cheras-Kajang Highway until Taman Koperasi Cuepacs. After Taman Koperasi Cuepacs, the line will head into Kajang town, passing along Taman Delima, Taman Mesra and Kg Batu 13 Kajang. The SBK Line will terminate near the existing Kajang KTMB Komuter Station.

Stations

30. The SBK Line will have 35 stations, 8 of which will be underground (**Table ES-1**). There will be four interchange stations:-

- Sg Buloh Station with existing KTM Komuter Line
- Pasar Seni Station with existing Kelana Jaya LRT Line
- Maluri Station with existing Ampang LRT Line
- Kajang with existing KTM Komuter Line

Table ES-1 : Proposed Stations

No	Station Name	Type	Park & Ride Facilities	Ridership passengers/day
1	Sg Buloh	Elevated	Yes	2,400
2	Kg Baru Sg Buloh	Elevated	No	6,600
3	RRI	Elevated	Yes	9,800
4	Kota Damansara	Elevated	No	9,000
5	Taman Industri Sg Buloh	Elevated	Yes	36,600
6	PJU5	Elevated	No	10,100
7	Dataran Sunway	Elevated	No	12,900
8	Curve	Elevated	No	27,200
9	One Utama	Elevated	No	46,900
10	TTDI	Elevated	No	24,500
11	Section 17	Elevated	Yes	24,500
12	Section 16	Elevated	Yes	8,300
13	Pusat Bandar Damansara	Elevated	No	60,700
14	Semantan	Elevated	No	32,400
15	KL Sentral	Underground	No	22,200
16	Pasar Seni	Underground	No	73,800
17	Merdeka	Underground	No	39,100
18	Bintang Bintang West	Underground	No	37,500
19	Bukit Bintang East	Underground	No	39,600
20	Pasar Rakyat	Underground	No	67,300
21	Cochrane	Underground	No	24,000
22	Maluri	Underground	Yes	28,000
23	Taman Bukit Ria	Elevated	No	36,500
24	Taman Bukit Mewah	Elevated	No	16,000
25	Leisure Mall	Elevated	No	13,800
26	Plaza Phoenix	Elevated	Yes	54,000
27	Taman Suntex	Elevated	Yes	9,900

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Table ES-1 : Proposed Stations

No	Station Name	Type	Park & Ride Facilities	Ridership passengers/day
28	Taman Cuepacs	Elevated	Yes	11,300
29	Bandar Tun Hussein Onn	Elevated	Yes	9,100
30	Balakong	Elevated	No	11,100
31	Taman Koperasi	Elevated	Yes	13,800
32	Taman Mesra	Elevated	No	3,700
33	Saujana Impian	Elevated	Yes	2,500
34	Bandar Kajang	Elevated	Yes	18,200
35	Kajang	Elevated	No	30,200

Depots

31. Depots for the SBK Line will be built at RRIM land at Sg. Buloh and near Kg. Sg. Balak, Kajang. The depots will occupy 41 ha and 25 ha respectively.

Rolling Stock

32. Conventional Electric Multiple Units (EMU) of 21.5m long, 3.1m wide and 3.7m high will be used for the SBK Line. Each EMU have a carrying capacity of about 300 passengers, comprising 48 seated and 252 standing (density 6 persons/m^2). The system will be driverless.

System Operations

33. The SBK Line will operate from 0600 to 2400 hours daily. The peak hour train frequency during the initial year (2016) will be 3.5 minutes (~ 17 trains per hour). This will be increased progressively to 1.8 minutes (~ 33 trains per hour) in 2050 as ridership builds up through the years. The maximum train speed will be about 100 km/hr while the average train speed will be 36 km/hr. The Operation Control Center located at the RRIM depot will be the main control hub.

34. The feeder bus services are currently being planned to ensure adequate access to the stations. Park and ride facilities (see Table ES-1) are currently being planned to ensure sufficient parking facilities for the passengers.

Construction Method

35. Before the construction proper begins, utilities (water and sewer mains, electrical cables, gas pipes, etc) along the SBK Line will be relocated. In some cases, there may be a temporary loss of parking spaces or temporary closure of road lanes.

36. The viaducts will be generally located either in the road median or the side. A pre-stressed segmental concrete box girder superstructure will be used. The elevated viaducts will consist of 35m standard spans depending on location. Pre-cast segments will be launched into position using Elevated Launching Gantry. In certain cases where long spans are required, steel or post tensioned balanced cantilever may be used.

37. Tunnel launch shafts will be constructed at Semantan and Cochrane. Retrieval shafts will be located near the Merdeka Station and Maluri Station. Two types of Tunnel Boring Machines (TBM), Earth Pressure Balance TBM or Mix Shield Slurry TBM will be used depending on the geological conditions. Twin bored tunnels will be constructed to house the pair of tracks. In most areas, the tunnel will be designed to be parallel to each other. In areas where space is limited such as at Bukit Bintang West, Bukit Bintang East and Pasar Rakyat, the tunnels will be vertically stacked.

38. Other elements in the tunnel such as the ventilation system, drainage system, lighting system, air conditioning, communication system and fire fighting system will be installed thereafter. Slurry treatment plants will be located at both launch shafts to treat the slurry material that will be discharged from the tunneling process.

39. The underground stations will be constructed using the "cut and cover" method. Diaphragm wall will be constructed along the perimeter of the station by excavating deep contiguous trenches using the slurry trench method. The station will be constructed either top-down or bottom-up method. Backfilling works will be carried out over the completed top slab and the surface of the soil is reinstated. The bottom-up method is the normal construction sequence for most of the underground station.

40. Site offices will be established near the Cochrane and Semantan lauching shaft areas. Approximately 3400 workers will be involved during construction stage during peak period.

41. The Project is expected to commence in July 2011 after all regulatory approvals are obtained. It is scheduled for completion in December 2016 with a construction period of 54 months.

PROJECT OPTIONS

42. Various project options and design concepts have been formulated and considered in selecting the optimum project design. The options varied according to the physical characteristics and requirements of each route and location. The project options examined include :

- No-Project Option
- Modal Technology Options
- Alignment Options
- Tunnelling vs Elevated Structure Options

No Project Option

43. The no-project option will not enable the KL metropolitan to achieve a 40 : 60 modal split for public transport and its aspirations for efficient public transportation network. Without substantial investments in urban rail, the traffic congestion could continue to rise, causing billions of ringgit in terms of loss of productivity, air pollution, health hazards and worsen the urban sprawl.

Modal Technology Options

44. The Project Proponent has evaluated various modal technology options in planning and designing the Project. The modal options considered include :
    a) Conventional Bus
    b) Bus Rapid Transits
    c) Street Tram
    d) Monorail
    e) Light Rapid Transit
    f) Mass Rapid Transit

45. Convential buses, bus rapid transit, street trams and monorails will not be able to supply sufficient capacity to serve the primary corridors in the medium to long-term. The LRT (like Kelana Jaya Line and Ampang Line) is technically a Mini-metro but does not have the required capacity to meet the expected demand in the Sg. Buloh – Kajang corridor.

46. A MRT system of high capacity with major interchange stations located in high-demand areas and high accessibility to the surrounding development is essential to enable a shift from the current high proportion of private car usage. The MRT system was deemed the most appropriate system to be the backbone of the Klang Valley's public transport system.

47. Numerous alignment options were investigated by the Project Proponent prior to adopting the SBK Line. Four alternative segments within the SBK Line were also examined in terms of geometry and journey speed, cost, constructability social impact and ridership.
    - Segment B1 (Jalan Sg. Buloh – Kota Damansara)
    - Segment B2 (Jalan Duta to Pasar Seni)
    - Segment B3 (Bandar Husssein Onn to Taman Koperasi)
    - Segment B4 (Kg Batu 13 to Kajang)

48. The Project Proponent had also, prior to adopting the SBK Line, considered the Red Line, Green Line and Circle Line. The Red Line was to start at the RRIM and traverse along Kota Damansara, Mutiara Damansara and Bandar Utama, LDP, Sprint Expressway, Jalan Parlimen and finally into the KL's Central Business District. The Green Line was designed to serve the heart of the city and the shopping area of KL's Golden Triangle. The Circle Line was designed to connect key secondary urban centres and between the radial corridors. Element of the Red Line and Green Line have been incorporated into the SBK Line while no decision has been made on the Circle Line.

49. The choice of the final alignment (i.e. Sg. Buloh to Kajang) was made after a review of all the three lines (Red, Green and Circle) and their variants as well as the older proposals made by Syarikat Prasarana in 2006. The review was carried out by an independent consultant appointed by the Government of Malaysia (which also included an environmental appraisal) and was presented to the Cabinet.

50. The Cabinet, on 17 December 2010, agreed in principle to proceed with the Sg. Buloh – Kajang line. Subsequent to that decision, the Sg. Buloh – Kajang alignment was further improved based on a value management study and public feedback.

51. The Project Proponent has considered the advantages and disadvantages of building elevated rail lines *viz* tunnelled lines. The key factors considered were the availability of land, constructability, land acquisition, construction costs and social impacts. Based on these factors, it was decided that the Semantan – Maluri stretch of the SBK Line should be underground.

EXISTING ENVIRONMENT

52. The SBK Line traverses elevations that range from RL 25m to RL 81m. The lowest point is at PJU5 while the highest is at Semantan and Plaza Phoenix. The Depot at RRIM is located rolling terrain with the elevation ranging from 34m to 41m. The terrain at the Taman Koperasi depot is flat, with the elevation ranging from 27 - 28m.

53. The SBK Line runs over several geological formations, namely the Kenny Hills Formation, Kuala Lumpur Limestone, Kajang Formation and Granite **(Figure ES-6)**. The alignment from Sg. Buloh station to Pasar Rakyat station is underlain by Granite and Kenny Hill Formation. The stretch from Kota Damansara to Section 17 is underlain by Granite while Section 16 to Bukit Bintang West is underlain by Kenny Hill Formation. Only short stretch from Bukit Bintang East to Pasar Rakyat is underlain by KL Limestone.

Table ES-2 : Geology Along Sg. Buloh – Pasar Rakyat Station

Station	Geological Formation
Sg. Buloh	Granite
Kg. Baru Sg. Buloh	Kenny Hill
RRI	Kenny Hill
PJU 5	Granite
Dataran Sunway	Granite
Curve	Granite
One Utama	Granite
TTDI	Granite
Section 17	Granite
Section 16	Kenny Hill
Pusat Bandar Damansara	Kenny Hill
Semantan	Kenny Hill
KL Sentral	Kenny Hill
Pasar Seni	Kenny Hill
Merdeka	Kenny Hill
Bukit Bintang West	Kenny Hill
Bukit Bintang East	Kenny Hill – KL Limestone
Pasar Rakyat	KL Limestone
Cochrane	KL Limestone
Maluri	KL Limestone
Taman Bukit Ria	Granite
Taman Bukit Mewah	Granite
Leisure Mall	Granite
Plaza Phoenix	Granite
Taman Suntex	Granite
Taman Cuepacs	Granite
Bandar Tun Hussien Onn	Granite
Balakong	Granite
Taman Koperasi	Granite
Taman Mesra	Kajang Formation
Saujana Impian	Kajang Formation
Bandar Kajang	Kajang Formation
Kajang	Kajang Formation

Source : Geotechnical Assessment of Klang Valley MRT Project

54. The alignment from Pasar Rakyat station to Kajang station is underlain by KL Limestone, Granite and Kajang Formation **(Table ES-2)**. The stretch from Pasar Rakyat to Maluri is underlain by KL Limestone while the Taman Bukit Ria to Taman Koperasi stretch is underlain by Granite. The remaining stretch from Taman Mesra to Kajang is underlain by Kajang Formation.

55. The SBK Line traverses along highway and highly built up areas in Kuala Lumpur and Selangor. The Project traverses areas under the jurisdiction of the 5 local authorities namely:

- Dewan Bandaraya Kuala Lumpur (DBKL)
- Majlis Perbandaran Kajang (MPKj)
- Majlis Bandaraya Shah Alam (MBSA)
- Majlis Perbandaran Selayang (MPS)

56. The land use along the SBK Line consists of residential, commercial, industrial, institutional and recreational uses. From Sg. Buloh Station – RRI Station, the land use is mainly industrial and commercial. As the SBK Line enters Kota Damansara, the land use along the SBK Line becomes predominantly residential and remains so until TTDI. After TTDI, the SBK Line follows Jalan Damansara, Leburaya SPRINT and Jalan Semantan where the land use is mainly commercial.

57. The land use above the underground section of the SBK Line is mixed, with a significant proportion of commercial and institutional land uses given that the segment passes through the KL central business district. After Maluri, the land uses along the elevated section are mainly residential, commercial area and public facilities all the way to Kajang.

58. The general climate along the SBK Line is characterized by high annual rainfall and relatively uniform high humidity and temperature. Mean annual rainfall ranges from 2010 mm to 3204 mm (based on data from Subang, Petaling Jaya and Sepang). The mean annual 24-hour temperature ranges from 27.6°C to 27.8°C. The annual mean 24-hour relative humidity is between 77% - 80%. The dominant wind directions are northwest (>12%), east (>9%) and north (>12%) respectively.

59. The SBK Line traverses three river basins, namely Sg Klang (31km), Sg Langat (15 km) and Sg Buloh (5 km). The SBK Line crosses several rivers **(Table ES-3)** but no structures will be built in the rivers.

Table ES-3 : River Crossed by the SBK Line

Catctment	Description
Sg Buloh	• Sg. Buloh river crossing the alignment at Jalan Sg Buloh near KTM Sg. Buloh
	• Sg Hampar river crossing near proposed RRIM depot
	• Sg Kembit river crossing over Sec 8 Kota Damansara's lake
Sg Klang	• Sg Tambul river crossing at Persiaran Surian, near the proposed PJU5 station
	• Sg Kayu Ara river crossing at LDP, near Sri Pentas TV3
	• Sg Penchala river crossing at Jalan Damansara near Damansara Regional Sewage treatment plant.
	• Sg Klang river crossing at Jalan Tun Sambanthan near Pasar Seni
	• Sg Kerayong river crossing at Jalan Cheras, near Jusco Taman Maluri and PGRM tower.
Sg. Langat	• Sg Langat river crossing at Lebuhraya Cheras – Kajang
	• Sg Long Kechil river crossing at Jalan Cheras near Tmn Cuepacs
	• Sg Sekamat river crossing at Jln Cheras near Masjid Kg Sekamat
	• Sg. Jernih river crossing at Jln Cheras near Kg. Sg. Jernih
	• Sg. Merbau river crossing at Jln Cheras near Stadium Kajang

60. The Sg. Kelang, Sg. Langat and Sg. Buloh are relatively urbanized catchments with numerous point and non-point sources of pollution. River water samples collected 8 locations showed that the water quality of the rivers along the SBK Line ranges from Class II to Class III.

61. Air quality measurement carried out at 5 locations showed that the air quality is generally within the Recommended Malaysia Air Quality Guidelines. The TSP level was good, ranging from 63 $\mu g/m^3$ to 88 $\mu g/m^3$ and PM_{10} concentrations ranged from 72 $\mu g/m^3$ to 85 $\mu g/m^3$. Both NO_2 and CO were not detected.

62. 24-hour noise level monitoring carried out at 18 locations from 26th July -20 August 2010 and 1 December 2010 - 30 December 2010 (**Table ES-4**). Most of measured noise levels exceeded the recommended limits for suburban residential area (55dBA for daytime and 45dBA during nighttime) and urban residential area (60dBA during daytime and 50dBA during nighttime) except for Station N10 (Jalan Bukit Ledang) and Station N11 (Damansara Height).

Table ES-4 : Measured NoiseLevels

Location	Time	Noise Level (dBA)		
		Leq	L10	L90
Pangsapuri Cempaka, Seksyen 6, Kota Damansara	Daytime	68.4	71.1	62.8
	Nightime	63.2	66.6	54.9
Jalan Camar, Seksyen 4, Kota Damansara	Daytime	75.4	78.2	67.1
	Nightime	69.5	72.2	57.0
Pelangi Damansara Condominium	Daytime	69.9	71.8	66.4
	Nightime	65.2	68.0	58.8
Jalan Aminudin Baki, TTDI	Daytime	71.9	73.6	69.4
	Nightime	67.8	70.4	62.7
Pinggiran Zaaba, TTDI	Daytime	65.7	67.3	63.7
	Nightime	64.7	67.0	60.6
Jalan SS20/10 Damansara Utama	Daytime	62.2	64.1	59.1
	Nightime	59.2	61.9	53.6
Jalan 17/52, PJ	Daytime	63.9	65.8	60.5
	Nightime	59.8	61.6	54.8
Jalan Medang Serai, Bukit Bandaraya	Daytime	60.2	62.4	55.8
	Nightime	53.0	54.6	48.4
Jalan Jelutong, Taman Damansara Endah	Daytime	61.0	62.2	59.1
	Nightime	54.0	56.4	49.2
Jalan Bukit Ledang, K.L	Daytime	51.9	53.4	49.6
	Nightime	49.6	50.9	47.5
Jalan Bukit Kota, Bukit Damansara	Daytime	57.0	58.1	47.8
	Nightime	50.1	51.1	45.2

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Table ES-4 : Measured NoiseLevels

Location	Time	Noise Level (dBA)		
		Leq	L10	L90
Jalan Desa Aman 2, Taman Desa Aman	Daytime	71.8	73.6	69.2
	Nightime	69.7	71.9	66.0
Jalan Cerdas, Taman Connaught	Daytime	67.0	69.1	63.4
	Nightime	64.0	66.2	57.9
Jalan Sri Kiambang, Taman Sri Raya, Cheras	Daytime	63.1	64.4	60.7
	Nightime	59.4	61.6	55.3
Jalan Dewan, Batu 9 Cheras	Daytime	62.6	65.2	59.0
	Nightime	60.6	62.8	57.3
Jln Psrn Cuepacs,Tmn Koperasi Cuepacs	Daytime	55.9	58.4	51.5
	Nightime	55.0	57.1	52.1
Masjid Sg Sekamat, Kajang	Daytime	66.2	70.4	52.3
	Nightime	53.3	69.2	48.5
Jalan 37, Kajang (near stadium Kajang)	Daytime	58.9	62.0	52.9
	Nightime	50.9	52.5	46.2

63. Vibration levels were also measured at the same 18 locations. The vibration levels range from 0.0071mm/s to 0.0244mm/s. The annoyance levels were at Curve 0.7 or lower than Curve 0.7 at all monitoring stations. The vibration levels measured were well below the level that will threaten any structural damage and well within human comfort level as assessed against limits stipulated in the DOE's Guidelines.

64. The SBK Line does not traverse through any ecologically sensitive areas. There are no forests, wetlands or areas of biological importance along the SBK alignment.

65. The potentially affected communities along the SBK Line are :
- Users of the roads/highways;
- Land owners whose properties are likely to be acquired;
- Residents within 30 metres of the SBK Line
- Residents within 100 metres of SBK Line;
- Residents within 500 metres of SBK Line; and
- Residents in wider KL and Selangor region.

66. Within the 30m corridor, there are 2,080 landed residential units, 2,980 units of condominium and apartments and 1,000 units of flats. There are also 12 educational institutions, 3 mosques, 2 churches, and a temple, 4 medical centres/hospitals and a veterinary hospital, a wet market, about 40 businesses and several government complexes.

67. Within the 100m corridor, there are 17,100 property units, of which 6,700 units are located in the Sg Buloh-Semantan (elevated) segment. Another 5,900 units are above the underground segment from Semantan to Maluri, and 4,500 units are in the Maluri to Kajang segment. About 82% of the C100

comprise of residential use; 16% comprise commercial use and 2% industrial use and 1% institutional use.

68. Within the 500m corridor, there are about 91,900 property units (of which, 82,700 are residential units). About 38% of the properties are located in the Sg Buloh – Semantan area, and 46% of the properties are in the Maluri - Kajang segment. The total population within this corridor is about 341,000 (average density 5,700 persons/km^2).

69. The SBK Line traverses busy roads and highways **(Table ES-5)**. The two-way traffic volume along Persiaran Surian is approximately 5300 passenger car unit/hour (pcu/hr) with a volume-capacity ratio of between 0.60 and 0.70. As the SBK Line progresses from One Utama Station to TTDI Station, traffic volume gets heavier along the LDP, in excess of 8400 pcu/hr and the volume-capacity ratio almost reaching 1.0. This is observed in the traffic congestion during peak periods whereby traffic comes to a standstill along the LDP.

70. From TTDI Station to Section 17 Station onwards, the major roads that may be affected during the construction of the viaduct are SPRINT Highway and Jalan Semantan. From the Semantan Station the viaduct runs along Jalan Duta and into the tunnel. Traffic volume peaks at 12,600 pcu/hr and the volume-capacity ratio approaches 1.0.

71. The main roads adjacent to the elevated section from Maluri to Kajang are Lebuhraya Cheras-Kajang, Jalan Cheras and Jalan Reko. Most of these roads are dual three lane carriageways and accommodate traffic volume in excess of 9000 pcu/hr during peak hours. The volume-capacity ratio is estimated at 0.80, indicating that the roads are congested.

72. The roads adjacent to the underground stations are Jalan Damansara, Jalan Hang Tuah, Jalan Bukit Bintang, Jalan Cheras and Jalan Peel. With the exception of Jalan Peel, it can be concluded that the other roads in the underground segment are currently catering for heavy traffic demand and are operating close to their respective capacities.

Table ES-5 : Broad-based Volume/Capacity Analysis

Road Adjacent to Station	No of Lanes	Two-way Capacity	Two-way Peak Hour Vol	Vol/Cap Ratio
Jalan Sg.Buloh	6 lanes	9000	9300	1.03
Jalan Batu Tiga Sg.Buloh	6 lanes	9000	6621	0.74
Persiaran Surian	4 lanes	8000	5300	0.66
LDP	6 lanes	9000	8400	0.93
Jalan Damansara	6 lanes	9000	8400	0.93
Lebuhraya Sprint	8 lanes	16000	12600	0.79
Jalan Semantan	6 lanes	12000	12600	1.05
Jalan Duta	6 lanes	12000	8433	0.70
Jalan Damansara	6 lanes	12000	7300	0.61
Jalan Hang Tuah	6 lanes	12000	10000	0.83
Jalan Bukit Bintang	6 lanes	9000	2689	0.30
Jalan Peel	4 lanes	8000	5300	0.66
Jalan Cheras	6 lanes	9000	4300	0.48
Lebuhraya Cheras Kajang	7 lanes	14000	9177	0.66
Jalan Cheras	4 lanes	8000	3902	0.49
Jalan Reko	4 lanes	8000	3299	0.41

PUBLIC PERCEPTION AND STAKEHOLDER FEEDBACK

73. The public's perception of the proposed Project and stakeholder feedback are important elements in the planning of the SBK Line. A public perception survey involving 675 respondents was undertaken from 18 December 2010 to 16 January 2011. Three dialogues with various stakeholders were held. Local communities at existing LRT lines were interviewed.

Public Perception

74. More than three-quarters of the 675 respondents were aware of the proposed MRT project. Most of the respondents knew about the project mainly through the newspapers while some of them had obtained this information from other media such as television. A substantial percentage of them heard about the project through friends and neighbours and the internet. However, although aware of the MRT project, only 34% of the respondents discussed the project with their neighbours.

75. **Table ES-6** summarises the benefits and negative aspects of the Project as perceived by the respondents along the Sg. Buloh to Semantan stretch. About 42% of the respondents said that the MRT will save costs and travel time. This is no surprise as a large proportion of them (71%) complained about the traffic congestion in their areas. On the other hand, about 45% of the respondents said that the MRT project may introduce or increase environmental pollution such as noise, dust and floods. About 22.1% were concerned about the congestion the Project may cause during the construction stage.

Table ES-6 : Sg. Buloh – Semantan Respondents' Perception of Positive and Negative Aspects of the Project

Positive	%	Negative	%
Save costs and travel time	41.9	Environmental pollution (noise, dust, flood)	45.1
Reduce traffic congestion in the city	35.1	Traffic congestion during construction stage	22.1
Easy to access	18.5	Safety of residents not guaranteed/crime/ thefts	10.9
Convenience to travel	19.3	Create parking problem	5.1
Improve standard of living	8.8	Land acquisition / Resettlement	2.7
Encourage more economic activities	2.7	Track too close to the residential area	4.1
Reducing road accidents	0.5	Prone to mismanage (fund, operation, etc)	3.0
Others	4.1	Others	9.1
No comment	10.3	No comment	22.6
Total	**100%**	**Total**	**100%**

76. Similarly, along the Maluri-Kajang stretch, the respondents also listed saving costs and travel time as well as reducing traffic congestion in the city as key benefits, albeit in smaller proportions than the Sg. Buloh to Semantan stretch. This is partly due to a smaller proportion of respondents complaining about traffic congestion in their area. Easy access to the MRT was also cited by 21% of the respondents. In terms of negative aspects of the MRT project, environmental pollution, traffic congestion during the construction phase were the main concerns. Additionally, 13% of them expressed concerns about the safety of the residents in relation to crime (**Table ES-7**).

Table ES-7 : Maluri to Kajang Respondents' Perception of Positive and Negative Aspects of the Project

Positive	%	Negative	%
Save costs and travel time	39.8	Environnemental pollution (noise, dust, flood)	30.5
Reduce traffic congestion in the city	29.2	Traffic congestion during construction stage	19.1
Easy to access	20.8	Safety of residents not guaranteed/crime/ thefts	13.1
Convenience to travel	15.2	Create parking problem	6.8
Improve standard of living	3.8	Land acquisition / Resettlement	8.1
Encourage more economic activities	3.4	Track too close to the residential area	0.8
Reducing road accidents	1.3	Prone to mismanage (fund, operation, etc)	0.4
Others	2.1	Others	4.2
No comment	12.7	No comment	35.2
Total	**100%**	**Total (n)**	**100%**

77. The respondents listed several mitigation measures that could be implemented. The main mitigating measures suggested were that the construction should not be too close to the residential areas (15.2%) and that there should be proper transportation planning to be put in place to avoid the negative elements.

78. 87.5% of the respondents supported the proposed Project (**Table ES-8)**. Among those who did not support the project said that the construction would be too close to their house and would thus create pollution. Some of them were wary that their properties may be acquired and they may be resettled at another location if their properties fell in the path of the MRT alignment. Other concerns were that the route of the shuttle buses would not be connected to their place.

Table ES-8 : Support for the Project

Support	Sg. Buloh to Semantan (%)	Maluri to Kajang (%)	Total (%)
Yes	86.1	90.1	87.5
No	13.9	9.9	12.5
Total	**100%**	**100%**	**100%**

79. The majority of the respondents (82%) would use the MRT– stating that it would facilitate travel to work, school or market (49.5%). For the 18% who do not intend to use the MRT said that they already posses their own vehicles and do not require public transport. Another reason was that they felt the MRT was not convenient for them (**Table ES-9)**.

Table ES-9 : Reasons for Not Intending to Use the MRT

	Sg. Buloh to Semantan (%)	Maluri to Kajang (%)	Total (%)
Possess own vehicle or do not use public transport	48.8	55.6	51.2
Not convenient to residents (system, facilities, restriction to carry goods from wet market)	32.1	17.8	26.8
Some destinations are not in the MRT route	10.3	6.7	8.9
Too crowded, congested during peak hours	5.1	0.0	3.3
Others	11.5	11.1	11.4
No comment	5.1	8.9	6.5
Total	**100%**	**100%**	**100%**

Stakeholder dialogues

80. Two dialogues were held with the local communities in two sub-regions and one dialogue with non-governmental organizations, businesses and government agencies. These dialogues were held in different locations on 14 and 15 January 2011. At these dialogues, the stakeholders were briefed about the proposed SBK Line, the EIA process and an overview of the anticipated environmental impacts. For many stakeholders, it was actually the first time that the project was formally described for them.

81. Different stakeholder groups raised different sets of issues. However, the most important issues raised in all these meetings and discussions were:

- Traffic congestion;
- Accessibility to stations and facilities;
- Public transport connectivity;
- Land acquisition issues;
- Environmental pollution;
- Flood issues and risk;
- Affordability and subsidy;
- Uncontrolled parking around stations;
- Constructability of some MRT sections; and
- Appropriateness of some stations

Local Community Experience With Existing LRT Lines

82. The communities from Kelana Jaya, Miharja, Ampang and Sentul were interviewed about their experience with the LRT project. The key findings were

- There was very little communication between the relevant authorities (government, local council) or the project proponents and the residents affected. Instead, the residents had to rely upon news reports and unverified sources for information.
- While those affected had to certainly bear the noise, dust and vibration resulting from construction works, they could still tolerate and manage these effects as long as the effects were not excessive to the extent of invoking grave concerns.
- The choice of construction method will be highly influential in dictating the response of the public toward the prospective MRT project. It will be important to employ methods that produce less noise, air pollution and vibration.
- Problems such as traffic congestion and parking issues were isolated cases. While noise of rolling stocks in operation could be slightly overwhelming for outsiders, those living around the transit lines will eventually adapt to it as a part of their surrounding environment.
- Although some of the respondents had experienced grievances but rarely were complaints lodged; they were unsure of the appropriate channels to do so and were skeptical of the prospects of appropriate action being taken to address their issues.
- Almost all of the respondents had a favorable opinion of the LRT project throughout its inception, construction and post-construction phases. Convenience i.e. better accessibility was largely regarded as the key benefit of the LRT.

POTENTIALLY SIGNIFICANT IMPACTS & MITIGATING MEASURES DURING PRE-CONSTRUCTION AND CONSTRUCTION STAGES

83. The receptors of the potential impacts from the Project would include the various communities and land uses located close to the line and the proposed stations. Since the SBK Line mainly traverses built-up area of urban and suburban areas, there are no ecologically sensitive areas. The potentially significant impacts during the pre-construction and construction stages of the Project are shown in **Table ES-10**.

EXECUTIVE SUMMARY

Table ES-10 : Potential Impacts During Pre-Construction and Construction Stage

Potential Impacts	Activities
Loss of land or properties	• Land and/or property acquisition
Traffic congestion	• road diversion, closure and lane reduction for viaduct and station construction • construction vehicles transporting excavated materials, construction materials and equipment/ machinery
Risks to the public safety (residents, workers, road users and adjacent building)	• accidents from temporary closure or diversion of roads, transportation of construction material & equipment • occupational and safety hazard from use of heavy machinery, malfunction of machinery, working at height and confined space
Increased noise level	• piling works • construction of viaducts and elevated stations • use of high noise generating machineries such as generators, power tools, hydraulic breaker and grinding and cutting equipment
Increased vibration level	• tunneling and piling works
Pollution of water courses	• the use of bentonite slurry for tunneling works • sedimentation from excavation works
Air pollution	• earthworks • movement of construction vehicles
Economic benefits	• economic growth, job creation, other multiplier effects and tax revenues to Government would accrue during the construction period.

84. 473 lots are likely to be acquired for the SBK Line. Out of this, 103 located within the Sg Buloh – Semantan stretch, 163 over the underground section and 207 along the Maluri – Kajang segment. Some of the impacts include:
    - Loss of social cohesion, sense of community and current lifestyle for long standing communities
    - Value of property may decline if only part of the lot is acquired.
    - In the case of businesses, there will be potential loss of customers – particularly businesses that rely on the local neighbourhoods.

85. Some of the mitigating measures proposed include:
    - Provide due notice, information and assistance to the affected parties, giving them ample time to make alternative plans and minimize inconveniences
    - Ensure a fair and equitable valuation of land or properties that will be acquired.
    - Acquire entire property if the remaining land or building value would be severely affected by the land acquisition (critical for small lots)

- Acquire the entire row of houses rather than allowing just a few standing in the midst of incompatible land use.
- Further refine alignment to minimize land and properties acquisition.
- Continue engaging with the affected land/property owners. Critical areas include TTDI, Taman Suntex, Kg Sg Sekamat and Kg Sg Balak. Kg Bt 10, Kg Sg Sekamat and Kg Sg Balak are Malay Reserve Land. Special attention need to be paid to the residents of Kg Sg Balak since they would have been affected by land acquisition for the third time

Impacts and Mitigating Measures for Underground Works

86. Potentially significant impacts from the underground works include:
- Traffic congestion
- Increased noise and vibration levels
- Construction risks due to karstic geology
- Other construction risks
- Impacts to groundwater regime
- Pollution of watercourses
- Flooding

87. Traffic congestion due to underground works is expected to be significant due to reduction in lane sizes or road diversion to accommodate machinery and working space. Traffic congestion is expected to be significant at the Bukit Bintang and Cochrane stations due to movement of construction vehicles or dump trucks and its surrounding land use. Several schools (eg: SM Jalan Cochrane, SRK and SML Convent Jalan Peel) are located within the locality of the Cochrane station. At Bukit Bintang, the main concern is due to high pedestrian and vehicle movement since it is a tourist and commercial centre. The transportation of excavated material (about 180 trucks/day) from the launching shaft areas at Cochrane and Semantan to the disposal site in Puchng has the potential to cause congestion since the route will pass through residential areas.

88. Measures proposed to minimize traffic congestion include:
- Proper traffic management with adequate warning signs and flagmen to manage traffic flow
- Maintain number of lanes of major roads as much as possible
- Dump trucks to operate outside peak traffic hours (7am to 10am morning peak and 4pm to 7pm evening peak hours)
- Specific traffic management plan for each construction site shall be prepared.

89. Noise generated during underground works will come primarily from earth moving equipment (dozers, tractors), heavy vehicles (lorries, trucks), generators and piling. These noise sources are however fairly small relative to the entire Project site, and are limited to specific locations where they are used. Critical areas identified include: houses near the Semantan launch shaft, government quarters near Cochrane launch shaft and the SJK (C) Nam Kheung which is located near the Maluri retrieval shaft.

90. Measures to minimize noise and vibration include the use of bored pile or other low impact piling methods, noise barrier for stations areas (such as car parks and perimeter boundary), full hoarding of sufficient height, traffic diversion plan to avoid local roads (where possible) and movement of construction vehicles during off-peak hours.

91. Main risks posed by karstic geology are the potentially erratic rock head level and the possible presence of large cavities. Some of the associated risks are from tunneling, pile foundation, deep excavation retaining structures and sub-surface investigation. Measures to minimize risks from karstic geology include grouting and the proper selection of TBM operating parameters for tunnelling. For pile foundation and retaining structures, rock socketing, continuous bored pile and secant and grouting will be adopted.

92. Underground works pose safety concerns to the public and workers directly involved in the construction. Some of the critical areas would be the SJK (C) Nam Kheung school near the Maluri Retrieval Shaft. There is also risk of vehicular accidents due to road closure or diversion.

93. The underground works could potentially lower the groundwater table and cause settlement, collapse or sinkholes. Any inflow of water into the tunnel will result in loss of face support which can lead to face collapse. The loss of face support may lead to large volume of ground loss and may even trigger huge collapse and formation of sinkholes, which could be fatal. Measures to minimize impacts to groundwater regime include conduct groundwater leakage test prior to excavation works for launching shaft, provide cut-off walls during station box construction and proper design of face support pressure for tunnelling.

94. Slurry discharge from tunnelling works and erosion at the launch shafts and retrieval shafts could potentially cause water pollution. The waste slurry shall be treated at the slurry treatment plants prior to discharge into the drainage system.

95. Impact from soil erosion and sedimentation at the shafts and underground stations are expected to be minimal due to small work area. In addition, all excavated material will be disposed into the bins prior to disposal at the dump site. Erosion and Sedimentation Control Plan (ESCP) has been prepared for the construction sites. Measures proposed in the ESCP include silt traps, perimeter drains, containment bund and wash troughs.

96. Flooding may occur if the drainage system at the ground level of the work area is obstructed or unable to accommodate the increase in surface run-off. Flooding is not expected at launching shaft areas due to the relatively small work area (2.6 ha at Semantan launch shaft and 5.8 ha at Cochrane launch shaft). Perimeter drains and berm drains for proper conveyance of surface runoff into the drainage system have been proposed in the ESCP.

Impacts and Mitigating Measures for Elevated Works

97. Viaduct and elevated station construction is of concern to the adjacent communities, particularly residential areas and institutions such as schools and hospitals. Safety to road users are also of concern since it will involve construction of columns, pier and launching of pre-cast segmental box girders. Some of the main impacts are traffic congestion, increased noise and vibration level as well as risks to the public safety.

98. The proposed construction works will involve the reduction of lane widths and working area being located on the road shoulder - effectively reducing the capacity of the roads.

99. Some major roads where the elevated stations are located are expected to experience significant traffic congestion. Along the Sg Buloh – Damansara segment, the affected roads are Persiaran Surian (near Curve Station), Lebuhraya Damansara Puchong (One Utama Station) and Jalan Semantan (Semantan Station). Similarly, the elevated works along Jalan Damansara alongside TTDI is expected to cause congestion.

100. Along the Maluri – Kajang segment, the most significant impacts on the existing carriageways will be at Phoenix Plaza, Taman Mesra and Bandar Kajang station sites.

101. At the Taman Mesra, the existing 4-lane Jalan Cheras will be reduced to a 2-lane two-way road. The reduction of the number of lanes would also have a significant impact on the performance of these roads and cause congestion.

102. At Bandar Kajang, the existing 4-lane section of Jalan Semenyih approaching the Jalan Semenyih/Jalan Besar signalized junction will be reduced to 2 lanes. This will significantly reduce the capacity of this

signalized junction and result in congestion at this locality. It is essential not to reduce the capacity of this junction as all major arterials of Kajang town intersect at this junction.

103. Construction of piers supporting the elevated section of the SBK Line may require piling. Some degree of noise and vibration concern to houses in close proximity to the line for the duration of construction is therefore anticipated. The areas of concern are those houses located close to the existing road or highway such as Sierra Damansara, Casa Indah, Palm Spring Condominium, Opal Damansara, Pelangi Damansara, Pinggiran Zaaba at TTDI, Bangsar Puteri, Perumahan Sri Sabah, Flat Taman Aman, Taman Mutiara Timur, Kampung Sungai Raya, Taman Suntex, Taman Shah Jaya, and Taman Mesra.

104. Measures to minimize noise and vibration include noise barrier for stations areas (such as car parks and perimeter boundary), full hoarding of sufficient height and traffic diversion plan to avoid local roads (where possible) and movement of construction vehicles during off-peak hours.

105. Construction of elevated section requires use of special machinery since most of the works will be carried out at elevated height. This poses higher risk and hazard to the public and workers directly below or close to the elevated works. Vehicular accidents and safety hazards during construction of elevated stations and viaduct are of concern. Some of the critical areas include Persiaran Surian, LDP, Jalan Semantan, Jalan Cheras and Jalan Reko.

106. ESCP has been prepared for all the elevated works. Some of the measures proposed include wash troughs, concrete bunding, temporary containment by sandbag and proper diversion of surface runoff into the nearest stormwater inlet.

<u>Potential Impacts and Mitigating Measures from Depot Construction</u>

107. The two depots at Sg Buloh and Kajang will occupy areas of about 41 ha and 25 ha respectively. The potential impacts are dust, sedimentation from site clearing and generation of wastes and sewage.

108. The dust (TSP) concentration can be reduced to within the recommended limits at the nearest receptors (Section 8 Kota Damansara and Kg Sg Balak) with the implementation of mitigating measures such as phasing development instead of total site clearing, watering or spraying of access road, wash trough, hoarding around the work area and control movement of construction vehicles carrying earth.

109. Site clearing and earthwork from the construction of the depots may cause soil erosion and result in sedimentation in the surrounding drainage and waterways. The main concern would be exposure of the cleared area (41 ha for Sg Buloh and 25 ha for Taman Koperasi depot) as this will increase erosion risks and lead to sedimentation of the receiving water way or drainage system. The ESCP has been prepared for both sites. Some of the measures proposed include temporary earth drains, temporary slope protection and wash trough.

110. Biomass, solid wastes, scheduled wastes and construction wastes will be generated from depot construction. These include. Proper storage, management and disposal of each type of wastes are required to minimize the environmental impacts.

111. There will be about 3400 construction workers (at the peak period) the majority of whom will be housed at the depot sites. At Taman Koperasi depot, the nearest settlement or village is Kg Sg Balak, which is a traditional Malay village while at RRIM, the nearest residential area is Section 8 Kota Damansara. Presence of foreign workers in the quiet and traditional ambience near Kg Sg Balak could result in social conflicts. On the other hand, some of the positive impacts include increase in economic activities at nearby towns such as Kajang, Sg Buloh and Kota Damansara area whereby increasing demand for housing, food and other goods and services.

112. Some of the measures proposed to minimize social conflicts include providing housing for foreign workers within the depot site and monitoring their activities. Priorities for employment and business opportunities should also be given to the locals.

Benefits During Construction Stage

113. Increase in economic activities and employment are the major positive impacts during the construction stage. At the national level, the construction sector is expected to benefit from the Project due to its size and magnitude. The main beneficiaries in this sector include:

- construction companies (various work packages will be tendered out for the Project)
- construction material supplier (demand for construction material such as cement and steel is expected to increase)
- engineering and support services companies that provide civil and structural works, survey works, transport planning and other related services.

114. Significant number of employment will be generated to fulfill the demand for the construction needs of the Project. Other spin-offs and business opportunities can also be expected at local level in terms of job creation and demand for property or housing, food and other services.

POTENTIALLY SIGNIFICANT IMPACTS & MITIGATING MEASURES DURING THE OPERATIONAL STAGE

115. The main potentially significant impacts expected during the SBK Line operations are:
    - Noise - from the operations of the trains, particularly at the approach to stations and at bends
    - Vibration - from the train operations particularly in the underground sections
    - Traffic – on the whole, the Project would contribute towards alleviating traffic in the Klang Valley. There are concerns of localized congestions in the vicinity of stations.
    - Visual impact – the elevated structures are likely to affect the landscape along the entire alignment
    - Air quality – the Project will contribute to the air quality improvement in terms of avoided emissions.
    - Social impacts – the majority of the residents in the wider KL Conurbation will benefit in terms of improved efficiency of transportation and enhanced economic activities. At some localized areas, adverse impacts in terms of nuisance, traffic congestion and property value depreciation could occur.

Noise And Vibration

116. The noise modelling shows that the increase in the continuous equivalent sound pressure levels (L_{Aeq}), is generally not significant **(Table ES-11)** due to the short term nature of train pass-bys. The total equivalent noise (Leq) levels (considering both the MRT train noise and current existing noise levels) in most locations typically increases by no more than 5 dB (**Table ES-11**). However three locations (Jalan Bkt. Ledang, Damansara Heights, Jalan Persiaran Cuepacs and Jalan 37, Kajang) will experience increases between 6 – 13 dB.

117. The maximum noise level, L_{max} (without any noise barriers) will be however higher than 75 dB(A) at all control locations. The difference of predicted L_{max} from the train and measured current $L_{eq\ Day}$ at most monitoring locations were 10 dB and above; in some cases up to 29 dB. It is therefore pertinent that noise mitigation measures are installed to reduce the noise levels at the sensitive noise recipients along the SBK Line.

118. Without noise barriers, potential noise disturbance are anticipated for all residential dwellings with a line of sight to the tracks (including high rise apartments), and also dwellings even without a direct line of sight but in closer proximity to the alignment.

Table ES-11 : Predicted Train Noise Levels from Proposed Alignment to Measurement Locations (without noise barriers)

Measurement Locations	Predicted Lmax	Predicted Short Term Leq	Measured Leq Day	Predicted Total Local Leq Day	Predicted increase	Predicted increase
					Predicted Lmax - Measured Leq Day	Predicted Total Leq Day - Measured Leq Day
P1 : Flat Cempaka, Seksyen 6, Kota Damansara	78.7	73.1	68.4	69.3	10.3	0.9
P2 : Jalan Camar/Persiaran Surian, Seksyen 4, Kota Damansara	76.6	71.1	75.4	75.5	1.2	0.1
P3 : Pelangi Damansara Condominium, Kota Damansara	77.0	71.1	69.9	70.3	7.1	0.4
P4 : Jalan Aminuddin Baki, TTDI	75.3	69.4	71.9	72.1	3.4	0.2
P5 : Pinggiran Zaaba, TTDI	77.5	72.3	65.7	67.1	11.8	1.3
P6 : Jalan SS20/10, Damansara Utama	76.8	70.7	62.2	64.1	14.6	2.0
P7 : Seksyen 17, Petaling Jaya	76.3	70.3	63.9	65.2	12.4	1.3
P8 : Jalan Medang Serai, Bukit Bandaraya	77.1	71.3	60.2	63.3	16.9	3.1
P9 : Jalan Jelutong, Taman Damansara Endah	77.5	71.7	61.0	63.9	16.5	2.9
P10 : Jalan Bukit Ledang, Damansara Heights	80.8	75.5	51.9	64.8	28.9	12.8

Table ES-11 : Predicted Train Noise Levels from Proposed Alignment to Measurement Locations (without noise barriers) (cont'd)

Measurement Locations	Predicted Lmax	Predicted Short Term Leq	Measured Leq Day	Predicted Total Local Leq Day	Predicted increase	Predicted increase
					Predicted Lmax - Measured Leq Day	Predicted Total Leq Day - Measured Leq Day
P11 : Seri Murni Condominium, Jalan Bukit Kota, Damansara Heights	75.6	69.6	57.0	60.9	18.6	3.9
P12 : Jalan Desa Aman 2, Taman Desa Aman, Cheras	80.3	74.7	71.8	72.4	8.5	0.6
P13 : Jalan Mahir, Taman Connaught, Cheras	78.6	72.6	67.0	68.1	11.6	1.1
P14 : Jalan Sri Kiambang, Taman Sri Raya, Batu 9 Cheras	74.5	68.5	63.1	64.2	11.4	1.1
P15 : Jalan Dewan, Batu 9, Cheras	75.5	70.2	62.6	64.2	12.9	1.6
P 16 : Jalan Persiaran Cuepacs, Taman Koperasi Cuepacs, Kajang	77.6	71.2	55.9	61.6	21.7	5.7
P 17 : Masjid Sg. Sekamat, Kajang	76.1	70.1	66.2	67.0	9.9	0.8
P18 : Jalan 37, Kajang (near stadium Kajang)	79.5	75.0	58.9	65.2	20.6	6.3

Note : assumed train pass-by time is 20s each trip

119. Noise mitigation for the SBK Line will entail the use of continuous welded tracks, acoustic absorption and noise barriers. The most common and practical mitigation of airborne noise transmission from the MRT tracks is the use of noise barriers built on the edge of the viaduct (on the parapet wall of the viaduct) for elevated tracks. For barriers to be effective, there must be no line of sight from a receiver location to the MRT tracks.

120. **Figures ES-7, ES-8 and ES-9** show typical noise propagation from the MRT tracks to receivers in a residential house on ground and in a high rise building without and with various types of noise barriers. The use of curved/ semi-curved noise barrier (i.e. a semi-enclosure) extending over the MRT tracks can substantially reduced the noise levels. The noise propagation analysis shows the need for a semi-enclosure type barrier for the protection of residents on elevated locations above the MRT tracks (be it in high rise buildings and houses on elevated grounds). For high rise buildings and/or receivers located on both sides of the tracks and for noise sensitive areas located near the stations, a full enclosure or almost full enclosure may be required. Locations where noise barriers are required have been identified.

Vibration

121. Train-induced vibrations in buildings are dependent on the severity of the vibration generation at source, transmission through the ground (ground borne vibrations) and interaction with the building (vibration response).

122. The ground borne vibration propagation analysis showed that receivers in buildings (1 to 2 storey houses) at 30m away would have vibration levels at Curve 1 to Curve 2 for rail tracks on resilient pads (assumed with 8 dBV vibration reduction). For a receiver in a high rise building on piles (at 1st floor) at 20m away vibration levels are estimated to be Curve 1 to Curve 2 for rail tracks on resilient pads. The DOE Vibration Guidelines recommend an acceptance limit of Curve 2 in the night and Curve 2 to Curve 4 in the day for residential receivers and Curve 1 day and night for vibration sensitive receivers.

123. The mitigation of the ground borne vibration requires the control of vibration transmission from the tracks to the ground. This involves a vibration isolation medium introduced between the tracks and supporting structure. Several methods with varying degree of effectiveness are available including the use of highly resilient rail pad**,** under base plate and floating track slab where reductions of up to 15 dBV are possible depending on the mat stiffness. Further reductions in vibration can be achieved by supporting the floating track slab with individual vibration isolation pads. With the use of one or a combination of the above tracks vibration reduction devices, ground borne vibration propagation from the SBK Line can be mitigated to acceptance limits recommended in the DOE Planning Guidelines for Vibration Limits and Control in the Environment.

124. The use of floating track slab, direct fixation devices or under base plate may be necessary in the underground section of the alignment. The use of under base plate or highly resilient rail pads is anticipated for viaducts alignments that are within 30m of buildings.

Traffic

125. The SBK Line will also greatly benefit thousands of people in the Klang Valley. Besides enabling people to commute efficiently and in comfort, the KVMRT will contribute towards avoiding further traffic congestion in the Klang Valley. The major roads that would experience a reduction are Persiaran Surian, Jalan Damansara, Jalan Semantan, Jalan Duta, Jalan Parlimen, Jalan Cheras and the Grand Saga Highway.

126. It is anticipated that some of the stations upon commissioning and operation would experience traffic related issues such as congestion of adjacent roads and secondary roads, parking and traffic circulation, roadside parking and pick-up/drop-off due to the activities generated by the stations. Among stations expected to experience traffic congestion would be the The Curve, PBD, Bukit Bintang, Maluri, Phoenix Plaza, Bandar Tun Hussien Onn and Kajang stations. The Project Proponent is currently conducting detailed traffic impact assessment for all the 35 stations with a view of understanding the potential traffic volumes, planning for traffic circulation, estimating parking spaces and designing traffic management measures.

Visual impacts

127. The SBK Line is expected to cause visual impacts along the landscape that it traverses. From the Sg. Buloh station to Taman Industri Sg. Buloh station, the impact is minimal because of the absence of residential areas. The impacts along PJU5 station to Section 17 station are the most critical due to the high concentration of residential areas, particularly the high-rise apartments and commercial buildings along Persiaran Surian. The visual impacts from Section 16 station to Semantan station are relatively minimal. After the Semanatan station until Maluri station, the visual impacts are minimal because the line will go underground.

128. From Taman Bukit Ria station to Balakong station, the visual impacts are expected to be minimal as the line follows existing main roads and highways where existing measures such as wide road reserve and availability of buffer zones are already in place. As the line approaches Kajang town, the visual impacts are more significant as the presence of the structure will overshadow and obstruct the view of the aesthetically attractive buildings in the area.

129. Measures to minimize the visual impacts of the elevated sections of the SBK Line include appropriate design of the stations, assimilation of structures with the surrounding landscapes and beautification - such as the application of suitable colours and themes to the structures or any components associated with the development and inclusion of trees and green buffers along the proposed structure. Where facade blocking is unavoidable, sufficient signage should be installed to navigate people especially road users towards the affected premises.

130. With the operation of the MRT system, it is anticipated that there will be a positive impact to the air quality within the Klang Valley – mainly due to the reduction of vehicular emission as a result of reduced congestion on roads and reduced fuel consumption. It has been estimated that the SBK Line could lead to an avoided emission of at least 34,400 MT/CO_2e per annum.

131. The likely risks and hazards during the operation of the SBK Line have been identified and risk minimization measures spelt out. The types of hazards include fire, flood, collisions, derailment, door accident, breakdown of power, intrusion, gap fall, train scrap and natural disasters.

132. A requisite to hazard treatment and mitigation are formulations of Operational Emergency Response Plan, Local Emergency Response Plan, Traffic Management Plan and Management Plan for Construction Surrounding or Near Track/ Alignment. Proper maintenance of all machinery and equipment is paramount as is adequate staff training. Installaiton of closed circuit television inside trains and stations to monitor suspicious activities and to assure safety and security aboard the line.

133. It is expected that the SBK Line will lead to an increase in demand for land along the proposed alignment. Changes in land use and/or development densities can be expected. Areas which may experience development pressure include the area between the proposed RRIM and Taman Industri Sg. Buloh station, area between the proposed Plaza Phoenix and Balakong station and the area between the proposed Taman Koperasi and Kajang station. It is anticipated that there will be a tendency among land and property owners to increase or maximize the use of their lands with the presence of the SBK Line/stations near their properties.

134. Most of these changes to the land use and land demands are secondary impacts of the Project and may be beyond the control of the Project Proponent. It may be necessary for all the 5 Local Authorities along the SBK Line (and future MRT lines) to revisit their Structure and Local Plans to better plan for land use zoning and densities.

135. About 5,890 housing units, 12 educational institutions, 6 religious buildings and 5 medical centres or hospitals facilities and 20 odd clusters of commercial premises and enterprises have been identified being within 30m

of the SBK Line. The communities may potentially be directly impacted by noise and vibration during operational stage since they are located adjacent to the SBK Line. Other potential impacts are traffic congestion in the vicinity of stations. On the other hand, being located close to the stations will also benefit them due to easier and better access to the SBK Line.

136. There are about 9,000 housing units and over 8000 commercial and business premises within 100m of the SBK Line. The various groups of people are expected to benefit from being within walking distance to the stations, thereby increasing accessibility and mobility of the community. The perception survey has shown that more than 80% of the respondents support the project. The C100 community will also benefit from the appreciation of their property prices, particularly the commercial establishments. On the other hand, rentals will also rise and affect people who are currently staying in rented properties.

137. Communities living within 500m corridor would enjoy services and facilities when the SBK Line is completed. People living near to the proposed stations would be able to walk to the stations, but the other residents would be able to access the MRT services and facilities with little difficulty. The benefits for this community would increase once other facilities such as feeder buses and park and ride facilities become operational.

138. The SBK Line, once completed and operational, will provide greater connectivity for Kuala Lumpur and its conurbation via integration with other rail lines such as KTM Komuter, monorail, Ampang and Kelana Jaya LRT Lines. This will enable efficient travel which would reduce social cost of travel and enhance overall productivity.

139. Measures needed to minimize impacts to communities neighbouring the SBK Line, especially the C30 communities, include:

- Provide sufficient car parking facilities to avoid any negative impact on local communities; and
- Develop feeder bus systems to minimise impact on local communities around stations;
- Maintain universal design MRT stations and to make sure that it is accessible and works as was designed;
- Maintain the cleanliness and physical conditions of stations during operations;
- Provide on-line feedback mechanism and establish a communications channel in order to facilitate dialogue.

140. Improved communications between the Project Proponent, Local Authorities and the communities along the SBK Line are vital.

Other Economic Benefits

141. Many economic benefits will accrue to the country, particularly the Klang Valley with the construction and operation of the KVMRT. The Performance Management and Delivery Unit (PEMANDU) in the PM's Department has estimated that the *entire* MRT project, when completed by 2020, will contribute up to RM 21 billion per annum to the GNI.

142. With an efficient Klang Valley MRT system, there will be reduction in fuel consumption as a result of the modal shift from road to rail. The reduction in fuel consumption will mean that the Government's budget allocation for fuel subsidy will be reduced and can be utilized in other sectors. Improved public transport will enhance property values and increase in stamp duty collection to the Government.

143. The SBK Line will lead to substantial savings in travel time with benefits totaling some RM 1.6 billion per year. In addition to this, there will be time-saving for thousands of road users as a result of reduced congestion and the benefits could run into the hundreds of millions of ringgit. Vehicle operating cost savings will accrue to those who transfer to public transport and car users who have fuel consumption savings and other VOC cost savings (maintenance) from reduced congestion. There will also be significant accident reduction benefits due to the modal shift to public transport which has lower accident rates than car or motorcycles.

RESIDUAL IMPACTS

144. Although the Project Proponent is expected to take precautionary measures during the construction phase, traffic congestion may not be completely avoided. Given the fact that construction of the viaducts will take place along busy roads and the underground stations at busy commercial areas, the service level of the affected roads may be reduced despite all measures. Of particular concern are Persiaran Surian, Lebuhraya Damansara Puchong, Jalan Semantan, Jalan Cheras and Kajang town centre. The residual impacts at any particular road could persist from several months to two years – depending the nature and duration of construction.

145. Some amount of congestion can be expected to persist at some stations due to either inadequate road capacity, vehicles stopping to drop and pick up passengers and haphazard/illegal parking.

146. The viaducts and the pillars supporting them will be prominent features along the SBK Line – all the way from Sg. Buloh to Kajang except at the underground stretches. Although hard and soft landscaping will be carried out, the impact of the structures on the landscape will remain. The problem may be compounded by other issues such as illegal billboards and graffiti.

The residual visual impacts will lessen over time as people get accustomed to the structures.

147. Residents, whose houses will be acquired, will need to relocate elsewhere. While the compensation is expected to fair and reflect the market value of their properties, certain "quality of life" elements may be irreplaceable. These include a sense of community, attachment to a particular street, loss of familiar landmarks and conveniences such as shops, markets, schools, etc. Those who are able to relocate near their acquired homes, these losses may not be significant. However, those who have to relocate far from their current homes, these losses will be substantial. Similarly, businesses that have to relocate may lose some portion of the customers and business – especially if they have to relocate far from their original location.

148. Although noise levels from the trains can be adequately mitigated when the SBK starts operations, with the wear and tear of the track and wheels, noise levels may increase over time. This may be critical as each component approaches the end of its life and needs to be replaced. Rigorous maintenance is critical to keep this residual impact as low as possible.

ENVIRONMENTAL MANAGEMENT FRAMEWORK

149. An environmental management framework to ensure that relevant mitigating measures will be implemented and monitored during construction stage has been proposed. The framework will address the following components:
    - Organization set-up - which will form the back-bone of the environmental management structure in identifying roles and responsibilities of parties involved in the Project
    - Environmental reporting - which will state the types of reporting required
    - Environmental monitoring - which will stipulate the monitoring requirements as well as implementation of the mitigating measures proposed in the DEIA and EMP
    - Emergency response plan – which will identify the responses to potential emergencies at site

150. The key objectives for post-EIA environmental management shall be:
    - Comply with all environmental requirements imposed by the DOE and relevant requirements by other agencies and local authorities.
    - Implement the EMP and monitor its implementation to ensure that potential significant impacts are minimized to an acceptable level.
    - Conduct audit to assess level of environmental performance both in terms of compliance to legal environmental requirements as well as complaints from the public or community.
    - Communicate Project's environmental performance to relevant stakeholders.

CONCLUSIONS

151. The KVMRT aims to alleviate traffic congestion and provide a fast, convenient and reliable public transportation for the population of the Klang Valley. The SBK Line will provide the much-needed urban rail service for the densely populated northwestern and southeastern regions of the Klang Valley. It will contribute towards the KL Local Plan's aspirations of increasing the public transport modal share from 18% to 40% by 2020.

152. The KVMRT is also a key Entry Point Project of the nation's Economic Transformation Programme (ETP). The Economic Transformation Programme (ETP) is a major effort by the Malaysian Government to transform Malaysia into a high-income nation by 2020. The MRT is integral to the success of the Greater Kuala Lumpur/Klang Valley NKEA, which in turn is a catalyst for the ETP.

153. The very nature of a mass rapid transit project requires it to traverse close to densely populated areas in order to deliver the benefits it is designed for. Stations must be located in highly populated areas – failing which accessibility will become a problem and the MRT system will not be able to carry as many passengers as it can and should. This basic premise of siting the MRT line and stations means that residents along the proposed SBK Line and stations could potentially be subject to a variety of environmental impacts.

154. Land acquisition and relocation of people and businesses are the main impacts during the preconstruction stage. 473 lots (totaling 97ha) are expected to be acquired to accommodate the ROW of the SBK Line. The Project Proponent will compensate the affected parties at prevailing market rates. Nevertheless, resident affected by the acquisition and relocation could potentially endure problems such as temporary disruption to lives and loss of social cohesion unless they relocate within the immediate neighbourhood. In the case of businesses, there will be potential loss of customers – particularly businesses that rely on the local neighbourhoods. Continued engagement with the local residents who would be affected by the acquisition is important. Special attention need to be paid to the residents of Kg Sg Balak, Kajang since they would have been affected by land acquisition for the third time.

155. The most significant issue during the construction stage of the project will be traffic congestion due to road diversions, closures and lane reductions. The duration of the congestion at any one location could be anything from a few months to two or three years. The most affected roads include Persiaran Surian, LDP, SPRINT, Jalan Semantan, Jalan Cheras and Lebuhraya Cheras – Kajang. It is important that the existing number of lanes on the major roads be maintained as far as possible and sufficient warning signs

are provided at all locations. Detailed traffic management plans are now being prepared by the Project Proponent for every construction site – which would detail out all the necessary precautions needed to minimise congestion.

156. Minimizing the environmental impacts during the construction stage is all about adopting construction best management practices. Most of the impacts anticipated are common to many construction projects and adequate technology and knowledge exists to control these impacts to acceptable level. Only traffic congestion may not be fully mitigated due to the fact that the SBK Line will be built along busy roads.

157. The main concerns during the operations of the SBK Line are noise and vibrations. Prediction of noise propagation has shown that without noise barriers, almost the entire alignment will experience noise levels (L_{max}) exceeding 75 dB. Noise levels at bends and at the approach to stations may even be higher. It has been shown that various types of noise barriers can be used to reduce to the noise levels to within acceptable limits. In addition to noise barriers, the adoption of continuous welded tracks and acoustic absorption on track sides will further reduce noise levels. Locations where noise barriers are required have been identified. Vibration may be of concern at the underground sections of the SBK Line. Several types of vibration-reduction measures will be adopted for the SBK Line – among others floating slab tract, direct fixation devices and under base plates.

158. The SBK Line will also greatly benefit thousands of people in the Klang Valley. Besides enabling people to commute efficiently and in comfort, the KVMRT will contribute towards avoiding further traffic congestion in the Klang Valley. The shift from private transport to rail will also contribute towards the improvement in the air quality in the Klang Valley – at least 34,400 tonnes of CO_2-e per annum could be avoided. The other benefits include reduction of public funds used for fuel subsidy, appreciation of property prices - especially in commercial areas, savings in travel time, increase in productivity, job creation, reduction in vehicle operating costs and reduction in road accidents. The construction and the operation of the SBK Line are expected to contribute substantially to the nation's GNI.

159. In order to maximize the benefits of the Project and to minimize its economic costs, it is crucial that the identified mitigation measures are implemented effectively and the construction process be monitored diligently.

EXECUTIVE SUMMARY

PROJECT ACTIVITIES AND IMPACT SOURCES	SIGNIFICANT ENVIRONMENTAL IMPACTS	PROPOSED / ADOPTED MITIGATION MEASURES	RESIDUAL IMPACTS	DOE'S COMMENTS
PRE CONSTRUCTION STAGE				
• Soil investigation • Utilities relocation • Land property acquisition	Loss of land and property	• Provide information and maintain communication with the affected parties • Provide sufficient notice and time to the affected parties • Fair and equitable valuation of land or property • Acquire entire lot and not partially		
CONSTRUCTION STAGE				
• Road diversion, closure and lane reduction • Transportation of excavated material for disposal	Traffic congestion	• Traffic management for specific roads • Designated route for disposal of excavated material	Persistent congestion at selected locaitons	

PROJECT ACTIVITIES AND IMPACT SOURCES	SIGNIFICANT ENVIRONMENTAL IMPACTS	PROPOSED / ADOPTED MITIGATION MEASURES	RESIDUAL IMPACTS	DOE'S COMMENTS
CONSTRUCTION STAGE (CONT'D)				
• Vehicular accidents from temporary closure or diversion of roads, movement of construction vehicles • Occupational and safety hazard from use of heavy machineries, working at height and confined space	Risks to the public safety (residents, workers, road users and adjacent building)	• Proper training and PPE for all workers • Traffic management plan • Procedure for special working conditions and emergency situation		
• Tunneling	Sinkholes and ground subsidence	• Treatment in the form of jet grouting and compaction grouting for mixed face conditions • Proper selection of TBM operating parameters		
• Piling works • Use of high noise generating machineries	Increased noise level	• Use of bored piles, injection piles or other low noise impact piling methods • Install noise barrier or full hoarding (where relevant) • No piling works after 7pm		

PROJECT ACTIVITIES AND IMPACT SOURCES	SIGNIFICANT ENVIRONMENTAL IMPACTS	PROPOSED / ADOPTED MITIGATION MEASURES	RESIDUAL IMPACTS	DOE'S COMMENTS
CONSTRUCTION STAGE (CONT'D)				
• Tunneling • Piling works	Increased vibration level	• Settlement and continuous vibration monitoring in buildings, houses or structures		
• Use of bentonite slurry for tunneling works • Sedimentation from earthworks and excavation works	Pollution of water courses	• Slurry treatment plant • Prepare and implement ESCP		
• Site clearing and earthworks	Air pollution	• Planning and phasing of earthworks • Wheel washing facility • Hoarding • Cover vehicles carrying earth , sand or other similar material		

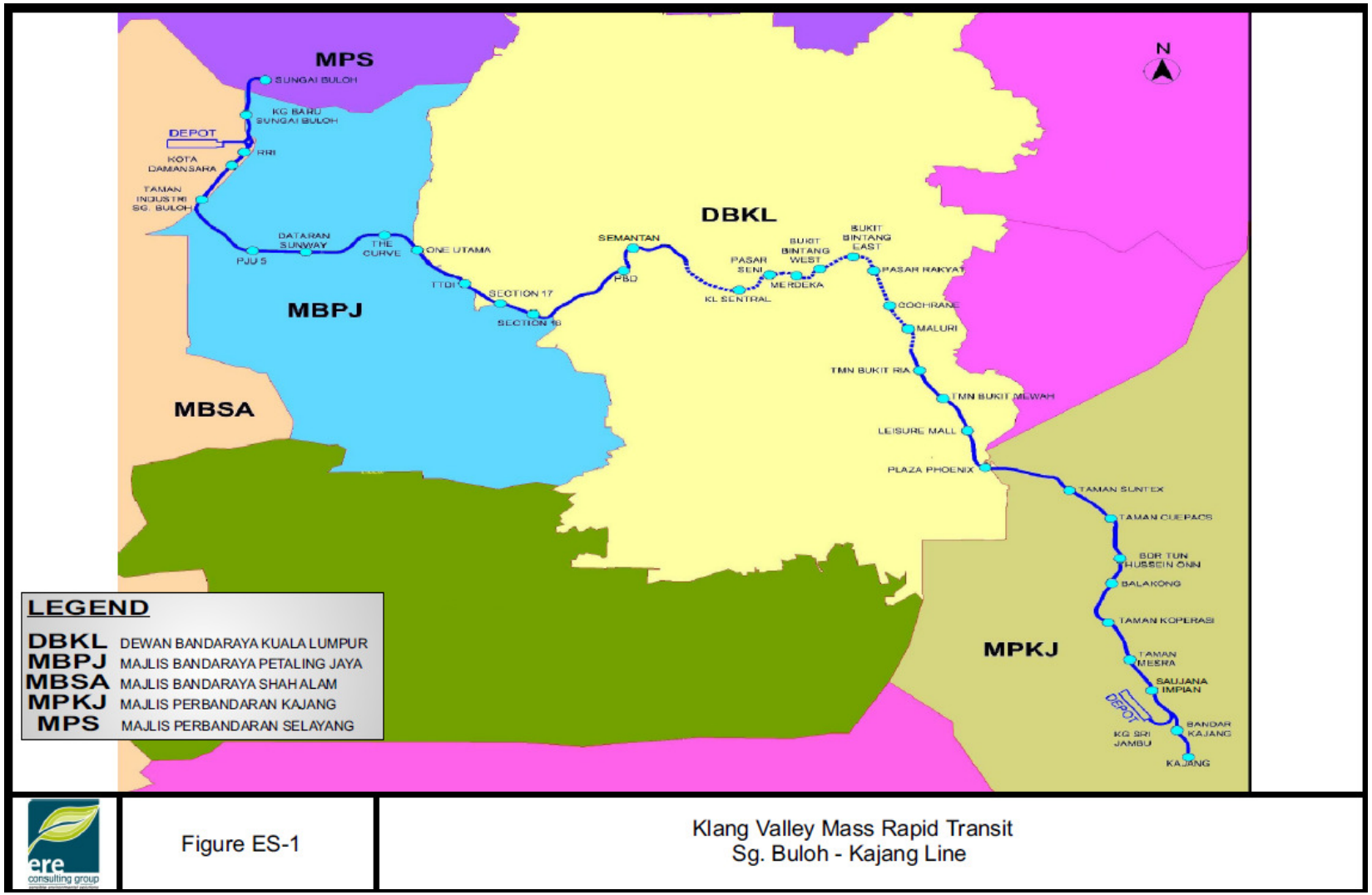
PROJECT ACTIVITIES AND IMPACT SOURCES	SIGNIFICANT ENVIRONMENTAL IMPACTS	PROPOSED / ADOPTED MITIGATION MEASURES	RESIDUAL IMPACTS	DOE'S COMMENTS
OPERATIONAL STAGE				
Train operation	Increased noise level	• Continuous Welded Tracks • Alignment Selection • Maintenance of Wheels and Track • Noise Barrier • Acoustic Absoprtion	Due to wear and tear of the track and wheels, noise levels could increase over time	
	Increased vibration level (underground tunnel and stations)	• Use of sound attenuators / silencers • Acoustics lining of the air ducts use of acoustically line air plenum at the air intakes and discharge. • Use of low noise fan type with high air flow capacities • Correct sizing of fresh air opening		
	Risk from operation (fire, derailment, collision, etc.)	• Detailed risk assessment comprising hazard analysis shall be carried out for each stations and alignment stretches. • Design shall include safety requirements and standards for safe operation. Eliminate or minimise using fire tolerant materials. • Station design should incorporate appropriate fire fighting system, fire retardant materials and fire rated walls separating unlike areas, adequate emergency exits and ventilation.		

PROJECT ACTIVITIES AND IMPACT SOURCES	SIGNIFICANT ENVIRONMENTAL IMPACTS	PROPOSED / ADOPTED MITIGATION MEASURES	RESIDUAL IMPACTS	DOE'S COMMENTS
Train operation (Cont'd)		• Provision appropriate emergency equipment inside rolling stock and within station • Daily operation procedures shall include provision for emergencies • Housekeeping of track area • ERP for each station and alignment stretches shall be prepared • Include participation from local population in plan where appropriate • Management plan for development of areas surrounding the stations and alignment should be prepared for controlling unlikely external risks • Timely manintenance of rolling stocks, machineries and electronic system • Training for staffs to include safety aspects and awareness as well as emergency preparedness. • Continual security monitoring of station and track safety by CCTV, patrol, etc.		

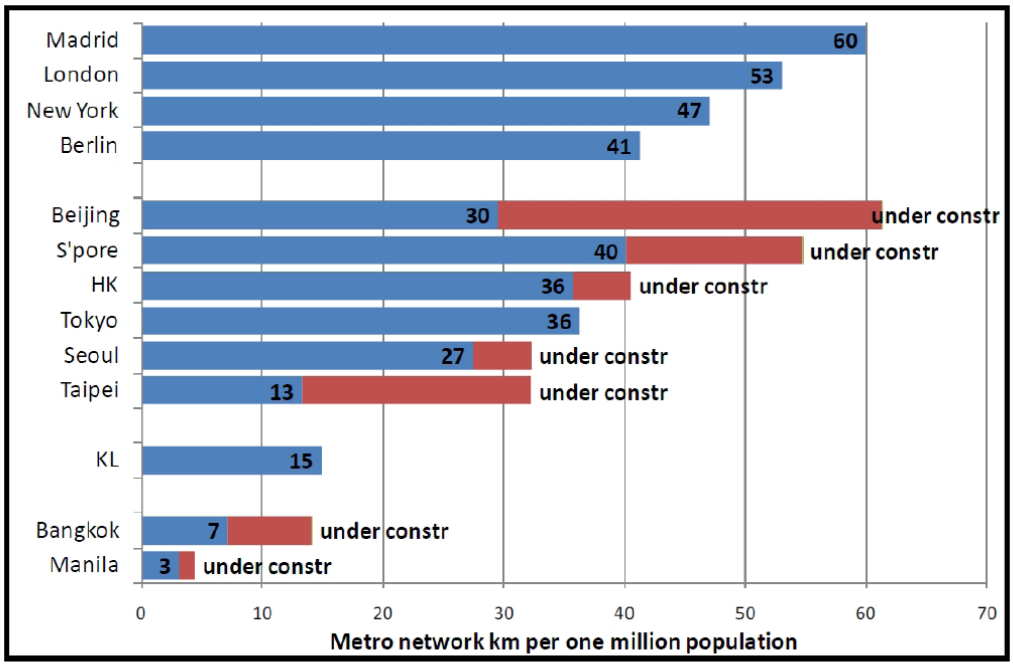
PROJECT ACTIVITIES AND IMPACT SOURCES	SIGNIFICANT ENVIRONMENTAL IMPACTS	PROPOSED / ADOPTED MITIGATION MEASURES	RESIDUAL IMPACTS	DOE'S COMMENTS
OPERATIONAL STAGE				
Vehicles movement - Stations	Increased of noise level	• Noise barrier to mitigate local traffic noise along the approach roads and car park located close to adjacent neighbors. Noise barriers could be masonry type to be rendered aesthetically acceptable to minimize visual impact.	Long term	
		• Use of noise screening barriers, soft and hard landscape shall be encouraged in the station planning and design to minimize potential noise disturbance and nuisance from traffic congestion		

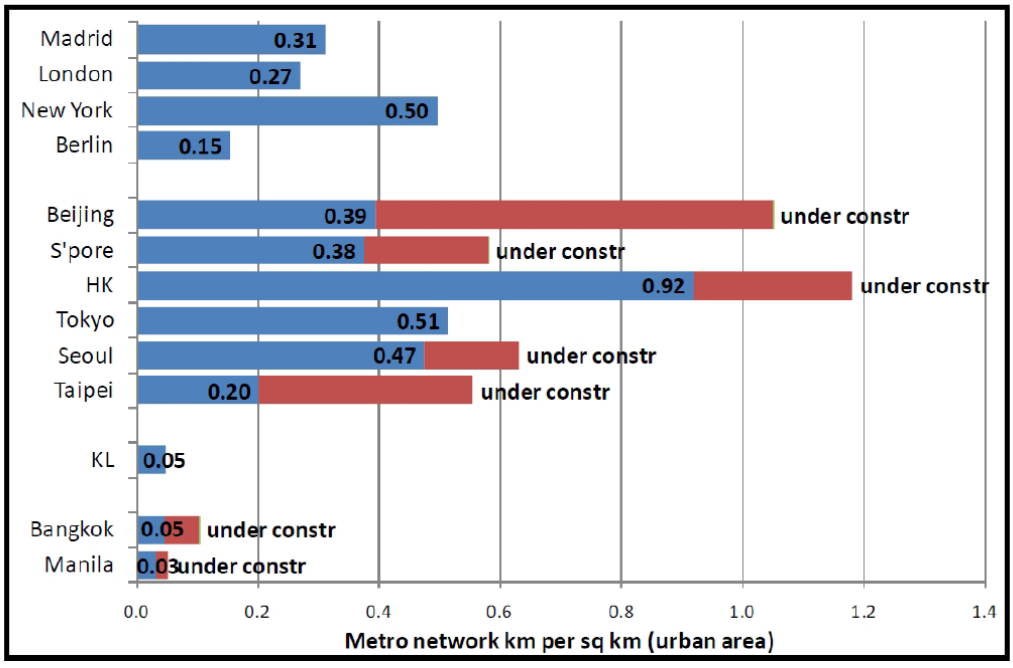
PROJECT ACTIVITIES AND IMPACT SOURCES	SIGNIFICANT ENVIRONMENTAL IMPACTS	PROPOSED / ADOPTED MITIGATION MEASURES	RESIDUAL IMPACTS	DOE'S COMMENTS
OPERATIONAL STAGE (CONT'D)				
Vehicles movement – Stations (Cont'd)	Fatality or injury from accidental incidences or intentional	• Provision of safe design for user and public at large • Provision of appropriate emergency equipment inside rolling stock and within station, e.g. emergency stop button, etc. • CCTV to monitor security and safety • Incorporate procedures for safety management in SOP		
Elevated structure – permanent	Visual Impact (change in present landscapes)	• Smart train stations design and alignment design by "blending" unattractive features of the stations and alignment with the surrounding landscapes. • Track structural design to focus on height, width, shape and materials in order it can assimilate with surroundings • Beautification initiatives • Landscaping and green elements • Adequate signage to be provided for navigation to key landmarks/ areas • Sufficient lighting underneath viaducts	Impact on landscape will remain until resident are accustomed to it	

EXECUTIVE SUMMARY



EXECUTIVE SUMMARY





Source : KV MRT, Alignment Planning Report, AECOM 2010

Figure ES-2 Population and Density Comparison of Metro Network

EXECUTIVE SUMMARY

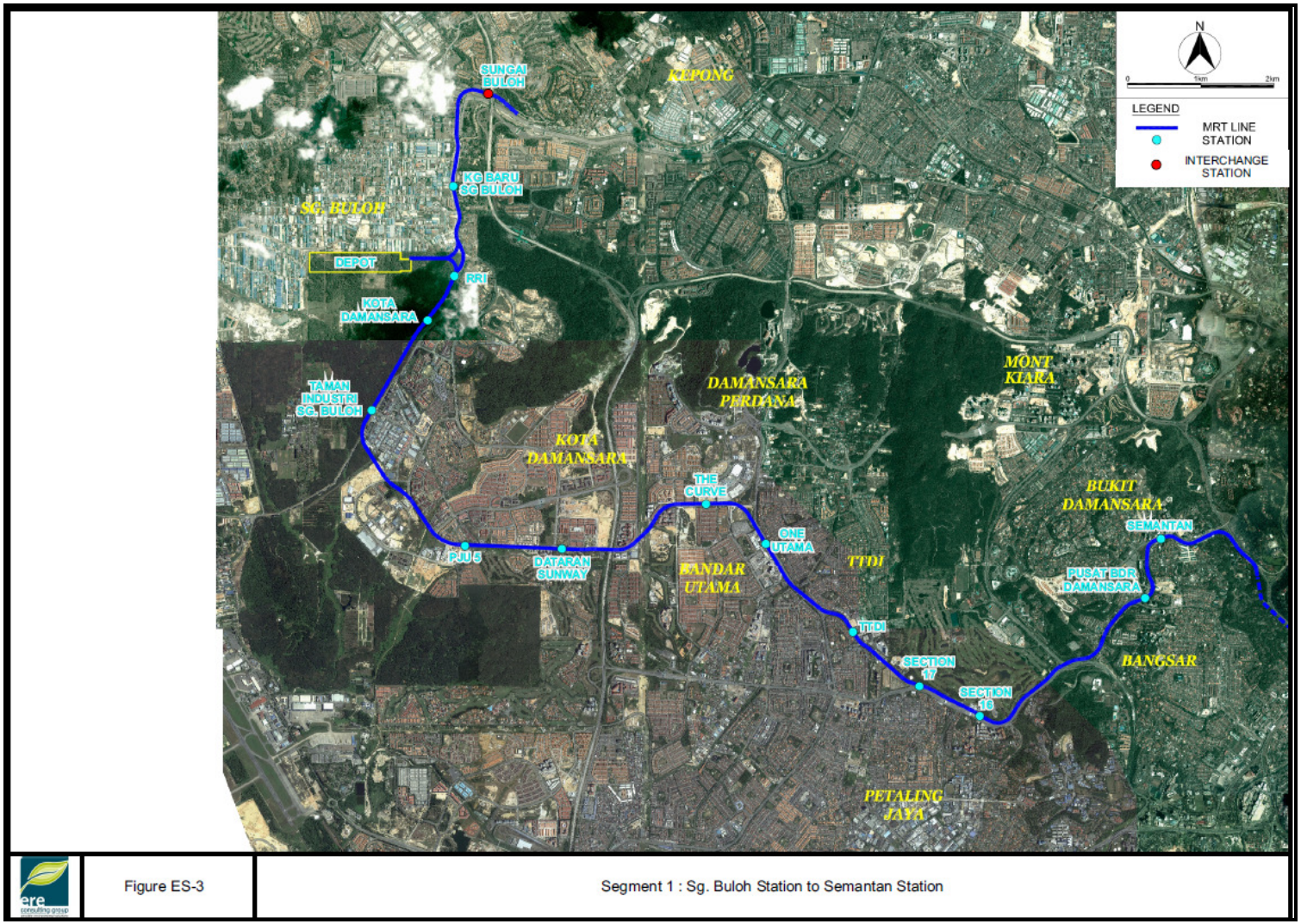


Figure ES-3 Segment 1 : Sg. Buloh Station to Semantan Station

EXECUTIVE SUMMARY

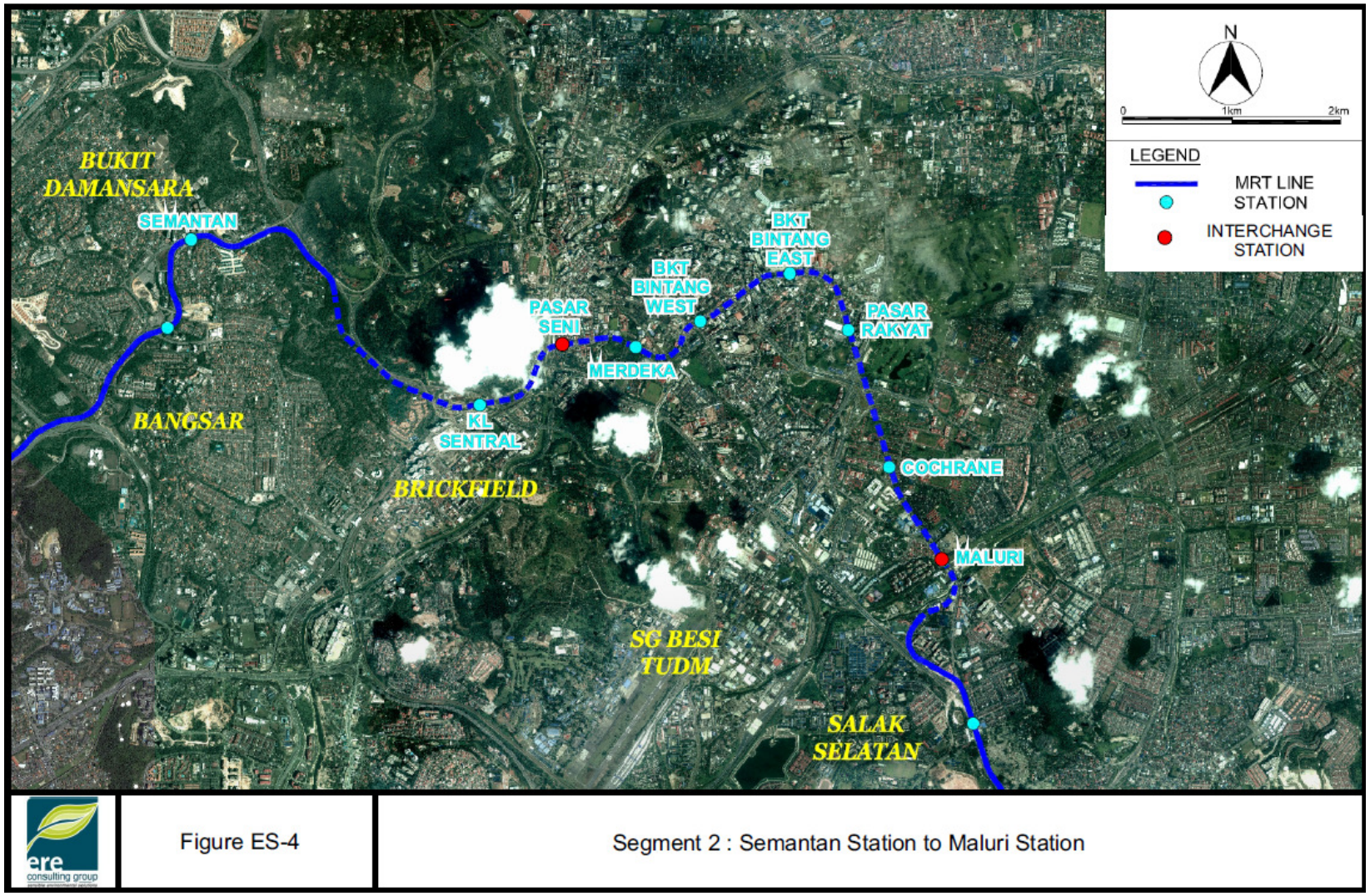


Figure ES-4

Segment 2 : Semantan Station to Maluri Station

EXECUTIVE SUMMARY

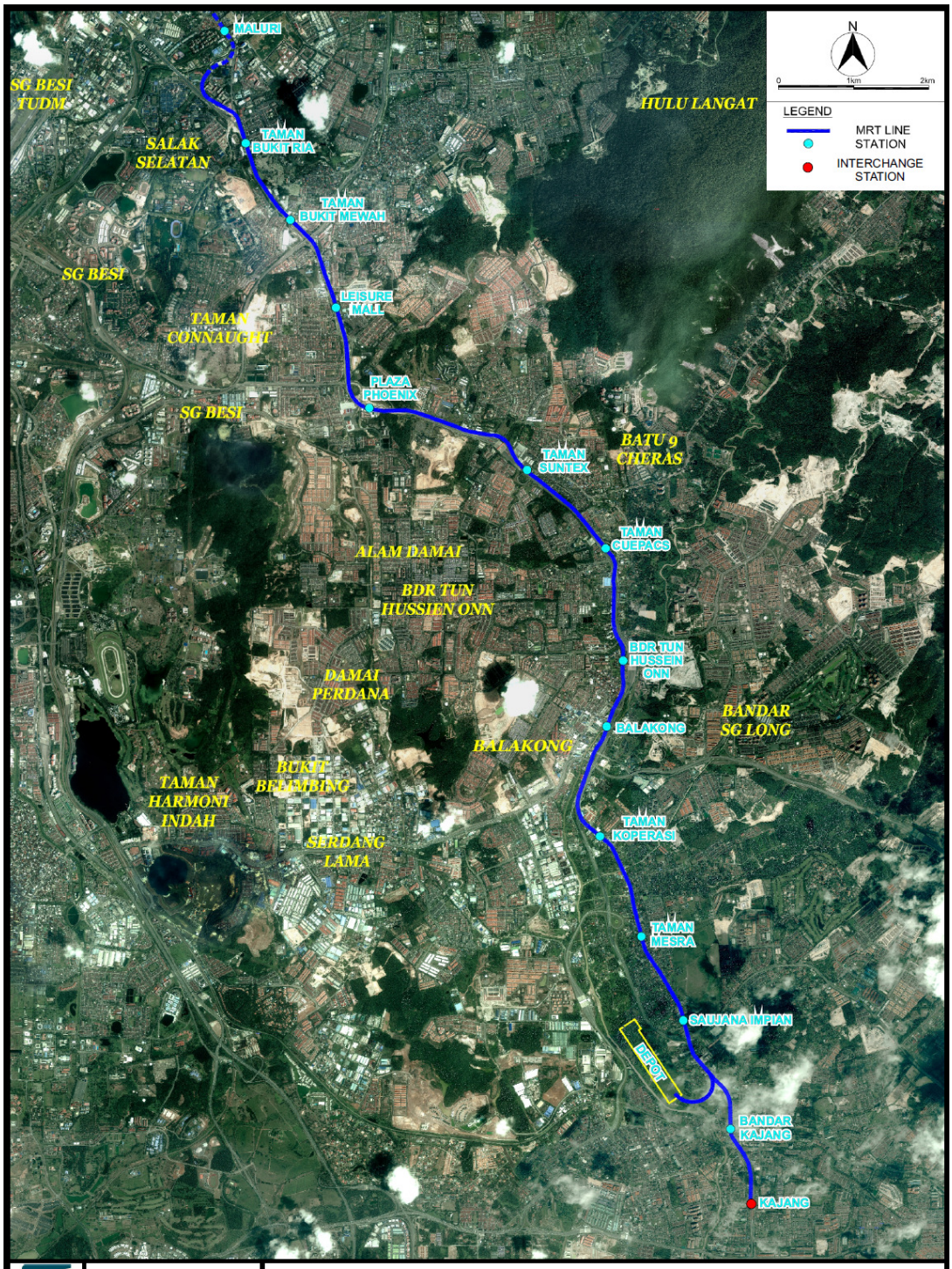
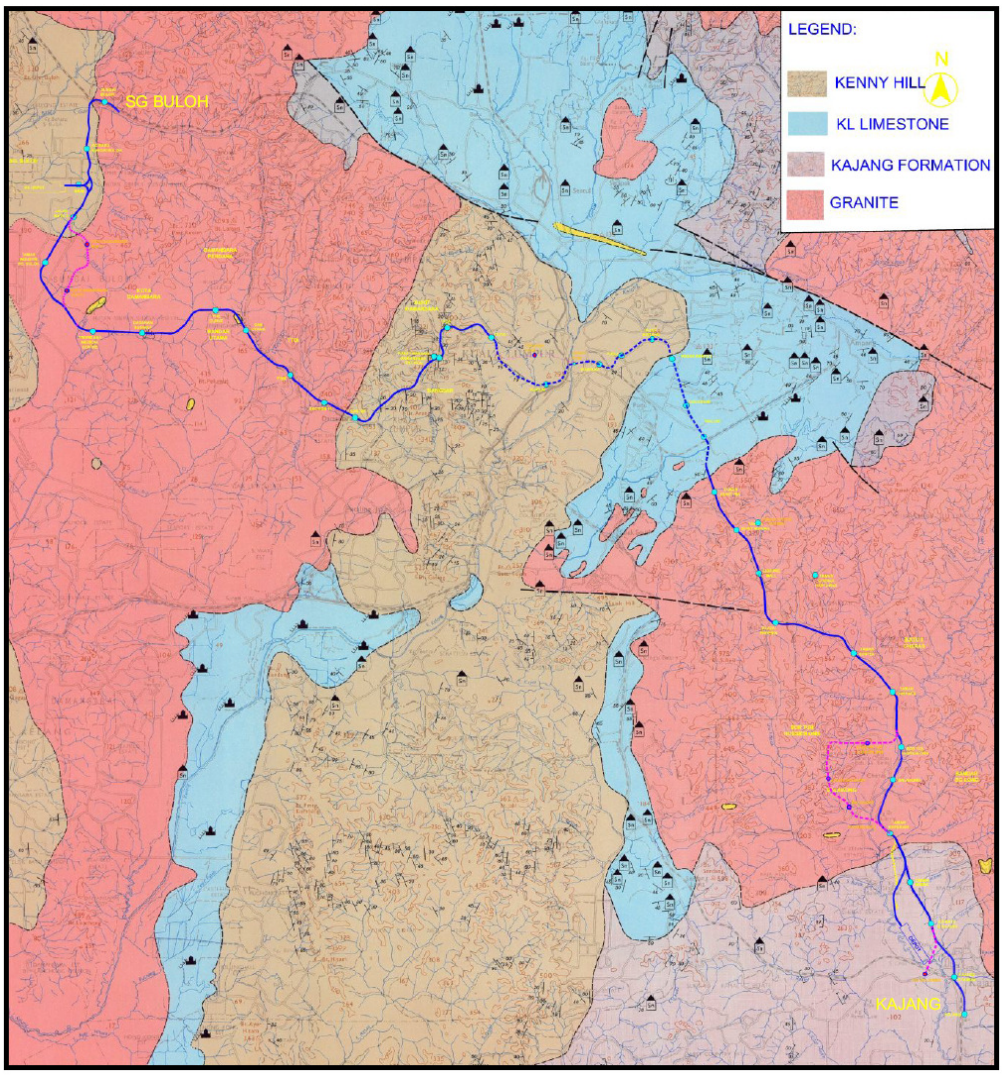


Figure ES-5 Segment 3 : Maluri Station to Kajang Station

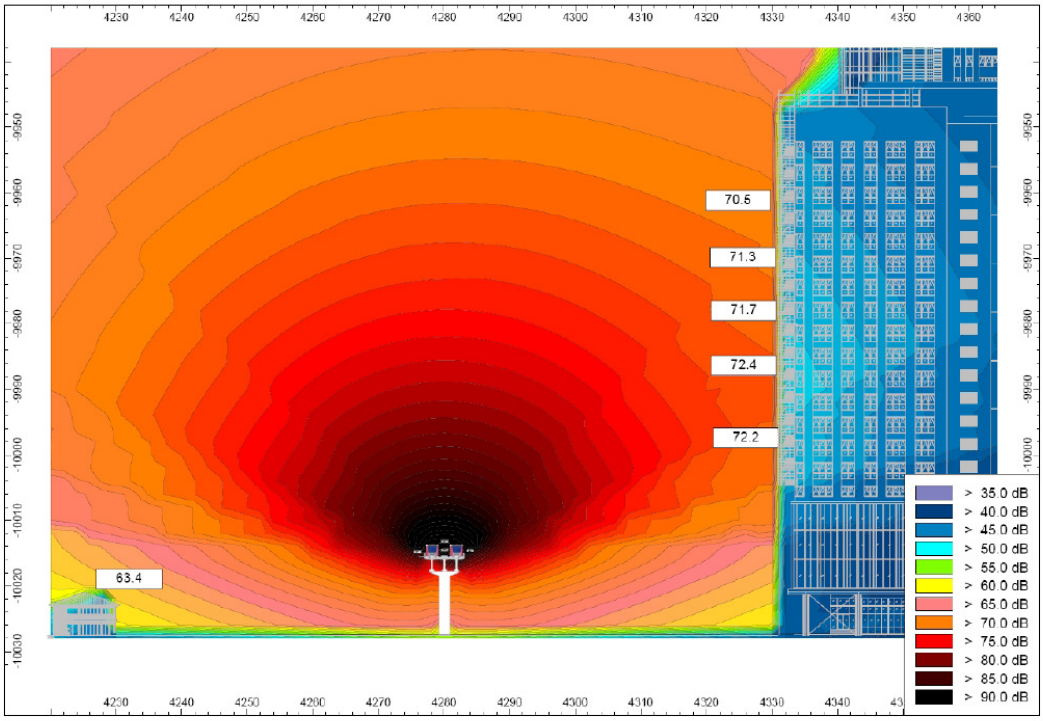
EXECUTIVE SUMMARY



Source : Geology Map For Klang Valley

Figure ES-6 Geology Underlying The SBK Line

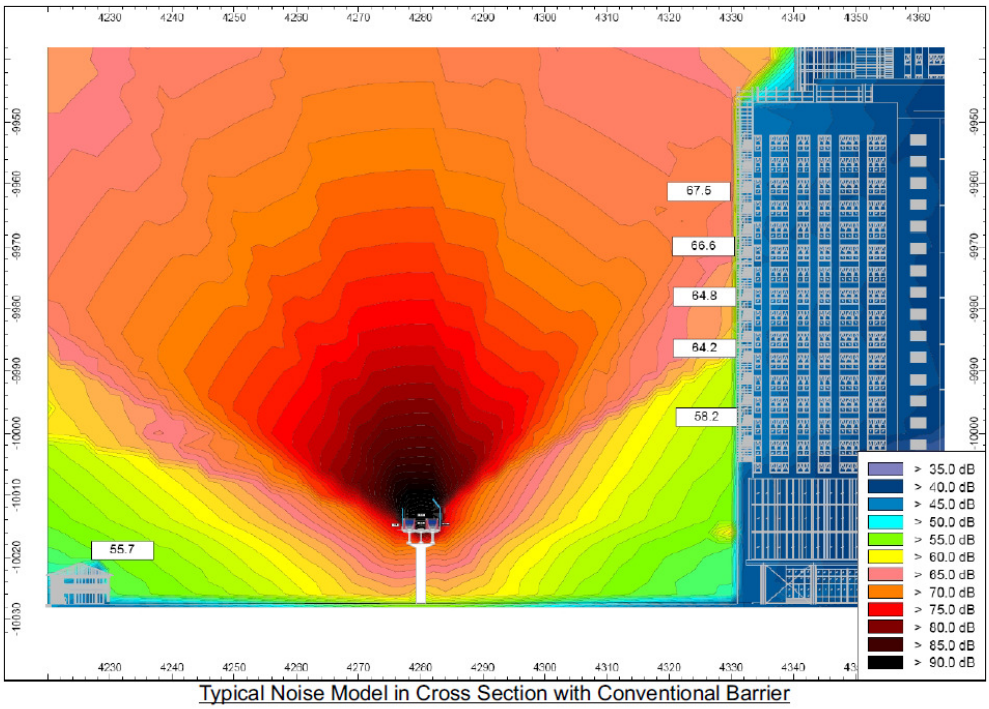
EXECUTIVE SUMMARY



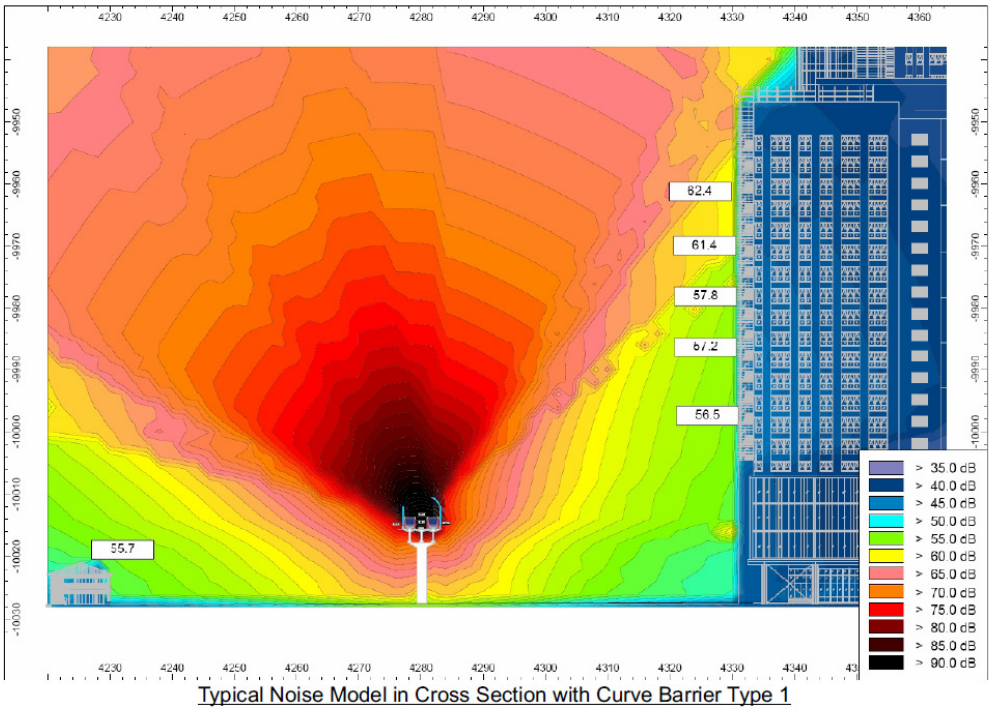
Typical Noise Model in Cross Section (without noise mitigation)

ere consulting group	Figure ES-7	Typical Noise Model in Cross Section (without noise mitigation)

EXECUTIVE SUMMARY



Typical Noise Model in Cross Section with Conventional Barrier



Typical Noise Model in Cross Section with Curve Barrier Type 1

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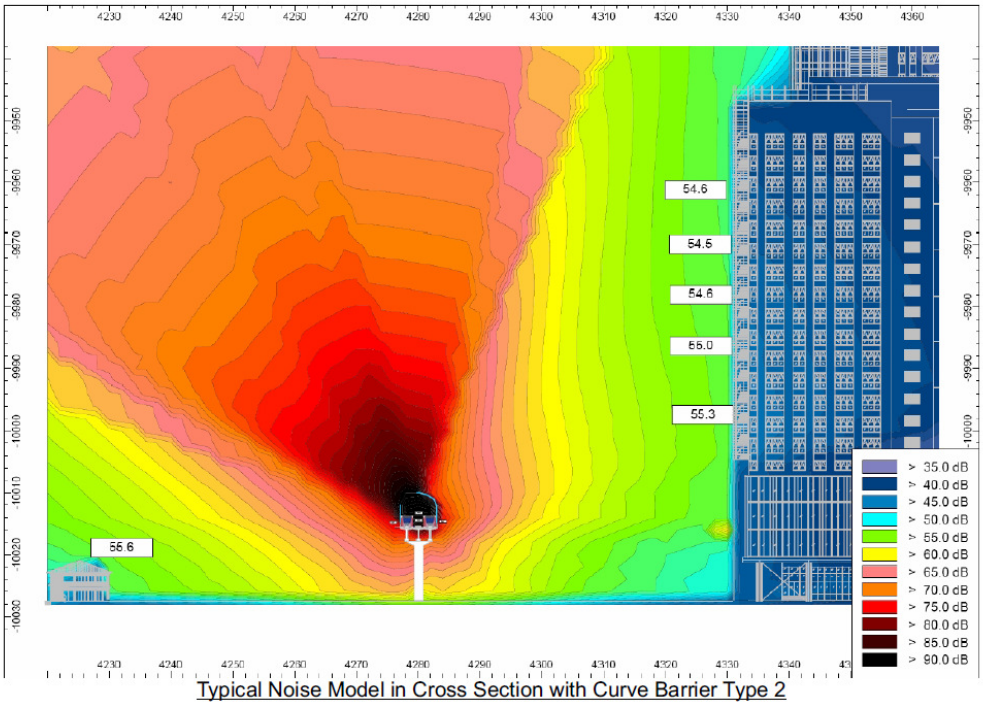
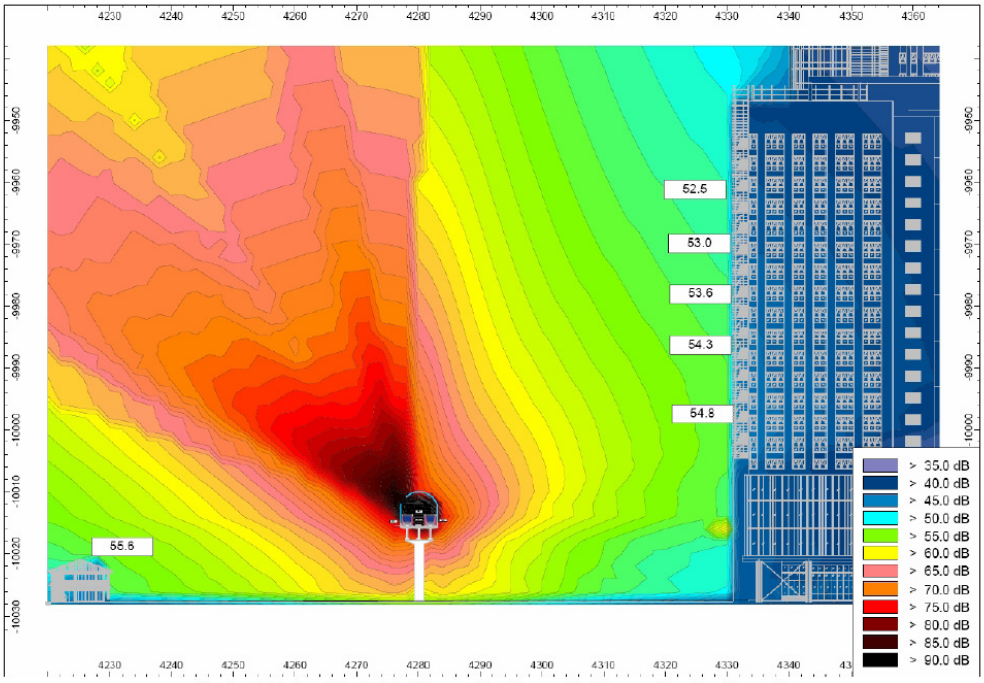


Typical Noise Model in Cross Section with Curve Barrier Type 2



Typical Noise Model in Cross Section with Curve Barrier Type 3

ere consulting group	Figure ES-9	Typical Noise Model in Cross Section with Curve Barrier Type 2 and Type 3