SYRAH BALAMA GRAPHITE PROJECT ESIA
CABO DELGADO PROVINCE, MOZAMBIQUE

TRAFFIC AND TRANSPORT ASSESSMENT

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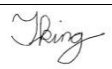
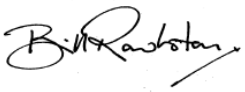
Thomas King	Author		September 2014
Bill Rowlston	Reviewer		October 2014

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EXECUTIVE SUMMARY

This study has, where possible based on the current level of planning, quantified traffic flows expected during the construction and operation phase of the mine. The study has assessed the condition of the roads from the mine site to Pemba and Nacala, commented on the existence of bridges, villages, and intersections and how these might be affected by project related traffic. The study has reviewed the Mozambican Road Code, Decree-Law 1/2011 of 23 March and described the ports of Pemba and Nacala and logistics considerations within both towns. The foreseeable impacts have been described and assessed in Chapter 8.

Of the operations phase traffic that will be generated, the most significant contribution will be due to transport of the graphite concentrate from the mine site to the port of export. The mine will produce approximately 380,000 tons of graphite per year. Graphite will be bagged on-site, and transported to Nacala or Pemba (Nacala preferred) on a covered multi-axle articulated truck. Graphite will be stored at a warehouse, then containerised and transported to the nearby port. Containers will be transported to the port on a regular schedule: 7 days a week during daylight hours. Production of approximately 380,000 tons of graphite per year translates to approximately 1056 tons per day (delivery to Nacala / Pemba 360 days of the year). A payload of approximately 37 tons per load has been assumed for the transport of graphite-containing bags to Nacala / Pemba. This means that approximately 29 loads per day will be required. A “trip” is defined as a one-way journey between the mine and Nacala/Pemba or back from Nacala/Pemba to the mine. As trucks will need to return for the next day’s loads, the number of trips generated due to product transport will be approximately 58 per day.

From the mine site to Nacala/Pemba, trucks will need to pass through a number of settlements, some of which have markets along the roadside. Pedestrians and shoppers frequently cross the road, or the sheer number of people present spill into the road. Additional hazards are caused by taxis, vehicles and bicycles pulling off and pulling onto the road. Drivers of trucks will need to be vigilant in these areas and will need to exercise caution. There are also bridges along the route, some of which need to structurally assessed by a competent professional prior to having trucks pass over them. This may not be required for the bridges on the paved and good quality roads from Montepuez to Nacala and Pemba, but for the road from Balama to Montepuez this will be necessary. The second bridge along this route is in very poor condition, with the underside beginning to fall away. The passing of traffic along the unpaved road will generate large amounts of dust if the road is left untreated. The dust will affect local residents who have their houses and stalls built immediately on the road side. Their houses and merchandise will be coated with dust. Measures have been suggested to reduce dust emissions. Operations phase traffic will also be due to transport of skilled employees to and from the site and the airport in Pemba, buses transporting locally sourced labour from surrounding villages to the mine site, and the delivery of supplies and consumables to the mine site. These have all been quantified in Chapter 2 of this report, but are insignificant in relation to product export traffic. This is seen as the most significant impact upon which mitigation measures should be focused.

In the absence of a detailed Bill of Quantities for the construction phase, it has not been possible to calculate traffic quantities during this phase, however many of the expected impacts have been identified and discussed. Many of the plant components will be manufactured outside of Mozambique, and be delivered to the ports of either Nacala or Pemba. A small proportion of these will be abnormally sized, and will need special transport arrangements that will need to be made in consultation with local traffic authorities. To reduce transport and logistics costs, the EPCM contractor is likely to attempt to source as much construction material locally as possible. The area is very rural and all traffic, regardless of its source, will concentrate on the EN242 from Montepuez to site. Construction will take approximately a year to complete. Delivery of the bulk of construction materials is likely to take place within the first few months, with deliveries tapering off as construction activities are completed.

Impacts that have been identified and assessed relate to: safety of other road users, the generation of dust, and the transport of abnormal loads. Mitigation measures have been suggested

which will significantly relieve the seriousness of these impacts. Many of the impacts identified will no longer be applicable when the upgrade of the EN242 is completed prior to the initiation of construction. Syrah's personnel met with the project manager for CMC (who is the contractor to undertake the road upgrade) and the road is due to be completed by December 2015.

1 INTRODUCTION

1.1 Project background

Syrah Resources Limited (Syrah) has contracted Coastal and Environmental Services, independent environmental and social consultants of Grahamstown, South Africa to undertake an Environmental and Social Impact Assessment (ESIA) for a proposed graphite mine in the district of Balama town, Cabo Delgado Province, Mozambique. This Traffic and Transport Assessment is one of a suite of studies that will be conducted as part of the assessment.

Syrah plans to extract and process the graphite ore at the mine site outside Balama. The graphite will be bagged, and loaded onto a multi-axle articulated truck and transported to a warehouse in the Nacala municipal area. Pemba is also a possible export port option, but Nacala is preferred. When the upgrade of Pemba port is completed, it may be considered as an export option. At the warehouse, graphite bags will be containerised - that is, packed into standard sized shipping containers - and then transported to the port in preparation for export.

Product transport for export will be the most significant contributor to operations phase traffic, but there will also be small contributions due to the supply of fuel and supplies to site and the commute of operations phase staff. The mine will be a totally new development in the area, and it is likely that a large amount of construction material and equipment will need to be delivered to site from distant sources. The use of locally-available material and equipment is likely to be limited.

The mine is planned to produce approximately 380,000 tons of graphite per year. On a 360 days-per-year delivery schedule to Nacala/Pemba, this translates to approximately 1,056 tons per day.

1.2 Terms of Reference

The terms of reference provided for this study are the following:

a) Describe the mining process with particular reference to traffic and transport issues including estimates of the volumes of traffic expected to be generated by the project.
b) Describe the road route from the mine site to Nacala and Pemba and identify sensitive areas such as bridges, intersections, villages close to the road and potential bottlenecks or hazardous areas. The road condition must also be described.
c) Describe the ports with details of: current activities, infrastructure and layout, and ability of the ports to accommodate product export.
d) Review Mozambican legislation pertaining to traffic and transport issues.

1.3 Approach to the study

At this stage in the planning and design of the project it is not possible to quantify the volumes of traffic that will be generated by the project with any precision. However, estimates of traffic volumes have been made based on a thorough review of available project planning documents, and these are considered to be sufficient to assess the potential environmental and social impacts of project-related traffic on the roads in the project area, and especially between the project site and the port of entry for equipment and materials, and for product export.

The study was informed by a site visit, during which detailed observations were made of conditions on site, candidate transport routes and the port of export. The site visit, undertaken by Thomas King in July 2013, assessed the route from Balama to Pemba. At that time, Pemba was assumed to be the port of export. However, improved knowledge and planning has led to the selection of Nacala as the preferred choice for port of export. The route from Metoro (in Cabo Delgado Province) to Nacala (in Nampula Province), and the Port of Nacala, was visited and assessed by Andrew Hickey and Dinis Napido of Syrah Resources, whose detailed report has contributed significantly to the compilation of this report.

The routes assessed in this study are as follows:

Between the mine site and the Port of Pemba:

- Road 242: Balama to Metoro
- Road 106: Metoro to Pemba

Between the mine site and the Port of Nacala:

- Road 242: Balama to Metoro
- Road 106: Metoro to Namialo
- Road EN108: Namialo to Nacala

Within the city of Pemba there is one route to reach the Port through the town:

- Turn right off the 106, onto Avenida do Chai then left onto Avenida da Marginal. This road follows the coastline, avoiding the crowded centre of Pemba, and is commonly used by port-related traffic.

Along these roads, notes were taken of the following:

- The location and condition of bridges;
- Villages alongside or near the road, taking special note of near-road trading areas;
- The width of the carriageway and the condition of the surface.

Descriptions of the Port of Pemba and the Port of Nacala were obtained from existing project documents.

During the construction phase it will be necessary to import materials and equipment into Mozambique and transport it to the project site. This contractor appointed for the construction of the mine will be responsible for obtaining all material and equipment required for completion of the construction work. Because detailed construction plans are not yet available, it is not possible at this stage to accurately quantify traffic volumes expected to be generated as a result of the import of materials and equipment. Currently-available information has therefore been used to estimate traffic volumes for the construction phase. Lastly, the study reviews pertinent legislation with regard to traffic and transport issues in Mozambique. Through consultation with experienced Mozambican consultants, it has been established that the most relevant document in this regard is the Road Traffic Code: Decree-Law 1/2011 of 23 March. A summary of important information in this Code is presented.

1.4 Assumptions and limitations

Many aspects of the operation phase are still in the planning stages, and as a result this study will focus less on the quantification of traffic numbers and more on current conditions on site pertinent to future potential traffic and transport issues. This report is based on the following plans for the operations phase:

- That either the Port of Pemba or the Port of Nacala will be used for export, but the Port of Nacala is preferred;
- Approximately 380,000 tons of graphite will be produced per year for export;
- Concentrate will be packaged on site, and containerised at a warehouse in Nacala, or possibly Pemba. The warehouse will be located close to the port.

The source of equipment and materials, the means and the routes of transport of construction materials are details that will be decided by the contractor when the construction phase begins. No accurate quantification of traffic expected to be generated during the construction phase can be made until a detailed bill of quantities is available, suppliers of goods and equipment are known, and a timetable of construction activities has been agreed on. **In** this report, the word “ton” refers to a metric ton.

2 OPERATION PHASE TRANSPORT DESCRIPTION

Chapter 2: **Operation phase traffic and transport description.** This chapter presents currently available information on the operation phase of the project, with a focus on traffic and transport issues. The following will be discussed: graphite concentrate packaging, transport and storage; road routes to be used; and the type of transport vehicles to be used in transportation.

2.1 Product transport

The end product of the mine processing will be graphite concentrate. This concentrate will be bagged on-site, and transported to Nacala or Pemba on a multi-axle covered articulated truck. A load of 37 tons per truck has been assumed. Bags will be stored and then containerised in standard sized shipping containers. Containers will be transported to the port on a regular schedule: 24 hours a day, 7 days a week. Trucks used to transport containers from the warehouse to Port will have a maximum vehicle weight of 56 tons and will not exceed 22 metres in length.

The mine will produce approximately 380,000 tons of graphite per year, translating to approximately 1,056 tons per day (in terms of delivery to Pemba / Nacala, 360 days a year). A payload of 37 tons per load has been assumed for the transport of graphite-containing bags to Nacala / Pemba. This means that approximately 29 loads per day will be required. A “trip” is defined as a one-way journey between the mine and Nacala/Pemba or back from Nacala/Pemba to the mine. As trucks will need to return for the next day’s loads, the number of trips generated due to product transport will be approximately 58.

2.2 Workforce transport

Although the biggest source of operations phase traffic is expected to be due to heavy truck traffic related to the transport of product, there will also be increased light and medium-heavy passenger vehicle traffic due to the transport of mine employees and contractors. The workforce during the operations phase will total approximately 276 personnel (Ian Stewart review).

Most employees will be from the local district.
Remaining employees are likely to include skilled Mozambicans with homes far away from the project site, foreign nationals. It is probable that they will be transported from the airport at Pemba in light passenger vehicles. Total vehicle trips are unlikely to exceed 5 or 10 vehicle trips a week, not during peak morning and evening travel periods.

2.3 Equipment and supply transport

The day to day functioning of the mine will require the delivery of certain consumables. These are expected to be:

- The delivery of production supplies to the mine, including:
  - Diesel,
  - Oils,
  - Chemicals,
  - Spare parts.
- Delivery of domestic supplies to the mine, including:
  - Food and cooking materials,
  - Consumables such as mosquito spray, toothpaste, soap, etc
  - Equipment and furniture replacements.

2.3.1 Production supplies

The exploration camp currently receives its power from a diesel generator that consumes about 67 litres of diesel per day. By the time that the operations phase of the mine is reached, electricity will have been installed as far as Balama. The supply line is currently being extended from Montepuez

towards Balama. At the time of the site visit, August 2013, the poles had been installed.. During the operations phase the mine will draw its power from the Mozambican grid. It is likely a few generators will still remain on site, to be used when electricity from the grid is not available. Therefore, during the operations phase, diesel will be required for the mine vehicles with a small store kept aside for the generators. Diesel is available from the town of Balama.

Oils and grease for engines and moving mechanical parts will be less than 50 litres per week. Oil comes in 210 litre drums.

Chemicals will be required during the production phase, including:

- Froth 180 tons per annum, requiring approximately 20 deliveries;
- Paraffin 130,000 litres per annum, requiring approximately 15 deliveries assuming a tanker with 10,000 litre capacity;
- Flocculent 20 tons per annum, requiring no more than 2 deliveries.

Daily traffic generated by the transport of diesel, oil and chemicals to site will be negligible. There will be an estimated total of no more than 2 trips – loaded and return – a week.

2.3.2 Domestic supplies

Currently, during the exploration phase of the project, the accommodation camp caters for on average 30 staff at any time, and provides lunch for 50 casual labourers. This requires the delivery of approximately 350 kg of supplies per week. Supplies include: foodstuffs, cooking materials, consumables such as insecticides and soap, furniture, etc. (Pers. Com. Lovemore Jonasi). During the full operations phase, the camp will need to cater for approximately 276 personnel.

Extrapolating these figures to the full operations phase, it is anticipated that about 750kg of weekly supplies will be required, and that two vehicles will be required for their delivery to the mine - a refrigerated truck and a normal 2-axle truck. Each of these will not be expected to make more than 2 trips per week to Pemba, adding a total of 8 vehicle trips to the road per week, or 32 per month.

Table 2.1 below provides a summary of vehicle trips anticipated during the full production phase.

Table 2.1: Summary of production phase vehicle trips.

Purpose	Vehicle type	Number of trips	Route
Graphite product transport	Multi-axle articulated trucks	Approximately 58 per day; Approximately 1,740 per month*	Site to Nacala (preferred) **or** Site to Pemba
Transport of staff	Double cab Toyota Hilux or similar	5 per week; 20 per month	Site to Pemba
Delivery of production supplies	2- & 3- axle trucks	±2 per week <10 per month	Pemba to site
Delivery of domestic supplies	2-axle delivery truck	8 per week; 32 per month	Site to Pemba

*Note that a trip includes a vehicle returning empty. In this case, a truck transporting 1 load of graphite to Nacala/Pemba will return empty for the next load, thus generating 2 trips per load of graphite delivered.

3 CONSTRUCTION PHASE TRANSPORT DESCRIPTION

Project implementation will be conducted by an Engineering, Procurement, Construction and Management (EPCM) Contractor, who will be appointed by Syrah to manage and supervise the engineering, equipment and material supply, and complete the construction of the plant. At this stage, without a detailed construction plan formulated by the EPCM Contractor, it is not possible to quantify the volumes of traffic which will be generated by the mine construction. Once all permitting and financing arrangements have been concluded, and water and electricity supply to the project area has been secured, the construction and pre-production phase of the mine will take approximately 18 months to complete (Snowden Draft Scoping Report, 2013).

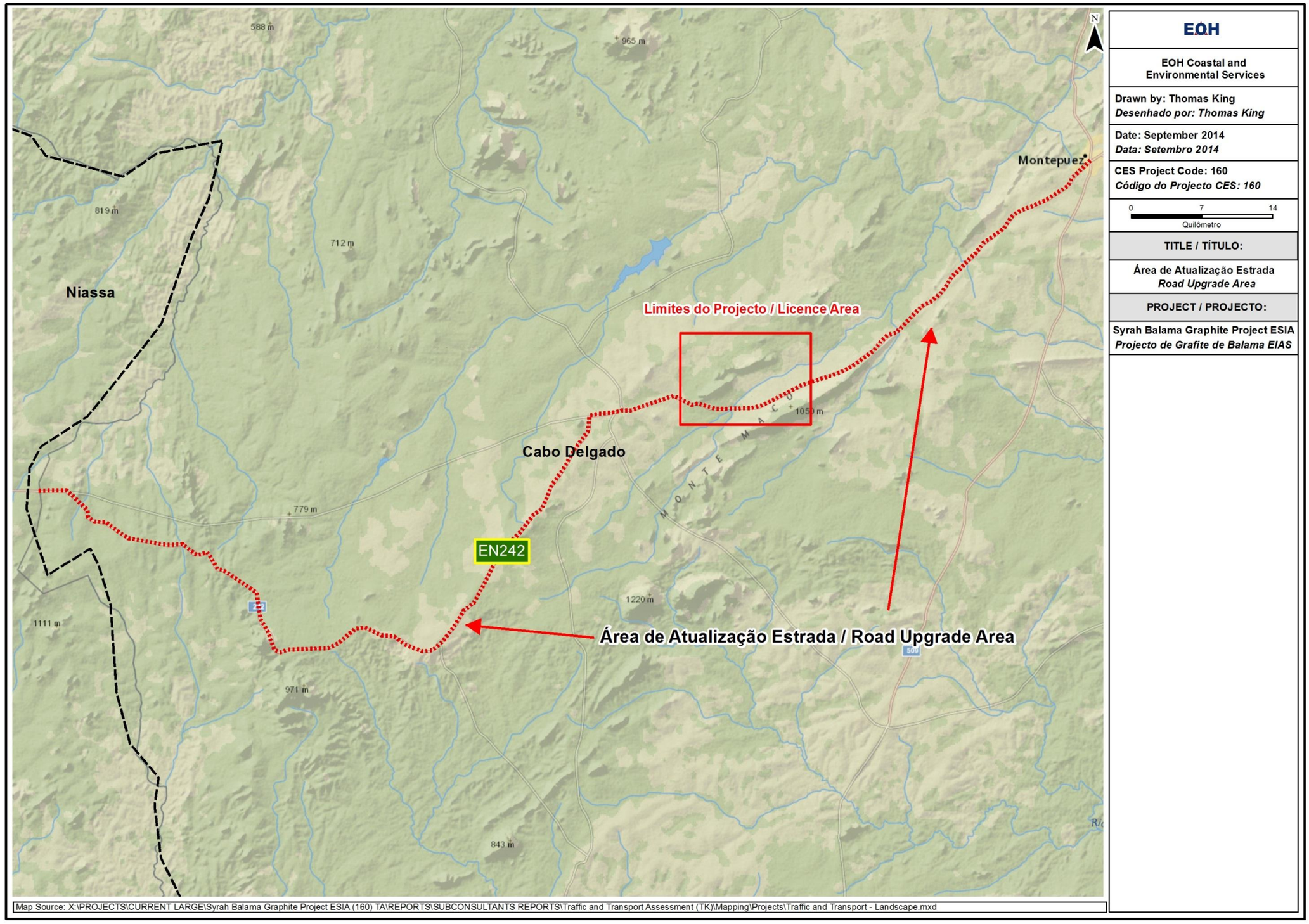
3.1 Traffic generation

A range of vehicle types are likely to be used during the construction of the mine. Heavy vehicles which will be required to transport goods, materials and equipment to site will include three, five and seven axle trucks; flatbed semi-trailers and, possibly, road trains pulling a number of trailers. Tracked vehicles such as excavators and bulldozers will be transported to site on lowloaders. It is probable there will be some abnormal loads for large items such as transformers, that cannot be assembled on site.

An accommodation camp will need to be constructed to house construction workers but since the accommodation camp and the mine infrastructure will all be within a defined, access-controlled mine area, no impact is expected on external, public roads.

Large pieces of equipment will be shipped to the closest port, either Pemba or Nacala. Thereafter, they will be transported by road to site. The majority of smaller items (<10 tons) will be manufactured in South Africa and transported by road through the Mozambique or Malawian border posts (Pers. Com. Vince Agnello [Consultant Snowden] 17.07.2013). Crushed stone for construction activities will be acquired from Montepuez (Pers. Com. Peter Buckle [Geologist Syrah] 26.07.2013).

CMC Africa Austral Lda is currently upgrading the 135 km stretch of road from the border of Niassa and Cabo Delgado Province, the crossing of the Ruaça River, to the southwest part of Montepuez town. The route from Balama to Montepuez is part of the road route to the Port of Pemba that will be utilised during construction and operation. The road upgrade area is shown in Figure 3.1.



EOH

EOH Coastal and Environmental Services

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Desenhado por: Thomas King

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Quilômetro

TITLE / TÍTULO:

Área de Atualização Estrada
Road Upgrade Area

PROJECT / PROJECTO:

Syrah Balama Graphite Project ESIA
Projecto de Grafite de Balama EIAS

Figure 3.1: The section of the EN242 being upgraded by CMC Africa Austral Lda.

The major structural elements at the mine site for which building and other materials will be required, are:

- The mineral processing plant, including ancillary structures such as offices, workshops, stores and the bagging plant.
- The tailings storage facility.
- The reservoir, pumping station, and pipeline from Chipembe dam to site.
- The mine accommodation camp, including all buildings (housing units, kitchen, dining hall, laundry, clinic, recreational facilities, guardhouse), sewage treatment plant, perimeter fencing.

The detailed design of the mine and the ancillary structures on site is not yet at a stage where accurate estimates of quantities and weights of materials and equipment are available. The main items of equipment and materials transported will be:

- Structural steelwork.
- Ready-mixed concrete, or aggregate, sand and cement for on-site batching.
- General civils and building materials (falsework, bricks, cement)
- Pre-assembled items of equipment for the processing plant) crushing; milling, flotation, regrind, product handling), electricity distribution system, and wastewater treatment plant.
- Pumps and pipes for the water supply system.
- Fill material for the TSF embankment[1].
- Construction plant and machinery.

In addition, construction staff and personnel will have to be transported to the site during construction, as well as consumable materials such as fuel and lubricants.

As an initial first estimate, to provide an indicative estimate of the volumes of construction-related traffic generated by the project, it is assumed that around 50 000 tonnes of materials and equipment will be required to construct the mine (35 000 tonnes of structural steelwork and equipment, and 15 000 tonnes of civils and building materials).

3.2 Trip distribution

Details of the origins of the various items of construction-related equipment and materials are not yet available, and as a consequence it is not possible to define the routes - trip assignment - they will take from the point of origin to the mine site. As noted above it is, however, probable that large pieces of equipment, manufactured outside of Mozambique, will be delivered to the Port of Pemba, or possibly Nacala and transported by road to site. Smaller deliveries (<10 tons) of materials that cannot be sourced from surrounding urban centres are likely to be delivered by truck from South Africa or Malawi. All items will be transported on the EN242 on the final stage of the route to the site.

For the purposes of these initial estimates it is conservatively assumed that:

- During the peak of construction activity two-thirds of the total tonnage of equipment and materials (say 35 000 tonnes) will be delivered to site during 20 weeks of the total anticipated 40-week construction period. The anticipated construction schedule is shown in Table 1 (Draft Scooping Report, Snowden Consultants)
- The average payload will be 25 tonnes.
- Trips will be distributed evenly over 8-hour working days in a 5-day working week.

[1] It is unlikely that mine waste will be used as embankment fill, as it will generally be classified as mineralised waste and will not be a suitable construction material. The overburden in the mining area is relatively shallow - between 2 and 5m - and thus only limited amounts of waste material will be generated during the mining process. Off-site areas are being investigated as possible sources of suitable materials for the construction of the embankment.

Table 3.1: The construction and pre-production schedule for the project.

Phase	Time (weeks)	Start date*	End date*	Duration
Engineering design	12	October 2013	January 2014	4 months
Procurement	24	December 2013	May 2014	6 months
Construction and management	40	October 2013	July 2014	10 months
Construction:				
Water supply and distribution	20	June 2013	October 2013	5 months
Access road	3	3 June 2013	21 June 2013	1 month
Site camp	20	June 2013	October 2013	5 months
Production start up:				
Water system commissioning	1	21 October '13	25 October '13	1 month
Training	8	June 2014	August 2014	3 months
Production ramp-up	8	August 2014	September '14	1 month

*Source: Draft Scoping Study, Snowden Mining Industry Consultants. *Note that the dates presented in the table are incorrect, as at time of writing these dates have already past. However, for the purposes of this study the table above provides useful information on the duration of each phase of the construction schedule.*

On this basis it is estimated that there could be five vehicle trips per hour, loaded into the site and empty out of the site, at the peak of construction activity, to deliver equipment and materials.

Neither the expected numbers of staff and workers on the site during construction, nor their transport requirements and arrangements to and from the site, are known at this stage. However, unlike materials deliveries, the timing of which can be adjusted to avoid the morning and evening peak traffic periods, workers must travel to and from the site at the beginning and ending of their working days/shifts. Depending on the number of workers on the site and their transport arrangements worker-related traffic volumes can result in a significant increase in road usage by local people and other vehicles not associated with the project.

4 ROUTE DESCRIPTION

4.1 Road EN242: Balama to Montepuez

4.1.1 Route map

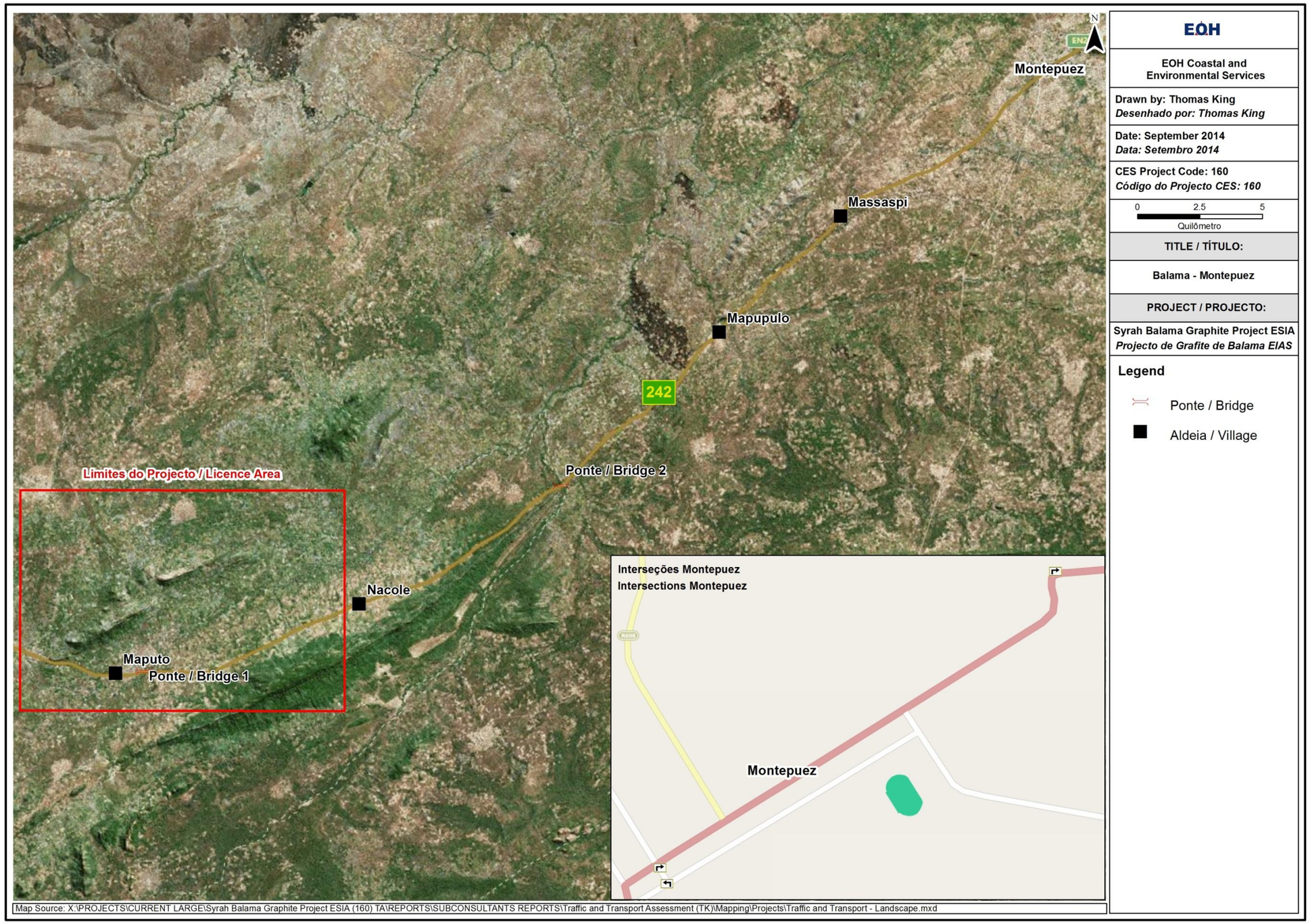


Figure 4.1: The route from the mine site to Montepuez (Approximately 50 km)

4.1.2 Road condition

The road is unpaved, and is in the process of being upgraded by CMC Africa Austral Lda. On the outskirts of Montepuez the new road surface, which is only about one year old, has deteriorated quite rapidly, resulting in numerous sharp-edged potholes. See Plate 4.1. This deterioration was observed along a stretch of the new road for about 15 km leading into Montepuez from the west. The unpaved section of the road is not in bad condition but progress along it is slow. This route survey was conducted in the dry season, and in the wet season this route is likely to be more hazardous. There is a tendency for the road to wash out near the bridges, but up until now this has been repaired by simply by filling in the ruts with gravel and soil.

Plate 4.1: The patchy, broken tar for about 15 km west of Montepuez (July 2013)

4.1.3 Bridges

There are two bridges along this stretch of the road. CMC is in the process of building new bridges immediately adjacent to the existing bridges. It is expected that all road upgrade work will be completed by December 2015. At this stage (July 2013) only the bridge piers have been constructed. The first bridge, immediately east of Maputo is in reasonably good condition and could be expected to handle the heavy loads that will be passing over it. Its load-bearing capacity will need to be assessed. The bridge is single-lane, and can handle one vehicle passing over it at a time. Since other motor traffic on this road is minimal this is not expected to cause much disruption. Plate 4.2 below shows the existing bridge outside of Maputo, with the new bridge under construction appearing in the right of the picture. This bridge (referred to as a singular object) is in fact a series of three bridges in close proximity to each other, but all crossing the same wetland/riparian system.

Plate 4.2: Bridge 1, immediately east of Maputo Village (July 2013)

Plate 4.3: New bridge under construction adjacent to bridge 1 (July 2013)

The second bridge, between the villages of Nacole and Mapupulo, is in poor condition. An inspection of the underside of the bridge revealed rotting of the wood structures and rusting and disintegration of the steel structure. The pictures that follow will illustrate this more clearly

Plate 4.3: Bridge 2, between the villages of Nacole and Mapupulo (July 2013)

Plate 4.4: The disintegrating underside of bridge 2 (July 2013)

Plate 4.5: New bridge under construction next to bridge 2 (July 2013)

4.1.4 Villages

Along this stretch of the route there are three large villages with buildings on both sides of the road.

Besides these three villages, there are approximately 2 smaller settlements no larger than a few houses and restricted to one side of the road. Compared to the eastern side of Montepuez market activity on the side of the road was minimal. The biggest concern along this stretch of the road is likely to be dust generation due to the heavy project-related vehicles which will be using the road. But once the road is surfaced this will not be a problem. Other road users include a small number of motor vehicles, mainly two-axle transport trucks, villagers on motorcycles and bicycles, and pedestrians.

Table 4.1: Villages along the route from the mine site to Montepuez.

Village name	Brief description of size
Maputo	Quite large with numerous pedestrians
Nacole	Medium size, no market, but pedestrians present.
Mapupulo	Medium size, small market.
Massaspi	Small, no market.

The outskirts of Montepuez extend for approximately 5 km and immediately before the 90-degree street intersections which are described in Section 4.1.5 there is a busy market on the western outskirts of Montepuez (see Plates 4.5 and 4.6). Once in Montepuez, trucks will need to make a journey of approximately 3 kilometers through the centre of Montepuez, a double-lane road with a median island. The road is tarred and in good condition, but there is poor observance of road rules by other vehicles and there is the possibility for some delays, and potentially accidents. Towards the end of the 3 kilometre stretch, before the right turn onto the EN242 bound for Metoro, there is a busy market on the side of the road. In market situations such as this, pedestrians frequently stray into the road, and cross it frequently with little regard to traffic safety. Taxis and motorcycles are constantly pulling over or pulling out into the road. The only way to safely pass through markets such as this is by driving very slowly, and with care.

Plate 4.5: The outskirts of Montepuez on the western side.

Plate 4.6: A close-up view of the Montepuez market on the western outskirts.

4.1.5 Turns and intersections

Trucks passing through Montepuez will need to make three 90-degree turns.

Plate 4.7: The first turn, a left turn, which passes the hotel He Lanconette.

Plate 4.8: The second turn onto a two- lane carriageway through the centre of Montepuez.

Plate 4.9: The last turn, a right turn, onto the EN242 bound for Metoro.

4.2 Road EN242: Montepuez to Metoro

4.2.1 Route map

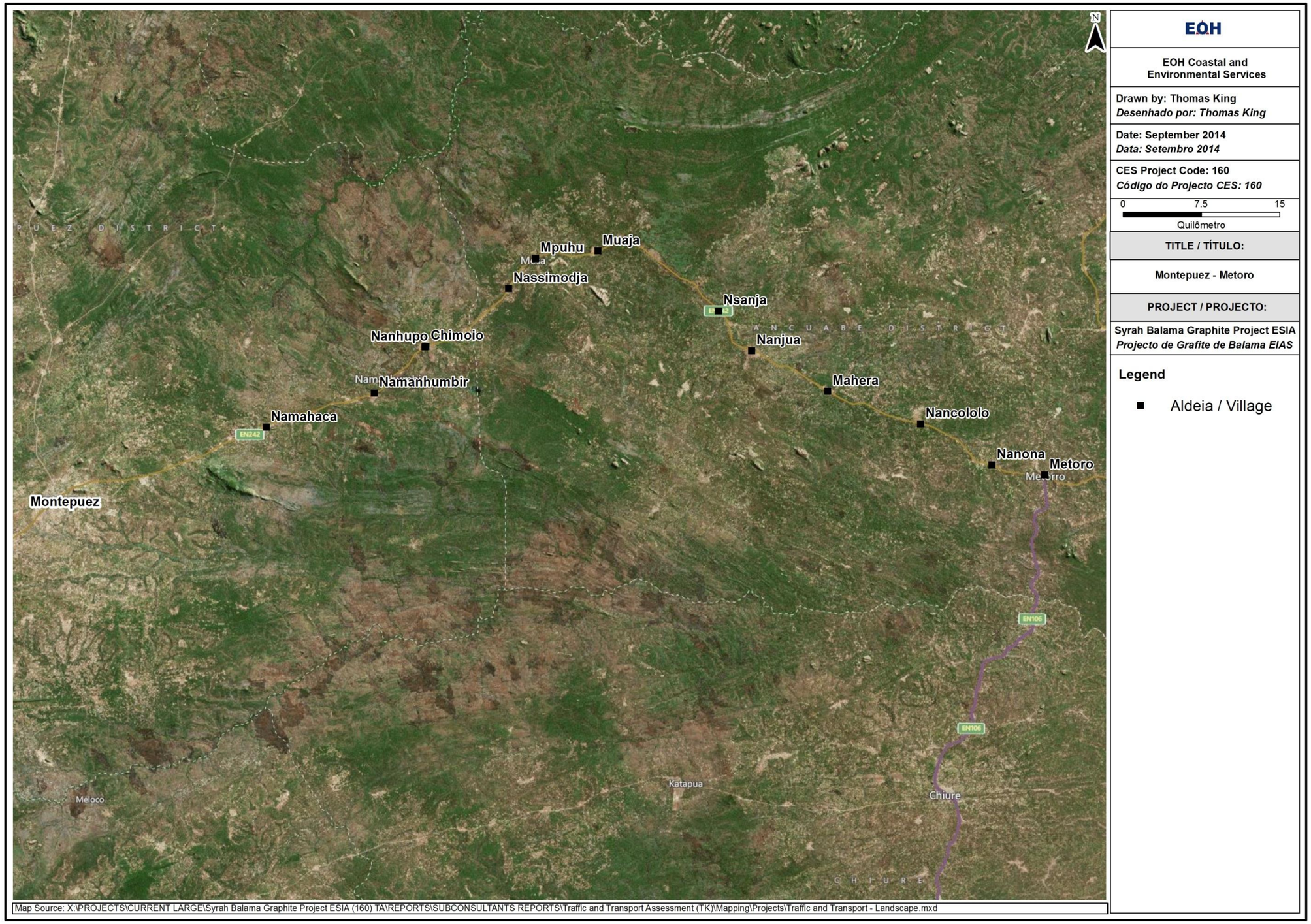


Figure 4.2: The route from Montepuez to Metoro (approx. 110 km)

4.2.2 Road condition

The road is in excellent condition, with a single lane in each direction. The road verges are kept clear of vegetation, and work crews were observed undertaking road maintenance. Unfortunately the road has no double lane sections or shoulders. The road is in this condition all the way to Pemba. Upon entering Pemba, the road becomes a double lane.

4.2.3 Bridges

There are no bridges along this stretch of the route.

4.2.4 Villages

A total of 13 villages are situated along this route, including Metoro. There are two bustling markets, centred on the trade of rubies, in the towns of Namanhumbir and Nanhupo.

Table 4.2: Villages along the route from Montepuez to Metoro

Village name	Brief description of size
Namahaca	Medium size, small market.
Namanhumbir	A very busy ruby market.
Nanhupo	A very busy ruby market.
Chimoio	Small village, no market.
Nassimodja	Small village, small market.
Mpuhu	Medium size, small market.
Muaja	Medium size village and moderate levels of trading activity.
Nsanja	Medium size village with a small road side market.
Nanjua	Medium size town with a busy road side market.
Mahera	Small town with virtually no market activity.
Nacololo	Very small town with tiny market.
Nanona	Medium sized town with little market activity.
Metoro	Large village with a busy market. This town is part of a bus route which attracts large numbers of traders attempting to sell the travellers goods.

Plate 4.10: The congested conditions in the village of Nanhupo.

4.2.5 Turns and Intersections

Trucks will need to make no turns along this route.

4.3 Road EN106: Metoro to Pemba

4.3.1 Route map

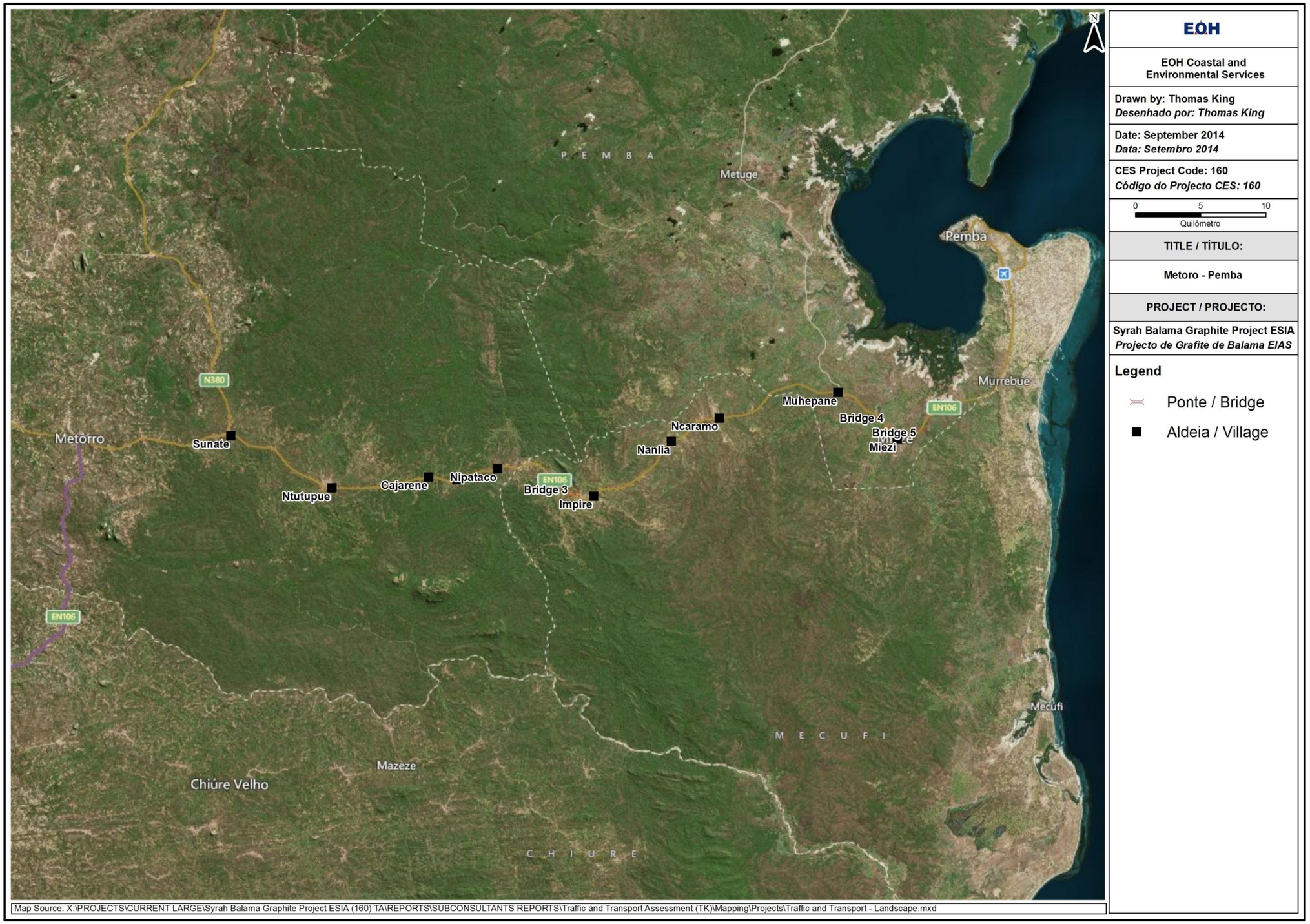


Figure 4.3: The route from Metoro to Montepuez (approx. 90 km)

4.3.2 Villages

Along this section there are 10 villages. These are described in Table 4.3 below.

Table 4.3: Villages along the route from Metoro to Pemba

Village name	Brief description of size
Sunate	A small town with a busy market because it is along a bus route.
Ntutupue	A medium sized town stretched out along the road, but with minimal market activity.
Cajarene	A small town with a correspondingly small amount of road side trading activity.
Aldeia Miguel	A small town with a small market selling grass for roofing and long wooden poles, presumably for house construction.
Nipataco	A small town with no road side market activity.
Impire	A medium sized town stretched out along the road, but with minimal market activity.
Nanlia	A small town with a small amount of road side market activity.
Ncaramo	A small town with a moderate amount of market activity, selling coal and clothes.
Muhepane	A small town but along a bus route, causing a busy market which frequently spills into the road.
Miezi	A medium sized town.

4.3.3 Bridges

There are three bridges along this stretch of the route. They are in good condition like the road they are part of, with two lanes across.

Plate 4.11: Bridge 3 at the village of Impire.

Plate 4.12: The underside of bridge 3.

Plate 4.13: Bridge 4 at the village of Mieze.

Plate 4.14: The underside of Bridge 4.

Plate 4.15: Bridge 5 on the eastern side of Miezi village.

Plate 4.16: The underside of bridge 5.

4.3.4 Turns and intersections

There are no turns along this route.

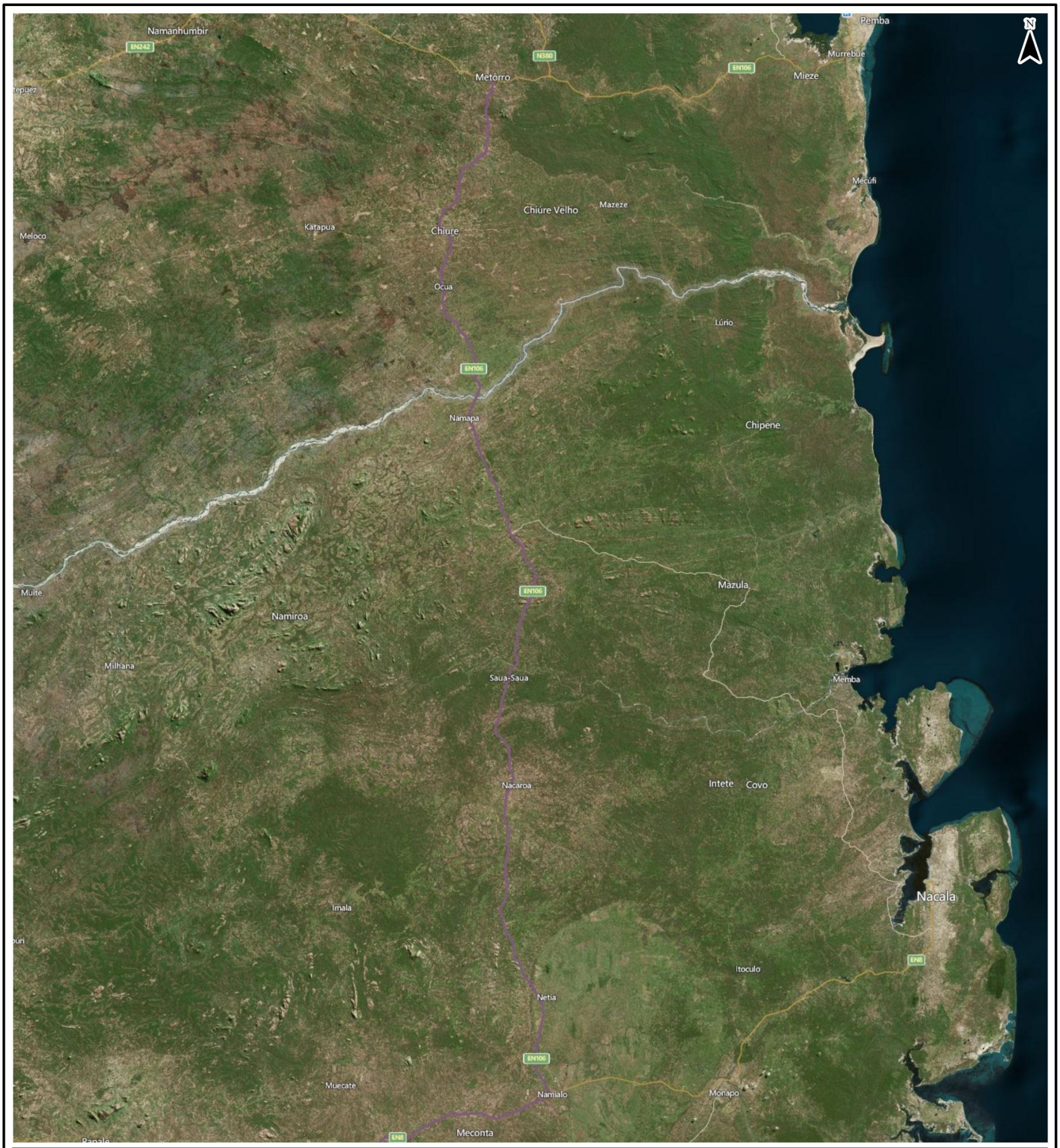
4.4 Road 106: Metoro to Namialo

This section of the route was surveyed by Mr Andrew Hickey and Mr Dinis Napido (Syrah Resources) in August 2014, who provided EOH CES with notes and photographs that have been used to complete this section. This section of road will be used if Nacala is chosen as the port of export.

4.4.1 Road condition

From Metoro to the junction with the EN8 at Namialo, this section of the road is 223 km long. The road is in poor condition for the first 74 km, until the border with Nampula Province is reached at the Lurio River, after which it improves. For the first 74 km, edge cracking is common and in some sections the road is reduced to a single lane. After crossing the Lurio River, the road becomes a good quality and relatively new highway. There are various settlements and villages of various size and activity, and various good quality bridges.

4.4.2 Route map



Map Source: X:\CURRENT LARGE\Syrah Balama Graphite Project ESIA (160) TA\REPORTS\SUBCONSULTANTS REPORTS\Traffic and Transport Assessment (TK)\Mapping\Projects\Traffic and Transport - Portrait.mxd

EOH Coastal and Environmental Services
Drawn by: Thomas King *Desenhado por: Thomas King*
Date: September 2014 *Data: Setembro 2014*
CES Project Code: 160 *Código do Projecto CES: 160*
TITLE / TÍTULO:
Metoro to Namialo
PROJECT / PROJECTO:
Syrah Balama Graphite Project ESIA *Projecto de Grafite de Balama EIAS*

Figure 4.4: Metoro to Namialo

4.5 Road EN8: Namialo to Nacala Port

This section of the route was surveyed by Mr Andrew Hickey and Mr Dinis Napido (Syrah Resources) in August 2014, who provided EOH CES with notes and photographs that have been used to complete this section. This section of road will be used if Nacala is chosen as the port of export.

4.5.1 Road condition

From Namialo to Nacala Port the road is well maintained and suitable for heavy vehicles with no restrictions. One short road diversion exists, at the point where the Nacala rail link is under construction.

On the outskirts of Nacala, the road forks with the right fork leading into Nacala and the left fork leading directly to the port, and avoiding any congested areas.

4.5.2 Route map

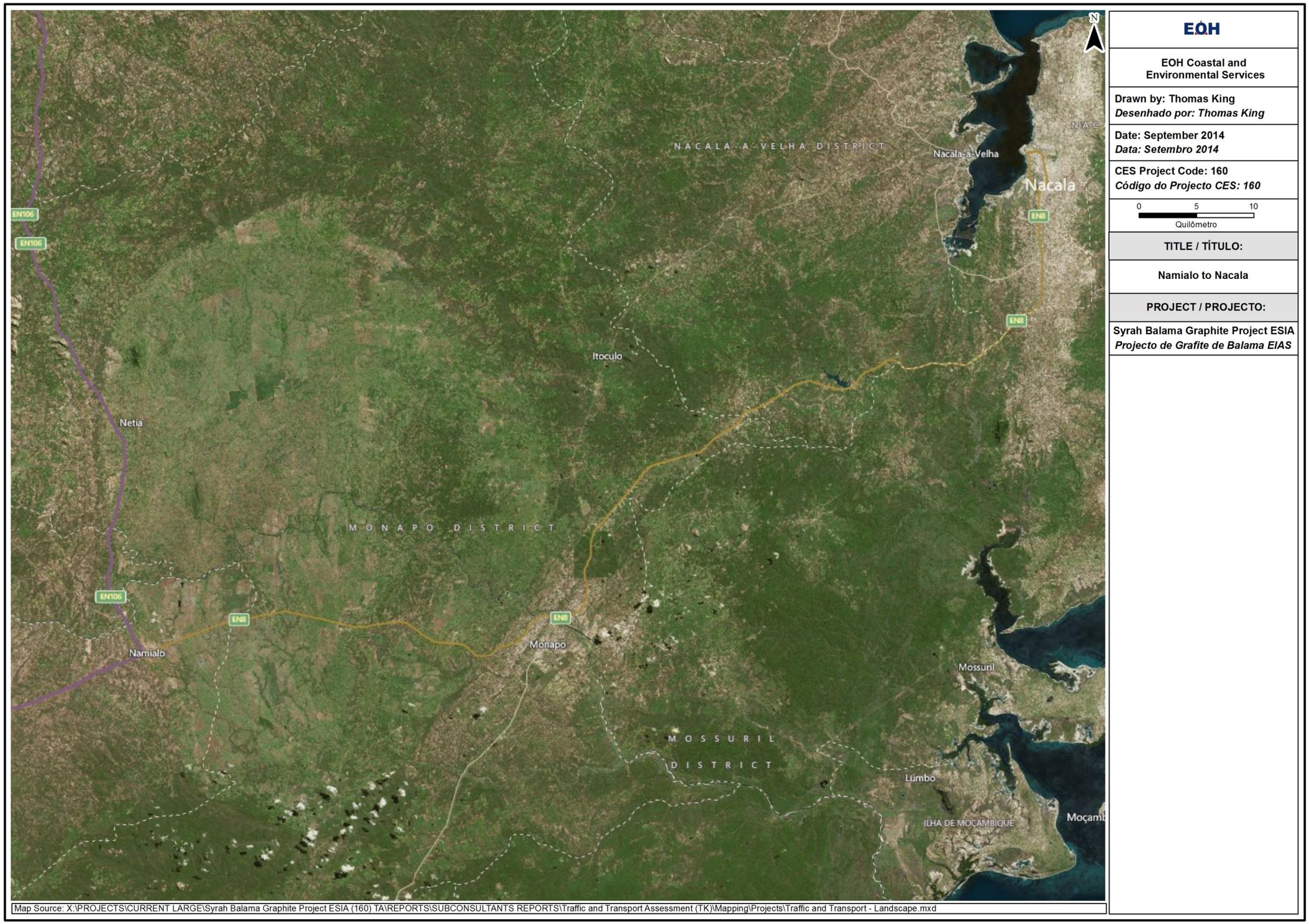


Figure 4.5: Namialo to Nacala

4.6 Within Pemba: Option 3

This route is currently used by most port traffic, as it avoids the congested centre of Pemba by skirting along the coastline. Port bound traffic turns right off the EN106 onto the Avenida do Chai then left onto Avenida da Marginal.

Plate 4.17: The turn to enter the Port of Pemba.

Plate 4.18: The intersection of the Avenida 16 de Junho and the Rua No. III.

Plate 4.19: The intersection of the Avenida Eduardo Mondlane and the Rua No. III

Plate 4.20: The intersection of the EN106 and the Avenida Eduardo Mondlane

Plate 4.21: The intersection of the Avenida 25 de Septembro and the Avenida 16 de Junho

5 PORT OF PEMBA DESCRIPTION

The Port of Pemba consists of one quay, which is 183 m long. With the average tide water depth is 9 m. Ship refuelling facilities are available at the port and are operational. The storage area is 7 500 m^2 and has storage capacity for 400 containers. The storage area is currently being expanded so that it will be able to store 800 containers. It is expected that the growing oil and gas industry will increase imports through the port, which will increase the availability of empty containers. Shipping containers that arrive at a Port are emptied, cleaned and then, if they do not have any cargo to transport from their location, are repositioned to an area of need. Pemba and Nacala are both classified as feeder ports, meaning that the large deep-sea vessels do not call there. Typically, containerised cargoes are loaded at these feeder ports into feeder vessels and are then transhipped to a hub port. According to Snowden investigations, the only shipping line which calls at the Port of Pemba is the PIL line. It calls monthly and its hub port is at Singapore. Given the projected volumes of graphite production, it may be possible for a shipping line to begin calling at Pemba more regularly. For instance, investigations by Snowden revealed that MSC (which hubs at Durban) would consider calling at Pemba if they could have a minimum of 200 containers per vessel (Snowden Draft Scoping Study, 2013).

The port currently caters for the import of goods that are distributed to the local and regional area. Products imported through the Port include: consumer goods, food and light industrial goods. Exports include small volumes of: cotton, sisal, cashew nuts and timber. The port handles between 400 and 500 containers a month in imports and a similar number in exports. However, exports are mostly of empty containers being repositioned by the shipping line to an area of demand (Snowden Draft Scoping Study, 2013).

The Port has no shoreside equipment, and the ships' cranes are required for the loading of containers. The Port is operated by Caminhos de Ferro de Mozambique (CFM). Port container volumes in 2012 were 10 493 TEU[2] in imports and exports.

Port fees are high, infrastructure is lacking, shipping line diversity is low, and access to the port is difficult and congested. Pemba in its present form will not be able to handle the project's exports.

[2] The Twenty-foot Equivalent Unit (TEU) is an inexact unit of cargo often used to describe capacity of container ships and container terminals. It is based on the volume of a 20 foot long intermodal container, a standard sized metal box which is easily transferred between different forms of transportation – ships, trains and trucks. There is a lack of standardisation of the height with values ranging between 4 feet 3 inches (1.30 meters) and 9 feet 6 inches (2.9 meters) with the most common being 8 feet 6 inches (2.59 meters) (Wikipedia, accessed 30.07.2013).

Plate 5.1: The Port of Pemba.

Plate 5.2: A 6-axle articulated truck, carrying two containers each capable of storing 28 tons of goods, delivering to the Port of Pemba on 28 July 2013.

6 PORT OF NACALA DESCRIPTION

All the information in this chapter is drawn from existing project documentation, which is not extensive. Specific reference is not provided but all information is drawn from the Snowden Draft Scoping Study (Snowden 2013) and an internal port investigation report compiled by Andrew Hickey and Dinis Napido (Syrah Resources).

The Nacala Port and railway is concessioned to Portos do Norte SA, a consortium that includes the Brazilian mining group Vale. Cargo handled includes cement, petrol, grains and various construction materials. In 2010 the port's container volumes were 71 112 TEU. The port has no restrictions on ship movement or size, but pilotage is compulsory.

Nacala has four cargo berths, two for bulk cargo and two for container traffic. The port does not have a shore crane, and ships' gear is used. Two shore cranes are being installed which will increase container transfer rates from the current 12 per hour (using ships' gear) to 20 per hour. The container terminal has a three-high stacking capacity of 2 500 TEUs, but currently containers are stacked four high, which increases the capacity to 3 300 TEUs.

According to Hickey & Napido the port has capacity to manage the additional volume that will be generated by the mine, and a greater diversity of shipping lines call here compared to Pemba.

On the outskirts of Nacala, the road forks, with the left fork leading down to the Port and the right fork leading into central Nacala. The road leads down to a traffic circle and the main port gates. The project's plan is to lease, own or build a warehouse within the Nacala municipal area. Bags of graphite will be delivered here and containerised. Containerised graphite will then be delivered to the port for export.

Figure 6.1: The road leading to the port from the fork

Figure 6.2: The traffic circle outside Nacala Port

7 THE ROAD CODE

This chapter presents a summary of the Mozambican Road Code, Decree-Law 1/2011 of 23 March. Only those sections deemed pertinent to Syrah and its mine operations have been presented. The Mozambican Road Code is an over-arching document, presenting the framework for the laws on Mozambican roads. Some specific details have been left to be defined in the regulations. The regulations necessary for effective enforcement of this code, are approved by the Minister responsible for overseeing the transport sector.

Article 9 (Traffic control), paragraph 1, states the following:

"Traffic control is the responsibility of:
a) The National Vehicle Institute (INAV), on all roads;
b) Administrative bodies or Municipalities, within towns."

Article 10 (Traffic oversight), paragraph 1, states the following:

"The overseeing of compliance with the provisions of this code, and other transport legislation, shall, without prejudice to other entities with specific responsibility, be the responsibility of:
a) The traffic police (PT);
b) The National Vehicle Institute (INAV);
c) The National Roads Administration (ANE), in the case of national roads; and municipalities in the case of municipal roads, streets and rural roadways.

Article 14 (Hierarchy of rules), paragraph 2, states the following:

"The hierarchy of rules derived from signposting, is the following:
a) Rules of temporary signposting, which modify the normal road use regime;
b) Rules resulting from illuminating signs;
c) Rules resulting from vertical signs;
d) Rules resulting from road markings.

Practical interpretation: All drivers associated with the mine should be aware that this is the order in which to obey road rules.

Article 22 (Traffic at intersections, junctions and traffic circles), paragraph 4, states the following:

"At intersections and junctions, drivers may not overtake."

Article 23 (Signalling of manoeuvres), paragraph 1, states the following:

"When a vehicle commences travelling, slows down, stops, changes direction of travel or lane, starts to overtake or changes it's direction of travel, and in all in which it is necessary to indicate it's approach, the driver shall be obliged to use a mechanical light or sound device, or, in the absence thereof, his arm, to make the corresponding signal, as per regulations, with due warning."

Paragraph 2 states the following:

"The measure shall continue to be effected, and shall cease as soon as it has been concluded."

Article 24 (Sound signals), paragraph 1, states the following:

"Sound signals shall be brief, used moderately, and shall in no case be used to protest against traffic interruptions, or as ways of calling others"

Paragraph 3 states the following:

"It shall only be permissible to use sound signals in the following cases:

a) Imminent danger;
b) Outside of towns, to warn a driver of the intention to overtake him, and also on bends, intersections, junctions and slopes with reduced visibility"

Practical interpretation: Drivers will need to use their hooters appropriately, in accordance with this paragraph.

Article 31 (Slow travel), paragraph 1, states the following:

"Without prejudice to the maximum limits set down, vehicles shall not travel so slowly as to cause an unjustified hindrance to the remaining road users."

Practical interpretation: This has important implications for mine vehicles carrying heavy loads, which as a consequence are travelling very slowly.

Article 33 (Speed limits), paragraph 1, states the following:

"Without prejudice to the provisions of articles 29 and 32, and the lower limits which may be imposed in terms thereof, drivers may not exceed the following instantaneous speeds (in kilometers per hour):

Classes and types of vehicles	Speed in km/h	
	Inside of towns	Outside of towns
Mopeds and quadricycles	40	45
Motorcycles		
Simple:	50	90
With side car	50	70
Light vehicles		
Passenger and mixed use:		
Without trailer	60	120
With trailer	60	100
Goods:		
Without trailer	60	100
With trailer	60	100
Heavy automobiles:		
Passenger	60	100
Goods and mixed use	60	100
Agricultural tractor with or without trailer	30	40

Practical interpretation: Vehicles associated with the mine are likely to be: Passenger and mixed use, Goods with trailers, Heavy automobiles (passengers and goods/mixed use). Drivers of these vehicles will need to be instructed to obey the speed limits described in this article.

Paragraph 3 states the following:

"Without prejudice to the provisions of Article 31, on freeways, drivers may not drive their vehicles at a speed of less than 40 km/h."

Article 43 (Overtaking), paragraph 6, states the following:

"All drivers of vehicles or animals are obliged, whenever there is no impeding obstacle, to immediately facilitate overtaking by moving as far left as possible, and not increasing their speed

while being overtaken."

Practical interpretation: Slow moving transport vehicles are likely to be overtaken frequently by other road users. They will need to be aware of this requirement.

Paragraph 8 states the following:

"Except during the time necessary to perform overtaking, heavy vehicles, when travelling outside of towns, shall keep a distance of not less than 50 metres between them."

Practical interpretation: An important consideration for mine vehicles driving in convoy.

Article 50 (Places at which stopping or parking is prohibited), paragraph 1, states the following:

"It is forbidden to stop or park:

a) On bridges, in tunnels, at level crossings, at underpasses and overpasses, and in all places of insufficient visibility;
b) Less than 5 metres from either side of an intersection or junction, without prejudice to the provisions of line (a) of paragraph 2;
c) Less than 3 metres in front, or less than 15 metres on either side, of signs indicating the stopping of vehicles employed for the collective transport of passengers, depending on whether this runs on rails, or not;
d) Less than 5 metres from areas marked for the crossing of pedestrians and velocipedes;
e) Less than 20 metres before traffic lights placed at the entrance to intersections and junctions, and next to signs or traffic lights, if the height of the vehicles, including their cargo, conceals these signs;
f) In bicycle lanes, on directional islands, on the central plazas of traffic circles with circular vehicle movement, on sidewalks and at other places designated for the travel of pedestrians;
g) On the carriageway, whenever this is marked with a continuous longitudinal line, and the distance between this and the vehicle is less than 3 metres;
h) 10 metres from level crossings in the case of those vehicles which transport explosive substances."

Practical interpretation: Important regulations for drivers of vehicles used for the transporting of passengers and goods, these rules specify the places where it is illegal to stop or park.

Article 54 (General rules), paragraph 1, states the following:

"It is forbidden to enter or exit, load, unload, or open the doors of vehicles which have not stopped completely."

Article 55 (Transport of passengers), paragraph 3, states the following:

"The transport of passengers of a number exceeding the seating of the vehicle, or in a manner which compromises their safety, or the safety of driving, is prohibited."

Paragraph 4 states the following:

"The transport of unseated passengers is equally prohibited, except in exceptional situations, to be defined in regulations."

Article 56 (Transport of cargo), paragraph 1, states the following:

"Loading and unloading shall be done at the back of the vehicle, or on the side of the edge of the carriageway against which the vehicles is stopped or parked."

Paragraph 3 states the following:

"When placing cargo, it shall be verified that:

a) The vehicles equilibrium is duly assured, whether stopped or on route;
b) The cargo cannot fall on the road, or oscillate in a manner which makes it's transport dangerous or difficult, or result in the projection of debris onto the public roadway;
c) It does not reduce the driver's visibility;
d) It does not drag on the ground;
e) It's capacity for transporting animals is not exceeded;
f) A height of 4.3 metres from the ground is not exceeded;
g) In the case of vehicles intended for the transport of passengers, or mixed cargo, that these do not exceed beyond the contours of the vehicle, and that the correct signalling, illumination and registration devices are maintained;
h) In the case of vehicles intended for the transport of goods, such goods fit within the limits of the cabin, in length and width, except in exceptional situations set out in regulations;
i) In the case of bulk goods, that these do not exceed the height of the top of the dropsides or similar devices."

Practical interpretation: This article provides specifications for the size of cargo that may be carried.

Paragraph 4 states the following:

"At stopping places, during loading and unloading operations, and when parked, a vehicle shall be positioned in the direction of traffic, parallel to the edge of the carriageway, and against the curb, duly signposted exceptions being permissible."

Article 58 (Special authorisation), paragraph 1, states the following:

"On the conditions set out in regulations, the National Vehicle Institute (INAV) may permit the travel of vehicles of a weight or dimensions which exceed those set out in law, or which transport indivisible objects which exceed the limits of their respective cabins."

Paragraph 2 states the following:

"The authorisations referred to in the previous number [paragraph 1] require the issuing of a favourable opinion by the National Roads Administration (ANE) and the municipal authorities, in accordance with the cases in question, regarding the nature of the surface, the resistance of artworks on the authorised routes, or the technical characteristics of public roads, making it a condition that these vehicles only be used on public roads which have the necessary technical characteristics therefor."

Paragraph 5 states the following:

"The owners of these vehicles may be required to provide a guarantee, or insurance, aimed at guaranteeing the payment of civil liabilities flowing from damage imputable to them, as well as other guarantees necessary or convenient for traffic safety."

Practical interpretation: In the event of having to transport an abnormal load to site, these three paragraphs from article 58 will provide the reader with information regarding the legal procedure to be followed.

Article 59 (General rules [Section VIII - Lighting]), paragraph 1, states the following:

"Those illumination and light signalling devices, and reflectors, with which a vehicle shall be

equipped, as well as their respective characteristics, shall be defined in regulations."

Article 61 (Situations in which lights must be used), paragraph 2, states the following:

"The use of floodlights is prohibited whenever meteorological or environmental conditions do not justify it."

Article 64 (Travel of vehicles which perform special transport), paragraph 2, states the following:

"Vehicles which transport powdery and inert materials, shall travel in a manner so as to avoid the dispersion of these materials into the air or soil, by being covered by tarpaulins or canvasses of suitable dimensions."

Practical interpretation: This paragraph states that the graphite product must be suitably secured during transport.

Article 72 (Freeways), paragraph 1, states the following:

"Pedestrians, animals, animal-drawn vehicles, velocipedes, mopeds, motorcycles with cylinders exceeding 50 cm^3, agricultural tractors, as well as vehicles or convoys of vehicles which cannot reach speeds of 40 km/hr when travelling on the level, may not travel on freeways and their respective accesses, when duly signposted."

Practical interpretation: As there are no freeways along the transport route at the time of writing, this article is not currently relevant.

Article 74 (Transport of heavy goods vehicles or of vehicle convoys), paragraph 1, states the following:

"On freeways, or stretches of freeways with three or more lanes of traffic travelling in the same direction, the drivers of heavy goods vehicles, or of vehicle convoys, the length of which exceeds 7 meters, may only use the two traffic lanes on the furthest left hand side."

Article 79 (Sound pollution), paragraph 1, states the following:

"The driving of vehicles, and loading and unloading operations, shall be done in such a way as to avoid creating a disturbing noise."

Paragraph 2 states the following:

"The transport of vehicles which emit noise of a level exceeding the maximum limits set out in regulations, prohibited."

Article 81 (Driving under the influence of alcohol, narcotics or psychotropic substances), paragraph 3, states the following:

"A driver shall be deemed to be under the influence of alcohol if his blood alcohol level is equal or superior to 0.3 mg/l when tested using a breathalyser, or by way of a blood test."

Practical interpretation: The legal blood alcohol limit under which a driver can operate a vehicle is defined in this paragraph.

Article 88 (Professional driving of transport vehicles), paragraph 1, states the following:

"The performance of paid services is only permissible in the case of holders of professional driver's licenses."

Paragraph 2 states the following:

“For reasons of safety, times of driving and of rest may be defined for professional drivers of transport vehicles, and the presence of more than one person qualified to drive the same vehicles, may be required.”

Practical interpretation: These paragraphs state that drivers used in the transport of goods must hold a “professional” drivers licence. It may also be required that a relief driver is present, if a schedule of driving and rest is not defined.

Article 91 (Signs for indicating danger), paragraph 1, states the following:

“All motor vehicles in circulation, except those having only two or three wheels, motor cultivators and tractor cars, shall be equipped with two reflective signs for indicating danger, and one reflective jacket.”

Practical interpretation: This paragraph states that all mine vehicles will need to be equipped with 2 triangles and a reflective jacket, for breakdown or other dangerous situations in which their use would seem applicable.

Paragraph 2 states the following:

“The use of a sign for indicating danger shall be obligatory:

a) During the day, whenever the vehicle is immobilised, totally or partially, on the carriageway, or whenever goods which have fallen onto the road surface are not visible for a distance of at least 100 metres;
b) At dusk, or at dawn, in any circumstances or vehicle immobilisation, or of goods having fallen onto the carriageway or onto the shoulder, except in places where lighting conditions allow this to be easily seen from a distance of 100 metres, without prejudice to the provisions of this code, as regards vehicle lighting;
c) In towns, in situations in which the placing of warning triangles is not viable, the broken down vehicle must be signposted by way of the simultaneous use of all indicator lights.

Practical interpretation: Guidelines for the use of warning triangles and hazard lights during breakdown situations.

Paragraph 4 states the following:

“Heavy vehicles and trailers with a gross weight exceeding 10,000 kg, or which are longer than 6 meters, shall be equipped with yellow reflective marks, so as to enable their easy identification on the public roadway.”

Paragraph 5 states the following:

“In the circumstances referred to in number 2, the person who attends to the placing of the sign for the indicating of danger, or to the repair of the vehicle or the removal of goods, shall use a reflective jacket.”

Article 92 (Identification in case of accident), paragraph 1, states the following:

“A driver involved in an accident shall provide, to all other parties involved, his identification, as well as that of the owner of the vehicle and of it’s insurer, as well as the number of the insurance policy, and shall, whenever requested, produce documentation in proof thereof.”

Practical interpretation: All transport drivers must be knowledgeable of their company’s

insurance policies, so that these can be provided in the case of an accident.

Article 109 (Classes and types of automobiles), paragraph 1, states the following:

"Automobiles are classified as:
a) Light: vehicles with a gross weight up to 3,500 kg, and with seating not exceeding nine places, including that of the driver;
b) Heavy: vehicles with a gross weight exceeding 3,500 kg, or with seating of more than nine places, including that of the driver, and tractor units."

Paragraph 2 states the following:

"Light or heavy automobiles include, according to their use, the following types:
a) Passenger vehicles: those intended for the transport of persons;
b) Goods vehicles: those intended for the transport of cargo;
c) Mixed: those intended for the transport, alternatively or simultaneously, of persons and cargo;
d) Tractors: vehicles constructed so as to provide traction force, without carrying goods;
e) Special: vehicles intended for employment for a specific function, different from the normal transport of passengers or goods."

Article 113 (Trailers) paragraph 6, states the following:

"No more than one trailer may be linked to each motorised vehicle, except in the case of vehicles called "interlinks", which may tow two semi-trailers."

Article 117 (Characteristics of vehicles) paragraph 6 states the following:

"The import of left hand drive vehicles for commercial purposes is prohibited."

Article 118 (Vehicle transformation) paragraph 1, states the following:

"Transformation of a vehicle shall mean any alteration of it's characteristics of construction, or functioning."

Paragraph 2 states the following:

"The transformation of motor vehicles and trailers shall be authorised on the terms set out in the regulations."

Article 119 (Inspections) paragraph 1, states the following:

"Motor vehicles and their trailers may be subject, on terms set out in regulations, to inspection for:
a) The approval of their respective design or trademark;
b) Registration;
c) Approval of the alteration of their characteristics of construction, or functioning;
d) Periodic verification of their characteristics, and safety."

Article 120 (Registration requirement) paragraph 1, states the following:

"Motor vehicles, and their trailers, may only be driven if they have a registration document which contains details of their identifying characteristics."

Paragraph 4 states the following:

"The registration of the vehicle shall be requested from the competent authority by the person, singular or collective, who attends to it's admittance, import, or introduction onto the consumer

market, in the national territory."

Practical interpretation: A copy of all vehicle registration documents should be kept in vehicles.

Article 127 (Driver's license) paragraph 1, states the following:

"A driver's license authorises the driving of one or more of the following categories of vehicles:

A1	Motorcycles, with or without sidecar, or motorcycles with four wheels, and cylinder capacity of less than 125 cm^3.
A	Motorcycles, with or without sidecar, or motorcycles with four wheels, and cylinder capacity greater than 125 cm^3.
B	Light automobiles, including those with a trailer, provided that the gross weight of this trailer does not exceed 750 kg, or if it does exceed 750 kg that it does not exceed the tare weight of the vehicle, and the sum of the gross weight of the automobile and trailer together does not exceed 3,500 kg.
C1	Heavy goods or passenger vehicles with a gross weight of less than 16,000 kg including those with a trailer provided that the gross weight of these trailers does not exceed 750 kg, that it is not heavier than the tare weight of the automobile and the gross weight of the tractor unit.
C	Heavy goods or passenger vehicles with a gross weight exceeding 16,000 kg including those with a trailer provided that the gross weight of these trailers does not exceed 750 kg, or if it does exceed this weight, is not greater than the tare weight of the vehicle and the gross weight of the vehicle tractor.
BE, CIE and CE	Articulated vehicles or vehicle convoys.
P	Public passenger services.
D	Transport of dangerous goods.
G	Merchandise.

Paragraph 3 states the following:

"The holders of driver's licenses valid for vehicles in category B, shall also be deemed qualified to drive:

a) Agricultural or forestry tractors, by themselves, or with mounted equipment provided that their maximum weight does not exceed 6,000 kg.
b) Light agricultural or forestry machines, motor cultivators, tractor cars and light industrial machines."

Paragraph 4 states the following:

"The holders of driver's licenses valid for vehicles in category C1, shall also be qualified to drive:

a) Vehicles in category B;
b) Vehicles referred to in the previous number [paragraph 3];
c) Other agricultural or forestry tractors, with or without trailer, agricultural or forestry machines, and industrial machines.

Paragraph 5 states the following:

"The holders of driver's licenses valid for vehicles in category C, shall also be deemed to be qualified to drive:

a) Vehicles in category C1;
b) Vehicles referred to in [paragraphs] 3 and 4 of this article;
c) Other agricultural or forestry vehicles, with or without trailer, agricultural or forestry

machines, and industrial machines."

Practical interpretation: Drivers should have driver's licences for the correct class of vehicle they will be driving.

Article 129 (Other licenses) paragraph 1, states the following:

"The following also authorize the driving of motor vehicles, in addition to the licenses referred to in articles 127 and 128:

a) Special driver's licenses issued by the diplomatic corps and consular posts accredited in the country;
b) Driver's licenses issued by other SADC member states;
c) Driver's licenses issued by a foreign state, which the state of Mozambique has been obligated to recognise, by international convention or treaty;
d) Driver's licenses issued by a foreign state, provided that this state gives identical validity to national [Mozambican] licenses;
e) International driver's licenses;
f) Military driving authorisations.

Practical interpretation: This paragraph explains the validity of foreign driver's licences in Mozambique.

Article 130 (Requirements for the obtaining of driver's licenses) paragraph 1, states the following:

"Any person who satisfies the following requirements, cumulatively, may obtain a driver's license:

a) Possession of a document identifying him, in legal terms;
b) Be of the minimum age, according to the category for which he intends to obtain a qualification;
c) Have the necessary physical, mental and psychological aptitude;
d) Be resident in the national territory, in the case of a foreigner;
e) Be able to read and write;
f) Have passed the respective driving test.

Practical interpretation: This paragraph describes the attributes necessary of a person wishing to obtain a driver's licence.

Article 140 (Liability for offences) paragraph 3, states the following:

"Liability for the offenses set out in the Road Traffic Code and in complementary legislation, falls to:

a) The driver of the vehicle, as regards offenses which relate to driving;
b) The titleholder of the vehicle identification document, as regards offenses relating to the conditions for the driving of the vehicle on public roadways, as well as offenses referred to in the previous line when it is not possible to identify the driver;
c) Pedestrians, as regards offenses relating to pedestrian traffic;
d) The passenger, as regards that which is applicable to him or her."

Paragraph 4 states the following:

"If the titleholder of a vehicle identification document proves that the driver used the vehicle abusively; or infringed the orders, instructions or terms of authorisation issued, his liability shall cease and the driver shall in this case be liable."

Practical interpretation: This paragraph states that drivers of mine vehicles are responsible in the case of an accident when the accident was clearly due to their negligence, or when it can be proved by the owner of the vehicle (Syrah) that the driver disobeyed instructions with regards to safe driving. Syrah will be responsible for accidents caused due to the poor condition of the

vehicle.

Paragraph 7 states the following:

"The following persons are also liable for offenses set out in the Road Traffic Coad and complementary legislation:

a) Employers who require from drivers a degree of effort which makes driving unsafe, or who subject drivers to a work schedule incompatible with their need for rest, when offenses are a consequence of the fatigue of the driver;
b) Parents or guardians who are aware of the inability or imprudence of their minor children or those under their guardianship, and who do not prevent them from driving, while being able to do so;
c) The drivers of vehicles which transport minor passengers or those who may not be held criminally liable and who permit these passengers not to use obligatory safety accessories;
d) Those who facilitate the use of vehicles by persons who are not duly qualified to drive, who are under the influence of alcohol or psychotropic substances, or in whom the physical or psychological faculties necessary for driving have been reduced in any other way."

Practical interpretation: Syrah could be held liable for accidents and offences when they require of their drivers a "degree of effort which makes driving unsafe" or "subject drivers to a work schedule incompatible with their need for rest".

Paragraph 8 states the following:

"The titleholder of a vehicle identification document shall be … liable for the payment of fines and costs which may be due by the offender, without prejudice to his right of recourse against this offender, except when the vehicle had been utilised abusively."

Article 146 (Medium offenses) paragraph 1, states the following:

"The following are considered to be medium driving offenses:

a) Throwing objects or substances out of the vehicle, or leaving them on the road;
b) Failing to indicate, in advance, by way of a regulated arm gesture or by use of a light indicating the direction of the vehicle, the commencement of travel, the performance of a vehicle stopping manoeuvre, or a change of direction of travel, or a lane;
c) Travelling with a vehicle speed less than half of the maximum vehicle speed set down for that road, thereby delaying or obstructing traffic, unless traffic or meteorological conditions do not permit otherwise;
d) Driving with a vehicle displaying identification plates which do not comply with the specifications and designs established by the National Vehicle Institute (INAV);
e) Failure to keep parking lights on, at night, when the vehicle is stopped for the purpose of loading or unloading passengers and goods, or unloading merchandise;
f) Driving with a part of the body outside of the vehicle;
g) Crossing or driving without regard for, one or two continuous longitudinal lines delimiting traffic directions, or one mixed line with the same meaning;
h) Driving a motorcycle or a moped without the use of a protective helmet;
i) Travelling with a vehicle which may damage a road, or it's installations or equipment;
j) Excessive speed, in accordance with the classification contained in [paragraph] 2 of article 33;
k) Not using, or allowing a passenger not to use, a safety belt or protective helmet;
l) Transporting children in an automobile, without complying with the special safety rules set out in this code."

Article 147 (Serious offenses) paragraph 1, sub-section D, states the following:

"The following shall be considered to be serious driving offences:

d) Failure by a driver involved in an accident, in which there is a victim:
   i. To give or provide first aid to the victim, when he is able to do so;
   ii. To take measures, when he is able to do so, to avoid danger to traffic at the location;
   iii. To preserve the accident scene, so as to facilitate the work of the police and experts;
   iv. To take measures to remove the vehicle from the accident scene, when required by police or a traffic officer;
   v. To identify himself to police, and to provide information necessary for the drafting of an incident report, when requested by the authority and it's agents."

Article 157 (Insurance obligation) states the following:

"Motor vehicles and their trailers, on terms to be set out in regulations, may only travel on a public roadway if they have obtained, in terms of special legislation, third party liability insurance."

Practical interpretation: Vehicles require third party liability insurance.

Article 162 (Seizure of vehicles) paragraph 1, states the following:

"Vehicles shall be seized by the authorities when:
b) They are driven without number plates, or have not been registered, except in cases where this is legally permitted;
f) An accident has been caused, without third party liability insurance, as required by law."

Paragraph 5 states the following:

"In the case of accident, the seizure referred to in line (f) of [paragraph] 1 shall remain in place until it is proven that due compensation has been paid, or if the respective amount has not been determined, until a security deposit is paid in an amount equal to the minimum amount of obligatory insurance."

Paragraph 6 states the following:

"The title holder of the vehicles identification document shall be liable for the payment of expenses flowing from its seizure."

Article 163 (Undue or abusive parking) paragraph 1, states the following:

"Parking is deemed to be undue or abusive, if:
d) The vehicle remains in a limited parking zone for more than 2 hours after the permitted time period has expired."

Practical interpretation: An important consideration for transport vehicles having to perform loading and unloading jobs in urban areas.

8 ASSESSMENT OF IMPACTS

8.1 Construction phase impacts

8.1.1 Increase in traffic frequency through villages

Cause and comment

Currently the route EN106 from Pemba to Metoro and the EN242 from Metoro to Montepuez are relatively quiet roads. The EN242 from Montepuez to Balama has even less activity, due to the poor condition of the road. From Montepuez to Balama, the road is mainly used by pedestrians on bicycles, motorbikes, and on foot. The volumes of existing vehicular traffic are relatively low, much of this due to transport trucks delivering goods to towns and villages along the route, and picking up agricultural produce such as cotton and cashew nuts for sale elsewhere. There are a total of 27 villages (excluding Montepuez) of various size and states of activity located between the project site and Pemba. Some of these towns, especially Namanhumbir and Nanhupo, have very busy markets located on both sides of the road. Pedestrians frequently cross the road or, due to the sheer number of people in the market, are forced to walk in the road in order to make headway. In other villages, hitchhikers, playing children and motorbike repairmen utilise the side of the road for their activities. In most villages, there will be at least a few stalls selling merchandise such as timber poles, straw or clothes. It is obvious that without proper management, the risk of accidents involving pedestrians could be quite high.

Mitigation and management

It is essential for drivers to obey the speed limits in force in these settlements. Drivers must be strongly encouraged to proceed slowly and with patience through villages. Schedules for deliveries should be reasonable, and take account of road, and local pedestrian and vehicular traffic conditions en route, so that drivers can travel within speed limits, and exercise due patience when travelling through, for example, roadside trading areas. Drivers should also be encouraged to use their hooter liberally.

A Construction Emergency Preparedness and Response Plan must be developed and implemented that includes provisions to deal with traffic accidents, particularly accidents involving personal injuries, and all drivers must be made aware of the procedures to be followed.

Significance statement

		Temporal Scale	Spatial Scale	Severity of Impact	Risk or Likelihood
RATING	Without Mitigation	Short term	Regional	Severe	May occur
	With Mitigation	Short term	Regional	Severe	Unlikely
	NO-GO				
Overall Significance without mitigation					**MOD**
Overall Significance with mitigation					**MOD**
No-Go					**N/A**

8.1.2 Transport of abnormal loads

Cause and comment

Although not certain, it is likely that some abnormally sized plant components will need to be transported from either the port of Pemba or Nacala to the project site. An abnormal load will require two escort vehicles (one behind and one in front) to warn other road users of the hazard

ahead. The vehicle will also be slow moving relative to other traffic, which could cause delays. There are no road obstacles, which could be envisaged to halt an abnormal load. The bridge referred to as bridge number 2 in this report (Plate 4.3) would need to have its structural integrity assessed by an expert before passing any heavy loads over it. Also, there are three 90-degree turns within Montepuez where the delivery truck will be likely to need the entire road in order to make the turn. It would need to be arranged with local traffic authorities for the roads around the turns to be blocked for 10 minutes while the truck passes through.

Mitigation and management

Trucks with abnormal loads will be escorted by at least two vehicles (one before and one behind). The truck should consider pulling off the road periodically to allow trailing vehicles to overtake. Bridge number 2 is to have its structural integrity assessed prior to passing heavy loads over it. Traffic authorities are to be consulted with regards to the passing of these large trucks through Pemba / Nacala and Montepuez, if these trucks need two lanes to turn.

Significance statement

		Temporal Scale	Spatial Scale	Severity of Impact	Risk or Likelihood
RATING	Without Mitigation	Short term	Regional	Slight	May occur
	With Mitigation	Short term	Regional	Slight	Unlikely
	NO-GO				
Overall Significance without mitigation					**LOW**
Overall Significance with mitigation					**LOW**
No-Go					**N/A**

8.1.3 Dust generation

Cause and comment

Currently the road from Balama to Montepuez is not surfaced but CMC Africa Austral Lda is in the process of upgrading it. The road will be surfaced upon completion, and therefore vehicles travelling on it will not generate dust. Upgrading is due to be complete by December 2015. If completion of the upgrade is delayed, or Syrah mine construction begins before completion of the upgrade, construction phase traffic on the road will generate dust. This will impact the four sizable villages along this route: Maputo, Nacole, Mapupulo and Massaspi. There are also smaller unnamed settlements. In most cases, houses are built with their front facing the road, and in many cases little further than 10 metres from the road edge. The increase in traffic along this unpaved road is certain to cause fugitive dust emissions from the wheels of vehicles, which will coat the surrounding houses, including the vegetables and merchandise of traders.

Mitigation and management

Methods that could be employed to reduce dust levels generated within the villages include:

- Speed reduction – all mine vehicles should be required to obey reasonable speed limits through urban settlements to prevent potential accidents assessed in impact 7.1.1 from occurring, as well as to reduce dust emissions, especially during windy conditions;
- The road could be surfaced with gravel, if this can be sourced locally, although this is still likely to result in some dust emissions;
- Surface the road (CMC is in the process of upgrading the road (July2013));
- The road could be treated with chemical binders.

Significance statement

RATING		Temporal Scale	Spatial Scale	Severity of Impact	Risk or Likelihood
	Without Mitigation	Short term	Regional	Sever	May occur
	With Mitigation	Short term	Regional	Slight	May occur
	NO-GO				
Overall Significance without mitigation					**MOD**
Overall Significance with mitigation					**LOW**
No-Go					**N/A**

8.2 Operations phase impacts

8.2.1 Increase in traffic frequency through villages

Cause and comment

For the construction phase, it was not possible to provide an accurate estimate of vehicle numbers to be generated, but estimates have been made for the operations phase. Vehicle trips are presented in Table 2.1. The same potential concerns as are applicable during the construction phase, are applicable during the operations phase. These concerns relate to the movement of a large number of mine vehicles through often crowded and chaotic market villages.

Mitigation and management

There is little that can be done to mitigate this impact, as the graphite that is produced needs to be delivered to the port for export. The potential for accidents will probably be highest during the early stage of mine development and operation, as citizens adjust to the increased traffic flow. We would suggest that the following specific mitigation measures be implemented:

- Speed limits;
- The scheduling of deliveries so that drivers may drive safely and do not need to exceed speed limits to meet schedules;
- Training of drivers so that they know how to react in the event of an accident.
- Deliveries by heavy vehicles must, as far as possible, be scheduled to avoid the formation of convoys. Sufficient distance must be maintained between heavy vehicles to allow light vehicles to overtake safely.

Significance statement

RATING		Temporal Scale	Spatial Scale	Severity of Impact	Risk or Likelihood
	Without Mitigation	Long term	Regional	Moderate	May occur
	With Mitigation	Long term	Regional	Moderate	Unlikely
	NO-GO				
Overall Significance without mitigation					**MOD**
Overall Significance with mitigation					**LOW**
No-Go					**N/A**

8.2.2 Increase in traffic frequency through Pemba

Cause and comment

It must be noted that use of Pemba as the port of export is not preferred, but is mentioned in this report for completeness. Heavy transport trucks entering Pemba will need to make their way to a warehouse or the port. The port is situated on the tip of the tongue of land that juts into the Bay of Pemba and it is impossible to access the port without travelling through at least some dense urban areas. One route option is discussed in this report. The volumes of Balama's export will significantly increase port traffic from its current levels.

Mitigation and management

Implementation of the following mitigation measures is suggested:

- Heavy vehicles should not travel the road between 10pm and 6am unless it is absolutely unavoidable.
- Within the urban area, trucks should observe appropriate speed limits.
- Drivers should have knowledge of how to react in the event of an accident.

Significance statement

RATING		Temporal Scale	Spatial Scale	Severity of Impact	Risk or Likelihood
	Without Mitigation	Long term	Localised	Moderate	Probable
	With Mitigation	Long term	Localised	Moderate	May occur
	NO-GO				
Overall Significance without mitigation					**MOD**
Overall Significance with mitigation					**LOW**
No-Go					**N/A**

8.2.3 Increase in traffic frequency through Nacala

Cause and comment

From the perspective of this assessment, the primary advantage of the use of the port of Nacala as the port of export, is that the route to the port (within the urban limits) is more direct compared to Pemba and avoids dense urban areas. Deliveries will be to a warehouse, and its location will have influence on the significance of this impact. It is expected however, that Syrah will seek to establish this warehouse as close to the port as reasonably possible.

Mitigation and management

The same mitigation measures as are applicable to impact 8.2.2. are applicable here.

Significance statement

RATING		Temporal Scale	Spatial Scale	Severity of Impact	Risk or Likelihood
	Without Mitigation	Long term	Localised	Moderate	May occur
	With Mitigation	Long term	Localised	Moderate	Unlikely
	NO-GO				
Overall Significance without mitigation					**LOW**
Overall Significance with mitigation					**LOW**
No-Go					**N/A**

8.2.4 Dust generation

Cause and comment

It is probable that, by the time Syrah-Balama enters its operational phase, the unpaved section from Balama to Montepuez will be upgraded and surfaced. As such, there will not be any gravel roads between the mine site and Nacala/Pemba and therefore dust generation during the operations phase will not be applicable to transport traffic. This does not include on-site dust emissions due to processing, handling, site clearing and other activities assessed in the Air Quality study.

Mitigation and management

Not applicable.

Significance statement

Not applicable.

8.3 Decommissioning phase impacts

8.3.1 Mine decommissioning

Cause and Comment

Mine decommissioning would essentially be the construction phase in reverse, but on a lesser scale and over a longer time period which would result in less significant impacts. It would be on a lesser scale because infrastructure components may, in the future, be refurbished and sold to another similar development in the region, should one come into existence. Otherwise steel would be scrapped and transported to Pemba/Nacala, from where it would be exported to markets in Asia (in current economic conditions). The transport of aggregates and cement would not be a feature of the decommissioning phase. It would be on a lesser timescale, because it is expected that as the mine's operations taper down, infrastructure will be disassembled in phases and scrapped or sold. So the decommissioning phase would be spread out over a longer timeframe than the construction phase.

Mitigation Measures

The mitigation measures associated with product transport, and general road safety (as applicable to the construction and operation phase) will be sufficient to mitigate any impacts associated with decommissioning.

Significance Statement

RATING		Temporal Scale	Spatial Scale	Severity of Impact	Risk or Likelihood
	Without Mitigation	Short term	Regional	Moderate	Definite
	With Mitigation	Short term	Regional	Slight	Definite
	NO-GO				
Overall Significance without mitigation					**MOD**
Overall Significance with mitigation					**LOW**
No-Go					**N/A**

8.4 Cumulative Impacts

8.4.1 Cumulative traffic impacts

Cause and Comment

CMC Africa Austral Lda is currently upgrading the 135 km stretch of road from the border of Niassa and Cabo Delgado Province, the crossing of the Ruaça River, to the southwest part of Montepuez town. This is part of the route that will be utilised by the mine. With the improved road, it is expected that traffic volumes on the road will increase as access becomes easier. This may facilitate economic development of the region. Although the development of the mine is unrelated to the road upgrade, it is possible that the improved road will increase non-mine related traffic, which would result in risks associated with the mine's operations i.e. potential accidents involving mine vehicles and other road users, which wouldn't have been using the road if it was not in good condition.

Mitigation Measures

Mitigation measures applicable to construction and operation phase impacts will also be applicable here.

Significance Statement

RATING		Temporal Scale	Spatial Scale	Severity of Impact	Risk or Likelihood
	Without Mitigation	Long term	Regional	Moderate	May occur
	With Mitigation	Long term	Regional	Slight	Unlikely
	NO-GO				
Overall Significance without mitigation					**MOD**
Overall Significance with mitigation					**LOW**
No-Go					**N/A**

9 SUMMARY AND RECOMMENDATIONS

Of the operations phase traffic that will be generated, the most significant contribution will be due to transport of the graphite concentrate from the mine site to the Port of Nacala or the Port of Pemba. The mine will produce approximately 380,000tons of graphite per year, which will require approximately 29 truck-loads per day (delivery 360 days per year, payload 37t) to the warehouse. Graphite will then be containerised at the warehouse, and transported the short distance to the port.

From the mine site to Nacala/Pemba, trucks will need to pass through a number of settlements, some of which have markets along the roadside. Pedestrians and shoppers frequently cross the road, or the sheer number of people present spill into the road. Additional hazards are caused by taxis, vehicles and bicycles pulling off and pulling onto the road. Drivers of trucks will need to be vigilant in these areas and will need to exercise extreme caution. Completion of the upgrade of the road between Balama and Montepuez is scheduled for December 2015. When this upgrade is compete there will be no gravel roads between the mine site and Pemba/Nacala and therefore dust generation due to transport will not be an issue. However, if construction begins before December 2015, or if the completion of the upgrade is delayed, dust generation may be an impact and mitigation measures for this have been suggested.

Operations phase traffic will also be due to transport of skilled employees to and from the site and the airport in Pemba, buses transporting locally sourced labour from surrounding villages to the mine site, and the delivery of supplies and consumables to the mine site. These have all been quantified in Chapter 2 of this report, but are insignificant in relation to product export traffic. This is seen as the most significant impact upon which mitigation measures should be focused.

In the absence of a detailed Bill of Quantities for the construction phase, it has not been possible to calculate traffic quantities during this phase, however many of the expected impacts have been identified and discussed. Many of the plant components will be manufactured outside of Mozambique, and be delivered to the ports of either Nacala or Pemba. Some of these will be abnormally sized, and will need special transport arrangements that will need to be made in consultation with local traffic authorities. To reduce transport and logistics costs, the EPCM contractor is likely to attempt to source as much construction material locally as possible. The area is very rural and all traffic, regardless of its source, will concentrate on the EN242 from Montepuez to site. Construction will take approximately a year to complete. Delivery of the bulk of construction materials is likely to take place within the first few months, with deliveries tapering off as construction activities are completed.

Impacts that have been identified and assessed relate to: safety of other road users, the generation of dust, and the transport of abnormal loads. Mitigation measures have been suggested which will significantly relieve the seriousness of these impacts. Many of the impacts identified will no longer be applicable of the upgrade of the EN242 is completed prior to the initiation of construction.

10 REFERENCES

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