14. Simplified Land Use Compensation Plan (SLUCP)

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ENVIRONMENTAL AND SOCIAL CONSIDERATION SURVEY (ESCS) FOR PREPARATORY SURVEY ON THE PROJECT FOR REINFORCEMENT OF TRANSMISSION NETWORK IN NACALA CORRIDOR IN THE REPUBLIC OF MOZAMBIQUE

Simplified Land Use Compensation Plan (SLUCP)

January 2015

THE PRESENT DOCUMENT COMPRISES:

PART 1: EXECUTIVE SUMMARY

PART 2: SIMPLIFIED LAND-USE COMPENSATION PLAN

ACRONYMS AND ABBREVIATION

DUAT	Direito de Uso e Aproveitamento da Terra (*right of use and benefit of land*)
DPA	Direcção Provincial de Agricultura (*Provincial Directorate of Agriculture*)
EDM	Electricidade de Moçambique, E.P.
ESIA	Environmental and Social Impact Assessment
HH	Household Head
JICA	Japanese International Cooperation Agency
MICOA	Ministry for the Coordination of Environmental Affairs
MZM	Mozambican Meticais
PAP	Project Affected Persons
ROW	Right-of-Way
RU	Relocation Unit
SES	Socio-Economic Survey
SLUCP	Simplified Land Use Compensation Plan
TL	Transmission Line

DEFINITIONS OF TERMS

Assistance	Support, rehabilitation and restoration measures extended in cash and/or kind above the compensation for lost assets.
Census	The field survey carried out to identify and determine the number of Project Affected Persons (PAP) and their assets, in accordance with the internationally accepted procedures satisfactory to JICA Policies. The meaning of the word also embraces the criteria for eligibility for compensation, relocation and other measures, emanating from consultations with affected communities and the local leaders within the project area.
Compensation	Cash or payment-in-kind to which the affected persons are entitled, in order to replace the lost assets, resources or income, at the time it needs to be replaced.
Cut-Off Date	Date of completion of the census and assets inventory of persons affected by the Project. Persons occupying the Project area after the Cut-off date are not eligible for land and assets entitlements.
Entitlement	A variety of measures including compensation, income restoration and interim support, transfer assistance, relocation and other benefits that is due to affected persons, depending on the nature or their losses, to improve their economic and social base.
Entitlement matrix	Identifies categories of eligible persons and the specific entitlements for each category.
Encroachers	Those people who move into the project area after the cut-off date and are therefore not eligible for compensation or other rehabilitation measures provided by the project.
Grievance Procedures	The processes established under administrative decision to enable project affected persons to redress issues related to acquisition, compensation, or other aspects.
Household	A household includes all persons living as a single-family unit sharing the same space.
Income restoration	Re-establishing income sources and livelihoods of affected persons.
Inventory of losses	Complete and accurate count of the persons, households, land, business and other assets on the land that is affected by the project.
Involuntary Resettlement / Resettlement	The unavoidable displacement of people arising from development projects that creates the need for rebuilding their livelihood, income and asset bases in another location (i.e displacement of people from their homes, lands, livelihoods).
Project Affected Persons (PAP)	Any person, who as a result of the implementation of a project, losses the right to own, use, or otherwise benefit from a built structure, land, annual or perennial crops and trees, or any other fixed or moveable asset, either in full or in part, permanently or temporarily.

Relocation	Moving of affected person's properties and economic activity (i.e farms, shops) to another location.
Replacement cost	The method of valuation of assets that helps determine the amount sufficient to replace lost assets and cover transaction costs. In applying this method of valuation, depreciation of structures and assets should not be taken into account. For losses that cannot easily be valued or compensated for in monetary terms such as farmlands, attempts are made to establish access to equivalent and culturally acceptable resources and earning opportunities. **In a land in rural area**, replacement cost is defined as the pre-project or pre-displacement value, whichever is higher, of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes.
Compensation Budget	A detailed breakdown of all the costs of a compensation plan phased over the implementation period.
Vulnerable groups	Distinct groups of people who might suffer disproportionately from displacement effects, such as, the old, the young, the handicapped, the poor, isolated groups and single heads of households.

PART 1

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The reinforcement of the transmission network in the Nacala corridor project is a small-scale project that falls under the area of influence of the already approved ESIA study by Ministry for the Coordination of Environmental Affairs (MICOA) for the NORCONSULT Feasibility Study on Chimuara-Nacala Transmission Project, completed in October 2013.

The main objective of this Simplified Land Use Compensation Plan (SLUCP) is to address the social impacts of the project and ensure the successful restoration and improvement of the living standards, income earning capacity and production levels of Project Affected Persons (PAP). To compensate for the socioeconomic losses the study proposes a comprehensive compensation package.

The general guiding principles for achieving the objective of this SLUCP are, among others, that there should be fair compensation upon land acquisition, relocation, loss of assets and impact on livelihood.

The proposed site is located in Namialo area, in the administrative district of Meconta, Nampula Province. The gross land area required for the construction of the new substation is about 25 hectares.

The SLUCP was drafted by taking into account the data generated through Socio-Economic Survey of all the project affected persons.

The socioeconomic survey was done covering 100% of the project affected Household Head (HH) with farming activity within the project area.

The socioeconomic survey collected a wide range of data, such as, demography, number of affected households; members of the affected households, sources of livelihood, age/sex distribution, education, occupation, income, types and ownership status of affected land, vulnerability, etc.

The socioeconomic survey revealed the following findings:

- The majority of the PAP is ethnically Makhua;
- The common spoken language is Emakhuma;
- Society is characterized as being matriarchal;
- PAP obtain their income from agriculture;
- None of the 19 household heads interviewed have a written DUAT title for the land they use.
- 42% of HH are female;
- The gender balance among PAP is fairly even;
- The average household size consists on 7.7 members;

- 37% of all household heads in the project area are single;
- The population in the project area are relatively young with over 50% aged under 20;
- 67% of males on the project area attended to primary school;
- 8% of the PAP are to be considered vulnerable;
- The average size of farm within the project area is 0.32 hectares;

In regarding to assets there are approximately 1,708 fruit trees, with economic value, that will be lost to the project.

In respect to the total project proposed area, 25 hectare, only approximately 3.0 hectares were in fact cultivated.

The fundamental principle of the SLUCP is that all persons, regardless the type of ownership, occupying, using or doing income generation activities inside the project area are eligible for a compensation package.

Thus, agricultural land within the proposed site for the construction of the new substation and access road will be compensated in kind, including replacement cost.

The Nampula Directorates of Agriculture provided the unit price for calculating compensation values for crops and trees through the table of price for food crops for compensation for loss of harvests (Refer to Annex A).

Thus, each affected crops were valued in the following way:

Crop area x crop price

And each fruit trees were valued as following:

Fruit tree x price

The total estimated value of the assets affected by project is approximately 554,515.00 Mozambican Meticais, 151,015.00MZM associated to the affected crops and 403,500.00MZM in regarding to the valuation of fruit trees.

The **Constitution of the Republic of Mozambique** states, in its fundamental principle, that all natural resources and means of production are public property of collective interest. Thereby, the land belongs to the State and the right to use it can only be granted by the State through a formal land use title (DUAT). Article 9 of the Land Law, however, fully recognizes the legitimacy of the occupation of land by individuals or communities, when made according to customary principles.

Under the Mozambican **Law on Territorial Organization** a fair compensation must be paid for loss of property and/or the loss of means of livelihood induced by the project.

Although in recent years the national legislation has been changed significantly as a result of the need for greater protection of the public interests and their property, a gap between existing legal framework of Mozambique and requirements of the JICA guidelines is still there, especially regarding to compensation for losses.

Gaps between Mozambican legislation and JICA Guideline, in the context of the SLUCP, are presented on chapter 3.3.

The following table provides an entitlement matrix for losses incurred by PAP.

Item Nº	Type of loss	Entitled Person (Beneficiaries)	Entitlement (compensation Package)	Responsible organization
1	Loss of agricultural land (permanent)	Owners with traditional rights to the agricultural land located inside the project site	Compensation in kind. Replacement land with at least the same size and productivity potential. Assistance in kind: New land preparation, including payment for wages, at market price by employer.	Proponent (EDM) or Subcontracted entity
		Tenant of agricultural land located inside the project site	No compensation for loss of land; Compensation for loss of crops	Proponent (EDM) or Subcontracted entity
2	Loss of cropping areas	Owner of crops located inside the project site	Monetary compensation based on the relevant agriculture crop loss compensation tables as legally determined by the Nampula Provincial Directorate of Agriculture (DPA-Nampula). The compensation tables could be referred to in Annex A of this SLUCP Report. The compensation is based on the current market price and productivity values for various annual and permanent crops. Assistance in kind: Seeds will be provided.	Proponent (EDM) or Subcontracted entity
3	Loss of fruit trees	Owner of fruits trees located in the project site	Monetary compensation based on the relevant fruit tree loss compensation tables provided by the Nampula Provincial Directorate of Agriculture (DPA-Nampula) as referred above.Replacement trees: For each loss trees two trees will be replaced.	Proponent (EDM) or Subcontracted entity

The implementation of the Simplified Land Use Compensation Plan it proposed to be pursued by EDM in cooperation with Nampula Provincial Government, Meconta District Administration, Nampula Provincial Directorate of Agriculture, Nampula Provincial Services of Geography and Cadastre as well as with the Traditional Authorities.

In addition, EDM may set up a Compensation Advisory Committee at the project level to involve the local community in the implementation process.

The Committee will ensure local participation in the implementation of the SLUCP and provide support to PAP on grievance resolution.

Appropriated conflict resolution mechanisms will be established in order to ensure that the grievance is well addressed. When conflicts cannot be resolved at the Project level, formal second instance mechanisms will be required.

EDM shall establish a Relocation Unit, an internal monitoring system for collection, analysis and reporting on SLUCP progress. In addition, an independent external monitoring and evaluation agency will be commissioned for monitoring the impact of the SLUCP implementation and periodic evaluation of compensation process and final outcome.

The performance indicators will be listed and monitored by means of the two monitoring mechanisms.

A total estimated time of 14 month is suggested for the implementation of SLUCP. The proposed process for compensation and posterior reallocation will occur within the first 4 months. Additional 10 months will be required for monitoring PAP and ensure that livelihood and income have improved at least to the pre-project standard, by allowing the monitoring to cover at least 2 harvest seasons.

In order to implement the Simplified Land Use Compensation Plan on the Project for Reinforcement of Transmission Network in the Nacala Corridor a grand total of 1,337,515.00 Mozambican Meticais is estimated to be necessary.

PART 2

SIMPLIFIED LAND-USE COMPENSATION PLAN

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1 INTRODUCTION

1.1 Objective

The main objective of this Simplified Land Use Compensation Plan (SLUCP) is to address the social impacts of the project and ensure the successful restoration and improvement of the living standards, income earning capacity and production levels of Project Affected Persons (PAP).

Thereby, it aims to ensure that no affected person shall be worse off as a result of the Project and that PAP are provided with sufficient compensation and assistance for lost assets which will help them improve or at least restore their pre-project standard of living.

To compensate for the socioeconomic losses the study will also propose a comprehensive compensation package so that the affected persons at least can restore their pre-project socio-economic standard.

The general guiding principles for achieving the objective of this SLUCP are, among others, that there should be fair compensation upon land acquisition, relocation, loss of assets and impact on livelihood.

In this sense, in order to mitigate the socio-economic impact of the project on PAP, the SLUCP purposes are: 1) to assess the impacts and to determine compensation for losses by PAP; 2) to present organizational responsibilities for implementation of the SLUCP; 3) to prepare an implementation schedule; 4) to prepare an implementation budget for the SLUCP and; 5) to prepare monitoring and evaluation mechanisms for implementation process.

The SLUCP was drafted by taking into account the data generated through Socio-Economic Survey (SES) of all the project affected persons and the results of meetings with different stakeholders.

The present study was conducted in accordance with environmental guidelines for Category B Project of Japan International Cooperation Agency (JICA) in addition to technically compliancy of the environmental guidelines of Mozambique for Category B Project.

The reinforcement of the transmission network in the Nacala corridor project is a small-scale project that falls under the area of influence of the already approved ESIA study by Ministry for the Coordination of Environmental Affairs (MICOA) for the NORCONSULT Feasibility Study on Chimuara-Nacala Transmission Project, completed in October 2013.

According to the National legislation, no further ESIA study for the project is required.

Still, in order to meet the JICA Guidelines for Category B projects a Simplified Land Use Compensation Plan must be conducted.

1.2 Project Description

The project aims to reinforce the transmission network in the Nacala corridor. For this purpose, the construction of a new electricity transformer substation located along the Right-of-Way (ROW) of an already existing power transmission line (TL) and a new access road is planned.

The proposed site for this new substation is located at the deviation point of the two existing transmission lines, one to Nacala and the other to Metoro. This substation location at 2 parallel transmission lines facilitates the availability of wider width area of ROW for the substation. The gross land area required for the construction of the new substation is about 10 hectares.

The new access road is located along 1.5 km in length of the existing 110kV high voltage power transmission line to Metoro and aim to facilitate effective transportation of construction materials and equipment from the EN12 (National Road 12) to the substation.

Therefore, significant part of the project facilities of both the access road and substation is expected to be provided within the existing ROW of the transmission lines under the jurisdiction of the project proponent, Electricidade de Moçambique, E.P. (EDM).

1.3 Project Site

The project site is located in Namialo area, in the administrative district of Meconta, Nampula Province.

The present study will address the affected households, population and asset throughout the entire gross land area of 25 hectares, 10 ha for the proposed site for the new substation project and 15 ha for the new access road.

It may be mentioned that the electricity transformer substation will have to be constructed from scratch which may require land acquisition at the selected place of Namialo.

The project site (Figure 1) is basically located in an area that is open/vacant lands interspersed with small-scale agricultural subsistence oriented farmlands, machambas, with no human settlements. There is no housing/human settlement in the gross 100m of ROW located along the TL planned for the project facilities of access road and substation.

Figure 1- Map of Namialo Substation proposed Site

Given the location of the project no physical reallocation is expected to be conducted, although, the project may generate temporary economic displacement to PAP with economic activity along the site. The impacts are mostly on annual crop, trees and land.

In this sense, land users will only be compensated by the loss of income earning capacity (production levels).

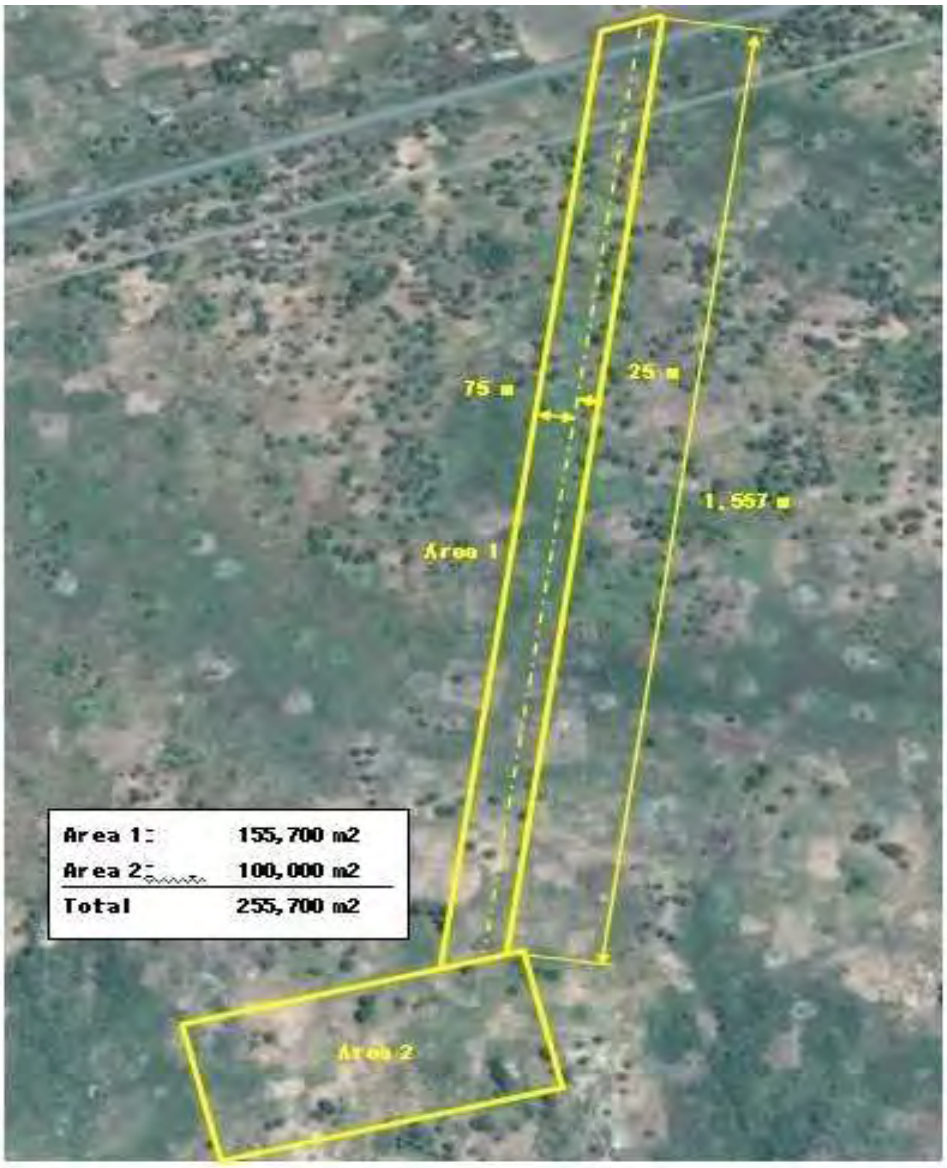

Figure 2 - View of project area

According to JICA guideline involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.

The choice of the project site has followed this principle in the sense that both access road and substation is expected to be provided within the area of existing ROW of the transmission lines under the jurisdiction of EDM. On the other hand, all alternatives that have been studied generate major impact (involuntary resettlement and loss of means of livelihood) on the community. For this reason the choice of the actual site results from prior analyses that aimed to minimize and avoid involuntary resettlement and loss of means of livelihood.

2 SOCIO-ECONOMIC SURVEY AND DATA ANALYSIS

The census covered the totality of the project area and all owner of the small farmland (machambas) were inquired. This section summarizes the findings of the census and socioeconomic surveys and thus describes project impacts as well as a socioeconomic overview over PAP.

2.1 Methodology for Socioeconomic Survey and Census on PAP

The approach adopted to conduct socio-economic study is described below. The study has been conducted in accordance with both JICA guidelines and the Mozambique guidelines.

The census and a socio-economic survey was carried out in July 18th to provide essential details on the project affected persons (PAP) and further assess the magnitude of likely impacts on the livelihood. (See Data Collection Report)

The socioeconomic survey was done covering 100% of the project affected Household Head (HH) with farming activity within the project area. The identification of the farmers and land holders inside the project area was made with the help of the traditional authority that follows the socioeconomic team from day one through all stages.

In addition, the presence of a local translator was required to facilitate the communication between the team and the local community.

Based on the ROW identified by the technical engineers and marked on cadastral maps, the survey team covered small farmland within the project proposed site and the access road with a corridor width of 100 meters.

The survey included:

(i) Census of the project affected persons;
(ii) Socioeconomic survey of the households heads with farmlands in the project area;
(iii) Measurements of the farmland that needs to be compensated;
(iv) Inventory of losses. Identification of specific crops and fruit trees in the farmlands;
(v) Photography of the affected properties, both farmland and trees;

The survey team also carried out in depth interviews with the secretary of the affected area and the secretary of the nearest area on their socioeconomic conditions and to obtain further detailed information on

their opinion with regard to the project, displacement and income restoration.

The socioeconomic survey collected a wide range of data, such as demography, number of affected households; members of the affected households, sources of livelihood, age/sex distribution, education, occupation, income data, types and ownership status of affected land, vulnerability, etc.

As procedure, signatures from the inquired HH, the secretary of the affected area and a witness were required on the last sheet of the questionnaire stating the exact details of assets held at the time of the survey. For record purposes and to avoid conflict, household heads were photographed while signing and holding a census ID card. (See Annex I)

2.2 Livelihoods

Both project site and access road are located in an area with no human settlement. The area is characterized by small plots of farmland, machambas, where the local community cultivates, mostly subsistence agriculture.

The nearest locality is Micolene, where most of the PAP lives. The majority of the project affected persons is ethnically Makhua.

Although the official language in Mozambique is Portuguese, most of the PAP do not speak Portuguese fluently. The common spoken language among the population is Emakhua.

As among Makhuas in general, the local communities residing in the Project's area of influence are matriarchal, women playing an important role in both education of the children and as support of the family. In most cases the woman is the head of family.

All the respondents stated that they obtain their income from agriculture. The main crops in the area are corn, cassava, beans and nuts.

In fact, both male and female participate in the farming activity in order to get food or incomes from selling agricultural surpluses. The products are sold at prices set by the buyers, and the income is used to buy other basic goods and make payments.

Given the small scale of farming activates on project site, no machinery is used and hoes are the only instrument used.

The harvest depends on factors such as seasonality, weather condition and manpower to work the land.

The majority of the houses in Namialo are constructed with traditional methods, walls are made of a combination of wood, clay and adobe, while roof are covered with straw or zinc. Figure 3 shows a traditional house in Namialo.

In general the houses don't have plumbing or electricity. The drinking water originates either from communal wells, holes and/or rivers.

The survey revealed that there are no graves and sacred or culturally important sites in the project area.

Figure 3 - Traditional house in Namialo

2.3 Results of the Socio-Economic Survey

A total of 19 household heads with small farmlands and fruit trees on the project site were surveyed through a structured socioeconomic survey questionnaire. This includes 2 households with farmland within the new substation project and 17 households with farmland in the area proposed to be the access road to the project site. This represents 100% of the project affected persons.

All of the 19 household heads interviewed stated that they have not requested the legal title of the land they use, DUAT. However, according to

the Mozambican law, they are entitled to the land either because they have occupied the land for more than ten years or they have been allocated by the local traditional authorities.

Two cases of leased land were reported within the access road area.

The Table 1 below presents the number of affected household heads based on the census survey.

Table 1 - Number of Surveyed Households Head

Type of Households Heads	Nº of Households Heads	%
Male HH	11	58%
Female HH	8	42%
Total HH	19	100%

Source: SLUCP team

It must be pointed out that all 19 questioners were answered by HH only, and out of total affected households 42% is female headed and 58% is male headed.

The Gender balance among the project population (PAP) is fairly even at 47% male and 53% female, as shown in Table 2.

With regards to losses, the following table does not discriminate the losses associated with fruit trees or crop since in many cases there is an overlap between the owners of farmland and the owners of crops and fruit trees. This subject will be discussed in detail on the following chapters.

Table 2 - Number of Affected Households by type of loss

Type of Loss		Nº of Households Heads	%of Households Heads	Nº of PAP	% of PAP
Land owners	**Male**	11	58%	57	39%
	Female	6	32%	68	47%
Land lease holder	**Male**	0	0%	12	8%
	Female	2	11%	9	6%
Total		**19**	**100%**	**146**	**100%**

Source: SLUCP team

The average household size consists on 7.7 members. Although it may seem like a high number, it should be taken into account the fact that Namialo is a rural area where polygamy is normal and the number of children in a family represents agricultural extra labour. Furthermore, many households

include extended-family dependents such as aunts, brothers, grandmothers, mothers in law.

It must also be referred that approximately 37% of all household heads in the project area are single and that approximately 63% of female household heads are single, divorced or widowed (Table 3).

Table 3 - Marital status of PAP by Gender and Age

Marital Status	Gender	Total	Age						
			10 - 20	21 – 30	31 - 40	41 - 50	51 – 60	61 - 70	Above 71
Married	Male	25	4	5	3	5	3	4	1
	Female	32	1	11	12	5	2	1	0
Single	Male	28	20	5	3	0	0	0	0
	Female	22	15	1	2	2	2	0	0
Widower /widow	Male	0	0	0	0	0	0	0	0
	Female	2	0	1	0	0	0	0	1
Divorced	Male	0	0	0	0	0	0	0	0
	Female	3	0	1	0	1	0	1	0
Total		**112**	**40**	**24**	**20**	**13**	**7**	**6**	**2**

Source: SLUCP team

In the community females tend to get married at the age of 20 while males only get married at the age of 30.

The population in the project area, both male and female, are relatively young, with over 50% aged under 20, 18% aged between 21 and 30 years old. Only 10% of the population are aged over 51 years (Table 4). The average age of the PAP is 27.6 years.

Table 4 - Distribution of PAP by Age and Gender

Age Group	Male		Female		Total	
	Nº. PAP	%	Nº. PAP	%	Nº. PAP	%
1 – 10	16	23%	18	23%	34	23%
11 - 20	24	35%	16	21%	40	27%
21 - 30	10	14%	14	18%	24	16%
31 - 40	6	9%	14	18%	20	14%
41 - 50	5	7%	8	10%	13	9%
51 - 60	3	4%	4	5%	7	5%
61 - 70	4	6%	2	3%	6	4%
Above 71	1	1%	1	1%	2	1%
Total	**69**	**100%**	**77**	**100%**	**146**	**100%**

Source: SLUCP team

However, the average age of the household head is 53.5 years. The female HH are in average younger then male HH, approximately 47 year and 58 years respectively.

In rural areas such as Namialo the education levels are generally low. There is a trade-off between education and contribution to the household income. The general idea is that a child represents labour force and thereby wealth since they can earn money (on the informal market) or help on the farm augmenting the family income. On the other hand, school represents expenses to the parents.

In this sense, the grand majority of children drop out of school on the secondary level.

According to the result of the census (Table 5), males tend to have more formal education than females. In fact, 67% of males on the project area attended to primary school while only 60% of female attended to primary school.

Table 5 - Distribution of PAP by Education Level and Gender

Age Group	Male		Female		Total	
	Nº. PAP	%	Nº. PAP	%	Nº. PAP	%
None	22	32%	31	40%	53	36%
Attended Primary school	46	67%	46	60%	92	63%
Concluded Primary school	1	1%	0	0%	1	1%
Attended Secondary school	0	0%	0	0%	0	0%
Concluded Secondary school	0	0%	0	0%	0	0%
Attended to college	0	0%	0	0%	0	0%
Total	**69**	**100 %**	**77**	**100 %**	**146**	**100 %**

Source: SLUCP team

There are high levels of illiteracy among the project population. Indeed, 36% of adult household members have no education at all and only one PAP attended to secondary school. Those results do not include children between 1 and 8 year old since they are too young to attend to primary school.

According to JICA guideline, particular attention must be paid to the needs of the vulnerable groups among those displaced. Thus, at all stages of SLUCP, all project affected persons considered to be vulnerable should be properly monitored in order to ensure a successful restoration and/or improvement of the living standards, income earning capability and

production. In other words, ensure that no vulnerable persons shall be worse off as result of the project. Table 6 depicts the number of vulnerable PAP in the area.

Table 6 - Number of Vulnerable PAP

Type of Vulnerability	Vulnerable Male		Vulnerable Female		Total	
	Number	%	Number	%	Number	%
Physical Disabilities	2	67%	1	11%	3	25%
Single Mother	0	0%	3	33%	3	25%
elderly Person (>60 years)	1	33%	5	56%	6	50%
Total Vulnerable PAP	**3**	**100%**	**9**	**100%**	**12**	**100%**
% (Vulnerable/Total)	**4%**		**12%**		**8%**	

Source: SLUCP team

Vulnerability situations recorded during the survey are as follows (Table 6):

- 8% of the PAP are to be considered vulnerable (12 vulnerable persons);
- In the universe of vulnerable persons, women are more vulnerable than men. 75% of vulnerable PAP are female.
- There are 3 persons with physical disabilities;
- Special attention must be given to elderly persons, 50% of the venerable group.
- There is one vulnerable person per household, therefore there is a total of 12 households with vulnerable people.

Difficulties arose when collecting PAP annual income level information. On one hand, people were not receptive to report their annual income. On the other, the annual household income is highly dependent on the production capacity of farms since it is the only income source. Thus, in this case the best performance indicator on household annual income may be the size of farms.

The total farming area within the project site is 9.7 hectares.

On average, a farm within the project area measures 0.32 hectares (Table 7).

Table 7 - Total and average size of the Farmlands

Household head	Nº of farmland	Total size (ha)	Average size (ha)
Male	**11**	**3.3 ha**	**0.30 ha**
Female	**20**	**6.5 ha**	**0.33 ha**
Total	**31**	**9.8 ha**	**0.32 ha**

Source: SLUCP team

Survey results indicate that, on average, farmlands owned by a female household head are larger than male headed household farmlands. Households typically have between one and four farmlands.

According to the respondents, commuting between the family house and the family farmland typically takes between 30 and 90 minutes, by foot (see Table 8).

Table 8 - Time expended to the farmland (daily)

Nº of HH	Time Spend (min)						
	0 - 15 m	16 - 30 m	31 - 45 m	46 - 60 m	61 -75 m	76 - 90 m	More than 90 m
Male	0	2	4	4	0	1	0
Female	0	3	2	1	0	2	0
Total	**0**	**5**	**6**	**5**	**0**	**3**	**0**

Source: SLUCP team

The majority of PAP takes between 30 and 60 minutes to walk from their houses to the farmland. Those are the PAP located within the access road area. Households having agricultural plots located on the substation project site spend, on average, more time to access the land. Access to the farmland can only be done by foot.

2.4 Inventory of Affected Assets

The socioeconomic survey revealed that within the project area there are approximately 1,708 fruit trees with economic value that will be lost to the project. Those trees play an important role in the local economy since they provide fruits that are typically consumed or traded.

The Table 9 presents the varieties of fruit trees affected by the project.

Table 9 - Number of fruits trees affected

Type of tree	N.º of Fruit Trees
Banana	1,498
Cashew	164
Mango	40
Pear	1
Guava	4
Papaya	1
Total	**1,708**

Source: SLUCP team

It must be referred that at the moment that the socio-economic survey was conducted most of the farmlands were not cultivated duo to seasonality of the main crops.

On this sense, in respect to the total project proposed area, 25 hectare, only approximately 0.3 hectares were in fact cultivated (Table 10).

Table 10 - Type of crops and cropped area affected

Type of Crop	Area of Plantation (ha)
Cassava	0.22 ha
Beans	0.07 ha
Total	**0.29 ha**

Source: SLUCP team

The following Table 11 resumes the inventory of asset affected by the implementation of the project and that can be eligible for compensation.

Table 11 - Total of farmland and fruit trees within the project area

Area	Nº of Household head	Nº of farmland	Size (ha)	Nº of trees
Substation	2	10	3.23 ha	183
Access road	17	21	6.54 ha	1,525
Total	**19**	**31**	**9.77 ha**	**1,708**

Source: SLUCP team

2.5 Valuation of Assets

The fundamental principle of the SLUCP is that all persons, regardless the type of ownership, occupying, using or doing income generation activities inside the project area at the cut-off date are eligible for a compensation package.

Thus, loss of agricultural land within the proposed site for the construction of the new substation and access road will be compensated in kind, including replacement cost. As such no financial valuation was made for loss of farmlands. The terms of such compensation will be presented on the entitlement chapter.

The Nampula Directorate of Agriculture provided the unit price for calculating compensation values for crops and trees. The table of price for food crops for compensation for loss of harvests produced by the Nampula Directorate of Agriculture is presented in Annex A.

During the public consultations PAP were informed of the method of valuation of their assets.

Annex B presents a detailed inventory of asset and it valuation for each PAP.

The following sections describe the methods by which compensation for both fruit trees and crops were calculated.

2.5.1 Valuation of Crops

The crops were assessed based on the formula established by the Nampula Directorate of Agriculture. The calculation of compensation value of each plant depends on the type of plant and the production area.

Since plots can have more than one type of crop, the methodology adopted in the valuation process was to consider only the plant with highest economic value and attribute it to the all plot.

In the small plots existing within the project site the main crops produced are cassava and beans.

Thus, each affected crops were valued in the following way:

Crop area x crop price

Table 12 presents the valuations of the crops identify by the census at the cut-of date.

The valuation on the cassava does not depend on the cropped area size. It depends of the number of cassava trees.

Table 12 - Valuation of affected crops

Type of affected Crop	Total Crop Area (m2)	Price (MZM)	Total Crop Value (MZM)
Cassava	22,137	5.00	1,015.00
Beans	7,500	20.00	150,000.00
Total	29,637		151,015.00

Source: SLUCP team

2.5.2 Valuation of Fruit Trees

The value of each fruit tree were also estimated in accordance with the "table of cost for food crops for compensation for loss of harvests" provided by the Nampula Directorate of Agriculture.

In the assessment of the value of fruit tree the age of the tree and the stage of reproduction were taken into account.

Each fruit trees were valued as following:

Fruit tree x price

As presented on Table 13, 1,708 fruit trees were identify in the proposed project site, among them there are banana, cashew and mango trees.

Table 13 - Valuation of affected fruit trees

Type of affected tree	N.º of Fruit Tree	Price (MZM)	Total Tree Value
Banana	1,498	150.00	224,700.00
Cashew	164	1,000.00	164,000.00
Mango	40	300.00	12,000.00
Pear	1	500.00	500.00
Guava	4	500.00	2,000.00
Papaya	1	300.00	300.00
Total	**1,708**		**403,500.00**

Source: SLUCP team

Thus, the total estimated value of the assets affected by project is approximately 554,515.00 Mozambican Meticais (Table 14).

Table 14 - Total valuation of assets affected

Type of asset	Total Value (MZM)
Crops	151,015.00
Fruit Trees	403,500.00
Total	554,515.00

Source: SLUCP team

3 POLICY AND LEGAL FRAMEWORK

This chapter briefly sets out the following:

- Mozambican legislation regarding to resettlement and compensation
- JICA's policy on involuntary resettlement
- Gap Analysis between JICA Guideline and Mozambican Policy

3.1 Mozambican Policy and Legal Framework

The **Constitution of the Republic of Mozambique** states, in its fundamental principle, that all natural resources and means of production are public property of collective interest. Thereby, the land belongs to the State and the right to use it can only be granted by the State through a formal land use title (DUAT).

This position is corroborated by the Land Law (**Law 19/97 of 1 October**) that covers regulation for the key aspects of land occupation and use in Mozambique. According to the land Law all land belongs to the State and cannot be sold, transferred, mortgaged or pledged (Land Law, Article 2).

However, although land is owned by the State, all Mozambicans citizens (regardless of gender), legal persons and local communities have the right to use and enjoy the land or the right to land use and benefits thereto (Land Law, Article 3).

Article 9 of the Land Law recognizes the legitimacy of the occupation of land by individuals or communities via traditional structures, customary right, while Article 10 provides for the rights derived from the occupation of land by Mozambican individuals, when the occupation is in good faith and extends for more than 10 years, even without a regular title. Thus, the absence of formal written title (DUAT) issued by the official cadastral services does not imply any loss of rights over land.

Under the DUAT, the right for use and exploitation of land for economic activities is granted for a maximum period of 50 years, renewable for an equal period on request by the interested party (Article 17). The right of use and exploitation of land occupied by traditional communities is not limited by any term (Art.17-2).

A Land-use title, DUAT, or obtained by customary norms and practice, may be revoked where this is in the public interest, preceded by provision of fair compensation (Article 18). Procedures for the termination of a land title in

the public interest must follow expropriation procedures and after payment of fair compensation;

In Article 13 is recognized the role Local communities and in the identification and definition of the boundaries of the land they occupy and the process for obtaining the title. In addition, communities are involved in both natural resource management and conflict resolution processes. The articulation procedures between local State authorities and community leaderships (local councils, community leaders and zone secretaries) are described by **Decree-Law 15/2000**.

The **Framework Environmental Law** (1997) provides the legal framework for the use and sustainable management of the environment and seeks to protect environmental components with recognized ecological and socioeconomic values. The law is applicable to all public and private activities that direct or indirectly affect the environment with or without significant impact.

The **Environmental Impact Assessment Regulation** approved on 29th of September 2004 (Decree Nº. 45/2004) provide the framework for the responsibility and conduct of Environmental Impact Assessment for various infrastructure projects and highlight the importance of the public consultation process in carrying out EIA studies and in development of environmental management plans.

According to this regulation the granting of an environmental license is a prerequisite to a range of development activities defined in the Regulations. The process of EIA in Mozambique follows a set of protocols in the Environmental Impact Assessment regulations (defined by MICOA's guideline) and the extent of the EA is decided upon by the National Directorate of Environmental Impact Assessment from MICOA after review of the Registration Process containing among others, an environmental screening form.

As the results of this environmental screening, a project is given environmental category which consists of three, Category "A", Category "B" and Category "C", in accordance with the degree of predicted negative impacts on social and nature environment.

The Table 15 below provides a brief overview of the Environmental Impact Assessment Regulation in regard to categories as well as the requirement of each category.

Table 15 - Environmental categories, impact and requirement under Environmental Impact Assessment Regulation

Category	Impact	Requirement
Category A	Significant and irreversible impact is predicted by the project implementation	Environmental Impact Assessment (EIA) and at least of one public consultation are required
Category B	The adverse impact is predicted but the impact level may not be significant comparing with Category A.	Simplified Environmental Impact Assessment Report is required. In case of relocation of people is involved with a project then the project is required to hold at least of one public consultation
Category C	The adverse impact is predicted to be low or none	No requirement. However the appropriate environmental management including the monitoring is required

The specific scale standards and the pre-requirement conditions for the classification of the project are described in detail on the regulation.

Once an environmental license has been granted the proponent can begin the process of project implementation.

The Mozambican **Law on Territorial Organization** was established in 2007 and enforced the need for spatial organization in rural areas as well as the principles of public participation, rights to information and equality of opportunity in access to land, infrastructure and services.

Under this law, fair compensation must be paid for loss of property and/or the loss of means of livelihood induced by the project.

The Law on Territorial Organization is complemented by the **Regulations of the Law on Territorial Organization** promulgated in 2008 (Decree 23/2008), wish regulates the bases for calculating compensations for loss of assets and stipulate that the payment must take place prior to expropriation. According to the regulation compensation may be in cash or in kind and it should not only cover the real value of expropriated assets, but also damage and loss of profit. Moreover, a social cohesion disruption coefficient should be applied in the calculation of the compensation package. Compensation for crops should take into account several factor such as the life-span, age, productive period, average annual yield, as well

as a coefficient (between 0 and 1) on the crop condition and factors that may affect crop performance.

The **Ministerial Diploma 181/2010** of 3 of November regulates the process of expropriation for projects declared as being of public interest. The directive contains specific guidelines to the compensation of losses induced by Projects. A basic guide on compensation for permanent and annual crops is provided and updated by the Provincial Directorates of Agriculture. It covers the current market price and productivity values for various annual and permanent crops.

3.2 JICA Policy

The key principle of JICA policies on involuntary resettlement is summarized below:

- Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.
- When population displacement is unavoidable, effective measures to minimise the impact and to compensate for losses should be taken.
- People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.
- Compensation must be based on the full replacement cost as much as possible. For the propose of the project JICA guideline states that the replacement cost for an agricultural land must reflect the market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes.
- Compensation and other kinds of assistance must be provided prior to displacement.
- For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12.
- In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.

- Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.
- Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

It may be mentioned the JICA's overall policy on Involuntary Resettlement is almost similar to those of other donors' policy in this respect.

Thus, the above principle is complemented by the World Bank OP 4.12, since it is stated in JICA Guideline that "JICA confirms that projects do not deviate significantly from the World Bank's Safeguard Policies". Additional key principle based on World Bank OP 4.12 is as follows.

- Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits.
- Eligibility of Benefits include, the PAP who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAP who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAP who have no recognizable legal right to the land they are occupying.
- Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.
- Provide support for the transition period (between displacement and livelihood restoration).
- Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc.
- For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.

In addition to the above core principles on the JICA policy, it also laid emphasis on a detailed resettlement policy inclusive of all the above points; project specific resettlement plan; institutional framework for implementation; monitoring and evaluation mechanism; time schedule for implementation; and, detailed Financial Plan etc.

3.3 Gap between Mozambican Legislation and JICA Policy

Although in recent years the national legislation has been changed significantly as a result of the need for greater protection of the public interests and their property, a gap between existing legal framework of Mozambique and requirements of the JICA guidelines is still there, especially regarding to compensation for losses.
The Land Law Legislation has captured internationally innovative features that facilitate equitable development, based on relations that are mutually beneficial to local communities and to investors whether these are national or foreign.

JICA's guideline results from a set of lessons and best practices of the resettlement/displacement process in different countries of the world.

These practices have been optimized in order to minimize risks associated with the process maximizing the benefits, especially with regards to the affected people and the most vulnerable.

Therefore, the present SLUCP adopted the policies and procedures set out in the guideline JICA, jointly with the best practices established by national legislation. As result, the SLUCP represents the harmonization between the two instruments safeguarding, whenever possible, the best interest of PAP. So where Mozambican legislation differs or do not mention specific issues, the principles of JICA guideline will be considered. These issues include the eligibility of persons without legal rights to the land, grievance and redress mechanisms, etc.

Gaps between Mozambican legislation and JICA Guideline, in the context of the SLUCP, are presented on the Table 16 below.

Table 16 - Gaps between JICA Guideline and Mozambican Legislation

JICA Guidelines	Mozambican Legislation	Adopted Measure in SLUCP
Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives	There is no provision for this under Mozambican legislation	Others viable alternatives were explored. The adopted solution minimizes the impacts on livelihood with no involuntary resettlement.
Compensation must be based on the full replacement cost as much as possible. For the propose of the project JICA guideline states that the replacement cost for an agricultural land most reflect the market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes.	Decree No. 23/2008 states that compensation can be in kind or cash. Although the law requires compensation in market value, compensation are in fact "defined" in the legislation for structures and crops, and any adjustment must be agreed with DPA. On other hand, legislation refers that compensation should reflect depreciation of value of structures through age. National legislation does not predict other kinds of assistance beyond compensation.	Agricultural land will be replaced by new land with equal productive potential located as close as possible of the current farmland. Crops will be compensated with market value defined by DPA. In addition, seed will be provided. Trees will be replaced (two trees for each lost) plus the monetary compensation in accordance with DPA definition.
Appropriate and accessible grievance mechanisms must be established for the affected people and their communities	National legislation does not specifically require the creation of a grievance mechanism for the affected people, although this is common practice and the role of local leaders in process facilitation and dispute resolution is recognized.	Appropriate and accessible grievance mechanisms will be established for the affected people and their communities
Eligibility of Benefits include, the PAP who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAP who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAP who have no recognizable legal right to the land they are occupying.	Mozambican law does not specifically states that Tenant have right to any compensation, although this is common practice.	Compensate tenant for types of losses in production/crops and fruit tree
Provide support for the transition period (between displacement and livelihood restoration	There is no provision for other kinds of assistance beyond compensation.	Assistance will be provided specially to the more vulnerable
For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.	Mozambican legislation requires planning instruments, such as resettlement action plans. However it does not differentiate planning instruments according to the scale and characteristics of displacement	Only this SLUCP is prepared since there is no involuntary resettlement is involved for the conduct of even Abbreviated Resettlement action plan (ARAP).
JICA Guidelines	Mozambican Legislation	Adopted Measure in SLUCP

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4 DESCRIPTION ON COMPENSATION

As mention in Section 2.3 of Chapter 2 of residents located within the project area have a formal DUAT title on the occupied land, and the rights of use were established under traditional or communal structures.

The Mozambican legislation states that individual or legal entities may acquire rights for the use and exploitation of land in rural or urban areas by acquiring the necessary permits (DUAT).

On one hand, the right for use and exploitation of land for economic activities is granted for a maximum period of 50 years (renewable for an equal period on request). On the other hand, the right of use and exploitation of land occupied by traditional communities is not limited by any term but it can be revoked for reasons of public interest, upon payment of just compensation.

Although the implementation of project does not generate situations of physical displacement, economic displacement of PAP involving losses of income or means of livelihood will be unavoidable.

4.1 Eligibility Criteria

All persons, regardless the type of ownership, occupying, using or doing income generating activities inside the project area on the cut-off date are eligible for compensation. Any encroacher or new settlements within the project impact area after the determined cut-off date will not be eligible for compensation.

In brief, the implementation of the project will result in the following impacts:

- Loss of agricultural land (permanent);
- Loss of cropping areas;
- Loss of fruit trees;

The following categories of project affected persons were considered as eligible for compensation:

- Owners with traditional rights to agricultural land located inside the project site (either substation or access road);
- Tenant of agricultural land located inside the project area;
- Owner of crops located inside the project site area;
- Owner of fruits trees located in the project site;

4.2 Entitlement for Compensation

4.2.1 Entitlement for Loss of Agricultural Land

Agricultural land within the proposed site for the construction of the new substation and access road will be compensated in kind (land for land) including replacement cost.

The replacement land must have at least the same size and productivity potential as the lost land.

The current land should be abandoned immediately after the harvest season, to avoid loss of cultures.

The replacement land should be cleared of trees prior to delivery. The project will cover the cost of clearing and preparation of new fields and affected communities will be involved in the work of clearing and removal of vegetation in new fields, receiving appropriate payment, at market price, for such work.

In addition, seeds should also be given to the owners of the new plots.

The project proponent (EDM) or a subcontracted entity shall be responsible for finding the replacement land and most to ensure that it is located within the household community, as close as possible of the current farmland.

4.2.2 Entitlement for Loss of Crops

Monetary compensation will be provided in case of crop loss. The amount of compensation to be awarded will be based on the tables provided for this purpose by the Nampula Provincial Directorate of Agriculture and should never be less than current market prices.

In addition, the project proponent shall provide seeds to the owners of the lost crops.

PAP will be allowed to harvest their crops before construction works begin.

4.2.3 Entitlement for Loss of Fruit Trees

In case of loss of fruit trees located in the area occupied by the household replacement trees will be provided. For each lost tree two replacement trees will be provided.

In addition, monetary compensation will be granted to cover the loss of production from lost mature trees. The amount of compensation to be awarded will be based on the tables provided for the purpose by the

Nampula Provincial Directorate of Agriculture and should never be less than current market prices.

4.2.4 Other Related Assistance

There are vulnerable people among those affected by the project. Given the number of vulnerable persons identified on the socio-economic survey, the entity responsible for the implementation of SLUCP must take additional measures in order to minimize the impact of the project on PAP ensuring that their livelihood does not deteriorate comparing to the pre-project situation.

In order to facilitate payment of compensation it is suggested that EDM in coordination with local authorities, identify PAP with no Identification Documents and/or no bank account and provide the necessary means to assist them in the opening of a bank account.

As such, the following actions must be taken into place:

- Identification PAP with no bank account;
- Ensure that PAP have the necessary documents for an account opening;
- Assist PAP in the obtainment of the documents, if necessary provide transportation.
- Identify and contact the most appropriate bank to open the bank accounts;
- Arrange for a meeting between PAP and the bank for processing the bank account paper;
- Arrange for transportation to and from the meeting site, especially for PAPs.

In addition, during the consultation with PAP and information dissemination stage EDM most advise PAP on the best way of using the compensation payment

Table 17 provides an entitlement matrix for losses incurred by PAP.

Table 17 - Entitlement matrix

Item Nº	Type of loss	Entitled Person (Beneficiaries)	Entitlement (compensation Package)	Responsible organization
1	Loss of agricultural land (permanent)	Owners with traditional rights to the agricultural land located inside the project site	Compensation in kind. Replacement land with at least the same size and productivity potential. Assistance in kind: New land preparation, including payment for wages, at market price by employer.	Proponent (EDM) or Subcontracted entity
		Tenant of agricultural land located inside the project site	No compensation for loss of land; Compensation for loss of crops	Proponent (EDM) or Subcontracted entity
2	Loss of cropping areas	Owner of crops located inside the project site	Monetary compensation based on the relevant agriculture crop loss compensation tables as legally determined by the Nampula Provincial Directorate of Agriculture (DPA-Nampula). The compensation tables could be referred to in Annex A of this SLUCP Report. The compensation is based on the current market price and productivity values for various annual and permanent crops. Assistance in kind: Seeds will be provided.	Proponent (EDM) or Subcontracted entity
3	Loss of fruit trees	Owner of fruits trees located in the project site	Monetary compensation based on the relevant fruit tree loss compensation tables provided by the Nampula Provincial Directorate of Agriculture (DPA-Nampula) as referred above. Replacement trees: For each loss trees two trees will be replaced.	Proponent (EDM) or Subcontracted entity

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5 RESULT OF CONSULTATION WITH PAP

Consultation with PAP was initiated during the data collection in July 2014. During the fieldwork, 19 household heads with small farmlands and fruit trees on the project site were surveyed and general expectations regarding the project were gathered. There is a general satisfaction with the implementation of a new project in the Meconta area, particularly if this project is likely to provide tangible benefits to the local communities that will be directly or indirectly affected by the project. Monetary compensations were mentioned by the PAP as one of the most important tangible benefits followed by the creation of employment in the construction and operation of the substation. There is a general sense that if acceptable alternatives were provided by the project proponent, the PAP would easily accept the implementation of the substation and they would be opened for a discussion and agreement on possible relocation and/or compensation.

The consultation for the Reinforcement of Transmission Network in Meconta and the involvement of the PAP had three main objectives: (1) Inform about the proposed project to be implemented in Meconta; (2) Present the results of the simplified environmental study and; (3) Present the results of the simplified land use compensation plan.

The objective 3 with regards to the compensation component, however, was not totally fulfilled due to legal requirements and constraints on the consultation for the compensation process. This is further detailed below:

1) As outlined in the SLUCP, the establishment of the proposed project will result in the economic displacement of a number of PAPs. This, on its turn will lead to the cessation/expropriation of asset ownership or use rights among the affected PAPs. The project proponents, are therefore, required by law to compensate for the partial or complete loss of those assets or land access use rights.

2) In conformity with the Decree 19/2007 of 18th July, the expropriation/compensation process should be carried out following the procedures/steps indicated below:

    a) The expropriation is always preceded by a public statement issued by the government expressing interest, need or utility area to be expropriated, and stating the reasons that motivate such expropriation.

b) The expropriation process begins with the notification by the proponent (drafted by the entity that proposed the expropriation) of the intention to expropriate.

c) The notification should contain:
   - ✓ Copy of the declaration that awarded competences for the expropriation. (*please refer to the 3 options in the footnote*)[1];
   - ✓ Proposals of the terms and compensation calculations per Household (the HH files will contain all relevant information at HH level and a location map of the concerned agriculture plot(s);
   - ✓ Modalities and timelines for payment of the compensations;
   - ✓ Timeline for effective occupation of the expropriated land;
   - ✓ Timeline awarded to the affected parties to contest the terms of the compensation and handover of the assets;

3) All of the above, which fall under the responsibility of the proponent, were still lacking definition, during the consultation phase of the project, particularly the public statement issued by the government. In addition, the initiation of the compensation process requires by law, close collaboration and coordination between the proponent, the local authorities and the PAPs. In conclusion, in the absence of a public statement issued by the government and information on communication between the proponent and local government and PAPs, it is not possible to the impact assessment firm, *Impacto Lda – Projectos e Estudos Ambientais*, to conduct the compensation process particularly in terms of acceptable alternatives on means of compensation, areas of small scale agricultural and other land relocation and other aspects.

o [1] a) Request an approval for the expropriation decree to be issued by the Government, and thereafter the proponent should follow all the procedures regarding the payment of indemnities, and if applicable to the case, the resettlement of populations; b) In the light of the private law, acquire the rights and/or assets present in the designated area (in accordance with the willing seller - willing buyer principle); c) Request, from the entity that authorized the issuing of the title or recognition of the DUAT, a declaration of extinction of rights of use and benefit of land.

6 INSTITUTIONAL AND IMPLEMENTATION FRAMEWORK

6.1 Overview

In Mozambique it is common practice that the responsibility for planning and implementing compensation measures lays on the project proponent. However, the State reserves the right to closely monitor the process and, therefore, certain State institutions play an important role.

It is proposed that the implementation of the Simplified Land Use Compensation Plan shall be pursued by a Relocation Unit (RU) to be established by EDM in cooperation with Nampula Provincial Government, Meconta District Administration, Nampula Provincial Directorate of Agriculture, Nampula Provincial Services of Geography and Cadastre as well as with the Traditional Authorities.

In this section, the various players proposed to be involved in the SLUCP implementation process are named and their respective roles defined. The Figure 4 below resumes the SLUCP organization.

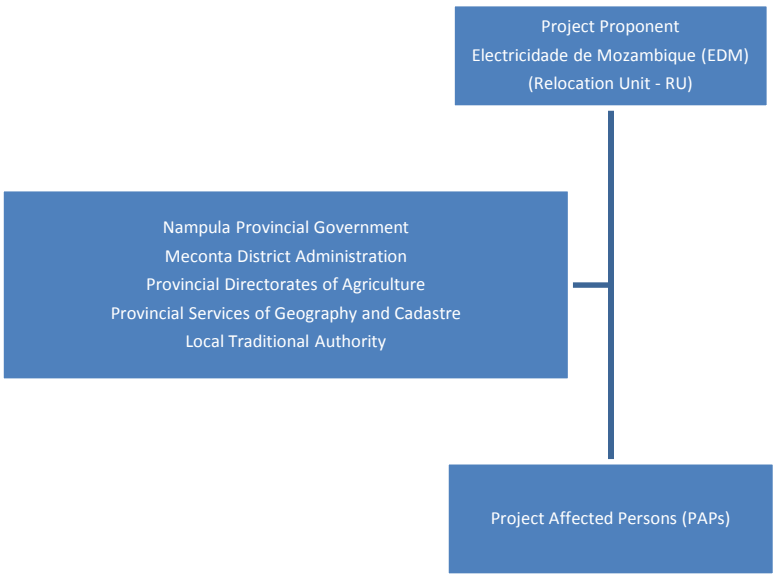


Figure 4 - SLUCP implementation Organization

6.2 Electricidade de Moçambique, E.P. (EDM)

Electricidade de Moçambique (EDM) is the proponent of the project reinformecement of transmission network in the Nacala corridor. As such, EDM shall establish a Relocation Unit (RU), referred to as RU of EDM, with

one relocation unit manager for the 14 months, to fulfil the following responsibilities:

- Management, coordination and supervision of all the SLUCP activities, including, land acquisition and land-use related compensation:
- Maintenance of the SLUP database, ensuring that all persons and assets affected by the project are adequately identified. This includes updating the database with possible new PAP that were not identified during the preparation of the SLUCP;
- In coordination with Provincial Government, District Administrators and Traditional Authorities ensure that PAP are well informed at each stage of the process, including procedures and time frames for displacement and compensation;
- Ensure that PAP are aware of their rights and obligations;
- In coordination with the Provincial Services of Geography and Cadastre and Traditional Authorities, RU of EDM will identify and provide replacement farmland for all PAP. The replacement land must have at least the same size and productivity potential as the lost land.
- Consult Nampula Provincial Services of Geography and Cadastre on the necessaries technical procedures on land acquisition, namely for cadastro, demarcation and delimitation of new sites;
- In coordination with the Traditional Authorities, ensure that the new land is located within the household community, as close as possible of the current farmland.
- Coordinate the removal of planted fruit trees and preparation of new farmlands, in close liaison with the PAP, the Local Leaders, and the contractor of RU of EDM.
- Provide new fruit trees and seeds to PAP.
- Ensure necessaries funds to fairly compensate the PAP;
- In coordination with the District Administration and Traditional Authorities, obtain PAP ID and bank account number and if necessary assist PAP opening a bank account, when monetary compensation is due;
- Make compensation payments to the PAP through deposits on the PAP bank account and notify PAP;
- Submit copies of payment records to Nampula Provincial Governor, Meconta District Administration, Nampula Provincial Directorate of Agriculture and Traditional Authorities
- Ensure that compensation is received by PAP through a PAP statement;
- Provide support in grievance redress;
- Perform meetings with Nampula Provincial Governor, Meconta District Administration, Nampula Provincial Directorate of

Agriculture, Traditional Authorities and PAP in order to evaluate the SLUP implementation and to ensure livelihood restoration;

6.3 Nampula Provincial Government and Meconta District Administration

Nampula Provincial Government and Meconta District Administration is proposed to be the major players assisting RU of EDM providing the necessary legal and logistical support for the implementation of the SLUCP.

We propose that Meconta District Administration, in it is capacity as the lawful authority, will perform the following functions:

- Provide formal channel of communication and goodwill between the community members and RU of EDM;
- Ensure that PAP are well informed through the local authorities, at each stage of the process;
- Ensure that PAP are aware of their rights and obligations;
- Assist RU of EDM on the identification of replacement farmland and awarding of ownership rights;
- Follow up RU of EDM on the removal of planted trees and preparation of new farmlands.
- Follow up monetary compensation payment to PAP;
- Maintain records of PAP and the payment details;
- Receive complaints from PAP and assist PAP accordingly;

In addition, Nampula Provincial Government will mediate in the resolution of disputes and complaints.

6.4 Nampula Directorate of Agriculture and Nampula Services of Geography and Cadastro

Nampula Services of Geography and Cadastro will have the overall responsibility of assisting RU of EDM on the land acquisition technical procedures.

It shall provide RU of EDM the necessary elements to proceed with land acquisition, namely demarcation and delimitation of new sites.

Nampula Directorates of Agriculture will prepare updated list of standard compensation values for annual crops and fruit trees.

6.5 Traditional Authorities

The local Traditional Authorities/Community leadership will establish the linkage between PAP and Meconta District Administration. They will have the overall responsibility of supervising the SLUCP implementation and

report to local authorities any deviation on the project objectives in particular regarding to livelihood restoration.

Thus, it is proposed that local Traditional Authorities/Community leaders will undertake the following tasks:

- Ensure that all persons and assets affected by the project are adequately identified.
- Ensure that PAP are well informed at each stage of the process, including procedures and time frames for displacement and compensation;
- Ensure\ that PAP are aware of their rights and obligations;
- In coordination with the District Administration provide replacement farmland of same farming potential for PAP.
- Ensure that the new land is located within the household community, as close as possible of the current farmland.
- Assist on the removal of planted fruit trees and preparation of new farmlands, in order to ensure that displacement process is in accordance with the plan.
- Assist PAP in the opening of bank accounts, when monetary compensation is due;
- Submit all PAP complaints to the respective District Administration in accordance with established procedures for grievance redress claims;

6.6 Compensation Advisory Committee

The implementing entity, RU of EDM, will set up a Compensation Advisory Committee at the project level to involve the local community in the implementation process.

The Compensation Advisory Committee will be comprised by the following membership:

- RU of EDM representative, as the chair;
- Nampula Provincial Government Representative;
- Meconta District Administration Representative;
- Nampula Provincial Directorate of Agriculture Representative;
- Nampula Provincial Services of Geography and Cadastre Representative;
- Local Traditional Authorities;

The committees will seek local inputs from the affected people and communities in the implementation process and assist the implementing entity in all matters related to displacement.

The Compensation Advisory Committee will ensure local participation in the implementation of the SLUCP and provide support to PAP on grievance resolution.

The Committee will meet monthly, until one months after displacement completion.

6.7 Procedures for Grievance Redress Claims

In process involving economic displacement and compensation, it is common that PAPs are not fully satisfied with the solution. Typically grievance will be concerned with asset identification, entitlement to compensation and assessment of the value of assets.

In this sense, appropriated conflict resolution mechanisms will be established in order to ensure that the grievance is well addressed.

By establishing a grievance resolution mechanism it is essential to ensure a channel of communication in which PAP can rely on and where complaints are treated through an accessible and transparent process. Therefore, the procedures for grievance and redress claims will involve the local community and local authorities.

Grievances related to any aspect of the SLUCP will be handled through negotiation aimed at achieving consensus. Complaints will pass through 3 stages before applying to a court of law as a last resort.

In the first instance, grievance should be solved at the local level with the assistance of traditional leaders. Aggrieved PAP can address the complaint in writing or verbally (Annex C). The traditional leaders must resolve the dispute within 7 days.

If the aggrieved PAP is not satisfied with the decision taken on the complaint or when disputes cannot be solved at this level, PAP can present the complaint to the Compensation Advisory Committee.

The complaint can be submitted by filling a grievance registration form. A template of grievance registration form is presented on Annex C. If the complainant requires assistance to formalize the writing complaint, either the traditional leaders or RU of EDM must provide it.

The Compensation Advisory Committee will propose a resolution to the grievance and communicate it to the PAP within 10 days after the committee decision. The Compensation Advisory Committee will communicate the resolution to the aggrieved in writing by filling the Complaint Resolution Form (See Annex D).

When conflicts cannot be resolved informally at the Project level, formal mechanisms will be required. The Provincial Government can be referred. Decisions by Provincial Government leaders can be subject to appeals in a Court of Law, where the case will be handled under Mozambican law

RU of EDM must keep record of the entire process, taking note of the grievances presented, the responses to them and the agreements reached. This information must be stored in a file in order to ensure that the process is transparent and accessible. The following chart Figure 5 shows the steps for the grievance redress mechanism:

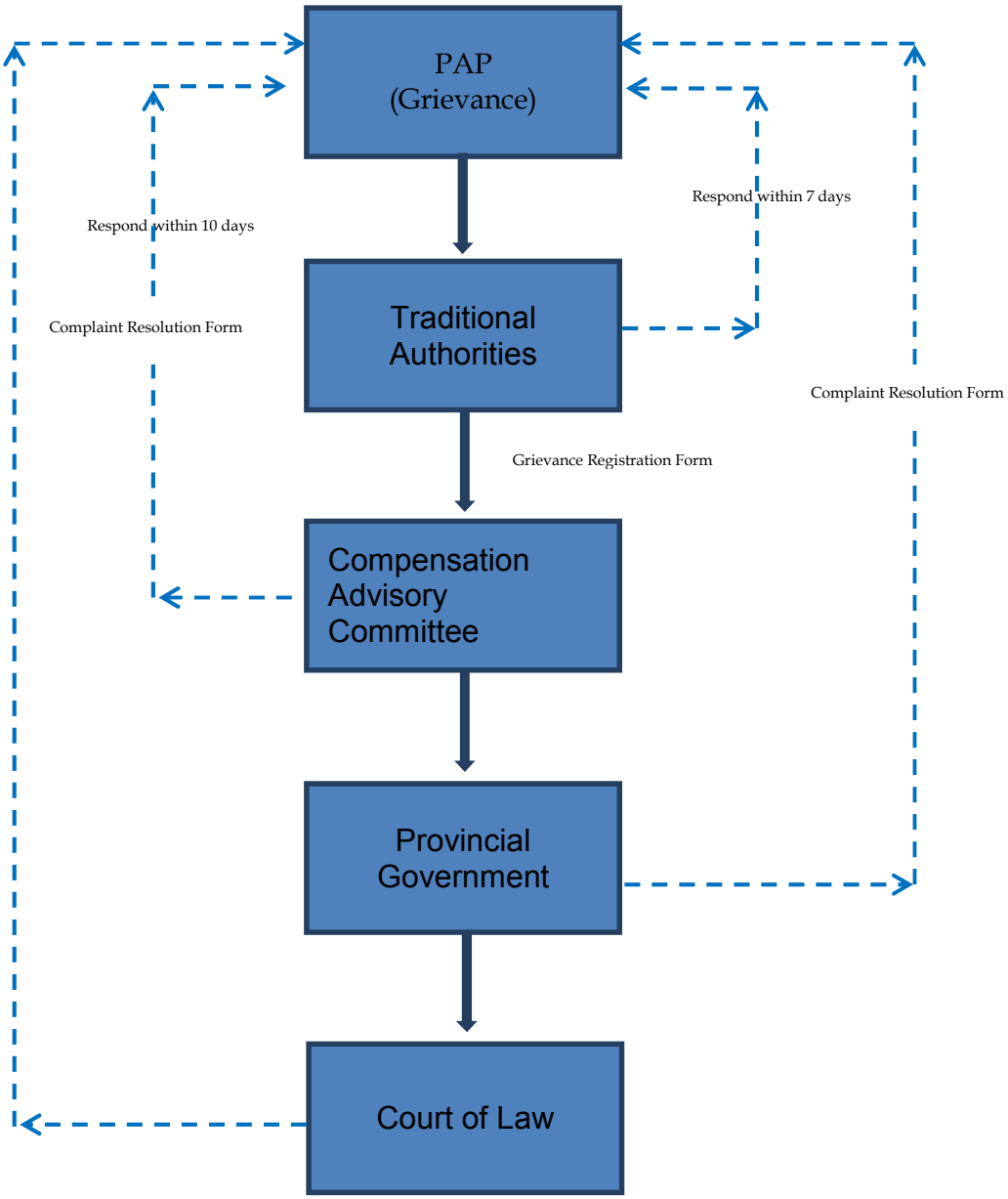


Figure 5 - Grievance redress mechanism

7 MONITORING

7.1 Overview

Monitoring is a critical tools in order to assess the overall project performance, particularly in regarding to PAP livelihood restoration.

For this purpose, a monitoring system is required to be developed aiming to give feedback to the project management which will help keep the SLUCP on schedule and make it successful. Monitoring provides a working system for effective implementation of the SLUCP and an information channel for the PAP to assess how their needs are being met.

RU of EDM, the implementing entity, shall establish an internal monitoring system for collection, analysis and reporting on SLUCP progress.

In addition, an independent external monitoring agency must be commissioned for monitoring the impact of the SLUCP implementation and periodic evaluation of compensation process and final outcome.

The performance indicators will be listed and monitored by means of the two monitoring mechanisms.

The monitoring and evaluation system must pay considerable attention to vulnerable groups, since they are more susceptible to negative impacts of displacement than the rest of PAP.

The monitoring and evaluation system, including progress report and final reports delivery, is described in the following sections.

The tables presented below shows the monitoring form as well as the indicators that would be presented on the reports, in both internal and external monitoring.

This indicator results from the socio-economic survey evaluation and allows establishing baseline scenarios on which monitoring will relay on.

The monitoring indicators are designed to quantitatively measure the physical and socio-economic status of the PAP and to determine and guide improvement in their social wellbeing.

7.2 Entitlement System

The following Table 18 presents the anticipated PAPs issues entitled for compensation.

Table 18 – Anticipated Entitlement for Compensation

Item Nº	Type of loss	Entitled Person (Beneficiaries)	Entitlement (compensation Package)	Unit	Number of PAP's affected	Number of households affected	Budget (MZM)
1	Loss of agricultural land (permanent)	Owners with traditional rights to the agricultural land located inside the project site	Assistance in kind: new land preparation, including payment for wages at market price	10 ha	146	17	100,000.00
2	Loss of cropping areas	Owner of crops located inside the project site	Monetary compensation	10 ha	81	9	151,015.00
			Assistance in kind: seeds will be provided	Kg	81	9	3,000.00
3	Loss of fruit trees	Owner of fruits trees located in the project site	Monetary compensation	1708 Trees	140	18	403,500.00
			Replacement trees (duplicate)	2416 Trees	140	18	10,000.00
4	Other	Vulnerable persons	Monetary assistance	-	12	12	20,000.00
5	Relocation Unit	within EDM	Salary for a relocation unit manager, transportation and accommodation costs	-	-		500,000.00
5	Monitoring	External Agency	Payments	-	-		150,000.00
Total					146	-	1337,515.00

A14-50

7.3 Internal Monitoring

As mentioned in Figure 4 of section 6.1, a Relocation Unit (RU) established by the project proponent EDM (RU of EDM) will conduct, supervise and monitor the implementation of the SLUCP and will report the result of such assessment to JICA on a monthly basis.

Internal monitoring will allow the RU of EDM to measure physical progress against the milestones established in the SLUCP displayed through timetable.

The report will cover the following:

- Degree of SLUCP implementation against milestones established;
- Results obtained, achievement of the SLUCP objectives;
- Main challenges encountered;
- Outcomes/effects of the implemented activities;

Internal monitoring should be proactive. It must confirm whether SLUCP implementation has been carried out in accordance with the planned, identify issues and suggest corrective measures.

In this light, internal monitoring should be focused on the monitoring indicator presented on the template below, Table 19.

Table 19 - Monitoring Form - Monthly Progress Report for SLUCP (Internal Monitoring)

N.	Monitoring Indicators	Unit	Monthly Progress (Nº)	Monthly Progress (% of the total)	Cumulative Achievement (Nº)	Cumulative Achievement (% of the total)
1. Displacement Preparation						
1	Identification of PAP	Nº				
2	Nº of HH signatures for Compensation contracts	Nº				
3	Nº of HH with bank account	Nº				
4	Identification of farmlands	Nº				
5	Identification of Fruit Trees	Nº				
6	Identification of Crops	Nº				
7	Nº of Meeting with PAP	Nº				
2. Delivery on Compensation						
1	Nº of PAP replaced	Nº				
2	Size of farmland allocated	Ha				
3	Nº of farmland plots allocated	Nº				
4	Nº of fruit trees replaced	Nº				
5	Nº of HH that received seeds assistance	Nº				
6	Nº of HH-VP that received assistance	Nº				
7	Amount of Compensation on Land preparation	MZM				
8	Amount of Compensation on Crops	MZM				
9	Amount of Compensation on Fruit Trees	MZM				
10	Amount of Compensation on Seed	MZM				
11	Amount of assistance to HH-VP	MZM				
3. Public Consultation						
1	Nº of compensation and reallocation meetings	Nº				
2	Nº of Grievance redress procedures filed	Nº				
3	Nº of Grievance resolved	Nº				

Table 20 lists the public consultation meetings to be held with PAP's, their main concerns and the answers to address PAPs issues. Every new event should be appended to the list.

Table 20 - Monitoring Format for Public Consultation

Serial	Date	Place	No. of Participants	Contents of the consultation	
				Main comments	Main answers
1					
2					
3					

7.4 External Monitoring

One month after the displacement completion an external monitoring is to be conducted by an independent agency that shall be commissioned though the standard bidding process. The Terms of Reference of the arrangement with the external monitoring agency shall be prepared by the RU of EDM and shall be submitted to JICA approval as appropriate.

External monitoring will take place at least every three months until the end of the monitoring process.

This agency will be responsible for evaluating the impact of project on the socio-economic status of PAP after the displacement and compensation process, whether they are better or worse regarding livelihoods restoration, especially for vulnerable persons. Thus, external monitoring will focus on the outputs and outcomes of the SLUCP. It shall measure the effectiveness of the SLUCP in meeting the needs of the PAP.

In this sense, external monitoring and evaluation must conduct an on-going comparative analysis with reference to pre and post-project achievement.

In addition to the reviewing on internal monitoring, the external monitoring agency will carry out field visits in order to assess specific issues such as:

- Degree of SLUCP implementation against the planned activities;
- Assessment of the level of satisfaction of PAP in the displacement process overall, including displacement policy, entitlements, compensation payment, support provided and livelihood restoration;
- Participation of PAP in the SLUCP planning, updating and implementation;
- Transparency and access to information under the SLUCP implementation;
- Land acquisition and displacement procedures, including coordination between the SLUCP and construction:
- Implementation of the grievance redress mechanism and effectiveness of resolution;

The external monitoring agency will present quarterly reports summarizing all the above mentioned aspects of SLUCP and monitoring.

The Report will highlight the issues and problems arising and if required, suggest specific mitigation measures.

Table 21 is intended for monitoring and report of the Compensation Plan, on a quarterly basis (three months).

Table 21 - Activities Monitoring Form (External Monitoring)

Relocation Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organization
			During the quarter	Till the last quarter	Up to the quarter	Till the last quarter	Up to the quarter		
Preparation of SLUCP									
Employment of Consultants		Man month							
Implementation of Census Survey (Including Socio Economic Survey)									
Approval of SLUCP			Date of Approval						
Finalization of PAPs List		No of PAPs							
Progress of Compensation payment		No of HHs							
Lot 1 (Land)		No of HHs							
Lot 2 (Crop)		No of HHs							
Lot 3 (Trees)		No of HHs							
Lot 4 (Seeds)		No of							

Relocation Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organization
			During the quarter	Till the last quarter	Up to the quarter	Till the last quarter	Up to the quarter		
		HHs							
Lot 5 (VP)		No of HHs							
Progress of Land Acquisition (All Lots)		m^2							
Progress of Asset Replacement (All lots):		No of HHs							
Lot 1 (Land)		No of HHs							
Lot 2 (Crop)		No of HHs							
Lot 3 (Trees)		No of HHs							
Lot 4 (Seeds)		No of HHs							
Lot 5 (VP)		No of HHs							

If the finding of the external monitoring indicates that the objectives of the SLUCP have not been achieved, the agency will propose appropriate measures to meet the SLUCP objectives. RU of EDM will initiate corrective action, where necessary, based on the recommendations of the agency.

Monitoring of certain indicators are very important for due implementation of involuntary resettlement issues and thus ensuring congenial social environment. As per JICA guidelines it should be at least for a minimum of 2 years period after the last date of completion of all resettlement of households.

It is expected that in this project case with no resettlement of population the proposed minimum timeframe of 10 months covering 2 harvesting seasons is regarded as adequate considering also the small scale nature of the SLUCP compensation in question (only 19 households). A Set of monitoring

indicators is proposed below on a tentative basis for the livelihoods and compensation monitoring, both internal and external. In addition, the monitoring indicators will be reported on monthly, quarterly and annual basis. The reporting will be carried out for the monitoring indicators outlined in Table 22.

Table 22 - Indicator-wise Monitoring Results during Report Period

Serial	Monitoring Item/Indicator	Report Period			
		Month-1	Month-2	Month-3	----------
1	Amicable Negotiation (Total 100%) Cumulative progress				
2	Successful grievance resolution (No.) Cumulative progress				
3	Timely delivery of Compensation (in MZM) Cumulative progress				
4	Satisfied with agreed relocation (No. of PAPs) Cumulative progress				
5	Restoration of economic/agricultural activities (No. of PAPs) Cumulative progress				
6	No of occupational disruption and major damages (No. of PAPs) Cumulative Figure				
7	Land prepared for compensation Cumulative Figure				
8	Trees provided for compensation Cumulative Figure				
9	Seed provided to PAPs Cumulative Figure				
10	Enhanced livelihood through effective use of compensation (No. of PAPs) Cumulative progress				
11	Assistance provided to Vulnerable Persons -In MZM -No. PAPs				

8 TIMETABLE AND BUDGET

8.1 Timetable

Implementation of the SLUCP will begin prior to the constructions works. No construction work will begin until all PAP have been compensated and relocated from the project site. On other hand, relocation will be undertaken after necessary compensation and assistance have been provided.

A total estimated time of 14 month will be required for the implementation of SLUCP. The process of compensation and posterior reallocation will occur within the first 4 months. Additional 10 months will be required for monitoring PAP and ensure that livelihood and income have improved at least to the pre-project standard, by allowing the monitoring to cover at least 2 harvest seasons.

Implementation timetable will commence after the final approval of the Simplified Land Use Compensation Plan by JICA.

The implementation of the SLUCP it is proposed to be pursued by RU of EDM in cooperation with Nampula Provincial Governor, Meconta District Administration, Nampula Provincial Directorate of Agriculture, Nampula Provincial Services of Geography and Cadastre and Traditional Authorities. For this propose a Compensation Advisory Committee will be established. The role of each play is described on chapter 6, institutional and implementation framework.

The following steps must be ensures for the SLUCP implementation:

1. Preliminary meeting with local authorities (Nampula Provincial Governor, Nampula District Administration, Nampula Provincial Directorate of Agriculture, Nampula Provincial Services of Geography and Cadastre and Traditional Authorities) with the propose of presenting the institutional framework and scope of the SLUCP implementation;
2. Establishment of the Compensation Advisory Committee;
3. Update SLUP database, ensuring that all persons and assets affected by the project are adequately identified;
4. Identify replacement farmland for all PAP and submit necessary applications for reallocation land;
5. Consultation with PAP and information dissemination. Inform PAP on the stages of the implementation process and timetable for compensation, displacement and commencement of construction works. PAP must be aware of condition to vacate current farmland. In addition,

RU of EDM must advise PAP on the best way of using the compensation payment;

6. The procedures for grievance redress most be publish and accessible for all PAP;
7. Preparation of a list of contractors service provider, including local community (preparation of new farmlands, new fruit trees and seeds);
8. Procurement for external Monitoring Agency;
9. Signature of the compensation agreements between EDM and the PAP;
10. Carry out bank accounts opening for PAP with Bank staff;
11. Make compensation payments to the PAP through deposits on the PAP bank account and notify PAP. Payment will take place one month after the SLUCP implementation begin;
12. Provide in kind assistance for new farmland preparation;
13. Notify PAP that they must vacate the farmland within 30 days after compensation payment;
14. Provide support in grievance redress. Grievance redress will be an ongoing process. It will last 3 month after displacement;
15. Perform monthly meetings with Compensation Advisory Committee and PAP in order to evaluate the SLUP implementation and to ensure livelihood restoration. The meetings will ensure that the information about the PAP are current and provide the necessary information for database update;
16. Internal Monitoring;
17. External Monitoring (after displacement completion);
18. Monthly Report;
19. Final SLUCP Completion Report, including SLUCP draft report;

The overall process of the SLUCP will be implemented following the Gantt chart below in Figure 6.

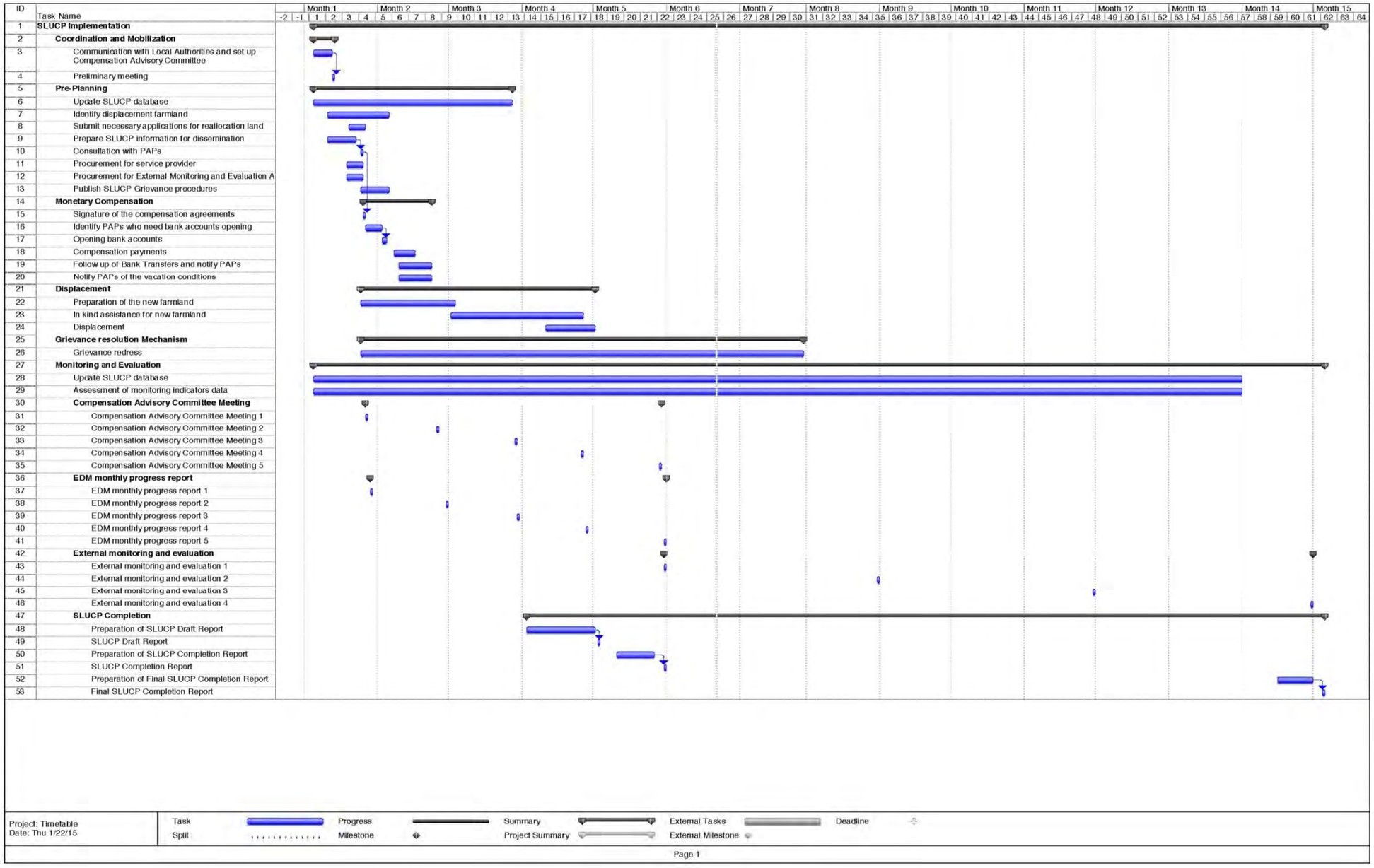


Figure 6 – SLUCP Implementation Schedule by RU of EDM

8.2 Budget

The total cost for compensating PAP on the assets affected by the project was estimated in chapter 2.5 and is approximately 554,515.00 Mozambican Meticais.In addition to the compensation value, the implementing entity will incur in others costs, namely:

- Assistance in-kind for new land preparation
- Assistance in-kind by providing seeds;
- Replacement trees;
- Assistance to vulnerable persons;
- Relocation Unit (RU) in EDM (RU of EDM);
- External monitoring agency;

The estimation of those cost were based on the market price of the required items.

Assistance in-kind for new land preparation

As mentioned in Table 11, all the 9.8 hectares of replacement land should be cleared of trees prior to delivery and the cost of clearing and preparation will be covered by the project proponent. For such task the affected communities will be involved in the work of clearing and removal of vegetation in new fields, receiving appropriate payment, at market price. Taking in to account the wage market price, the estimated cost of clearing and removal of vegetation in new fields is approximately 100,000.00 Mozambican Meticais.

Seeds provision

The estimated cost for the provision of seeds to the owner of the news farmlands is approximately 3,000.00 Mozambican Meticais.

Replacement of affected trees

In addition to the monetary compensation for the loss of trees, the project proponent will replace the loss of fruit trees located in the new area. For each loss trees two trees will be replaced. The inventory of assets revealed that there are grand total of 1,708 trees located within the project area.The estimated cost of replacing the farmland with new trees is approximately 10,000.00 Mozambican Meticais.

Assistance to vulnerable persons

RU of EDM will support all cost associated with assistance to vulnerable persons such as transportation, logistics and administration, when required. Additionally, families should be addressed, through a pre-scheduled visit by the local authorities (local chiefs and traditional leaders), to inform thoroughly about the implementation of the project in the area and the implications of the

implementation of the project on their livelihoods; Also a clear explanation shall be provided regarding the expropriation process that will be subject to and the measures that will be employed for compensation; Although, at this point is not possible to predict the total amount necessary, a rough estimation of 20,000.00 Mozambican Meticais can be suggested.

Relocation Unit (RU)

A RU will be established by EDM (Figure 4) as the implementing entity of the SLUCP and its monitoring programme. A relocation unit manager should be hired during the 14 months to fulfil the responsabilities presented in section 6.2. The estimated cost for the hiring of a relocation unit manager with housing and transportation costs is approximately 500,000.00 MZM.

External monitoring agency

One month after the displacement completion an external monitoring will take place at least every three months until the end of the monitoring process. The agency will be responsible for evaluating the impact of project on the socio-economic status of PAP after the displacement and compensation process, whether they are better or worse regarding livelihoods restauration. The estimated cost for the bidding process is 150,000.00 MZM.

Cost Summary

In order to implement the Simplified Land Use Compensation Plan on the Project for Reinforcement of Transmission Network in the Nacala Corridor a grand total of 1,337,515.00 Mozambican Meticais will be necessary, Table 23.

Table 23 – Summary of the estimated cost for the SLUCP (Budget)

Item	Total Cost (MZM)
Compensation	
Crops	151,015.00
Fruit Trees	403,500.00
Assistance	
Assistance in-kind for new land preparation	100,000.00
Assistance in-kind by providing seeds	3,000.00
Replacement trees	10,000.00
Assistance to vulnerable persons	20,000.00
Relocation Unit	500,000.00
External monitoring agency	150,000.00
Total	**1,337,515.00**

Source: SLUCP team

Annex A - Nampula Directorate of Agriculture - Table of prices for food crops for compensation for loss of harvests

República de Moçambique

GOVERNO DA PROVÍNCIA DE NAMPULA

DIRECÇÃO PROVINCIAL DE AGRICULTURA

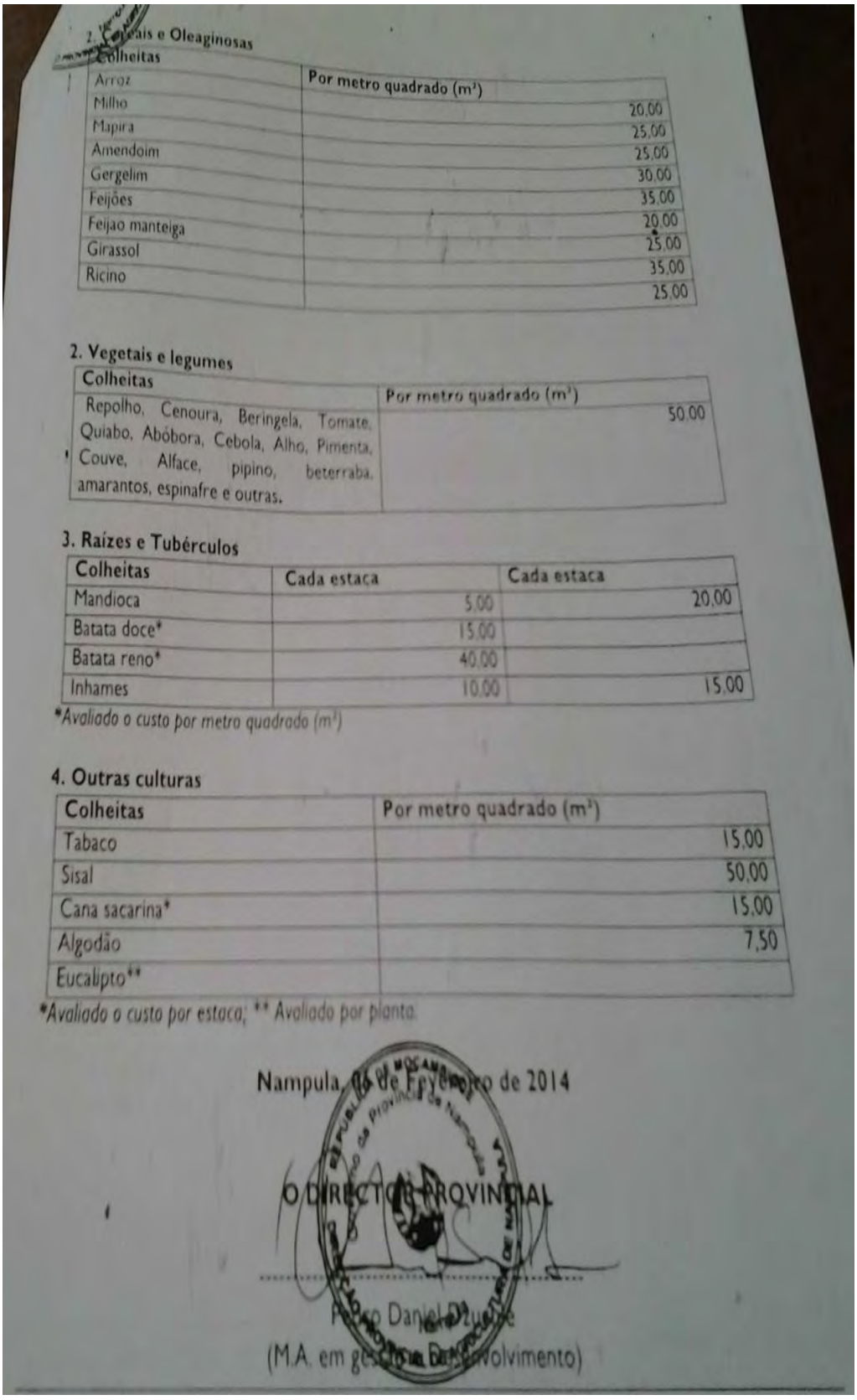
TABELA DE CUSTOS DE CULTURAS ALIMENTARES E DE RENDIMENTO PARA COMPENSASÃO PELA PERDA DE COLHEITAS EM METICAIS

1.Fruteiras

Plantas	Cada planta nova	Cada planta em reprodução	Planta velha (não produzem e secas)
Cajueiros	1.000,00	1.250,00	500,00
Mangueiras	300,00	400,00	150,00
Bananeiras	150,00	200,00	100,00
Citrinos	500,00	750,00	300,00
Litcheira	1.100,00	1.500,00	700,00
Paqueira	250,00	500,00	200,00
Pereiras/Abacateiras	500,00	750,00	300,00
Papaeira	300,00	600,00	200,00
Coqueiros	1.000,00	1.500,00	500,00
Goiabeiras	500,00	750,00	300,00
Caramboleira	500,00	750,00	300,00
Ateira	300,00	600,00	200,00
Trepadeira	300,00	600,00	200,00
Videira	350,00	750,00	250,00
Pesegueiro	500,00	900,00	400,00
Ananaseiro	25,00	50,00	15,00
Morangueiro*	50,00	100,00	30,00

* Avaliado o custo por metro quadrado (m^2)

Direcção Provincial de Agricultura – Nampula - Av. Josina Machel nº 1124, CP nº 42, Tel.: (26) 212974/(26) 213308, Faxe: (26) 214177



2. Cereais e Oleaginosas

Colheitas	Por metro quadrado (m²)
Arroz	20,00
Milho	25,00
Mapira	25,00
Amendoim	30,00
Gergelim	35,00
Feijões	20,00
Feijao manteiga	25,00
Girassol	35,00
Ricino	25,00

2. Vegetais e legumes

Colheitas	Por metro quadrado (m²)
Repolho, Cenoura, Beringela, Tomate, Quiabo, Abóbora, Cebola, Alho, Pimenta, Couve, Alface, pipino, beterraba, amarantos, espinafre e outras.	50,00

3. Raízes e Tubérculos

Colheitas	Cada estaca	Cada estaca
Mandioca	5,00	20,00
Batata doce*	15,00	
Batata reno*	40,00	
Inhames	10,00	15,00

*Avaliado o custo por metro quadrado (m²)

4. Outras culturas

Colheitas	Por metro quadrado (m²)
Tabaco	15,00
Sisal	50,00
Cana sacarina*	15,00
Algodão	7,50
Eucalipto**	

*Avaliado o custo por estaca; ** Avaliado por planta

Nampula, 06 de Fevereiro de 2014

O DIRECTOR PROVINCIAL

Pedro Daniel Duarte

(M.A. em gestão de Desenvolvimento)

Republic of Mozambique
Nampula Provincial Government
Provincial Directorate of Agriculture

Table of prices for food crops for compensation for loss of harvests

1. Fruit Trees

Plants	Each New Plant	Each plant at reproductive stage	Old Plant (does not reproduce and dry)
Cashew Tree	1,000.00	1,250.00	500.00
Mango Tree	300.00	400.00	150.00
Banana Tree	150	200.00	100.00
Citrus	500.00	750.00	300.00
Lychee Tree	1,100.00	1,500.00	700.00
Jackfruit Tree	250.00	500.00	200.00
Pear/Avocado Tree	500.00	750.00	300.00
Pawpaw Tree	300.00	600.00	200.00
Coconut Tree	1,000.00	1,500.00	500.00
Guava Tree	500.00	750.00	300.00
Starfruit Tree	500.00	750.00	300.00
Sugar Apple Tree	300.00	600.00	200.00
Climbing Fruit Plants	300.00	600.00	200.00
Vine or Grape Tree	350.00	750.00	250.00
Peach Tree	500.00	900.00	400.00
Pineapple Tree	25.00	50.00	15.00
Strawberry Tree*	50.00	100.00	30.00

*Cost evaluated per square meter (m^2)

2. Cereals and Oilseeds

Harvest	Per square meter (m^2)
Rice	20.00
Maize	25.00
Sorghum	25.00
Peanut	30.00
Sesame	35.00
Beans	20.00
French Beans	25.00
Sunflower	35.00
Castor	25.00

2. Vegetables

Harvest	Per square meter (m2)
Cabbage (*brassica oleracea var. Capitata*), carrot, eggplant, tomato, okra, squash, onion, garlic, pepper, cabagge (*brassica carinata*), lettuce, cucumber, beet, african spinach or amaranthus, spinach, other	50.00

3. Roots and Tubers

	Root	Tubers
Harvest	Each stack	Each stack
Cassava	5.00	20.00
Sweet Potato*	15.00	
Potato*	40.00	
Yam	10.00	15.00

*Cost evaluated per square meter (m2)

4. Other crops

Harvest	Per square meter (m2)
Tobacco	15.00
Sisal	50.00
Sugar cane*	15.00
Cotton	7.50
Eucalyptus**	missing in original

*cost evaluated per stack

**cost evaluated per plant

Nampula, 06th February 2014
The Provincial Director
Pedro Daniel Dzucule
M.A. in Development Management

Brief explanation on loss of harvest compensation estimation

The Ministerial Diploma 181/2010 of 3 of November regulates the process of expropriation for projects declared as being of public interest. The directive contains specific guidelines to the compensation of losses induced by Projects. A basic guide on compensation for permanent and annual crops is provided and updated by the Provincial Directorates of Agriculture.

It covers the current market price and productivity values for various annual and permanent crops. In a telephonic interview with Mr. Joaquim Tomas from the Nampula Directorate of Agriculture, the table of prices for food crops for compensation for loss of harvests has been developed for 2014 by the Provincial Government including people from agriculture, economy, livestock and forests in conjunction with one Government official from the Ministry of Agriculture based in Maputo. The tables are being updated almost every year and this is driven mainly by the development of new projects in the north of Mozambique. It is highly advised to use the table of prices for food crops for compensation for loss of harvest since they are based in the experience and data collected by the government officials from different areas mentioned above and therefore assumed by law, to be the "reference values" to be used in case of compensation or economic resettlement of local communities.

On the table of prices for food crops for compensation for loss of harvests developed for 2014, in point 3, the first value is related to the roots (when the cassava and yam are first planted) and the second value related directly to the tubers (after 6 month of the plantations. Additionally, in point 4, the value for eucalyptus crop is missing. There is no eucalyptus in the area where the project will be implemented, therefore there is no relation to the estimation of costs provided for the project.

Annex B - Detailed inventory of asset and its valuation

HH Code	HH Name	Farmland (ID Code)		Farmland area (m2)	Farmland Status	Crop	Nº of Cassava	Crop Price (MZM)	Total Crop Value (MZM)	Type of Fruit Tree	Nº of Fruit Trees	Fruit Tree Price	Total Fruit Tree Value (MZM)	Total Valuation
1	Marquita Emilio		1	1440	Cultivated	Cassava	4	5	20	Banana	169	150	25350	
			2	3456	Fallow					Cashew	12	1000	12000	
			3	1240	Fallow									
			4	1558	Fallow									
			5	1085	Fallow									
			6	5135	Fallow									
			7	2550	Fallow									
			8	136	Cultivated	Cassava	7	5	35					
			10	2500	Fallow									
		Sub-Total	**9**	**19100**					**55**				**37350**	**37405**
2	Maria Seleque Muquiquire		9A	5900	Fallow					Cashew	2	1000	2000	
			9B	713	Fallow									
			9C	3900	Cultivated	Cassava	43	5	215					
			9D	2655	Cultivated	Cassava	20	5	100					
		Sub-Total	**4**	**13168**			**63**		**315**				**2000**	**2315**
3	Alexandre Puompuela		12	0	Fallow					Cashew	1	1000	1000	
			15	940	Fallow					Mango	6	300	1800	
			16	940	Fallow									
		Sub-Total	**3**	**1880**									**2800**	**2800**

A14-69

HH Code	HH Name	Farmland (ID Code)		Farmland area (m2)	Farmland Status	Crop	Nº of Cassava	Crop Price (MZM)	Total Crop Value (MZM)	Type of Fruit Tree	Nº of Fruit Trees	Fruit Tree Price	Total Fruit Tree Value (MZM)	Total Valuation
4	Rafael Chahano		13A	8500	Fallow					Banana	1	150	150	
			13B	15	Fallow					Cashew	7	1000	7000	
			17	2948	Fallow									
		Sub-Total	**3**	**11463**									**7150**	**7150**
5	José Chico		14	0	Fallow					Cashew	6	1000	6000	
		Sub-Total	**14**										**6000**	**6000**
6	Agostinho Muquamoa		18	575	Cultivated	Cassava	8	5	40	Banana	51	150	7650	
										Cashew	37	1000	37000	
		Sub-Total	**1**	**575**			**8**		**40**				**44650**	**44690**
7	Fatima Ernesto		19	750	Cultivated	Cassava	54	5	270	Cashew	17	1000	17000	
			20	2356	Cultivated	Cassava	27	5	135	Banana	3	150	450	
		Sub-Total	**2**	**3106**			**81**		**405**				**17450**	**17855**
8	Amade sabonete		21A	525	Fallow					Cashew	10	1000	10000	
			21B	1050	Fallow									
		Sub-Total	**2**	**1575**									**10000**	**10000**
9	Julieta Manuel		22	15000	Fallow					Banana	357	150	53550	
										Cashew	39	1000	39000	
		Sub-Total	**1**	**15000**									**92550**	**92550**
10	Mauricio dos Santos Rosario		23	329	Fallow									
		Sub-Total	**1**	**329**									**0**	
11	Arira Momade		24	0	Fallow					Cashew	6	1000	6000	
		Sub-Total	**1**	**0**									**6000**	**6000**

A14-70

HH Code	HH Name	Farmland (ID Code)		Farmland area (m2)	Farmland Status	Crop	Nº of Cassava	Crop Price (MZM)	Total Crop Value (MZM)	Type of Fruit Tree	Nº of Fruit Trees	Fruit Tree Price	Total Fruit Tree Value (MZM)	Total Valuation
12	Francisco Horta		25	1325	Cultivated	Cassava	25	5	125	Cashew	4	1000	4000	
										Pear	1	500	500	
		Sub-Total	**1**	**1325**					**125**				**4500**	**4625**
13	Cardoso Manuel Manhaca		27	3975	Fallow					Mango	19	300	5700	
		Sub-Total	**1**	**3975**									**5700**	**5700**
14	Rosario Vasco		26	1875	Cultivated	Beans		20	37500	Banana	416	150	62400	
										Cashew	5	1000	5000	
										Mango	2	300	600	
										Guava	4	500	2000	
		Sub-Total	**1**	**1875**					**37500**				**70000**	**37500**
15	Fatima João (Tenant)		27	1875	Cultivated	Beans		20	37500	Banana	97	150	14550	
		Sub-Total	**1**	**1875**					**37500**				**14550**	**52050**
16	Arminda Rafael (Tenant)		28	3750	Cultivated	Beans		20	75000	Banana	153	150	22950	
										Cashew	3	1000	3000	
										Mango	10	300	3000	
										Papaya	1	300	300	
		Sub-Total	**1**	**3750**					**75000**				**29250**	**104250**
17	João Martins Alberto		29	9000	Fallow					Cashew	6	1000	6000	
										Mango	2	300	600	
		Sub-Total	**1**	**9000**									**6600**	**6600**

A14-71

HH Code	HH Name	Farmland (ID Code)		Farmland area (m2)	Farmland Status	Crop	Nº of Cassava	Crop Price (MZM)	Total Crop Value (MZM)	Type of Fruit Tree	Nº of Fruit Trees	Fruit Tree Price	Total Fruit Tree Value (MZM)	Total Valuation
18	Fernando Selemane		30	675	Fallow					Banana	247	150	37050	
										Cashew	1	1000	1000	
										Mango	1	300	300	
		Sub-Total	**1**	**675**									**38350**	**38350**
19	Elisa Megila		31	9000	Cultivated	Cassava	15	5	75	Banana	4	150	600	
										Cashew	8	1000	8000	
		Sub-Total	**1**	**9000**			**15**		**75**				**8600**	**8675**
		Total		**97 671**					**151 015**				**403 500**	**554 515**

A14-72

Annex C - Grievance registration form

Registration Form for Complaints			
Complaint Nr. (to be filled by Supervisorr)		Date	
Complainant name		Locality/Area	
Number of the Complainant		Census registration number (if applicable)	
Complainant phone number		Complaint recorded by (name and title):	
Detailed Description of the Complaint			
Photographs and / or supporting documents (insert reference and attach a copy)			

Annex D - Complaint Resolution Form

Complaint Resolution Form

Complaint Nr.		Complaint reception date	
Complainant name		Locality/Area	
Number of the Complainant		Census registration number (if applicable)	
Complainant phone number		Complaint redressed by	

Description of the complaint redress

Acceptance of the redress by complainant

I _____, declare that my complaint was handled in a timely and effective manner, and i declare that i agree with the resolution measure proposed and implemented.

Complainant name:

Complanant Signature (or fingerprint) :

Official name:

Official name:

Witness name:

Witness signature:

Photographs and / or supporting documents (insert reference and attach a copy)

15. Topographic Survey Report

PREPARATORY SURVEY ON THE PROJECT FOR REINFORCEMENT OF TRANSMISSION NETWORK IN NACALA CORRIDOR IN THE REPUBLIC OF MOZAMBIQUE

TOPOGRAPHIC SURVEY

FINAL REPORT

PREPARED FOR:

ORICONSUL

PREPARED By:

Address: Av. 25 de Setembro nº 2526, 1º floor
Maputo-Mozambique

September, 2014
Project No. P567/TEC/2014

FINAL REPORT

Document History and Status

Date of Submission	Semptember 20th 2014		**Sign and Date**
Project Description (Title)	PREPARATORY SURVEY ON THE PROJECT FOR REINFORCEMENT OF TRANSMISSION NETWORK IN NACALA CORRIDOR IN THE REPUBLIC OF MOZAMBIQUE TOPOGRAPHIC SURVEY		
Prepared By	José Walters Monteiro (Civil/Survey Eng.)		
Checked By	Sidney de Abreu (Civil/Geotechnical Eng.)		
Approved By	Carlos Quadros (Senior Geotechnical Eng)		

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1 Introduction 2

2 Methodology 2

3 Coordinates of benchmarks and corners 3

4 Deliverables 3

5 Resources involved 3

APPENDIX A – Verification of GPS heights accuracy

APPENDIX B – Coordinates of Benchmarks

APPENDIX C – Photographic record

APPENDIX D – Topographic Survey Maps

1 Introduction

As part of The Preparatory Survey on The Project for Reinforcement of Transmission Network In Nacala Corridor in The Republic of Mozambique, Oriental Consultants Co., Ltd has contracted TÉCNICA – Engenheiros Consultores Lda, to do the topographic survey of the indicated site.

2 Methodology

The survey was done on the WGS 84 UTM Zone 37 System. Unfortunately the closest official beacon to the site, which was reported to be located in Meconta has been destroyed as a result of vandalism action. In the absence of an official beacon the survey was conducted on the basis of self-positioning a differential GPS Trimble make, model R4. The base was set for about four hours enabling to have accurate horizontal coordinates, which are tided to the Mozambique official network. The heights used in this survey were GPS heights, which are geoid ones. No transformation was done to get levels referenced to the mean sea level; therefore heights in this survey are geoid heights.

Concrete benchmarks have been established in the corners of the plot as well as some control points have been established along the corridor connecting the substation plot to the EN8 though a straight alignment. The Benchmarks were coordinated by GPS. Verification was done through orthometric survey with a level to check the accuracy of the GPS. The differences found were less than 5mm. The verification of GPS heights accuracy can be seen in Appendix A.

The ground survey was done using the differential GPS while the location of electrical towers, poles and trees was done by a Total station.

3 Coordinates of benchmarks and corners

The coordinates of the benchmarks and the control points along the corridor can be seen in Appendix B.

4 Deliverables

Pursuant to the terms of reference the following deliverables are included:

- Layout of the plot in hard copy and pdf format;
- Survey map in DWG format (Autocad 2007);
- Survey map in hard copy in 1:500 scale

5 Resources involved

Surveyors: Amós Mandlate Júnior; Remédio Francisco, qualified surveyors

Coordinator: José Walters Monteiro, Civil Engineer

Equipment: GPS Trimble R4; Total Station Topcon GPT 7500; Level

APPENDIX A

Verification of GPS Heights

NAMIALO SUBSTATION
APPENDIX A. VERIFICATION OF GPS HEIGHTS ACCURACY

Benchmark	Back Sight	Forward Sight	Height of Instrument	Real Level	corrected level	Level by GPS
C0	1,422		174,601	173,179		
Change Point	1,245	1,303	174,543			
C3	1,181	1,181	174,543	173,362	**173,357**	**173,379**
Change Point	1,319	1,225	174,637			
C0		1,453		173,184		
	closing error= 0.005m					

Benchmark	Back Sight	Forward Sight	Height of Instr	Real Level	corrected level	Level by GPS
C0	0,52		173,699	173,179		
Change Point	0,82	1,81	172,709			
C4	**2,371**	**2,37**	**172,71**	**170,339**	**170,336**	**170,36**
Change Point	1,801	0,951	173,56			
C0		0,378		173,182		
	Closing error= 0.003m					

Benchmark	Back Sight	Forward Sight	Height of Instr	Real Level	corrected level	Level by GPS
C0	1,44		174,619	173,179		
Change Point	1,685	1,631	174,673			
Change Point	1,33	1,575	174,428			
Change Point	0,76	3,718	171,47			
C2	**2,279**	**2,279**	**171,47**	**169,191**	**169,19**	**169,203**
Change Point	2,985	0,232	174,223			
Change Point	1,709	1,261	174,671			
C0		1,491		173,18		
	closing error= 0.001m					

Benchmark	Back Sight	Forward Sight	Height of Instr	Real Level	corrected level	Level by GPS
C0	1,251		174,43	173,179		
Change Point	0,779	1,099	174,11			
Change Point	0,225	1,99	172,345			
Change Point	0,475	3,72	169,1			
C1	**3,602**	**3,602**	**169,1**	**165,498**	**165,501**	**165,525**
Change Point	3,71	0,227	172,583			
Change Point	2,062	0,47	174,175			
Change Point	1,87	1,439	174,606			
C0		1,43		173,176		
	closing error=- 0.003m					

Benchmark	Back Sight	Forward Sight	Height of Instr	Real Level	corrected level	Level by GPS
C3	1,375		174,732	173,357		
Change Point	1,433	1,22	174,945			
E1	**1,314**	**1,314**	**174,945**	**173,631**	**173,632**	**173,65**
Change Point	1,269	1,478	174,736			
C3		1,38		173,356		
	closing error= -0.001m					

Benchmark	Back Sight	Forward Sight	Height of Instr	Real Level	corrected level	Level by GPS
E1	1,519		175,151	173,632		
Change Point	1,32	1,39	175,081			
E2	**1,361**	**1,361**	**175,081**	**173,72**	**173,717**	**173,714**
Change Point	1,36	1,27	175,171			
E1		1,536		173,635		
	closing error= 0.003m					

Benchmark	Back Sight	Forward Sight	Height of Instr	Real Level	corrected level	Level by GPS
E2	1,425		175,142	173,717		
Change Point	1,67	0,81	176,002			
Change Point	1,511	1,449	176,064			
E3	**1,229**	**1,229**	**176,064**	**174,835**	**174,839**	**174,825**
Change Point	1,143	1,481	175,726			
Change Point	1,21	1,82	175,116			
E2		1,403		173,713		
	Closing error =- 0.004					

APPENDIX B

Benchmarks Coordinates

APPENDIX B - BENCHMARKS COORDINATES

pt. Name	Northing	Easting	elevation
Substation Plot Corners			
C0	8347621,37	603400,713	173,179
C2	8347607,368	603045,39	169,203
C1	8347422,802	603107,924	165,525
C4	8347557,634	603505,945	170,36
C3	8347742,208	603443,349	173,379
C5	8349284,63	603632,859	176,052
Access Corridor Control Points			
E1	8347898,219	603468,166	173,65
E2	8348114,887	603409,816	173,714
E3	8348349,68	603514,236	174,825
E4	8348550,313	603465,635	175,557
E5	8348750,099	603470,98	175,679
E6	8348935,918	603592,936	174,608
E7	8349009,117	603527,86	174,965
E8	8349188,815	603534,788	175,448
E9	8349224,726	603645,302	175,181

APPENDIX C

Photographic Record

APPENDIX B - PHOTOGRAFIC RECORD

Corner C0

Corner C1

Corner C2

Corner C3

Corner C4

Corner C5

Removed beacon in Meconta

Railway crossing

EN8 crossing facing Namialo

Access corridor from EN8 to railway

Substation plot

Substation plot

APPENDIX D

Topographic Survey Maps

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TEL +258 24 215784
FAX +258 24 215784
EMAIL teckllm@tdm.co.mz

REV	DATA	DESIGNAÇÃO

DATA	JULHO 2014
PROJECTADO	.....
DESENHADO	J.Pereira
CALCULADO	.....
APROVADO	.....

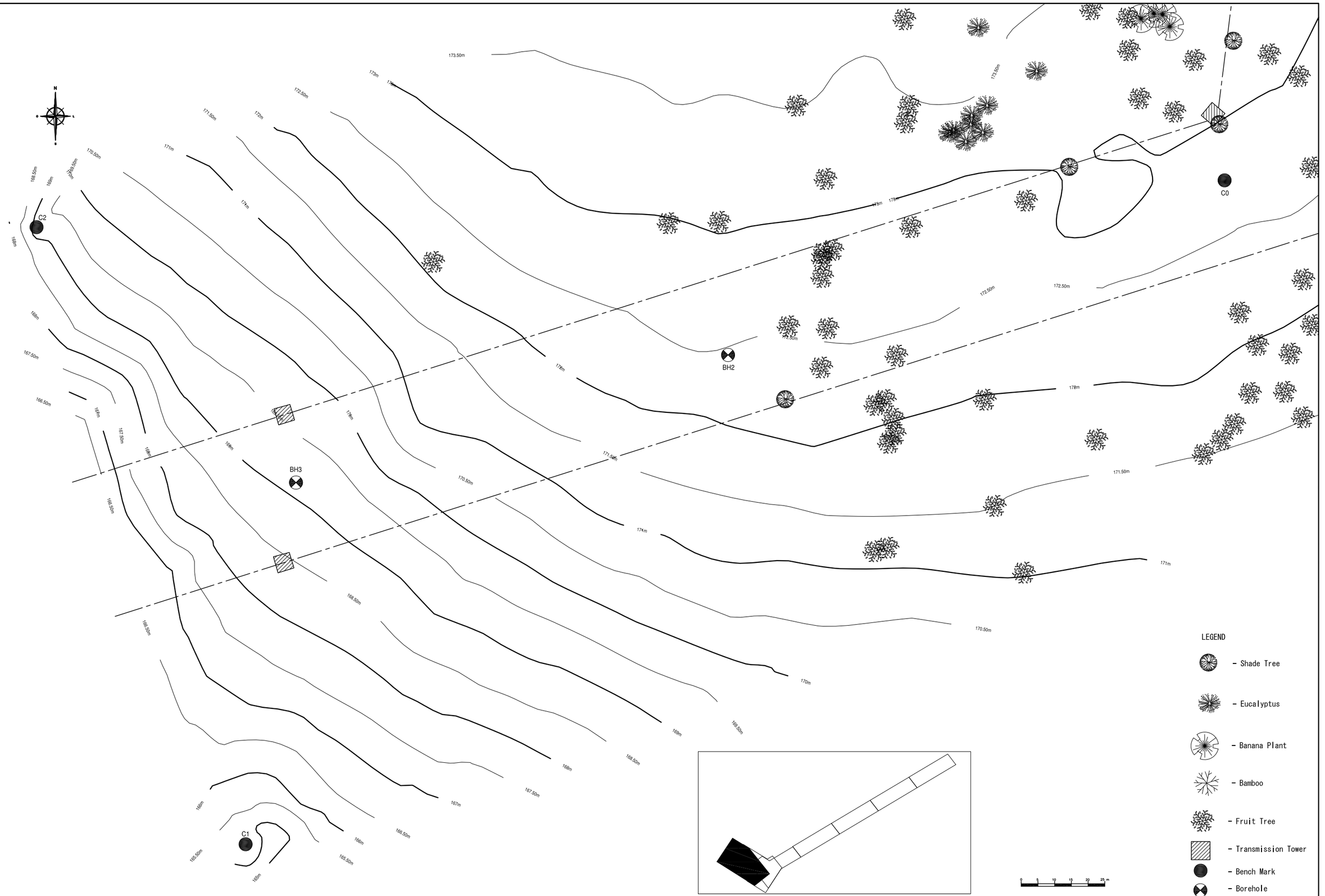
CLIENTE **ORICONSUL**

PROJECTO PREPARATORY ON THE PROJECT FOR REINFORCEMENT OF TRANSMISSION NETWORK IN NACALA CORRIDOR

DESENHO N°	PTO-CP-TOP-000
PROJECTO N°	P 567
ASSUNTO	TOPOGRAPHIC SURVEY
ESCALA	1 : 2500

00

A15-15



LEGEND

- Shade Tree
- Eucalyptus
- Banana Plant
- Bamboo
- Fruit Tree
- Transmission Tower
- Bench Mark
- Borehole

0 5 10 15 20 25 m

tecnica ENGENHEIROS CONSULTORES . LDA.

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REV	DATA	DESIGNAÇÃO

DATA JULHO 2014
PROJECTADO .....
DESENHADO J.Pereira
CALCULADO .....
APROVADO .....

CLIENTE ORICONSUL

PROJECTO PREPARATORY ON THE PROJECT FOR REINFORCEMENT OF TRANSMISSION NETWORK IN NACALA CORRIDOR

DESENHO N° PTO-CP-TOP-001
PROJECTO N° P 567
ASSUNTO TOPOGRAPHIC SURVEY

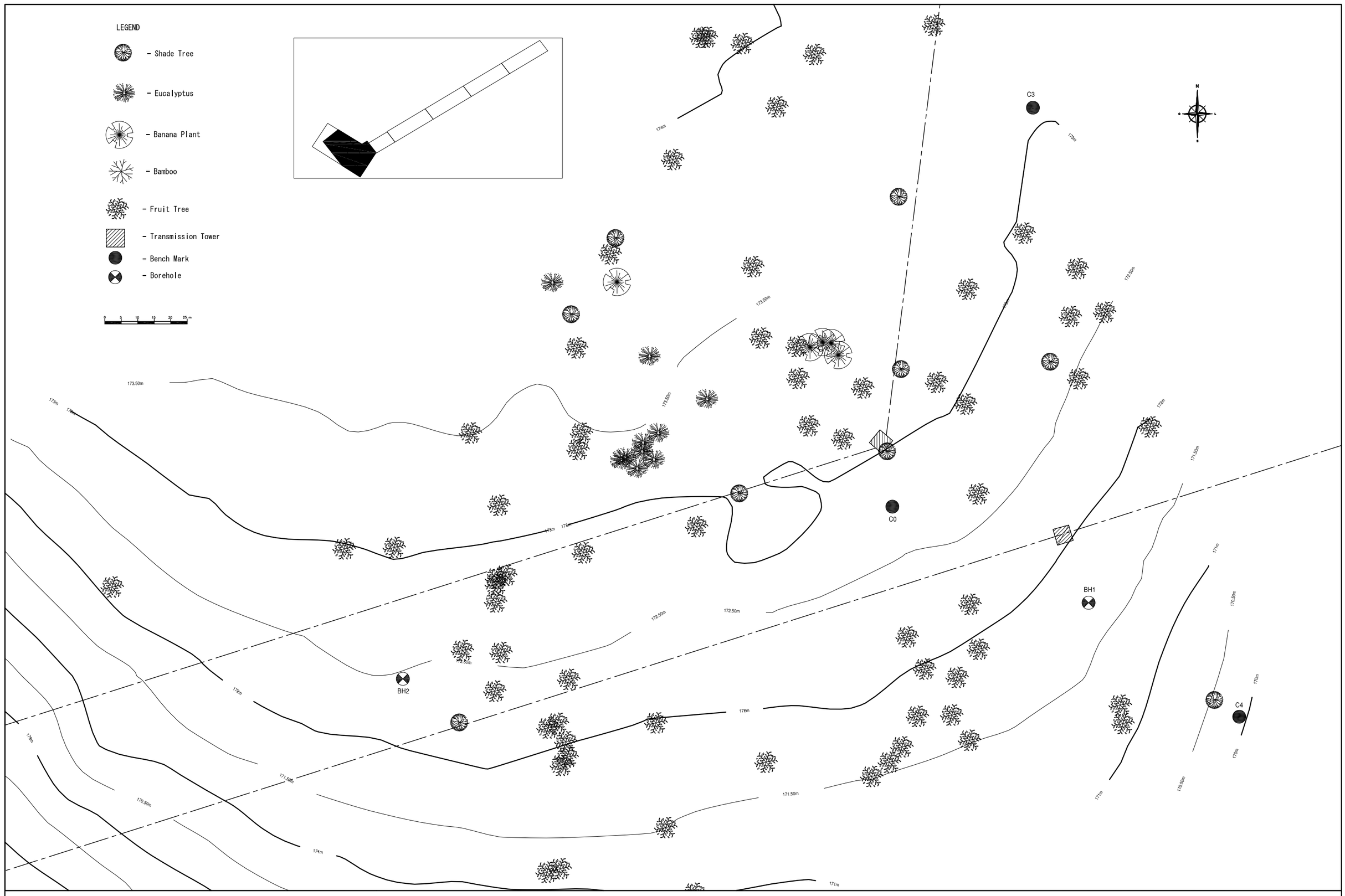
ESCALA 1 : 500

01

LEGEND

- Shade Tree
- Eucalyptus
- Banana Plant
- Bamboo
- Fruit Tree
- Transmission Tower
- Bench Mark
- Borehole

0 5 10 15 20 25 m



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REV	DATA	DESIGNAÇÃO

DATA JULHO 2014
PROJECTADO .....
DESENHADO J.Pereira
CALCULADO .....
APROVADO .....

CLIENTE ORI CONSUL

PROJECTO PREPARATORY ON THE PROJECT FOR REINFORCEMENT OF TRANSMISSION NETWORK IN NACALA CORRIDOR

DESENHO N° PTO-CP-TOP-002
PROJECTO N° P 567
ASSUNTO TOPOGRAPHIC SURVEY
ESCALA 1 : 500

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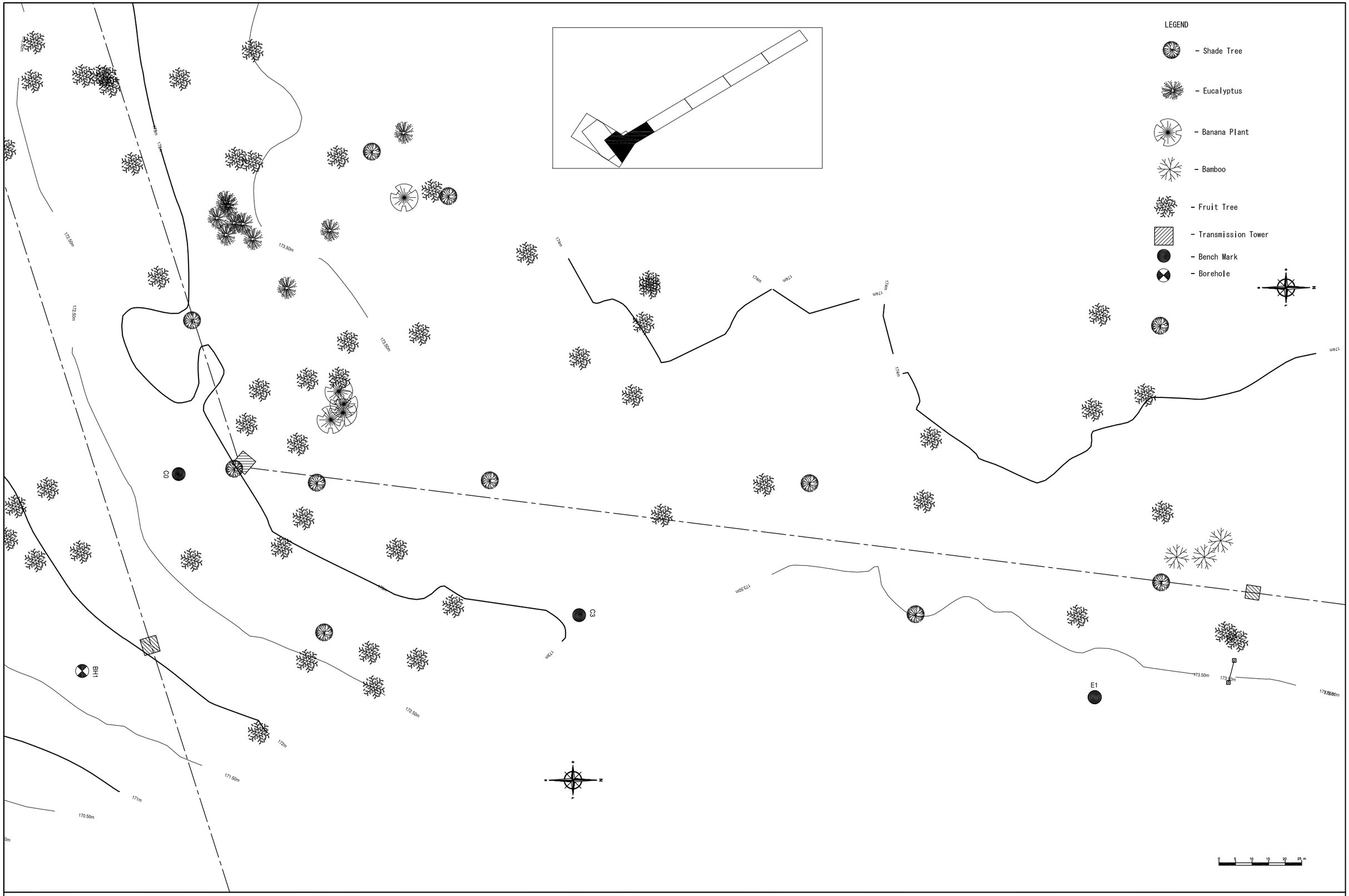
A15-17



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EMAIL tecklm@tdm.co.mz

REV	DATA	DESIGNAÇÃO

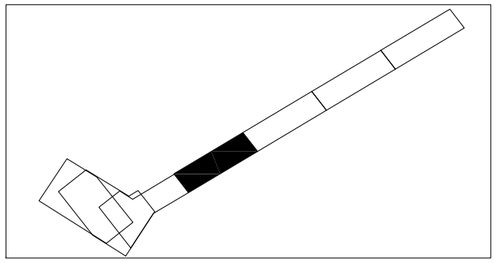
DATA JULHO 2014
PROJECTADO .....
DESENHADO J.Pereira
CALCULADO .....
APROVADO .....

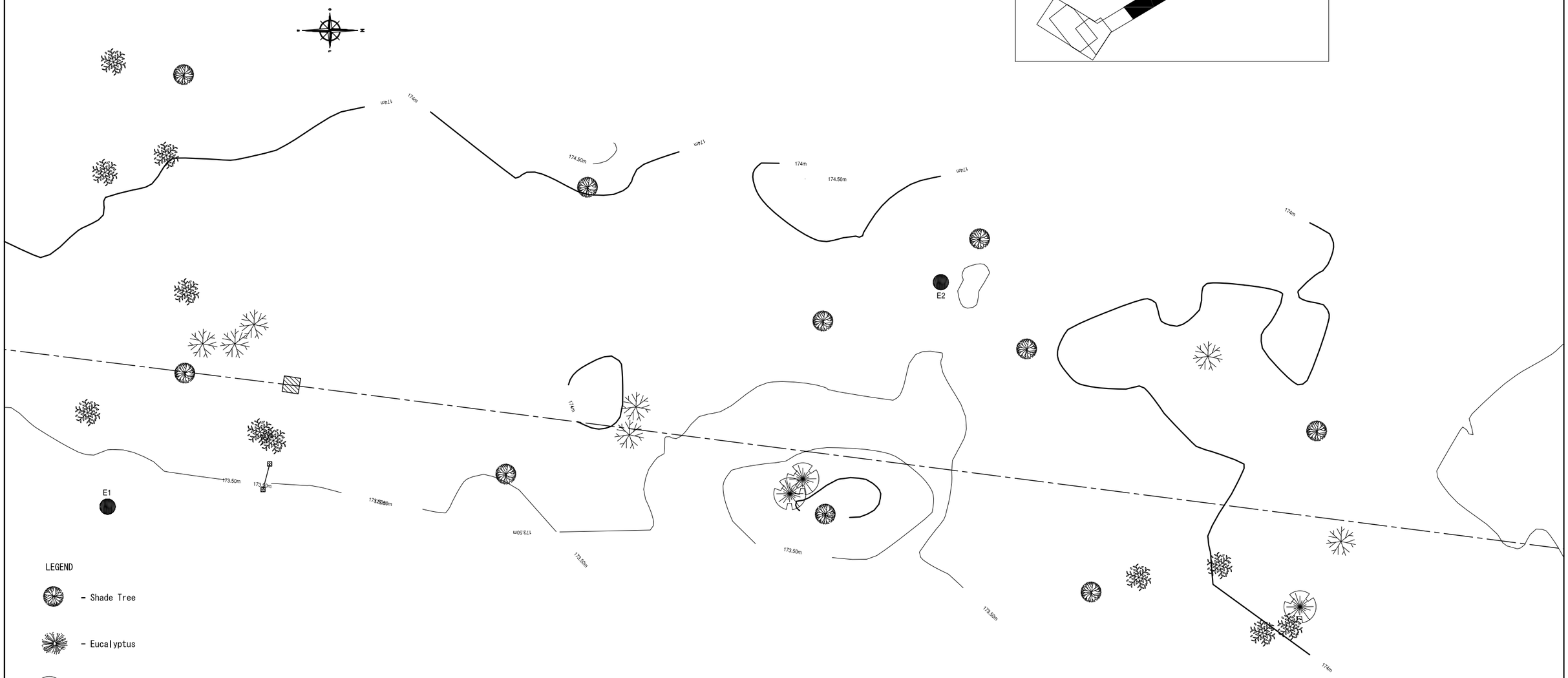
CLIENTE ORI CONSUL

PROJECTO PREPARATORY ON THE PROJECT FOR REINFORCEMENT OF TRANSMISSION NETWORK IN NACALA CORRIDOR

DESENHO N° PTO-CP-TOP-003
PROJECTO N° P 567
ASSUNTO TOPOGRAPHIC SURVEY
ESCALA 1 : 500

03





LEGEND

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0 5 10 15 20 25 m

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REV	DATA	DESIGNAÇÃO

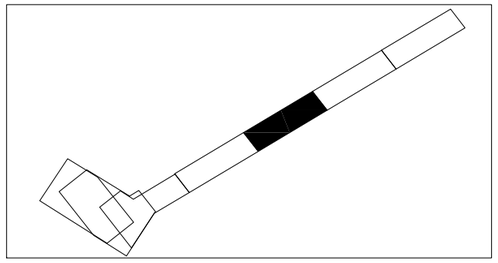
DATA JULHO 2014
PROJECTADO .....
DESENHADO J.Pereira
CALCULADO .....
APROVADO .....

CLIENTE **ORI CONSUL**

PROJECTO PREPARATORY ON THE PROJECT FOR REINFORCEMENT OF TRANSMISSION NETWORK IN NACALA CORRIDOR

DESENHO N° PTO-CP-TOP-004
PROJECTO N° P 567
ASSUNTO TOPOGRAPHIC SURVEY
ESCALA 1 : 500

04



LEGEND

- Shade Tree
- Eucalyptus
- Banana Plant
- Bamboo
- Fruit Tree
- Transmission Tower
- Bench Mark
- Borehole

0 5 10 15 20 25 m

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REV	DATA	DESIGNAÇÃO

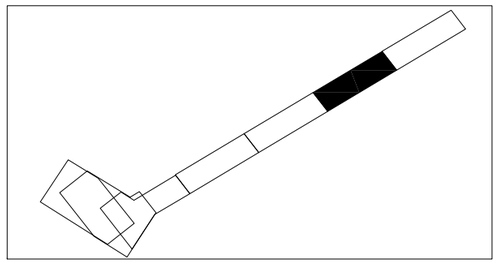
DATA	JULHO 2014
PROJECTADO	.....
DESENHADO	J.Pereira
CALCULADO	.....
APROVADO	.....

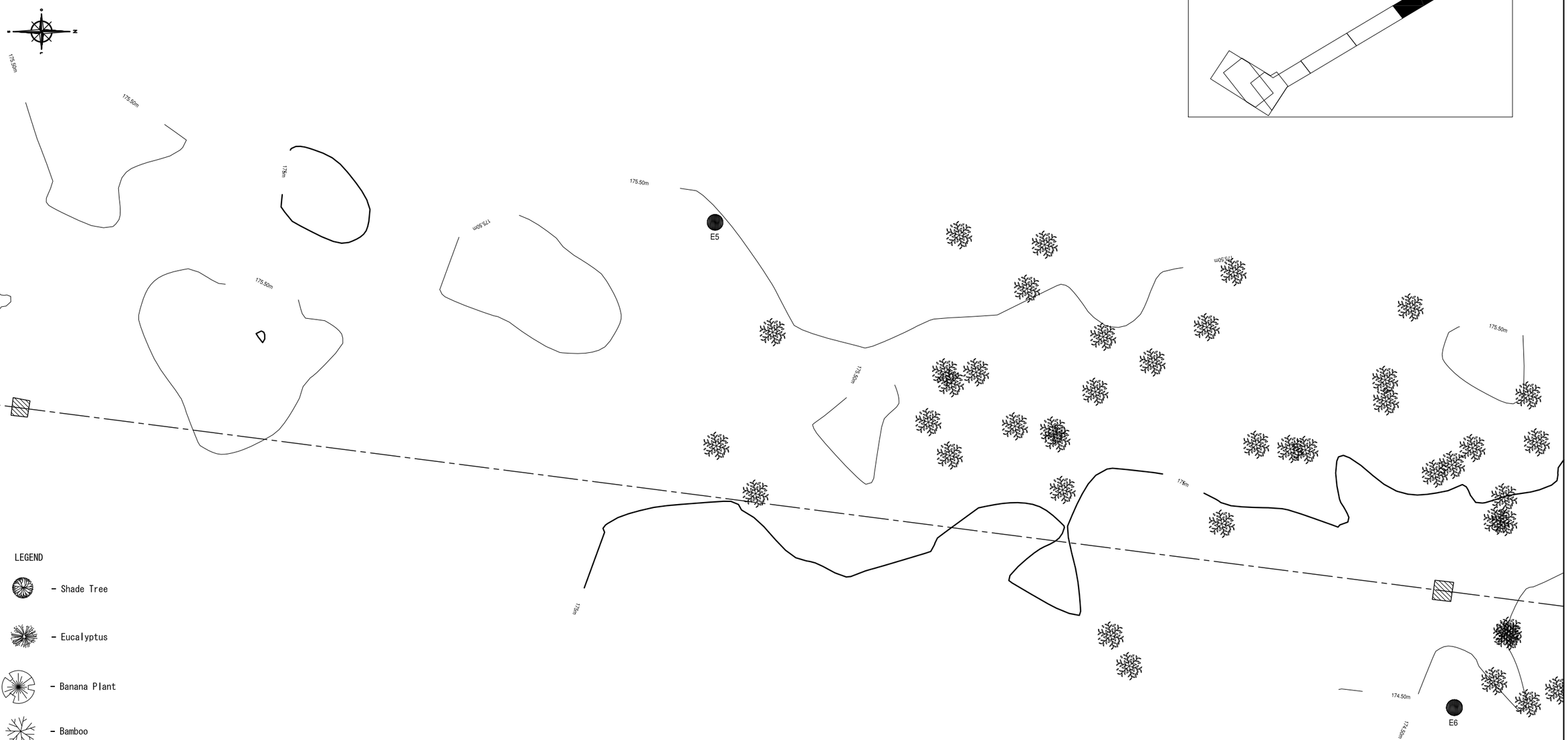
CLIENTE **ORI CONSUL**

PROJECTO PREPARATORY ON THE PROJECT FOR REINFORCEMENT OF TRANSMISSION NETWORK IN NACALA CORRIDOR

DESENHO N°	PTO-CP-TOP-005
PROJECTO N°	P 567
ASSUNTO	TOPOGRAPHIC SURVEY
ESCALA	1 : 500

05





LEGEND

- Shade Tree
- Eucalyptus
- Banana Plant
- Bamboo
- Fruit Tree
- Transmission Tower
- Bench Mark
- Borehole

0 5 10 15 20 25 m

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REV	DATA	DESIGNAÇÃO

DATA JULHO 2014
PROJECTADO .....
DESENHADO J.Pereira
CALCULADO .....
APROVADO .....

CLIENTE **ORI CONSUL**

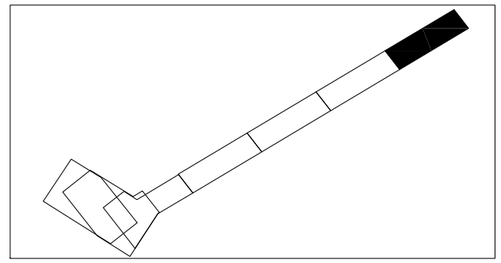
PROJECTO PREPARATORY ON THE PROJECT FOR REINFORCEMENT OF TRANSMISSION NETWORK IN NACALA CORRIDOR

DESENHO N° PTO-CP-TOP-006
PROJECTO N° P 567
ASSUNTO TOPOGRAPHIC SURVEY

ESCALA 1 : 500

06

A15-21



E7

E8

E6

E9

C5

RAILWAY

EN6

EN6

LEGEND

- Shade Tree

- Eucalyptus

- Banana Plant

- Bamboo

- Fruit Tree

- Transmission Tower

- Bench Mark

- Borehole

0 5 10 15 20 25 m

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REV	DATA	DESIGNAÇÃO

DATA	JULHO 2014
PROJECTADO	.....
DESENHADO	J.Pereira
CALCULADO	.....
APROVADO	.....

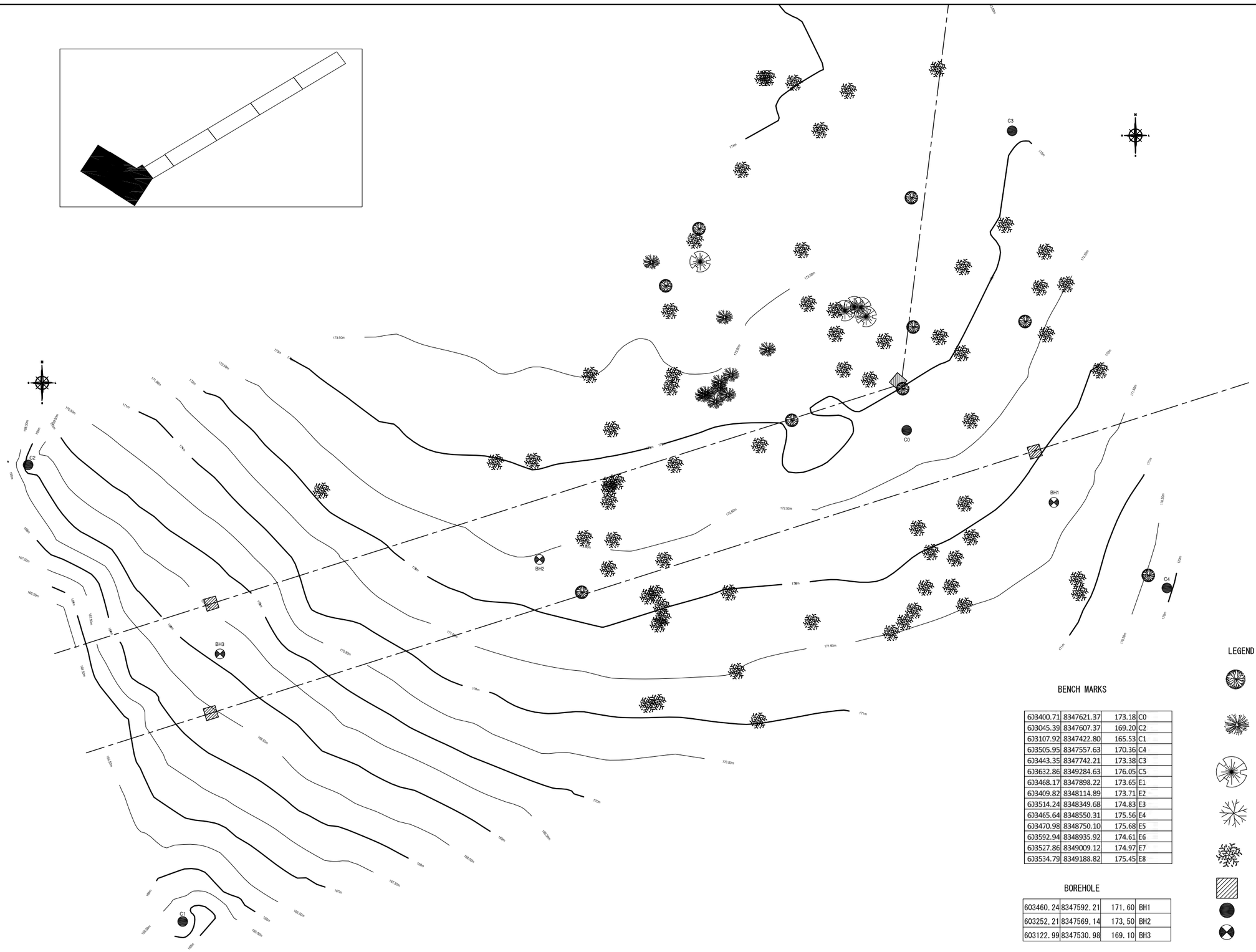
CLIENTE **ORI CONSUL**

PROJECTO PREPARATORY ON THE PROJECT FOR REINFORCEMENT OF TRANSMISSION NETWORK IN NACALA CORRIDOR

DESENHO N° PTO-CP-TOP-007
PROJECTO N° P 567
ASSUNTO TOPOGRAPHIC SURVEY
ESCALA 1 : 500

07

A15-22



BENCH MARKS

603400.71	8347621.37	173.18	C0
603045.39	8347607.37	169.20	C2
603107.92	8347422.80	165.53	C1
603505.95	8347557.63	170.36	C4
603443.35	8347742.21	173.38	C3
603632.86	8349284.63	176.05	C5
603468.17	8347898.22	173.65	E1
603409.82	8348114.89	173.71	E2
603514.24	8348349.68	174.83	E3
603465.64	8348550.31	175.56	E4
603470.98	8348750.10	175.68	E5
603592.94	8348935.92	174.61	E6
603527.86	8349009.12	174.97	E7
603534.79	8349188.82	175.45	E8

BOREHOLE

603460.24	8347592.21	171.60	BH1
603252.21	8347569.14	173.50	BH2
603122.99	8347530.98	169.10	BH3

LEGEND

- Shade Tree
- Eucalyptus
- Banana Plant
- Bamboo
- Fruit Tree
- Transmission Tower
- Bench Mark
- Borehole

0 10 20 30 40 m

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REV	DATA	DESIGNAÇÃO

DATA JULHO 2014
PROJECTADO .....
DESENHADO J.Pereira
CALCULADO .....
APROVADO .....

CLIENTE ORICONSUL

PROJECTO PREPARATORY ON THE PROJECT FOR REINFORCEMENT OF TRANSMISSION NETWORK IN NACALA CORRIDOR

DESENHO N° PTO-CP-TOP-001
PROJECTO N° P 567
ASSUNTO PROPOSED NAMIALO SS SITE

ESCALA 1 : 750

08

16. Geotechnical Investigation

GEOTECHNICAL INVESTIGATION AND TOPOGRAPHIC SURVEY FOR PREPARATORY SURVEY OF REIFORCEMENT PLAN FOR TRANSMISSION LINE AT NACALA CORRIDOR IN MOZAMBIQUE

FINAL REPORT

PREPARED FOR:

ORICONSUL

PREPARED By:

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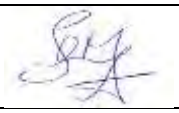
October, 2014
Project No. P567/TEC/2014

FINAL REPORT

Document History and Status

Date of Submission	October 06th 2014		**Sign and Date**
Project Description (Title)	GEOTECHNICAL INVESTIGATION AND TOPOGRAPHIC SURVEY FOR PREPARATORY SURVEY OF REIFORCEMENT PLAN FOR TRANSMISSION LINE AT NACALA CORRIDOR IN MOZAMBIQUE		
Prepared By	Olga Honchar (Civil/Geotechnical Eng.)		
Checked By	Sidney de Abreu (Civil/Geotechnical Eng.)		
Approved By	Carlos Quadros (Senior Geotechnical Eng)		

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- Summary of Soil Laboratory Tests
- Sieve Analysis
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- Log of Boreholes
- Photography Report

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1 INTRODUCTION

TECNICA Lda was contracted by ORICONSUL to undertake a geophysical and geotechnical investigation for the "Preparatory Survey on the Project for Reinforcement of Transmission Network in Nacala Corridor".

The purpose of the Geotechnical and Geological investigations was to provide a geological description of the region and ascertain the nature of soil at the project area and determine the geotechnical properties of the subsoil. The other aim of the site investigation was to determine the position of the groundwater level and the soil resistivity. To define the soil properties laboratory tests were conducted. The knowledge of the engineering properties of the soil are very useful to design and propose a suitable and economical foundation for the structures.

TECNICA hereby presents the Final Report of the field work and laboratory tests carried out in the framework of this project.

This report is based on the field investigation carried between 14th and 31st July 2014 at the site project. The services were carried out in accordance with the scope of work proposed by the Client.

The objectives of investigation were to obtain:

- Subsurface profile detailing different strata and their variation with depth – this was done by core drilling investigation of 3 boreholes up to 15 meters depth;
- Position of the Groundwater surface;
- To determine the engineering properties of the strata and necessary soil data to help in deciding on soil bearing capacity and the suitable foundation structures;

2 SCOPE OF WORK

2.1 General

To prepare this report, TÉCNICA undertook the following work:

a) Physical site reconnaissance to review project limits, clearing drill rig access, mark out exploration boring locations;
b) Geological desktop study;
c) Borehole Drilling
d) Soil sampling
e) Laboratory soil testing;
f) Geotechnical soil characterization.
g) In Situ Soil resistivity testing

2.2 Project Location

The project site is located in Namialo, District of Nampula, approximately 78km to the East of Nampula City, near the Namialo Village (Figure 1).

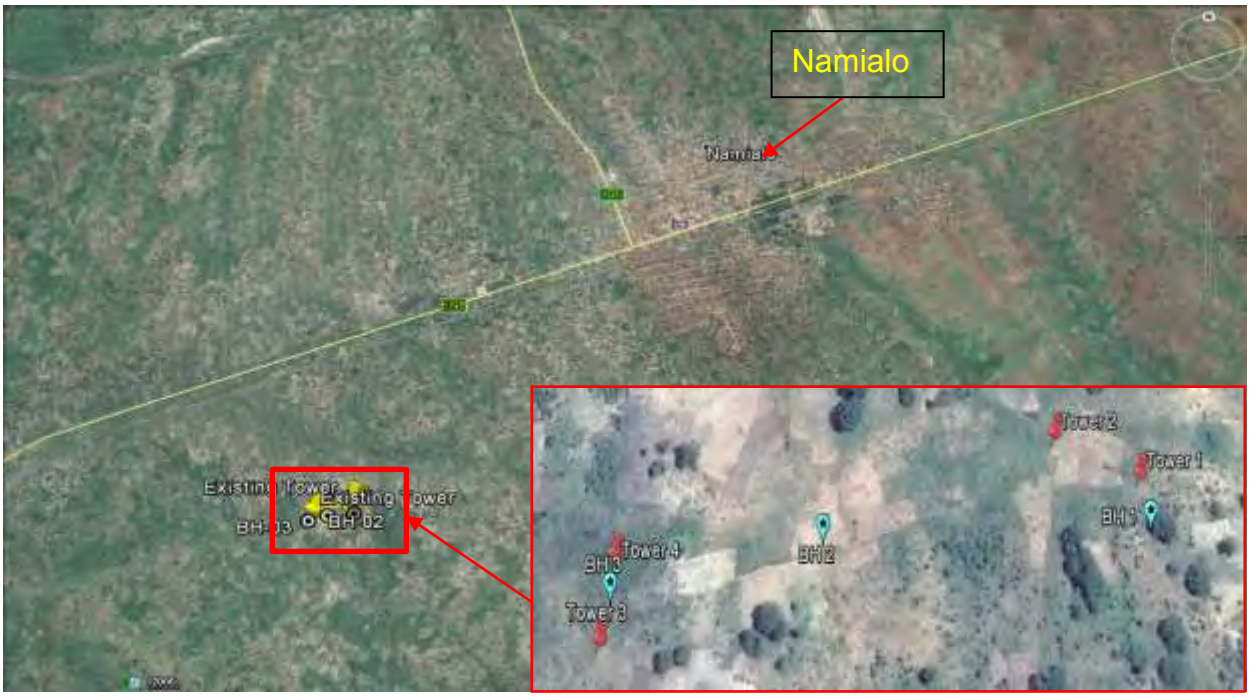


Figure 1 - Borehole site location

2.3 Scope of Works

The following works were executed, following the ToR and the main objectives of the investigation:

a) No. 3 Boreholes up to 15 m depth, with the execution of SPT test (Standard Penetration Test) at every 1.0 m depth;
b) Collection of disturbed soil samples to perform the following laboratory tests:
    - Moisture content
    - Sieve analysis
    - Atterberg Limits
c) No. 2 Soil Resistivity Tests using the Wenner method

The soil laboratory tests such as the triaxial compression test, unconfined compression test, and consolidation test, was not executed since the soil encountered on the boreholes was mostly composed by sand and silty sand.

3 GEOLOGICAL DESCRIPTION

The project area belongs to the Namialo pluton consisting mainly on granodioritic rocks and is closely associated with tonalitic gneisses.

In terms of Geomorphology, the project area is flattened land and downgraded as a result of changing existing rock that is predominantly granodiorite and gneissic quatzodiorites easily weathered rocks. The weathering process is made easier by the granular texture and composition rich in feldspar and biotite and the result is the formation of a residual soil (thin layers of sandy and clayey soils).

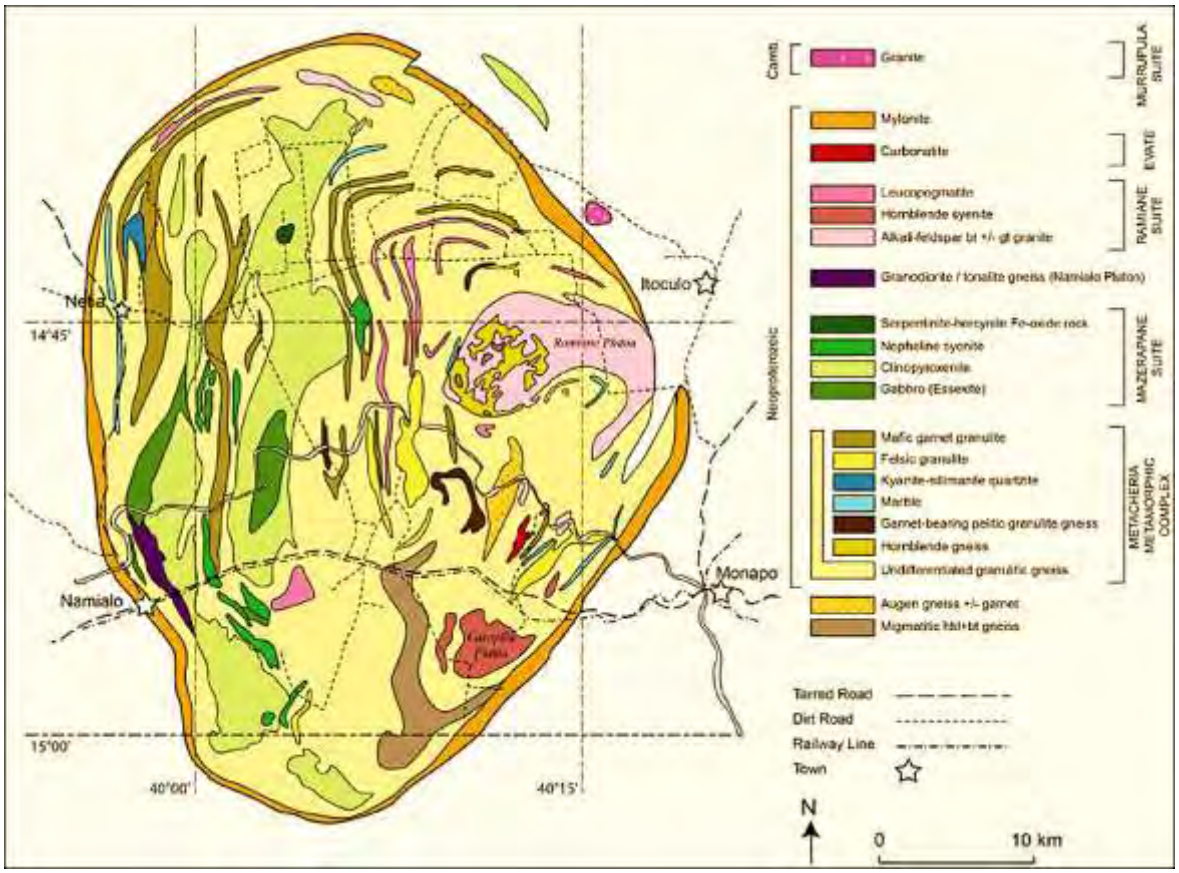


Figure 2 - Geological map of the Monapo Klippe.

The weathering leads to the formation of fine grained soils and the genesis of clay minerals that in turn favor the flattening of these areas due to the erosion process.

4 DRILLING INVESTIGATION

Between 14th and 31st July 2014 No.3 boreholes were drilled at the locations shown on the Site Plan, APPENDIX 1. Each borehole was drilled to a depth of 15 m. The soil found was visually examined during drilling, and logged according to the ASTM International Standards System. Standard Penetration Tests (SPT) was executed at every 1.0 m, and disturbed samples from the standard SPT- sampler were taken.

All samples were properly packed and taken to the laboratory of Soillab in Maputo, Mozambique. Groundwater levels were measured upon completion of drilling. The local ground

surface elevations of the borehole locations were surveyed using GPS equipment referenced to a geodetic datum. The elevations are shown on the table below.

Boreholes	Elevation (m)	Maximum depth drilled (m)	Coordinates (Latitude^{o})	Coordinates (Longitude^{o})	Date (dd/July/2014)	
					Start	End
BH1	171.6	15	-14.944467°	39.962067°	14	24
BH2	173.5	15	-14.944683°	39.960133°	25	27
BH3	169.1	15	-14.945033°	39.958933°	28	31

Table 1- Boreholes coordinates

4.1 Methodology

As specified, three boreholes were drilled by rotary core drilling method.
The objectives of the drilling investigation were to obtain the following:

a) Subsurface profile identifying different strata and their thickness ;
b) Obtain representative samples from the soil strata;
c) Carry out Standard Penetration Test (SPT) for bearing capacity estimation;
d) Determination of the position of the groundwater table;
e) Logging of the subsoil

Standard Penetration Test (SPT)

Standard Penetration Tests were performed on each hole at depths indicated in Table 1. The SPT tests were conducted in general compliance with applicable ASTM requirements. The test is basically a penetration test in which, a thick wall split tube sampler, is driven 300 mm into the undisturbed soil at the bottom of the hole under the blows of a 63.5 kg drive weight with 75 cm free fall.

4.2 Soil Condition

The general soil profile encountered at this site consists of superficial topsoil overlying mostly Silty Sands with some Clay layers. There is also the occurrence of beds of saprolite of

weathered gneiss rock along the 15m with variable thickness with more predominance on region where is located the borehole BH2. The soils generally increased in consistency and density with depth. It is found that up to 2.5 m depth the soil is less compacted but from there on the soil become dense to very dense with N_{SPT} greater than 60.

The detailed soil conditions found at the borehole locations are described on the borehole logs in APPENDIX 3. The following is a brief description of the soil types encountered

a) Topsoil

The layer of topsoil was encountered at all borehole locations with thickness ranging from 30 to 70 cm.

The topsoil was moderately organic, sandy silts with dark brown to reddish brown color and medium to fine grain size, very loose.

In general, this topsoil is considered to be weak and compressible under load.

b) Silty Sand

Silty sand is the kind of soil most abundant at the project site. It is a very dense and compact fine to medium grained material with mica minerals, interspread sometimes with some conglomerates, with N_{SPT} values ranging between 40 and greater than 50 blows per 300 mm of penetration, with exception of the first 2 meter in which the soil is less compacted with N_{SPT} ranging from 9 to 25 blows, as observed on borehole BH2 and BH3. The color of the silty sand varies from brown on the first meters, to light grey at higher depths. The fine component of this material shows a non-plastic behavior in accordance with the laboratory plasticity results (Atterberg Limits).

c) Clays,

Generally, there clay was found mixed with sand or silt. But there are some layers with thickness less than 1 m composed by sandy plastic clays, as could be observed in borehole BH1. The clays are in general light grey to reddish in color. In terms of consistency these clays can be classified as ”hard” (N_{SPT} > 35).

d) Saprolite

Saprolites (mixtures of residual soils and weathered rock) were found in borehole BH1 (8m and 10m) with thickness varying from 1 to 1.5 m, but it is more predominant in borehole BH2 being the layers thicker than 4 meter, starting from the depth 11.5m extending further than 15 m. These saprolites are the product of weathered gneiss with color varying from light brown to whitish grey.

4.3 Penetration Resistance, SPT-N

The sampler is first driven through 150 mm as a seating drive. It is further driven through 300 mm or until 50 blows have been applied. The number of blows required to drive the sampler 30 cm beyond the seating drive is termed as “Penetration Resistance N”. The tag of identification marks such as project, location, borehole number, sample number, penetration resistance with blows for each 15 cm and depth were attached to the sample.

Results of the SPT tests are shown on the individual boring log sheets in APPENDIX 3.

The degree of relative density of granular soils and the degree of consistency of cohesive soils are generally described on the boring logs according to the conventional correlation that can be visualized in Table 2 below:

Granular Soils		**Cohesive Soils**	
SPT Blow Count, N	**Description**	**SPT Blow Count, N**	**Description**
< 4	Very Loose	< 2	Very Soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium Dense	4 - 8	Medium Stiff
30 - 50	Dense	8 - 15	Stiff
> 50	Very Dense	15 - 30	Very Stiff
		> 30	Hard

Table 2- Conventional Correlation for Log Sheets

It is widely accepted that SPT blow count correlations, including those above, are overly simplistic and the blow counts should be adjusted for other factors, which may include, depending on the application, the effective vertical pressure at the sample depth and the details of the sampling system (such as hammer efficiency, rods, sampler details, and techniques used). The relative density and consistency descriptions on the logs are based on the unadjusted SPT blow count recorded in the field and reported on the logs.
In the present case, no correction of the blow count was introduced.

4.4 Sampling for laboratory tests

No. 13 disturbed samples were collected from each borehole. The soil samples collected were preserved in plastic bags, well packed and suitably labeled according with good practices. From each borehole No. 3 representative samples were selected for the laboratory tests.

4.5 Groundwater

The results of an investigation of the resistivity of the soil at the location of boreholes BH1 and boreholes BH2 indicate the existence of a partially saturated water layer. This layer has a thickness ranging from 5.0 to 7.0 meters. On the region of the borehole BH1 it has a thickness of about 7.0 meter and is located between the depth of 3.0 m and 11.0 m. At the zone of the borehole BH2 it has a thickness of about 5.0 meters and it is located between the depth of 3.5 m and 8.0 m.

Although groundwater was found at shallow depth, we are of the opinion that this water is due to localized effects, probably a result of the existence of a less pervious layer (perched groundwater level). The existence of the groundwater has, in our view, no detrimental effect in the bearing capacity of the soil.

5 LABORATORY TESTING

5.1 General

The soil samples were labeled and numbered in the field and taken to the materials laboratory of SOILLAB. The following tests were carried out:

- Particle size distribution
- Atterberg limits
- Moisture content

All laboratory tests were done in accordance with ASTM , "Standard Test Method" . The summary of the tests are presented on the Table 3 below.

Complete laboratory results can be found in the APPENDIX 2- summary of soil laboratory tests

Table 3 - Summary of laboratory tests

Sample No.	Depht (m)	Borehole No.	SPT No.	Moisture Content (%)	Sieve Analysis Percentage Passing Sieves (mm)					Atterberg Limits (%)		
					19	9.50	4.75	2.36	0.075	LL	PL	IP
61/SM/1	1.0 - 1.45	1	1	5.9	100	100	92	83	16	NP	NP	NP
61/SM/2	3.0 - 3.45	1	3	32.6	100	100	100	100	53	54.0	27.9	26.1
61/SM/3	13.5 - 14.0	1	13	14.7	100	98	98	97	33	31.8	17.9	13.9
61/SM/4	2.0 - 2.45	2	2	9.9	100	100	96	80	14	NP	NP	NP
61/SM/5	9.0 - 9.45	2	9	13.9	100	100	100	100	13	NP	NP	NP
61/SM/6	11.0 - 11.45	2	11	15.1	100	97	87	75	17	23.5	18.2	5.3
61/SM/7	4.0 - 4.75	3	4	4.3.6	100	99	98	96	19	NP	NP	NP
61/SM/8	9.0 - 9.45	3	9	12.2	100	100	100	100	11	NP	NP	NP
61/SM/9	13.0 - 13.45	3	13	11.7	100	100	100	99	16	NP	NP	NP

6 LOGGING OF SOILS

The logging of the boreholes was initiated in the field in which it was recorded the soil characteristics, observations, sample location, and other drilling information.

The soils were visually classified in general accordance with the Unified Soil Classification System (ASTM D 2488, “Standard Practice for Description and Identification of Soils). The final boring logs were prepared on the basis of visual observation of the samples and results of the laboratory tests. Groundwater observations are included in the logs. The logs also include our interpretation of the condition between sampling intervals.

7 GEOPHYSICAL INVESTIGATION

7.1 Methodology

The study involved measuring the resistivity in the form of vertical electrical soundings (VES) using the Ohmega resistivity (Fig 4).

The array of the electrodes, both current and potential was Schlumberger, in this case with a constant separation between both electrodes.

The VES intended to give an insight of the lithological differences with depth, and thickness of the layer.

Figure 3 - Image of Ohmega resistivity used in geophysical research.

7.2 Vertical Electrical Sounding (VES)

The vertical electrical soundings using the geoelectric method took place in the pre-selected sites according to the needs of the study.

The field work took place in August 2014 after a reconnaissance visit to the site involving the Client´s representative.

Two vertical electrical soundings to a depth of 45 m each were made in places where the borehole investigations were done.

Figure 4 - SEV set-up and geophysical technician during the field works near Borehole 01

7.3 Results

The results of the geophysical investigation are presented in tables and graphs (APPENDIX 4)

The table used to present the field data was provided by the Client and it contains the intervals separating the electrodes, both current and potential.

The arrangement of the electrodes was executed strictly in accordance with the instructions given in the table.

Table 4 - Values used for measuring the resistivity of the soil in the study area.

Earth Resistivity Measurement Sheet (Example)

				Musurement Company	ABC Co., Ltd.
Venue of site	Namialo SS	Date of measurement	25/06/2014		
Electrode Distance a[m]	Electrode moving distance P1and P2 (1/2a)	Electrode moving distanceC1and C2 (1.5a)	2πa [m]	R[Ω]=V/I Actual measurement value	ρ[Ωm]=2πa*R
0.6	0.3	0.9	3.77	61.0	230.0
1.0	0.5	1.5	6.28	38.2	240.0
1.5	0.75	2.25	9.42	28.5	269.6
2.0	1.0	3.0	12.57	23.9	300.3
3.0	1.5	4.5	18.85	20.7	390.2
5.0	2.5	7.5	31.42	15.6	490.1
7.0	3.5	10.5	43.98	12.3	541.0
10.0	5.0	15.0	62.8	8.4	527.8
15.0	7.5	22.5	94.2	5.5	480.0
30.0	15.0	45.0	188.5	2.5	471.3

It is noted that the values in the table above correspond to the distance between the current electrodes, the potential and the geoelectrical constant (2πa) was used.

More detailed results are presented in the APPENDIX 4.

8 CONCLUSIONS

The conclusions of the investigation are the following:

1. The project area is located at Namialo-Metochéria Formation consisting on a range of mafic, ultramafic and silica over saturated rocks (Fig. 3). The most important of these are the Evate Carbonatite, which is tentatively correlated with the Mezerepane Suite, and the Namialo Pluton, which has characteristics similar to the Ramiane.

2. On the geological/geotechnical formation: the whole area, with minor variations, is composed by silty sands with some clay and silty clay layers. There is also the occurrence of beds of Saprolite of weathered Gneiss rock and gneiss rock along the 15m with variable thickness, more predominant in region of borehole BH2. The soils generally increased in consistency and density with depth. It is found that up to 2.5 m depth the soil is relatively loose but from there on the soil becomes dense to very dense with N_{SPT} greater than 60. The silty sands show a small fraction of clay with low plasticity and in most of the cases non-plastic fines.

3. For engineering purposes:
    - In terms of bearing capacity, considering a shallow foundation, the results of STP test shows that the Allowable Bearing Capacity (with a Factor of Safety of 3) range from 200 to 250 kPa at 1.5m and it increases with depth. This is applicable to the locations of BH1 and BH3. The first layers of soil (up to 1m depth) are composed by less compacted silty sand and sandy silt with low bearing capacity. Founding structures in this layer should be avoided;
    - At location of BH2, the bearing capacity inferred directly from the SPT readings is apparently lower at 1.5m. However, in residual soils the spatial variation of the soils properties is a fact. It is noted that the formation is rather homogeneous and therefore the bearing capacity at say 1.5m can be taken as 200 kPa. There is no concern regarding soil failure. It is also noted that the thickness of the less compact soil is “small” and therefore no significant vertical movements are to be expected. Due to the nature of the soils, any vertical movements will be of the type “immediate settlements”.
    - The soil encountered on the project area has a poor drainage capacity (permeability estimated at 10^{-5} to10^{-6} cm/s) at the investigated depths. In this case a well-designed drainage system is important to protect the foundations of the structures and it should be implemented in the project area;
    - As per the results found from the STP test it is clear that there is no soft or very compressible material that could lead to critical settlement, after 1.5 m depth. Even the layers of clay found on the site, despite having no significant thickness, it has a very stiff to hard consistency (N_{SPT} greater than 60 blows), not constituting a major concern;
    - Excavations may stand stable with vertical walls for a reasonable time. If left exposed to the weather elements, walls of excavation may collapse, on the long term;

APPENDIX I

Site Plan


Existing Tower
Existing tower
BH-01
BH-02
Existing Tower
BH-03
Existing Tower
Image © 2014 CNES / Astrium
Google
2006
Data das imagens: 2/2/2014 lat. -14.944723° long. 39.960485° elev 189 m altitude de visualizaçã

APPENDIX II

Laboratory Tests

- Summary of Test Results
- Sieve Analysis
- Atterberg Limits

SUMMARY OF SAMPLING & LABORATORY TEST RESULTS

Borehole Information					Moisture Content	Atterberg Limits			Particle Size Distribution (% Passing Sieve Size)					USCS Classification
Borehole Ref.	Sample Nr. Ref	SAMPLES TYPE	DEPTH (m)			Liquid Limit	Plastic Limit	Plasticity Index	19	9.5	4.75	2.36	0.075	
			From	To	%	%	%	%	mm	mm	mm	mm	mm	
BH1	1	Disturbed Samples	1	1.45	5.9	NP	NP	NP	100	100	92	83	16	SM
	2	Disturbed Samples	3	3.45	32.6	54	27.9	26.1	100	100	100	100	53	CH
	3	Disturbed Samples	13.5	14	14.7	31.8	17.9	13.9	100	98	98	97	33	SC-SM
BH2	1	Disturbed samples	2	2.45	9.9	NP	NP	NP	100	100	96	80	14	SM
	2	Disturbed Samples	9	9.45	13.9	NP	NP	NP	100	100	100	100	13	SM
	3	Disturbed Samples	11	11.45	15.1	23.5	18.2	5.3	100	97	87	75	17	SC-SM
BH3	1	Disturbed Samples	4	4.75	4.36	NP	NP	NP	100	99	98	96	19	SM
	2	Disturbed Samples	9	9.45	12.2	NP	NP	NP	100	100	100	100	11	SP-SM
	3	Disturbed Samples	13	13.45	11.7	NP	NP	NP	100	100	100	99	16	SM

Borehole BH1

SOILLAB
Moçambique

Gravel:	17.2	%
Coarse Sand:	27.1	%
Medium Sand:	31.4	%
Fine Sand:	8.1	%
Elem. < 0.075 mm	16.2	%

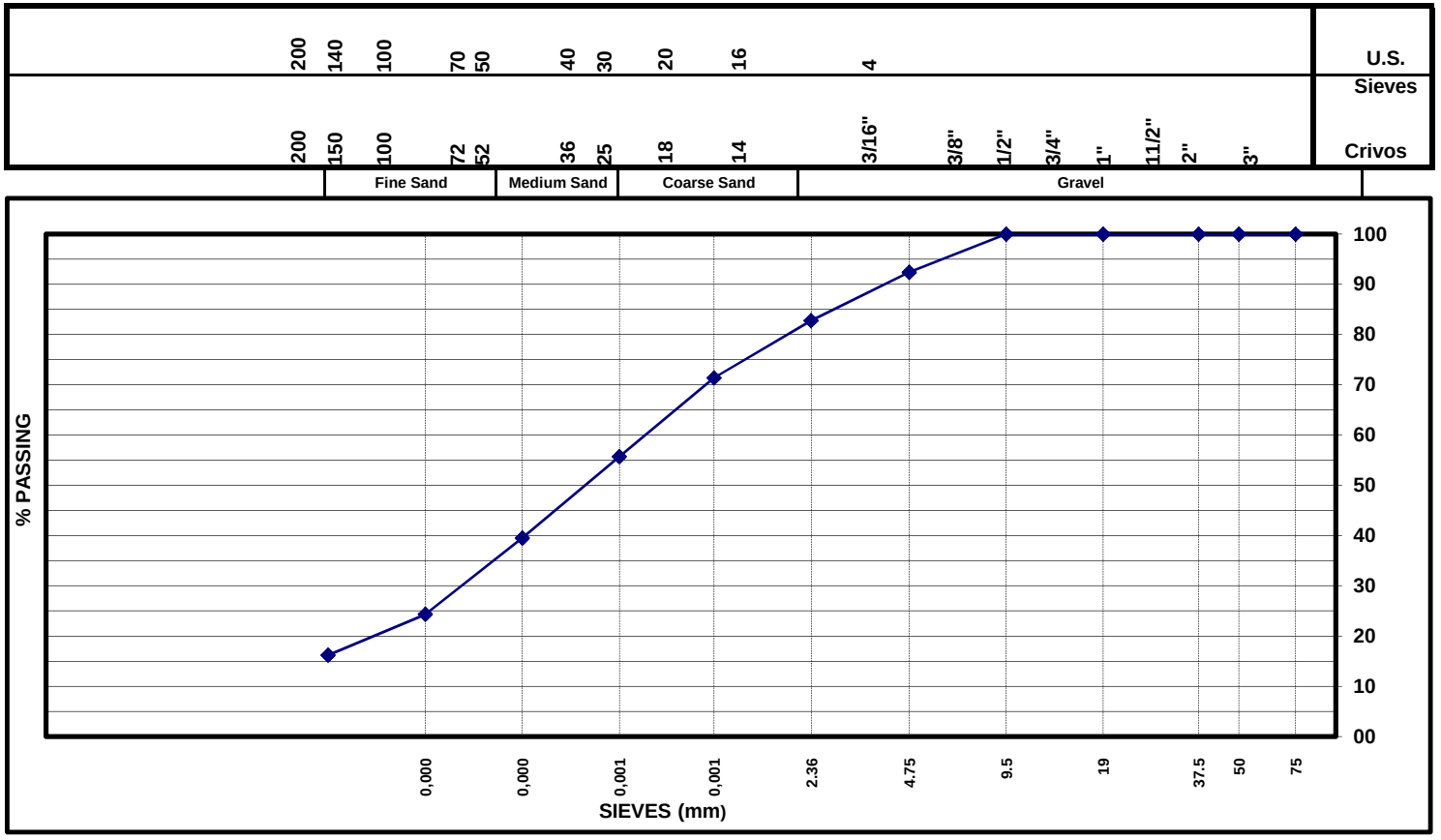
Weight of oven dry sample:	300.0	gr
Weight of washed oven dry:	251.4	gr
Weight of wash loss<0.075mm:	48.6	gr (P1)

REQUEST/ LAB. No.: 61/SM/GR/1
SPECIFICATION: ASTM C136 **DEPTH:** 1.0 - 1.45 m
SAMPLE No.: BH1-01 **CLIENT:** Oriconsul
SOIL DESCRIPTION: Silty Sand with Gravel
TESTED BY: Flora Cariório **DATE:** 05.08.14

Module Granulometric. G.M.= 0.68

Sieve mm	Retained (g)	Retained (%)	Passing (%)
			100
75.0			100.00
50.0			100.00
37.5			100.00
19.0			100.00
9.5			100.00
4.75	22.80	7.60	92.40
2.36	28.80	9.60	82.80
1.18	34.30	11.43	71.37
0.600	47.00	15.67	55.70
0.300	48.60	16.20	39.50
0.150	45.6	15.20	24.30
0.075	24.3	8.10	16.20
Base (P2)			
(P1)	48.6		
< 0.075	48.6	16.20	
W.Total	300.0		

Tot. Weight Pass. 0.075mm = (P1)+(P2)



Checked By: Flora Cariório
Date: 06.08.14

Approved By: Vilma Manhique
Date: 06.08.14

A16-23

SOILLAB
Moçambique

Gravel:		%
Coarse Sand:	6.6	%
Medium Sand:	31.2	%
Fine Sand:	9.4	%
Elem. < 0.075 mm	52.8	%

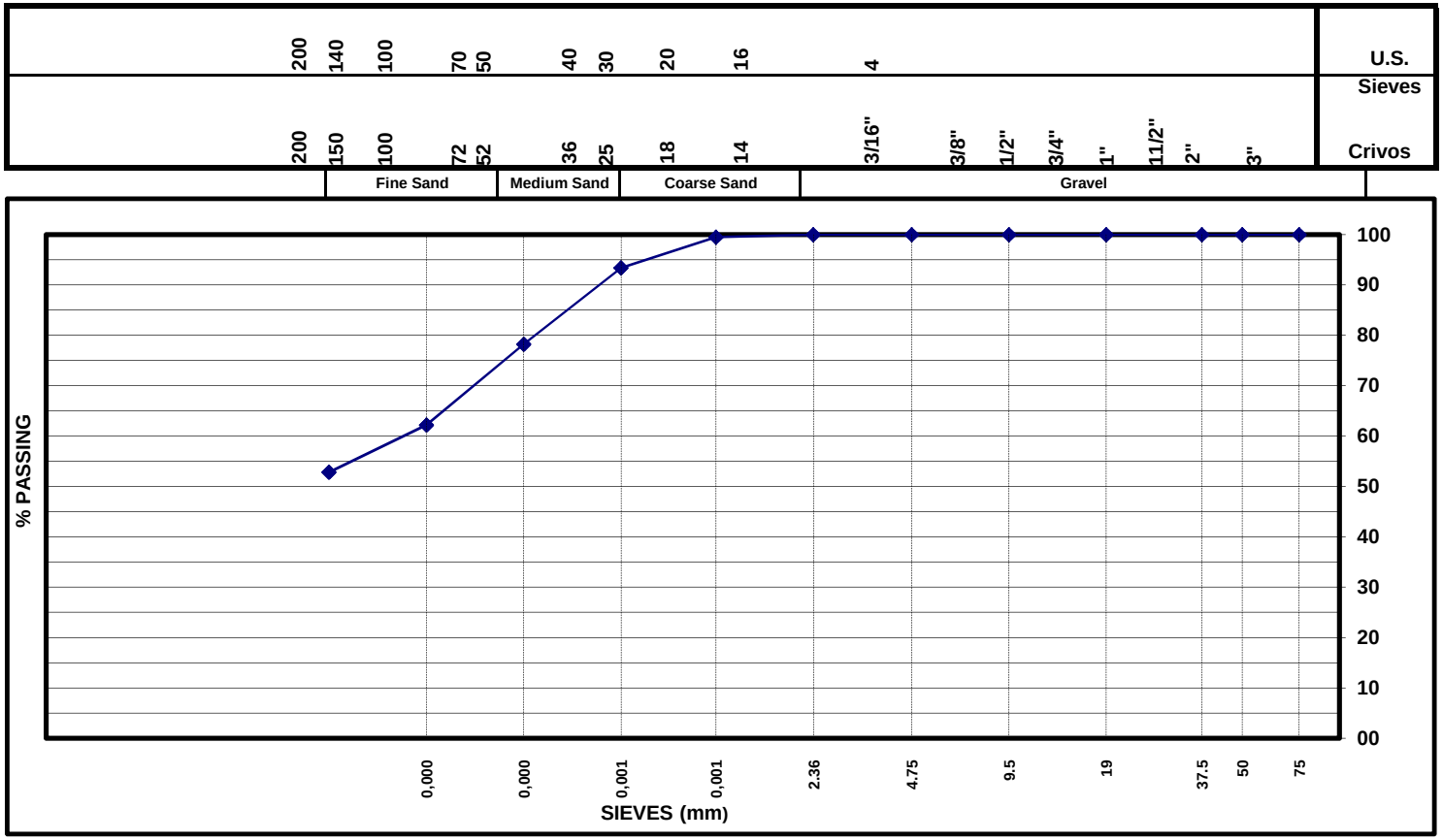
Weight of oven dry sample:	100.0	gr
Weight of washed oven dry:	47.2	gr
Weight of wash loss<0.075mm:	52.8	gr (P1)

REQUEST/ LAB. No.: 61/SM/GR/2
SPECIFICATION: ASTM C136 **DEPTH:** 3.0 - 3.45 m
SAMPLE No.: BH1-03 **CLIENT:** Oriconsul
SOIL DESCRIPTION: Sandy fat Clay
TESTED BY: Flora Cariório **DATE:** 05.08.14

Module Granulometric. G.M.= 0.38

Sieve mm	Retained (g)	Retained (%)	Passing (%)
			100
75.0			100.00
50.0			100.00
37.5			100.00
19.0			100.00
9.5			100.00
4.75			100.00
2.36			100.00
1.18	0.50	0.50	99.50
0.600	6.10	6.10	93.40
0.300	15.20	15.20	78.20
0.150	16.0	16.00	62.20
0.075	9.4	9.40	52.80
Base (P2)			
(P1)	52.8		
< 0.075	52.8	52.80	
W.Total	100.0		

Tot. Weight Pass. 0.075mm = (P1)+(P2)



Checked By: Flora Cariório
Date: 06.08.14

Approved By: Vilma Manhique
Date: 06.08.14

A16-24

SOILLAB
Moçambique

Gravel:	**3.2**	%
Coarse Sand:	**13.8**	%
Medium Sand:	**38.0**	%
Fine Sand:	**11.8**	%
Elem. < 0.075 mm	**33.3**	%

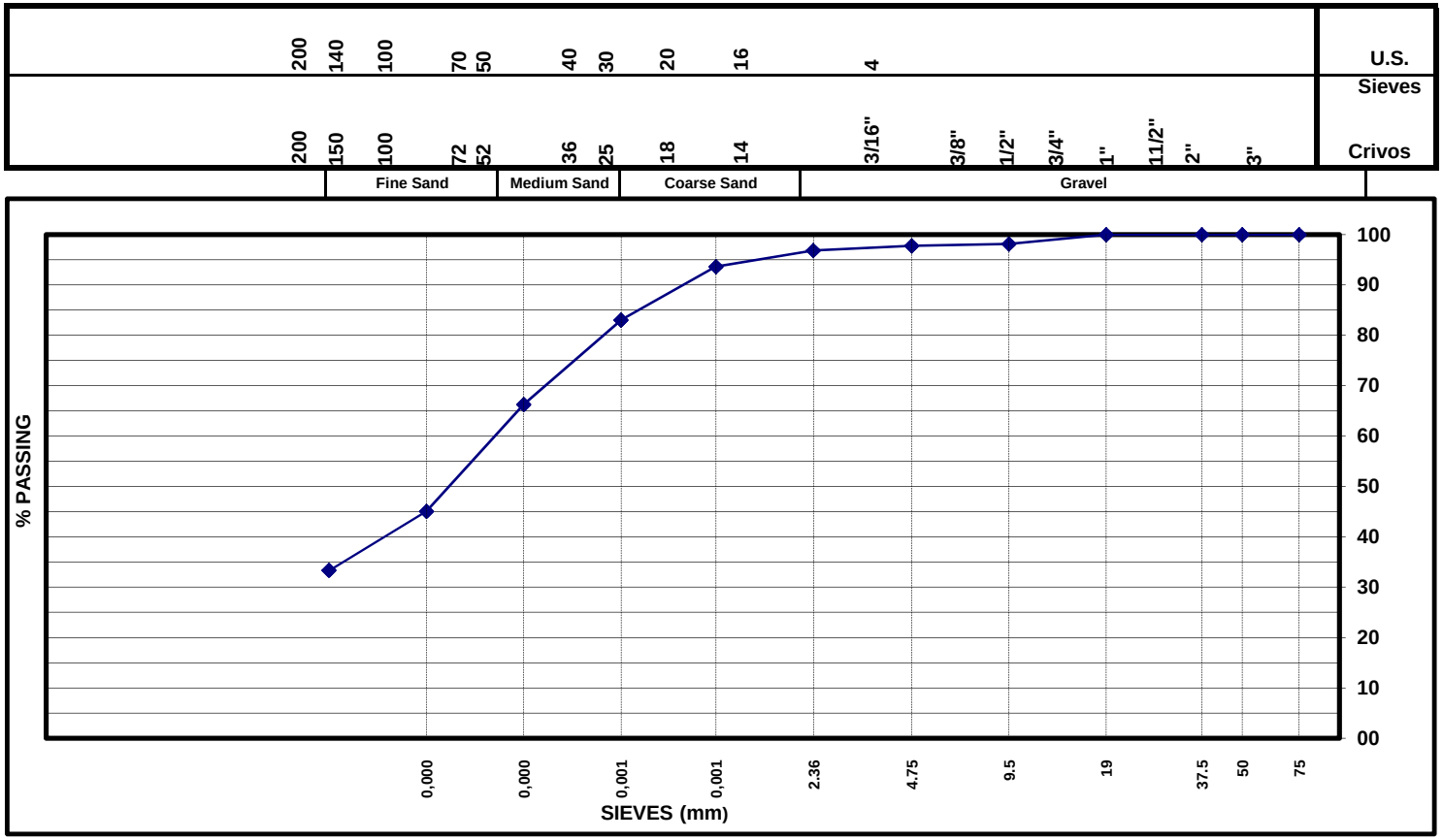
Module Granulometric. G.M.= **0.55**

Weight of oven dry sample:	500.0	gr
Weight of washed oven dry:	333.5	gr
Weight of wash loss<0.075mm:	166.5	gr (P1)

REQUEST/ LAB. No.: 61/SM/GR/3
SPECIFICATION: ASTM C136 **DEPTH:** 13.5 - 14.0 m
SAMPLE No.: BH1-13 **CLIENT:** Oriconsul
SOIL DESCRIPTION: **Clayey Silty Sand**
TESTED BY: Flora Cariório **DATE:** 05.08.14

Sieve mm	Retained (g)	Retained (%)	Passing (%)
			100
75.0			100.00
50.0			100.00
37.5			100.00
19.0			100.00
9.5	9.40	1.88	98.12
4.75	1.70	0.34	97.78
2.36	4.70	0.94	96.84
1.18	16.10	3.22	93.62
0.600	53.00	10.60	83.02
0.300	83.80	16.76	66.26
0.150	106.0	21.20	45.06
0.075	58.8	11.76	33.30
Base (P2)			
(P1)	**166.5**		
< 0.075	**166.5**	33.30	
W.Total	**500.0**		

Tot. Weight Pass. 0.075mm = (P1)+(P2)



Checked By: Flora Cariório **Approved By:** Vilma Manhique
Date: 06.08.14 **Date:** 06.08.14

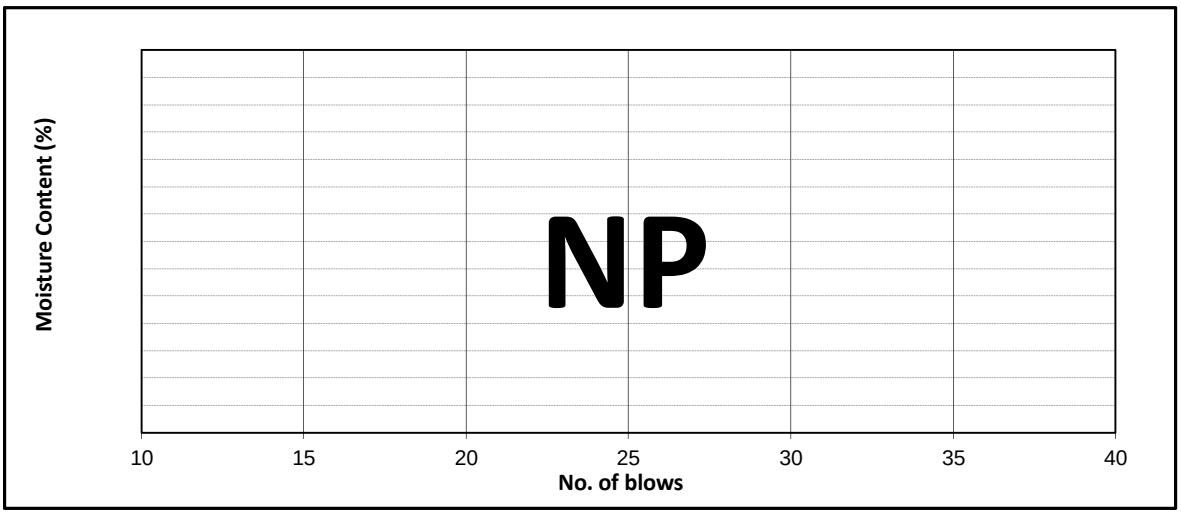
A16-25

SOILLAB Moçambique	***Determination of Atterberg Limits*** ***Air-Dried***	***Request/ Lab. No.*** ***61/SM/AL/01***

Contract:	P567	**Sample Location:**	Namialo
Project:	Reinforcement of Transmission Network in Nacala	**Depth:**	1.0 - 1.45 m
Client:	Oriconsul	**Specification:**	ASTM, D4318
Sample No.:	BH1-01	**Operator:**	Joaquina
Description:	SM	**Date:**	04.08.14

1. DETERMINATION OF LIQUID LIMIT

Container	**No.**							
Wgt of Wet Soil + Container	**g**							
Wgt of Dry Soil + Container	**g**							
Wgt of Moisture	**g**							
Wgt of Container	**g**							
Wgt of Dry Soil	**g**							
Moisture Content	**%**							
Number of Blows	**No.**							



2. DETERMINATION OF PLASTIC LIMIT

Container	**No.**							
Wgt of Wet Soil + Container	**g**							
Wgt of Dry Soil + Container	**g**							
Wgt of Moisture	**g**							
Wgt of Container	**g**							
Wgt of Dry Soil	**g**							
Moisture Content	**%**							
Average	**%**							

3. DETERMINATION OF LINEAR SHRINKAGE

Trough	**No.**	
No. of Blows	**No.**	
Length Before Drying	**mm**	
Length After Drying	**mm**	
Linear Shrinkage	**%**	

4. RESULTS

Liquid Limit	**%**	NP
Plastic Limit	**%**	NP
Plastic Index	**%**	NP
Linear Shrinkage	**%**	

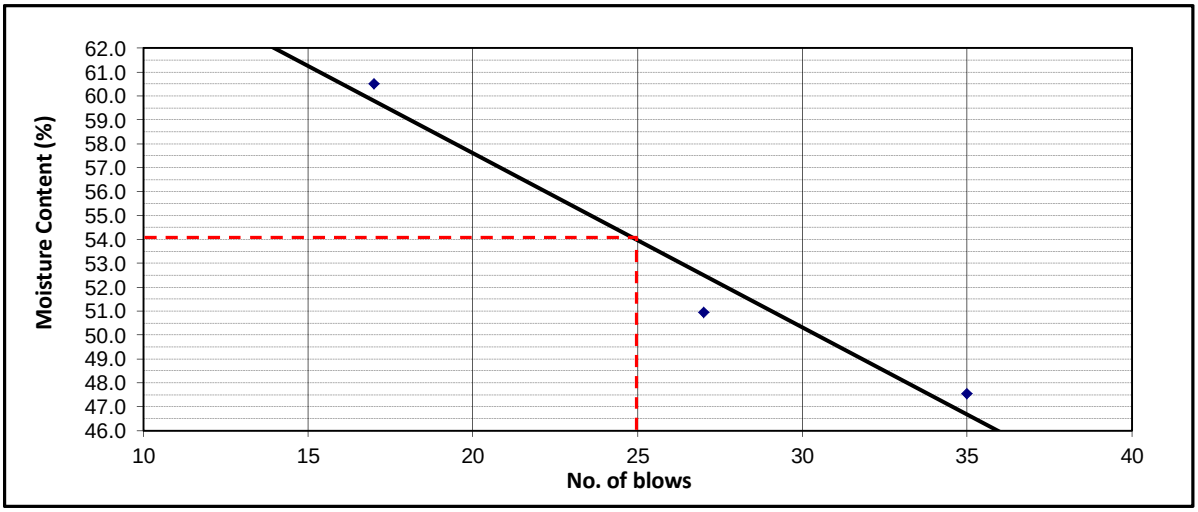
Checked By: Flora Cariório	**Approved By:** Vilma Manhique
Date: 05.08.14	**Date:** 06.08.14

SOILLAB Moçambique	***Determination of Atterberg Limits*** ***Air-Dried***	***Request/ Lab. No.*** ***61/SM/AL/02***

Contract:	P567	**Sample Location:**	Namialo
Project:	Reinforcement of Transmission Network in Nacala	**Depth:**	3.0 - 3.45 m
Client:	Oriconsul	**Specification:**	ASTM, D4318
Sample No.:	BH1-03	**Operator:**	Joaquina
Description:	CH	**Date:**	04.08.14

1. DETERMINATION OF LIQUID LIMIT

Container	**No.**	T	D	C				
Wgt of Wet Soil + Container	**g**	27.50	27.46	28.80				
Wgt of Dry Soil + Container	**g**	25.56	25.32	25.92				
Wgt of Moisture	**g**	1.94	2.14	2.88				
Wgt of Container	**g**	21.48	21.12	21.16				
Wgt of Dry Soil	**g**	4.08	4.2	4.76				
Moisture Content	**%**	47.55	50.95	60.50				
Number of Blows	**No.**	35	27	17				



2. DETERMINATION OF PLASTIC LIMIT

Container	**No.**	R	J					
Wgt of Wet Soil + Container	**g**	23.72	24.56					
Wgt of Dry Soil + Container	**g**	23.18	23.84					
Wgt of Moisture	**g**	0.54	0.7					
Wgt of Container	**g**	21.26	21.24					
Wgt of Dry Soil	**g**	1.92	2.6					
Moisture Content	**%**	28.13	27.69					
Average	**%**	27.9						

3. DETERMINATION OF LINEAR SHRINKAGE

Trough	**No.**	2
No. of Blows	**No.**	27
Length Before Drying	**mm**	150
Length After Drying	**mm**	123
Linear Shrinkage	**%**	18

4. RESULTS

Liquid Limit	**%**	54.0
Plastic Limit	**%**	27.9
Plastic Index	**%**	26.1
Linear Shrinkage	**%**	18

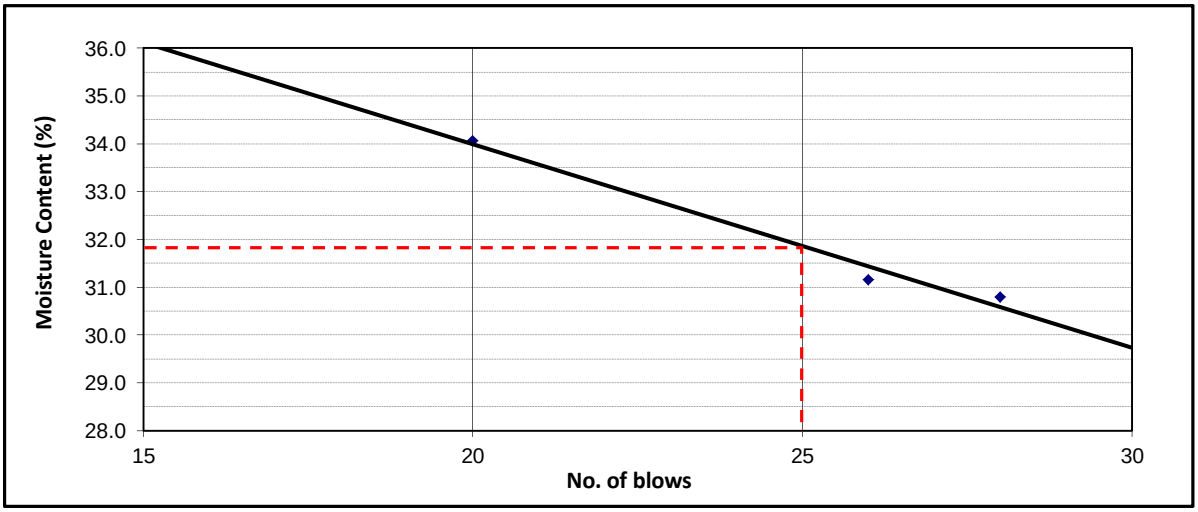
Checked By: Flora Cariório	**Approved By:** Vilma Manhique
Date: 05.06.14	**Date:** 06.06.14

SOILLAB Moçambique	***Determination of Atterberg Limits*** ***Air-Dried***	***Request/ Lab. No.*** ***61/SM/AL/03***

Contract:	P567	**Sample Location:**	Namialo
Project:	Reinforcement of Transmission Network in Nacala	**Depth:**	13.5 - 14.0 m
Client:	Oriconsul	**Specification:**	ASTM, D4318
Sample No.:	BH1-13	**Operator:**	Joaquina
Description:	SC-SM	**Date:**	04.08.14

1. DETERMINATION OF LIQUID LIMIT

Container	**No.**	A	B	E				
Wgt of Wet Soil + Container	**g**	28.60	28.60	27.52				
Wgt of Dry Soil + Container	**g**	26.90	26.88	25.96				
Wgt of Moisture	**g**	1.70	1.72	1.56				
Wgt of Container	**g**	21.38	21.36	21.38				
Wgt of Dry Soil	**g**	5.52	5.52	4.58				
Moisture Content	**%**	30.80	31.16	34.06				
Number of Blows	**No.**	28	26	20				



2. DETERMINATION OF PLASTIC LIMIT

Container	**No.**	F	S					
Wgt of Wet Soil + Container	**g**	28.16	28.74					
Wgt of Dry Soil + Container	**g**	27.1	27.62					
Wgt of Moisture	**g**	1.06	1.1					
Wgt of Container	**g**	21.28	21.28					
Wgt of Dry Soil	**g**	5.82	6.34					
Moisture Content	**%**	18.21	17.67					
Average	**%**	17.9						

3. DETERMINATION OF LINEAR SHRINKAGE

Trough	**No.**	11
No. of Blows	**No.**	26
Length Before Drying	**mm**	150
Length After Drying	**mm**	145
Linear Shrinkage	**%**	3

4. RESULTS

Liquid Limit	**%**	31.8
Plastic Limit	**%**	17.9
Plastic Index	**%**	13.9
Linear Shrinkage	**%**	3

Checked By: Flora Cariório	**Approved By:** Vilma Manhique
Date: 05.06.14	**Date:** 06.06.14

Borehole BH2

SOILLAB
Moçambique

Gravel:	20.4	%
Coarse Sand:	28.8	%
Medium Sand:	31.0	%
Fine Sand:	6.2	%
Elem. < 0.075 mm	13.5	%

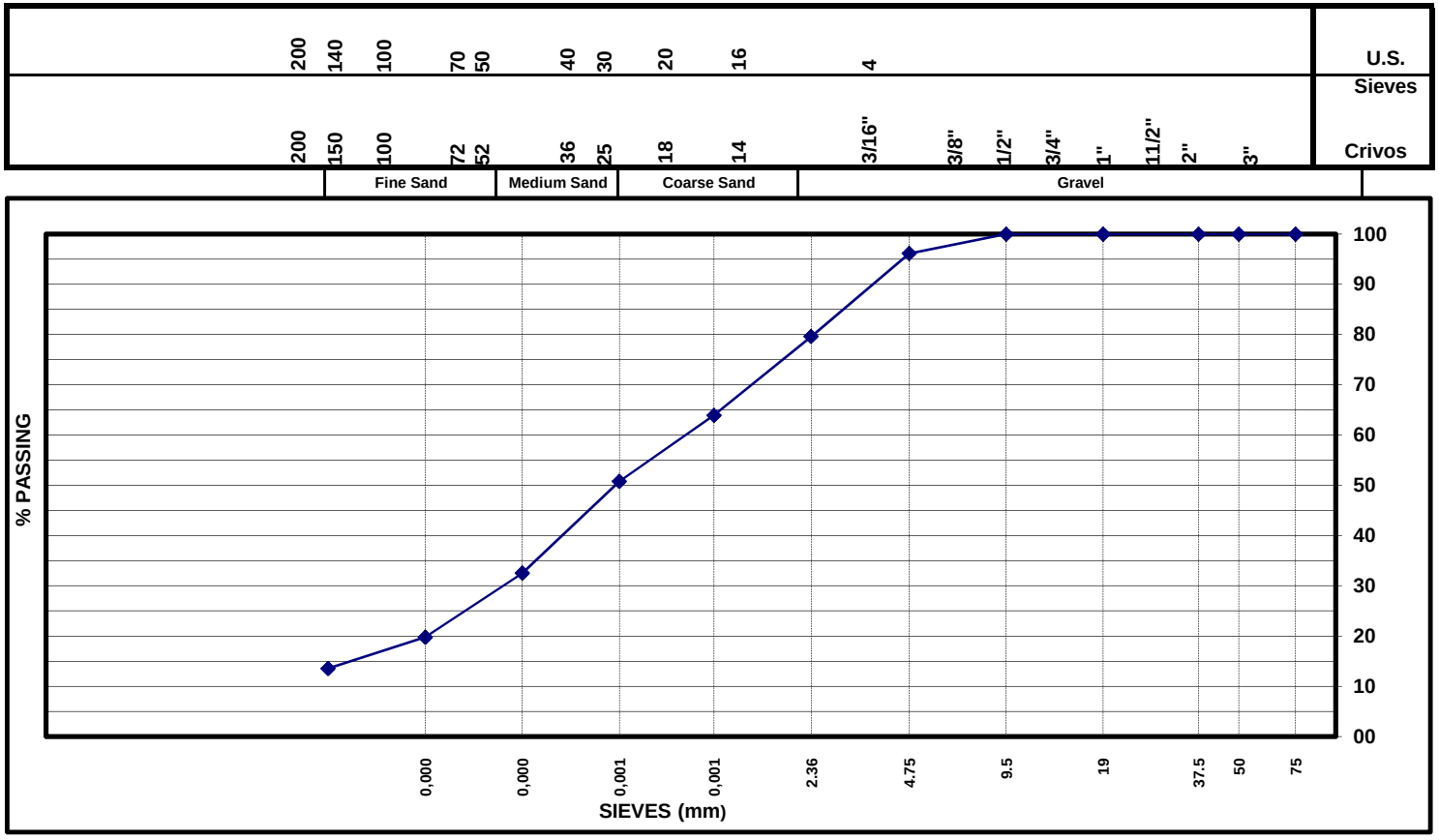
Weight of oven dry sample:	300.0	gr
Weight of washed oven dry:	259.4	gr
Weight of wash loss<0.075mm:	40.6	gr (P1)

REQUEST/ LAB. No.: 61/SM/GR/4
SPECIFICATION: ASTM C136 **DEPTH:** 2.0 - 2.45 m
SAMPLE No.: BH2-02 **CLIENT:** Oriconsul
SOIL DESCRIPTION: Silty Sand with Gravel
TESTED BY: Flora Cariório **DATE:** 22.08.14

Module Granulometric. G.M.= 0.80

Sieve mm	Retained (g)	Retained (%)	Passing (%)
			100
75.0			100.00
50.0			100.00
37.5			100.00
19.0			100.00
9.5			100.00
4.75	11.60	3.87	96.13
2.36	49.60	16.53	79.60
1.18	47.10	15.70	63.90
0.600	39.40	13.13	50.77
0.300	54.80	18.27	32.50
0.150	38.2	12.73	19.77
0.075	18.7	6.23	13.53
Base (P2)			
(P1)	40.6		
< 0.075	40.6	13.53	
W.Total	300.0		

Tot. Weight Pass. 0.075mm = (P1)+(P2)



Checked By: Flora Cariório **Approved By:** Vilma Manhique
Date: 23.08.14 **Date:** 23.08.14

A16-30

SOILLAB
Moçambique

Gravel:		%
Coarse Sand:	5.9	%
Medium Sand:	70.0	%
Fine Sand:	11.6	%
Elem. < 0.075 mm	12.5	%

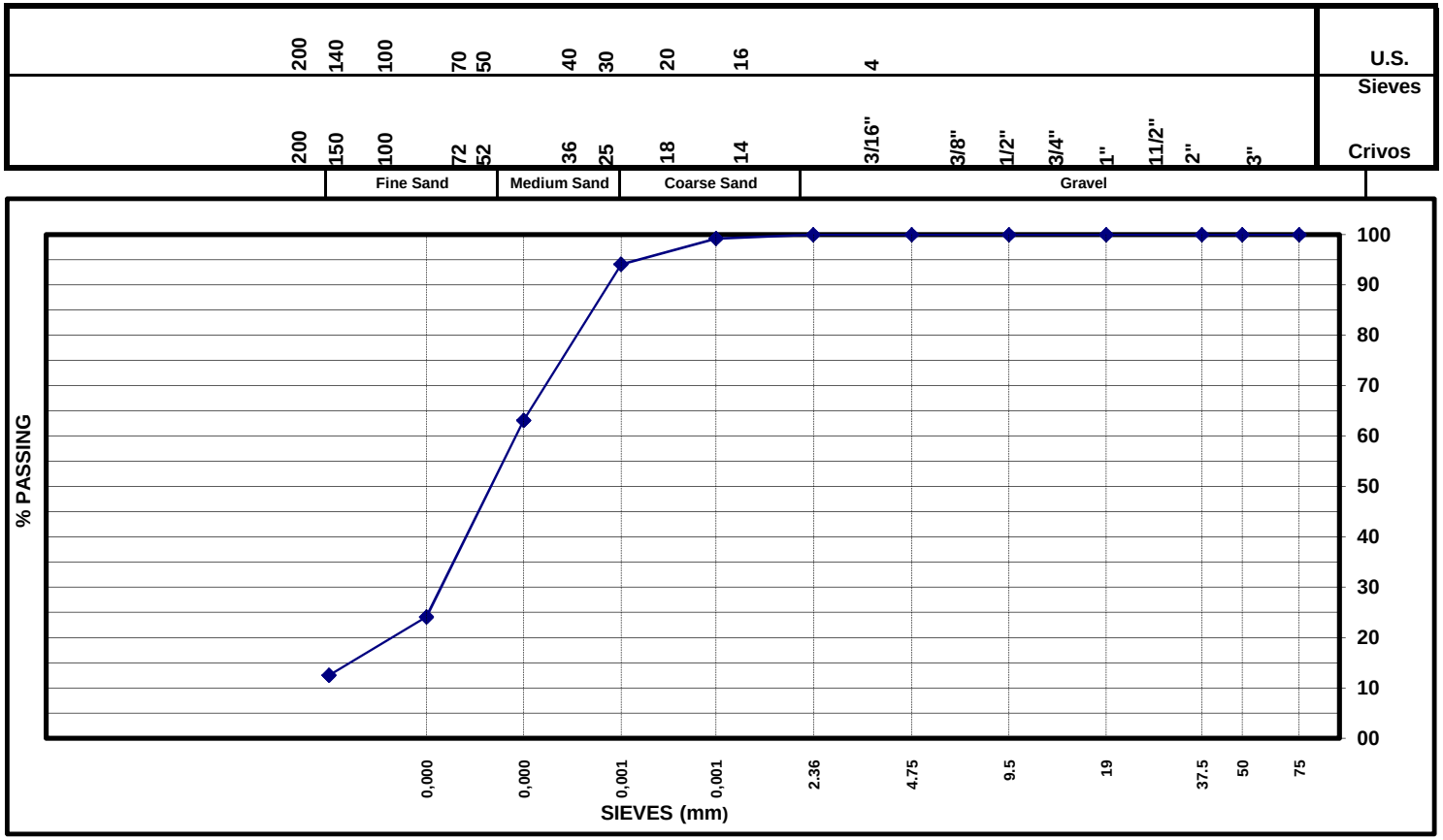
Weight of oven dry sample:	100.0	gr
Weight of washed oven dry:	87.5	gr
Weight of wash loss<0.075mm:	12.5	gr (P1)

REQUEST/ LAB. No.: 61/SM/GR/5
SPECIFICATION: ASTM C136 DEPTH: 9.0 - 9.45 m
SAMPLE No.: BH2-09 CLIENT: Oriconsul
SOIL DESCRIPTION: Silty Sand
TESTED BY: Flora Cariório DATE: 22.08.14

Module Granulometric. G.M.= 0.76

Sieve mm	Retained (g)	Retained (%)	Passing (%)
			100
75.0			100.00
50.0			100.00
37.5			100.00
19.0			100.00
9.5			100.00
4.75			100.00
2.36			100.00
1.18	0.80	0.80	99.20
0.600	5.10	5.10	94.10
0.300	31.00	31.00	63.10
0.150	39.0	39.00	24.10
0.075	11.6	11.60	12.50
Base (P2)			
(P1)	12.5		
< 0.075	12.5	12.50	
W.Total	100.0		

Tot. Weight Pass. 0.075mm = (P1)+(P2)



Checked By: Flora Cariório **Approved By:** Vilma Manhique
Date: 23.08.14 **Date:** 23.08.14

A16-31

SOILLAB
Moçambique

Gravel:	**24.8**	**%**
Coarse Sand:	**22.3**	**%**
Medium Sand:	**27.8**	**%**
Fine Sand:	**8.2**	**%**
Elem. < 0.075 mm	**16.9**	**%**

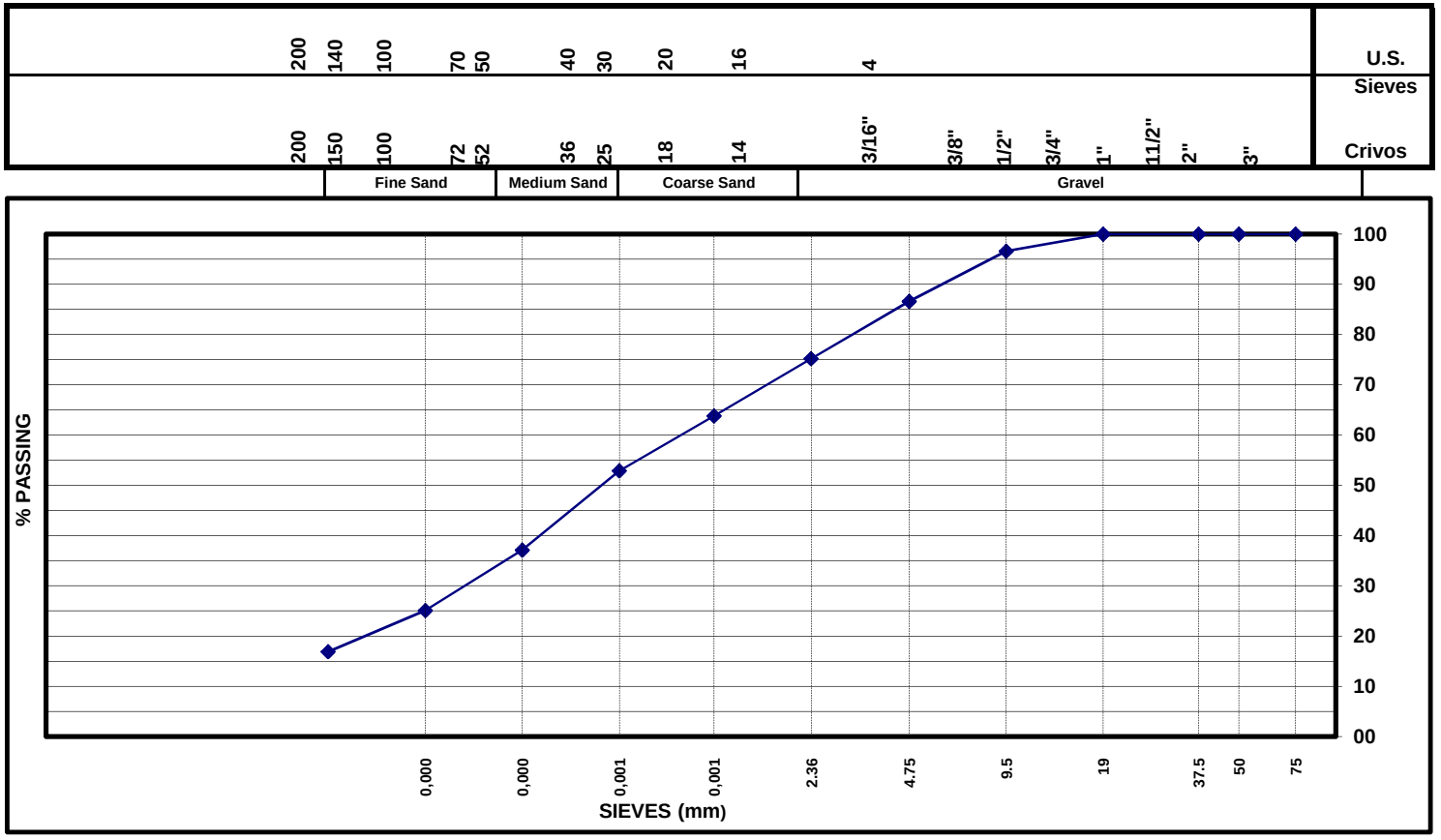
Weight of oven dry sample:	100.0	**gr**
Weight of washed oven dry:	83.1	**gr**
Weight of wash loss<0.075mm:	16.9	**gr (P1)**

REQUEST/ LAB. No.: 61/SM/GR/6
SPECIFICATION: ASTM C136 **DEPTH:** 11.0 - 11.45 m
SAMPLE No.: BH2-11 **CLIENT:** Oriconsul
SOIL DESCRIPTION: **Silty Clayey Sand (SC-SM)**
TESTED BY: Flora Cariório **DATE:** 22.08.14

Module Granulometric. G.M.= **0.75**

Sieve mm	Retained (g)	Retained (%)	Passing (%)
			100
75.0			100.00
50.0			100.00
37.5			100.00
19.0			100.00
9.5	3.40	3.40	96.60
4.75	10.00	10.00	86.60
2.36	11.40	11.40	75.20
1.18	11.40	11.40	63.80
0.600	10.90	10.90	52.90
0.300	15.80	15.80	37.10
0.150	12.0	12.00	25.10
0.075	8.2	8.20	16.90
Base (P2)			
(P1)	**16.9**		
< 0.075	**16.9**	16.90	
W.Total	**100.0**		

Tot. Weight Pass. 0.075mm = (P1)+(P2)



Checked By: Flora Cariório **Approved By:** Vilma Manhique
Date: 23.08.14 **Date:** 23.08.14

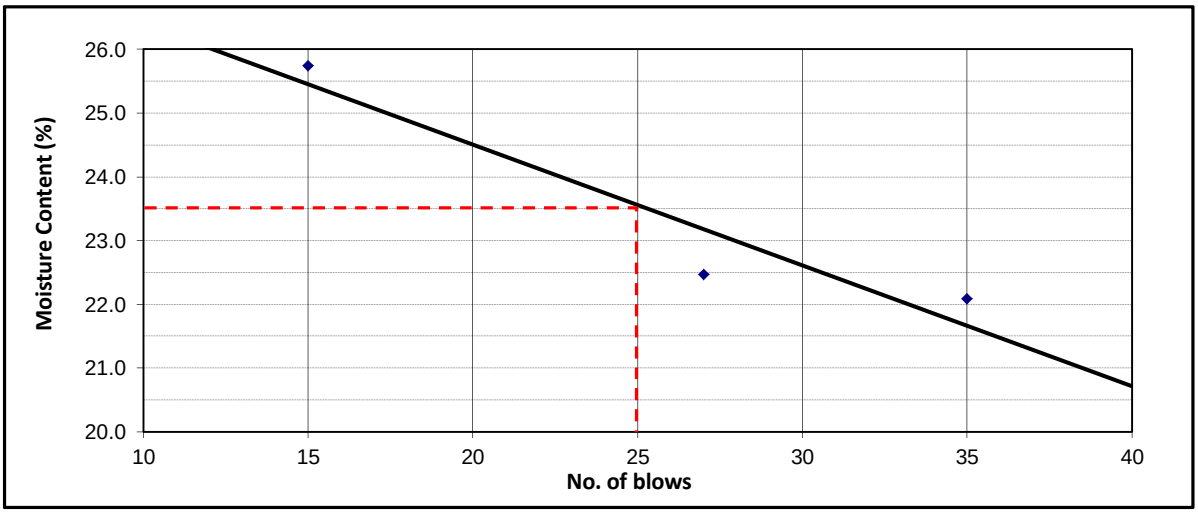
A16-32

SOILLAB Moçambique	Determination of Atterberg Limits Air-Dried	Request/ Lab. No. 61/SM/AL/06

Contract:	P567	**Sample Location:**	Namialo
Project:	Reinforcement of Transmission Network in Nacala	**Depth:**	11.0 - 11.45 m
Client:	Oriconsul	**Specification:**	ASTM, D4318
Sample No.:	BH2-11	**Operator:**	Joaquina
Description:	SC-SM	**Date:**	21.08.14

1. DETERMINATION OF LIQUID LIMIT

Container	No.	K	L	M				
Wgt of Wet Soil + Container	g	27.56	26.50	27.20				
Wgt of Dry Soil + Container	g	26.46	25.48	25.98				
Wgt of Moisture	g	1.10	1.02	1.22				
Wgt of Container	g	21.48	20.94	21.24				
Wgt of Dry Soil	g	4.98	4.54	4.74				
Moisture Content	%	22.09	22.47	25.74				
Number of Blows	No.	35	27	15				



2. DETERMINATION OF PLASTIC LIMIT

Container	No.	N	O					
Wgt of Wet Soil + Container	g	28.8	26.42					
Wgt of Dry Soil + Container	g	27.7	25.62					
Wgt of Moisture	g	1.1	0.8					
Wgt of Container	g	21.64	21.24					
Wgt of Dry Soil	g	6.06	4.38					
Moisture Content	%	18.15	18.26					
Average	%	18.2						

3. DETERMINATION OF LINEAR SHRINKAGE

Trough	No.	
No. of Blows	No.	
Length Before Drying	mm	
Length After Drying	mm	
Linear Shrinkage	%	

4. RESULTS

Liquid Limit	%	23.5
Plastic Limit	%	18.2
Plastic Index	%	5.3
Linear Shrinkage	%	0

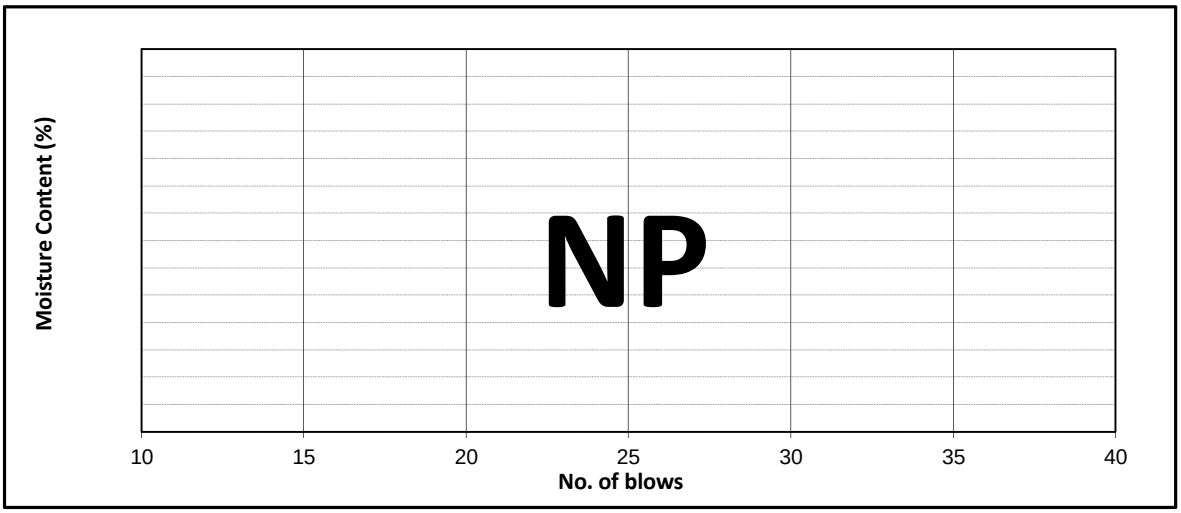
Checked By: Flora Cariório	**Approved By:** Vilma Manhique
Date: 22.08.14	**Date:** 22.08.14

SOILLAB Moçambique	***Determination of Atterberg Limits*** ***Air-Dried***	***Request/ Lab. No.*** ***61/SM/AL/04***

Contract:	P567	**Sample Location:**	Namialo
Project:	Reinforcement of Transmission Network in Nacala	**Depth:**	2.0 - 2.45 m
Client:	Oriconsul	**Specification:**	ASTM, D4318
Sample No.:	BH2-02	**Operator:**	Joaquina
Description:	SM	**Date:**	21.08.14

1. DETERMINATION OF LIQUID LIMIT

Container	**No.**							
Wgt of Wet Soil + Container	**g**							
Wgt of Dry Soil + Container	**g**							
Wgt of Moisture	**g**							
Wgt of Container	**g**							
Wgt of Dry Soil	**g**							
Moisture Content	**%**							
Number of Blows	**No.**							



2. DETERMINATION OF PLASTIC LIMIT

Container	**No.**							
Wgt of Wet Soil + Container	**g**							
Wgt of Dry Soil + Container	**g**							
Wgt of Moisture	**g**							
Wgt of Container	**g**							
Wgt of Dry Soil	**g**							
Moisture Content	**%**							
Average	**%**							

3. DETERMINATION OF LINEAR SHRINKAGE

Trough	**No.**	
No. of Blows	**No.**	
Length Before Drying	**mm**	
Length After Drying	**mm**	
Linear Shrinkage	**%**	

4. RESULTS

Liquid Limit	**%**	NP
Plastic Limit	**%**	NP
Plastic Index	**%**	NP
Linear Shrinkage	**%**	

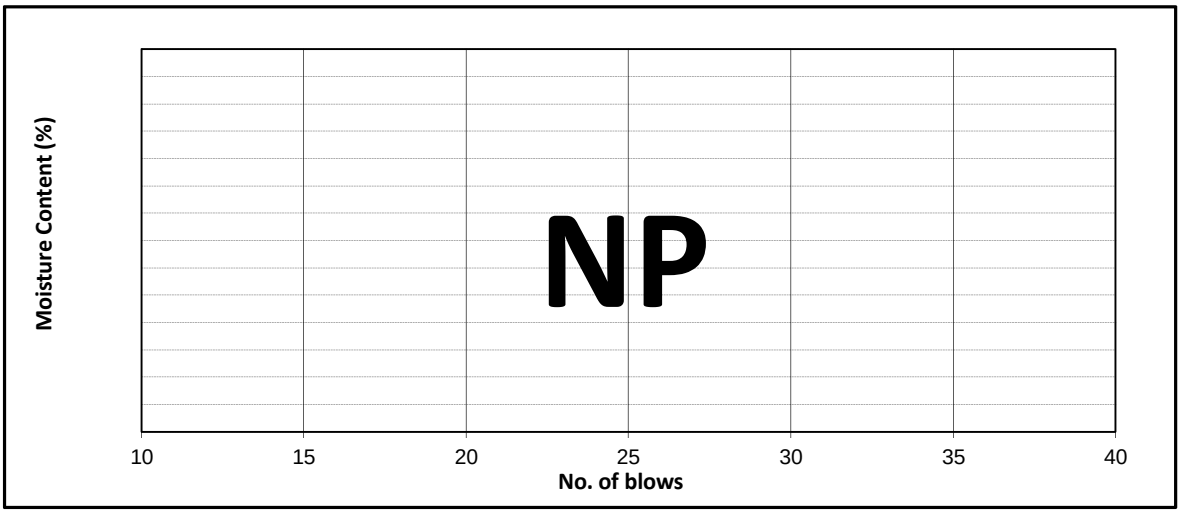
Checked By: Flora Cariório	**Approved By:** Vilma Manhique
Date: 22.08.14	**Date:** 22.08.14

SOILLAB Moçambique	***Determination of Atterberg Limits*** ***Air-Dried***	***Request/ Lab. No.*** ***61/SM/AL/05***

Contract:	P567	**Sample Location:**	Namialo
Project:	Reinforcement of Transmission Network in Nacala	**Depth:**	9.0 - 9.45 m
Client:	Oriconsul	**Specification:**	ASTM, D4318
Sample No.:	BH2-09	**Operator:**	Joaquina
Description:	SM	**Date:**	21.08.14

1. DETERMINATION OF LIQUID LIMIT

Container	**No.**							
Wgt of Wet Soil + Container	**g**							
Wgt of Dry Soil + Container	**g**							
Wgt of Moisture	**g**							
Wgt of Container	**g**							
Wgt of Dry Soil	**g**							
Moisture Content	**%**							
Number of Blows	**No.**							



2. DETERMINATION OF PLASTIC LIMIT

Container	**No.**							
Wgt of Wet Soil + Container	**g**							
Wgt of Dry Soil + Container	**g**							
Wgt of Moisture	**g**							
Wgt of Container	**g**							
Wgt of Dry Soil	**g**							
Moisture Content	**%**							
Average	**%**							

3. DETERMINATION OF LINEAR SHRINKAGE

Trough	**No.**	
No. of Blows	**No.**	
Length Before Drying	**mm**	
Length After Drying	**mm**	
Linear Shrinkage	**%**	

4. RESULTS

Liquid Limit	**%**	NP
Plastic Limit	**%**	NP
Plastic Index	**%**	NP
Linear Shrinkage	**%**	

Checked By: Flora Cariório	**Approved By:** Vilma Manhique
Date: 22.08.14	**Date:** 22.08.14

Borehole BH3

SOILLAB
Moçambique

Gravel:	**3.6**	%
Coarse Sand:	**11.9**	%
Medium Sand:	**51.3**	%
Fine Sand:	**14.6**	%
Elem. < 0.075 mm	**18.7**	%

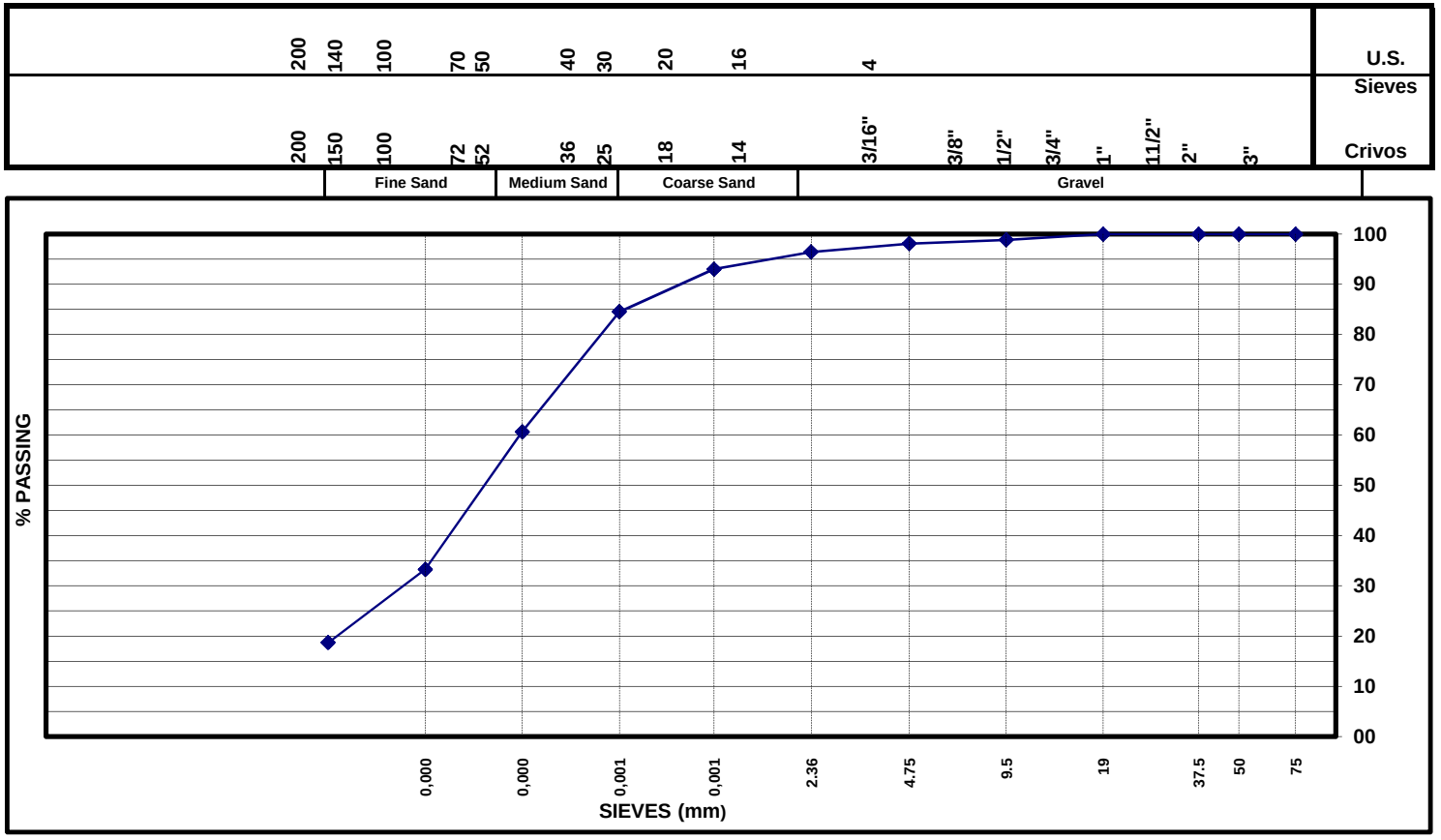
Weight of oven dry sample:	300.0	gr
Weight of washed oven dry:	244.0	gr
Weight of wash loss<0.075mm:	56.0	gr (P1)

REQUEST/ LAB. No.: 61/SM/GR/7
SPECIFICATION: ASTM C136 **DEPTH:** 4.0 - 4.45 m
SAMPLE No.: BH3-04 **CLIENT:** Oriconsul
SOIL DESCRIPTION: **Silty Sand (SM)**
TESTED BY: Flora Cariório **DATE:** 22.08.14

Module Granulometric. G.M.= **0.67**

Sieve mm	Retained (g)	Retained (%)	Passing (%)
			100
75.0			100.00
50.0			100.00
37.5			100.00
19.0			100.00
9.5	3.50	1.17	98.83
4.75	2.20	0.73	98.10
2.36	5.00	1.67	96.43
1.18	10.20	3.40	93.03
0.600	25.50	8.50	84.53
0.300	71.60	23.87	60.67
0.150	82.2	27.40	33.27
0.075	43.7	14.57	18.70
Base (P2)	0.1		
(P1)	**56.0**		
< 0.075	**56.1**	18.70	
W.Total	**300.0**		

Tot. Weight Pass. 0.075mm = (P1)+(P2)



Checked By: Flora Cariório **Approved By:** Vilma Manhique
Date: 23.08.14 **Date:** 23.08.14

A16-37

SOILLAB
Moçambique

Gravel:		%
Coarse Sand:	2.8	%
Medium Sand:	79.8	%
Fine Sand:	6.7	%
Elem. < 0.075 mm	10.7	%

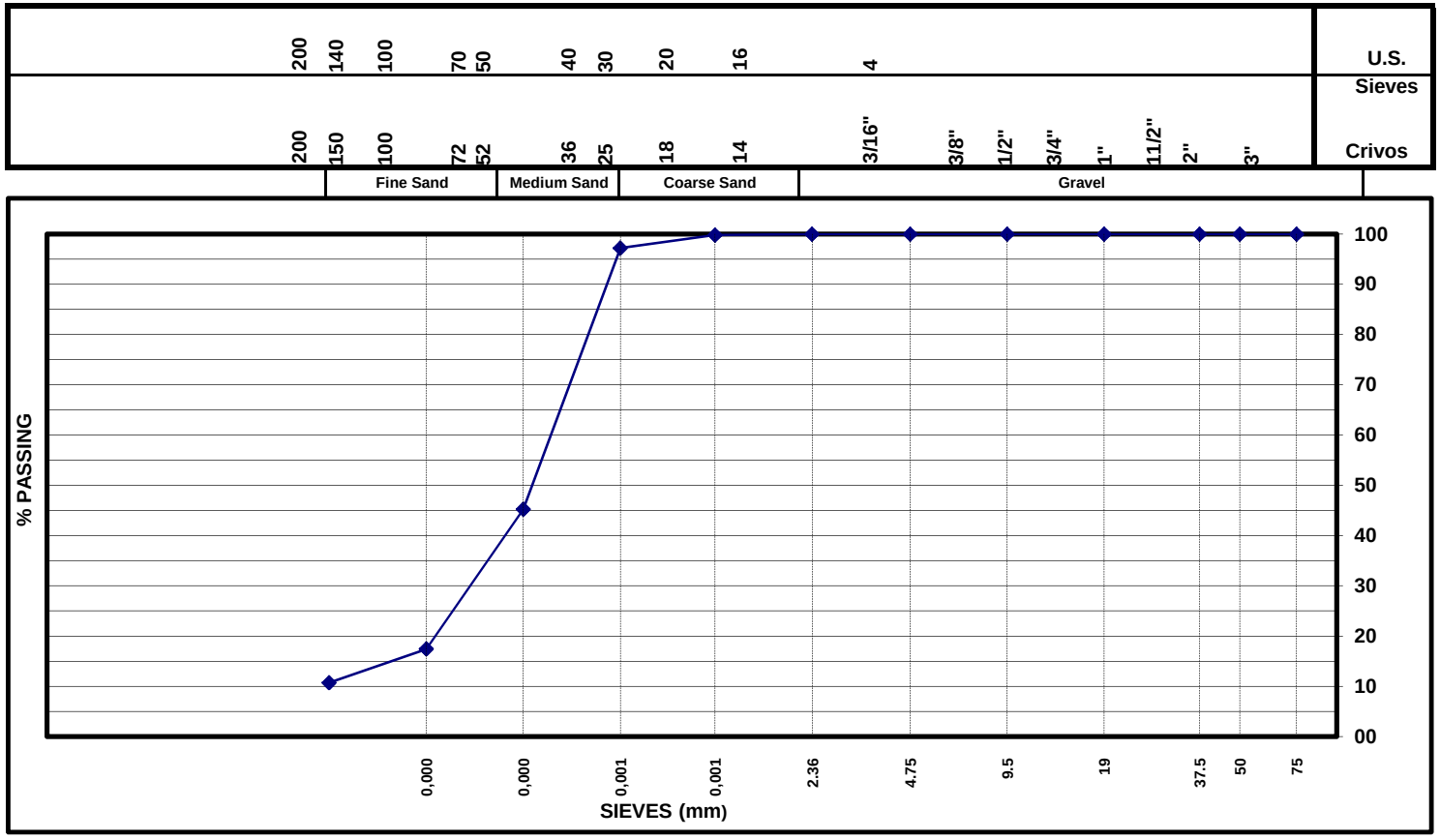
Weight of oven dry sample:	100.0	gr
Weight of washed oven dry:	89.3	gr
Weight of wash loss<0.075mm:	10.7	gr (P1)

REQUEST/ LAB. No.: 61/SM/GR/8
SPECIFICATION: ASTM C136 DEPTH: 9.0 - 9.45 m
SAMPLE No.: BH3-09 CLIENT: Oriconsul
SOIL DESCRIPTION: Poorly Graded Sand with Silt (SM)
TESTED BY: Flora Cariório DATE: 22.08.14

Module Granulometric. G.M.= 0.83

Sieve mm	Retained (g)	Retained (%)	Passing (%)
			100
75.0			100.00
50.0			100.00
37.5			100.00
19.0			100.00
9.5			100.00
4.75			100.00
2.36			100.00
1.18	0.20	0.20	99.80
0.600	2.60	2.60	97.20
0.300	52.00	52.00	45.20
0.150	27.8	27.80	17.40
0.075	6.7	6.70	10.70
Base (P2)			
(P1)	10.7		
< 0.075	10.7	10.70	
W.Total	100.0		

Tot. Weight Pass. 0.075mm = (P1)+(P2)



Checked By: Flora Cariório **Approved By:** Vilma Manhique
Date: 23.08.14 **Date:** 23.08.14

A16-38

SOILLAB
Moçambique

Gravel:	0.6	%
Coarse Sand:	16.2	%
Medium Sand:	55.8	%
Fine Sand:	11.2	%
Elem. < 0.075 mm	16.2	%

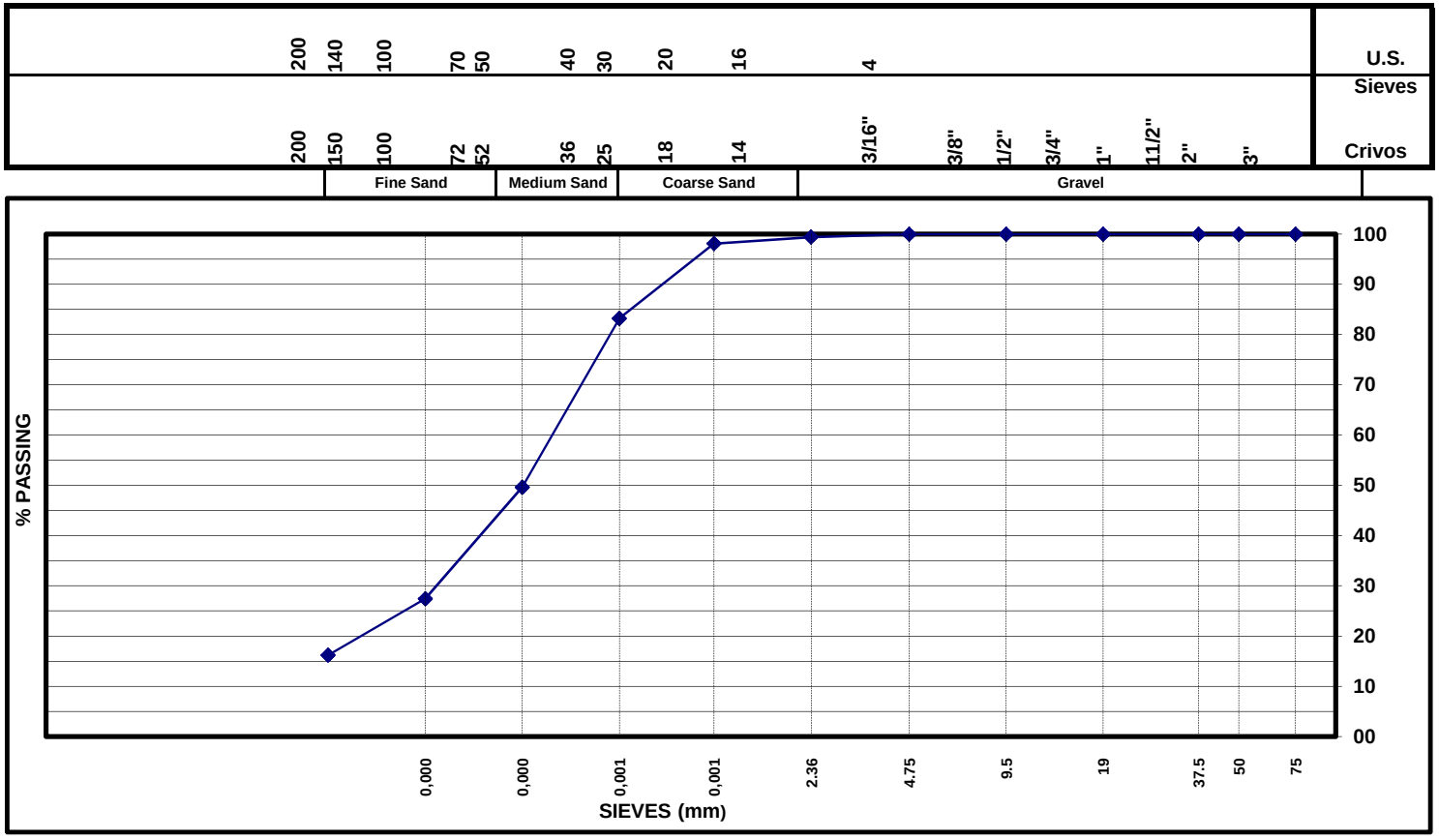
Weight of oven dry sample:	100.0	gr
Weight of washed oven dry:	83.8	gr
Weight of wash loss<0.075mm:	16.2	gr (P1)

REQUEST/ LAB. No.: 61/SM/GR/8
SPECIFICATION: ASTM C136 **DEPTH:** 13.0 - 13.45 m
SAMPLE No.: BH3-13 **CLIENT:** Oriconsul
SOIL DESCRIPTION: Silty Sand (SM)
TESTED BY: Flora Cariório **DATE:** 22.08.14

Module Granulometric. G.M.= 0.73

Sieve mm	Retained (g)	Retained (%)	Passing (%)
			100
75.0			100.00
50.0			100.00
37.5			100.00
19.0			100.00
9.5			100.00
4.75			100.00
2.36	0.60	0.60	99.40
1.18	1.30	1.30	98.10
0.600	14.90	14.90	83.20
0.300	33.60	33.60	49.60
0.150	22.2	22.20	27.40
0.075	11.2	11.20	16.20
Base (P2)			
(P1)	16.2		
< 0.075	16.2	16.20	
W.Total	100.0		

Tot. Weight Pass. 0.075mm = (P1)+(P2)



Checked By: Flora Cariório **Approved By:** Vilma Manhique
Date: 23.08.14 **Date:** 23.08.14

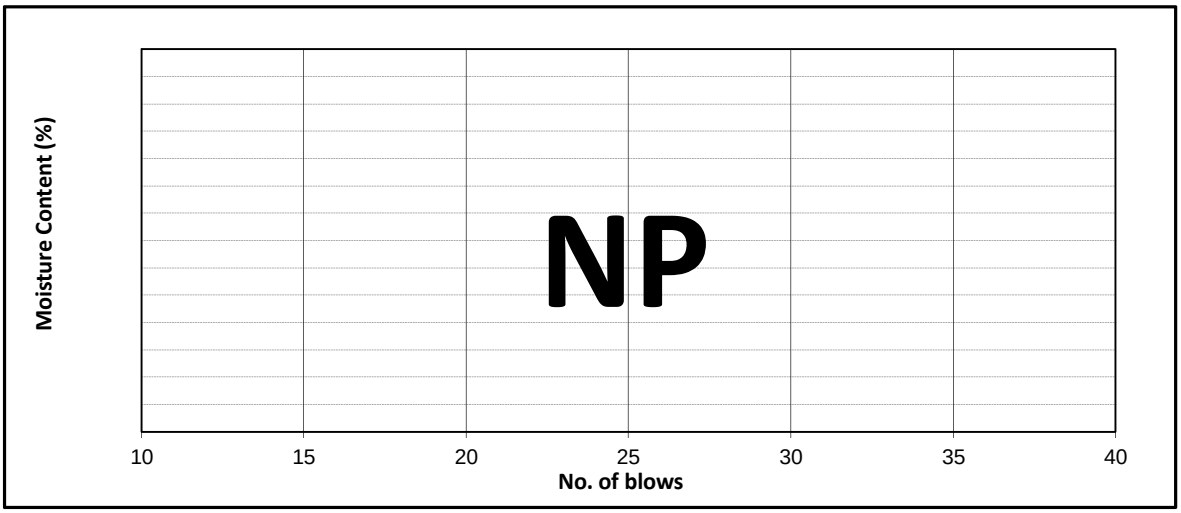
A16-39

SOILLAB Moçambique	***Determination of Atterberg Limits*** ***Air-Dried***	***Request/ Lab. No.*** ***61/SM/AL/07***

Contract:	P567	**Sample Location:**	Namialo
Project:	Reinforcement of Transmission Network in Nacala	**Depth:**	4.0 - 4.75 m
Client:	Oriconsul	**Specification:**	ASTM, D4318
Sample No.:	BH3-04	**Operator:**	Joaquina
Description:	SM	**Date:**	21.08.14

1. DETERMINATION OF LIQUID LIMIT

Container	**No.**							
Wgt of Wet Soil + Container	**g**							
Wgt of Dry Soil + Container	**g**							
Wgt of Moisture	**g**							
Wgt of Container	**g**							
Wgt of Dry Soil	**g**							
Moisture Content	**%**							
Number of Blows	**No.**							



2. DETERMINATION OF PLASTIC LIMIT

Container	**No.**							
Wgt of Wet Soil + Container	**g**							
Wgt of Dry Soil + Container	**g**							
Wgt of Moisture	**g**							
Wgt of Container	**g**							
Wgt of Dry Soil	**g**							
Moisture Content	**%**							
Average	**%**							

3. DETERMINATION OF LINEAR SHRINKAGE

Trough	**No.**	
No. of Blows	**No.**	
Length Before Drying	**mm**	
Length After Drying	**mm**	
Linear Shrinkage	**%**	

4. RESULTS

Liquid Limit	**%**	NP
Plastic Limit	**%**	NP
Plastic Index	**%**	NP
Linear Shrinkage	**%**	

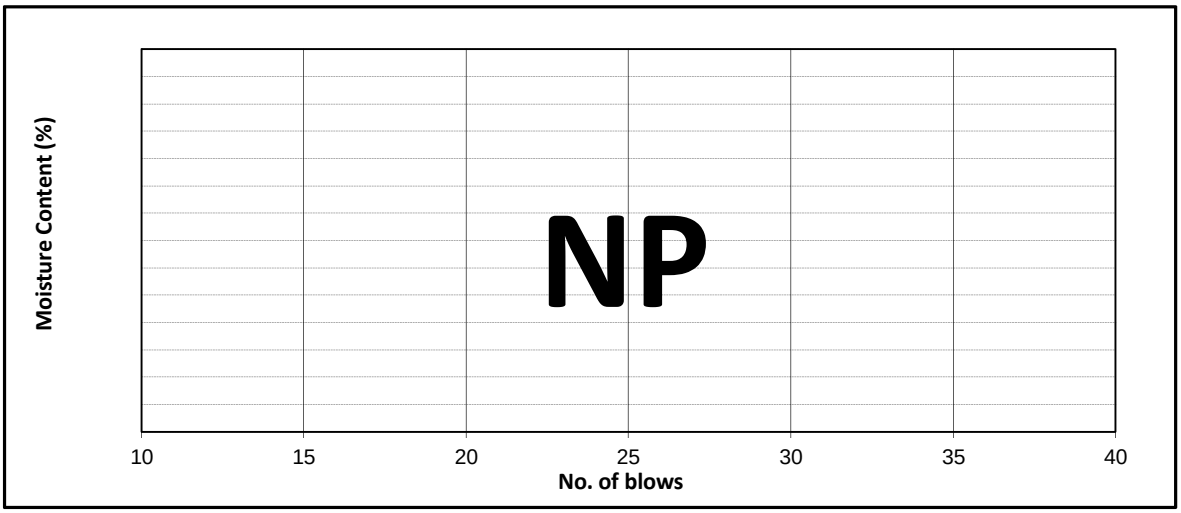
Checked By: Flora Cariório	**Approved By:** Vilma Manhique
Date: 22.08.14	**Date:** 22.08.14

SOILLAB Moçambique	***Determination of Atterberg Limits*** ***Air-Dried***	***Request/ Lab. No.*** ***61/SM/AL/09***

Contract:	P567	**Sample Location:**	Namialo
Project:	Reinforcement of Transmission Network in Nacala	**Depth:**	13.0 - 13.45 m
Client:	Oriconsul	**Specification:**	ASTM, D4318
Sample No.:	BH3-13	**Operator:**	Joaquina
Description:	SM	**Date:**	21.08.14

1. DETERMINATION OF LIQUID LIMIT

Container	**No.**							
Wgt of Wet Soil + Container	**g**							
Wgt of Dry Soil + Container	**g**							
Wgt of Moisture	**g**							
Wgt of Container	**g**							
Wgt of Dry Soil	**g**							
Moisture Content	**%**							
Number of Blows	**No.**							



2. DETERMINATION OF PLASTIC LIMIT

Container	**No.**							
Wgt of Wet Soil + Container	**g**							
Wgt of Dry Soil + Container	**g**							
Wgt of Moisture	**g**							
Wgt of Container	**g**							
Wgt of Dry Soil	**g**							
Moisture Content	**%**							
Average	**%**							

3. DETERMINATION OF LINEAR SHRINKAGE

Trough	**No.**	
No. of Blows	**No.**	
Length Before Drying	**mm**	
Length After Drying	**mm**	
Linear Shrinkage	**%**	

4. RESULTS

Liquid Limit	**%**	NP
Plastic Limit	**%**	NP
Plastic Index	**%**	NP
Linear Shrinkage	**%**	

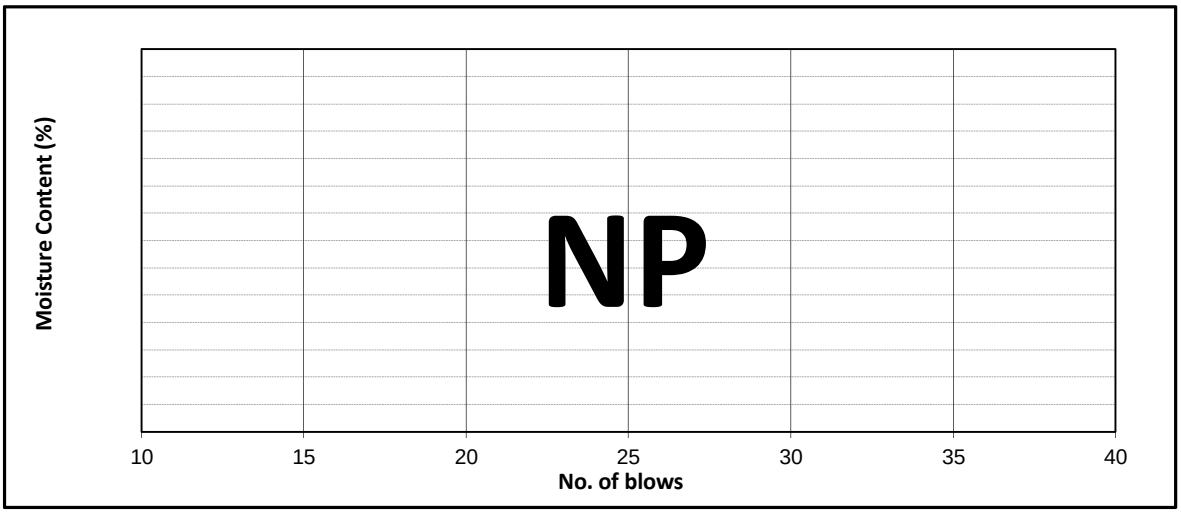
Checked By: Flora Cariório	**Approved By:** Vilma Manhique
Date: 22.08.14	**Date:** 22.08.14

SOILLAB Moçambique	***Determination of Atterberg Limits*** ***Air-Dried***	***Request/ Lab. No.*** ***61/SM/AL/08***

Contract:	P567	**Sample Location:**	Namialo
Project:	Reinforcement of Transmission Network in Nacala	**Depth:**	9.0 - 9.45 m
Client:	Oriconsul	**Specification:**	ASTM, D4318
Sample No.:	BH3-09	**Operator:**	Joaquina
Description:	SP-SM	**Date:**	21.08.14

1. DETERMINATION OF LIQUID LIMIT

Container	**No.**							
Wgt of Wet Soil + Container	**g**							
Wgt of Dry Soil + Container	**g**							
Wgt of Moisture	**g**							
Wgt of Container	**g**							
Wgt of Dry Soil	**g**							
Moisture Content	**%**							
Number of Blows	**No.**							



2. DETERMINATION OF PLASTIC LIMIT

Container	**No.**							
Wgt of Wet Soil + Container	**g**							
Wgt of Dry Soil + Container	**g**							
Wgt of Moisture	**g**							
Wgt of Container	**g**							
Wgt of Dry Soil	**g**							
Moisture Content	**%**							
Average	**%**							

3. DETERMINATION OF LINEAR SHRINKAGE

Trough	**No.**	
No. of Blows	**No.**	
Length Before Drying	**mm**	
Length After Drying	**mm**	
Linear Shrinkage	**%**	

4. RESULTS

Liquid Limit	**%**	NP
Plastic Limit	**%**	NP
Plastic Index	**%**	NP
Linear Shrinkage	**%**	

Checked By: Flora Cariório	**Approved By:** Vilma Manhique
Date: 22.08.14	**Date:** 22.08.14

APPENDIX III

Logging of Boreholes

Photography Report

Borehole BH1

LOG OF BORING BH1

Boring No:	BH 01	**Sheet**	1
Project Number:	P567	**Project Name:**	GEOTECHCANICAL INVESTIGATION AND TOPOGRAPHIC SURVEY FOR PREPARATORY SURVEY OF REIFORCEMENT PLAN FOR TRANSMISSION LINE AT NACALA CORRIDOR IN MOZAMBIQUE
Total depth:	15 m	**Location:**	Namialo - Nampula
Drill contractor:		**Sampling Method:**	Rotary Drilling
Date Started:	14-Jul-14		
Date Completed:	24-Jul-14	**Driller:**	Manuel Cardoso
Client:	ORICONSUL	**Drill Rig Type:**	Unimog, V100 – Bomag

tecnica ENGENHEIROS CONSULTORES , LDA

Depth (m)	Water level	Samples Type	Samples Number	Blow counts (N) 30 cm	Graphic Log	MATERIAL DESCRIPTION	Classification Symbol	Water Content (%)	Dry Unit Weight kg/m3	REMARKS AND OTHER TESTS
0						Clayey silt, dark brown, fine grained, loose				
1		SPT disturbed	BH1-01	Refusal		Sandy silt, reddish color, fine grained, medium	SM	5.9		LL=NP PL=NP IP=NP
2		SPT disturbed	BH1-02	Refusal		Silt and conglomerate botrioidal calcite and spherical. Phenocrysts and quartz crystals, reddish and brown color, very dense				
3		SPT disturbed	BH1-03	35		Silty clay (calcite), white color and medium to fine grain size, hard				
4				Refusal		Sandy fat clay, white and red color, with fine to medium grain size sand, hard	CH	32.6		LL=54 PL=27.9 IP=26.1
5		SPT disturbed	BH1-05	Refusal		Silty sand, gray color, with fine grain size, very dense				
6		SPT disturbed	BH1-06	39		Silty clay (calcite), white color and medium to fine grain size, hard				
7		SPT disturbed	BH1-07	64		Silty clay, grey color, medium to fine grain size, hard. Gneiss rock of medium to fine grain size, hard. (6.5m to 6.6m deep)				
8		SPT disturbed	BH1-08	Refusal		Clayey sand, brownish green color, medium to fine grain size, hard				
9		SPT disturbed	BH1-09	Refusal		Silty clay of medium to fine grain size, hard				
10		SPT disturbed	BH1-10	Refusal		Saprolite (weathered gneiss) brown color, medium to fine grain size, hard				
11		SPT disturbed	BH1-11	Refusal		Clayey sand, variegated, gray color, with medium to fine grain size, hard				
12				Refusal		Clayey sand, gray color with medium to fine grain size, hard				
13				Refusal		Fragmented saprolite, brownish yellow color, medium to fine grain size, hard				
14		SPT disturbed	BH1-13	Refusal		Gneiss rock with brown to white color, fine to medium grain size, hard. Saprolite, gneissy and clayey micaceous intemperate, gray green color, fine to coarse grain size, hard (11.2m to 11.3m deep)				
15						Silty clayey sand, mottled with gray color, medium to fine grain size, hard	SC-SM	14.7		LL=31.8 PL=17.9 IP=13.9
						Gneiss rock, gray to white color, very hard				
						Silty clay, graycolor, medium to fine grain size, very hard				
						Granite, very hard				

Co-ordinates		Borehole diameter: 114 mm	Checked by: Sidney de Abreu
Lat. (°)	(-)14.944467°		Logged by: Ivan Manhiça
Long. (°)	39.962067°	Ground Water Observation: Existente of parcialy saturated layer between the depth 3,0m and 11,0 m	
Ground Elevation:	171.6 m		

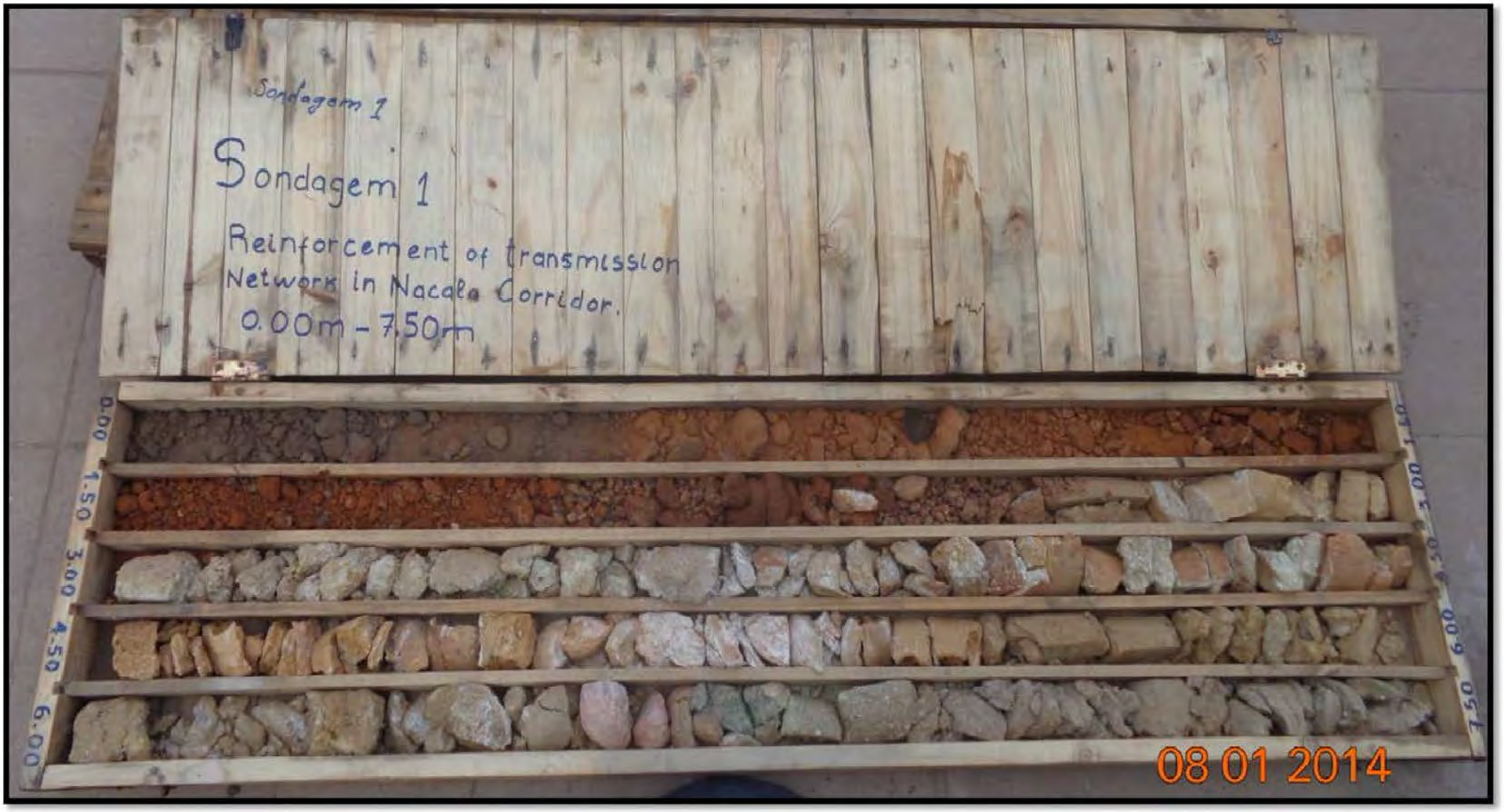


Photo 1 - Logg 1, from 0.0m to 7.5m depth

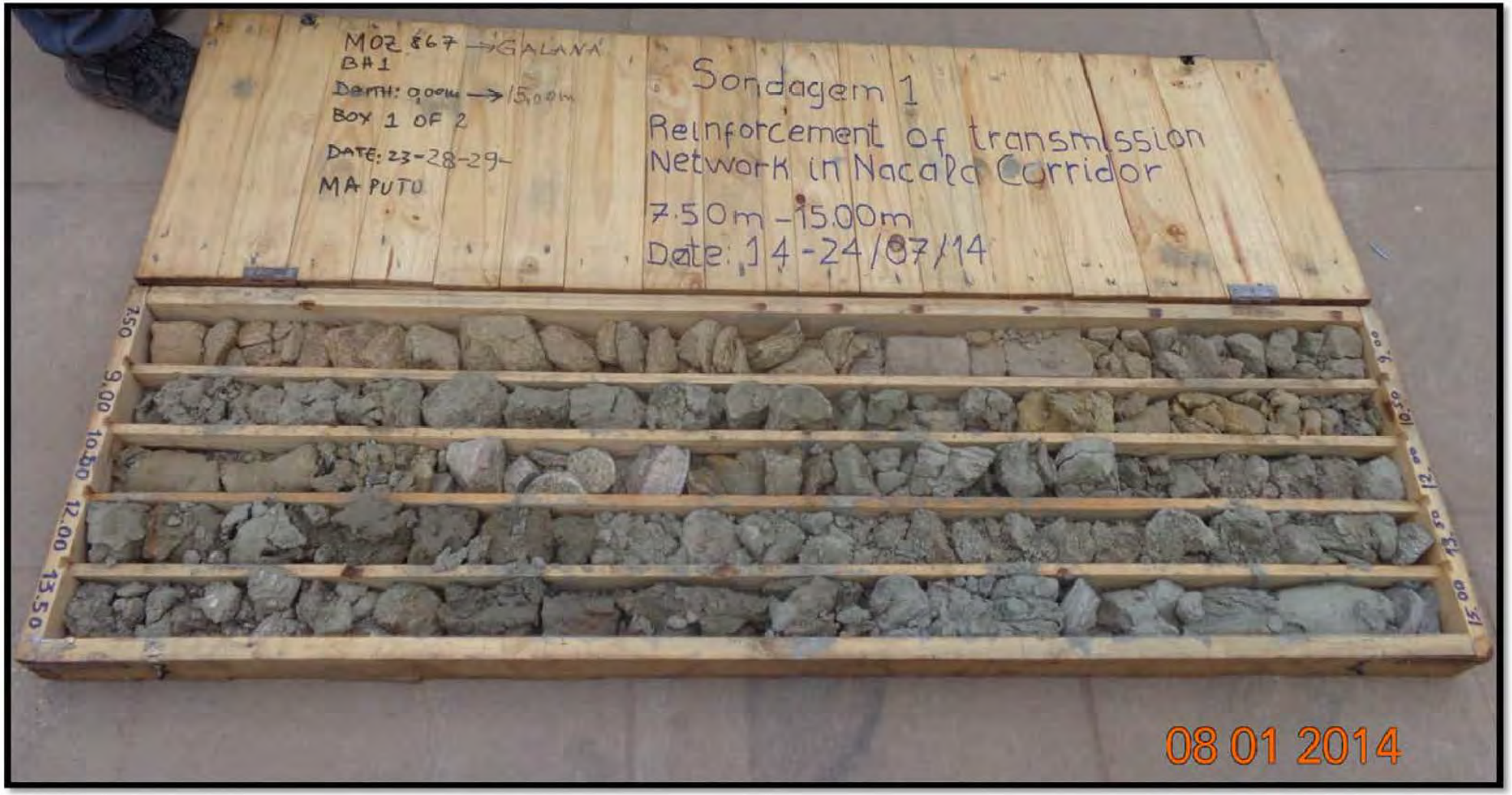


Photo 2 - Logg 1, from 7.5m to 15m depth

Borehole BH2

LOG OF BORING BH2

Boring No:	BH 02	**Sheet**	1
Project Number:	P567	**Project Name:**	GEOTECHCANICAL INVESTIGATION AND TOPOGRAPHIC SURVEY FOR PREPARATORY SURVEY OF REIFORCEMENT PLAN FOR TRANSMISSION LINE AT NACALA CORRIDOR IN MOZAMBIQUE
Total depth:	15 m	**Location:**	Namialo - Nampula
Drill contractor:		**Sampling Method:**	Rotary Drilling
Date Started:	25-Jul-14		
Date Completed:	27-Jul-14	**Driller:**	Manuel Cardoso
Client:	ORICONSUL	**Drill Rig Type:**	Unimog, V100 – Bomag

Depth (m)	Water level	Samples: Type	Samples: Number	Blow counts (N) 30 cm	Graphic Log	MATERIAL DESCRIPTION	Classification Symbol	Water Content (%)	Dry Unit Weight kg/m3	REMARKS AND OTHER TESTS
0						Sandy silt dark brown color, medium to fine grain size, very loose				
1				-		Silty Sand, reddish brown color, medium to fine grain size, very loose				
		SPT disturbed	BH2-01	9		Silty sand, brown color, medium to fine grain size, loose				
2		SPT disturbed	BH2-02	14		Micaceous silty sand, conglomerates (botrioidal calcite) and saprolite, fine grain size, medium	SM	9.9		LL=NP PL=NP IP=NP
						Silt (calcite and siltstone), white color, medium to fine grain size, medium dense				
3		SPT disturbed	BH2-03	46		Micaceous silty sand, brown color, variegated, medium to fine grain size, very dense				
4		SPT disturbed	BH2-04	Refusal		Fragmented saprolite preserving gneiss structure, brown color, very dense				
5		SPT disturbed	BH2-05	54		Saprolite, yellowish brown color, with medium to fine grain size, very dense				
						Very weathered quartzite, white color, medium to coarse grain size, very dense				
6				Refusal		Micaceous silty sand, brown color, very fine grain size, very dense	SM			LL=NP PL=NP IP=NP
7		SPT disturbed	BH2-07	Refusal						
8		SPT disturbed	BH2-08	Refusal						
9		SPT disturbed	BH2-09	Refusal		Silty sand, light brown color, with large insurgency of quartz crystals, very dense	SM	13.9		
10		SPT disturbed	BH2-10	Refusal		Fragmented saprolite (weathered gneiss), brown color, medium to fine grain size, very dense				
						Clay and variegated silty sand (loam), brown color, hard				
11		SPT disturbed	BH2-11	Refusal		Silty sand, brown to purple color, with medium to fine grain size, very dense	SC-SM	15.1		LL=23.5 PL=18.2 IP=5.3
						Varigated silty sand (loam) with clay, brown to purple color, hard				
12		SPT disturbed		Refusal		Fragmented saprolite (weathered gneiss), brown color, with medium to fine grain size, very dense				
13				Refusal		Fragmented saprolite (weathered gneiss), brown color, medium to fine grain size, very dense				
14				Refusal						
15										

Co-ordinates		Borehole diameter: 114 mm	Checked by: Sidney de Abreu
Lat. (°)	(-)14.944683°		Logged by: Ivan Manhiça
Long. (°)	39.960133°	Ground Water Observation: Existente of parcialy saturated layer between the depth 3,5m and 8,0 m	
Ground Elevation:	173.5m		

Photo 3 - Logg 2, from 0.0m to 7.5m depth

Photo 4 Logg 2, from 7.5m to 15.0m depth

Borehole BH3

LOG OF BORING BH3

Boring No:	BH 03	**Sheet**	1
Project Number:	P567	**Project Name:**	GEOTECHCANICAL INVESTIGATION AND TOPOGRAPHIC SURVEY FOR PREPARATORY SURVEY OF REIFORCEMENT PLAN FOR TRANSMISSION LINE AT NACALA CORRIDOR IN MOZAMBIQUE
Total depth:	15 m	**Location:**	Namialo - Nampula
Drill contractor:		**Sampling Method:**	Rotary Drilling
Date Started:	28-Jul-14		
Date Completed:	31-Jul-14	**Driller:**	Manuel Cardoso
Client:	ORICONSUL	**Drill Rig Type:**	Unimog, V100 – Bomag

Depth (m)	Water level	Samples Type	Samples Number	Blow counts (N) 30 cm	Graphic Log	MATERIAL DESCRIPTION	Classification Symbol	Water Content (%)	Dry Unit Weight kg/m3	REMARKS AND OTHER TESTS
0						Sandy silt (with organic material) dark brown to reddish color, medium to fine grain size, very loose				
1				-		Mottled silty sand, reddish brown color, fine to medium, very lose				
		SPT disturbed	BH3-01	11		Mottled sandy clay, brown color, fine to coarse grain size medium				
2		SPT disturbed	BH3-02	24		Mottled silty sand, white and brown banded color (calcita and siltstone), fine grain size, dense	SM			LL=NP PL=NP IP=NP
3		SPT disturbed	BH3-03	46						
4		SPT disturbed	BH3-04	79		Mottled micaceous silty sand, light gray green color, fine to medium grain size, very dense		4.36		
5		SPT disturbed	BH3-05	27		Silty clay, gray to green color, fine to medium grain size, very stiff				
6		SPT disturbed	BH3-06	Refusal		Mottled sandy clay, gray to brown color, fine grain size very dense				
7				Refusal						
8		SPT disturbed	BH3-08	Refusal		Micaceous clayey sand with evidence of gneiss (weathered) saprolite and large quartz crystals, with gray / green color, very dense				
9		SPT disturbed	BH3-09	Refusal		Mottled micaceous silty sand,Brown color, very fine to coarse grain size, very dense	SP-SM	12.2		LL=NP PL=NP IP=NP
10		SPT disturbed	BH3-10	Refusal		Micaceous variegated silty sand, fine grain size, very dense				
11				Refusal		Variegated loamy sand, Brown to gray color, fine to medium grain size, very dense Silty clay, gray color, fine grained, hard				
12		SPT disturbed	BH3-12	Refusal						
13		SPT disturbed	BH3-13	Refusal		Micaceous silty sand, gray color, fine grain size, very dense	SM	11.7		LL=NP PL=NP IP=NP
14				Refusal		Bent sandy clay, gray to green color, fine to medium grain size, hard Micaceous silty clay, gray and brown colors, fine to medium grain size, Bent silty sand, gray color, medium to fine grain size, very dense Silty clay, gray color, very fine grained, hard				
15										

Co-ordinates		Borehole diameter: 114 mm	Checked by: Sidney de Abreu
Lat. (°)	(-)14.945033°		Logged by: Ivan Manhiça
Long. (°)	39.958933°	Ground Water Observation: Existente of parcialy saturated layer between the depth 2,5m and 8.0m	
Ground Elevation:	169.1m		

Photo 5 - Logg 3, from 0.0m to 7.5m depth

Photo 6 - Logg 3, from 7.5m to 15.0m depth

APPENDIX IV

SOIL RESISTIVITY RESULTS

BH1 - Earth Resistivity Measurement Sheet

Project:	Reinforcement of Transmission Network in Nacala Corridor	**Client:**	Oriconsul	**Logged by**: Amilcar Amiacale **Revised by**: Sidney de Abreu	
Local:	Namialo-Nampula	**Data:**	12-08-2014		
Electrode Distance a[m]	**Electrode moving distance P1and P2 (1/2a)**	**Electrode moving distanceC1and C2 (1.5a)**	**2πa [m]**	**R[Ω]=V/I Actual measurement value**	**ρ[Ωm]=2πa*R**
0.6	0.3	0.9	3.77	165.2	230.0
1.0	0.5	1.5	6.28	94.0	240.0
1.5	0.75	2.25	9.42	75.8	269.6
2.0	1.0	3.0	12.57	44.3	300.3
3.0	1.5	4.5	18.85	21.3	390.2
5.0	2.5	7.5	31.42	8.2	490.1
7.0	3.5	10.5	43.98	2.9	541.0
10.0	5.0	15.0	62.8	0.7	527.8
15.0	7.5	22.5	94.2	0.4	480.0
30.0	15.0	45.0	188.5	0.5	471.3

BH2 - Earth Resistivity Measurement Sheet

Project:	Reinforcement of Transmission Network in Nacala Corridor	**Client:**	Oriconsul	**Logged by**: Amilcar Amiacale **Revised by**: Sidney de Abreu	
Local:	Namialo-Nampula	**Data:**	12-08-2014		
Electrode Distance a[m]	Electrode moving distance P1and P2 (1/2a)	Electrode moving distanceC1and C2 (1.5a)	2πa [m]	R[Ω]=V/I Actual measurement value	ρ[Ωm]=2πa*R
0.6	0.3	0.9	3.77	501.7	230.0
1.0	0.5	1.5	6.28	252.4	240.0
1.5	0.75	2.25	9.42	172.3	269.6
2.0	1.0	3.0	12.57	114.5	300.3
3.0	1.5	4.5	18.85	69.8	390.2
5.0	2.5	7.5	31.42	22.2	490.1
7.0	3.5	10.5	43.98	6.9	541.0
10.0	5.0	15.0	62.8	1.2	527.8
15.0	7.5	22.5	94.2	0.9	480.0
30.0	15.0	45.0	188.5	1.0	471.3

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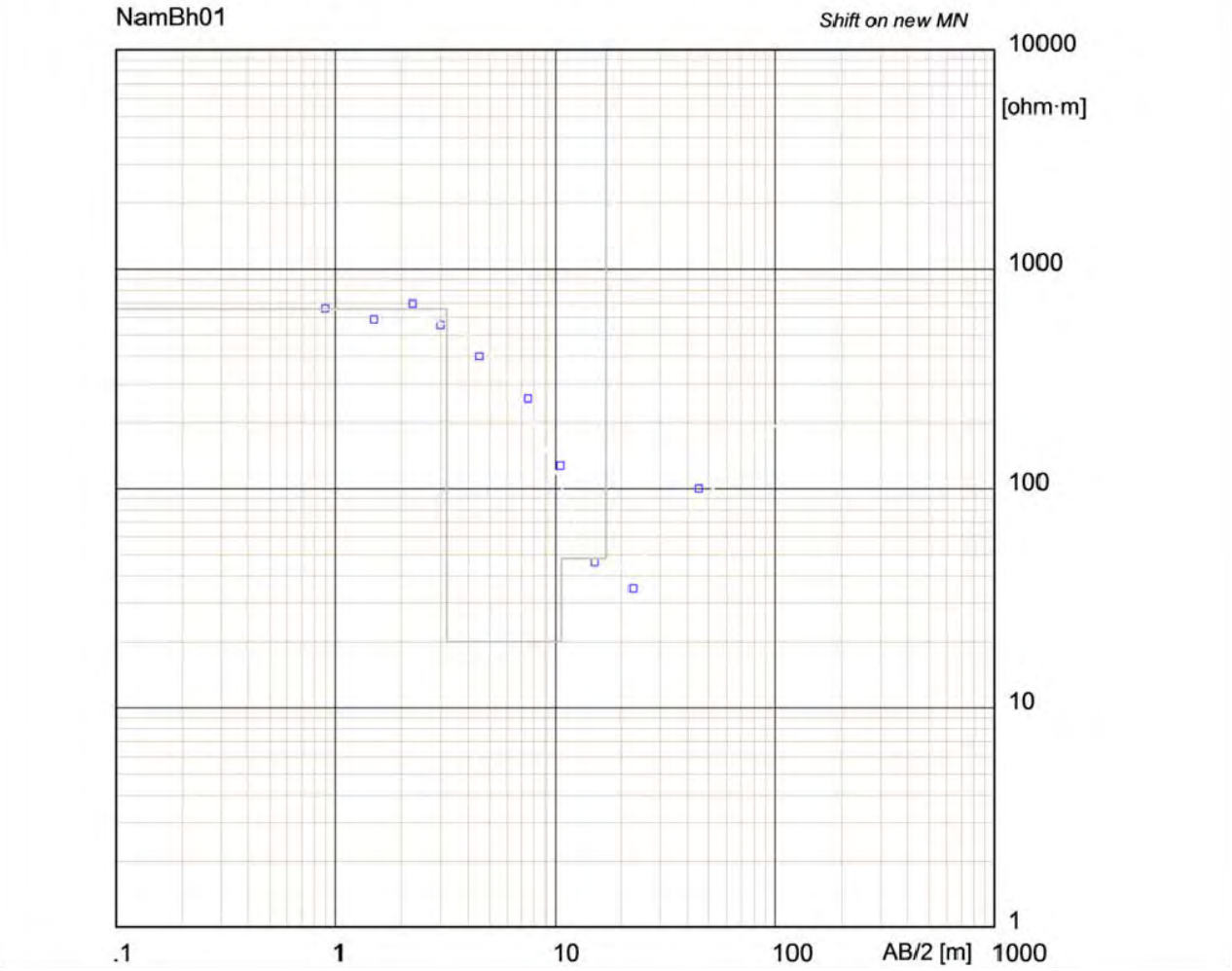
Electrical sounding Schlumberger - NamBh01.WS3



Location X = 39.962067 Y = -14.944467 Z = 189 Azim = N-S

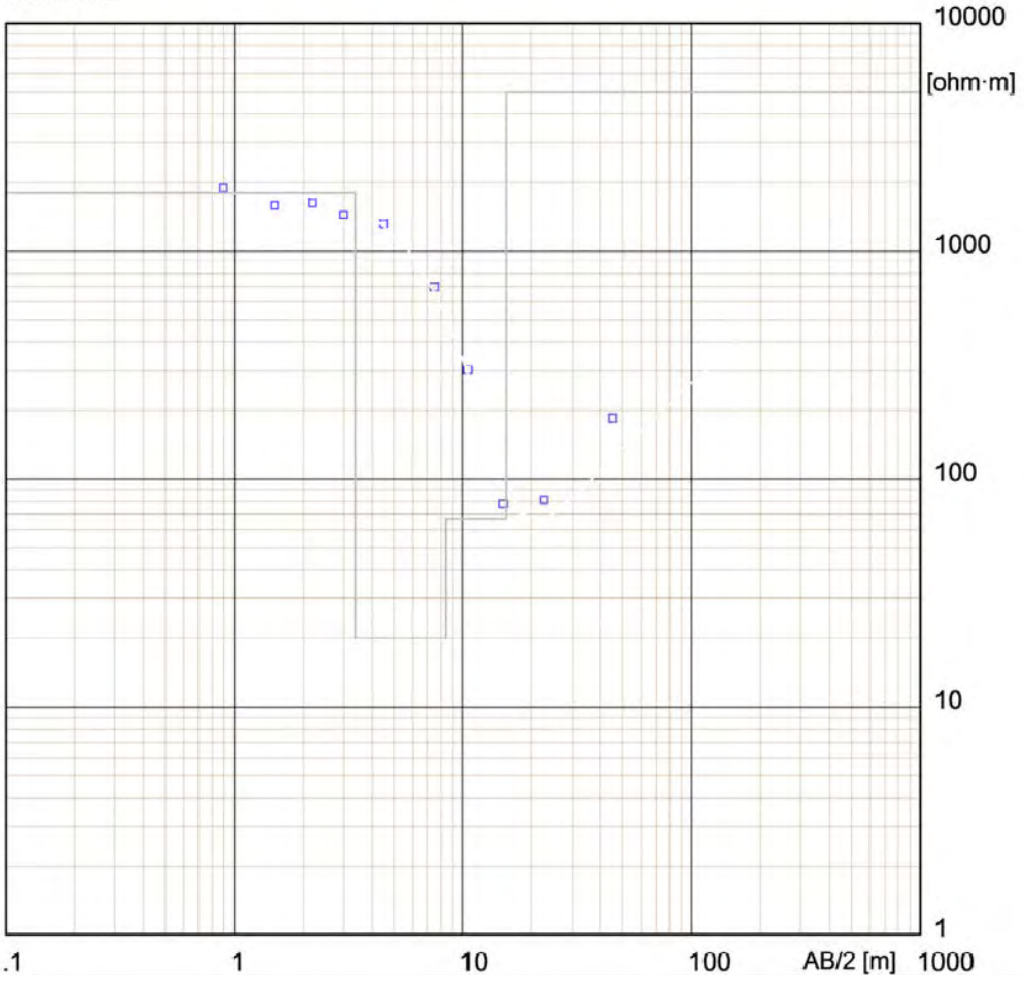
Model Resistivity	Thickness	Depth	Altitude
[ohm·m]	[m]	[m]	[m]
658	3.2		189
20	7.4	3.2	185.8
48	6.4	11	178
61358		17	172

The VES was made nearby the Borehole nº01.

W-GeoSoft / WinSev 6.3

Electrical sounding Schlumberger - NamBh02.WS3

NamBh02



Location X = 39.962067 Y = -14.944467 Z = 190 Azim = 060-240

Model Resistivity	Thickness	Depth	Altitude
[ohm·m]	[m]	[m]	[m]
1807	3.4		190
20	5	3.4	186.6
67	7	8.4	181.6
5000		15	175

The VES was made nearby the the Borehole nº02 between Bh nº 01 and Bh nº 03

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