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Newcastle Landfill Site: Visual Impact Assessment

Report

Version 1

04 April 2018

GCS Project Number: 17-0212

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Report
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EXECUTIVE SUMMARY

GCS Water and Environmental (Pty) Ltd was appointed by Envitech Solutions (Pty) Ltd to carry out a Visual Impact Assessment (VIA) on the proposed development of a G:L:B+ landfill site in the Newcastle region, Kwazulu Natal.

From a visual perspective, the effect that the landfill site will have in the environment based on the dimensions of the infrastructure was modelled to quantify the extent of its visual effect. Potential receptors were initially identified in a 10km radius which included the Richview, Fairleigh, Equarand, Sunset View, Lennoxton, Kilbarchan and Ingagane areas. In addition to the identified settlement areas, transportation routes within the 10km radius were identified as the N11 and boundary street as the most significant transport receptors.

The results of the VIA reveal that the topography of the region leads to 62% of the area being screened out of visibility, while 38% of the potential zone of influence (defined as a 10 kilometre buffer) is visually exposed with varying degrees of intensity. The majority of the screened areas lie to the North and South of the development. Visual exposure to the Eastern region is largely dependent on the height of the proposed infrastructure elements, with a threshold of 5 meters vertically.

The remainder of areas that are visually exposed and their degree of visual exposure largely depends on the vertical height of the infrastructure. Importantly, the visual exposure does not expand to the northern region where a large number of urban settlements are found (Newcastle), and the transport routes are effectively screened from visual exposure to the landfill site. Medium to high degrees of exposure are limited to the immediate plateau that of the landfill location, with medium to low degrees expanding to the agricultural disperse settlements identified. Visual guidelines for the development and operational phase of the proposed landfill site have been provided with the aim of minimising the visual affect that the Newcastle landfill site will have on the receiving environment.

Due to the nature of the development, the categorisation of the development places it in a high impact category, with the associated medium to high level impacts on the surrounding environment. The topography of the region is conducive to screening, and the viewshed results indicate that the majority of sensitive receptors will be screened out of visibility. Mitigation measures are therefore provided for the remaining percentage of receptors, which plays a minor role in the overall sensitivity rating after mitigation measures have been applied.

PROJECT COMPLIANCE

REQUIREMENT	STATUS
1. A specialist report prepared in terms of these Regulations must contain—	
(a) details of—	
(i) the specialist who prepared the report; and	✓
(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	✓
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	✓
(c) an indication of the scope of, and the purpose for which, the report was prepared;	✓
(cA) an indication of the quality and age of base data used for the specialist report;	✓
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	✓
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	✓
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	✓
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	✓
(g) an identification of any areas to be avoided, including buffers;	✓
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	✓
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	✓
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	✓
(k) any mitigation measures for inclusion in the EMPr;	✓
(l) any conditions for inclusion in the environmental authorisation;	✓
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	✓
(n) a reasoned opinion—	
(i) whether the proposed activity, activities or portions thereof should be authorised;	✓
(iA) regarding the acceptability of the proposed activity or activities; and	✓
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	✓
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	✓
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	
(q) any other information requested by the competent authority.	
2. Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	-

1 SPECIALIST DECLARATION OF INTEREST

I, Prevlan Chetty declare that –

- I act as the independent specialist in this Visual Impact Assessment (VIA) study;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist

Visual Impact Assessment

Specialist field

GCS (PTY) Ltd

Name of company

04/04/2018

Date

2 INTRODUCTION

Envitech Solutions (Pty) Ltd. has appointed GCS Water and Environment (Pty) Ltd. (GCS) to carry out a Visual Impact Assessment (VIA) for the proposed development of a G:L:B+ landfill site in the Newcastle region, Kwazulu Natal, South Africa. The proposed site on which this VIA is based on falls within the Newcastle Local Municipality, in the Amajuba District Municipality. The intention of the landfill site will be to service the municipal area with a general waste disposal site.

The development of surface infrastructure and cells related with the landfill operation could potentially have an adverse effect on the landscape character and visual aesthetics of the surrounding environment within 10km of any of the proposed surface infrastructure, defined as the potential zone of influence. The spatial extent and magnitude of the effect that the proposed infrastructure has on the receiving environment is influenced by the topography of the environment. In addition to this, the current region has a predominant grassland with disperse plantation landuse, and the development of a landfill site with the associated infrastructure will alter the immediate receiving environment.

The need therefore exists for a Visual Impact Assessment; hereafter referred to as 'VIA', to investigate any impacts that may adversely impact the natural landscape and visual environment. This report will apply qualitative techniques to address any resulting impacts that are anticipated as a result and consequence of the proposed mining operation, described in the detailed project description below:

The development of the landfill site is anticipated to be composed of the following key infrastructure elements:

- Landfill Cells
- Cover Material Stockpile
- Landfill Gas Extraction Plant
- Leachate Treatment Plant
- Gas Monitoring Probe
- Leachate Collection Dam
- Recycling//Transfer Area
- Wheel wash / workshop area
- Palisade Fencing
- Storm Water Channels

For the purpose of this assessment, infrastructure with the largest footprint and vertical offsets are envisaged to extrude a larger visual impact and have been prioritised for visual modelling. Such infrastructure includes:

1. Landfill Cells:
   - 6 cells in total (modelled at 5m offset), of which:
   - 3 large cells that range between widths 0f 170 meters to 250 meters and a constant length of 500 meters.
   - 3 smaller cells that range between widths of 130 meters to 220 meters and a constant length of 350 meters.

2. Cover Material Stockpile Area
   - Modelled at 6 meters high, 60 meters wide, 300 meters long.

3. Gas Extraction Plant
   - Modelled at 3 meters high across the footprint area of 15 meters by 25 meters.

4. Leachate Treatment Plant & Collection Dam
   - Leachate Plant Modelled at 6 meters high, across the footprint area of 58 meters long, 27 meters wide.
   - Collection Dam modelled in conjunction with the leachate plant due to proximity, with a height of 2 meters and a footprint size of 50 meters long and 40 meters wide.

Ancillary activities, including roads, palisade fencing, leachate lines, storm water channels and other ancillary infrastructure listed in the detailed project description have been excluded from detailed visual modelling due to their relatively small impact in relation to main infrastructure detailed above.

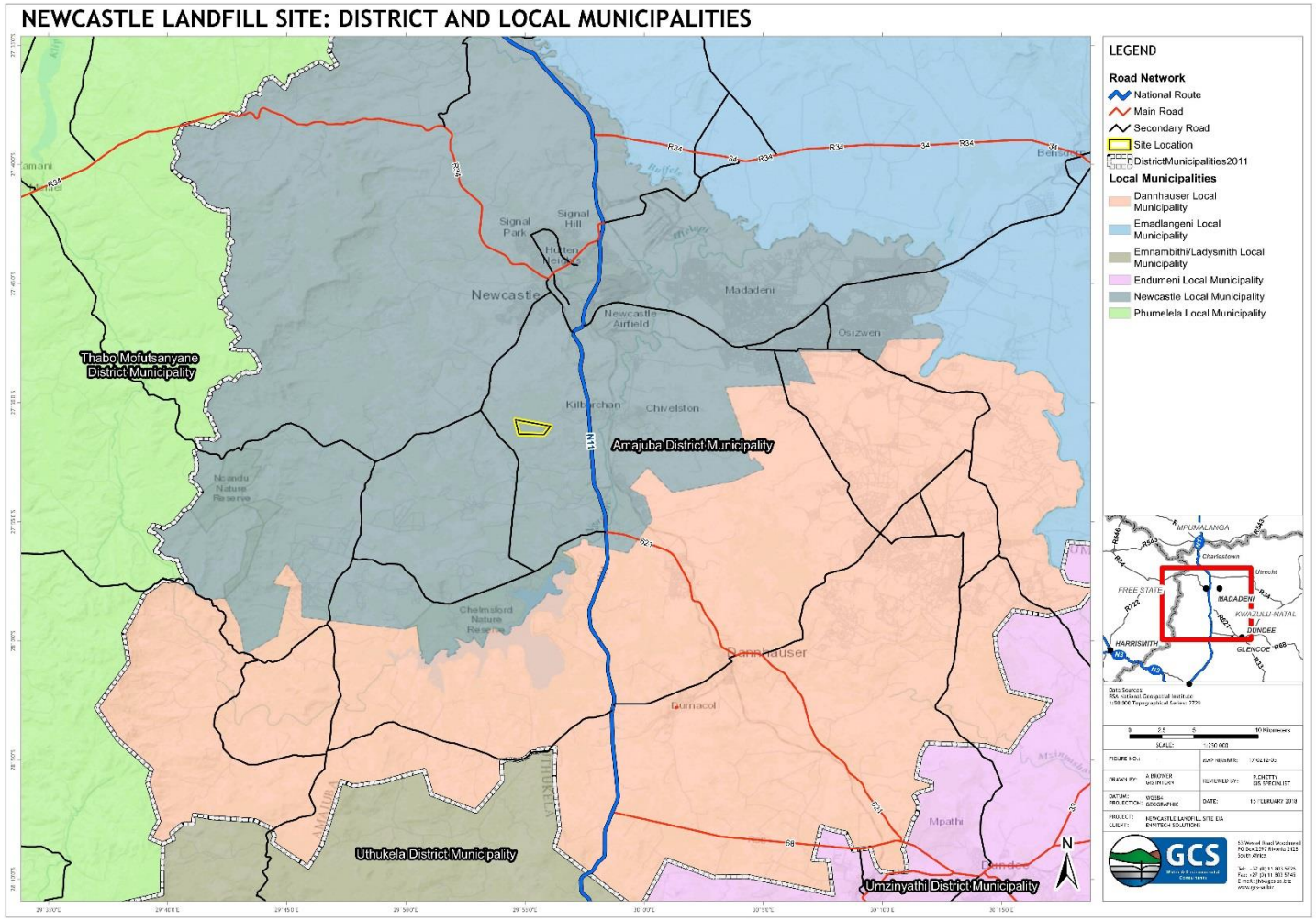

Figure 2-1 Regional Locality

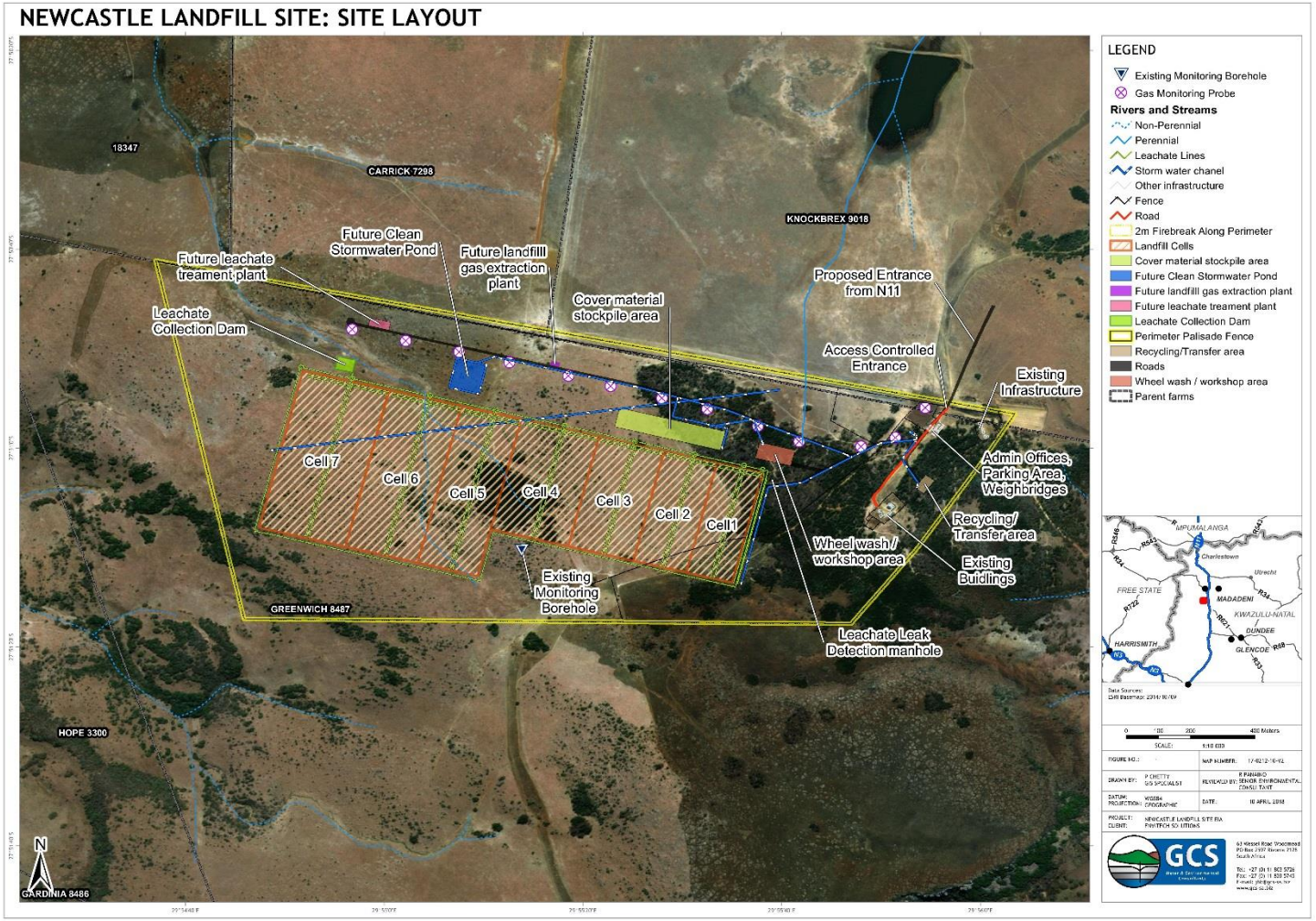

Figure 2-2 Newcastle Landfill Site - Project Layout

3 REPORT OVERVIEW AND SCOPE OF WORK

The scope of work entails a comprehensive visual assessment of all of the activities associated with the proposed mining operation. This includes:

- **Legal Framework** – Description of any local South Africa laws that prohibit or regulate the proposed mining activities as a result of specific zoning, height or visual intrusion / pollution used in this assessment.
- **Adopted International Standards and Guidelines** – Description of international regulations or best practice guidelines that were used in this assessment.
- **Information and data Sources -** Summary of the various sources of information used to compile this assessment and any associated gaps / limitations associated with such data sources.
- **Assumptions and Limitations** – Description of the assumptions and limitations associated with this report.
- **Description of the Receiving Environment-** Description of the following criteria that will determine the current status of the surrounding visual environment, including brief descriptions of the visual character, landscape quality, sense of place and quality of visual resource of the immediate and surrounding project area.
- **Impact Identification and Description -** Identifies any major impacts associated with the proposed mining activity on surrounding receptors (residents, motorists, and tourists). These impacts are based on visual modelling results and factors including the Visual Absorption Capacity, Visibility and Visual Exposure, Sensitive Receptors and the Visual Distance of Sensitive Receptors from the proposed activity; and the Magnitude / Intensity of Visual Impact.
- **Mitigation of Impacts** – Identifies the most feasible and practical way of mitigating any potential impacts on sensitive receptors. There are two categories of mitigation that will be identified in this section of the report.
    1. General (Generic) mitigation measure used to limit the visual impact of the landfill.
    2. Mitigation for specific critical receptors identified in the previous
- **Proposed EMP Control and Monitoring Plan** – Description of necessary plan that needs to be adopted to mitigate potential impacts resulting from the proposed activity and the associated ways in which the effectiveness of such measures can be monitored.

4 LEGAL FRAMEWORK

There are no specific legal requirements in the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) that specifically regulates activities that may infringe on the visual attributes of a region.

The National Heritage Resources Act, 1999 (Act No. 25 of 1999) provides legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes and requires that these areas are protected against physical and aesthetic change. No protected sites fall within the immediate study area.

Visual pollution is controlled, to a limited extent, by the Advertising on Roads and Ribbons Act (Act No. 21 of 1940), which deals mainly with signage on public roads.

The 'Guideline for involving visual & aesthetic specialists in EIA processes', by Oberholzer (2005) has been developed to provide guidelines and general good practices for the specialist visual input into the EIA process in South Africa. These guidelines are used extensively and will be used as a guide for this assessment (Please refer to **Table 3.1**).

Based on these guidelines, the proposed activity is a ***Category 5*** development with a high impact expected, meaning a ***Level 4 Assessment*** will be required for this comprehensive visual impact assessment.

VISUAL AND AESTHETIC SPECIALISTS GUIDELINE

Table 3.1 depicts the general expected level of visual impacts for various types of developments and environments. According to the categorisation of visual impacts (Oberholzer, 2005) the development and operational activity on sites is expected to have a very high visual impact. **Appendix A** shows a key that defines the categories of development as per Oberholzer (2005).

Table 3.1 Categorisation of visual impacts (Oberholzer, 2005)

Type of environment	Type of development (Low to high intensity)				
	Category 1 development	Category 2 development	Category 3 development	Category 4 development	Category 5 development
Protected/wild areas of international, national, or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural or historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	*High visual impact expected*
Areas or routes of low scenic, cultural or historical significance / disturbed	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	***High visual impact expected***
Disturbed or degraded sites / run-down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

5 INFORMATION AND DATA SOURCES

The study was conducted on the following base information:

- The South African National Geospatial Information (NGI) Topographic Map series (1:50 000)
- The Department of Environmental Affairs National Landcover Dataset (2014) derived from SPOT satellite imagery.
- Available reports from previous ESIA
- Layouts in drawing format supplied by the client
- 5m contour elevation datasets as acquired from the NGI
- The Landscape Institute with the Institute of Environmental Management and Assessment. 2002: Guidelines for Landscape and Visual Impact Assessment

6 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations are applicable to this study:

- All viewsheds were based on terrain level. As such these viewsheds do not incorporate distractive views in the form of vegetation or land-use (infrastructure, buildings, etc). An enhanced terrain model was created by GCS, incorporating the client supplied surface elevation information along with the regional NGI derived contours.
- The accuracy and extent of the receptors mapped relates to the accuracy of the landcover dataset used in this study. GCS has however validated the receptor identification process by a field visit, a heads up approach with satellite imagery and aerial photography.
- This level of assessment excludes perception surveys to establish viewer preference and thereby their sensitivity. For example; 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; and
- The major limitation of this study is the unavoidable subjectivity relating to the assessment of the visual impact. Findings will also be restricted to information on hand, as well as the quality of spatial data.

7 DESCRIPTION OF THE RECEIVING ENVIRONMENT

7.1 Landuse

The proposed project is located in the Newcastle Local Municipality which forms part of the Amajuba District Local Municipality. The predominant land-use in the region includes grasslands, cultivated land, small tracts of woodlands and Urban smallholdings. The region surrounding the mining PRA is made up of a combination of commercial agricultural activity, grasslands, woodlands, urban residential settlements and coal mining activity. There are various residential communities that are located within 10km's the proposed phase 1 development of the landfill site. Figure 6.3 shows the landuse classes for the project area.

7.2 Topography

The topography of the surrounding environment includes semi-mountainous terrain, while the proposed development itself lies on an elevated ridge. The elevation ranges from 1 180 meters above mean sea level (mamsl) to 1410 mamsl within a 10km region of the proposed development. Figure 6.3 shows the regional topography of the project area. Figure 6.1 below provides a graphical illustration of the regional topography from a West to East and North to South cross sectional view of the project area.

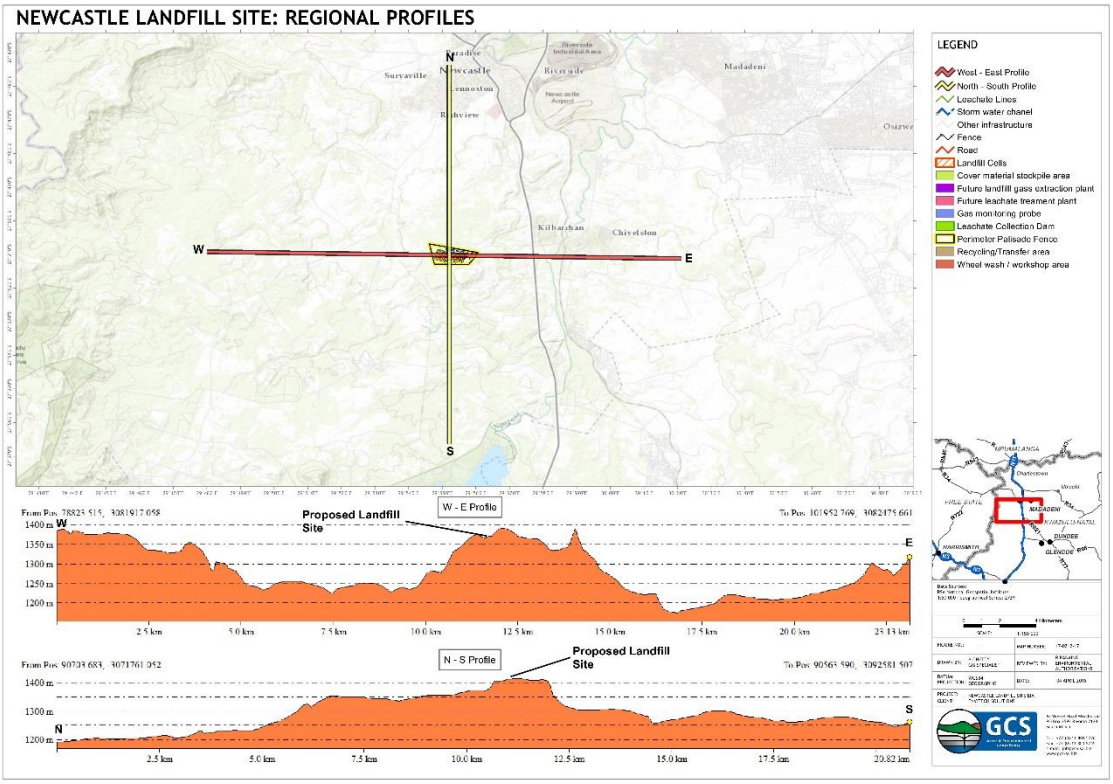

Figure 7-1 Regional Cross Section: Newcastle

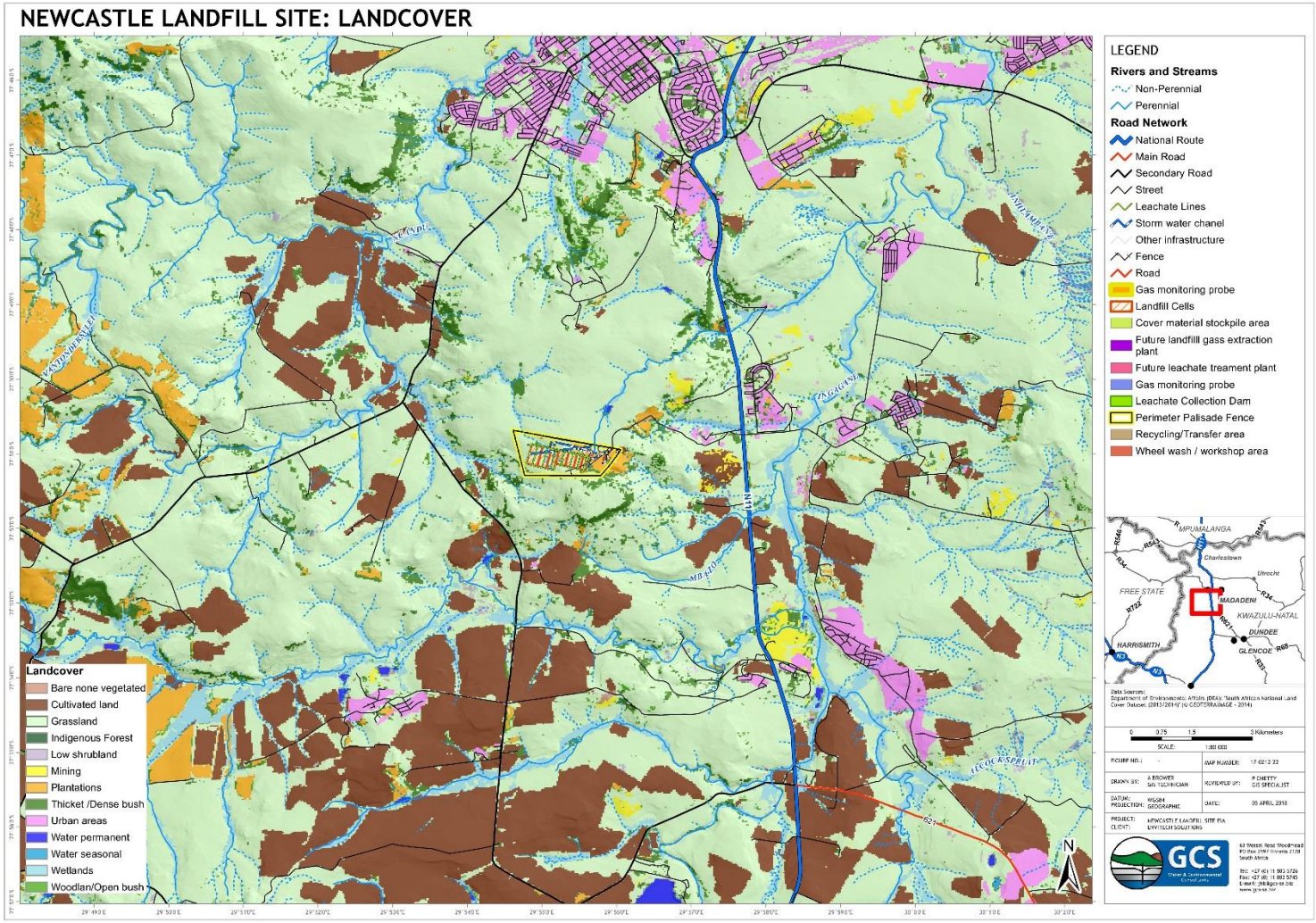

Figure 7-2 Newcastle Landuse

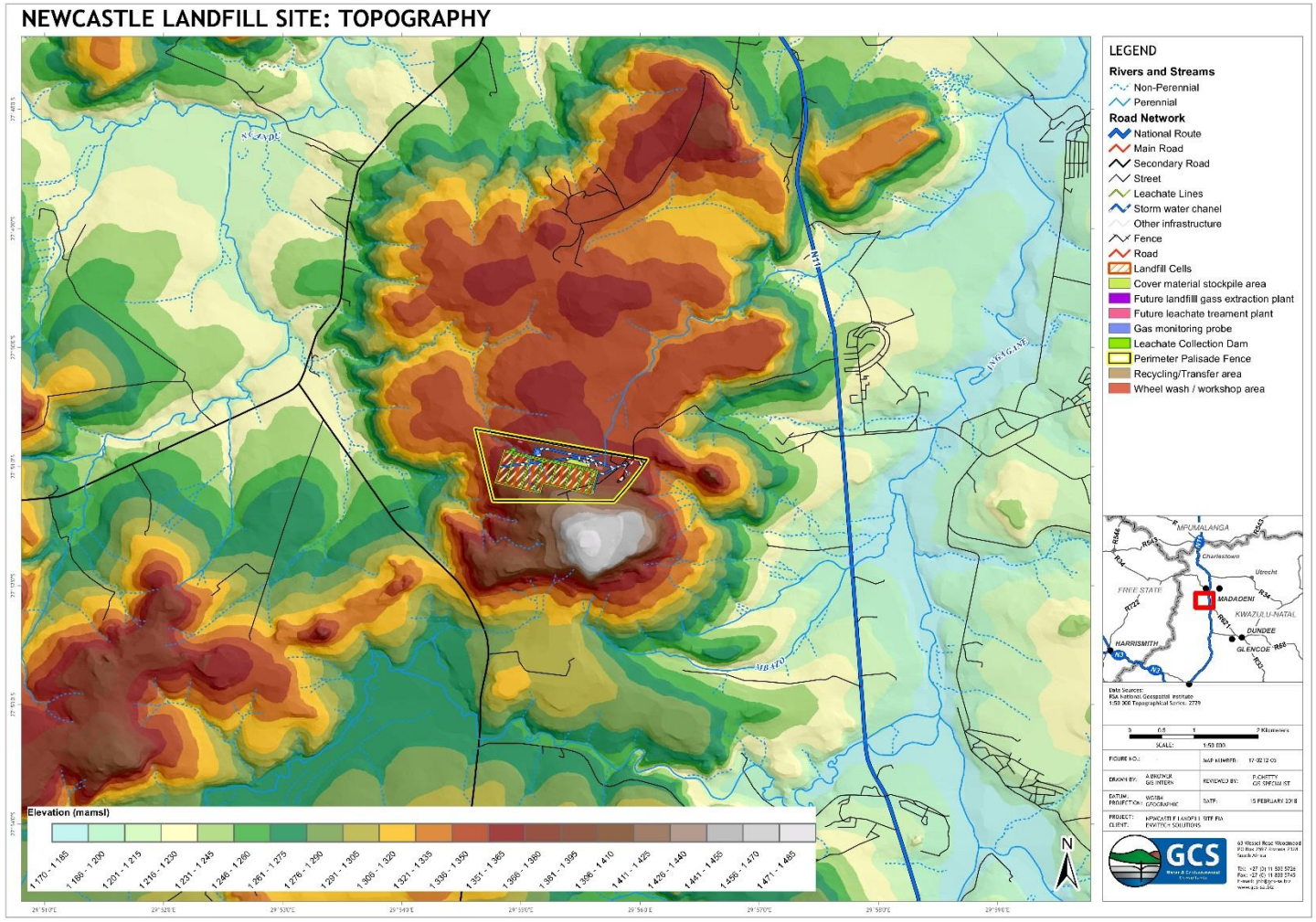

Figure 7-3 Newcastle Topography

7.3 Vegetation

Vegetation of the surrounding environment is predominantly identified as the Northern Kwazulu Natal Moist Grassland type for the proposed development area. The region is characterized by hilly and rolling landscapes supporting tall tussock grassland usually dominated by Themeda triandra and Hyparrhenia hirta. Open Acacia sieberiana var. woodii savannoid woodlands encroach up the valleys, usually on disturbed (strongly eroded) sites. Figure 6.4 below shows the regional vegetation, looking towards the Newcastle Landfill development site from the N11.

Figure 7-4 Newcastle vegetation - Field Visit (2018)

Figure 6.5 shows the regional vegetation for the project.

7.4 Tourism

While there are no significant tourist attractions in the immediate vicinity of the proposed Newcastle Landfill site, there are numerous Nature reserves, a National Parks, and potential tourism points of interest that can be accessed in routes in the vicinity of the proposed development. In particular, the N11 main route is the closest main road to the site, which links road users from the north to the Chelmsford Nature Reserve. Figure 6.6 shows the regional national parks and tourism spots as per the Department of Environmental Affairs.

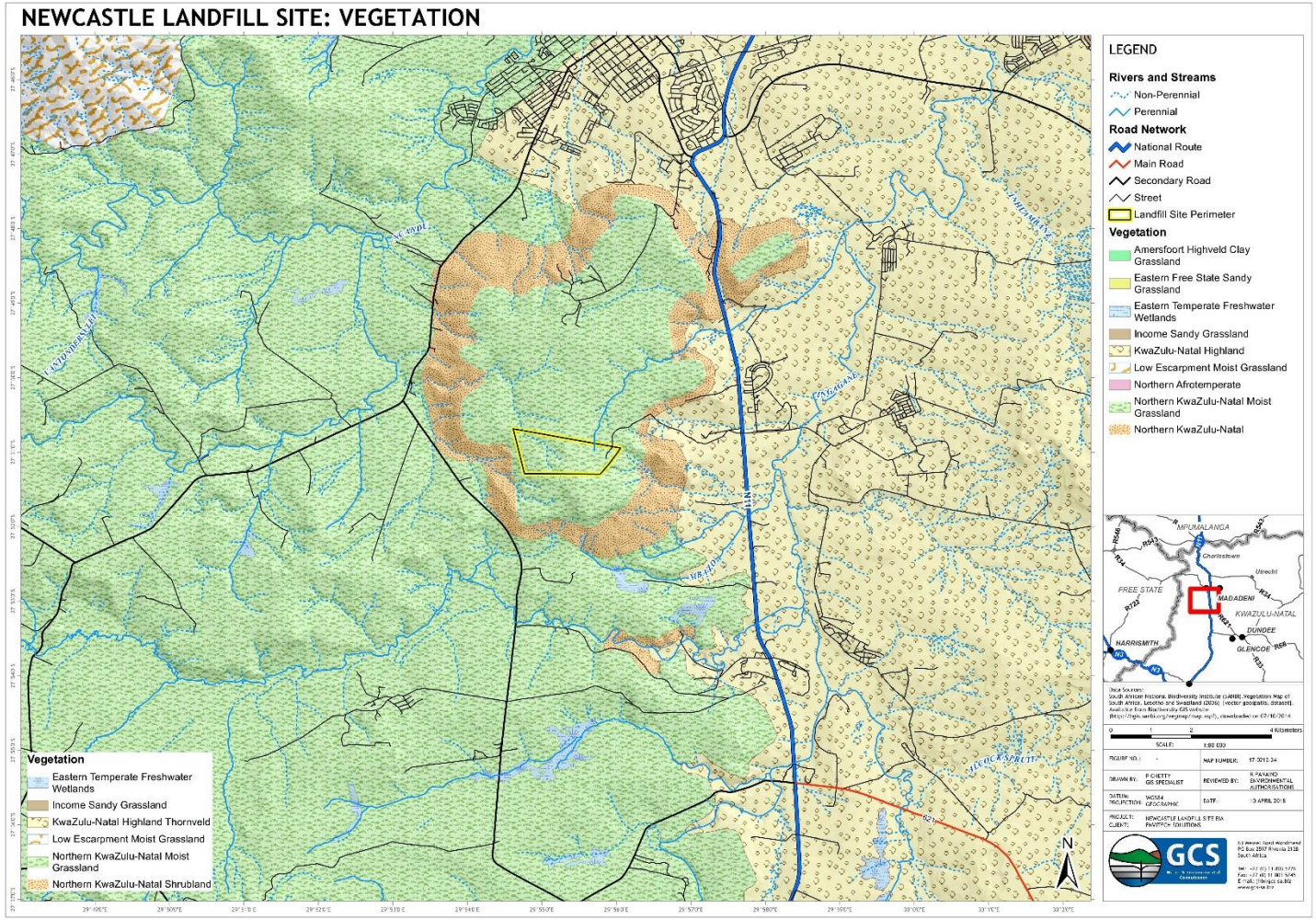

Figure 7-5 Newcastle Vegetation

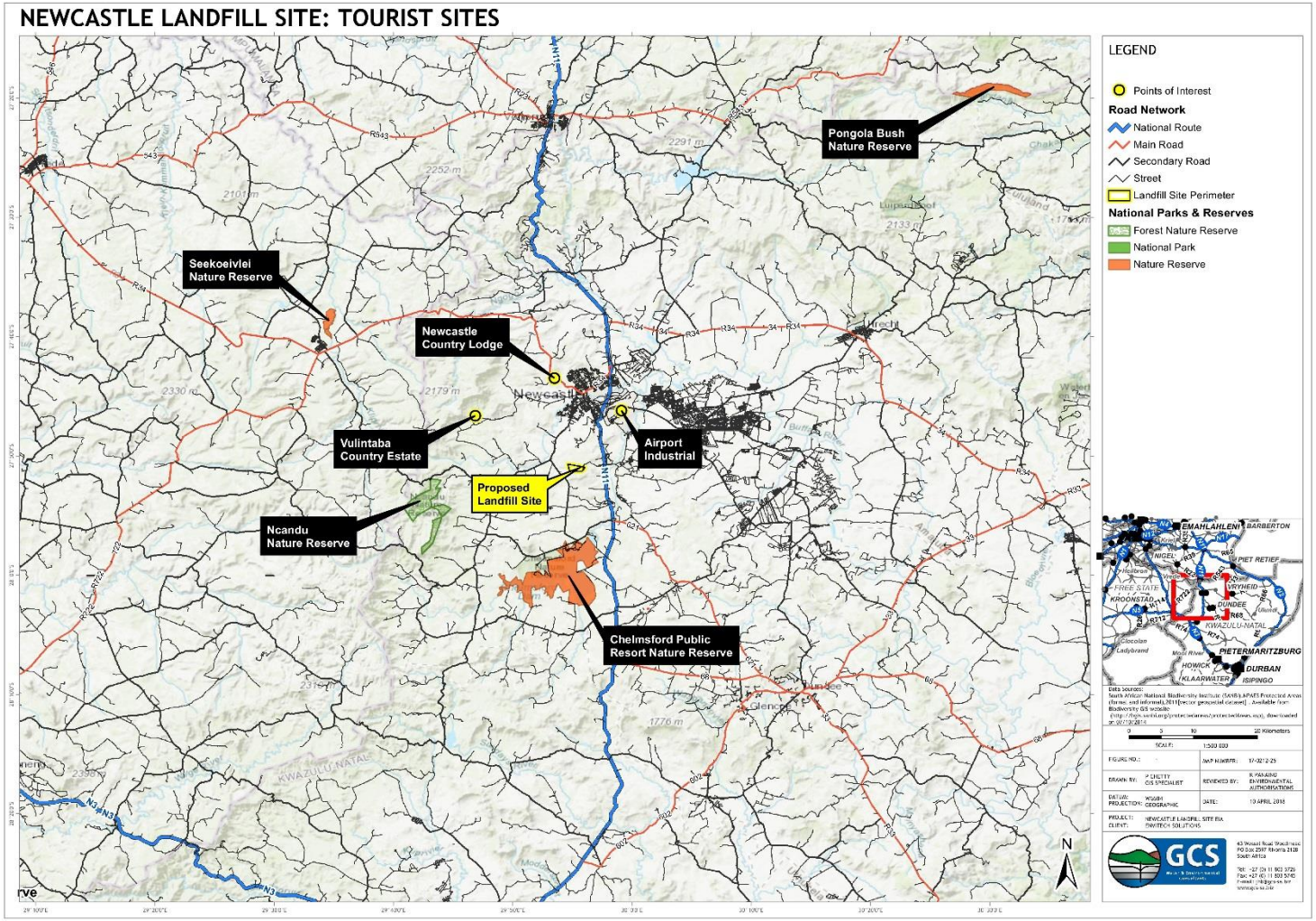

Figure 7-6 National Parks, Reserves and Tourist Sites

7.5 Sense of Place

As per the Newcastle Municipality IDP (2017-2018), the overarching principles that have been identified include:

- Sustainability
- Integrated development
- Equitable access to basic services and public facilities
- Efficient and effective delivery of services

One of the key development areas identified as part of the IDP includes improved access to basic service delivery, which includes water, sanitation, electricity, housing and waste removal and disposal. The proposed development of the landfill site is therefore in-line with the municipalities infrastructural requirements, as the need for the landfill site has already been established and motivated.

Given the hilly and rolling landscapes, with relatively undisturbed surrounding environments, the sense of place for the project area is defined as an area of medium scenic, cultural or historical significance. Photos 6.1 to 6. illustrate the sense of place description and provide in-field perspectives of the land use in the region.

Photo 7-1 Taken from Ballengeich train station, 5.7km away, looking towards project site

Photo 7-2 Taken from Fairleigh (Newcastle Central) 6.3km away looking towards the project site

Photo 7-3 Taken from corner of boundary road and unnamed road running closest to the site, 2.7km away.

Photo 7-4 Taken from Cecelia settlement AH 6.7km away, looking towards project site

7.6 Climate

Newcastle receives approximately 726mm of rain per annum with most rainfall occurring during the summer period. Newcastle historically receives the lowest rainfall in June and peak rainfall in December.

Figures 6.7 to 6.10 below represent the average rainfall, average temperature values, average wind speeds (Meteoblue, 2018) and an average wind rose (meteoblue) for Newcastle from the year 2009 to 2018.

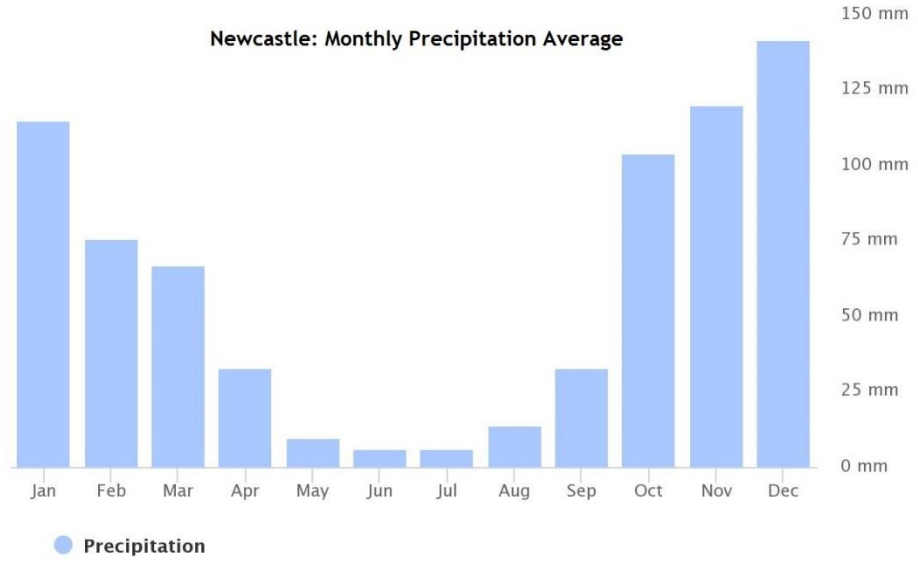

Figure 7-7 Average Rainfall Graph for Newcastle: 2009 - 2017

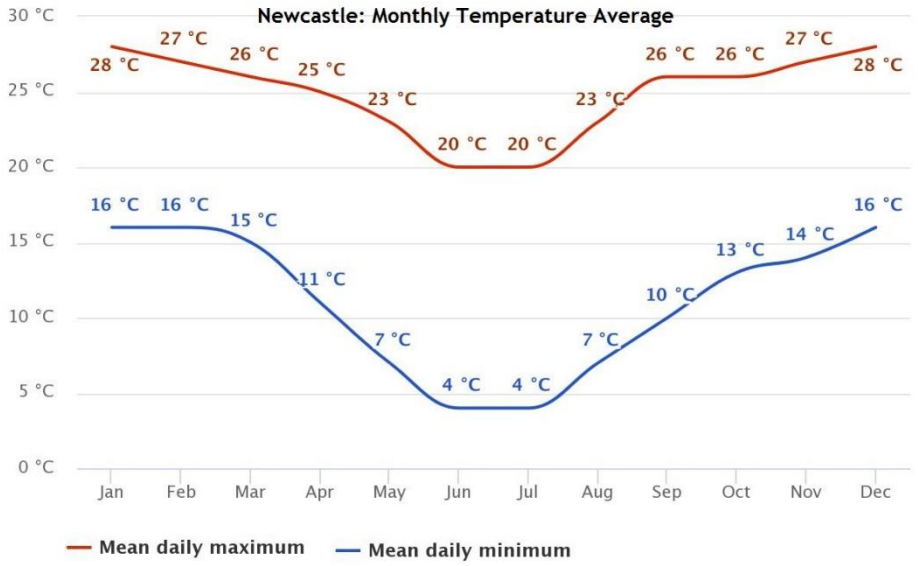

Figure 7-8 Average Temperature Graph for Newcastle: 2009 - 2017

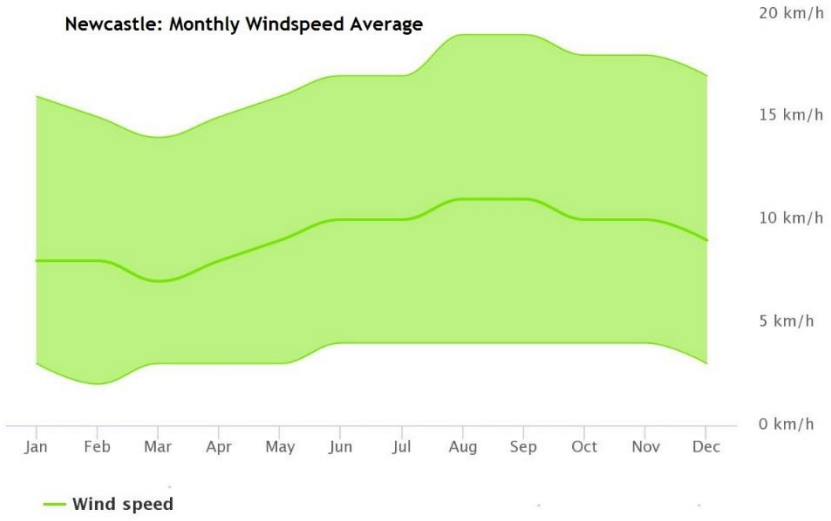

Figure 7-9 Newcastle Average and Maximum Wind Speed (km/h)

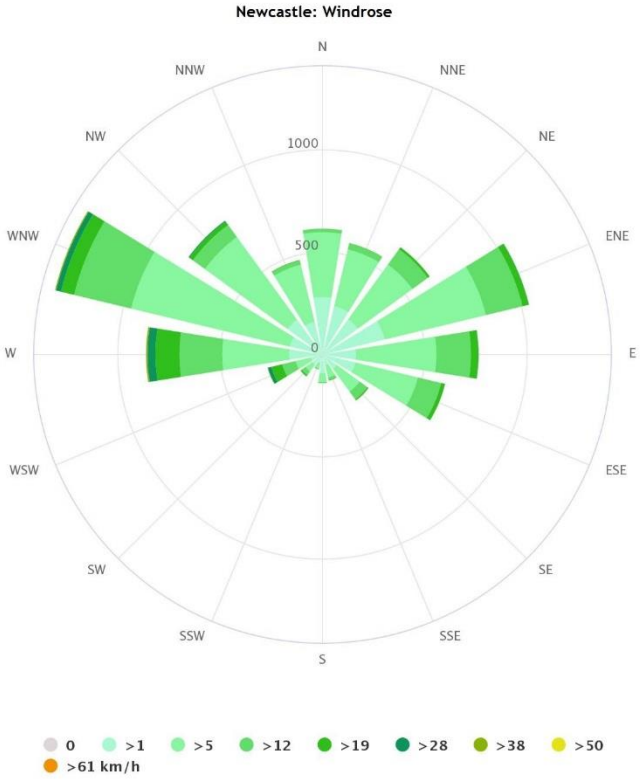

Figure 7-10 Newcastle Windrose

The prevailing wind direction blows from a West to East direction throughout the year with the wind speeds peaking in the August-September months to approximately 20 km/h.

8 IMPACT IDENTIFICATION AND DESCRIPTION

8.1 Sensitive / Critical Receptors

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;
- Adjacent Mines/Quarries; 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 (Please refer to Appendix A). 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.

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.

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 viewers. Motorists will therefore show low levels of sensitivity as their attention is focused on the road and their exposure to roadside objects is brief.

For this particular project, tourists would be travelling as motorists and have therefore been included in the motorist receptor categorisation. 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. While there may not be any tourist attractions in proximity to the project area, tourists may use the N11 and boundary street to travel to their destinations.

Neighbouring Mines/Quarries

2 significant mines / quarries were identified within the 10 kilometre radius of influence.

Afrisam Aggregate Newcastle is situated approximately 2 kilometres to the North East of the propose landfill site. SA Calcium Carbide is an opencast operation, approximately 6.2 kilometres to the South East.

An additional quarry was also identified to the south of the proposed landfill site, approximately 5.5 kilometres away.

The critical receptors identified for the proposed Landfill project includes residents (Urban settlements and sparsely located homesteads) and motorists. Any tourists have been included under motorists as their interaction with the environment is limited primarily to driving past the proposed landfill en route to tourist attractions in the Kwazulu Natal and Mpumalanga region which includes the Chelmsford Nature Reserve, the Nacandu Nature Reserve, the Vulintaba Country Estate and various accommodation holdings in the Newcastle Urban area.

Using ArcGIS, a buffer operation was conducted across the major infrastructure development features which include the Landfill Cells, Cover Material Stockpile, Stockpiles, the Gas Extraction Plant, the Leachate Treatment Plant and Collection Dam. The output of the buffer operation is used to identify a zone where varying degrees of influence are anticipated based on the description of the generalised topography in the region. The site specific topographical features combined with the Newcastle Landfill projects development plan then refined the Zones of influence to form segmented areas of varying amounts of visual exposure.

Figure 7.1 shows the identification of receptors based on the categorization criteria discussed above. The national landcover dataset distributed from the Department of Environmental Affairs was used to identify the areas described above, along with the additional of points of interest for potential tourism destinations.

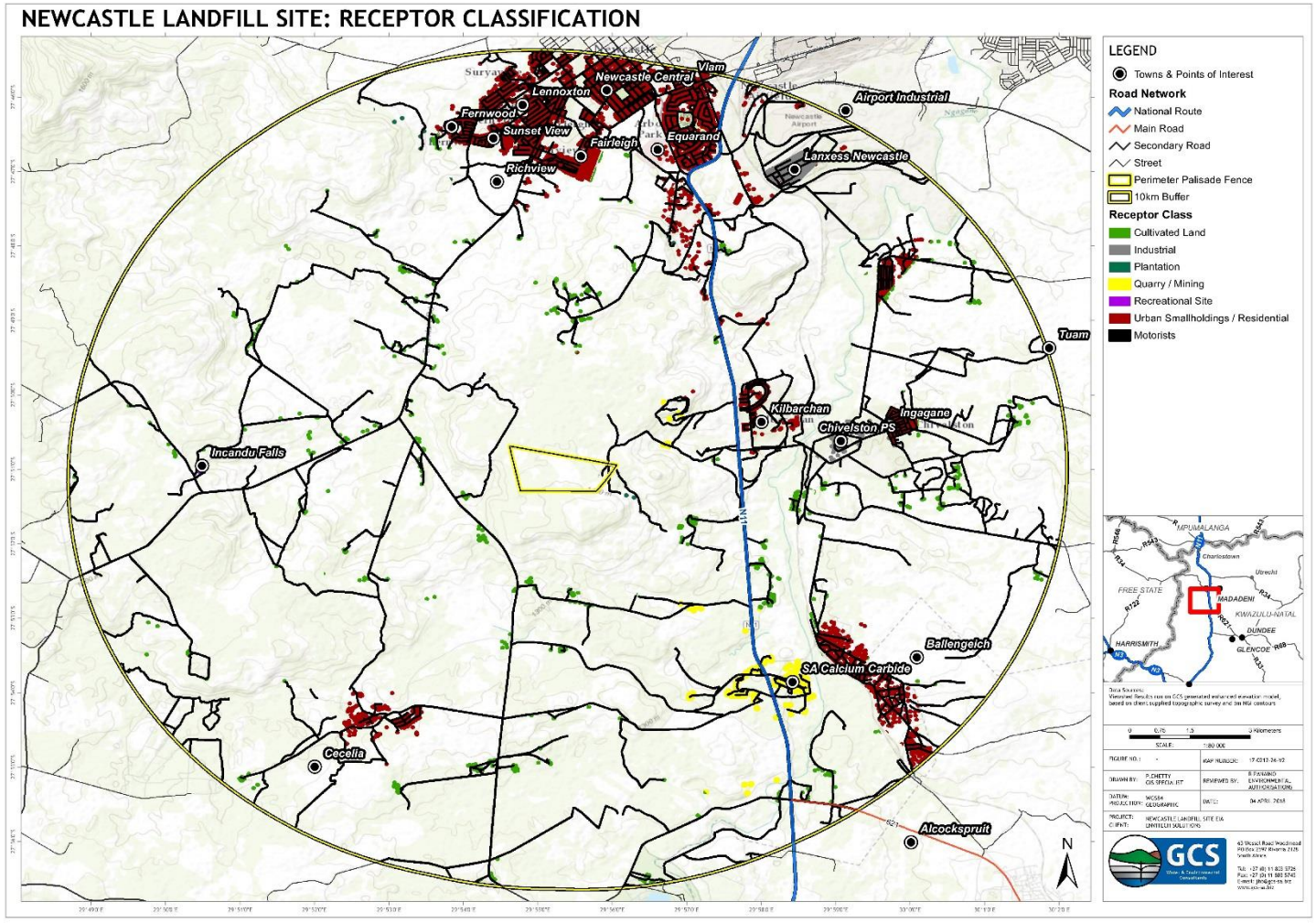

Figure 7-1 Identified Receptors

Sensitive receptors were identified (towns and regional roads) within a 10km Potential Zone of Influence (PZI) of the proposed mining infrastructure and are listed in Table 7.1 below:

Table 8-1: List of Potential Sensitive Receptors

List of Critical Receptors			
Receptor	**Receptor Category**	**Closest Infrastructure**	**Distance from closest mining operation**
Dispersed Settlements - Agriculture	Settlement	Landfill Cells	1.1 km
Dispersed Settlements - Agriculture	Settlement	Landfill Cells	1.4 km
Dispersed Settlements - Agriculture	Settlement	Admin Offices, Parking Areas, Weighbridges	2.04 km
Afrisam Aggregate	Quarry	Admin Offices, Parking Areas, Weighbridges	2.08 km
Dispersed Settlements - Agriculture	Settlement	Landfill Cells	3.11 km
Kibarchan Settlement & Golf Course	Urban Settlement	Admin Offices, Parking Areas, Weighbridges	3.31 km
Chivelston Powerstation	Industrial	Admin Offices, Parking Areas, Weighbridges	4.83 km
Equarand Settlement	Urban Settlement	Cover Material Stockpile Area	6.0 km
Ingagane Settlement	Urban Settlement	Admin Offices, Parking Areas, Weighbridges	6.3 km
Cecelia Settlement	Urban Settlement	Landfill Cells	6.5 km
Incandu Falls	Recreational Facility	Landfill Cells	7.0 km
Fairleigh Settlement	Urban Settlement	Future Leachate Treatment Plant	7.06 km
Sunset View	Urban Settlement	Future Leachate Treatment Plant	7.53 km
Fernwood	Urban Settlement	Future Leachate Treatment Plant	8.0 km
Lennoxton	Urban Settlement	Future Leachate Treatment Plant	8.75 km
Lanxess Newcastle	Industrial	Admin Offices, Parking Areas, Weighbridges	9.01 km
Newcastle Central	Urban Settlement	Future Landfill Gas Extraction Plant	9.29 km

To identify and quantify potential magnitude of impact on such receptors, individual viewshed analysis (areas which have direct visibility to proposed infrastructure) were run for the proposed infrastructure. The infrastructure elements sensitive to the visual impact assessment are listed in Table 7.2 below.

Table 8-2: Viewshed Analysis by Infrastructure Type ; Viewshed Classification

Viewshed Analysis Infrastructure Parameters	
Infrastructure	Vertical Footprint
Landfill Cells	± 5m
Cover Material Stockpile	± 6m
Gas Extraction Plant	± 3m
Leachate Treatment Plant	± 6m
Collection Dam	± 3m

Viewshed Classification	
Viewshed Exposure Classes	**Grading (%)**
Low	5 - 20
Low - Medium	20 - 40
Medium	40 - 60
Medium - High	60 -80
High	80 - 100

8.2 Viewshed Results

The results of the individual viewshed analysis indicates that the visibility of the proposed surface infrastructure will be largely contained to the Eastern and Western regions of the 10km buffer extent. The changes in topographic ranges in the region act as a screen for the regions to the south and north. The key results and findings from the viewshed analysis for each modelled site is discussed below:

8.2.1 Landfill Cells Viewshed Results

The landfill cells were modelled with a 5m vertical offset to cater for the maximum elevation at any point of the landfill sites operation. The results of the viewshed analysis indicate that areas to the West and areas to the East will experience Medium – Low degrees of exposure to the proposed infrastructure. The highest visual exposure will be constricted within the immediate plateau of the development site, extending to the south west.

The affected receptors identified include disperse agricultural settlements, parts of the boundary street route and low exposure to the Incandu falls recreational site. Importantly, the viewshed models indicate that the landfill cells will have no exposure along the N11 route. Figure 7.2 shows the results from the Landfill Cells viewshed analysis.

8.2.2 Cover Material Stockpile Viewshed Results

The cover material stockpile region was modelled at a 6m vertical offset. The viewshed results for the stockpile indicate that the highest degrees of visibility will be limited ot the immediate plateau region, with medium – low degrees of exposure to the western sectors of the potential zone of influence. Figure 7.3 shows the results from the cover material stockpile viewshed analysis.

8.2.3 Gas Extraction Plant Viewshed Results

The Gas Extraction Plant was modelled with a 3m vertical offset across the footprint of the proposed gas extraction plant.

The viewshed results indicate that the gas extraction plants high visual exposure is limited to the western side of the plateau, with lesser degrees to the far western regions of the potential zone of influence. Figure 7.4 shows the results from the gas extraction plant viewshed analysis.

8.2.4 Leachate Treatment Plant & Collection Dam Viewshed Results

The leachate treatment plant and collection dam were modelled simultaneously, due to the proximity of the proposed footprints. The leachate treatment plant was modelled with a vertical offset of 6 meters, while the collection dam was modelled with an offset of 2 meters.

The viewshed outputs for the leachate treatment plant resemble the outputs for the gas treatment plant, with the highest degrees of visual exposure along the western plateau, and medium to low degress of exposure in the distant western region of the zone of influence.

A cumulative view of all viewshed modelling results can be seen on figure 7.6.

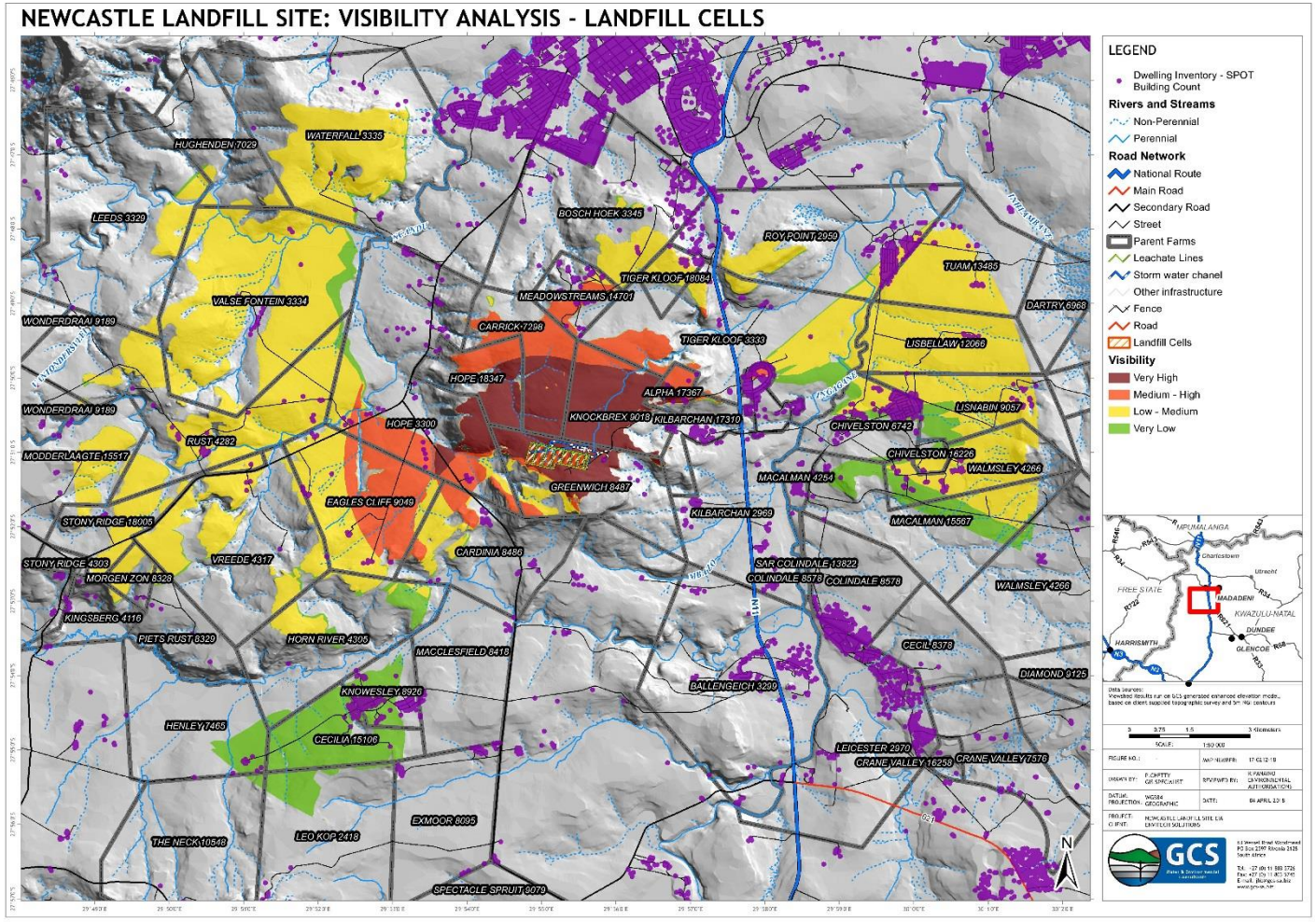

Figure 8-2: Viewshed Analysis for the Landfill Cells

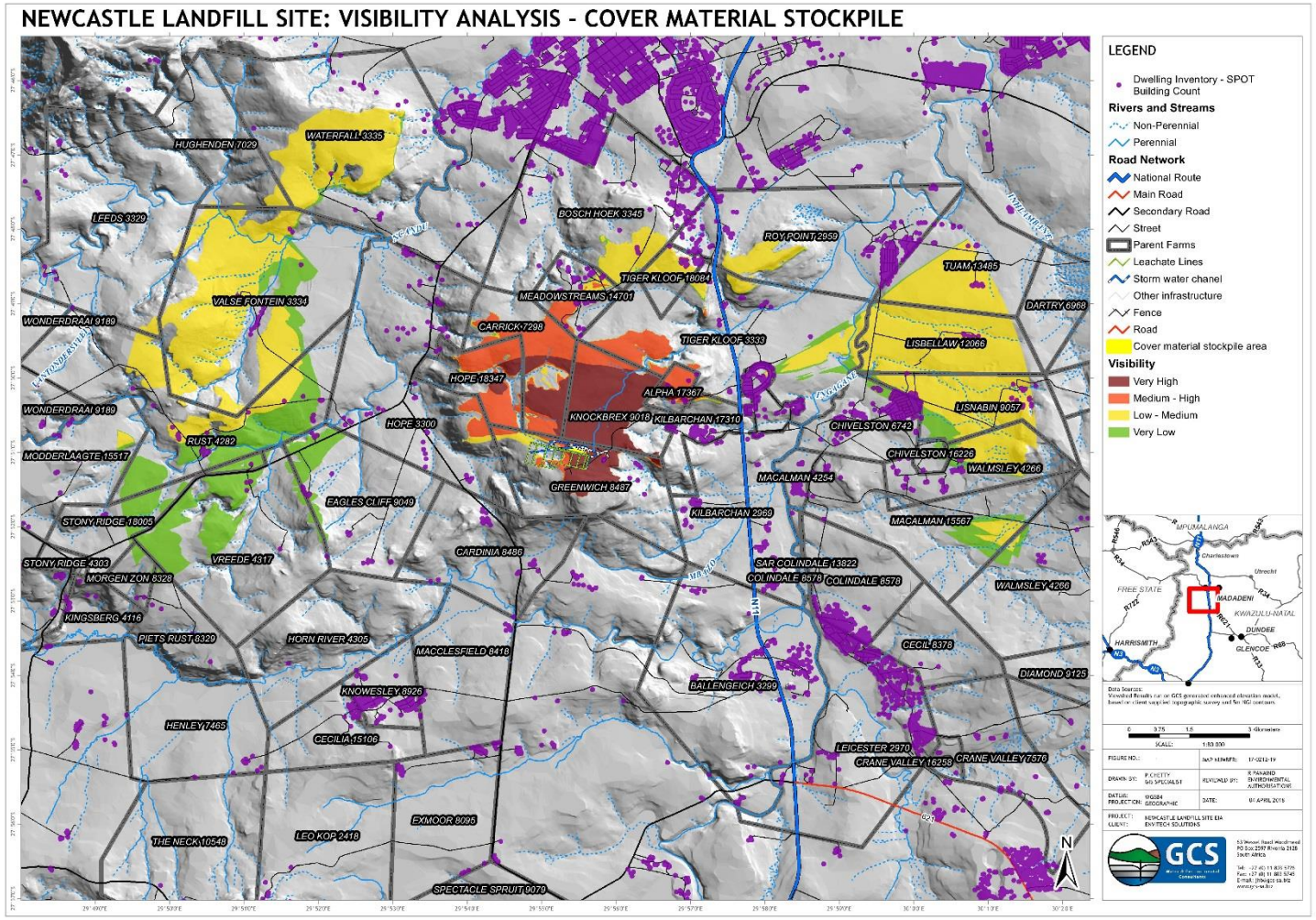

Figure 8-3 : Viewshed Analysis for the Cover Material Stockpile

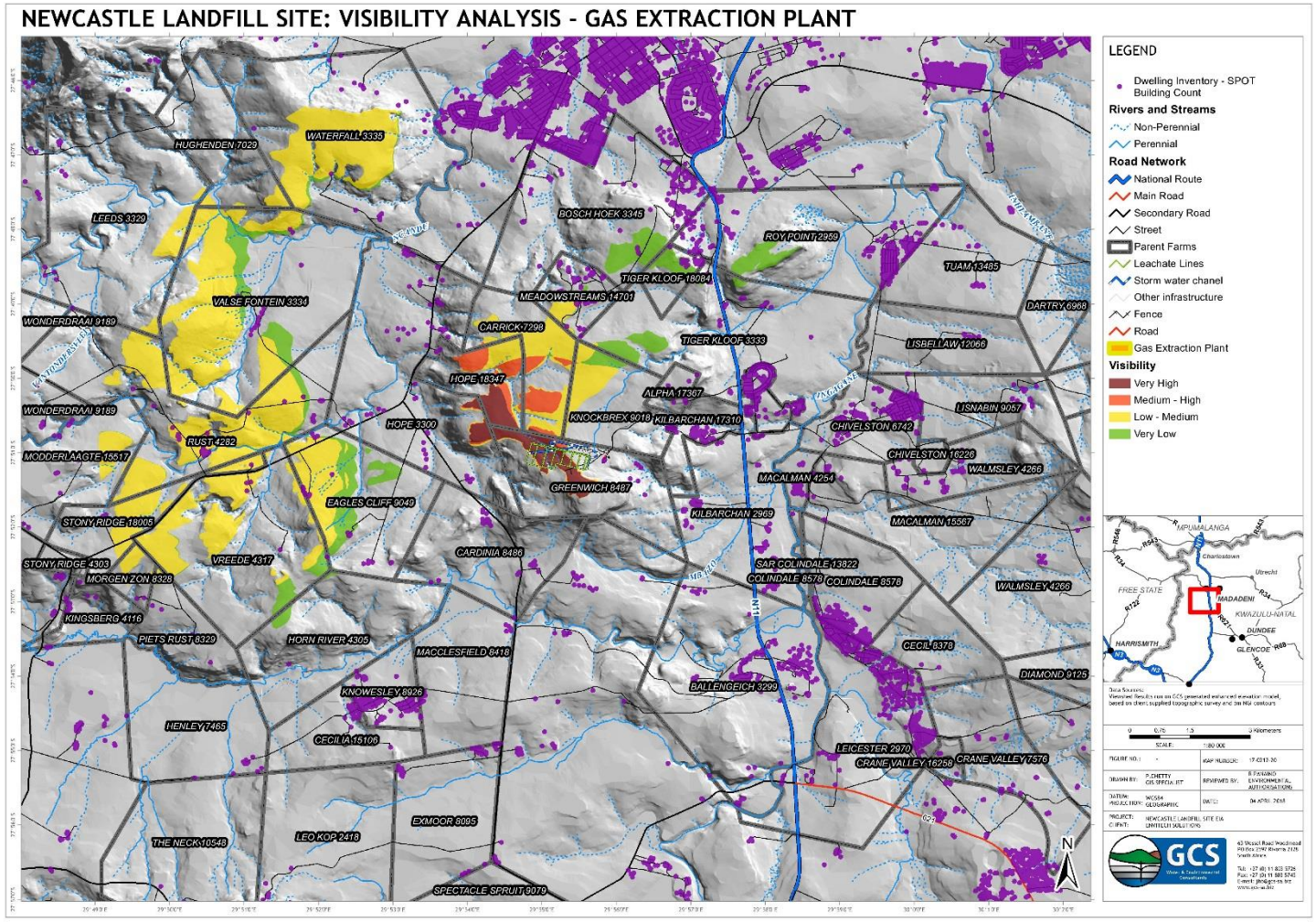

Figure 8-4 : Viewshed Analysis for the Pollution Control Dam

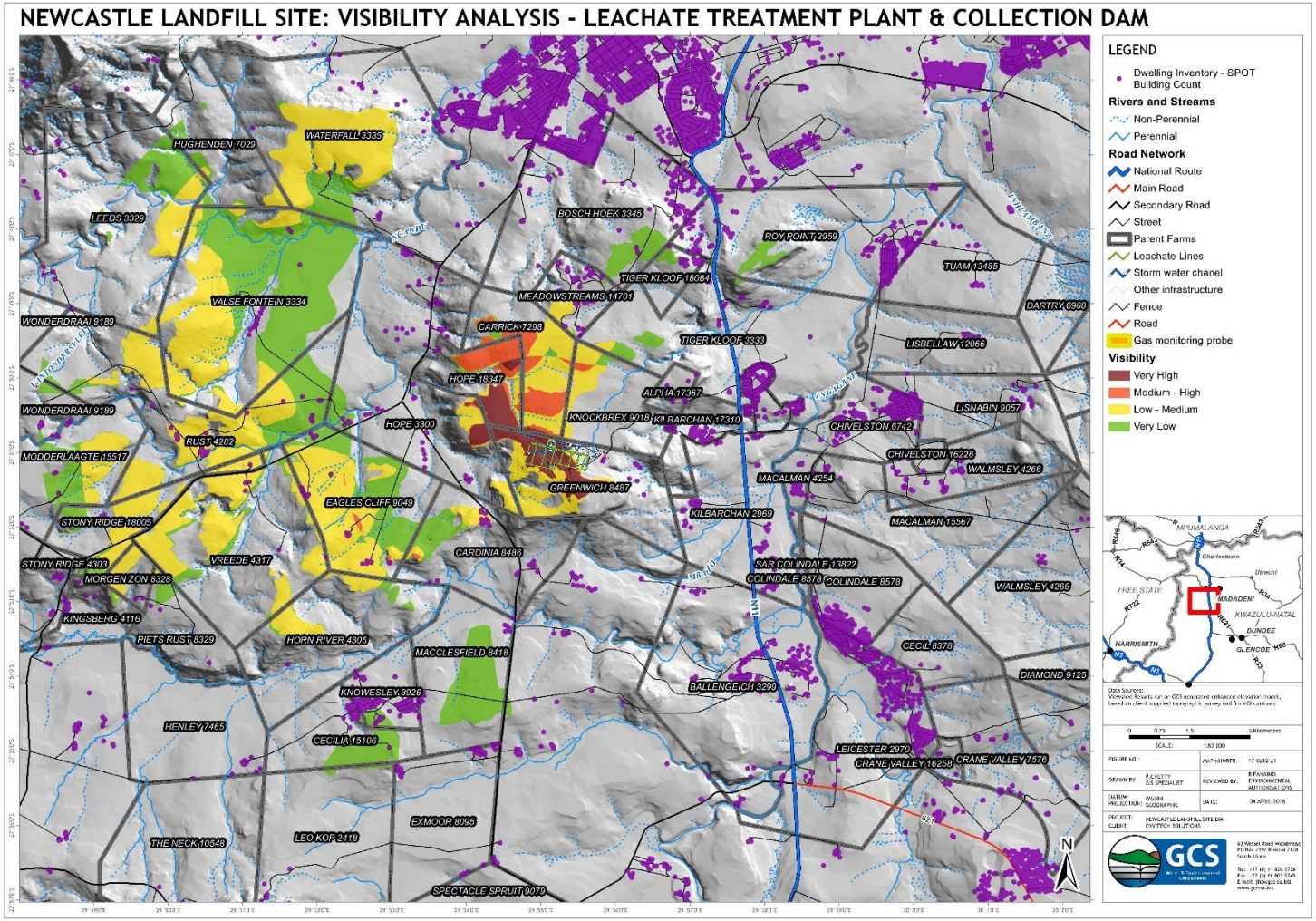

Figure 8-5: Viewshed Analysis for the leachate treatment plant & collection dam

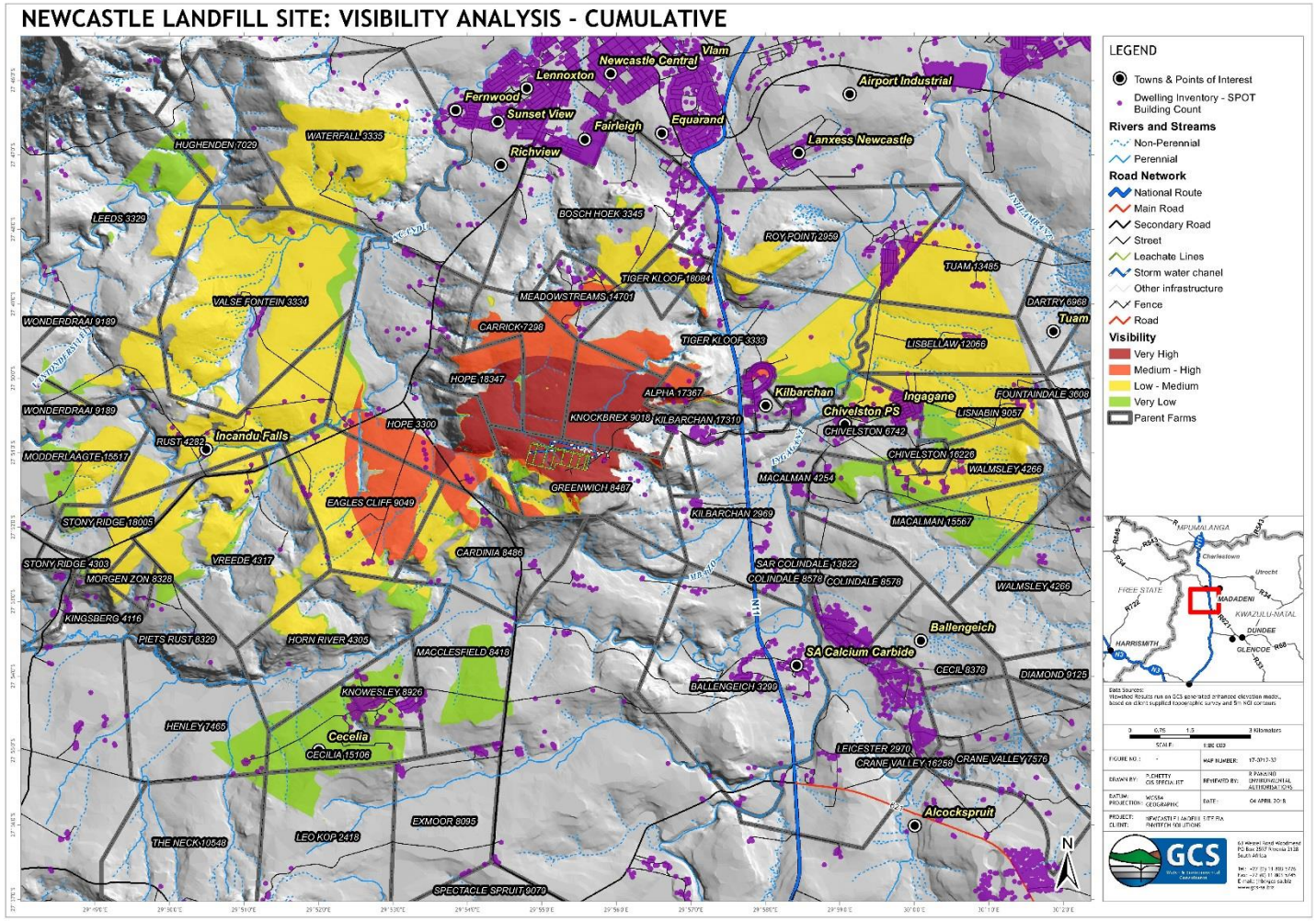

Figure 8-6 : Viewshed Analysis for the Cumulative effects of all infrastructure components

8.3 Overall Magnitude of Visual Impact

The impact methodology used for this report conform to specific GCS defined criteria that has been standardised across all relevant specialist studies associated with the Environmental Impact Assessment.

The impact rating methodology involves ratings and ranking scales as per tables 7.3 to 7.9. Each impact is rated according to the expected magnitude (severity), duration (temporal scale), scale (spatial scale) and probability of the impact.

Consequence is then determined as follows:
Consequence = Severity + Spatial Scale + Duration

The Risk of the activity is then calculated based on frequency of the activity and impact, how easily it can be detected and whether the activity is governed by legislation. Thus:
Likelihood = Frequency of activity + frequency of impact + legal issues + detection

The risk is then based on the consequence and likelihood.
Risk = Consequence x likelihood

Table 8-3: Severity

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful / within a regulated sensitive area	5

Table 8-4: Spatial Scale

Area specific (at impact site)	1
Whole site (entire surface right)	2
Local (within 5km)	3
Regional / neighboring areas (5km to 50km)	4
National	5

Table 8-5: Duration

One day to one month (immediate)	1
One month to one year (Short term)	2
One year to 10 years (medium term)	3
Life of the activity (long term)	4
Beyond life of the activity (permanent)	5

Table 8-6: Frequency of the activity

Annually or less	1
6 monthly	2
Monthly	3
Weekly	4
Daily	5

Table 8-7: Frequency of the incident/impact

Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitely / >100%	5

Table 8-8: Legal Issues

No legislation	1
Fully covered by legislation	5

Table 8-9: Detection

Immediately	1
Without much effort	2
Need some effort	3
Remote and difficult to observe	4
Covered	5

Environmental effects will be rated as either of high, moderate or low significance on the basis provided in table 7.10.

Table 8-10: Cumulative effect rating

RATING	CLASS
1 – 55	(L) Low Risk
56 – 169	M) Moderate Risk
170 – 600	(H) High Risk

A summary of the impact determination can be found in table 7.11 below.

A more detailed version of the impact matrix can be found as appendix A.

Table 8-11: Impact Rating Summary

Impact description					Signicance before mitigation		Signicance after mitigation		Mitigation measures	Action plan	Responsible person
No.	Phases	Activity	Aspect	Impact							
1	Construction	Site clearing / preparation	vegetation removal	Loss of floral species and habitat	-	M	-	M	none	refer to rehabilitation plan	Site manager
2	Construction	Infrastructure establishment	Cover Material Stockpile	Landscape visual Change	-	M	-	L	Minimise construction duration	Refer to Visual Impact Assessment Mitigation	Site manager
3	Operation	Earth Excavation	Landfill Cells	Change of Visual Character	-	M	-	M	Set visual screens up along permiter fence	Refer to Visual Impact Assessment Mitigation	Site manager
4	Operation	Infrastructure establishment	#REF!	Change of Visual Character	-	M	-	M	Set visual screens up along permiter fence	Refer to Visual Impact Assessment Mitigation	Site manager
5	Operation	Infrastructure establishment	Gas Extraction Plant	Change of Visual Character	-	M	-	M	Cover material to be a neutral colour in relation to the environment	Refer to Visual Impact Assessment Mitigation	Site manager
6	Operation	Infrastructure establishment	Leachate Treatment Plant	Change of Visual Character	-	M	-	M	Cover material to be a neutral colour in relation to the environment	Refer to Visual Impact Assessment Mitigation	Site manager
4	Operation	Infrastructure establishment	Collection Dam	Change of Visual Character	-	M	-	M	Set visual screens up along permiter fence	Refer to Visual Impact Assessment Mitigation	Site manager
5	Operation	Heavy machinery and vehicle movement	Associated logistics on site	Change in sense of place	-	M	-	M	none	Refer to Visual Impact Assessment Mitigation	Site manager
6	Decommisioning and Closure	Infrastructure removal	Deconstruction activity	Landscape visual Change	-	M	-	M	Minimise deconstruction duration	Refer to Visual Impact Assessment Mitigation	Site manager
7	Residual	After closure rehabilitation	Closure of capacity landfill site	Artificial Hills - Change in immediate relief	-	M	-	M	Vegetation of residual slopes	Refer to Visual Impact Assessment Mitigation	Site manager

9 MITIGATION MEASURES

9.1 General Mitigation

The mitigation measures for the visual impact have been separated into three phases:

- Construction Phase
- Operational Phase
- Closure Plan (Rehabilitation, Remediation & Aftercare)

9.1.1 Construction Phase

It is anticipated that the construction phase of the landfill will lead to significant levels of dust displacement from the topsoil stripping that will make way for the various landfill infrastructure elements. Dust suppression activities through increasing the moisture content in the ground should be a viable mitigation measure at this stage due to its temporary nature.

A lighting plan for the construction phase should be developed. In addition to this, construction work on the site itself should be restricted to daylight hours to minimize the effect of light pollution to the region.

Dumps and mounds from displaced material during the construction phase should be kept to a minimum height level (not in excess of 4 meters).

Any vegetative material that is displaced should be transplanted to an offsite amenity region, or alternatively planted in the administration regions of the site to enhance its visual setting.

Extended durations of exposure lead to higher cumulative weightings, and as such the construction phase should be optimized to minimize the construction duration.

9.1.2 Operational Environmental Management Plan (EMP)

Dust Suppression – Daily dust suppression should form part of the daily management of the landfill. Dust suppression should be applied to any open, unprotected areas, such as gravel roads and bare surfaces with no paving. The placement of windbreakers will slow the speed and may even assist in changing the direction of the wind. Windbreaker options include planting rows of trees in the originating direction of the wind (WNW, ENE), which will also act as visual screens for the areas to the East and West. The speed at which the landfill related vehicles will travel should also be regulated which will assist in reducing dust dispersion close by.

Any structures of a permanent nature from materials including metal and concrete should be painted earth-like colours (tans, greens, etc) to limit the contrast of such structures in relation to the natural vegetation and terrain. Highly reflective metals should be avoided to limit reflection and glaze of such structures.

The landfill cells should be designed with a contoured approach (if engineering design permits) to avoid harsh straight lines that are visually invasive. The phased development and utilization of the cells will limit the visual exposure of the combined cells.

Revegetation of areas of striped land cover should be done from the outset where possible. Revegetation of exposed footprint areas and areas of cut and fill serves to limit any visual intrusion, whilst also limiting other environmentally degrading implications such as erosion, dust, and air pollution.

Lighting Plan – A detailed lighting plan should be issued. This plan should take measures to limit light spills within the plant area and any other areas requiring security lighting. Areas expected to provide the highest lighting impacts include temporary and moveable equipment associated with the construction and operational growth of the open pit. The lighting should also be focused into the pit and on the operational elements required by the landfill.

Where possible, footprint areas of disturbed areas should be minimized. Limiting the footprint areas will directly limit the resulting visual impact on the surrounding environment and the critical receptors within the environment.

A visual screen, specifically along the Eastern and Western boundaries of the proposed landfill site in the form of a tree line will limit the amount of visual exposure to the local area within a 1- 2 kilometer radius. The tree line will also act as a wind break, and will aid in limiting dust movement from the prevailing wind directions (WNW, ENE).

9.1.3 Closure Plan [Rehabilitation, Remediation and Aftercare]

Dismantling of infrastructure, landscaping, contouring of areas of cut and fill, re-vegetation, and maintenance / aftercare will need to be included in the rehabilitation and aftercare. This would require input from a landscape architect and /or botanist.

Dust suppression and monitoring of revegetated / rehabilitated areas is recommended for a period of two years after the landfill closure.

In particular, landfill cells characteristically lead to artificial hills and mounds which can be mitigated by vegetating the hill to simulate the hilly nature of the Newcastle region.

9.2 Mitigation Measures Specific to Critical Receptors

Specific mitigation measures to limit the visual impacts on sensitive and critical receptors listed in chapter 7.1 include:

Disperse Settlements (Agricultural Receptors):
Line of Sight screening using large trees could be planted in close proximity of the perimeter fence. This would intercept the line of sight and also act as a natural wind break for any dust pollution that may result from the proposed landfill operation. This would have to be done in consultation with a qualified botanist to assist with the best tree types for the local climatic and water requirements. Indigenous trees would be preferable.

10 CONCLUSIONS AND RECOMMENDATIONS

The results from the viewshed analysis across the various infrastructure of the proposed landfill site indicate that the topography of the region acts as an effective screen to the potential receptors identified.

The majority of the visual exposure anticipated will be limited to the Western and Eastern regions of the potential zone of influence (within a 10 kilometre radius). Receptors within the modelled results include disperse agricultural settlements, of which the majority lie within the medium visual exposure range.

While mitigation measures have been suggested as per the impact table, the overall impact from a visual perspective largely remains in the same category as unmitigated, due to the screening nature of the region and the site location on a plateau. Importantly, most critical receptors in the form of Urban Settlements and transportation receptors are avoided, while the majority of receptors affected are disperse cultivation settlements.

11 REFERENCES

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Appendix A

Impact before mitigation

No.	Phases	Activity	Aspect (cause of the impact)	Impact	Severity: Physico & Chemical (Water Quality, Soils)	Habitat (Geomorph + Vegetation)	Biota	Ecosystem functioning	Air Quality	Traffic load	Road infrastructure	Sense of place	Viewshed Potential Zone of Influence Impacted	Viewing Distance	Visual Absorption Capacity	Sensitivity of Infrastructure on Receptors	Severity rating	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	+/-	Risk Rating
1	Construction	Site clearing / preparation	vegetation removal	Loss of floral species and habitat	3	3	3	2	2			2	1	2	2	1	2.1	1	4	7.1	5	2	1	5	13	92.3	-	M
2	Construction	Infrastructure establishment	Construction Activity	Landscape visual Change					2	2	2	3	2	2	3	2	2.25	2	2	6.25	3	2	1	4	10	62.5	-	M
3	Operation	Earth Excavation	Landfill Cells	Change of Visual Character								3	3	3	3	3	3	3	4	10	5	3	1	2	11	110	-	M
4	Operation	Infrastructure establishment	Cover Material Stockpile	Change of Visual Character								2	2	2	3	2	2.2	2	4	8.2	5	2	1	4	12	98.4	-	M
5	Operation	Infrastructure establishment	Gas Extraction Plant	Change of Visual Character								3	2	2	2	2	2.2	2	4	8.2	5	2	1	4	12	98.4	-	M
6	Operation	Infrastructure establishment	Leachate Treatment Plant	Change of Visual Character								3	2	2	2	2	2.2	2	4	8.2	5	2	1	4	12	98.4	-	M
4	Operation	Infrastructure establishment	Collection Dam	Change of Visual Character								2	1	2	2	2	1.8	2	4	7.8	5	2	1	4	12	93.6	-	M
5	Operation	Heavy machinery and vehicle movement	Associated logistics on site	Change in sense of place							2		2	1	1	1	2	1.5	1	4	6.5	5	2	1	4	12	78	-	M
6	Decommisioning and Closure	Infrastructure removal	Deconstruction activity	Landscape visual Change							2		3	2	2	3	3	2.5	2	2	6.5	3	2	1	4	10	65	-	M
7	Residual	After closure rehabilitation	Closure of capacity landfill site	Artificial Hills - Change in immediate relief								1	3	3	1	2	2	3	5	10	5	1	5	3	14	140	-	M

Impact after mitigation

No.	Phases	Activity	Aspect (cause of the impact)	Impact	Severity: Physico & Chemical (Water Quality, Soils)	Habitat (Geomorph + Vegetation)	Biota	Ecosystem functioning	Air Quality	Traffic load	Road infrastructure	Sense of place	Viewshed Potential Zone of Influence Impacted	Viewing Distance	Visual Absorption Capacity	Sensitivity of Infrastructure on Receptors	Severity rating	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	+/-	Risk Rating
1	Construction	Site clearing / preparation	vegetation removal	Loss of floral species and habitat	3	3	3	1				1	1	2	2	1	2.5	1	2	5.5	5	2	1	5	13	71.5	-	M
2	Construction	Infrastructure establishment	Construction Activity	Landscape visual Change					1	2	2	2	2	2	3	2	2	2	2	6	3	1	1	4	9	54	-	L
3	Operation	Earth Excavation	Landfill Cells	Change of Visual Character								2	2	3	3	2	2.4	2	4	8.4	5	2	1	2	10	84	-	M
4	Operation	Infrastructure establishment	Cover Material Stockpile	Change of Visual Character								2	2	2	2	2	2	1	4	7	5	2	1	4	12	84	-	M
5	Operation	Infrastructure establishment	Gas Extraction Plant	Change of Visual Character								1	1	1	2	2	1.4	1	4	6.4	5	2	1	4	12	76.8	-	M
6	Operation	Infrastructure establishment	Leachate Treatment Plant	Change of Visual Character								1	1	1	2	1	1.2	1	4	6.2	5	2	1	4	12	74.4	-	M
4	Operation	Infrastructure establishment	Collection Dam	Change of Visual Character								2	1	2	2	1	1.6	1	4	6.6	5	2	1	4	12	79.2	-	M
5	Operation	Heavy machinery and vehicle movement	Associated logistics on site	Change in sense of place						2		2	1	1	1	2	1.5	1	4	6.5	5	2	1	4	12	78	-	M
6	Decommisioning and Closure	Infrastructure removal	Deconstruction activity	Landscape visual Change						2		2	2	2	3	2	2.1666667	2	2	6.166666667	3	5	1	4	13	80.166667	-	M
7	Residual	After closure rehabilitation	Closure of capacity landfill site	Artificial Hills - Change in immediate relief								1	1	1	1	1	1	2	5	8	5	1	5	3	14	112		M

Appendix A Continued

Impact description					Impact before mitigation	Impact after mitigation				
No.	Phases	Activity	Aspect (cause of the impact)	Impact	Risk Rating	Risk Rating	Confidence level	Mitigation measures	Action plan	Responsible person
1	Construction	Site clearing / preparation	vegetation removal	Loss of floral species and habitat	M	M	75%	none	refer to rehabilitation plan	Site manager
2	Construction	Infrastructure establishment	Construction Activity	Landscape visual Change	M	L	0%	Minimise construction duration	Refer to Visual Impact Assessment	Site manager
3	Operation	Earth Excavation	Landfill Cells	Change of Visual Character	M	M	0%	Set visual screens up along permiter fence	Refer to Visual Impact Assessment	Site manager
4	Operation	Infrastructure establishment	Cover Material Stockpile	Change of Visual Character	M	M	0%	Set visual screens up along permiter fence	Refer to Visual Impact Assessment	Site manager
5	Operation	Infrastructure establishment	Gas Extraction Plant	Change of Visual Character	M	M	0%	Cover material to be a neutral colour in relation to the environment	Refer to Visual Impact Assessment	Site manager
6	Operation	Infrastructure establishment	Leachate Treatment Plant	Change of Visual Character	M	M	0%	Cover material to be a neutral colour in relation to the environment	Refer to Visual Impact Assessment	Site manager
4	Operation	Infrastructure establishment	Collection Dam	Change of Visual Character	M	M	0%	Set visual screens up along permiter fence	Refer to Visual Impact Assessment	Site manager
5	Operation	Heavy machinery and vehicle movement	Associated logistics on site	Change in sense of place	M	M	0%	none	Refer to Visual Impact Assessment	Site manager
6	Decommisioning and Closure	Infrastructure removal	Deconstruction activity	Landscape visual Change	M	M	0%	Minimise deconstruction duration	Refer to Visual Impact Assessment	Site manager
7	Residual	After closure rehabilitation	Closure of capacity landfill site	Artificial Hills - Change in immediate relief	M	M	0%	Vegetation of residual slopes	Refer to Visual Impact Assessment	Site manager