

***Quarterly Environmental Quality Monitoring Report for the
Landslide Disaster Protection Project of the National Road
Network
Package 2- JICA Format
Report No-08 (June 2019)***

**Mitigation Measures
Air Quality (Ambient Air Quality)
1). Design and Construction Stage**

Item	Averaging Time	Unit	Measured Value (mean)	measured value (max) ^{*1}	National standards (max) ^{*1}	WHO Guidelines #2	Location	Remarks	
								Frequency	Implementation
SO ₂	24 hours	µg/m ³			80	20			
	8 hours				120	-			
	1 hour		12	15	200	-	Walhaputenna-03		
NO ₂	24 hours	µg/m ³			100	-			
	8 hours				150	-			
	1 hour		10	12	250	200	Walhaputenna-03		
	1 year				-	40			
CO	8 hours	µg/m ³			10000	10000			
	1 hour		2015	2220	30000	30000	Walhaputenna-03		
O ₃	8 hours	µg/m ³			-	100			
	1 hour		4	7	200	-	Walhaputenna-03		
Lead Compounds	24 hours	µg/m ³			2	-			
	1 year		0.1	0.1	0.5	0.5	Walhaputenna-03		
PM ₁₀	24 hours	µg/m ³			100	20			
	1 year		38.2	40.2	50	50	Walhaputenna-03		
SPM	1 hour	µg/m ³			500	-			
	3 hours				450	-			
	8 hours		174.6	180.2	350	-	Walhaputenna-03		
	24 hours				300	-			
	1 year			100	-				

*1: national Ambient Air Quality (NAAQS) of Sri Lanka (2009)

*2: WHO Air Quality guideline for particular matter, ozone, nitrogen dioxide and sulfur dioxide (2006)

Design Stage
1 time as a baseline data
Constriction stage:
4 time /year for 2 years

Constructor through approved monitoring agency

RDA/ESD

Supervision

**Mitigation Measures
Air Quality (Ambient Air Quality)
1). Design and Construction Stage**

Item	Averaging Time	Unit	Measured Value (mean)	measured value (max) ^{*1}	National standards (max) ^{*1}	WHO Guidelines ^{*2}	Location	Remarks	
								Frequency	Implementation
SO ₂	24 hours	µg/m ³			80	20			
	8 hours				120	-			
	1 hour		21	23	200	-	Kahagalla		
NO ₂	24 hours	µg/m ³			100	-			
	8 hours				150	-			
	1 hour		13.3	15	250	200	Kahagalla		
	1 year				-	40			
CO	8 hours	µg/m ³			10000	10000			
	1 hour		2153	2255	30000	30000	Kahagalla		
O ₃	8 hours	µg/m ³			-	100			
	1 hours		3	4	200	-	Kahagalla		
Lead Compounds	24 hours	µg/m ³			2	-			
	1 year		0.1	0.1	0.5	0.5	Kahagalla		
PM ₁₀	24 hours	µg/m ³			100	20			
	1 year		46.2	50.2	50	50	Kahagalla		
	1 hour				500	-			
SPM	3 hours	µg/m ³			450	-			
	8 hours		171.5	180.2	350	-	Kahagalla		
	24 hours				300	-			
	1 year				100	-			

*1: national Ambient Air Quality (NAAQS) of Sri Lanka (2009)

*2: Who Air Quality guideline for particular matter, ozone, nitrogen dioxide and sulfur dioxide (2006)

Design Stage
1 time as a baseline data
Constriction stage:
4 time /year for 2 years

Constructor through approved monitoring agency

RDA/ESD

**Mitigation Measures
Air Quality (Ambient Air Quality)
1). Design and Construction Stage**

Item	Averaging Time	Unit	Measured Value (mean)	measured value (max)*1	National standards (max)*1	WHO Guidelines *2	Remarks			
							Location	Frequency	Implementation	Supervision
SO ₂	24 hours	µg/m ³		80	20					
	8 hours		120	-						
	1 hour		200	-	2 nd Mile Post					
NO ₂	24 hours	µg/m ³	10	11	100	-				
	8 hours			150	-					
	1 hour		11	14	250	200	2 nd Mile Post			
	1 year			-	40					
CO	8 hours	µg/m ³		10000	10000	10000				
	1 hour		1486	1660	30000	30000	2 nd Mile Post			
O ₃	8 hours	µg/m ³				100				
	1 hours		5	7	200	-	2 nd Mile Post			
Lead Compounds	24 hours	µg/m ³	0.1	0.1	2	-				
	1 year				0.5	0.5				
PM ₁₀	24 hours	µg/m ³	26.63	28.2	100	20				
	1 year				50	50				
SPM	1 hour	µg/m ³		500	-	-				
	3 hours		215.2	220.2	450	-	2 nd Mile Post			
	8 hours			350	-	-				
	24 hours			300	-	-				
	1 year			100	-	-				

*1: national Ambient Air Quality (NAAQS) of Sri Lanka (2009)

*2: Who Air Quality guideline for particular matter, ozone, nitrogen dioxide and sulfur dioxide (2006)

Design Stage
1 time as a baseline data

Constriction stage:
4 time /year for 2 years

Constructor through approved monitoring agency

RDA/ESD

**Mitigation Measures
Air Quality (Ambient Air Quality)
2). Operation Stage**

Item	Average Time	Unit	Measured Value (mean)	measured value (max)*1	National standards (Max.)*1	WHO Guidelines	Location	Remarks		
								Frequency	Implementation	Supervision
SO ₂	24 hours	µg/m ³		80	80	20				
	8 hours			120	10000					
	1 hours			200	30000					
NO ₂	24 hours	µg/m ³		100	-	-				
	8 hours			150	-	-				
	1 hours			250	200	200				
	1 year			-	-	40				
CO	8 hours	µg/m ³		10000	10000	10000				
	1 hours			30000	30000	30000				
	8 hours			-	-	100				
O ₃	1 hours	µg/m ³		200	200					
Lead Compounds	24 hours	µg/m ³		2	2					
	1 year			0.5	0.5	0.5				
PM ₁₀	24 hours	µg/m ³		100	100	20				
	1 year			50	50	50				
	1 hours			500	500	-				
SPM	3 hours	µg/m ³		450	450	-				
	8 hours			350	350	-				
	24 hours			300	300	-				
	1 year			100	100	-				

*1: national Ambient Air Quality (NAAQS) of Sri Lanka (2009)

*2: Who Air Quality guideline for particular matter, ozone, nitrogen dioxide and sulfur dioxide (2006)

Mitigation Measures
Water Quality (Effluent/Wastewater)
1). Design and Construction Stage

Item	Unit	measured value (mean)	measured value (max)*1	National Standards (max)*1	International Guidelines	Remarks			
						Location	Frequency	Implementation	
EC	S/m	0.135	0.183	-	-	Walhaputenna-03	Design Stage 1 time as a baseline data	Constructor through approved monitoring agency	RDA/ESD
pH		7.0	7.1	6-8.5	6-9*2	Walhaputenna-03			
DO	mg/L	10.13	10.7	-	-	Walhaputenna-03	Constriction stage: 4 time /year for 2 years		
Turbidity	mg/L	Not Detected	Not Detected	-	0.2*3	Walhaputenna-03			
TSS	mg/L	Not Detected	Not Detected	50	50*3	Walhaputenna-03			
BOD ₅	mg/L	1.21	1.24	30	30*3	Walhaputenna-03			
Lead	mg/L	Not Detected	Not Detected	0.1	0.01*2	Walhaputenna-03			
Oil and grease	mg/L	Not Detected	Not Detected	10	10*2	Walhaputenna-03			
Coliform	MPN/100	Not Detected	Not Detected	40	400*2	Walhaputenna-03			
E-coli	MPN/100	Not Detected	Not Detected			Walhaputenna-03			

1). Design and Construction Stage

Item	Unit	measured value (mean)	measured value (max)*1	National Standards (max)*1	International Guidelines	Remarks			
						Location	Frequency	Implementation	
EC	S/m	0.135	0.184	-	-	Kahagalla	Design Stage 1 time as a baseline data	Constructor through approved monitoring agency	RDA/ESD
pH		7.0	7.1	6-8.5	6-9*2	Kahagalla			
DO	mg/L	10.4	11.0	-	-	Kahagalla	Constriction stage: 4 time /year for 2 years		
Turbidity	mg/L	1.25	1.81	-	0.2*3	Kahagalla			
TSS	mg/L	Not Detected	Not Detected	50	50*3	Kahagalla			
BOD ₅	mg/L	1.1	1.4	30	30*3	Kahagalla			
Lead	mg/L	Not Detected	Not Detected	0.1	0.01*2	Kahagalla			
Oil and grease	mg/L	Not Detected	Not Detected	10	10*2	Kahagalla			
Coliform	MPN/100	1241	1800	40	400*2	Kahagalla			
E-coli	MPN/100	Not Detected	Not Detected			Kahagalla			

*1: National Environmental (protection and Quality) Regulation, CEA (2008)

*2: IFC EHS general guideline, for Sanitary Sewage Discharge (2007)

*3: ADB guideline and standards in relation to waste water Reuse (2011), Main usage- "All nondrinking water uses"

Mitigation Measures

Water Quality (Effluent/Wastewater)

1). Design and Construction Stage

Item	Unit	measured value (mean)	measured value (max)*1	National Standards (max)*1	international Guidelines	Location	Remarks		
							Frequency	Implementation	Supervision
EC	S/m	0.202	0.236	-	-	2 nd Mile Post	Design Stage 1 time as a baseline data	Constructor through approved monitoring agency	RDA/ESD
pH		6.8	7.0	6-8.5	6-9*2	2 nd Mile Post			
DO	mg/L	11.2	12	-	-	2 nd Mile Post			
Turbidity	mg/L	1.31	1.81	-	0.2*3	2 nd Mile Post			
TSS	mg/L	Not Detected	Not Detected	50	50*3	2 nd Mile Post	Constriction stage: 4 time /year for 2 years		
BOD ₅	mg/L	0.8	1.1	30	30*3	2 nd Mile Post			
Lead	mg/L	Not Detected	Not Detected	0.1	0.01*2	2 nd Mile Post			
Oil and grease	mg/L	Not Detected	Not Detected	10	10*2	2 nd Mile Post			
Coliform	MPN/100	Not Detected	Not Detected	40	400*2	2 nd Mile Post			
E-coli	MPN/100	Not Detected	Not Detected						

02). Operation Stage

Item	Unit	measured value (mean)	measured value (max)*1	National Standards (max)*1	international Guidelines	Location	Remarks		
							Frequency	Implementation	Supervision
EC	S/m			-	-		2 times/year for 2 year	RDA through approved monitoring agency	RDA/ESD
pH				6-8.5	6-9*2				
DO	mg/L			-	-				
Turbidity	mg/L			-	0.2*3				
TSS	mg/L			50	50*3				
BOD ₅	mg/L			30	30*3				
Lead	mg/L			0.1	0.01*2				
Oil and grease	mg/L			10	10*2				
Coliform	MPL/1000			40	400*2				

*1: National Environmental (protection and Quality) Regulation, CEA (2008)

*2: IFC EHS general guideline, for Sanitary Sewage Discharge (2007)

*3: ADB guideline and standards in relation to waste water Reuse (2011), Main usage- "All nondrinking water us

Mitigation Measures

Noise

1). Design and construction Stage

Item	One hour Laeq	Unit	Measured value (mean)	measured value (max)*1	National Standards(max)*1	World Bank Guideline*2	Remarks			
							Location	Frequency	Implementation	Supervision
Noise*1	Day time (7.00-22.00) Design/Construction	db(A)	68	71	50/75	55	Walhaputenna-03	Design Stage 1 time as a baseline data	Constriction through approved monitoring stage	RDA/ESD
	Night time (22.00-7.00) Design/Construction		No work	No work	40/50	45	Walhaputenna-03	Constriction stage: 4 time /year for 2 years		

1). Design and construction Stage

Item	One hour Laeq	Unit	measured value (mean)	measured value (max)*1	National Standards(max)*1	World Bank Guideline*2	Remarks			
							Location	Frequency	Implementation	Supervision
Noise*1	Day time (7.00-22.00) Design/Construction	db(A)	70	72	50/75	55	Kahagalla	Design Stage 1 time as a baseline data	Constriction through approved monitoring stage	RDA/ESD
	Night time (22.00-7.00) Design/Construction		No work	No work	40/50	45		Constriction stage: 4 time /year for 2 years		

*1: National Environmental (protection and Quality) Regulation, CEA (2008)

*2: Residential area IFC EHS general guideline, for general health and Safety (EHS) guideline (2007)

1). Design and construction Stage

Item	One hour Laeq	Unit	Measured value (mean)	measured value (max)*1	National Standards(max)*1	World Bank Guideline*2	Remarks			
							Location	Frequency	Implementation	Supervision
Noise*1	Day time (7.00-22.00) Design/Construction	db(A)	69	71	50/75	55	2 nd mile post	<u>Design Stage</u> 1 time as a baseline data	Constriction through approved monitoring stage	RDA/ESD
	Night time (22.00-7.00) Design/Construction		No work	No work	40/50	45		<u>Constriction stage:</u> 4 time /year for 2 years		

*1: National Environmental (protection and Quality) Regulation, CEA (2008)

*2: Residential area IFC EHS general guideline, for general health and Safety (EHS) guideline (200

2). Operation Stage

Item	One hour Laeq	Unit	Measured value (mean)	measured value (max)*1	National Standards(max)*1	World Bank Guideline*2	Remarks			
							Location	Frequency	Implementation	Supervision
Noise*1	Day time (7.00-22.00)	db(A)			50/75	55		2 times/year for 2 year	RDA through approved monitoring agency	RDA/ESD
	Night time (22.00-7.00)		No work	No work	40/50	45				

*1: National Environmental (protection and Quality) Regulation, CEA (2008)

*2: Residential area IFC EHS general guideline, for general health and Safety (EHS) guideline (2007)

Mitigation Measures

Vibration

1). Design Stage

Item	Unit	Frequency Band	Measured Value (mean)	measured value (max)	National Standards(max)*1	international Guidelines	Remarks			
							Location	Frequency	Implementation	Supervision
Vibration	mm/sec	0-10Hz			1			1 time with identification of noise barriers requirement location	Constructor through approved monitoring agency	RDA/ESD
		10-50Hz			2					
		Over 50Hz			4					

2). Construction Stage

Item	Unit	Frequency Band	Measured Value (mean)	measured value (max)	National Standards(max)*1	international Guidelines	Remarks			
							Location	Frequency	Implementation	Supervision
vibration	mm/sec	0-10Hz			1			Every 6 months during stage, and on complain at the construction site	Constructor through approved monitoring agency	RDA/ESD
		10-50Hz			2					
		Over 50Hz	0.53	0.66	4		Walhaputenna-03			

2). Construction Stage

Item	Unit	Frequency Band	Measured Value (mean)	measured value (max)	National Standards(max)*1	international Guidelines	Remarks			
							Location	Frequency	Implementation	Supervision
vibration	mm/sec	0-10Hz			1		Kabagalia	Every 6 months during stage, and on complain at the construction site	Constructor through approved monitoring agency	RDA/ESD
		10-50Hz			2					
		Over 50Hz	0.48	0.62	4					

2). Construction Stage

Item	Unit	Frequency Band	Measured Value (mean)	measured value (max)	National Standards(max)*1	international Guidelines	Remarks			
							Location	Frequency	Implementation	Supervision
vibration	mm/sec	0-10Hz			1		2 nd Mile Post	Every 6 months during stage, and on complain at the construction site	Constructor through approved monitoring agency	RDA/ESD
		10-50Hz			2					
		Over 50Hz	0.52	0.60	4					

3). Operation Stage

Item	Unit	Frequency Band	Measured Value (mean)	measured value (max)	National Standards(max)*1	international Guidelines	Remarks			
							Location	Frequency	Implementation	Supervision
vibration	mm/sec	0-10Hz			1			Every 6 months during stage, and on complain at the construction site	RDA through approved monitoring agency	RDA/ESD
		10-50Hz			2					
		Over 50Hz			4					

***1: National Environment (Protection and quality) Regulations, CES (2008), Category of the Structure: - "Type C" Type of Vibration- "intermittent"**

***2: The distance from the source (radius/width of corridor) shall be decided by the constructor and RDA**

Mitigation Measures

Groundwater Level

Item	Unit	Stage	Measured Value	Measured value(Max)	Remarks			
					Location	Frequency	Implementation	Supervision
Ground Water Level	m	Design Stage				2 times during dry and wet season	Constriction through approved monitoring stage	RDA/ESD
		Construction Stage			Walhaputenna-03	On Complain	DRA through approved monitoring agency	
		Operation Stage				2 times with an interval of 6 months for 3 year time		

Item	Unit	Stage	Measured Value	Measured value(Max)	Remarks			
					Location	Frequency	Implementation	Supervision
Ground Water Level	m	Design Stage				2 times during dry and wet season	Constriction through approved monitoring stage	RDA/ESD
		Construction Stage			kahagalla	On Complain	DRA through approved monitoring agency	
		Operation Stage				2 times with an interval of 6 months for 3 year time		

Item	Unit	Stage	Measured Value	Measured value(Max)	Remarks			
					Location	Frequency	Implementation	
Ground Water Level	m	Design Stage				2 times during dry and wet season	Constriction through approved monitoring stage	RDA/ESD
		Construction Stage			2 nd Mile Post	On Complain	DRA through approved monitoring agency	
		Operation Stage						2 times with an interval of 6 months for 3 year time

Waste/Spoil Disposals

Monitoring Item	Monitoring Result during Report Period
Adequateness of slope drainage design	As per the approved Design
Protection of drainage outline against score and erosion	Drainage paths were covered by tarpaulin or disturbed by aggregates where possible.
Complaints on land acquisition and resettlement issue	No Complaints and issues
Disruption of drinking or irrigation water	Earth works were mostly carried out in dry period. Erosion, canal bank erosion and sedimentation of surface water bodies were minimized through water pooling, silt traps and temporary drains. Tarpaulin sheets were used for cover the soil when heavy rains occurred. Spills of oil and chemicals from machines and vehicles were avoided through proper and timely maintenance.
Adequateness of spoil tipping away	Earth removed is used for backfilling and soil that cannot be reused were disposed in an approved disposal yards. Adequate facilities available for quick removal of soil.