Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

Consulting Services for the Detailed Design and Tender Assistance of

The Davao City Bypass Construction Project

(South and Center Sections)

(LA No. PH-P261)

UPDATED
ENVIRONMENTAL IMPACT STATEMENT
(EIS)

February 2018

Joint Venture of:

NIPPON KOEI CO.,LTD.

Katahira & Engineers International

Nippon Engineering Consultants Co., Ltd

In Association with:

PHILKOEI INTERNATIONAL, INC.
CONSULTANTS • PLANNERS • ENGINEERS

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ACRONYMS

BC	Before Construction Stage
CDA	Cooperative Development Authority
CENRO	City Environment and Natural Resources Office
CS	Construction Stage
ECC	Environmental Compliance Certificate
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
ESSD	Environmental and Social Safeguard Division of DWPH
DAO	Department of Agrarian Reform
DCWD	Davao City Water District
DED	Detailed Engineering Design
DENR	Department of Environmental and Natural Resources
DENR-EMB	Department of Environmental and Natural Resources Environmental Management Bureau
DEO	District Engineering Office, DPWH
DLPC	Davao Light and Power Company
DPWH	Department of Public Works and Highways
DS	Demobilization/Decommission Stage
DTI	Department of Trade Industry
DSWD	Department of Social Welfare Development
ECA	Environmentally Critical Areas
EMP	Environmental Management Plan
FS	Feasibility Study
GOP	Government of the Philippines
JICA	Japan International Cooperation Agency
LGUs	Local Government Units
MMT	Multi-Partite Monitoring Team
NATM	New Australian Tunneling Method
NHA	National Housing Authority
NK-JV	Nippon Koei-Joint Venture
OCPDC	Office of the City Planning and Development Coordinator
OS	Operation Stage
PD	Presidential Decree
PO	People's Organization
RA	Republic Act
RAP	Resettlement Action Plan
PNP	Philippine National Police
ROW	Right of Way
SAFDZ	Strategic Agriculture and Fisheries Development Zone
TESDA	Technical Education and Development Agency
UMPO-RMC1	Road Management Cluster 1, Unified Project Management Office of DPWH

CHAPTER 1: PROJECT DESCRIPTION

1.1 Objective of Updating Environmental Impact Statement

Davao Bypass Construction Project travers approximately 45 km in total, and is composed of the 2 packages. Package I is composed of 2 sections (i.e. South and Center sections) and Package II is composed of 1 section (i.e. North sections).

Environmental Impact Statement (EIS) for the entire alignment of Davao Bypass Construction Project (the Original EIS) was prepared as a part of the Preparatory Survey for South Mindanao Economic Corridor Improvement conducted by Japan International Cooperation Agency (JICA) in 2014 to 2015 (JICA FS). Environmental Compliance Certificate (ECC) to the entire stretch was issued by Department of Environmental and Natural Resources (DENR) on 22 September 2015 (ref. no. ECC-CO-1503-007).

Detailed Engineering Design (DED) was conducted for Package I (the Project) since February 2017, and alignment at some sections in the Project was reviewed and shifted based on the results of technical survey and consultation with stakeholders and surrounding communities. Accordingly, evaluation of possible environmental and social impact to be caused by implementing the Project was updated based on the latest project description.

1.2 Implementation Organization of Environmental Impact Assessment

EIS report to the entire alignment was prepared by ECOSYSCORP, INC. during JICA FS, and update works for the Project portion was conducted by Nippon Koei-Joint Venture (NK-JV), Katahira and Engineers International, Nippon Engineering Consultants Co., Ltd. in association with Philkoei International, Inc.(PKII).

1.3 Project Outline

(1) Project Outline

Davao Bypass Construction Project for the whole alignment planned in JICA FS was shown in Table 1.3-1.

Table 1.3-1 Project Outline Designed in FS 2014

	Package I		Package II	Total
	Section 1 (South)	Section 2 (Center)	Section 3 (North)	
Length (km)	11.7	17.1	15.8	44.6
Finance	To be financed by JICA Loan	To be financed by JICA Loan	To be financed by Government of the Philippines (GOP)	

Source: NK-JV

Package I was modified in this DED as shown in Table 1.3-2.

Table 1.3-2 Project Outline Modified in DED

	Package I (South and Center)			Package II (North)	Total
	I-1	I-2	I-3	Section 3	
Length (km)	10.7	12.8	6.1	15.8*	45.4*
Finance	Under examination	To be financed by JICA Loan	Under examination	To be financed by GOP	

Note: DED for Package II is not yet commenced. Thus, length of Package II is tentatively set as same as the one in JICA FS.
Source: NK-JV

(2) Modification of Project Description from JICA FS

Table 1.3-3 and Figure 1.3-1 show major modification from JICA FS.

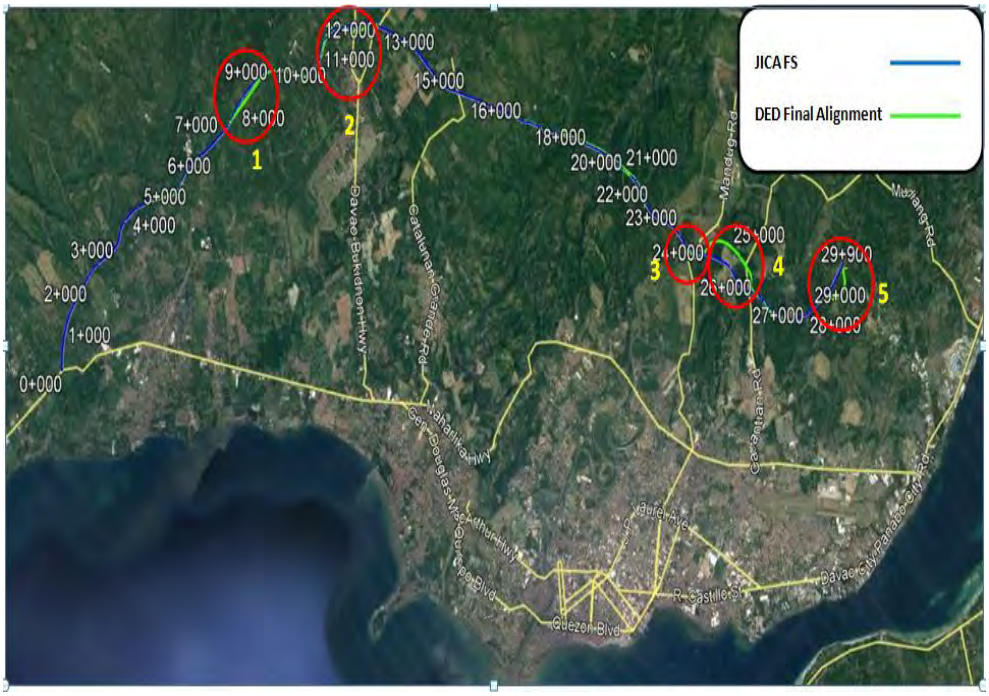
Table 1.3-3 Major Modification of Package I Design

Structure	Design Item	JICA FS (2014)	Detailed Design (2017/2018)
Highway	Width of Carriageway	3.5 m	3.35 m
	Maximum Gradient	6%	Flat, Rolling/Mountainous Taking 30-35% of the truck and trailer traffic on the Project road into consideration, the maximum grade of 5% be applied.
	Main Road Type of Pavement Base	 PCCP T=300mm T=300mm	 Required Portland Cement Concrete Pavements with Dowel Bars at Contract Joints Crushed Aggregate Base Course
	Right of Way (ROW) Main Road	60m	Vary approximately 40-100m depending on cross section design. 100m ROW is required at high embankment sections. Existing ROW except improvement sections.
Bridges	Structural Design Standards	Design Guidelines, Criteria and Standards of the Department of Public Works and Highways (1984)	Design Guidelines, Criteria and Standards of the Department of Public Works and Highways (2015)
	Left Shoulder	0.16 m	0.31 m
	Right Shoulder	0.16 m	0.31 m
	Preliminary Design of Bridge Structure	Section-1: 10-Bridges & 2-Overpasses Section-2: 14-Bridges & 4-Overpass	Section-1: 6-Bridges & 3-Overpass Section-2: 6-Bridges & 3-Overpass, 2-Ramp bridges
	Preliminary Design of Culvert Structure	Section-1: 16-Culverts for river Section-2: 16-Culvert for river & 3-Culvers for crossing road	Section-1: 22-Culverts for river Section-2: 25-Culvert for river & 3-Culvers for crossing road
	Vertical Clearance	5.0 m	5.03 m
Tunnel	Traffic and Evacuation	One main tunnel of two-way traffic + Evacuation tunnel.	Two tube tunnels with same section area are applied.
	Tunnel Alignment	The alignment is planned mainly for one main tunnel.	- The realignment plan has been conducted for the applied two tube tunnel plan.

	Tunnel profile	The long and high bridge is applied to approach the tunnel.	- The tunnel elevation is planned lower than PS.
	Typical Cross Section	The typical cross section for 2-way traffic tunnel for main tunnel is applied.	- The typical cross section for one way traffic is applied for two main tube tunnel.
	Interval of Crossing passage	The interval, 350m, for two-way traffic is applied.	- The interval, 750m, for one way traffic is applied.
	Interval of Emergency parking lane	The interval, 350m, for two-way traffic is applied.	- The interval, 750m, for one way traffic is applied.

Source: NK-JV

Total 5 Sections of Alighment Shifting (General)

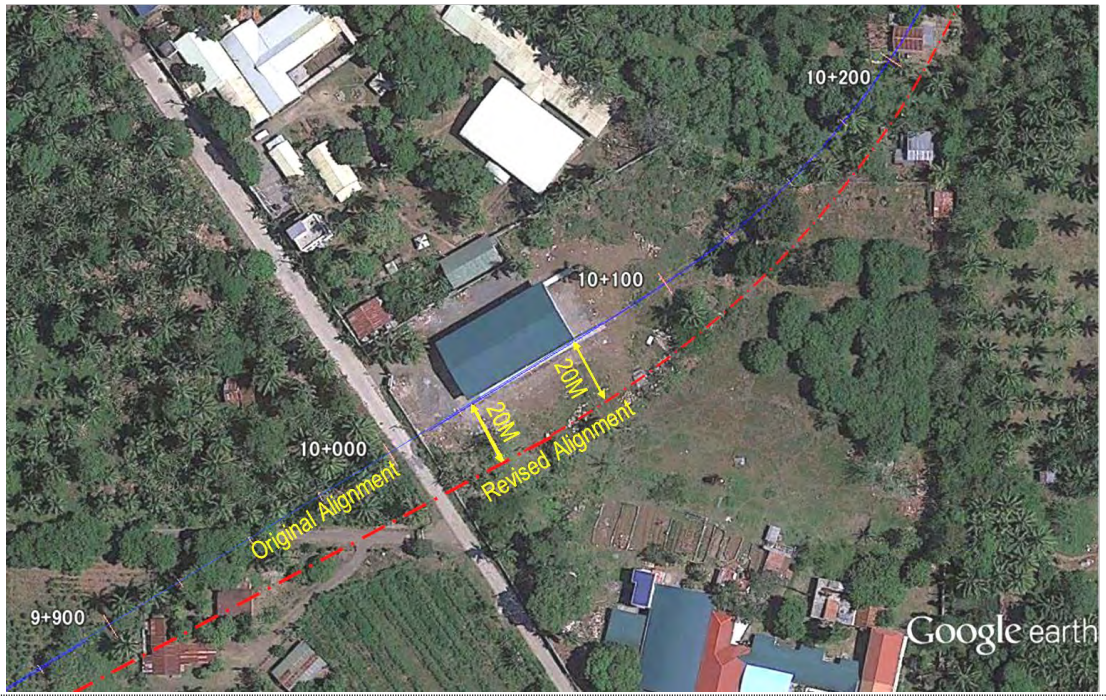


Alighnemnt at 5 sections in total was shifted from the one proposed during JICA FS due to technical and social viewpoints.

1. Station 8+400

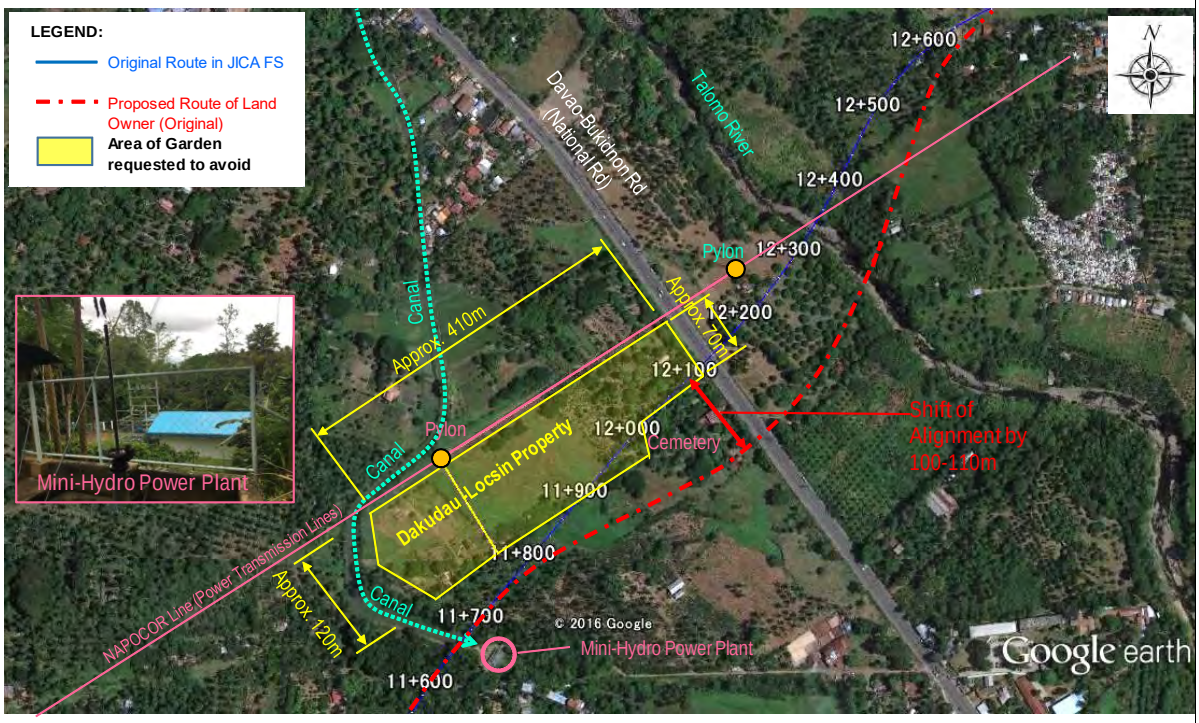
The proposed alignment at JICA FS passed through the two (2) sub-division development areas. The aligment was shifted to the border of both sub-division development.

2. Station 9+200 to 10+000



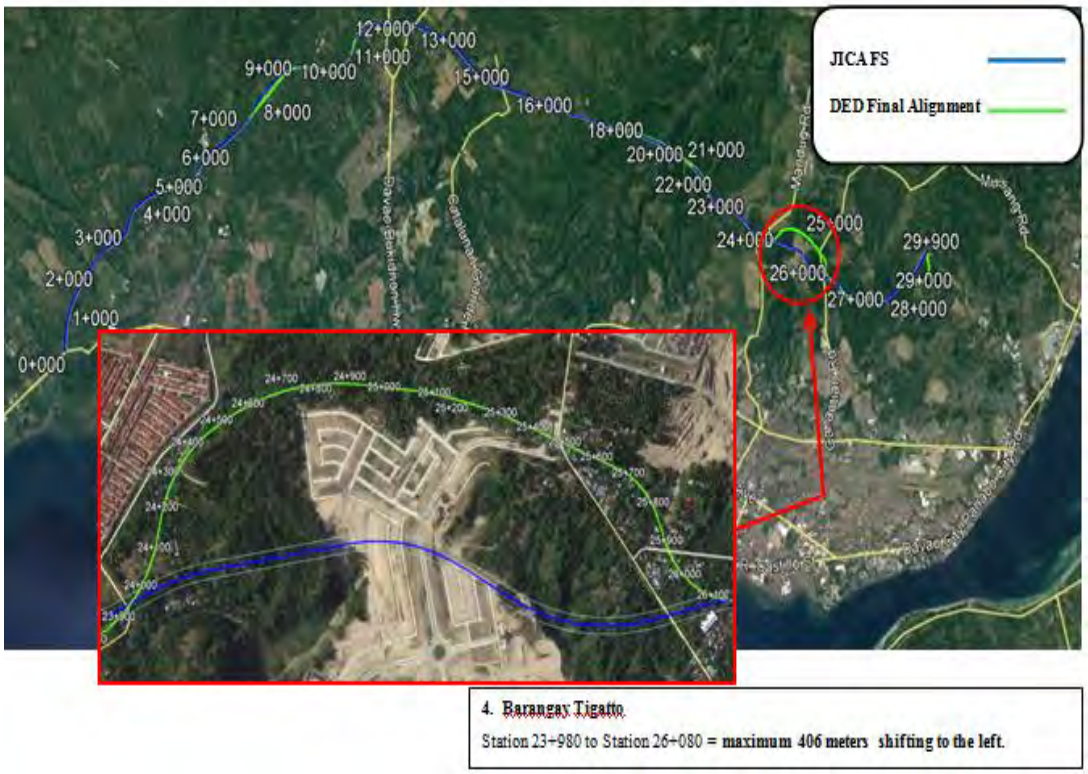
The proposed alignment at JICA FS run adjacent to the new structure (30m x 40m) belong to Welfare Department of Region XI. Accordingly, it was shifted 20 meters to the right to avoid the structure.

3. Station 12+100



The proposed alignment at JICA FS around Station 12+100 (Davao-Bukidnon Road Intersection) was shifted considering plea for reservation of the Davao Ancestral Heritage Property.

4. Station 24+000



The proposed alignment at JICA FS was passed inside the new subdivision development, and it was shifted to northern side to avoid new subdivision development.

5. Station 28+400

The proposed alignment at JICA FS was shifted to the right side to avoid new subdivision development.

Source: NK-JV

Figure 1.3-1 Sections of Shifting Alignment

(3) Latest Project Description

The latest Project description incorporating modification from JICA FS is shown in Table 1.3-4.

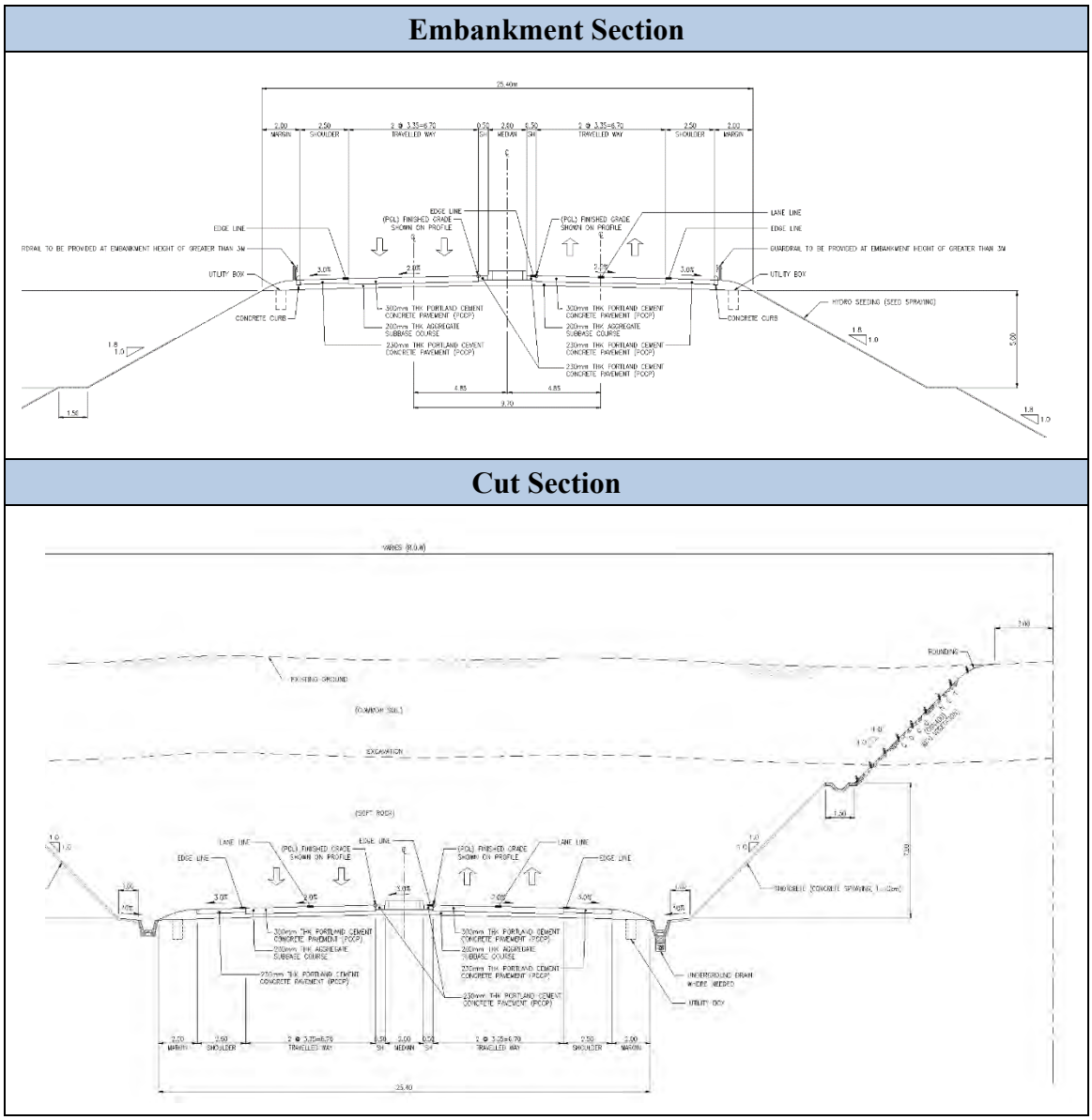
Table 1.3-4 Latest Description of the Project

No.	Item	Package 1-2	Package 1-1	Package 1-3
1	Starting Point	STA 0+000, General Santos Road	STA 12+800.0, Mintal Road	STA 23+500.0, Mandug Road
2	Ending Point	STA 12+800.0, Mintal Road	STA 23+500.0, Mandug Road	STA 29+600.0, Malagamot Road
3	Length	12.8 km	10.7 km	6.1 km
4	Road Class	National Road: Primary	National Road: Primary	National Road: Primary
5	Design Speed	60 km/hr	60 km/hr	60 km/hr
6	Nos. of Lanes	Four (4) lanes: Main Carriageway	Four (4) lanes: Main Carriageway	Four (4) lanes: Main Carriageway
7	Road Width	Main Road: 21.4m Bridge: 7.32m@2	Main Road: 21.4m Bridge: 7.32m@2 Tunnel: 7.70m@2	Main Road: 21.4m Bridge: 7.32m@2 BOX: 7.70m@2
8	Cross Section	Main Road: 2.5+2@3.35+0.5+2.0+0.5+2@3.35+2.5 Bridge: (0.31+2@3.35+0.31)@2	Main Road: 2.5+2@3.35+0.5+2.0+0.5+2@3.35+2.5 Bridge: (0.31+2@3.35+0.31)@2 Tunnel: (0.50+2@3.35+0.50)@2	Main Road: 2.5+2@3.35+0.5+2.0+0.5+2@3.35+2.5 Bridge: (0.31+2@3.35+0.31)@2 Cut & Cover Tunnel: (0.50+2@3.35+0.50)@2
	Elements	- Carriageway : 4@3.35 m = 13.4 m - Shoulder (out) : 2@2.5 m = 5.0 m - Shoulder (in) : 2@0.5 m = 1.0 m - Median : 1@2.0 m = 2.0 m - Barrier : 2@2.0 m = 4.0 m	- 4@3.35 m = 13.4 m - 2@2.5 m = 5.0 m - 2@0.5 m = 1.0 m - 1@2.0 m = 2.0 m - 2@2.0 m = 4.0 m	- 4@3.35 m = 13.4 m - 2@2.5 m = 5.0 m - 2@0.5 m = 1.0 m - 1@2.0 m = 2.0 m - 2@2.0 m = 4.0 m
9	Interchange, Intersections, Ramp Bridge, Overpasses, Box culvert, Tunnel Operation Control center and Toll Gate	One (1) interchange & Sixteen (16) intersections & Three (3) overpasses & One (1) box culvert Intersection-1: STA 0+000 Intersection-2: STA 1+340 Intersection-3: STA 1+680 Intersection-4: STA 2+090 Intersection-5: STA 2+185 Intersection-6: STA 2+670 Intersection-7: STA 3+130 Intersection-8: STA 4+630 Intersection-9: STA 6+460 Intersection-10: STA 6+630 Intersection-11: STA 9+940 Intersection-12: STA 9+965 Intersection-13: STA 10+200 Intersection-14: STA 10+625	Three (3) intersections & Two (2) overpasses & Two (2) box culvert & Toll gate Intersection-17: STA 12+825 Intersection-18: STA 15+630 Intersection-19: STA 16+640	Three (3) intersections & One (1) overpasses Intersection-20: STA 23+500 Intersection-21: STA 23+900 Intersection-22: STA 29+500

		Intersection-15: STA 11+055 Intersection-16: STA 11+410 - Signal with 4 directions Overpass-1: STA 3+814 - Bridge type: PC flat slab - L = 50 m, W = 9.54 m Overpass-2: STA 5+668 - Bridge type: PC flat slab - L = 60 m, W = 9.54 m Overpass-3: STA 9+049 - Bridge type: PC flat slab - L = 50 m, W = 9.54 m Box culvert-1: STA 2+034 L = 34 m, W=6.0m Interchange: STA 12+120 - Ramp-A - Bridge type: PSCG - L = 110m,, W = 7.67m - Ramp-B - Bridge type: PSCG - L = 110m,, W = 7.67m	- Signal with 4 directions Overpass-4: STA 17+385 - Bridge type: PC flat slab - L = 50 m, W = 9.54 m Overpass-5: STA 18+890 - Bridge type: PC flat slab - L = 60 m, W = 9.54 m Box culvert-2: STA 22+370 L = 32.5 m, W=9.7m Tunnel Operation Control Center: STA 21+600 - Operation Control Center - Maintenance Building - Emergency Car Building - Substation-3 - Fire Pump, tank - Intake chamber - Parking space Toll Gate: STA 22+700 - 6 lanes with 7 booths, management office building	- Signal with 4 directions Overpass-6: STA 27+859 - Bridge type: PC flat slab - L = 60 m, W = 9.54 m - -
10	Bridges	Total Length: 1,065 m Creek 5 Bridge (STA 1+850) - 5 spans PSCG - L=165m, W=9.54m - Single column pier - Sinso Caisson foundation Bayabass Creek Bridge 1 (STA 2+490) - 4 spans PSCG - L=140m, W=9.54m - Single column pier - Sinso Caisson foundation - Bored Pile foundation Bayabass Creek Bridge 2 (STA 2+730) - 3 spans PSCG - L=120m, W=9.54m - Single column pier - Bored Pile foundation Lubogan River Bridge (STA 4+955) - 4 spans PSCG	Total Length: 870 m Matina River Bridge 1 (Southbound) (STA 18+427) - 7 spans PSCG - L=260m, W=8.84m - Single column pier - Sinso Caisson foundation - Bored Pile foundation Matina River Bridge 1 (Northbound) (STA 18+427) - 7 spans PSCG - L=270m, W=8.84m - Single column pier - Sinso Caisson foundation - Bored Pile foundation Matina River Bridge 2 (Southbound) (STA 18+910) - 2 spans PSCG - L=70m, W=8.84m - Bored Pile foundation Matina River Bridge 2 (Northbound) (STA 18+915) - 2 spans PSCG	

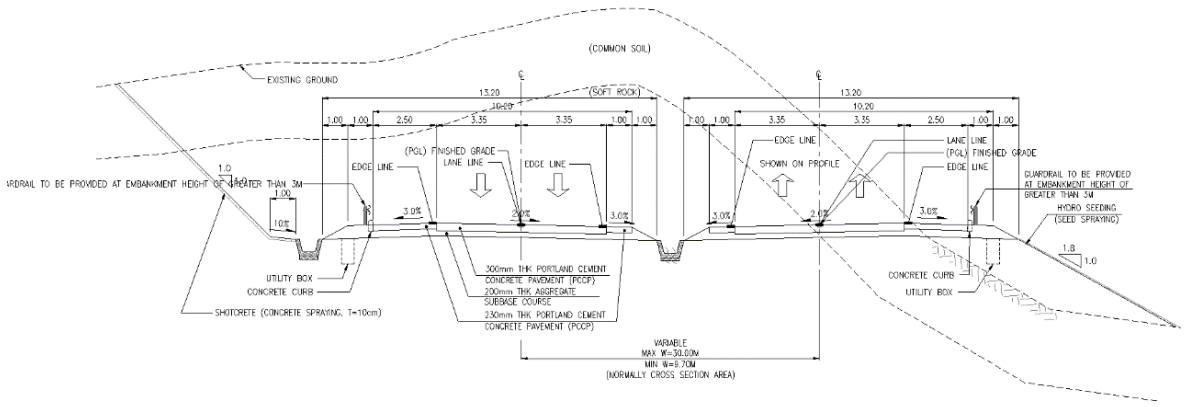
		- L=150m, W=9.54m - Single column pier - Sinso Caisson foundation - Bored Pile foundation <u>Lipadas River Bridge (STA 6+139)</u> - 3 spans PSCG - L=87.5m, W=9.54m - Single column pier - Bored Pile foundation <u>Talomo River Bridge 1 (Southbound) (STA 11+601)</u> - 3 spans PSCG - L=87.5m, W=8.84m - Single column pier - Bored Pile foundation <u>Talomo River Bridge 1 (Northbound) (STA 11+601)</u> - 3 spans PSCG - L=87.5m, W=8.84m - Single column pier - Bored Pile foundation <u>Davao Bukidnon Flyover (STA 12+080)</u> - 3 spans PSCG - L=87.5m, W=9.54m - Wall type pier - Bored Pile foundation <u>Talomo River Bridge 2 (STA 12+271)</u> - 4 spans PSCG - L=140m, W=9.54m - Single column pier - Bored Pile foundation	- L=70m, W=8.84m - Bored Pile foundation <u>Davao River Bridge (STA 22+925)</u> - 5 spans PSCG - L=200m, W=9.54m - Bored Pile foundation	
11	Tunnel		<u>NATM</u> Southbound: 19+172 - 21+421, L=2,249m Northbound: 19+160 – 21+400, L=2,240m	<u>Cut & Cover Tunnel – 1</u> Structure: Twin Box 25+320 - 25+530, L=210m <u>Cut & Cover Tunnel – 2</u> Structure: Twin Box 25+820 - 25+950, L=130m
12	Pavement Structure	<u>Bridge Deck</u> <u>PSCG</u> - Coarse 50mm -	<u>Tunnel</u> - Subbase 300 mm - Concrete Pavement 330 mm	<u>Main Road</u> - Subbase 200 mm - Concrete Pavement 300 mm <u>Toll Gate</u> - Subbase 250 mm + Base 100 mm - Concrete Pavement 30 mm
13	Auxiliary works	drainage system, power supply system, road lighting system, obstruction lights, communication system, firefighting system, ventilation system, water supply system, wastewater treatment system, bridge bearings, expansion joints, navigation signs, road signs, road markings, inspection access, monitoring system, supports for water pipes & telecom fibers, signals, etc.		

Source: NK-JV



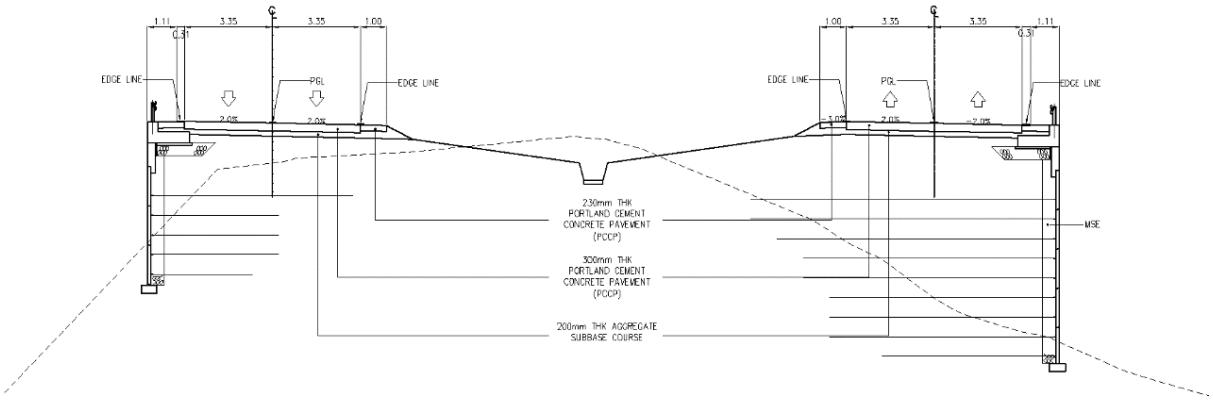
Source: NK-JV

Figure 1.3-2 Typical Cross Section of Embankment and Cut



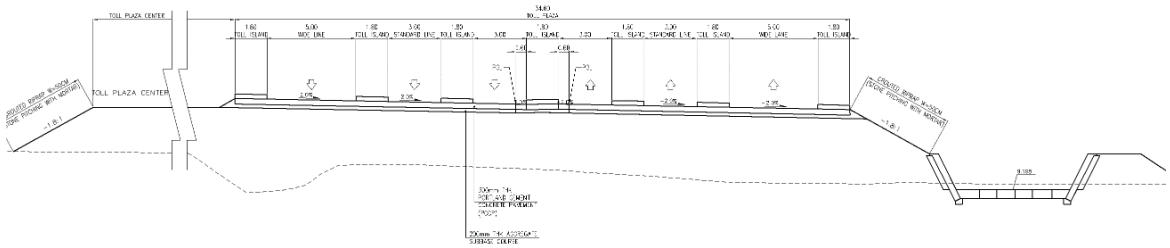
Source: NK-JV

Figure 1.3-3 Typical Cross Section of Divided Road Section



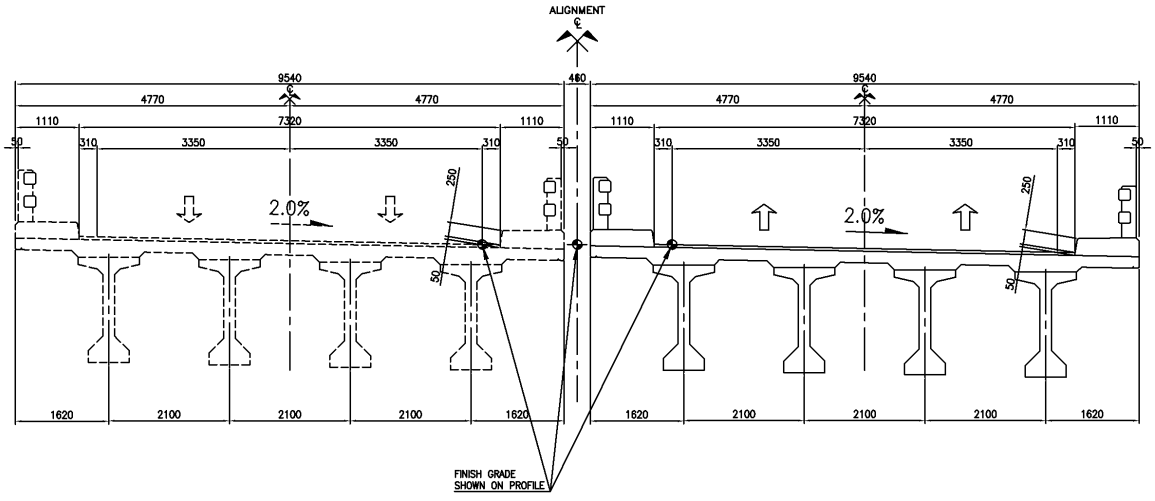
Source: NK-JV

Figure 1.3-4 Typical Cross Section of MSE Section



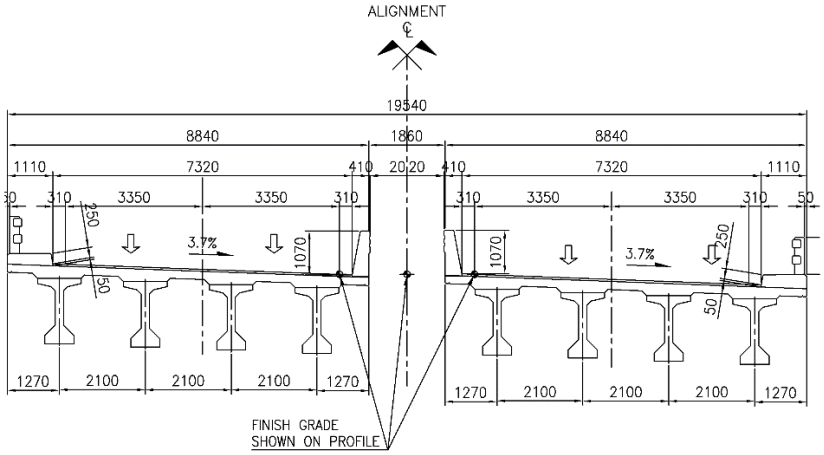
Source: NK-JV

Figure 1.3-5 Typical Cross Section of Toll Plaza



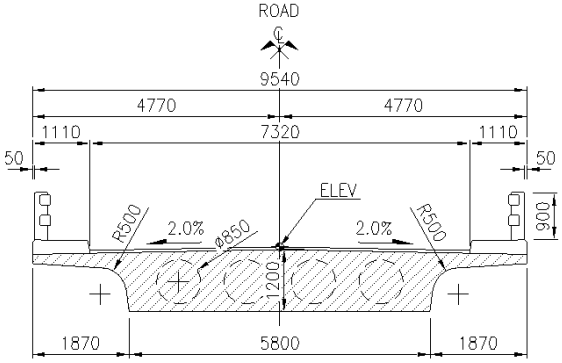
Source: NK-JV

Figure 1.3-6 Typical Cross Section of 2 Lane Bridge



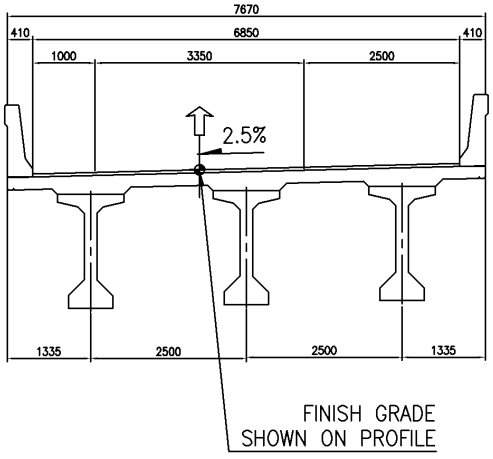
Source: NK-JV

Figure 1.3-7 Typical Cross Section of 4 Lane Bridge



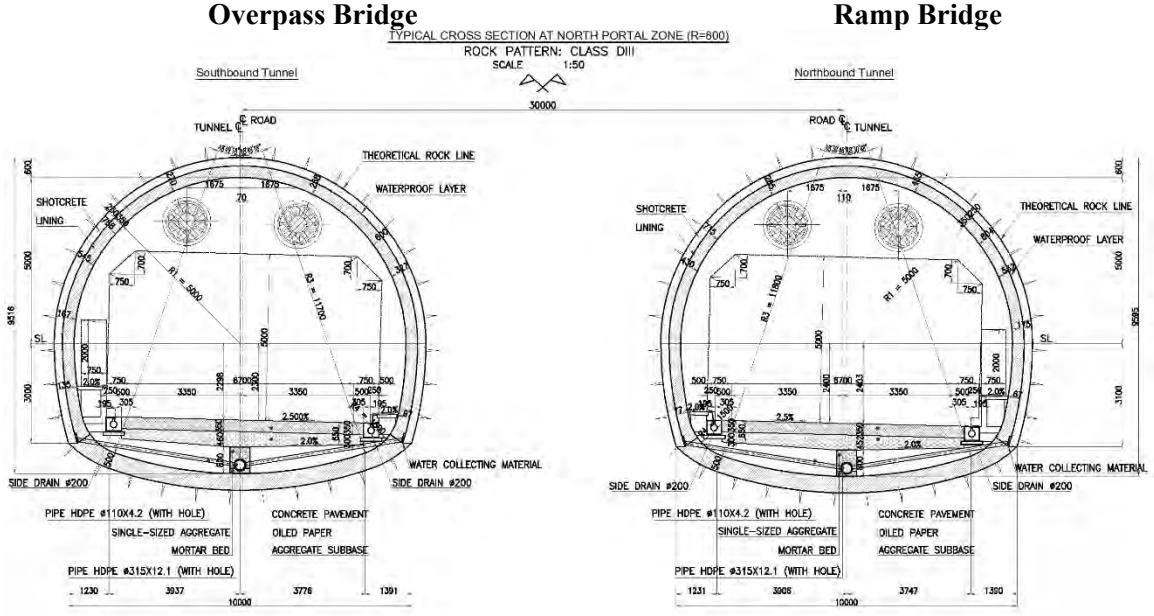
Source: NK-JV

Figure 1.3-8 Typical Cross Section of Overpass Bridge



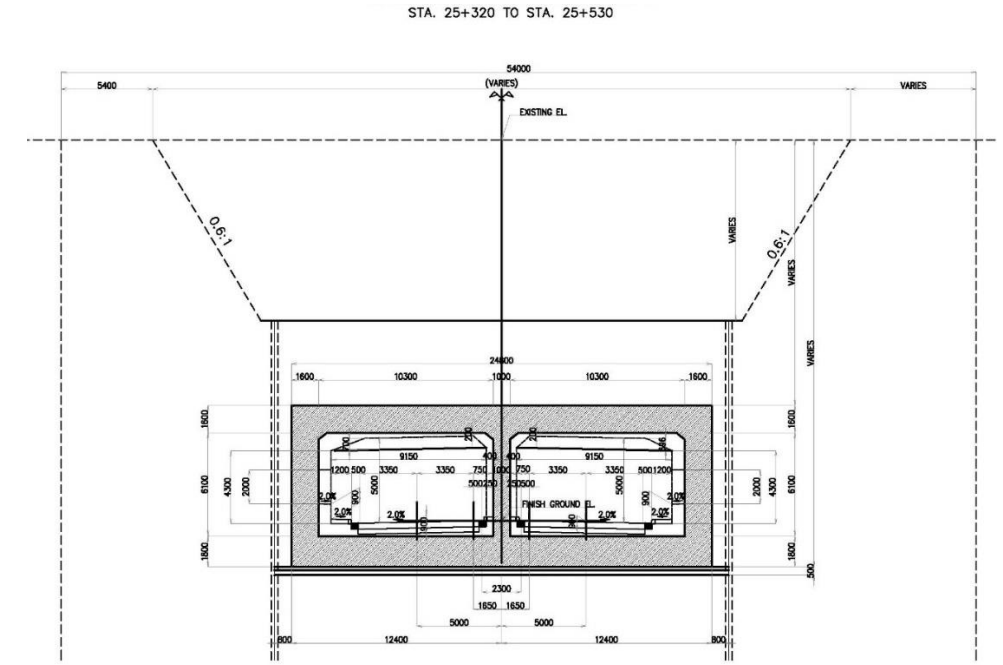
Source: NK-JV

Figure 1.3-9 Typical Cross Section of Ramp Bridge



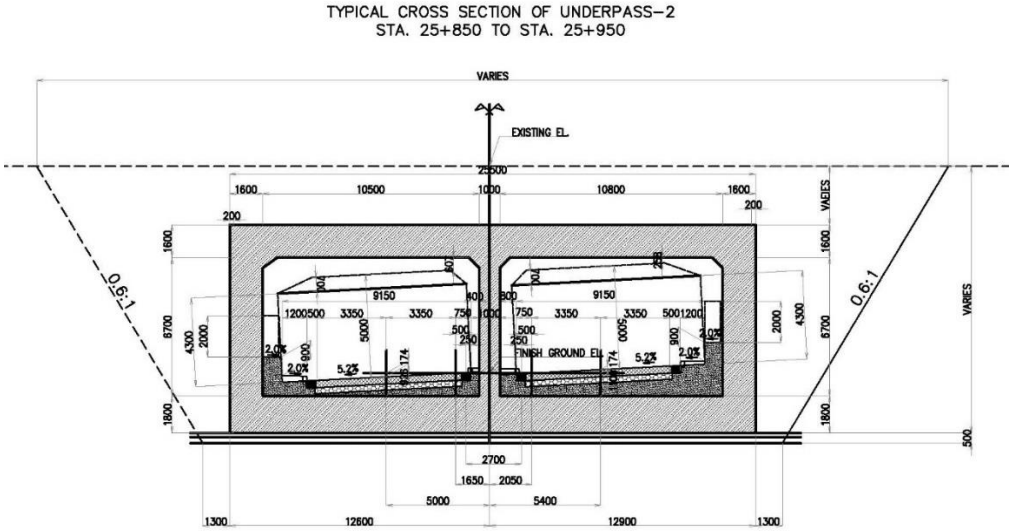
Source: NK-JV

Figure 1.3-10 Typical Cross Section of Tunnel



Source: NK-JV

Figure 1.3-11 Typical Cross Section of Cut & Cover Tunnel-1



Source: NK-JV

Figure 1.3-12 Typical Cross Section of Cut & Cover Tunnel-2

In addition to description in Table 1.3-4, there are related works outlined below.

1) River Works

Table 1.3-5 Outline of River Works

Location	Description
Station 2+800	Slightly shift river flow within the creek
Station 5+000	Widen river width due to installing bridge foundations

Location	Description
Station 6+000 6+200	Linearize the current flexuous river flow for approx. 200 m
Station 14+300	Protect the one side of river bank by concrete
Station 15+200	Ditto
Station 22+300	Arrange current river flow by installing drainage with gabion

Source: NK-JV

2） Disposal Sites

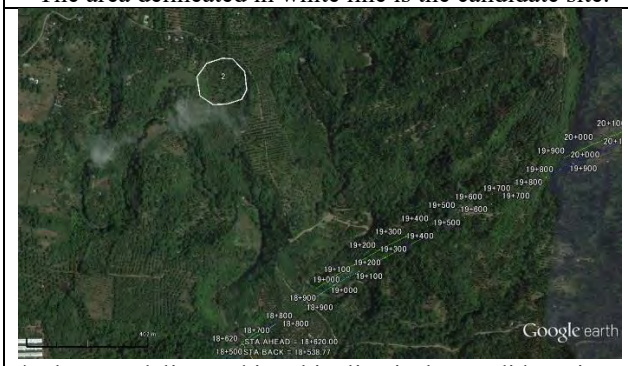
There are 5 candidate disposal sites as shown in Table 1.3-6 though the Contractor will decide the sites before construction works are commenced.

Table 1.3-6 Outline of Candidate Disposal Sites

1. Approx. 800 m east from Station 15+200

* The area delineated in white line is the candidate site.

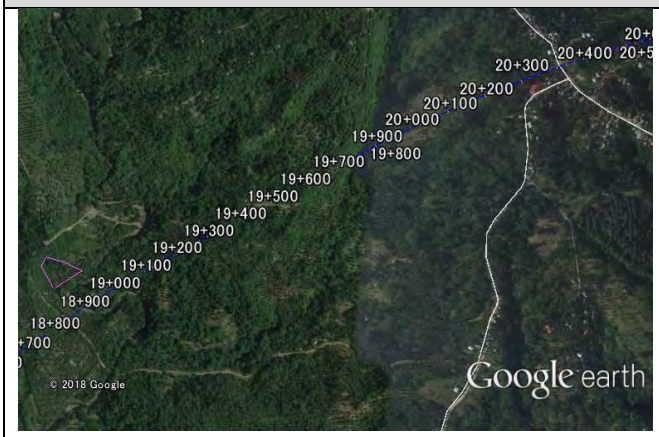
This is private plain land, and approx. 30,000 m^3 of soil disposable is considered as possible.



* The area delineated in white line is the candidate site.

This is private land of valley, and approx. 600,000 m^3 of soil disposable is considered as possible

3. Approx. 200 m west from Station 18+900



* The area delineated in pink line is the candidate site.

This is private land of valley, and approx. 100,000 m^3 of soil disposable is considered as possible.

<table>
<tr><th colspan="2">4. Approx. 800 m east from Station 23+000, and 5. Approx. 1.5 km east from Station 23+000</th></tr>
<tr><td colspan="2"> 

* The area delineated in white line is the candidate site.</td></tr>
<tr><td> 
Photo of Location No. 4</td><td> 
Photo of Location No. 5</td></tr>
<tr><td>This is private plain land, and approx. 200,000 m^3 of soil disposable is considered as possible.</td><td>This is private plain land, and approx. 200,000 m^3 of soil disposable is considered as possible.</td></tr>
</table>

Source: NK-JV

3) Arrangement of Relocation Site for Informal Settlers

There are numbers of Informal Setters (IFSs) who are requested to relocate due to implementing the Project though National Housing Authority (NHA) will officially determine who will be IFSs for the Project based on NHA database. A relocation site will be arranged for them, and a candidate site is located approx. 1.3 km west from Station 17+000. The candidate site is approx. 3.7 ha, and necessary development to be used as a relocation site will be done by NHA.

(4) Construction Method

The planning construction methods are summarized in Table 1.3-7.

Table 1.3-7 Outline of Construction Methods of the Project

Structure		Construction Method
Road Works	Cut	➢ Bench cut method ➢ Total excavation volume is 4,142,395.21 m^3
	Embankment	➢ Using the general earth work and Mechanically Stabilized Earth (MSE) wall ➢ Using excavated materials after filtering unsuitable materials ➢ Total embankment volume is 3,140,908.19 m^3
	Drainage	Side ditch, seam ditch, pipe culvert and box culvert

Structure		Construction Method
	Slop Protection	[Non-Structural Method] ➢ Fill slope areas: Spraying seed ➢ Cut slope of general soil areas: Coconut mat soil protection [Structural Method] ➢ Fill slope areas: Stone pitching with mortar ➢ Cut slop in soft rock areas: Spraying concrete [Combined Method (vegetation and structure)] ➢ Spraying crib-works with anchor and seed packet works
River Works		➢ River diversion and revetment ➢ Bank protection by gabions and gabion mattresses at the proposed all bridge and ramp bridge locations
Bridge Works	Substructure	➢ Benoto Method for the areas with sufficient space ➢ Shinso Method for the narrower areas
	Superstructure	➢ Electing girders by a crane ➢ Electing girders by launching girder for the areas where a crane cannot be installed
Tunnel Works	Main Tunnel	➢ New Australian Tunneling Method (NATM) Bench Cut Method
	Cut & Cover Tunnel	➢ Cut & Cover Method

Source: NK-JV

(5) Construction Schedule（最新スケジュールを確認後に記載）

1.4 Target of Updated EIS

Table 1.4-1 and Figure 1.4-1 show the target area for updating EIS.

The Project plans to traverse 18 Barangays in total as shown in Table 1.4-1, and these Barangays were the target area of environmental study at the time of JICA FS for preparing the original EIS. Barangay Bago Oshiro was newly added in the project area in DED due to slightly shifting the center line at Station 9+762.55 to 9+773.11 to the east side. As a result, only a small part of the edge in ROW was located in Barangay Bago Oshiro.

Table 1.4-1 Project Area

Package	Station (km)		Barangay	Sub-District	District
	From	To			
Package I-2	0	0+976.5	1. Sirawan	Toril	Third
	0+976.5	3+130.78	2. Marapangi		
	3+130.78	4+984.05	3. Bato		
	4+984.05	5+383.39	4. Lubogan	Tugbok	
	5+383.39	6+190	5. Alambre	Toril	
	6+190	6+962.19	6. Bankas Heights		
	6+962.19	9+737.12	7. Mulig		
	9+762.55	9+773.11	8. Bago Oshir	Tugbok	
	9+737.12	11+573.42	9-1. Mintal		
	11+573.42	12+800	9-2. Mintal 10-1. Tugbok		

Package	Station (km)		Barangay	Sub-District	District
	From	To			
Package I-1	11+800	12+842.53	10-2. Tugbok		
	12+842.53	17+789.26	11. Tacunan		
	17+789.26	19+821.39	12. Matina Biao		
	19+821.39	21+664.42	13. Magtuod	Talmo	First
	21+664.42	22+991.18	14. Waan	Buhangin	Second
	22+991.18	23+500	15-1. Tigatto		
Package I-3	23+600	25+390.41	15-2. Tigatto		
	25+390.41	27+355.49	16. Cabantian		
	27+355.49	28+015.73	17. Communal		
	28+015.73	29+600	18. Indangan		

Source: NK-JV

Source: NK-JV

Figure 1.4-1 Target Area of Updated EIS

CHAPTER 2: OVERVIEW OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 Policy of Environmental and Social Considerations

Major legislations on environmental and social conservation related to the Project are listed in Table 2.1-1.

Table 2.1-1 Major Laws and Regulations on Environmental Conservation related to the Project

Title of Regulations	Outline
1. Environmental Policy	
Presidential Decree No. 1151	Stipulating environmental policy
Presidential Code No. 1152	Environmental regulations
2. Environmental Conservation	
Public Law No. 3931	Stipulating to establish the national committee on air and water pollution management
Presidential Decree (PD) No. 825 (1975)	Regulation on penalty for illegal dump of disposal, dirt and other wastes
Presidential Decree (PD) No. 826 (1975)	Regulation on responsibility for treatment of solid and liquid wastes by local government
Presidential Decree (PD) No.1152 (1977)	Regulation on method and management of wastes
Republic Act No. 8749	Philippine Clean Air Act of 1999
Republic Act No. 9275	Philippine Clean Water Act of 2004
DENR Administrative Order No. 2000-81	Implementing Rules and Regulations (IRRs) for RA8749
DENR Administrative Order No. 2016-08	The guideline of water quality and genal effluent standards of 2016
DENR Administrative Order No. 2003-30	IRRS for EIS System in the Philippines
DENR Administrative Order No. 36 Series of 2004 (DAO 04-36)	Procedural manual of DAO 92-29 stipulating legal and technical requirements of hazardous waste management
DENR Administrative Order No. 49 Series of 1998 (DAO 98-49)	The technical guidelines for municipal solid waste management
Republic Act No. 9003	Ecological Solid Waste Management Act of 2000
DENR Administrative Order No. 34 Series of 1990 (DAO 01-34)	Implementing Rules and Regulations (IRRs) of RA 9003
3. Land Acquisition	
Republic Act 7279 or the Urban Development and Housing Act of 1992	Stipulating procedures for eviction and demolition for informal settlers' families
DPWH Department Order No. 5 Series of 2003	Stipulating to prepare Land Acquisition Plan and Resettlement Action Plan (LAPRAP) in case land acquisition is needed
DPWH Department Order No. 327 Series of 2003	Stipulating the necessary guidelines for the preparation of land acquisition and resettlement action plan for infrastructure projects
DPWH Department Order No. 65 Series of 2017	Stipulating the scope and delegation of the ROW functions and creation and composition of ROW task forces

Source: Compiled by NK-JV based on Preparatory Survey for South Mindanao Economic Corridor Improvement (Davao City Bypass Construction Project) (JICA, February 2015)

2.2 Institutional Framework

2.2.1 Institutional Framework for Environmental Management

Relevant parties and their responsibilities to implement environmental management for the Project were defined in the Original EIS as summarized in Table 2.2-1. Responsibility of each party defined in the table is still same though alignment is slightly shifted.

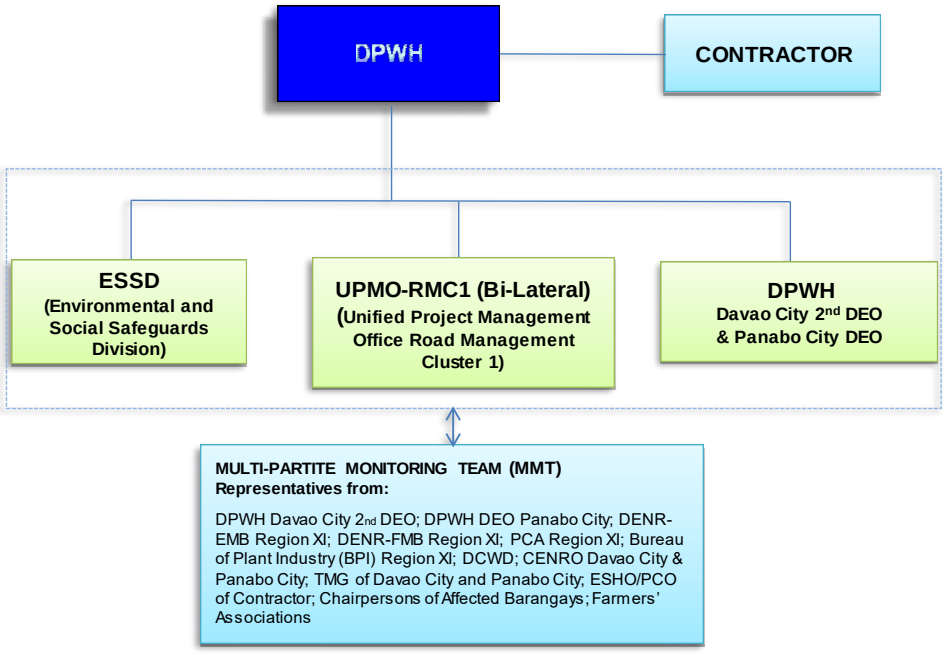
Table 2.2-1 Responsibilities of the Relevant Parties at Each Stage

Project Stage	Organization	Responsibility
Pre-Construction and Construction	ESSD of DPWH	➢ Overseeing the implementation of the EMP by the Contractor; ➢ Overseeing the updating of the Resettlement Action Plan (RAP) after the DED; ➢ Assisting in the conduct of IEC Meetings as enumerated in the IEC Framework of this EIS ➢ Monitoring actual payments of compensation to affected landowners, structure owners, and crops/trees owners; ➢ In coordination with the Davao City District Engineering Office prepare periodic supervision and monitoring reports on RAP implementation; and
	Construction Supervision Consultant	➢ Inspection of mitigation measures and environmental monitoring conducted by the contractor based on the approved EIS ➢ Report the monitoring result to DPWH by monthly report
	UPMO-RMC1 of DPWH	➢ Ensure that compliance to all conditions stipulated in the ECC are included as provisions in the Bid Documents to be issued to prospective Contractors; ➢ Execution of MOA with DENR-EMB Region XI, Davao City and Panabo City LGUs regarding formation and operationalization of the Multi-Partite Monitoring Team (MMT) for implementing the Environmental Monitoring Plan
	Multi-Partite Monitoring Team (MMT)	➢ Validate project compliance with the conditions stipulated in the ECC and the EMP; ➢ Validate DPWH's conduct of self-monitoring; ➢ Receive complaints, gather relevant information to facilitate determination of validity of complaints or concerns about the project and timely transmit to the Proponent and EMB recommended measures to address the complaint; ➢ Prepare, integrate and disseminate simplified validation reports to community stakeholders; and ➢ Make regular and timely submission of MMT Reports based on the EMB-prescribed format ➢ Observe/participate as applicable during conduct of monitoring activities; ➢ Coordinate with the Pollution Control Officer (PCO) of Contractors assigned to the Project, to ensure that conditions stipulated in the ECCs are properly complied with, including the gathering of baseline data on ➢ air and water quality, and subsequent monitoring of such; ➢ Notify DPWH ESSD about any act or activity by the Contractors that are deemed as violations to the stipulations in the ECCs and amendments issued, and recommend immediate courses of action to avoid or mitigate any violation to said stipulations; and

Project Stage	Organization	Responsibility
		➢ Compile monitoring data gathered by the Contractors and supervise preparation of semi-annual monitoring reports to be submitted to the DENR
Construction	Contractor	➢ Implanting mitigation measures and monitoring based on the approved EMP on EIS and RAP
Operation	Region XI and DEO of DPWH	➢ Regular inspection and maintenance of the Bypass Road, including all appurtenant structures ➢ Conducting monitoring for 2 years after construction of the bypass

Source: Preparatory Survey for South Mindanao Economic Corridor Improvement (Davao City Bypass Construction Project) (JICA, February 2015)

Figure 2.2-1 shows the organizational structure to implement environmental management for the Project. Since Panabo City is the area for Package II (to be financed by GOP), DPWH Panabo City DEO will participate into this structure when the construction works of Package II is commenced.



Source: Compiled by NK-JV based on Draft Environmental Impact Statement for Davao City Bypass Construction Project (October 2014)

Figure 2.2-1 Organizational Structure to Impelemnt Environmental Management for the Project

CHAPTER 3: BASELINE NATURAL AND SOCIAL ENVIRONMENTAL CONDITIONS

3.1 Physical Natural and Social Enviromental Conditions

The project area is still within the same area from the Original EIS, and physical natural and social environmental conditions in and around the project area is considered as not changed based on observation from site reconnaissance conducted in this DED. Physical natural and social environmental conditions confirmed by the Original EIS are summarized below.

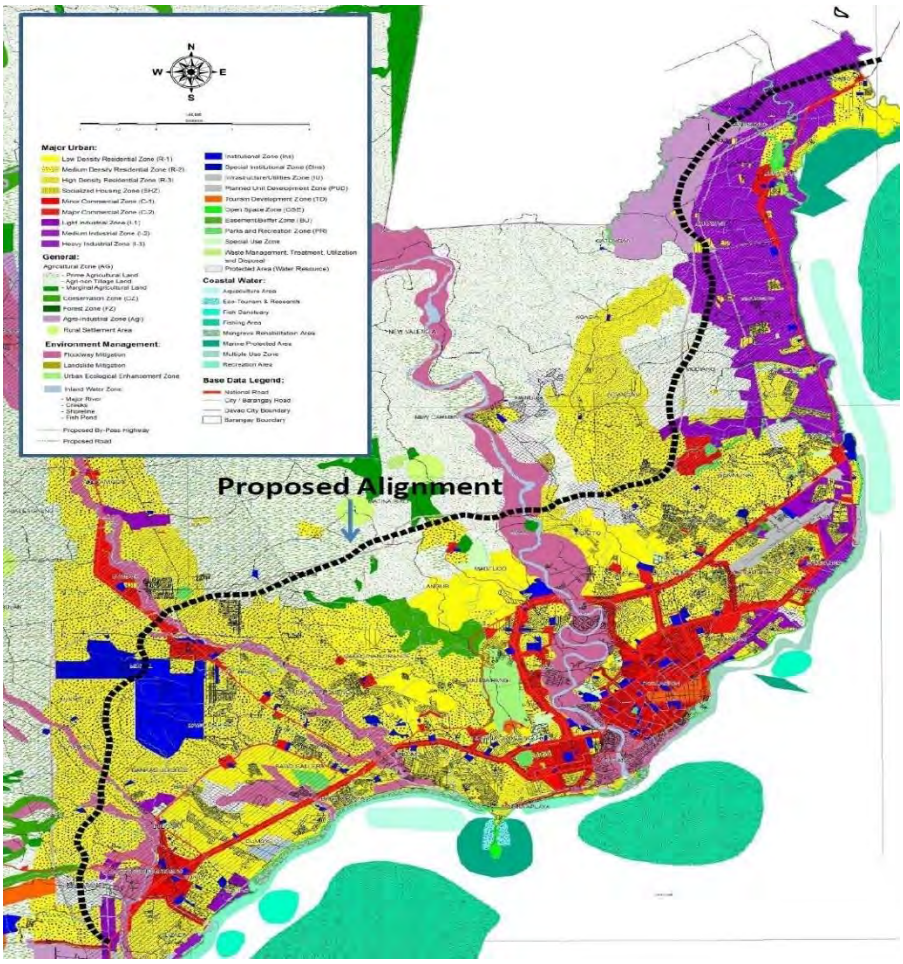
(1) Land Use

According to the Original EIS, the proposed alignment would traverse three (3) major zones which are composed of six (6) sub-zones as shown in Table 3.1-1. The major land use of the project area is agricultural area such as palm tree and secondary woodland and residential area.

Table 3.1-1 Summary of Land Use in the Project Area

Major Zones	Sub-Zones	Description
Major Urban Zone	Medium Density Residential Sub-Zone	Housing/dwelling area
	Minor Commercial Sub-Zone	Central Business sub-zone (CBD), principally for trade, services and business activities
	Medium Industrial Sub-Zone	Area for pollutive/non-hazardous and pollutive/ hazardous manufacturing and processing establishments
	General Institutional Sub-zone	Areas with an established organization or foundation especially one dedicated to education, public service or culture
Agricultural Land Zone	Prime Agricultural Land	All types of agricultural activities identified and delineated in the Watershed Code and areas declared as Strategic Agriculture and Fisheries Development Zone (SAFDZ) per Republic Act No. 8435
	Agri-Non-Tillage Land	Consisting of 12,240 identified and declared as Environmentally Critical Areas (ECA) in the Watershed Code of Davao City
Agro-Industrial Zone		Area for integrated farm operations and processing activities for farm products

Source: Compiled by NK-JV based on Draft Environmental Impact Statement for Davao City Bypass Construction Project (October 2014)

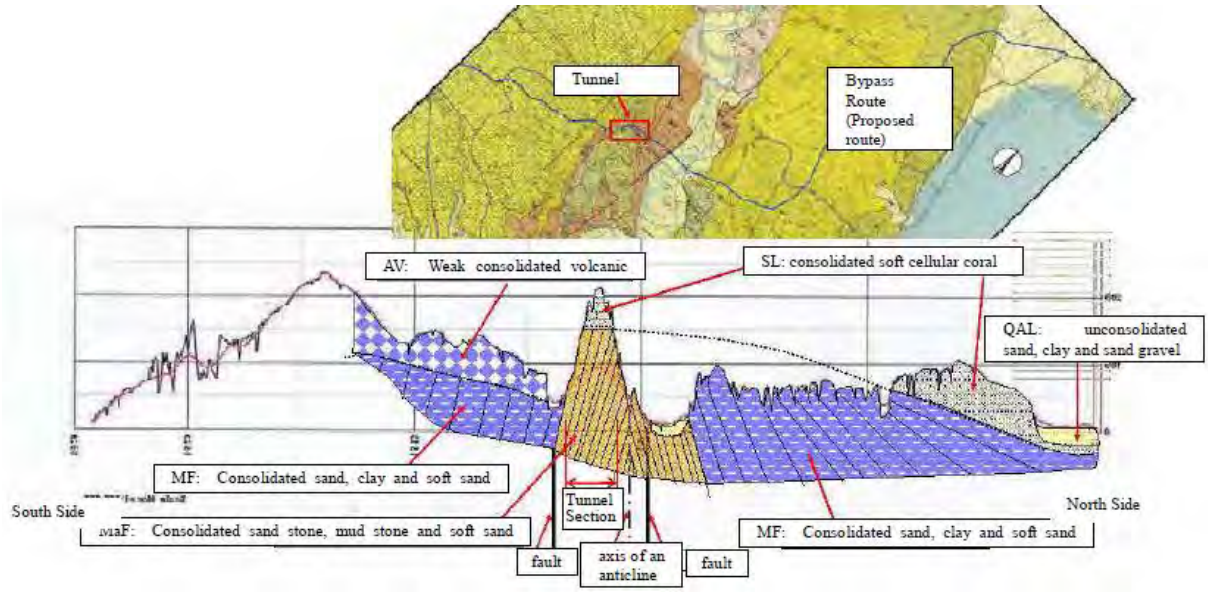


Source: Compiled by NK-JV based on Compiled by NK-JV based on Draft Environmental Impact Statement for Davao City Bypass Construction Project (October 2014)

Figure 3.1-1 Land Use Map of Davao City (2013-2022)

(2) Topography and Geology

The proposed alignment is planned to be passed through a mountainous area traversing some rivers as shown topographical and geological conditions in Figure 3.1-2 which was confirmed by JICA FS.



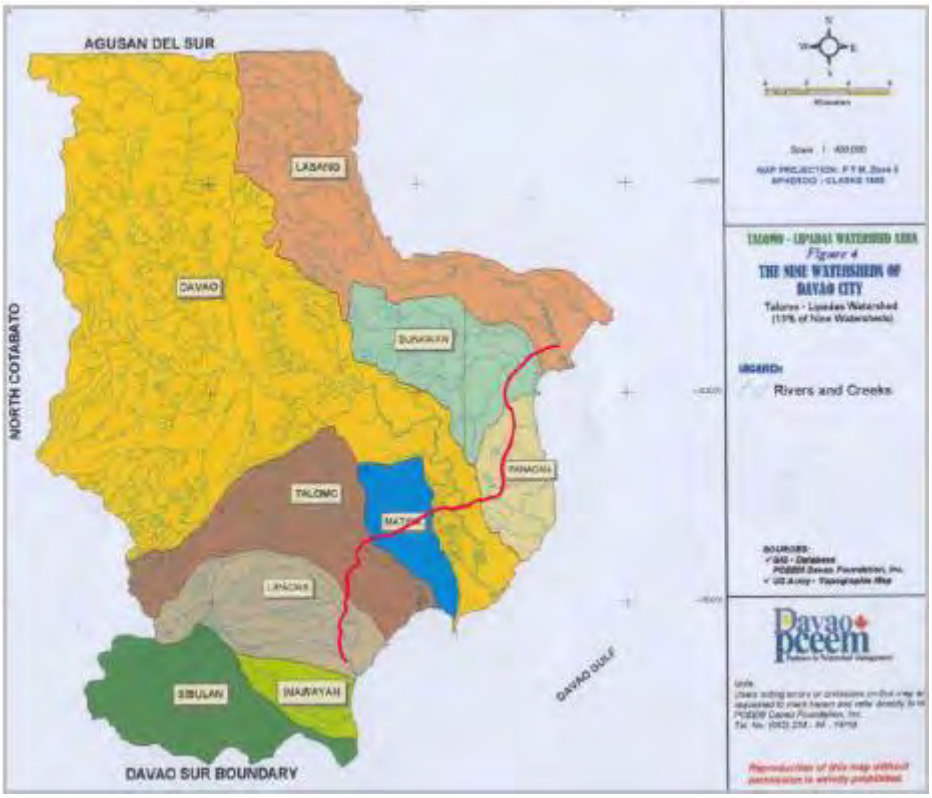
Source: Preparatory Survey for South Mindanao Economic Corridor Improvement (Davao City Bypass Construction Project) (JICA, February 2015)

Figure 3.1-2 Topographical and Geological Condition in the Projec Area

(3) Hydrology

The project area is located at the 7 different watersheds such as Lipadas, Talomo, Matina, Davao, Panacan, Bunawan and Lasang as shown in Figure 3.1-3, and most of production wells are located at the downstream of Talomo watershed area. The project area has 5 major river systems; Davao, Lasang, Talomo, Lipadas and Matina Rivers, and a number of smaller river systems will also be traversed by the project area.

Flooding is a common occurrence in specific locations in Davao City. Generally, floods can be classified into riverine floods along the river system, localized floods in urban area due to combination of cloudburst, saturated soil, poor infiltration rates and inadequate or poorly built/maintained drainage lines, flooding due to typhoon and storm surge in the coastal areas, subsiding coastline; and flood flow impedance by high tide.

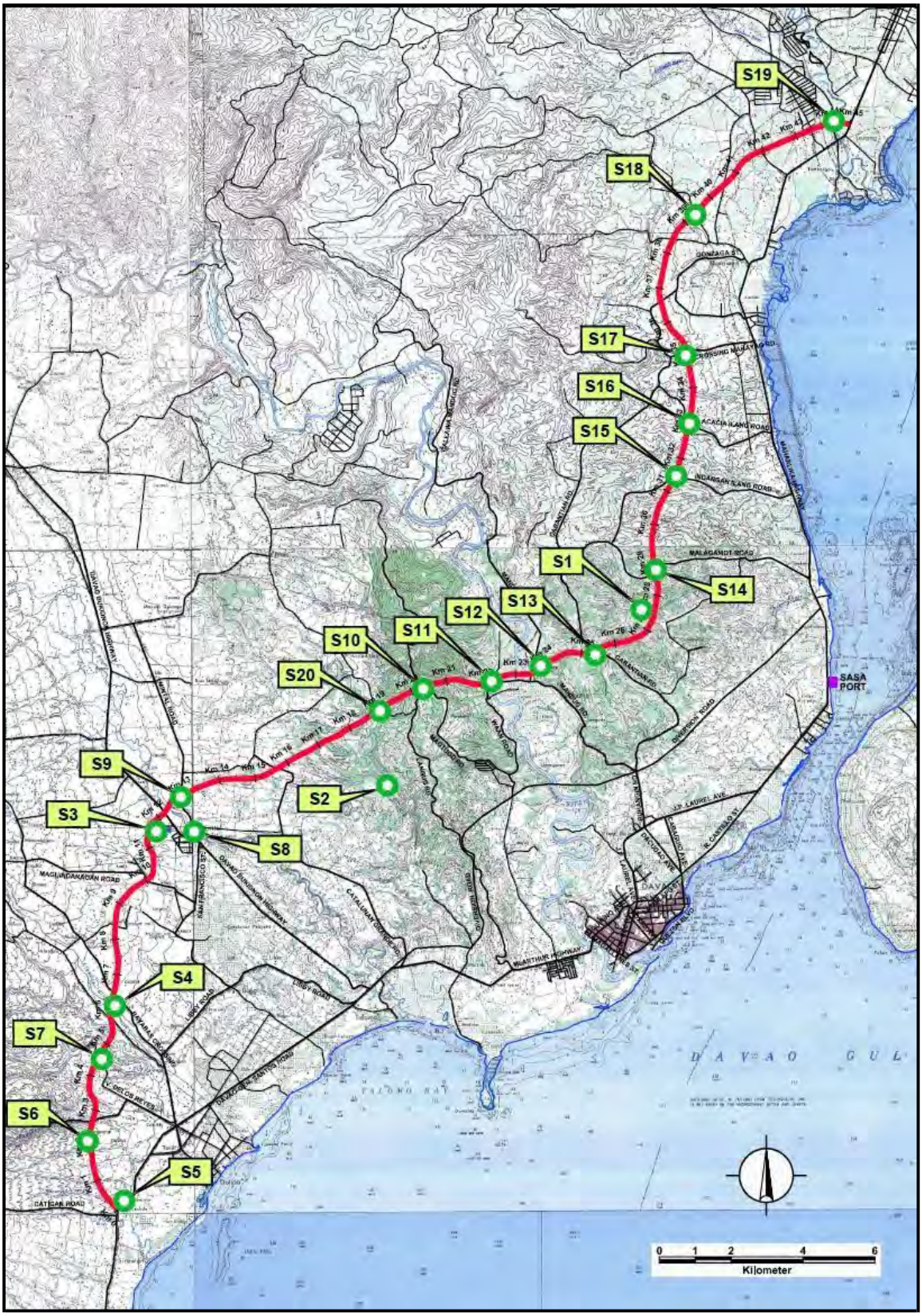


Source: Preparatory Survey for South Mindanao Economic Corridor Improvement (Davao City Bypass Construction Project (JICA, February 2015)

Figure 3.1-3 Watersheds in the Projec Area

(4) Flora and Fauna

Field survey for terrestrial flora and fauna was conducted at 20 survey sites (19 points for plant survey and 20 sites for bird survey) during FS for preparing the original EIS. Figure 3.1-4 shows the survey sites, and S1 to S14 is the project area.



*S20 is located at Matina River, Brgy. Matina Biao (Tunnel Site).
Source: Preparatory Survey for South Mindanao Economic Corridor Improvement (Davao City Bypass Construction Project) (JICA, February 2015)

Figure 3.1-4 Flora and Fauna Survey Sites at the Original EIS

1) Flora

The Original EIS explained that 19 vegetation transects counting 5,487 plants in total were confirmed at the entire project area. The 5,487 species were resolved into 64 families and 185 species (i.e. 1 zingiber species, 2 aroids, 2 fern allies, 2 pandan species, 2 sedges, 5 palms, 15 grasses, 17 ferns, 18 shrubs, 26 herbs, 27 vines and 62 trees). These are the characteristics of recorded 185 species, and details are shown in Attachment-1.

- Out of 185 species, 10 are the endemic species,
- There are 3 species classified as endangered, 2 species classified as critically endangered, 1 species classified as endangered/vulnerable, and 1 species classified as vulnerable species in DAO 2007-01, and
- There are 16 species classified as least concern and 6 species classified as vulnerable species in IUCN Redlist (2013)

2) Fauna

a) Birds

The first survey was conducted at the beginning of April 2014 for the entire alignment, and the second survey was additionally conducted at the beginning of February 2015 for the Matinao-Biao and Magtuod section.

In the first survey, total 336 individuals resolved into 29 species and 22 families were identified. There were 4 dominant species, *Corvus macrorhynchos*, *Egretta garzetta*, *Batrachostomus septimus* and *Saxicola caprata*, and the first three (3) species are widely distributed in the country.

In the second survey, total of 68 birds resolved into 21 species were found. The most abundant species of bird at the time of sampling was represented by the ubiquitous yellow-vented bulbul (*Pycnonotus goaivier*).

Highest diversity of birds was observed along the riparian habitats of Matina River in Barangay Langub and Barangay Matina Biao due to the presence of remnant stands of trees, relatively dense forest cover and low population density.

Among bird species identified during the field survey, 28 species are categorized as Least Concern in IUCN Redlist, and 1 species is categorized as Vulerable in DAO 2004-15 and IUCN Redlist. Details are attached in Attachment-2.

b) Herpetofauna

Total 74 frog individuals resolved into 5 species and 4 families (i.e. Bufonidae, Dicroglossidae, Microhylidae, and Raniidae) were found in the four sampling sites along the entire alignment. The cane toad (*Bufo marinus*) was the dominated species in the entire survey area. These 5 species are categorized as Least Concern in IUCN Redlist (2014) though they are not endemic species.

c) Bats

Total 50 individual bats resolved into 4 species were found at the 3 sampling sites. Lesser dog-faced fruit bat (*Cynopterus brachyotis*) was the dominant species found in the field survey. These 4 species are categorized as Least Concern in IUCN Redlist (2014). One of them is endemic species though the remaining 3 species are widely distributed in Southeast Asia.

(5) Pollutant

Site measurement for air quality, water quality and noise was conducted during JICA FS at the following measurement points.

Source: Preparatory Survey for South Mindanao Economic Corridor Improvement (Davao City Bypass Construction Project) (JICA, February 2015)

Figure 3.1-5 Site Measurment Points at the Original EIS Time

1) Air Quality

Measurement results of air quality at JICA FS are summarized in Table 3.1-2. It was observed from

the measurement results that air quality in the project area was below the Philippines standard values.

Table 3.1-2 Summary of Air Quality Conditions in the Project Area

Location	A1	A2	A3	A4	A5	A6	A7	Philippines Standard
	Connected road	Connected road	Connected road	Connected road and near university	Connected road	Residential area (ambient)	Near school (ambient)	
TSP	298.5	158.3	128.1	275.9	221.1	57.7	82.0	300
NO2	6.1	3.7	2.4	3.7	4.3	1.7	0.9	260
SO2	7.8	1.8	4.6	13.9	5.1	0.8	1.1	340
CO	1.0	<1.0	1.0	1.0	1.0	1.0	1.0	30

Source: Preparatory Survey for South Mindanao Economic Corridor Improvement (Davao City Bypass Construction Project) (JICA, February 2015)

2) Noise

Measurement results of noise level at JICA FS are summarized in Table 3.1-3. It was observed from the measurement results that noise level at most of measurement points was exceeded the Philippines standard values.

Table 3.1-3 Summary of Noise Conditions in the Project Area

Location	N1	N2	N3	N4	N5	N6	N7	Philippines Standard	
	Connected road	Connected road	Connected road	Connected road and near university	Connected road	Residential area (ambient)	Near school (ambient)	N1-5	N6-7
Morning	-	-	-	-	-	64	62	60	65
Daytime	72	72	74	80	73	64	64	65	50
Evening	-	-	-	-	-	57	69	60	45
Night Time	-	-	-	-	-	53	62	55	40

Source: Preparatory Survey for South Mindanao Economic Corridor Improvement (Davao City Bypass Construction Project) (JICA, February 2015)

3) Water Quality

Measurement results of water quality at JICA FS are summarized in Table 3.1-4. It was observed that water quality parameters generally conform to the prescribed limits for Class C (primarily used for the propagation and growth of fish and other aquatic resources) waters, except total coliform and fecal coliform counts.

Table 3.1-4 Summary of Water Quality in the Project Area

Parameters	DAO 34 CLASS C	W1	W2	W3	W4	W5
DO, mg/L	5.0	7.3	7.6	7.3	7.5	7.1
pH, @26.2°C	6.5-8.5	7.87	7.75	7.73	7.71	7.97
TSS, mg/L	(a)	ND	82.0	2.0	4.0	1.0
BOD, mg/L	7	1.1	0.5	2.0	3.9	2.7

Parameters	DAO 34 CLASS C	W1	W2	W3	W4	W5
COD, mg O_2/L	100	9.7	6.7	8.7	14.5	9.7
Oil and Grease, mg/L	2	ND	0.67	ND	ND	ND
Total Coliforms, MPN/100 mL	1000	5.4×10^3	9.2×10^3	9.2×10^3	1.6×10^4	9.2×10^3
Fecal Coliforms, MPN/100 mL	1000	3.5×10^3	9.2×10^3	1.3×10^3	1.6×10^4	5.4×10^3

(a) Not more than 30 mg/L increase; the prescribed criterion entails that increase of measured TSS should not exceed 30 mg/L of the receiving water body
Source: Draft Environmental Impact Statement (October 2014)

(6) Freshwater Ecology

Total 31 individuals of freshwater fish and 1 freshwater shell were recorded at the 5 river sampling stations along the proposed Davao City Bypass alignment at JICA FS. Fish captures were dominated by mosquito fish (*Gambusia affinis*), followed by tilapia (*Oreochromis nilotica*) and spotted barb (*Puntius binotatus*). All freshwater fish recorded in the survey were classified as Least Concern in IUCL Redlist as shown in Table 3.1-5. The Original EIS study confirmed that Cichlidae, Channidae and Poecillidae are introduced and the remaining are the natives.

Table 3.1-5 Freshwater Fish in the Project Area

Family	Common Name	Species Name	IUCL RedList	Abundance	Relative Abundance (%)
Poecillidae	Mosquito Fish	*Gambusia affinis*	Least Concern	12	37.50
Cichlidae	Tilapia	*Oreochromis nilotica*	Least Concern	8	25.00
Cyprinidae	Spotted Barb	*Puntius binotatus*	Least Concern	7	21.88
Channidae	Striped snakehead	*Channa striata*	Least Concern	2	6.25
Gobiidae	Celebes Goby	*Glossogobius celebius*	Least Concern	2	6.25
Thiaridae	Suso	*Melania sp.*	Least Concern	1	3.13
Total				32	100.00

Source: Draft Environmental Impact Statement (October 2014)

3.2 People

According to the Original EIS, total number of households in Davao City is estimated as 1,443,890 households based on the 2010 Census. This is 32.43% of the total population in the Southern Mindanao Region, 5.71% of the total population in Mindanao, and 1.57% of the total Philippine population.
Sex distribution was an almost equal number of males and females counting 49.9% and 50.1% respectively. As for dependent, 31.4% of the total population was the young (0-14 years old) and 3.6% is the old group (65 and over). The working age (15 and over) population accounted for 64.9% of the total population with an almost equal share between males and females.

Table 3.2-1 Population Distribution in Davao City

Age Group	Both Sexes		Male		Female		Sex Ratio
	No.	%	No.	%	No.	%	
School Going Population							
Pre-school (3-6)	125,712	22.05	65,212	22.83	60,500	21.27	1.07
Elementary (7-12)	173,647	30.46	89,483	31.34	84,164	29.59	1.06
Secondary (13-16)	115,067	20.19	56,587	19.82	58,480	20.56	1.04
Tertiary (17-21)	155,572	27.29	74,277	26.01	81,295	28.58	1.10
Total	**569,998**	**100.00**	**285,559**	**100.00**	**284,439**	**100.00**	**1.00**
Labor Force (15 and over)	990,204	68.58	487,584	49.52	502,620	50.48	1.03
Working Age (15-64)	937,212	64.91	464,077	32.14	473,135	32.77	1.02
Dependent population							
Young (0-14)	453,686	31.42	233,769	51.53	219,917	48.47	1.06
Old (65 and over)	52,992	3.67	23,507	44.36	29,485	55.64	1.25
Total	**1,443,890**	**100.00**	**721,353**	**100.00**	**722,537**	**100.00**	

Source: Draft Environmental Impact Statement (October 2014)

(1) Literacy Rate, Profile of Educational Attainment

The Original EIS studied educational attainment in Davao City, and found that 97.09% reached various levels of educational attainment as shown in Table 3.2-2.

Table 3.2-2 Educational Attainment in Davao City in 2010

Highest Educational Attainment	Male		Female		Both Sexes	
	No.	%	No.	%	No.	%
No Grade Completed	19,033	52.72	17,068	47.28	36,101	2.81
Pre – School	23,448	52.42	21,282	47.58	44,730	3.49
Elementary	195,273	53.35	170,724	46.65	365,997	28.52
High School	220,434	48.42	234,845	51.58	455,279	35.48
Post – Secondary	20,313	55.36	16,382	44.64	36,695	2.86
College Undergraduate	76,879	48.12	82,895	51.88	159,774	12.45
Academic Degree Holder	80,222	44.72	99,181	55.28	179,403	13.98
Post Baccalaureate	1,769	44.60	2,197	55.40	3,966	0.31
Not Stated	562	49.60	571	50.40	1,113	0.09
Total	**637,933**	**49.72**	**645,145**	**50.28**	**1,283,078**	**100.00**

Source: Draft Environmental Impact Statement (October 2014)

(2) Water Supply

According to the Original EIS, 106 barangays (58.24%) out of 182 barangays are served Level III water supply system operated by the Davao City Water District (DCWD). The remaining 76 barangays are served by Level I and II water supply systems as shown in Table 3.2-3.

Table 3.2-3 Water Supply System in the Project Area

District/Sub-District	Total No. of HH	Level I	%	Level II	%
District 1					
Talomo	88,903	1,477	1.7	1,099	1.2
District 2					
Buhangin	58,848	-	-	-	-
Bunawan	29,871	214	0.7	3,032	10.1
District 3					
Toril	30,623	7,126	23.3	7,997	26.1
Tugbok	20,888	690	3.3	1,344	6.4
Total	**229,133**	**9,507**	**4.1**	**12,472**	**5.4**

Source: Draft Environmental Impact Statement (October 2014)

(3) Power Supply

The Davao Light and Power Company (DLPC) largely distributes the power supply of Davao City. According to the study by the Original EIS, it distributes 66.79% of total households in the urban area and 33.21% in the rural areas, and the project area is covered.

CHAPTER 4: UPDATED ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

4.1 Updated Environmental and Social Impact Assessment

This chapter updates impacts to be caused by implementing the Project based on the latest project description shown in Table 1.3-4, project activities at each project stage shown in Table 4.1-1 and physical environmental conditions explained in Chapter 3.

Table 4.1-1 Planned Project Activities at Each Project Stage

Project Stage	Planned Activities of the Project
Before Construction Stage (BC)	Acquiring land for securing land/space for roads, bridges, tunnels and related facilities
Construction Stage (CS)	Cutting trees in the Project area
	Procurement of construction materials, equipment, plants, etc.
	Engineering works such as earthmoving
	Operation of construction machines, vehicles, plants, etc.
	Installation of construction work offices, worker's camps, storage sites, etc.
	Construction of roads, bridges, tunnels and related facilities
Demobilization/Decommission Stage (DS)	Clearing equipment, temporary facilities (i.e. construction office, construction yards and worker's camp) from the project area
Operation Stage (OS)	Operation of roads, bridges, tunnel and related facilities
	Spatial occupancy of bridge, roads, flyover, on-ramp and related facilities
	Movement of people (inflow, outflow, migration, etc.)
	Movement of goods (inflow, outflow, etc.)

Source: Compiled by NK-JV

Table 4.1-2 shows updated assessment of natural and social environmental impact to be caused due to implementation of the Project.

Table 4.1-2 Updated Summary of Environmental and Social Impact Assessment

Category	Scoping Item	Reason for Scoping Evaluation
Pollution	Air Quality	**BC:** Significant negative impact is not anticipated. **CS:** Impact on air quality (i.e. increasing level of TSP, NO_2, SO_2, and CO) due to earth work, operation of construction machineries and traveling of construction vehicles is anticipated. **OS:** Although positive impact to decrease level of CO_2 is anticipated due to faster and smoother traffic flow, increase of air pollutant is also anticipate due to increase of traffic volume.
	Water Quality	**BC:** Significant negative impact is not anticipated. **CS:** There is a possibility of turbidity due to earth works such as excavation for bridge foundation and tunnel and increase in pH level and organic pollution due to domestic wastewater from the contractor's office and worker's camp. However, extent of impact is assumed as small since wastewater from construction works and contractor's office/worker's camp will be treated by treatment facility/equipment. **DS:** Possible contamination of waterways crossed by the bypass alignment may occur if residual domestic and solid wastes are abandoned at the construction sites adjacent the rivers and creeks. **OS:** There is a possibility of water degradation due to soil erosion from the slope and embankment areas if they will not be properly maintained.

Category	Scoping Item	Reason for Scoping Evaluation
	Waste	**BC:** Significant negative impact is not anticipated. **CS:** Waste such as soil and trees from construction works and domestic waste from worker's camp will be generated. **OS:** Significant negative impact is not anticipated.
	Soil Contamination	**BC:** Significant negative impact is not anticipated. **CS:** Soil contamination was not observed in the project area. Thus, diffusion of soil contamination due to excavation work is not anticipated. **OS:** Significant negative impact is not anticipated.
	Sediment	**BC:** Significant negative impact is not anticipated. **CS:** Contaminated soil is not existed in the project area. Thus, possibility of soil contamination is considered as low. **OS:** Significant negative impact is not anticipated.
	Noise	**BC:** Significant negative impact is not anticipated. **CS:** Increase of noise levels due to operation of construction machineries and traveling of construction vehicle may temporarily occur. **OS:** Noise level may increase in the area traversed by the bypass alignment at some extent.
	Ground Subsidence	**BC:** Activities to be caused ground subsidence is not planned in the Project. **CS:** Excavation for tunnels may cause seepage of groundwater, which may cause ground subsidence. Excavation work for tunnel is planned to be implemented by monitoring volume of groundwater seepage, and it will be stopped once large volume of groundwater seepage is observed. Thus, possibility of ground subsidence related to excavation for tunnel is considered as low. **OS:** It was found from the geological survey result that the soil condition in the project area was quite hard. Thus, possibility to cause ground subsidence at the fill/embankment sections after operation due to heavy traffic is low.
	Offensive Odor	**BC/CS/OS:** Significant negative impact is not anticipated.
Natural Environment	Protected Areas	**BC/CS/OS:** There is neither protected nor environmentally sensitive area in and around the project area.
	Terrestrial Flora and Fauna	**BC:** Significant negative impact is not anticipated. **CS:** Trees listed in IUCN Redlist or DAO in the Philippines were recorded in the project area, but they are located in the riparian habitats. Thus, these trees due to implementation of the project is not necessarily impacted. As for habitats of birds and/or others in the area, it may be changed due to cutting tree though its impact is considered as small degree. **OS:** Significant negative impact is not anticipated.
	Aquatic Flora and Fauna	**BC:** Significant negative impact is not anticipated. **CS:** A possibility to hamper movement of aquatic organism along the waterways may be small since sufficient space between piers is planned to be secured. However, river diversion and river bank protection works may temporarily affect habitation of aquatic flora and fauna. In addition, turbidity due to earth work may temporarily affect aquatic flora and fauna. **DS:** There is a possibility that residual construction spoils particularly earth materials may be eroded during high precipitation periods and cause increased siltation rate of adjacent waterways. **OS:** Significant negative impact is not anticipated.
	Hydrology	**BC:** Significant negative impact is not anticipated. **CS:** Groundwater regime above the proposed tunnel area will not materially changes since the overlying rocks do not hold much groundwater. In addition, volume of seepage due to excavation of tunnel will be small based on the groundwater condition. Thus, significant impact to hydrology is not considered. **OS:** Significant negative impact is not anticipated.
	Topography and geology	**BC:** There will not be any activities which will cause negative impact to topography and geology. **CS:** Slope failure, soil erosion and rock fall may potentially occur along high cut slope sections widely underlain by unconsolidated soil layers of sand and gravel due to cut (tress release), weathering, erosion, and water infiltration. Since conceivable potential risk is already avoided in the design and construction methods to be applied, possibility to cause impact to topography and geology is considered as small. **OS:** Significant negative impact is not anticipated.
Social environment	Involuntary Resettlement	**BC:** Land acquisition and resettlement is inevitable though effort to minimize land resettlement impact was made. Total 308 families will be necessary to be relocated for implementing the Project. RAP was prepared separately by holding consultation meeting with LGUs and project affected persons in timely manner. **CS:** No negative impact is anticipated. **OS:** No negative impact is anticipated.

Category	Scoping Item	Reason for Scoping Evaluation
	Livelihood and Local Economy	**BC:** There is a possibility that household of land-based income sources including running shops will be affected their income source due to land acquisition. **CS:** Beneficial impacts such as creation of employment opportunity for construction works are expected. **OS:** Through the Project, road network in the area may be improved. It will contribute for enhancement of the local economy.
	Cultural Heritage	**BC/CS/OS:** The proposed alignment will not traverse any area covered by Certificates of Ancestral Domain Title (CAD). Thus, there will not be any negative impact on cultural heritage.
	Vulnerable Groups	**BC:** Among project affected families, 58 families are headed by the elderly, 1 household is headed by the young, 279 families are regarded as the poor and 72 families are headed by female. These families are defined as vulnerable families according to the criteria set by RAP for the Project though one family can fall into 2 or 3 vulnerable categories. Special assistance is considered in RAP to mitigate their impact to be cause by land acquisition for the Project. **CS:** Job opportunity as construction workers will be increased for vulnerable groups living near the Project area. **OS:** Job opportunity as workers of maintenance of road and bridge will be increased for vulnerable groups living near the Project area.
	Land Use	**BC:** There will not be any activities which will change land use. **CS:** Current land use (i.e. residential land, agricultural land and green area) will be changed due to construction works. **OS:** Due to bypass road, the surrounding area will be developed and urbanized. Accordingly, land use at the roadside of bypass will be changed from agricultural land to residential or industrial land.
	Water Use	**BC:** There will not be any activities which will change water use. **CS:** River surface water in the project area is generally used for domestic use such as bathing and washing. Thus, there is a possibility that turbid water due to earth works during construction may affect domestic water use. As for usage of groundwater, as explained in "Hydrology", impact to groundwater regime is considered as small. Therefore, impact to groundwater use is considered as small. **OS:** There will not be any activities which will change usage of river surface water or groundwater.
	Existing Social Infrastructures and Services	**BC:** Significant impact is not anticipated. **CS:** Relocation of approx. 50 power posts, 2 locations of high voltage electrical lines and 7 locations of water pipes and protection of water pipes at 4 locations are necessary. These works will cause temporary access limitation. In addition, traffic congestion due to increase of construction vehicles is anticipated. **OS:** The current traffic situation will be improved by implementing the project. In addition, the bypass tunnel will improve connectivity between the west and east side areas which are currently separated by a mountain.
	Misdistribution of Benefit and Damage	**BC:** Misdistribution of benefit and damage would be occurred since there are PAPs who need to relocate, while there are people who would get job opportunity as workers related to the Project. **CS/OS:** Significant impact is not anticipated.
	Local Conflict of Interests	**BC:** Local conflict of interests would be happened if job opportunity increased by the Project is mis-distributed to PAPs and the surrounding community. **CS/OS:** Significant impact is not anticipated.
Health and Safety	Risks for Infectious Disease such as AIDS/HIV	**BC:** Significant impact is not anticipated. **CS:** There is possibility to increase the risks of infectious disease due to influx of construction workers into the Project area. **OS:** Significant impact is not anticipated.
	Occupational Health and Safety	**BC:** Significant impact is not anticipated. **CS:** Accidents related to construction works may be occurred if construction and equipment maintenance are not properly implemented or workers are not properly educated. **OS:** Significant impact is not anticipated.
	Community Health and Safety	**BC:** Significant impact is not anticipated **CS/OS:** Impacts on community health and safety are anticipated due to influx of construction workers, increase of vehicle traffic and operation of construction machineries during the construction stage as well as increase of traffic volume after the operation stage.
Emergency Risk	Flood Risk	**BC:** Significant impact is not anticipated. **CS:** Although the Project includes embankment and cut, earth works will not alter the hydrological condition in the area. Thus, it is assumed that the Project related works will

Category	Scoping Item	Reason for Scoping Evaluation
		not cause flood. However, there is a risk of flood at construction sites near the river after heavy rain. **DS:** There is a possibility of aggravation of the existing flood conditions along the identified flood risk area in case construction spoils and debris impede flow of waterways. **OS:** There is a possibility of aggravation of the existing flood conditions along the identified flood risk area in case drainage facilities to be installed are not properly maintained.
	Risk of Fire	**BC:** Significant impact is not anticipated. **CS:** There is a possibility to increase the risk of fire related to construction work. **OS:** Significant impact is not anticipated.
Other	Global Warming	**BC:** Significant impact is not anticipated. **CS:** Small scale and temporary generation of greenhouse gases like CO_2 are expected due to construction vehicles and machines. However, impact on transboundary and climate change is negligible **OS:** Increase in greenhouse gases like CO_2 is expected in a small scale due to increase of traffic volume. However, impact on transboundary and climate change is negligible.

Notes: Works on tree cut and relocation of public utilities are regarded as the works in the construction stage although they were included in the pre-construction phase in the original EIS.

Source: Compiled by NK-JV referring to Compiled by NK-JV based on Draft Environmental Impact Statement for Davao City Bypass Construction Project (October 2014) and Preparatory Survey for South Mindanao Economic Corridor Improvement (Davao City Bypass Construction Project) (JICA, February 2015)

CHAPTER 5: UPDATED ENVIRONMENTAL MANAGEMENT PLAN

5.1 Updated Mitigation Measures

The Environmental Management Plan (EMP) consists of a set of mitigation and monitoring measures to be taken into consideration to eliminate or to reduce adverse environmental and social impacts identified at each project stage (i.e. pre-construction, construction, Demobilization/Decommission and operation stages) through impact assessment until they become acceptable levels. The categories evaluated as negative impact regardless of impact extent in the environmental impact assessment were examined mitigation measures. In addition, responsibility and organization structure to implement mitigation measures is clarified. Mitigation measures and implementing organization at each project stage were examined in the Original EIS, which were updated as shown in the tables below based on the updated impact assessment.

Table 5.1-1 Summary of Identified Potential Negative Impact and Mitigation Measures at the Pre-Construction Stage

Category	Items	Identified Potential Impact	Mitigation Measures	Concerned Package	Implementing Organization	Responsible Organization	Items of Expenditure
Social Environment	Involuntary Resettlement*	- Loss or change livelihood of relocated families	- Preparation of appropriate RAP and holding consultation with affected people in timely manner	All package	UPMO-RMC1 (DPWH)	UPMO-RMC1 (DPWH)	Expense for compensation and assistance
	Vulnerable Groups*	- Loss or change of livelihood	- Preparation of appropriate RAP and holding consultation with affected people in timely manner	All package	UPMO-RMC1 (DPWH)	UPMO-RMC1 (DPWH)	Expense for compensation and assistance
	Livelihood and local economy	- Lose or decrease land-based income source	- Provide appropriate assistance in accordance with RAP	All package	UPMO-RMC1 (DPWH)	UPMO-RMC1 (DPWH)	Expense for compensation and assistance
	Misdistribution of Benefit and Damage	- Possibility of conflict between people in and around the project area due to inequality	- Consult with project affected persons timely, - Assign a staff in cage of complain, and - Examine appropriate measures by holding consultation among concerned parties	All package	UPMO-RMC1 (DPWH)	UPMO-RMC1 (DPWH)	Miscellaneous expense
	Local Conflict of Interests	- Possibility of conflict between people in and around the project area due to inequality	- Consult with project affected persons timely, - Assign a staff in cage of complain, and - Examine appropriate measures by holding consultation among concerned parties	All package	UPMO-RMC1 (DPWH)	UPMO-RMC1 (DPWH)	Miscellaneous expense

Source: NK-JV

Table 5.1-2 Summary of Identified Potential Negative Impact and Mitigation Measures at the Construction Stage

Category	Items	Identified Potential Impact	Mitigation Measures	Concerned Package	Implementing Organization	Responsible Organization	Items of Expenditure
Pollution	Air Quality	- Temporary increase of air pollutants (i.e. increasing level of TSP, NO_2, SO_2, CO) from construction vehicle and machines and civil works	- Use construction machines and vehicles with good conditions, - Limit speed for construction machines at construction sites adjacent to residential areas - Sprinkle water timely	All package	Contractor	UPMO-RMC1 (DPWH)	- Expense for car maintenance - Expense for sprinkle water
	Water Quality	- Deterioration of water quality especially siltation due to excavation and earth working, oil and grease contamination, coliform contamination and organic pollution from worker's camps and increase in pH level due to concrete spillage	- Proper treatment of water pollutants generated from construction works in accordance with the regulations in the Philippines, - Arrange silt traps or sedimentation pond as necessary not to discharge wastewater from construction sites to public water cannels directly, - Shelter scattered river mud from dredging works by using silt fence as necessary - Install portable toilet for workers	All package	Contractor	UPMO-RMC1 (DPWH)	Expense for installation of equipment/facilities
	Waste	- Soil waste from construction works - Human-related waste from daily life at the worker's camp and construction offices	- Dispose waste at the designated places after considering a possibility of reuse - Provide education on waste management to construction workers	All package	Contractor	UPMO-RMC1 (DPWH)	Expense for education on waste management for workers

Category	Items	Identified Potential Impact	Mitigation Measures	Concerned Package	Implementing Organization	Responsible Organization	Items of Expenditure
	Noise	- Increase noise level due to construction work	- Avoiding works of heavy equipment during the night time around the sensitive area such as residential area - Install soundproof walls/acoustic enclosures as necessary - Inform the construction schedule to surrounding communities to obtain their consensus	All package	Contractor	UPMO-RMC1 (DPWH)	- Maintenance of equipment - Installation of equipment
Natural Environment	Terrestrial Flora and Fauna	- Decrease green area	- Cut trees only at the designated area according to permission from concerned authorities - Plant trees at sites designated by DENR	All package	DENR and other concerned tree owner authorities	DENR and other concerned tree owner authorities	Expense for relocation/replanting trees
	Aquatic Flora and Fauna	- Impact to aquatic fauna due to deterioration of water quality by degradation of water quality due to excavation works and wastewater from construction yards and worker's camp	- Same as mitigation measures explained in Water Quality	All package	Contractor	UPMO-RMC1 (DPWH)	Same as Water Quality
Social Environment	Land Use	- Change the current use (i.e. residential land, agricultural land and green area) due to construction works.	- Cut trees only at the designated area according to permission from concerned authorities	All package	Contractor	UPMO-RMC1 (DPWH)	Expense for tree cut
	Water Use	- Impact to domestic water use of river surface water due to turbidity by earth works and excavation	- Inform construction schedule and contents to the downstream communities in advance	All package	Contractor	UPMO-RMC1 (DPWH)	Miscellaneous expense

Category	Items	Identified Potential Impact	Mitigation Measures	Concerned Package	Implementing Organization	Responsible Organization	Items of Expenditure
		- Impact to groundwater use though such impact is considered as small	- Provide alternative water sources in case ground water is affected due to construction work				
	Existing Social Infrastructures and Services	- Temporary disturbance or limitation of road traffic due to relocation of public utilities above ground and underground	- Preparation of appropriate relocation plan - Informing relocation works in the communities in timely manner.	All package	Each authority maintaining public utility	Each authority maintaining public utility	Miscellaneous expense
		- Temporary traffic congestion due to temporary closure, detour or access limitation for construction work	- Control traffic volume	All package	Contractor	UPMO-RMC1 (DPWH)	Miscellaneous expense
Health and Safety	Infectious Disease such as HIV/AIDS	- Increase risk of infectious disease due to influx of construction workers in the construction site	- Prepare and implement HIV/AIDS prevention plan	All package	Contractor	UPMO-RMC1 (DPWH)	Expense for implementing plan
	Occupational Health and Safety	- Increase risk of safety for construction workers due to mishandling of equipment or accidents of construction vehicles	- Prepare and implement a safety plan - Provide education to construction workers on safety at the construction site	All package	Contractor	UPMO-RMC1 (DPWH)	Expense for education to workers
	Community Health and Safety	- Increase risk of safety at surrounding communities due to increase of construction vehicles and machines	- Prepare and implement safety plan	All package	Contractor	UPMO-RMC1 (DPWH)	Expense for education to surrounding communities
Emergency Risk	Flood	- Impact of flood at the construction sites near the rivers after heavy rain	- Prepare and implement safety plan	All package	Contractor	UPMO-RMC1 (DPWH)	Miscellaneous expense
	Fire	- Increasing fire risk at the construction yards	- Prepare and implement safety plan	All package	Contractor	UPMO-RMC1 (DPWH)	Expense for education to workers

Source: NK-JV

Table 5.1-3 Summary of Identified Potential Impact and Mitigation Measures at the Demobilization/ Decommissioning Stage

Category	Items	Identified Potential Impact	Mitigation Measures	Relevant Package	Implementing Organization	Responsible Organization	Items of Expenditure
Pollution	Water Quality	- Possibility of contamination of waterways crossed by the bypass alignment if residual domestic and solid wastes are abandoned at the construction sites adjacent the rivers and creeks	- Dismantle all temporary equipment/facilities - Inspect the site condition with all concerned parties	All package	Contractor	UPMO-RMC1 (DPWH)	Miscellaneous expense

Source: NK-JV

Table 5.1-4 Summary of Identified Potential Negative Impact and Mitigation Measures at the Operation Stage

Category	Items	Identified Potential Impact	Mitigation Measures	Relevant Package	Implementing Organization	Responsible Organization	Items of Expenditure
Pollution	Air quality	- Increase air pollutants (i.e. increasing level of TSP, NO_2, SO_2) due to increase vehicle transportation	- Sufficient control of traffic volume and flow by proper maintenance of road and bridge and other equipment such as traffic signal	All package	Region XI of DPWH	Region XI of DPWH	Expense for maintaining road, bridge and other equipment
	Noise	- Possibility of increase level of noise due to increase of traffic volume	- Sufficient control of traffic volume and flow by proper maintenance of road and bridge and other equipment such as traffic signal	All package	Region XI of DPWH	Region XI of DPWH	Expense for maintaining road, bridge and other equipment
Health and Safety	Community Health and Safety	- Possibility of increase traffic accidents due to increase of traffic volume	- Provide education on traffic safety at the surrounding communities	All package	Region XI	Region XI of DPWH	Miscellaneous expense
Emergency Risk	Flood Risk	- Possibility of aggravation of the existing flood conditions along the identified flood risk area in	- Monitor drainage conditions regularly	All package	Region XI	Region XI of DPWH	Miscellaneous expense

Category	Items	Identified Potential Impact	Mitigation Measures	Relevant Package	Implementing Organization	Responsible Organization	Items of Expenditure
		case drainage facilities to be installed by the Project are not properly maintained					

Source: NK-JV

5.2 Updated Monitoring Plan

The environmental monitoring plans including monitoring items, location, frequency and responsibility at each project phase are shown in Table 5.2-1 to Table 5.1-4. Organization responsible for monitoring at each stage needs to review the monitoring results and takes necessary actions in case monitoring results do not satisfy the standard values. The monitoring results will be submitted to DENR and JICA in accordance with the institutional framework described in Section 2.2.

Table 5.2-1 Frequency and Locations of Environmental Monitoring at Pre-Construction Stage

Item	Monitoring Item	Monitoring Method	Monitoring Site	Frequency	Package	Responsibility
1. Social Environment						
Involuntary Resettlement*	Progress of relocation and payment in accordance with RAP	Check relocation and payment records	Project sites	Monthly	All package	UPMO-RMC1
Vulnerable Groups*	Ditto	Ditto	Ditto	Ditto	Ditto	Ditto
Livelihood and Local Economy	Ditto	Ditto	Ditto	Ditto	Ditto	Ditto
Misdistribution of Benefit and Damage	Ditto	Ditto	Ditto	As necessary	Ditto	Ditto
Local Conflict of Interests	Ditto	Ditto	Ditto	As necessary	Ditto	Ditto

* Monitoring for Involuntary Resettlement, Vulnerable Groups and Livelihood and Local Economy is to be done by Internal and External Monitoring defined in RAP.
Source: JK-JV

Table 5.2-2 Frequency and Locations of Environmental Monitoring at Construction Stage

Item	Monitoring Item	Monitoring			Package	Environmental Requirement		Implementing Organization	Responsible Organization
		Method	Site	Frequency		Level	Concerned Regulation		
1. Pollution									
Air Quality	i) Level of TSP, NO2, SO_2, CO_2 and CO	Site measurement using the following methods: ➢ TSP - Gravimetric Method; ➢ SO_2 - Pararosaniline Method; ➢ NO_2 - Griess Saltzman Reaction; ➢ CO - Direct Reading (Gas Analyzer)	At 2 measurement points: ➢ Beginning point of Package I-1, ➢ Ending point of Package I-1	Quarterly	Package I-1	TSP 1 hr – 300 µ/Ncm 24 hr – 230 µ/Ncm SO_2 1 hr – 340 µ/Ncm 24 hr – 180 µ/Ncm NO2 1 hr – 260 µ/Ncm 24 hr – 150 µ/Ncm CO 1 hr – 30 ppm 24 hr – (Every 8 hrs) 9 ppm	➢ Clean Air Act (RA 8749) ➢ DENR AO #14, S. 1993	Contractor	UPMO-RMC1 of DPWH
	Ditto	Ditto	At 2 measurement points: ➢ In front of Univ. of Southern Philippines (USeP) along Davo-Bukidnon National	Ditto	Package I-2	Ditto	Ditto	Ditto	Ditto

Item	Monitoring Item	Monitoring			Package	Environmental Requirement		Implementing Organization	Responsible Organization
		Method	Site	Frequency		Level	Concerned Regulation		
			Highway, Brgy. Mintal ➢ Beginning of the Project along the Davao Digos National Highway, 500m south of Lipadas Bridge, Brgy. Sirawan						
	Ditto	Ditto	At 2 measurement point: ➢ Residential area around Station 23+900 ➢ Residential area around Station 27+900	Ditto	Package I-3	Ditto	Ditto	Ditto	Ditto
Water Quality (Surface Water)	Level of pH, DO, Oil & Grease, BOD, Fecal Coliform/ Total Coliform, and TSS	Site measurement in accordance with the methodologies described in DAO 34- 1990 and EMB-DENR, Manual for Ambient Water Quality Monitoring Volume I	At 9 measurement points: [Davao River] ➢ 1 location at 100 m upstream from the proposing bridge location ➢ 2 locations at 100 m downstream from the	Quarterly	Package I-1	pH: 6.5 to 8.5 DO: 5.0 mg/L Oil & Grease: 2.0 mg/L BOD: 7.0 mg/L TSS: not more than 30 g/L increase	DENR AO No. 34 (Water Quality Criteria for Inland Waters Class C)	Contractor	UPMO-RMC1 of DPWH

Item	Monitoring Item	Monitoring			Package	Environmental Requirement		Implementing Organization	Responsible Organization
		Method	Site	Frequency		Level	Concerned Regulation		
			proposing bridge location [Matina River-1] ➢ 1 point at 100m upstream from the proposing bridge location ➢ 1 point at 100m downstream from the proposing bridge location [Matina River-2] ➢ 1 point at 100m upstream from the proposing bridge location ➢ 1 point at 100m downstream from the proposing bridge location [Tunnel Construction Section] ➢ 1 point at upstream of tunnel section						

Item	Monitoring Item	Monitoring			Package	Environmental Requirement		Implementing Organization	Responsible Organization
		Method	Site	Frequency		Level	Concerned Regulation		
			➢ 1 point at Station 22+200						
	Ditto	Ditto	At 2 measurement points at Talomo River: ➢ 1 point at 100m upstream from proposing bridge location ➢ 1 point at 100m downstream from proposing bridge location	Ditto	Package I-2	Ditto	Ditto	Ditto	Ditto
	Ditto	Ditto	At 2 measurement point at Lasang River: ➢ 1 point at 100m upstream from the proposing bridge location ➢ 1 point at 100m downstream from the proposing bridge location	Ditto	Package I-3	Ditto	Ditto	Ditto	Ditto
Water Quality (Groundwater)[1]	Volume and water level	Site measurement in accordance with the methodologies described in	At 2 measurement points around ➢ 1 point at the existing well for observation of groundwater	Quarterly	Package I-1	pH: 6.5 to 8.5 DO: 5.0 mg/L BOD: 7.0 mg/L TSS: not more than 30 g/L increase	DENR AO No. 34 (Water Quality Criteria for Inland Waters Class C)	Contractor	UPMO-RMC1 of DPWH

Item	Monitoring Item	Monitoring			Package	Environmental Requirement		Implementing Organization	Responsible Organization
		Method	Site	Frequency		Level	Concerned Regulation		
		DAO 34- 1990 and EMB-DENR, Manual for Ambient Water Quality Monitoring Volume I	level at Station 20+350 ➢ 1 point at the existing water tank at Station 20+350 for local residents						
Waste	Volume and type of waste, cutting tree and domestic garbage	Check records of amount and type of waste, and disposal method	Cutting land section, tunnel section, tutting tree section and worker's camp	As per disposal of waste	All package	-	-	Contractor	UPMO-RMC1 of DPWH
Noise	Ambient and road side noise (dB(A)L_{Aeq})	$L_{Aeq, 10min}$ during morning, daytime, evening and night time	Same as Air Quality	Quarterly	Package I-1	For "AA" categorized areas (an area requires quietness, such as an area within 100 m from school sites, nursery schools, hospitals, places of worships, and special homes for the aged) Morning: 45 db Daytime: 50 db Evening: 45 db Night Time: 40 db For "A" categorized areas (general areas) Morning: 50 db Daytime: 55 db Evening: 50 db Night Time: 45 db For "A" categorized areas (directly		Contractor	UPMO-RMC1 of DPWH

Item	Monitoring Item	Monitoring			Package	Environmental Requirement		Implementing Organization	Responsible Organization
		Method	Site	Frequency		Level	Concerned Regulation		
						facing/fronting a 4-lane road) Morning: 50 db Daytime: 60 db Evening: 50 db Night Time: 45 db For "B" categorized areas (general commercial areas) Morning: 60 db Daytime: 65 db Evening: 60 db Night Time: 55 db			
	Ditto	Ditto	Same as Air Quality	Ditto	Package I-2	Ditto	Ditto	Ditto	Ditto
	Ditto	Ditto	Same as Air Quality	Ditto	Package I-3	Ditto	Ditto	Ditto	Ditto
Ground Subsidence[2]	Volume of groundwater seepage	Record the seepage volume	Tunnel section	Daily	Package I-1	-	-	Contractor	UPMO-RMC1 of DPWH
2. Natural Environment									
Terrestrial Flora and Fauna	Condition of vegetation	Visual check of vegetation condition	Project site	Daily	All package	-	-	Contractor	UPMO-RMC1 of DPWH
Aquatic Flora and Fauna	Checking the conditions of water quality	Same as water quality	Same as water quality	Same as water quality	Same as water quality	Same as water quality	Same as water quality	Contractor	UPMO-RMC1 of DPWH
3. Social Environment									
Land Use	Condition of tree cut	Check site condition	Project sites	As necessary	All package	-	-	Contractor	UPMO-RMC1 of DPWH
Water Use	- Complaint from downstream area - Complaint from groundwater users	- Check complaint records	Project sites	As necessary	All package	-	-	Contractor	UPMO-RMC1 of DPWH

Item	Monitoring Item	Monitoring			Package	Environmental Requirement		Implementing Organization	Responsible Organization
		Method	Site	Frequency		Level	Concerned Regulation		
Existing Social Infrastructure and Service	Complaint from surrounding communities	- Check complaint records	Project sites	As necessary	All package	-	-	Contractor	UPMO-RMC1 of DPWH
4. Health and Safety									
Infectious Disease	- Awareness of infectious disease	- Check records of awareness activities on infectious disease	Project site	As necessary	All package	-	-	Contractor	UPMO-RMC1 of DPWH
Occupational Health	- Record of accidents in the construction site	- Check record of accidents in the construction site	Project site	As necessary	All package	-	-	Contractor	UPMO-RMC1 of DPWH
Community Health and Safety	- Records of traffic accidents in the surrounding communities	- Check records of traffic accidents in the surrounding communities	Project site	As necessary	All package	-	-	Contractor	UPMO-RMC1 of DPWH
5. Emergency Risk									
Flood	Condition of flood	Check the site conditions	One point at Davao River	Quarterly	Package I-1	-	-	Contractor	UPMO-RMC1 of DPWH
Fire	Condition of fire	Check the site conditions	Construction sites and worker's camp	As necessary	All package	-	-	Contractor	UPMO-RMC1 of DPWH

Notes:
1. Although impact to groundwater is considered as small, monitoring for groundwater shall be done during the construction phase based on a discussion result with a local community.
2. Although impact to ground subsidence due to tunnel construction work is not anticipated, regular monitoring on groundwater seepage will be done as a precaution measure.
Source: NK-JV

Table 5.2-3 Frequency and Locations of Environmental Monitoring at Operation Stage

Item	Monitoring Item	Monitoring			Package	Environmental Requirement		Implementing Organization	Responsible Organization
		Method	Site	Frequency		Level	Concerned Regulation		
1. Pollution									
Air Quality	Level of TSP, NO2, SO_2, CO	Site measurement using the following methods: ➢ TSP - Gravimetric Method; ➢ SO_2 - Pararosaniline Method; ➢ NO_2 - Griess Saltzman Reaction; ➢ CO - Direct Reading (Gas Analyzer)	Same as Air Quality at Construction Phase	Semi-annual (up to 3 years after starting operation)	Package I-1	TSP 1 hr – 300 µ/Ncm 24 hr – 230 µ/Ncm SO_2 1 hr – 340 µ/Ncm 24 hr – 180 µ/Ncm NO2 1 hr – 260 µ/Ncm 24 hr – 150 µ/Ncm	➢ Clean Air Act (RA 8749) ➢ DENR AO #14, S. 1993	Region XI of DPWH	Region XI of DPWH
	Ditto	Ditto	Ditto	Ditto	Package I-2	Ditto	Ditto	Ditto	Ditto
	Ditto	Ditto	Ditto	Ditto	Package I-3	Ditto	Ditto	Ditto	Ditto
Noise	Ambient and road side noise (dB(A)LAeq)	LAeq, 10min during morning, daytime, evening and night time	Same as Air Quality	Semi-annual (up to 3 years after starting operation)	Package I-1	For "AA" categorized areas (general areas) Morning: 45 db Daytime: 50 db Evening: 45 db Night Time: 40 db For "A" categorized		Region XI of DPWH	Region XI of DPWH

Item	Monitoring Item	Monitoring			Package	Environmental Requirement		Implementing Organization	Responsible Organization
		Method	Site	Frequency		Level	Concerned Regulation		
						areas (general areas) Morning: 50 db Daytime: 55 db Evening: 50 db Night Time: 45 db For "A" categorized areas (directly facing/fronting a 4-lane road) Morning: 50 db Daytime: 60 db Evening: 50 db Night Time: 45 db For "B" categorized areas (general commercial areas) Morning: 60 db Daytime: 65 db Evening: 60 db Night Time: 55 db			
	Ditto	Ditto	Same as Air Quality	Ditto	Package I-2	Ditto	Ditto	Ditto	Ditto
	Ditto	Ditto	Same as Air Quality	Ditto	Package I-3	Ditto	Ditto	Ditto	Ditto
2. Health and Safety									
Community Health and Safety	Accident records	Check accident records	Project site	As necessary	All package	-	-	Region XI of DPWH	Region XI of DPWH
3. Emergency Risk									
Flood Risk	Drainage condition	Check drainage condition	Project site	As necessary	All package	-	-	Region XI of DPWH	Region XI of DPWH

Source: NK-JV

CHAPTER 6: SOCIAL DEVELOPMENT PLAN

6.1 Social Development Plan

Social Development Plan (SDP) was developed in the Original EIS as shown in Table 6.1-1, and ECC stipulated to implement comprehensive SDP. Although alignment was slightly shifted from the one studied in the Original EIS, overall contents of SDP developed in the Original EIS is not changed since the concerns are still same at the time of studying the Original EIS. Thus, all concerned parties shall implement SDP according to description in Table 6.1-1.

Table 6.1-1 Social Development Plan

Concern		Responsible Community Member/ Beneficiary	Government Agency/ Non-Government Agency and Services	Proponent	Indicative Timeline	Source of Fund
1	Formation of the City Resettlement Implementation Committee (CRIC)	➢ Barangay Chairpersons of affected barangays ➢ Presidents of Homeowners Association	➢ ESSD of DPWH ➢ DPWH Region XI and concerned District Engineering Offices ➢ Davao City Planning and Development Office	DPWH	After updating of RAP	Part of Project Cost
3	Relocation of informal settlers (If there are any)	➢ Barangay Chairpersons ➢ Presidents of Homeowners Association	➢ Davao City Housing Office under the OCPDC ➢ DSWD ➢ DPWH ➢ Lingap Para sa Mahirap Office ➢ Partner Housing POs, NGOs of Davao City	NHA	Pre-Construction Stage	NHA for site development and DPWH for infrastructure development
4	Gender Responsive Livelihood Training Program Skills training for construction work Skills training for handicraft making Skills training for food preparation	➢ Barangay Chairpersons ➢ Barangay Kagawad for Livelihood ➢ Presidents of Homeowners Association ➢ Officers of Women's ➢ organizations	➢ City Cooperative Development Office ➢ DSWD ➢ TESDA	ESSD of DPWH	After ECC Issuance	LGU Livelihood Office
5	Formation of/Support to Farmers Cooperatives	➢ Barangay Chairman ➢ Presidents of City and Barangay farmers associations or organizations	➢ DPWH ➢ DTI ➢ Cooperative Development Authority (CDA)	ESSD of DPWH	Prior to RAP Implementation	LGU Livelihood Office

	Concern	Responsible Community Member/ Beneficiary	Government Agency/ Non-Government Agency and Services	Proponent	Indicative Timeline	Source of Fund
6	Health and Safety	➢ Barangay Chairman ➢ Barangay Kagawad for Health and Safety	➢ City Health Office ➢ DSWD ➢ Barangay Health Centers	➢ DEO of DPWH ➢ ESSD of DPWH	Pre-Construction, Construction, Operation Stage	LGU Health Office
7	Environment and Sanitation	➢ Barangay Chairman ➢ Barangay Kagawad for Environment and Sanitation	➢ LGU ➢ CENRO ➢ DENR Region XI	➢ DEO of DPWH ➢ ESSD of DPWH	Pre-Construction, Construction, Operation Stage	LGU CENRO
8	Peace and Order	➢ Barangay Chairman ➢ Barangay Kagawad for Peace and Order; and ➢ Homeowners Association Sargent-at- Arms	➢ LGU ➢ PNP	➢ ESSD of DPWH ➢ DEO of DPWH	Pre-Construction, Construction, Operation Stage	LGU & PNP
9	Spiritual	➢ Barangay Chairman; ➢ Parish Pastoral Council; ➢ Leaders of other religious groups	➢ Parish Priests ➢ LGU	➢ DEO of DPWH ➢ ESSD of DPWH	Pre-Construction, Construction, Operation Stage	LGU

Source: Compiled by NK-JV based on Draft Environmental Impact Statement for Davao City Bypass Construction Project (October 2014)

Attachment-1 List of Flora recorded by JICA FS

Family	Official Common Name	Scientific Name	Habit	DAO 2007-01	IUCN Redlist 2013	Endemicity
Acanthaceae	Acanthus	*Acanthus hirsutus*	Herbs	–	–	Not Endemic
Acanthaceae	Bunlaw	*Justicia gendarussa*	Shrub	–	–	Not Endemic
Acanthaceae	Sanchezia	*Sanchezia speciosa*	Shrub	–	–	Not Endemic
Acanthaceae	White Funnel Acaranthus	*Ruellia metziae*	Herbs	–	–	Not Endemic
Amaranthaceae	Kulitis	*Amaranthus viridus L.*	Herbs	–	Least Concern	Not Endemic
Anarcadiaceae	Mangga	*Mangifera indica*	Tree	–	–	Not Endemic
Annonaceae	Basikong Kalawang	*Alphonsea arborea*	Tree	–	–	Not Endemic
Annonaceae	Ilang-Ilang	*Cananga odorata*	Tree	–	–	Endemic
Apocynaceae	Calumpang	*Catharanthus pusillus*	Tree	–	–	Not Endemic
Apocynaceae	Hingiw	*Ichnocarpus volubilis*	Vines	–	–	Not Endemic
Apocynaceae	Pandakaki Tsina	*Tabernaemontana divaricata (Linn.) E. Br.*	Shrub	–	–	Not Endemic
Apocynaceae	Tubli	*Derris tubli Linn.*	Vines	–	–	Not Endemic
Araceae	Aglaonema	*Aglaonema spp.*	Herbs	–	Least Concern	Not Endemic
Araceae	Alupayi	*Homalomena pygmaea*	Aroids	–	–	Not Endemic
Araceae	Kamay Kastila	*Syngonium podophyllum Schott.*	Aroids	–	–	Not Endemic
Araceae	Pihau	*Schimatoglottis spp.*	Herbs	–	–	Not Endemic
Araliaceae	Malapapaya	*Polyscias nodosa (Blume) Seem.*	Tree	–	Least Concern	Not Endemic
Arecaceae	African Oil Palm	*Elaeis guineensis*	Palms	–	–	Not Endemic
Arecaceae	Ditaan	*Daemonorops mollis (Blanco) Merr.*	Vines	–	–	Not Endemic
Arecaceae	Fishtail Palm	*Caryota mitis*	Palms	–	–	Not Endemic
Arecaceae	Niyog	*Cocos nucifera L.*	Palms	–	–	Not Endemic
Arecaceae	Palasan	*Calamus maximus L.*	Vines	–	–	Not Endemic

Family	Official Common Name	Scientific Name	Habit	DAO 2007-01	IUCN Redlist 2013	Endemicity
Arecaceae	Pugahan	*Caryota cumingii L.*	Palms	–	–	Not Endemic
Asclepiadaceae	Milkweed	*Ascelpias syriaca*	Herbs	–	–	Not Endemic
Asclepiadaceae	Tayom-Tayom	*Marsdenia tinctoria R. Br.*	Shrub	–	–	Not Endemic
Asparagaceae	Pony Tail Palm	*Beaucarnea recurvata*	Palms	–	–	Not Endemic
Asparagaceae	Song of India	*Dracaena reflexa L.*	Herbs	–	–	Not Endemic
Aspleniaceae	Asplenium	*Asplenium azoricum*	Ferns	–	–	Not Endemic
Aspleniaceae	Bird's Nest Fern	*Aspleniu australasicum*	Ferns	–	–	Not Endemic
Aspleniaceae	Maidenhair Fern	*Asplenium tenerum Forst.*	Ferns	–	–	Not Endemic
Asteraceae	Dwarf Sunflower	*Helianthus gracilentus*	Herbs	–	–	Not Endemic
Asteraceae	Hagonoy	*Chromolaena odorata (L.) R.M.*	Vines	–	–	Not Endemic
Asteraceae	Sambong	*Blumea balsamifera (L.) DC*	Herbs	–	–	Not Endemic
Asteraceae	Wedelia	*Wedelia chinensis*	Herbs	–	–	Not Endemic
Athyriaceae	Pako	*Diplazium esculentum (Retz.) Sw.*	Ferns	–	Least Concern	Not Endemic
Bignoniaceae	African Tulip	*Spathodea campanulata*	Tree	–	–	Not Endemic
Blechnaceae	Diliman/Hagnaya	*Stenochlaena melnei Underw.*	Ferns	–	–	Not Endemic
Burseraceae	Bogo	*Garuga floribunda*	Tree	–	–	Not Endemic
Canabaceae	Anabiong	*Trema orientalis (L.) Blume*	Tree	–	Least Concern	Not Endemic
Caricaceae	Wild Papaya	*Carica papaya*	Tree	–	–	Not Endemic
Clusiaceae	Guyong-guyong	*Cratoxylum blancoi*	Tree	–	–	Not Endemic
Combretaceae	Kalamansanai	*Terminalia calamansanai*	Tree	–	–	Endemic
Convolvulaceae	Bulakan	*Merremia peltata L.*	Vines	–	–	Not Endemic

Family	Official Common Name	Scientific Name	Habit	DAO 2007-01	IUCN Redlist 2013	Endemicity
Convolvulaceae	Kamkamote	*Ipomoea triloba L.*	Vines	–	–	Not Endemic
Convolvulaceae	Kupit-Kupit	*Merrremia emarginata*	Herbs	–	–	Not Endemic
Convolvulaceae	Malakamote	*Ipomoea obscura L.*	Vines	–	–	Not Endemic
Convolvulaceae	Spanish Flag	*Ipomoea lobata*	Vines	–	–	Not Endemic
Costaceae	Step Ladder Plant	*Costus malortieanus*	Herbs	–	–	Not Endemic
Cyperacaea	Arat	*Scleria scrobiculata Nees*	Sedges	–	–	Not Endemic
Davalliaceae	Solida	*Davallia solida (Forst.) Sw.*	Ferns	–	–	Not Endemic
Dioscoreaceae	Nami	*Dioscorea hispida L.*	Vines	–	–	Not Endemic
Ebenaceae	Bolong Eta	*Diospyros pilosanthera*	Tree	EN	–	Indigenous
Euphorbiaceae	Alim	*Melanolepis multiglandulosa*	Tree	–	–	Not Endemic
Euphorbiaceae	Balitahan	*Bridelia glauca*	Tree	–	–	Not Endemic
Euphorbiaceae	Cassava	*Manihot esculenta*	Shrub	–	–	Not Endemic
Euphorbiaceae	Hamindang	*Macaranga bicolor Muell.-Arg.*	Tree	–	–	Not Endemic
Euphorbiaceae	Kamot Pusa	*Caesalpinia latisiliqua*	Herbs	–	–	Not Endemic
Euphorbiaceae	Malabagang	*Glochidian album (Blanco) Boerl.*	Shrub	–	–	Not Endemic
Euphorbiaceae	Matang Hipon	*Breynia rhamnoides (Retz.) Muell.-Arg.*	Shrub	–	–	Not Endemic
Euphorbiaceae	Poinsettia	*Euphorbia pulcherrima*	Shrub	–	–	Not Endemic
Euphorbiaceae	Soro-sampalok	*Euphorbia neriiflora*	Herbs	–	–	Not Endemic
Euphorbiaceae	Tawa-Tawa	*Euphorbia hirta*	Herbs	–	–	Not Endemic
Euphorbiaceae	Tuba-Tuba	*Jatropha curcas*	Shrub	–	–	Not Endemic
Euphorbiaceae	Takip Asin	*Macaranga grandifolia (Blanco) Merr.*	Tree	–	–	Not Endemic
Euphorbiaceae	Teramycin Plant	*Glochidion pubicarpum Elm.*	Herbs	–	–	
Fabaceae	Acapulco	*Cassia alata*	Shrub	–	–	Not Endemic

Family	Official Common Name	Scientific Name	Habit	DAO 2007-01	IUCN Redlist 2013	Endemicity
Fabaceae	Agpoi	*Phanera integrifolia subsp. cumingiana*	Vines	–	Least Concern	Not Endemic
Fabaceae	Ascova	*Cytisus scoparius*	Shrub	–	–	Not Endemic
Fabaceae	Tindalo	*Afzelia rhomboidea*	Tree	EN	Vulnerable	Indigenous
Fabaceae	Centrosema	*Centrosema plumeiri*	Vines	–	–	Not Endemic
Fabaceae	Hairy-leafed centrosema	*Centrosema pubescens L.*	Vines	–	–	Not Endemic
Fabaceae	Ipil-Ipil	*Leucaena leucocephala*	Tree	–	–	Not Endemic
Fabaceae	Kawati	*Gliricidia sepium*	Tree	–	–	Not Endemic
Fabaceae	Makahiya	*Mimosa pudica L.*	Herbs	–	Least Concern	Not Endemic
Fabaceae	Mani-Manihan	*Desmodium capitatum*	Shrub	–	–	Not Endemic
Fabaceae	Payang-Payang	*Desmodium pulchellum (L.) Desv.*	Shrub	–	–	Not Endemic
abaceae	Prickly Narra	*Pterocarpus indicus echinus*	Tree	Critically Endangered	Vulnerable	Indigenous
Fabaceae	Smooth Narra	*Pterocarpus indicus indicus*	Tree	Critically Endangered	Vulnerable	Indigenous
Fabaceae	Tayom	*Indigofera suffruticosa Mill.*	Shrub	–	–	Not Endemic
Fabaceae	Yellow Creeper	*Arachis duranensis*	Vines	–	–	Not Endemic
Flagellariaceae	Balingwai	*Flgellaria indica L.*	Vines	–	–	Not Endemic
Gleicheniaceae	Kilob	*Dicranopteris linearis*	Ferns	–	–	Not Endemic
Gleicheniaceae	Sticherous Fern	*Sticherous truncatus (Willd.) Nakaii*	Ferns	–	–	Not Endemic
Gnetaceae	Kuliat	*Gnetum gnemon*	Vines	–	Least Concern	Not Endemic
Guttiferae	Paguringan	*Cratoxylon arboreum*	Tree	–	–	Not Endemic
Icacinaceae	Anilaw	*Gonocaryum calleryanum/ Colona serratifolia*	Tree	–	–	
Lamiaceae	Dilang Baka	*Hypyis capitata Jacq.*	Herbs	–	–	Not Endemic

Family	Official Common Name	Scientific Name	Habit	DAO 2007-01	IUCN Redlist 2013	Endemicity
Lamiaceae	Gmelina	*Gmelina arborea*	Tree	–	–	Not Endemic
Lamiaceae	Molaveng Aso	*Vitex cofassus*	Tree	–	–	Not Endemic
Lamiaceae	Turukan	*Hyptis capitata Jacq.*	Herbs	–	–	Not Endemic
Lauraceae	Marang	*Litsea perrottettii*	Tree	–	–	Not Endemic
Leguminosae	Brazilian Fire Tree	*Schizolobium parahyba*	Tree	–	–	Not Endemic
Loganiaceae	Strychnos vine	*Strychnos multiflora L.*	Vines	–	–	Not Endemic
Lycopodiaceae	Lycopodium	***Lycopodium spp.*	Fern Allies	*(En/Vul)*	–	Not Endemic
Lygodiaceae	Nito	*Lygodium flexuosum (L.) Sm.*	Vines	–	–	Endemic
Lygodiaceae	Nitong Hapon	*Lygodium japonicum*	Vines	–	–	Not Endemic
Lythraceae	Luktob	*Duabanga moluccana*	Tree	–	–	Not Endemic
Malvaceae	Balobo	*Diplodiscus paniculatus*	Tree	–	Vulnerable	Endemic
Malvaceae	Banalo	*Thespesia populnea*	Tree	–	–	Not Endemic
Malvaceae	Biknong	*Kleinhovia hospita*	Tree	–	–	Not Endemic
Malvaceae	Cacao	*Theobroma cacao*	Tree	–	Least Concern	Not Endemic
Malvaceae	Malubago	*HIbiscus tiliaceus*	Tree	–	–	Not Endemic
Malvaceae	Tan-ag	*Kleinhovia hospita*	Tree	–	–	Not Endemic
Malvaceae	Walis-walisan	*Sida acuta Burm. f.*	Herbs	–	–	Not Endemic
Marantaceae	Bamban	*Donax cannaeformis*	Herbs	–	–	Not Endemic
Marattiaceae	Giant Fern	*Marattia sylvatica Bl.*	Ferns	–	–	Not Endemic
Meliaceae	Igyu	*Dysoxylum daeandrum*	Tree	–	–	Not Endemic
Menispermace ae	Ligtang	*Anamirta cocculus*	Vines	–	–	
Menispermace ae	Cyclea	*Cyclea merrilli*	Sedges	–	–	Not Endemic
Moraceae	Alangas	*Ficus heteropoda Miq.*	Tree	–	–	Not Endemic
Moraceae	Antipolo	*Artocarpus blancoi (Elmer) Merr.*	Tree	–	Least Concern	Endemic
Moraceae	Basikong	*Ficus botryocarpa Miq.*	Tree	–	–	Not Endemic

Family	Official Common Name	Scientific Name	Habit	DAO 2007-01	IUCN Redlist 2013	Endemicity
Moraceae	Dulalug	*Ficus variegate Blume var. sycomoroides (Miq.)*	Tree	–	–	Not Endemic
Moraceae	Ficus spp.	*Ficus lanceolata*	Tree	–	–	Not Endemic
Moraceae	Hagimit	*Ficus minahassae*	Tree	–	–	Not Endemic
Moraceae	Hawili	*Ficus septica Burma f. var. septica*	Shrub	–	–	Not Endemic
Moraceae	Isis	*Ficus ulmifolia*	Tree	–	Vulnerable	Endemic
Moraceae	Malagumihan	*Artocarpus elasticus*	Tree	–	–	Not Endemic
Moraceae	Malatibig	*Ficus congesta var. congesta*	Tree	–	–	Not Endemic
Moraceae	Niyug-niyugan	*Ficus pseudopalma Blanco*	Tree	–	Least Concern	Endemic
Moraceae	Tangisang Bayawak	*Ficus variegata Blume var. variegata*	Tree	–	–	Not Endemic
Moraceae	Tangisang Layugan	*Ficus latsonii*	Tree	–	–	Not Endemic
Moraceae	Tibig	*Ficus nota (Blanco) Merr.*	Tree	–	–	Endemic
Moraceae	Kalokoy	*Ficus callosa*	Tree	–	–	
Myrtaceae	Bayabas	*Psidium guajava*	Tree	–	–	Not Endemic
Myrtaceae	Binunga	*Tristaniopsis dicorticata*	Tree	–	–	Not Endemic
Nephrolepidaceae	Alulukdo	*Nephrolepis hirsutula*	Ferns	–	Least Concern	Not Endemic
Nephrolepidaceae	Christella	*Christella parasitica (Lindl.) Lev.*	Ferns	–	–	Not Endemic
Oleandraceae	Pakong-kalabaw	*Nephrolepis biserrta (Sw.) Schott.*	Ferns	–	–	Not Endemic
Osmundaceae	Osmunda/Royal Fern	*Osmunda banksiifolia (C. Prosl.) Kuhn.*	Ferns	–	–	Not Endemic
Pandanaceae	Bariu	*Pandanus copelandii Merr.*	Pandans	–	–	Not Endemic
Pandanaceae	Pandan-	*Pandanus exaltatus*	Pandans	–	–	Not Endemic

Family	Official Common Name	Scientific Name	Habit	DAO 2007-01	IUCN Redlist 2013	Endemicity
	layugan	*Blanco*				
Passifloraceae	Pasiflora	*Pasiflora spp.*	Vines	–	–	Not Endemic
Piperaceae	Palo Verde	*Piper arborescens*	Tree	–	–	Not Endemic
Piperaceae	Pamintang-aso	*Piper interruptum Opiz.*	Vines	–	–	Not Endemic
Piperaceae	Piper	*Piper spp.*	Vines	–	–	Not Endemic
Poaceae	Amorseco	*Andropogon aciculatos*	Grasses	–	–	Not Endemic
Poaceae	Bikal	*Dinochlea acutiflora (Munro) S. Dransf.*	Grasses	–	–	Not Endemic
Poaceae	Carabao Grass	*Paspalum conjugatum Berg.*	Grasses	–	Least Concern	Not Endemic
Poaceae	Carpet Grass	*Axonopus fissifolius*	Grasses	–	–	Not Endemic
Poaceae	Cat's Tail	*Typha orientalis*	Grasses	–	Least Concern	Not Endemic
Poaceae	Cogon	*Imperata cylindrica var. koenigii*	Grasses	–	–	Not Endemic
Poaceae	Crab Grass	*Digitaria sanguinalis*	Grasses	–	–	Not Endemic
Poaceae	Fishing Rod Bamboo	*Schizostachyum lima (Blanco) Merr.*	Grasses	–	–	Not Endemic
Poaceae	Johnson Grass	*Sorghum halapense*	Grasses	–	–	Not Endemic
Poaceae	Nut Grass	*Cyperus rotundus*	Grasses	–	–	Not Endemic
Poaceae	Paragis	*Eleusine indica (L.) Gaertn.*	Grasses	–	Least Concern	Not Endemic
Poaceae	Pusher Bamboo	*Schizostachyum fennixii*	Grasses	–	–	Not Endemic
Poaceae	Talahib	*Saacharum spontaneum L.*	Grasses	–	–	Not Endemic
Poaceae	Tambo	*Thysonolaena latifolia (Roxb. Ex Hornem.) Honda*	Grasses	–	–	Not Endemic
Poaceae	Whipping Grass	*Sporobolus indicus L.*	Grasses	–	–	Not Endemic

Family	Official Common Name	Scientific Name	Habit	DAO 2007-01	IUCN Redlist 2013	Endemicity
Polypodaceae	Kabkab/Oak-Leaf Fern	*Drynaria quercifolia (L.) Sm.*	Ferns	VUL	–	Not Endemic
Polypodaceae	Thai Fern	*Microsorum thailandicum*	Ferns	–	–	Not Endemic
Rhamnaceae	Salapao	*Ventilago dichotoma*	Vines	–	–	Not Endemic
Rubiaceae	Bangkal	*Nauclea orientalis*	Tree	–	–	Not Endemic
Rubiaceae	Dilang Butiki	*Dentella repens*	Herbs	–	–	Not Endemic
Rubiaceae	Kahoy Dalaga	*Mussaenda philippica A.Rich*	Tree	–	–	Not Endemic
Rutaceae	Kalamansi	*Citrofortunella microcarpa*	Tree	–	–	Not Endemic
Salicaceae	Aninguai	*Scolopia luzoniensis (Presl.) Merr.*	Vines	–	–	
Sapindaceae	Kapulasan	*Nephelium mutabile*	Tree	–	–	Not Endemic
Sapindaceae	Large Leaf Malugay	*Pometia pinnata*	Tree	–	–	Not Endemic
Sapotaceae	Kaimito	*Chrysophyllum cainito*	Tree	–	–	Not Endemic
Selaginellaceae	Kamariang Gubat	*Selaganella planna Hieron*	Fern Allies	–	–	Not Endemic
Selaginellaceae	Selaginella	*Selaginella involvens (Sw.) Spreng*	Ferns	–	–	Not Endemic
olanaceae	Malatalong	*Solanum verbascifolim* Linn.	Shrub	–	–	Not Endemic
Sterculiaceae	Bayok	*Pterospermum diversifolium*	Tree	–	–	Not Endemic
Sterculiaceae	Labayo	*Commersonia platyphylla*	Shrub	–	–	Not Endemic
Sterculiaceae	Taloto	*Pterocymbium tinctorium*	Tree	–	–	Not Endemic
Sterculiaceae	U-us	*Sterculia glabrifolia*	Tree	–	–	Not Endemic
Thelypteridaceae	Cristella Fern	*Christella dentata*	Ferns	–	–	Not Endemic
Tiliaceae	Kulot-kulotan	*Triumfetta rhomboidea Jacq.*	Herbs	–	–	Not Endemic

Family	Official Common Name	Scientific Name	Habit	DAO 2007-01	IUCN Redlist 2013	Endemicity
Urticaceae	Alagasi	*Leucosyke capitellata*	Shrub	–	Least Concern	Endemic
Urticaceae	Rami	*Boehmeria nivea*	Herbs	–	–	Not Endemic
Verbenaceae	Coronitas	*Lantana camara*	Herbs	–	–	Not Endemic
Verbenaceae	Kandikandilaan	*Stachytarpheta jamaicacensis*	Herbs	–	–	Not Endemic
Verbenaceae	Magilik	*Premna cumingiana*	Tree	–	–	Not Endemic
Verbenaceae	Molave	*Vitex parviflora*	Tree	EN	Vulnerable	Indigenous
Verbenaceae	White Kandi-kandilaan	*Stachytarpheta jamaicensis* Linn.	Herbs	–	–	Not Endemic
Vitaceae	Alangingi	*Cayratia guineensis G.Don*	Vines	–	–	Not Endemic
Vitaceae	Ayo	*Terrastigma harmandii*	Vines	–	–	
Vitaceae	Kaliantan	*Leea philippinensis*	Tree	–	–	Endemic
Zingiberaceae	Tagbak	*Alpinia elegans L.*	Zingibers	–	–	Not Endemic
	Bataran Grass					
	Kulot-Kulot					
	Lupog-Lupog					

Source: Source: Compiled by NK-JV based on Draft Environmental Impact Statement for Davao City Bypass Construction Project (October 2014)

Attachment-2: List of Fauna

1. Birds recorded by the 1st Site Survey (April 2014) for the Original EIS

Common Name	Scientific Name	Abundance	Relative Abundance (%)
Glossy Swiftlet	*Collocalia esculenta*	76	22.26
Eurasian Tree Sparrow	*Passer montanus*	40	11.90
Yellow-vented Bulbul	*Pycnonotus goiavier*	38	11.31
Red-keeled Flowerpecker	*Dicaeum australe*	30	8.93
White-eared Brown-dove	*Phapitreron leucotis*	21	6.25
Olive-backed Sunbird	*Nectarinia jugularis*	17	5.06
Cattle Egret	*Bubulcus ibis*	15	4.46
White-collared Kingfisher	*Halcyon chloris*	15	4.46
Chestnut Munia	*Lonchura malacca*	13	3.87
Pied Fantail	*Rhipidura javanica*	12	3.57
Philippine Coucal	*Centropus viridis*	9	2.68
Pygmy Swiftlet	*Collocalia troglodytes*	6	1.79
Blue-tailed Bee-eater	*Merops philippinus*	4	1.19
White-breasted Wood-swallow	*Artamus leucorynchus*	5	1.49
Brahminy Kite	*Haliastur indus*	4	1.19
Coppersmith Barbet	*Megalaima haemacephala*	4	1.19
Striated Grassbird	*Megalurus palustris*	4	1.19
Yellow Wagtail	*Motacilla flava*	4	1.19
Asian Glossy Starling	*Aplonis panayensis*	3	0.89
Grey-tailed Tattler	*Heteroscelus brevipes*	2	0.60
Red Junglefowl	*Gallus gallus*	2	0.60
Silvery Kingfisher	*Alcedo argentata*	2	0.60
Temminck's Stint	*Calidris temminckii*	2	0.60
White-bellied Munia	*Lonchura leucogastra*	2	0.60
Zebra Dove	*Geopelia striata*	2	0.60
Large-billed Crow	*Corvus macrorhynchos*	1	0.30
Little Egret	*Egretta garzetta*	1	0.30
Philipine Frogmouth	*Batrachostomus septimus*	1	0.30
Pied Buschat	*Saxicola caprata*	1	0.30
Total		**336**	**100.00**

Source: Compiled by NK-JV based on Draft Environmental Impact Statement for Davao City Bypass Construction Project (October 2014)

2. List of Birds recorded by the 2nd Survey (February 2015) for the Original EIS

Common Name	Scientific Name	Abundance	Relative Abundance (%)
Glossy Swiftlet	*Collocalia esculenta*	6	8.82
Eurasian Tree Sparrow	*Passer montanus*	4	5.88
Yellow-vented Bulbul	*Pycnonotus goiavier*	12	17.65
Red-keeled Flowerpecker	*Dicaeum australe*	1	1.47
White-eared Brown-dove	*Phapitreron leucotis*	1	1.47
Olive-backed Sunbird	*Nectarinia jugularis*	2	2.94
White-collared Kingfisher	*Halcyon chloris*	1	1.47
Chestnut Munia	*Lonchura malacca*	5	7.35
Pied Fantail	*Rhipidura javanica*	2	2.94
Philippine Coucal	*Centropus viridis*	1	1.47
Blue-tailed Bee-eater	*Merops philippinus*	2	2.94
White-breasted Wood-swallow	*Artamus leucorynchus*	4	5.88
Coppersmith Barbet	*Megalaima haemacephala*	6	8.82
Striated Grassbird	*Megalurus palustris*	4	5.88
Asian Glossy Starling	*Aplonis panayensis*	4	5.88
Red Junglefowl	*Gallus gallus*	1	1.47
Silvery Kingfisher	*Alcedo argentata*	2	2.94
Zebra Dove	*Geopelia striata*	4	5.88
Large-billed Crow	*Corvus macrorhynchos*	3	4.41
Pied Buschat	*Saxicola caprata*	1	1.47
Pied Triller	*Lalage nigra*	2	2.94
Total		**68**	**100.00**

Source: Compiled by NK-JV based on Draft Environmental Impact Statement for Davao City Bypass Construction Project (October 2014)

3. List of Amphibians recorded by the Field Survey for the Original EIS

Family	Common Name	Scientific Name	Site				Total	Rel. Abundance (%)
			1	2	3	4		
Bufonidae	Cane Toad	*Bufo marinus*	15	15	15	8	53	71.62
Dicroglossidae	Crab-eating Frog	*Rana cancrivora*	12	3	3		18	24.32
Microhylidae	Black-spotted sticky frog	*Kalophrynus pleurostigma*	1				1	1.35
Raniidae	Variable-backed Frog	*Rana signata*		1			1	1.35
Microhylidae	Slender-digit Chorus Frog	*Kaloula picta*				1	1	1.35
Total			**28**	**19**	**18**	**9**	**74**	**100.00**

Note: Lasang River, Brgy. Communal; 2 – Lipadas River, Bangkas Heights; 3 – Matina River, Brgy. Langub; 4 – Tunnel Site, Brgy. Matina Biao

Source: Compiled by NK-JV based on Draft Environmental Impact Statement for Davao City Bypass Construction Project (October 2014)

4. List of Bats recorded by the Field Survey for the Original EIS

Family	Common Name	Scientific Name	Site			Total	Relative Abundance (%)
			1	2	3		
Pteropodidae	Geoffroy's Rousette	*Rousettus amplexicaudatus*	6			6	12.00
Pteropodidae	Lesser Dog-faced Fruit Bat	*Cynopterus brachyotis*	22	5	5	32	64.00
Pteropodidae	Greater Musky Fruit Bat	*Ptenochyrus jagori*	5		5	10	20.00
Pteropodidae	Dagger-toothed Long-nosed Fruit Bat	*Macroglossus minimus*	1		1	2	4.00
Total			**34**	**5**	**11**	**50**	**100.00**

Note: Lasang River, Brgy. Communal; 2 – Lipadas River, Bangkas Heights; 3 – Matina River, Brgy. Langub; 4 – Tunnel Site, Brgy. Matina Biao

Source: Compiled by NK-JV based on Draft Environmental Impact Statement for Davao City Bypass Construction Project (October 2014)

5. Conservation Status of Fauna recorded by the Field Survey for the Original EIS

Family Name	Species Name	Common Name	Residency Status	IUCN Redlist (2014)
Birds				
Ardeidae	*Egretta garzetta*	Little Egret	Migrant	Least Concern
Ardeidae	*Bubulcus ibis*	Cattle Egret	Resident/ Migrant	Least Concern
Accipitridae	*Haliastur indus*	Brahminy Kite	Resident	Least Concern
Phasianidae	*Gallus gallus*	Red Junglefowl	Resident	Least Concern
Scolopacidae	*Heteroscelus brevipes*	Grey-tailed Tattler	Migrant	Least Concern
Scolopacidae	*Calidris temminckii*	Temminck's Stint	Migrant-Rare	Least Concern
Columbidae	*Phapitreron leucotis*	White-eared Brown-dove	Endemic	Least Concern
Columbidae	*Geopelia striata*	Zebra Dove	Resident	Least Concern
Cuculidae	*Centropus viridis*	Philippine Coucal	Endemic	Least Concern
Podargidae	*Batrachostomus septimus*	Philippine Frogmouth	Endemic	Least Concern
Apodidae	*Collocalia esculenta*	Glossy Swiftlet	Resident	Least Concern
Apodidae	*Collocalia troglodytes*	Pygmy Swiftlet	Endemic	Least Concern
Alcedinidae	*Alcedo argentata*	Silvery Kingfisher	Endemic	Vulnerable
Alcedinidae	*Halcyon chloris*	White-collared Kingfisher	Endemic	Least Concern
Capitonidae	*Megalaima haemacephala*	Coppersmith Barbet	Resident	Least Concern
Pycnonotidae	*Pycnonotus goiavier*	Yellow-vented Bulbul	Resident	Least Concern
Corvidae	*Corvus macrorhynchos*	Large-billed Crow	Resident	Least Concern
Turdidae	*Saxicola caprata*	Pied Buschat	Resident	Least Concern
Meropidae	*Merops philippinus*	Blue-tailed Bee-eater	Resident	Least Concern
Sylviidae	*Megalurus palustris*	Striated Grassbird	Resident	Least Concern
Muscicapidae	*Rhipidura javanica*	Pied Fantail	Resident	Least Concern
Motacillidae	*Motacilla flava*	Yellow Wagtail	Migrant	Least Concern
Artamidae	*Artamus leucorynchus*	White-breasted Wood-swallow	Resident	Least Concern
Sturnidae	*Aplonis panayensis*	Asian Glossy Starling	Resident	Least Concern
Nectariniidae	*Nectarina jugularis*	Olive-backed Sunbird	Resident	Least Concern
Dicaeidae	*Dicaeum australe*	Red-keeled Flowerpecker	Endemic	Least Concern

Family Name	Species Name	Common Name	Residency Status	IUCN Redlist (2014)
Ploceidae	*Passer montanus*	Eurasian Tree Sparrow	Resident	Least Concern
Estrildidae	*Lonchura leucogastra*	White-bellied Munia	Resident	Least Concern
Estrildidae	*Lonchura Malacca*	Chestnut Munia	Resident	Least Concern
Amphibians				
Bufonidae	*Bufo marinus*	American Bullfrog	Introduced	Least Concern
Dicroglossida e	*Rana cancrivora*	Crab-eating Frog	Resident	Least Concern
Microhylidae	*Kalophrynus pleurostigma*	Black-spotted sticky frog		Least Concern
Raniidae	*Rana signata*	Variable-backed Frog	Resident	Least Concern
Microhylidae	*Kaloula picta*	Slender-digit Chorus Frog	Resident	Least Concern
Bats				
Pteropodidae	*Rousettus amplexicaudatus*	Geoffroy's Rousette	Resident	Least Concern
Pteropodidae	*Cynopterus brachyotis*	Lesser Dog-faced Fruit Bat	Resident	Least Concern
Pteropodidae	*Ptenochyrus jagori*	Greater Musky Fruit Bat	Endemic	Least Concern
Pteropodidae	*Macroglossus minimus*	Dagger-toothed Long- nosed Fruit Bat	Resident	Least Concern

Source: Compiled by NK-JV based on Draft Environmental Impact Statement for Davao City Bypass Construction Project (October 2014)