IX. ENVIRONMENTAL MANAGEMENT PROGRAM (EMP)

The purpose of the Environmental Management Program (EMP) is to provide the environmental measures oriented to prevent, mitigate and/or compensate the negative environmental impacts that the Project could produce, and that generate damaging effects on the quality of life and or the environment.

According to Art. 24 of the General Regulations of the LMA, the Environmental Management Program (EMP) should include:

a. The determination, prioritization and quantification of the prevention, mitigation and compensation measures of the environmental impact and delimitation of necessary investment.

b. Monitoring.

c. Closing of operations and rehabilitation, when necessary; and,

d. The risk and environmental management study , when necessary.

In this case only paragraphs a, b, and d are considered, since c, does not apply due to the Project duration, that is planned for 30 years or more.

Art. 25 of such Regulations, states that the component of determination, prioritization and quantification of prevention, mitigation and compensation measures for the impacts, should aim at identifying and implementing the environmental measures that the Project owner shall implement in the different phases.

This chapter explains, the proposed environmental measures, including their location of the measures, quantification of the investments, Schedule for the implementation of the measures and supervision of their implementation.

Table VII. 1 retakes the significant negative impacts of the Project for which one or several environmental measures are proposed, which are described hereafter.

THE EMP will be implemented throughout the Project, defines each project phase (Site preparation, Construction and Operations), and includes all the proposed environmental measures to take the environmental impacts identified in the previous chapter, to acceptable levels; the costs of the Works and investments proposed to be implemented are assessed economically, such assessment is presented in United States dollars (US$), taking the Project Schedule into account and projecting the figures according to the evolution foreseen in the Project duration years.

The total amount for the environmental measures will be US$2,107,032.90, for an implementation term offifty-four months, thirty of which are for the construction phase and twenty-four months (the first 2 years) for the operations phase. Designs IX-1 and environmental measure designs IV-4 1/19 to 19/19, show the location of the environmental measures in the project details. All environmental measures, with or without an economic valuation,that will be carried out are included in the EMP.

IX. 1 DETERMINATION OF THE ENVIRONMENTAL MEASURES

The following table shows the environmental measures proposed for the impacts identified as medium, high and very high level. The table presents the Project stages: construction site preparation (C: P.S.) or construction (CONST), and operations (FUNC), the activity or activities that generate the impact, the level of the impact and the proposed measure.

For some of the impacts foreseen to occur during the Project operations, the environmental measure will be applied during the construction phase.

Some impacts have been grouped to be mitigated by one environmental measure. After the table is the technical description of the environmental measures proposed. Some impacts that have been categorized as low have also been included and that at the consultant team's criteria need the implementation of environmental measures.

TABLE No. IX. 1. ENVIRONMENTAL MEASURE PROPOSED FOR SIGNIFICANT POTENTIAL ENVIRONMENTAL IMPACTS BY THE PROJECT, SORTED BY ENVIRONMENTAL IMPACT VALUE

PROJECT STAGE AT WHICH IMPACT IS PRODUCED	PROJECT ACTIVITY	DESCRIPTION OF ENVIRONMENTAL IMPACT GENERATED	EIV	ENVIRONMENTAL MEASURE
CONST: SITE PREPARATION	Cutting down trees and shrubs	Reducing infiltration caused by felling	**8**	1.1 Revegetation to offset for felling 3.1 Maintenance of newly planted trees and shrubs
CONST: SITE PREPARATION	Acquisition of rights of way	Impact on property and structures	**8**	1.7 Project's Social and Environmental Management
CONST: SITE PREPARATION	Clearing, cleaning and grubbing.	Reduction of crops and agricultural areas	**7.5**	1.2 Training for improving crops, soil and agroforestry
CONST: SITE PREPARATION	Acquisition of rights of way	Impact on social amenities	**6.9**	1.7 Project's Social and Environmental Management
CONST: SITE PREPARATION	Clearing and grubbing and installation of work camp	Transport of sediment to rivers and streams	**6.8**	1.4 Temporary drainages during site preparation
CONST: SITE PREPARATION	Cutting down trees and shrubs	Felling of trees, shrubs and grass during site preparation	**6.5**	1.1 Revegetation to offset for felling 3.1 Maintenance of newly planted trees and shrubs
CONST: SITE PREPARATION	Felling of trees and shrubs, clearing, cleaning and grubbing.	Impact on proposed protected area	**6**	1.5 Minimizing impact on proposed protected area
CONST: SITE PREPARATION	Cutting down trees and shrubs	Reduction of riparian and secondary forest: trees, shrubs and wildlife	**5.9**	1.1 Revegetation to offset for felling 3.1 Maintenance of newly planted trees and shrubs
CONST: SITE PREPARATION	Acquisition of rights of way	Relocation of people	**5.5**	1.7 Project's Social and Environmental Management
CONST: SITE PREPARATION	Acquisition of rights of way, cutting trees and shrubs, clearing, cleaning and grubbing.	Reduction or division of agricultural land	**4.6**	1.6 Signage for cattle crossings
CONST: SITE PREPARATION	Felling of trees and demolition of structures	Risk to people during site preparation	**4.4**	1.7 Project's Social and Environmental Management
CONST: SITE PREPARATION	Felling of trees and shrubs, clearing, cleaning and grubbing.	Possible impact on wildlife during site preparation	4.2	1.8 Measures to protect wildlife during site preparation
CONST: SITE PREPARATION	Acquisition of rights of way	Impact on commercial activities	4.2	1.9 Supporting small businesses

CONST: SITE PREPARATION	Demolition of structures, felling of trees, filling of wells, management of quarries and setting up the work camp	Possible contamination of soil and water by effluents, waste and residues from site preparation	3.5	1.10 Effluent, waste and residue management during site preparation
CONST: SITE PREPARATION	Demolition of existing structures, cutting of trees and shrubs, clearing, cleaning and grubbing, installation of work camp.	Health hazard by outsiders during site preparation	3.5	1.11 Prevention of health impacts during site preparation
CONST: SITE PREPARATION	Demolition of structures and felling of trees	Increased travel times during site preparation	3.2	1.7 Project's Social and Environmental Management
CONST: SITE PREPARATION	Demolition of structures and others	Temporary impact on infrastructure: power poles, drinking water, drainages	2.6	1.7 Project's Social and Environmental Management
CONST: SITE PREPARATION	Demolition of existing structures, cutting of trees and shrubs, clearing, cleaning and grubbing, installation of work camp.	Occupational hazards to employees during site preparation	2.6	1.12 Occupational Safety measures during site preparation
CONST.	Application of asphalt concrete paving, miscellaneous: sidewalks, barriers and others, construction of waystation	Reduction of infiltration from impermeabilization of areas	9	2.1 Offsetting for impermeabilization and felling of areas
CONST.	Supply of materials, earthworks, construction of tunnels, bridges and at-level crossings, slope treatment.	Emissions to air from transportation, earthworks and excavation	7.6	2.2 Dust control.
CONST.	Earthworks	Modification of natural relief	7.5	2.3 Slope management
CONST.	Earthworks	Change in soil quality: topsoil	7.5	2.4 Collection and reuse of topsoil
OPERATING	Vehicle and people traffic, storm drainage and road maintenance	Noise of vehicles passing daily	7.5	2.5 Noise reduction measures
CONST.	Earthworks	Modification of drainage patterns during construction	6.9	2.6 Maintenance of temporary drainage during construction
CONST.	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Possible impact on cultural-interest sites	6.9	2.7 Monitoring, rescue and / or recovery of cultural-interest sites
CONST.	Earthworks, construction of tunnels, bridges and at-grade crossings, slope treatment.	Instability of soil due to cut slopes and fills	6.5	2.3 Slope management
CONST.	Supply of materials, earthworks, construction of tunnels, bridges and at-grade crossings, slopes treatment, most construction activities.	Hazard, noise and vibration caused by supplying and general construction noises and explosions	6.1	2.8 Setting up schedules, signage and training in populated areas
CONST.	Earthworks, construction of tunnels, bridges and at-grade crossings, slope treatment.	Sediment washed into rivers and streams	5.8	2.6 Maintenance of temporary drainage during construction
CONST.	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Risk to people during construction	5.4	1.7 Project environmental and social management
CONST.	Earthworks, construction of tunnels, bridges and at-grade crossings, slope treatment.	Possible erosion processes	5.1	2.3 Slope management

CONST.	Earthworks, construction of tunnels, bridges and at-grade crossings, slope treatment.	Possible impact on forests and / or trees	4.5	2.9 Measures to protect forests, soil and proposed protected area
CONST.	Earthworks, construction of tunnels, bridges and at-grade crossings, slope treatment.	Possible impact on wildlife during construction	4.5	2.9 Measures to protect forests, soil and proposed protected area
CONST.	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Increased travel times during construction	4.1	1.7 Project's Social and Environmental Management
CONST.	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Possible impact on proposed protected area	3.9	2.9 Measures to protect forests, soils and proposed protected area
CONST.	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Health hazard by foreign people during construction.	3.5	2.10 Prevention of health impacts during construction.
CONST.	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Impact on roads and access routes for residents	3.5	2.11 Maintenance of temporary roads
CONST.	Supply of materials, earthworks, construction of tunnels, bridges and at-level crossings, slope treatment.	Possible contamination of soil and water by effluents, waste and residues from construction	2.6	2.12 Waste, residue and effluent management during construction
CONST.	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks,	Occupational hazards to employees during construction	2.6	2.13 Occupational safety measures during construction
CONST.	Vehicle and people traffic, storm drainage and road maintenance with presence of slopes and floodplains	Environmental hazards	-	2.14 Risk prevention plan
OPERATING	Vehicles and people traffic	Development induced by the presence of the road	7	3.2 Integrated vegetation management
OPERATING	Vehicles and people traffic and road maintenance	Impact on wildlife by opening of new access roads	5	3.2 Integrated vegetation management
OPERATING	Road maintenance	Possible soil contamination by effluents, waste and residues during maintenance	2.6	3.3 Occupational safety and waste and residue management during maintenance
OPERATING	Road maintenance	Occupational hazards to employees during maintenance works	2	3.3 Occupational safety and waste and residue management during maintenance

OPERATING	Road maintenance	Risk of damage to walls, drainages and embankments	2	3.4 Frequent checks and maintenance of protective walls, drainages and embankments.

Note: PAR and the acquisition of Rights of Way are part of the project and will be monitored by the Social and Environmental Management Office, and therefore amounts are not included for them as part of environmental measures.
Source: Results of Environmental Assessment conducted by multidisciplinary consulting team

IX.2 DESCRIPTION AND SPECIFICATIONS OF ENVIRONMENTAL MEASURES

The measures proposed are described hereunder, and there is a description of the measure, the objectives, specific activities and costs. To simplify their identification, the measures are organized according to the corresponding construction stage, and are numbered. There are three types of measures:

- Prevention, to prevent the environmental impacts foreseen.
- Mitigation, to reduce the effect or attenuate potential environmental impacts.
- Compensation, when it is not possible to prevent or attenuate the impact, it is compensated.

For the purpose of the project implementation, it has been divided in two parts, as explained in the project description, due to the EMP and the summary tables presented for these two individual parts, which are detailed as follows:

1. SECTION 1: From project beginning to Road CAI (to La Union)
2. SECTION 2: From highway CA1 (La Union) to highway RN17 (Road to El Delirio)

Some measures apply to both sections and other only to section 1, as shown below.

No.	MEASURE	SECTION 1	SECTION 2
1.1	Revegetation to offset for felling	x	x
1.2	Training to improve crops, soils and agroforestry.	x	x
1.3	Pedestrian crossings and road safety	x	
1.4	Temporary drainage during site preparation	x	
1.5	Minimize impact on proposed protected area	x	
1.6	Signage for cattle crossings	x	
1.7	Project environmental and social management	x	x
1.8	Measures to protect wildlife during site preparation.	x	x
1.9	Support for small businesses	x	
1.10	Effluent, waste and residue management during site preparation and filling of existing wells.	x	x
1.11	Prevention of health impacts during site preparation	x	x
1.12	Occupational safety measures during site preparation	x	x
2.1	Offsetting for impermeabilization and felling of areas	x	x
2.2	Dust control	x	x
2.3	Slope management	x	x

2.4	Collection and reuse of topsoil	x	x
2.5	Noise reduction measures	x	-
2.6	Maintenance of temporary drainages during construction	x	
2.7	Monitoring, rescue and / or recovery of cultural-interest sites	x	x
2.8	Setting up schedules, signage and training in populated areas	x	x
2.9	Measures to protect forests, soils and proposed protected area	x	x
2.10	Prevention of health impacts during construction	x	x
2.11	Temporary road maintenance	x	x
2,12	Waste, residue and effluent management during construction	x	x
2.13	Occupational safety measures during construction	x	x
2.14	Risk prevention plan	x	x
3.1	Maintenance of planted trees and shrubs	x	x
3.2	Integrated management of vegetation	x	x
3.3	Occupational safety and waste and residue management during maintenance	x	x
3.4	Regular checks and maintenance of protective walls on waterways, drainages and embankments	x	x

IX.2.1 Measures *to be implemented during site preparation*

IX.2.1.1 Re-forestation to compensate for felling

- *TYPE OF MEASURE*

Compensation

- *DESCRIPTION OF THE MEASURE PROPOSED*

This measure consists of general aspects of how the pruning and felling should be conducted and the compensation of felling with re-forestation.
The compensation is detailed as follows:

TABLE No. IX.2. FELLING AND PROPOSED OFFSETTING MEASURES

Affected plant species	Proposed offset measure	Qtty to be felled	Total offset
Trees	10 per tree	2,636	26,360
Threatened or endangered tree species*	25 per tree	11	275
Shrubs	1 per shrub	8,509	8,509

* 4 cedar trees and 7 mahogany trees
Source: *ECO Consulting Team*

Since there will be a compensation for **26,635 trees and 8,509 shrubs** of which 16,780 trees will be planted in slope bases, 997 in roundabouts and triangles and 5,013 shrubs between these trees, the rest of the compensation for felling will be carried out by building a fence in the Natural Protected Area El Socorro, which is detained in measure 21 Compensation for waterproofing areas.

The affectation for the two sections is detailed as follows:

♦ PROJECT SECTION I: *CA1 to CA1 (La Union)*

Affected plant species	Proposed offset measure	Qtty to be felled	Total offset
Trees	10 per tree	2,462	24,620
Threatened or endangered tree species*	25 per tree	10	250
Shrubs	1 per shrub	7,650	7,650

Source: Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Unión) to RN17*

Affected plant species	Proposed offset measure	Qtty to be felled	Total offset
Trees	10 per tree	174	1,740
Threatened or endangered tree species*	25 per tree	1	25
Shrubs	1 per shrub	859	859

Source: ECO Consulting Team

The distribution of the trees was made considering the following parameters

1. Existing species in the site
2. Spacing among species
3. Recommended altitude for each specie
4. Recommendation of biologists that analyzed the project
5. Physical characteristics of each specie
6. Request of the municipalities on the type of trees that produce fruits.
7. Recommendations according to Agreement 73 of the Ministry of Agriculture and Cattle, MAG, of May, 204 that provide the "Instructions to Grow Ornamental Species in Urban Areas"

The environmental measures drawings FV-4 1/19 to 19/19, show the information regarding re-forestation, including the distance between trees, sites where interspersing shrubs have been considered, number of trees in each section, zone areas for re-forestation by sections and the longitude of reforestation zones.

It is important to take into account that although in most cases the area the drawings and tables seems to have more area available trees; it is not only this area available that has been considered, but also the real useful area of the each portion.

Regarding the strips where only the distance and not the area is shown, this is because only one line is used, and generally there is interspersing with shrubs, which are placed in the areas

between the shoulders and the slopes. The data is shown in the drawings and in the tables. For the triangles and roundabouts there are schemes indicating the distributions of the trees and to define their number.

TABLE No. IX.3. SUMMARY OF SITES PROPOSED FOR REVEGETATION

LOCATION OF REVEGETATION	INDIVIDUALS	SECTION 1	SECTION 2
Trees, base of cut and or/fill slopes in opening section	16,780	15,105	1,675
Project's traffic circles and triangles	997	907	90
TOTAL	**17,777**	16,012	1,765
Shrubs at base of cut or fill slopes in opening section	5,013	4,154	859

Source: ECO Consulting Team

The compensation for felling will be done in two ways:

1. Strips of land that will be bought for the right of way will not be used for the road and slopes, when this space is located at the base of the slopes, triangles and roundabouts of the Project. The space available, the number of trees, the side, and species suggested are detailed in the following table, presented by project station. There is an estimated detail of the trees and recommended species in the following table and in the drawings for environmental measures IV-4 from 1/19 to 19/19.

TABLE No. IX.4. NUMBER OF TREES AND PLANT SPECIES TO BE PLANTED PER STATION AT THE BASE OF SLOPES EVERY 5, 4 OR 3 METERS

PROJECT SECTION 1: CA1 to CA1 (La Union)

										5x5										4x4								3x3								SHRUBS							
AREAS (m2)	DIST. (m)	START STATION	END STATION	LOCATION	TREE SPACING (m)	SHRUB SPACING (m)	No. ROWS	QTTY. TREES TO BE PLANTED	QTTY. SHRUBS TO BE PLANTED	"olive tree"	"amate"	"caulote"	"chilamate"	"cortés negro"	"cortés blanco"	"maquilishuat"	"mango"	"marañon japonés" or "rose apple"	"almendro de río"	"anona poshta"	"cassia fistula"	"winter jocote"	"summer jocote"	"guava"	"morro"	"tecomasuche"	"copinol"	"Persian lime"	"Indian lime"	"tangerine"	"cashew"	"Valencia orange"	"Victoria organge"	"paraíso" or "chinaberry"	"San Andrés"	"cinco negritos"	"chichipince"	"flor tarbona"	"ixora"	"matial"	"mirto"	"poinsettia"	"quina"
9,960.26		4+040	4+600	Right	5x5		3	390		40	40	40	40	40	40	40	55	55																									
10,634.47		3+980	4+600	Left	5x5		3	421		45	45	45	45	45	45	45	53	53																									
5,683.30		4+600	5+240	Right	5x5	7x7	1	112	112	12	12	12	12	12	12	12	14	14																	14	14	14	14	14	14	14	14
3,667.83		4+600	5+240	Left	5x5	7x7	1	74	74	8	8	8	8	8	8	8	9	9																	9	9	9	9	9	9	10	10
2,925.74		5+345	5+940	Right	4x4	6x6	1	80	80										10	10	10	10	10	10	10	10									10	10	10	10	10	10	10	10
2,650.51		5+345	5+940	Left	4x4	6x6	1	72	72										9	9	9	9	9	9	9	9									9	9	9	9	9	9	9	9
27,246.29		5+940	7+460	Right	4x4		3-4	1,680											210	210	210	210	210	210	210	210																
25,692.20		5+940	7+460	Left	4x4		3	1,500											187	189	187	187	187	189	187	187																
6,727.58		7+460	8+180	Right	4x4		1-2	400											50	50	50	50	50	50	50	50																
6,796.23		7+460	8+180	Left	5x5	7x7	1-2	132	132	15	15	15	12	15	15	15	15	15																	16	16	16	16	17	17	17	17
3,767.43		8+540	8+854	Right	5x5	7x7	2	74	74	8	8	8	8	8	8	8	9	9																	9	9	9	9	9	9	10	10
8,928.19		8+440	8+854	Left	5x5	7x7	3	180	180	20	20	20	20	20	20	20	20	20																	22	22	22	22	23	23	23	23
1,210.27		9+200	9+260	Right	4x4		3	72											9	9	9	9	9	9	9	9																
1,867.47		9+180	9+260	Left	4x4		3	104											13	13	13	13	13	13	13	13																
	560.00	9+300	9+860	Right	5x5	7x7	1	80	80	8	9	9	9	9	9	9	9	9																	10	10	10	10	10	10	10	10
	580.00	9+280	9+860	Left	5x5	7x7	1	80	80	8	9	9	9	9	9	9	9	9																	10	10	10	10	10	10	10	10
	360.00	9+920	10+280	Right	5x5	7x7	1	48	48	5	5	5	5	5	5	6	6	6																	6	6	6	6	6	6	6	6
	380.00	9+900	10+280	Left	5x5	7x7	1	52	52	5	5	6	6	6	6	6	6	6																	6	6	6	6	7	7	7	7
3,857.11		10+300	10+480	Right	4x4		3	232											29	29	29	29	29	29	29	29																
3,758.07		10+300	10+480	Left	4x4		3	224											28	28	28	28	28	28	28	28																
	660.00	10+480	11+140	Right	5x5	7x7	1	92	92	10	10	10	10	10	10	10	11	11																	11	11	11	11	12	12	12	12
	660.00	10+480	11+140	Left	5x5	7x7	1	92	92	10	10	10	10	10	10	10	11	11																	11	11	11	11	12	12	12	12
1,719.85		11+120	11+220	Right	4x4		3	104											13	13	13	13	13	13	13	13																
2,065.86		11+140	11+225	Left	4x4		3	112											14	14	14	14	14	14	14	14																
	300.00	11+280	11+580	Right	5x5	7x7	1	40	40	5	5	5	5	4	4	4	4	4																	5	5	5	5	5	5	5	5
	232.00	11+280	11+512	Left	5x5	7x7	1	32	32	4	4	4	4	4	3	3	3	3																	4	4	4	4	4	4	4	4
1,908.18		11+580	11+810	Right	3x3	5x5	1-2	74	74																		8	8	8	8	8	8	8	9	9	9	9	9	9	9	10	10
1,341.74		11+530	11+810	Left	3x3	5x5	1	50	50																		5	5	5	5	6	6	6	6	6	6	6	6	6	6	7	7
4,059.12		11+820	12+100	Right	3x3	5x5	3	160	160																		15	15	15	15	20	20	20	20	20	20	20	20	20	20	20	20
3,255.58		11+820	12+060	Left	3x3	5x5	3	128	128																		14	14	16	14	14	14	14	14	14	16	16	16	16	16	16	16
4,888.98		12+145	12+430	Right	3x3		3	540																			60	60	60	60	60	60	60	60	60							
5,336.58		12+145	12+452	Left	3x3		3	585																			65	65	65	65	65	65	65	65	65							
2,939.68		12+473	12+620	Right	5x5		3	110									55	55																								
2,749.94		12+473	12+600	Left	5x5		3	110									55	55																								
	280.00	12+620	12+900	Right	4x4	6x6	1	44	44										5	5	5	5	6	6	6	6									5	5	5	5	6	6	6	6
	300.00	12+600	12+900	Left	4x4	6x6	1	48	48										6	6	6	6	6	6	6	6									6	6	6	6	6	6	6	6
1,802.38		12+900	13+053	Right	5x5		2-3	70									35	35																								
1,728.06		12+900	13+000	Left	5x5		2-3	65									32	33																								
	53.00	13+000	13+053	Left	4x4	7x7	1	6	6	3	3																												3	3		
	328.00	13+082	13+410	Right	4x4	7x7	1	44	44	4	5	5	5	5	5	5	5	5																	5	5	5	5	6	6	6	6
	328.00	13+082	13+410	Left	4x4	7x7	1	44	44	4	5	5	5	5	5	5	5	5																	5	5	5	5	6	6	6	6

										5x5									4x4								3x3								SHRUBS							
AREAS (m2)	DIST. (m)	START STATION	END STATION	LOCATION	TREE SPACING (m)	SHRUB SPACING (m)	No. ROWS	QTTY. TREES TO BE PLANTED	QTTY. SHRUBS TO BE PLANTED	"olive tree"	"amate"	"caulote"	"chilamate"	"cortés negro"	"cortés blanco"	"maquilishuat"	"mango"	"maratón japonés" or "rose apple"	"almendro de río"	"anona poshta"	"cassia fistula"	"winter jocote"	"summer jocote"	"guava"	"morro"	"tecomasuche"	"copinol"	"Persian lime"	"Indian lime"	"tangerine"	"cashew"	"Valencia orange"	"Victoria organge"	"paraíso" or "chinaberry"	"San Andrés"	"cinco negritos"	"chichipince"	"flor barbona"	"ixora"	"matial"	"mirto"	"poinsettia"	"quina"
	270.00	13+410	13+680	Right	4x4	6x6	1	44	44										5	5	5	5	6	6	6	6									5	5	5	5	6	6	6	6
	270.00	13+410	13+680	Left	4x4	6x6	1	44	44										5	5	5	5	6	6	6	6									5	5	5	5	6	6	6	6
2,159.56		13+800	13+900	Right	5x5		3	80		8	8	8	8	8	8	8	12	12																							
2,221.06		13+800	13+900	Left	5x5		3	80		8	8	8	8	8	8	8	12	12																							
	420.00	13+920	14+340	Right	4x4	7x7	1	60	**60**	6	6	6	7	7	7	7	7	7																	7	7	7	7	8	8	8	8
	440.00	13+900	14+340	Left	4x4	7x7	1	60	**60**	6	6	6	7	7	7	7	7	7																	7	7	7	7	8	8	8	8
	380.00	14+380	14+760	Right	4x4	7x7	1	52	**52**	6	6	6	6	6	6	6	5	5																	6	6	6	6	7	7	7	7
	400.00	14+380	14+780	Left	4x4	7x7	1	56	**56**	7	7	6	6	6	6	6	6	6																	7	7	7	7	7	7	7	7
8,093.14		14+760	15+100	Right	4x4		3	500											60	65	60	65	65	65	60	60																
	280.00	14+780	15+060	Left	4x4	7x7	1	40	40	5	5	5	5	4	4	4	4	4																	5	5	5	5	5	5	5	5
	1260.00	15+100	16+360	Right	4x4	7x7	1	180	180	20	20	20	20	20	20	20	20	20																	22	22	22	22	23	23	23	23
	1320.00	15+060	16+380	Left	4x4	7x7	1	186	186	20	20	20	21	21	21	21	21	21																	24	24	23	23	23	23	23	23
1,094.52		16+360	16+490	Right	4x4		1-2	64											8	8	8	8	8	8	8	8																
1,040.03		16+380	16+509	Left	4x4		1-2	64											8	8	8	8	8	8	8	8																
3,579.86		16+534	16+768	Right	4x4		3	200											25	25	25	25	25	25	25	25																
3,009.43		16+553	16+750	Left	4x4		3	170											20	25	20	20	20	25	20	20																
	320.00	16+780	17+100	Right	4x4	6x6	1	52	**52**										6	6	6	6	7	7	7	7									6	6	6	6	7	7	7	7
	380.00	16+760	17+140	Left	4x4	6x6	1	62	**62**										7	7	8	8	8	8	8	8									7	7	8	8	8	8	8	8
4,229.19		17+120	17+360	Right	4x4		3	260											32	32	32	32	33	33	33	33																
4,027.48		17+140	17+360	Left	4x4		3	240											30	30	30	30	30	30	30	30																
8,039.76		17+375	17+900	Right	4x4		3	480											60	60	60	60	60	60	60	60																
7,654.53		17+375	17+880	Left	4x4		3	460											55	60	55	60	60	60	55	55																
	200.00	17+920	18+120	Right	4x4	6x6	1	32	**32**										4	4	4	4	4	4	4	4									4	4	4	4	4	4	4	4
	240.00	17+900	18+140	Left	4x4	6x6	1	40	40										5	5	5	5	5	5	5	5									5	5	5	5	5	5	5	5
2,774.81		18+120	18+300	Right	4x4		3	168											21	21	21	21	21	21	21	21																
2,517.64		18+140	18+280	Left	4x4		3	154											19	20	19	19	19	20	19	19																
	280.00	18+300	18+580	Right	4x4	6x6	1	46	**46**										5	5	6	6	6	6	6	6									6	6	6	6	6	6	5	5
	300.00	18+280	18+580	Left	4x4	6x6	1	48	**48**										6	6	6	6	6	6	6	6									6	6	6	6	6	6	6	6
9,976.04		18+580	16+245	Right	4x4		3	600											75	75	75	75	75	75	75	75																
11,761.06		18+550	16+245	Left	4x4		3	712											89	89	89	89	89	89	89	89																
9,330.61		19+255	20+560	Right	4x4	6x6	1-2	248	248										30	30	30	30	32	32	32	32									31	31	31	31	31	31	31	31
11,812.71		19+255	20+280	Left	4x4	6x6	2	324	324										40	40	40	40	41	41	41	41									40	40	40	40	41	41	41	41
1,553.74		20+280	20+560	Left	4x4	6x6	3	42	**42**										5	5	5	5	5	5	6	6									5	5	5	5	5	5	6	6
2,205.85		20+605	20+735	Left	4x4	6x6	3	60	**60**										7	7	7	7	8	8	8	8									7	7	7	7	8	8	8	8
8,882.72		20+760	21+840	Right	4x4	6x6	1-2	240	240										30	30	30	30	30	30	30	30									30	30	30	30	30	30	30	30
14,649.59		20+760	21+840	Left	4x4	6x6	2-3	400	400										50	50	50	50	50	50	50	50									50	50	50	50	50	50	50	50
				TOTAL SECTION 1				**15,105**	**4,154**	300	304	301	301	302	301	302	515	516	1290	1308	1292	1302	1311	1319	1302	1302	167	167	169	167	173	173	173	174	174	509	509	512	512	526	526	530	530

Source: ECO Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Unión) to RN17*

										5x5										4x4								3x3								SHRUBS							
AREAS (m2)	SPACING (m)	START STATION	END STATION	LOCATION	TREE SPACING (m)	SHRUB SPACING (m)	No. ROWS	QTTY OF TREES TO PLANT	QTTY OF SHRUBS TO PLANT	"olive tree"	"amate"	"cauleo"	"chilamate"	"cortés negro"	"cortés blanco"	"maquilishuat"	"mango"	"marañón japonés" or "rose apple"	"almendro de río"	"anona poshta"	"cassia fistula"	"winter jocote"	"summer jocote"	"guava"	"morro"	"tecomasuche"	"copinol"	"Persian lime"	"indian lime"	"tangerine"	"cashew"	"Valencia orange"	"Victoria organge"	"paraíso" or "chinaberry"	"San Andrés"	"chichipince"	"quina"	"matial"	"cinco negritos"	"izora"	"poinsettia"	"flor barbona"	"mirto"
657.26		21+905	21+960	Right	5x5		**2**	24		2	2	2	3	3	3	3	3	3																									
864.7		21+905	21+960	Left	5x5		**2**	32		3	3	3	3	4	4	4	4	4																									
8,841.37		22+040	22+745	Right	5x5		**2**	349		35	35	39	40	40	40	40	40	40																									
12,061.44		22+040	22+745	Left	5x5	7x7	**2**	244	244	25	25	25	25	28	29	29	29	29																		30	30	30	30	31	31	31	31
7,059.29		22+800	23+400	Right	5x5	7x7	**2**	142	142	15	15	16	16	16	16	16	16	16																		17	17	18	18	18	18	18	18
9,841.59		22+800	23+400	Left	4x4	6x6	**2**	200	240										25	25	25	25	25	25	25	25											30	30	30	30	30	30	30	30
9,913.09		23+900	24+650	Right	4x4	6x6	**2**	204	233										25	25	25	25	26	26	26	26											29	29	29	29	29	29	29	30
12,065.19		23+900	24+600	Left	5x5		**2**	480		50	50	50	55	55	55	55	55	55																									
				TOTAL SECTION 2				**1,675**	**859**	130	130	135	142	146	147	147	147	147																				106	106	107	107	108	108	108	109

Source: ECO Consulting Team

15,105 trees will be compensated for in plots of section 1 and 1,675 trees will be compensated for on plots of section 2 as a result of felling in this sections, for a total of 16,780 trees. Moreover, 4,154 shrubs will be compensated for in plots of section 1 and 859 shrubs will be compensated for in plots of section 2, for a total of 5,013 shrubs.

1. Project triangles and roundabouts. Available space, number of trees and suggested species are listed in the following table, by project station.

TABLE No. IX.5. NUMBER OF TREES AND SPECIES TO BE PLANTED IN PROJECT ROUNDABOUTS AND TRIANGLES OF SECTION 1: *CA1 to CA1 (La Union)*

						5x5									4x4								3x3								SHRUBS							
AREAS (m2)	START STATION	END STATION	LOCATION	TREE SPACING (m)	QTTY. TREES TO BE PLANTED	"olive tree"	"amate"	"caulote"	"chilamate"	"cortés negro"	"cortés blanco"	"maquilishuat"	"mango"	"marañón japonés" or "rose apple"	"almendro de río"	"anona poshe"	"cassia fistula"	"rainy-season jocote"	"dry-season jocote"	"guava"	"morro"	"tecomasuche"	"copinol"	"Persian lime"	"Indian lime"	"tangerine"	"cashew"	"Valencia orange"	"Victoria organge"	"paraiso" or "chinaberry"	"San Andrés"	"chichipince"	"quina"	"matial"	"cinco negritos"	"ixora"	"poinsettia"	"flor barbona"	"mirto"
804.24	3+840	3+870	Roundabout 1	3x3	78																		16			15	15			16	16								
2,600.16	3+675	3+840	Triangle 1, roundab. 1	3x3	280																		20	40	40	40	20	40	40	20	20								
1,971.34	3+870	4+040	Triangle 2, roundab. 1	3x3	200																			35	35	35		35	35	12	13								
408.33	3+860	3+890	Triangle 3, roundab. 1	3x3	42																		4	4	4	5	5	5	5	5	5								
5.63	3+880	3+885	Triangle 4, roundab. 1	3x3	1																		1																
706.85	8+220	8+250	Roundabout 2	3x3	78																		16			15	15			16	16								
110.52	8+180	8+210	Triangle 1, roundab. 2	3x3	12																		4							4	4								
110.53	8+260	8+290	Triangle 2, roundab. 2	3x3	12																		4							4	4								
706.85	13+056	3+086	Roundabout 3	3x3	78																		16			15	15			16	16								
68.27	13+065	13+075	Triangle 1, roundab. 3	3x3	8																		3							3	2								
68.27	13+065	13+075	Triangle 2, roundab. 3	3x3	8																		3							3	2								
706.85	21+858	21+888	Roundabout 4	3x3	78																		16			15	15			16	16								
105.43	21+820	21+847	Triangle 1, roundab. 4	3x3	12																		4							4	4								
97.58	21+870	21+880	Triangle 2, roundab. 4	3x3	10																		4							3	3								
97.58	21+870	21+880	Triangle 3, roundab. 4	3x3	10																		4							3	3								
			TOTAL SECTION 1		**907**																		115	79	79	140	85	80	80	125	124								

PROJECT SECTION 2: CA1 (La Unión) to RN17

						5x5									4x4								3x3								SHRUBS							
AREAS (m2)	START STATION	END STATION	LOCATION	TREE SPACING (m)	QTTY. TREES TO BE PLANTED	"olive tree"	"amate"	"caulote"	"chilamate"	"cortés negro"	"cortés blanco"	"maquilishuat"	"mango"	"marañón japonés" or "rose apple"	"almendro de río"	"anona poshe"	"cassia fistula"	"rainy-season jocote"	"dry-season jocote"	"guava"	"morro"	"tecomasuche"	"copinol"	"Persian lime"	"Indian lime"	"tangerine"	"cashew"	"Valencia orange"	"Victoria organge"	"paraiso" or "chinaberry"	"San Andrés"	"chichipince"	Sg-	"matial"	"cinco negritos"		"poinsettia"	"flor barbona"	"mirto"
706.86	25+005	25+035	Roundabout 5	3x3	78																		16			15	15			16	16								
34.5	24+980	24+905	Triangle 1, Roundab. 5	3x3	4																									2	2								
35.86	25+017	25+025	Triangle 2 Roundab. 5	3x3	4																									2	2								
35.86	25+017	25+025	Triangle 3 Roundab. 5	3x3	4																									2	2								
			TOTAL SECTION 2		**90**																		16	0	0	15	15	0	0	22	22								

Source: ECO Consulting Team

The total number of trees in triangles and roundabouts is 907 in section 1 and 90 of section 2, for a total of 997 trees.

The total number of trees in the Project area: 17,777.
The total number of shrubs in the Project area: **5,013.**

Shrubs will be planted at the base of the slopes, only in the opening section, eliminating Street crossings and bridges, according to the drawing, between the trees, 1 shrub in the indicated sites.

2. The rest of the compensation for the logging will be done in the Natural Protected Area El Socorro, in the municipality of Yayantique, department of La Unión, which was proposed as the Management of the Natural Protected Areas of MARN. The proposal in this site will be through a fence of vegetation regrowths for the natural regeneration, the amount used for this compensation is equivalent to planting 8,858 trees and 3,496 shrubs and it is detailed in measure 2.1 and in annex IX.4.

Annex IX.4 includes quotations from commercial tree nurseries, where the average sales price trees is $1.25, however, and in addition the price doubles in price due to inflation at the time of the planting of the tree, transportation and the initial planting.

The environmental measures drawings IV-4 from /19 to 19/19 indicate the location and include the number of trees in the project section, as well as the areas and dimensions to be used for the planting.

The species recommended for re-forestation are detailed:
- To plant especially species from which wildlife feed, such as nectarivorous and fructivorous.
- For municipal land, fruit trees that adapt to the Project zone are recommended
- Or to also consider the native species that will be affected.

TABLE No. IX.6. SUGGESTED TREE SPECIES FOR REFORESTATION AT SM BYPASS ROAD PROJECT AREA, 2012, AND RECOMMENDED SPACING

No.	VERNACULAR NAME	SCIENTIFIC NAME	SPACING (m)
	FRUIT TREES		
1	"avocado"	*Persea americana*	***8.00***
2	"anona poshta"	*Annona cherimola*	***3.00***
3	"goat hoof"	*Bauhinla purpúrea*	***3.00***
4	"cassia fistula"	*"Cassia fistula"*	***4.00***
5	"cujin"	*Inga preussi*	***5.00***
6	"guava"	*Psidium guajava*	***4.00***
7	"rainy season jocote"	*Spondia cirouella*	***4.00***
8	"dry season jocote"	*Spondias purpurea*	***4.00***
9	"Persian lime"	*Citrus latifolia*	***3.00***
10	"Indian lime"	*Citrus aurantifolia*	***3.00***
11	"mango"	*Mangifera austroyunnanensis*	*5.00*
12	"tangerine"	*Citrus reticulata*	***3.00***
13	"cashew"	*Anacardium occidentale*	***3.00***
14	"rose apple"	*Eugenia malaccensis*	*5.00*
15	"nance"	*Byrsonia crassifolia*	*5.00*
16	"Valencia orange"	Citrus sinensis var. Valencia	***3.00***
17	"Victoria organge"	Citrus sinensis var. Tehuacan	***3.00***
18	"zapote"	*Pouteria sapota*	***5.00***
	NECTARIVOROUS AND FRUGIVOROUS SPECIES		
1	"olive tree"	*Simarouba glauca*	*5.00*
2	"almendro de río"	*Andira inermis*	*4.00*
3	"amate"	*Ficus trigonata*	*5.00*
4	"cabo de hacha"	*Luhea candida*	*5.00*
5	"caulote"	*Guazuma ulmifolia*	*5.00*
6	"ceibillo"	*Ceiba aesculifolia*	*5.00*
7	"chilamate"	*Sapium macrocarpum*	*5.00*
8	"turkey tail"	*Trichilia hirta*	*5.00*
9	"cortés negro"	*Tabebuia impetiginosa*	*5.00*

10	"cortés blanco"	*Tabebuia chrysanta*	*5.00*
11	"cutuco"	*Crescentia cujete*	*4.00*
12	"irayol"	*Genipa americana*	*5.00*
13	"maquilishuat"	*Tabebuia rosea*	*5.00*
14	"mora"	*Madura tinctoria*	*5.00*
15	"morro"	*Crescentia alata*	*4.00*
16	"nance"	*Byrsonima crassifolia*	*5.00*
17	"palo de zope"	*Piscidia grandifolia*	*5.00*
18	"paraiso"	*Mella azederach*	*3.00*
19	"pepeto de río"	*Inga calderonii*	*5.00*
20	"San Andrés"	*Tecoma stans*	*3.00*
21	"tecomasuche"	*Cocholospermun vitifolium*	*4.00*
ENDANGERED SPECIES			
1	Cedar	*Cedrela odorata*	*10.00*
2	Mahogany	*Swietenia humilis*	*8.00*
3	Sweet mangrove	*Bravaisia intigerrima*	*6.00*

Planted in square formations in flat and semi-flat areas and in triangle formations on sloping terrain
Source: ECO Consulting Team

SUGGESTED SHRUB SPECIES

No.	VERNACULAR NAME	SCIENTIFIC NAME	SPACING (m)
1	Cinco negritos	*Lantana camara*	*1.00*
2	Flor barbona	*Caesalpinta pulcherrima*	*2.00*
3	Ixora	*Ixora coccínea*	*1.00*
4	Mirto	*Murraya panicualata*	*2.00*
5	Poinsettia	*Euphorbia pulcherrina*	*1.00*
6	quina	*Coutarea hexandra*	*1.00*
7	chichipince	*Hamelia patens*	*1.00*
8	Tempate	*Jatropha curcas*	*0.50 to 1.00*
9	capulín	*Muntingia calabura*	*2.00*
10	matial	*Pereskia autumnalis*	*1.00*
11	Candelillo or piper	*Piper arboreum*	*1.00*
12	cocoa	*Theobroma cacao*	*2.00*

The species *Acacia;* Acacia tenuiflora "carbón negro"; Acacia cornigera "iscanal"; Acacia farnesiana "espino blanco" and Acacia hindsii "iscanal" can also be considered, although these also appear eventually as spontaneous vegetation in altered areas.

- *Technical specifications of the plantation*

Plantation

- These species that will be planted should be one year old and two feed high, with a plastic container to contain their roots, free of plagues, acquired in any nursery.
- The tree should be planted making sure it is in a vertical position, well centered in the hole and stable. During the planting the roots should be carefully extended and broken or dry parts cut off, immediately after the soil should be deposited in the hole in layers.
- Dig a 50x50x50 cm hole; the bigger, the better.
- Homogeneously mix topsoil extracted with 4 to 5 kilos of good quality fertilizer or compost. Mineral fertilizers can also be applied during the planting, but this is optional. What is important at the beginning is that the fertilizer is organic.
- Before placing the tree, nail a stake or guide to tie the fruit tree until it puts down roots. .
- The individuals that will be planted should be at least 1m high.
- The planting period recommended is the beginning of the rainy season, between the second half of May and the first half of June.

Maintenance

- The trees planted and the ones that will be located near the project works and the area of influence shall have maintenance that assures the normal development and normal

production of soil and water resources.

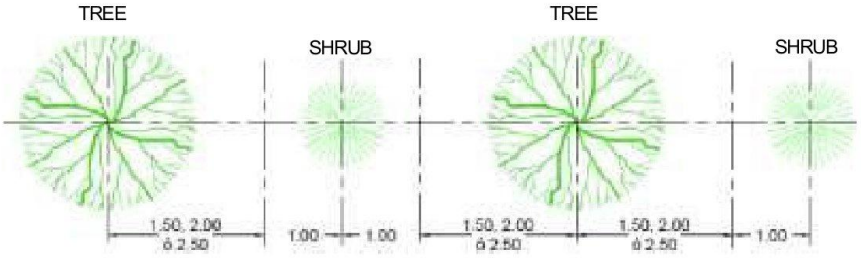
- The maintenance of the species starts at the time of the planting (beginning of winter or rainy season) or following the construction activities according to the program) and have a duration of three years.
- Watering of the species planted: the process shall be repeated until the plant has put down roots for a period of at least 2 years. Special care must be taken during the dry days of the mid-summer heat, the transitional station rainy-dry and dry.
- Perform pest control.
- Apply fertilizers as required.
- Protection of the vegetation cover (mulsh): it is recommendable to cover the area with dry vegetation material, of 3 to 5 cm thick around the plant, in order to minimize the loss of water from the soil and avoid the possibility of weeds growing around it.
- Guide: some plants need the support of a guide to avoid the plant from flattening (inclination).
- Cleaning, pruning and replanting: this consists of eliminating weeds that are competing with the plant, by keeping the area of the crown (1 m in diameter) clean and repositioning the mulsh. maintain the appropriate density of the plant coverage.

- *Planting methods*

Lines method

This method will be used in the areas parallel to the road, in the base of the slope cut-off and filling. A distance of 5 and 4 meters has been proposed. The species to be considered should also have the characteristics of a deep primary root, in order to avoid damage to the urban structures that will be implemented. Between the tree lines there will also be a spacing of 5 and 4 m.

Additional spacing has been considered in the sites were trees and shrubs will be interspersed as shown in the following figure. An additional spacing of 2 x 2 is considered for shrubs in general.



Source: ECO Consultant Team

Figure No. IX. 1. Method by rows: 5 m spacing between shrubs amid trees.

Squared Method

The planting method proposed for triangles of the project and the roundabouts will be “squared" which is detailed below:

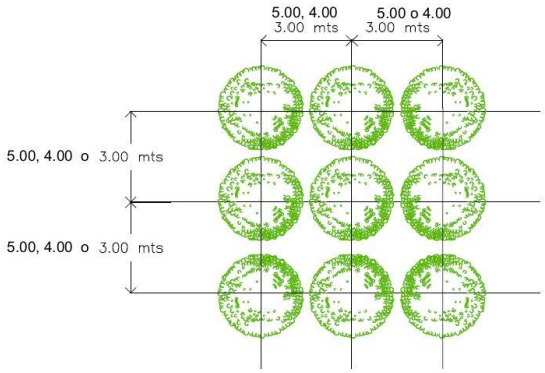


Figure No. IX.2. Method of revegetation in squares with spacings of 3x3, 4x4 and 5x5.

♦ *Reducing logging and pruning*

The logging and pruning of the vegetation will be carried out trying to cause the least damage possible, following the rule of only logging the trees and shrubs indicated. The general guidelines are detailed as follows

1. Before starting with the clearing, the contractor will make sure that the vegetation removed will be the minimum necessary, delimitating each one of the areas affected by the construction. All the activities performed in the different working fronts shall be planned and programmed, on a case by case basis, and directed to agreeing the technical measures that shall be implemented in the removal of the plant coverage and layer.
2. The staff of the MOP responsible of following-up the Project, will confirm that the contractor applies appropriate techniques to clear the materials as trunks and branches (that will be delivered to the owners of the parcels, to be used as lumber and/or firewood), as well as the adequate disposition of leaves and small branches that will be cleared as common solid wastes.
3. In as much as possible the zones that are not affected directly by the Project activities, it is suggested to leave them as they are and not to log or prune. The logging of trees and vegetation in general should be limited to the minimum indispensible.
4. All crops shall be protected and preserved. The Contractor shall act in a way to respect the plants, cops and the local conditions, in the immediate surrounding areas of the project.
5. It is forbidden to burn plant wastes and/or leaves in the works site.
6. It is forbidden to use pesticides or chemicals to eliminate the vegetation.
7. In some areas, it might be necessary to control sedimentation, using bundles of *barbecho* or fodder barriers.

The material will not be taken away and will be disposed of as follows:

1. Separating usable wood.
2. Separating firewood.
3. Separating fallen leaves.

Every six months an inspection will be conducted to monitor the plantation and count and verify

the establishment of the trees, replace the damaged ones or those that have not developed well. A record will be kept of the inspections conducted.

- *LOCATION OF THE ENVIRONMENTAL MEASURE*

1. Base of the slope cut-offs and/or filling in the opening section, re-forestation.
2. Roundabouts and triangles of the Project, re-forestation.

See designs of environmental measures of IV-4 from 1/19 to 19/19

- *AMOUNT CALCULATED FOR THE ENVIRONMENTAL MEASURE*

In this measure maintenance is included only for 1 year; two year maintenance is included for the environmental measures for the operations phase. Maintenance prices were provided by the Management Studies and the road designs of the Road Planning Unit of the MOP

♦ *PROJECT SECTION 1: CA1 TO CA1 (La Unión)*

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Purchasing trees for project sites	16,012.00	ea.	$ 2.50	1.00	$ 40,030.00
Tree maintenance for 12 months during construction.	16,012.00	ea.	$ 0.21	12.00	$ 40,350.24
Purchasing shrubs	4,154.00	ea.	$ 1.00	1.00	$ 4,154.00
Shrub maintenance for 12 months during construction	4,154.00	ea.	$ 0.11	12.00	$ 5,483.28
				TOTAL	$ 90,017.52

Source: ECO Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Union) to RN17*

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Purchasing trees for project sites	1,765.00	ea.	$ 2.50	1.00	$ 4,412.50
Tree maintenance for 12 months during construction and site preparation	1,765.00	ea.	$ 0.21	12.00	$ 4,447.80
Purchasing shrubs	859.00	ea.	$ 1.00	1.00	$ 859.00
Shrub maintenance for 12 months during construction and site preparation	859.00	ea.	$ 0.11	12.00	$ 1,133.88
				TOTAL	$ 10,853.18

Source: ECO Consulting Team

The total amount of the environmental measure is $ 100,870.70

■ *IMPLEMENTATION PERIOD*

Construction phase, as the sections are finalized the trees will be planted in the right of way, triangles and roundabouts of the Project, once the construction of such sections is finalized, begin at least 1 year before completing the construction.

Maintenance in the construction phase will be provided for 12 months, and in the operations phase for 24 months, which includes the measures in the operations phase.

The maintenance phases for vegetation is divided into: first 12 months that will be provided during the construction phase by the Project owner (MOP), and the following 24 months it will be provided by the Project owner through FOVIAL. Afterwards, maintenance will be provided by the Municipalities.

■ *EXPECTED OUTCOME*

Improvement of the plant coverage in the Project area, conditions are better than before the project.

IX.2.1.2 Training to improve crops, topsoils and agro-forestry

I *TYPE OF MEASURE*
Compensation

■ *DESCRIPTION OF MEASURE PROPOSED*

A person will be hired, an engineer or agronomist or related careers, to advise the owners of the land affected by the right of way on how to improve their crops, preserve the soils and achieve better yields. This person will provide training and assistance on planting of the species for the people partially affected, for the following:

Visits will be conducted to the owners of land that will be partially acquired for the rights of way, in the section of road expansion, to make an appointment and explain to them the soil improvement, crop improvement and agroforestry techniques. A record will be kept on the persons that receive advisory services and delivery of an informative brochure about these practices.

It includes knowledge transfer and techniques to small and medium farmers, male and female, so they can implement in their parcels best practices on the use of soils and crop management, including substituting agrochemicals for environmentally-friendly solutions.

The agronomy Engineer will provide the following training:

a) How to plant trees and/or shrubs in edges: live barriers (fences).
This will consist on advice provided for the planting of tree and shrub species around the parcels. Advise on the selection of species that can be planted. Recommendations on the spacing for each species and how to use leaves and young branches of the trees as fertilizer.

b) Advisory on planting interspersed trees. The purpose of this advisory is that they learn to produce Wood and firewood in basic grain production parcels in slopes. This way their production is diversified and produces an income flow.

Appropriate technologies will be promoted to harvest and store water, so it can be used during the dry season for productive purposes.

Farmer training and technical assistance for the implementation of good soil management practices and knowledge on organic alternatives that can substitute the use of agrochemicals

Agro-forestry refers to the soil use systems and technologies in which perennial woody (trees, shrubs and others) species are used deliberately in the same management system with agriculture crops and/or animal production, in some form of space arrangement or time sequence.

For monitoring purposes surveys will be conducted with the beneficiaries of the training to verify that the objectives of improving their crop management, yields and additional income among others, have been achieved.

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

Sections: 0+00-0+500, 1+000-3+000, 4+000-8+500, 9+000-12+000, 12+500-13+500, 14+000-20+000, 21+000-21+500, 22+000-23+500, 24+800-25+022. Training will be provided for approximately100 beneficiary families in these sections indicated, approximately 87 in section 1 and 13 in section 2.

■ CALCULATED COST OF ENVIRONMENTAL MEASURE

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Promoter to provide agroforestry consulting to landowners	1.00	ea.	$ 800.00	2.50	$ 2,000.00
Brochure to be delivered	261.00	ea.	$ 1.00	1.00	$ 261.00
				TOTAL	$ 2,261.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Unión) to RN17*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Promoter to provide agroforestry consulting to landowners	1.00	ea.	$ 800.00	0.50	$ 400.00
Brochure to be delivered	39.00	ea.	$ 1.0	1.00	$ 39.00
				TOTAL	$ 439.00

Source: ECO Consulting Team

■ *IMPLEMENTATION PERIOD*

Site preparation phase.

■ *EXPECTED OUTCOME*

To improve crop yields and compensate for the land occupied by the Project, aiming also at reaching sustainable development, soil protection and protection of the natural resources in general. To help group members to improve the soil fertility and conservation, as well as to improve the nutrition of their families through higher compensation for the properties, and the value of local trees.

IX.2.1.3 Pedestrian Crossings and Road Safety

I *TYPE OF MEASURE*

Compensatory

■ *DESCRIPTION OF MEASURE PROPOSED*

When reviewing the schools, churches and health units, as well as population concentration sites in the zones of influence, important points will be identified to install: walkways, speed reducers (in pairs), protection zones and sidewalks. The points are detailed and presented in the environmental measures drawings:

TABLE No. IX.7. LOCATION OF MEASURES FOR PEDESTRIAN CROSSINGS AND ROAD SAFETY

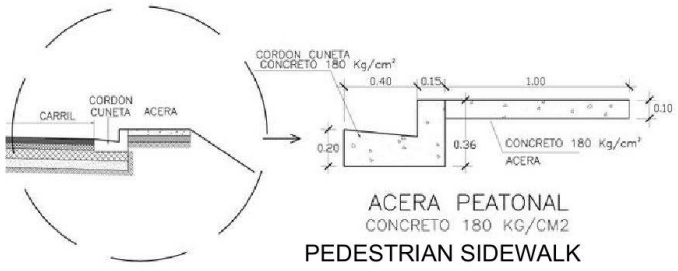
LOCATION	ITEM	STATION	REMARKS
San Jose School	Reconstruction of pedestrian overpass and speed bumps	1+340	Existing overpass in front of the San Jose School has to be modified in length to span over the width of the new road. The overpass bridge is in good condition and its disassembly, modification and reassembly is feasible.
Road to Agua Zarca to Bridge to Riverside	Sidewalk and pedestrian stairs	8+240 to 9+175	In the area north of the river, public access is through a cable bridge or roads in bad state, so a sidewalk and steps on the fill slope facilitates movement into the road to Agua Zarca
Military Route Zone (RN19)	Sidewalk	12+480 to 13+460	High concentration of population, housing developments: Las Margaritas, Alas Campos, Altos de Hato Nuevo, San Francisco.
Military Route Zone (RN19)	Overpass	13+120	Facilitate passage to Colonia Hato Nuevo School and to all housing developments in the canton located south of the project.
Road to Apacunque	Sidewalk and stairs	17+340 to 17+400	Facilitate access of persons by the new highway into the city; people currently cross the Rio Grande de San Miguel on a boat or on foot in the summer
Crossing on Highway CA1 to La Union	Overpass	21+830	Facilitate access to students from the houses and housing developments east of the project crossing. This overpass was requested in a public consultation

Source: ECO Consulting Team

The technical specifications are detailed:

- *Sidewalk:*

The sidewalk will be simple concrete with a resistance of 180 kg/cm2 with a ditch towards the street. The mínimum width should be de 1 m.

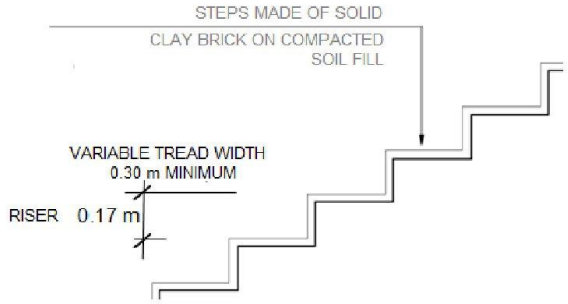


Source: ECO Consultant Team

Figure No. IX.3. Details of pedestian sidewalk

- *Stairs on the Slope:*

These will be built in stairs with mud bricks of at least 0.30 cm in dimension of print and 0.175 for counter-print, and plastered with a cement mix.



Source: ECO Consultant Team

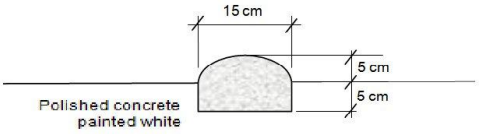
Figure No. IX.4. Detail of stairs on the slopes

- *Walkways:*

There is a diversity of designs for walkways. What has to be respected is that it should be at least 4 m high from ground level to the support beam and 1.50 m width inside to allow two people crossing simultaneously. Annex IX -2 shows the design for the walkways proposed.

- *Speed reducers:*

The speed reducers recommended consist of small mounds built of simple concrete, which are built-in into the pavement, and finished with white pint. They will be installed at least 50m before the main entrance of the school on both lanes.



Source: ECO Consultant Team

Figure No. IX.5. Detail of speed reducer

The monitoring will consist of a record of the road accidents and surveys about the advantage and good use of the pedestrian crossings and other structures and on road safety, to the beneficiaries.

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

The environmental measures drawings show the location, that is detailed in the following table: (See environmental measures drawingsIV-4 from 1/19 to 19/19).

TABLE No. IX.8. LOCATION OF PEDESTRIAN OVERPASSES, SPEED BUMPS, SIDEWALKS AND STAIRS

ITEM	STATION
Reconstruction of pedestrian overpass and speed bumps	1+340
Sidewalk and pedestrian stairs	8+240 to 9+175
Sidewalk	12+480 to 13+460
Overpass	13+120
Sidewalk and stairs	17+340 to 17+400
Overpass	21+830

Source: ECO Consulting Team

■ CALCULATED COST OF ENVIRONMENTAL MEASURE

PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Modification of current overpass	1.00	**lump sum**	$ 33,600.00	1.00	$ 33,600.00
Construction of overpass	2.00	**lump sum**	$ 84,000.00	1.00	$168,000.00
Construction of sidewalks	460.00	**m**	$ 8.00	1.00	$ 3,680.00
Construction of access stairs	30.00	**m**	$ 12.00	1.00	$ 360.00
Speed bumps	2.00	**ea.**	$ 100.00	1.00	$ 200.00
				TOTAL	$205,840.00

Source: ECO Consulting Team

♦ *PROJECT SECTION 2 CA1 (La Union) to RN17*

This measure does not apply to this section.

■ *IMPLEMENTATION PERIOD*

End of the construction phase

■ *EXPECTED OUTCOME*

That the Project does not affect the influence area of the social equipment, to facilitate the crossing of the people and that they benefit from the construction, instead of being affected security-wise. And to leave the equipment affected (current walkway) in the same or improved conditions.

IX.2.1.4 Temporary drainages for site preparation

I *TYPE OF MEASURE*

Preventive

■ *DESCRIPTION OF MEASURE PROPOSED*

It refers to the actions that will allow a good use of run-off waters, during site preparation, which includes the clearing of the land and demolition of structures, consisting on capturing, conduction and delivery of waters to the natural draining network.

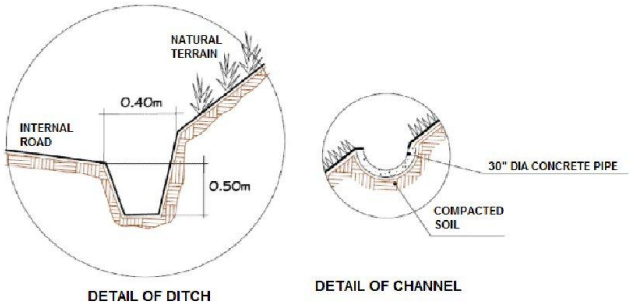
Specific activities

- Assure continuity of the fillings as not to interrupt the natural draining, and the evacuation of run-off waters appropriately, leaving a minimum slope of 2% in the fillings.
- Construction of the lateral of a triangular type on the side and foot of the natural slope in the filling edge, approximately 80 to 100 cm win width and 30 to 50 cm deep. If the material of the ditch ground is rocky, generally it is left built as part of the removal of earth. On the contrary, once finalized, in the profiling stage the platform is pumped and the ditch is built using a motor grader.

Construction of the edges and ditches, for the discharge of the ditches towards the lowest points and the discharge points. The distance between the ditch discharges is set by the land conditions, the road slope, the curves, natural courses, and possible tributary volume of water, which generally is not more than100 m.

- This measure will only be necessary in the event that the site preparation phase in these stations is developed during the rainy season.

A detail of the ditches and temporary channels are presented below:



Source: ECO Consultant Team

Figure No. IX.6. Detail of ditch and/or channel to channel off rain water during the site preparation and construction phases

- *LOCATION OF THE ENVIRONMENTAL MEASURE*

There was a revision to see where it was necessary to channel the rain waters during the site preparation phase, the stations are shown in the following table. See environmental measures drawings IV-4 from 1/19 to 19/19.

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TABLE No. IX.9. LOCATION OF GUTTERS AND / OR CANALS DURING SITE PREPARATION STAGE, SM BYPASS ROAD 2012

BETWEEN STATIONS		LENGTH (m)
9,180	11,240	2,060.00
11,240	11,600	360.00
13,740	14,600	860.00
14,020	16,440	2,420.00
16,600	16,760	160.00
16,840	17,000	160.00
	TOTAL	**6,020.00**

Source: ECO Consulting Team

For monitoring purposes the conditions of the channels will be reviewed at least once a moth, verifying there are no erosive processes, gullies, water stagnation or any type of affectation due to run-offs caused by the project.

- *AMOUNT CALCULATED FOR THE ENVIRONMENTAL MEASURE*

Construction of channels or ditches in the edge of the Project line to manage water temporarily, while the ditches, channels and pipelines of the projects are built

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Gutters or canals	6,020.00	m	$ 3.00	1.00	$ 18,060.00
				TOTAL	$ 18,060.00

Source: ECO Consulting Team

- *PROJECT SECTION 2:* CA1 (La Unión) to RN17

There are no temporary drainages in this section.

■ *IMPLEMENTATION PERIOD*

Site preparation phase

■ *EXPECTED OUTCOME*

Prevent the transportation of sediments, erosion processes and bad run-offs management during the site preparation phase.

IX.2.1.5 Minimize impacts to the proposed protected area

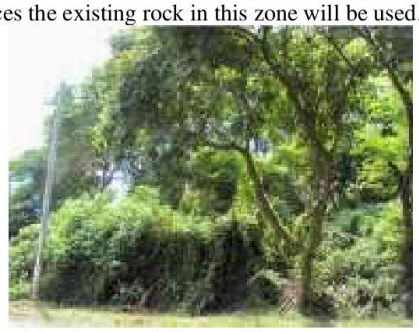
■ *TYPE OF MEASURE*

Compensation

■ *DESCRIPTION OF MEASURE PROPOSED*

The impact of the proposed protected zone in section 0+880 a 0+960 of the Project shall be the minimum necessary for the right of way of the project.
The following considerations shall be followed:

- No provisional infrastructures shall be installed in this zone, such as portable toilets, garbage cans, or others.
- It will be delimited and signalized as not to affect it and to avoid the vehicles or people crossing this area.
- The slopes will not be modified in this area, in order to minimize the impact on the land. The existing slope will be protected with a wall of armed soil, as the other walls of the project, leaving an almost vertical inclination, considering the any rocks present.
- Under no circumstances the existing rock in this zone will be used.



Photograph No. IX. 1. View of the almost verticle cut-off in the proposed protected área, which keeps stable due to the rocks present

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■ LOCATION OF THE ENVIRONMENTAL MEASURE

Station 0+880 a 0+960. See environmental measures drawings IX-1/19 to 19/19 .

■ *AMOUNT CALCULATED FOR THE ENVIRONMENTAL MEASURE*

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Signage and demarcation of area	200.00	m	$ 3.00	1.00	$ 600.00
Slope protection with reinforced-earth wall	200.00	m	$ 164.00	1.00	$ 32,800.00
				TOTAL	$ 33,400.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: CA1 (La Union) to RN17
The protected area is in section 1.

■ *IMPLEMENTATION PERIOD*

Site preparation phase

■ *EXPECTED OUTCOME*

Maintain the proposed protected zone, consisting of different lava from the San Miguel Volcano, with the minimum impact possible.

IX.2.1.6 signaling cattle pathways

I *TYPE OF MEASURE*

Mitigation

■ *DESCRIPTION OF MEASURE PROPOSED*

The cattle pathway points should be left without the central separating area to allow this activity to continue.

To avoid accidents use signaling indicating cattle pathways and verify that in fact this is for the benefit of the population.
The signs will be similar to the sign MDC - 17 VERTICAL FLAG SIGN, manufactured in galvanized sheet No.22 in an 80 cm triangle form with a rounded corner and treated with anticorrosive and oleo-resinous background. The structure of the support will be a galvanized tube with a 5 cm diameter and 2.10 high in total, and in the lower part it will be fixed in the ground with concrete.

Figure No. IX.7. Sign Detail

For monitoring purposes, the effectiveness of the cattle crossing will be verified, as well as what the population knows about its location. Surveys will be conducted with the beneficiaries when the signaling has been completed.

- *LOCATION OF THE ENVIRONMENTAL MEASURE*

Expansion zone CA-1 (3) Old road to *Quelepa*, Road to *agua zarca canton*. Road to *plan de las mesas*. Zone *Hato Nuevo*, Militar Route, Street to *Cantón Las Delicias*. Zone of the Street to *Las Hojas* (2) Stations 0+200, 1+320, 2+780, 5+254, 8+240, 9 + 070, 11+821, 13+070, 17+377, 19 + 700, 20 + 000, See environmental measures drawings IX-1/19 to 19/19 .

- *AMOUNT CALCULATED FOR THE ENVIRONMENTAL MEASURE*

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Signage	11.00	ea.	$ 50.00	1.00	$ 550.00
				TOTAL	$ 550.00

Source: ECO Consulting Team
Note: The price was provided by VMOP obtained from the costing of another project of a similar nature

♦ PROJECT SECTION 2: CA1 (La Union) to RN17
Since a viaduct will be built , cattle crossings will not be affected.

- *IMPLEMENTATION PERIOD*

Site preparation phase

- *EXPECTED OUTCOME*

To have no impact on the economic activities of the population in the project area, such as cattle-raising activity.

IX.2.1.7 Project Social and Environmental Management

- I *TYPE OF MEASURE*

Preventive

- *DESCRIPTION OF MEASURE PROPOSED*

The Office of Social and Environmental Management will be established for the entire Project implementation period.

- *Goals*

This measure intends to achieve the following goals:

- Provide information to the local population and citizens in general on the advances, advantages and benefits of the construction of this important road.
- Avoid in as much as possible the speculations and collective rumors to prevent social and environmental conflicts.
- Notify with enough time in advance the people affected directly by the project development.
- Prevent social conflicts and maintain a good relation with the project neighbors.
- Prevent troubles for the population living in the surrounding zones of the Project area, due to, services interruptions, access difficulties, material damage, accidents, etc.
- Somehow service the affected population during the construction.

- *Resources*

The office will have at least the following staff:

1. Social Specialist: will be responsible of all the project social management. The profile required for the social management person is the following:
   - Graduated of B.A. in Social Work, Sociology or Anthropology.
   - Experience in conflict settlement and citizen participation processes.
   - Experience in social promotion of community development projects, indicate time, considered necessary.
2. Environmental Specialist: will be responsible of verifying the correct implementation of the Environmental management plan. The profile required is:
   - Graduated from Civil Engineering or related field, specialized in environment issues.
   - Experience in implementation of environmental measures in road or similar projects.
   - Experience in environmental impact evaluations or environmental audits.
3. Social Worker: a support person for social management.
   - Graduated in Social Work, Sociology or Anthropology.
   - Experience in conflict settlement and citizen participation processes.

- *Functions of the office and its staff*

- Receive consultations and complaints by the population, respond or coordinate a respond to the same.
- Verify the execution of the environmental management program, according what has been planned. Keeping a record and prepare an annual report, which will be available, when MARN conducts the environmental audits.
  - Coordinate the environmental management of the project.
  - Carry out briefing meetings at the level of the municipalities / cantons affected. The community leaders, representatives of the main institutions and the corresponding municipality should be included in these meetings. To be held at least on a quarterly basis.
  - To have monthly talks for the workers related with environmental protection, about the customs and values, with different groups of 50.
  - Talks in the schools and for the population in general in the Project surrounding zones on road safety. At least ton a quarterly basis, by zones.

- Organize prevention campaigns on the health effects.
- Carry out communication campaigns on the project.
- Coordinate information with MOP on social and environmental management.
- Prepare written information documents of the project.

The specific activities are detailed in the following table.

TABLE No. IX.10. SPECIFIC ACTIVITIES TO BE UNDERTAKEN

ACTIVITY	FREQUENCY	TOTAL
Meetings with the Municipality (3 mayor's offices)	1 per month	30 meetings (one meeting with one mayor's office per month
Meetings with the community (10 areas)	3 per month	100 meetings (3 communities per month)
Driver education talks	Bimonthly	15 talks to 10 communities and 5 schools, at least once during project implementation
Talks to workers	Fortnightly	60 talks, two per month with different groups of at least 35 people

Source: ECO Consulting Team

♦ *Minimum characteristics for its operations*

It should have at least three desks, telephone, one computer and space for small meetings of at least five people, to receive small groups that visit the office.

♦ *Location*

The office will be installed within the Project location, but in an area that is accessible from the main entrance so that visitors will not have to cross restricted or risk areas because of the management of material, hazardous material, or moving machinery. There will be signaling in this area.

In the Plant the installation of two visible notices on the location of the Social Management Office, visible to pedestrians and car drivers, shall be considered.

♦ *Office operations period*

The office will be established before the construction process begins, and it will be closed when the provisional Project delivery document is obtained. (Provided the observations made at the time of the provisional reception do not concern the social area or social impacts).

♦ *Communications campaign*

A national level communications campaign will be conducted, with special attention on the municipalities affected by the Project to inform the population of the kick-off, advance and completion of the works, inform about: the characteristics of the Works, terms and timetables of the temporary closing of roads, alternative routes available, and other important information of the users and Project neighbors.

Before posting any publication, billboards or fliers, the support of the Institutional Communications Manager of the MOP shall be requested. Any sign, flyer, publication or communications of the Project issued by any means shall follow the guidelines of the press publications manual of MOP.

The communications campaign will be conducted using the following media:

- National and local circulation newspapers, following the press publications manual on dimensions and guidelines, a complete page on two national circulation newspapers. According to the formats and designs established in the manual. A total of 6 notices will be published.

- Billboards on Project surrounding areas, according to the design of the MDC reference BILLBOARD – 23, of the referred manual. The billboard structure will be a squared industrial tube of 2.54 cm, totally covered with galvanized sheet No. 26, treated with an oleo-resinous and anti-corrosive bottom. The logo with enamel paint according to the design requirements and colors established. The text will be labeled on one side in white with a yellow background. One will be placed at the beginning and another at the end of the Project, and an additional one every 5 km, that is four more billboards. The size of the billboard will be 9 m long by 2.75 high. Adequate maintenance shall be provided.

Source: MOP Press Publications Manual.

Figure No. IX.8. Publicity billboard model

- Informative flyers. To be delivered to the neighbors in the Project surrounding , mainly to the owners of affected land. One will be delivered at the beginning, one for the advances and one at the end. It can be a flier indicating the work zones and their terms. The flyer should contain the address of the Social and Environmental Management Office and the telephone numbers of the Project's complaints, consultations, and questions and/or suggestions services.

♦ *Accident Prevention in the road expansion Section and in populated zones*

The Social and Environmental Management Office will also be responsible of conducting all the activities to prevent accidents or incidents of residents of the areas surrounding the works areas. It shall:

- Directly inform, at least one week in advance, according to the sections that will be affected.
- Take an inventory with photos of all the buildings and land at least 20 m from the edge of land that will be occupied by the Project, at the beginning of the same, to leave evidence of the initial conditions of the site.
- Verify that at all times there is space to Access the land.
- Verify the signaling in risk areas, mainly ditches and explosion zones.
- Verify that the structures at less than 2 m from the work area are protected and will not be affected.

The information for the neighbors will be provided using the following means:

- National or local circulation newspapers
- Billboards in Project immediate areas
- Information flyers or information Brochures (Trifold)

- *Notice to the population on services interruption*

There will be coordination with the corresponding institutions for the relocation of the infrastructure affected during the Project construction, in order to minimize the interruption of services for the population. It is recommended that modifications to pipelines and gutters be done during the dry season.

Infrastructure detail:

1. 25 kV or less, power transmission lines: Pan-American road (CA-1), road to *agua zarca*, *Development Alas Campos* and *Development Joselyn*, Street to Hacienda El Milagro, road to La Unión (RN 19), road to El Delirio (RN17).
2. Drinking water pipelines in the Pan-American road, Developments: *Alas Campos, Joselyn, Altos de Hato Nuevo*, road to La Unión (RN 19) and Road to El Delirio (RN17).

3. Idle pipelines that was used to divert water from San Esteban River for power generation. Station 8+340.
4. One power substation in plot 8 on the Pan-American road (CA-1).
5. Rain water drainage vaults and pipelines that cross the Pan-American road (CA-1) in stations: 0+620, 1+490, 2+040.
6. Gutter in station 7+600, gutter on both sides of the roads: 8+240 13+070, 21+810, 24+940.

The affected population should be informed at least 1 week in advance, to avoid them significant impacts and inconveniences.

The notice or news to the population will be transmitted through the following:

- Radio
- Local circulation newspapers
- Information flyers

The information will be published, at least:

1. Publications of 1/4 page in local circulation newspapers, indicating the date of service suspension and Works performance, the term of the suspension, zones to be affected and other relevant information. The announcement will be published for every service to be interrupted, which are 12 (an estimate of 6 temporary interruptions of power lines and 6 of drinking water pipelines).

2. Local Radio announcements of the zones where the service will be interrupted, with the same information.

Before and during the service suspensions a survey will be conducted by the population to verify their knowledge of the suspension.

♦ *Guidelines of the Construction Phase*

The responsibilities acquired by the construction company on social management issues of a project implies, fully complying the provisions established in the technical conditions and the contract signed, such responsibilities are framed to implement the following activities and/or actions:

a. Formulate an operations work plan based on the Social Management Program, which will require an updating of the same, if necessary, given that the time elapsed between the study and the Project implementation can be long, and there can be changes around it.

b. Incorporate the person responsible of social management in the monthly follow-up meetings.

c. Prepare monthly follow-up reports and a final report, reflecting the compliance of the measures and processes implemented for this purpose, such documents should have the respective support.

d. Inform and communicate to the communities on the Project impacts and the proposed compensation measures.

e. Identify possible local resource sources that will cooperate to implement the mitigation measures and notify the Project owner so he will evaluate the suitability of the funding sources and begins the relevant negotiations to formalize the cooperation.

f. Duly document (photos, participants' records, and visits, reports, aide-memoires, etc.) the activities implemented and/or the ones that have been followed-up.

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

The entire direct or indirect Project influence area

■ *AMOUNT CALCULATED FOR THE ENVIRONMENTAL MEASURE*

The provisional signaling and information signs of the project are part of the project costs, of mandatory character for MOP, under Budget item 1.04.

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Informative flyers*	780.00	ea.	$ 0.30	1.00	$ 234.00
Social Specialist	1.00	ea.	$1,000.00	26.00	$ 26,000.00
Environmental Specialist	1.00	ea.	$1,000.00	26.00	$ 26,000.00
Social Promoter	1.00	ea.	$ 700.00	26.00	$ 18,200.00
1/4 page ads in local newspapers, one for each service to be interrupted	10.00	ea.	$ 100.00	1.00	$ 1,000.00
Local radio announcements on the areas where service will be interrupted	40.00	days	$ 20.00	1.00	$ 800.00
				TOTAL	$ 72,234.00

Source: ECO Consulting Team
** Flyers are suggested, but brochures with more detailed project information can also be designed*

♦ PROJECT SECTION 2: *CA1 (La Unión) to RN17*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Informative flyers*	120.00	ea.	$ 0.30	1.00	$ 36.00
Social Specialist	1.00	ea.	$1,000.00	4.00	$ 4,000.00
Environmental Specialist	1.00	ea.	$1,000.00	4.00	$ 4,000.00
Social Promoter	1.00	ea.	$ 700.00	4.00	$ 2,800.00
1/4 page ads in local newspapers, one for each service to be interrupted	2.00	ea.	$ 100.00	1.00	$ 200.00
Local radio announcements on the areas where service will be interrupted	5.00	days	$ 20.00	1.00	$ 100.00
				TOTAL	$ 11,136.00

Source: ECO Consulting Team
**Flyers are suggested, but brochures with more detailed project information can also be designed*

■ *IMPLEMENTATION PERIOD*

Project site preparation phase and construction phase

■ *EXPECTED OUTCOME*

Prevent social conflicts and maintain a good relationship with the Project neighbors. Prevent inconveniences for the population living in the surrounding areas of the Project, due to: interruption of the services, Access difficulties, material damage, accidents, etc. Provide accurate and timely information on the Project development to all the users of the roads affected by the construction. And for the program environmental management is implemented as required and the necessaries adjustments are made to achieve the objectives of the environmental measures.

IX.2.1.8 Wildlife protection measures during site preparation

I *TYPE OF MEASURE*

Preventive

■ *DESCRIPTION OF MEASURE PROPOSED*

To mitigate the impact on wildlife during the construction activities appropriate training on wildlife conservation is proposed.

The purpose of wildlife protection is to:

- Develop actions for the protection and care of the wildlife.
- Train the workers to assure the environmental sustainability project area during the execution of the construction works.
- Promote individual and collective responsibilities with nature, environmental and economic responsibility, and human solidarity with the environment.
- Raise awareness among neighbors about environmental protection by placing education messages in the common use areas of the Project.

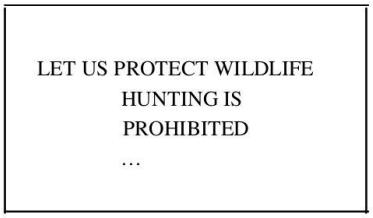
Hunting or destruction of the wildlife that displaces within the properties were the structures will be installed during Project implementation is prohibited.

- *Wildlife Rescue*

If wildlife was damaged or chicks were found or other type of circumstances that force the management of wildlife during the site preparation phases the following will be done:

- Cages for the transportation of wildlife will be available at the Project camp and the transportation field team, and the specimens collected will be taken to the plant.
- From the plant they will be taken to suitable organizations to recover the animals affected and to reintegrate them to their environment, already recovered as Funzel or other.
- A record will be kept of the animals affected and delivered to such institutions. The topics to include in the training are:
- Recognition of the main wildlife species: reptiles, mammals, birds, etc.; identified in the Project zone.
- Discussion on the concept of over-exploitation, extinction, sustainable use or related issues.
- Promote the participation in the commitment to care for the environment in general.
- Reinforcing the principles and attitudes of the management of the occupied or inhabited environment, though environment education.
- Description and awareness raising on the importance of the endangered species identified in the Project area, how to recognize and protect them
- What to do in the event you find a nest, burrows, and live individuals.
- Wildlife management
- Benefits of preserving biodiversity
- Teaching manipulation of live animals without harming them

The heads of the crews will be trained, that are permanent staff, and who will be responsible of transmitting the information to the rest of the staff, it has been estimated 30 people will be trained. The staff that will be working has to be selected. At least 8 trainings will be held, one at the onset and reinforcement with different groups, every four months. The trainings can be from 2 to 4 hours max.
In the zones with more wildlife presence signs will be placed, as a reminder of the care that should be given as minimum. Some examples to be included in the signs are:



The type of sign can be similar to sign MDC-19 Vertical in construction zone, manufactured with a galvanized sheet No. 22, in a rectangular form of 91 cm long by 61 cm high with rounded edges, treated with an oleo-resinous and anti-corrosive bottom. The support structure will be a galvanized tube of 5cm in diameter, in the bottom parts of the same material in a cross for the support 60 cm per side, with a total height of 1.5 m.

As reinforcement talks will be given on the protection of wildlife, during the monthly meetings with the construction workers, 15 min once a month, inherent to Project costs. The Project environmental specialist will be in charge of the training and follow-up of this environmental measure.

The monitoring will be semi-annual data collection of the wildlife by parcel in sensitive points to verify the presence of wildlife species.

- *LOCATION OF THE ENVIRONMENTAL MEASURE*

Sections of secondary forest, station 3+500 a 4+100 and *riparian* forest sections 8+900, 13+000, 13+800, 22+000 and 24+800 and zones with greater tree density. See environmental measures drawings IV-4 from 1/19 to 19/19.

- *AMOUNT CALCULATED FOR THE ENVIRONMENTAL MEASURE*

♦ PROJECT SECTION 1: *CA1 to CA1 (La Unión)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Signage	12.00	ea.	$ 50.00	1.00	$ 600.00
Training of at least 30 people from staff, crew chiefs, trainer and written materials	7.00	ea.	$ 50.00	1.00	$ 350.00
				TOTAL	$ 950.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Unión) to RN17*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Signage	10.00	ea.	$ 50.00	1.00	$ 500.00
Training of at least 30 people from staff, crew chiefs, trainer and written materials	5.00	ea.	$ 50.00	1.00	$ 250.00
				TOTAL	$ 750.00

Source: ECO Consulting Team

- *IMPLEMENTATION PERIOD*

Site preparation phase.

- *EXPECTED OUTCOME*

Wild animals will not be harmed during the site preparation phase of the project.

IX.2.1.9 Support to small business owners

- *TYPE OF MEASURE*

Mitigation

- *DESCRIPTION OF MEASURE PROPOSED*

In order not to affect the local business owners, the Project activities should be planned in such a way that , in as much as possible, in front of the existing businesses on the route, they are carried out rapidly.

To allow Access to these businesses during most of the time the Works are carried out.

Place signs with posters in the location of the businesses, so the clients can visit them without any problems.

Monitoring will consist of surveys implemented by the beneficiary population on the effectiveness of the sign locations in terms of maintaining their businesses in operation.

For the posters, the format of the mini billboards, from the Manual of Traffic Control Devises in Road Construction zones can be used.

The vertical mini billboard type is 1.35 m in width by 3 m high, its structure will be will be a squared industrial tube of 2.54 cm, totally covered with galvanized sheet No. 26, treated with an oleo-resinous and anti-corrosive bottom. The text will be labeled on one side. I.62 cm in diameter and will be 5 m high in total
Example:

Source: Adaptation of sign suggested in the Traffic Control Manual for road construction sites, MOP

Figure No. IX.9. Signs for businesses located along the road expansion section

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

Station 0+00 a 3+000, expansion section, station 8+700 and station 25+022. The businesses are detailed here below: (See environmental measures drawings FV-4 1/19 to 19/19).

1. Plot 9: Spare parts sale: partial affectation of the gallery and parking space.
2. Plot 24: mechanic shop, only the mud walls are affected and parking space.
3. Plot 27: carpentry.
4. Plot 41: Hardware store, the mud wall and parking is affected.
5. Plot 54 Store, partial affectation.
6. Plot 55 Workshop, partial affectation
7. Plot 56, Workshop, partial affectation.
8. Plot 57: Carpentry, partial affectation
9. Plot 58: store, partial affectation
10. Informal stores in triangle in detour to Quelepa.
11. Plot 72: Store, partial affectation
12. Plot 77: Motel, Wall and Access are affected.
13. Plot 107: Workshop, parking space.
14. Plot 108 Workshop, partial affectation
15. Plot 111: Brewery, partial affectation
16. Plot 112: Workshop, access and part of the gallery is affected.
17. Plot 115: Store, parking affected.
18. Plot 116: Dinners, partial affectation
19. Plot 119: Store and dinners, partial affectation.
20. Plot 120: Restaurant, the Wall is affected and the garden is reduced.
21. Plot 121: Workshop, tin sheet, parking space
22. Plot 123: Dinners, space to service customers is reduced, a gallery
23. Plot 127: Plant nursery, space for plant exhibit is reduced.
24. Plot 323: Motel, Wall is affected.

■ CALCULATED COST OF ENVIRONMENTAL MEASURE

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Signage	24.00	ea.	$ 100.00	1.00	$ 2,400.00
				TOTAL	$ 2,400.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: CA1 (La Union) to RN17

No businesses affected in this section.

■ *IMPLEMENTATION PERIOD*

Site preparation phase, and will be maintained during the construction.

■ *EXPECTED OUTCOME*

To affect commercial activities the least possible

IX.2.1.10 <u>Management of effluents, wastes and residues in site preparation.</u>

I *TYPE OF MEASURE*
The measure is considered Preventive.

■ *DESCRIPCIÓN DE LA MEASURE*
In the areas of structure demolition work and tree logging waste material will be generated, such as gravel and organic wastes (form the logging, pruning, excreta, food remains) generated from the presence of workers and several wastes.
A description of each type of waste to be generated and the management proposal for each one of them is included.

- *Temporary disposal of workers wastes and residues*

Disposal in the generation source: in the demolition and logging sites, at least one deposit will be made available for workers to dispose their organic wastes of domestic type, generated by their daily activities, mainly food.
Transfer: The responsible for material transportation will take to each work site a deposit for organic wastes, that will be emptied at least every two days; the transporter responsible of taking or withdrawing the materials of the sites will also be responsible of taking the contents of the waste deposits, from the work sites to the plant, or site of final disposal (sanitary filling) that has the corresponding environmental permit.

- *Disposal of demolition wastes*

Normal wastes from the demolition, such as: metal pieces, scraps, garbage, pieces, and broken tiles, among others. They will be removed from the front part of the work area to the plant or the final disposition site with the corresponding environmental permit or this permit will be processed prior to the construction.

In the case of metal sheets, tiles, lumber, metal beams, poles, etc., they will be removed trying not to damage them, to reuse them if possible or sell them to recycling companies.

The garbage will be taken to an appropriate disposal site, authorized by the Municipality Office and MARN, for which the contractor shall take all the necessary steps to obtain the necessary environmental authorizations and permits.

Adequate excreta disposal In the different work sites: given the type of Project and the areas used for the same, in the areas at a far distance from housing infrastructure, in ach work site and to avoid excreta disposal in open sky areas, portable toilets shall be installed for excreta management. One toilet will be installed for 25 workers or less in front of the work area.

Monitoring will consist of a record that will be kept on the amount of wastes and residues generated, by type of residue r waste, from the removal of the wastes and/or residues, and a photographic registry of the storage site, at least once a month.

-
- *Disposal of logging and pruning wastes*

The leaves and branches from logging and pruning will be removed from the Project area and taken to an authorized dump for this type of wastes, that has the corresponding environmental permit, or this permit will be processed prior to the construction.

- *Closing of existing wells*

In land plots 14, where there are currently wells that shall be closed, the material of the place from the corresponding layers of the well will be used for its closing in order to preserve the same characteristics.

The existing filling of the well shall be coordinated and supervised for this to be done in the appropriate manner, taking the following steps into account:

- Evaluating the depth of the well
- Cleaning the well
- Calculating the amount and type of material that will be used.
- Filling and compacting with select material from the site.

The following tables show the location of the wells and the levels obtained from some samples.

TABLE No. IX.11. LOCATION OF WELLS IN THE AREA OF DIRECT INFLUENCE OF PROJECT

No.	STATION	WATER TABLE (m from ground level)		ELEVATION (MASL)
		RAINY SEASON	SUMMER	
1	1+410	-	-	**166**
2	1+590	-	-	**167**
3	4+740	-	-	**113**
4	4+800	-12 meters	-8 meters	**111**
5	4+880	-	-	**107**
6	8+040	-	-	**103**
7	8+620	-	-	**102**
8	8+910	-	-	**114**
9	9+290	-	-	**115**
10	12+620	-18 meters	-14 meters	**97**
11	15+010	-	-	**101**
12	16+520	-12 meters	-8 meters	**90**
13	16+620	-13 meters	-8 meters	**89**
14	17+640	-	-	**86**

Source: Consultation with owners during walkthrough of project layout and topographic map

■ *LOCATION OF ENVIRONMENTAL MEASURE*

Project camp and work fronts, as works advance.

■ *CALCULATED COST OF ENVIRONMENTAL MEASURE*

An estimated 500 workers (440 workers for section 1 and 60 for section 2) will be required during site preparation stage.

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Portable Toilets	22.00	ea.	$ 80.00	5.00	$ 8,800.00
Plastic trash bins	22.00	ea.	$ 10.00	1.00	$ 220.00
Closure of wells	14.00	ea.	$ 140.00	1	$ 1,960.00
				TOTAL	**$** 10,980.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: CA1 (La Unión) to RN17

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Portable Toilets	3.00	ea.	$ 80.00	5.00	$ 1,200.00
Plastic trash bins	3.00	ea.	$ 10.00	1.00	$ 30.00
				TOTAL	**$** 1,230.00

Source: ECO Consulting Team

The cost of the well filling includes labor for extracting and placing the select material of the site and the compacting, and supervision of correct implementation.

Considering an approximate average depth of 10 m by 1.40 in diameter, which is approximately 14 mt^3 to fill out the well, and with a unit Price of $140.00 per well, and with a total of 14 weeks. The total cost of the activity is $ 1960.00

The removal of the garbage is one of the budget items of the project that will be paid to the contractor and it is mandatory to do this, therefore there is no bond for this purpose.

- *IMPLEMENTATION PERIOD*

Site preparation phase

- *EXPECTED OUTCOME*

Prevent soil and water contamination, as well as the proliferation of vectors in the project work area that might affect the workers of inhabitants of the zone.

Prevention of health impacts during site preparation

I *TYPE OF MEASURE*

Preventive

- *DESCRIPTION OF MEASURE PROPOSED*

In the Environmental Management Program, to develop the San Miguel Trunk road project, the implementation of HIV-AIDS prevention campaigns and workshops is proposed as environmental measure.

By improving the existing roads, there is a risk of increasing the transmission of HIV/AIDS and other sexually transmitted infections in communities that were previously inaccessible. The prevention campaigns aim at preventing/mitigating the impact of HIV/AIDS transmission during the construction of the Trunk road of San Miguel

♦ *HIV-AIDS prevention campaigns*

The HIV-AIDS prevention campaigns will be directed to the employees and people living near the sections where the San Miguel Trunk Road will be built.

The purpose is: To assure that all employees and neighbors of the Trunk road of San Miguel are capable of making well informed decisions to protect themselves from HIV and AIDS, to help preventing and controlling the propagation of HIV/AIDS, to mitigate the impact of the epidemics, to distribute education material and raise awareness about the use of latex condoms as a protection factor against HIV/AIDS.

The HIV/AIDS Prevention Campaigns could be implemented with support from the Ministry of Public Health and Social Assistance or through the Atlacatl/Vivo Positivo Association, private. Non-political, non-religious and non-profit non-governmental organization (NGO) with its own legal entity that can direct its actions to social mobilization, thus contributing to the improvement of the quality of lives of the people living with HIV in El Salvador, for which the construction company responsible shall negotiate or coordinate the contracting of a promoter.

The HIV/AIDS Prevention campaigns include the following:

- Consequences of the infection
- Explanation of the prevention measures

- Free tests for the inhabitants (men and women) that live near the Trunk road of San Miguel, owners, workers, administration and technical staff of the companies building the road. Also, training and creating awareness among the MINISTRY OF PUBLIC WORKS staff.
- Coffee break for the participants

The support of the Ministry of Public Works and Social assistance will be requested, staff, health promoters that manage the topic of this disease and its prevention methods, to provide support the day of the campaign, in the site preparation phase. Transportation, the cost of the tests and written material that will be distributed, as well as a coffee break for the participants will be provided.

One-day campaigns will be held, with visits to three sites in the project area and nearby zones, providing information and free tests for the population, and one-day in the project work camp, providing the same information to the employees.

The expected outcomes of the Prevention campaigns are:

- To contribute to raising awareness among the male and female workers on prevention, which will improve the quality of their lives through prevention and best practices
- To promote the eradication of the stigma and discrimination towards people living with HIV.

- *HIV-AIDS Prevention Workshops*

There will be awareness raising workshops for the employees of the construction or site preparation that will consist of education talks on HIV/AIDS prevention, The methodology is ludic-life experiences. The following topics will be addressed:

- Human Relations and Sexuality
- Myths and Realities on Sexuality
  Sex, Gender and Sexual Orientations
- Transmission Forms
- Prevention of sexually transmitted infections
- Myths and stereotypes in STI treatment
- Conceptual differences between HIV and aids
- Forms of transmission and non-transmission
- Use of Condom
- Tests: Detection and Confirmation
- Opportunistic diseases
- Myths and stereotypes around HIV/AIDS
- HIV/AIDS and Human Rights: Aids Law

A monthly workshop will be conducted with about 30 construction workers, of at least 3 hour. The workshops will be imparted by the project environmental specialist with support from staff of the Ministry of Health. The workshops will be held in the plant.

For monitoring purposes a registry will be kept on the diseases of employees and consultations with the health units in the influence area to verify there have been no increases in diseases outside the area.

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

Direct influence area in the project trace where there is a greater presence of population living or with commercial activities.

■ *CALCULATED COST OF ENVIRONMENTAL MEASURE*

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Flyers	435.00	flyers	$ 0.30	1.00	$ 130.50
Vehicle and fuel	0.75	day	$ 150.00	1.00	$ 112.50

Free tests	44.00	people	$ 12.00	1.00	$ 528.00
Snack	435.00	people	$ 2.00	1.00	$ 870.00
				TOTAL	$ 1,641.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: CA1 (La Unión) to RN17

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Flyers	65.00	**flyers**	$ 0.30	**1.00**	$ 19.50
Vehicle and fuel	0.25	day	$ 150.00	**1.00**	$ 37.50
Free tests	6.00	people	$ 12.00	**1.00**	$ 72.00
Snack	65.00	people	$ 2.00	**1.00**	$ 130.00
				TOTAL	$ 259.00

Source: ECO Consulting Team

■ *IMPLEMENTATION PERIOD*

Site preparation phase.

■ *EXPECTED OUTCOME*

To prevent from the area getting infected by diseases brought in by construction employees or vice-versa.

IX.2.1.12 Occupational safety measures in site preparation

I *TYPE OF MEASURE*

Preventive

■ *DESCRIPTION OF MEASURE PROPOSED*

The tasks and activities developed during site preparation put personal security at risk, therefore, and in order to prevent health risks and to minimize the probability of incidents during the construction activities, the personnel working in the construction will receive instruction on the appropriate management of the equipment and tools.

The construction company will be responsible of demanding its workers to use gear such as gloves, helmets, harnesses, that protect their health, during the construction activities.

The personnel shall receive training on the appropriate management of hazardous material, training which shall also be implemented. Fire extinguishers and the appropriate personal protection equipment shall be provided, where necessary. Works will be conducted to reduce the risk of spills.

To effectively inform the personnel, a management plan shall be implemented, consisting of keeping a complete list of hazardous material at hand, as well as the safety sheets of the materials. Also, the staff shall be trained on the use the materials safety sheets.

The materials that are listed in table No. IX. 13, will be kept in the plant in small amounts, however, they are always hazardous

TABLE No. IX.12. LIST OF HAZARDOUS MATERIALS DURING SITE PREPARATION

PRODUCT	RISKS	FIRST AID	SIGNAGE	PROTECTIVE EQUIPMENT	WASTE TREATMENT
DIESEL FUEL	Flammable and combustible Health: low degree of toxicity by inhalation or ingestion, skin and eye irritation. Carcinogenic potential.	EYES: rinse with slow running water. SKIN: Once cold: apply plenty of water, remove contaminated clothing and wash with soap and water. INHALATION: Move to cool area, call the doctor. If not breathing, start CPR and apply oxygen. INGESTION: Do not induce vomiting, keep at rest, call the doctor.	"FLAMMABLE" SIGNS	Only for high exposure or risk of contact: respirator cartridge and safety glasses with side shields.	SPILLS: Isolate an area of 50-100 m depending on the extent of the spill. Eliminate all sources of ignition, contain spill using sand or other absorbent material. Properly dispose of this material afterwards.
LUBRICATING OILS	Fuel Health: irritating to eyes, skin and prolonged inhalation exposure. Abdominal discomfort, nausea and diarrhea if swallowed.	EYES: rinse with slow running water. SKIN: apply plenty of water, remove contaminated clothing and wash with soap and water. INHALATION: Move to cool area, call the doctor. INGESTION: Do not induce vomiting, keep at rest, call the doctor.	NOT REGULATED	Foam, water spray, dry chemical, carbon dioxide.	If spilled, contain with absorbing material. Wear protective equipment for vapors.

Source: Material Safety Data Sheets

- Storage Requirements

  - Diesel storage

These materials should be stored in an area far from ignition sources. The barrels should be kept closed when not in use. A small berm structure is to be installed to protect the receiving medium free of any fuel spill. This should be in a waterproof area with absorbent material.

  - Extinguishers signaling and location.

All areas should have signaling indicating the different zones of the place, the risk, and use of protection equipment and the management of hazardous materials. Also, fire extinguishers should be placed on visible accessible sites with no obstructions, and due information. Adequate extinguishers should be installed for stored products.

  - *Occupational security and hygiene training*
  - Global environmental management requires changes in attitudes, behavior patterns and thinking processes from the employees, In addition to the basic knowledge on environment conservation. This process begins by improving the understanding all individuals have on environmental issues, and of the elements of environmental management processes.

In terms of staff training, the most important trainings for their security and that of the contractor, should focus on establishing methods through which information will be transmitted to the employees, on an ongoing basis, about the hazardous materials to which they could be exposed, types of labels, and signs used in the plant, first aids, and also about the importance of protection gear, care and use of the machines, as well as training for the staff on how to act in the event of an accident or emergency, such as fires and earthquakes, among others.

The most important areas to be included in the training are:

a. Introduction to environmental management: Importance and comprehension of environmental management

b. Occupational safety and hygiene aspects:
   - First aids

- Fire prevention and control
- Management of chemical substances and hazardous materials
- Signaling used
- Use and importance of personal protection gear
- Contingency plan Knowledge and training about the same.
- Provide safety equipment and personal protection-

Adjustment of the contingency plan and accidents prevention

Due to the fact that to date the exact location of the construction plant has not yet been defined, and which will be located at the constructor's convenience, the proposed contingency plan shall be adapted according to the facilities and land where the construction plant will be located. Risks, the location of fire extinguishers and emergency material, evacuation plan, signaling, appropriate extinguishers location, waterproofing areas where oils will be located, fuel and other hazardous materials, and the revision of all facilities shall be adjusted accordingly.

Due to the management of hazardous materials, such as explosives, and the risks identified in chapter 10: Risk Analysis and Prevention and Contingency Plan, the contingency plan shall be reviewed and adapted to the new facilities. This includes: Description of possible and probable accidents, information on the intervention and communications mechanisms and measures in the event of an emergency, description of safety measures, review and updating of the contingency measures.

The contingency plan shall be adjusted in the plant and front work areas, through signaling, training and conducting drills. A log shall be kept on the accidents or incidents, in order to update the contingency plan and to verify the effectiveness of the use of protection gear and other security measures.

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

Entire Project length

■ *CALCULATED COST OF ENVIRONMENTAL MEASURE*

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Adaptation of prevention plan to work camp or camps	1.00	ea.	$ 2,000.00	1.00	$ 2,000.00
Extinguishers and monitoring thereof	10.00	ea.	$ 60.00	1.00	$ 600.00
Signage	1.00	lump sum	$ 190.00	1.00	$ 190.00
Training in occupational safety	30.00	ea.	$ 8.00	2.00	$ 480.00
				TOTAL	$ 3,270.00

Source: ECO Consulting Team

PROJECT SECTION 2: CA1 (La Unión) to RN17

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Adaptation of prevention plan to work camp or camps	1.00	ea.	$ 2,000.00	1.00	$ 2,000.00
Extinguishers and monitoring thereof	5.00	ea.	$ 60.00	1.00	$ 300.00
Signage	1.00	lump sum	$ 190.00	1.00	$ 190.00
Training in occupational safety	30.00	ea.	$ 8.00	1.00	$ 240.00
				TOTAL	'$ 2,730.00

Source: ECO Consulting Team

- *IMPLEMENTATION PERIOD*

Site preparation phase.

- *EXPECTED OUTCOME*

To prevent accidents to employees and the population

IX.2.2 *Measures during the construction phase*

IX.2.2.1 <u>Compensation through waterproofing areas</u>

I *TYPE OF MEASURE* Mitigation

- *DESCRIPTION OF MEASURE PROPOSED*

To improve the infiltration, the possibility of installing filtration wells was analyzed and it was determined that it is not convenient to install them because small oils and grease spills can be caused that could contaminate the run-off water at a given moment. On the other hand, the water table in the zone is quite superficial, which could affect the operation of the infiltration well or be affected by possible contamination of run-off water, as already mentioned, therefore re-forestation is proposed as an environmental measure to improve infiltration.

Rain waters in the roads can contain oils and grease, metals and solid particles, and other contaminant elements released by the vehicles circulating in them.

Among the compensatory environmental measures MARN has other measures besides re-forestation which are important for the maintenance of the ANP, in this sense the corresponding management was consulted on the needs of a site near to the Project and they expressed that it is necessary to fence the ANP El Socorro.

Therefore, it was agreed with the protected Natural Areas Management to compensate by installing a fence of regeneration posts for natural regeneration, and it is detailed in the proposed measure accepted by the ANP Management. It is made up of two plots which are presented in Annex IX.4, as well as the proposal and acceptance of this measure.

The proposal consists of a partial perimeter fencing of the El Socorro ANP, located in the municipality of Yayantique, department of La Unión, as well as its maintenance for a 2 years period by a guard, as well as the cleaning to arrange the site for the construction of the perimeter fence.

Specific environmental specification for hedgerows

a) Living posts or fixable posts is a technique used to establish living fences. The posts are generally planted at a distance of 2 to 4 meters (for Project effects they will be planted at a distance of 3 meters between living posts), soil preparation is limited to the holes for the planting. The posts must be buried enough (at least 20- 30 cm) so that the radicular system will not be superficial and to avoid it from falling. In order to make good use of the plant material resulting from the spill or pruning of existing living fences, it is recommended to use the species described hereunder.
b) Maintenance: During the period of establishment, the little trees should be kept free of weeds to avoid competition with the weeds during the uprooting period. The best method to maintain the land humid and free of weeds is to cover the entire planting belt and to keep it under a layer of 2-5 cm of hay,

leaves or rice peel. The covering should not touch the neck of the plants, this fertilization allows considerably accelerating the plants growth and to reduce the necessary time to establish the fence.

c) Planting period recommended is the last week of April and the first half of May.
d) The recommended species to plant will be at least three of the following varieties:

TABLE No. IX.13. SUGGESTED SPECIES FOR FENCING

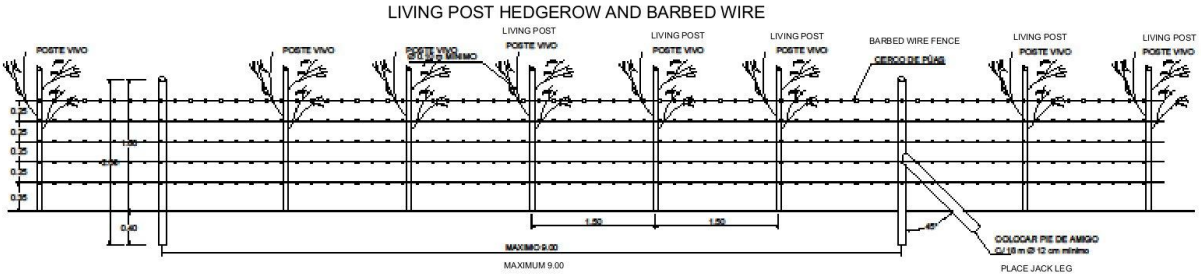
VERNACULAR NAME	SCIENTIFIC NAME	FAMILY
Madrecacao	Gliricidia sepium (Jacq.) Steud	Fabaceae
Jiote tree	B. simarouba	Burseraceae
Maquilishuat	Tabebuia rosea	Bignonaceae
Chilamate	Ficus spp. .	Moraceae
Caulote	Guazuma ulmifolia	Sterculiaceae
Tihuilote	Cordia sp.	Boraginaceae

Description of the living fences to demarcate land
Materials: Prendones or live posts, barbed wire, staples
Tools: Machetes, Coba, Palines,

Work method

- Prepare enough prendones.
- Keep the prendones in the shade before taking them to the planting site.
- Soil preparation is limited to digging the holes for the planting.
- Living posts are generally planted at a distance of 2 to 4 meters (for the purposes of the Project they will be planted at a distance of 3meters between living posts).
- The posts shall be buried enough (at least 20- 30 cm) so the radicular system will not be superficial and to prevent them from falling.

Diagram:



Source: ; Manual de *Agroforestería CA TIE, 99, adapted by Jiménez, 2008, for the Final design of a terciary road CABWE, between Cinequera-Tejutepeque, Cabañas*

Maintenance :

- During the period of establishment, the little trees should be kept free of weeds to avoid competition with the weeds during the uprooting period. .
- The best method to maintain the land humid and free of weeds is to cover the entire planting belt and to keep it under a layer of 2-5 cm of hay, leaves or rice peel. .
- The covering should not touch the neck of the plants, this fertilization allows considerably accelerating the plants growth and to reduce the necessary time to establish the fence.

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

The plots of the Natural Protected Area El Socorro, in the municipality of Yayantique, Department of La Unión, see drawing in annex IX.4.

■ *AMOUNT CALCULATED FOR THE ENVIRONMENTAL MEASURE*

The total amount for the environmental measure comes from the part of compensation for logging 8,858 trees and 3,496 shrubs in section 1 and its maintenance for the amount of$ 106,451.64 and the compensation measure of waterproofing which is equal to 850 trees of section 1 $4,267.00 and 150 trees in section 2 $753.00 with a total of $111,471.64.

This amount is applicable to the measure of fencing as follows:

FENCES MADE OF SPROUTING FENCE POSTS AND BARBED WIRE – PLOT 1 COMPLETE AND PLOT 2 PARTIAL

Line Item	Qtty.	Unit	Unit Price	Total
Construction of perimeter fence including materials, transportation and labor PLOT 1	4,617.92	ML	$ 6.20	$ 28,631.10
Construction of perimeter fence including materials, transportation and labor PLOT 2	11,052.545	ML	$ 6.20	$ 68,525.78
Fence maintenance for 2 years	24.00	month	$ 150.00	$ 3,600.00
Staff from ANP and others for rangers	24.00	month	$ 300.00	$ 7,200.00
Site cleanup and conditioning	1.00	Unit	$ 3,514.76	$ 3,514.76
TOTAL				$ **111,471.64**

Source: ECO Consulting Team

Amount Section 1: $ 110,718.64
Amount Section 2: $753.00
The total cost of the environmental measure is $ 111,471.64

■ *IMPLEMENTATION PERIOD*

Construction Phase. The measure will be implemented in a 12-month period parallel to the construction phase of the Trunk Road and 24 months in the operations phase, which includes the measures in the operations phase.

- *EXPECTED OUTCOME*

To protect and demarcate El Socorro ANP

IX.2.2.2 <u>Dust control</u>

I *TYPE OF MEASURE*

Preventive

- *DESCRIPTION OF MEASURE PROPOSED*
  - *Covering truck chutes*

The transfer of materials will generate dust, therefore the surrounding environment will be affected, and therefore, so will the health of the people (the inhabitants of nearby areas and the workers themselves), animals and objects. To prevent this during the transportation activity, all the chutes of trucks transporting topsoil or other materials that can produce dust should be covered.

  - *Machinery and equipment maintenance*

With the purpose of avoiding the emission of pollutants into the atmosphere, mainly dust, vehicles and machinery maintenance will reduce the emission of other pollutants.

All vehicles and internal combustion machinery that will be used in the construction Phase shall have preventive maintenance which will include at least a revision of the engine, change of oil, filter and tuning.

These activities will not be carried out in the Project site (plant or work areas), only in places devoted to this purpose, with the corresponding authorization.

This maintenance plan will be submitted to the MOP Project supervisor for approval, this as part of the programming of the Works to be carried out. The MOP supervisor, when detecting any vehicle or machine that issues a non-acceptable amount of pollutants to the atmosphere will order the contractor to remove this vehicle or machinery from the Works until repaired.

  - *Irrigation*

In order to prevent the risk of respiratory diseases produced by potential environmental dust emissions generated during the transportation activity in the Project development, the measure wetting the soil to settle dust will be implemented, in order to reduce potential emissions. The measure of wetting the soil includes the following guidelines:

1. The system that will be implemented will be what is known as a dust mitigation irrigation, which is applied to temporally reduce dust formation.
2. Special attention shall be given to the squares and rolling tracks through irrigation or soil humidifying to control dust from rising as a result to the machines moving.
3. The amount of time and the place where irrigation or humidity will be applied are key criteria to be evaluated “in situ” to respond to the wetting needs in an effective manner. This will depend on the type of soil, weather conditions and the amount of vehicle traffic.
4. In addition to humidifying the soil it is necessary to:
   a. Eliminate unnecessary trips, and for this purpose access should be restricted or traffic redirected to reduce the trips of vehicles.
   b. During periods with strong winds and before forecasted windy situations, the application of humidity will be doubled or it could be considered to temporarily stop transportation activities if necessary in the most sensitive sites.
   c. This will be done in the most sensitive areas and only during the dry season.

In places where it is considered to have high amounts of dust an analysis of total suspended particles will be conducted, samples taken every 24 hours, to verify that the levels do not exceed 260 (ig/m^3, according the SALVADORAN STANDARDNSO 13.11.01:00 in approval process). At least 5 samples will be taken during the Project execution.

- *LOCATION OF THE ENVIRONMENTAL MEASURE*

Project line, where there is a larger presence of population and road Access for materials supply that is not paved. Old Street to Quelepa (there is a school at 500 m), station 5+260, internal streets in Hato Nuevo, with housings: Urban Development Las Margaritas, Joselyn, Alas Campos, San Francisco and Altos de Hato Nuevo, between station 12+460 and station 13+540, schools at less than 300 m. Street to cantón Las Delicias and Street to la Hacienda La Joya. See drawing IX-1.

- *AMOUNT CALCULATED FOR THE ENVIRONMENTAL MEASURE*

The cost is calculated considering 2mm of water three times a day, in the surface where dust will be controlled, in 2,000 m^2, for six months during the dry season.

The calculation is detailed in the following table:

TABLE No. IX.14. CALCULATION OF IRRIGATION BY SECTION

ITEM	UNIT	PROJECT TOTAL	SECTION 1	SECTION 2
Layer to be spread	mm	2.00	2.00	2.00
In meters	m	0.00	0.00	0.00
Irrigation volume in 1 m	m^3	0.00	0.00	0.00
Three times daily (A)	m^3/ m2	0.01	0.01	0.01
Kilometers to moisturize	**km**	**13.00**	**12.00**	**1.00**
in meters	m	13,000.00	12,000.00	1,000.00
Area (B)	m2	220,000.00	203,076.92	16,923.08
Total volume for 3 irrigations per day (AXB)	m^3	1,320.00	1,218.46	101.54
Price per m	m^3	0.21	0.21	0.21
Price per day		$277.20	$255.88	$21.32
Per month		$8,316.00	$7,676.31	$639.69
Per eleven months		$91,476.00	$84,439.38	$7,036.62
Price per day per tankful more than 2 people	ea.	$55.52	$55.52	$55.52
Per month	monthly	$1,665.60	$1,665.60	$1,665.60
For 4 teams dividing the project in 4 sections		$6,662.40	$4,996.80	$1,665.60
Per eleven months		$73,286.40	$54,964.80	$18,321.60
TOTAL		**$164,762.40**	**$139,404.18**	**$25,358.22**

Source: ECO Consulting Team

♦ PROJECT SECTION 1 *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Price	(Unit)	Term (months)	Total
Water for irrigation (13 km)	30.00	days	$	255.88	11.00	$ 84,440.40
Tanker truck and two people (3 tankfuls)	30.00	days	$	166.56	11.00	$ 54,964.80
Monitoring of particulate matter	4.00	ea.	$	140.00	11.00	$ 6,160.00
					TOTAL	$145,565.20

Source: ECO Consulting Team

♦ PROJECT SECTION 2: CA1 (La Unión) to RN17

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Irrigation program (1 km)	30.00	days	$ 21.32	11.00	$ 7,035.60
Tanker truck and two people (1 tankful)	30.00	days	$ 55.52	11.00	$ 18,321.60
Monitoring of particulate matter	1.00	ea.	$ 140.00	11.00	$ 1,540.00
				TOTAL	$ 26,897.20

■ *IMPLEMENTATION PERIOD*

Construction Phase.

■ *EXPECTED OUTCOME*

Keep particle material emissions under the standard, in order not to affect the population in the direct influence.

IX.2.2.3 Slope Management

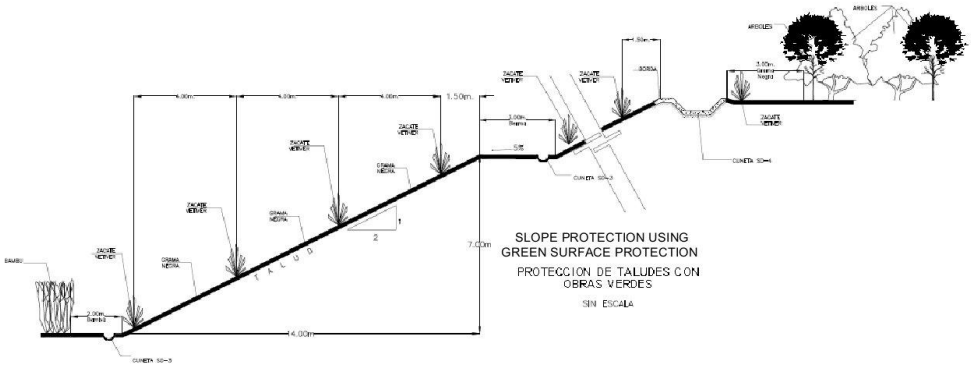
I *TYPE OF MEASURE*

Preventive

■ *DESCRIPTION OF MEASURE PROPOSED*

For all slopes three solutions have been proposed:

♦ Slopes in filling
- Leave them in a proportion of 2H: IV
- Ledges every 7 m high with a 3 m width
- Drainage in the upper and lower part, with gutters and in the intermediate berms.
- Bamboo in the bottom part to protect the soils.
- Black grass as protection coverage, although vetiver can also be used.



Source: JICA study Team

Figure No. IX.10. Detail of fill slope protection

- Cut slopes between station 3+900 a 8+900, and station 16+500 to station 25+020
  - Leave them of a proportion of 1H:2V
  - Drainages in the upper and lower parts, with gutters.
  - Protection with geo-meshes: the protection consists of reinforced concrete frames that are cast in situ, with pins soaked up in the slope, to sustain it.

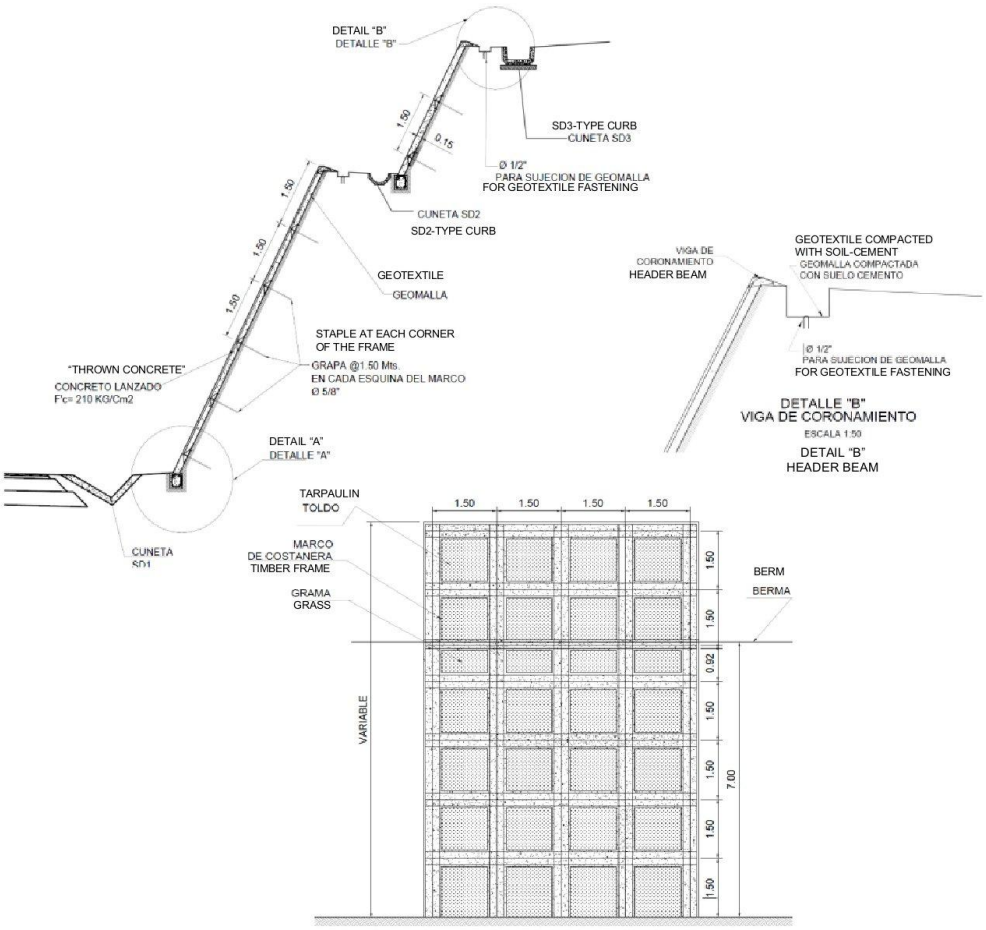


Figure No. IX.11. Detail of geomesh for slope protection

- Black grass as protection coverage in the geomesh middle spaces.

Slope Cut between 8+900 a 16+500

- Leave them at a proportion of 1H:2V
- Berms every 7 m high with a width of 1.50
- Drainages in the upper and lower parts with gutters, and in the middle berms.
- Stabilization with hexagonal mesh to stop the blocks from falling.

Fuente: Equipo de estudio JICA

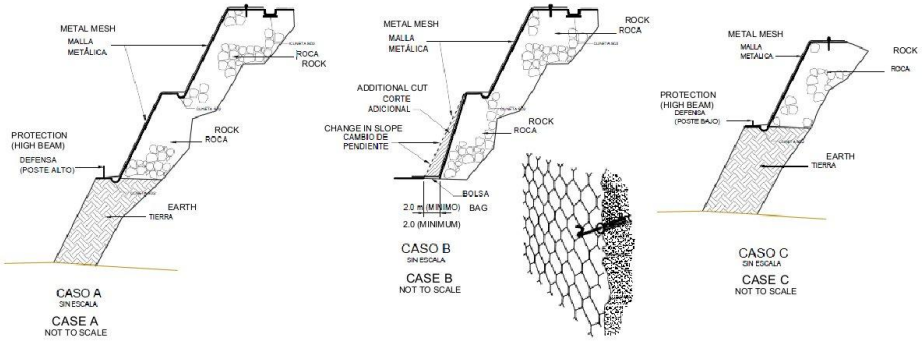


Figure No. IX.12. Detail of slope stabilization using hexagonal mesh

Annex IX. 1 shows the location of the measures in slopes, height, width, and area of the same, and Annex No. IV.5 presents a construction detail of the measures in the slopes.

In the case of the viaduct, grass should be placed under the same land at the end of the construction, in this section no cuts or filling will be generated, station 21+873 a station 24+548.

Monitoring will verify there are no landslides, mudslides, erosion processes; traction cracks in the upper other indication of instability, at least during three years after the Project is completed.

- *LOCATION OF THE ENVIRONMENTAL MEASURE*

Sections with cut-off and filling slopes. See environmental measures drawings IV-4 1/19 to 19/19.

- *AMOUNT CALCULATED FOR THE ENVIRONMENTAL MEASURE*

The Works in the slopes are integrated to the Project Budget, under items 6.01 Protection with concrete rack in Cut Slopes and 6.02 Protection with Mesh for Rocks in slope Cuts. The drains in the slopes are in time 4.-MINOR DRAINS.

As environmental measure only the Green work is included: placing grass and vetiver, its planting and maintenance.

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Black grass on fill slopes	88,561.12	m2	$ 2.50	1.00	$ 221,402.80
Vetiver on fill slopes	58,800.00	m	$ 2.10	1.00	$ 123,480.00
Black grass on slopes with hexagonal metal mesh	17,543.00	m2	$ 2.50	1.00	$ 43,857.50
				TOTAL	$ 388,740.30

Source: ECO Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Unión) to RN17*

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Black grass on fill slopes	1,339.36	m2	$ 2.50	1.00	$ 3,348.40
Vetiver on fill slopes	300.00	m	$ 2.10	1.00	$ 630.00
Turfed area under viaduct	61,525.00	m2	$ 2.50	1.00	$ 153,812.50
				TOTAL	$ 157,790.90

Source: ECO Consulting Team

■ *IMPLEMENTATION PERIOD*

Construction Phase

■ *EXPECTED OUTCOME*

To prevent damage to infrastructure and population due to landslides

IX.2.2.4 Collection and reuse of topsoil

I *TYPE OF MEASURE*

Preventive

■ *DESCRIPTION OF MEASURE PROPOSED*

It refers to accumulating and maintaining the organic soil extracted in good conditions to be later use don Green areas of the Project itself, and for cut-off and filling slopes.

- Specific activities

Organic soil will be stored in a specific area, where the topsoil material coming from the cuts to form the Access roads will be located. This will avoid mixing it and assuring it preserves the topsoil productive properties. It will also be used for the filling and superficial compacting of the land, in order to leave the land in as close as possible to its original state and avoid mixing horizons.

Where fillings are done, first the surface organic layer will be removed for its temporary collection and to be used again later in areas, considering:

- This material shall be placed in mounds, not greater than 1.5 m high and without compacting them, which will be totally covered with waterproof material (plastic, canvas or other appropriate methods) to avoid its loss or to be wetted from time to time. Cover with black plastic or other material during periods of continuous rain.
- For the area designated for temporary piling up of material removed, the following should be considered:
  - Cleaning the area from any material or residues it might have;
  - Use sites with slopes in a range of2-5%;
  - Do not pile up soil in areas of protection of water bodies or natural drainage natural.

- Land within the right of way

The monitoring will consist of verifying there is no combination of horizons and that topsoil is collected in the designated sites. An inspection log with photos will be kept.

- *LOCATION OF THE ENVIRONMENTAL MEASURE*

Rural land of the Project route.

- *AMOUNT CALCULATED FOR THE ENVIRONMENTAL MEASURE*

The movement of topsoil has been considered in$ 1.00 for cubic meter as follows.

- *PROJECT SECTION 1 : CAI TO CAI (La Union)*

  52,080.00 m^3 x $1.00 = $ 52,080 m^3

- *PROJECT SECTION 2 : CAI (La Union) TO RN17*

  537 m^3x $1.00 = $ 537.00 m^3

- *IMPLEMENTATION PERIOD*

Construction Phase

- *EXPECTED OUTCOME*

To preserve the topsoil to be used rationally

IX.2.2.5 Noise reduction measures

I *TYPE OF MEASURE*

Preventive

- *DESCRIPTION OF MEASURE PROPOSED*

To minimize the effect of the noise produced by traffic by installing barriers (prefabricated concrete walls) in the most vulnerable zones: populated areas.

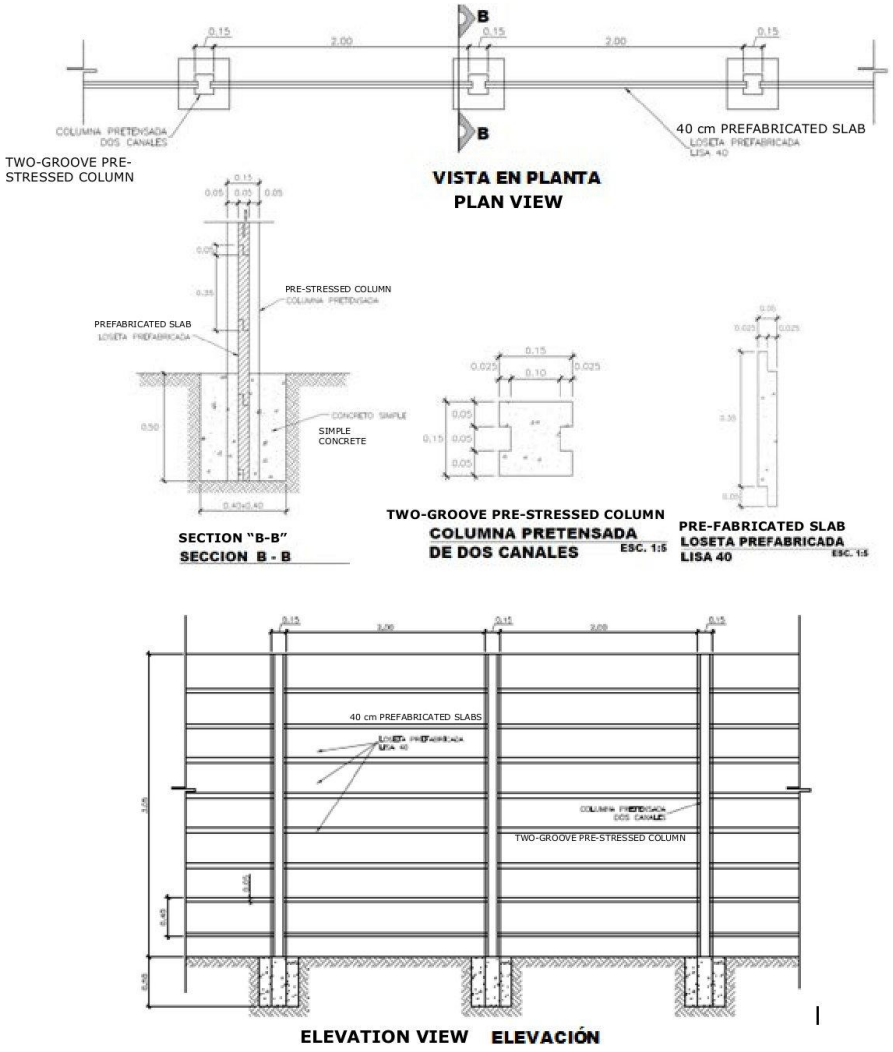
To reduce the levels of noise by at least10 dB (A) in the populated areas or housing sites.

In rural Project zones there will be increases estimated up to10 dB (A), therefore sound barriers shall be installed to reduce expected levels.

The walls or barriers will be at least 2 meters high, of prefabricated tiles of 5 cm or greater width, sustained by pretension columns. The barrier will be located just after the drainage besides the shoulder, before the slope or wall.

Proposed barriers are:

1. Prefabricated concrete walls, with which a reduction of38 db (A) is expected. The walls will be located at the left side of the road.

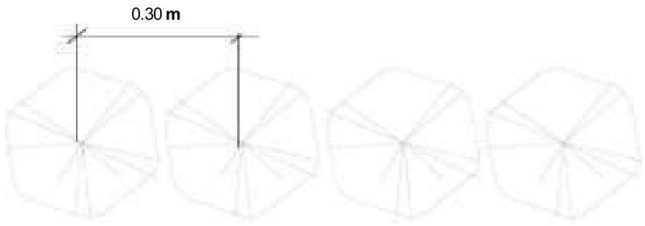


Source: ECO Consultant Team

Figure No. IX.13. Construction detail for prefabricated wall

2. In rural zones where there are houses near the road, hedgerows will be installed.

For hedgerows shrub species are recommended such as: "copalchí" Crotón reflexifolius, "clavel" *Hibiscus sinensis,* "bambú verde" *Bambusa sp.,* "bambú amarillo" *Bambusa tuldoides,* placed every 0.30 cm and keeping a height of at least 2 m, in double line where possible, separated 1 m from each line.



Source: ECO Consultant Team

Figure No. IX.14. Detail of hedgerow

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

Indirect influence area along the path of the Project where there greater presence of population living there. See environmental measures drawings IV-4 1/19 to 19719.

TABLE No. IX.15. LOCATION OF HEDGEROWS AND WALL

STATION A	STATION	FLANK	LENGTH (m)	TYPE OF BARRIER
3+740.00	4+000.00	left	260.00	hedgerow
3+900.00	4+020.00	right	120.00	hedgerow
5+360.00	5+400.00	right	40.00	Wall
8+260.00	8+420.00	right	160.00	hedgerow
12+460.00	13+000.00	left	540.00	hedgerow
12+460.00	13+000.00	right	540.00	hedgerow
13+140.00	13+400.00	left	260.00	hedgerow
13+140.00	13+400.00	right	260.00	hedgerow

Source: ECO Consulting Team

The appendices of the environmental measures drawings include a detail of the sites proposed.
There will be monitoring twice a month during the operations phase of the Project, in a six month period

■ CALCULATED COST OF ENVIRONMENTAL MEASURE

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Earthen wall with Hedgerow	2,140.00	**m**	$ 7.00	1.00	$ 14,980.00
Prefabricated wall	40.00	**m**	$ 18.00	1.00	$ 720.00
Noise monitoring	16.00	**ea.**	$ 5.00	**6.00**	$ 480.00
				TOTAL	$ 16,180.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: CA1 (La Unión) to RN17

There are no places to implement noise reduction measures in this section.

■ *IMPLEMENTATION PERIOD*

Final Construction Phase

■ *EXPECTED OUTCOME*

Not to produce an increase of more than 5 dB(A) in existing housing areas along the Project route.

IX.2.2.6 Temporary drainage maintenance during construction

I *TYPE OF MEASURE*

Preventive

■ *DESCRIPTION OF MEASURE PROPOSED*

Refers to the actions that allow good run-off waters management, during construction, maintaining the gutters built during the site preparation phase.

Specific activities:

- Maintaining the gutters or temporary ditches: review the conditions of the same and reconstruction.
  It has been estimated that 20% of the ditches or gutters will be reconstructed.
- Discharge points will also be revised, at least before and after winter (rainy season) and after heavy storms that are not typical.
- Verification that there are no erosion processes, water stagnation , or any other evidence of bad drainage in the Project area

.

I *LOCATION OF THE ENVIRONMENTAL MEASURE PROPOSED*

TABLE No. IX.16. LOCATION OF GUTTERS AND / OR CANALS DURING CONSTRUCTION STAGE SM BYPASS ROAD 2012

BETWEEN STATIONS		LENGTH (m)
9,180	11,240	2,060.00
11,240	11,600	360.00
13,740	14,600	860.00
14,020	16,440	2,420.00
16,600	16,760	160.00
16,840	17,000	160.00
	TOTAL	**6,020.00**

ECO Consulting Team

See environmental measures map IV-4 from 1/19 to 19/19.

■ CALCULATED COST OF ENVIRONMENTAL MEASURE

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Gutters and/or canals	1,204.00	m	$ 3.00	1.00	$ 3,612.00
Sedimentation pits during construction	10.00	ea.	$ 40.00	1.00	$ 400.00
				TOTAL	$ 4,012.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: CA1 (La Union) A RN17

There are no drains to maintain in this section.

♦ *PROJECT SECTION 2 CAI (La Union) to RN17*

No drainage maintenance is needed in this section.

■ *IMPLEMENTATION PERIOD*

Construction Phase

■ *EXPECTED OUTCOME*

To reduce excessive transportation of sediments to the rivers and streams of the Project, and to avoid erosion processes.

IX.2.2.7 Monitoring, rescue and / or salvage of cultural sites

I *TYPE OF MEASURE*

Mitigation

■ *DESCRIPTION OF MEASURE PROPOSED*

Archeological and paleontological interest sites were identified. The measures are detailed as follows:

TABLE No. IX.17. ARCHAEOLOGICAL-INTEREST SITES

STATION AND COORDINATES	ITEMS FOUND	ACTIVITY TO BE CARRIED OUT
4+100: 13°30'16.1", 88°13'12.7"	Fragments of cultural-interest material occurring in low density, predominantly pottery	Archaeological Monitoring
5+020: 13°30'33.0", 88°12'49.0"	Cultural-interest material occurring scattered in medium density, pottery and obsidian fragments associated with two terraces.	Archaeological Survey
5+500: 13°30'37.8", 88°12'30.1"	Concentration of colored rock fragments from some construction and cultural-interest material occurring in low density	Archaeological Survey
6+000: 13°30'44.6", 88°12'14.8"	Pre-Hispanic material occurring in low density, pottery shards and obsidian and lithic fragments.	Walkthroughs
7+700: 13°30'45.9", 88°ll'20.9"	Second concentration of cultural-interest material occurring in medium density, pottery fragments and obsidian in fewer quantity.	Archaeological Survey
9+310: 13°31'20.9", 88°10'41.8"	Outcrop of ignimbrite rocks and basalt with surface depressions, possibly due to human intervention.	Walkthroughs
9+700: 13°31'27.5", 88°10'30.7"	Cultural-interest material on surface, occurring in low density concentration. Small pottery shards	Archaeological Survey
9+750: 13°31'27.77", 88°10'29.03"	Alignment of stones, probably a house foundation, it is unknown if it is of Pre-Hispanic origin.	Archaeological Survey
17+200: 13°28'54.9", 88°08'44.7"	Cultural-interest material occurring in medium density on the surface, pottery and obsidian fragments.	Archaeological Survey
19+750: 13°27'55.5", 88°07'56.4"	It was not possible to make the walkthrough	Walkthroughs
24+180: 13°25'58.5", 88°08'47.2"	35. Concentration of cultural-interest material occurring in high density, decorated pottery, obsidian and lithic fragments.	Archaeological Survey
24+630: 13°25'53.5", 88°09'01.2"	It was not possible to make the walkthrough.	Walkthroughs
24+870: 13°25'53.1", 88°09'13.2"	45. Surface concentration of cultural-interest material occurring in medium density, pottery and obsidian fragments.	Archaeological Survey

Source: Resolution by Secretariat of Culture

Note: An additional Paleontological survey and collection of samples necessary for documentation were conducted at sites of interest mentioned in the table above; Annex VI.15 contains the Resolution of the Ministry of Culture and its findings are presented in the table below.

TABLE No. IX.18. PALEONTOLOGICAL-INTEREST SITES

STATION AND COORDINATES	ITEMS FOUND	ACTIVITY TO BE CARRIED OUT
6+870: N13°30'43.7", W88°II'48.2"	Fossil material, geological material belonging to the Cuscatlán formation, sub member C1, fossilized humeral shield of unknown turtle	1 Have the presence of a technician at the start of clearing works and related activities to verify the recovery of materials failing 2 Otherwise begin research work in the area to demarcate the boundaries of the carrier soil. 3 Set up a log of the area and launch an exhaustive of stream banks to be affected by construction of bypass road. 4 Conduct a general exploration of surrounding soils to confirm sediment formations and their association with soil around them.
20+200: N13°27'40.0", W88°07'53.7"	Sedimentary soil, sediment sequences belonging to ashes mixed with alluvial sediments that are carriers of plant material. Clays appear to be from the Cuscatlán Formation, member C1, belonging to the late Pliocene or early Pliocene.	1 Survey of sediments by layers 2 Sampling of sediments to establish the density of paleontological material it carries. 3 Demarcation of the area of influence of carrier soils. 4 Study of flora or fauna preserved in the sediment. 5 Survey and sampling of fossils preserved in the area. 6 Bio-stratigraphy (establishing the age of the remains) 7 Geo-stratigraphy (correlation of soil age through the surrounding geological formations) 8 Preparation, conservation and mounting of specimens collected. 9 Comply with the TDR that MUHNES and the Saburo Hirao Eco Park submitted to the relevant authority, if research by the Ministry of Culture is desired to be undertaken.

Source: Resolution by Secretariat of Culture

■ *LOCATION OF ENVIRONMENTAL MEASURE*

Location of archaeological-interest sites: 4+100, 5+020, 5+500, 6+000, 7+700, 9+310, 9+700, 9+750, 17+200, 19+750, 24+180, 24+630, 24+870; and paleontological-interest sites: 6+870, 20+200. See map IX-1.

CALCULATED COST OF ENVIRONMENTAL MEASURE

PROJECT SECTION 1: CA1 to CA1 (La Union)

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Archaeological Walkthrough	3.00	ea.	$ 200.00	1.00	$ 600.00
Archaeological Monitoring	1.00	ea.	$ 1,000.00	1.00	$ 1,000.00
Archaeological Survey	6.00	ea.	$ 2,500.00	1.00	$ 15,000.00
				TOTAL	$ 16,600.00

Source: ECO Consulting Team

PROJECT SECTION 2: CA1 (La Unión) to RN17

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Archaeological Walkthrough	1.00	ea.	$ 200.00	1.00	$ 200.00
Archaeological Survey	2.00	ea.	$ 2,500.00	1.00	$ 5,000.00
				TOTAL	$ 5,200.00

Source: ECO Consulting Team

■ IMPLEMENTATION PERIOD

Construction Phase

■ EXPECTED OUTCOME

The archeological and paleontological Project resources are not affected.

IX.2.2.8 Timetabling, signage and training, in populated areas

I *TYPE OF MEASURE*

Preventive

■ *DESCRIPTION OF MEASURE PROPOSED*

To prevent health effects as a result of the noise, dust and smoke, due to the traffic of vehicles and heavy machinery, as well as high noises and vibrations caused by vehicles passing, and the eventual explosions. Adequate timetabling should be established.

The schedules for activity development will be from 6 am to 6 pm; in exceptional cases, these timetables can be modified according to agreements reached between the neighbors and the Constructor; supervision by the Project owner, will record the purposes and understanding for the changes to be made. In the event of the section of the expansion of the Pan-American Road (CA-1), it is recommended not to apply this measure, in order to advance as quickly as possible and not to impact traffic more.

For blowing-up activities, the explosions shall take place between 8 am and 4 pm; in sites neighboring schools, the timetable for explosions shall be coordinated with the school director in order to select the best time.

In addition, it is recommended to reduce the emission of vibrations in the source for which it is recommended to:

- To establish detonation intervals for explosive charges, and not simultaneous ones. This can be achieved by detonating explosive charges for each fire at different moments, or grouping holes of the same fire or detonating hole by hole.
- The explosion front shall be oriented, in such a way that the propagation direction of the shock waves does not coincide with the direction of the nearest infrastructures.

Signaling will be placed in the edges of the security zones of the explosion sites. The type of signaling can be similar to vertical signaling MDC-19 Vertical in the construction zone.

Source: MOP Traffic Control Manual

FigureNo. IX.15. Detail of sign posted in the immediate detonation area

The signs will be manufactured with galvanized sheets No. 22 in a rectangular shape of 91 cm long by 61 cm high and rounded borders, treated with oleoresinous and anti-corrosive background. The Sign has a copper high intensity grade reflective side in yellow. The support structure will be a galvanized tube 5 cm in diameter, in the bottom part it will have pieces of the same material in a cross shape for support that measure 60 cm on the sides and a total height of 1.5 m.

Specific activities to be carried out:

1. Location of signs to indicate the delimitation of the explosion security zone sites. The community must be informed about the blow-up. If it is near the Street crossing area, a worker holding a flag will be placed there to stop the traffic at the time of the explosion.

2. Train the personnel in charge of the explosions on the minimum security measures, considering that work will be done beside zones where there are people, either in their homes or in working in the fields. There will be at least one training for the personnel every year.

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

The Project trace and the indirect influence area at a distance of 100 m from the limit of the direct influence area, where there is a greater presence of people living or conducting commercial activities. The sections detailed are:

- Development Los Ángeles, Riverside and Anagil Afife, en 8+240.
- Development Las Margaritas, Joselyn, Alas Campos, San Francisco and Altos de Hato Nuevo, between station 12+460 and station 13+540.
- Development, station 23+440
- Development, station 25+020

The most populated áreas, close to the Project are the expansion section, near the Agua Zarca road and the Development Las Margaritas. See drawing FX-1.

■ *CALCULATED COST OF ENVIRONMENTAL MEASURE*

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Signage	12.00	ea.	$ 108.56	1.00	$ 1,302.72
Training of construction personnel	25.00	people	$ 20.00	1.00	$ 500.00
				TOTAL	$ 1,802.72

Source: ECO Consulting Team

♦ PROJECT SECTION 2: CA1 (La Unión) to RN17

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Signage	2.00	ea.	$ 108.56	1.00	$ 217.12
Training of construction personnel	5.00	people	$ 20.00	1.00	$ 100.00
				TOTAL	$ 317.12

Source: ECO Consulting Team

Local population surveys will be undertaken as a means of monitoring.

■ *IMPLEMENTATION PERIOD*

Construction Phase

■ *EXPECTED OUTCOME*

To reduce the inconveniences due to noise and vibrations

IX.2.2.9 Proposed forest, soil and protected zones protection measures

I *TYPE OF MEASURE*

Mitigation

■ *DESCRIPTION OF MEASURE PROPOSED*

Access will not be allowed for personnel, machinery and vehicles in the forest áreas, soil and protected zones proposed, and in general outside the delimitated work areas.

The necessary measures will be taken to reduce the impact of the development of construction activities on forest zones and contamination of the soil through accidental discharges (spills)will be avoided. In addition, Access roads will be marked and the roads for vehicle and machinery movement will be marked to avoid unnecessary compacting of the soil and damage to the vegetation in the zones outside the direct impact area.

The surface of the Works will be limited to the strictly minimum. During the Works phase the precautions will be taken to harm the vegetation the least possible, efforts will be made so all specimens situated in the area that will be directly occupied by the work are not damaged. For this purpose, the Works area will be delimitated, trying that is the smallest possible, but without making it the maneuver possibilities for vehicles and machinery difficult.
The location of the booths and auxiliary warehouses shall be in the zones that take the least surface possible in the plant, and that because of their location they have easy communication, and avoid forming Access roads with complex tracing and unnecessary widths. Only temporary character facilities will be allowed, which will be removed once the Works are completed, having to restore the land to its original conditions, both in terms of orography as plant and soils.

The vehicle and personnel crossing sites will be signaled, and free crossing in the Plots will be allowed for non-authorized staff, and even less with vehicles or equipment that could generate the compacting of the organic soils.

In the event that isolated trees or groups of trees inside the area delimitated for the Works can be affected, although they are not in the area to protect them, using wooden boards tied together by a wire around the trunk or protecting the leaves to avoid shocks that could cause irreversible damage.

In any case, there will be pruning to avoid important damage to the trees. In any case, there will be no pruning that implies completely cutting the complete tree structure. Pruning will be carried out only by specialized staff and will coincide in as much as possible with the period of plant rest (December, January, and February).

As a supplementary measure to pruning, lower branches or those hanging and could be susceptible to being damaged during the Works, shall be tied and directed upwards. For this purpose tensors will used to tie the branches and protect the tree trunk, also previously protecting the ties to avoid any damaged the trunks and branches.

Throughout the Works and once these have been completed, a visual inspection will be conducted in the tree zones adjacent to the Works, in order to assess possible damage caused by the Works, and if so, treating the wounds and eliminating dead, torn or Split parts by the pruning the trees by specialized personnel.

In any case, it should be avoided to:

- Place nails, pegs, etc. On the trees
- Place twisted silk pieces, cables or chains on the trees without the appropriate protection
- Light fires near trees and shrubs
- Manipulate fuels, gas, oils and chemical products in the root zones
- Pile-up materials against tree trunks.
- Circulate with machinery outside the areas established.
- Works will not be carried out simultaneously during the reproduction seasons of the species in the Works zones or their proximity.
- Nests and burrows will be respected.
- Placing barriers that hinder the natural crossing of the wildlife in the zone will be avoided.

Signs will be installed in the most sensitive areas, as a reminder of what should not be affected at all.

The signs will have the following specifications:

The vertical mini billboard type is 1.35 m in width by 3 m high, its structure will be will be a squared industrial tube of 2.54 cm, totally covered with galvanized sheet No. 26, treated with an oleo-resinous and anti-corrosive bottom. The text will be labeled on one side. It is not required to have the MOP logo. In the back part it will have two iron angle guides to be fixed on the main pedestal of the iron post of 7.62 cm in diameter and 5 m high in total.

A visual inspection will be carried out and data collected in the parcels on the vegetation to assess the damage caused by the crossing of people.

- *LOCATION OF THE ENVIRONMENTAL MEASURE*

Indirect influence area of the Project, where there are many trees, sections of secondary forest, station 3+500 a 4+100 and riparian forest sections 8+900, 13+000, 13+800, 22+000 and 24+800 and zones with a high tree density, and the proposed protected zone. See drawing IX-1.

- *CALCULATED COST OF ENVIRONMENTAL MEASURE*

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Signaling of restricted right of way areas	10.00	ea.	$ 200.00	1.00	$ 2,000.00
				TOTAL	$ 2,000.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Unión) to RN17*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Signaling of restricted right of way areas	2.00	ea.	$ 200.00	1.00	$ 400.00
				TOTAL	$ 400.00

Source: ECO Consulting Team

- *IMPLEMENTATION PERIOD*

Construction Phase

- *EXPECTED OUTCOME*

Existing forests in the protected area are not affected.

IX.2.2.10 Prevention of health impacts during construction

I *TYPE OF MEASURE*

Preventive

- *DESCRIPTION OF MEASURE PROPOSED*

The environmental management program, for the development of the San Miguel Trunk Road Project proposes the implementation of HIV-AIDS Prevention Campaigns as environmental measure.

By improving the road networks, there is a risk of increasing the transmission of HIV/AIDS and other sexually transmitted infections in the communities that were previously inaccessible. The Prevention Plan aims at preventing/mitigating the impact of HIV/AIDS transmission during the construction of the San Miguel Trunk Road.

- *HIV-AIDS Prevention Campaigns*

The HIV-AIDS Prevention Campaigns will be directed to the employees and the inhabitants that live near the sections where the San Miguel Trunk Road will be constructed. The objective will be: The purpose is: To assure that all employees and neighbors of the Trunk road of San Miguel are capable of making well informed decisions to protect themselves from HIV and AIDS, to help preventing and controlling the propagation of HIV/AIDS, to mitigate the impact of the epidemics, to distribute education material and raise awareness about the use of latex condoms as a protection factor against HIV/AIDS.

The purpose is: To assure that all employees and neighbors of the Trunk road of San Miguel are capable of making well informed decisions to protect themselves from HIV and AIDS, to help preventing and controlling the propagation of HIV/AIDS, to mitigate the impact of the epidemics, to distribute education material and raise awareness about the use of latex condoms as a protection factor against HIV/AIDS.

The HIV-AIDS Prevention campaigns will include the following:

- Consequences of the infection
- Explanation of prevention measures
- Free tests for the population (men and women) living near the line of the San Miguel Trunk Road, owners, workers, administration and technical staff of the companies building the road. Also, the training and awareness of the personnel of the Ministry of Public Works.
- Coffee break for the participants

- The support of the Ministry of Public Works and Social assistance will be requested, staff, health promoters that manage the topic of this disease and its prevention methods, to provide support the day of the campaign, in the site preparation phase. Transportation, the cost of the tests and written material that will be distributed, as well as a coffee break for the participants will be provided.
- One-day campaigns will be held, with visits to three sites in the area project and nearby zones, providing information and free tests for the population, and one-day in the project work camp, providing the same information to the employees.

The expected outcomes of the prevention campaigns are:

- To contribute to raise awareness among the male and female workers on prevention, which will improve the quality of their lives through prevention and best practices
- To promote the eradication of the stigma and discrimination towards people living with HIV.

- *HIV-AIDS Prevention Workshops*

There will be awareness raising workshops for the employees of the construction or site preparation that will consist of education talks on HIV/AIDS prevention, The methodology is ludic-life experiences. The following topics will be addressed:

- Human Relations and Sexuality
- Myths and Realities on Sexuality
  Sex, Gender and Sexual Orientations
- Transmission Forms
- Prevention of sexually transmitted infections
- Myths and stereotypes in STI treatment
- Conceptual differences between HIV and aids
- Forms of transmission and non-transmission

- Use of Condom
- Tests: Detection and Confirmation
- Opportunistic diseases
    - Myths and stereotypes around HIV/AIDS
    - HIV/AIDS and Human Rights: Aids Law

• A monthly workshop will be conducted with about 30 construction workers, of at least 3 hour. The workshops will be imparted by the project environmental specialist with support from staff of the Ministry of Health. The workshops will be held in the plant.
• For monitoring purposes a registry will be kept on the diseases of employees and consultations with the health units in the influence area to verify there have been no increases in diseases outside the area.

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

Indirect influence project area in the Project trace, where there is a greater presence of population living or conducting commercial activities.

■ *CALCULATED COST OF ENVIRONMENTAL MEASURE*

PROJECT SECTION 1: CA1 to CA1 (La Union)

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Flyers	435.00	flyers	$ 0.30	9.00	$ 1,174.50
Vehicle and fuel	0.75	day	$ 150.00	9.00	$ 1,012.50
Free tests	45.00	people	$ 12.00	9.00	$ 4,860.00
Snack	435.00	people	$ 2.00	9.00	$ 7,830.00
				TOTAL	$ 14,877.00

Source: ECO Consulting Team

PROJECT SECTION 2: CA1 (La Unión) to RN17

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Flyers	65.00	flyers	$ 0.30	**9.00**	$ 175.50
Vehicle and fuel	0.25	day	$ 150.00	**9.00**	$ 337.50
Free tests	5.00	people	$ 12.00	**9.00**	$ 540.00
Snack	65.00	people	$ 2.00	**9.00**	$ 1,170.00
				TOTAL	$ 2,223.00

Source: ECO Consulting Team

■ *IMPLEMENTATION PERIOD*

Construction Phase.

■ *EXPECTED OUTCOME*

To prevent people from this area getting infected by diseases brought in by the construction workers, or vice-versa .

IX.2.2.11 Maintenance of temporary roads

I *TYPE OF MEASURE*

Preventive

■ *DESCRIPTION OF MEASURE PROPOSED*

During the construction phase easy access to the Project neighboring areas should be assured at all times.

Dirt roads can be damaged due to the constant crossing of vehicles; mainly those ballast roads or are dirt roads. Repairs and leveling will be made in the roads affected by the circulation of construction vehicles.

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

Roads to be used: Old road to Quelepa, road to Hacienda al Refugio, streets in Development Altos de Hato Nuevo, Road to Cantón Las Delicias, Road to Cantón El Papalón. See drawing IX-1

■ *CALCULATED COST OF ENVIRONMENTAL MEASURE*

♦ PROJECT SECTION I: *CA1 to CA1 (La Union)*

SITE	LENGTH OF ROAD TO (m)	APPLIED AMOUNT ($/ml)	TOTAL AMOUNT
Old road to Quelepa	2,503.00	$ 2.50	$ 6,257.50
Road to Hacienda El Refugio (Rio Grande)	1,338.00	$ 2.50	$ 3,345.00
Housing Development Altos de Hato Nuevo (several	1,774.00	$ 2.50	$ 4,435.00
Canton Las Delicias	3,785.00	$ 2.50	$ 9,462.50
Road to Las Hojas	2,563.00	$ 2.50	$ 6,407.50
	11,963.00		$ 29,907.50

♦ PROJECT SECTION 2: *CA1 (La Unión) to RN17*

SITE	LENGTH OF ROAD TO (m)	APPLIED AMOUNT ($/ml)	TOTAL AMOUNT
Canton El Papalon road to Rio Grande	2,503.00	$ 2.50	$ 6,257.50

■ *IMPLEMENTATION PERIOD*

Construction Phase.

■ *EXPECTED OUTCOME*

To leave the existing roads in the same condition or improved to the condition they have at the onset of the project.

IX.2.2.12 Wastes, residues and effluent management during Construction

I *TYPE OF MEASURE*

Preventive

■ *DESCRIPTION OF MEASURE PROPOSED*

The wastes and residues that will be generated during the Construction Phase consist mainly of organic wastes of the clearing of the areas. Also, there will be wastes from the construction of the roads, gutters, consisting of construction garbage, carton of the cement bags, reinforcement steel pieces, PVC tubes, among others. These wastes and residues shall be separated and managed appropriately.

- *Specific activities* During the Construction Phase we have the following wastes and residues:

1. **Domestic wastes in the working fronts,** in the Project Construction Phase, the presence of workers (permanent or by specific schedules) will generate domestic and office waste.

2. **Wastes from the equipment maintenance,** Although NO maintenance activities for Major equipment will be conducted in the Plant, there are daily activities such as application of oil or grease, for daily maintenance, which generates wastes such as: wipes or disposable wipes, cotton with oil, oil containers, empty grease cans, in small amounts. Hazardous wastes, although will be produced in small amounts, only from the daily preparation of the machinery and equipment in use, such as greasing-up and fuel supply, a barrel of at least 55 gallons in capacity will be available, subsequently this material will be delivered to an recycler, authorized by the competent authority, for its final and appropriate disposal. To dispose of used oil, in no case can it be used to control dust, on the rolling áreas of the ballasted road or dirt roads.

3. **Pavement demolition wastes.** The old surface materials that will be removed from the section of the expansion and from the crossings of the Agaua Zarca Road, Ruta Militar (RN18), the road to La Unión and Calle to El Delirio (RN17); will be grinded and reused as sub-base or as the constructor specifies.

4. **Sterile material from earth movement.** The material removed will be taken to the site for the disposal of sterile material, where the soil conservation works will be conducted: forming slopes, drainages, and re-vegetation. Sites for final disposal of the material have been proposed and are presented in drawing No. IX-1, however, it will be the Project constructor that will define the final sites and process the corresponding permits, including the environmental permit of the selected sites.

The recommended management for wastes and residues produced in the Construction Phase, are summarized in the following table:

TABLE No. IX.19. WASTE AND RESIDUE MANAGEMENT DURING CONSTRUCTION

WASTE / RESIDUE	ORIGIN	MANAGEMENT	DISPOSAL
Fuel or used oil	Daily preparation of machinery and equipment	Recyclable oil storage tank.	Sale to be used as fuel.
Used absorbent material (wiper rags, sawdust).	Daily preparation of machinery and equipment	Storage in tanks or bags properly closed and labeled as "hazardous waste"	Incineration by controlled methods, in sites with permission by the competent authority.
Timber or firewood	Felling and stump removal	Gathering in designated area. Firewood will be chopped and placed in stacks, measured in *pantes*.	Sale of timber or firewood
Leaves and branches	Felling and stump removal	Gathering in designated locations at each work front	Placed on the ground to be reincorporated into the soil
Paper.	Office and packaging	Store in a marked container.	Sold for recycling
Domestic.	Food, miscellaneous.	Storage in closed containers.	With the garbage truck or authorized transport to landfill
Glass	Bottles	Storage in closed container	Sale for reuse
Plastics	Packaging material	Storage in closed container	Sold for recycling
Old removed asphalt	Demolition of CA1 road and other road crossings	Collected in outdoor mounds	Crushed and reused for road construction.
Rubble	Demolition of curbs, sidewalks, pipes, etc.	Storage	Transport to authorized rubble dumpsite.
Sterile material from earthworks	Earthworks	Not stored	Evacuation to designated landfill site

Source: ECO Consulting Team

Upon completion of removal of all type of wastes and residues form the site where the construction

material was located and the machinery parking shall be verified; if soil contaminated with oil is found, it shall be removed and adequately disposed of.

- *Appropriate disposal of excreta*

In the different work sites: given the type of Project and the areas used for the same, in the areas at a far distance from housing infrastructure, in each work site and to avoid excreta disposal in open sky areas, portable toilets shall be installed for excreta management. At least 80 portable toilets will be installed during the construction, for 2000 workers. These will be strategically placed in front of the project work area.

The specific activities of this measure include:

- Installation of portable toilets
- Purchase of garbage deposits to place in work fronts, 10 work fronts have been estimated, with 5 deposits in each.

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

Project camp and work fronts

■ CALCULATED AMOUNT OF ENVIRONMENTAL MEASURE

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Line Item	Qtty.	Unit	Price (Unit)	Term (months)	Total
Portable Toilets	70.00	ea.	$ 80.00	25.00	$ 140,000 00
Plastic trash bins	45.00	ea.	$ 10.00	1.00	$ 450 .00
				TOTAL	$ 140,450 00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Unión) to RN17*

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Portable Toilets	10.00	ea.	$ 80.00	25.00	$ 20,000.00
Plastic trash bins	5.00	ea.	$ 10.00	1.00	$ 50.00
				TOTAL	$ 20,050.00

Source: ECO Consulting Team

■ *IMPLEMENTATION PERIOD*

Construction Phase

■ *EXPECTED OUTCOME*

To prevent contamination through effluent, wastes and residues in the soil or surface or underground waters mismanagement. To use the residues in a rational manner

IX.2.2.13 Occupational Safety Measures during Construction

I *TYPE OF MEASURE*

Preventive

■ *DESCRIPTION OF MEASURE PROPOSED*

The tasks and activities developed during site preparation put personal security at risk, therefore, and in order to prevent health risks and to minimize the probability of incidents during the construction activities, the personnel working in the construction will receive instruction on the appropriate management of the equipment and tools.

The construction company will be responsible of demanding its workers to use gear such as gloves, helmets, harnesses, that protect their health, during the construction activities.

The personnel shall receive training on the appropriate management of hazardous material, training which shall also be implemented. Fire extinguishers and the appropriate personal protection equipment shall be provided, where necessary. Works will be conducted to reduce the risk of spills.

To effectively inform the personnel, a management plan shall be implemented, consisting of keeping a complete list of hazardous material at hand, as well as the safety sheets of the materials. Also, the staff shall be trained on the use the materials safety sheets.

The materials that are listed in table No. IX. 120, will be kept in the plant in small amounts, however, they are always hazardous.

TABLE No. IX.20. LIST OF HAZARDOUS MATERIALS DURING CONSTRUCTION

PRODUCT	RISKS	FIRST AID	SIGNAGE	PROTECTIVE EQUIPMENT	WASTE TREATMENT
DIESEL FUEL	Flammable and combustible Health: low degree of toxicity by inhalation or ingestion, skin and eye irritation. Carcinogenic potential.	EYES: rinse with slow running water. SKIN: Once cold: apply plenty of water, remove contaminated clothing and wash with soap and water. INHALATION: Move to cool area, call the doctor. If not breathing, start CPR and apply oxygen. INGESTION: Do not induce vomiting, keep at rest, call the doctor.	SIGNAGE: "FLAMMABLE"	Only for high exposure or risk of contact: respirator cartridge and safety glasses with side shields.	SPILLS: Isolate an area of 50-100 m depending on the extent of the spill. Eliminate all sources of ignition, contain spill using sand or other absorbent material. Properly dispose of this material afterwards.
LUBRICATING OILS	Fuel Health: irritating to eyes, skin and prolonged inhalation exposure. Abdominal discomfort, nausea and diarrhea if swallowed.	EYES: rinse with slow running water. SKIN: apply plenty of water, remove contaminated clothing and wash with soap and water. INHALATION: Move to cool area, call the doctor. INGESTION: Do not induce vomiting, keep at rest, call the doctor.	NOT REGULATED	Foam, water spray, dry chemical, carbon dioxide.	If spilled, contain with absorbing material. Wear protective equipment for vapors.

Source: Material Safety Data Sheets

Storage requirements

- *Diesel Storage*:

These materials should be stored in an area far from ignition sources. The barrels should be kept closed when not in use. A small berm structure is to be installed to protect the receiving medium free of any fuel spill. This should be in a waterproof area with absorbent material.

- Extinguishers signaling and location.

All areas should have signaling indicating the different zones of the place, the risk, and use of protection equipment and the management of hazardous materials. Also, fire extinguishers should be placed on visible accessible sites with no obstructions, and due information. Adequate extinguishers should be installed for stored products.

- *Occupational security and hygiene training*

Environmental management in the plant require changes in attitudes, behavior patterns and thinking processes from the employees, In addition to the basic knowledge on environment conservation. This process begins by improving the understanding all individuals have on environmental issues, and of the elements of environmental management processes.

In terms of staff training, the most important trainings for their security and that of the contractor, should focus on establishing methods through which information will be transmitted to the employees, on an ongoing basis, about the hazardous materials to which they could be exposed, types of labels, and signs used in the plant, first aids, and also about the importance of protection gear, care and use of the machines, as well as training for the staff on how to act in the event of an accident or emergency, such as fires and earthquakes, among others.

The most important areas to be included in the training are:

a. Introduction to environmental management: Importance and comprehension of environmental management

b. Occupational safety and hygiene aspects:

- First aids
- Fire prevention and control
- Management of chemical substances and hazardous materials
- Signaling used
- Use and importance of personal protection gear
- Contingency plan Knowledge and training about the same.

- *contingency plan and accidents prevention*

Due to the management of hazardous materials, such as explosives, and the risks identified in chapter 8: Risk Analysis and Prevention and Contingency Plan, there should be a contingency plan, which is included in the same chapter. This includes: Description of possible and probable accidents, information on the intervention and communications measures and mechanisms in the event of an emergency, description of safety measures, review and updating of the contingency measures.

The contingency plan shall be implemented in the plant and work fronts through signaling, training and conducting drills. A log shall be kept on the accidents or incidents, in order to update the contingency plan.

- *LOCATION OF THE ENVIRONMENTAL MEASURE*

All the project length

- *AMOUNT CALCULATED FOR THE ENVIRONMENTAL MEASURE*

During the Site preparation phase the plant adjustments, extinguishers and signaling were included. In this stage only training is included.

PROJECT SECTION 1: CA1 to CA1 (La Union)

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Training in occupational safety	30.00	ea.	$ 8.00	12.00	$ 2,880.00
				TOTAL	'$ 2,880.00

Source: ECO Consulting Team

PROJECT SECTION 2: CA1 (La Unión) to RN17

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Training in occupational safety	30.00	ea.	$ 8.00	2.00	$ 480.00
				TOTAL	'$ 480.00

Source: ECO Consulting Team

- *IMPLEMENTATION PERIOD*

Construction Phase.

- *EXPECTED OUTCOME*

To prevent accidents for employees and the population

IX.2.2.14 Risk prevention plan

I *TYPE OF MEASURE*

Preventive

- *DESCRIPTION OF MEASURE PROPOSED*

According to the risk study carried out, the following risk prevention measures have been identified:

1. Landslides: loose rocks, in the zone where there are loose rocks in station 13+700, east slope of Taishihuat River, on this slope there is loose rocks that could injure the workers or damage the works due to shock impacts in the event of a tremor (earthquake) or strong rains. Before starting the works in this area, the rock entailing the greater risks should be removed. From the slope, only loose rocks will be removed before starting the bridge construction. The natural slope is not considered unstable in itself, since it is made up of rock, as can be evidenced by the presence of fractured rock in the surface.

Photograph No. IX.2. View of loose rocks in the slope in the entry of Taishihuat River, to be removed before the construction

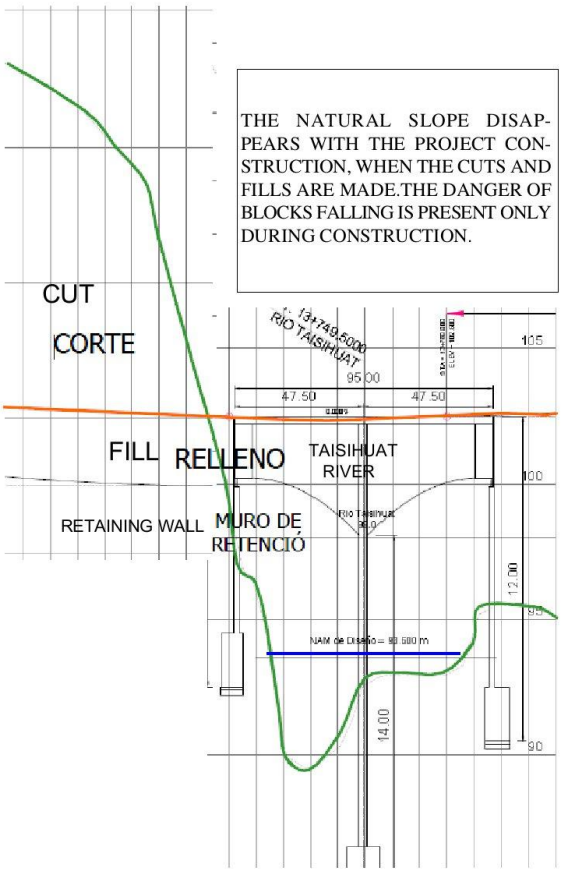
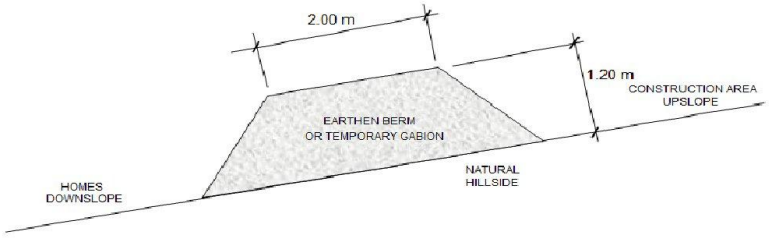


Figure No. IX.16. Cross-sectional view of works to be carried out at the Taishihuat River pass.

This zone will be modified by making a cut-off to reach the level of the bridge on theTaishihuat River, therefore, no permanent works are proposed, given that the segment of the slope where there are rocks will disappear by the end of the construction, with the cuts projected. Rocks will only be removed to reduce the risk during the construction process.

2. Landslides: land movements, the cut and fill slopes have been designed according to the geotechnical study, therefore they meet the expected security factors, however, there are two zones where there is population on the slope under the Project line and there are houses for which additional precautions need to be taken during the construction. The installation of temporary gabions or retaining walls is recommended downslope to stop any small slides that could happen during the construction and that could affect the houses. The location comprises stations 9+500 and 15+800 to 16+300.



Source: ECO Consultant Team

Figure No. IX.17. Detail of the gabion or berm to stop small landslides

3. Fires. In the area where the sugar cane plantation is burnt, the Works should be coordinated in such a way that during this activities Works will be temporarily suspended in order not to damage the equipment and avoid project staff being affected. Station 6+500 a 7+100, and 23+100 a 24+500.

Also, the following should be considered, when SNET or National Emergency Committee's alerts are generated:

- Volcanic Risk: suspend Works temporarily in the expansion section up to station 2+500.
- Earthquakes: Suspend works until the project manager authorizes access for the personnel, mainly in the zones of cut-off-offs and fillings.
- Strong rains: likewise, the project manager will determine the places where works cannot continue, depending on the alert level. Asphalt should not be applied under rain conditions in order not to contaminate surface water.

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

Risk zones identified: station 23+500 a 23+900, 13+700. 9+500, 15+800 a 16+300, 6+500 a 7+100 and 23+100 a 24+500.

■ *CALCULATED COST OF ENVIRONMENTAL MEASURE*

PROJECT SECTION 1: CA1 to CA1 (La Union)

Line Item	Qtty.	Unit	Price (Unit)	Term (months)	Total
Removal of loose rock	1.00	lump sum	$ 800.00	12.00	$ 9,600.00
Earth walls to contain small landslides (temporary)	700.00	m	$ 5.00	12.00	$ 42,000.00
				TOTAL	$ 51,600.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Unión) to RN17*

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Earth walls to contain small landslides (temporary)	100.00	m	$ 5.00	12.00	$ 6,000.00
				TOTAL	$ 6,000.00

Source: ECO Consulting Team

■ *IMPLEMENTATION PERIOD*

At the end of Construction Phase

■ *EXPECTED OUTCOME*

To prevent risks from small landslides and water stagnation in the Project area

IX.2.3 *Measures to be applied during the operations*

IX.2.3.1 Maintenance of trees and shrub planting measures

I *TYPE OF MEASURE*

Compensation

■ *DESCRIPTION OF MEASURE PROPOSED*

This measure consists of providing maintenance during two years to the tree and shrub plantation planted during the Construction phase. Maintenance will be for at least two years.

During this 2-year period, a tour will be conducted every two months to verify the plantation and the establishment of the trees.

Irrigation, fertilizer will be provided, species will be replaced and pruned, and related activities carried out to assure the trees and shrubs are well established in the site.

■ *LOCATION OF THE ENVIRONMENTAL MEASURE*

The sites where the maintenance will be provided are summarized in the following table.

TABLE No. IX.21. SUMMARY OF SITES PROPOSED FOR REVEGETATION

LOCATION OF REVEGETATION	TREES	TREES SECTION 1	TREES SECTION 2
MAINTENANCE MEASURE 1.1.			
Base of cut and / or fill slopes of opening section	16,780	15,105	1,675
Project's traffic circles and triangles	997	907	90
TOTAL	**17,777**	16,012	1,765
Shrubs at base of cut or fill slopes in opening section	5,013	4,154	859

Source: ECO Consulting Team

■ CALCULATED COST OF ENVIRONMENTAL MEASURE

Only includes maintenance for one year. Two-year maintenance included for environmental measures during the operating stage.

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Tree maintenance during 2 years of project operation	16,012.00	month	**$ 0.21**	24.00	$ 80,700.48
Shrub maintenance	4,154.00	month	**$ 0.11**	24.00	$ 10,966.56
				TOTAL	$ 91,667.04

Source: ECO Consulting Team

♦ PROJECT SECTION 2: CA1 (La Unión) to RN17

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Tree maintenance during 2 years of project operation	1,765.00	month	**$ 0.21**	24.00	$ 8,895.60
Shrub maintenance	859.00	month	**$ 0.11**	24.00	$ 2,267.76
				TOTAL	$ 11,163.36

Source: ECO Consulting Team

The total amount for the measure is $ 102,830.40

- *IMPLEMENTATION PERIOD*

Operations phase.

- *EXPECTED OUTCOME*

To improve the plant coverage in the Project area, to better conditions as the ones before the project

IX.2.3.2 Integrated vegetation management

I *TYPE OF MEASURE* Preventive

- *DESCRIPTION OF MEASURE PROPOSED*

Maintenance of the rights of way will be carried out on an on-going basis to control the vegetation, including grass and vetiver maintenance in slopes; if more than necessary is done, this could generate a continuous substitution of succession species and a greater possibility of invasive species establishing.

Vegetation integrated management should be implemented, from the road edge to the limit of the right of way, structuring vegetation with larger size species in farther areas, to provide habitats for plants and animals. Planting native species and eliminating invasive species. Avoid the use of chemical herbicides.

- *LOCATION OF THE ENVIRONMENTAL MEASURE*

Secondary forest segments, station 3+500 a 4+100 and riparian forest segments 8+900, 13+000, 13+800, 22+000 and 24+800 and zones with a greater tree density; slopes with black grass and vetiver applied.

- *CALCULATED COST OF ENVIRONMENTAL MEASURE*

STAFF TRAINING

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Training to personnel responsible for pruning for three years, every 6 months	25.00	ea.	$ 20.00	6.00	$ 3,000.00
				TOTAL	$ 3,000.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Unión) to RN17*

		Unit	Unit Price	Term (months)	Total
Training to personnel responsible for pruning for three years, every 6 months	5.00	ea.	$ 20.00	6.00	$ 600.00
				TOTAL	$ 600.00

Source: ECO Consulting Team

VETIVER GRASS AND MAINTENANCE

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Maintenance of grass and vetiver	106,104.12	m2	$ 0.50	3.00	$ 159,156.18

Source: ECO Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Unión) to RN17*

Line Item	Qtty.	Unit	Unit Price	Term (months)	Total
Maintenance of grass and vetiver	62,864.36	m2	$ 0.50	3.00	$ 94,296.54

Source: ECO Consulting Team

TOTAL SECTION 1: $ 162,156.18
TOTAL SECTION 2: $ 94,896.54

■ *IMPLEMENTATION PERIOD*

End of Construction Phase

■ *EXPECTED OUTCOME*

To reduce the effect of the rim and protect semi-natural inhabitants found, to keep the grass and vetiver in slopes in optimal conditions

IX.2.3.3 Occupational safety and waste and residue maintenance

I *TYPE OF MEASURE*

Preventive

■ *DESCRIPTION OF MEASURE PROPOSED*

Just as during the operations phase, for road maintenance, a contingency and accident prevention plan needs be applied. This plan should include the same elements considered during the construction phase.

- *Safety and hygiene training*

One of the most important measures to be taken is to provide the personnel the necessary information about the materials to be used and the safety measures to be taken, in addition to the risks they are exposed to. Instruct the personnel on the probability of incidents during the road maintenance activities, training them on safety standards for the type of work and the appropriate management of the equipment and tools. This is achieved by providing training on safety and hygiene, reinforcing it, at least every three months. It should include:

a. Introduction to environmental management: Importance and comprehension of environmental management
b. Occupational safety and hygiene aspects:
   - First aids
   - Fire prevention and control
   - Management of chemical substances and hazardous materials
   - Signaling used
   - Use and importance of personal protection gear
   - Contingency plan Knowledge and training about the same.
   - Provide safety equipment and personal protection-

Extinguishers will be provided for the vehicles making transfers to the work zone, as well as the appropriate personal protection equipment. The contractor shall be responsible of requesting the workers use gear such as gloves, helmets and harnesses, that they protect their health during the maintenance activities. Contingency and accident prevention plan. Traffic accidents and incidents should be recorded in a log to update the contingency plan.

- Waste and residues management

The wastes and residues of the maintenance zone shall be picked up and taken the maintenance plant. If the works will take more than 15 days and need more than 5 employees, a portable toilet will be installed.

- Hazardous wastes

Paint wastes, from bridge maintenance that could contain lead shall be therefore considered as hazardous wastes.

Asphaltic material shall not be applied under rainy conditions.

■ *LOCATION OF THE ENVIRONMENTAL*

MEASURE

Entire project line

■ *CALCULATED COST OF ENVIRONMENTAL MEASURE*

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Signage	2.00	ea.	$ 50.00	1.00	$ 100.00
Extinguishers	2.00	ea.	$ 60.00	1.00	$ 120.00
Training for at least 30 staff, crew chiefs, trainer and written material	2.00	ea.	$ 50.00	1.00	$ 100.00
				TOTAL	$ 320.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Union) to RN17*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Signage	1.00	ea.	$ 50.00	1.00	$ 50.00
Extinguishers	1.00	ea.	$ 60.00	1.00	$ 60.00
Training of at least 30 people from staff, crew chiefs, trainer and written materials	1.00	ea.	$ 50.00	1.00	$ 50.00
				TOTAL	$ 160.00

Source: ECO Consulting Team

■ *IMPLEMENTATION PERIOD*

Operations phase

■ *EXPECTED OUTCOME*

To prevent soil and water contamination and prevent accidents of project workers

IX.2.3.4 Periodical review and maintenance of protection walls in water streams, drainages and slopes

I *TYPE OF MEASURE*

Preventive

■ *DESCRIPTION OF MEASURE PROPOSED*

This measure consists of the periodical inspection of walls, draining and slopes along the road and its consistent maintenance. This maintenance is provided by FOVIAL, part of MOP, and will be provided not only during the three years of implementation of the environmental measures, but on a continuous basis to guarantee road safety. The measure is implemented in two parts: first, evaluation of the structures and slops, for which a technical evaluation team is necessary, and afterwards, the repair, in necessary cases, with the team and trained personnel for each case.

It could be divided as follows.

Wall Inspection and maintenance:

It is necessary to have the required personnel and team to evaluate the walls and their correct functioning, considering man-made and natural factors that could affect these structures. At least the following should be inspected:

- Structural integrity of the walls
- Safety conditions of the environment
- Vertical and horizontal level
- Inspect turn-over with regards to the peak
- Inspect for landslide fault along the base
- Inspect for load capacity fault of the base
- Inspect settlement
- Inspect whole stability

After the evaluation and identifying necessary maintenance, the Works and activities indicated by the technical evaluation should be conducted, emphasizing on the structural function of the walls.

- *Inspection and maintenance of draining:*

An inspection and the necessary works will be conducted to assure the correct functioning of the longitudinal and crosscutting drains and the risk conditions of the same will be assessed.

- Surrounding soil and foundation soil condition
- Correct functioning of drains
- Inspect for existing stagnated water
- Inspect the existence of erosion processes in Works surrounding area
- Hydrostatic charges evaluation
- Cracks in the structure.
- Inspect for landslide fault
- Review settlement
- Review entire stability and functioning

As for the walls, repair and maintenance work shall be conducted by trained personnel and appropriate equipment.

- *Slope inspection and maintenance*

Slopes should be periodically evaluated, including all the components, as according to the case, considering:

- Hexagonal mesh
- Geomesh

and considering the following evaluations:

- Land and water pressures
- Inspect landslide fault
- Inspect settlement
- Structural integrity of the hexagonal mesh or geomesh
- Anchoring of the components.
- Inspect entire stability and functioning

In such a way that the stability of the slopes is the ideal one, or on the contrary to proceed with the maintenance Works for each case. The maintenance of the black grass and vetiver are included in measure 3.1.

- *LOCATION OF THE ENVIRONMENTAL MEASURE*

- The entire project.

- *CALCULATED COST OF ENVIRONMENTAL MEASURE*

♦ PROJECT SECTION 1: *CA1 to CA1 (La Union)*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Technical team evaluation of the entire length of the section.	21.00	km	$ 150.00	6.00	$ 18,900.00
Repairs and maintenance estimated to be performed on an average of one month every six months on two work fronts.	21.00	km	$ 350.00	6.00	$ 44,100.00
Special training of personnel for assessments and repairs (1 year)	3.00	u	$ 250.00	1.00	$ 750.00
				TOTAL	$ 63,750.00

Source: ECO Consulting Team

♦ PROJECT SECTION 2: *CA1 (La Union) to RN17*

Activity	Qtty.	Unit	Unit Price	Term (months)	Total
Technical team evaluation of the entire length of the section.	4.00	km	$ 150.00	6.00	$ 3,600.00
Repairs and maintenance estimated to be performed on an average of one month every six months on two work fronts.	4.00	km	$ 250.00	6.00	$ 6,000.00
				TOTAL	$ 9,600.00

NOTE: Training is considered under section 1, because the same personnel will be used for implementation of the works.
Source: ECO Consulting Team

Section 1: $63,750.00
Section 2: $9,600.00
Total for the two sections: $ 73,350.00

- *IMPLEMENTATION PERIOD*

Operations phase.

- *EXPECTED OUTCOME*

To prevent the deterioration of walls, slopes and drainages through the entire length of the project

IX.2.3.5 Measures subject to be reviewed

There are certain measures that because of the stage in which the Project is currently (Feasibility Study), there are no details available for certain aspects, therefore, some measures related with detailed designs will be prepared later and will be subject to a review by MARN to reevaluate the amounts for these measures, and to be adjusted, if necessary

The designs that will detailed afterwards are:

1. Longitudinal Drains and discharge works
2. Detailed slope designs
3. Detailed design of bridges and crossings works.
4. Detailed design of the reorientation of crossings with existing streets, secondary roads and cattle crossings.

Water discharge works

IX.3 ENVIRONMENTAL MANAGEMENT PROGRAM SUMMARY TABLES

The tables present the environmental management program, addressed separately according to the construction and operations phases, respectively. The measures have been grouped and organized by type of measure: prevention (P), Mitigation (A) or Compensation (C). The tables indicate:

- Project activities with an impact
- Description of the impact generated
- Proposed measure and a short description
- Physical location of the environmental measure
- Execution responsible.
- Estimated cost for the environmental mitigation measure
- Expected outcome with the implementation of the proposed measure

For the purposes of the Project execution, that will be constructed in two parts, all the environmental measures have been divided in the Management Environmental Program into the two segments as follows:

- Section 1: CAI to CAI (to La Unión)
- Section 2 CAI (to La Unión) to RN17

The total cost of the environmental measures is $2.107,032.90, from which $1,736,910.10, is the estimated cost for the segment between the Project beginning to the intersection with the CAI road to La Unión, and the cost of the segment between the CAI to la Union to the RN17 (Road to El Delirio) is $370,122.80. The following table shows a detail of the amounts.

TABLE No. IX.22. SUMMARY OF ENVIRONMENTAL BOND PER SECTION AND PROJECT STAGE

PROJECT STAGE	CA1 TO CA1	CA1 TO RN17	TOTAL
CONSTRUCTION	1,419,016.88	254,302.90	1,673,319.78
OPERATION	317,893.22	115,819.90	433,713.12
TOTAL	1,736,910.10	370,122.80	2,107,032.90

IX.3.1 Section 1: *CA1 TO CA1 (A La Unión)*

IX.3.1.1 Environmental Management Program Summary

TABLE No. IX.23. ENVIRONMENTAL MANAGEMENT PROGRAM FOR SM BYPASS ROAD 2012, CONSTRUCTION STAGE

IMPLEMENTATION STAGE	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF ENVIRONMENTAL MEASURE	PERSONNEL RESPONSIBLE FOR ITS IMPLEMENTATION	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
CONST : SITE PREPARATION	Cutting down trees and shrubs	Reduction of infiltration due to felling of riparian and secondary forest: trees, shrubs and wildlife Felling of trees, shrubs and grass during site preparation	Offsetting 1.1. Revegetation to offset for felling	Planting of 16,780 trees and 5,013 shrubs	Base of cut and / or fill slopes of opening section 15.105; roundabouts and triangles 907; and 5,013 shrubs between trees in project sites	Project owner	$ 90,017.52	Last year of construction	Improved vegetation cover in the project area, compared to conditions before the project.
CONST : SITE PREPARATION	Clearing, cleaning and grubbing.	Reduction of crops and agricultural areas	1.2 Training for improving crops, soil and agroforestry	Hiring of a promoter for two and a half months for providing technical advice to farmers and distributing leaflets	Sections: 0+00-0+500, 1+000-3+000, 4+000-8+500, 9+000-12+000, 12+500-13+500, 14+000-20+000, 21+000-21+500, 22+000-23+500.	Project owner	$ 2,261.00	Site preparation stage	Minimizing impacts by reducing agricultural areas Adequate crop management.
CONST : SITE PREPARATION	Acquisition of rights of way	Impact on social amenities	1.3 Pedestrian crossings and road safety	Construction of overpasses, speed bumps, sidewalks and road safety talks	San José School, from Road to Agua Zarca to Riverside Bridge, Military Route Road (RN19), Road to Apacunque, La Union Road Crossing (CA1)	Project owner	$205,840.00	Site preparation stage	Prevent project from impacting on the area of influence of social amenities, facilitate the movement of people, and provide benefits to the population from the construction, rather than making them feel concerned about their safety.

STAGE: IMPLEMENTATION	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF MEASURE MEASURE	PERSONNEL RESPONSIBLE FOR ITS IMPLEMENTATION	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
CONST: SITE PREPARATION	Clearing and grubbing and installation of work camp	Transport of sediment to rivers and streams	Prevention 1.4. Temporary drainage during site preparation	Installing temporary gutters and canals to prevent sediment from being swept down high sloping sections	Sections of stations 9+180 to 11+240, 11+240 to 11+600, 13+580 to 13+740, 13+740 to 14+600, 14+020 to 16,440, 16+600 to 16,760+ 16+840 to 17,000.	Project owner	$18,060.00	Site preparation stage	Prevent sediment transport, erosion and inappropriate runoff management during site preparation stage.
CONST: SITE PREPARATION	Felling of trees and shrubs, clearing, cleaning and grubbing.	Impact on proposed protected area	1.5 Minimize impact on proposed protected area.	Almost vertical slope with hexagonal mesh to reduce impact on area and signage to restrict access	Protected area in expansion section Station 0+880 to 0+960	Project owner	$ 33,400	Site preparation stage	Least possible impact on proposed protected area
CONST: SITE PREPARATION	Acquisition of rights of way, cutting trees and shrubs, clearing, cleaning and grubbing.	Reduction or division of agricultural land	1.6 Signage for cattle crossings	Placing signs to inform people of the location of cattle crossings.	Road to La Union, old road to Quelepa. Road to Canton Agua Zarca, Road to Plan de las Mesas. Road to Canton Las Delicias. Road to El Papalon.	Project owner	$ 550.00	Site preparation stage	Minimizing impacts from the reduction or division of agricultural land.
CONST: SITE PREPARATION	Demolition of structures and others	Temporary impact on infrastructure: power poles, drinking water, drainages	1.7 Project social and environmental management	Establish an environmental management office to provide social assistance to the population, verify measures, carry out communication campaigns, etc.	Project walkthrough	Project owner	$ 72,234.00	Stage for site preparation	Prevent social conflicts and maintain good relations with neighbors of project Prevent inconveniences to the population, problems of access, property damage, accidents, etc. Provide accurate and timely information about the Project
CONSTRUCTION: SITE PREPARATION	Felling of trees and shrubs, clearing, cleaning and grubbing.	Possible impact on wildlife during site preparation	1.8 Measures to protect wildlife during site preparation.	Signage and staff training on respect for wildlife, and rescue wildlife found during walkthrough	Secondary forest sections: station 3+500 to 4+100; and riparian forest sections: 8+900, 13+000, 13+800 and areas with higher tree density	Project owner	$ 950.00	Site preparation stage	Minimizing impacts on wildlife.
CONST: SITE PREPARATION	Acquisition of rights of way, demolition of structures	Impact on commercial activities	1.9 Supporting small businesses	Mark and provide free passage to customers of businesses located on the expansion section	Station 0+00 to 3+000, expansion section.	Project owner	$2,400.00	Site preparation stage	Minimization of impacts on commercial activity.

STAGE: IMPLEMENTATION	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF ENVIRONMENTAL MEASURE	PERSONNEL RESPONSIBLE FOR ITS IMPLEMENTATION	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF ITS IMPLEMENTATION	EXPECTED OUTCOME
CONST: SITE PREPARATION	Demolition of structures, setting up camp, felling, filling wells, quarry management and setting up camp	Possible contamination of soil and water by effluents, waste and residues during site preparation	Prevention 1.10. Effluent, waste and residue management during site preparation and filling of existing wells.	Waste, residue and effluent management, installation of 22 portable toilets and 22 waste bins for 500 employees in this stage, filling of existing wells.	Project camp and work fronts.	Project owner	$10,980.00	During demolition of structures	Preventing contamination of soil and water as well as the proliferation of vectors in the workspace of the project that may affect the local population or the workers themselves.
CONST: SITE PREPARATION	Demolition of existing structures, cutting of trees and shrubs, clearing, cleaning and grubbing, installation of work camp.	Health risk due to outsiders	1.11 Prevention of health impacts during preparation.	Campaigns for the prevention of HIV-AIDS, including workshops and testing	Area of indirect influence along the path of the project where we find greater presence of residences or businesses.	Project owner	$ 1,641.00	Site preparation stage	Reduced risk of damage to population's health.
CONST: SITE PREPARATION	Demolition of existing structures, cutting of trees and shrubs, clearing, cleaning and grubbing. Installation of camp.	Occupational hazards to employees during site preparation	1.12 Occupational Safety measures during site preparation	Adaptation of prevention plan, fire extinguishers, signage and training	Project layout	Project owner	$3,270.00	Site preparation stage	Reduced risk of damage to health of employees.
CONST	Application of asphalted concrete pavements, Miscellaneous, sidewalks, barriers and others; construction of waystation	Reduction of infiltration from impermeabilization of areas	2.1 Offsetting for impermeabilization and felling of areas	Offsetting for reduced infiltration and felling with fencing at El Socorro ANP	Fencing with sprouting fence posts and maintenance thereof at El Socorro ANP.	Project owner	$ 110,718.64	Construction stage, during the last year	Promoting infiltration through revegetation.

IMPLEMENTATION STAGE	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	MEASURE MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF ENVIRONMENTAL MEASURE	PERSONNEL RESPONSIBLE FOR IMPLEMENTATION	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
CONST.	Supply of materials, earthworks. Construction of tunnels, bridges and at-grade crossings, slope treatment.	Emissions to air from transportation, earthworks and excavation	2.2 Dust control.	Covering truck hoppers, maintenance of machinery and equipment, regular watering at least three times a day in areas with the largest population and roads being used temporarily	Unpaved sections of the project layout and access roads used for supplying materials: Old road to Quelepa, station 5+250, internal roads in Hato Nuevo: Housing Development at Las Margaritas, Joselyn, Alas Campos, San Francisco and Altos de Hato Nuevo, between station 12+460 and station 13+540. Road to Canton Las Delicias	Project owner	$145,565.20	Construction Stage	Reducing dust emissions
CONST.	Earthworks, construction of tunnels, bridges and at-grade crossings, slope treatment.	Modification of the natural relief, Soil instability from cut and fill slopes, Possible erosion processes	2.3 Slope management	Management of cut slopes: geogrid or hexagonal grid with berms, gutters and earth and filling walls: 2H/1V slope, protective cover, berms, earth walls and gutters.	Sections with cut and fill slopes, all throughout the project path.	Project owner	$388,740.30	Construction Stage	Prevent instability caused by cuts and fills and erosion processes
CONST.	Earthworks	Change in soil quality: topsoil	2.4 Collection and reuse of topsoil	Separation, collection and reuse of topsoil.	Rural plots along the project walkthrough.	Project owner	$52,080.00	Construction Stage	Prevention of pollution or alteration of topsoil.
CONST	Vehicular traffic during the operating stage of the project.	Estimated increases of up to 10dB(A)	2.5 Noise reduction measures	installation of hedgerows or walls for noise attenuation near homes or forested areas	Station 3+740, 3+900, 5+360, 8+260,12+460 y 13+140.	Project owner	$16,180.00	Construction Stage	Avoid increases of more than 5 dB(A) near existing homes along the path of the project.
CONST.	Earthworks	Modification of drainage patterns during construction	2.6 Maintenance of temporary drainage during construction.	Maintenance of temporary gutters and canals to prevent the transport of sediment in high sloping sections	Sections of stations 9+180 to 11+240, 11+240 to 11+600, 13+580 to 13+740, 13+740 to 14+600,14+020 to 16,440, 16+600 to 16,760+ 16+840 to 17,000	Project owner	$4,012.00	Construction Stage	Reduction of impacts generated by modification of surface drainage.

IMPLEMENTATION STAGE	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	MEASURE MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF ENVIRONMENTAL MEASURE	PERSONNEL RESPONSIBLE FOR IMPLEMENTATION	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
CONST	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalted concrete pavements, misc.: sidewalks, barriers and others.	Possible impact on cultural-interest sites	2.7 Monitoring, rescue and / or recovery of cultural-interest sites	Perform rescue, recovery or additional walkthroughs at potential archaeological-interest sites	Location of archeological-interest sites: 4+100, 5+020, 5+500, 6+000, 7+700, 9+310, 9+700, 9+750, 17+200, 19+750	Project owner	$ 16,600.00	Construction Stage	Protection of cultural-interest sites.
CONST	Supply of materials, earthworks, construction of tunnels, bridges and at-grade crossings, slopes treatment, most construction activities.	Noise caused by supplying and general construction activities	2.8 Setting up schedules, signage and training in populated areas	Set hours of 6 am to 6 pm and other noise reduction measures. Conduct signage and training	Throughout the project path and area of indirect influence at a distance of 100 m from the edge of the area of direct influence, where there are more people residing or conducting commercial activities.	Project owner	$ 1,802.72	Construction Stage	Noise emission reduction
CONST.	Earthworks, construction of tunnels, bridges and at-grade crossings, slope treatment.	Possible impact on forests and / or trees and proposed protected area	2.9 Measures to protect forests, soils and proposed protected area.	Demarcating work areas, protection of existing flora and fauna, and wildlife rescue	Indirect influence area of the project, with a high proportion of trees and sections of secondary forest, stations: 3+500 to 4+100; and riparian forest sections, stations: 8+900, 13+000, 13+800, and areas with higher tree density	Project owner	$ 2,000.00	Construction Stage	Reducing impacts on forested areas.
CONST.	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Health risk due to outsiders during construction	2.10 Prevention of health impacts during construction	Campaigns for the prevention of HIV-AIDS, including workshops and testing	Area of direct influence along the path of the project where we find greater presence of residences or businesses.	Project owner	$ 14,877.00	Construction Stage	Preventing the spread of disease

IMPLEMENTATION STAGE	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	MEASURE MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF MEASURE MEASURE	PERSONNEL RESPONSIBLE FOR ITS IMPLEMENTATION	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
CONST.	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Impact on roads and access routes for residents	2.11 Maintenance of temporary roads	Provide maintenance to roads to be used for the storage of materials.	Roads to be used: Old road to Quelepa, road to Hacienda El Refugio, Housing Development of Hato Nuevo, road to Canton Las Delicias,	Project owner	529,907.50	Construction Stage	Reducing impacts on temporary roads.
CONST	Supply of materials. Earthworks. Construction of tunnels, bridges and at-grade crossings, slope treatment,	Possible contamination of soil and water by effluents, waste and residues from construction	2.12 Waste, residue and effluent management during construction	Waste and residue management and disposal, purchase and installation of garbage bins and installation of 80 portable toilets	Project camp and work fronts.	Project owner	$140,450 00	Construction Stage	Preventing contamination of soil and water through proper management of waste and residues.
CONST.	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Occupational hazards to employees during construction	2.13 Occupational safety measures during construction	Adaptation of prevention plan, fire extinguishers, signage and training	Project layout	Project owner	$ 2,880.00	Construction Stage	Reducing risk of injury to employees.
CONST.	Project Construction.	Hazard of floods, landslides, volcanic activity and fires	2.14 Risk prevention plan	Removal of loose rocks, construction of earth walls for small landslides	Risk areas identified: station 3+700. 9+500, 15+800 to 16+300 y 6+500 to 7+100.	Project owner	$51,600.00	Construction Stage	Prevent damage to areas prone to flooding, landslides, volcanic eruption and fires.
TOTAL FOR PROPOSED ENVIRONMENTAL MEASURES SECTION 1, CONSTRUCTION STAGE							**$1,419,016.88**		

TABLE No. IX.24. ENVIRONMENTAL MANAGEMENT PROGRAM OF SM BYPASS ROAD 2012, OPERATING STAGE

IMPLEMENTATION STAGE	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	MEASURE MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF ENVIRONMENTAL MEASURE	PERSONNEL RESPONSIBLE FOR ITS IMPLEMENTATION	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
OPERATING	Cutting down trees and shrubs	Reduced infiltration due to felling, reduction of riparian and secondary forests: trees, shrubs and wildlife, felling of trees, shrubs and grasses during site preparation	3.1 Maintenance of planted trees and shrubs	16.012 Maintenance of 16,012 planted trees and 4,154 shrubs	Base of cut and/or fill slopes in opening section: 15.105 trees; roundabouts and triangles: 907 trees and 4.154 shrubs.	Project owner	$91.667.04	Two years during operation	Improved vegetation cover in the project area, compared to conditions before the project.
OPERATING	Maintenance of right of way	Continuous replacement of succession species and a higher probability of invasive species becoming established.	3.2 Integrated vegetation management	An integrated vegetation management plan has to be implemented, using larger vegetation species to provide habitats to plants and animals. Planting native species and removing invasive species Avoid using chemical herbicides. Maintenance and vetiver grass on slopes	Secondary forest sections, Station 3+500 to 4+100 and riparian forest sections 8+900, 13+000, 13+800, and areas with higher tree density. All slopes with grass and / or vetiver	Project owner	$162,156 18	Operating stage	Reduce the fringe effect and protect the semi-natural habitats found.
OPERATING	Road maintenance	Occupational hazards to employees during maintenance works	3.3 Occupational safety and waste and residue management during maintenance	Adaptation of prevention plan, fire extinguishers, signage and training	Project layout	Project owner	$320,00	Operating stage	Prevent soil and water pollution and accident prevention among project workers
OPERATING	Road Maintenance	Deterioration of protective walls in waterways, drainages and embankments.	3.4 Review and periodic maintenance of protection walls in waterways, drainages and embankments.	Inspection and possible maintenance of protection walls in watercourses every 6 months.	Throughout the project	Project owner (FOVIAL)	5 63,750.00	Operating stage.	Reduce possible risks to waterways where protection works have been built

IMPLEMENTATION STAGE	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF ENVIRONMENTAL MEASURE	PERSONNEL RESPONSIBLE FOR ITS IMPLEMENTATION	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
TOTAL OF PROPOSED ENVIRONMENTAL MEASURES – SECTION 1, OPERATING STAGE							$317,893.22		

IX.3.1.2 Schedule of Implementation of Environmental Management Program

Following is the environmental measures execution Schedule for each one of the prevention, mitigation and compensation environmental measures proposed for the CONSTRUCTION and OPERATIONS phases which are presented. The programming time for each one of the Project activities and the environmental measures determined for the Environmental Management Program according to each one of the phases to be developed and according to the timeframes planned.

TABLE No. IX.25. SCHEDULE OF IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PROGRAM - SM BYPASS ROAD 2012, SITE PREPARATION STAGE SITE AND CONSTRUCTION

IMPLEMENTATION STAGE	ENVIRONMENTAL MEASURE	IMPLEMENTATION TIME IN MONTHS																												Amount
		YEAR 1												YEAR 2												YEAR 3						
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	
CONSTRUCTION: SITE PREPARA	1.1 Revegetation to offset for felling																															$90,017.52
CONSTRUCTION: SITE PREPARATION	1.2 Training and support to agroforestry projects.																															$2,261.00
CONST: SITE PREPARATION	1.3 Pedestrian crossings and road safety																															$205,840.00
CONST: SITE PREPARATION	1.4 Temporary drainages during site preparation site																															$18,060.00
CONST: SITE PREPARATION	1.5 Minimize impact on proposed protected area.																															$33,400.00
CONST: SITE PREPARATION	1.6 Signage for cattle crossings																															$550.00
SITE PREPARATION and CONSTRUC	1.7 Project social and environmental management																															$72,234.00
CONST: SITE PREPARATION	1.8 Measures to protect wildlife during site preparation.																															$950.00

IMPLEMENTATION STAGE	ENVIRONMENTAL MEASURE	IMPLEMENTATION TIME IN MONTHS	Amount
		YEAR 1: 1 2 3 4 5 6 7 8 9 10 11 12 / YEAR 2: 1 2 3 4 5 6 7 8 9 10 11 12 / YEAR 3: 1 2 3 4 5 6	
CONST: SITE PREPARATION	Offsetting 1.9 Supporting small businesses		$2,400.00
CONST: SITE PREPARATION	Prevention 1.10 Effluent, waste and residue management during site preparation, filling of wells		$10,980.00
CONST: SITE PREPARATION	Prevention 1.11 Prevention of health impacts during site preparation.		$1,641.00
CONST: SITE PREPARATION	Prevention 1.12 Occupational Safety measures during site preparation		$3,270.00
CONST	Offsetting 2.1 Offsetting for impermeabilization and felling of areas		$110,718.64
CONST	Mitigation 2.2 Dust control.		$145,565.20
CONST	Prevention 2.3 Slope management		$388,740.30
CONST	Prevention 2.4 Collection and reuse of topsoil		$52,080.00
CONST	Prevention 2.5 Noise reduction measures		$16,180,00

IMPLEMENTATION STAGE	ENVIRONMENTAL MEASURE	IMPLEMENTATION TIME IN MONTHS	Amount
		YEAR 1: 1 2 3 4 5 6 7 8 9 10 11 12 / YEAR 2: 1 2 3 4 5 6 7 8 9 10 11 12 / YEAR 3: 1 2 3 4 5 6	
CONST	Prevention 2.6 Maintenance of temporary drainage during construction.		$4,012.00
CONST	Prevention 2.7 Monitoring, rescue and / or recovery of cultural-interest sites		$ 16,600.00
CONST.	Attenuation 2.8 Setting up schedules, signage and training in populated areas		$1,802.72
CONST	Prevention 2.9 Measures to protect forests, soils and proposed protected area.		$2,000.00
CONST	Prevention 2.10 Prevention of health impacts during construction		$14,877.00
CONST	Prevention 2.11 Maintenance of temporary roads		$29,907.50
CONST	Prevention 2.12 Waste, residue and effluent management during construction		$140,450.00

STAGE IMPLEMENTATION	ENVIRONMENTAL MEASURE	IMPLEMENTATION TIME IN MONTHS																												Amount
		YEAR 1												YEAR 2												YEAR 3					
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	
CONST	2.13 Occupational safety measures during construction																															$2,880.00
CONST	2.14 Risk prevention plan																															$51,600.00
																													TOTAL			$1,419,016.88

TABLE No. IX.26. SCHEDULE OF IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PROGRAM - SM BYPASS ROAD 2012, STAGE: OPERATION

Implementation Stage	Environmental Measure	Implementation Time in Quarters								Amount
		Year 1				Year 2				
		1	2	3	4	1	2	3	4	
Operation	Offsetting 3.1. Maintenance of planted trees and shrubs									$91,667.04
Operation	Prevention 3.2 Integrated vegetation management									$162,156.18
Operation	Prevention 3.3 Occupational safety and waste and residue management during maintenance									$ 320.00
Operation	Prevention 3.4 Review and periodic maintenance of protection walls in waterways, drainages and embankments.									$ 63,750.00
									TOTAL	$317,893.22

IX.3.1.3 Description of monitoring and execution summary table

In every one of the Project phases there will be monitoring, which purpose is to guarantee the efficiency and effectiveness of the measures and controls implemented, allowing, through a periodical evaluation, to adopt corrective measures for the implementation of the same. The frequency of the monitoring will be determined by the nature of the project.

The company that is awarded the Project construction will be responsible of the monitoring, which can be implemented through technicians appointed by the company or through an accredited laboratory that the consultant will propose, as well as the standards that will be used for this effect. Each one of the Project phases is presented separately: CONSTRUCTION AND OPERATIONS.

TABLE No. IX.27. SUMMARY TABLE OF APPLICATION OF MONITORING MEASURES DURING CONSTRUCTION STAGE - SM BYPASS 2012

Execution Stage	**Environmental Measure**	**Parameters to consider**	Place or point of monitoring	**Frequency of monitoring**	Method to use	Personnel responsible for monitoring	**Interpretation of results**	**Feedback**	Reference in the text of the description of the impact
CONST: SITE PREPARATION	Offsetting 1.1 Revegetation for offsetting for tree felling	Number of individuals and species	Revegetation sites: Project areas	Semiannual	Visual inspection and recording the number of trees in poor condition or lost	Project owner	Trees and shrubs in good condition and settled in	Maintenance of vegetation and replacement of individuals	IX-7
CONST: SITE PREPARATION	Attenuation 1.2 Training for improved crops, soil and agroforestry,	Improved crop management in terms of performance, additional income	Sections: 0+00-0+500, 1+000-3+000,4+000-8+500,9+000-12+000,12+500-13+500, 14+000-20+000, 21+000-21+500.	Semiannual	Survey to beneficiaries	Project owner	Check for improvement in vegetation cover, yields and income to beneficiaries of the measure	Enhance training with people who have yet to achieved the objectives	IX-19
CONST: SITE PREPARATION	Prevention 1.3 Pedestrian crossings and road safety	Use of crossings and accident log	Location of crossings	Daily during construction	Survey to beneficiary population	Project owner	Minimize accidents and improve road safety knowledge	Enhance road safety talks	IX-20
CONST: SITE PREPARATION	Prevention 1.4 Temporary drainages during site preparation	Presence or erosion processes or gullies, poor drainage	The entire path of the project from station 4+000 to station 21+800	Monthly	Visual inspection and photographic record	Project owner	No presence of gullies or erosion processes	Cleaning and maintenance of drainages or installing new gutters or canals	IX-23
CONST: SITE PREPARATION	Mitigation 1.5 Minimize impact on proposed protected area.	State of proposed protected area	Station 0+880 to 0+960	Quarterly	Visual inspection and photographic report based on vegetation inventory	Project owner	Check for impacts to the area	Enhance training to workers regarding protection of the area	1X25
CONST: SITE PREPARATION	Attenuation 1.6 Signage for cattle crossings	Awareness of cattle crossings and their use by beneficiaries	Sections with cattle pastures and crossings proposed	On completion of construction of cattle crossings	Survey to beneficiary population	Project owner	Verify the use of the proposed crossings	Inform the public of existing crossings to promote their use	IX-26
CONST: SITE PREPARATION	Prevention 1.7 Project social and environmental management	Corroborate information provided by the population about the project and conflicts arising thereof	Walkthrough of the project and area of influence	Semiannual	Survey to population and evaluation and resolution of complaints	Project owner	Verify that information on the project and conflict resolution has been provided	Improve the means of informing the public and handling complaints	IX-28

Execution Stage	Environmental Measure	Parameters to consider	Place or point of monitoring	Frequency of monitoring	Method to use	Personnel responsible for monitoring	Interpreting the results	Feedback	Reference in the text of the description of the impact
CONST: SITE PREPARATION	Prevention 1.8 Measures to protect wildlife during site preparation.	Presence of wildlife to protect in the area	Secondary forest sections, station: 3+500 to 4+100; and riparian forest sections, stations 8+900, 13+800, 13+800 and areas with greatest tree density	Semiannual	Sampling of wildlife at affected area, surveying of wildlife plots	Project owner	Check for the presence of wildlife species	Enhanced training to project workers on wildlife protection and establish barriers in sensitive areas	IX-33
CONST: SITE PREPARATION	Compensation 1.9 Supporting small businesses	Keeping businesses in operation	Station 0+00 to 3+000, extension section, and station 8+700.	Monthly, during works in this section	Survey to owners or managers of businesses	Project owner	Minimization of impacts on commercial activity.	Collaborate with other measures to keep businesses in operation	IX-36
CONST: SITE PREPARATION	Prevention 1.10 Effluent, waste and residue management during site preparation and filling of existing wells.	Proper waste management and evacuation to authorized sites or sale to companies for reuse	Project camp and work fronts.	Monthly	Visual inspection and photographic record of waste outlets	Project owner	Preventing contamination of soil and water through proper management of waste	Enhance employee training and site housekeeping	IX-38
CONSTRUCTION: SITE PREPARATION	Prevention 1.11 Prevention of health impacts during site preparation.	Increase of disease among resident population and project workers	Area of indirect influence along the path of the project where we find greater presence of residences or businesses.	Semiannual	Log of diseases reported by workers and patient visits to area clinics	Project owner	Check for increase in foreign diseases	Enhanced training in prevention measures	IX-41
CONST: SITE PREPARATION	Prevention 1.12 Occupational Safety measures during site preparation	Log of accidents and incidents	Project layout	Monthly	Log	Project owner	Reduced risks to employees' health.	Purchasing of protective equipment and improving workers' awareness	1X43
CONST.	Compensation 2.1 Offsetting for impermeabilization and felling of areas	Length of fencing and site maintenance	Fenced sites: El Socorro ANP	Semiannual	Visual inspection of the number of meters of fencing	Project owner	Amount and state of fences.	Maintenance of fences	IX-46
CONST.	Mitigation 2.2 Dust control.	Dust in the area of influence of the project caused by construction works	4 monitoring points where the baseline was conducted	Monthly	Analysis of particulate matter in ambient air	Project owner	Levels of particles less than 260 $\mu g/m^3$ according to SALVADORAN STANDARD NSO 13.11.01:00	increase dust control measures in the affected areas	IX-49

Execution Stage	Environmental Measure	Parameters to consider	Place or point of monitoring	Frequency of monitoring	Method to use	Personnel responsible for monitoring	Interpreting the results	Feedback	Reference in the text of the description of the impact
CONST.	2.3 Slope management	Check for stability of slopes, landslides, tension cracks and presence of erosion	Sections with cut and fill slopes.	Quarterly, three years after project completion	Visual inspection and verification using surveying equipment if in doubt	Project owner	Check slopes for good condition	Check for slope stability through analysis	IX-S2
CONST.	2.4 Collection and reuse of topsoil	Inspection of topsoil management: storage site, mixing of soil horizons, etc.	Rural plots along the project walkthrough.	Monthly	Photographic record of inspection	Project owner	Prevention of pollution or alteration of topsoil.	Enhanced management training with workers	IX-55
CONST.	2.5 Noise reduction measures	Noise levels	Station 3+740, 3+900, 5+360, 8+260,12+460 and 13+140.	Monthly	Measurement of noise dB(A)	Project owner	Noise levels should not increase by more than 5 dB (A) near existing homes along the path of the project	Implement noise barriers	IX-56
CONST.	Prevention 2.6 Maintenance of temporary drainage during construction.	presence or erosion processes and gullies, poor drainage	Construction camp and alongside project path from the station 4+000 to 21+800	Monthly	Visual inspection and photographic record	Project owner	No presence of gullies or erosion processes	Cleaning and maintenance of drainages or installing new gutters or canals	IX-59
CONST.	Prevention 2.7 Monitoring, rescue and / or recovery of cultural-interest sites	State of identified sites and application of measures	Location of archeological-interest sites: 4+100, 5+020, 5+500, 6+000, 7+700, 9+310, 9+700, 9+750, 17+200, 19+750	Semiannual	Register of surveys, rescues and / or walkthroughs made	Project owner	Protection of cultural-interest sites.	Improving protection measures	IX-60
CONST.	Prevention 2.8 Setting up schedules, signage and training in populated areas	Inconveniences to the population	Alongside the entire path of the project and the area of indirect influence at a distance of 100 m from the edge of the area of direct influence.	Quarterly	Survey to residents	Project owner	Prevent major inconveniences due to noise emissions and vibrations	Increase the measures proposed	IX-62
CONST.	Prevention 2.9 Measures to protect forests, soils and proposed protected area.	State of vegetation, wildlife and soil	Forest and proposed protected area	Semiannual	Visual inspection and survey of wildlife plots	Project owner	Unaffected forest areas and proposed protected area	Enhanced protection measures	IX-64

Execution Stage	Environmental Measure	Parameters to consider	Place or point of monitoring	Frequency of monitoring	Method to use	Personnel responsible for monitoring	Interpreting the results	Feedback	Reference in the text of the description of the impact
CONST.	Prevention 2.10 Prevention of health impacts during construction	Increase of disease among resident population and project workers	Area of indirect influence along the path of the project where we find greater presence of residences or businesses.	Semiannual	Log of diseases reported by workers and patient visits to area clinics	Project owner	Check for increase in foreign diseases	Enhanced training in prevention measures	IX-66
CONST.	Prevention 2.11 Maintenance of temporary roads	Condition of temporary roads	Roads to be used: Old road to Quelepa, road to Hacienda El Refugio, streets in the Housing Development of Hato Nuevo, road to Canton Las Delicias,	Quarterly	Keep a record of visual inspections with photographs	Project owner	Roads in good condition	Improve with pothole repair, reconstruction of gutters and other measures	IX-69
CONST.	Prevention 2.12 Waste, residue and effluent management	Proper waste management and evacuation to authorized sites or sale to companies for reuse	Project camp and work fronts.	Monthly	Visual inspection and photographic record of waste outlets	Project owner	Preventing contamination of soil and water through proper management of waste	Enhance employee training and site housekeeping	IX-70
CONST.	Prevention 2.13 Occupational safety measures during construction	Log of accidents and incidents	Project layout	Monthly	Log	Project owner	Reduced risk of damage to health of employees.	Purchasing of protective equipment and improving workers' awareness	IX-72
CONST.	Prevention 2.14 Risk prevention plan	Event Log	Along entire project path	Monthly	Log of landslides, floods and other events	Project owner	Prevent harm to workers and the general population	Apply risk minimization measures, as appropriate.	IX-75

TABLE No. IX.28. MONITORING IMPLEMENTATION SUMMARY TABLE FOR SM BYPASS ROAD – 2012 OPERATING STAGE MEASURES

Execution Stage	**Environmental Measure**	**Parameters to consider**	**Place or point of monitoring**	**Frequency of monitoring**	**Method to use**	**Personnel responsible for monitoring**	**Interpreting the results**	**Feedback**	Reference in the text of the description the impact
CONST: SITE PREPARATION AND	3.1 Maintenance of planted trees and shrubs, related to Offsetting Measure 1.1.	Number of individuals and species	Revegetation sites: project areas	Semiannual	Visual inspection and recording the number of trees in poor condition or lost	Project owner	Trees and shrubs settled in and in good condition	Maintenance of vegetation and replacement of individuals	IX-78
OPERATING	3.2 Integrated vegetation management	State of vegetation, wildlife and soil	Secondary forest sections, stations 3+500 to 4+100; and riparian forest sections, stations 8+900,13+000, 13+800, 22+000 and areas with higher tree density.	Monthly during road maintenance	Visual inspection and survey of flora and fauna plots	Project owner	Unaffected forest areas and proposed protected area	Enhanced protection measures	IX-79
OPERATING	3.3 Occupational safety and waste and residue management during maintenance	Log of accidents and incidents	Project layout	Monthly	Log	Project owner	Reduced risk of damage to health of employees.	Acquisition of protection equipment and improvement of workers' awareness	IX-81
OPERATING	3.4 Regular checking and maintenance of protective walls on waterways, drainages and embankments.	Maintenance and assessments records	Project layout	Semiannual	Supervision and enforcement of maintenance	Project owner.	Decrease in deterioration of walls, drainages and embankments and accident prevention.	Care and maintenance of walls, slopes and drainages.	IX83

IX.3.2 Section 2: *CA1 (to La Union) to RN17*

IX.3.2.1 Environmental Management Program Summary

TABLE No. IX.29. ENVIRONMENTAL MANAGEMENT PROGRAM SM BYPASS ROAD STAGE CONSTRUCTION

IMPLEMENTATION STAGE	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	MEASURE MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF ENVIRONMENTAL MEASURE	PERSONNEL RESPONSIBLE FOR ITS IMPLEMENTATI	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
CONST : SITE PREPARATION	Cutting down trees and shrubs	Reduction of infiltration due to felling of riparian and secondary forest: trees, shrubs and wildlife Felling of trees, shrubs and grass during site preparation	Offsetting 1.1. Revegetation to compensate for felling	Planting of 1,765 trees and 859 shrubs	Base of cut and / or fill slopes of opening section, 1.675 trees; roundabouts and triangles 90 trees and 5,013 shrubs between trees in project sites	Project owner	$10,85318	Last six months of project construction	Improved vegetation cover in the project area, compared to conditions before the project.
CONST : SITE PREPARATION	Clearing, cleaning and grubbing.	Reduction of crops and agricultural areas	1.2 Training for improving crops, soil and agroforestry	Hiring a promoter for three months to provide technical advice to farmers and distribute leaflets	Section: 21+800-25+022.	Project owner	$ 439,00	Site preparation stage	Minimizing impacts from reduction of agricultural areas. Proper handling of crops.
CONST : SITE PREPARATION	Demolition of structures and others	Temporary impact on infrastructure: power poles, drinking water, drainages	1.7 Project social and environmental management	Establish an environmental management office to provide social assistance to the population, verify measures, carry out communication campaigns, etc.	Project walkthrough	Project owner	$11, 136.00	Site preparation stage	Prevent social conflicts and maintain good relations with neighbors of project Prevent inconveniences to the population, problems of access, property damage, accidents, etc. Provide accurate and timely information about the Project
CONST : SITE PREPARATION	Felling of trees and shrubs, clearing, cleaning and grubbing.	Possible impact on wildlife during site preparation	1.8 Measures to protect wildlife during site preparation,	Signage and staff training on respect for wildlife, and rescue wildlife found during walkthrough	Riparian forest sections, stations 22+000 and 24+800, and areas with greater tree density	Project owner	$750.00	Site preparation stage	Minimizing impacts on wildlife.

IMPLEMENTATION STAGE	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	MEASURE MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL	LOCATION OF MEASURE MEASURE	PERSONNEL RESPONSIBLE FOR ITS	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
CONST : SITE PREPARATION	Demolition of structures, setting up the working camp, felling, quarry management and installation of working camp	Possible contamination of soil and water by effluents, waste and residues from site preparation	Prevention 1.10. Effluent, waste and residue management during site preparation	Waste, residue and effluent management, installation of 3 portable toilets and 3 three garbage bins for 75 employees in this stage	Project camp and work fronts.	Project owner	$1,230.00	During demolition of structures	Preventing contamination of soil and water as well as the proliferation of vectors in the workspace of the project that may affect the local population or the workers themselves.
CONST : SITE PREPARATION	Demolition of existing structures, cutting of trees and shrubs, clearing, cleaning and grubbing, installation of working camp.	Health risk due to outsiders	1.11 Prevention of health impacts during site preparation.	Campaigns for the prevention of HIV-AIDS, including workshops and testing	Area of indirect influence along the path of the project where we find greater presence of residences or businesses.	Project owner	$259.00	Site preparation stage	Reduced risk of damage to population's health.
CONST : SITE PREPARATION,	Demolition of existing structures, cutting of trees and shrubs, clearing, cleaning and grubbing. Installation of camp.	Occupational hazards to employees during site preparation	1.12 Occupational Safety measures during site preparation	Adaptation of prevention plan, fire extinguishers, signage and training	Project layout	Project owner	$2,730.00	Site Preparation Stage site	Reduced risk of damage to health of employees.
CONST	Application of asphalt concrete paving, miscellaneous: sidewalks, barriers and others, construction of waystation	Reduction of infiltration from impermeabilization of areas	2.1 Offsetting for impermeabilization and felling of areas	Compensate for the reduction of infiltration by planting 150 trees in the same basin	Planting 150 trees on municipal lands	Project owner	$753.00	Construction Stage	Promoting infiltration through revegetation.
CONST	Supply of materials, earthworks. Construction of tunnels, bridges and at-grade crossings. Treatment of slopes.	Emissions to air from transportation, earthworks and excavation	2.2 Dust control.	Covering truck hoppers, maintenance of machinery and equipment, regular watering at least three times a day in areas with the largest population and roads being used temporarily	Unpaved sections of the project path and access ways used for the supply of materials: Road to Hacienda La Joya	Project owner	$26,897 20	Construction Stage	Reducing dust emissions
CONST.	Earthworks, construction of tunnels	Modification of natural relief	2.3 Management of	Management of cut slopes: geogrid and with	Sections with cut and fill slopes.	Owner of	$157,790,90	Construction stage	Prevent instability

STAGE EXECUTION	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF ENVIRONMENTAL MEASURE	PERSONNEL RESPONSIBLE FOR	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
	bridges and at-grade crossings, slope treatment.	Instability of soil due to cut slopes and fills Possible erosion processes	slopes	berms, gutters and earth and filling walls: 2H/1V slope, protective cover, berms, earth walls and gutters and vegetation cover under viaduct	full length of the project. Turfed areas under viaduct.	ITS project		tion	generated by cuts and fills, and erosion processes
CONST.	Earthworks	Change in soil quality: topsoil	2.4 Collection and reuse of topsoil	Separation, collection and reuse of topsoil.	Rural plots along the project walkthrough.	Project owner	$537.00	Construction Stage	Prevention of pollution or alteration of topsoil.
CONST	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Possible impact on cultural-interest sites	2.7 Monitoring, rescue and / or recovery of cultural-interest sites	Perform rescue, recovery or additional walkthroughs of potential archaeological and paleontological-interest sites	Location of archaeological-interest sites: 24+180, 24+630, 24+870.	Project owner	$5,200.00	Construction Stage	Protection of cultural-interest sites.
CONST.	Supply of materials, earthworks, construction of tunnels, bridges and at-grade crossings, slope treatment and most construction activities.	Noise caused by supplying and general construction activities	2.8 Setting up schedules, signage and training in populated areas	Set hours of 6 am to 6 pm and other noise reduction measures. Conduct signage and training	Along the whole path of the project and the indirect influence area at a distance of 100 m from the edge of the direct influence area, where there are more residences and businesses.	Project owner	$317.12	Construction Stage	Noise emission reduction
CONST	Earthworks, construction of tunnels, bridges and at-grade crossings, slope treatment.	Possible impact on forests and / or trees and proposed protected area	2.9 Measures to protect forests, soils and proposed protected area.	Demarcate working areas, protection of existing vegetation and fauna, and wildlife rescue	Project indirect influence area with greater proportion of trees, sections of riparian forest, stations 22+000 and 24+800, and areas with higher tree density	Project owner	$400,00	Construction Stage	Reducing impacts on forested areas.

IMPLEMENTATION STAGE	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	MEASURE MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF ENVIRONMENTAL MEASURE	PERSONNEL RESPONSIBLE FOR ITS IMPLEMENTATI	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
CONST.	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Health risk due to outsiders during construction	2.10 Prevention of health impacts during construction	Campaigns for the prevention of HIV-AIDS, including workshops and testing	Direct influence area along the path of the project where we find greater presence of residences and businesses.	Project owner	$2,223.00	Construction Stage	Preventing the spread of disease
CONST	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Impact on roads and access routes for residents	2.11 Maintenance of temporary roads	Provide maintenance to roads to be used for the storage of materials.	Road to Canton El Papalon and to Rio Grande near Hacienda La Joya.	Project owner	$6,257.50	Construction Stage	Reduction of impacts on temporary roads.
CONST.	Supply of materials, earthworks, construction of tunnels, bridges and at-level crossings, slope treatment.	Possible contamination of soil and water by effluents, waste and residues from construction	2.12 Waste, residue and effluent management during construction	Waste and residue management and disposal, purchase of garbage bins and installation of 80 portable toilets	Project camp and work fronts.	Project owner	$20,050.00	Construction Stage	Preventing contamination of soil and water through proper management of waste and residues.
CONST	Traffic control, supply of materials, earthworks, minor drainage works, major drainage works, slope treatment, application of asphalt concrete pavement, horizontal and vertical signaling, miscellaneous: sidewalks, barriers and others.	Occupational hazards to employees during construction	2.13 Occupational safety measures during construction	Adaptation of prevention plan, fire extinguishers, signage and training	Project layout	Project owner	$480.00	Construction Stage	Reducing risk of injury to employees.
CONST	Project Construction.	Fire hazard	2.14 Risk prevention plan	coordination with sugarcane farms	Identified risk areas: stations 23+500 to 23+900 and 23+100 to 23+500.	Project owner	$ 6,000.00	Construction Stage	Prevent damage to areas from burning sugarcane for harvesting

IMPLEMENTATION STAGE	. PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF ENVIRONMENTAL MEASURE	PERSONNEL RESPONSIBLE FOR ITS IMPLEMENTATI	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
TOTAL FOR PROPOSED ENVIRONMENTAL MEASURES SECTION 2, CONSTRUCTION STAGE							5254,302.90		

TABLE No. IX.30. ENVIRONMENTAL MANAGEMENT PROGRAM - SM BYPASS ROAD 2012, OPERATING STAGE

IMPLEMENTATION STAGE	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF ENVIRONMENTAL MEASURE	PERSONNEL RESPONSIBLE FOR ITS IMPLEMENTATION	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
OPERATING	Cutting down trees and shrubs	Reduced infiltration due to felling, reduction of riparian and secondary forests: trees, shrubs and wildlife, felling of trees, shrubs and grasses during site preparation	3.1 Maintenance of planted trees and shrubs	Maintenance of 1,765 planted trees and 859 bushes and 150 trees to compensate for the loss of infiltration, during two years	Land proposed for El Socorro ANP, 150 trees; compensation for impermeabilization, base of cut and / or fill slopes in opening section, 1,6575 trees; roundabouts and triangles, 90 trees; and 859 shrubs between trees in the project sites	Project owner	$11,163.36	Two years during operation	Improved vegetation cover in the project area, compared to conditions before the project,
OPERATING	Maintenance of right of way	Continuous replacement of succession species and a higher probability of invasive species becoming established.	3.2 Integrated vegetation management	An integrated management of vegetation should be implemented including the use of the larger species to provide habitats for plants and animals. Planting native species and removing invasive species. Avoid the use of chemical herbicides. Maintenance of grass and vetiver	Riparian forest sections, stations 22+000 and 24+800 and areas with higher tree density. Areas with vetiver grass along the entire length of the section.	Project owner	$94,896.54	Operating stage	Reduce the fringe effect and protect the semi-natural habitats found.
OPERATING	Road maintenance	Occupational hazards to employees during maintenance works	3.3 Occupational safety and waste and residue management during maintenance	Adaptation of prevention plan, fire extinguishers, signage and training	Project layout	Project owner	$ 160.00	Operating stage	Prevent soil and water pollution and prevent accidents among project workers

IPLEMENTATION STAGE	PROJECT ACTIVITY	DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACT	ENVIRONMENTAL MEASURE	DESCRIPTION OF PROPOSED ENVIRONMENTAL MEASURE	LOCATION OF ENVIRONMENTAL MEASURE	PERSONNEL RESPONSIBLE FOR ITS IMPLEMENTATION	CALCULATED COST OF ENVIRONMENTAL MEASURE	MOMENT OF IMPLEMENTATION	EXPECTED OUTCOME
OPERATING	Road Maintenance	Deterioration of protective walls in waterways, drainages and embankments	3.4 Review and periodic maintenance of protection walls in waterways, drainages and embankments.	Inspection every 6 months of protective walls in waterways for possible maintenance,	Throughout the project	Project owner (FOVIAL)	$ 9,600.00	Operating stage.	Reduce possible risks to waterways where protection works have been built
TOTAL OF PROPOSED ENVIRONMENTAL MEASURES - SECTION 2 - OPERATING STAGE							$115, 819.90		

IX.3.2.2 Schedule of Implementation of Environmental Management Program

The environmental measures program implementation Schedule is presented for each one of the prevention, mitigation and compensation environmental measures proposed for the CONSTRUCTION and OPERATIONS phases' separately. The timetable programming for each one of the Project activities and of the environmental measures determined for the Environmental Management Program is included, according to each one of the phases to be developed, and according to timeframes planned.

TABLE No. **IX.31.** SCHEDULE OF IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PROGRAM - SM BYPASS ROAD 2012, SITE PREPARATION STAGE

SITE AND CONSTRUCTION

IMPLEMENTATION STAGE	ENVIRONMENTAL MEASURE	IMPLEMENTATION TIME IN MONTHS	Amount
		YEAR 1: 1 2 3 4 5 6 7 8 9 10 11 12 / YEAR 2: 1 2 3 4 5 6 7 8 9 10 11 12 / YEAR 3: 1 2 3 4 5 6	
CONST: SITE PREPARATION	1.1 Revegetation to offset for felling		$10,853 18
CONST: SITE PREPARATION	1.2 Training and support for agroforestry projects,		$ 439,00
SITE PREPARATION and CONSTRU	1.7 Project social and environmental management		$11,136.00
CONST: SITE PREPARATION	1.8 Measures to protect wildlife during site preparation.		$750.00
CONSTRUCTION: SITE PREPARATION	1.10 Effluent, waste and residue management during site preparation		$1,230 00
CONSTRUCTION: SITE PREPARATION	1.11 Prevention of health impacts during site preparation.		$259 00
CONST: SITE PREPARATION	1.12 Occupational Safety measures during site preparation		$2,730 00

IMPLEMENTATION STAGE	ENVIRONMENTAL MEASURE	IMPLEMENTATION TIME IN MONTHS	Amount
		YEAR 1: 1 2 3 4 5 6 7 8 9 10 11 12 / YEAR 2: 1 2 3 4 5 6 7 8 9 10 11 12 / YEAR 3: 1 2 3 4 5 6	
CONST	2.1 Offsetting for impermeabilization and felling of areas		$753.00
CONST	2.2 Dust control.		$26,897.20
CONST	2.3 Slope management		$157,790.90
CONST	2.4 Collection and reuse of topsoil		$537 00
CONST	2.7 Monitoring, rescue and / or recovery of cultural-interest sites		55,200,00
CONST	2.8 Setting up schedules, signage and training in populated areas		$317,12
CONST	2.9 Measures to protect forests, soils and proposed protected area.		$400.00
CONST	2.10 Prevention of health impacts during construction		32,223.00
CONST	2.11 Maintenance of temporary roads		$6,257.50
CONST	2.12 Waste, residue and effluent management during construction		$20,050.00
CONST	2.13 Occupational safety measures during construction		$480.00

IMPLEMENTATION STAGE	ENVIRONMENTAL MEASURE	IMPLEMENTATION TIME IN MONTHS																												Amount
		YEAR 1												YEAR 2												YEAR 3					
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	
CONST	2.14 Risk prevention plan																															$6,000.00
																														TOTAL		$254,302.90

TABLE No. IX.32. SCHEDULE OF IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PROGRAM - SM BYPASS ROAD 2012, OPERATING STAGE

Implementation Stage	Environmental Measure	Implementation Time in Quarters								Amount
		Year 1				Year 2				
		1	2	3	4	1	2	3	4	
Operation	Offsetting 3.1. Maintenance of planted trees and shrubs									$11,163.36
Operation	3.2 Integrated vegetation management									$94,896.54
Operation	Prevention 3.3. Occupational safety and waste and residue management during maintenance									$160.00
Operation	3.4 Review and periodic maintenance of protection walls in waterways, drainages and embankments.									$9,600,00
									TOTAL	**$115,8195.90**

IX.3.2.3 Summary Table of Monitoring Implementation

In every one of the Project phases there will be monitoring, which purpose is to guarantee the efficiency and effectiveness of the measures and controls implemented, allowing, through a periodical evaluation, to adopt corrective measures for the implementation of the same. The frequency of the monitoring will be determined by the nature of the project.

The company that is awarded the Project construction will be responsible of the monitoring, which can be implemented through technicians appointed by the company or through an accredited laboratory that the consultant will propose, as well as the standards that will be used for this effect. Each one of the Project phases is presented separately: CONSTRUCTION AND OPERATIONS.

TABLE No. IX.33. SUMMARY TABLE OF MONITORING IMPLEMENTATION – SM BYPASS ROAD 2012, MEASURES UNDERTAKEN DURING CONSTRUCTION STAGE

Execution Stage	Environmental Measure	Parameters to consider	Place or point of monitoring	Frequency of monitoring	Method to use	Personnel responsible for monitoring	Interpreting the results	Feedback	Reference in the text of the description of the impart
CONST: SITE PREPARATION	1.1 Revegetation for offsetting for tree felling	Number of individuals and species	Revegetation sites: project areas and land proposed for revegetation	Semiannual	Visual inspection and recording the number of trees in poor condition or lost	Project owner	Trees and shrubs in good condition and settled in	Maintenance of vegetation and replacement of individuals	IX-7
CONSTRUCTION: SITE PREPARATION	1.2 Training for improved crops, soil and agroforestry.	Improved crop management in terms of performance, additional income	Sections: 22+000-23+500, 24+800-25+022.	Semiannual	Survey to beneficiaries	Project owner	Check for improvement in vegetation cover, yields and income to beneficiaries of the measure	Enhance training with people who have yet to achieved the objectives	IX-19
CONST: SITE PREPARATION	1.7 Resettlement action plan	State of the resettlement process	Proposed site for the relocation of persons	Quarterly, until completion of resettlement process	Survey to resettlers	Project owner	Relocation of people in conditions pursuant to PAR	The Project Owner reports to the Project Manager on identified problems in order to solve them	IX-28
CONST: SITE PREPARATION	1.8 Measures to protect wildlife during site preparation.	Presence of wildlife to protect in the area	Riparian forest sections, stations 22+000 and 24+800, and areas with greater tree density	Semiannual	Sampling of wildlife at affected area, surveying of wildlife plots	Project owner	Check for the presence of wildlife species	Enhanced training to project workers on wildlife protection and establish barriers in sensitive areas	IX-33
CONST: SITE PREPARATION	1.10 Measures to protect wildlife during site preparation.	Presence of wildlife to protect in the area	Riparian forest sections: 22+000 and 24+800 and areas with higher tree density	Semiannual	Sampling of wildlife at affected area, surveying of wildlife plots	Project owner	Check for the presence of wildlife species	Enhanced training to project workers on wildlife protection and establish barriers in sensitive areas	IX-38
CONSTRUCTION: SITE PREPARATION	1.11 Prevention of health impacts during site preparation.	Increase of disease among the local population and project workers.	Indirect influence area along the path of the project where there is higher population density.	Semiannual	Log of diseases reported by workers and patient visits to area clinics	Project owner	Check for increase in foreign diseases	Enhanced training in prevention measures.	IX-41

Stage Implement ation	Environmental Measure	Parameters to consider	Place or point of monitoring	Frequency of monitoring	Method to use	Personnel responsible for monitoring	Interpreting the results	Feedback	Reference in the text of the description of the
CONST: SITE PREPARA TION	1.12 Effluent, waste and residue management during site preparation	Proper waste management and evacuation to authorized sites or sale to companies for reuse	Project camp and work fronts.	Monthly	Visual inspection and photographic record of waste outlets	Project owner	Preventing contamination of soil and water through proper management of waste	Enhance employee training and site housekeeping	IX-43
CONST.	2.1 Offsetting for impermeabilization and felling of areas	Number of meters of fencing	Compensation sites: El Socorro ANP, Yayantique, La Union	Semiannual	Visual inspection and record of number of meters of fencing	Project owner	Number of meters of fencing and maintenance thereof	Maintenance of fence by rangers	IX-46
CONST.	2.2 Dust control.	Dust in the area of influence of the project caused by construction works	1 monitoring point where baseline was conducted	Monthly	Analysis of particulate matter in ambient air	Project owner	Particle levels less than 260 $\mu g/m^3$, according to SALVADORAN STANDARD NSO 13.11.01:00	Increasing dust control measures in the affected area	IX-49
CONST.	2.3 Slope management	Check for slope stability, landslides, tension cracks and presence of erosion processes	Sections with cut and fill slopes.	Quarterly, three years after project completion	Visual inspection and verification using surveying equipment if in doubt	Project owner	Check slopes for good condition	Check for slope stability through analysis	IX-52
CONST.	2.4 Collection and reuse of topsoil	Inspection of topsoil management: storage site, mixing of soil horizons, etc.	Rural plots along the project walkthrough.	Monthly	Photographic record of inspection	Project owner	Prevention of pollution or alteration of topsoil.	Enhanced management training with workers	IX-55
CONST.	2.7 Monitoring, rescue and / or recovery of cultural-interest sites	State of identified sites and application of corresponding measures	Location of archaeological-interest sites, stations 24+180, 24+630, 24+870.	Semiannual	Register of surveys, rescues and / or walkthroughs made	Project owner	Protection of cultural-interest sites.	Improving protection measures	IX-60
CONST.	2.8 Setting up schedules, signage and training in populated areas	Inconveniences to the population	Alongside the entire path of the project and the area of indirect influence at a distance of 100 m from the edge of the area of direct influence.	Quarterly	Survey to residents	Project owner	Prevent major inconveniences due to noise emissions and vibrations	Increase the measures proposed	IX-62
CONST.	2.9 Measures to protect forests, soils and proposed protected area.	State of vegetation, wildlife and soil	Forests	Semiannual	Visual inspection and survey of wildlife plots	Project owner	Unaffected forest areas and proposed protected area	Enhanced protection measures	IX-64

Execution Stage	Environmental Measure	Parameters to consider	Place or point of monitoring	Frequency of monitoring	Method to use	Personnel responsible for monitoring	Interpreting the results	Feed back	Reference in the text of the description of the impact
CONST.	2.10 Prevention of health impacts during construction	Increase of disease among resident population and project workers	Area of indirect influence along the path of the project where we find greater presence of residences or businesses.	Semiannual	Log of diseases reported by workers and patient visits to area clinics	Project owner	Check for increase in foreign diseases	Enhanced training in prevention measures	IX-66
CONST.	2.11 Maintenance of temporary roads	Condition of temporary roads	Roads to close: Road to Hacienda La Joya.	Quarterly	Keep a log of visual inspections with photographs	Project owner	Roads in good condition	Improve with pothole repair, reconstruction of gutters and other measures	IX-69
CONST.	2.12 Waste, residue and effluent management	Proper waste management and evacuation to authorized sites or sale to companies for reuse	Project camp and work fronts.	Monthly	Visual inspection and photographic record of waste outlets	Project owner	Preventing contamination of soil and water through proper management of waste	Enhance employee training and site housekeeping	IX-70
CONST.	2.13 Occupational safety measures during construction	Log of accidents and incidents	Project layout	Monthly	Log	Project owner	Reduced risk of damage to health of employees.	Purchasing of protective equipment and improving workers' awareness	IX-72
CONST.	2.14 Risk prevention plan	Event Log	The entire path of the project	Monthly	Log of landslides, floods and other events	Project owner	Prevent harm to workers and general population	Apply risk minimization measures, as appropriate.	IX-75

TABLE No. IX.34. MONITORING IMPLEMENTATION SUMMARY TABLE FOR SM BYPASS ROAD – 2012 OPERATING STAGE MEASURES

Stage Implementation	Environmental Measure	Parameters to consider	Place or point of monitoring	Frequency of monitoring	Method to use	Personnel responsible for monitoring	Interpreting the results	Feedback	Reference in the text of the description of the impact
OPERATING	3.1 Maintenance of planted trees and shrubs 1.1	Number of individuals and species	Revegetation sites: project areas and land proposed for revegetation.	Semiannual	Visual inspection and recording the number of trees in poor condition or lost	Project owner	Trees and shrubs in good condition and settled in	Maintenance of vegetation and replacement of individuals	IX-78

OPERATING	3.2 Integrated vegetation management	State of vegetation, wildlife and soil	Riparian forest sections, stations 22+000 and 24+800 and areas with higher tree density.	Monthly during road maintenance	Visual inspection and survey of wildlife plots	Project owner	Unaffected forest areas and proposed protected area	Enhanced protection measures	IX-79
OPERATING	3.3 Occupational safety and waste and residue management during maintenance	Log of accidents and incidents	Project layout	Monthly	Log	Project owner	Reduced risk of damage to health of employees.	Purchasing of protective equipment and improving workers' awareness	IX-81
OPERATING	3.4 Regular checking and maintenance of protective walls on waterways, drainages and embankments.	Maintenance and assessments records	Project layout	Semiannual	Supervision and enforcement of maintenance	Project owner.	Decrease in deterioration of walls, drainages and embankments and accident prevention.	Care and maintenance of walls, slopes and drainages.	IX-83