11 PLANS AND PROGRAMS

Find in this chapter management measures applied to the development of pre-construction, construction, operation, and maintenance activities of the Rumichaca-Pasto divided highway project, San Juan-Pedregal segment.

Programs, projects and activities are oriented to preventing, mitigating, correcting and compensating impacts generated by activities related to the construction of the road project in its different phases, as per the impacts identified and described in Chapter 8, Environmental Assessment, as well as the results of the Characterization of the area of influence (Chapter 5) and Description of the project (chapter 3).

The Environmental Management Plan – EMP is prepared taking into account the technical guidelines and the legal requirements established in the Terms of Reference for the preparation of the Environmental Impact Study for the road and/or tunnels construction project M-M-INA-04 (ANLA, 2015) adopted by means of Resolution 751 of 26 March 2015 by the Ministry of the Environment and Sustainable Development (MADS).

11.1 ENVIRONMENTAL MANAGEMENT STRUCTURE AND PROGRAMS

The content and description for each of the management data-sheets proposed are shown in the following Table 11.1.

Table - Content of management data sheets

ITEM	DESCRIPTION
OBJECTIVE	Explains in a specific and precise manner the objective it purports to put in place with the environmental management strategy.
GOAL	Present goals to reach, indicating the objective it purports to put in place with the environmental management strategy.
PHASE	Explains the timing of the project and where the proposed environmental management measures should be conducted.
SOCIO ENVIRONMENTAL IMPACTS TO MANAGE	Relates to the impacts generated by the different stages of the projects, indicating type, causes, affectation and implicit environmental risks of the activity.
TYPE OF MEASURE	States the character of the measure, such as: prevention, mitigation, correction and compensation.
ACTIONS TO DEVELOP	Corresponds to the description of the measures to put in place for the adequate management of impacts.
INDICATORS	Relates to establishing indicators that will show efficacy, efficiency and/or success of the measure.
PLACE OF APPLICATION	Indicates the places in which environmental management measures should be applied
EXECUTION TIMETABLE	Establishes the phase in which the measures will be executed.
QUANTIFICATION AND COSTS	Establishes the unit of measure, the quantity, unit cost and total cost.

Source: GEOCOL CONSULTORES S.A., 2017.

Table 11.2 shows the structure established by the Environmental Management Plan of the road project breaking up each of the data-sheets that comprise the different management programs.

Table - Structure of the Environmental Management Plan

ENVIRONMENT	PROGRAM	No.	NAME OF MANAGEMENT DATA-SHEET
ABIOTIC ENVIRONMENT	Management of Soil	1	Management and Disposal of Debris and Excavation Material
		2	Management of Slopes and Hills
		3	Management and Control of Erosion
		4	Management and Use of explosives
		5	DATA SHEET No. 5 MANAGEMENT AND TRANSPORT OF CONSTRUCTION MATERIALS
		6	DATA SHEET No. 6 MANAGEMENT OF RUNOFF
		7	Landscaping Management
		8	Management of Solid and Special Wastes
	Water resource management	9	Management of crossings over water currents
		10	Management of ground water, springs and birth waters
		11	Management and intake of surface water
		12	Management of Domestic and industrial liquid wastes
	Management of Air Resource	13	Management of Emission and Noise Sources
	MANAGEMENT OF SOIL RESOURCE	14	Soil recovery project
BIOTIC ENVIRONMENT	Management of biodiversity and ecosystem services	15	Management of stripping and topsoil
		16	Protection of wildlife
		17	Protection of flora
		18	Protection of sensitive ecosystems
		19	Management of revegetation in intervened areas
		20	Management for the compensation and affectation of topsoil
SOCIOECONOMIC ENVIRONMENT	Socioeconomic Management	21	Information and Community Participation
		22	Attention to users
		23	Accompaniment on land and social management
		24	Education and training of personnel hired by the project
		25	Training, education and awareness building to the community on the project's surroundings
		26	Road Safety Culture

Source: GEOCOL CONSULTORES S.A., 2017.

According to the identification, description (See Table 11.3) and valuation of impacts, as a result of the environmental assessment, it determines the mechanism for the prevention, mitigation, correction and compensation of impacts to be generated during the different project phases.

Table - Definition of impacts

ENVIRONMENT	ENVIRONMENTAL ELEMENT AFFECTED	ENVIRONMENTAL IMPACT	DESCRIPTION OF THE IMPACT
ABIOTIC	SOIL	Modification of soil stability	This impact refers to changes on the soil stability during the execution of different activities assessed.
		Change of physical-chemical and biological properties	Consists on physical, chemical and biological modifications that soil may suffer due to natural or anthropic intervention.
		Change in the use and potential use of soil	Consists on assessing the use of soil, according to the natural vocation or potential use of soil.
	Ground water.	Alteration of courses	Consists on valuing changes in natural watercourses of rivers and creeks, with respect to the different construction activities and the execution of other works assessed.
		Alteration in ground water quality	Consists on assessing ground water present as per its natural conditions and the effect of the works considering the different phases and aspects thereof.
		Variation on the availability of the surface water resource	Corresponds to the valuation of changes in the availability of surface water resource, according to the intervention of activities for the execution of the works contemplated.
		Variation of the contribution and transport of sediments	Related to the weighing of the variation of contribution and transport of sediments taking into account the assessed phases and aspects.
		Reduction in the transport capacity of surface water sources	Relates to the review of changes in the transport capacity of water sources with respect to the construction phases foreseen for the project.
	GROUND WATER	Alteration of the quality of ground water	Indicates the assessment of changes in quality values corresponding to ground water, taking into account the execution of works with their respective phases.
		Alteration of the flow network of ground waters	Relates to assessing the changes generated in the flow established in ground waters and the intervention of activities for the development of a series of phases assessed.
		Alteration of recharge zones	It refers to establishing a valuation on the alternation of water recharge zones with respect to the execution of construction activities in different aspects assessed.
	AIR	Modification of air quality due to gases	Variation in gas concentration, mainly from the combustion process, when it is above allowable limits in may generate changes in the area.
		Modification of air quality due to particulate matter	Variation in the typical concentration of particulate matter in an area, when these are above the allowable limits may lead to changes in the surroundings.

ENVIRONMENT	ENVIRONMENTAL ELEMENT AFFECTED	ENVIRONMENTAL IMPACT	DESCRIPTION OF THE IMPACT
		Generation of doors	The emission of odorous substances may generate concerns in the economy surrounding; bad odors may generate inconveniences in the surrounding area; these bad smells may be inconvenient, a cause of reject and may affect the quality of life of people and animals in the environment, therefore it is deemed as environmental contamination.
		Variation in sound pressure levels	Variation of noise intensity in the area determined by the development of many anthropic activities, such as the use of machinery, vehicles and equipment. When noise exceeds certain limits, it may generate changes in the displacement dynamics of fauna and inconveniences in the communities close to the emission source.
	LANDSCAPE	Changes in landscape integrity	Corresponds to changes in landscaping units due to the effect of the transformation of topsoil, and the increase of artificial and conflicting elements that reduce landscape integrity. These changes respond, in an open manner, to the direct use of soil, land movements, changes in topsoil and the development of activities in the project, which implies changes in the perception of the landscape for permanent and floating observers and quality and visual fragility.
BIOTIC	FLORA	Modification of topsoil structure	This impact refers to changes on natural topsoil, due especially to the result of surface activities.
		Changes on floristic structure and composition	This impact refers to changes on natural topsoil qualities due to project activities, specifically flora composition, disregarding the area's layout.
	FAUNA	Changes on the structure, extension and availability of wildlife fauna.	This impact is the result of a fragmentation and transformation of topsoil, which are key elements to provide habitats to different species; it consists on a reduction in the size of certain topsoil areas, or in an increase in the number of resulting habitat fragments, in addition to the evidence of distance increase between fragments. These events hinder exchanges b among isolated populations, as well as their recovery on account of colonization, vis-à-vis potential extinction.
		Changes in the composition and structure of fauna communities.	Human activities on natural ecosystems generate significant changes on animal species' habitats; which in turn affect, in a positive or negative manner, resident fauna communities; changes in animal diversity are the result of the reduction in size of population of affected organisms and reduced density of species (number of individuals per surface). Structure changes are related to modifications that may be generated in ecological interactions among species that make up animal communities and their relationship with plants.

ENVIRONMENT	ENVIRONMENTAL ELEMENT AFFECTED	ENVIRONMENTAL IMPACT	DESCRIPTION OF THE IMPACT
		Affectation of structural and functional connectivity of wildlife habitats	Structural connectivity understood as the way in which habitat patches are physically distributes and related in a landscaping matrix, and the functional connectivity understood as the capacity of landscape elements to facilitate a more effective movement of species, are to fundamental aspect for the functioning of the ecosystems and maintenance of dynamics and interactions between different animal and vegetable species. This connectivity may be affected by interventions conducted on topsoil, affecting not only habitats' availability but also access to resources available and dispersion, colonization and migration processes.
		Alteration of edaphic fauna	Soil is a normal constituent of nature with different components and organisms living therein. Any type of physical, chemical or biochemical alteration leads to the loss of essential animal elements to maintain the former.
		Changes in mobility patters of individuals.	Many fauna species show defined displacement territories and specific zones to access feed resources, shelter and reproductive areas. These patterns may become altered by an intervention in the natural environment, including actions such as the transformation of the habitat, incorporation of artificial structures, noise generation, thermal radiation, vehicle traffic and even human presence, which may be seen by some species as a potential threat, which must be avoided by changes in their displacement trajectories or foraging or shelter.
	HYDRO BIOLOGY	Changes on the composition and structure of hydro biological communities.	This impact is related to the alteration of habitat, on which many water species depend upon and different taxonomic groups for their development of a specific site of the water column and along the course or extension of the water body. Water species are highly sensitive to changes in their habitat conditions and with the respect to events that may alter, they may suffer death of some individuals or they might migrate to sites with improved conditions, which changes density or the presence of species and their distribution. Likewise it is worth mentioning that Hydro biological communities present in water ecosystems are important, as they constitute an essential element in the preservation of biodiversity.
		Alteration the habitat of Hydro biological communities	Water habitats are made up by internal elements such as physical conditions, concentration of dissolved substances or suspended and the presence of water communities, as well as external elements on the riverbed (vegetation, slopes and use of soil). Any alterations to these components may lead to important changes in the habitat structure and may affect its

ENVIRONMENT	ENVIRONMENTAL ELEMENT AFFECTED	ENVIRONMENTAL IMPACT	DESCRIPTION OF THE IMPACT
			composition, abundance and distribution of water species.
SOCIO ECONOMIC	ECONOMIC AND PRODUCTIVE STRUCTURE	Changes on population dynamics.	Consists on assessing that way in which The population structure is modified revolving around activities of the project.
		Changes on road accidents index	Consists on assessing the modification in the population structure of minor territorial units of the project, vis-à-vis mobilization activities of project's supplies, materials and personnel.
		Changes in and demand of goods and services	Consists on assessing the increase of reduction on the demand for goods and services offered in the region, generated by the displacement of people to the zone or due to the increase of revenues among the population.
		Fragmentation of land	Consists on analyzing the remaining area of different plots of land after defining the required area. Establishing if at the end they have the defined area to conduct productive activities.
		Changes to land prices	Consists on assessing Price variation per square meter or hectare for the execution of the project.
		Change on economic activities	Consists on assessing variations in traditional productive activities in the region as regards new activities generated by the execution of the project.
		Changes on employment dynamics	Consists on assessing that reduction or increase in the quality of life of the population taking into account basic aspects such as economic indicators defined it for this purpose as the Gini indicator,
		Changes on revenue levels	Consists on assessing variations in the revenue of resident population as a result of the execution of the project.
		Changes in the quality-of-life of the population	Variations, either reductions or increases in the quality-of-life of the population taking into account Basic aspects such as housing, education, Health, Manpower among others.
	SOCIAL INFRASTRUCTURE	Changes in the status of social infrastructure and public services (collective equipment, aqueduct, sewage, electric power, etc.)	It is described as the change generated on the current status (Quality and coverage) of social infrastructure and public services due to project development activities. Relates to the change in the quality and coverage of social services generated by revenues of people foreign who work in the road project.
		Changes in the status of road infrastructure	The project generates a change in the current status of road infrastructure used permanently by communities,

ENVIRONMENT	ENVIRONMENTAL ELEMENT AFFECTED	ENVIRONMENTAL IMPACT	DESCRIPTION OF THE IMPACT
			which impacts economic, cultural and education related activities. It is an impact that generates the continuous transit of heavy vehicles and other vehicles to places where relevant economic activities take places. There are changes in the behavior of the population, as roads are uses as means of trading and communication at township and municipal level.
	COMMUNITY	Generation of conflicts	Consists on mitigating the generation of conflicts due to activities of the project, which means in the preconstruction and construction stages.
		Generation of expectations	Consists on assessing the expectations that may arise, resulting from the negotiation of land and right of ways, as well as on account of goods and services.
		Changes in social relations	Social relations at Township level are modified buy large projects, which also contribute to the social management of community relations and even when they have not been impacted by large projects, the same may seek training and capacity building when faced with these types of projects.
	CULTURE	Changes on health of the population	Any change generated on people's health as a result of any activity related to the project.

Source: GEOCOL CONSULTORES S.A., 2017.

11.1.1 ABIOTIC ENVIRONMENT

Table 11-4 shows Management Programs performed for the abiotic environment, breaking down each of the technical data-sheets comprising each of them.

Table - Structure of the environmental management program for the abiotic environment

F	PROGRAM	NAME OF MANAGEMENT DATA-SHEET	No. No. EIA Data-sheet
ABIOTIC ENVIRONMENT	Management of Soil	Management and Disposal of Debris and Excavation Material	1
		Management of Slopes and Hills	2
		Management and Control of Erosion	3
		Management and use of explosives	4
		DATA SHEET No. 5 MANAGEMENT AND TRANSPORT OF CONSTRUCTION MATERIALS	5
		DATA SHEET No. 6 MANAGEMENT OF RUNOFF	6
		Landscaping Management	7
		Management of Solid and Special Wastes	8
		Management of crossings over water currents	9

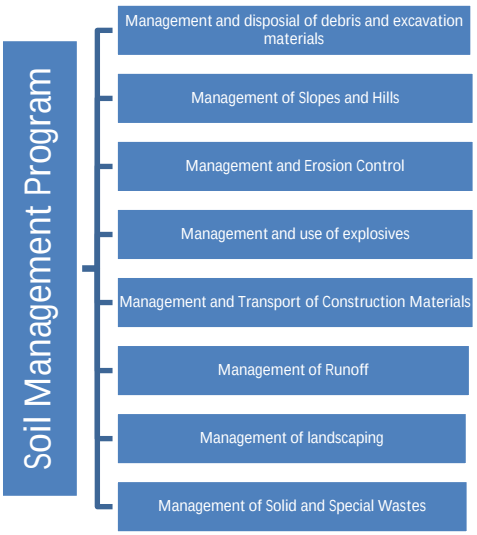
F	PROGRAM	NAME OF MANAGEMENT DATA-SHEET	No. No. EIA Data-sheet
	Water resource management	Management of ground water, springs and birth waters	10
		Management and intake of surface water	11
		Management of Domestic and industrial liquid wastes	12
	Management of Air Resource	Management of Emission and Noise Sources	13
	MANAGEMENT OF SOIL RESOURCE	Soil recovery project	14

Source: GEOCOL CONSULTORES S.A., 2017.

11.1.1.1 Soil Management Program

This program exposes management measures leading to present, Control and mitigate soil damage during the performance of each phase of the road project, which contemplates the intervention of the resource, specifically where it carries out topsoil, stripping and excavation removal activities related to civil works.

Figure - Soil Management Program



Source: GEOCOL CONSULTORES S.A., 2017

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.1.MANAGEMENT OF SOIL RESOURCE

DATA-SHEET No. 1 MANAGEMENT AND DISPOSAL OF DEBRIS AND EXCAVATION MATERIAL (ZODME)

1. OBJECTIVE

- Established preventive and control measures for an adequate management and disposal Control of left overs resulting from cutting and excavation activities.
- Prevent soil, air and water affectation due to transport and disposal of materials management process, left overs from excavations.

2. GOAL

- 100% of leftover excavation materials generated will be adequately managed and disposed of

Source: http://www.colgrass.com.co

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
	X	

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Changes in the use and potential use of soil.
- Changes to soil physicochemical and biological properties.
- Modification of soil stability.
- Changes on landscape integrity.
- Alteration of the course of ground water networks.
- Alteration of recharge zones.

5. TYPE OF MEASURE

Prevention	X	Correction	
Mitigation		Compensation	

6. ACTIONS TO PERFORM

ACTION 1: LAND NEGOTIATION.

Prior to the commencement of excavation leftover materials disposal activities, the Concessionaire Union del Sur shall negotiate land according to guidelines established in Data-sheet 23. Accompaniment on land and social management

ACTION 2: USE OF CUTTING AND EXCAVATION MATERIAL

Materials from cuts and excavations having good characteristics to be used in the construction of the divided highway, will be selected and used in those sections requiring landfills and/or work sites that require them depending on their geomechanical conditions.

ACTION 3: MANAGEMENT OF STRIPPING MATERIAL

Prior to the commencement of works, in the areas foreseen for Zodme and non-structural landfills, it will conduct stripping of topsoil activities, with thickness no greater than 50cm, depending on topsoil characteristics in the area and taking into account management measures established in Data-sheet 15 Management of stripping and topsoil. Stripping must be reused with the proper equipment, to ensure adequate cutting and avoid mixing sterile material with topsoil.

It shall carry out clearing, cleaning and stripping of the area to be filled with waste - material as per article 200 of INVIAS-12, making the respective shaping of the terrain to all drainage of runoff waters.

ACTION 4: MANAGEMENT OF LEFTOVER MATERIAL, SHAPING OF ZODME AND/OR NON-STRUCTURAL LANDFILL

Leftover material shall be managed, gathered and disposed of in Zodme and in non-structural landfills, (see Chapter 3 of this study), without exceeding the design capacity related in Table 11.1 and in Table 11.2.

Table Zodme capacity

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.1.MANAGEMENT OF SOIL RESOURCE

DATA-SHEET No. 1 MANAGEMENT AND DISPOSAL OF DEBRIS AND EXCAVATION MATERIAL (ZODME)

NAME OF THE STRUCTURE	ABSCISSA OF THE PROJECT	SIDE OF THE ROAD	AREA IN M2	CAPACITY IN M3
Z1-10B	15+700	Right	16634.28	91.955
Z1-11	15+800	Right	13.124	57.488
Z1-11B	16+400	Right	9.116	27.365
Z1-12	17+200	Right	19.658	133.600
Z1-13	17+600	Left	8.847	38.847
Z1-14	18+000	Left	22.533	207.400
Z1-14B	18+500	Right	28.581	324.587
Z1-14C	18+800	Right	13.437	100.600
Z1-15	19+600	Left	34.241	238.245
Z1-15B	20+800	Left	27.382	203.804
Z1-15C	21+200	Left	26.643	307.870
Z	22+350	Left	8.149	42.982
Z1-16A	22+500	Right	47.727	323.059
Z1-16B	22+700	Left	15.050	156.251
Z1-17	24+100	Right	4.362	18.718
Z1-17B	24+400	Left	14.121	126.934
Z1-17C	24+600	Left	12.935	87.025
Z2-1B	26+500	Left	196.939	1.868.746
Z2	27+600	Right	113.502	2.440.663
Z2-3A	30+700	Left	203.089	1.906.098
Z2-3B	30+700	Left	41.146	280.321
Z2-3C	30+700	Left	82.154	989.765
Z2-3D	31+700	Left	18.342	164.276
Z2-4	30+700	Left	57.982	318.587
Z2-5	30+700	Left	69.149	646.039
Z2-7	33+300	Right	8.225	49.831
Z2-8	33+800	Right	31.825	352.389
Z2-9	34+000	Right	62.742,00	656.890,94
Z2-10	35+600	Left	8.166	36557.43
Z2-10A	34+700	Left	19.908	138.412
Z2-11	35+600	Left	9.517	81.832
Z2-13	35+000	Left	27.663	184.618
Z2-14	36+400	Left	17.524	167.553
Z3-1B	38+100	right-left	69.014	373.710
Z3-2B	38+700	Right	11.503	59.507
Z3-2	38+900	Right	29.856	454.052
Z3-3	39+300	Right	22.368	177.485
Z	41+500	Right	64.449	205.387
Z3-6	43+500	Right	16.148	180.562
			TOTAL CAPACITY	**14.183.454**

Source: Consortium SH, 2017

Table Capacity of non-structural landfills

NAME OF THE STRUCTURE	ABSCISSA OF THE PROJECT	SIDE OF THE ROAD	AREA IN M2	CAPACITY IN M3
R1-9 A	18+940	Right	34.019	122.531

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.1.MANAGEMENT OF SOIL RESOURCE

DATA-SHEET No. 1 MANAGEMENT AND DISPOSAL OF DEBRIS AND EXCAVATION MATERIAL (ZODME)

R1-9 B	18+947	Right	36.873	404.958
R2-1	30+200	Right	51.353	844.672
			TOTAL CAPACITY	**1.372.161**

Source: Consortium SH, 2'17

It shall place waste material, spreading it by layers and compacting it; beginning in the lower part of the deposit zone and moving in an ascending manner. At subsurface level of the deposit, it shall be scarified with thickness of 0.10m, at the beginning of each work's day. In the event subsurface material is saturated or dry, it shall be removed.

When it becomes necessary to temporarily gather leftover material from cuts or excavation in work sites; these shall be secured and protected with plastic covers, canvas and/or textiles to avoid the transport of particulate matter due to water and/or wind action. In addition, it will avoid disposing material close to ditches, channels or any other type of drainage, due to the fact than volume guiding structures may become obstructed or may drag materials to drainage or water courses.

Material should be removed as soon as possible towards the closest Zodmes and/or non-structural landfill, in order to avoid mobility problems, occupation of places destined to other activities, transport or diffusion of particulates (which leads to leaving the area free from leftover excavation materials", avoiding hurdles in the normal performance of programmed activities.

To transport leftover materials resulting from excavations and cuts, it shall take into account that set forth in Data-sheet 5. MANAGEMENT AND TRANSPORT OF CONSTRUCTION MATERIALS

Areas destined to Zodmes and/or non-structural landfills will respect a protection round of 100m for ground water births and 30m for surface water bodies.

ACTION 5: MANAGEMENT OF RUNOFF WATERS BY ZODME'S AND NON-STRUCTURAL LANDFILLS

To manage runoff waters, it shall take into account that set forth in Data-sheet No. 6 MANAGEMENT OF RUNOFF

ACTION 6. REVEGETATION AND GRASS PATCHING

Once the disposal of leftover materials in Zodme's or non-structural landfills is completed, it will proceed to patching and revegetation of areas used, as per that set forth in Data-sheet 19. Management of revegetation in intervened areas and taking into account article 810 of INVIAS-12

7- INDICATORS

GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL
100% of leftover excavation materials generated will be adequately managed and disposed of .	Negotiation of land	(Number of land visited/number of land intervened in the project" x 100	100% Excellent
	Using cutting and excavation materials	(Volume of reused leftover material /Volume of leftover material generated in good geomechanical conditions).	80-100% Excellent 60-79% Complies <59% Non compliance
	Management of stripping material	(Volume of reused stripping material /volume of stripping material) x 100	80-100% Excellent 60-79% Complies <59% Non compliance
	Management of leftover material, shaping of Zodme and/or non-structural landfill	(Volume of leftover material disposed of in Zodme and/or non-structural landfills / volume of generated leftover material) x 100	100% Excellent
	Management of runoff water of Zodme and non-structural landfills	(Linear meter of works built to manage rain and runoff waters / linear meters of works	100% Excellent

11.1.1.ABIOTIC ENVIRONMENT			
11.1.1.1.MANAGEMENT OF SOIL RESOURCE			
DATA-SHEET No. 1 MANAGEMENT AND DISPOSAL OF DEBRIS AND EXCAVATION MATERIAL (ZODME)			
		forecasted to manage rain and runoff waters) x 100 In Zodme and non-structural landfills	
	Revegetation and grass patching	(Revegetated and patched area / slope and berm areas of Zodme and/or non-structural landfills) x 100	100% Excellent

8. PLACE OF APPLICATION

- Areas where Zodme and non-structural landfills are located
- Temporary excavation and cutting leftover materials gathering area.
- Project sites where land movements were forecasted (cutting and landfills).

9. EXECUTION TIMETABLE

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
Negotiation of land	X		
Using cutting and excavation materials		X	
Management of stripping material		X	
Management of leftover material, shaping of Zodme and/or non-structural landfill		X	
Management of runoff water of Zodme and non-structural landfills		X	
Revegetation and grass patching		X	X

10. QUANTIFICATION AND COSTS

ITEM	UNIT	UNIT COST (COP)	QUANTITY	TOTAL COST COP)
Follow-up of Environmental Management Application Plan	Month	$ 2,000,000	42**	$ 82,364,000
Ancillary follow-up of Environmental Management Application Plan	Month	$700.000	42**	$ 82,364,000
TOTAL COST OF DATA-SHEET				**$113,400,000**

Costs related to actions and activities to develop , manage and dispose of debris and excavation materials, are included in the general cost of the project, within the allocated budgets to civil works. Therefore in the quantification and costs of this data-sheet, it specifies only the cost of professionals and operators for an adequate execution, control and verification of forecasted actions.
A certified and expert professional, specialized in executing data-sheet follow-up activities, shall make follow-up.
Assistant for follow-up of the management plan may be an unskilled worker; to provide support to execute data-sheet follow-up activities. Professional and assistant must also conduct follow-up to data-sheets 4, 5 and 6 and will be available during the duration of the project (42 months).

11.1.1.ABIOTIC ENVIRONMENT
11.1.1.1.MANAGEMENT OF SOIL RESOURCE
DATA-SHEET No. 1 MANAGEMENT AND DISPOSAL OF DEBRIS AND EXCAVATION MATERIAL (ZODME)
**The duration of the project is 42 months

11.1.1.ABIOTIC ENVIRONMENT			
11.1.1.1.MANAGEMENT OF SOIL RESOURCE			
DATA-SHEET NO. 2 MANAGEMENT OF SLOPES AND HILLS			
1. OBJECTIVE · Establish stabilization, protection and environmental management measures to mitigate erosive processes and mass removal on slopes and hills intervened during the construction of the road. **2. GOAL** · Environmentally stabilize and cover slopes and hills intervened during the construction of the road project.		 Source: Geocol Consultores S.A. 2017	
3. PHASE			
PRE – CONSTRUCTION	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**	
	X		
4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE			
- Mobilization of construction materials, supplies, machinery, equipment and personnel. - Intake of surface water - Removal of topsoil, stripping and cleaning - Demolition and removal of existing infrastructure in the area to intervene - Land movements (excavations and Landfills) - Installation and operation of camps - Installation and operation of process plants (asphalt, concrete, grinding) - Construction and Operation of Debris and Excavation Material Management Zone			
5. TYPE OF MEASURE			
Prevention	**X**	Correction	
Mitigation	**X**	Compensation	
6. ACTIONS TO PERFORM			
Measures and actions established to stabilize slopes will be oriented to the implementation of containment works, management of surface and sub-surface waters, implementation of works for the correct shaping of cut and landslide slopes and the implementation of environmental recovery measures (bioengineering). Following find preventive and mitigation management measures proposed to manage slopes and hills, which are contemplated in the geotechnical study of the project. **Containment works:** Geotechnical works proposed by a professional in geo-technique, aimed at maintaining the integrity of slopes designed and these have the following structures: Concrete walls, structures with flexible materials to reinforced earth walls For			

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.1.MANAGEMENT OF SOIL RESOURCE

DATA-SHEET NO. 2 MANAGEMENT OF SLOPES AND HILLS

slopes, when bolus and litter fall, install guide wire and reinforced cable mesh. These measures are included in the geotechnical study for the stabilization of slopes.

Management of rain water Measures implemented to manage rain waters in cut slopes, such as: Coated ditch and internal berm and guard counts

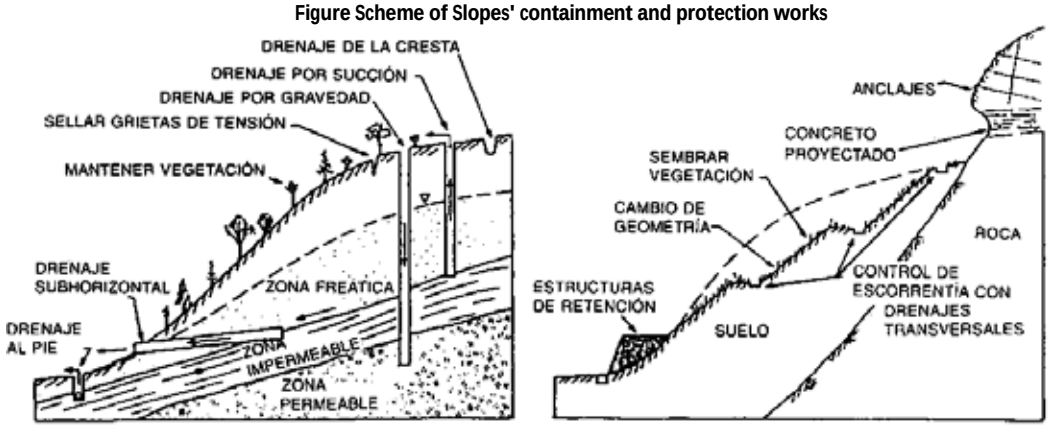
Management of sub-surface waters correspond to activities aimed at managing waters that occur on the face of slopes and may eventually lead to mass removal processes. To counteract impacts produced by sub-surface water, it builds California drainage of 12 meters in length.

Revegetation of slopes: It will implement actions aimed at mitigating impacts due to erosive processes in cut slopes, such activities correspond to revegetation with different grass species.

Geotechnical instrumentation Sites with largest landfill areas (greater than 40 m) will have to install inclinometers to identify potential flaws in surfaces. Sites where landfills are shaped and there is evidence of water, will have to install piezometers in order to monitor water table and prevent mass movements of land. Instrumentation measures are indicated in the geotechnical study to stabilize slopes.

It is worth mentioning that the foregoing actions described, are a comprehensive part of the road design and thus costs are included in the general value of the works: figure 11.1 shows a scheme of measures to stabilize and protect slops and hills during the construction process.

Figure Scheme of Slopes' containment and protection works



Source: Japan Road Association, 1984 in Suárez, 1998

Ø **Maintenance of stabilization works**

Maintenance activities to slope stabilization and protection works must be conducted, specially in steep zones, in order to ensure proper functionality of stabilization works, and to that end it recommends, among others, the following activities:

ü Conduct maintenance of existing drainage works in slopes to ensure proper functioning of structures.

ü Keep well-shaped slopes to prevent the activation of erosive processes or mass removal processes. In the event there are cracks on slope surfaces, these must be sealed to impede infiltration of surface water.

In slope areas where no revegetation has been conducted or when it has deteriorated, it shall reshape and revegetate the area again to prevent erosive processes from occurring.

11.1.1.ABIOTIC ENVIRONMENT			
11.1.1.1.MANAGEMENT OF SOIL RESOURCE			
DATA-SHEET NO. 2 MANAGEMENT OF SLOPES AND HILLS			
7- INDICATORS			
GOAL	**NAME OF INDICATOR**	**ASSESSMENT MEANS**	**COMPLIANCE LEVEL**
Stabilize slopes and hills generated in intervened areas.	**ACTION 1:** Containment works	Slope areas requiring containment works (m2)/total area of slopes generated that require containment works (m2) x 100	100% Excellent
	ACTION 2: Works to manage rain and sub-surface waters	Slope areas requiring water management works (m2) / Total area of slopes generated that require water management works (m2) x 100	100% Excellent
	ACTION 3: Protection works	Slope areas requiring protection works (m2)/total slope areas generated that require protection works (m2) x 100	100% Excellent

8. PLACE OF APPLICATION
On slopes and hills generated during the construction of the project.

9. EXECUTION TIMETABLE			
PROJECT ACTIONS	**PRE – CONSTRUCTION**	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**
ACTION 1.		**X**	
ACTION 2.		**X**	
ACTION 3.		**X**	

10. QUANTIFICATION AND COSTS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
ACTION 1.				**$**
ACTION 2.				**$**
ACTION 3.				**$**
TOTAL COST DATA SHEET TOTAL COST DATA-SHEET (cost is part of the value of the works)				**$**

Source: GEOCOL CONSULTORES S.A., 2017

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.1.MANAGEMENT OF SOIL RESOURCE

DATA-SHEET 3. MANAGEMENT AND CONTROL OF EROSION

1. OBJECTIVE

- Establish environmental management measures aimed at mitigating erosive processes on slopes and hills intervened during the construction of the road.

2. GOAL

- Environmental recovery of areas where morphodynamic process related to laminar erosion occur.

Source: Geocol Consultores S.A. 2017

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
	X	

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Mobilization of construction materials, supplies, machinery, equipment and personnel.
- Intake of surface water
- Removal of topsoil, stripping and cleaning
- Demolition and removal of existing infrastructure in the area to intervene
- Land movements (Excavations and Landfills)
- Installation and operation of camps
- Installation and operation of process plants (asphalt, concrete, grinding)
- Construction and Operation of Debris and Excavation Material Management Zone

5. TYPE OF MEASURE

Prevention	X	Correction	
Mitigation	X	Compensation	

6. ACTIONS TO PERFORM

Measures and actions established to manage and control erosion are oriented to both the management of topsoil loss, when a laminar erosive process takes place and the contention of the erosive process when furrows and gullies develop, which involve concentrated erosion processes. Following find a description of preventive management and mitigation measures proposed to manage and control erosion:

ACTION 1: Works to control laminar erosion: In these activities, it performs activities aimed at the environmental recovery of slopes, which action are related to revegetation by means of grass species. These measures are included in the geotechnical study for the stabilization of slopes.

It should be made clear that this type of intervention is a comprehensive part of the road design, and thus, costs are included in the value of the project.

7- INDICATORS

GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL
Control erosion in intervened areas	**ACTION 1:** Works to control laminar erosion	Area that requires laminar erosion control (m2) / total area with laminar erosion (m2) x 100	100% Excellent
	ACTION 2: Works to control concentrated erosion	Area that requires concentrated erosion control (m2) / total area with concentrated erosion (m2) x 100	100% Excellent

11.1.1.ABIOTIC ENVIRONMENT				
11.1.1.1.MANAGEMENT OF SOIL RESOURCE				
DATA-SHEET 3. MANAGEMENT AND CONTROL OF EROSION				
8. PLACE OF APPLICATION				
On slopes and hills generated during the construction of the project.				
9. EXECUTION TIMETABLE				
PROJECT ACTIONS	**PRE – CONSTRUCTION**	**CONSTRUCTION:**		**ABANDONMENT AND FINAL RESTORATION**
ACTION 1.		**X**		
10. QUANTIFICATION AND COSTS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
ACTION 1.				**$**
TOTAL COST OF DATA-SHEET (COST IS PART OF THE WORKS)				**$**

Source: GEOCOL CONSULTORES S.A., 2017

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.1.MANAGEMENT OF SOIL RESOURCE

DATA SHEET No. 4 MANAGEMENT AND USE OF EXPLOSIVES

1. OBJECTIVE

- Establish measures to safely conduct the storage and use of explosives in work sites that require them.

2. GOAL

- Comply with 100% of measures defined to store and use explosives
- Obtain zero (0) requirements by environmental and military authorities on account of the management and storage of explosive materials.

Source:

www.indumil.gov.co.

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
	X	

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Changes to soil physicochemical and biological properties.
- Modification of soil stability.
- Changes on landscape integrity.
- Alteration of the course of ground water networks.

5. TYPE OF MEASURE

Prevention	X	Correction	
Mitigation	X	Compensation	

6. ACTIONS TO PERFORM

ACTION 1. VERIFICATION OF PERMITS TO USE EXPLOSIVES.

Before the National Defense Ministry it must request a permit to use explosives in a specific work site.

ACTION 2. TRANSPORT AND STORAGE OF MATERIALS.

The transports of explosive materials do not follow specific requirements, safety of each, is analyzed with each of the transports required. Generally, explosives are brought from the nearest military brigade with actual possibilities of having the triggering material.

It will only store that corresponding to 15 days of work, both for blasts as well as for production. The Ministry of Defense dictates specific conditions for each case and issues Specific recommendations on that place of explosives (explosive central unit).

It must be considered, that the place to store explosives must be sufficiently ventilated so that nitrate gases may be aired as soon as possible. Temperature must be regulated, without exceeding 25°C.

ACTION 3. MANAGEMENT OF EXPLOSIVES.

Explosives will be used concretely to fracture blocks of rocks during the construction of works on cutting slopes.

During the construction of the project, security standards must be followed regarding the management of explosives, such as the following:

- Acquisition of materials in the national Ministry of Defense and its military industry (INDUMIL).
- Have the required permits to transport and manage explosives by military authorities (INDUMIL).
- Maintain a detailed daily inventory of explosives, to avoid leaving them on the field and avoid accidents and theft.
- Handling of explosives will be the responsibility of experts.
- Wastes of explosive packaging and other materials that had come into contact with the former, will be stored temporarily as established in the data management sheet on solid, domestic, industrial and special waste), and subsequently these will be transferred to the acquisition place for their final disposal.

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.1.MANAGEMENT OF SOIL RESOURCE

DATA SHEET No. 4 MANAGEMENT AND USE OF EXPLOSIVES

The explosive Storage place will take into account the following safety measures according to decree Number 2222 of 1993, or by hygiene and safety regulations for open pit mining activities and decree number 035 of 1994, on prevention and safety measures in mining activities:

- Explosives and ignition means will be stored in independent sections for each material destined exclusively to that end.
- This structure will be solid, fireproof and bullet proof, with proper illumination and ventilation, located in a place away from facilities, railroads, roads equipped with buffer or sound chambers, etc. It will have iron doors with safety locks. It will not have other openings, besides those necessary to the entrance of material and ventilation ducts.
- It will be located at a minimum distance of 100 m from the roads.
- It will be forbidden to store metal cables, tools, metal scrap or any other metal object that may lead to explosions due to impact or friction on explosives.
- Likewise it shall not store material other than explosives, such as: paint, timber, trash, cartons or any other element other than explosives.
- Blasting powder will have warning signals in an area of no less than 10 square meter, this zone will be kept free from shrubs, waste, timber, papers and materials.
- In a 50-meter radius from the blasting powder, it cannot store flammable materials.
- Works that may generate sparks or flames are also forbidden.
- It is forbidden to smoke near or inside blasting powder areas.
- Electrical installations inside blasting areas shall be dully protected, as well as lightning systems; safety switches shall be used or otherwise installed outside the structure.
- There will be fire extinguishers inside and outside blasting powder areas.
- The place will have specialized security in charge of a retired official from the Armed Forces.

7- INDICATORS

GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL
· Comply with 100% of measures defined to store and use explosives · Obtain zero (0) requirements by environmental and military authorities on account of the management and storage of explosive materials.	Verification of permits to use explosives	(Number of permits obtained to use explosives/Necessary number of permits to use explosives) * 100	100% Excellent
	Transport and storage of materials:	(Inventories of explosive materials conducted/Programmed inventory of explosives) * 100	100% Excellent
	Management of explosives.	(Number of sited with an adequate use of explosives /Total number of sites requiring the use of explosives) * 100	100% Excellent

8. PLACE OF APPLICATION

- Temporary storage sites for explosive materials.
- Zones where the use of explosive is required during construction works (cutting of slopes).

9. EXECUTION TIMETABLE

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
Verification of permits to use explosives		X	

11.1.1.ABIOTIC ENVIRONMENT			
11.1.1.1.MANAGEMENT OF SOIL RESOURCE			
DATA SHEET No. 4 MANAGEMENT AND USE OF EXPLOSIVES			
Transport and storage of materials:		**X**	
Management of explosives.		**X**	
10. QUANTIFICATION AND COSTS			
Costs related to the use of explosives in land movements are included in the general cost of the project, as part of the assigned budget for civil works.			

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.1.MANAGEMENT OF SOIL RESOURCE

DATA SHEET No. 5 MANAGEMENT AND TRANSPORT OF CONSTRUCTION MATERIALS

1. OBJECTIVE

- Acquire drag and/or quarry material in sites having the respective mining permits and environmental license in force.
- Ensure that construction and cut and excavation leftover materials are properly transported.
- Minimize impacts on the generation of particulate matter in the air or contribution of sediments to drainage systems in the area.
- Define actions to environmentally manage the use of construction equipment in work sites and temporary gathering yards.

Source: Geocol Consultores S.A.

2. GOAL

- Acquire 100% of rock materials through third parties having licenses and permits in force for the exploitation and commercialization thereof.
- Ensure compliance of 100% with measures to manage, store and transport materials.
- Ensure that 100% of vehicles and machinery of the project have optimal mechanical conditions to avoid changes in the environment.

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
	X	

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Modification of air quality due to particulate matter.
- Modification of air quality due to gases
- Variation of sound pressure levels.

5. TYPE OF MEASURE

Prevention	X	Correction	
Mitigation	X	Compensation	

6. ACTIONS TO PERFORM

ACTION 1: ACQUISITION OF CONSTRUCTION MATERIALS

Acquire construction materials through third parties that have quarries with their respective licenses that provide permits for the exploitation and trading activities (mining Rights and environmental license).

ACTION 2: TRANSPORT OF MATERIALS.

Every vehicle and machinery used for material manipulation activities, shall be inspected by project audit in order to certify their sound operation. Vehicles shall have their respective technical and mechanical revisions in force.

Vehicles used to transport materials shall be equipped with appropriate containers or hoppers, so that the load carried may be fully contained, to avoid spills, loss of materials - discharge of wet material during transport activities. Therefore, the container or hopper must be built in a continuous structure without breakage, perforations, grooves or slots.

Hopper trucks or transport vehicles shall not be loaded with material exceeding the upper rim of the hopper, in addition they shall comply with all the mechanical and environmental requirements established by Colombian Legislation on such subject matter.
Once the vehicle is loaded, the material shall be covered with fitted fabrics, plastics, tents or textiles to hinder discharges during normal movement of the vehicle and while it is being transported to the disposal site

Concrete mixing vehicles and other elements having high wet content, must have the necessary safety devices to avoid spillage during transport.
The distance between the gathering site and leftover excavation and transport vehicles, to the extent possible, must be the minimum possible (looking for the closest sites), in order to reduce transfer stretches. During this state, in the event the material is dry and contains fines; water aspersion may be used to avoid diffusion from wind action.

ACTION 3: MAINTENANCE OF MACHINERY AND VEHICLES

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.1.MANAGEMENT OF SOIL RESOURCE

DATA SHEET No. 5 MANAGEMENT AND TRANSPORT OF CONSTRUCTION MATERIALS

Machinery and vehicles operating in material transport activities, must be in perfect mechanical conditions. These vehicles must undergo continuous maintenance to reduce air emissions from their combustion. Furthermore, maintenance should emphasize avoiding mechanical failures that may lead to spillage of fuels and lubricants.

In the camps, there will be a specific area acting as a machinery yard, to provide maintenance area to all machinery, equipment and vehicles.

Once machinery is withdrawn from works, due to completion of works it will proceed to the reconditioning the area used as a machine yard, including the removal and elimination of possible contaminated soil with fuel and lubricants wastes.

ACTION 4: MANAGEMENT OF FUELS AND LUBRICANTS

Fuel storage sites, shall be placed considering a stable geo-technical condition, preferably in flat areas away from natural drainage. They shall have spillage containment, with a capacity of 110% of all the volume to be stored, and shall also have adequate management of storm waters. Likewise, this place must be built under a firewall system, as it must contain any fuel spillage and avoid that in the event of a fire contingency, it propagates easily.

Fuel and lubricant reservoirs for machinery must be of a material that is compatible with the type of compound to be deposited therein, each of these vessels must be tagged with clear letters indicating content. Permanent fuel storage areas will not have other ignitable fuel to isolate potential fires. Storage sites for these ignitable products shall be located at a distance of 50 meters from the camps and adequately located as regards predominant wind direction.

Fuel storage areas shall have signage stating that smoking is forbidden at a distance of 25 meters around the place where such fuel vessels are located..

Under no circumstances may an operator suction method be used to transfer fuels with hoses. Fuel vessel transfer operations must be conducted with manual or automatic pumps, hindering operator's contact with these fuels.

In the event of fuel or oil spillage, the soil affected should be immediately removed and it should be managed as a hazardous waste. Contaminated material shall be taken to the yard or to vessels adequate to such function, taking into account measures established in Data sheet 8. Management of Solid and Special Wastes.

ACTION 5: NOISE CONTROL

In construction materials storage sites and in transport activities, the same management measures established in Data Sheet 13. Management emission and noise sources will apply

ACTION 6. AIR QUALITY.

Areas destined to the location of plants will be isolated with adequate materials such as specialized fabrics, plastic canvas, etc., to reduce the dispersion of materials. Material storage areas that issue particulate matter will be totally covered with plastic and will be wet, if necessary, avoiding segregation.

In concrete plants, it will store cement in metallic places that have sleeve filters and safety valves to control atmospheric emissions. Vehicles that transport the mixture outside the concrete plant will go through a tunnel type wash system, with pressure water jets ensuring that vehicles do not disperse particulate matter to the environment..

In asphalt plants, it will manage furnace emissions and output of ancillary equipment where it will have cyclones to separate coarse particles, gas scrubbing filters (which require sedimentation pools and treated or fresh water for recirculation purposes) and self-cleaning sleeve filters with temperature filtering means.

ACTION 7: WATER QUALITY AND SOIL PHYSICOCHEMICAL CONDITIONS

Storage of concrete additives will be carried out in Fiberglass airtight tanks, which will have contention dikes to avoid potential spills. All other materials stored temporarily will be completely covered, avoiding wash due to rain and dragging of particulate matter Likewise, fuels necessary for the operation of equipment will be stored in airtight tanks as per the measures stated in the fuels and lubricants management process.

11.1.1.ABIOTIC ENVIRONMENT			
11.1.1.1.MANAGEMENT OF SOIL RESOURCE			
DATA SHEET No. 5 MANAGEMENT AND TRANSPORT OF CONSTRUCTION MATERIALS			
7- INDICATORS			
GOAL	**NAME OF INDICATOR**	**ASSESSMENT MEANS**	**COMPLIANCE LEVEL**
Acquire 100% of rock materials through third parties having licenses and permits in force for the exploitation and commercialization thereof.	Acquisition of construction materials	(Volume of rock material used / Volume of rock material certified) x 100	100% Excellent
Ensure compliance of 100% with measures to manage, store and transport materials.	Transport of materials	(Number of vehicle inspections / Number of vehicles used to transport materials to the site) x 100	100% Excellent
Ensure that 100% of vehicles and machinery of the project have optimal mechanical conditions to avoid changes in the environment.	Maintenance of machinery and vehicles	(Number of maintenance executed / Number of maintenance programmed) x 100	100% Excellent
Ensure compliance of 100% with measures to manage, store and transport materials.	Management of fuels and lubricants	(Number of dikes and firewalls built/number of dikes and firewalls required) x 100	100% Excellent
	Air quality	(Perimeter of isolated camps and plants / Perimeter of existing plants and camps) x 100	100% Excellent
	Water quality and soil physicochemical conditions	(Storage areas of liquid hazardous products controlled air tightly / Area of storage of hazardous liquid products built) x 100	100% Excellent
8. PLACE OF APPLICATION			
Camp zones, process plants, work sites, access roads and mobilization and sites of Project intervention.			
9. EXECUTION TIMETABLE			

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
Acquisition of construction materials		X	
Transport of materials		X	
Maintenance of machinery and vehicles		X	
Management of fuels and lubricants		X	
Air quality		X	
Water quality and soil physicochemical conditions		X	

11.1.1.ABIOTIC ENVIRONMENT				
11.1.1.1.MANAGEMENT OF SOIL RESOURCE				
DATA SHEET No. 5 MANAGEMENT AND TRANSPORT OF CONSTRUCTION MATERIALS				
Transport of materials		X		
10. QUANTIFICATION AND COSTS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
Construction materials (coating)*	Glb	$ 20,000,000	1	$ 20,000,000
Inspection of vehicles	Month	$ 2,700,000	42**	$113,400,000
TOTAL COST OF DATA-SHEET				**$ 133,400,000**

Costs related to actions and activities carried out within transport of materials, fuel and lubricants management are included in the general cost of the project, within the allocated budgets for civil works.
*Global costs of construction materials correspond to the purchase of coating material (polisher, plastic canvas etc.), which takes into account the following:
- Monthly purchase of 30ml of sunscreen textile, the value per linear meter of weather protection fabric is $11.000. (30ml x $11000 x 42 months =
$ 13.860.000)
- Purchase of plastic canvas or any other similar material, which monthly value equals $146.190 ($146.190 x 42 months=-$6.140.000).
***The duration of the project is 42 months

ABIOTIC ENVIRONMENT

MANAGEMENT OF SOIL RESOURCE

DATA SHEET No. 6 MANAGEMENT OF RUNOFF

1. OBJECTIVE

- Establish measures that allow adequate management of runoff waters to avoid erosive processes during construction stages and operation of the project.
- Avoid sediments from reaching natural drainage and altering river dynamics.

2. GOAL

Construction of 100% of works and implementation of 100% of environmental actions to manage runoff waters according to that defined in the design.

Source: Geocol Consultores S.A.

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
	X	

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Changes to soil physicochemical and biological properties.
- Modification of soil stability.
- Alteration of water courses.
- Variation of the availability of surface water resources.

5. TYPE OF MEASURE

Prevention	X	Correction	
Mitigation	X	Compensation	

6. ACTIONS TO PERFORM

ACTION 1. MANAGEMENT OF RUNOFF WATERS IN ZODME'S

Build ditches in the perimeter of Zodme's intervention and non-structural landfill areas and in the internal part of terraced berms (disposal and shaping of material) as indicated in the designs, in order to capture and guide surface runoff water. (see Figure 11-3). These will lead to tiered channels (heat sink) for an appropriate delivery without leading to erosion of the terrain. See Figure 11-4).

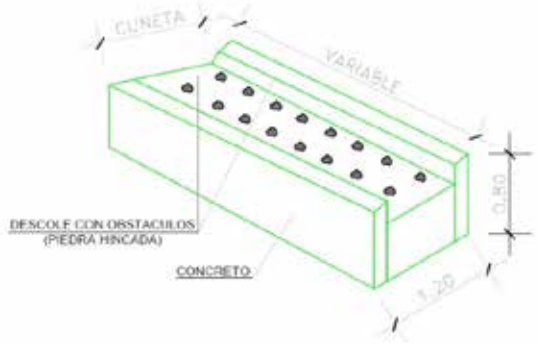
Figure Cross-section of perimeter ditch **Figure clearing of perimeter ditch**

ABIOTIC ENVIRONMENT

MANAGEMENT OF SOIL RESOURCE

DATA SHEET No. 6 MANAGEMENT OF RUNOFF

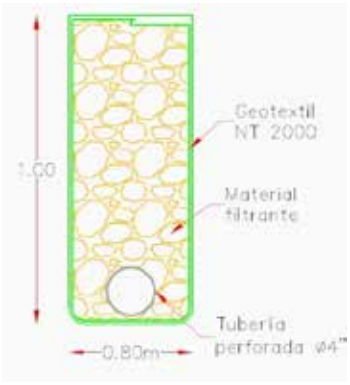
Source: Consortium SH, 2017.



Source: Consortium SH, 2017.

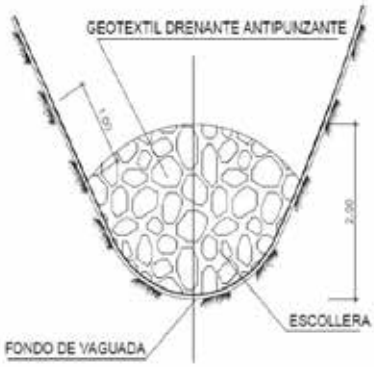
When necessary and/or when required by Zodme's design, fish-bone shaped collecting channels will be built, supplemented with filters (figure 11-5), to reduce water infiltration and conduct collected water outside vulnerable areas of slopes, delivering them to ditches. Also, when required, it shall build breakwater laces (figure 11-6), to reduce erosion problems and eventually avoid surface movements.

Figure Detail of the fish-bone shaped filter



Source: Consortium SH, 2017.

Figure Breakwater lace



Source: Consortium SH, 2017

In addition, Zodme's and non-structural landfills will be shaped with 3H slopes. 1V or 2.5H IV, as per specified in each design and a pumping of 2% will lead waters towards the ditches.

ACTION 2. IMPLEMENTATION OF DRAINAGE WORKS TO MANAGE RUNOFF WATERS ON ROADS

To manage runoff waters in the layout of the road, a series of infrastructures shall be built according to that set forth in the hydraulic studies and designs related in Chapter 3 Description of the Project of this study. Such infrastructure will allow the intake, conduction and delivery of waters. Following find a description of the element and measures that comprise the infrastructure to manage runoff waters.

Pumping: The road shall have a normal 2% pump, to direct runoff waters to ditches.

ABIOTIC ENVIRONMENT			
MANAGEMENT OF SOIL RESOURCE			
DATA SHEET No. 6 MANAGEMENT OF RUNOFF			
Perpendicular drainage works: Perpendicular drainage works shall be built, such as: circular sewage and box culvert, taking into account hydraulic designs in the area (see Chapter 3 of this study) and distributed along the layout just as established in project blueprints and designs. In addition and if required, heat sink and clearing gutters supplementary works will be built Longitudinal drainage works: Longitudinal drainage works shall be built, such as ditches and trenches, taking into account hydraulic designs of the area (see Chapter 3 of this study) and distributed along the layout as indicated in the project's blueprints and design reports. Management measures established for drainage works required on account of occupation of riverbed (sewage, box culvert, bridges, etc.) are described in Data-sheet 9. Management of crossings over water currents. **ACTION 3. RUNOFF MANAGEMENT IN OTHER PROJECT AREAS** In construction and excavation materials leftover zones and in machinery shops that may require, runoff management and control works will be built, such as ditches, channels, collectors and clearing gutters with heat sink, in order to prevent the accumulation of water, and the occurrence of erosive and sediment dragging processes. The delivery of runoff water collected from natural channels will be made in a manner to avoid erosion. Building perimeter channels to facilities such as camps and process plants in order to avoid contribution of sediments due to surface runoff towards these ecosystems and building intercepting channels for rainwater and systems prone to sedimentation. During the construction activities prior to the completion of the general drainage system, provisional trenches should be built, to guide rainwater and runoff water to clearing gutters. Provisional ditches for collection and guiding of rainwater must have in place sediment control systems.			
7- INDICATORS			
GOAL	**NAME OF INDICATOR**	**ASSESSMENT MEANS**	**COMPLIANCE LEVEL**
Construction of 100% of works and implementation of 100% of environmental actions to manager runoff waters according to that defined in the design.	Management of runoff water in Zodme's and non-structural landfills	(Number of linear meters of runoff management works built / linear meters of runoff management works forecasted) x 100 Number of runoff management works built / number of runoff management works forecasted) x 100	100% Excellent
	Implementation to drainage works to manage runoff on roads.		
	Management of runoff in other areas of the project.		
8. PLACE OF APPLICATION			
Zones for the disposal of excavation leftover material (Zodme and non-structural landfills). Road layout Camps, process plants and other project infrastructure areas.			
9. EXECUTION TIMETABLE			
PROJECT ACTIONS	**PRE – CONSTRUCTION**	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**
Management of runoff water in Zodme's and non-structural landfills		**X**	
Implementation to drainage works to manage runoff on roads.		**X**	
Management of runoff in other areas of the project.		**X**	
10. QUANTIFICATION AND COSTS			

ABIOTIC ENVIRONMENT
MANAGEMENT OF SOIL RESOURCE
DATA SHEET No. 6 MANAGEMENT OF RUNOFF
Costs related to the construction of works to manage runoff waters that are included in the general cost of the project, within the budget assigned to civil works.

ABIOTIC ENVIRONMENT

MANAGEMENT OF SOIL RESOURCE

DATA-SHEET NO: 7 LANDSCAPING MANAGEMENT

1. OBJECTIVE

- Establish environmental management measures for the prevention, control and mitigation of visual landscape attributes in areas subject to intervention within the area of influence of the project.

2. GOAL

- Comply with 100% of measures established to manage potential impact generated on landscape visual attributes, intervened by project's building, operative and dismantling activities.

Source: Geocol Consultores S.A. 2017

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
	X	X

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Alteration of courses
- Variation of the contribution and transport of sediments
- Alteration of recharge zones
- Changes in landscape integrity
- Modification of topsoil structure
- Changes on floristic structure and composition
- Changes in the status of social infrastructure and public services (collective equipment, aqueduct, sewage, electric power, etc.)
- Changes in the status of road infrastructure

5. TYPE OF MEASURE

Prevention		Correction	X
Mitigation	X	Compensation	

6. ACTIONS TO PERFORM

ACTION 1: Prevention

- It shall make a complete photographic record of the area before beginning any type of constructive or equipment installation activities, including various points of observation of the same zone, in order to compare the zone before and after the intervention. Each photograph should have its coordinates and date.
- It shall have detailed blueprints of the zone to intervene, in order not to alter zones that are not included in the construction blueprints or in the license.
- It is deemed pertinent that the location of gathering centers, parking, supplies and leftover materials, equipment, tools and other are disposed in areas where there is no direct affectation to potential and permanent observers of the area, in addition good housekeeping should be maintained.
- For adequate landscape management, it is important to have periodic talks with contractor and workers on topics such as speed on roads, the correct installation and maintenance of weather protection fabric and housekeeping of other facilities.

ACTION 2: Mitigation

For stripping activities in areas, it is pertinent to conduct and inventory and storage of most of the materials removed, such as grass patches withdrawn in clean grass coverage or shrubs, in order to reuse this material in affected areas for the project. Storage of grass patches must have daily irrigation and maintenance, in order to increase survival of stored material.

- For all construction works, it is necessary to use dark or green weather protection fabrics, so these will not have a strong contrast with adjacent coverage of work areas. Weather protection fabrics should interrupt the visibility of pedestrians, hindering the observation of materials, supplies and machinery related to the activity.

ABIOTIC ENVIRONMENT

MANAGEMENT OF SOIL RESOURCE

DATA-SHEET NO: 7 LANDSCAPING MANAGEMENT

ACTION 3: Correction

- Use most of the grass patches that were recovered and stored prior to the construction phase, so as not to waste materials and maintain landscape integrity. It is worth mentioning that restored areas must be covered with the same type of cover removed, so as not to introduce conflicting elements in the landscape.
- As regards dismantling activities of materials and equipment related to the project, it must ensure that the withdrawal of material introduced on account of construction activities of the project, may generate affectation of landscape visibility.
- In addition to topsoil, it is important to restore the shape and topography of native terrain, carrying out land movement before revegetation. This movement of land must be carried out, to the extent possible, according to the topography the terrain had prior the intervention, with close attention to detail such as hills, depressions, which seem more natural to the zone rebuilt. This activity may be supported in a topographic survey conducted prior to the performance of the project.
- It must be mindful that zones subject to reforestation activities comply with minimum specific measures, such as using native species that meet the consent of the regional autonomous corporation. Likewise it must endeavor to achieve forest restoration, complying with measures set forth in the revegetation management data-sheet of areas intervened and in the compensation data-sheet on loss of biodiversity, included in this document.
- It is pertinent to conduct photographic records of the zones restored to compare them to those taken before the construction activities of the project, this activity determines the effectiveness of landscaping recovery. It is important that landscape restored is similar, to the extent possible, to the state of the landscape before the execution of the project, most importantly, restoring topsoil and topography of the terrain.

7- INDICATORS

GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL
Isolate 100% of the areas to intervene to avoid visual impact.	**Visual isolation of construction works.**	X = (Install weather protection fabric with low contrast colors (m) / total perimeter used for the disposal of materials, supplies and machinery related to the activity (m)) * 100	Greater than 90%
Reshape 100% of the landscape intervened by land movements, cuts and excavations.	**Landscape reshaping.**	X = (number of grass patches reused to reshape landscape / number of grass patches withdrawn and stores)* 100	50% of grass patches used
		X = (topographic reshaping of area (m2) / total area modified as a result of land movement activities (m2)) *100	60% of areas reshaped
		X = (area of the slope recovered with bioengineering works (m2))/area of total slope generated by the project (m2)) * 100	40% of areas recovered with bioengineering works.
Involve 100% of the community related to the project in topics of landscape and surroundings.	**Perception of landscape by the community related to the project.**	X = (Number of talks carried out /number of programmed talks) * 100	100% of talks carried out

8. PLACE OF APPLICATION

Management measures oriented towards the landscape component, will be applied in landscaping units intervened by the project.

9. EXECUTION TIMETABLE

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
Action 1 Prevention	**X**	**X**	**X**
Action 2 Mitigation		**X**	**X**
Action 3 Correction			**X**

10. QUANTIFICATION AND COSTS

ABIOTIC ENVIRONMENT				
MANAGEMENT OF SOIL RESOURCE				
DATA-SHEET NO: 7 LANDSCAPING MANAGEMENT				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
Professional trained to manage landscape (ecologist, biologist, forest engineer, or similar).	month	**3.000.000**	**10 months**	**$ 30,000,000**
HSE ancillary personnel	month	**3.000.000**	**10 months**	**$ 30,000,000**
Weather protection fabric with low contrast	meters	**2.000**	**10.000**	**$ 20,000,000**
Pegs	UNIT	**1.000**	**5.000**	**$ 5,000,000**
TOTAL COST OF DATA-SHEET				**$ 85,000,000**

Source: GEOCOL CONSULTORES S.A., 2017

11.1.1.ABIOTIC ENVIRONMENT

SOIL MANAGEMENT PROGRAM

DATA-SHEET NO. 8 MANAGEMENT OF SOLID AND SPECIAL WASTES

1. OBJECTIVE

· Establish environmental management measures to ensure comprehensive management of solid wastes generated in the different stages of the project, to prevent soil and water affectation.

Source: GEOCOL CONSULTORES S.A., 2017.

2. GOAL

· Adequate management and disposal of 100% of solid wastes generated by the project as per its nature.

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
	X	X

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Change of physicochemical and biological properties
- Change in the use and potential use of soil
- Alteration in ground water quality
- Modification of air quality due to gases
- Generation of odors

5. TYPE OF MEASURE

Prevention	X	Correction	
Mitigation	X	Compensation	

6. ACTIONS TO PERFORM

ACTION 1 TRAINING AND EDUCATION STRATEGIES

It will establish sensitizing and training processes for the entire population, in order to illustrate aspects related to the comprehensive management of wastes, especially specific procedures, functions, responsibilities, coordination mechanisms as well as guidelines of standards in force.

Following, find a list of topics to teach in this training process.

- Prevention in the generation of wastes and reductions at the source.
- Segregation of wastes, collection and storage workshops
- Environmental risks on account of poor management of wastes.
- Knowledge of the responsibilities assigned
- Management of hazardous residues or hazardous wastes

ACTION 2: GENERATION AND CLASSIFICATION OF WASTES

During the project, many types of solid wastes will be generated. To that end, it will conduct comprehensive management of wastes, beginning with separation at the source, thus allowing optimization for subsequent storage, collection, transport, usage and final disposal. During the domestic and industrial activities of the project, three types of wastes will be generated in camps, and in work fronts; non-hazardous, hazardous and special; at the same time, non-hazardous waste may be sub-classified in usable or not and organic biodegradable; following in Table 11.7 find a description of the types of wastes that shall be classified according to their nature.

Table Classification and description of types of solid wastes

TYPE OF WASTE	DESCRIPTION
USABLE	Is the type of waste that has no value for those generating it, but may be reintegrated to a productive process, therefore, having a commercial value.

11.1.1.ABIOTIC ENVIRONMENT

SOIL MANAGEMENT PROGRAM

DATA-SHEET NO. 8 MANAGEMENT OF SOLID AND SPECIAL WASTES

	Example: archive paper, cardboard, glass, plastic (bottles, bags, cups) metals
NON-USABLE	Relates to all materials that given their characteristics cannot be used, either because it has been reused or re-included in the productive process. Has no commercial value and therefore requires final disposal areas *Example: Dirty paper (toilet paper, paper towels, etc.), swiped material, cigarette buds, expanded polystyrene, Styrofoam, metallic paper, among others.*
ORGANIC BIODEGRADABLE WASTES	All those that due to their organic properties, are susceptible to degradation through biological processes, transferring into another type or organic matter. *Example: fruit peel, food waste and/or plant waste*
HAZARDOUS	All those wastes that have corrosive, explosive, reactive, toxic, infectious, flammable and/or radioactive characteristics that may pose a risk to human health and the environment. Similarly, vessels, packaging and other that had come into contact with hazardous wastes are also deemed as hazardous waste. *Example: Batteries, chemicals, medicines, used oils and biological wastes, among others,*
SPECIAL	All those wastes that given their nature, composition, size, volume and/or weight, transport needs, storage and compacting conditions, cannot be collected, managed, treated or disposed normally by normal utility companies and thus may be potentially hazardous and therefore require special treatment. Example: tires, mattresses, furniture, large waste, sludge, etc.

Source: GEOCOL CONSULTORES S.A., 2017.

As part of the program Comprehensive Management of Solid Wastes, it will foster the minimization of waste at the generation point, having as a priority the minimization at the source (reduce, recycle and reuse, taking advantage of materials and/or the energy contained in such wastes.) To this end, it shall consider the following activities to minimize potential impact in the generation of wastes:

- Classification at the source: wastes shall be classified in work fronts, as per their origin and nature.

- Reuse: It shall, to the extent possible, reuse wastes such as paper, cardboard, containers, packaging, structures, cables and insulators. Among others.

- Recycle: It shall separate solid waste that may be used as raw material in the production of new elements.

- FINAL DISPOSAL After being classified and packaged, wastes shall be delivered to an authorized manager and disposed of in authorized sites to that end.

As part of the classification process of wastes at the source, it will implement ecological points in different work and camp areas to separate wastes, taking into account the type of wastes. Table 11-8 exhibits the color chart of containers for wastes to be generated; as well as management and final disposal suggested for each group of wastes.

Table Classification of ordinary solid wastes

TYPE OF WASTE	MANAGEMENT LOCATION/DISPOSAL	CONTAINER
ORGANIC	Collection will be carried out in black plastic bags in containers duly identified for this type of waste; bags shall be transported and disposed of in a sanitary landfill with environmental license, following a period that ensures no presence of vectors in the area surrounding the storage container. Location of storage containers will be made in a strategic manner as per the distribution of facilities and concurrence of personnel.	**BLACK** **Food waste and plant waste**
NON-USABLE	These wastes will be separated at the source in green plastic bags, and then temporarily stored in the comprehensive management of solid waste hut; finally if they cannot be used, they will be delivered to a company in charge of their treatment and final disposal in a sanitary landfill that must have	**GREEN** (Ordinary and inert)

11.1.1.ABIOTIC ENVIRONMENT

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	environmental documentation in force for transport and final disposal thereof, *Example: Dirty paper (toilet paper, paper towels, etc.), dirt material, cigarette buds, expanded polystyrene, Styrofoam, metallic paper, among others.*	
USABLE	Separation of this material will be made at the source by using colored trashcans duly identified. Usable wastes will be handed to companies that treat and recover those materials, either for use and/or recycling. *Example: Plastic bottles, disposable cups, water bags, milk bags, containers, plastics, pens, disposable cutlery, paper, cardboard, newspaper, notebooks, magazines, calendar, cleaned glass bottles, etc.*	**BLUE** (Recyclable plastic) **GRAY** (paper, cardboard, clean newsprint)
HAZARDOUS WASTE	These wastes will be temporarily stored in 55-gallon metal containers or red plastic bags depending of the state of such wastes and its generation source, Manipulation thereof shall follow the nature of hazardous wastes. These wastes must be tagged prior to delivery, with basic information to allow authorities or transporting company and final disposal companies to have total identification of wastes and amounts generated. Wastes will be delivered to companies that comply with environmental permits required for their operation and must issue a certification of the elimination of wastes collected. *Example: Batteries, chemicals, medicines, used oils and biological wastes, among others,*	**RED** (Contaminated material with hazardous wastes or substances with biological risk).

Source: GEOCOL CONSULTORES S.A., 2017.

Industrial solid waste generated in the project and their disposal is shown herein below in Table 11-9.

Table Management of industrial solid waste

INDUSTRIAL WASTE		TREATMENT, MANAGEMENT AND DISPOSAL
USABLE	Cans, paper, cardboard, glass, plastic, scrap, as well as packages or packaging's free from contaminated substances.	Wastes that are free from chemical substances that may be treated as recyclable and may be gathered with domestic origin waste, these will also be separated at the source and their collection will be made periodically by recycle companies or cooperatives that have the respective environmental permits for their final disposal.
HAZARDOUS	Paper and cardboard of bags and sacs used as chemical packaging and cement.	Residues and packaging of chemical products, cement and other, used in civil works, will be withdrawn and disposed of by contractors and/or supply companies.
	Burlap, gloves, overalls, wipes among other textile that cannot be recycled as they are contaminated. Oil changing containers, anti-freeze, concrete curing compounds, engine lubricants, air sprays and foaming agents, polishes containing tar, silicone or other sealing products, fuel gas used and the packaging of chemical product agents be stored temporarily in gathering points in camps, which will be dully identified, roofed and preferably waterproof, will subsequently be delivered to providers and/delivered to	Their storage will take place in properly tagged containers for their transport and disposal by a company having environmental permits in force to transport, treat and dispose of those products. They will be temporarily stores in gathering points located in camp areas, which will be duly identified, roofed and preferably water-proof and subsequently delivered to suppliers and/or delivered to companies that have environmental permits in force to transport these products.

11.1.1.ABIOTIC ENVIRONMENT

SOIL MANAGEMENT PROGRAM

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	companies that have environmental permits in force for their transportation.	
	Acid lead batteries, tires, batteries and/or accumulators, light bulbs, computers and/or similar, medicines, paints and equipment and electronic or electrical parts.	These will be classified at the source, temporarily stored in containers clearly identified and delivered to providers who will disposed of these residues according to purchase agreements, entered into prior to the commencement of the project and environmental laws in force, Resolution 371 of 23 February 2009. of MAVIN
	Infirmary sharp elements	These will be stored in red in the infirmary area, to be delivered to authorized personnel by the regional autonomous corporation, specialized in managing such elements.
SPECIAL	Bricks, tile, cement, hardened mortar, steel armors and other metallic structures, profiles, form work panels.	All these elements will be sent to waste areas authorized by transport companies in the department where they are authorized, the former only if they cannot be reused.

Source: GEOCOL CONSULTORES S.A., 2017.

ACTION 3: TEMPORARY STORAGE

During the generation of solid wastes, it will require the temporary gathering and storage of these wastes. (Photo 11-1) until the same are delivered to a third party for their treatment, used and/or final disposal. For their implementation, they will consider the following:

- The gathering center will be protected from outdoors, from potential vectors and will only have access to authorized personnel to store or take out such wastes.
- It will have a waterproof surface in cement or geomembrane.
- For safety reasons, hazardous wastes will be isolated from non-hazardous wastes' compartments; in order to avoid contamination processes.
- The gathering center will have good ventilation as a safety measures and as control measure from potential odors.
- The location of the gathering center will be distant from mesh halls and sleep areas, taking into account wind direction.
- It will have a fire system, as a precautionary measure, wash units in the event of coming into contact with hazardous waste and with PPE.
- It will have appropriate signaling, and for hazardous wastes, the respective identification and nature of such waste.
- The gathering center will meet all other provisions required in Decree 2981 of 2013

Picture. Temporary storage hut for solid wastes.

Source: GEOCOL CONSULTORES S.A., 2017.

11.1.1.ABIOTIC ENVIRONMENT
SOIL MANAGEMENT PROGRAM
DATA-SHEET NO. 8 MANAGEMENT OF SOLID AND SPECIAL WASTES

Special wastes appearing on Table 1, that are big in size, will be stores in special areas to that end, that could be located in a site next to the storage unit, for example, scrap, the area should be refurbished to avoid outdoor contact and avoid leaching of secondary wastes due to corrosion processes.
Storage time for waste shall ensure that the capacity of the gathering center does not exceed 90% of its total capacity and will also depend on the conditions of the waste stored; for example, it will ensure that biodegradable wastes are delivered periodically to avoid the presence of odors, vectors and leaching processes.
Daily, it will conduct housekeeping inspections with the purpose of verifying that wastes generated are classified, stored and disposed of according to management and classification of the current data-sheet.
It will conduct a review of containers that store organic wastes and will conduct washing with the necessary frequency to remove wastes that adhered to the walls of those containers. All containers will be kept duly covered to avoid the generation of odors, vectors and lixiviate spills.

ACTION 4: COLLECTION AND TRANSPORT

It will implement and adjust collection routes according to volumes and characteristics of wastes, in order to permanent collect prioritizing wastes, because given their characteristics, they would required transport and disposal at reduced frequencies.

Wastes that require special handling, such as hazardous wastes and some special wastes, will be delivered to third parties that have the respective permits for their treatment and final disposal.

During the collection and transport process, it will take the following minimum precautions:

- The load in the vehicle must be duly stacked and piled, fastened
- and covered in a way that they do not pose any danger to people or the environment.

- Transporting company must have all basic emergency elements required, such as: fire extinguishers, PPE, flashlight, first-aid kit, collection and cleaning equipment.

Waste transporting company will have a contingency plan in place, given that in the event a spill or leak of hazardous waste occurs, during transport, it shall put in place all contingency measures necessary to protect human health and the environment.
Service rendering collection, usage, treatment and final disposal companies, shall certify the weight of wastes delivered by the company, and the company will have a periodic weight registry generated by type of waste. To collect and transport wastes, it shall comply with obligations established in Decree 2981 of 2013m 1609 of 2002 and 4741 of 2005.

ACTION 5: FINAL DISPOSAL

The final disposal of waste will be made according to the nature of non-usable, usable or hazardous.
Regarding non-usable ordinary waste, will be disposed in a sanitary landfill with Environmental License, in the region; la Victoria sanitary landfill in the municipality of Ipiales, located in the township of Cutuaquer, via La Victoria hamlet, has an environmental license (Resolution 151 of 2012); and is operated by Instituto de Servicios Varios de Ipiales ISERVI. Useful life is estimated in 14.9 years as of 2009; the municipality of Pasto has a sanitary landfill, named Antanas, located in kilometer 13 from Pasto, at the Daza Buesauco detour, in Josefina hamlet, township of Morasurco, which has environmental license (Resolution 943 of 23 November 2009;, modified by Resolution 277 of 29 September of 2003 and Resolution 843 of 11 November 2008) and is operated by Empresa Metropolitana de Aseo de Pasto EMAS, E.S.P, and started operation in April 2001 and has an estimated useful life of 28 years. Or it must be delivered to authorized companies for transportation and final disposal.
Usable solid waste will be delivered to recycling companies for their reuse or inclusion in the useful life cycle, Ipiales has the company Recicladores Unidos de Ipiales and in Pasto de following companies: Cooperativa empresarial reciclardores Nariño, Surcolombiana de plásticos y recicladores S.A.S and Empresa recicladora de escombros S.A.S
Hazardous wastes will be delivered to companies in charge of treating and dispose of and which have the respective environmental permits to carry out these types of activities.
Special industrial solid wastes shall be delivered to authorized companies for their collection, treatment and final disposal.

11.1.1.ABIOTIC ENVIRONMENT

SOIL MANAGEMENT PROGRAM

DATA-SHEET NO. 8 MANAGEMENT OF SOLID AND SPECIAL WASTES

Companies having Environmental Licenses issued by CORPONARIÑO to carry out collection, transport, storage and final disposal of Hazardous Wastes in the Nariño department are the following:

Table Companies that have Environmental License to manage Hazardous Wastes.

COMPANY	ADDRESS:	TELEPHONE:	DESCRIPTION	WASTES
SERPRO INGENIERÍA S.A.S	VEREDA BOTANILLA DEL MUNICIPIO DE PASTO	3176755966 CARMEN ALICIA CALVACHE	Collection, transport and storage PCB Analysis of dielectric oil	Dielectric oils used, used oils in oil changes, mercury and sodium PCB light bulbs, ballasts, fluorescent tubes, compact lamps, batteries, alkaline batteries, cadmium, nickel and lithium batteries and/or lead wastes, all types of mercury wastes included those from hospitals, excess wastes from lab analysis. Electronic wastes and those from obsolete RAE equipment with hazardous materials contents. Home appliances such as heaters, stoves, refrigerators, freezers, air conditioning, "Ozone Depleting Substances (Refrigerant, R-11,R-12, R-22), contaminated sawdust filters, sludge
HELMERJESÚS DÍAZGOMAJOA	CRA 45A N.20-39. BARRIOJUANOY	7312134	Temporary collection, transport and storage	Used oils
EMAS	CRA 24 N.23-51	7362874	Collection, transport and storage	Hospital and amalgams
SALVI	CRA 363OE-05	7228019	Collection, transport and storage	Hospital waste, lighting, developing liquids and mercurial fasteners.
RECUPEROILS S.A.S	CRA 5 NO. 20–58 PANAMIPIALES	3137505799PABLOANDRESRICAURTE	Temporary collection, transport and storage	Used oils

Source: Corporación Autónoma Regional de Nariño, 2014.

7- INDICATORS

GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL
Training of 100% of personnel involved in PGIRS project	Training: training and education strategies	(Number of people trained in separation, management and disposal of any type of solid waste/number of people contracted for the project)* 100	100%
Classification of 100% of wastes generated by the project	Generation and classification of wastes	(Kg of classified non-hazardous solid wastes/kg of generated non-hazardous solid wastes).	100%
		(kg of classified and special hazardous solid wastes / kg of special and generated hazardous solid wastes) *100	100%
Adapting gathering centers will all technical indications.	Temporary storage	(Number of temporary gathering centers under indication / Number of temporary gathering center) *100	100%

11.1.1.ABIOTIC ENVIRONMENT			
SOIL MANAGEMENT PROGRAM			
DATA-SHEET NO. 8 MANAGEMENT OF SOLID AND SPECIAL WASTES			
100% control of transported wastes by contracting companies	Collection and transport	(kg of certified wastes by the contracting company/kg of transported wastes) *100	100%
Adequate disposal of non-usable solid waste	FINAL DISPOSAL	(kg of non-hazardous solid wastes adequately disposed/kg of non-hazardous solid wastes generated) *100	100%
		(kg of hazardous and special solid wastes adequately disposed/kg of hazardous and special solid wastes generated) *100	100%
8. PLACE OF APPLICATION			
Work front and operation camps			
9. EXECUTION TIMETABLE			

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
Training: training and education strategies	X	X	X
Generation and classification of wastes		X	X
Temporary storage		X	
Collection and transport		X	X
FINAL DISPOSAL		X	X

10. QUANTIFICATION AND COSTS

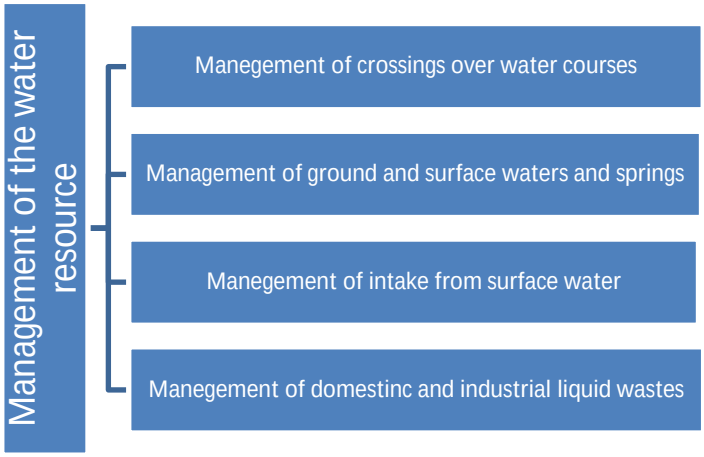
ITEM	UNIT	UNIT COST (COP)	QUANTITY	TOTAL COST COP)
Training: training and education strategies	UNIT	$ 500,000	10	$5'000.000
Construction of hut for the temporary storage of wastes	UNIT	$ 5,000,000	1	$5'000.000
Trash cans and containers	Global:	$ 700,000	5	$ 3,500,000
Collection of non-hazardous wastes	ton/month	$ 49.000	4.5 ton/month (5 years = 60 months)	$ 13,230,000
Collection of hazardous and special wastes	ton/month	$ 4,000,000	01 Ton/month (5 years = 60 months)	$ 33,000,000
TOTAL COST OF DATA-SHEET				**$59'730.000**
** Costs shown correspond to those of one camp*				

Source: GEOCOL CONSULTORES S.A., 2017.

11.1.1.2 Management of water resource

Management measures stipulated herein below, are aimed at preventing, controlling or mitigating possible alterations to the water resource in water currents to be intervened by the different activities undertaken in this project.

Figure Management program of water resources



Source: GEOCOL CONSULTORES S.A., 2017

11.1.1.ABIOTIC ENVIRONMENT	
11.1.1.2.MANAGEMENT OF WATER RESOURCES	
DATA-SHEET NO. 9. MANAGEMENT OF CROSSINGS OVER WATER CURRENTS	
1. OBJECTIVE	
· Control and mitigate impacts generated by the occupation of water bodies due to structures: Bridges, Box culvert and sewage, resulting from the different construction activities.	
2. GOAL	
· Execute 100% of measures foreseen to comply with the data-sheet	Source: Geocol Consultores S.A.

11.1.1.ABIOTIC ENVIRONMENT			
11.1.1.2.MANAGEMENT OF WATER RESOURCES			
DATA-SHEET NO. 9. MANAGEMENT OF CROSSINGS OVER WATER CURRENTS			
3. PHASE			
PRE – CONSTRUCTION	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**	
	X		
4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE			
- Alteration of watercourses. - Variation on the availability of the surface water resource - Reduction in the transport capacity of surface water sources - Changes on landscape integrity.			
5. TYPE OF MEASURE			
Prevention	**X**	Correction	
Mitigation	**X**	Compensation	

6. ACTIONS TO PERFORM

ACTION 1. MANAGEMENT OF DRAINAGE WORKS FOR THE CROSSING OF WATER BODIES IN SITES WHERE THERE IS OCCUPATION OF RIVERBED

For crossings of water bodies the layout of the Rumichaca - Pasto Divided Highway Project, San Juan - Pedregal Segment, it foresees the construction of sewage and box culvert in the sites shown on Figure 11-11.

Table Location of waterbed occupation points and proposed works.

ID	NAME OF WATER BODY	ABSCISSA OF THE PROJECT	MAGNA SIRGAS COORDINATES ORIGIN 3 WEST		PROPOSED WORKS
			EAST	NORTH	
OC1	NN1	PK16+120	946811.93	589397.70	Box culvert 2 x 2 m
OC2	MN2	PK16+503	947121.83	589603.72	Box culvert 3x2 m
OC3	Yamurayán creek	PK20+831	949114.02	592065.11	Box culvert 3 x 3 m
OC4	NN3	PK22+428	950054.08	593102.63	Box culvert 3 x 3 m
OC5	Guayarín creek	PK23+157	950212.94	593774.90	Box culvert 2 x 2 m
OC6	NN4	PK23+370	950321.61	593956.90	Box culvert 1.5 x 1.5 m
OC7	NN5	PK24+136	950636.07	594629.81	Box culvert 3x2 m
OC8	NN5	PK24+136	950617.38	594684.56	Box culvert 3x2 m
OC9	N6N	PK24+315	950764.62	594725.77	Box culvert 2 x 2 m
OC10	NN7	PK24+525	950967.72	594782.47	Box culvert 2 x 2 m
OC11	NN8	PK25+529	951686.27	595151.47	Sewage 900 mm
OC12	Manzano creek	PK25+589	951906.14	595274.20	Sewage 1200 mm
OC13	Brigada creek	PK25+952	952253.56	595420.32	Sewage 1200 mm
OC14	NN9	PK26+440	952669.62	595499.39	Sewage 900mm
OC15	NN1 Affluent La Humeadora creek	PK28+516	954206.18	596624.50	Sewage 900mm
OC16	NN2 Affluent La Humeadora creek	PK28+516	954290.20	596720.59	Sewage 900mm
OC17	NN10	PK28+677	954363.00	596797.00	Sewage 900 mm
OC18	Los Arrayanes creek	PK29+212	954729.44	597199.25	Box culvert 3x2 m
OC19	Manzano creek	PK29+437	954925.68	597342.18	Box culvert 3x2 m
OC20	NN11	PK29+593	955050.07	597431.63	Box culvert 3x2 m

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2.MANAGEMENT OF WATER RESOURCES

DATA-SHEET NO. 9. MANAGEMENT OF CROSSINGS OVER WATER CURRENTS

OC21	Urbano creek	PK29+756	955178.38	597501.33	Box culvert 3x2 m
OC22	NN12	PK30+040	955429.67	597508.01	Sewage 900 mm
OC23	NN13	PK30+880	955776.28	598034.29	Sewage 900 mm
OC24	NN14	PK31+746	955959.13	598715.59	Sewage 1200 mm
OC25	Moledores creek	PK32+103	955961.93	598913.93	Sewage 900 mm
OC26	El Tablón creek	PK32+729	954964.97	600264.24	Sewage 900 mm
OC27	NN15	PK33+863	954928.86	600362.86	Sewage 1200 mm
OC28	NN16	PK34+018	954892.74	600499.78	Box culvert 1.5 x 1.5 m
OC29	NN17	PK34+107	954867.24	600605.07	Sewage 1200 mm
OC30	NN18	PK34+350	954841.74	600838.89	Box culvert 1.5 x 1.5 m
OC31	NN19	PK35+732	954860.08	601994.55	Box culvert 2 x 2 m
OC32	NN1 Affluent San Francisco creek	PK35+917	954632.16	602074.88	Sewage 900 mm
OC33	San Francisco creek	PK36+000	954609.64	602099.98	Box culvert 5 x 15 m
OC34	NN20	PK36+751	954134.22	602589.08	Box culvert 2 x 2 m
OC35	NN21	PK36+878	954020.90	602661.87	Sewage 900 mm
OC36	NN22	PK37+959	954012.69	603620.06	Box culvert 2 x 2 m
OC37	NN23	PK39+700	953918.82	604516.47	Box culvert 2 x 2 m
OC38	NN23	PK40+085	953963.00	604813.00	Box culvert 3 x 3 m
OC39	NN24	PK44+013	956818.81	605952.00	Sewage 900 mm
OC40	NN25	PK44+425	956886.56	606301.41	Box culvert 2 x 2 m

Source: GEOCOL CONSULTORES S.A., 2017.

In the construction of circular sewage and box culvert, firstly it will ensure drainage of passing water and secondly it will ensure the connectivity of the resource between initial and final points of the works to be executed. Detours of creeks or drainage will be made through cofferdams (in current having flow when structures are being built), where it will ensure that such detours are built in short periods of time, with low detour lengths and the least possible affectation to the quality of the resource.

During the construction of works that cross water bodies, it must install a sedimentation barrier (see Figure 11-8) in each work, to avoid affecting currents with materials from the construction, ensuring the quality of currents to be intercepted. Likewise, each work shall be isolated with tape and reflective columns, where there is intervention and/or open excavations; temporary construction materials sites shall be duly cordoned of, having a perimeter ditch to guide rainwater to sedimentation barriers (in the case of small works such as ditches and sewage), in order to avoid the alteration of areas outside work areas.

Figure Cross section of sedimentation barriers

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2.MANAGEMENT OF WATER RESOURCES

DATA-SHEET NO. 9. MANAGEMENT OF CROSSINGS OVER WATER CURRENTS

Source: GEOCOL CONSULTORES S.A., 2017.

In sites where concrete is being mixed (prepared in-situ) it will take the necessary measures so that neither components or the mix itself fall onto the waterbed, therefore these will be prepared as far as possible from protection areas or as last resource by using surfaces that avoid soil contamination and the runoff of discharges to water mirrors. Under no circumstances can machinery be washed on or close to water bodies, such procedures will be conducted in specific sites.

Excavation materials of any type of crossing under water bodies, destined to Zodme's areas will be located at a distance of minimum 30m of water bodies and will not remain there over one day, to avoid sediments from reaching near-by sources; similarly these will be covered with geotextile, plastic or canvas.

In water bodies where the communities identify uses, it will previously issues signs communicating the works to be executed, estimated times and preventive measures to take into account, highlighting the following:

- Foresees the collection of water for domestic consumption, informing on the activity at least three days prior to it.
- Suspension of domestic consumption water for the community, cannot exceed 24 hours, when more time is required, the Contractor will supply water with tankers, as of the second day water is suspended and during the time required.

Subsequently, when works have been completed, the area will be handed free from trash, debris, materials or sedimentation systems (sedimentation or sedimentation barriers).

On bridge peers it will endeavor to remove the least vegetation possible to avoid the contribution of sediments; during cementation activities, when the use of sludge is required, it will implement a containment system (pools or tanks) to allow recirculation, decanting and drying and the subsequent treatment of debris; these containment systems must receive periodic maintenance, and dry material will be disposed in the nearest Zodme.
Regarding access and plains, in the construction of viaducts and bridges, it will consider the stability of materials and their transitory disposal outside nearby water bodies or runoff and their protection round, indicated for river, affluent creeks in 30m, the same should apply to other intervention works on water bodies.
Crossings of water bodies by means of bridges (which do not generate occupation of riverbeds) are shown in Table 11-12

Table Location of bridges for crossing over water bodies with no occupation.

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2.MANAGEMENT OF WATER RESOURCES

DATA-SHEET NO. 9. MANAGEMENT OF CROSSINGS OVER WATER CURRENTS

ID	NAME OF WATER BODY	ABSCISSA OF THE PROJECT	MAGNA SIRGAS COORDINATES ORIGIN 3 WEST		PROPOSED WORKS
			EAST	NORTH	
P1	Boquerón river	PK18+960	948301.45	591158.78	Boquerón bridge
P3	Macal creek	PK37+100 and PK37+285	953951.30	602936.63	Bridge Macal creek
P4	NN	PK38+624 and PK38B	954465.82	604275.77	Bridge El Porvenir township
P5	Sapuyes river	PK41+056.60 and PK42+256.60	955313.95	604941.52	Sapuyes river bridge

Source: Consortium SH, 2017

7- INDICATORS

GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL
Execute 100% of measures foreseen to comply with the data-sheet	Management of drainage works in crossing over water bodies in riverbed occupation sites	(Number of structures built that occupy riverbeds/number of structures forecasted to occupy riverbeds) x 100	100% Excellent
		(Number of drainage built with sedimentation barriers/number of drainage works forecasted) x 100	100% Excellent
		(number of prior signs to the community / Number of crossing works over water bodies) x 100	100% Excellent

8. PLACE OF APPLICATION

Riverbed occupation sites

9. EXECUTION TIMETABLE

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
Management of drainage works in crossing over water bodies in riverbed occupation sites		X	

10. QUANTIFICATION AND COSTS

ITEM	UNIT	UNIT COST (COP)	QUANTITY	TOTAL COST COP)
Follow-up to the Application of the Environmental Management Plan	Month	$ 2,700,000	42**	$113,400,000

11.1.1.ABIOTIC ENVIRONMENT	
11.1.1.2.MANAGEMENT OF WATER RESOURCES	
DATA-SHEET NO. 9. MANAGEMENT OF CROSSINGS OVER WATER CURRENTS	
TOTAL COST OF DATA-SHEET	$113,400,000
Costs related to the construction of works for crossings of water bodies in riverbed occupation sites are included in the general cost of the project, within the budget assigned to civil works. *Verification of management measures will be the responsibility of professionals in charge of the follow-up of the environmental management plan. ***The duration of the project is 42 months	

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2.MANAGEMENT OF WATER RESOURCES

DATA-SHEET NO. 10 MANAGEMENT OF GROUND WATERS, SPRINGS AND WATER BIRTHS

1. OBJECTIVE

- Minimize changes in water infiltration patterns to non-saturated areas; minimize dejection effect of water table in nearby plots of land; collect, process and analyzed data on the amount and quality of ground waters as baseline to acknowledge the state and forecast of the environment.

2. GOAL

- Prevent soil and sub-surface water contamination in the area, minimize dejection effect to water table in points of interests for the community, such as cisterns, natural springs and anthropic springs.

Source: Geocol Consultores S.A. 2017

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
X	X	X

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- **GROUND WATER Negative impact, Alteration of the quality of ground water Changes on the natural physicochemical and/or bacteriological characteristics of ground waters due to anthropic activities.**
- **GROUND WATER Negative impact: alteration of the flow of ground waters network variation of piezometric level or hydraulic charge of the aquifer in cutting sectors and thick landfills (ZODME); it also relates to the potential reduction of storage capacity, transmitting and freeing water of an aquifer**
- **GROUND WATER Negative impact: alteration of recharge zones. Changes in water infiltration patters of saturated and non-saturated water, implying greater recharge time on the non-saturates area.**

5. TYPE OF MEASURE

Prevention	X	Correction	X
Mitigation	X	Compensation	

6. ACTIONS TO PERFORM

a. Alteration of the quality of ground water

ACTION 1: Socialization of the project with the community and institutions in the region.
ACTION 2: Undertaking-monitoring programs of the photochemical and bacteriological qualities of water in the network of ground water points selected to that end. Regarding hydro chemical monitoring, 2 sampling campaigns should be conducted during one hydrological years, one in the dry season and another one in the rainy season, as established in the Follow-up and Monitoring Data-sheet "Data-sheet PSM No. 5 Environmental element of ground water"
ACTION 3: Constriction of historical series of data (quality - levels)
ACTION 4: Feed, supplement and update the intrinsic vulnerability map on the contamination of aquifers, which primary information surveyed at the time of construction, operation, abandonment and final restoration, together with the quality monitoring result of physicochemical and bacteriological water characteristics. Variables to take into account relate to depth of water table data, assessment of net recharge and permeability in non-saturated area.
ACTION 5: Adequate design and implementation of works to manage runoff waters and passing structures.
ACTION 6: Periodical maintenance of intake, conduction, distribution and clearing gutters systems of surface runoff water (stages: construction, operation, abandonment and final restoration).
ACTION 7: Adequate lining of final surfaces, using grass patching and/or revegetation techniques

b. Alteration of the flow network of ground waters

ACTION 1: Socialization of the project with the community and institution in the region.

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2.MANAGEMENT OF WATER RESOURCES

DATA-SHEET NO. 10 MANAGEMENT OF GROUND WATERS, SPRINGS AND WATER BIRTHS

ACTION 2: Feed, supplement and update inventory of ground water sources in the project's area of influence.
ACTION 3: Undertake programs to monitor piezometric level in points in the ground water network selected to that end. It must be undertaken monthly (stages: construction, abandonment and final restoration), as per that established in the Follow-up and Monitoring Data-sheet "Data-sheet PSM No. 5 Environmental element of ground water".
ACTION 4: Construction of a series of historic data (Registration of multi-temporal static level vs. climatic period and utilization).
ACTION 5: Establish local flow networks and their potential impact to the project's development, local conceptual models defined in critical areas detected during the construction of the project.
ACTION 7: Implementation of a Program to Save and Make an Efficiency use of Water

c. Alteration of recharge zones

ACTION 1: In critical areas detected during the construction of the project: simulate and diagnose hydro system responses when subjected to disturbances such as coverage of large landfills or cuts in important areas, predicting changes in water table levels by means of a hydro geological numeric model (stages: construction, abandonment and final restoration).
ACTION 2: Adequate lining of final surfaces, by means of grass patching and/or revegetation techniques.

7- INDICATORS

GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL
Prevent the contamination of surface water bodies in the area of influence (Alteration of ground water quality).	Multi-temporal monitoring of physicochemical and bacteriological quality parameters of ground water.	Number of points monitors / Number of points programs during the activity) x 100	100%
Minimize dejection effect of water table level (Alteration of ground water network flow).	Multi-temporal monitoring of piezometric level in the selected monitored network.	Number of points monitors / Number of points programs during the activity) x 100	100%
Mitigate potential changes in water infiltration patters in non-saturated areas (Alteration of recharge zones).	Lining of final surfaces, by means of grass patching and or revegetation techniques (in ZODMEs low slopes and surfaces)	Number of hectares with grass patching and/or revegetated / Number of forecasted hectares to be lined with natural surfaces x 100	100%

8. PLACE OF APPLICATION

The place of application will be in sites defines for the execution of construction activities and works of the road project and its area of influence.

9. EXECUTION TIMETABLE

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
Socialization and agreement on the project	X		
Monitoring physicochemical and bacteriological qualities of ground water.	X	X	X
Monitoring piezometric levels of reservoir and open piezometers	X	X	X
Construction of the historic series of data (quality - levels, climatic period, utilization).		X	X
Feed, supplement and update the intrinsic vulnerability map of contamination of aquifers and recharge zones.		X	

11.1.1.ABIOTIC ENVIRONMENT				
11.1.1.2.MANAGEMENT OF WATER RESOURCES				
DATA-SHEET NO. 10 MANAGEMENT OF GROUND WATERS, SPRINGS AND WATER BIRTHS				
Feed, supplement and update the inventory of ground water sources		X		
Establish local flow networks and their potential impact with the undertaking of the project (in critical sites defined during the construction of the project).		X		x
Hydro geological numeric model in critical sites defined during the construction of the project,		X		x
Implementation of a Program to Safe and Make Efficient use of water.		X		x
10. QUANTIFICATION AND COSTS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
Socialization and agreement on the project*	-	-	-	-
Monitoring physicochemical and bacteriological qualities of ground water.	**Point**	**$ 1,200,000**	**56**	**$ 67,200,000**
Monitoring piezometric levels of reservoir and open piezometers	**Monthly campaign**	**$500,000**	**60**	**$ 30,000,000**
Construction of the historic series of data (quality - levels, climatic period, utilization).	**Day/hydro geology**	**$420,000**	**30**	**$12,600,000**
Feed, supplement and update the intrinsic vulnerability map for the contamination of aquifers and recharge zones.	**Day/hydro geology**	**$420,000**	**30**	**$12,600,000**
Feed, supplement and update the inventory of ground water sources	**Day/hydro geology**	**$420,000**	**30**	**$12,600,000**
Establish local flow networks and their potential impact with the undertaking of the project (in critical sites defined during the construction of the project).	**UNIT**	**$15,000,000**	**1**	**$15,000,000**
Hydro geological numeric model in critical sites defined during the construction of the project,	**UNIT**	**$15,000,000**	**1**	**$15,000,000**
Implementation of a Program to Safe and Make Efficient Use of Water*	-	-	-	-
TOTAL COST OF DATA-SHEET				**$165,000,000**
***THE BUDGET FOR THE IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT MEASURES IS INCLUDED WITHIN THE BUDGET TO THE CONSTRUCTION WORK.**				

Source: GEOCOL CONSULTORES S.A., 2017

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2. MANAGEMENT PROGRAM OF WATER RESOURCES

DATA-SHEET NO. 11. MANAGEMENT AND INTAKE OF SURFACE WATER

1. OBJECTIVE

- Provide management guidelines that ensure minimum affectation to water bodies and its surroundings in the water intake activity in places authorized by the project's environmental license.

2. GOAL

- Compliance with 100% of Physical and Biotic restrictions, as well as management measures for surface water intake.
- Compliance of up to 10% of intake volume authorized by the activity.

Source: GEOCOL CONSULTORES S.A., 2017.

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
	X	

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Alteration in ground water quality
- Variation on the availability of surface water resource
- Variation of the contribution and transport of sediments
- Alteration of courses

5. TYPE OF MEASURE

Prevention	X	Correction	
Mitigation	X	Compensation	

6. ACTIONS TO PERFORM

ACTION 1: INTAKE OF WATER BODIES

Intake of water for domestic and industrial use required during the undertaking of the project, prior Environmental Authority authorization, will be made on water currents described in Table 11-13. For the selection of sources susceptible to intake, it established a series of criteria to identify may drainage areas with the appropriate conditions for water intake.

Table - Water intake points requested by the Rumichaca – Pasto Dual Carriageway Project, San Juan – Pedregal Section

ID	Source	MAGNA SIRGAS COORDINATES WEST ORIGIN		MOBILITY RANGE
		EAST	NORTH	
1	Guitar river	948503	590762	It request a mobility range of up to 200 m, and 100m upstream and 100m downstream of the points proposed.
2	Boquerón river	948589	590972	
3	La Humeadora creek	955074	597201	
4	Moledores creek	956019	598991	
5	San Francisco creek 2	953962	601557	
6	El Macal Creek	954870	603721	
7	Sapuyes river	954844	605090	
8	Yamurayán creek	949128	592258	
9	San Francisco creek	949976	593121	
10	Culantro creek	950642	594577	
11	El Manzano creek	951631	595174	

Source: GEOCOL CONSULTORES S.A., 2017.

ACTION 2: INTAKE VOLUME CONTROL

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2. MANAGEMENT PROGRAM OF WATER RESOURCES

DATA-SHEET NO. 11. MANAGEMENT AND INTAKE OF SURFACE WATER

Each intake system will have a permanent control of intake volume to address Project's needs, to that end it will install flow measurement systems (flow meter) duly gauged, in order to have a continuous registry, Table 11-14 shows the maximum intake flow and the season such flow is required, determined based on the hydrological analysis conducted in this study.
It will ban any type of activity other than that of the intake process, including fishing or recreational activities of personnel in water bodies.

Table Maximum flow volume and intake period in intake ranges
Rumichaca – Pasto Divided Highway Project, San Juan – Pedregal Segment, Chapter 8.

ID	Source	volume (L/s)		volume (L/s) Total	INTAKE PERIOD
		Domestic use	Industrial use		
1	Guáitara river		1.5	1.5	All year
2	Boquerón river	0.45	1.5	1.95	All year
3	La Humeadora creek	0.45	1.5	1.95	(Feb - Aug and Oct - Dec)
4	Moledores creek	0.45	1.5	1.95	(Feb - Aug and Oct - Dec)
5	San Francisco creek 2	0.45	1.5	1.95	(Feb - Jul and Oct - Dec)
6	El Macal Creek		1.5	1.5	(Feb - Jul and Oct - Dec)
7	Sapuyes river	0.45	1.5	1.95	All year
8	Yamurayán creek		1.5	1.5	(Mar- Jul and Nov - Dec)
9	San Francisco creek		1.5	1.5	(Mar - May and Nov - Dec)
10	Culantro creek		1.5	1.5	(Mar - May and Nov - Dec)
11	El Manzano creek		1.5	1.5	(Mar - May and Nov - Dec)

Source: GEOCOL CONSULTORES S.A., 2017.

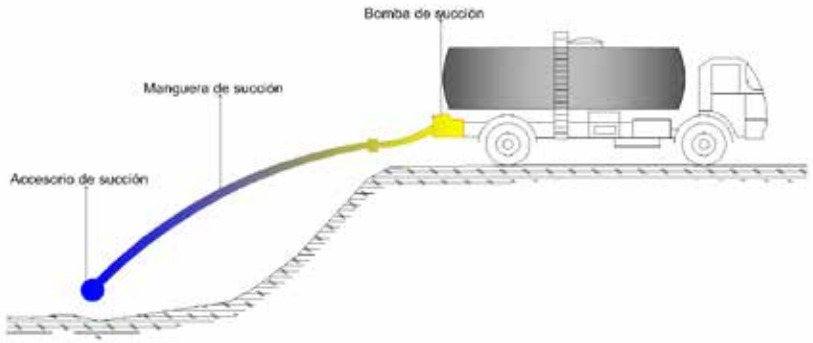
ACTION 3: INFRASTRUCTURE AND SYSTEM INTAKE

For intake of water at the sources to use, it provides three alternative, which are found herein below:

· **Intake by means of a motor pump from a tanker truck**

It foresees using tanker trucks equipped with motor pumps and an up to 6" suction hose that will only be used for this activity. The hose will be equipped with a flow meter to control intake rate, and a mesh on the end of the suction hose to avoid the ingress of solids or any suspended agent in the water that may hinder the proper functioning of the pump. Figure 11-9)

Figure Direct Intake System from the Tanker Truck



Source: GEOCOL CONSULTORES S.A., 2017.

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2. MANAGEMENT PROGRAM OF WATER RESOURCES

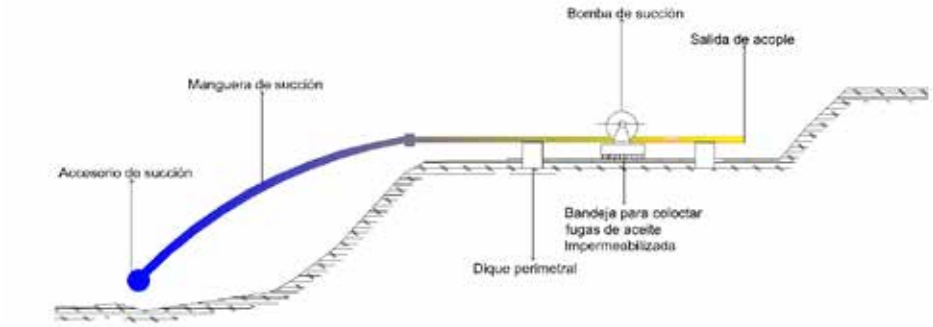
DATA-SHEET NO. 11. MANAGEMENT AND INTAKE OF SURFACE WATER

- Under no circumstances may the tanker truck access the water body and will keep prudent distance with respect to the water body to avoid affecting the slopes.

· **Intake by means of a fixed motor pump and flow line.**

As an alternative, it considers direct intake with motor pumps installed in the field, which will have a containment and/or protection systems with geomembrane to control spills of oil and grease, ensuring that the location is not carried out inside the current or interferes with activities carried out therein or on the border, in addition avoiding that it may be affected due to flash floods in rivers or creeks. Suction elements will be the same as those used with tanker trucks, (Figure 11-10) and will have an output or connection enabling the coupling of the motor pump of the tanker truck or camps or work fronts, using a high-pressure hose on the terrain and controlling with flow meters. (Photograph 11-2).

Figure Typical intake scheme with fixed pumps



Source: GEOCOL CONSULTORES S.A., 2017.

Photograph of a flow meter

Source: GEOCOL CONSULTORES S.A., 2017.

- In the event intake is carried out by means of a fixed motor pump installation, it will be installed over the geomembrane, a concrete plate with containment dikes to control oily and greasy water from possible spills and/or maintenance and pump priming procedure.
- It will build a protection hut to avoid contaminant wash due to rainwater.

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2. MANAGEMENT PROGRAM OF WATER RESOURCES

DATA-SHEET NO. 11. MANAGEMENT AND INTAKE OF SURFACE WATER

· **Intake by gravity and flow line**

Likewise, it proposes to conduct intake by gravity, taking advantage of the differences in the level of the terrain. For intake, it introduces the end of the hose provided with a nozzle and a mesh, at a depth that will not allow dragging of waterbed material of the water source, and it will be pumped using a high-pressure pump on the terrain.

- The hose lying from the tanker truck to the motor pump, to the water body will be carried out with the existing access to avoid opening new trails.

ACTION 4: TRANSPORT OF RESOURCE

It will conduct an inspection on the tanker truck prior intake activities, to identify potential contaminants inside the tank. In the event this situation is confirmed, it will not allow the use of such vehicle to transfer, until unit maintenance or tank wash is performed. Maintenance shall be carried out periodically, as well as to intake elements: hoses, suction pumps, accessories and couplings to avoid possible leaks during intake or water transport.

The tanker truck shall not exceed the speed of 80 km/h when on the Panamericana highway, in tertiary roads it shall not exceed a speed greater than 30 km/h and shall have a certificate in forces of gas emission, as well as road equipment and necessary supplies to service emergencies in the event of an accident.

ACTION 5: ENVIRONMENTAL TRAINING

To reduce water intake volumes during the undertaking of the activities forecasted in the area, it will implement environmental education campaigns aimed at rationalizing its uses, minimizing losses and preventing waste. Likewise, it will seek to use residual water, to the extent conditions allow.

7- INDICATORS

GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL
100% intake of the water resource in bodies, flows and during seasons allowed.	Intake in water bodies	(Number of intake points used / Number of intake points authorized) x 100	100%
	Control of volume intake	((l/s) Intake volume / (l/s) authorized volume) x 100	100%
Construction and modification of infrastructure fitted for water intake	Infrastructure and intake system.	(Number of intake system fitted following described management measures / number of intake systems fitted)x100	100%
Preventive reviews to intake systems to prevent environmental impacts.	Transport of the resource.	(Number of preventive reviews carried out to transport systems / Number of reviews programed in transport systems)x100	100%
Training of 100% of personnel involved in the project on savings and efficient use of water resources.	Environmental Training	(Number of persons trained / number of persons involved in intake and water resource related works)x100	100%

8. PLACE OF APPLICATION

Intake stretches and operational camps

9. EXECUTION TIMETABLE

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
Intake in water bodies,		X	
Control of volume intake		X	
Infrastructure and intake system.		X	
Transport of the resource.		X	
Environmental Training	X	X	X

10. QUANTIFICATION AND COSTS

11.1.1.ABIOTIC ENVIRONMENT				
11.1.1.2. MANAGEMENT PROGRAM OF WATER RESOURCES				
DATA-SHEET NO. 11. MANAGEMENT AND INTAKE OF SURFACE WATER				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
Flow meter	UNIT	$ 300,000	1	$$1,200,000
Water storage tanks	UNIT	$500,000	4	$ 2,000,000
Environmental Trainings	Global:	$200,000	5	$ 1,000,000
TOTAL COST OF DATA-SHEET				**$ 4,200,000**

** Costs shown correspond to those of one camp*
**Costs related to distribution systems are included in the operational cost of the project.*

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2. MANAGEMENT PROGRAM OF WATER RESOURCES

DATA-SHEET NO. 12 MANAGEMENT OF DOMESTIC AND INDUSTRIAL LIQUID WASTES

1. OBJECTIVE

· Prevent and mitigate possible negative impact to soil and water that may be derived as a result of the management and disposal of domestic and industrial liquid wastes during the undertaking of project activities.

2. GOAL

· Control and treatment of 100% of liquid wastes generated, in order not to affect environmental receptors, due to project activities.

Source: GEOCOL CONSULTORES S.A., 2017.

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
X	X	X

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Alteration in ground water quality
- Variation on the availability of the surface water resource
- Change of physicochemical and biological properties
- Generation of odors

5. TYPE OF MEASURE

Prevention	X	Correction	
Mitigation	X	Compensation	

6. ACTIONS TO PERFORM

ACTION 1: INSTALLATION, OPERATION AND MANAGEMENT OF GENERATED WASTE WATER TREATMENT SYSTEMS

DOMESTIC WASTE WATER TREATMENT SYSTEMS

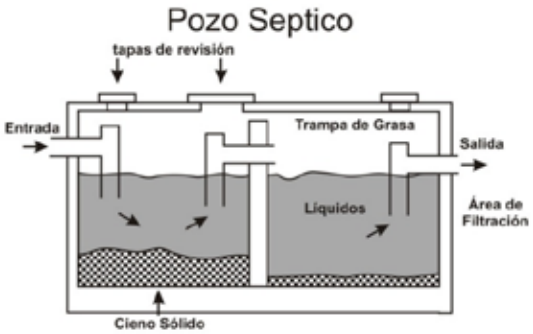
For the treatment of domestic waste waters, it may carry out an array of treatment systems, provided the affluent meets the physicochemical parameters established to be discharged in the different recipient bodies, following find two types of treatment systems which may be implemented in camps and operational areas, final decision of which system to implement will depend on the condition found and the volume of waste waters to be treated.

OPTION 1

Septic Tank

Domestic waste water will be directed to a septic tank which will be made up by two chambers connected with PVC pipes, in the first one and by density, the decanting of larger solid wastes and in the second one it traps greases and the decanting of lower size solid occurs. This structure is covered to avoid the scape of gases and the ingress of rain waters, it can be built using any material that meets its function and does not affect the environment or these may be installed using already manufactures septic tanks.

Figure scheme of a type of Septic tank



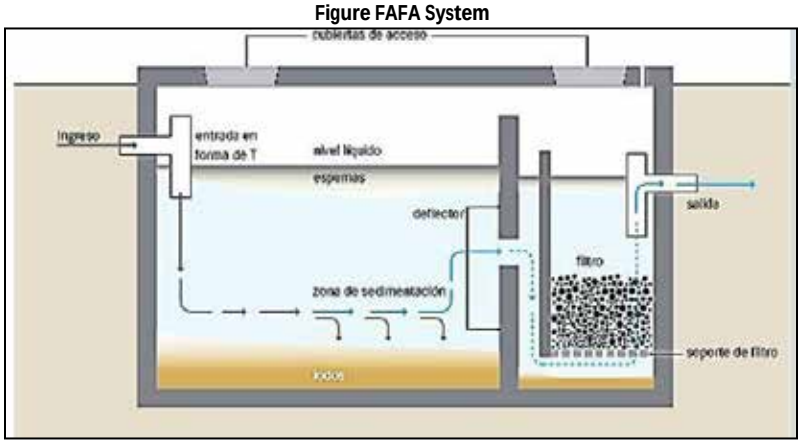
Source: Pan-American Health Organization, 2009.

FAFA System (Ascending flow anaerobic filter)

Once the flow leaves the septic tank, it is transported to FAFA filter. The system consists of a closed tank or chamber, comprising a bed of gravel where the affluent coming from the septic tank passes in an ascending manner through the interstices and the biological film formed on the surface, then this gradual material carries the work of digestion and anaerobic reduction.

The FAFA system is a anaerobic bio reactor with inert filling material, on that filling material a bacterial population grows, which degrade soluble DBO of the affluent, resulting a clarified effluent with reduced organic load.

Figure FAFA System



Source: Water Alliance, 2016

Once the flow leaves the treatment system it expects a removal of 95% of the contaminated load and at that moment it may be transported to storage tanks for final disposal, every time these waters will be disposed, it will conduct monitoring of parameters that may be determined in situ. (pH, color, chlorine, turbidity, conductivity, temperature, dissolved oxygen).

OPTION 2

To facilitate management of domestic waste waters generated during the construction stages and to ensure the efficiency of treatment systems, grey water will be collected separately (waters from showers, basins, laundry and kitchen) from black water (from toilets located in the camp).

Grey waters (Grease tarps)

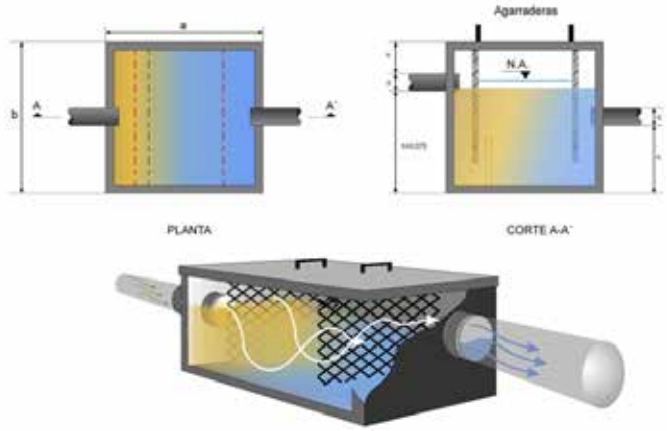
Grey waters will be treated separately in a grease trap Figure 3 This trap will be of a conventional type and will have a cover to facilitate segregation of skimming proceeds. It may be built in any material that allows it to function properly.

Figure Typical scheme and dimensions of Grease Traps for grey waters:

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2. MANAGEMENT PROGRAM OF WATER RESOURCES

DATA-SHEET NO. 12 MANAGEMENT OF DOMESTIC AND INDUSTRIAL LIQUID WASTES



Source: Geocol Consultores s.a., 2017

The cleaning of grease trap includes the manual removal of skimming proceeds, which will be stored in totally closed containers and will be handed to companies that have permits to manage these greases, the volumes delivered will be recorded and certificates of adequate disposal by third parties will be provided.

Sewage (portable plant)

Sewage is taken from generation point in a 4 or 6" PVC pipe to the collecting box, dimensions of which are 1m * 1m * 1m, where en electro submersible pumps lead this volume to the portable Treatment Plant for Domestic Waste Water. **Photograph**

Treatment of waste waters in the treatment plant begins in an airing tank or reactor, where it forms aerobic and anaerobic type bacteria by the action of enzyme complex. Aeration of the effluent with organic matter is a basic treatment process; bacteria multiply forming a bacterial sludge where organic loads contained in the water are consumed. Subsequently, water goes through a section where the volume is made stable and produces sedimentation. Afterwards, primary sedimentation will be led to floating sludge return pipes to the aeration chamber and precipitated sludge will return to the collection chamber or pumping to begin the process again. By overflow, water passes through a chlorinator where chlorine doses are added in the form of tablets; the effluent is taken to secondary sedimentation tank

Each camp will have a permanent operator in charge of the treatment plant, managing volume and monitoring in situ parameters (pH, Color, Chlorine, Turbidity, Conductivity, Temperature and Dissolved Oxygen), to make the necessary controls and adjustments.

Photograph

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2. MANAGEMENT PROGRAM OF WATER RESOURCES

DATA-SHEET NO. 12 MANAGEMENT OF DOMESTIC AND INDUSTRIAL LIQUID WASTES

Source: GEOCOL CONSULTORES S.A., 2015.

Removal efficiency of these plants is 97% in normal operating conditions, therefore it will have good oxygenation and avoid the entry of grey waters into the system, as its soap and detergent contents inhibit the formation and development of bacterial or activated sludge.
Monitoring will be performed at least every three months, where it will assess efficiency of domestic waste water treatment plant, carrying out monitoring of the effluent, being mindful of the following parameters: Temperature, pH, Conductivity, Dissolve oxygen, turbidity, flow, true color, total alkalinity, total hardness, chlorine, sulphates, phosphates, nitrates, total suspended solid, DQO, DBO5, iron, sodium, grease and oils, total coliforms and fecal coliforms.
Lastly, the treated effluent of the PTARD, will be taken in a distribution chamber where grey waters will be treated and these are sent to storage tanks for their final disposal, each time they will be disposed of, it will conduct monitoring of parameters that may be determined in situ, (pH, Color, Chlorine, Turbidity, Conductivity, Temperature and Dissolved Oxygen).

Portable toilets for domestic sewage.

During the operating stage in that referring to the construction of works, it will have portable toilets for personnel. (See Photo 11-4). Toilets will be subject to maintenance to ensure their correct operation. Treatment and disposal of wastes will be conducted by a company in charge of maintenance of these installation in sites duly authorized to that end, or through a Public Utilities Company with permits to carry out such task.
As a control mechanism, each time maintenance is carried out on portable toilets, the contracting company will issue a minute, specifying volumes and the treatment and final disposal site.
Portable toilets include sinks and a paper dispenser and disposable paper towels. Depending on the number of workers at the work front and taking into account an average of four (4) entries/day/worker, and usage capacity to 100 per unit, it will calculate the number of units required by work site and maintenance frequency thereof.

Photograph Portable Bathrooms

Source: GEOCOL CONSULTORES S.A., 2017.

INDUSTRIAL WASTE WATERS

Industrial waste waters are liquid effluents related to the characteristics inherent to the activity of aggregate preparation (grinding and asphalt plants), waters used in washing and cleaning equipment, warehouses, shops and contaminated rain waters with oils, chemical or fuels that have come into contact with such equipment.

Following find a basic description of treatment for these waters

Entrance channel and grease traps

Perimeter channels towards grease traps will take waters that come into contact with equipment or machinery, where greases and oils are separated from this effluent.

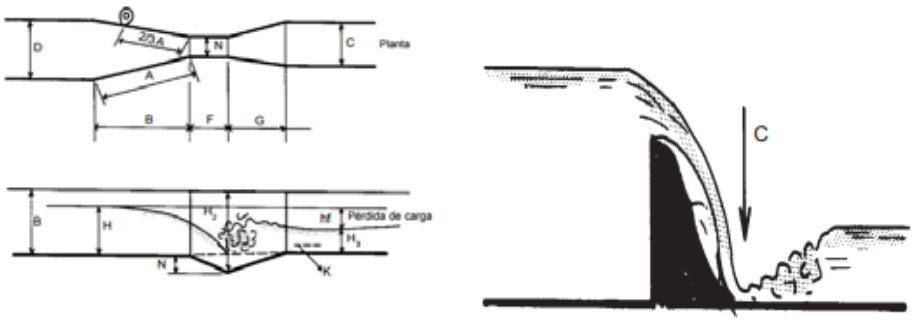
Oils and greases will be stored in metal containers, which will be delivered to companies duly authorized to treat and dispose of them, volumes delivered will be registered and a certificate evidencing adequate disposal be third parties will be obtained.

Rapid mixing system (flocculator)

Once skimming proceeds are removed from the effluent, it is transported to a rapid mixing system (I.e. Parshall flumes, dump sites among others) (See Figure 11-14) where chemical and flow coagulant are added, these systems may be built of any material that allow correct functioning and d not affect the natural environment where they are installed.

Coagulants are polymers that allow flocculation and decanting of smaller size particles, in addition it adjusts pH and disinfection processes by adding calcium hypochlorite (chlorinated lime).

Figure typical rapid mixing systems



Parshall flumes Rectangular dump

Source: Rapid mixing systems, Lidia de Vargas by GEOCOL CONSULTORES S.A., 2017.

Treatment pool (Sedimentation)

Once the flow leaves the rapid mixing system, it is directed to a treatment pool, where by sedimentation processes, it proceeds to decanting larger particles and flocks.

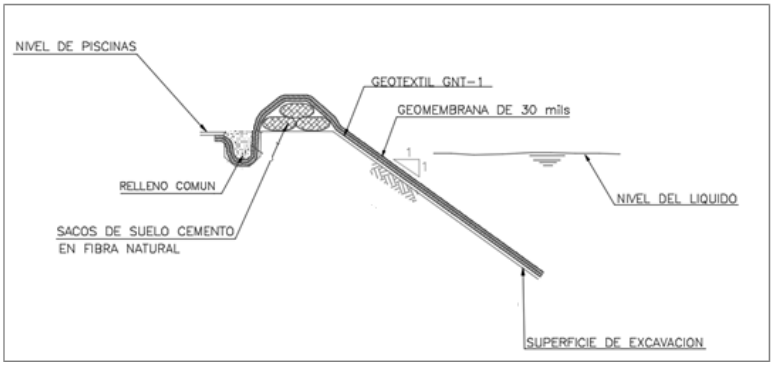
11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2. MANAGEMENT PROGRAM OF WATER RESOURCES

DATA-SHEET NO. 12 MANAGEMENT OF DOMESTIC AND INDUSTRIAL LIQUID WASTES

This pool will be waterproof by high-density geomembrane and geotextile, which hinder infiltration of liquid waster to the soil, a perimeter barrier must be built by using cement sacs on the bottom, which will anchor and prevent movements of the geomembrane. (See Figure 11-15)

Figure pool anchorage system



Source: GEOCOL CONSULTORES S.A., 2017.

Mixing and exiting tanks

Once the flow meets all the physicochemical characteristics and parameters to be reused in these processes or to be dumped, it is stored in storage tanks where it is directed to process plants or sent to be dumped.

ACTION 2: FINAL DISPOSAL

Prior verification of compliance with monitored parameters, based on environmental laws in force, it will consider the disposal of domestic waste waters treated by:

Disposal in aspersion fields and/or infiltration in each of the fields.

For the disposal of domestic and industrial waste waters in aspersion camps, waste water transport will be made by installing a surface piping network or conduction hoses, Figure 11-16 shows this aspersion type field. The following actions must be considered for aspersion fields.

Physicochemical characteristics of waters to be disposed in order to test quality thereof, parameter for characterization shall be adjusted according to main sanitary interests parameters that are part of the compositions of waters to be dumped, provided that dumping alternative is intended for domestic and industrial waste waters.

The Physicochemical characterization of the aspersion area will be conducted every 6 months, or during closure of irrigation fields (three sites evenly distributed), upon which it will conduct the disposal, including as a minimum the following parameters: Texture, cathonic exchange capacity, pH, sodium absorption ration (RAS), % of exchangeable sodium, wet content, greases and oils, total hydrocarbons and metals (arsenic and barium).

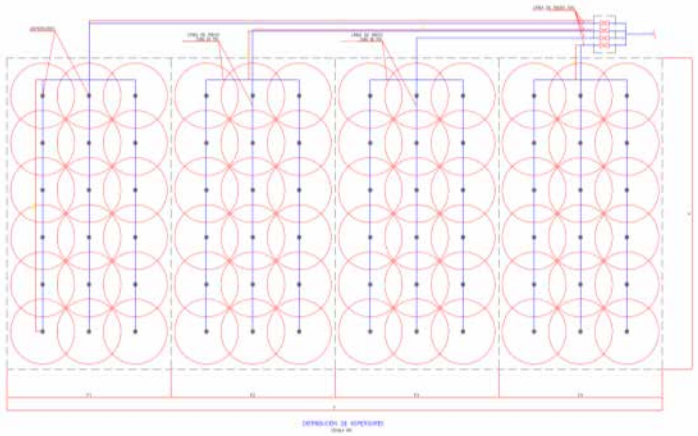
Dump will be suspended where there is evidence of puddles on areas due to soil saturation.

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2. MANAGEMENT PROGRAM OF WATER RESOURCES

DATA-SHEET NO. 12 MANAGEMENT OF DOMESTIC AND INDUSTRIAL LIQUID WASTES

Figure Type of aspersion field



Source: GEOCOL CONSULTORES S.A., 2017.

Discharge in water bodies

Prior the review of its physicochemical characteristics, it may discharge domestic and industrial waste waters in water bodies as shown in Table 11.15, where it also establishes the mobility range and maximum flow, according to the assimilation capacity model conducted.

Table Maximum flow and discharge strips
Rumichaca – Pasto Divided Highway Project, San Juan – Pedregal Segment, Chapter 8.

ID	Source	MAGNA SIRGAS COORDINATES WEST ORIGIN		FLOW (L/s)	MOBILITY RANGE
		EAST	NORTH		
1	Boquerón river	948589	590972	0.44	It request a mobility range of up to 200 m, and 100m upstream and 100m downstream of the points proposed.
2	La Humeadora creek	955074	597201	0.44	
3	Guáitara river	956508	600552	0.44	
4	Sapuyes river	954844	605090	0.44	

Source: GEOCOL CONSULTORES S.A., 2017.

It requires the authorization to discharge by means of a submersible hose from a tanker truck, which must have a capacity oscillating between 3,200 and 2,700 gallons, depending on the vehicle. In addition, it requests the option of discharging via the discharge line,

The identification of discharge sites were defined taking into account the following parameters:

- Easy access
- Minimum affectation to existing vegetation
- Sufficient flow to ensure assimilation thereof
- Inventory of uses and users of the resources¡
- Sites requested to carry out discharges will be located on the main course of currents, taking into account that under no circumstances can it be done on branches, old wetlands, temporary courses or on lakes and ponds.

It will ensure that discharges of the project to undertake, meet that set forth in Decree 2900 of 25 October 2010 and resolution 631 of 17 March 2015.

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.2. MANAGEMENT PROGRAM OF WATER RESOURCES

DATA-SHEET NO. 12 MANAGEMENT OF DOMESTIC AND INDUSTRIAL LIQUID WASTES

The discharge of treated waste waters to a surface source, will be made by controlled discharge, and to that end it will implement necessary mechanisms and thus ensure that the effective volume to be discharged in the river or creek, correspond to the maximum volume authorized; also discharges will be done always seeking to ensure minimum distance of the mixing zone and favor the assimilation of such discharge.

It will avoid that discharging waste waters cause affectation to the quality of the receiving water body, or compromises the admissible quality criteria to use the water downstream of authorized discharge points, In addition it will report the discharge regime (hours/day) and discharge period (day/month)

During final disposition of treated waste waters on the surface source, it will adjust the model presented using actual discharge information in the modeling vis-à-vis the characteristics of the surface current, so it may become a fundamental follow-up and lesson-learning tool. The respective report on progress of the adjustment of the model will be presented in the Environmental Compliance Report.

It will conduct monitoring at least every 3 months during discharges, upstream, in the point and downstream in discharge points, taking into account coordinates in which baseline and modeling monitoring were made, collecting water quality samples and inspection of the water body to assess and monitor volume and concentrations of required parameters, and the behavior of the water source vis-à-vis discharge of the project, in this manner it may have continuous validation of the model with updated data and discharge adjustments, if any. An accredited IDEAM Lab will carry out monitoring.

Delivery to authorized third parties.

Another alternative to conduct final disposal of domestic and industrial waste waters, is by delivering treated liquid wastes to third parties that carry out transport, handling, treatment and final disposal of this type of waste, and to that end they shall have the respective permits and licenses to execute the task. Transport will be carried out in tanker trucks from camp sites to receiving sites, these must comply with Decree 1609 of 2002, to transport hazardous materials, and will ensure adequate disposal and will issue environmental follow-up minutes from the delivery, treatment, characterization and adequate final disposal, indicating amounts treated.

ACTION 3: DISCHARGE QUALITY

Prior disposal to water bodies, it must review the parameters established in resolution 631 of 17 March, 2015, issued by the Ministry of the Environment and Sustainable Development, and to that end it establishes maximum allowable limits and parameters in the specific discharges to surface water bodies.

Prior disposal to soil, it must review parameters established in resolution 1594 of 1984, given that environmental legislation does not have minimum quality parameters for waters to be disposed of on soil (Paragraph of article 1, Resolution 631 of 2015).

ACTION 4: MAINTENANCE OF TREATMENT SYSTEMS

Maintenance of treatment systems will be made according to the efficiency in the removal of contaminants process or deterioration of units that comprise it. Thus, of the system has alterations in the quality follow-up parameters, it will verify if airing units are operating properly or if there is a short circuit in coagulation-flocculation processes, clarification and/or disinfection, on a case by case basis.

Excess sludge in the portable treatment plant, septic tanks (should they be used) will be eliminated when due to its concentration they inhibit degradation process of organic matter. Sludge generated will be delivered to an authorized third party for their treatment and final disposal. This same verification will be made in water clarification units, in order to ensure retention times.

Treatment units shall also receive preventive maintenance, and to that end it will carry out periodic verifications of valves and/or insulators of treatment units employed, as well as of pumps or engine used in the mechanical process of such treatment. This should be done at least once a week.

It shall verify clogging and obstruction in collection channels by means of visual inspection, carrying out the removal of waste or vegetation that hinder the normal flow of waters. Visual inspections will be verified weekly.

In the event maintenance of treatment units imply emptying it completely, it shall have a relief tank for temporary storage of fluids present in the treatment unit that will have maintenance.

7- INDICATORS

GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL
Treatment of 100% of liquid wastes generated	Treatment systems of waste waters generated	(Volume of waste water treated/volume of domestic water generated)*100	100%

11.1.1.ABIOTIC ENVIRONMENT			
11.1.1.2. MANAGEMENT PROGRAM OF WATER RESOURCES			
DATA-SHEET NO. 12 MANAGEMENT OF DOMESTIC AND INDUSTRIAL LIQUID WASTES			
Adequate disposal of 100% of liquid wastes generated.	FINAL DISPOSAL	(No of discharge points used/ Number of discharge points authorized)	≤1
Control and measurement of 100% of parameters of liquid wastes to dispose.	Discharge quality	(Number of parameters with results that meet legal standards in force(number of parameters analyzed with established limit)*100	100%
Preventive maintenance of treatment systems to prevent affectation on removal efficiency.	Maintenance of treatment systems	(Maintenance of treatment systems.(Number of maintenance to treatment systems/number of maintenance programmed)*100	100%

8. PLACE OF APPLICATION
Operational camps and discharge sites in surface sources.

9. EXECUTION TIMETABLE			
PROJECT ACTIONS	**PRE – CONSTRUCTION**	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**
Treatment systems of waste waters generated		**X**	
FINAL DISPOSAL		**X**	
Discharge quality		**X**	
Maintenance of treatment systems.(Number of maintenance to treatment systems/number of maintenance programmed)*100		**X**	

10. QUANTIFICATION AND COSTS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
Grease traps	UNIT	$5.000.000	1	$5.000.000
Portable toilets	Month	$700.000	10	$7.000.000
Installation or construction of septic tank and aspersion field	UNIT	$4.500.000	1	$4.500.000
Rent of ARD treatment plant	UNIT	$40.000.000	1	$40.000.000
PTARD maintenance and operation	Month	$$1,200,000	60	$72.000.000
Entry channel	UNIT	$34.062.089	1	$34.062.089
Flocculator	UNIT	$174.323.475	1	$174.323.475
Sedimentation unit	UNIT	$186.845.728	1	$186.845.728
Mixing and exit tank	UNIT	$25.670.690	1	$25.670.690
PTARD maintenance and operation	Month	$$1,200,000	60	$72.000.000
TOTAL COST OF DATA-SHEET				**$621.401.982**

** Costs shown correspond to those of one camp*
**Costs related to distribution systems are included in the operational cost of the project.*
**Values shown in this budget are subject to variations depending on the specific conditions of the terrain and prices established by contractors.*

11.1.1.3 Program to manage air resource

For this program, it establishes environmental management guidelines to prevent and/or mitigate possible alterations to air resource, so that during the execution of activities it allows a sound undertaking of the project.

Figure Program to manage air resource

Source: GEOCOL CONSULTORES S.A., 2017.

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.3.MANAGEMENT PROGRAM OF AIR RESOURCE

DATA-SHEET NO. 13. MANAGEMENT OF EMISSION AND NOISE SOURCES

1. OBJECTIVE

· Establish environmental measures that contribute to reducing and controlling negative impacts generated by the increase in sound pressure levels, gas emissions and particulate matter due to activities of the project.

Source: GEOCOL CONSULTORES S.A., 2017.

2. GOAL

· Execute 100% of management action to minimize and control sources that generate atmospheric emissions and noise, in order to comply with air quality levels and sound pressure levels in project facilities.

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
X	X	X

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Modification of air quality due to gases
- Modification of air quality due to particulate matter
- Variation in sound pressure levels

5. TYPE OF MEASURE

Prevention	X	Correction	
Mitigation	X	Compensation	

ACTIONS TO PERFORM

ACTION 1: Inspection and preventive control of vehicles, equipment and machinery.

· Vehicles to be used, will be subjected to a preventive maintenance program, adjusted to manufacturer's recommendations and standards, to ensure the sound mechanical state to generate the least contaminant emission and noise to the atmosphere. To that end, the vehicle must have the respective technical and mechanical inspection in force, carried out in a specialized center ensuring it complies with emission levels established in Resolution 910 of 2008.

· As preventive measures, it will compel contractors to implement a prior inspection and maintenance program of all combustion equipment and machinery used in the different stages of the project.

· It will carry out a periodic review of exhaust and smokestacks of equipment and vehicles to observe their correct functioning. In the event there is noise, vibration or something imperfect, it will require immediate maintenance to prevent the increase of noise during the operation, it will keep a record of these maintenance and follow-up conducted.

ACTION 2: Mobilization, storage and transport of supplies

· During transport of material, it shall ensure that vehicles such as dump trucks have coverage of transported loads to avoid re suspension of material (art 41 Decree 948 of 1995), likewise it shall ensure that doors are properly sealed to avoid discharging material to the environment.

· Mobilization of vehicles on unpaved roads and that have populated areas, shall not exceed 30KM/h,

· Instructions will be given to machinery and vehicle operators to avoid the unnecessary use of horns.

· Excavation material, land and sands shall be covered with textiles, fibers, canvas or other, to avoid the generation of particulate matter in project area that may affect the community.

· In work fronts, contractors my locate only the volume of material required for one or two working shifts and these must be properly covered, tagged and signaled.

· When climate conditions compel, contractor must permanently irrigate unpaved areas to prevent emissions of particulate matter to the atmosphere, water bodies and vegetation. Irrigation frequency will be agreed with the audit team.

ACTION 3: Sound proofing

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.3.MANAGEMENT PROGRAM OF AIR RESOURCE

DATA-SHEET NO. 13. MANAGEMENT OF EMISSION AND NOISE SOURCES

- Fixed sources of noise that alter local sound pressure conditions (engines, generators, compressors, etc.), will be subject to the implementation of barriers and screens that isolate or minimize noise effects. Which will be verified after the noise monitoring and control follow-up.
- Personnel exposed to high noise levels shall have ear protection as part of their PPE (Law 9 of 1979 - Part II - Industrial Safety Statute), these may be the inserted or cup type, for greater protection, the uses of both considering exposure levels and exposure times,

ACTION 4: Air quality monitoring and noise levels

- Noise monitoring will be conducted with guidelines established in Resolution 627 of 2006, per day and night period, in working days and holidays; during construction activities, in the different areas close to the work site, specially in populated area that may become affected by noise generated by the project,
- Air quality monitoring will be carried out following sampling and analysis methods established in the monitoring and follow-up protocol for air quality as per that set forth in Resolution 2154 of 2010, and to that end it shall take into account Decree 97 of 2006 and Resolutions 601 of 2006, 610 and 650 of 2010 for air quality, as well as Resolution 627 of 2006 on noise.

7- INDICATORS

GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL
Preventive review and control of 100% of equipment, machinery and vehicles used in the project, in order not to affect the environment.	Preventive review and control of vehicles, equipment and machinery.	(Number of vehicles with technical and mechanical inspections, compliant /number of vehicles used during a period) x 100	100%
		(Number of equipment with preventive maintenance / number of equipment in operation) x 100	100%
Foster sound practices for the mobilization, storage and transport of supplies with the objective of avoiding air affectation by re suspension of particles.	Mobilization, storage and transport of supplies.	(Number of vehicles with load coverage during transport / Number of vehicles used to transport freight) x 100	100%
		(Amount of materials properly gathered, signaled and covered (polyethylene) / amount of materials gathered in work fronts) * 100	
Sound proof 100% of equipment identified as high-sound pressure generators,	Sound-proofing	(Number of equipment isolated or with sound-proofing / Number of equipment installed and in operation that require isolation or sound-proofing) x 100	100%
Conduct monitoring on air and sound pressure quality to conduct action to mitigate and prevent affectations.	Monitoring air quality and noise levels.	(Number of air quality parameters as per the limits established by environmental standards in force/number of parameters analyzed) x100	≥90
		(Number of points with sound pressure levels as per environmental standards in force /number of points monitors) x100	

8. PLACE OF APPLICATION

Camps and operational areas

9. EXECUTION TIMETABLE

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
Preventive review and control of vehicles, equipment and machinery.	X	X	X
Mobilization and transport	X	X	X
Sound-proofing		X	
Monitoring air quality and noise levels.	X	X	X

10. QUANTIFICATION AND COSTS

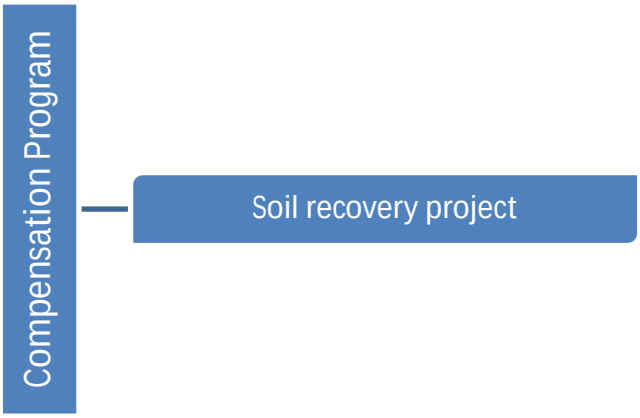
ITEM	UNIT	UNIT COST (COP)	QUANTITY	TOTAL COST COP)

11.1.1.ABIOTIC ENVIRONMENT				
11.1.1.3.MANAGEMENT PROGRAM OF AIR RESOURCE				
DATA-SHEET NO. 13. MANAGEMENT OF EMISSION AND NOISE SOURCES				
Air monitoring (weekly in 6 points)	UNIT	$44.820.000	6	$268.920.000
Noise monitoring (twice a year in 6 points)	UNIT	$960.000	6	$5.760.000
TOTAL COST OF DATA-SHEET				**$274.680.000**
**Costs related to operational aspect are included in the operational cost of the project.* **The budget includes a monitoring campaign to be carried out twice a year, taking into account two climatic periods during the year (rainy season and dry season)* **Values shown in this budget are subject to variations depending on the specific conditions of the terrain and prices established by contractors.*				

11.1.1.4 Compensation program for the abiotic environment

This program seeks to compensate, through a series of technical and environmental measures the effects generated on soil resource during the activities undertaken by the road project, in cases where even if management actions were to be applied, it would not be possible to prevent or avoid impacts.

Figure11-18 Compensation program for the abiotic environment



Source: GEOCOL CONSULTORES S.A., 2017.

11.1.1.ABIOTIC ENVIRONMENT

11.1.1.4. COMPENSATION PROGRAM TO THE ABIOTIC ENVIRONMENT

DATA-SHEET 14 SOIL RECOVERY PROJECTS

1. OBJECTIVE

- Establish adequate technical and environmental measures for the recovery of soils intervened by the works undertaken in each of the stages of the project.

2. GOAL

- Restore directly intervened soils by activities related to the project.
- Carry out the geomorphological reshaping of 90% of the areas intervened.
- Guarantee the no affectation of soil resources due to discharge wastewaters in aspersion fields.

Source: Geocol Consultores S.A. 2017

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
	X	X

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Change of physicochemical and biological properties
- Change in the use and potential use of soil

5. TYPE OF MEASURE

Prevention	X	Correction	X
Mitigation	X	Compensation	X

6. ACTIONS TO PERFORM

Subsequently, it describes management measures proposed (specific actions)

ACTION 1: GEOMORPHOLOGICAL CONFORMATION OR RE-SHAPING

Areas that show erosive processes and mass removal processes will be selected, these areas will be marked and isolated to avoid ingress of persons and domestic animals. Upon the foregoing, it will begin geomorphological reshaping tasks, such geomorphological reshaping of the area to recover will be achieved by the topographic reconstruction and re-leveling and reconformation of the terrain (Figure Data-sheet Management and Control of Erosion). On the other hand, in the event slopes show surface deformities, it will conduct an initial leveling and in sectors where there is evidence of trails and/or furrows, it will build reconformation works as per that established in Data-sheet 2 Management of Slopes and Hills

ACTION 2: SOIL RECOVERY

During stripping, it may use up to 50 cm of organic soil, corresponding the Lomerio landscape, which will be necessary to established plant species (preferably native species), soil storage area must be covered with resistant materials (plastic or canvas) to avoid dispersion due to wind or rain, and in order to maintain it in optimal conditions to be reused. First and foremost, soil must serve as substratum for revegetation of slopes in the project, in sites where there have been excavations.

Areas intervened must be revegetated and geomorphologically fitted so their conditions would be similar to those existing before executing works. It will conduct grass patching works in soils intervened, considering environmental management measures established in Data-sheet 19 Managing revegetation of intervened areas and Data-sheet 20 Management of compensation due to affectation to topsoil of this study.

ACTION 3: DISCHARGE IN SOILS

If will undertake adequate management of water to be used for irrigation in aspersion fields in different camp areas, thus, it will have in place appropriate treatment systems (see management details Data-sheet 12 Management of domestic and industrial waste liquids), to ensure quality of discharged liquids and compliance with environmental standards in force and the no affectation of soil.

11.1.1.ABIOTIC ENVIRONMENT			
11.1.1.4. COMPENSATION PROGRAM TO THE ABIOTIC ENVIRONMENT			
DATA-SHEET 14 SOIL RECOVERY PROJECTS			
7- INDICATORS			
GOAL	**NAME OF INDICATOR**	**ASSESSMENT MEANS**	**COMPLIANCE LEVEL**
Geomorphological reconformation of affected areas by erosive processes, mass removal and deformed slopes.	Geomorphological formation or re-shaping	(Total area of terrain reshaped (total area affected by the restoration and/or recovery process) x 100	100%
Revegetated affected areas	Soil recovery	(Number of native species planted / total number of species in revegetated areas) *100=100	80-100% Excellent 60-79% Complies <59% Non compliance
Compliance with Standards for the discharge of domestic and industrial waste water	Soil discharge	Physicochemical parameter values conducted /compliance of parameters with Louisiana Standard 29B (discharges on soil)*100	100%

8. PLACE OF APPLICATION
Areas intervened due to the undertaking of construction and project adjustment tasks.

9. EXECUTION TIMETABLE			
PROJECT ACTIONS	**PRE – CONSTRUCTION**	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**
ACTION 1.		**X**	**X**
ACTION 2.		**X**	**X**
ACTION 3.		**X**	**X**

10. QUANTIFICATION AND COSTS				
SOIL PHYSICOCHEMICAL ANALYSIS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
1	1	300.000	1	300.000
Costs on account of the execution of the geomorphological formation, are contemplated in Data-sheet 2 Management of Slopes and Hills and Data-sheet 3 Management and Control of Erosion, on the other hand, soil recovery are included in Data-sheet 19 Management of revegetation areas intervened and Data-sheet 20 Management for compensation due to affectation of topsoil				

Source: GEOCOL CONSULTORES S.A., 2017

11.1.2 BIOTIC ENVIRONMENT

Table 11-4 shows Management Programs performed for the abiotic environment, breaking down each of the technical data-sheets comprising each of them.

Table - Structure of the environmental management program for the abiotic environment

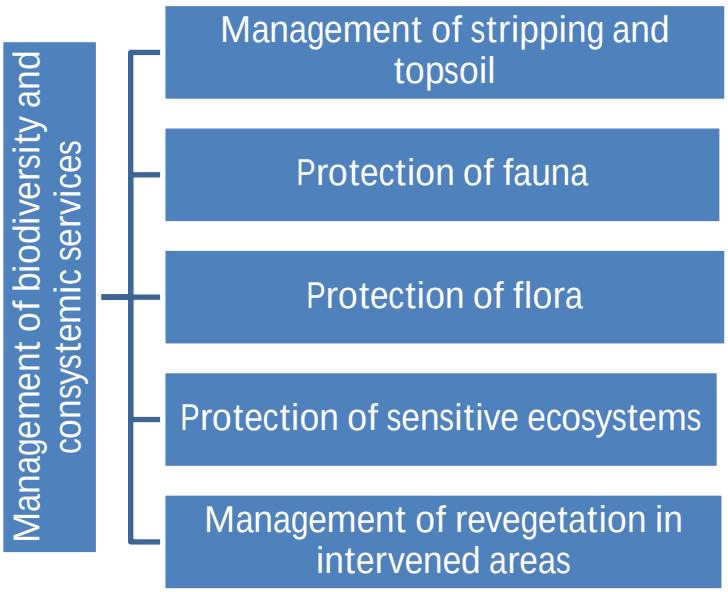
ENVIRONMENT	PROGRAM	NAME OF MANAGEMENT DATA-SHEET	No. No. Data sheet EIA
BIOTIC ENVIRONMENT	Management of biodiversity and ecosystem services	Management of stripping and topsoil	15
		Protection of wildlife	16
		Protection of flora	17
		Protection of sensitive ecosystems	18
		Management of revegetation in intervened area	19
		Management for the compensation and affectation of topsoil	20

11.1.2.1 Management of biodiversity and ecosystem services

Soil programs for the Biotic environment have the objective of minimizing impact caused on biodiversity and ecosystem services, produced during the Pre-Construction, Construction and Abandonment and Final Restoration stages of the Rumichaca - Pasto Divided Highway Project, San Juan - Pedregal Segment.

The scope of the project develops management measures for the biotic environment that include actions to prevent the generation of impact during topsoil removal and stripping activities. These measures will be guided to manage fauna, wildlife and forest utilization in all those areas where it needs to conduct activities.

Figure 11 -19 Management of biodiversity and ecosystem service



11.1.2.BIOTIC ENVIRONMENT	
11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES	
DATA-SHEET NO. 15 MANAGEMENT OF STRIPPING AND TOPSOIL	
1. Objectives:	
· Plan activities to generate the least possible impact on the environment and material manipulated, · Define areas to intervene and strategic zones to control impacts according to the type of work to undertake, where it requires the removal of topsoil included in forest utilization. · Prevent and mitigate negative impact generated on the modification of topsoil due to the removal of shrubs located within the areas of intervention of the project. · Remove plant topsoil, controlling the intervention of stripping material for its subsequent re-utilization. · Generate the necessary measures to reuse organic matter and mineral material resulting from stripping in areas requiring grass patching, slopes in embankments and green areas.	 Source: Geocol Consultores S.A. 2017
2. GOALS	

11.1.2.BIOTIC ENVIRONMENT			
11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES			
DATA-SHEET NO. 15 MANAGEMENT OF STRIPPING AND TOPSOIL			
· Protection to vegetation found off the felling line, · Compliance with forest utilization amounts authorized by the forest utilization permit. · Conservation and re-utilization of stripping material generated in project activities.			
3. PHASE			
PRE – CONSTRUCTION	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**	
	X		
4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE			
- Modification of topsoil structure - Changes on floristic structure and composition			
5. TYPE OF MEASURE			
Prevention	**X**	Correction	**X**
Mitigation	**X**	Compensation	

6. ACTIONS TO PERFORM

PREVIOUS ACTIVITIES

Prior topsoil removal and stripping activities, it must verify that the environmental license granted by the environmental authority, its scope and permits to use natural resources, management measures proposed and restrictions that will be vital for planning and execution works.

It must analyze installation options of works, taking into account that topsoil removal activities are minimum and only in the areas contemplated in the works and to that end it generates lateral instability processes. In addition as not to affect surface runoff channels or manage them so downstream waters recover natural conditions. Adequacy of road, management zones of excavation material and the areas of intervention must be in accordance to that set forth in the environmental license granted.

ACTION 1: Boundaries for the Removal of Topsoil

Areas adjacent to the construction area will be isolated by a perimeter closing, which serve as a visual screen; these screens will be installed specially on vegetation areas around the water round and where there is presence of natural plant coverage. as well as those individuals that are not part of authorization of forest utilization permits, emphasizing Riparian vegetation (riparian forest and secondary high vegetation) of riverbed in the project's area. The corridor to be intervened and the area to be removed will be marked with signaling tape at a height of 1.5m. Marking this areas will allow avoiding passage to unauthorized corridors, in order to prevent unnecessary intervention of soil and vegetation. After the intervention, it shall remove all the signaling tape as per the length used and managed according to that set forth in Data-sheet on the Management of domestic, industrial and special solid wastes.
In roads, it must use information signaling of works and available pathways, to reduce affectation to mobility and avoid interference of users mobilizing themselves outside the layout of the road and affecting soil and vegetation.

ACTION 2: Management of the removal of woody biomass and herbaceous vegetation.

The removal of individuals pertaining to herbaceous and shrub stratum must be carried out prior to stripping activities, thus it will determine management thereof, taking into account size and location, the following procedures must be considered:

Forest utilization

Following find a description of some activities prior to forest utilization:
Mark the action corridor; prior felling activities it must define the topographic re framing and is physical demarcation along the corridor, to comply with preventive and work control procedures; trees to be fell must be marked with permanent paint, so that felling operator knows exactly what to do,

11.1.2.BIOTIC ENVIRONMENT
11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES
DATA-SHEET NO. 15 MANAGEMENT OF STRIPPING AND TOPSOIL

Clearing of the tree falling area to open visualization and outline evacuation routes.
It must eliminate epiphytes, climbing plants and herbaceous plants that hinder operations. Subsequently, small trees that serve in the construction and other tasks; furthermore, it must remove rocks, logs and any other object that may pose problems or risks to the operation.
Prior the commencement of activities of forest utilization, it must report the presence of banned, endemic or threatened flora and fauna species or in critical danger, with commercial, scientific and cultural value, following measures as per the flora management data-sheet, as well as marking these areas and isolating them. For plant species, it will take into account restrictions of the environmental license granted and reposition, blocking, transfer and isolation measures or those deemed necessary to ensure the presence of species in the area.
Safety Analysis: Follow safety standards and have a Forest Engineer who will oversee the felling activity. The project must take all precautions for potential risks. It must make assessments on tree surroundings and observe a viable falling alternative (generally it corresponds to the side with greatest tree inclination).

Measures for felling:

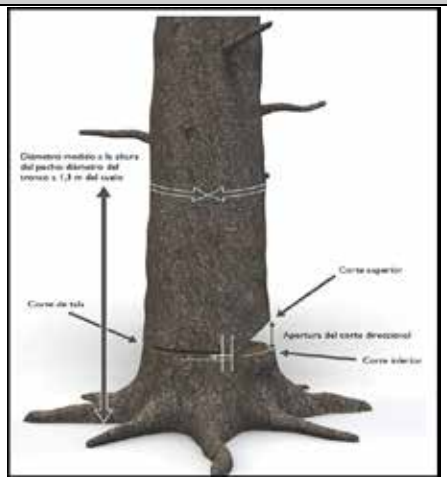
Following find a description of the procedures to manage vegetation, with respect to felling, management of organic matter (no timber production) from actions that must be applied in the undertaking of the project for all works considered therein and that have a forest utilization component.
Forest Utilization of trees must be articulated with stripping activities, avoiding hurdles on the mobility of machinery and personnel during felling activities. It requires the removal of tall herbaceous trees and shrubs, then it must remove timber and other organic matter that affects transit of machinery due to stripping. Measures for its implementation are as follow:
Method: The method for forest utilization will consist on clear felling and the basic extraction system will be round timber or logs. It will be done by stages per utilization areas to induce and allow fauna to chase away. The utilization will begin with isolated trees and will continue with mass plants or thick stable. Collection of waste produced in this forest utilization will be made by cutting sectors to avoid accumulation thereof and avoid excess times; to undertake this work it must consider the data-sheet of management of industrial, domestic and special solid wastes.
Trimming and topping: these activities will be undertaken manually with machete or mechanical objects. In the event there are branches exceeding 8cm in diameter, as it must identify branches that may generate weight and support tree falling direction, if needed, it must pre-trim branches, doing it close to the union, to avoid definite cuts that may lead to risks on personnel involved in such felling tasks. Branches and other trimmed material must be removed from the tree falling area or the scape route. If needed, felling will begin as of topping until the shaft, using strings to tie and guide the falling of the tree to a lower risk area to avoid harm on nearby infrastructure or third parties.
Demolition and overturning: It will only fell trees approved and marked as not to affect more vegetation than required during the execution of the project. When conditions allow for free-fall of trees, it will verify that the felling operation is safe and clean, and to that end it will delimit a fall cone to mark a demolition orientation hole; it is conducted by an operator with a chainsaw in two cuts; first cut like a wedge on the falling side; this cut will deepen according to tree inclination, between 25 to 50% of the shaft's diameter. Once the wedge is extracted and its interior cut deepened, it must proceed to total demolition, making a straight and definite cut on the opposite side of the wedge. (figure 11-20). The operator must change his position and avoid risks, he may strike the final cut of the shaft, 10cm or more above the prior cut, as straight as possible, avoiding the tree from " kicking" toward the operator or shackling the spade of the equipment.

Figure 11-20 Cuts to direction trees

11.1.2.BIOTIC ENVIRONMENT

11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES

DATA-SHEET NO. 15 MANAGEMENT OF STRIPPING AND TOPSOIL



Source: HUSQVARNA, 2011.

In the event there is existing infrastructure, felling will begin with topping until the base of the shaft, using strings to tie and guide the tree in order for it to fall towards an area with reduced risk, avoiding damage to nearby infrastructure or third parties.

Special slope conditions and nearby roads: It should be mindful of very steep areas as trees may slide downhill. Therefore it must consider that trees cannot be thrown in the direction of the valley to avoid downhill falls; unless these are so steep that direct cutting techniques do not allow the fall of the tree in any other direction. If trees are falling in a perpendicular manner vis-à-vis the slope or along level curves, it will limit the momentum of the tree, its breakage and damage to nearby trees.

In very steep slopes, it may use an intermediate technology such as winches (overhead cables) to transfer dispersed lumber in the forest and pile them up in one point, and avoiding rolling of lumber into water bodies.
Additional safety considerations
The activity of forest utilization poses risks during its execution, thus it is necessary to have a personnel evacuation vehicle in the event of an emergency, preferably an ambulance with adequate information regarding assistance capacity of closest health centers,
Hooked trees To avoid dangerous situations, before the felling operation, trees that are hooked must be marked, as well as the areas, with high-visibility signaling tape; when felling a hooked tree, it must determine the direction the tree might turn, following it frees the trees with tools such a turning belt or hooks, to achieve a proper falling and in the desired direction. These actions require a series of operators.
For demolition it must make a cut in the center part of the hinge, leaving two corners without cutting, following it must carry out a series of cuts from above leaving a corner without cutting, which should be on the same side where the tree will fall, the operator must use a hook or a strap pushing in the contrary direction towards the other operator.
Withdrawal of woody vegetation: Cutting and clearing of herbaceous and shrub-like vegetation will be made using manual tools, such as machete, sticks and scythes. Eradication will be carried out in a technical manner following safety standards and under safety conditions established by the HSE professional. The executing personnel shall have experience in the task.
Withdrawal of herbaceous vegetation: When grasses are found on stripping areas, it must proceed to remove in a manner that grass patches may be reused in assigned places (slopes, cut, etc.)
Once clearing and cleaning operations have been completed, it must separate and locate surface and organic material (soil, herbs, grasses and shrubs) in areas closed by to the sites where they will be reused. This material will be applied to adequate yards, in ordered lines for their preparation and reuse.

11.1.2.BIOTIC ENVIRONMENT
11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES
DATA-SHEET NO. 15 MANAGEMENT OF STRIPPING AND TOPSOIL

During the preparation process of this plant material, including wastes from the felling activity (soft and thin material), will require previous treatment of grubbing and chopping. Usually, chopping activity should be done "in situ", distributing chopped material in areas destined to revegetation and landscaping, taking into account that it cannot be disposed in places close to water sources in steep slopes, to the extent possible, it should be disposed of in a patio fitted for piling and management of this material, which will be selected in the constructive process.

Management of lumber and organic matter resulting from forest utilization.

Debarking: Consists on the separation of bark from the shaft stem of the tree, which will be done manually or mechanically.
Previous dimensioning: this activity will be made according to requirements for woody material for project related activities, such as fencing. Likewise, dimensioning will be limited to the physical state of each individual and according to the specific characteristics of each species. In this regard, it must take into account branches, inclinations, twists among others to utilize as much wood possible for dimensioning.
Piling of gross product: lumber resulting from the utilization must be temporarily organized in independent piles to facilitate loading into transport means. Piling will be temporary and must endeavor to carry it out perpendicular to the slope and with the necessary measures to hinder rolling.
Loading onto vehicle: Loading onto vehicle for gross products of forest utilization may be done manually or mechanically, it is important to have vehicles fitted for this tasks, preferably with accessories that help organized loading, and also unloading in final disposal sites or processes where they will be used. It must take into account that for manual loading, no operator may carry loads in excess of 50 Kg. Neither is it allowed to throw elements over operators, mobilization routes should be market with loads and take precautions such as distances that allow for adequate maneuverability and response to emergencies.
Protection for mobilization: Once forest utilization material has been disposed in special vehicles, it begins the mobilization in internal roads towards final disposal sites, therefore forest loads must be fastened to avoid sliding of lumber pieces. It is important to consider that when fine organic matter is transported (thin branches and waffle) it must cover the load to avoid these materials to be dispersed when the vehicle is in motion.
Final Disposal of Lumber and organic matter: This activity is referred to in loading, transport and final disposal activities of organic matter generated by felling, trimming and clearing tasks, where a large number of timber foliage and branches is produced that may or may not be useful. Plant material such as timber generated by the utilization activity cannot be sold, it shall be used, to the extent possible, by the different construction activities that require it, such as fences, closings for work sites, among others; should there be leftovers, this material may be donated to the community, prior written request, and to that end it must prepare donation minutes specifying final use of the resource, and if required, request competent authorities to direct its usage.
Regarding non-timber materials such as branches, leaves, bark or sawdust, they cannot be piled nor be disposed in riverbed areas or close to them. This organic matter must be chopped and disposed of uniformly in sowed areas established in the revegetation management of intervened areas, so they may be reintegrated naturally to the soil, therefore burning of this plant waste is forbidden, It is forbidden to accumulate large lumps during working shifts, to avoid them from becoming a contamination area due to decomposition This activity can never be undertaken when is raining or immediately after, it must be done with dry soil and dry plant material to reduce risk of accident due to swampy soil and smooth logs.

ACTION 3: Management of stripping:

- Stripping material cannot be mixed with inert material from excavation, as it will be used as stratum for coating and subsequent patching of slopes, where the slope allows, slope terraces, conformation of ZODMES and camp and plant areas once they are cleared for their subsequent revegetation.

Clearing procedures cannot be done through burning or the use of herbicides
Stripping cuts are done with machinery that allows control of cuts (backhoe with small hopper or small bulldozer)- The foregoing taking into account thickness of soil close to 50 cm.
Cutting direction is done taking into account shovel load capacity, the size of cuts and the location of the disposal site, which will allow to reduce displacement and affectation of substratum.
In areas where stripping is done, it should try to preserve, to the extent possible, the weathered surface horizon, which generally posses some type of organic content.

11.1.2.BIOTIC ENVIRONMENT
11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES
DATA-SHEET NO. 15 MANAGEMENT OF STRIPPING AND TOPSOIL

To remove herbaceous type plant material (clean grasses and grassy areas), it can be withdrawn in patches to be reused in grass patching works and stabilization of slopes in intervened areas for adequacy or construction. These grass patches shall have dimensions of less than 1m2 to facilitate manipulation and will be extracted with PAN DE TIERRA.

Stripping must be done being mindful of the preservation of the material removed to its use and recovery in intervened areas, the construction of embankments and landfills, avoiding affectation to sterile or contaminated soil.

Bulldozers must be the responsibility of trained personnel, with enough experience in this type of labor, contributing to an adequate management of material removed.

Deposit stripping materials in piles of maximum height of 1 m, to avoid any risk of falling,

Material dispose temporarily during each shift, shall be protected with grubbing material, to leave fine particles in the internal area. At the same time, they will be covered with geotextile material or straw to protect material from rain, solar radiation or wind effects.

To avoid the collapse of removed material, it is custom to put barriers or trenches to contain them.

The traffic of heavy machinery of material gathered and organized is forbidden.

To use stripping resulting material in the recovery of soils, both for the project as well as in areas that are foreign but close to the project, they will be temporarily stored in a site located inside camp areas, ensuring that water currents will not be obstructed, and their protection from rain to avoid dragging, also it must be careful not to mix them with contaminant substances or sterile soil.

Organize these areas with processed organic material, as identified in the landscaping plan, to the extent slope conformation works are completed (cuttings, embankments or profiles for the disposal of materials) or flat surfaces (sources of materials, zodme, central separator); in external slopes of the second land, it will fill a surface with a layer with a mean of 30cm in thickness, to carry out the landscaping plan (revegetation - grass patching and road separator).

Materials from the removal of vegetation that may be reused for grass patching tasks, cannot be burnt or commercialized. For their temporary disposal in areas nearby, before proceeding to stripping, it must first have completed the following activities:

- Selection of approved sites for the environmental management of the project.
- Prior selection of the disposal site and method, it shall take into account that it is not performed near sensitive areas such as water sources or affectation to water quality.
- In slope areas, to preserve topsoil in a provisional manner, it can by using lateral forks to avoid rainwater action and the loss of this material.
- In piling areas of stripping material, lumps cannot exceed one meter in height, protecting grass patches from compacting weight.
- It should avoid piling plan material removed at a distance less that the water body protection round found in the area of influence.
- It is necessary to foresee that there is no interference with natural regeneration in piling areas, verifying that there are no vegetation or tree seedlings. In order not to cause further impact and also contribute to the protection of stripping material from decomposition acceleration processes, due to the presence of organisms found in natural areas.
- Piled material must be periodically inspected, as a measure to verify soil quality, afterwards it may control irrigation being applied, the state of grass patches and subsequent control measures, such as the application of phytosanitary correction methods.

Contractor should give special care of not damaging trees nor vegetation of excavation and construction lines, shown in the previously approved designs, it must make the respective demarcation and delimitation to avoid causing affectation.

It will ban the use or felling of species that are not within the area to intervene, and also the use of plant material that is in areas foreign to the design, in all activities related to the project.

Control of Erosion

It is important that works adhere to designs established for each, the removal of cover in flat areas has no erosion risks vis-à-vis slopes, which determines to a great extent the area of intervention.

It should have special care with natural runoff areas, where vegetation regulates water mobility and soil is more stable.

Conduct protection activities of soil in areas where there is evidence of erosion process developing, making use of waste plant material from stripping activities, building sediment containment bundles and coarse materials specially in slope areas, in order to provide the conditions for the beginning of association of grass and plant species with pioneer species in the area, which leads to the possibility of natural plant secession, and accordingly, to the protection of soil from erosive processes due to the influence of runoff rain water;

11.1.2.BIOTIC ENVIRONMENT			
11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES			
DATA-SHEET NO. 15 MANAGEMENT OF STRIPPING AND TOPSOIL			
likewise, it increases humidity retention in these bundles. To ensure an adequate germination and development process, works must be conducted just before or during the rainy season. In areas where it requires utilization of woody vegetation, specifically large trees (fruit trees) it should pay special attention to roots, these must be totally removed as they are an important aspect to land stability, given their size and capacity to withstand loads, in time roots decompose and affect land stability. **Tasks for the Evacuation of Gross Product and Sub products from Stripping** In practice and according to work conditions and closeness to waste disposal sites, it will be convenient to load sub products of this removal activity to a medium size vehicle to avoid falling of materials, lastly, these sub products will be processed in the disposal yard. Such materials may be used and/or mixed with stripping materials. If required, transport of stripping material to other sites, vehicles (dump trucks) will have a permeable loan to cover the hopper during displacement to final disposal site. These vehicles will meet all measures proposed for air quality control and maintenance of machinery and equipment. **Storage Labor of Gross Product and Sub products from Stripping** To protect the lump, it should be covered with a geotextile fabric or hemp, to protect the soil removed from precipitation and intense sun exposure and possible wash of nutrients. In addition, this site will be confined with a CORONA DE SACO SUELO, to preserve or improve soil conditions, while it is used again.			
7- INDICATORS			
GOAL	**Name of the Indicator**	**ASSESSMENT MEANS**	**COMPLIANCE LEVEL**
Protection to vegetation found off the felling line,	**ACTION 1:** Boundaries for the Removal of Topsoil	(Length delimited and signaled /perimeter of required works) x 100	100%
		(Number of trees preserved by perimeter isolation /Number of trees identifies that must be isolated to execute the project) x100	100%
Compliance with forest utilization amounts authorized by the forest utilization permit.	**ACTION 2:** Management of the removal of woody biomass and herbaceous vegetation.	(Total number of trees felled /Total number of trees to be fell authorized per environmental license) x 100	100%
		(Total volume of non-timber product manages / Total volume on non-timber product generated) x 100	70%
		(Volume of lumber obtained and used in civil works + volume of lumber delivered to the community)/Volume of	100%

11.1.2.BIOTIC ENVIRONMENT			
11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES			
DATA-SHEET NO. 15 MANAGEMENT OF STRIPPING AND TOPSOIL			
		lumber generated during forest utilization) x 100	
Conservation and re-utilization of stripping material generated in project activities.	**ACTION 3:** Management of stripping:	(Volume of soil stored and preserved resulting from stripping/volume of soil stripped) x 100	70%
		(Volume of stripping reused for the final reconformation of works/volume of stripping material generated) x 100	70%

8. PLACE OF APPLICATION				
The place of application will be in sites defined for the execution of activities of the Rumichaca - Pasto Divided Highway Project, San Juan - Pedegral segment, where it requires forest utilization and removal of topsoil and stripping.				
9. EXECUTION TIMETABLE				
PROJECT ACTIONS		**PRE – CONSTRUCTION**	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**
ACTION 1.			**X**	
ACTION 2.			**X**	
ACTION 3.			**X**	
10. QUANTIFICATION AND COSTS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
ACTION 1.	**Ha**	**1.550.000**	**Proportional to hectares to intervene**	**$**
ACTION 2.	**Ha**	**35.000.000**	**Proportional to hectares to intervene**	**$**
ACTION 3.	**Ha**	**30.000.000**	**Proportional to hectares to intervene**	**$**
TOTAL COST OF DATA-SHEET				**$**

11.1.2.BIOTIC ENVIRONMENT

11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES

DATA-SHEET NO. 16 PROTECTION OF WILDLIFE

1. OBJECTIVE

Reduce direct affectation for wildlife, as well as their habitats, shelter sites and/or feeding grounds present in the area of intervention of the Rumichaca - Pasto Divided Highway Project, San Juan-Pedregal Segment..

Gastrtoheca espeletia
(Marsupial frog from la Cocha)
Source: Geocol Consultores S.A. 2017

2. GOAL

- Educate and train 100% of personnel working on the project to create awareness on the protection of natural resources to avoid death and commercialization of wildlife species.
- Chase away the largest number of fauna species (success 80%) from habitats that will be affected by the project.
- Capture and transfer 100% of species in the area of intervention after chase-away tasks to nearby ecosystems with similar characteristics.
- Rescue 100% of wounded or disabled species unable to move on their own, to be transferred to fauna reception sites as stipulated in the environmental corporation CORPONARIÑO.
- Prevent running over of fauna in roads where project activities are undertaken.
- Adjust and maintain 100% of structures that will be used as fauna passages.
- Installation of 100% of signs proposed in located sites as the most prone to fauna related accidents.

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
X	X	X

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Changes on the structure, extension and availability of wildlife fauna.
- Changes in the composition and structure of fauna communities.
- Alteration of edaphic fauna

5. TYPE OF MEASURE

Prevention	x	Correction	
Mitigation	x	Compensation	

6. ACTIONS TO PERFORM

Action to implement within the fauna management program will be developed across the project and are focused on preventing and mitigating impacts derived from all those activities that may affect wildlife and/or their habitats, which are:

General measures to all areas of the project.

- For skilled labor and non-skilled labor of the project, ban hunting, capture, manipulation or extraction of animal found in the project's area of influence, as well as products derived therewith.
- It shall supervise, by the environmental supervisor in charge of the contractor responsible for the execution of the works, that during chasing-away activities, there are no hunting, extraction or aggregation activities to fauna by project's personnel.

11.1.2.BIOTIC ENVIRONMENT

11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES

DATA-SHEET NO. 16 PROTECTION OF WILDLIFE

ACTION 1: Workshops and training

Conduct four (4) socialization and training workshops directed to personnel and the community in the Direct Area of Influence of the road project, on the diversity of local and regional fauna, their ecological, economic and cultural values and the importance and need to preserve and make sustainable use thereof, these workshops will be conducted according to the following programs and every time they shall be supported with audiovisual material such as primer or pamphlets to allow improving perception of what is being conveyed.

Pre-Construction Stage

Day 1 - Environmental Sensitizing This training will be open to the local population and mandatory for all workers in the project and its objective is to sensitize, both workers as well as community dwellers in the area on the importance, vulnerability, fragility and preservation of different ecosystems and fauna, in addition to the environmental standards that govern, the following topics should be dealt:

- **Training for contracted personnel to the project and population in the area of the project**

  - Information regarding species that live in the Direct Area of Influence of the project and respective ecological requirements.
  - Conservation of those fauna species deemed sensitive (endemic, migratory and threatened)
  - Identification of ecosystems or topsoil comprising the Direct Area of Influence of the Project.

- **Training of personnel contracted for the project**

This workshops in mandatory for all workers of the project.

  - Management of wildlife:
  - Action protocol in the event of finding wounded species during the construction stage.
  - Procedures to transfer fauna

Day 2 - Hunting and illegal trade of species With respect to the problem regarding hunting and illegal trade of species, it proposes including a sensitizing program with community, workers and schools focused on species included in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) or with any endangered risk at national level (Red Books, Res 0192 of 2014, or International Union for Conservation of Nature) which have been identified during fauna characterization in the Direct Area of Influence of the Project (Table 11.1).

The program must deal with the following topics:

  - General information and ecological importance of species subject to hunting and illegal trade.
  - Economic importance
  - Economic alternatives
  - Protection and conservation mechanism

Table Fauna species included in CITES appendix, endemic and/or with some endangered category

AMPHBIANS								
SPECIE	COMMON NAME	ENDANGERED CATEGORIES				CITES (2017)	ENDEMISM	COORDINATES
		GLOBAL	NATIONAL		REGIONAL			
		(IUCN, 2017)	Red Book (Rueda-Almonacid et al., 2004)	Res. 0192 (2014)	Corresponding Coorporation			
Centrolene buckleyi	High Andes Buckley Crystal Frog	VU					AMP	-
Pritsimantis buckleyi	Rain frog	LC					C-END	E947040 N589194
Pritsimantis curtipes	Rain frog	LC					C-END	-

11.1.2.BIOTIC ENVIRONMENT

11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES

DATA-SHEET NO. 16 PROTECTION OF WILDLIFE

Pritsimantis supernatis	Rain frog	VU					C-END	-
Pritsimantis unitsrigatus	Stripped frog	LC					C-END	E951154 N594527
Pritsimantis w-nigrum	Rain frog	LC					C-END	-
Pritsimantis leoni	Rain frog	LC					C-END	-
Gastrtoheca argenteovirens	Marsupial frog	LC					END	
Gastrtoheca espeletia	Marsupial frog from la Cocha	EN	EN	EN			C-END	E954262 N602351
Gastrtoheca orophylax	Marsupial frog	EN					C-END	-

SPECIE	COMMON NAME	ENDANGERED CATEGORIES				CITES (2017)	ENDEMISM
		GLOBAL	NATIONAL		REGIONAL		
		(IUCN, 2017)	Red Book (Morales-Betancourt, 2015)	Res. 0192 (2014)	Corresponding Coorporation		
Anolis heterodermus	Chameleon						C-END
Pholidobolus montium	Lizard	NT					C-END
Pholidobolus montium	Lizard	NT					C-END
Riama simtoera	Lizard		EN				C-END
Stenocercus angel	Lizard	NT					C-END
Stenocercus guentheri	Lizard						C-END

BIRDS

SPECIE	COMMON NAME	ENDANGERED CATEGORIES			CITES' CLASSIFICATION	ENDEMISM	COORDINATES
		GLOBAL	NATIONAL				
		IUCN, 2016	Red Book (RenJiof *et al*, 2014)	Res. 0192/2014			
Colibri delphinae	Brown Hummingbird	LC	LC	N.I.	Appendix II	-	E953577 N604676
Colibri coruscans	Common hummingbird	LC	LC	N.I.	Appendix II	-	E951186 N594533
Adelomyia melanogenys	Speckled Hummingbird	LC	LC	N.I.	Appendix II	-	E954386 N602587

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Lesbia victoriae	Black-tailed trainbearer	LC	LC	N.I.	Appendix II	-	E953622 N600834
Lesbia nuna	Green-tailed trainbearer	LC	LC	N.I.	Appendix II	-	E954339 N602495
Metallura tyrianthina	Tyrian Metaltail	LC	LC	N.I.	Appendix II	-	E953620 N600846
Eriocnemis derbyi	Black-thighed puffleg	NT	LC	N.I.	Appendix II	C-end	E951186 N594521
Coeligena torquata	Allen Hummingbird	LC	LC	N.I.	Appendix II	-	E953593 N600939
Lafresnaya lafresnayi	Mountain velvet breast	LC	LC	N.I.	Appendix II	-	E955350 N599247
Chaetocercus mulsant	White-belled woodstar	LC	LC	N.I.	Appendix II	-	E948905 N592830
Chlorostilbon melanorhynchus	Western Emerald	LC	LC	N.I.	Appendix II	C-end	E953596 N604678
Amazilia saucerrtotei	Sealy-vented Hummngbird	LC	LC	N.I.	Appendix II	C-end	E953534 N604824
Hylocharis grayi	Blue-headed Sapphire	LC	LC	N.I.	Appendix II	C-end	E956346 N604974
Circus cinereus	Ash colored harrier	LC	LC	N.I.	Appendix II	-	E955036 N598345
Accipiter striatus	American Hawk	LC	LC	N.I.	Appendix II	-	E953674 N604729
Rupornis magnirostris	Sparrow hawk	LC	LC	N.I.	Appendix II	-	E947034 N589753
Geranoaetus melanoleucus	Eagle Paramuna	LC	LC	N.I.	Appendix II	-	E954251 N602532
Tyto alba	Barn owl	LC	LC	N.I.	Appendix II	-	E951944 N594959
Megascops choliba	Common Currucutu	LC	LC	N.I.	Appendix II	-	E955249 N598136
Bubo virginianus	Eagle Owl	LC	LC	N.I.	Appendix II	-	E953521 N600705
Asio flammeus	Short-ear Owl	LC	LC	N.I.	Appendix II	-	E953785 N601056
Falco sparverius	American Kestrel	LC	LC	N.I.	Appendix II	-	E948693 N592787
Falco peregrinus	Peregrine Falcon	LC	LC	N.I.	Appendix I	-	E954361 N602674
Psittacara wagleri	Scarlet-fronted parakeet	LC	LC	N.I.	Appendix II	-	E953723 N604822
Myiarchus apicalis	Apical flycatcher	LC	LC	N.I.	-	End	E953550 N604851
Tangara vitriolina	Blue bird	LC	LC	N.I.	-	C-end	E953551 N604676
Saltator atripennis	Black-winged russet	LC	LC	N.I.	-	C-end	E954602 N602584

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Atlapetes pallidinucha	White-headed sparrow	LC	LC	N.I.	-	C-end	E954394 N602595

MAMMALS

SPECIE	COMMON NAME	ENDANGERED CATEGORIES				CITES' CLASSIFICATION (2017)	ENDEMISM	COORDINATES
		GLOBAL	NTIONAL REGIONAL					
		(IUCN, 2017)	Red Book (Mammals 2016)	Res. 0192 (2014)	BAN			
Lycalopex culpaeus	Wolf			VU	Res 848 of 1973	II		REGISTERED IN SURVEY
Leoparddus pajeros	Ocelot	NT			Res 848 of 1973	II		REGISTERED IN SURVEY
Ntoosciurus pucheranii	Andean squirrel	DD			Res 848 of 1973	II	X	E 947414 N 590071
Cerdocyon thous	Fox				Res 848 of 1973	II		
Conepatus semitsriatus	Amazonian Skunk				Res 848 of 1973			
Mustela frenata	Andean weasel				Res 848 of 1973			
Ptoos flavus	Bush dog				Res 848 of 1973			

IUCN Categories and Red Book: (CR) Critically threatened, (VU) Vulnerable, (NT) Not threatened, (LC) Least Concern, (DD) Deficient data. CITES Categories (Appendices in force as of 04 April 2017): (II) Species that are not currently in extinction, but may become unless trade thereof is subject to regulations; Endemism End: Endemic Species of Colombia.

Day 3 - Accidentally linked to wildlife Training session to protect workers as regards wildlife management to avoid accidents linked to this component. Part of such training must include protocols to manage and respond to bites and/or stings of any taxonomic type, whether (bees, wasps, etc.), reptiles (snakes) or wild mammals. This workshop must be carried out with the respective ARL; which is the entity in charge of managing work related accidents' protocols. The presence and support in training by biologists in charge of chasing and relocation activities is mandatory.

Pre-construction, Construction and Operation stages.

11.1.2.BIOTIC ENVIRONMENT

11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES

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Day 4 - Socialization of fauna monitoring programs: According to measures proposed in this data-sheet after the field stage, it must conduct a socialization (access to all) before the community and workers of the project regarding the results, in the event endangered species are found, these shall be given enough space during socialization.

ACTION 2: Signaling and mobilization measures of vehicles and machinery

- Before the commencement of works (construction stage), it must isolate the area around the places where cuts and excavations will take place with weather protection fabric, as these may be deadly traps to wildlife.
- Implement strict control of speed limits for all vehicles present in the project, informing all direct personnel of the project, as well as contracting companies on allowable speed limits, both in internal roads as well as external roads.
- The vehicle fleet must establish measures to restrict the use of horns that may disturb surrounding fauna.
- In the event an accident occurs and a wildlife species is run over, it is important to make a photo registry, to record the cause of the accident, name of specie (scientific and common), maturity state (young or adult), gender (male or female), among others. The foregoing to determine areas with greatest risk of accidents and to take management measures. The format to register this events is found in ANEXO BIOTICO_FAUNA_Formatos Manejo de Fauna_PMA, which describes how to register wildlife run over in the respective format.
- Every certain amount of kilometers (8km suggested) it should place information signs along the project's vehicle mobilization area, in order to inform population on the presence of wildlife in the area and the most important measures that should apply, "Driving carefully, no hunting and no extraction of animal or byproducts thereof in the area". Similarly, it is made clear that should anyone find an injured animal, they should report to the contractor's environmental coordinator who is responsible of executing works. (Figure 11.1)

Figure11.1 Examples of information signs on environmental standards

1Source: GEOCOL CONSULTORES S.A., 2017

- To reduce mortality of wildlife fauna due to accident on the roads, it will alert vehicle drivers on the placement of signage regarding speed limit and the present of fauna on the roads (Figure 11.2), this will take place in socialization and fauna training workshops.

FIGURE2 EXAMPLE O SIGNALLING ON THE PRESENCE OF FAUNA, AS AN ACCIDENT PREVENTIVE MEASURE AND RUN OVER PREVENTION.

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Source: GEOCOL CONSULTORES S.A., 2017

ACTION 3: Chasing, rescue and relocation measures for wildlife fauna.

Before the commencement of works it must agree with CORPONARIÑO on all possible reception sites of wildlife fauna and/or temporary homes for fauna that have been authorized by the respective environmental corporations.

Prior to the commencement of any work it will proceed to chase away wildlife fauna present, to that end it will take into account areas identified with faunistic importance and that require saving of wildlife fauna present therein. With this premise in mind, it is necessary to avoid or in absence thereof, minimize affectation of forest areas such as woodlands and secondary high and low vegetation woods in the area of influence of the road project, given its importance to fauna related species and/or restricted to this type of area, to which it may add the function of mobility corridors for fauna.

During stripping and topsoil removal activities, it must take into account the present of professional in biology or the environmental auditor of the contractor responsible to execute the work, regarding the accidental encounter of wildlife in the area that do not respond to chasing activities and have returned to the construction area.

- **Chasing activities prior to intervention**

These tasks will be conducted to disperse and chase away fauna species present in the area, before the commencement of intervention activities in the area.

Chasing activities shall be carried out with direct intervention on habitats, by means of generation of noise, removal of existing biomass and controlled intervention is shelter sites (including existing infrastructure to intervene); thus fauna may leave their shelter area and go to places with woodland vegetation or plant cover accessible and that has been previously used by them. In those cases where related activities to the removal of topsoil or where vegetation is next to the existing road, where the possibility of fauna running into the road exists and may be run over, it will install fabric screens or awnings to hinder access toward these road sectors and they are compelled to return to vegetation zones nearby.

Works related to forest utilization and removal of topsoil will be performed in a tiered manner to induce and allow chasing activities of wildlife fauna, not without first having conducted chasing away activities prior to interventions.

- **During the intervention**

In the event litters, nests or animals that required rescuing efforts, because they have been injured or for any reason have lost their ability to move, to those insisting on remaining despite of chasing away activities and are still found in the areas to be intervened, the following procedure must be followed:

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- Capture protocol to rescue potential fauna individuals

As a general measure, professionals in charge of carrying out these activities must be vaccinated or have the adequate dosage of rabies vaccination. To proceed to the manipulation of species, the work team shall have a first aid kit, ensuring the presence of antiophidic serum (to be delivered to a health center in the event of a related contingency), this is mainly useful in lowlands towards the townships of Torvenir, lower Tablón and Pilcuan viejo area.
Personnel must have PPE, such as bait gloves, leather boots that cover up to the ankle and safety glasses.
Protocol proposed to transfer (only upon finding species that persist on the place of intervention after chasing away activities) and potential rescue of those injured or unable to move on their own, consists on firstly, capturing these animals using to that end all the necessary equipment. Subsequently, introducing species in crates and carrying out a photographic record of the animal and identifying the species (if identifiable), fill in a rescue forma ANEXO BIOTICO_FAUNA_Formatos Manejo de Fauna_PMA, and proceed to their transportation. The foregoing, to take them to nearby habitats with similar characteristics to those established by CORPONARIÑO outside the area of project's activities
In they are injured, they must be delivered to reception sites established or to the Rehabilitation Center for wildlife authorized by CORPONARIÑO.
Animals rescued must be transported separately, even if they are of the same species. Thus, each one must have its own cage or crate; transport cages must be closed with venting systems and legs, sliding doors with safety latches and a handle. Measurements of cages should allow the ingress and comfortable stay of animals, as well as easy to manipulate. It is also important to consider using buffer surfaces when many cages are being transported, and the specialist must be mindful of trying to maintain adequate average temperature.
To rescue reptiles, it must have herpetologist hooks. The potential transfer of these animals must be conducted in plastic or glass containers, well closed, but with good ventilation, or they can also go on crates.

To rescue birds, only if they are injured or do not respond to chasing away activities conducted, they will be transferred in cages or boxes, well ventilated, isolating them from strange noises and avoiding disturbances so they do not become stressed. Manipulation must be done with gloves, safeguarding the wing position of the bird. For birds of pray, night birds and medium size animals, their eyes and heads must be covered during manipulation to avoid the bird from spreading its wings.
In the event birds are rescued, the following restrictions should be considered: Do not feed or provide water to birds and do not hold them in injured areas, in the event there are wounds.
In the event the transfer of animals with low mobility or that after chasing away activities they remain in the area, is required, after assessing that they are in optimal physical conditions they can be freed in adjacent areas, but outside the areas of intervention that have similar ecological configurations to the sites where they were rescued. To avoid or reduce stress in animals in captivity, animal's capture will be freed in the least possible time as of their capture.
In the event they are located in areas prone to stripping or forest utilization of plant material and other floristic species, nests or litters, they should be rescued and to that end, branched should be cut, specially those which are found to avoid direct contact with hands. When this activity cannot be undertaken in a safe manner, because there is the risk of the nest falling on the ground or water, it will be taken directly and they will be placed on a cardboard box with soft substrate to minimize stress on these animals. It will avoid direct contact with chicks or eggs present.
In the event the transfer of tree species, or nests with eggs or chicks are required to rehabilitation centers or authorized fauna rescue centers, it must avoid to the extent possible, physical contact of workers with fauna individuals and/or nests. No food or water should be given to individuals or chicks found, once they are retrieved from the tree, these must be placed on a cardboard box, adequate to their side, covered with newspaper to isolate the cold and with small holes punctured so they can breath. No container with water should be introduced.
To rescue mammals, the Biologist shall use overalls, glasses, bait gloves, crate and cages to manipulate small and medium size mammals. For their transfer, crates must be properly conditioned to avoid damage during transport, to that end it must consider the size of the animal to be transported.
Reception sites for wildlife (fauna reception centers) will be previously agreed with the autonomous corporation, also prior to transferring these animals to these places, it shall be clear on the reception system plan considering the following:

- § Clarity of the type of species that are received or rehabilitated in that place, in the event a species is rejected, it will receive orientation regarding other places that would receive them.

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11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES

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- § Reception of threatened species
- § Order to offer them as a donation on account of fauna reception for their rehabilitation.

In ANEXO BIOTICO_FAUNA_Formatos Manejo de Fauna_PMA, it shows rescue registration format of wildlife species taken to fauna reception center due to being in a poor health and/or transfer of nests or litters as well as the receiving format by these authorized fauna centers by the competent environmental corporation (CORPONARIÑO). Thus, rescued individuals will be the responsibility of the company in charge of the execution of the project and once delivered to the competent authority, they will be the responsibility of fauna reception centers or according to that set forth in the conditions established or in agreements entered into for that purpose. Hence, recovery, management and relocation of wildlife species rescued, is part of the tasks that fauna reception centers must undertake.

In addition, it establishes that within environmental compliance reports, it shall include support on the management of CORPONARIÑO, as regards the definition of delivery and/or liberation of wildlife fauna.

ACTION 4: Fauna steps

Wildlife fauna groups identified as sensitive to the effect of the road as a mobility and displacement obstacle were small mammals such as the long-tailed weasel (Mustela frenata), Opossum, (D. marsupialis, D. Pernigra), Armadillo (D. novemcinctus), Skunk (C. semitsratus), Fox (cerdocyon thous) among others, also lizards and snakes.

The identification of infrastructure points required by the construction on fauna passages was carried out taking into account the analysis of three factors:

- o Identification of habitats of interest for fauna groups.
- o Identification of sectors of the territories, which are of interests for connectivity.
- o Identification of conflicting segments with which a high mortality index of fauna is produced or accidents due to collision of vehicles with small and medium size mammals.

Fauna passages will be located in all places which, as of the analysis of the factors indicated, determines as necessary to:

- o Facilitate a safe crossing that avoids access of wildlife fauna to roads, which may pose a risk to road safety to vehicles' circulation platforms.
- o Avoid leaving isolated fragments of the habitat of referenced species.
- o Facilitate animals access to basic resources (feeding, shelter, reproduction areas, etc.) to maintain a determine population.
- o Facilitate passage structures that allow passing through road infrastructure in fauna customary displacement routes.

Adjusting fauna passages is planned as of the construction and/or adjustments of works such as bridges, sewage and box culverts within the road layout.

The functionality of fauna passages related to hydraulic works like sewage and boxes is given because these adjustments increase permeability and facilitate fauna interaction on each side of the road. Taking into account that most of the project crosses intervened lands, the fragmentation of ecosystems' connectivity is evident, generated by the presence of the existing road and soil uses related to intensive cattle raising and farming, which results in having registered fauna species for a zone, which are mainly generalist species characterized by showing ample distribution ranges, adaptors to inhabit intervened ecosystems.

For the construction of the Pasto - Rumichaca Project, San Juan - Pedregal segment proposes 13 terrestrial fauna crossings, as detailed herein below in Table 11.2:

Table Hydraulic works adapted by potential sites of terrestrial fauna passages:

LOCATION OF FAUNA PASSAGES						
CHAINAGE	Location	COORDINATE MAGNA WEST				WORK
		BEGINNING		End -		
		EAST	NORTH	EAST	NORTH	
PK18+900	Contadero, La Providencia, secondary vegetation low woodland plantation	948294	591156	948301	591171	Layout crossing with native vegetation

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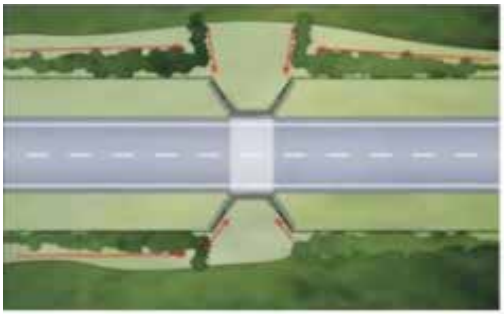
PK25+000	Contadero, caves, secondary high vegetation	951443	594962	951451	594968	Layout crossing with native vegetation
PK25+529	Contadero, caves, gallery and riparian forest	951673	595148	951688	594984	Sewage 900mm
PK25+589	Contadero, Ospina Pérez caves, secondary high vegetation	951910	595279	951912	595279	Sewage 1200 mm
PK29+437	Iles, Alto rey-Urbano, mosaic of grasses and crops.	954909	597337	954913	597339	Box culvert 3x2 m
PK29+756	Iles, Urbano, Gallery Grove	955175	597505	955183	597507	Box culvert 3x2 m
PK31+746	Iles, High Urbano-Tablón, secondary high vegetation	955962	598699	955954	598713	Sewage 1200 mm
PK32+729	Iles, Tablón Bajo, secondary low vegetation	954946	600276	954946	600278	Sewage 900mm
PK34+350	iles, Tablón Bajo, secondary high vegetation	954834	600831	954836	600836	Box culvert 1.5 x 1.5 m
PK35+732	Iles, Tablón Alto, secondary low vegetation	954844	601992	954839	601994	Box culvert 2 x 2 m
PK36+500	Iles, Tablón Alto, gallery and riparian forests	954222	602378	954216	602386	Layout crossing with native vegetation
PK37+200	Iles, El Rosario,	953946	602939	953949	602947	Layout crossing with native vegetation
PK39+700	Iles, El Porvenir, secondary high vegetation	953919	604509	953912	604512	Box culvert 2 x 2 m

Source: GEOCOL CONSULTORES S.A., 2017

For terrestrial fauna passages, it proposes the revegetation in immediate zones, by means of planting native species, provided it has the support of competent personnel who develop and verify their tasks.

In box culverts it will adjust dry zones, as shown in the following Figure 11.3; the dry fauna passage shall contain cross sections of drainage that allow maintaining dry platforms even during high-volume periods, by building lateral sidewalls of one meter with pre-fabricated concrete walls and a welded mesh to keep them dry to avoid complete flooding of the structure without affecting or reducing hydraulic capacity of it and to adjust passages.

Figure 11.3 Example of adjusted zones for the passage of terrestrial fauna in a Box



Fauna passage zones in box culvert, figure to the right shows an alternative dry passage, which does not alter the hydraulic properties of the structure.

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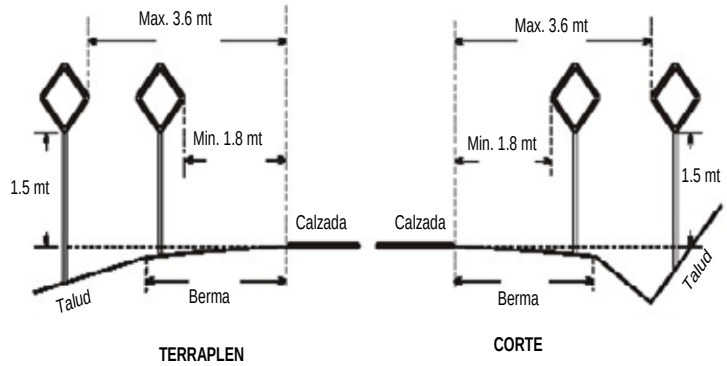
Source: Consorcio Constructora ruta del sol, 2014.

ACTION 5: Signaling

It is a measure that generates an alert to drivers of the high-probability of wild fauna crossing on the road, so they may reduce circulation speed with the purpose of avoiding fauna run-over accidents. It is worth noting that all signals shall adjust to the signaling manual of INVIAS and when specific elements are used, it will require prior authorization of competent bodies.

Figure 11.4 Signaling measures



Source Invias,2004

In order to establish conservation standards and avoid running over animals on the road during the operation stage, it will install signals 100m before the structures adapted as potential crossings of wildlife (Figure 11.3) to indicate road users on the presence of animals. In addition they will install zones where given their environmental importance, for example adjacent vegetation and pipes that serve the biological corridor, might have species. Maintenance of each signage will be the responsibility of the concessionaire

Figure5 Signage for fauna crossings

Source: COVIANDINA, 2016

7- INDICATORS

11.1.2.BIOTIC ENVIRONMENT			
11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES			
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GOAL	**Name of the Indicator**	**ASSESSMENT MEANS**	**COMPLIANCE LEVEL**
Training of 100% of workers at the work front and ancillary workers fro fauna related works	**ACTION 1: Workshops and training**	Number of people in charge of work fronts and trained works on fauna / total number of persons in charge of work front and fauna works) x 100	100% Excellent
Reduction of 90% of impact generated on fauna (fauna run over) due to the mobilization of vehicles and machinery in the layout of the divided highway and roads connecting them.	**ACTION 2: Signaling and mobilization measures of vehicles and machinery**	(Number of points signaled on internal roads as critical points for fauna run-over/Number of points detected as critical due to fauna run over risks in internal roads) x 100	100% Excellent
Carrying out 100% of the chasing and rescue activities in each work front.	**ACTION 3: Chasing, rescue and relocation measures for wildlife fauna.**	(Number of chasing and rescues of wildlife made in areas to be intervened/Number of chasing and rescues of wildlife request per areas to intervene)*100	100% Excellent
Relocation to 100% of species rescued in the different work fronts.	**ACTION 3: Chasing, rescue and relocation measures for wildlife fauna.**	(Number of animals relocated/number of animals rescued in work fronts)*100	100% Excellent
Build 80% of fauna passages proposed to allow fro the crossing of animals due to the road layout.	**ACTION 4: Fauna steps**	(Number of steps proposed/number of fauna passages built)*100	100% Excellent
Installation of 100% of signage proposed in fauna passages.	**ACTION 5: Signaling**	(Number of signage installed in fauna passages/number of programed signage)*100	100% Excellent

8. PLACE OF APPLICATION

These works will be carried out on the road corridor Rumichaca-Pasto, San Juan - Pedregal segment, in zones where works that imply the removal of vegetation are carried out.
Contractor's facilities responsible for work execution.

9. EXECUTION TIMETABLE

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
ACTION 1: Workshops and training	X	X	
ACTION 2: Signaling and mobilization measures of vehicles and machinery	X	X	X
ACTION 3: Chasing, rescue and relocation measures for wildlife fauna.		X	X
ACTION 4: Fauna steps	X	X	

10. QUANTIFICATION AND COSTS

11.1.2.BIOTIC ENVIRONMENT				
11.1.2.1.BIODIVERSITY AND ECOSYSTEM SERVICES				
DATA-SHEET NO. 16 PROTECTION OF WILDLIFE				
Costs related to activities aimed at protecting fauna may vary due to the different work fronts, the intensity of workshops and trainings and the different fauna passage points identified. Costs related to the construction and/or adjusting fauna passages are related to construction costs of hydraulic works.				
Profession/Activity	**UNIT**	**Amount**	**v/unit**	**Total**
WORKSHOPS AND TRAINING*				
Biologist	Man	1	$4.500.000	$4.500.00
Audiovisual means and stationary	N/A	N/A	$5.000.000	$5.000.000
Refreshments	100	30 (days)	$3000	$9.000.000
Stationary	N/A	N/A	$500,000	$500,000
CHASING AWAY, RESCUE AND RELOCATION MEASURES FOR WILDLIFE FAUNA*				
Biologist	Man/month	6	$4.500.000	$27.000.000
Vet	Man/month	1	$4.500.000	$3.500.000
Field support workers	Man/month	6	$1.600.000	$9.600.000
Vaccines, crated, herpetological hooks, mist networks, antiophidic serum (per each work front).	Units	-	-	$150.000.000
Transport and per idem	Man/month	12		$64.800.000
Internal transport	Man/month	13	350.000	$ 82,364,000
SIGNAGE MEASURES AND MOBILIZATION OF VEHICLES AND MACHINERY*				
Preparation and installation of traffic signals related to fauna	Global:	100	300.000	$30.000.000
Transport of professional and local guides	Truck/day	3	350.000	$1.050.000
TOTAL COST OF DATA-SHEET				**$436.950.000**
*** costs of these activities may vary according to work front assigned during the undertaking of the project.**				

Source: GEOCOL CONSULTORES S.A., 2017

BIOTIC ENVIRONMENT			
BIODIVERSITY AND ECOSYSTEMS SERVICES			
DATA-SHEET No.17 MANAGEMENT OF FLORA			
1. Objectives:		 Source: Geocol Consultores S.A. 2017	
· Plan activities to cause the least possible impact on flora, · Prevent and mitigate negative impact on account of the modification of topsoil due to the removal of trees or natural regeneration with some type of threat located within the areas of intervention of the project.			
2. GOALS			
· Conservation of banned, endemic, threatened and critically endangered species with commercial, scientific and cultural values.			
3. PHASE			
PRE – CONSTRUCTION	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**	
	X		
4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE			
- Modification of topsoil structure - Changes on floristic structure and composition			
5. TYPE OF MEASURE			
Prevention	**X**	Correction	**X**
Mitigation	**X**	Compensation	
6. ACTIONS TO PERFORM			

BIOTIC ENVIRONMENT

BIODIVERSITY AND ECOSYSTEMS SERVICES

DATA-SHEET No.17 MANAGEMENT OF FLORA

PREVIOUS ACTIVITIES

*** Prior any activity on flora, it must verify the environmental license granted by the environmental authority, the scope and permits to use natural resources, management measures proposed and restrictions that are decisive in planning works and their execution.**

* It must analyze options to install works, taking into account minimum affectation on flora and this must be the decisive parameter in the decision made upon each work to undertake.

* Individuals identified as species in the area, in spite of having utilization permits, will have priority in terms of conservation, therefore it will endeavor in each case to prevent utilization, by specific alternatives.

It must locate and georeference in the areas of intervention, all banned, endemic, threatened and critically endangered species with commercial, scientific and cultural values, taking into account content lists in the Appendices of CITES in force, Resolution 0192 of 2014 - MADS, UICN red lists and the collection of red Books of Flowering Plants in Colombia.

ACTION 1: Training and sensitizing to personnel linked to the project.

Training personnel in that set forth in the environmental license guidelines granted for the execution of the project.

It will conduct workshops on environmental training to sensitize personnel on the importance of carrying out intervention only in licensed areas, it also states the function of flora, emphasizing of banned, endemic, threatened and critically endangered species with commercial, scientific and cultural values, and their protection during the execution of works, as well as preserving such species in time.

ACTION 2: Safeguarding Plant Material

It will proceed to safeguard plant material corresponding to natural regeneration, especially samplings of species with some degree of threat, meaning individuals between 30 cm and 1.5 m. To that end, it will proceed to the identification of material to rescues and its subsequent conservation and transfer. Collection of material must be made in the morning when there is high relative humidity in the environment, likewise to ensure that seedlings resist field conditions, it is necessary to verify the following:

Seedlings should not have mechanical damage nor phytosanitary issues.

Size of seedling should be proportional to its diameter.

Seedlings with wounds or scars should not be used.

Root should not be damaged.

It should use seedlings with terminal bud.

Transport of materials

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Seedlings must be taken to the definite site with special soil, so as to have certain volume of earth on their roots, to protect roots and allow maintaining humidity avoiding dehydration, reducing significantly mortality risks during transport. Likewise, before packaging it must spray substratum adequately for it to maintain humidity avoiding that it breaks up. Seedlings are placed on Styrofoam coolers.

MATERIAL PRESERVATION

Material will be temporarily placed in green houses sheltered from direct sunlight and fenced to keep it away from the intervention of animals and people, ensuring optimal environmental conditions for their conservation and development to be subsequently used in repopulating areas to be compensated. It considers the location of a temporary greenhouse, either own or contracted.

7- INDICATORS

GOAL	Name of the Indicator	ASSESSMENT MEANS	COMPLIANCE LEVEL
Conservation of banned, endemic, threatened and critically endangered species with commercial, scientific and cultural values.	**ACTION 1:** Training and Sensitizing Personnel Linked to the Project.	(No. of persons trained in flora management /total number of persons contracted to manage flora) x 100	100%
		(No.. of workshops on flora management conducted/Number of workshops on flora management programmed) x 100	100%
	ACTION 2: Safeguarding Plant Material	(Total number of seedlings of threatened species recovered /Total number of seedlings of threatened species reported) x 100	70%

8. PLACE OF APPLICATION

The place of application will be sites defined for the execution of the works of the Rumichaca - Pasto Divided Highway Project, San Juan - Pedregal Segment, where it reports species under the category of threatened or restricted.

9. EXECUTION TIMETABLE

BIOTIC ENVIRONMENT				
BIODIVERSITY AND ECOSYSTEMS SERVICES				
DATA-SHEET No.17 MANAGEMENT OF FLORA				
PROJECT ACTIONS		**PRE – CONSTRUCTION**	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**
ACTION 1.			**X**	
ACTION 2.			**X**	
10. QUANTIFICATION AND COSTS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
ACTION 1.	Workshop	$ 700,000		$ per each work crew
ACTION 3.	Individual	32.000		$ Related to number of seedling of recovered threatened species.
TOTAL COST OF DATA-SHEET				**$**

BIOTIC ENVIRONMENT			
BIODIVERSITY AND ECOSYSTEMS SERVICES			
DATA-SHEET NO. 18 PROTECTION OF SENSITIVE ECOSYSTEMS			
1. OBJECTIVE			
Prevent and mitigate negative impacts generated on sensitive ecosystems located within the area of influence of the project.	 Source: Geocol Consultores S.A. 2017		
2. GOAL			
- Protection and conservation of sensitive ecosystems that may be found within the area of influence of the project. - Zero affectation of hydro biological communities of water ecosystems, as contingencies of the project. - Training 100% of personnel linked to the project, as regards the protection and conservation of sensitive ecosystems.			
3. PHASE			
PRE – CONSTRUCTION	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**	
	X		
4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE			
- Modification of topsoil structure - Changes on floristic structure and composition - Changes on the composition and structure of hydro biological communities. - Alteration of the habitat of Hydro biological communities			
5. TYPE OF MEASURE			
Prevention	**X**	Correction	
Mitigation	**X**	Compensation	

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BIODIVERSITY AND ECOSYSTEMS SERVICES

DATA-SHEET NO. 18 PROTECTION OF SENSITIVE ECOSYSTEMS

6. ACTIONS TO PERFORM

In spite of the fact that in the area of influence what prevails is covers of intervened lands and natural vegetation is scarce and of vital importance to generate protection on these types of ecosystems, especially those related to water bodies to foster conservation and improvement of conditions.

ACTION 1: Training and sensitization of personnel linked to the project and the community.

It shall train personnel linked to the project, as well as the community in the area of influence on the protection and conservation of sensitive ecosystems, their importance to the natural balance and the influence on each of the productive activities undertaken in the region.

ACTION 2: Isolation of areas.

In adjacent areas to the construction area (natural vegetation, woody areas and water bodies), it will be isolated through perimeter closing that also operate as visual screens. These barriers will be installed on the most sensitive topsoil to alteration on its composition (dense woodland, riparian forest and secondary vegetation), taking in account not blocking biological corridors in areas as to not affect the flow of related fauna to the surrounding or implementing fauna passages suggested in Data-sheet 15 Protection of Wildlife Fauna.

It will make preventive restriction during the constructive stage of hydraulic works planned, to avoid contamination of water bodies, the affectation of topsoil and isolation of zones to build as not to affect adjacent topsoil, as well as maintaining physicochemical and hydro biological conditions in these water bodies. Similarly, it will control the passage or access of workers to the workplace, in order to avoid them from circulating in non-authorized sites.

ACTION 3: Reforestation of sensitive ecosystems

Due to the characteristic of lack of topsoil on water bodies, which are the most representative ecosystems in the area, it will conduct reforestation measures for the protection and conservation of these rounds, seeking to increase representation and ecological importance they have as a habitat for faunistic species in the area, or that are used as passage, feeding and shelter zones for these species. This will be made articulating a program of Compensation due to affectation of topsoil and wildlife fauna and in (Data-sheet 20) Compensation Plan due to the loss of Biodiversity (chapter 11).

For the establishment of reforestation it must take into account the following:

Location

Reforestation will be located in basins of water bodies and water springs located in the area of intervention of the project as determined by the environmental authority (CORPONARIÑO).

Selection of Species

Species to establish will be native. To select these species it will take into account a series of factors, first that these species are native in basins of water bodies that are found in the project's area of influence, to stimulate the development by means of faster adaptation processes; secondly, its potential uses for reforestation and soil conservation. Table 1 shows a list of possible species fitted to carry out a compensation program in the area.

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Table 1 Species recommended for compensation activities due to changes in soil use.

No.	COMMON NAME	SCIENTIFIC NAME	FAMILY
1	Encenillo	*Weinmannia cochensis*	CUNONIACEAE
2	Green shrub	*Escallonia paniculata*	ESCALLONIACEAE
3	Walnut tree	*Juglans netoropica*	JUGLANDACEAE
4	Cedar	*Cedrela odorata*	MELIACEAE
5	Saphindales	*Tecoma stans*	BIGNONACEAE
6	Mahogany	*Laofensia acuminata*	LYTHRACEAE
7	Capuli	*Prunus sertoina*	ROSACEAE
8	Black elder	*Sambucus nigra*	ADOXACEAE
9	Pumamaque	*Oreopanax sp.*	ARALIACEAE
10	Colla	*Verbesina arbórea*	ASTERACEAE

Source: GEOCOL CONSULTORES S.A., 2017.

Planting density

Trees will be planted in a triangle manner, at a distance of 2 meters each, for a density of 1111 trees per hectare.

Layout and drowning:

For trees, it must locate a plantation site according to design; set a 0.80 m of diameter; open broad holes with dimensions of 0.60 m of diameter by 0.60 in depth for high trees and of 0.40 m of diameter and 0.50 in depth for shrubs and medium size trees.

For non-woody plants, locate the planting site as per design; set a 0.80 m of diameter, open a broad hole of 0.6 m in diameter by 0.6 m of depth.

ACTION 5: Protection of Aquatic Ecosystems

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For the protection of water bodies and their related fauna it must take into account measures proposed in Data-sheet 9 Management of Crossings in Water Bodies of the Environmental Management program of Water Resources - Abiotic Environment.

It will forbid personnel that works in the consumption project, or capture of ornamental species during the execution of all activities contemplated in the area of influence of the road project. The contracting company will take the corresponding sanctions required on account of non-compliance

Prohibition of activities as washing and maintenance of materials and vehicles in water networks.

a. Training personnel

From the beginning of the project and as part of the Education and Training Program of personnel linked to the project, will do workshops and training about the protection and conservation of the water resource and the related hydro biota, emphasizing the management measure established in this PMA, which compliance will allow avoiding or reducing contaminant factors and other impact of water ecosystems affected by the development of activities in the area on influence of the road project.

- Training personnel linked to the project shall revolve around the following topics:
    - Adequate management of water resources in the execution of civil works; implementation of constructive methods and drainage works that prevent or mitigate the alteration of drainage surfaces and impact on water networks that are engaged within the project.
    - Induction of measures of Management of solid and liquid wastes that generate all types of project phases.
    - During workshops and trainings it must incentivize a culture of respect and preservation of water systems and other natural resources in the region, by project personnel.

b. Monitoring of hydro biological communities

- It will carry out hydro biological monitoring as states in the Environmental Monitoring Plan, in which it includes follow-up of volume and monitoring of sediments.
- Carry out discharge control of waters closed to rivers in the construction site of hydraulic works, as established in the Data-sheet of Management of Crossings of Water Bodies of the Environmental Management Program of Water Resources - Abiotic Environment.
- Carry out characterizations of hydro biological resources, with special emphasis on bio indicators groups of changes in the environment, to ensure maintenance of adequate conditions of the existence of all initial groups of benthos and icthyofauna (the latter for Sapuyes river and Guaitara river). These monitors shall be made at the beginning, during and in the final construction of each Segment.

c. Contingency Measures

- It proposes the following contingency measures to implement before a potential incident that affects hydro biological communities of water bodies subject matter of this data sheet until the affectation ceases:
- It will conduct registration of species rescued, which must include the scientific name, abundance and registration of the final management of those individuals.
- It will establish as a minimum three points of sampling for water quality monitoring and hydro biological communities: 50 meters of upstream watercourse in the contingency site, one directly in the contingency site and finally 50 meters downstream of the contingency.

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- Hydro biological communities that will be subject to this monitoring will be as a minimum: Benthos, aquatic macrophytes, vegetation inter phase water-land in a range of 10 meter and fishes (where it applies).
- Monitoring and actions of proposed rescues in this data-sheet will be maintained until technically there is a cease of affectation on the water body.

7- INDICATORS

GOAL	Name of the Indicator	ASSESSMENT MEANS	COMPLIANCE LEVEL
Protection and conservation of sensitive ecosystems that may be found within the area of influence of the project.	**ACTION 1:** Training and sensitization of personnel linked to the project and the community.	(Number of persons trained in the protection of ecosystems/no total of persons contracted)x 100	100%
		(No of workshops on the protection of ecosystems carried out with communities / Number of workshops on the protection of programmed ecosystems) x 100	100%
	ACTION 2: Isolation of areas.	Area of isolation for protection /Area of ecosystems sensitive identified)	100%
	ACTION 3: Reforestation of sensitive ecosystems	Areas with reforestation in rounds/ areas of ecosystems sensitive identified)	50%
Training of 100% of personnel engaged in the project, as regard the protection and conservation of water resource and aquatic related biota.	**ACTION 4:** Training of personnel	(No of workers trained in environmental education / Number of workers contracted) x 100	100% Excellent
Zero affectation of hydro biological communities, due to project contingencies	**ACTION 4:** Monitoring of hydro biological communities	(Monitoring conducted/ Monitoring programmed) 100%	90% Excellent
Zero affectation of hydro biological communities, due to project contingencies	**ACTION 4:** Contingency Measures	(contingencies presented/ contingencies monitored)*100	100% Excellent

BIOTIC ENVIRONMENT

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DATA-SHEET NO. 18 PROTECTION OF SENSITIVE ECOSYSTEMS

8. PLACE OF APPLICATION

- Sensitive ecosystems present in the areas of execution of activities in the Rumichaca - Pasto Divided Highway, San Juan - Pedregal segment and its area of influence.
- Water bodies present in the area of intervention of the project.

9. EXECUTION TIMETABLE

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
ACTION 4:	**X**	**X**	
ACTION 4:		**X**	
ACTION 4:		**X**	**X**
ACTION 1.		**X**	
ACTION 2.		**X**	
ACTION 3.		**X**	**X**

10. QUANTIFICATION AND COSTS

Costs related following will depend upon the duration of the project, it only presents costs per unit, and it does not determine the total cost, which will depend on the duration of activities undertaken by the project.,

Profession/Activity		UNIT	Amount	v/unit	Total
ACTION 4:	Hydro biological labs	1	Required	$ 1.500.000	$ 1.500.000
	Transport	Global:	1	$ 450.000	$ 450.000
	Per diem	Day.	1	$ 120.000	$ 120.000
	Rent of venue for workshops	Global:	1	$ 60.000	$ 60.000
	Rent of video beam	Day.	1	$ 50.000	$ 50.000

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	Materials	1	50	$ 10.000	$ 10.000
ACTION 1.		Workshop	1	700.000	Total number executed is shown
ACTION 2.		Ha	1	1.155.000	Total number executed is shown
ACTION 3.		Ha	1	32.000.000	Total number executed is shown
TOTAL ACTION 4					**$2.190.000**

BIOTIC ENVIRONMENT			
BIODIVERSITY AND ECOSYSTEMS SERVICES			
DATA-SHEET NO. 19 MANAGEMENT OF REVEGETATION IN INTERVENED AREAS			
1. Objectives:			
· Prevent, mitigate and correct negative impacts generated by the removal of topsoil and stripping be revegetation of areas intervened in the project.	 Source: Colgrass S.A.S 2017		
2. GOALS			
· Revegetation is effective in those areas that have been intervened by the project.			
3. PHASE			
PRE – CONSTRUCTION	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**	
	X		
4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE			
- Modification of topsoil structure - Changes on floristic structure and composition			
5. TYPE OF MEASURE			
Prevention	**X**	Correction	**X**
Mitigation	**X**	Compensation	
6. ACTIONS TO PERFORM			

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DATA-SHEET NO. 19 MANAGEMENT OF REVEGETATION IN INTERVENED AREAS

ACTION 1: Revegetation of areas intervened

Revegetation criteria in areas intervened.

This is not a supplementary activity, nor does it replace environmental compensation obligation of the surroundings, nor the obligations generated by the loss of biodiversity and that are governed by regulations. Revegetation contributes to the stabilization of areas with erosive processes or to mitigate impacts caused by civil works.

Revegetation must take into account climatic factors, availability of substratum, slope, erosion, timing and then it will select the type of vegetation and the species according to development characteristics that allow to comply with expected functions.

Areas with slopes, low soil depth and slope areas, where soils are not very stable, may support herbaceous vegetation and in some cases shrub-type vegetation. While plains, with adequate furrows may support trees.

In addition to the criteria that contribute to the selection of species, tress have roots of greater depth than herbaceous or shrubs, which allows for greater anchorage capacity in a moderate slops it provides greater stability.

Herbaceous plants cling faster to land that shrubs, and even exceed those of tree species, in addition, among trees, heliophytes species (those requiring more light) grow faster, but shade-loving plants show better averages.

To protect erosive processes it must take into account that they are dynamic, terrain stability has been affected therefore it requires fast clinging plants to protect soils from the actions of environmental factors.

Tree vegetation develops branches that contribute to the protection of soils from rain, wind and sun radiation.

The foregoing compels to think about grass patching plans including species with different stratum, so they may control and detain erosive processes, while larger species contribute to improving progressively terrain stability with their growth.

Terrain preparation

Marking zone to revegetate for their protection, which will allow avoiding people, animals or vehicles from stepping on soils, which increases erosion and soil compacting,

The area to revegetate must be marked with signaling tape at a height of 1.5m.

It should delimit the area where they will temporally store stripping and cuttings.

Next to the area to be intervened, it should delimit the area were there are trees, surface runoff, fauna shelter sites (such as dens and nests), water bodies or floodable areas and other that may be intervened and are highlighted as areas of ecosystem interests by specialists.

In the case of roads, it must signal planting areas, and areas where the road may be used, to reduce mobility affectation and avoid interference to users who make parallel crossings on the road.

For clearing of the surface or substrate, it should verify that there is no litter and that substratum is not contaminated with oils or liquids that may affect species to plant.

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DATA-SHEET NO. 19 MANAGEMENT OF REVEGETATION IN INTERVENED AREAS

To plant tree or shrub species, it must take into account the following:

Layout and drowning

For trees, it must locate a plantation site according to design; set a 0.80 m of diameter; open broad holes with dimensions of 0.60 m of diameter by 0.60 in depth for high trees and of 0.40 m of diameter and 0.50 in depth for shrubs and medium size trees.

For non-woody plants, locate the planting site as per design; set a 0.80 m of diameter, open a broad hole of 0.6 m in diameter by 0.6 m of depth.

Selection of Species

Species to establish will be native. To select these species it will take into account a series of factors, first that these species are native in basins of water bodies that are found in the project's area of influence, to stimulate the development by means of faster adaptation processes; secondly, its potential uses for reforestation and soil conservation. Table 1 shows a list of possible species fitted to carry out a compensation program in the area.

Table 1 Species recommended for compensation activities due to changes in soil use.

No.	COMMON NAME	SCIENTIFIC NAME	FAMILY
1	Encenillo	*Weinmannia cochensis*	CUNONIACEAE
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3	Walnut trees	*Juglans netoropica*	JUGLANDACEAE
4	Cedar	*Cedrela odorata*	MELIACEAE
5	Saphindales	*Tecoma stans*	BIGNONACEAE
6	Mahogany	*Laofensia acuminata*	LYTHRACEAE
7	Capuli	*Prunus sertoina*	ROSACEAE
8	Black elder	*Sambucus nigra*	ADOXACEAE
9	Pumamaque	*Oreopanax sp.*	ARALIACEAE

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10	Colla	*Verbesina arbórea*	ASTERACEAE

Source: GEOCOL CONSULTORES S.A., 2017.

Planting density

Trees will be planted in a triangle manner, at a distance of 2 meters each, for a density of 1111 trees per hectare.

Preparation of planting sites: Some soils in the area have been exploited as a result of farming activities, therefore soil conditions are not adequate. Hence it should use organic matter to increase the availability of nutrients. Once the holes are made, it should provide each planting site an favorable adjustment in terms of texture and pH management; it should carry out a specific soil preparation to regulate amounts that improve texture such as sawdust and organic fertilizers and acidity corrector such as calcium, phosphorous and magnesium; in addition to the need to control harmful fungi in the mixture, applying a broad spectrum of anti-fungi product. The base of this compositions should be soil with organic content (silts) Sow plant material eight or two weeks after having adjusted the soil of holes.

It also recommends spreading and mixing rice husk in soil in a ratio of 1:8. If required, it must use organic soil fertilizers that are easily assimilated by the environment, to that end y must have the advise of a professional on that subject matter, who will verify conditions in the area according to requirements of species it will generate its fertilization scheme.

When land is clean, it mas have plant material and substratum that may be seedlings or the first layer surveyed and protected in places where it was stores, until reaching sowing grounds. Provided that it has adequate sanitary and physical substratum, taking into account that set forth in the data-sheet on Management the removal of topsoil and stripping.

Establishing the topsoil plan.

This program comprises activities to reestablish topsoil, by means of planting trees and grass patching in areas intervened by constructive activities.

Things to take into account in the tree planting plan:

To select trees to be planted it will consider the characteristics of their roots, height, morphology, diameter of canopy, the manner it which it propagates, capacity to withstand pollution due to vehicles operation and dominance vis-à-vis other species in the area.

In order not to damage infrastructure due to roots of tree species in the center of the divided highway, it will plant medium size species - from 1 to 1.50 meters in height - and small trees - from 0.30 meters to 1 meter in height.

It will not plant fruit trees as these are susceptible to plagues. Therefore it will establish ornamental species and/or as food for fauna and birds-

Plant material will be bought in area's greenhouses in advance, to ensure an optimum percentage of plants growing and should not require special care as regards plague control; this material should have straight stems and they should be in a

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DATA-SHEET NO. 19 MANAGEMENT OF REVEGETATION IN INTERVENED AREAS

state that reduces losses of material during sowing, as well as reducing the probability that on their adult stage the bent compromising their stability. Also, plant material will be sowed during the rainy season to avoid loss due to lack of irrigation.

To ensure success of tree planting, it will conduct a permanent follow-up and monitoring of species planted, in order to establish corrective measures, if any, thus avoiding loss of plant and in a timely manner replant those that did not grow adequately.

The replacement of plant material shall comply with the conditions previously stated:

For the selection of species, it is important to have the species proposed by the environmental corporation, for this type of activities; however it is clear that it should used native and/or project area species in every stratum, either shrubs, herbaceous as trees, the foregoing prior agreement with CORPONARIÑO and the involvement of local communities.

To take into account during the grass patching stage:

Sites that will receive grass patching activities, it will avoid the passing through of heavy machinery of the soil already planted.

To avoid dragging of solids, activities related to the management of soil's fertile layer may not be undertaken under high rain conditions.

Grass patching must be conducted immediately after having adjusted the fertile layer.

Grass to be planted should be trimmed, and permanent irrigation should be ensured.

Surface prepared must be sufficiently hydrated, as it helps to control temperature on soil, which will be planted.

Grass patches will be located on the surface prepared to that end, fitting them in the best possible manner, avoiding overlaps or voids, and seeking that the ends of these grass patched areas fit harmoniously with the adjacent terrain.

In the unions of these patches it will place organic earth (brine), protecting the interior end of the dehydration grass.

One may bury pegs in these grass patches to avoid that the may rise due to wind, animals or anthropic incidence. Maintaining the internal area of the grass patch protected reduces dehydration.

Once grass patching activities are completed, the area shall be compared slightly within the following 24 hours with a manually operated roller.

Once planted, it must periodically verify humidity of substratum maintaining it hydrated until it is fixed, color should be the natural color of the species and coverage growth, seven (7) centimeters.

Maintenance:

It makes general recommendation for periodic maintenance tasks of the plant material implemented in the topsoil establishment plan:

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DATA-SHEET NO. 19 MANAGEMENT OF REVEGETATION IN INTERVENED AREAS

Fertilization, it is necessary to know soil chemical conditions and nutritional requirements of the species, to achieve expected results. it recommends using organic fertilizers to increase humidity retention of the soil.

Risks, foreseeing irrigation needs, according to climatic conditions, it will be necessary to periodically use an irrigation system with the capacity of servicing each day in a maximum time of eight days, therefore such system should be available.

Trimming, trimming of trees and shrubs must be done to provide volume, these depend basically upon coverage objective and management of micro spaces. In practice, they must be done after the first sowing year; these are recommended specially for shrubs.

Weeding consists on extracting weeds and cutting of grass in each of the sites managed, it must be done periodically, maximum at 60 days, as weeds close by compete for space and nutrients. It will be done during the first two years.

Replant, as material losses happen, due to poor effects of transport, manipulation or poorly rooted material, planting tasks and inconveniences during their planting period, it foresees a 10% more of necessary material, which will be replaced to the extent of their needs.

Phytosanitary control, it must make constant reviews to identify the state of trees and achieve, in time, sufficient control of plagues and illnesses.

Grass trimming, this is a permanent task, which will be necessary to conduct periodically. There should be specific sites for the disposal of these wastes generated.

7- INDICATORS

GOAL	Name of the Indicator	ASSESSMENT MEANS	COMPLIANCE LEVEL
Revegetation is effective in those areas that have been intervened by the project.	**ACTION 1:** Revegetation of intervened areas.	(Revegetated areas /areas intervened by the project) x 100	100%
		Number of trees, non-woody plans planted /number of tress, non-woody plants programmed for the Plan) x 100	100%

8. PLACE OF APPLICATION

The application will be in sites defined for the execution of the activities of the work of the Divided Highway Project Rumichaca - Pasto, San Juan - Pedregal Segment, where the removal of topsoil and stripping occur.

BIOTIC ENVIRONMENT				
BIODIVERSITY AND ECOSYSTEMS SERVICES				
DATA-SHEET NO. 19 MANAGEMENT OF REVEGETATION IN INTERVENED AREAS				
9. EXECUTION TIMETABLE				
PROJECT ACTIONS	**PRE – CONSTRUCTION**	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**	
ACTION 1.		**X**	**X**	
10. QUANTIFICATION AND COSTS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
Action 1 Revegetation with woody plants	Ha	32.000.000	1	Total number executed is shown Cost per Ha of reforestation
Action 1 Grass Patching	Ha	27.000.000	1	Total number executed is shown Cost per Ha of grass patching works
TOTAL COST OF DATA-SHEET				Total number executed is shown

BIOTIC ENVIRONMENT

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DATA-SHEET NO. 20 MANAGEMENT FOR THE COMPENSATION ON ACCOUNT OF THE AFFECTATION OF TOPSOIL AND WILDLIFE FAUNA

1. OBJECTIVE

Establish the necessary guidelines to compensate effects generated by activities of the highway project on topsoil and wildlife fauna.

Source: Geocol Consultores S.A. 2017

2. GOAL

- Implementation of 100% of management measures proposed in the compensation program of fauna affectation.
- Compensate 100% of the areas intervened in the project.

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
	X	X

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Changes on the structure, extension and availability of wildlife fauna.
- Changes in the composition and structure of fauna communities.
- Affectation of structural and functional connectivity of wildlife habitats
- Alteration of edaphic fauna
- Changes in mobility patterns of individuals.
- Modification of topsoil structure
- Changes on floristic structure and composition

5. TYPE OF MEASURE

Prevention		Correction	
Mitigation		Compensation	**X**

6. ACTIONS TO PERFORM

BIOTIC ENVIRONMENT

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DATA-SHEET NO. 20 MANAGEMENT FOR THE COMPENSATION ON ACCOUNT OF THE AFFECTATION OF TOPSOIL AND WILDLIFE FAUNA

1. COMPENSATION ON ACCOUNT OF AFFECTATION ON TOPSOIL

ACTION 1: Compensation of utilization of different non-natural topsoil and changes in the use of soil, it will be conducted as per that determined by the environmental authority in the project's License; to that end, it will reach an agreement with the Corporación Autónoma Regional of Nariño - CORPONARIÑO the sites to conduct protective reforestation with native species, prioritizing in the basins all water bodies that are found within the area of influence of the project.

For this activity it will take into account the area intervened according to the type of topsoil and will be compensated as per the guidelines established in the Environmental License, following, the suggested compensation factors.

- § Wooded areas identified as dense woodlands in firm land in the high-Andes orobioma (BD), riparian forest in the medium orobioma of the Andes (Br), secondary high vegetation in the high orobioma of the Andes (VSAoaA) and secondary high vegetation in the medium orobioma of the Andes (VSAoaA), as well as for open rocky grassland structure in the medium orobioma of the Andes, secondary low vegetation of the medium orobioma of the Andes and secondary low vegetation in the high orobioma of the Andes it proposes the compensation factor calculated in Chapter 11.2.2. *Compensation plan of loss of biodiversity.*
- § With respect to topsoil: grass mosaics and crops, mosaics of corps, planted woodlands (forest plantations and other anthropic topsoil are to be compensated in a 1:1 ratio (1 hectare intervened - 1 reforested hectare).

Compensated areas will have a close relationship with identified units as the affectation in the zoning area of the project management zone.

Compensation measures to be executed will be agreed upon with the Environmental Authority of the area's jurisdiction - CORPONARIÑO and the Ministry of the Environment and Sustainable Development.

Reforestation program

Given that the compensation alternative corresponds to the implementation of a reforestation program, of a protector type with native species, following find the guidelines for its execution.

- **Location of reforestation areas**

The selection of plots of land to reforest will be made in an agreed manner between the Road Concessionaire of Unión del Sur and the Corporación Autónoma Regional - CORPONARIÑO., prioritizing in the sites where there are water body basins found within the area of influence of the project.

The selected areas for the plantation to be isolated with physical barriers (fences, barbed wire, meshes etc.) to protect the permanence of planted species.

To ensure the biological quality, the development, stability and durability of the plantation as a system, it will, first of all, conduct a soil study of the areas selected to establish the plantation, to ensure the quality of the site with respect to species proposed and defined, according to results, a fertilization program (if necessary) that ensures success thereof. It will ensure sufficient substratum to house the root system.

- **Selection of Species**

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Species to establish will be native. To select these species it will take into account a series of factors, first that these species are native in basins of water bodies that are found in the project's area of influence, to stimulate the development by means of faster adaptation processes; secondly, its potential uses for reforestation and soil conservation. Table 1 shows a list of possible species fitted to carry out a compensation program in the area.

Table 1 Species recommended for compensation activities due to changes in soil use.

No.	COMMON NAME	SCIENTIFIC NAME	FAMILY
1	Encenillo	*Weinmannia cochensis*	CUNONIACEAE
2	Green shrub	*Escallonia paniculata*	ESCALLONIACEAE
3	Walnut tree	*Juglans netoropica*	JUGLANDACEAE
4	Cedar	*Cedrela odorata*	MELIACEAE
5	Saphindales	*Tecoma stans*	BIGNONACEAE
6	Mahogany	*Laofensia acuminata*	LYTHRACEAE
7	Capuli	*Prunus sertoina*	ROSACEAE
8	Black elder	*Sambucus nigra*	ADOXACEAE
9	Pumamaque	*Oreopanax sp.*	ARALIACEAE
10	Colla	*Verbesina arbórea*	ASTERACEAE

Source: GEOCOL CONSULTORES S.A., 2017.

- **Terrain preparation**

Land preparation, depends on the specific conditions of each site, the following phases may be mentioned:

- **Clearing of land: consist on the elimination of vegetation by manual means (machete); it will be conducted to avoid light and soil nutrients competition with small trees to be planted. Weeds that may compete with 1m seedlings, clearing using hoe and machete; if land is compacted will loosen with the hoe, pickaxe in an area of 20 to 40 cm of diameter and depth**

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- **Layout is done by marking holes in each plantation site according to the distribution selected for that plantation, it uses tapes and pre-marked strings so selected distances will be uniformly distributed in the terrain.**
- **Weeding and drowning: Consists in clearing vegetation in a circle with an approximate diameter of 90 cm at one meter and subsequently in the center of the plate, it makes a hole of 60 x 60 centimeters, in a manner that the bud of the root remains a little bit below to preserve humidity.**
- **Transport of seedlings: Seedlings will be transported from the gathering point or greenhouse to the plot in mention.**
- **Fertilization:** Fertilization, if required, will be executed applying the necessary dosage depending on land conditions, it suggests using organic fertilizers. The application of organic fertilizers is important due to the fact that it avoids leaching of chemical products and the contamination of water sources. It advised carrying out a prior soil analysis and the application of fertilizers at the time of planting.

- **Planting of trees.**

The distance of seedling will be minimum 3.5 m x 3.5 m distributed as a square if dealing with slopes of less than 12%, otherwise, the distribution will be in a triangle. The height of seedlings to plant will not be less than 0.40 m (40 cm).

Once the holes are made it proceeds to establishing small trees in each of the holes. For the transfer of seedlings with exposed roots, it will fill containers with plant material with sufficient water. Seedlings in bags will have sufficiently wet earth. It will open a hole of enough depth and diameter so that roots of the plant feed without being bent, ill treated or harmed and according to the size of each seedling; plants on bags will be withdrawn from the packaging to be planted; endeavoring so roots remain intact. Seedlings are located straight and the surface of the root base at a depth in accordance with said specie and the size of the plant. It will use hydro retainers in a dosage between 3 and 5 gr., according to soil characteristics, the size of the hole, site rainfall, temperature and tree size, if sowing occurs during the dry season. Subsequently it will fill the hole and will slightly compact soil around the small tree as not to leave air spaces.

- **Maintenance:**

Maintenance will be conducted during a minimum period of three (3) years as of the completion of planting or when seedling reach a height in excess of 2 meters, with biannual maintenance activities.

As part of maintenance activities, find the following:

- **Phytosanitary control It conducts Phytosanitary control of the plantation with biological pesticides, as these exhibit a less harmful effect against plagues, as well as helping to the protection and conservation of the environment. In the event there is incidence of a plague attack or the presence of any disease, it will seek the advise of a professional in the phytosanitary realm.**
- **Replanting: It consists on changing those plants that die during the adaptability process. Maintenance of the plantation will be conducted for a period of minimum 3 years, until planted species reach a minimum height of 2 meters and success rate of no less than 85%.**
- **Fire protection: Consists on the elimination of topsoil in the plantation perimeter, in order to reduce the possibility of forest fires. It will keep a protective path of approximately 3 meters, free from topsoil.**
- **Isolation: Consists on fencing, if necessary, the land where the small trees were planted, to avoid the entrance of animals and/or personnel that may generate physical damage to planted trees.**

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Progress report:

During maintenance period, it will present biannually to CORPONARIÑO and ANLA, performance and topsoil management reports. Such reports are preferably presented in the months of June and December of each year with the exception of the last report, which will be submitted once the maintenance period is completed (3 years). Reports will contain the following information:

1) Name of plot of land and of owner. 2) Surface planted with its respective dates 3) Number of species and types of trees planted per area. 4) Height and diameter per species. 5) Phytosanitary status by species (presence of plagues, animal attacks, detours, drying and other phenological characteristics). 6) Works and activities conducted and programmed. 7) Photographic record of species and plots of land. 8) Location of plots of land in blueprints at a scale greater or equal to 1:10000; maps or blueprints will include conventions to allow their interpretation and location in the area. 9) The reports will show the consolidation of relevant information of previous reports. 10) Photographic supports. 11) The company will be responsible for the adequate development and growth of trees, and to that end it will implement different fertilization campaigns (every 6 months and during 3 years), fire control, plagues, animals and diseases (every 6 months and during 3 years) 12) It cannot make use of exotic species.

Measured delivery: To receive the measure of compensation; the Highway Concessionaire Unión del Sur will attach the information with progress reports to Corporación Autónoma Regional CORPONARIÑO and ANLA, where it will show the execution of the measure and will conduct field verification. Reforestation receipt will be conducted when it manages to proof the establishment or survival of at least 85% of species planted.

2. COMPENSATION ON ACCOUNT OF AFFECTATION TO WILDLIFE FAUNA

To conduct compensation on account of affectation of wildlife fauna, it recommends carrying out a study of any aspect of the biology of one species present within the area of influence of the project and which is deemed threatened to a certain degree at national/international level, or which is catalogued as an endemic species (See Table 11.3 Fauna species included in CITES appendices, endemic and/or with a threat category, in Data-sheet 15 Protection of Wildlife Fauna.

ACTION 2: Formulation of the conservation plan

To generate a work plan that allows to gather the largest amount of possible information of the species upon which the investigation is undertaken, it proposes addressing the following topics:

- *Biology and conservation status: This chapter will gather the information of the taxonomical and geographic context of the species. geographic, historical and current distribution, habitat of the species and natural history.*

- *Protection Status In this chapter it must mention protected areas, conservation areas and management and areas without category management in the region, where it reports that it wishes to preserve such species.*

BIOTIC ENVIRONMENT

BIODIVERSITY AND ECOSYSTEMS SERVICES

DATA-SHEET NO. 20 MANAGEMENT FOR THE COMPENSATION ON ACCOUNT OF THE AFFECTATION OF TOPSOIL AND WILDLIFE FAUNA

- *Sociopolitical Framework Here, it shall characterize the context in which it will frame any action that it will conduct with respect to the conservation of species.*

- *Operative Framework and Action Plan: In this chapter it should identify concrete actions to tackle each of the threats, oriented to complying with specific objectives. Within the actions to consider, find the following: research and monitoring, conservation and landscape management, policies and management measures, education - communication and management of individual species and populations ex situ.*

In addition, with the selected species it shall take into account the following considerations to conduct the research:

- Habitat and ecology requirements of the species within the area of influence of the project.
- Identification of specific threats to which they are subjected in the area of influence of the project.

ACTION 3: Socialization of products obtained

Lastly, it purports that environmental education (Corredor et al,2010) plays an important role in the conservation and in this way guarantee, to a certain extent, that within the activities conducted in this proposal, the project involves human communities present in the sampling area,[1]

As of the generation of didactic, educational and informative material in which it includes pamphlets, posers, videos and/or scientific articles, it will show results to nearby communities of the project to make public the monitoring findings illustrating both the process to obtain data, results and measures for the conservation as established by the selected species in the area of the project.

7- INDICATORS

GOAL		Name of the Indicator	ASSESSMENT MEANS	COMPLIANCE LEVEL
Compensation of account of affectation of wildlife fauna.	Implementation of 100% of activities related to the proposed monitoring of species for the compensation program on account of affectation of fauna.	**ACTION 2:** Formulation of the conservation plan	Conducting monitoring on the proposed species	100% Excellent

[1] Corredor G., Velásquez B., Velasco J., Castro F., Bolívar W. & Salazar M.2010. Action Plan for the Conservation of Amphibians in the Department of Valle del Cauca CVC, Fundación Zoológica de Cali and UniValle.

BIOTIC ENVIRONMENT				
BIODIVERSITY AND ECOSYSTEMS SERVICES				
DATA-SHEET NO. 20 MANAGEMENT FOR THE COMPENSATION ON ACCOUNT OF THE AFFECTATION OF TOPSOIL AND WILDLIFE FAUNA				
	Disseminate by means of publications, findings of faunistic monitoring.	**ACTION 3:** Socialization of products obtained to communities close to the project.	Number of socialization carried out / Number of socialization programmed during the activity) x 100	100% Excellent
Compensation due to affectation of topsoil	Compensate 100% of the areas intervened by the project as per that set forth by the Environmental Authority.	**ACTION 1a:** Socialization and agreement on the project with the community and institutions in the region,	Number of socialization carried out / Number of socialization programmed during the activity) x 100	100%
		ACTION 1b: Area to compensate* * Is equivalent to the area intervened and which soil use changes, except natural coverage.	(Areas to compensate /area intervened) x 100 = 100%	100%
		ACTION 1c: Native species planted	(Number of native species planted / total number of species in the area to revegetate) x100 = 100	80-100% Excellent 60-79% Complies <59% Non compliance
	Carrying out 100% of forecasted maintenance.	**ACTION 1d:** Carrying out Maintenance activities	(Number of maintenance activities carried out / Number of maintenance activities programmed) x 100 = 100%	80-100% Comply <79% does not comply
8. PLACE OF APPLICATION				
- Area of influence of the road project. - All those areas agreed upon with the environmental authority (Corporación Autónoma Regional), the constructing company and areas endorsed by owners of land that allow for the performance of tasks set out herein.				
9. EXECUTION TIMETABLE				

BIOTIC ENVIRONMENT

BIODIVERSITY AND ECOSYSTEMS SERVICES

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- Actions established in this data-sheet must be implemented during the activities of pre-construction, construction and operation of the Road Project.

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
ACTION 1.		X	X
ACTION 2.	X	X	
ACTION 3.		X	X

10. QUANTIFICATION AND COSTS

ACTIVITY		UNIT	AMOUNT OF MONTHS	V/UNIT	Total
ACTION 2.	1 Biologist (fauna coordinator)	Man/month	36	$3.500.000	$126.000.000
	Biology undergraduate students (theses)	Man/month	18	$1.500.000	$27.000.000
	Field support	Man/month	18	$900.000	$32.400.000
ACTION 3.	Pamphlets, billboards, video beam, stationery	Units	-	-	$6.000.000
ACTION 1a:		Workshop	A workshop per each forest plantation on account of compensation to establish (if they are in the same township, it can conduct only one workshop)	$ 2.000.000 /workshop	It forecasts the total number of forest compensation plantations to be established.

BIOTIC ENVIRONMENT				
BIODIVERSITY AND ECOSYSTEMS SERVICES				
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ACTION 1b:	Hectare	Equals to number of hectares intervened in the project	$ 32.000.000 /ha	It forecasts the total number of hectares intervened for the project.
ACTION 1c:	Individual	Included Action 1B		Included in Action 1b
ACTION 1d:	Hectare	Nine (9) maintenance (three per years) per hectare	$ 3.000.000 per maintenance	It forecasts the total number of hectares of plantations established.
TOTAL COST OF DATA-SHEET				**$191.400.000**

11.1.1. SOCIOECONOMIC ENVIRONMENT

Table 11.6 shows Management Programs performed for the abiotic environment, breaking down each of the technical data-sheets comprising each of them.

Table - Structure of the environmental management program for the abiotic environment

ENVIRONMENT	PROGRAM	NAME OF MANAGEMENT DATA-SHEET	No. No. Data sheet EIA
SOCIOECONOMIC ENVIRONMENT	Socioeconomic Management	Information and Community Participation	21
		Attention to users	22
		Accompaniment on land and social management	23
		Education and training of personnel hired by the project	24

		Training, education and awareness building to the community on the project's surroundings	25
		Road Safety Culture	26

11.1.1.1 Socioeconomic management program

Figure 11.6 Socioeconomic Management

PROGRAM OF INFORMATION AND COMMUNITY PARTICIPATION

SOCIOECONOMIC ENVIRONMENT

SOCIOECONOMIC MANAGEMENT

DATA-SHEET NO. 21 INFORMATION AND COMMUNITY PARTICIPATION

1. OBJECTIVE

- Inform municipal authorities of Ipiales and communities of small territorial units in the area of influence of the project, in a clear and timely manner regarding the technical, social and environmental aspects proposed in the execution of the project.
- Generate encounter and dialogue mechanisms with communities of small territorial units to establish lasting relationships, creating positive surroundings to activities to be developed by the concessionaire.
- Undertake mechanisms that allow to know progress of the project and compliance of management measures of municipal and community authorities in the area of local intervention.

Source: Geocol Consultores S.A. 2017

2. GOAL

- Involve 100% of communities pertaining to large and small territorial units in the project's area of influence.
- Inform by means of mass media to 100% of communities and their representatives, as well as local authorities in municipalities and territorial units involved in the undertaking of projects, works and activities of the company in its different stages - about activities, works, impacts, management measures and other topics defined in this program.

3. PHASE

PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
X	X	X

4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE

- Changes on population dynamics.
- Generation of expectations
- Generation of conflicts

5. TYPE OF MEASURE

Prevention	X	Correction	
Mitigation		Compensation	

6. ACTIONS TO PERFORM

To conduct the development of community information and participation process it takes into account the performance of the following actions.

SOCIOECONOMIC ENVIRONMENT

SOCIOECONOMIC MANAGEMENT

DATA-SHEET NO. 21 INFORMATION AND COMMUNITY PARTICIPATION

ACTION 1. SUMMONS

Summon municipal authorities and communities pertaining to the project's area of influences with the purpose of conducting informative meetings related to the performance of activities contemplated in the project. For these summons, it is necessary to apply informative diffusion tools, both written and verbal, such as: edicts, billboards, fliers, telephone calls, voice to voice, megaphoning; diffusion through members of JAC, directors of education institutions, Summons will emphasize day, place and time of meeting.

For each of the meetings to conduct, the concessionaire shall make a formal invitation to ANI and Audits, ten (10) days prior to the date set for the meeting.

ACTION 2: COMMENCEMENT MEETINGS

Minimum 3 months prior to the commencement of interventions in a functional unit, and before handing the detail studies corresponding to the functional unit to the auditor, the concessionaire shall conduct one (1) commencement meeting to inform municipal authorities and communities in the area of influence, the activities that will be undertaken, indicating when and where they will take place, as well as the technical characteristics of the project, the user services office, the minutes to be written, manpower required for the project and programming of their meetings during the constructive stage. This will be conducted to avoid the dispersion of information or generating false expectations with the community.

Among the topics to discuss:

- Presentation by ANI
- Presentation by the concessionaire
- Presentation of audits
- Advantages and benefits of the Concession program
- General scope of the project
- Project's timetable
- Presentation of social management (emphasizing on impacts and management measures of the social management program)
- Procedure to hire manpower
- Scope of environmental management
- Land management
- PMT (for its Spanish acronym) Traffic Management Plan
- Community's Participation Committee for the Project
- Questions and suggestions

ACTION 3: INFORMATION MEETING

It should conduct at least (1) informative meeting before the beginning of work activities with each of the communities, this meeting should be programmed at least 10 days in advance in the rural district or agreed venue with the community leader, the venue should be able to hold approximately 50 people. Presentation of the project This meeting shall also be programmed with the respective municipal authority

- Activities developing scheme (technical presentation or project characteristics).

SOCIOECONOMIC ENVIRONMENT

SOCIOECONOMIC MANAGEMENT

DATA-SHEET NO. 21 INFORMATION AND COMMUNITY PARTICIPATION

- Companies and professionals engaged in the project
- Aspects and actions of the Environmental Management Plan (PMA) and especially those related to social management program.
- Tasks to be performed by the Concessionaire
- Timetable (Begin data - contract duration and contracted tasks with personnel in the region)
- Information corresponding to the contracting of Personnel required for the execution of development strategies contemplated in the project (position profile, requirements, type of contract, funding, social security).
- Procedure to use for the contraction of local manpower (as per that established by SEAN and according to Concessionaire's procedure.
- Contact information of the Concessionaire

As a supplemental activity, it must conduct at least (1) progress meeting, on work activities, results of the social and environmental management programs. It is worth noting that the same number of progress meetings programmed as of the commencement meeting, will be held, taking into account territory characteristics where the project is located.

Meaning that these meetings will be conducted during the constructive processes with all communities and respective municipal authorities, every six months, where it will discuss the execution of environmental measures of the EIA, or those that have been required by local authorities and communities. Supports of these meetings will be supplied for the preparation of ICA.

A (1) closing meeting will be held, during the last stage of the project (completion of interventions), with each of the municipal authorities and communities in the area of the project, where it will discuss the following topics:

- Summary of activities, time in which they are developed and results of the project.
- Report on personnel contracting process.
- Confirmation of topics. commitments entered into, status and level of compliance thereof (as per information and follow-up meetings).

The information provided must be clear, true and timely, and must be given by professionals engaged in the project.

Information meetings shall be supported by minutes, evidencing social, guild, population, territorial, sectorial organization or the authority with whom such meetings are held, concerns, agreements and topics discussed will be duly recorded. In addition, it will leave written documents and records, if any, attendance registry and photographic / film registry and written support of summons.

On the other hand, the Concessionaire shall deliver a timetable of meetings with communities for each of the functional units, which must be submitted to audit.

ACTION 4: MAKE UP OF THE COMMUNITY PARTICIPATION COMMITTEE

To ensure citizens' participation, concessionaire, if deemed appropriate, will summon the participation of the community to make up the COMMUNITY PARTICIPATION COMMITTEE, and to that end, upon finishing the commencement meeting it will request attendees to enroll, it will detail objective, scope and functions of the Committee, and will provide training to Committee members and the working timetable which will include walk-troughs of the work during the construction stage.

It will provide the necessary information to existing citizens' ombudsman, as per Law 850 of 2004, who request information on the project, these committees may be shared with the Community Participation Committee. Every meeting of the

SOCIOECONOMIC ENVIRONMENT			
SOCIOECONOMIC MANAGEMENT			
DATA-SHEET NO. 21 INFORMATION AND COMMUNITY PARTICIPATION			
committee must be supported with minutes or documents and written records, if any, attendance registry and photographic and/or video recordings and written support of the summons. Similarly, all meetings must be supported with their summons as per ANI format, a power point presentation, sending it in a timely manner to ANI and audit for their respective revision. Invitations should be distributed personally and/or through local organizations, at least 8 days prior to the event. Develop the event according to formats set forth to that end by ANI Attendance registry, minutes of meetings as per ANI format and photographic record- In sum, it will hold progress, completing and extraordinary meetings with this committee.			
7- INDICATORS			
GOAL	**NAME OF INDICATOR**	**ASSESSMENT MEANS**	**COMPLIANCE LEVEL**
100% of the area of influence of large territorial units to be summoned to information meetings.	Summons process for information meeting with small territorial units in the project's area of influence.	Number of small territorial units summoned/Total number of small territorial units existing in the project's area of influence x 100	Summons process made to 100% of small territorial units of the project.
100% of the small territorial units in the project's area of influence summoned to information meetings.	Summons process for information meetings with large territorial units in the project's area of influence.	Number of large territorial units summoned /total number of large territorial units existing in the project's area of influence x 100	Summons process carried out with 100% of large territorial units of the project.
100% of the area of influence informed of project activities.	Information and communication of project activities with small territorial units of the project.	Number of territorial units informed on the scope of the project / number of small territorial units summoned in the Area of Influence x 100	Inform and communicate 100% of small territorial units existing in the area of influence.
	Information and communication on project activities to large territorial units of the project.	Number of large units informed on the scope of the project / number of large territorial units summoned in the Area of Influence x 100	Inform and communicate to 100% of large territorial units existing in the area of influence.
100% of the members of the Community Participation Committee and the community of territorial units of the project trained.	Trainings imparted to members of the Community Participation Committee and the community in general, with the accompaniment of members of the municipal administration.	Number of trainings programmed /Number of trainings conducted referred to the project's area of influence.	Reports carried out by members of the Community Participation Committee and the community in general in the project's area of influence.
8. PLACE OF APPLICATION			

SOCIOECONOMIC ENVIRONMENT				
SOCIOECONOMIC MANAGEMENT				
DATA-SHEET NO. 21 INFORMATION AND COMMUNITY PARTICIPATION				
Small territorial units in the municipality of Ipiales (large territorial units)				
9. EXECUTION TIMETABLE				
PROJECT ACTIONS		**PRE – CONSTRUCTION**	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**
ACTION 1: Summons		**X**	**X**	**X**
ACTION 2: Initial meeting		**X**		
ACTION 3: Progress meeting			**X**	
ACTION 4: Assessment meeting				**X**
10. QUANTIFICATION AND COSTS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
Stationery for meetings, (printed material, computers, video beam) didactic, disseminated, sound and refreshments*	Month/day/global	$2.000.000 per meeting	1	$ 2.000.000
Social professional	Month/day/global	$10.000.000	**1**	$ 10.000.000
Environmental professional	Month/day/global	$10.000.000	1	$ $10.000.000
TOTAL COST OF DATA-SHEET				**$22.000.000**
*values applicable for the first year of execution of the project Such value may vary depending on the time of execution of the project and suppliers.				

Source: GEOCOL CONSULTORES S.A., 2017

SOCIOECONOMIC ENVIRONMENT
SOCIOECONOMIC MANAGEMENT
DATA-SHEET NO. 22 SERVICE TO USERS (PGRS)
1. OBJECTIVE
· Implement service attention methods to the population in the project's area of influence, that allows providing timely and effective information on Requests, Complaints, Claims and Suggestions of the community that are made in fixed and mobile offices; which refer to the development of the project to generate a quick, effective and appropriate response ensuring users' well being, thus achieving trust ties with the Concessionaire.
2. GOAL

SOCIOECONOMIC ENVIRONMENT			
SOCIOECONOMIC MANAGEMENT			
DATA-SHEET NO. 22 SERVICE TO USERS (PGRS)			
· Provide timely attention and response to requirements, complaints, claims and suggestion submitted in the community and Municipal Authorities on the technical, social and environmental procedures and personnel contracting, among others, related to the development of project's activities in order to maintain trusting relationships with stakeholders. · Involve in a participative manner 100% of the population on the area of influence of the project by means of PQRS. by installing social services offices.		 Source: Geocol Consultores S.A. 2017	
3. PHASE			
PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION	
X	X	X	
4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE			
- Fragmentation of land - Changes to land prices - Change on economic activities - Changes on employment dynamics - Changes in the state of road infrastructure and public services - Generation of conflicts - Generation of expectations - Changes in social relations - Change on values and cultural practices - Changes on health of the population			
5. TYPE OF MEASURE			
Prevention	X	Correction	X
Mitigation	X	Compensation	X
6. ACTIONS TO PERFORM			
In order to respond in a timely manner to requirements, complaints, claims and request (PQRS - for its Spanish acronym) that may arise during the development activities of the project, it has established communication mechanisms that allow building relationships based on trust with stakeholders. To develop this program, the project's contracting company has professionals in the social area, which will be in charge of providing attention to the community through different communication channels established, and to that end they will put in place a Social Services System, which will comprise: The Social Services System to users, will define an internal procedure to service and solve complaints, requests, suggestions, petition and claims of the community. Such system shall facilitate the response of any communication addressed to the concessionaire in a time equal or less to that set forth in Applicable Law regarding the right to petition.			

SOCIOECONOMIC ENVIRONMENT

SOCIOECONOMIC MANAGEMENT

DATA-SHEET NO. 22 SERVICE TO USERS (PGRS)

It shall identify players implied in the response process, processes executed for each one of them with respect to the communication received and the procedures given to he flow of information and documentation among players identified. as well as storage, reference and remittance of responses.

Likewise, the concessionaire shall make available to audit and ANI a copy of all communications received and responses granted.

The Social Services System for users shall be implemented by the concessionaire and its implementation is mandatory o processes, activities and procedures described in this program- Without prejudice to the obligation of providing a response to users within the term established in Applicable Law for the right to petition.

Lastly, it shall use formats to that end that will be provided for by ANI.

ACTION 1. PHYSICAL MEANS

Have one (1) permanent office as service attention point for each functional unit (as per that set forth in technical appendices 6. 7 and 8, to the extent possible, created as of the execution of the commencement minutes and to the completion of the operation stage, with room for a meeting room and equipment and computers require for PQRS processes. Users attention will be the responsibility of social professional of the Concessionaire, in office hours previously established.

It shall have a main office for user attention, which will be located in the municipality or large territorial unit containing the largest population of the functional unit (project's area of influence).

Users attention main office must have adequate space to conduct activities related to providing services to users, good lighting system, ventilation, access and furniture and equipment required to service the public in addition to having a good meeting room for 10 o more people.

This main office shall be mounted prior the expiration day of having entered into such commencement minutes and shall remain open until the end of the operation and maintenance stages.

Also, the concessionaire shall have satellite offices to provide service to users in every functional unit. Its location must correspond to an equidistant point for all users. Such office shall be in working condition as of the construction phase and until the month after executing the termination minutes of the respective functional unit. Such offices must have space to conduct activities related to user attention, lighting, ventilation and ease of access, as well as the necessary furniture and equipment to service users.

Each office shall have a visible sign, located outside the office (following guidelines on communication set forth by ANI's offices), it must include: name of the project, institutional logos, name "USER SERVICES OFFICE" in a visible manner in different user attention lines. mobile phone, web page, social networks, e-mails and office hours.

Office hours will be from Monday to Friday 8:00 am to 6:00 pm and Saturdays from 8:00 am to 2:00 pm. The offices shall be serviced by social professionals with experience in community work.

Regarding mobile offices, the concessionaire shall have at least two (2) for the project, which will correspond to a mobile structures, trailer type, including a vehicle necessary for displacement; or a vehicle equipped with the required technology to generate video and communication inter phases, as well as spaces to provide service to the public.

Each mobile office shall be equipped with computer and communications equipment in such a way the they may render the same services as in their permanent office, which includes computers, scanners, digital camera, stationery and telephone.

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DATA-SHEET NO. 22 SERVICE TO USERS (PGRS)

Mobile offices should be in operation before the expiration of the 30th day after having executed the commencement minutes and until the completion of the Pre-Operative stage. It is worth noting that for the Operation stage, it will leave just one mobile office for the entire project.

Displacement of mobile offices will be programmed considering information and services needs that arise in communities or according to programmed activities established by the concessionaire. Programming of such displacement shall be disclosed in communication media referred to in the community information and participation program.

ACTION 2. ELECTRONIC MEANS:

In order to communicate and socialize progress of works and other technical aspects related to mobility, on the website (http://www.hoovers.com/company-information/cs/company-profile.consorcio_sh_sas), will be made available for consultation 24 hours a day and will be updated as required to inform on affectation, restrictions or specific activities in the road corridor or any other topic the concessionaire deems appropriate. Also, the website will be the mechanism to receive PQRS's, the social management area will previously review all those related to concession management. In the event the request is not related to concession management, it will provide de adequate answer determined by the type of request.

E-mail will have the only purpose of providing service to the community to respond, follow-up or close PQRS that arise through this mean.

ACTION 3. PQRS RECORDS

The concessionaire shall maintain available to audit and ANI a copy of all incoming and outgoing correspondence , as well as copies of all documents that are issued in users' servicing processes in permanent and mobile offices.

On the other hand, the concessionaire shall maintain a record of the following documentation:

Record format of PQRS's established by ANI; the monthly program timetable on the location of the mobile office and the verification of its execution by audit. Acknowledgement of receipt and response, duly filed according to standards set forth in the Users' service office. Monthly audit report with compliance verification on the program to service users and the respective analysis of situation that arouse in the execution of the program, through a random sampling of users acknowledgement of having received a response to their satisfaction.

ACTION 4: ASSESSMENT AND SELF-ASSESSMENT

As regards assessment of compliance with response time to users' communications, concessionaire shall accredit that 95% or more of the communications received were answered on time and that less than 0.1% were left unattended within 5 working days following the expiration of the term foreseen in the right to petition.

Information regarding the relationship between communications received and response time, will be monthly addressed to the auditor by means of the Accounting and Control Information System (SIIC) referred to in Appendix 4.

In addition, concessionaire will implement every six months, a survey (performed by an independent contractor) to obtain information regarding users' satisfaction regarding response time and content thereof.

7- INDICATORS			
GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL

SOCIOECONOMIC ENVIRONMENT			
SOCIOECONOMIC MANAGEMENT			
DATA-SHEET NO. 22 SERVICE TO USERS (PGRS)			
100% attention to PQRS in the project's area of influence.	Installation and refurbishing of permanent users' service office for large and small territorial units of the project.	Number of permanent offices for users' services/ permanent users' service office foreseen x 100	Permanent office installed and furnishes to render services to PQRS in the project's area of influence.
	Installation and furnishing of mobile offices to service users to small and large territorial units of the project.	Mobile users' service office implemented/mobile users' service office foreseen x 100	Mobile offices installed and fitted to render PQRS services in the project's area of influence
	Viability of PQRS's received.	Number of PQRS's services/number of communications received - PQRS	Attention, proceeding and response to PQRS

8. PLACE OF APPLICATION

Large and small territorial units of the project.

9. EXECUTION TIMETABLE

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
Installation and furbishing of permanent office.	X		
Installation and furbishing of mobile offices.		X	
Receipt and closure of PQRS's	X	X	X

10. QUANTIFICATION AND COSTS

ITEM	UNIT	UNIT COST (COP)	QUANTITY	TOTAL COST COP)
Social Professional	Month/day/global	Personnel already established within social and environmental management of the project	4	$ value defined within the project's social management.
Materials, equipment and supplies of offices*	Month/day/global	Depending on the provider and whatever is established by the concessionaire	1	$ Depends on the provider and whatever is established by the concessionaire.
Space of permanent and mobile attention points and their respective supplies*	Month/day/global	Depends of its location and commercial values of properties therein	2	Depends of its location and commercial values of properties therein
TOTAL COST OF DATA-SHEET				$ Depends on that established by the concessionaire

*values applicable for the first year of execution of the project Such value may vary depending on the time of execution of the project and suppliers.

SOCIOECONOMIC ENVIRONMENT			
Socioeconomic Management			
DATA-SHEET NO. 23 ACCOMPANIMENT ON LAND AND SOCIAL MANAGEMENT			
1. OBJECTIVE			
· Carry out accompaniment to the population of social units (residential and/or productive) located within the area to be used on the development of the project and that may be directly affected by activities, and that they necessarily need to be resettled, as per laws in force.			
2. GOAL			
Carry out 100% of the accompaniment process to social and land management, in residential and/or productive social units.			
3. PHASE			
PRE – CONSTRUCTION	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**	
X	**X**		
4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE			
- Changes on population dynamics. - Change on economic activities - Changes on revenue levels - Changes in the quality-of-life of the population - Changes on the state of road infrastructure and public services - Changes in social relations - Change of values and cultural practices.			
5. TYPE OF MEASURE			
Prevention		Correction	**X**
Mitigation	**X**	Compensation	
6. ACTIONS TO PERFORM			

The implementation of the action plan containing procedures as per that established by standards in force (Resolution 545 of 2008, Resolution 1776 of 2015), and takes into account the following actions:

ACTION 1. DIAGNOSIS

Taking into account that carried out during the preparation of the Environmental Impact Study - EIS, where it conducted the characterization of each of the social units and it has identified: makeup of immediate family, level of education, type of health program, kinship, life conditions, type of housing (construction characteristics), public services, as well as expectation regarding the project and possible resettling place; the following specific actions must be undertaken:

· Analyze the documents attached to each soil unit, identifying losses of sources of income and productive assets, their condition of formality and the average value of their monthly net profit;

· Identify vulnerable groups, as per the cross section focus, it will take into account social units under the poverty line, elderly, women head of household, children under risk conditions and with no protection, being mindful of the data provided during the study stage (See Environmental Impact Study - Socioeconomic Environment - Information on the population to resettle).

Ø **ACTIONS IN THE EVENT POPULATION NEEDS TO BE RESETTLED (OWNERS)**

SOCIOECONOMIC ENVIRONMENT

Socioeconomic Management

DATA-SHEET NO. 23 ACCOMPANIMENT ON LAND AND SOCIAL MANAGEMENT

This leads to establishing a Basic Social Plan, with instrument for the development of social management, comprising programs to service users, road safety program, communication and information programs, criteria of application are expressed in the economic compensation plan, which is a catalogue of acknowledgement granted to social units to mitigate specific socioeconomic impact, these factors are: support factor to the reestablishment of housing, support factor to dwellers, support factor to proceedings, support factor to mobilization, support factor for the re-establishment of basic social services, support factor for the re-establishment of economic means and support factor for landlords. (Article eight. Res. 545 of 2008).

The Basic Social Plan applies to owners (holding titles of land and construction), also improvements or owner (whoever carries out or builds at their own expense and risk improvement in someone else's land), applies also to dwellers, who inhabit as lessees, elderly and usufruct, without being owners or improvements on the property.

It establishes the following actions for its implementation:

- **Diagnosis**

Taking into account that carried out during the preparation of the Environmental Impact Study - EIS, where it conducted the characterization of each of the social units and where it gathered the make up of immediate family, level of education, type of health program, kinship, life conditions, type of housing, public services, as well as expectation regarding the project and possible resettling place; the following specific actions must be undertaken

- Verify the documentation contributed by the person responsible of the social unit, to determine the quality, truthfulness as well as demands for the potential granting of socioeconomic compensations.
- Validate the information provided in the characterization and identification of impact in their status of studies as regard the socioeconomic diagnosis and supplementing it, if needed, determining factors that apply to each social unit.
- Build for every social unit a socioeconomic compensation acknowledgement agreement as a result of the socioeconomic diagnosis, under the commitment of carrying out a resettlement and/or suspend the productive activity voluntarily; destine resources granted by the factor of re-establishment of housing and facilitate the follow-up process of real estate management to the respective verification of such re-establishment.

- **Assistance**

The Concessionaire will carry out an agreed accompaniment with the population of social units, programming meetings and follow-up visits through Social Management, this process shall remain during the operative stage and subsequently it will agree with the owners of land who were relocated, on a follow-up plan and a closing minute, if both parties are satisfied.

It will have a written and photographic record of these meetings, attendance list and progress minutes in addition to difficulties encountered.

It will conduct accompaniment and psychosocial support in the uprooting process, to generate tools that will help families in their relocation and adaptation process, fostering wellbeing and improvement in the quality of life, carrying out actions, such as:

- Identify interests and needs of each household as it relates to the relocation site.
- Identify limitations due to rooting or breakage of home support social networks and the quest for solution alternatives.
- Conduct follow-up to the process of adaptation to the new habitat.

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Socioeconomic Management
DATA-SHEET NO. 23 ACCOMPANIMENT ON LAND AND SOCIAL MANAGEMENT

For each social unit and their family group, it will conduct a re-establishment of housing by means of the resulting amount of discount the value of social housing estimated by the respective municipalities in the project's area of influence, the value acknowledged during the voluntary sales process for residential units and for informal productive units, it will apply the respective to three minimum legal salaries in force, in the event of definite suspension. For formal productive units it will apply the respective six (6) times their monthly revenues. The foregoing will apply provided that they meet conditions set forth in article 11 of resolution 545 of 2008.

In the specific case of families that need to relocate and who have not yet received VISP, the concessionaire will pay a rent of up to 3 months for a house with the same characteristics as VISP.

It is worth remembering that these actions are intended to a population that in a given case will be relocated or resettled, as it does not consider such activity, according to field visits during walk troughs to fill in the socioeconomic data-sheet.

- **CLOSING**

The Concessionaire will issue a closing minute per each unit relocated, to complete the accompaniment process to property social management. It will be conducted after one year of the relocation process. Formats used are those defined by ANI

ACTION 2. MANAGEMENT OF COMMUNITY FACILITIES

In the event there is affectation to public infrastructure, which renders social services to communities and with the affectation it generates high-impact, the Concessionaire will identify said infrastructure and shall formulate solution alternatives that allow ensuring the re-establishment of said service.

If this facility is required, it should establish a compensation and reposition measure for said infrastructure, and will be conducted applying quality standards for the respective type of infrastructure, agreeing on the reposition process with the public authority and the affected community.

ACTION 3. MANAGEMENT OF IMPACTS

The program seeks to manage impacts directly related to those technical activities that each unit would eventually require (social and/or productive) established, in terms of physical or human security or due to technical needs.

In this regard, the program will apply provided there is a direct affectation and the transfer of every unit must be conducted, based on laws in force.

ACTION 4: COMPENSATION PLAN IN THE EVENT OF EXPROPRIATION

As per that set forth in article 19 of Res. 545 of 2008, social units will not be subject to acknowledgement contemplated, when due to the acquisition of their land do not voluntarily accept the sale of their property, except when beginning the legal expropriation process, they accept the purchase offer and agree to a voluntary sale.

7- INDICATORS			
GOAL	**NAME OF INDICATOR**	**ASSESSMENT MEANS**	**COMPLIANCE LEVEL**

SOCIOECONOMIC ENVIRONMENT			
Socioeconomic Management			
DATA-SHEET NO. 23 ACCOMPANIMENT ON LAND AND SOCIAL MANAGEMENT			
100% of social and productive units in the project's area of influence with social diagnosis.	Carrying out the diagnostics of social and productive units in the project's area of influence	Number of units with diagnosis/Number of units identified and susceptible to diagnose x 100	Social and productive units in the project's area of influence diagnosed at 100%
100% of the population of social and productive units with assistance and social and property accompaniment.	Accompaniment processes to inhabitants of social and productive units in the project's area of influence.	Number to units with an accompaniment plan/number of units diagnosed x 100	Population of social and productive units services and accompanied at 100% with social area professional.
100% of social and productive units with closing of accompaniment process to property management in the project's area of influence.	Closing of the accompaniment process to property management of social and productive units in the project's area of influence.	Number of units with closing minutes /number of units management x 100	Social and productive units with closing minutes as verifier of accompaniment and social property management.

8. PLACE OF APPLICATION

Social and productive units identified in the project`s area on influence.

9. EXECUTION TIMETABLE

PROJECT ACTIONS	PRE – CONSTRUCTION	CONSTRUCTION:	ABANDONMENT AND FINAL RESTORATION
ACTION 1: Social and land diagnosis	X		
ACTION 2: Social and land accompaniment	X	X	
ACTION 3: Closing of social and land accompaniment		X	

10. QUANTIFICATION AND COSTS

ITEM	UNIT	UNIT COST (COP)	QUANTITY	TOTAL COST COP)
Stationery for the development of the activity, (printing material, computers, letter size paper, pens, ruler, files, etc.) didactic, to disclose and refreshments*	Month/day/global	$60.000.000	Depends on the need and whatever the concessionaire establishes	**$**60.000.000
Social professional	Month/day/global	Personnel already established within social and environmental management of the project	**3.**	**$ Value defined within social management of the project.**

SOCIOECONOMIC ENVIRONMENT				
Socioeconomic Management				
DATA-SHEET NO. 23 ACCOMPANIMENT ON LAND AND SOCIAL MANAGEMENT				
Environmental professional	Month/day/global	Personnel already established within social and environmental management of the project	**3.**	**$ Value defined within social management of the project.**
TOTAL COST OF DATA-SHEET				**$**
*values applicable to the first year of project execution. *Amount of professional depending on project's needs therefore such amount is an approximate amount.				

SOCIOECONOMIC ENVIRONMENT		
Socioeconomic Management		
DATA-SHEET NO. 24 EDUCATION AND TRAINING TO PERSONNEL HIRED BY THE PROJECT		
1. OBJECTIVE		
· Allow workers contracted by the project to learn on environmental standards, HSE policies of the concessionaire, impacts generated by activities and applied management measures. · Train personnel contracted by the project on the adequate separation of industrial and special wastes. · Disclose cultural and environmental aspects to workers in order to foster a responsible culture. · Foster respect and care towards the environment and communities around the project's area of influence.		Source: Geocol Consultores S.A. 2017
2. GOAL		
· Inform 100% of personnel contracted by the project on environmental standards, HSE policies of the Concessionaire, impact and management measures that may be generated by the project. · Provide training in the separation of industrial and special wastes to 100% of personnel contracted by the project. · Sensitize, through talks, all personnel contracted by the project, on the adequate care to the surrounding and respect to the population in the project's area of influence.		
3. PHASE		
PRE – CONSTRUCTION	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**
X	**X**	
4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE		

SOCIOECONOMIC ENVIRONMENT			
Socioeconomic Management			
DATA-SHEET NO. 24 EDUCATION AND TRAINING TO PERSONNEL HIRED BY THE PROJECT			
- Changes on population dynamics. - Changes on employment dynamics - Changes on revenue levels - Changes in the quality-of-life of the population - Generation of conflicts - Generation of expectations - Change on values and cultural practices			
5. TYPE OF MEASURE			
Prevention	**X**	Correction	
Mitigation		Compensation	

6. ACTIONS TO PERFORM

Concessionaire plans and executes participative and effective strategies, that defend the preservation of the environment where it conducts its activities and articulated actions and guidelines so that his workers have awareness with respect to caring for the environment and the communities in the project's area of influence, where it contemplates performing the activities; to that end it undertakes the following:

ACTION 1: INDUCTION - When it requires hiring new personnel

Within the induction received by all contracted personnel for the different works to undertake in the project, it will have a specific chapter on the environmental subject, where it will explain socio environmental commitments issued by the Environmental Authority, as well as those in the Environmental Management Plan, environmental standards that the project must uphold, highlighting the role and the responsibility each worker has in that regard, as he performs his job, also with community relations and Concessionaire's policy as well as that of contractors and workers.

As subject to deal with in the induction, the following are suggested:

- Concessionaire's policies as regards labor, occupational health and environment aspects.
- Technical information on the project, measures and environmental management strategies established in the Environmental Management Plan, for the different activities of the project, highlighting the importance and mandatory nature thereof.
- Socioeconomic and cultural description of the area of influence; instilling behavioral and coexistence standards to all personnel applicable in and outside the project's area.
- It will make known all the commitments adhered to by the Concessionaire in the Management Plan, in addition to the role and responsibility each worker plays in the performance of their job, which must be conducted endeavoring for the conservation of the existing social infrastructure in the area and respecting the general social context of the area as well as care and respect for existing natural resources.

ACTION 2: TRAINING TO PERSONNEL - During the execution of the project

During the execution of the project, it must train all personnel contracted by the project in biotic, abiotic and social subjects, taking into account the application of techniques and dynamics aimed at an active and committed participation by all personnel, in addition it will endeavor to internalize on the importance of respecting communities settled in the area, as well as the importance and sensitivity of plant units present in the area and the prevention of potential damage to local fauna, which may be present in different work fronts,

SOCIOECONOMIC ENVIRONMENT
Socioeconomic Management
DATA-SHEET NO. 24 EDUCATION AND TRAINING TO PERSONNEL HIRED BY THE PROJECT

These training aspects will be carried out during the contracting process in each stage of the project's activities, across to abandonment and dismantling, as well as all workers who arrive to execute any activity related to the project.

As part of these socio environmental training and education spaces, it suggests the following topics:

- Efficient use and saving of water: This aspect will consider training on the importance of water resource, rationalization of its use and adequate management required for domestic waste waters, so as not to cause any alteration to water ecosystems.
- Re-utilization and recycling culture of waste and maintenance of workers' area clean and free from wastes and debris, to protect and conserve natural habitats.
- Environmental management of solid and liquid wastes
- Adequate management of water resources and the execution of civil works that may intervene the former.
- Prohibition of activities that may affect water bodies.
- Acknowledgement of Fauna and Flora Species endemic and/or threatened: Importance within the ecosystems, main threats at national and regional level.
- Acknowledgement of venomous and toxic animal and plant species.
- Environmentally sensitive area found within the project's area of influence and management measures to implement by the contracting company.
- Standards on control and ban on hunting.

Regarding sociocultural topics, it proposes:

- Social security system
- Socioeconomic and cultural description of the area of influence.
- Ethics Code of the Concessionaire, and community information mechanisms.
- General description of labor standards on intermediation,
- Management of interpersonal relations worker - community

In general, it will be mindful of the relations between community and personnel contracted for the project; the Concessionaire as well as the Environmental Auditors, will be mindful of informing any irregularity to avoid possible alterations to the correct functioning of activities and the relationship with stakeholders.

HSE contracted Supervisor shall know, obtain and gather all records, attendance lists, photos and documents that support information and trainings and talks conducted in the area where the project will be developed, also he must send complete information to the HSE auditors, so that he may fill in all reports on environmental compliance.

ACTION 3: PERIODIC TALKS - As per internal dynamics of the project

In addition, according to the project's dynamics, it will define the need to carry out periodic talks to solve concerns that arise during the development of the project, to reinforce regulatory topics, to disseminate inconveniences that arise at the socio-environmental level, the corrective actions and lessons learned.

ACTION 4: ASSESSMENT - at the completion of workshops

The environmental and social coordinator of the project will establish a mechanisms or a strategy to follow-up on training and achievements reached in that regard. It will also define a pertinent strategy to assess effectiveness and apprehension

SOCIOECONOMIC ENVIRONMENT			
Socioeconomic Management			
DATA-SHEET NO. 24 EDUCATION AND TRAINING TO PERSONNEL HIRED BY THE PROJECT			
of the information provided during training (written assessment - questionnaire, verbal evaluation - video, recreational evaluation, among others).			
7- INDICATORS			
GOAL	**NAME OF INDICATOR**	**ASSESSMENT MEANS**	**COMPLIANCE LEVEL**
100% of workers with induction, training in project activities.	Induction process to workers engaged in the project.	Number of induction activities carried out/Number of programmed activities x 100	Induction process carried out to 100% of workers contracted by the project.
	Training in activities of the project.	Number of workers trained/Number of workers x 100	Training process to 1100% of workers in the project.
100% of the area of influence with information and communication regarding project's activities.	Conduct periodic talks of project activities with population in small territorial units in the area of influence.	Number of periodic talks carried out/Number of periodic talks programmed.	100% of talks carried out to the population in the project's area of influence.
100% of workers assessed as regards trainings conducted.	Assessment of workers that have received training in project activities.	Number of workers assessed/number of workers trained x 100	100% of workers assessed in project activities.
8. PLACE OF APPLICATION			
Facilities of the Concessionaire			

9. EXECUTION TIMETABLE			
PROJECT ACTIONS	**PRE – CONSTRUCTION**	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**
ACTION 1: Induction	**X**	**X**	
ACTION 2: Training	**X**	**X**	
ACTION 3: Periodic talks		**X**	**X**
ACTION 4: Assessment	**X**	**X**	**X**

10. QUANTIFICATION AND COSTS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
Social professional	MONTH	$10.000.000	**2***	**10.000.000**
HSR Auditor	**MONTH**	$11.000.000	**2***	**$11.000.000.**
Environmental professional	**MONTH**	$10.000.000	**2***	**$10.000.000**
Induction and training material*	**GLOBAL**	**$20.000.000**	**2***	**$40.000.000**
TOTAL COST OF DATA-SHEET				**$$71.000.000**

SOCIOECONOMIC ENVIRONMENT
Socioeconomic Management
DATA-SHEET NO. 24 EDUCATION AND TRAINING TO PERSONNEL HIRED BY THE PROJECT
*values applicable to the first year of project execution. *Number of professionals may vary according to project's needs. *value given per one (1) meeting and (1) training It is worth noting that it mentions the total number of groups trained as it depends on the number per personnel contracted. Values may vary according to the amount paid to social and environmental professionals and auditors.

SOCIOECONOMIC ENVIRONMENT			
SOCIOECONOMIC MANAGEMENT			
DATA-SHEET NO. 25 TRAINING, EDUCATION AND AWARENESS BUILDING TO THE COMMUNITY ON THE PROJECT'S SURROUNDINGS			
1. OBJECTIVE			
· Sensitize the community in the project's area of influence on the need to preserve and conserve natural resources, as well as the protection of the environment, by establishing and implementing join strategies and actions that allow strengthening social and environmental management of the community.			
2. GOAL			
· Carrying out 100% of environmental sensitizing workshops programmed with communities and institutions in the project's area of influence.			
3. PHASE			
PRE – CONSTRUCTION	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**	
	X		
4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE			
- Changes in social relations - Change on values and cultural practices - Changes on health of the population			
5. TYPE OF MEASURE			
Prevention	**X**	Correction	
Mitigation		Compensation	
6. ACTIONS TO PERFORM			
ACTION 1. PEDAGOGICAL ACTIVITIES and/or workshops of sensitizing sessions			

SOCIOECONOMIC ENVIRONMENT

SOCIOECONOMIC MANAGEMENT

DATA-SHEET NO. 25 TRAINING, EDUCATION AND AWARENESS BUILDING TO THE COMMUNITY ON THE PROJECT'S SURROUNDINGS

It will conduct at least two (2) pedagogical activities (workshops, sensitizing campaigns(with population from small territorial units of the project, as well as with education centers existing in such territorial communities, specifically for 5th grade, ninth grade and eleventh grade students on environmental sensitizing topics, such as:

- Importance of flora and fauna and their conservation, as well as policies and restriction that the Concessionaire has regarding such component.
- Importance on the protection and conservation of topsoil established as part of the revegetation program.
- Protection, conservation and importance of the water resources, as well as policies and restrictions the concessionaire has on such component.

It is worth highlighting that such pedagogical sessions must be endorsed by the community (as per that set forth in the Concession contract, Appendix 8). Pedagogical sessions will be conducted in small territorial units implicated in the project or where it has been agreed with the community, as well as sessions on schools.
The population to participate in small territorial units will be made up by men and women over 18 years old. Expected participation of these communities will be approximately of at least 20 persons.
Regarding the population that will participate from schools, those will be approximately 30 students or according to those enrolled in 5th, 9th and 11th grades.
in addition, with the communities in the area of influence it can conduct an identification of productive projects and initiatives that can be supported by the public and private sector. Thus it will develop together with the concessionaire a work plan, as well as the methodology to implement the foregoing.

To conduct workshops or pedagogical activities, it will create recreational and dynamic spaces to integrate the community in caring for the environment, as a new practice contributed as of the performance of the project.

7- INDICATORS

GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL
100% of workshops conducted to the population in the project's area of influence.	Training, education and awareness building to the community on the project's surroundings	Number of workshops conducted/number of workshops programmed x 100	Conducting workshops to 100% of the community in the project's surroundings.
100% of communities sensitized regarding project activities.	Sensitizing communities around the project as regards project's activities	Number of communities sensitized /Number of communities in the project's direct area of influence x 100	Sensitized communities at 100% as regards project's activities.

8. PLACE OF APPLICATION

Territorial units engaged in the project's area of influence.

9. EXECUTION TIMETABLE

SOCIOECONOMIC ENVIRONMENT				
SOCIOECONOMIC MANAGEMENT				
DATA-SHEET NO. 25 TRAINING, EDUCATION AND AWARENESS BUILDING TO THE COMMUNITY ON THE PROJECT'S SURROUNDINGS				
PROJECT ACTIONS		**PRE – CONSTRUCTION**	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**
ACTION 1: Workshops			**X**	
10. QUANTIFICATION AND COSTS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
Stationery for meetings, (printed material, computers, video beam) didactic, disseminated, sound and refreshments*	Month/day/global	Depends on the amount of personnel participating in workshops	**-**	**$12.000.000**
Social professional	Month/day/global	$10.000.000	**1**	**$** 10.000.000
Environmental professional	Month/day/global	$10.000.000	**1**	**$** 10.000.000
TOTAL COST OF DATA-SHEET				**$32.000.000**
· Values applicable to the first year of the execution of the project. · Values may changed according to the implementation timing of the program.				

SOCIOECONOMIC ENVIRONMENT		
SOCIOECONOMIC MANAGEMENT		
DATA-SHEET NO. 26. ROAD SAFETY CULTURE		
1. OBJECTIVE		
· Establish the necessary measures for the proper implementation of mobility and transport on the road network in the project's area of influence.		
2. GOAL		
· Conducting 100% of road minutes to be used for the performance of the project. · Installation of 100% of signaling in roads used for the performance of the project.		
3. PHASE		
PRE – CONSTRUCTION	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**
X	**X**	**X**
4. SOCIO ENVIRONMENTAL IMPACTS TO MANAGE		

SOCIOECONOMIC ENVIRONMENT			
SOCIOECONOMIC MANAGEMENT			
DATA-SHEET NO. 26. ROAD SAFETY CULTURE			
- Changes on road accidents index - Generation of conflicts - Changes in social relations - Change of values and cultural practices			
5. TYPE OF MEASURE			
Prevention	**X**	Correction	
Mitigation	**X**	Compensation	

6. ACTIONS TO PERFORM

It will issue minutes, video recordings and photographic records of the conditions of existing road accesses to be used by the project; to that end it will have the participation of municipal authorities of affected large territorial units, representatives from community organization and owners of land, of small territorial units to be intervened.

ACTION 1. MEASURES TO IMPLEMENT DURING THE CONSTRUCTION AND OPERATION STAGES OF THE PROJECT

It will use informative, preventive and regulatory signage in a temporary and permanent manner, as applicable.

Ø In adjusting and/or enhancement of road activities.

· Installation of temporary construction signage, as per requirements of competent Authority.
· Identification of work personnel to easily acknowledge users.
· Partial preventive closure of work with cones and tape, with road culture facilitators to avoid accidents,
· Ensuring pedestrian crossings through pedestrian pathways.

Ø During the operation of the road in the construction phase:

· Permanent signaling of the road, together with operations to detect inadequate driving practices.
· Restriction of operation times by the company, restriction will be initially from 6:30 am to 5:00 pm. In the event of requiring extraordinary activities that need additional time, or in the event of emergencies it will inform the communities; to that end it must endeavor to have a proper communication channel with the community from the social area of the company.
· Irrigation will be undertaken of the road to mitigate particulate matter that may affect nearby population and will be suspended during the rainy season.

Ø During routine maintenance activities on roads.

· Temporary signaling indicating construction activity, as per requirements of the competent authority.
· Identification of work personnel to easily acknowledge users.
· Partial preventive closure of work with cones and tape, with road culture facilitators to avoid accidents,
· Ensuring pedestrian crossings through pedestrian pathways.
· No night work will be undertaken in access roads, avoiding unnecessary risks.

The installation of signage will be prior to beginning construction and will remain there while works are ongoing. Signaling will be withdrawn when the road in under normal trafficability conditions.

ACTION 3. SUPPLEMENTARY ACTIONS TO BE UNDERTAKEN

· Regulate maximum speed allowed and places where vehicles cannot pass other vehicles.
· Hold training meetings in road accident prevention, with the communities present in the project's area of influence.

SOCIOECONOMIC ENVIRONMENT

SOCIOECONOMIC MANAGEMENT

DATA-SHEET NO. 26. ROAD SAFETY CULTURE

- Signaling point that pose a critical situation or are highly sensitive,
- Verify communication systems of vehicles. If using radios, suggest programming a communication channel between vehicle fleet drivers and the person in charge of coordinating the operation, according to radio channel.
- Wetting roads in areas where there are houses, to avoid dust curtain, and therefore the risk of respiratory illnesses, in addition in peak hours of operation, improves visibility of drivers and other road users,
- Have an ambulance fully equipped to service wounded and provide support during contingencies.
- Disseminate the contingencies plan for transport operation.
- Construction of a parking zone for vehicles, taking into account basic safety and wellbeing conditions of drivers.

Carryout speed control and alcohol abuse campaigns on the road, to avoid unsafe acts during construction and/or operation.

On the other hand, and as a supplementary activity, conduct a training plan with communities in small territorial units in the project's area of influence including schools to foster a safe road culture. Such plan shall take into account pedagogical and training activities. This plan shall be implemented during the operation of the project and twice a year.

The place to conduct this activity will be agreed with participants of communities in the project's area of influence. The group to train will be made up by maximum 20 persons. In the case of schools, it will train students in elementary grades 2, 4 and 5 and high school student from 6th to 12th grades; the latter being captive population, will be conducted in their respective classrooms.

7- INDICATORS

GOAL	NAME OF INDICATOR	ASSESSMENT MEANS	COMPLIANCE LEVEL
100% of road minutes carried out to begin project activities.	Carry out road related minutes to perform project's activities.	Number of road related minutes performed/number of roads used for the performance of the project x 100	100% of road related minutes filled in in roads used by the population in the project's area of influence.
100% of signaling in road to use for the performance of project activities.	Signaling in road to used during the performance of the project.	Amount of signage installed in roads used for the project/amount of signage required x 100	100/ road signaled fro the performance of the project in its area of influence.
80% of the group trained in safety road culture of communities and small territorial units in the project's area of influence and students from schools.	Training on road safety culture	Number of trainings conducted to the group of small territorial units and students from schools /number of training sessions programed with the group of small territorial units and students from schools.	80% of the population trained.

8. PLACE OF APPLICATION

SOCIOECONOMIC ENVIRONMENT				
SOCIOECONOMIC MANAGEMENT				
DATA-SHEET NO. 26. ROAD SAFETY CULTURE				
Area of influence of the road project.				
9. EXECUTION TIMETABLE				
PROJECT ACTIONS		**PRE – CONSTRUCTION**	**CONSTRUCTION:**	**ABANDONMENT AND FINAL RESTORATION**
ACTION 1: Informative meetings		**X**	**X**	
ACTION 2: Walk through on roads to conduct road related minutes		**X**		**X**
ACTION 3: Road signaling		**X**	**X**	**X**
10. QUANTIFICATION AND COSTS				
ITEM	**UNIT**	**UNIT COST (COP)**	**QUANTITY**	**TOTAL COST COP)**
Civil Engineer	Month/day/global	10.000.000	**2**	**$** 20.000.000
Auditor	Month/day/global	11.000.000	**2**	$22.000.000
Social professional	Month/day/global	10.000.000	**2**	20.000.000
Environmental professional	Month/day/global	10.000.000	**2**	20.000.000
Supplies for meeting, to issue minutes and signaling. Refreshments during meetings	Month/day/global	Depends on the amount of participants per meeting*	**-**	**$12.000.000**
Supplies and training venues on road safety culture	Month/day/global	10.000.000	**2**	**20.000.000**
TOTAL COST OF DATA-SHEET				**$114.000000**
Values applicable as per the number or road related minutes required for the performance of the project. *Value of supplies for meetings may vary as per the moment of implementation of the data-sheet and supplier.				