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TABLES

12 ONE PERCENT INVESTMENT PLAN

The following is the one (1) percent (%) investment plan, in accordance with the regulations discussed in articles No. 1 to 5 Decree 1900, 2006. Annexes 12.1, 12.2, 12.3 and 12.4 contain the schedule and budget of plan 1, the registry of the property to be intervened, a copy of the owner's identity document and the compensation agreement.

The mining project "El Pescado" in mining title 5969 will use a total of 1.97 ha of secondary forests for open-pit extraction activities; therefore, the current investment plan will focus on the recovery of 20 ha of clean pastures and its transformation over time towards forest cover.

This investment, in accordance with the provisions of the first paragraph of Article 2, may only be made one (1) time. Considering this, the 1% investment project cannot deteriorate after the end of the useful life of the mining project due to lack of maintenance, monitoring or control; therefore, it is necessary to make this investment in a project that guarantees its longevity without dependencies or changes in its administration through the articulation with the environmental authority or territorial entities with similar objectives.

For the investment calculation or liquidation, according to article three of Decree 1900, 2006, it is based on the following costs of the construction and assembly activities, presented in Table 12-1.

Table 12-1 Costs for construction and assembly stage.

ACTIVITY	COST
Mining and Metallurgical Plant	$7.086.319.015
Mining development teams	$4.664.766.046
Construction and constitution of easements	$1.066.306.508
CONSTRUCTION AND ASSEMBLY COSTS	**$12.817.391.000**
INVESTMENT OF (1%)	**$128.173.910**

Source: TOUCHSTONE, 2015.

The destination of these one hundred and twenty-eight million one hundred and seventy-three thousand nine hundred and ten Colombian pesos ($128'173.910) corresponding to one percent of the costs within the construction and assembly activities, according to article five of the regulatory decree, it must be invested within the river basin that is in the project's IM, according to the priorities or projects and programs in the river basin management plan that includes water source from which the water is taken.

Therefore, it was necessary to consult the Planning and Management Plan for the Bagre River Basin (hereinafter POMCHB), where "El Pescado" project IA is located in the mining title 5969; finding the objectives, strategies, programs and priority projects defined for the area. (See

Table 12-2 and Table 12-3).

Table 12-2. Objectives and strategies of the POMCHBB

OBJECTIVES	STRATEGIES
Objective No. 1: To guarantee the protection and conservation of strategic ecosystems because of their environmental function and the presence of special biotic communities, in order to guarantee a sustainable development of environmental products.	Strategy No. 1: Protection of strategic ecosystems.
	Strategy No. 2: Protection of special interest areas
Objective No. 2: To promote the maintenance and/or increase of water supply as an essential element of the development, occupation and use of land in the basin.	Strategy No. 3: Maintenance of water supply.
Objective No. 3: Identify, promote and implement sustainable uses of land and natural resources in areas of peasant economy.	Strategy No. 4: Promotion and incentives of new agricultural production practices.
Objective No. 4: Institutional and community strengthening to consolidate the processes of planning, management and decentralization of environmental management.	Strategy No. 5: Institutional and community strengthening

Source: POMCHB, 2005.

Table 12-3 POMCHB program.

PROGRAMS	PROJECTS
Program No. 1: Conservation (Development of Strategies No.1, 2, 3 and 4)	Project No. 1.1: Environmental recovery of banks in La Cianurada and Doña Teresa stream.
	Project No. 1.2: Recovery, conservation and sustainable use of residual forests in the forest reserve.
	Project No. 1.3: Conservation, recovery and sustainable use of biodiversity in strategic ecoregions of local importance.
	Project No. 1.4: Training and education in cultural practices in line with the land supply
	Project No. 1.5: Acquisition of land.
	Project No. 1.6: Protection of water supply basins for aqueducts, sources and water currents.
Program No. 2: Mining Environmental Technical Management (Development of Strategies No. 1 and 3)	Project No. 2.1: Handling of tailings.
	Project No. 2.2: Industrial waste management.
Program No. 3: Basic sanitation (Development of Strategies No. 1 and 3)	Project No. 3.1: Rural domestic wastewater management
	Project No. 3.2: Disposal and recycling of household waste
Program No. 4: Incorporation of production systems (Development of strategies No. 1, 4 and 5)	Project No. 4.1: agro-forestry systems.
Program No. 5: Environmental education (Development of strategies No. 1, 2, 3 and 4)	Project No. 5.1: Environmental education for the different levels
	Project No. 5.2: Environmental training for the mining sector, restoration and perceptual and environmental management.
	Project No. 5.3: Institutional management Program.
Program No. 6: Institutional management (Development of strategies No. 1, 2 y 3)	Project No. 6.1: Inter-institutional coordination.
	Project No. 6.2: Creation of incentives to protect forests

Source: POMCHB, 2005.

The 1% investment will be made based on the program No. 1, Project No. 1.2 corresponding to the recovery, conservation and sustainable use of residual forests in the forest reserve, for the following considerations:

- Considering the investments covered by Decree 1900, 2006 it must be made in the basin and/or micro-basin that will be intervened by the activities of the project, it is established that this investment must be made in the micro-basin of El Pescado stream, given that the project is located within the area of the same name. Leaving the proviso that during its development will be adjusted to the conditions or changes of it.
- Considering that the mining project is located within the National Forest Reserve of the Magdalena River (hereinafter RFNRM), declared by Law 2,1959, it is a priority within the area to implement plans for the restoration and recovery of vegetation cover, especially in those areas where there are water source births and biological passages of endemic and threatened species of wild fauna and/or species of high ecosystem value.
- Through the vegetation cover recovery, the aim is to maintain abiotic factors such as: light, physical-chemical properties of the soil, climate regulation, among others, which enable the regulation of the water cycle in the area to be maintained, as well as maintaining the dynamics between terrestrial and aquatic ecosystems.
- Control soil degradation factors and erosion processes, as well as implement the restoration of degraded areas along the tributaries of the El Pescado stream.
- Promote passive restoration by natural and active regeneration through the enrichment of the forest reserve and the recovery of areas degraded by livestock and wood extraction, among others, in order to dedicate them for conservation and generate greater ecosystem services.
- Avoid local extinction of species (wild fauna and flora).

The project becomes important as long as the vegetation cover is recovered and indirectly it allows the flow and caudal of water sources to be maintained, even in dry season.

Among the activities planned for the appropriate development of the 1% investment plan, the following are stipulated:

- Environmental education workshops focused on raising awareness on topics such as: preservation of natural resources (water, flora, fauna, forests, air, among others), in addition to the training of leading personnel in reforestation and/or revegetation and technical management of restorable areas.

- The selection of the locations to be restored, which will be done together with the Environmental Authority, the community, technical personnel and TOUCHSTONE COLOMBIA S.A.S.

- The hiring of labor, which will be done considering aspects such as: local population, vocation and/or minimum experience in related issues.

- Collection and selection of plant species for the establishment and assembly of the temporary nursery, as there are no nurseries with the appropriate technical specifications in the area.

- Preparation and adaptation of the soil prior to the activities generated in order to provide the necessary conditions for planting and development of seedlings.

- Transportation of material from the temporary nursery facilities to the adequate area previously prepared according to the technological package of each species.

- Seeding of selected species.

- Plantation maintenance according to the species planted, where the annual frequency is three (3) stages.

- Signposting of the recovered areas, in order to delimit the zones where re-vegetation is established, preventing the degradation of the seedlings.

- Establishment of monitoring plots for both fauna and flora species, where it is possible to establish and promote the adaptability of the different species to the new habitat and/or ecosystem.

12.1 METHODOLOGY

The following is a technical description of each of the activities mentioned above, which will be implemented in the development of the 1% Investment Plan.

12.1.1 Environmental education workshops.

The environmental education workshops will be given as a first step in a series of educational and training workshops for the company's personnel and the community. Each workshop must be attended by social and environmental professionals who will have the objective of dynamically encouraging environmental care, transmitting basic concepts of restoration and technical management of restorable areas and highlighting the importance of sustainable management and care of environmental resources (air, water, flora, fauna, and waste, among others).

The environmental awareness days will be held one month before the selection of locations and plant species. The execution of the activities has been planned in two stages; the first, environmental awareness with the community and company personnel in a workshop with a maximum duration of 4 hours and a second stage, with a duration of one week, of exclusive training for a group of maximum 5 people of the company's personnel, who will be in charge of technical restoration activities in the areas. In this second stage, topics such as the following will be explored in depth:

- Basic concepts of ecological restoration.
- Recognition of pioneer species of flora to be used.
- Recognition of fauna species associated with restoration processes.
- Basic sowing concepts according to the technological package of each species.
- Basic concepts of fertilization and fertilization of plant species.

- General basic maintenance and monitoring of the hectares subject to restoration (removal of ecological barriers, thinning and thinning as appropriate).

12.1.2 Selecting Locations for Restoration

Once the education and training phase described above has been completed, the areas to be restored will be selected and the activities related to the planting of pioneer species will be implemented.

Once the professional staff of Touchstone Gold Holding (forestry engineer, biologist or similar) has pre-selected a tentative location(s) for the seedling plot(s), it should be considered by the competent environmental authority (in this case CORANTIOQUIA) and the community. In addition to the restoration area, a nearby zone should be chosen to serve as a reference ecosystem; the basis for future monitoring of the quantification and qualification of the restoration processes.

12.1.2.1 Characteristics of the selected areas.

It is recommended for the selected locations (restoration plot and reference ecosystem) to comply with the following characteristics:

Area to be restored: the objectives of the restoration plan are met in a significant manner; the area to be restored must fulfil the following characteristics:

- It must be a moderately degraded area with an anthropogenic intervention that has become evident in recent years.

- It should be covered with clean pastures, wooded pastures or, in a state of early succession, as a result of the recent abandonment of the area.

- To have an area of at least 20 ha.

- The land must be soil with acceptable quality.

- The area should be accessible and easily monitored.

- The land must be maintained over time.

In the chapter on land use in the Environmental Baseline (LBSA) there is a detailed description of the large number of hectares available for restoration, as they are devoid of woody vegetation cover within the IDA, due to extensive livestock farming and selective timber extraction, as well as informal mining and agriculture.

Reference ecosystem: In this case, the reference ecosystems are basically forest cover. This is part of the life zone of the tropical rainforest (bh-T). In general terms, the location to be selected should have the following characteristics:

- To be a location with a mosaic of transitional coverings, secondary vegetation and forests, which must be in a considerable state of maturity, with an average height of trees of 12 to 15 meters.

- Areas with fauna species, mainly terrestrial and flying mammals.

Within the elaboration of the LBSA and the respective description of the area, the following plant coverings were identified within the IDA, highlighting the presence of forests and vegetation in transition that can serve as a reference model:

Table 12-4. Plant coverings in the AID of "El Pescado" mining project

LEVEL No. 1	LEVEL No. 2	LEVEL No. 3	LEVEL No. 4	LEVEL No. 5	ABBREVIATION
1. ARTIFICIAL AREAS	1.1. Developed areas	1.1.2. Discontinuous urban fabric			Tud
2. AGRICULTURAL TERROTORIES	2.2 Permanent crops	2.2.1. Permanent herbaceous crops	2.2.1.3 Banana and Yucca		Cph
		2.2.2. Permanent shrub crops	2.2.2.3. Cocoa		Cpa
	2.3 Pastures	2.3.1. Clean pastures			Pl
3. FORESTS AND SEMI-NATURAL AREAS	3.1. Forests	3.1.1. Dense forest	3.1.1.2. Low dense forest	3.1.1.2.1. Dense forest beneath the mainland	Bdbtf
	3.2. Areas with herbaceous and/or shrub vegetation.	3.2.3. Secondary vegetation or in transition.	3.2.3.2. Lower secondary vegetation		Vsb

Source: Touchstone Colombia S.A.

12.1.3 Recruitment of staff

For the development of this 1% investment plan in the AID, Touchstone Gold Holding Colombia must have the following personnel:

Professional staff.

- 1 Forestry engineer, biologist or similar, resident, with specific experience in taxonomy of vascular plants and epiphytes, with knowledge in ecology and ecological restoration processes (Annex 12-1).

- 2 Forest engineers with experience in forest inventories, management, monitoring and follow-up of populations and ex situ planting. In addition, it must have extensive conceptual and technical knowledge of ecological restoration processes (Annex 12-1).

- 3 Biologists with experience in sampling terrestrial fauna (mastofauna, avifauna and herpetofauna), in managing population monitoring and tracking and reporting. In addition, it must have extensive conceptual and technical knowledge of ecological restoration processes (Annex 12-1).

Technical/auxiliary personnel.

5 auxiliaries trained in technical processes for restoration of intervened areas and in seeding and maintenance of ex situ plant species for the first year. From the second year onwards, 3 assistants will be employed for a period of 6 months (Annex 12-1).

12.1.4 Collection and selection of plant species.

One of the main aspects to be considered for the development of an ecological restoration program is the selection of species, since the success of this depends to a large extent on the rigor and capacity of the selection of species. The selected species are products of a previous analysis with secondary information on the regeneration potential, the structure and floristic composition of the reference ecosystem; in this way, species with high values in the attributes or features that are advantageous in the sites to be restored are selected.

Since the area to be restored corresponds to clean pastures, eventually with the presence of few isolated trees, pioneer species such as woody precursors (shrubs and heliophilous trees) will be used in the beginning of succession processes of tropical rainforests. This is intended, among other things, to break the equilibrium of the potrerization in the areas to be restored and to contribute at a low level some requirements for the arrival of some species of fauna.

The pioneer species to be used are divided into:

- Pioneer species type a: Fast-growing trees and shrubs highly tolerant to sun exposure and drought periods, with sizes between 2 and 8 meters. These species in general are good suppliers of habitats, mainly for birds and reptiles; an important factor if we take into account the fundamental role played by birds in the restoration process.

- Pioneer species type b: Trees and shrubs between 8 and 15 meters, tolerant to sun exposure and periods of drought, direct source of food for insects, birds and mammals, also generate a large amount of litter and make massive occupation of the rhizosphere, preventing the proliferation of grass.

- Initial secondary pioneer species: Trees and shrubs of more than 12 meters of rapid growth that constitute the future matrix of large trees more common in the ecosystem.

A total of 14440 seedlings will be used, where the proportion per species may vary due to the achievement of plant material, although initially the same number of seedlings per species is planned. The species to be used and the number of seedlings initially established are defined in Table 12-5.

Table 12-5. Pioneer and initial secondary plant species to be used within the restoration plan.

Type	Species	Number of seedlings
Pioneers type a	*Ossaea macrophylla*	412
	Miconia spicellata	412
	Piptocoma discolor	412
	Celtis trinervia	412
	Vismia baccifera	412
	Aegiphila sp	412
	Phyllanthus attenuates	412
	Piper aduncum	412
	Piper marginatum	412
	Isertia haenkeana	412
Pioneers type b	*Schefflera morototoni*	412
	Cochlospermum sp	412
	Inga sp	412
	Ochroma pyramidale	412
	Casearia corymbosa	412
	Lacistema aggregatum	412
	Pourouma hirsutipetiolata	412
	Vismia macrophylla	412
	Cespedesia spathulata	412
	Pourouma bicolor	412
	Zanthoxylum lenticulare	412
Initial secondary species	*Tapirira guianensis*	412
	Spondias mombin	412
	Ochoterenaea colombiana	412
	Andira inermis	412
	Inga punctata	412
	Apeiba membranacea	412
	Simaba cedron	412
	Guazuma ulmifolia	412
	Jacaranda copaia	412
	Luehea seemannii	412
	Ficus sp	412
	Chrysophyllum cainito	412
	Vochysia ferruginea	412
	Bunchosia armeniaca	412

Source: INGEX, 2015

Due to the fact that in the municipality of Segovia or in other nearby municipalities there is no nursery in optimum conditions for the production of native material, the construction of a temporary nursery for the production of this material is proposed.

Plant material will be obtained in the area by collecting seeds and seedlings no more than 20 cm high, which will be done in free rounds within the forest cover and secondary vegetation in transition. For this purpose, the participation of two professionals in forestry engineering, biology or similar, with experience in field recognition and propagation of native plant species, will be necessary.

The collected material, whether seeds or seedlings, should be placed in nursery bags for germination and development within the temporary nursery. While the seedlings remain in the nursery phase, they must be constantly fertilized organically and mineral with good water supply, always seeking a good phytosanitary management.

12.1.5 Nursery phase

The production of plant material in the temporary nursery should be performed by a nurseryman with experience in native vegetation, under the supervision of professional company staff. The activities that will be developed in this phase are:

Fertilization: which will be carried out with organic and mineral fertilizers, based on composted chicken manure or other origin (bovine manure, pork manure, etc.) also composted.

- Phytosanitary control: Given the susceptibility of the seedlings to the attack of plagues, there will be inspections and cleanings for the control of phytopathogenic biotic agents such as ants, crickets, nematodes, fungal bacteria, among others.

12.1.6 Soil preparation and adaptation

Prior to planting within the area to be restored, weeds must be eliminated in order to avoid competition for light and nutrients from the trees planted. This work should only be done with hand tools (hoes and knives), never with chemical herbicides. Under no circumstances should trees or seedlings of pre-existing native species be removed or cut down at the sites to be restored.

The plant residues from the preparation of the land will be collected and stored in sacks, in order to use them as a source of organic material after the planting of trees.

12.1.7 Restoration model

In the areas to be restored, a nucleation model will be implemented, which consists of the establishment of a series of random patches of initial pioneer and secondary species (Table 12-5) that initiate regeneration; it is worth mentioning that a good separation between nucleus and nucleus allows their propagation.

For the specific case of the areas to be restored, 45 pioneer and secondary species nucleus per hectare will be planted; each nucleus will have a random configuration and must contain an average of 16 trees, between initial pioneers and secondary ones, making sure that the latter are always located in the center of the nucleus. The distance between nucleus and nucleus is random but always trying to be larger than the size of a nucleus, while the distance between seedling and seedling within the nucleus, should be approximately 3 meters. 722 individuals per hectare will be planted for a total of 14 440 seedlings and 902 nuclei in the 20 hectares to be restored.

12.1.8 Material transport and distribution of seedlings in the field.

Before packing the material, it must be completely moistened in a nursery and only moved on the day of sowing. It is recommended to transport it in plastic boxes or wooden crates, it can be transported by mules or if the temporary nursery is close to the planting site it can be loaded by people.

For the distribution of seedlings at the nursery, it is essential for the hired professional to be in the field to advise and supervise the personnel employed for planting. This activity consists of distributing the plant material on the property to be planted, placing each seedling in the final planting area, according to the distribution of the species in each of the proposed restoration nuclei. This activity should be carried out with the maximum possible care to minimize damage to the seedlings, avoiding sudden discharge of the material into the soil or placing the crown down over depressions in the ground or in the direction of the slope, as this can affect the roots as well as the branches and apical buds of the plant material.

12.1.9 Plants Seedling

The sowing work should start following the recommendations below:

- Planting should be done at the same time as the plant material arrives in the area.

- Soil bread should be soaked with water at the time of planting; it should be compacted before removing the bag, to prevent the bread from crumbling from the soil. The tree should be sown with the pestle very complete, avoiding that it crumbles, if there are roots that come out from outside the bag or are rolled up at the bottom of the bag, they should be removed by cutting them with a pruning shear.

- The plastic bag will be removed by making two longitudinal cuts to it and stored to be counted at the end of the work.

- The seedling should be placed vertically, with the neck of the seedling flush with the ground (special care should be taken that the seedling is planted at the same height as it was in the bag).

- The seedling roots must not be bent or braided, the stem must be vertical and the soil must be compacted with the foot or hands in such a way that the seedling is anchored to prevent the formation of air pockets.

- All waste must be collected, packed and removed from the area. To later make its final disposition in authorized sites.
- It is important to be aware that the sowing season must coincide with the rainy season or a few days before the start of the rainy season (April or September), in order to ensure an optimal procedure.

The following minimum conditions on plant material should be considered:

- Good lignification of seedlings: When handled individually, they should be kept upright and should not show a tendency to lateral tilt or pitch.

- Good aerial development: The phenotype of the seedling must correspond to a vigorous, well-formed and colorful plant.

- Good root system: When evaluating the roots of any seedling, they should occupy the entire volume of the substrate in a homogeneous manner, with evident mycorrhizal infection, and present a perfectly developed main root.

- Do not present defects such as gooseneck, carrot root or secondary roots with strong spiral growth.

- Do not present phytosanitary problems as a result of attacks by pests or diseases, which are evident in the drying of leaves, necrosing of stems and leaves, and so on.

Size of the seedling for dispatch: Between 30 and 45 cm.

Once all these characteristics have been verified, the following activities will be carried out:

Placing and plowing: The residual weeds will be removed with a hoe around the planting areas of the trees within a radius of 1 meter; then a hole 30 cm in diameter and 30 cm deep will be dug out of each seedling using a pallet or shovel.

Preparation of the sowing substrate: The soil extracted from the hole should be repeated. The extracted soil will be broken and removed to defragment any hard layers that may hinder the penetration of the roots and prevent their proper development.

Application of hydro-retainers: Currently, hydro-retainers are indispensable tools in the establishment of crops and forest productions because during drought events they can guarantee the plant minimum quantities of water resources for its subsistence. This product should not be applied dry, but wet, because when used wet, its actual volume is known and there will be no problems with its use. When wetting the hydro-retainers are generally a uniform mass to be used on the hole previously made, ensuring that this mass has direct contact with the roots at the time of planting.

Fertilization: A mineral organic fertilization is proposed, based on composted chicken manure or other origin (bovine manure, pork manure, etc.) also composted. To this must be added a mixture of agricultural lime, phosphoric rock, DAP (dya-mmonium phosphate) fertilizer and minor elements. The quantities of each of these should be based on the particular requirements of each of the species.

When the specimen is already sown, the fertilizer should be applied by injection, crescent on top (depending on the topography of the soil), at least 15 cm from the stem of the tree, ensuring the product is covered with a layer of soil. It is important to clarify that the amount of fertilizer or amendment may vary according to the recommendations of the soil analysis. Failure to comply with this aspect will lead to toxicity problems, which will require replacement of the affected plant(s).

Tutoring: In case that some individuals require this activity for their optimal growth, tutors should be provided to be inserted in the soil and tied to the seedlings that require it.

Use of plant residues: After sowing and fertilization, plant residues from the soil preparation can be used. , For this purpose, it will be placed on the seedling plate area and the layer of residues must not be higher than 10 cm. This waste will be a source of organic material, shade of the stalls area and induction of beneficial macro and micro-fauna of the soil.

Phytosanitary control in areas to be restored: Given the susceptibility of the seedlings to attack by herding ants, the detection of nests and their control should be carried out from the very moment when the cleaning work begins. For control purposes, nests should be identified and attacked at doses that control the population of this insect. During the execution of the plantation and until the contracting company has received the plantation completely, preventive and corrective measures will be taken to control harmful phytopathogenic biotic agents, such as ants, crickets, nematodes, bacteria and fungi, among others. Packaging resulting from this activity must be collected and packed for subsequent transportation and disposal at an authorized disposal site.

12.1.10 Maintenance plan for vegetal material.

The maintenance phase will be carried out every 4 months, for an annual frequency of 3 stages, during a period of 5 years after planting, where the following activities will be implemented:

- **Clean:** it consists of eliminating the existing weeds at ground level in the nuclei planted in a manual way, always trying not to mistreat the growing seedlings.

- **Weeding:** this consists of manually eliminating the weeds present at a distance of 1 m from the base to the stem of the growing seedlings, thus leaving the soil bare without affecting the roots and thus promoting growth. The product from the stalls should not be removed and should cover the area of the plate after fertilization.

- **Re-seeding:** in case there is dead plant material, it should be replaced by the same material extracted from the temporary nursery and in optimal conditions for sowing.

- **Fertilization:** in cases where replanting and reseeding is required, fertilization should be carried out as described above.

- **Pruning:** formation pruning will be performed in order to stimulate apical growth, it is worth mentioning that this activity should be carried out exclusively with pruning shears in good condition.

- **Tutoring:** In the event that some individuals require it, tutors will be arranged to be inserted in the soil and tied to the seedlings.

12.1.11 General restoration monitoring

As a measure for the success of the restoration activities to be carried out on the 20 hectares selected within the current 1% investment plan, a comprehensive monitoring plan is stipulated that combines the monitoring of the biotic dynamics over the course of 5 years. The monitoring in the areas to be restored will be carried out bimodal each year, trying to cover the rainy and dry season, following the following programs:

12.1.11.1 Vegetal monitoring program.

The monitoring plan in a restoration process consists of monitoring and/or evaluating each of the proposed actions, possible changes in the ecosystem, and the adaptability of the species of both fauna and flora, under each of the strategies applied. Its main objective is to ensure the success of the project, obtaining the information required to adjust the methods used; therefore, if during the evaluation process it is considered that the procedures are not adequate, corrective measures may be applied and other proposals implemented, but if the results are as expected, they will continue to be reproduced.
Therefore, monitoring is proposed for rapid ecological assessments (flora and fauna), seeking to reach the reference ecosystem.

12.1.11.1.1 Monitoring plan for the flora component.

Monitoring should be carried out over different time periods (short, medium and long term) in order to evaluate whether the restoration techniques or strategies proposed were carried out as designed, if they met the goals or if they should be modified (Vargas 2007, MADS 2014). Therefore, to achieve effective and permanent monitoring of the area, the book Monitoring ecological restoration processes applied to terrestrial ecosystems (Alexander von Humboldt Biological Resources Research Institute, 2015) will be considered.

The permanent monitoring of the flora must respond mainly to the need for information on the proposed project and/or objective, the quality of this information depends on the variables collected and the precision of the same, as well as clearly defining the methods to be implemented.

The monitoring method to be implemented is based on ecological aspects, independent of the restoration strategy. In the case of the present study, it is proposed to implement random methods that are ideal for local scales, where conditions are homogeneous, and where, according to Ribeiro et al. (2011), for areas between 0.5 and 1 ha, 5 permanent replicas or plots of 100 m2 should be established, which should be spaced at least 50 meters apart to avoid repetition.

For the implementation of the permanent plots, its vertices should be located properly georeferenced with PVC pipes (11/2") preferably orange, in addition to these, secondary points should be located with white PVC pipe (11/2") indicating the perimeter of the area, this in order to identify easily and quickly these plots.

With the help of GPS, the primary vertices must be clearly georeferenced and marked with an aluminum plate, and duly numbered indicating the name of the test and the consecutive vertex.

Marking of plant individuals.

Within each of the permanent plots, it is necessary to consider the sampling of individual, which, according to Rangel and Lozano (1986), are established at ground level: <0.3 m high, herbaceous: 0.3-1.5 m, shrub: 1.5-5 m, low trees: 5-12 m, lower tree 12-25 m and upper tree ><0.30 m high, herbaceous: 0.3 - 1.5 m, shrub: 1.5 - 5 m, low trees 5 - 12 m, lower tree 12 -25 m and upper tree >25 m. Each of the individuals should be marked with yellow asphalt paint (heavy traffic) and the circumference as follows: the front-flush layer should be marked 10 cm from the ground, if it belongs to the grassy layer, the circumference should be marked 10 cm below the first branch (first fork) or 10 cm from the ground if the individual has several branches (<30cm). Finally, if the individual belongs to the shrub, tree and arboreal strata, the circumference at breast height is marked when it is 10 cm in diameter (at a height of 130 cm from the ground) (IvAH, 2015).

Each individual must be duly marked with a unique number that clearly identifies it, always using consecutive numbers for each trial and/or permanent plot.

Monitoring for natural regeneration.

In order to conduct proper monitoring and follow-up of the natural regeneration found, 100*100 cm quadrants should be established, permanently installing the vertices, in order to clearly identify the monitoring of the lower shrub strata

Data collection.

For each of the permanent plots, at least the following characteristics of the individuals found should be taken.

- **Diameter (cm):** Bearing in mind that in the previous steps it was estimated to mark the circumference of the individuals, each one of them should be measured with the help of a calibrator (individuals with diameter < 1 cm, the larger and smaller diameter is taken, these are averaged to obtain the final diameter) and tape measure (individuals with diameter ≥ 1 cm), in the latter case the diameter is calculated by dividing the circumference by π (3).1416).

- **Top diameters (cm):** The measurement of the cups is made from end-to-end, taking as reference the edges of the main top, averaging them.

Similarly, the following criteria could be considered for the collection of information (Table 12-6):

Table 12-6. Information to be considered when recording data

Criterion	Indicator	Quantifiers	Type	Scale/Subtype
Composition	Number of species	Taxonomy: Family, genus, species	Cl	Nominal
	Origin	Native, exotic	Cl	Nominal
Structure	Density of individuals	Number of individuals per unit area	Cn	Discreet
	Stem development	Diameter increase (cm)	Cn	Continuous
	Vertical growth	Increase in height (m)	Cn	Continuous
	Occupation of space	Increase in crown coverage (m)	Cn	Continuous
Function	Phytosanitary status	Health symptoms or physical effects	Cl	Nominal
	Form of growth	Existence value	Cl	Nominal
	Phenology	Existence value	Cl	Nominal

Source: IvAH, 2015

- **Height (m):** This variable will be measured by means of a hypsometer, from the base to the end of the most apical branch.

- **Taxonomic identification and species origin**: individuals inventoried in the field are recorded under the common name, provided by local experts, as well as scientific names recognized by the technical team and field assistants. Species that cannot be determined by scientific names must be properly collected and brought to a certified herbarium.

- **Phenology:** presence of reproductive structures at the time of inventory, each time monitoring is performed and the date of data collection.

- **Spacing of individuals:** measures X and Y on a central reference point.

- **Regeneration:** it must be recorded by measuring the cover occupied by the morphospecies in 100 quadrants of 10 x 10 cm (grid of 100 x 100 cm). Thus, the estimation of the coverage is based on the proportion of points (quadrants) in which the morphospecies is present, additionally in each quadrant (1 m2) the average height of each one is recorded (Barrera et al., 2010).

Criteria and indicators for vegetation monitoring.

Once this information is collected, some suggested indicators for the monitoring of the restoration processes will be performed , such as species richness , diversity, abundance , dissimilarity , species importance value , physiological prevalence , density , mortality and recruitment indices, vertical and

horizontal growth ratio, vegetation adaptation indicator, existence value, floral progress indicator, and so on, will be considered.

Vegetation monitoring and adaptive management.

In order to permanently monitor the adaptation of each individual and the restoration of the same in the short, medium and long term, the possible scenarios in Table 12-7.

Table 12-7. Possible adaptive management actions in the short, medium and long term.

Deadline	Objective restoration	Objective monitoring	Management actions
Short	Regenerating the ground cover	Evaluate the development of shrub, herbaceous and grass cover vegetation	Management actions 1. Introduction of organic layer and seeds for the recovery of the cover. 2. Control of the erosive processes that may be generated. 3. Soil regeneration for rooting tree species. 4. Nutrient implementation.
Medium	Generation and incentive for bush regeneration	Evaluate the development and adaptability of vegetation, which will encourage the dispersal and/or propagation of seeds and the assembly of pioneer species.	1. Constant pruning and thinning to avoid competition. 2. Removal of invasive plants, which do not allow for the proper growth or development of the others. 3. Replacement of those species whose growth has been faster due to adverse conditions.
Long	Enriching species communities	Assess the growth and development of planted species and their adaptability over time	1. Transplanting of the species with the lowest growth rate. 2. Thinning and thinning to avoid competition. 3. Stalls to avoid competition from the Arvennes. 4. Exhaustive phytosanitary control and application of necessary corrective measures.

Source: Touchstone Colombia S.A.

Final considerations.

The restoration project would not be possible if the community did not intervene in this process and become a participant; that is why various workshops, socializations and activities aimed at community participation should be carried out, where the decision-making process is conducted by the community to exchange knowledge points and effectively monitor the restoration.

Each of the socializations should have evidence, minutes and brochures showing that it was a concerted task between participants.

12.1.11.2 Fauna monitoring program

Since the objective of restoration in this case is not only the change of one cover for another (pastures for secondary vegetation), but also the establishment of a complex and stable ecosystem structure in the areas to be restored, the monitoring of birds, mammals and herpetofauna, indicators of different processes that signify the success of the activities implemented for the restoration of the designated area, is proposed.

12.1.11.2.1 Birdlife monitoring.

Birds are one of the most important components of a natural or artificial restoration process, since they are one of the main seed dispersers in natural systems (Moreno-Velazques, 2010), so their diversity, composition and structure within an area can reflect the state of restoration and maturation of a location. The following methodology will be used to measure the diversity, composition and structure of the birds in the area:

Sampling of birds by reunion of visual encounters.

For each hectare within the areas to be restored, there will be free routes, mainly in the nuclei of trees planted. The tours will be carried out during 8 hours days, for a total of 15 days, in these tours all the species of birds observed will be registered, recording data of abundance and diversity.

Installation of mist nets

In addition, a total of 15 mist nets per hectare will be installed to capture birds found inside the areas to be restored. The nets will alternate between the different nuclei until the 20 hectares planted are complete, where data on bird abundance and diversity will be collected.

At the end of each sampling, indices of diversity and abundance will be obtained, which must be compared by sampling, in order to monitor the growth and complexity of the bird structure.

12.1.11.2.2 Monitoring of mammals

Mammals generally have high habitat requirements for their populations to be stable and viable, so their presence in particular ecosystems is a sign of good health and optimal conditions. The

monitoring of mammals in the hectares to be restored will be carried out in two phases, which will depend on the structural state of the coverings being restored.

Phase I

This sampling phase will be conducted in the first stages of succession within the 20 ha, where bats (Chiroptera Order) will be sampled, as these mammal species play a fundamental role in natural regeneration through seed dispersal. The sampling of this type of mammals will be carried out by means of the installation of 15 mist nets per hectare, which will alternate within the different planted nuclei, where data on abundance and diversity of species will be obtained.

Phase II

The second phase of mammal sampling will be conducted once the plant structure of the area is in an advanced state and offers habitat requirements for higher-ranking terrestrial mammals. In this phase a total of 30 Sherman traps will be installed inside each kernel, which will be installed in a new kernel every 3 days of sampling. Additionally, within the 20 ha to be restored, a total of 5 trap chambers will be installed randomly, in order to record the presence of larger mammals, which will be active throughout the year and will be reviewed each time the monitoring program is executed.

12.1.11.2.3 Herpetofauna monitoring

The presence of herpetofauna (amphibians and reptiles) within a natural system contributes to primary production and ecological recycling (Urbina et al.; 2015), as well as to the contribution of biomass to food chains because they maintain a natural balance by consolidating themselves as primary and secondary predators (Vitt et al., 2014). This reflects the importance of these groups of fauna, even though their ecological knowledge and state of conservation is scarce for the neotropics, however their abundance and diversity can shed light on the complexity of ecosystem dynamics within a natural system. The monitoring of herpetofauna in the area will be carried out with the following methodology:

Sampling by visual re-encounters survey.

In this case, a 200 meters in length of transect will be traced, within each of the sown nuclei, in each transect all the species of herpetofauna present will be registered and data of abundance and diversity will be registered.

12.2 SCHEDULE

Annex 12-1 presents the annual activity schedule for the 1% investment plan.

12.3 BUDGET

For the development of the 1% investment plan, an initial investment of $. 26,171,215, an annual investment of $. 2,865,240 in inputs and $. 190,978,831 in the payment of professionals for the first year and $. 96,068,772 as of the second year are required.

The total budget of the investment plan exceeds the 1% estimated in Table 12-1,, however Touchstone Colombia S.A. assumes these costs.

12.4 EXPECTED RESULTS

Once the different restoration measures described in this plan have been implemented, it is expected in the areas selected for the implementation of the methodology that a strong dynamic in the different biotic components is established, in addition to the growth of the forest cover in the area and the structural connectivity with the different forest remnants present in the surrounding areas, thus improving, among other things, the local diversity and the ecosystem services it provides.