EnviroCam (PTY) LIMITED

Appendix 19

Yaoure Gold Project Landscape and Visual Baseline and Impact Study

Yaoure Gold Project, Côte d'Ivoire

Submitted to

Amara Mining Côte d'Ivoire SARL

Submitted By

Amec Foster Wheeler Earth & Environmental (UK) Ltd.

REPORT ISSUE FORM

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EXECUTIVE SUMMARY

This Landscape and Visual Impact Assessment (LVIA) assesses primarily the landscape and visual impacts associated with the proposed activities and infrastructure associated with the Yaoure Gold Project, Côte d'Ivoire and includes the extent of the Zone of Visual Influence (ZVI), approximately a 4 km buffer area around the operations.

The assessment describes visual and landscape aspects that could be affected considering i.e. the level of landscape/visual modification (magnitude), the area from which the project can be seen (i.e. ZVI), the viewing distance and the capacity of the landscape to visually absorb structures and forms placed upon it. The LVIA then makes a statement regarding the significance of landscape and visual impacts through considering the capacity of the landscape to accommodate change by assigning visual receptor sensitivity to potential visual receptors (i.e. residents and motorist).

The landscape and visual assessment methodology are both quantitative and qualitative and based on the following:

- An initial desktop analysis: through which the spatial digital terrain model (DTM) and project design data were analysed and manipulated using ArcGIS. This allowed gaining an understanding of the landscape, location of potential sensitive receptors, the scenic value and sense of place and an initial understanding of the absorption capacity of the landscape;
- Field survey: The purpose of the field survey was to identify representative viewpoints; to gain a better understanding of the sense of place, the character of the landscape to accommodate and absorb change and to understand the receptors that may be affected by the project;
- Data analysis and modelling: ArcGIS was used to determine the ZVI through terrain, topographical and land cover modelling of the various infrastructure components. Additional modelling was done to determine the visual impact index therefore the magnitude and extent of the various infrastructure components and the potential combined visibility thereof on the various receptors. Finally a representative view as experienced by Allahou Bazi/Angovia village residents was used for the photographic simulation. The photographic simulation show the proposed activity superimposed onto the existing landscape scene.

Visual impacts would result from the construction and operational phase of the proposed Yaoure Gold Project. Specifically, impacts would result from the Tailing Management Facility (TMF), Waste Rock Dumps (WRD) and ancillary surface infrastructure being seen from sensitive viewpoints (especially residents) and the negative effects (relating primarily to visibility and view distance) on the scenic quality and sense of place of the landscape within the project area.

It was determined that the magnitude of the various visual impacts of the proposed Yaoure Gold Project would be High mainly due to high visibility (e.g. ZVI), the proximity of villages/local roads to the proposed infrastructure (view distance), and the moderate

visual absorption capability of the surrounding areas. The fact that the visual receptors were rated as being of Low sensitivity resulted that the overall landscape and visual impact will be of Medium negative significance for the Yaoure Gold Project, assuming all mitigation measures suggested in this report are followed and successfully implemented.

Mitigation measures may not reduce the visual impact significantly as the proposed activity cannot be screened sufficiently, mainly due to the scale and dimensions of the proposed infrastructure. The mitigation measures for the proposed activity will need to focus on effective rehabilitation of the disturbed areas. Limited surface disturbance and prompt rehabilitation are prerequisite conditions if the severity of impact is to be reduced.

During the construction and operational phase a visual monitoring programme would be based on parameters such as the visibility of lights at night and airborne dust. At closure the success of rehabilitation would be based on the rate and percentage of vegetation recovery. Monitoring will continue after closure to ensure that the rehabilitation is successful and that the vegetation is self-sustaining.

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List of Abbreviations and Acronyms

Acronym	Explanation
DTM	Digital Terrain Model
ESIA	Environmental and Social Impact Assessment
LVIA	Landscape and Visual Impact Assessment
mamsl	Metres above mean sea level
RoM	Run of Mine
TMF	Tailings Management Facility
VAC	Visual Absorption Capability
WRD	Waste Rock Dump
ZVI	Zone of Visual Influence

1.0 INTRODUCTION

Amec Foster Wheeler, Earth & Environmental, (UK) Ltd. (Amec Foster Wheeler) appointed EnviroCam (Pty) Ltd to undertake a Landscape and Visual Impact Assessment (LVIA) as part of the larger Environmental and Social Impact Assessment (ESIA) for the proposed Amara Mining Côte d'Ivoire SARL Yaoure Gold Project, Côte d'Ivoire (herein mentioned as the project).

The LVIA is a specialist study which forms part of the ESIA conducted by Amec Foster Wheeler. The LVIA report focuses on the project area and includes the extent of the 'zone of visual influence' (ZVI), approximately a 4 km buffer area around the operations. It identifies the key visual aspects that may be associated with the project and assesses and address the visual effects of the proposed project on the receiving environment.

1.1 Location and Study Area

The study area is located in the Bouaflé Prefecture of the Marahoué Region in the central part of Côte d'Ivoire. The Prefecture of Yamoussoukro borders the site to the east. Lake Kossou, which was constructed in the 1970's for water provision and hydroelectric power generation, is located approximately 5 km east of the site.

The project is approximately 40 km northwest of the political capital Yamoussoukro, 260 km northwest of the administrative capital Abidjan and 25 km from the regional capital Bouaflé (refer to Figure 1-1). The study area include the proposed project components (Tailings Management Facility, Waste Rock Dumps and associated infrastructure) and the extent of the ZVI, approximately a 4 km buffer area around the operations (refer to Figure 1-2).

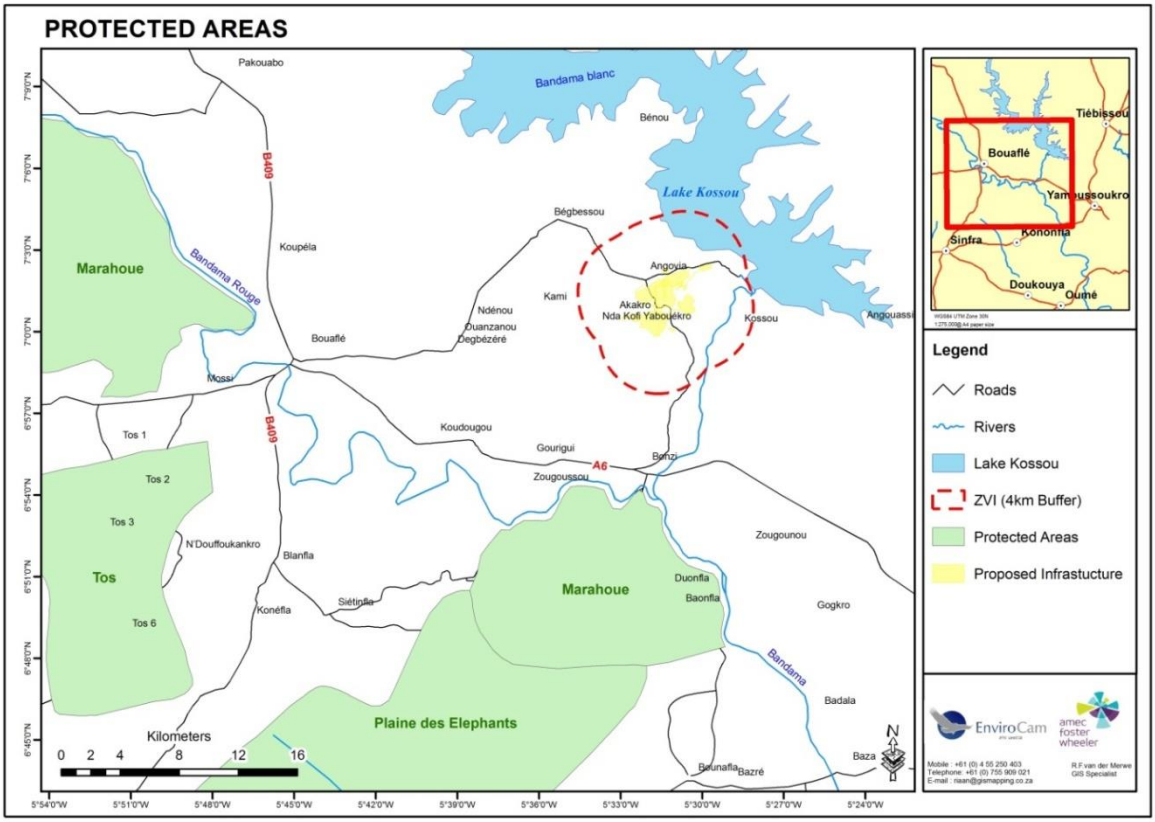
Figure 1-1: Location of the Yaoure project area (Source: Amec Foster Wheeler)

1.2 Regional and International Importance

The proposed project area is not in a legally protected national park or internationally recognised protected area; although there are a number of nationally protected areas close to the project site, these include (refer to Figure 1-2):

- Marahoue National Park;
- Tos Classified Forest;
- Marahoue Classified Forest; and
- Plaine des Elephants Classified Forest.

Figure 1-2: Protected areas near the Yaoure project area



1.3 Purpose of the Study

This LVIA assesses primarily the landscape and visual impacts associated with the proposed activities and infrastructure associated with the Yaoure Gold Project, Côte d'Ivoire and includes the extent of the ZVI, approximately a 4 km buffer area around the operations. The physical total footprint of the proposed infrastructure is approximately 1,250 hectares in size.

The purpose of this LVIA is to determine the impact of the proposed project on the visual and aesthetic character of the study area. The rationale for this LVIA is that the proposed activity may fundamentally alter the landscape character and sense of place of the local environment.

The primary objective of this LVIA is therefore to describe the potential impact of this proposed activity on the visual character and sense of place of the area. This assessment will consist of the following:

- Determine the visual character of the study areas by evaluating environmental components such as topography, hydrology, and land cover;
- Identify elements of particular visual quality that could be affected by the proposed project;
- Define the extent of the affected visual environment, the viewing distance and the critical views/visual receptors that may be affected by the proposed project; and
- Recommend mitigation measures to reduce the potential visual impacts generated by the proposed project.

1.4 Legal Requirements

The ESIA process is being undertaken in line with the Côte d'Ivoire environmental legal requirements (refer to Section 2 of the main ESIA Report) and the World Bank Group environmental and social standards guidelines.

The ESIA will comply with the international requirements stipulated in the International Finance Corporation Performance Standards, 2012 (IFC PS). The IFC PS are a tool used by financial institutions to ensure that projects which may seek funding are socially responsible and reflect sound environmental management practices, through the incorporation of international best practice and standards.

The visual and landscape assessment will be undertaken in terms of the Guidelines for Landscape and Visual Impact Assessment, 2013 provided by the Landscape Institute (UK). In addition, the requirements included in the IFC PS and guidelines will be incorporated into the assessment specifically:

- IFC PS 8 of 2012 where a project needs to take cognizance of sustainable natural resource management in relation to its landscape and considering sensitivities of cultural and historical landscape sensitivities respectively; and
- Section 1.1 of the IFC/World Bank Group Environmental, Health and Safety Guidelines for Mining of 2007 which indicates that operations should "prevent and minimize negative visual impacts through consultation with local communities about potential post-closure land use, incorporating visual impact assessment into mine reclamation process."

1.5 Report Structure

The report is structured as follows:

- Chapter 1: Introduction; Presents the project and introduces the site, outlines terms of reference for the LVIA, and report structure;
- Chapter 2: Methodology; Provides a brief description of the field survey and the relevant methodology used as part of the LVIA;
- Chapter 3: Results; Define the scope and scale of the proposed project, provides a baseline of the exiting visual resource, established the ZVI, view distance and visual absorption capability;
- Chapter 4: Impact Assessment; Individual landscape and visual impacts are identified and the significance of the specific impact calculated; and
- Chapter 5: Management & Monitoring Requirements; Outlines the key mitigation measures to be taken into consideration in the detailed design of the project based on the Landscape Character and Visual Impact Assessment.

2.0 METHODOLOGY

2.1 Defining Landscape and Visual Assessment

Landscape assessment is concerned with the changes in the physical landscape in terms of features/elements that may give rise to changes in the character of the landscape. Visual appraisal is concerned with the changes that arise in the composition of available views as a result of changes to the landscape, people's responses to the changes and to the overall effects on visual amenity. Changes may result in adverse (negative) or beneficial (positive) effects. The word 'visual' as used within this report is taken from the broadest meaning to include visual, scenic, aesthetic and amenity values represented by the built and natural environment, which in totality can be described as the area's sense of place. The nature of landscape and visual assessment requires both objective analysis and subjective professional judgement. Accordingly, the assessment is based on best practice, information and data analysis techniques and uses subjective professional judgement and quantifiable methods wherever possible.

2.2 Survey Period and Area Covered

One photographic and field reconnaissance survey was undertaken from 14 - 17 April 2015 of the site and the surrounding area. The study area was scrutinized to the extent that the receiving environment could be documented and adequately described. Data collected during the site visit allowed for a comprehensive description and valuation of the receiving environment, quality of the scenic resource, valuation of the sense of place, as well as the scope and extent of the proposed project.

Specific areas identified as critical views/sensitive receptors were visited in order to determine sensitivity and visual exposure of these receptors (refer to Section 3.4). These include the following villages:

- Allahou Bazi/Angovia;
- Akakro;
- N'da Koffi Yobouékro;
- Kouakougnanou-Bopri; and
- Kossou.

The photography survey was undertaken using a digital Canon camera and 50mm equivalent lens. Overlapping (50%) landscape format photographs were taken which are joined together using computer software to create a single panoramic image for each viewpoint. The photographer also notes the GPS location of the viewpoint and takes bearings to visible landmarks whilst at the viewpoint. For reference refer to Appendix B with regards to photo locations and photo orientation.

2.3 Methodology

The assessment of landscape and visual impacts is both quantitative and qualitative. The assessment describes what would be affected i.e. the level of landscape/visual

modification (magnitude), makes a judgement regarding the capacity of the landscape to accommodate change by assigning a visual receptor sensitivity and then assesses the significance of the resulting impact. These factors and the ways in which they are combined to identify the extent of landscape/visual impact are outlined in the following sections:

- Project Components; In order to understand the scope and scale of the proposed project the physical characteristics of the project components were described and illustrated;
- Landscape Baseline; To evaluate the impacts of the proposed project, the inherent scenic values of the landscape were determined by describing the setting, visual character and the sense of place;
- Magnitude Assessment; Estimate the magnitude of the visual impact by assessing the following factors:
    - Define the extent of the affected visual environment by identifying all possible observation sites from which the proposed infrastructure would be visible (i.e. ZVI) and the viewing distance from these observation site;
    - Determine the visual absorption potential (i.e. ability of the landscape to accommodate the proposed project from a visual perspective);
- Sensitive Visual Receptors; Determine the sensitivity of the critical views/visual receptors that may be affected by the proposed project (e.g. residents, motorist and tourist);
- Impact Assessment; The significance of the visual and landscape impact is calculated by taking in consideration the duration, extent, and magnitude of the visual impact. This is then multiplied with the critical view/visual receptor sensitivity rating as determined previously and the likelihood of the impact, (Significance = (duration + extent + magnitude) x sensitivity x likelihood); and
- Management Requirements; Suggest measures that could mitigate the negative impacts of the proposed project.

The landscape and visual assessment methodology is based on the following:

- An initial desktop analysis: through which the spatial digital terrain model (DTM) and project design data were analysed and manipulated using ArcGIS. This allowed gaining an understanding of the landscape, location of potential sensitive receptors, the scenic value and sense of place and an initial understanding of the absorption capacity of the landscape;
- Field survey: The purpose of the field survey was to identify representative viewpoints; to gain a better understanding of the sense of place, the character of the landscape to accommodate and absorb change and to understand the receptors that may be affected by the project;
- Data analysis and modelling: ArcGIS was used to determine the ZVI through terrain, topographical and land cover modelling of the various infrastructure

components. Additional modelling was done to determine the visual impact index therefore the magnitude and extent of the various infrastructure components and the potential combined visibility thereof on the various receptors. Finally a representative view as experienced by Allahou Bazi/Angovia village residents was used for the photographic simulation. The before and after photographic simulation show the proposed activity superimposed onto the existing landscape scene.

3.0 RESULTS

3.1 Project Components

Amara intends to commence with mining at Yaoure, through the expansion of the existing brownfields site. The mine site has previously been in production twice – once beginning in 1999 by CMA and then again in 2008 by Cluff Gold. In 2011, Amara put the mine onto care and maintenance due to the political uncertainty in Cote d'Ivoire at that time. The proposed expansion will involve upgrade of existing facilities and construction of new facilities where required.

The conceptual mine plan assumes drill and blast mining with trucks and shovels. Ore and waste will be transported by 135 tonne haul trucks. The construction phase is expected to last between 18 - 24 months depending on the final project design. According to current estimates, construction is projected to begin in Q1 2016. The expected lifetime of the Yaoure Project is between 13 – 15 years. The Project will require approximately 800 employees when in operation. The activity will take place in three phases namely construction, operational and closure and rehabilitation phase.

3.1.1 Construction Phase

During the construction phase temporary infrastructure which will be required, include:

- Contractors camp, including accommodation, security, and communication;
- Site ablution facilities;
- Temporary power;
- Diesel and materials storage area;
- Water provision;
- Contractors laydown area; and
- Internal and access road upgrade and construction.

3.1.2 Operational Phase

During the operational phase infrastructure which will be required, include:

- Pit; Expansion/deepening of existing open pits to cover an area of approximately 180 hectares (ha);
- Tailings Management Facility (TMF); For disposal of tailings as a conventional slurry, the resulting TMF would be capable of accommodating 6.5 Mt/a of tailings and have a minimum capacity of 70 Mt to make provision for the 13 years LoM;
- Waste Rock Dumps (WRD's); To accommodate the mine waste, three WRD's (WRD A, B and C) will be created with a capacity of 318 Mt;

- Stockpiles; There is existing overburden and mine waste stockpiles within the footprint of the proposed open pit boundary. Provision will be made for the relocation and or reuse of these stockpiles;
- Mineral and Ore Stockpiles; Provision will be made for a run of mine (RoM) stockpiling to the north of the open pit;
- Auxiliary Infrastructure; Additional buildings which will be constructed at the mine site include:
    - Processing plant, consisting of crushers, screens, potentially a mill, a conveyor, workshops;
    - Site security, fencing and fire protection;
    - Communication infrastructure;
    - Waste collection/management/recycling site;
    - Stormwater management infrastructure and structure;
    - Office complex, communication network, laboratory, warehouses, storage facilities;
    - Worker accommodation including associated facilities;
    - Explosives magazine;
    - Construction laydown area and general and domestic waste management facility;
    - Diesel storage facilities; and
    - Hazardous material storage area, including cyanide.

3.1.3 Decommissioning and Closure Phase

The decommissioning phase will commence once the mining operations has reached the end of life, and will involve:

- Dismantling of ancillary infrastructure (e.g. plant);
- Removal of linear infrastructure were necessary (e.g. pipelines); and
- Cease deposition of tailings on TMF and waste on the WRDs.

During the closure phase the disturbed areas will be rehabilitated and re-vegetated, although concurrent rehabilitation is recommended for all phases. The overall objectives of closure will be to rehabilitate the disturbed areas and to ensure that the site is made safe and to control erosion and pollution emanating from the former mine area. The planned life of the Yaoure Gold Project from construction to closure and rehabilitation is approximately 13 - 15 years.

3.2 Landscape Baseline

The following sections discuss the environmental parameters which have a direct impact on the aesthetic, landscape and visual value of the area.

3.2.1 Topography and Vegetation

The project area (including the 4km buffer around the proposed infrastructure) is located in mainly hilly terrain with elevations between 160 metres above mean sea level (mamsl) and 550 mamsl (refer to Figure 3-3, Figure 3-4, Figure 3-5 and Figure 3-6). The forest-savannah mosaic landscape of the Yaoure exploration licence area is dominated by the Mount Yaoure hills in the centre and southern western section of the licence area. The steep slopes associated with Mount Yaoure dominate the south-western topographic section of the project area and support semi-deciduous forest. Plains present in the southern section constitute river valleys and narrow floodplains.

The existing works are located against a ridge of hills with an open valley towards the north. This open valley consists of savannah and grassland plains, which in turn give way to the man-made Kossou Lake (refer to Figure 3-1).

Figure 3-1: Open plains towards Lake Kossou in the background

The Bandama River flood plain enters the project area from the northeast and gradually descents to the south, dominates the south-eastern section. The surrounding area is relatively more open than the south-western section but relative steep slopes are still present, as well as dense undergrowth (refer to Figure 3-8).

3.2.2 Hydrology

In addition to the primary river, the Bandama, which flows southwards from the Kossou hydroelectric power station is a radial pattern of minor rivers and streams which drain the Mount Yaoure hills. The Bandama River is the longest in Cote d'Ivoire at 800 km, flowing almost north-south through the centre of the country to discharge into the Tagba Lagoon and the Gulf of Guinea.

3.2.3 Transportation Networks

Main access to the site is via the good standard dual carriage surfaced A1, which directly links Abidjan to Yamoussoukro. The single carriage surfaced A6 provides access from Yamoussoukro to the Bandama River crossing at Lake Kossou. This stretch of the road consists of 16 km of paved road connecting the Kossou hydroelectric power station to the main Bouaflé–Yamoussoukro road at Toumbokro. Yamoussoukro lies a further 24 km to the south-east. Although the condition of the road is relatively good, it does deteriorate closer to the Bandama crossing.

Asphalt roads are mainly limited to linking the major urban areas, including Daloa, Bouafle, Yamoussoukro. A large network of unsealed roads exists linking local villages. The condition of these roads varies between very poor to a relatively good standard. The volume of traffic on the roads, especially in the rural areas of Yaoure is fairly low. Little public transport exists in these areas. With the exception of the Yamoussoukro road leading to Daloa and Bouaffle as well as the turn-off to Kossou, the main roads within the Project area are unsealed.

3.2.4 Land Cover

Generally the land cover is composed of a mixture of semi-deciduous, bush/grassed savannah, agriculture practices, mining (conventional and artisanal) and villages. The level of transformation is high to moderate in the northern section of the project area primarily due to conventional and artisanal mining activities and agricultural practices (refer to Figure 3-7).

Residential

There are several villages within the inner exploration licence footprint. The village of Allahou Bazi/Angovia is located to the northwest and closest (approximately 200m once completed) to the proposed mine site (refer to Figure 3-2). Other nearby villages include Akakro (approximately 1,600m) and N'Da Koffi Yobouekro (approximately 2,700m) to the southwest. The village of Kossou (approximately 2,600m) and Kouakougnanou-Bopri (approximately 1,200m) are located in the southeast. There are also some smaller hamlets within the mining licence footprint. Several artisanal miners live and operate within the inner exploration licence area. This ranges from organised large groups to smaller family-based units.

Figure 3-2: The village of Allahou Bazi/Angovia

Figure 3-3: Topography: Before the construction of the TMF and WRD's

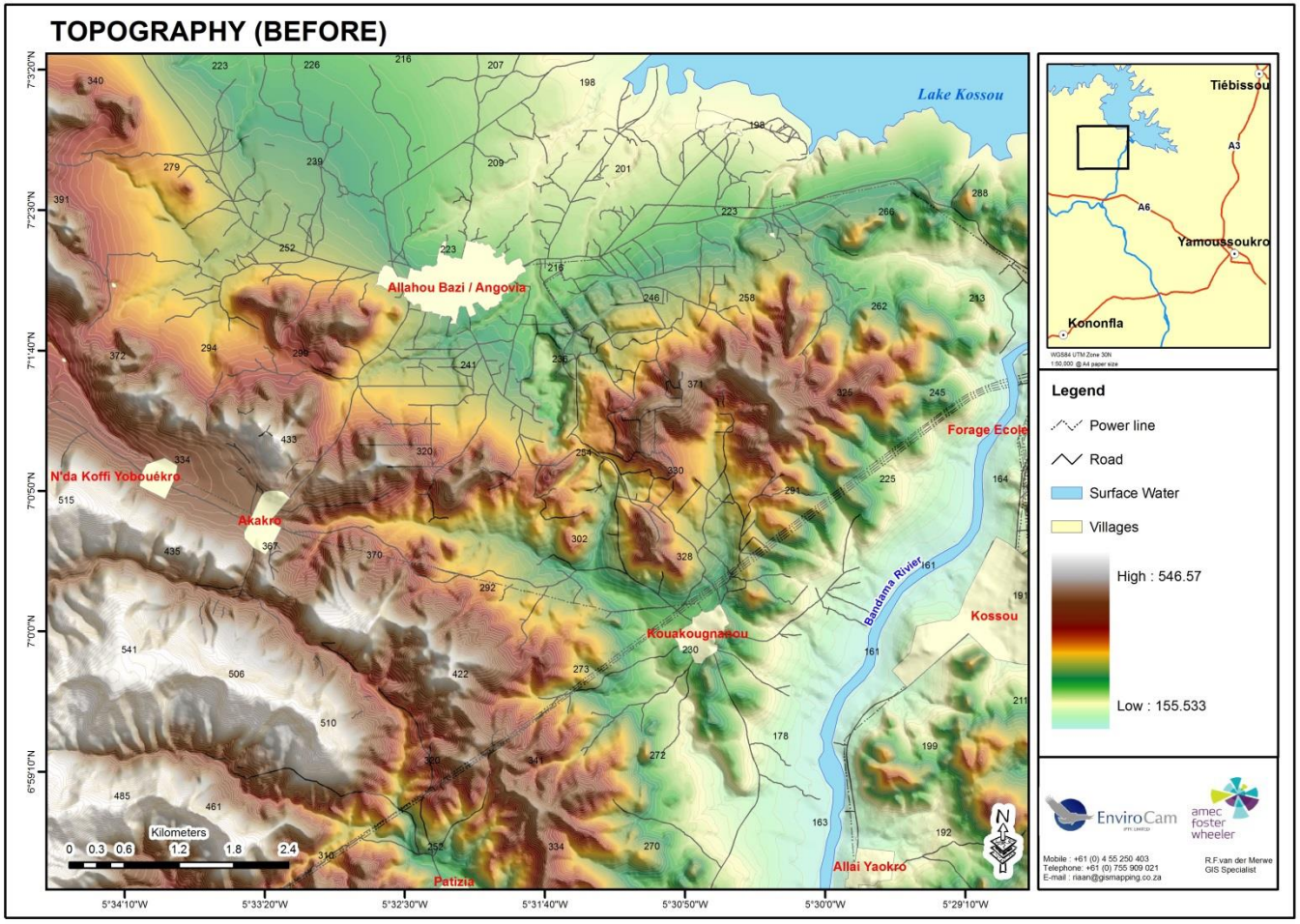


Figure 3-4: Topography: After the construction of the TMF and WRD's

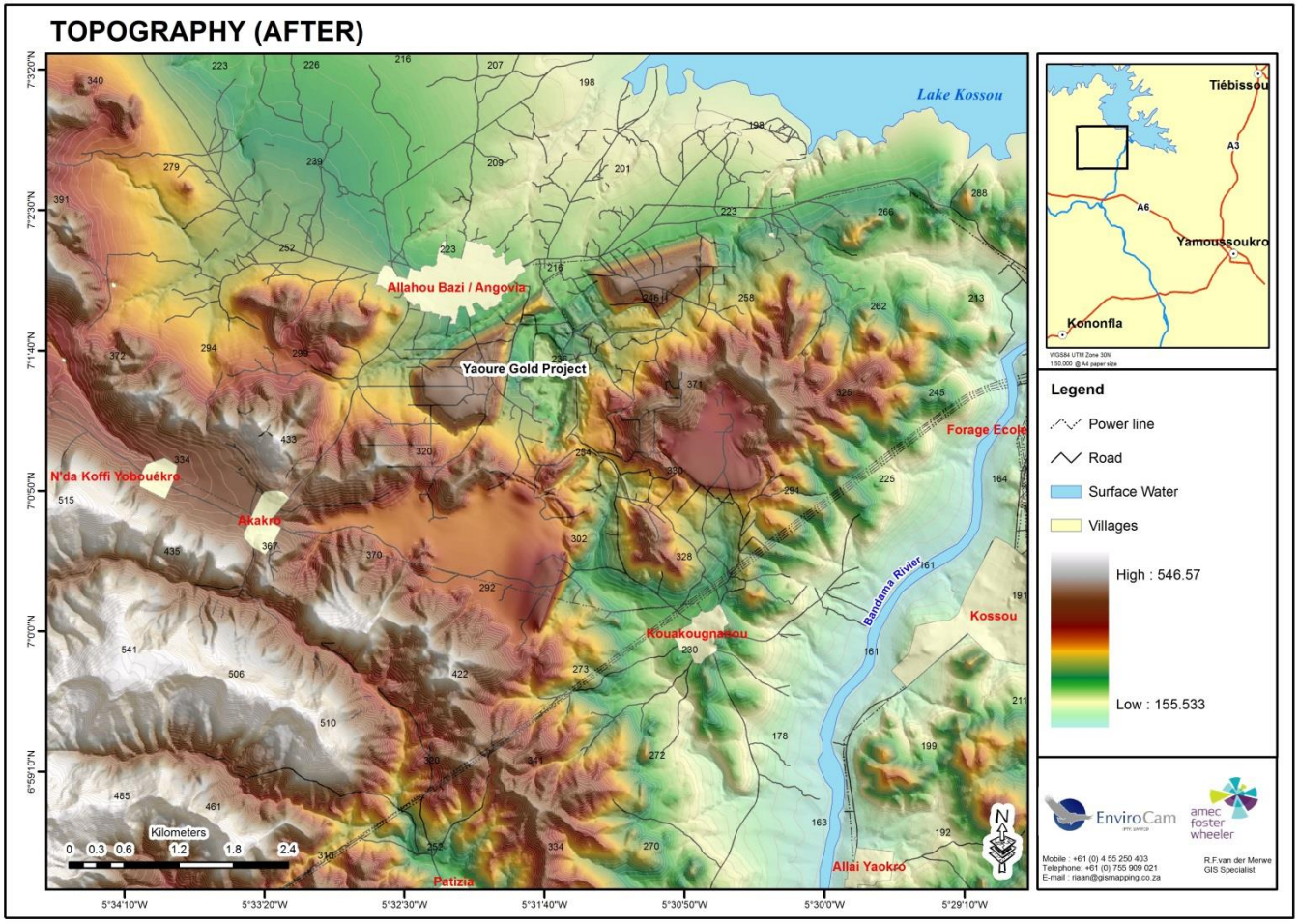


Figure 3-5: Topography: Before the construction of the TMF and the WRD's - 3D

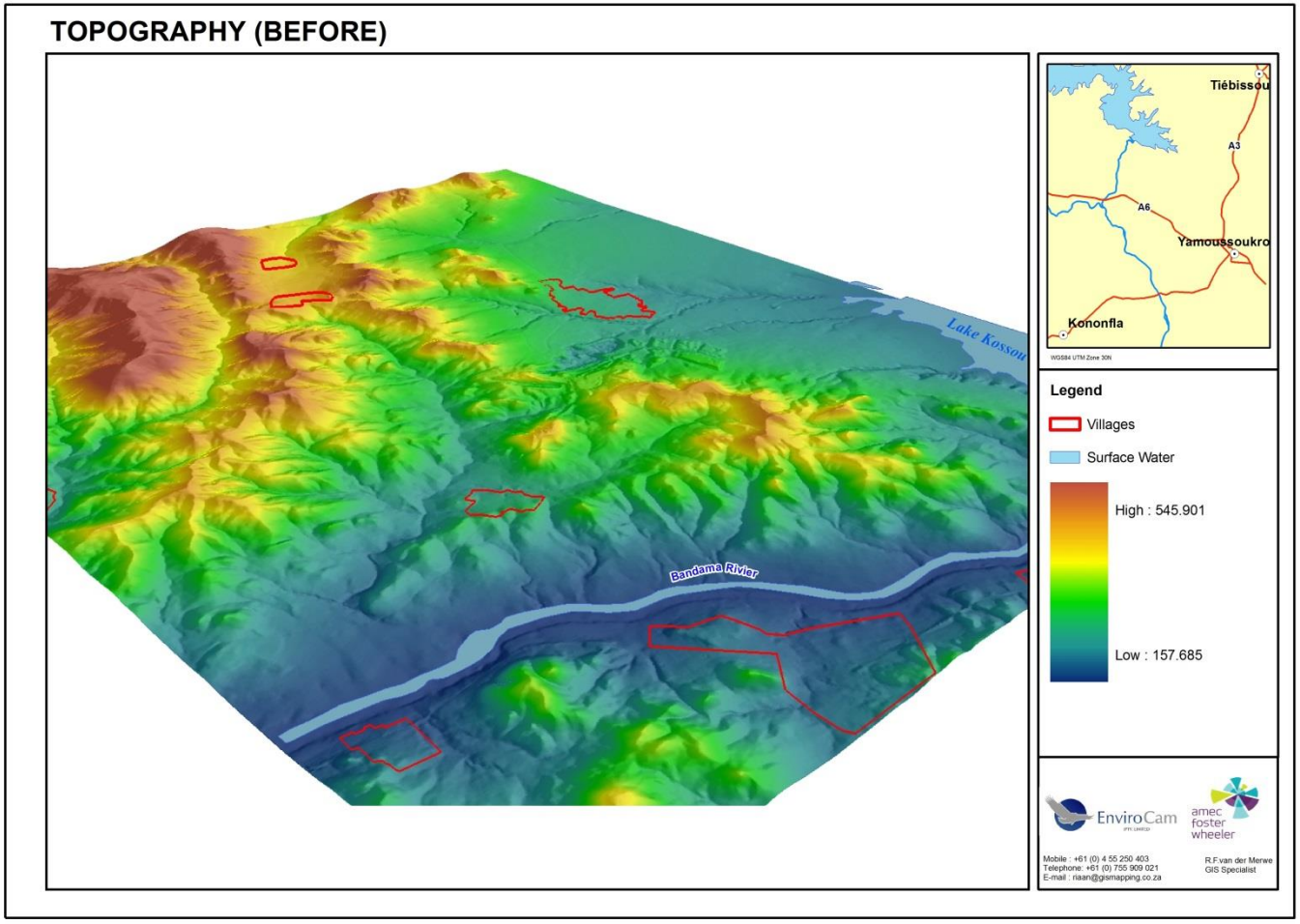


Figure 3-6: Topography: After the construction of the TMF and WRD's – 3D

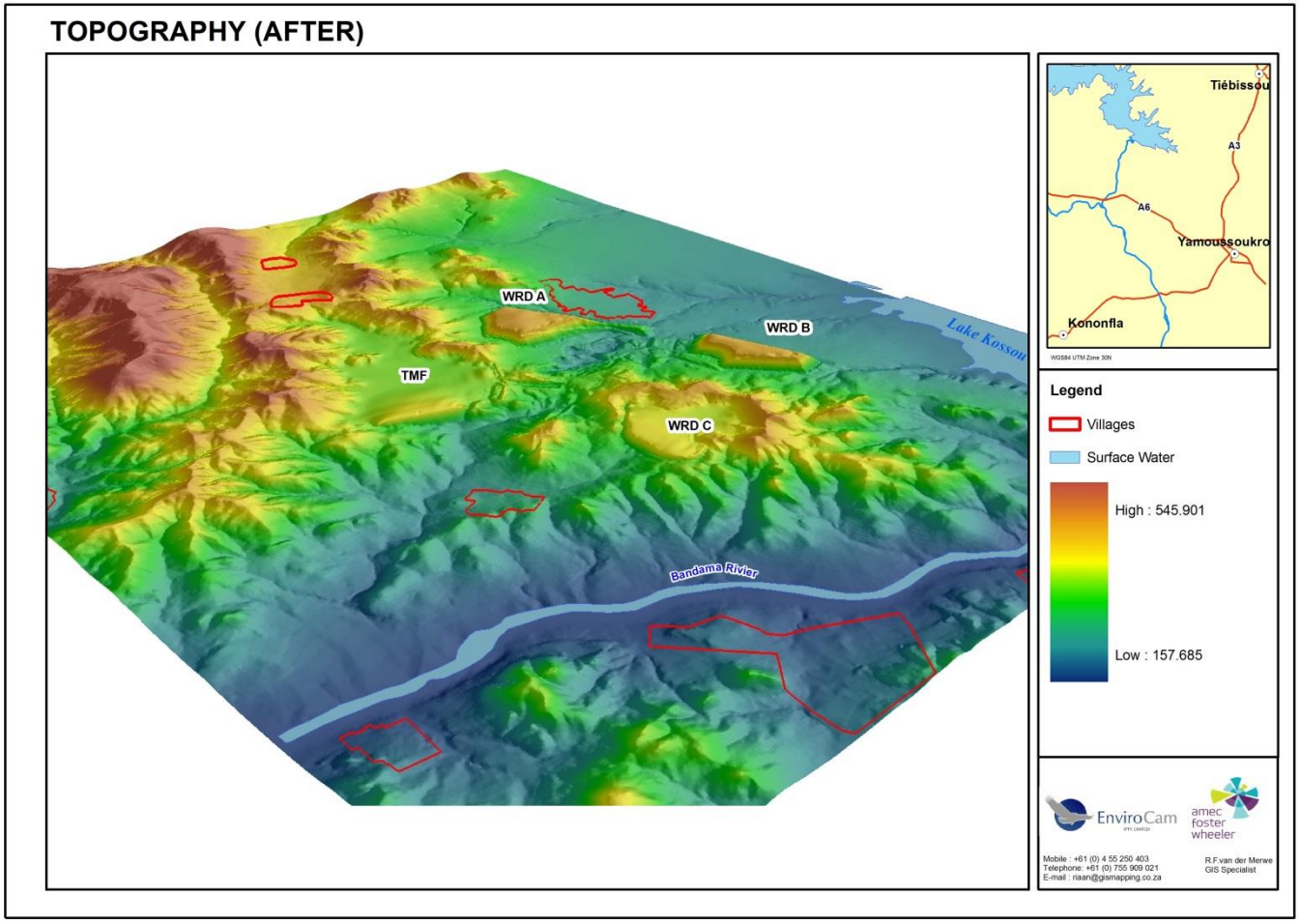


Figure 3-7: Land cover

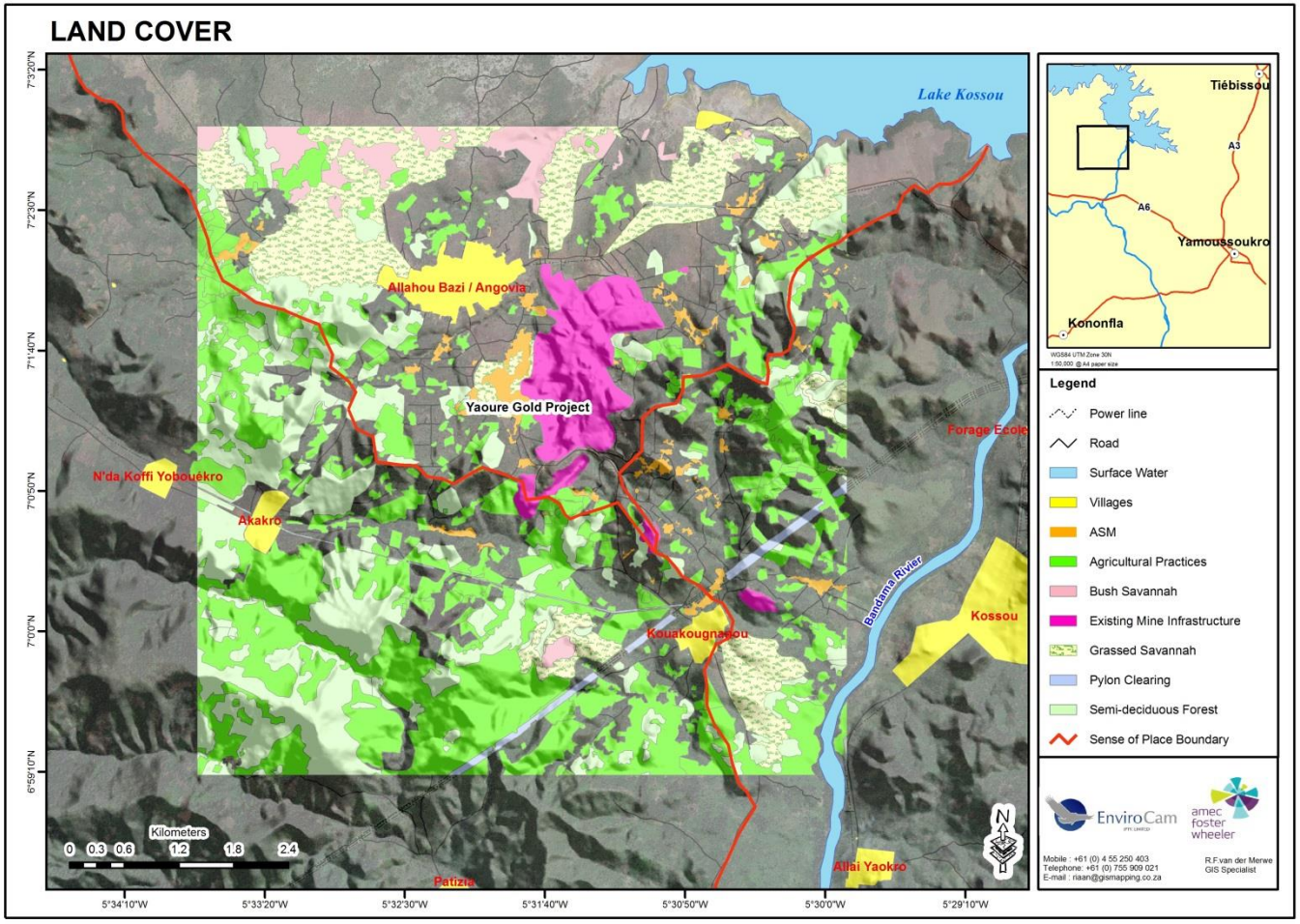
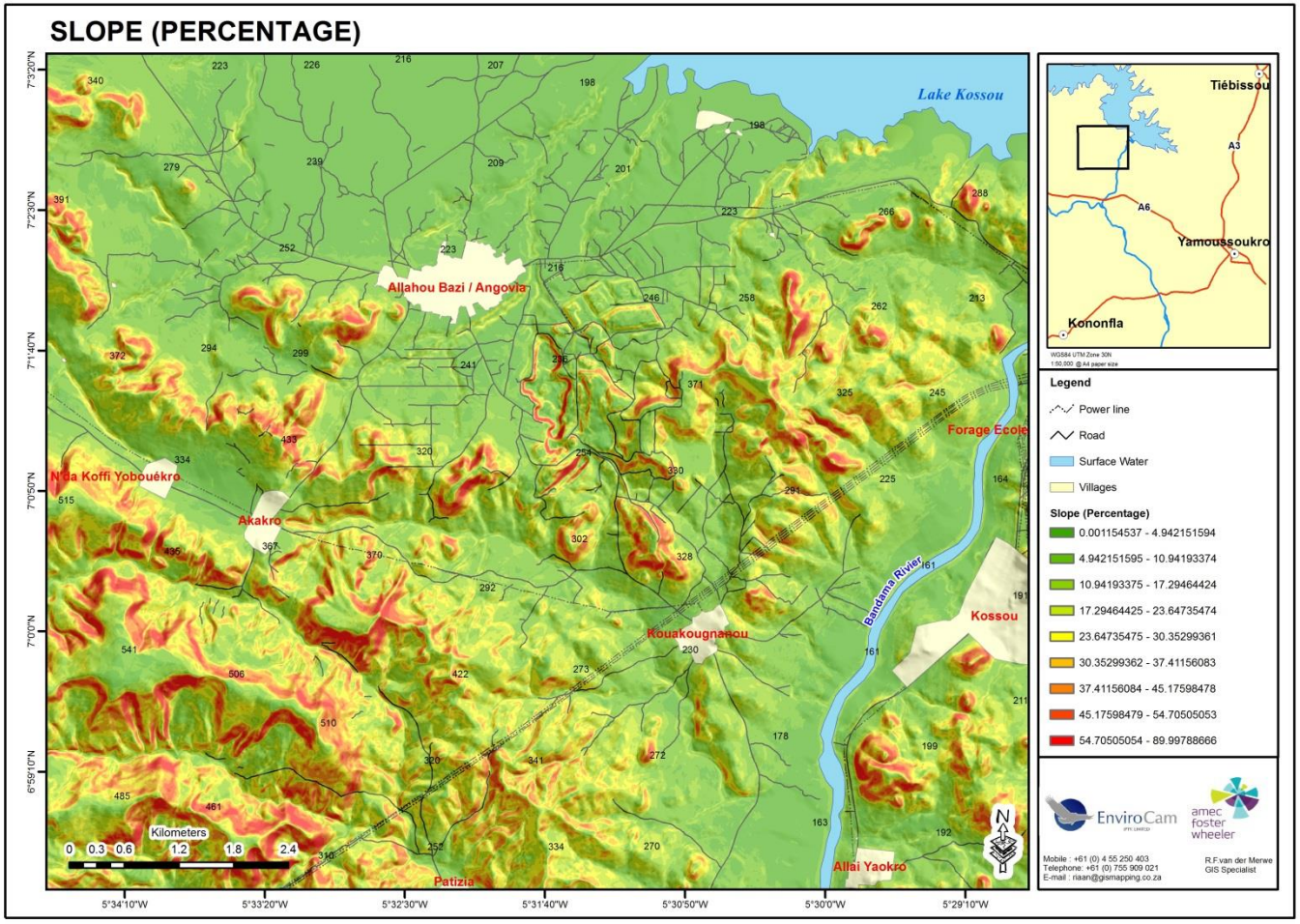


Figure 3-8: Slope (Percentage)



Agricultural

Agricultural activities include rice, yam, cassava, plantain, cacao, coffee, Teak wood, maize, mixed produce and vegetable. Farming in the larger project area varies between more family orientated subsistence type farming, to larger more organized commercial type farming activities. It was noticed that livestock farming is fairly limited in the area and seems to be only for subsistence use, including chickens, pigs, goats and cattle (refer to Figure 3-9). Agricultural activities are mainly located to the south of the proposed operations and randomly distributed within valley areas.

Figure 3-9: Agricultural activities within the project area

Mining

The northern section of the study area is characterised by extensive mining /exploration activities. These include artisanal mining activities that have continued from historic times within the project area to commercial mining which is on-going for more or less the past thirty years. Gold is recovered through conventional panning activities and is major source of income for the local population.

Previous conventional mining activities at Yaoure include the pit, heap leach pads, waste rocks dumps and associated infrastructure. The mine site has previously been in production twice – once beginning in 1999 by CMA and then again in 2008 by Cluff Gold.

Unregulated mining activities are also evident in the southern section of the study area. This is a relative new development and extents along the banks of the Bandama River opposite Kossou Township.

3.2.5 Sense of Place

Central to the concept of sense of place is that the landscape requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area. The study area is divided into three distinct areas (Northern, South-western and South-eastern sections), each with its own visual character and sense of place. A ridge line forms a natural barrier between these three sections (refer to Figure 3-7).

Northern Section

The visual character of the northern section is dominated by previous conventional mining activities (existing pit and associated infrastructure), and the Allahou Bazi / Angovia residential settlement (Please refer to Figure 3-10). Historic commercial mining, artisanal mining and associated activities provide the northern section with a distinct sense of place and form an integral part of the landscape. Expansion of the commercial mining activities will potentially limit and restrict artisanal mining and therefore have a distinct impact on the historic sense of place within this section.

Figure 3-10: Existing mining activities within the northern section

South-eastern Section

The area to the southeast of the proposed Yaoure Gold Project has a semi-rural character with a strong relationship with the village of Kossou and the Kossou hydroelectric power station with its associated power distribution network. The township of Kossou forms the centre of human activity within this section with various public

services based within the township (schools, hospital, etc.). The Bandama River forms an integral part of this section and adds to the character of this section although recent unregulated mining has degraded the visual resource and sense of place considerably.

South-western Section

The south-western section has a rural character with a strong relationship with subsistence farming. Smaller villages are located within this section and are more associated with subsistence agricultural activities and to a lesser degree with mining activities. The two main villages (Akakro and Kouakougnanou-Bopri) within this section are located within a valley and surrounded by hills and dense degraded and secondary forested areas.

In summary thus, it has been established that the study area represents three distinct areas, each with its own visual character and sense of place. All sections have a relatively moderate to high sense of place dominated by either mining, semi-rural or agricultural activities. From the baseline information the area most vulnerable to a change in the sense of place is the northern section of the proposed Yaoure Gold Project due to the scale and extent of the proposed operations. This is enhanced due to the limited screening potential towards the north. The impact on sense of place can be reduced by adhering to the mitigating measures suggested in chapter 5 of this document.

3.2.6 Visual Quality and Character

Perception results from the combination of the extent to which the activity is visible (level of visibility) and the response of individuals to what they see. A major influence on the perception of people in relation to the proposed mining activity will be the visual character and quality of the landscape in which they would be located. Natural landscape areas such as national parks and riverside areas are valued for their high visual quality. The expansion of mining activities and associated infrastructure may be seen as a negative impact on these areas of high visual quality. In contrast, areas which are degraded are less valued due to their low visual quality.

The relatively undistributed natural areas along the banks of Lake Kossou and the Bandama River with its high scenic beauty have created an aesthetic landscape (refer to Figure 3-11). The rural character, steep valleys, hilly terrain and forested areas add to the scenic value of the area. Related to the scenic value of a specific area is the tourism value attached to that associated area. The properties in the immediate vicinity of Lake Kossou and the Bandama River are regarded as areas with a high scenic and eco-tourism potential. Potential eco-tourism activities could include tourist accommodation (lodges, hotels, etc.) angling, water sports, hiking and camping. These scenic areas are currently not utilised (or very limited) for tourist activities but has the potential to be further developed, although recent unregulated mining has degraded this potential considerably, especially along the banks of the Bandama River (refer Figure 3-12).

Figure 3-11: The Bandama River as seen from Lake Kossou

Figure 3-12: Unregulated mining activities along the banks of the Bandama River

The level of transformation is high to moderate in the northern section of the project area primarily due to conventional and artisanal mining activities. This area is mainly degraded and the visual resource quality is low. The south-western section is less degraded, but agricultural activities have modified the scenic quality of the area negatively. The hilly

terrain and remaining degraded and secondary forested areas in this section adds to the visual character of this area.

3.3 Magnitude of the Visual Impact

This section describes the aspects which have been considered in order to determine the magnitude of the visual impact on the area. The criteria includes the area from which the project can be seen (i.e. ZVI), the viewing distance and the capacity of the landscape to visually absorb structures and forms placed upon it (i.e. Visual Absorption Capability, or VAC).

3.3.1 The Zone of Visual Influence

In order to determine the potential extent of visibility of the project, a ZVI analysis was conducted. The ZVI is defined as the 'area within which a proposed development may have an influence or effect on visual amenity' (GLVIA, Glossary). A ZVI analysis was carried out to define all possible sites from which the proposed infrastructure would be visible. A ZVI map therefore illustrates the potential (or theoretical) visibility of an object in the landscape. The phrase "potential visibility" is used to describe the result because the analysis does not take into account any landscape artefacts such as trees, woodland, buildings etc. The visibility analysis therefore considers the worst-case scenario, using line-of-sight i.e. ignoring vegetation cover and other structures and is based on topography alone. The ZVI also does not take into account the effects of weather and atmospheric conditions in reducing visual range. The ZVI analysis assists the process of identifying possible affected viewers and the extent of the effected environment. The results are not intended to show the actual visibility of an object, they are intended to indicate where the object may be visible from. Actual visibility can only accurately be determined by a site survey since there are a multitude of local variables that may affect lines of sight. On the other hand, a ZVI does show where an object definitely cannot be seen.

A ZVI analysis is prepared using the ESRI ArcGIS Viewshed routine. This creates a raster image that indicates the visibility (or not) of the points modelled. The first step in the production of a ZVI map is to obtain a computer representation of the ground surface in the vicinity of the proposed development, referred to as a Digital Terrain Model (DTM). This DTM is created using digital elevation data. The data may take a number of forms but most commonly it is a combination of contours and spot heights. For this project topographic data was obtained for the site and the surrounding environment at 1m contour interval to create the DTM. The DTM was draped over the topographic data (rivers, roads, villages, etc.) to complete the model used to generate the ZVI analysis.

As the ZVI model calculates the proposed infrastructure visible from ground level, a measure of viewing height is required. This was set at 1.5 metres above ground level (average viewer height). The offset height for each specific proposed infrastructure component (e.g. TMF, WRD's and plant) was extracted from the preliminary site layout drawings and added to the baseline DTM. The offset heights varied from 20m – 30m for components of the plant to around 70m to 120m for the WRD's and 80m for the TMF.

Visibility is affected by earth curvature and the refraction (bending) of light through the atmosphere, particularly at greater distances. Therefore this effect was included in the ZVI calculation as its absence will tend to overestimate visibility.

Refer to Figure 3-13, Figure 3-14, Figure 3-15, Figure 3-16 and Figure 3-17 which spatially depicts the ZVI for each major project component (WRD A, B, C, TMF and plant). Due to the limited ZVI of the plant area compared to WRD A and B and the spatial overlap, it was decided not to continue with analysing the plant area as the analysis would be redundant.

The WRD A and B ZVI maps (refer to Figure 3-13 and Figure 3-14) indicate that these WRD's are visible for the majority of the northern section of project area due to the relative flat terrain and dimensions of the proposed WRD's. Although localised vegetation cover will screen extensive views of the WRD A & B, especially in the beginning of the project before the WRD's reaches heights of over 30m, the final dimensions of the WRD's will make the visual screening in most cases inadequate. Views towards the southwest (towards the village of Kossou) would only reveal a glimpse of the higher portions of the WRD A and only at the end of the LoM. These views will be very limited and in most cases insignificant. The WRD's will also be visible from the higher ground in the southwest which is uninhibited.

WRD C (refer to Figure 3-15) will be directly visible from the village of Kouakougnanou-Bopri, but only partial views may be visible in the direction of Kossou village. The ridge forming the boundary around WRD C blocks extensive views towards the north, east and west. Views towards the southwest would only reveal a glimpse of the higher portions of the WRD and only later during the LoM. WRD C will also be visible from the higher ground in the southwest which is uninhibited.

Views from the TMF (refer to Figure 3-16) will be limited towards the east along the valley towards the village of Kouakougnanou-Bopri and mainly contained by local surrounding ridges. The secondary TMF embankments will be visible in the direction of the exiting works in a narrow visual envelope. The TMF will also be visible from the higher ground in the southwest which is uninhibited and to a limited extend towards the village of Kossou. The extent of the views will only reach this extent at the later stage of the LoM as the TMF embankments increase in size and height over time.

Using the criteria in Table 3-1, visibility of the proposed Yaoure Gold Project from the surrounding areas during the construction and operational phases will be high if concurrent rehabilitation is not implemented. Visibility during the closure phase will be moderate after mitigation measures have been correctly adhered to according to this report.

Table 3-1: ZVI evaluation for proposed Yaoure Gold Project

High	Moderate	Low
If the project and its infrastructure is visible from over half the zone of potential influence, and/or views are mostly unobstructed.	If the project and its infrastructure are visible from less than half the zone of potential influence, and/or views are partially obstructed.	If the project and its infrastructure is visible from less than a quarter of the zone of potential influence, and/or views are mostly obstructed.

Figure 3-13: Zone of Visual Influence: WRD A

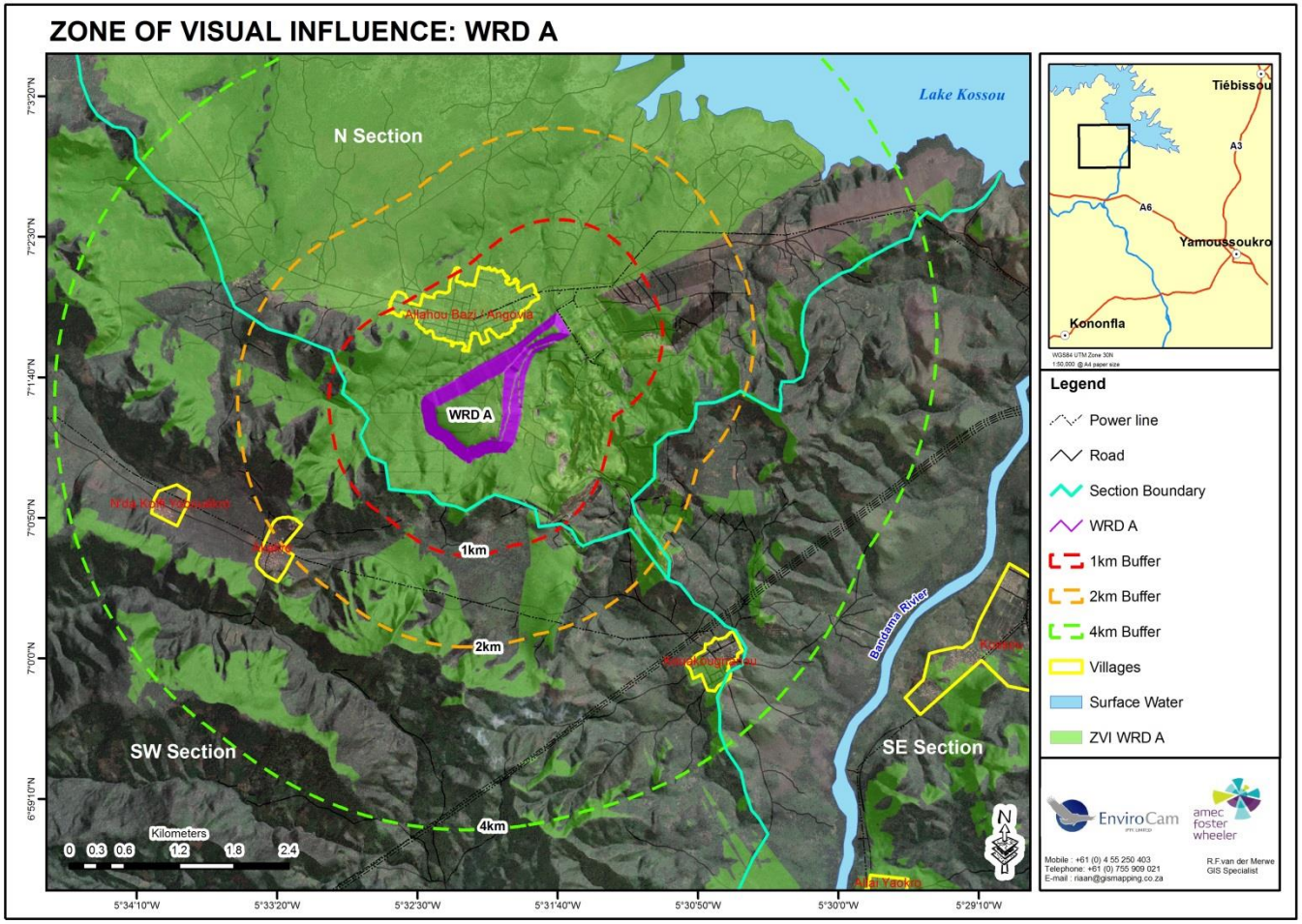


Figure 3-14: Zone of Visual Influence: WRD B

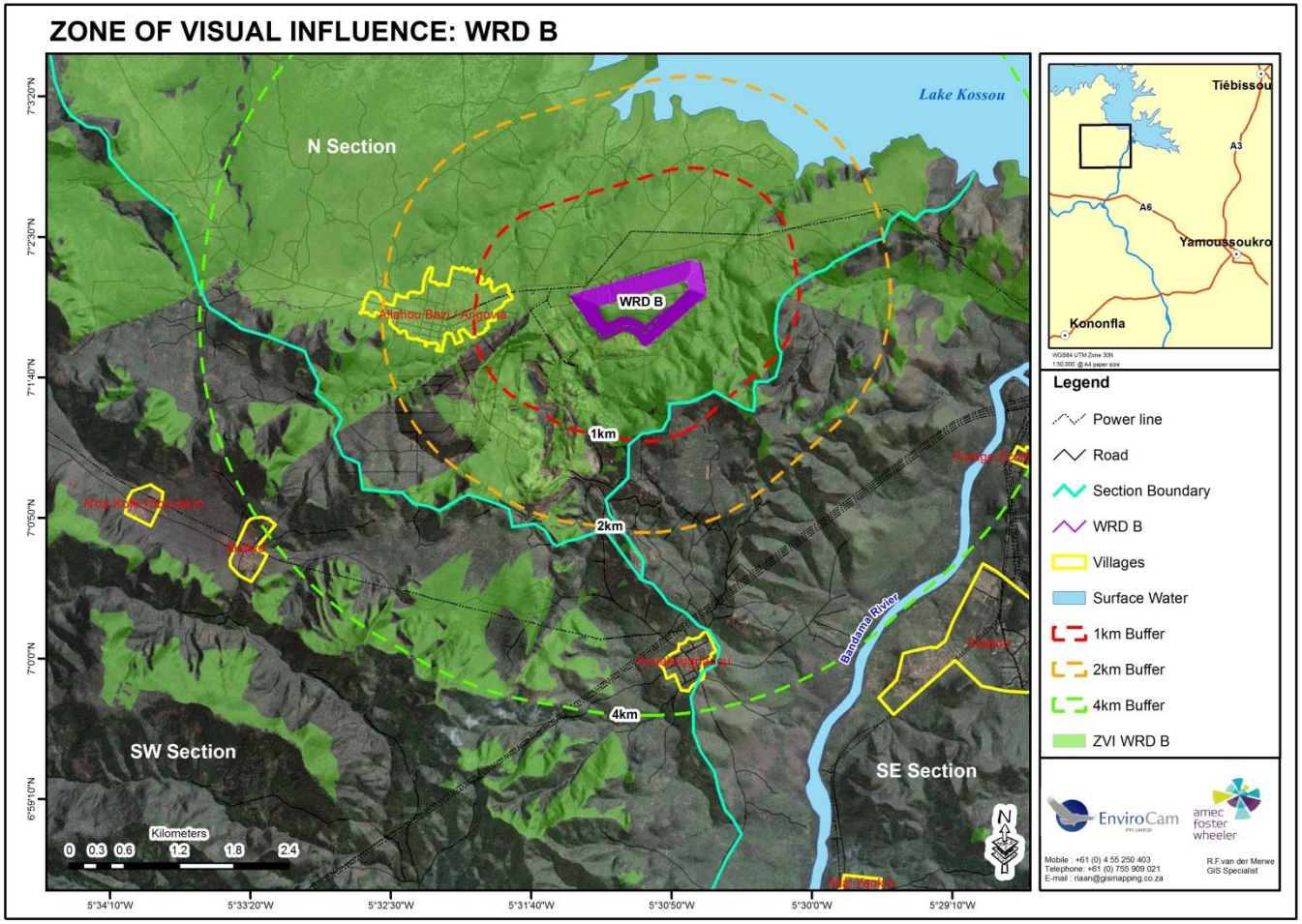


Figure 3-15: Zone of Visual Influence: WRD C

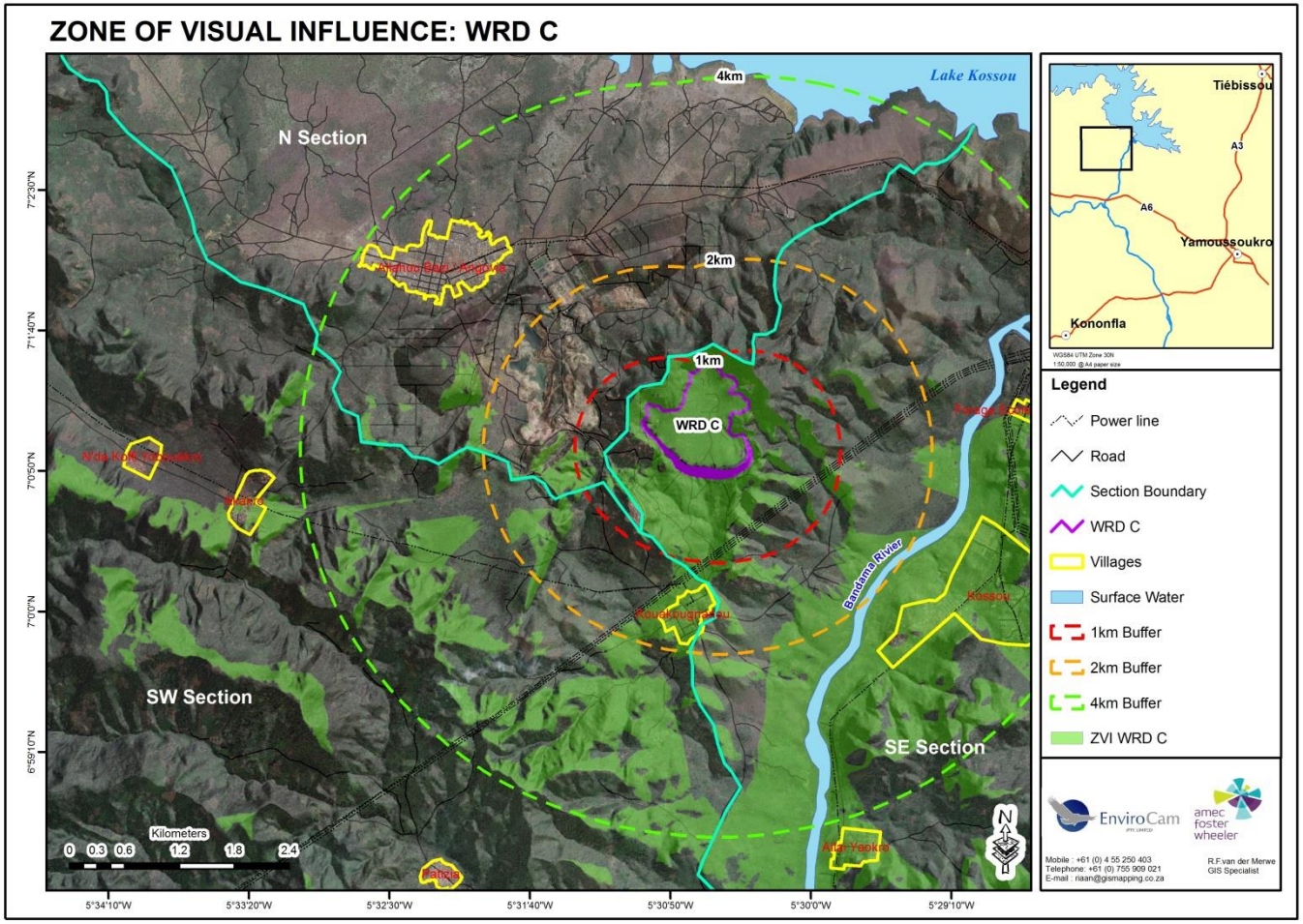


Figure 3-16: Zone of Visual Influence: TMF

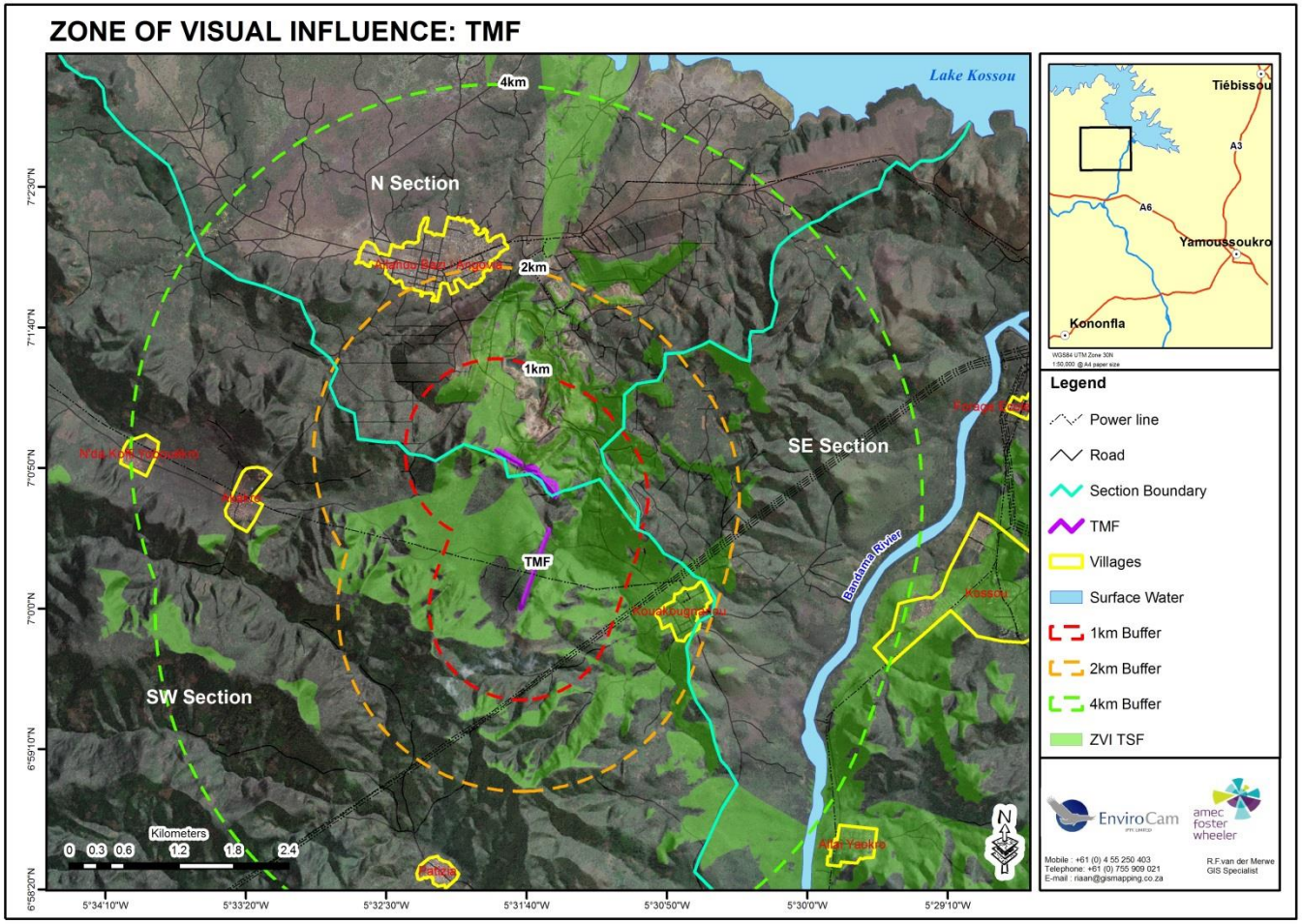
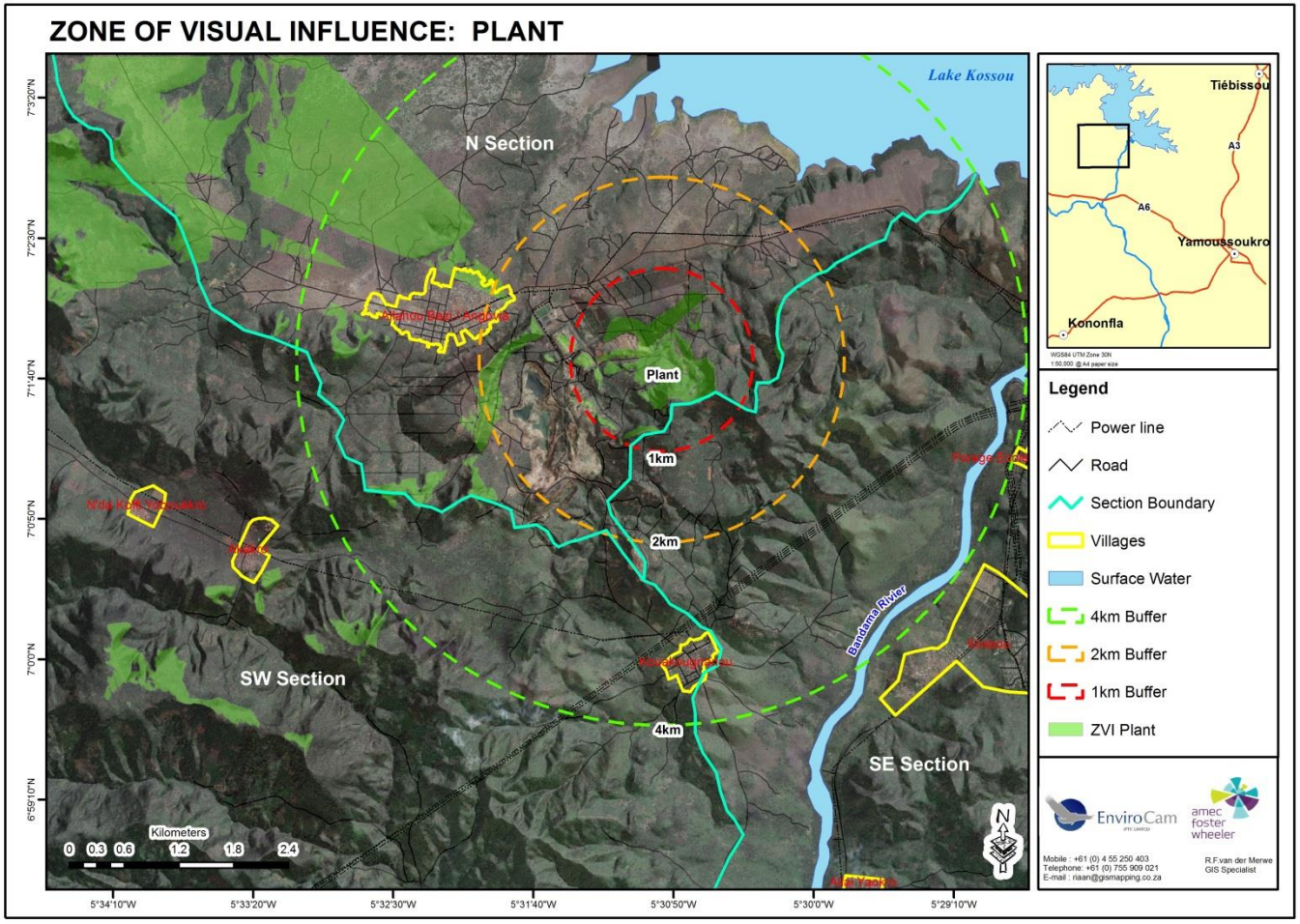


Figure 3-17: Zone of Visual Influence: Plant



3.3.2 The Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988). Thus, the visual impact at 1000m would be approximately a quarter of the impact as viewed from 500m. Consequently, at 2000m, it would be one sixteenth of the impact at 500m. Therefore the greater the distance from the proposed infrastructure, the lower the impact, as the development will take up a smaller portion of the view.

The area, defined as the radius from the boundary of the proposed infrastructure (e.g. TMF and WRD's), beyond which the visual impact of the most visible features will be insignificant was established at 4km. Over 4km the impact of the proposed infrastructure would have diminished considerably due to the diminishing effect of distance and atmospheric conditions (haze) on visibility. On the other hand the visual impact of the project components within a distance of 1000m or less would be at its maximum. View distance is rated using four increments of severity, each with their respective qualification and contribution to visual impact (Refer to Table 3-2 below).

Table 3-2: View distance evaluation

	High Exposure (significant contribution to visual impact) 0 – 1km	**Moderate Exposure (moderate contribution to visual impact) 1 - 2km**	**Low Exposure (minimal influence on visual impact) 2km – 4km**	**Insignificant Exposure (negligible influence on visual impact) Over 4km**
Residents	Applicable	Applicable	Applicable	Applicable
Tourist	Not Applicable	Not Applicable	Not Applicable	Applicable
Motorist	Applicable	Applicable	Applicable	Applicable

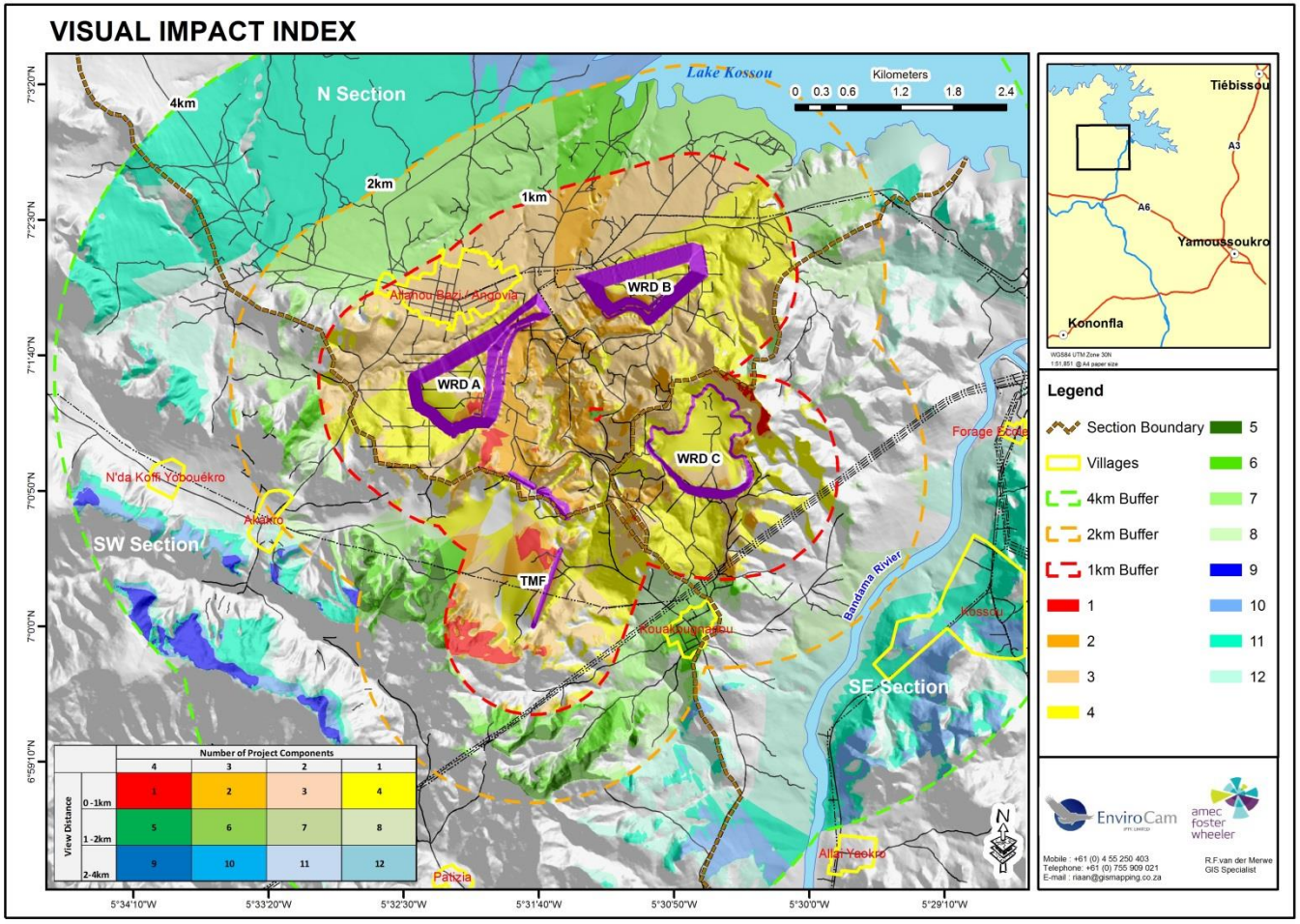
From Figure 3-13, Figure 3-14, Figure 3-15 and Figure 3-16 it is clear that the majority of sensitive viewer locations (residents and motorists) are located between the 0 - 1 km radius from the proposed Yaoure Gold Project. Therefore, the proposed Yaoure Gold Project would be in the foreground of these sensitive views. This results in a high visual exposure for the proposed Yaoure Gold Project site from these viewing points.

Some sensitive viewer locations (residents and motorists) are also located in the 1 - 2 km and the 2-4 km buffer areas from the proposed Yaoure Gold Project. Therefore, the proposed Yaoure Gold Project would be in the middle and background of these sensitive views depending on the specific range. This results in a moderate to low visual exposure respectively for the proposed Yaoure Gold Project from these viewing points depending on the range.

In order to spatial identify areas that may be affected more than others mainly due to views from multiple components and the physical location in relation to these components a Visual Impact Index map were created (refer to Figure 3-18). This map was created by combining the various ZVI maps and rating the areas that could see more than one project component (e.g. 1, 2, 3 or all 4 components). The distance (0 – 1 km, 1 -2 km and 2 -4 km) from the specific components were also rated and incorporated in this analysis. The analysis created a rating of 1 to 12, with 1 being an area which could see all 4 components and is within the 0 – 1 km buffer area. A rating of 12 in the other hand would correspond to an area which could observe only one project component and is within the 2 – 4 km buffer range.

It is evident from this map the village of Allahou Bazi/Angovia would be able to observe two components (i. e. WRD A and B) and is within the 0 – 1 km buffer area, therefore a visual impact index of 3 (high impact). The village of Kouakougnanou-Bopri would be able to observe two components (i.e. WRD C and TMF) and is within the 1 -2 km buffer area with a visual index of 7 (moderate impact). The villages of Akakro have a visual impact index of 12 (low impact) and will be able to observe only one component (i.e. TMF) and within the 2 -4 km buffer area. The village of N'da Koffi Yobouékro will not be affected at all.

Figure 3-18: Visual Impact Index



3.3.3 The Visual Absorption Capacity

Visual absorption capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as:

Degree of Visual Screening

A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating and mundane landscape covered in grass.

Terrain variability

Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of low terrain variability.

Land Cover

Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc.). Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them.

A representative view as experienced by residents was used for the photographic simulation. The before and after simulation illustrated in Figure 3-19 and Figure 3-20, show the proposed activity superimposed onto the existing landscape scene. The simulation illustrates the visual absorption potential of the affected landscape when viewed from the Allahou Bazi/Angovia village (note that these simulation may vary from the actual impact).

It is apparent that the landscape surrounding the proposed operations ability to 'visually absorb' the proposed project is high to moderate (low to moderate impact) due to the following:

- The proposed Yaoure Gold Project is situated on a relative diverse landform type especially in the northern section;
- The degree of visual screening is substantial due to the hilly terrain and dense vegetation which blocks extended views, especially in the south-eastern and south-western sections. In the northern section some visual screening (natural vegetation) along the outskirts of Allahou Bazi/Angovia village and the local road are present but the physical dimensions of the proposed WRD A & WRD B will

make these inadequate and will therefore not be able to screen the activity completely; and

- The colour and contrast of the proposed Yaoure Gold Project corresponds moderately with the colour of the existing mining activities/degraded environment of the immediate surrounding area. This is a bit more limited in the south-eastern and south-western sections.

The landscape therefore has a high to moderate visual absorption capacity and will suffer a low to moderate visual impact from the proposed activity imposed on it (refer to Table 3-3).

Table 3-3: Visual absorption capacity evaluation

Criteria	High (Low Impact)	Medium (Medium Impact)	Low (High Impact)
Visual Absorption Capacity (VAC)	The ability of the landscape to easily accept visually a particular development because of its diverse landform, vegetation and texture	The ability of the landscape to less easily accepts visually a particular development because of a less diverse landform, texture and vegetation.	The ability of the landscape not to visually accept a proposed development because of a uniform texture, flat slope and limited and limited vegetation cover.

Figure 3-19: View from Allahou Bazi/Angovia towards WRD A (south-southeast direction) - Before

Figure 3-20: View from Allahou Bazi/Angovia towards WRD A (south-southeast direction) - After

3.3.4 Analysis

The magnitude of the visual impact is determined using the ZVI, viewing distance, and visual absorption capability. Table 3-4 summarises the results of the criteria used to determine the magnitude of the visual impact. These results are based on worst-case scenarios when the impact of all factors (ZVI, Visual Distance and VAC) is considered together.

Table 3-4: Magnitude evaluation for proposed Yaoure Gold Project

	Quality of Visual Resource	Factors use to determine magnitude			Magnitude
		ZVI	Visual Distance	VAC	
Prior to construction	Moderate to Low				
Construction & Operational Phase **Assuming mitigation is successful**		High	High to Low	High to Moderate (Low to Moderate Impact)	High
Closure Phase **(Assuming mitigation is successful)**		Moderate	High to Low	High (Low impact)	Moderate

According to the results tabulated in Table 3-4 the magnitude of visual impact associated with the Yaoure Gold Project, during the construction and operational phase, will be high if concurrent rehabilitation is implemented, while during the closure phase the visual impact will be moderate assuming that mitigation measures are successful.

3.4 Sensitive Visual Receptors

Local roads in the immediate vicinity of the proposed activity and local villages were regarded as critical view zones against which the visual impact would be evaluated. Critical views were determined during the field trip and from the provided surface layout maps.

Viewer groups are a collection of viewers that are involved with similar activities and experience similar views of the proposed development. Within the receiving environment, specific visual receptors experience different views of the proposed development. They will be affected due to the alteration of their views and are therefore identified as part of the receiving and affected environment. The visual receptors are

grouped according to the similarities in views. The visual receptors included in this study are:

- Residents;
- Tourists; and
- Motorists.

The visual receptors will be affected because of alterations to their views due to the proposed project. In order to determine the sensitivity of these visual receptors a commonly used rating system is utilised (refer to Table 3-5). This is a generic classification of visual receptors and enables the visual impact specialist to establish a logical and consistent visual receptor sensitivity rating for viewers who are involved in different activities without engaging in extensive public surveys.

Table 3-5: Visual receptor sensitivity

Visual receptor sensitivity	Definition (Adopted from GLVIA)
Exceptional	Views from major tourist or recreational attractions or viewpoints promoted for or related to appreciation of the landscape, or from important landscape features.
High	Users of all outdoor recreational facilities including public and local roads or tourist alternatives whose attention or interest may be focussed on the landscape; Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; Residents with views affected by the development.
Moderate	People engaged in outdoor sport or recreation (other than appreciation of the landscape).
Low	People at their place of work or focussed on other work or activity; Views from urbanised areas, commercial buildings or industrial zones; People travelling through or passing the affected landscape on transport alternatives.

3.4.1 Residents

In the case of static views, such as views from buildings, the visual relationship between an activity and the landscape will not change. The cone of vision is relatively wide and the viewer tends to scan back and forth across the landscape. Residents of the affected environment are therefore classified as visual receptors of high sensitivity owing to their sustained visual exposure to the proposed development as well as their attentive interest towards their living environment.

It is the author's professional opinion that the localised visual perceptions of the economically marginalised communities within the project area may be influenced rather

by the short term economic and job opportunities that will exist rather than the direct visual perception of the project. In addition, the majority of residential views are obstructed as the nature of most residential dwellings does not promote any views at all. The building materials and informal manner of the buildings do not promote the construction of windows and therefore limit potential views (refer to Figure 3-21). The close proximity of the dwellings to each other, the relative dense vegetation cover on the outskirts of the various villages, and the fact that most dwellings do not face the proposed infrastructure directly will limit direct views towards the proposed infrastructure. Residents are therefore classified as low sensitivity rather than high sensitivity for purposes of this project.

Figure 3-21: Typical dwelling within the village of Allahou Bazi/Angovia

3.4.2 Tourists

Tourists are regarded as visual receptors of exceptionally high sensitivity. Their attention is focused towards the landscape which they essentially utilise for enjoyment purposes and appreciation of the quality of the landscape.

The existing mining activities (conventional and artisanal) at Yaoure have already degraded the visual integrity of the surrounding area especially in the northern section of the project area. This will be augmented by the expansion of the proposed Yaoure Gold Project and would impact negatively on the tourist's expectations. The closest protected areas, scenic roads and or existing tourist attractions are not within the ZVI, approximately a 4 km buffer area around the operations. It is therefore predicted that tourist will not be affected by the proposed project.

3.4.3 Motorists

Motorists are generally classified as visual receptors of low sensitivity due to their momentary views and experience of the proposed development. Under normal conditions, views from a moving vehicle are dynamic as the visual relationship between the activity is constantly changing as well as the visual relationship between the activity and the landscape in which they are seen. The view cone for motorists, particularly drivers, is generally narrower than for static views. Motorists will therefore show low levels of sensitivity as their attention is focused on the road and their exposure to roadside objects is brief.

4.0 IMPACT ASSESSMENT

4.1 Impact Description

Various risk sources for the visual impact have been identified for the construction and operation phases and can be classified as negative.

Construction Phase

The activities that are expected to cause visual impacts during construction would be:

- Excessive clearing of vegetation and stripping of topsoil for site preparation, temporary access roads, and open and un-rehabilitated landscape scarring leading to erosion and the formation of dongas;
- Cut and fill slopes of access roads become highly visible if not re-vegetated and shaped to blend in with the existing topography;
- The extent and intensity of the security and construction lighting at night; and
- Dust from construction activities and access roads.

Operational Phase

The activities that are expected to cause visual impacts during operational phase would be:

- The TMF, WRD's and localised cuts and fills, could remain aesthetically incompatible with surrounding landscape. Edges may not blend in with the landscape or cut slopes may be too steep to be adequately re-vegetated. This may result in a permanent change to the existing visual quality of visually sensitive areas;
- The extent and intensity of the security and operational lighting at night consisting out of the following:
  - 7 x Allight Lighting Plants (WRD and in pit);
  - 25-30 standard flood lights at various locations;
- The need to keep servitudes clear of vegetation, will result in landscape scarring;
- Dust from operational activities and access roads; and
- Presence of the associated infrastructure and equipment.

4.2 Impact Assessment

Significance is a measure of the response of viewers to the changes that occur. It represents the interaction between humans and the landscape changes that they observe. The potential significance of the visual impact will primarily result from changes

to the visual character of the area within the ZVI. The nature of these changes will depend on measurable factors such as visual extent (level of visibility), viewing distance, and the visual absorption capacity of the surrounding landscape and therefore the magnitude of the visual impact. Other factors are subjective, such as the visual perception of people viewing the activity as the response to visible changes in the landscape may vary significantly between individuals.

The significance of impact was determined using a ranking scale, based on terminology from Amec Foster Wheeler. When the magnitude and receptor sensitivity of impact is qualified, the significance of the impact can be predicted taking into account the extent, duration and probability of the proposed activity (refer to Table 4-1, Table 4-2,

Table 4-3 and Table 4-4).

Table 4-1: Operational and security lighting

Impact	**Operational and security lighting (construction and operational phase)**			
Nature	**Negative**		Positive	
	Light sources at night, particularly poorly directed security flood lighting, can influence the visual impact of the development. Unobstructed light sources can cause a general glow in the area and will be visible from significantly longer distances than any structural features during daylight hours.			
Nature of Impact	**Direct**		Indirect (Secondary)	**Cumulative**
	The impact of the proposed Yaoure Gold Project after sunset will be direct for people travelling along adjacent local roads and local population living within the surrounding area, especially within Allahou Bazi/Angovia and to a lesser degree at Kouakougnanou-Bopri. Operational and security lighting in and around the sites will be visible at night and might contribute to the cumulative effect of lights from existing settlements (e.g. general glow).			
Likelihood / Probability	1 = Unlikely	2 = Possible	**3 = Likely**	**4 = Definite likelihood**
	The impact of operational and security lighting is very likely but may be screen by exiting vegetation cover. It is predicted that WRD A and WRD B will screen most direct operational lighting from the plant area especially when the WRD's reach their maximum height. The cumulative impact caused by the general glow from the operational and security lighting is a definite as direct screening is not effective.			
Duration	1 = Short term	2 = Medium term	**4 = Long term**	4 = Permanent
	Long term: Potential impacts could be mitigated or remediated once operations cease at the end of life of mine with dismantling of operational and security lighting equipment.			
Extent / Spatial	1 = Localised	2 = Site	**3 = Wider and Adjacent Region**	4 = National / International
	Wider region as unobstructed light sources can cause a general glow in the area and will be visible from significantly longer distances than any structural features during daylight hours.			
Magnitude / Scale	1 = Low	2 = Minor	**3 = Moderate**	**4 = High**
	Moderate to High: Refer to Table 3-4.			
	2 = Low	4 = Moderate Low	6 = Moderate	8 = High

Impact	**Operational and security lighting (construction and operational phase)**			
Resource/Receptor Sensitivity/ Importance of Value	Low: localised visual perceptions of the economically marginalised communities of the population may be influenced rather by the short term economic and job opportunities that will exist rather than the direct visual perception of the project.			
Significance of the impact	1 – 20 = Negligible	21 – 56 = Low	**57 – 92 = Medium**	93 – 128 = High
	Medium: Although the likelihood, duration, spatial extent and magnitude score are relative high, the receptor sensitivity score are low. This will ultimately reduce the significance of the operational and security lighting impact to a medium significance score and therefore a moderate impact.			

Table 4-2: Infrastructure aesthetically incompatible with surrounding landscape.

Impact	**Infrastructure aesthetically incompatible with surrounding landscape. (Construction, operational and closure phase)**			
Nature	**Negative**		Positive	
	The TMF, WRD's and localised cuts and fills, could remain aesthetically incompatible with surrounding landscape. Edges may not blend in with the landscape or cut slopes may be too steep to be adequately re-vegetated. This may result in a permanent change to the existing visual quality of visually sensitive areas and therefore negative impact.			
Nature of Impact	**Direct**		Indirect (Secondary)	**Cumulative**
	The impact of the proposed Yaoure Gold Project will be direct for people travelling along adjacent local roads and the local population living within the surrounding area, especially within Allahou Bazi/Angovia village and to a lesser degree at Kouakougnanou-Bopri. The expansion of the mining activities of the Yaoure Gold Project may increase the population growth and expand other associated infrastructure and economic activities, possibly reducing the visual quality of the visual resource further if not managed. Therefore an overall cumulative degradation of the sense of place and visual resource quality is predicted.			
Likelihood / Probability	1 = Unlikely	2 = Possible	3 = Likely	**4 = Definite likelihood**
	Definite likelihood: Since mitigation measures may not reduce the visual impact sufficiently due to the scale of the proposed infrastructure and the close proximity of Allahou Bazi/Angovia village (less than 1km).			
Duration	1 = Short term	2 = Medium term	4 = Long term	**4 = Permanent**

Impact	**Infrastructure aesthetically incompatible with surrounding landscape. (Construction, operational and closure phase)**			
	Permanent: Potential impacts could be mitigated or remediated once operations cease at the end of life of mine with rehabilitation programs but the scale and extent of the operations will modify the area permanently.			
Extent / Spatial	1 = Localised	2 = Site	**3 = Wider and Adjacent Region**	4 = National / International
	Wider and Adjacent Region: The scale, dimensions and nature of the proposed infrastructure will allow extended views thereby influencing the wider region.			
Magnitude / Scale	1 = Low	2 = Minor	**3 = Moderate**	**4 = High**
	Moderate to High: Refer to Table 3-4.			
Resource/Receptor Sensitivity/ Importance of Value	**2 = Low**	4 = Moderate Low	6 = Moderate	8 = High
	Low: localised visual perceptions of the economically marginalised communities of the population may be influenced rather by the short term economic and job opportunities that will exist rather than the direct visual perception of the project.			
Significance of the impact	1 – 20 = Negligible	21 – 56 = Low	**57 – 92 = Medium**	93 – 128 = High
	Medium: Although the likelihood, duration, spatial extent and magnitude score are relative high, the receptor sensitivity score are low. This will ultimately reduce the significance of the Infrastructure aesthetically incompatible with surrounding landscape impact to a medium significance score and therefore a moderate impact.			

Table 4-3: Landscape scarring

Impact	**Landscape Scarring (Construction, operational and closure phase)**			
Nature	**Negative**		Positive	
	Excessive clearing and stripping of topsoil for site preparation, temporary access road, the need to keep servitudes clear of vegetation, cuts and fills and unnatural topographical features (TMF and WRD) will result in landscape scarring and therefore a negative impact.			
Nature of Impact	**Direct**		Indirect (Secondary)	**Cumulative**
	Excessive clearing and stripping of vegetation and topsoil for mine infrastructure will lead to direct landscape scaring. This together with possible clearance for power lines and pipelines could result in a cumulative impact in terms of degradation of the visual resource and sense of place.			
Likelihood / Probability	1 = Unlikely	2 = Possible	**3 = Likely**	4 = Definite likelihood
	Likely: As vegetation and topsoil removal will cause landscape scaring in the area.			
Duration	1 = Short term	2 = Medium term	**4 = Long term**	4 = Permanent
	Long term: Potential impacts could be mitigated or remediated once operations cease at the end of life of mine with reforestation and rehabilitation programs.			
Extent / Spatial	1 = Localised	2 = Site	**3 = Wider and Adjacent Region**	4 = National / International
	Wider region: As clearance for access/haul roads and utility servitudes will also be required.			
Magnitude / Scale	1 = Low	2 = Minor	**3 = Moderate**	**4 = High**
	Moderate to High: Please refer to Table 3-4.			
Resource/Receptor Sensitivity/ Importance of Value	**2 = Low**	4 = Moderate Low	6 = Moderate	8 = High
	Low: Localised visual perceptions of the economically depressed communities of the population may be influenced rather by the short term economic and job opportunities that will exist rather than the direct visual perception of the project.			
Significance of the impact	1 – 20 = Negligible	21 – 56 = Low	**57 – 92 = Medium**	93 – 128 = High
	Medium: Although the likelihood, duration, spatial extent and magnitude score are relative high, the receptor sensitivity score are low. This will ultimately reduce the significance of the landscape scarring impact to a medium significance score and therefore a moderate impact.			

Table 4-4: Alteration of current landscape character and sense of place

Impact	**Alteration of current landscape character and sense of place**			
Nature	**Negative**	Positive		
	Artisanal mining activities that have continued from historic times give the northern section uniqueness and a distinctive sense of place and may be limited and altered by the proposed expansion of commercial mining activities, thereby changing the cultural transformations and traditions associated with the historic use and habitation of the surrounding area. The construction of the TMF, WRD's and associated infrastructure may change the spatial form and character of the natural landscape and thereby the current uniqueness and distinctiveness of the current landscape character, especially in the northern section.			
Nature of Impact	**Direct**	Indirect (Secondary)	**Cumulative**	
	From the baseline information the area most vulnerable to an alteration of its current sense of place and landscape character is the northern section of the proposed Yaoure Gold Project, mainly due to the scale and extent of the proposed operations. Expansion of the commercial mining activities will potentially limit and restrict artisanal mining and therefore have a distinct direct impact on the historic sense of place within the northern section. The change to the fabric and character of the landscape caused by the physical presence of a development of the proposed Yaoure Gold Project will have a direct impact and will disturb a large percentage of the proposed project site directly. The size and scale of the WRD's and TMF will change the topography significantly and as a result alter the current landscape. The expansion of the mining activities of the Yaoure Gold Project may increase the population growth and expand other associated infrastructure and economic activities, possibly changing the landscape character and sense of place in the south-eastern and south-western sections. Therefore an overall cumulative impact on the current landscape and sense of place is predicted.			
Likelihood / Probability	1 = Unlikely	2 = Possible	3 = Likely	**4 = Definite likelihood**
	Definite likelihood: Since mitigation measures may not reduce the landscape impact sufficiently due to the scale of the proposed infrastructure and the close proximity of artisanal mining activities (within the infrastructure footprint).			
Duration	1 = Short term	2 = Medium term	4 = Long term	**4 = Permanent**
	Permanent: Potential impacts could be mitigated or remediated once operations cease at the end of life of mine with rehabilitation programs but the scale and extent of the operations will modify the landscape character and sense of place of the surrounding area permanently.			

Impact	**Alteration of current landscape character and sense of place**			
Extent / Spatial	1 = Localised	2 = Site	**3 = Wider and Adjacent Region**	4 = National / International
	Wider and Adjacent Region: The scale, dimensions and nature of the proposed infrastructure will allow extended views and may alter the economic activities/population growth in the region thereby influencing the landscape and sense of place in the wider region.			
Magnitude / Scale	1 = Low	2 = Minor	**3 = Moderate**	**4 = High**
	Moderate to High: Refer to Table 3-4.			
Resource/Receptor Sensitivity/ Importance of Value	**2 = Low**	4 = Moderate Low	6 = Moderate	8 = High
	Low: Localised visual perceptions of the economically marginalised communities of the population may be influenced rather by the short term economic and job opportunities that will exist rather than preserving the landscape character and sense of place of the surrounding area.			
Significance of the impact	1 – 20 = Negligible	21 – 56 = Low	**57 – 92 = Medium**	93 – 128 = High
	Medium: Although the likelihood, duration, spatial extent and magnitude score are relative high, the receptor sensitivity score are low. This will ultimately reduce the significance of the alteration of current landscape character and sense of place impact to a medium significance score and therefore a moderate impact.			

5.0 MANAGEMENT AND MONITORING REQUIREMENTS

5.1 Impact Mitigating and Management Requirements

The aim of mitigation is to avoid, reduce and where possible remedy or offset, any significant negative (adverse) effects on the environment arising from the proposed activity (GLVIA; 2013).

In considering measures to effect mitigation, there are three rules to consider. Mitigation measures should be:

- Economically feasible;
- Effective (time allowed for implementation and provision for management/maintenance); and
- Visually acceptable (within the context of the existing landscape).

To address these measures the following principles should be considered:

- Mitigation should be planned to fit into the existing landscape character. They should respect and build upon landscape distinctiveness;
- Mitigation should primarily aim to blend the proposed development into its surroundings and generally reduce its visibility; and
- It should be recognised that many mitigation measures, especially planting/rehabilitation, are not immediately effective.

General Recommendations

Mitigation measures may not reduce the visual impact significantly as the proposed activity cannot be screened sufficiently, mainly due to the scale and dimensions of the proposed infrastructure. The mitigation measures for the proposed activity will need to focus on effective rehabilitation of the disturbed areas.

Site Preparation and Maintenance

- The minimum amount of existing vegetation and topsoil should be removed from construction areas. Ensure, wherever possible, all existing natural vegetation is retained;
- Eradication of vegetation should be done in a ‘natural manner’, avoiding harsh straight lines;
- All areas affected by the activity will need to be rehabilitated and re-vegetated. This includes the areas beyond the Yaoure Gold Project such as temporary access roads, etc.;
- Rehabilitate disturbed areas as soon as practically possible after construction. This should be done to restrict extended periods of exposed soil;

- The sites should be kept neat and tidy at all times; and
- Litter and dust management measures should be in place at all times.

Buildings and Structures

Structures that are required to be built from steel or concrete can be painted a dark natural tone fitting with the surrounding environment. Olive greens and tans can be used at the base of buildings, fading to lighter colours, with the top section of the buildings painted a light grey to merge with the skyline. Tall structure's roofs should be painted a 'dirty' grey or light blue. A principle to note is that lighter tones advance toward the viewer while darker tones recede from the viewer. Pure whites, blacks and bright colours should be avoided. To reduce the potential of glare external surfaces of buildings and structures should be articulated or textured to create interplay of light and shade. Avoid shiny or bare metal. It is advisable to direct the slope of roofs away from critical views (e.g. Allahou Bazi/Angovia village).

Landscaping and Design

It is recommended that the TMF and WRD's be designed with the aim of closure in mind. The design process should specifically address the geometry of the WRD's, especially WRD A. The maximum height, area and shape of the WRD's should be designed with regard to the area of land available, and as far as practical the final angle and shape of the WRD's should blend with the natural landscape, providing that surface stability can be achieved. Where appropriate the TMF and WRD's should have a geometry that is irregular and does not look made-made.

The gradient of the side slopes must be designed to accommodate self-succession of natural vegetation. Long unbroken slopes allow surface runoff to accelerate and may produce erosion gullies. For these reasons it is recommended to design slopes of no greater than 20°, with benches every 7 - 10 metres of vertical height. Slopes below 20° will have reduced erosion hazards and will have a better change for re-vegetation to be successful.

An ecological approach to rehabilitation and vegetative screening measures, as opposed to a horticultural approach to landscaping should be adopted. For example communities of indigenous plants enhance bio-diversity and blend well with existing vegetation. This ecological approach to landscaping costs significantly less to maintain than conventional landscaping methods and is more sustainable. A registered landscape architect should be consulted for this purpose. It is important that landscaping be done concurrently from the onset of construction and throughout the operational phase and to rehabilitate exposed areas as soon as possible after construction activities are complete. Only indigenous vegetation should be used for rehabilitation / landscaping purposes.

Trees and shrubs can be used to screen structures and break stark contrasting lines if carefully planned and positioned. Where structures are silhouetted when viewed from local roads, the harsh lines can be broken by planting fast growing indigenous trees along the edges of the WRD's and TMF. Encouraging vegetation growth in disturbed

areas can reduce the visual scarring of the landscape and potentially reduce the visual impacts on potential visual receptors. The re-vegetation of the disturbed areas around the proposed infrastructure, including on the WRD, during the operational phase should be considered only if it does not interfere with operations or pose a risk to the health and safety of people and animals.

The TMF and WRD's geometry and design should be optimised considering not only construction but rehabilitation and re-vegetation costs and to provide suitable final land forms for the establishment of mixed native woodland thereby minimising the long term visual impact of the infrastructure by creating acceptable landforms compatible with the adjacent landscape. It is recommended that a registered Professional Landscape Architect assist with the final design and rehabilitation plan for the WRD's and TMF.

Access Roads

During construction of the relevant infrastructure, construction roads will require an effective dust suppression management programme such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface. Where a paved surface is required use dark paving materials that complement the natural brown colours and textures of the soil and rock in the area rather than light coloured materials i.e. concrete colours should be avoided.

Adjacent Land Uses

In areas where dwellings are directly affected by the proposed infrastructure mainly on the southern outskirts of Allahou Bazi / Angovia village, the residents should be consulted to discuss possible mitigation measures such as berms, screen planting, or walls were necessary. Where the WRD's is in close proximity to the local roads, care must be taken to retain a sufficient visual barrier (minimize vegetation removal and screen planting if necessary) so as to minimise the effect on motorist utilising the road.

Light Pollution

Light pollution should be seriously and carefully considered and kept to a minimum wherever possible as light at night travels great distances. Security flood lighting and operational lighting should only be used where absolutely necessary and carefully directed, preferably away from sensitive viewing areas (e.g. nearby village of Allahou Bazi / Angovia and local roads). Wherever possible, lights should be directed downwards and shielded so as to avoid illuminating the sky and minimizing light spills.

Dust Suppression

During the construction and operation of the mine measures must be taken to reduce dust, as cumulatively this could lead to a visual impact on a wider audience-due to the scale of the dust that could be generated. Suitable dust suppression must be undertaken during construction and active dust management must be undertaken when the infrastructure and activities associated with the project becomes operational. In addition,

the retention of vegetation and the re-establishment of groundcover will automatically reduce (mitigate) particulate emissions associated with wind erosion.

5.2 Residual Impacts

The scale and extent of the proposed components, especially the TMF and WRD's will permanently modify the topography and landscape of the project area. The visual impact of these project components will prevail even with the implementation of management measures (Please refer the Figure 3-3, Figure 3-4, Figure 3-5 and Figure 3-6).

5.3 Monitoring Requirements

During the construction and operational phase a visual monitoring programme would largely be based on visual reconnaissance at ground level. This would be based on parameters such as the visibility of lights at night from surrounding visual receptors and airborne dust (refer to Table 5-1).

Concurrent rehabilitation should be implemented by the Environmental Officer with the support of the Mine Manager.

At closure the success of rehabilitation would be based on the rate and percentage of vegetation recovery. Monitoring will continue after closure to ensure that the rehabilitation is successful and that the vegetation is self-sustaining. The success of rehabilitation will also largely be dependent upon the control of invasive or alien species.

Table 5-1: Monitoring Plan

Impact	Monitoring Locations	Parameters	Person Responsible	Frequency
Visibility of lights at night	At local visual receptor areas (e.g. villages)	Disturbance to sensitive visual receptors within the project study area.	Environmental Officer	Annually
Vegetation growth	TMF, WRD's, rehabilitated infrastructure and plant areas	Vegetation density, species analysis, soil fertility	Environmental Officer	Annually for 3 years after closure
Airborne dust	Based on air quality assessment report	Based on air quality assessment report	Environmental Officer	Quarterly

6.0 SUMMARY AND CONCLUSION

6.1 Gap Analysis

The following assumptions and limitations are applicable to this study:

- The basis for this assessment is that scenic wilderness areas form the core of eco-tourism due to the high positive aesthetic appeal;
- Site layout plans of the proposed project as dated 21 April 2015 (Preliminary Infrastructure Plan, Map Number 7879140169-0002) were used for the purposes of this assessment. Any changes to these site layout plans are not addressed within this report;
- This level of assessment excludes surveys to establish viewer preference and thereby their sensitivity. For example; localised visual perceptions of the economically marginalised communities of the population may be influenced rather by the short term economic and job opportunities that will exist rather than the direct visual perception of the project;
- The major limitation of this study is the unavoidable subjectivity relating to the assessment of landscape and visual impacts; and
- Findings will also be restricted to information on hand, as well as the quality and extent of spatial data (e.g. 1m contours extent limited to approximately 10km x 10km area). The spatial extent of contours available directly limited the extent of the ZVI.

6.2 Conclusion

The potential visual impact of the proposed Yaoure Gold Project has been evaluated against international accepted criteria to determine the impact it will have on the landscape character and the viewers that have been identified in the project area.

Visual impacts would result from the construction and operational phase of the proposed Yaoure Gold Project. Specifically, impacts would result from the TMF, WRD's and ancillary surface infrastructure being seen from sensitive viewpoints (especially residents) and the negative effects (relating primarily to visibility and view distance) on the scenic quality and sense of place of the landscape of the project area.

It was determined that the magnitude of the various visual impacts of the proposed Yaoure Gold Project would be High mainly due to high visibility (e.g. ZVI), the proximity of villages/local roads to the proposed infrastructure (view distance), and the moderate visual absorption capability of the surrounding areas. The fact that the visual receptors were rated as Low sensitive resulted in a Medium Negative significance for the Yaoure Gold Project, assuming all mitigation measures suggested in this report are followed and successfully implemented. Limited surface disturbance and prompt rehabilitation are prerequisite conditions if the severity of impact is to be reduced.

7.0 REFERENCES

Amec Foster Wheeler Earth & Environmental UK Ltd, 2014, Biodiversity and Ecology – Strategic pre-Scoping Study Amara Mining Côte d'Ivoire SARL. Yaoure Gold Project, Côte d'Ivoire. London

Amec Foster Wheeler Earth & Environmental UK Ltd, 2014, Yaoure Gold Project Scoping Report and Terms of Reference for Environmental and Social Impact Assessment. Yaoure Gold Project, Côte d'Ivoire. London.

Hull, R.B. and Bishop, I.E., 1988, Scenic Impacts of Electricity Transmission Towers: The Influence of Landscape Type and Observer Distance. Journal of Environmental Management. 1988 (27) 99-108

Landscape Institute and the Institute of Environmental Assessment and Management, 2013, Guidelines for Landscape and Visual Impact Assessment (GLVIA). Third Edition, Routledge.

APPENDICES

APPENDIX A

Likelihood:

1 = Unlikely	2 = Possible	3 = Likely	4 = Definite Likelihood
Low probability of occurrence with the implementation of management measures	Possible that impact may occur from time to time	Distinct possibility that impacts will occur if not managed and monitored	Impacts will occur even with the implementation of management measures

Duration:

1 = Short term	2 = Medium Term	3 = Long Term	4 = Permanent
Possible to immediately or within a short period of time mitigate / immediate or fairly quick progress with management implementation <3 yr	Impacts reversible within the Life of Mine +3 to 12 yrs	Impacts will only cease after the operational life +12 yrs	Long term, beyond mine closure or irreplaceable

Extent:

1 = Localised	2 = Confined to site	3 = Wider area of Influence	4 = National / International
Localised to specific area	Confined to site	The extent of the impacts will affect the wider area of Influence	Importance of the impact is of national and or international importance

Magnitude:

1 = Low	2 = Minor	3 = Moderate	4 = High
Minor deterioration Nuisance Will not cause any material change to the value or function of the receptor Emissions comply with legal limits Emissions contained within footprint	Moderate deterioration, partial loss of habitat / biodiversity/ social functions or resources, Emissions at times exceed legal limits Emissions reach outside project footprint	Reversible although substantial illness, injury, loss of habitat, loss of resources, deterioration of functions. Impact on biodiversity Causes a change in the value or function of receptor but does not fundamentally affect its overall viability Emissions regularly exceed legal limits Emissions will affect the wider region	Mainly irreversible Causes a significant change in the environment affecting the viability, value and function of the receptors Substantial impact on biodiversity Death/ loss of receptors Emissions do not comply with regulations, Extinction of Red List species

Sensitivity:

2 = Low	4 = Moderate Low	6= Moderate	8 = High
Areas already subjected to significant degradation Non-designated or locally designated sites/habitats Non-sensitive receptor with regards to the impact type (e.g. noise receptors) No vulnerable communities	Partially degraded area Sensitive receptors present Small number of vulnerable communities present	Regionally designated sites / habitats Regionally rare or endangered species Moderately sensitive receptor with regard to the impact type Some vulnerable communities present	Nationally or internationally designated sites/habitats Species protected under national or international laws / conventions High sensitivity with regard to the impact type High number of vulnerable communities present High dependency

A significance rating for each impact has to be reached by taking consideration of the likelihood, duration, extent, and magnitude and sensitivity ratings. The significance rating has to be calculated in line with these findings.

The formula to use to assign a significance class:

Significance = (duration + extent + magnitude) x sensitivity x likelihood

Significance

Score	Significance Class
1 to 20	Negligible
21 to 56	Low
57 to 92	Medium
93 to 128	High

APPENDIX C – Photos Survey

Figure C-1

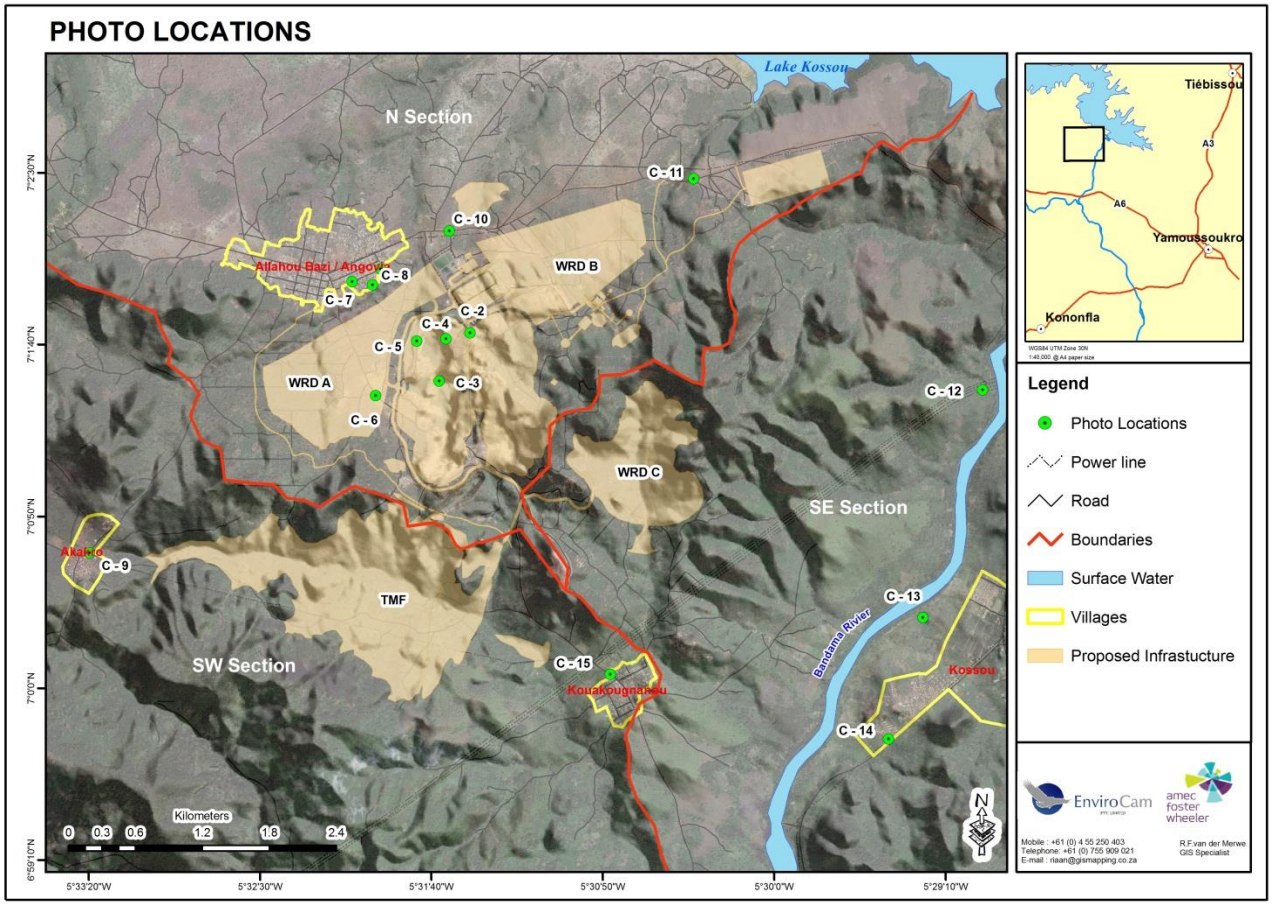


PHOTO LOCATIONS
Lake Kossou
N Section
SE Section
SW Section
WRD A
WRD B
WRD C
TMF
Alfahou-Bazi / Angovia
Akaffo
Kouakougnassou
Kossou
Bandama River
C - 2
C - 3
C - 4
C - 5
C - 6
C - 7
C - 8
C - 9
C - 10
C - 11
C - 12
C - 13
C - 14
C - 15
Kilometers
0 0.3 0.6 1.2 1.8 2.4
7°2'30"N
7°1'40"N
7°0'50"N
7°0'0"N
6°59'10"N
5°33'20"W
5°32'30"W
5°31'40"W
5°30'50"W
5°30'0"W
5°29'10"W
Tiébissou
A3
A6
Yamoussoukro
Kononfla
Legend
Photo Locations
Power line
Road
Boundaries
Surface Water
Villages
Proposed Infrastucture
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Figure C-2: Current mining infrastructure: View towards the east

Figure C-3: Existing open pit: View in western direction

Figure C-4: Existing open pit: View in a south south-western direction

Figure C-5: Existing open pit: View in an easterly direction

Figure C-6: Degraded primary and secondary vegetation: View in a westerly direction

Figure C-7: View from Allahou Bazi/Angovia in a south south-eastern direction towards the existing works

Figure C-8: View from Allahou Bazi/Angovia in a south south-eastern direction towards the existing works

Figure C-9: View of the village of Akakro in a southern direction

Figure C-10: View from local road towards Amara security gate in a southern direction

Figure C-11: View towards the southeast from a local road

Figure C-12: Power lines from Kossou hydroelectric power station: view in a north-eastern direction

Figure C-13: Unregulated mining activities along the banks of the Bandama River: view towards in a north-western direction

Figure C-14: Outskirts of Kossou village: View in a north-western direction

Figure C-15: Village of Kouakougnanou-Bopri: view in a north-western direction