ENVIRONMENTAL IMPACT STUDY FOR THE DUAL CARRIAGEWAY ROAD PROJECT
RUMICHACA - PASTO PEDREGAL SECTOR - CATAMBUCO, UF. 4 AND UF. 5.1
CONCESSION CONTRACT UNDER SCHEME NO APP. 15 OF 2015

Environmental Consultant

Chapter 11.1.1. Environmental Management Programs - Biotic Environment

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TABLE OF CONTENT

11.1.1 ENVIRONMENTAL MANAGEMENT PROGRAMS 2
11.1.1.2 Biotic Environment 2
Wildlife Resource Management Program 17

INDEX OF TABLES

Table 1.1 Structure of Biotic environment programs 2
Table 1.2 Clearing Management 3
Table 1.3 Flora Management 11
Table 1.4 Wildlife Management 17
Table 1.5 Habitat Management and Preservation 24

11.1.1 ENVIRONMENTAL MANAGEMENT PROGRAMS

11.1.1.2 Biotic Environment

Environmental Management Programs (PAM for its initials in Spanish) for the Biotic area, which will be implemented in the development of the dual carriageway road project Rumichaca - Pasto Pedregal Section- Catambuco (See) are described below. Those programs and projects described below were formulated based on biotic conditions of the area of influence and the impact assessment carried out for the project development.

Table 1.1 Structure of Biotic Environment Programs

COMPONENT	PROGRAM	CODE	PROJECTS
BIOTIC	SOIL AND FLORA RESOURCE MANAGEMENT	MRSF – 1	Clearing Management
		MRSF – 2	Management of flora
	FAUNA RESOURCE MANAGEMENT	MRF – 1	Wildlife management
	HABITATS MANAGEMENT	MH – 1	Management and Preservation of terrestrial and freshwater habitats

Source: Gemini Consultores S.A.S. 2016

It is important to mention that the PMA for the biotic environment does not include revegetation chart or related topics, since said measures are envisaged within the landscape management project, Chart PM- 1 Landscape Management.

Each biotic environment program and project is submitted below under the chart scheme.

Soil and Flora Resource Management Program

Table 1.2 Clearing Management

BIOTIC ENVIRONMENT							
PROGRAM	**SOIL AND FLORA RESOURCE MANAGEMENT**						
Chart MRSF - 1	**Clearing Management**						
OBJECTIVE							
Provide appropriate management of impacts on vegetable covers and soil organic horizon, by implementing measures to prevent and mitigate effects associated to the development of the project works and activities.							
GOALS							
- Prevent tree clearing activities of forest use areas located outside the area of intervention - Prevent cut activities of surfaces located outside the area of intervention - Prevent clearing activities outside the area of intervention - Prevent temporary impacts associated to inappropriate temporary collection of forestry products, cut and clearing - Mitigate impacts associated to plant waste generation through reuse and donation of forestry products - Mitigate impacts associated to plant waste generation through reuse of leaves, branches and cutting material - Provide an appropriate final disposal of plant wastes and cut material which are not to be reused							
ENVIRONMENTAL EVALUATION							
Activity			**Impact**				
Clearing			Changes on forests and semi-natural areas Changes in composition and structure of natural and semi-natural ecosystems Erosive Process Activation - Activation of mass removal phenomena. - Changes in soil structure				
Cut							
PHASES TO BE IMPLEMENTED							
Pre-constructive		**Constructive**	**X**	**Operation and maintenance**		**Dismantling and abandonment**	

TYPE OF MEASURE			
Prevention	**X**	**Correction**	
Mitigation	**X**	**Compensation**	

ACTIONS TO BE TAKEN

1. Delimitation of areas to be intervened

Before starting any activity implying clearing and cutting activities, provisions set forth in Chart MH - 1 Management and preservation of terrestrial and freshwater habitats shall be complied regarding delimitation of areas to be intervened and protection of flora and wildlife habitats.

2. Wildlife Management

Before starting any activity implying clearing and cut activities, provisions set forth in Chart MRF - 1 Wildlife Management regarding inspection of the work area or work front as well as implementation of wildlife chase away measures shall be complied.

3. Forest Use, Clearing and Cutting

3.1. Forest Use

This procedure is carried out through total cut or clear-felling rate of the forest mass of individuals with DAP> 10 cm.

Forest use activities will be carried out taking into consideration the following:

Forest Use Planning and Guidance

Before starting forest use activities, a tour led by a forest engineer will take place during which trees which will be collected will be marked with visible paint.

Only those trees located within the project area of intervention will be used; therefore, the forest engineer must mark in a strict manner those forest individuals located on sites where the works will be carried out.

Technical specifications for tree clearing or timbering

Those trees which contact their top level with other tops of trees which will remain, will be cut before timbering.

In areas of forest, shrubs or secondary vegetation, the fall direction must be projected towards the road axis or the central part between chamfer lines. This is to prevent

impact on surrounding vegetable covers which will not be intervened.

Treetop cut, trimming and cross-cutting of logs as well as root removal will be envisaged.

Once the trunk of the treetop is released, long length cuts of different sizes enabling mobilization thereof to the collection site will be made. This material will be stockpiled until there is a considerable amount for subsequent transfer to the collection site.

Trunks and large sized roots will be removed with a loader, tractor or another means enabling their mobilization.

Wood and plant waste collection

In each work front or area of intervention, there will be a site for temporary stockpiling of branches, logs and roots. It must be located away from water sources, social infrastructures, land with steep slopes and sites that can affect mobility of people and vehicles using the existing road.

These sites will have a lateral fence, duly signposted and easily accessible to size, load and unload products from forest use and the other plant debris.

Whenever it is not possible to make an immediate transfer of wood, branches and roots, round wood piles of 1 m high will be built at the right of way. Their collection will be temporary, for a period of time no longer than 15 days as a maximum.

3.2. Clearing

Clearing refers to the removal of shrub type vegetable material and all kinds of plant material existing up to the natural ground level. This process will be carried out so that the surface is completely cleared.

Under no circumstances, clearing activities will be carried out by using burning methods or herbicides.

Clearing and cut activities will only be carried out in those areas required for the development of the project. Under no circumstances impact or deterioration may generated on vegetation surfaces other than those authorized (area of intervention).

The procedure will consists in derooting and cleaning of areas covered by grass, stubble, shrubs and other type of small vegetation.

Once forest use activities are completed, clearing activities will start by cutting low bushes with machete or chainsaw.

Afterwards, ground and herbaceous vegetation will be removed. This activity will be done manually or if strictly necessary, machinery will be used according to those soil conditions and/or difficulty of the plant material.

As far as possible, grass will be removed as lawn patches, for its subsequent use in the project activities, its cut will be in homogeneous rectangular blocks. Its roots must be healthy to facilitate their adherence to the disposal and relocation site.

Once this material (lawn patches) is obtained, it must be used as soon as possible. Otherwise, it may be delivered to the community located in the area of influence of the project.

3.3. Cut

It consists in removing organic soil horizon. Its removal is foreseen at a depth ranging between 20 and 60 cm. approximately.

Cut will be take place in camps, temporary facilities, ZODME areas, dual carriageway construction areas and other areas subject to intervention by the project.

Organic oil cutting direction will be made in the longest direction of the polygon to be cut in order to reduce unnecessary movements and minor alteration of the substrate to be removed.

When handling it, you must have the minimum moisture content possible.

Cut material will be stockpiled temporarily on the sides of the right of way, in stacks not exceeding 1.5 meters high. Said stacks will be located on sites far from banks and river beds of water ways, social infrastructure, areas with steep slopes or near the existing road which can lead to difficulties in mobility or movement of pedestrians or vehicles areas.

Machinery and/or vehicles will not be allowed to pass on the stored organic soil, which will be protected against erosive action of water, wind and direct sunlight, by covering it with a tarp or a geotextile.

Depending on the season (summer or winter), irrigation will take place periodically over the material stored in order to keep its moisture, at least one daily watering in dry season is made.

4. Use and final disposal of products from forest use, plant waste and cut material

4.1. Forest use products

Under no circumstances, timber or forest use products may be commercialized.

Wood obtained will be used in various construction activities of the project and/or in donations to community settled within the area of influence of the project. Its delivery will be carried out after the minutes between the concession and the applicant or beneficiary are signed.

Whenever the beneficiary requires mobilizing the timber received as donation, he/she will have request a transport permit before CORPONARIÑO, without this meaning its commercialization.

4.2. Plant waste

Plant waste products will be understood as those vegetable by-products from forest use, clearing and cut of the vegetable cover with are not to be used for lumberable purposes (leaves, branches and roots).

Under no circumstances, plant wastes will be disposed at banks or beds of watercourses, geological faults or places where conditions sloping land do not allow their disposal.

It is absolutely forbidden any kind of burning activities or incineration of plant wastes, branches, roots or roundwood.

Leaves, branches and roots, which sizes allow chipping or shredding, will be processed and used for soil conditioning in areas intervened by the project and they will be applied in adjacent areas for reincorporation of organic matter into the soil.

Plant wastes that for some reason do not allow their reincorporation into the soil, either because of their size or because the difficulty to reduce them, will be disposed in any ZODME authorized by the environmental authority.

Plant wastes transfer will be carried out in dump trucks duly covered with a tarp in order to prevent sliding and loss.

4.3. Cut material

Cut material or organic soil removed during the development of the project, will be used for conditioning purposes and/or adaptation of slopes and embankments that will be subject to landscaping activities. Also, it may be brought to the ZODME authorized by environmental authorities, where it can be used for covering slopes or terraces.

Activities involving topsoil handling cannot be carried out under high rainfall conditions where they generate material drag or runoff.

Transfer of cut/stripping material will be done in properly covered dump trucks with tarp to prevent sliding and loss.

4.4. Operation of the organic layer in ZODMES areas

Removal of organic layer for the area where a land use for agricultural production predominates is provided at a depth ranging between about 20 and 60 cm.

The organic soil cut direction will be in the longest direction of the polygon to reduce the transfer and disturbance of soil to be extracted. Organic soil must be temporarily stored in a suitable site close to the Zodme, in stacks of no more than 1.5 meters high. The collection site must be located far from hydric rounds, social infrastructure, areas with steep slopes or areas near the existing road. Soil to be removed must have the minimum moisture content possible.

Neither external material must be disposed nor machinery and/or vehicles may pass over the organic soil. As far as possible, a tarp or a geotextile must cover said organic soil for its protection. It is important to keep moisture conditions for organic soil stored, which during dry season and if necessary, it must be subject to regular watering/irrigation.

Organic soil removed from zodmes areas will be used for conditioning and/or adaptation of slopes, embankments and terraces. If transfer of organic soil from the collection area of each zodme is required, said transfer will be done by dump trucks duly covered with a tarp to prevent its sliding.

APPLICATION SITE
Direct intervention areas of the project requiring activities related to forest use, cut and clearing of vegetation cover.
PERSONNEL REQUIRED
Environmental Coordinator, Safety and Occupational Health Specialist - SST, forestry or Agroforestry Resident, Environmental Resident and environmental Crew.
RESPONSIBLE FOR EXECUTION
Concesionaria Vial Unión del Sur S.A.S. will be responsible for the execution and compliance with this program by contractors throughout the development of the project with supervision and support by Oversight personnel (Interventoría).
PERFORMANCE INDICATORS

The following indicators were set for clarity on the progress, execution or implementation of measures during the reporting period established in the evaluation frequency. Therefore, no follow-up indicators are submitted since they are stated in the respective Follow-Up and Monitoring Plan.

It is fair to add that under framework of this chart, supports such as field formats and photographic records showing evidence of progress in implementing measures outlined herein will be generated.

GOAL	DESCRIPTION OF INDICATOR	TYPE OF INDICATOR	EVALUATION FREQUENCY
Prevent forest use activities of trees located outside the area of intervention	Location forest use activities execution	Qualitative	Weekly
	Surface subject to forest use and type of cover it belongs to	Quantitative	Weekly
	No. of marked trees/ No. of trees used	Quantitative	Monthly
Prevent execution of clearing activities in covers located outside the area of intervention	Location of clearing activities	Qualitative	Weekly
	Surface subject to clearing as per type of cover	Quantitative (Cleared area)	Monthly
Prevent execution of cut/stripping activities outside the intervention area	Location of cut/stripping activities	Qualitative	Weekly
	Surface subject to cut/Stripping	Quantitative	Monthly
	Average depth of the organic soil horizon observed during cut/stripping activity carried out in the period	Quantitative	Monthly
Prevent impacts associated to inadequate temporary stockpiling of wood and plant waste installed	No. of sites and location of temporary stockpiles of wood and plant waste installed	Quantitative and qualitative	Monthly
	No. of sites and location of temporary stockpiles of cut/stripping material	Quantitative and qualitative	Monthly
Mitigate impacts associated to the generation of plant	Sites and activities which took place wooden reuse project	Qualitative	Monthly

waste through reuse and donation of forest use products	Site and number of wood donations made to the community	Qualitative and quantitative	Monthly
Mitigate impacts associated to generation of plant wastes by reusing leaves, branches and cut/stripping material	Sites where reuse of plant waste (leaves, branches, etc.) took place	Qualitative	Monthly
	Sites where reuse of cut/stripping material took place	Qualitative	Monthly
Provide adequate final disposal to plant waste and cut/stripping material	Sites where disposal of plant wastes (leaves, branches, etc.) was carried out	Qualitative	Monthly
	Sites where final disposal of cut/stripping material was carried out	Qualitative	Monthly

EXECUTION SCHEDULE

PHASE	Timeframe (semester)								
	1	2	3	4	5	6	7	8	9
Pre-constructive									
Constructive									
Operational									

COSTS

Included in the construction costs of the project.

Table 1.3 Flora Management

BIOTIC ENVIRONMENT							
PROGRAM	**SOIL AND FLORA RESOURCE MANAGEMENT**						
Chart MRSF - 2	**Flora Management**						
OBJECTIVE							
Provide appropriate management of impacts that may be caused on the flora, by implementing measures to prevent and mitigate impacts associated to the development of the works and activities of the project.							
GOALS							
- Mitigate impacts on flora species classified under some degree of threat by rescuing plant material - Prevent plant material mortality and prepare it for physiologically and sanitarily for its relocation - Prevent mortality of plant material to be relocated through an appropriate site selection - Prevent mortality of individuals relocated by applying silvicultural treatments							
ENVIRONMENTAL EVALUATION							
Activity				**Impact**			
Vegetable cover removal				Changes in composition and structure of natural and semi-natural ecosystems			
PHASES TO BE IMPLEMENTED							
Pre-Constructive		**Constructive**	**X**	**Operation and maintenance**		**Dismantling and abandonment**	
TYPE OF MEASURE							
Prevention				**Correction**			**X**
Mitigation				**Compensation**			
ACTIONS TO BE TAKEN							
Once forest species in the area of intervention of the road project were identified, it was determined that species in a natural regeneration status classified in danger at local and national levels (Resolutions 192 of 2014 and 316 of 1974), corresponding to individuals of Juglans neotropica Diels (Walnut) and Cedrela odorata L. Below is the threat classification list of species identified as per threat category.							

Classification species identified in the area of influence of the road project as per threat category.

Common name	Scientific name	Res. 0192/2014	CITES	IUCN	RED BOOK OF LUMBERABLE PLANTS IN COLOMBIA
Walnut	*Juglans neotropica*	*Endangered (EN)*	*III*	*Endangered (EN) **	*Endangered (EN)*
Cedar	*Cedrela odorata*	*Endangered (EN)*	*III*	*Vulnerable (VU) ***	*Endangered (EN)*
TOTAL					

*http://www.iucnredlist.org/details/32078/0 ** http: //www.iucnredlist.org/details/32292/0

Source: Géminis Consultores Ambientales, 2016.

Given that Juglans neotropica Diels species is part of species forbidden through Resolution 316 of 1974 and its request for a waiver was submitted before the Ministry of Environment and Sustainable Development MADS through Order 391 of August 9, 2016, no measures for this species will be proposed since it is understood that the above mentioned will decide on those measures proposed under the aforementioned process.

For the foregoing, measures for the Cedrela odorata species as well as other species classified under some threat degree that can be found within the area of intervention of the project, but that are not forbidden, are shown below.

Rescue and relocation of threatened flora species

Prior to starting forest use and clearing activities stipulated in Chart MRSF - 1 Vegetable cover clearing and cut/stripping management, a forest engineer will verify the presence of seedlings of species classified under some degree of threat in each area of intervention of work front. In case of finding individuals with these characteristics, they will be demarcated with yellow tape and the necessary logistics will be available for their respective rescue and relocation.

For its part, the following individuals of Cedrela odorata identified in the intervention area of the project will be subject to the application of the measures included in this tab.

Cedar saplings identified in the area of intervention of the road project

* Plane

Field Id.	Common name	Species	Functional unit	Village	X *	Y*
26	Cedar	*Cedrela odorata*	UF 4 PK 0 + 800	La Lima (Imués)	957375.25	607356.98
27	Cedar	*Cedrela odorata*	UF 4 PK 0 + 800	La Lima (Imués)	957369.24	607357.09
28	Cedar	*Cedrela odorata*	UF 4 PK 0 + 800	La Lima (Imués)	957368.13	607348.47
30	Cedar	*Cedrela odorata*	UF 4 PK 0 + 800	La Lima (Imués)	957368.8	607343.16
30v	Cedar	*Cedrela odorata*	UF 4 PK 0 + 800	La Lima (Imués)	957368.23	607337.85
V1	Cedar	*Cedrela odorata*	UF 4 PK 0 + 800	La Lima (Imués)	957369.79	607338.85

Coordinates Magna Sirga West Origin
Source: Geminis Consultores Ambientales, 2016

Rescue of threatened flora species will be carried out taking into consideration the following activities:

Root Blocking

For this activity, at least the following tools and materials have to be available: pick, shovel, stick, hoe, pruning shears, trowel, plastic bags (different thick sizes), fique sacks, plastic boxes packaging fruit or vegetable type, hormone healing, newspaper, water and sisal rope for tying up.

This procedure involves consists in cutting the soil in such a way that a plot of land is left in each individual rescued.

Root digging and pruning: Digging is done manually to facilitate blocking and mobilization, as well as protection of roots under derooting process and transportation through the plot of land between the organic soil and roots. For this purpose, a conical inverted, compacted block will be arranged; the block size will depend on the pruning area, but in no case, the largest radius of the block will less than 0.3 m for smaller seedlings (0.3 m).

The block or plot of land will have a direct weight ratio with foliage in order to establish balance between them; in cutting the roots, at least two or three primary roots will be left to benefit of the

nutrition and fixation process at the new site by the seedling; remaining roots will be pruned with pruning shears or saw if applicable, and healed immediately to prevent root rot.

Packing and tie up: It enables to have a compact block, protect roots and facilitate their movements. The plot of land must be covered with a tarp or sisal sack and tied up with fique sack and tie up must be done with sisal rope well tensioned and free of outdoor spaces to prevent their collapse, root damage or damage to the mobilized plant. If there is a case where the soil forming the block is loose, the seedling will not be taken immediately to the final site; It is convenient to wrap the block with a henhouse type wire mesh. Finally, irrigation will be applied in order to reduce dehydration.

Handling of plant material rescued

Rescued individuals will be taken to a collection center, where they will be hydrated (twice a day: early in the morning and abundantly late in the afternoon) in order to minimize plant stress and mortality due to wilting. Prior to this, root wrapping in black plastic bags with potting soil will be take place.

This collection center will be located near the highway corridor, either at an operations control center - CCO (for its initials in Spanish) or a camp, where an indoors site will be conditioned enabling to preserve physiological and sanitary characteristics of individuals to be relocated.

Plant material will remain at the collection center for more than two weeks and afterwards, it will be taken to the field for its relocation and planting. The purpose of this is to avoid excessive growth of roots and thus avoid kinking, strangulation, etc., and ensure that plant material is in optimum conditions for its establishment.

Destination of material rescued

This rescued material will be used for enrichment of water rounds or woodlands located in forest reserve area, protected areas or civil society reserves. The following listing corresponds to those sites with the highest potential for relocation of plant material:

Forest reserves proposed for flora species relocation

Protected area	Municipalities
Rio Bobo and Buesaquillo Natural Reserve	Pasto
Galeras civil society reserve	Pasto, Yacuanquer, Tangua
Galeras Flora and Fauna Sanctuary	Pasto, Consacá, Yacuanquer, Tangua
Sheep Protection Area - Tauso	Pasto, Tangua, Funes
El Tábano Protection Area	Pasto
La Divina Pastora Protection Area	Pasto
Morasurco Protection Area	Pasto

Source: Geminis Consultores S.A.S., 2016.

Planting of the plant material will be carried out in areas predefined with the area Environmental

Authorities, always considering areas near to rescue sites with similar environmental conditions.

Aspects to be considered during the planting phase

Digging will be done manually and the layout will be done according to the transfer site conditions. Dimensions of the planting site will depend on the seedling size; for smaller seedlings, the digging depth will be about 15-20 cm larger than the block size, and 20-30 cm greater than its diameter. For large seedling, the diameter will be 40 cm to 80 cm greater than the block, and digging depth will be in line with the size of the seedling, so that it enables proper placement and allows the operator to accommodate the individual and hold fertilized black soil for its proper development.

Seedling transferred must be the same level it had at the previous site and, as far as possible, in the same direction, at right angles to the ground and with good stability. If necessary, there will be wooden stakes ensuring that the plant remains upright and promote its vertical development; in turn, they must be attached to the plant with fique material (sisal) without causing damages due to excessive compression.

Maintenance of plant material relocated

In order to ensure proper apprehension and survival of the relocated plant material, maintenance activities will be carried out for a three year period, during which activities related to planting, fertilization and phytosanitary control will be carried out.

APPLICATION SITE
Areas of direct intervention requiring tree cover and/or shrub clearing activities.
PERSONNEL REQUIRED
Environmental and/or Forest Coordinator, Occupational Health and Safety Specialist - SST, Forest and/or Agroforestry Resident, Environmental Resident and Environmental Crew
RESPONSIBLE FOR COMPLETION
Concesionaria vial Unión del Sur S.A.S. will be responsible for the execution and compliance with this program by contractors throughout the development of the project under the supervision and support by Interventoría (Oversight) .
PERFORMANCE INDICATORS
The following indicators were set to provide clarity on progress, execution and compliance with measures during the reporting period established in the evaluation frequency. Therefore, no follow-up indicators are submitted, as they are stated in the respective Follow-Up and Monitoring Plan. It is fair to add that under this chart framework, supports such as field formats and photographic records providing evidence on the progress in implementing those measures pointed out herein ,will be generated.

GOAL	DESCRIPTION OF	TYPE OF INDICATOR	EVALUATION

	INDICATOR		FREQUENCY
Mitigate impacts on flora species classified in some degree of threat by rescuing plant material	Target species subject to rescue	Qualitative	Monthly
	No. of individuals rescued per species	Quantitative	Weekly
	Location of plant material rescue sites	Qualitative	Biannual
Prevent mortality of plant material rescued and prepare it physiologically and sanitarily for its relocation	Location of sites for temporary storage of plant material rescue	Qualitative	Biannual
	No. of individuals admitted at temporary collection centers	Quantitative	Weekly
Prevent mortality of plant material to be relocated through an appropriate site selection	Sites selected in conjunction with environmental authority to relocate plant material rescued	Qualitative	Biannual
	Location of sites where plant material was relocated	Qualitative	Biannual
	No. of individuals per species relocated at the selected sites	Quantitative and qualitative	Monthly
Prevent mortality of individuals relocated by applying silvicultural treatments	No. of maintenance activities performed	Quantitative and qualitative	Biannual
	Date and type of activities carried out during maintenance	Qualitative	Biannual

EXECUTION SCHEDULE

PHASE	Timeframe (semesters)								
	1	2	3	4	5	6	7	8	9
Pre-constructive									
Constructive									
Operational									

COSTS

Included in the construction costs of the project.

Fauna Resource Management Program

Table 1.4 Fauna Management

BIOTIC ENVIRONMENT							
PROGRAM	**FAUNA RESOURCE MANAGEMENT**						
MRF record - 1	**Fauna Management**						
OBJECTIVE							
Provide adequate management of impacts that on wildlife by implementing measures to prevent and mitigate damages associated to the development of works and activities of the project.							
GOAL							
- Prevent impacts that may be caused on wildlife composition and structure by implementing chasing away, rescue and relocation measures of species located at work fronts - Mitigate impacts associated to mobility and displacement of wildlife, which will be affected by the development of the works							
ENVIRONMENTAL EVALUATION							
Activity				**Impact**			
Installation and operation of process plants (asphalt, concrete, crushing)				Changes in fauna composition and structure o			
Operation and maintenance of machinery and/or equipment							
Mobilization of construction materials, supplies, machinery, equipment							
Plant cover clearing							
Cut/Stripping							
Excavations and/or earth movements							
Operation of Debris and Excavation Material Management Areas							
Construction of hydraulic works and art works							
Foundations and piling							
PHASES TO BE IMPLEMENTED							
Pre-Constructive		**Constructive**	**X**	**Operation and maintenance**		**Dismantling and abandonment**	
TYPE OF MEASURE							
Prevention	**X**			**Correction**			
Mitigation	**X**			**Compensation**			

ACTIONS TO BE TAKEN

In preconstruction and construction phases inherent activities a direct and indirect impact may be caused to wildlife communities; in consequence, different actions prior to starting activities as well as activities parallel thereto as described below, will be considered.

Wildlife chasing away

Wildlife chasing away activities seek to create ecological type conditions causing environmental stress in communities of amphibians, reptiles, birds and mammals promoting their migration to other places, which must be done at least one week before performing activities such as clearing and cut, affecting species habitat, taking into account the following:

- It is important to previously know about the fauna in the area where chasing away and rescue activities will be carried out. A review of both the project baseline and literature in general must be carried out as well as of fauna inventories performed in the area and in the region in the past; the purpose is to have an overview of species that are likely found in the work area and be able to make an easier and timely identification in the field.

- Chasing away activities must be conducted and performed by professionals in different areas, that is, a herpetologist biologist must be available for Amphibians and Reptiles as well as a mammalogist biologist for Mammals and an ornithologist biologist for Birds; they must have good knowledge of visual and auditory techniques for taxonomic identification and must be familiar with those species within the area of study.

- In order to attain the most effective chasing away activities, different techniques to generate indirect environmental disturbances on wildlife must be used depending on the group of individuals to chased away such as noise with special sounds generating alerts or stress to animals (chasing away booths), controlled biomass removal, controlled intervention on shelter sites, sticks to move tree branches, shrubs and predator hormones to achieve the highest percentage of migrant individuals.

- It is important to ensure effective chasing away of most individuals so that as far as possible it minimizes handling and possible higher stress of individuals.

- Once chasing away activities have taken place and since many species are cryptic, and instead of fleeing, they get more confined, therefore, rescue and relocation of individuals proceed.

Wildlife rescue and relocation

Wildlife rescue and relocation activities must take place prior to cut and/or forest use activities, taking into consideration the following:

- A specialist per fauna group (herps, birds and mammals) capturing individuals in the area must be

available, according to characteristics of each species, using standard methodologies for each group:

- Herpetofauna biological group is comprised of two biological classes, Amphibian class and Reptilia class. For their rescue and relocation, a direct search of specimens is carried out in peak hours between 09:00 and 13:00 and between 17:00 and 22:00 hours, evaluating various micro habitats. Capture will be made taking into account standard biosafety recommendations, specifically for the case of reptiles, which capture will be done with herpetological clip and hook. The captured individuals will be identified and registered, subsequently stored in special boxes suitable for transportation until they are released in a similar or better habitat than the one from which they were extracted.

  For birds, visual and auditory censuses will be performed on transects on each work front where their taxonomic identification is recorded, coverage and as far as possible a photographic record, plus mist nets will be installed (a network of 10 to 12 meters long by 2.5 high) from 05:30 am to 10:00 am and from 3:00 pm to 6:00 pm schedule in which the highest peak of bird activity is established. Once mist nets are installed, timeframes of 15 to nearly 30 minutes will be reviewed. Individuals captured will be removed carefully from net, minimizing the possibility of injury or stress. After being removed, each individual will be introduced into cloth bags and will be transported to a safe area for the animal, where will be handled more easily. Each individual's morphometric aspects, taxonomic identity, breeding or moulting along with photographic records will be recorded. The rescued individuals will be transferred to a similar or better habitat and there, they will be released. If nests are found at the sampling point, they must be recorded and removed from the site carefully and transferred, if possible, with their parents to their new habitat, which must be similar or better.

  For mammals' community, capture of specimens will be done at each work front, where works will take place at least 5 days before installing traps for each target group; for flying mammals, mist nets will be used at night; for small mammal species, Sherman traps will be used; and for medium size mammal species Tomahawk traps will be used. All captured individuals are taxonomically specified and photographed before being transported in special boxes or bags to their new habitat which must be similar or better.

  Besides working with each fauna group, local inhabitants will be interviewed, interviews which may contribute to rescue wildlife community within the area to be intervened.

- Similar habitat or better potential for establishing new shelters for rescued wildlife must take into consideration: the extension, similarity and proximity of habitat where wildlife was removed to ensure populations survival.

- In cases where individuals are found to be disabled or injured due to accidents or similar actions, they must be delivered to a wildlife rescue center until the animal is in conditions to be released.

- It must be highlighted that activities related to capture, recording and release or transfer of animals must be done according to specific management protocols for each fauna group (amphibians, reptiles, birds and mammals); for capture activities, specialist tools such as hooks to catch snakes,

Sherman and Tomahawk traps for mammals, mist nets for birds and flying mammals must be available.

- Transferring requirements inherent to each species must be taken into consideration, for example, amphibians and reptiles can be transported in cloth bags (with wet litter for amphibians), birds and mammals in special cages or crates, assuring the individual's health as well as that of the researcher who is in charge of handling activities.

- Their release will take place prior identification of a place with similar or better conditions to that site where they were captured. Registration of the release site coordinate must be recorded by using a GPS as well as a photographic record.

- A recording format must be kept, where data related to capture, review and release of each individual are included.

Wildlife crossings or passageways

Wildlife crossings/passageways will be installed in strategic area throughout the dual carriageway road Rumichaca - Pasto, taking into account the following:

Selection of places where wildlife crossings or passageways will be located: Identification of infrastructure points required to build wildlife crossings, will be carried out based on the analysis of three factors:

- Factor 1. Identification of habitats of interest for wildlife groups requiring special attention.
- Factor 2. Identification of sectors in the area of interest for ecological connectivity, and specifically, for wildlife displacement.
- Factor 3. Identification of conflicting sections where a high rate of mortality of wildlife or accidents caused by vehicle collisions with large mammals occur. This aspect will be evaluated from data related to roads in operation that run parallel or close to the new road, or based on data from the road itself when said road is subject to improvement projects.

Wildlife crossings will be located in all places where, based on the above mentioned factor analysis, it is determined that they are necessary to:

- Facilitate safe crossing points to prevent access of wildlife implying road safety risk to vehicle traffic platforms.
- Avoid leaving isolated habitat fragments of referred species.
- Facilitate access of animals to basic resources (feeding, shelter, reproduction areas etc.) for maintaining a specific population.

- Facilitate crossing structures enabling to forbid road structure in regular fauna displacement routes.

Suggested wildlife crossings

In the roadway corridor, areas that might be necessary for fauna crossings due to the above mentioned factors were identified. Below is a detailed description of the importance of each wildlife crossing on the dual carriageway Rumichaca - Pasto. Such fauna passageways may be subject to modifications.

Wildlife Crossing 1	**Wildlife Crossing 2**
Coordinates: 608547.6263 / 958687.8826	Coordinates: 610143.7505 / 961033.5502
Municipality: Imués, Yacuanquer	Municipality: Tangua Yacuanquer
Village: Pedregal and low Inantas	Village: Villa Cruz Low and high Inantas
Importance: Wildlife crossing through the river bank vegetation of the Guaitara river	Importance: Wildlife crossing through the river bank vegetation, important shrub cover.

Wildlife crossing signposting

Information and prevention signs will be installed (**Figure 1**) along the Rumichaca – Pasto roadway corridor, taking into consideration:

- Strategic and critical sites must be identified for wildlife crossing, indicating the presence of wildlife in these areas and preventing the risk of accidents and fauna to be hit
- Likewise, speed bumps will be placed in wildlife sighting sites in order to be able to regulate speed in both wildlife sighting and crossing sites, especially, during night traffic where wildlife is most active.

Figure 1 Example of information and prevention signs of presence of wildlife on the road.
Taken on line: http://elcododelraul.blogspot.com/2011_04_01_archive.html

APPLICATION SITE
Areas of direct intervention of the project requiring activities inherent to the project such as: mobilization of construction materials, supplies, machinery, equipment, waste and vehicles, machinery operation, clearing and cut/stripping, demolition, excavations, Debris Management Area, Excavation Material (ZODME), etc.
PERSONNEL REQUIRED
a- Fauna Coordinator, b - biologist - herpetologist, c - biologist - mammalogist, d - biologist - ornithologist e. (2) hydrobiology biologists, f - field assistants for each professional.
RESPONSIBLE FOR EXECUTION
Concesionaria Unión Vial del Sur S.A.S. will be responsible for the execution and compliance with this program by contractors throughout the development of the project with supervision and support by Interventoría (oversight).
PERFORMANCE INDICATORS
The following indicators set for clarity on the progress, execution or implementation of measures during the reporting period established in the evaluation frequency. Therefore, no follow-up indicators are submitted since they are stated in the respective Follow-Up and Monitoring Plan. It is fair to add that under this chart, supports such as field formats and photographic records providing evidence of the progress in implementing those measures pointed out herein will be generated.

GOAL	DESCRIPTION OF INDICATOR	TYPE OF INDICATOR	EVALUATION FREQUENCY
Prevent impacts that may be generated on the fauna composition and structure by implementing chasing away, rescue and relocation measures of species found at work	Location and chasing away methods used	Qualitative	Weekly
	Location and species subject to capture	Qualitative	Weekly
	Location and relocated species	Qualitative	Weekly

fronts			
Mitigate impacts associated to mobility and displacement of wildlife that will be affected by the development of the works	Location and type of wildlife crossing installed	Qualitative	Biannual
	Location and type of signposting installed	Qualitative	Monthly

EXECUTION SCHEDULE

PHASE	Timeframe (semesters)								
	1	2	3	4	5	6	7	8	9
Pre-constructive									
Constructive									
Operational									

COSTS

Included in the construction costs of the project.

Habitat Management Program

Table 1.5 Management and preservation of habitats

BIOTIC ENVIRONMENT	
PROGRAM	**HABITAT MANAGEMENT**
MH record - 1	**Management and preservation of terrestrial and freshwater habitats**
OBJECTIVE	
Provide adequate management of impacts on terrestrial and freshwater habitats, by implementing measures to prevent and mitigate damages associated to the development of works and activities of the project.	
GOAL	
- Prevent impact on natural ecosystems and habitats surrounding job sites - Prevent impact on covers adjacent to work sites through an appropriate signposting of the intervention areas - Prevent impact on habitats by using prohibitive signposting	
ENVIRONMENTAL EVALUATION	
Activity	**Impact**
Camp installation and operation	Change in forest cover surfaces and semi-natural areas Alteration in the composition and structure of hydro-biological communities Fragmentation and changes in habitat connectivity
Process plants installation and operation (asphalt, concrete, crushing, etc.)	
Mobilization of construction materials, supplies, machinery, equipment, waste and vehicles.	
Operation and maintenance of machinery and/or equipment	
Plan cover removal	
Cut/Stripping	
Demolition	
Excavations and/or earth movements	
Operation of Debris and excavation material management area (ZODME).	
Installation of base, sub-base and ground	
Construction of hydraulic works and art works	
Foundations and piling	
Building of superstructure for bridges and by-passes	

Installation of asphalt base and surface course							
Installation of pedestrian bridges							
Slope Treatment							
Installation of toll facility							
PHASES TO BE IMPLEMENTED							
Pre-operative		**Constructive**	**X**	**Operation and maintenance**		**Dismantling and abandonment**	
TYPE OF MEASURE							
Prevention	**X**			**Correction**			
Mitigation	**X**			**Compensation**			

ACTIONS TO BE TAKEN

Isolation of habitats

Before starting the works, a tour will be carried out in order to identify sites or areas where habitats for wildlife, flora and hydro-biological resources are located. Priority will be given to riparian ecosystems, shrub forest, grassland and water bodies in general requiring protection.

Installation of isolations in areas identified must limit the passage of machinery, equipment, works personnel and must establish a safe distance avoiding vicinity of stockpiles of construction materials, excavation excess, waste, wood or cut/stripping, among others.

Delimitation of areas of intervention of the project

Prior to any intervention on vegetation covers and natural ecosystems in the area of influence of the project, delimitation of each front work will be carried out by using yellow ribbons, physical barriers in "polisombra" or barbed wire fences, delimiting the right of way in those specially important sites where water bodies or woodlands requiring protection are located. In addition, line chamfers will be marked by using stakes and flags in order to establish clearly areas and sites where activities and own works of the project will be carried out.

Implementation of containment measures

For the protection of freshwater habitats, containment measures such as sack barriers, stake fences, physical barriers, etc., to prevent passage, sliding or dragging of excavation and construction materials, as well as any type of waste towards water sources where construction works of hydraulic structures, bridges, etc. are being developed.

Similarly, this type of measures will be implemented in high slope areas so requiring it in order to avoid impact on adjacent covers located near to sites where cuts, excavations, stripping, temporary stockpiles, etc.,

are carried out.

Prohibitory signposting

Temporary signs will be installed at work sites located near to sites where natural ecosystems or habitats are isolated and delimited with physical barriers, indicating specifically that intervention thereof and passage of machinery, equipment and personnel for these areas are forbidden.

APPLICATION SITE

All areas where activities inherent to the project are going to be developed, and where presence of plant covers to be used as fauna habitat are foreseen, as well as areas acting as biological corridors to reduce potential impacts such as reduction of flora and fauna. Freshwater habitats are included.

PERSONNEL REQUIRED

Biotic coordinator, ecosystem biologist and assistants

RESPONSIBLE FOR EXECUTION

Concesionaria Unión Vial del Sur S.A.S. will be responsible for the execution and compliance with this program by its contractors throughout the development of the project.

PERFORMANCE INDICATORS

The following indicators were stated for clarity on the progress, execution or implementation of measures during the reporting period established in the evaluation frequency. Therefore, no follow-up indicators are submitted, since they state the respective Follow-Up and Monitoring Plan.

It is fair to add that under this Chart, supports such as field formats and photographic records providing evidence of progress in implementation of measures pointed out herein will be generated.

GOAL	DESCRIPTION OF INDICATOR	TYPE OF INDICATOR	EVALUATION FREQUENCY
Prevent impact on natural ecosystems and habitats adjacent to work sites	Location of habitats to be protected	Qualitative	Weekly
	Type of habitat protected and barrier implemented (barrier stake fences, etc.)	Qualitative	Weekly
Prevent impact on covers surrounding the work sites through appropriate signposting areas of intervention	Location of delimited work fronts	Qualitative	Quarterly
Prevent impact on habitats using prohibitive signs	Location and type of signposting implemented	Qualitative	Monthly

EXECUTION SCHEDULE

PHASE	Timeframe (semesters)								
	1	2	3	4	5	6	7	8	9
Pre-constructive									
Constructive									
Operational									

COSTS

Included in the construction costs of the project.