Energy from Waste Facility - Stage 1 Eastern Creek (SSD 6236)

Visual Impact Assessment

Prepared for The Next Generation NSW Pty Ltd

Final Report

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urbis

URBIS STAFF RESPONSIBLE FOR THIS REPORT WERE:

Director	Peter Haack
Senior Consultant	Ashley Poon
Senior GIS Analyst	Verity Miles
Job Code	MD3346
Report Number	TNG Energy from Waste Project – Stage 1

Approved by

Peter Haack

Position Director

Date 27th September 2017

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TABLE OF CONTENTS

FIGURES:

TABLES:

1 Introduction

1.1 SUMMARY DESCRIPTION OF THE PROJECT

The proposed Energy from Waste Facility – Stage 1 (the Project) is located at Eastern Creek, approximately 36 kilometres (km) west of the Sydney central business district (CBD) (***Figure 1***). The Applicant for the Project is The Next Generation NSW Pty Ltd (TNG). The Energy from Waste (EfW) Facility is proposed to be located on Lots 2 and 3, DP 1145808 (***Figure 3***).

The Project is identified as a State Significant Development (SSD) under Schedule 1, Clause 20 of the State Environmental Planning Policy (State and Regional Development) 2011.

A Visual Impact Assessment is required as part of the Environmental Impact Statement (EIS) for the Project. Urbis has been commissioned to undertake specialist visual impact assessment services for the Project. Due to an amendment to the application to construct Stage 1 development works only of the EfW Facility, this VIA has been updated to reflect the relative visual impacts of the development.

Stage 1 comprises the construction and operation for the treatment of 552,500 tonnes per annum of residual waste fuels (engineering capacity for approximately 405,000 to 675,500 tpa with an optimum expected throughput of 552,500 tpa). This will comprise the following plant and systems:

- Tipping hall and fuel storage.
- Waste bunker.
- Combustion line 1.
- Combustion line 2.
- Two independent boilers.
- Flue gas treatment systems.
- One stack.
- One turbine.
- One air cooled condenser.
- Associated auxiliary equipment.
- Control room, workshop, offices and amenities.
- Laydown areas.

1.2 OBJECTIVES OF THE STUDY

In accordance with the Director-General's Requirements (DGRs) issued by the NSW Department of Planning and Infrastructure, the preparation of a visual assessment is required as a component of the EIS for the Project. ***Table 1*** identifies each of the relevant DGRs and where they are addressed within this visual assessment.

DIRECTOR-GENERAL'S REQUIREMENTS	REPORT SECTION
Visual *– including:* - *an assessment of the proposed building height, scale, signage and lighting, particularly from nearby public receivers and significant vantage points of the broader public domain;*	Section 4
- *details of design measures to ensure the project has a high design quality and is well presented, particularly in the context of the broader Western Sydney Employment Area;*	Section 5
- *consideration of any impact on flight paths; and*	N/A
- *a detailed photo-montage based analysis of the visual impacts of development and emissions stacks.*	Section 4

TABLE 1 – DIRECTOR-GENERAL'S REQUIREMENTS – REFERENCE TABLE

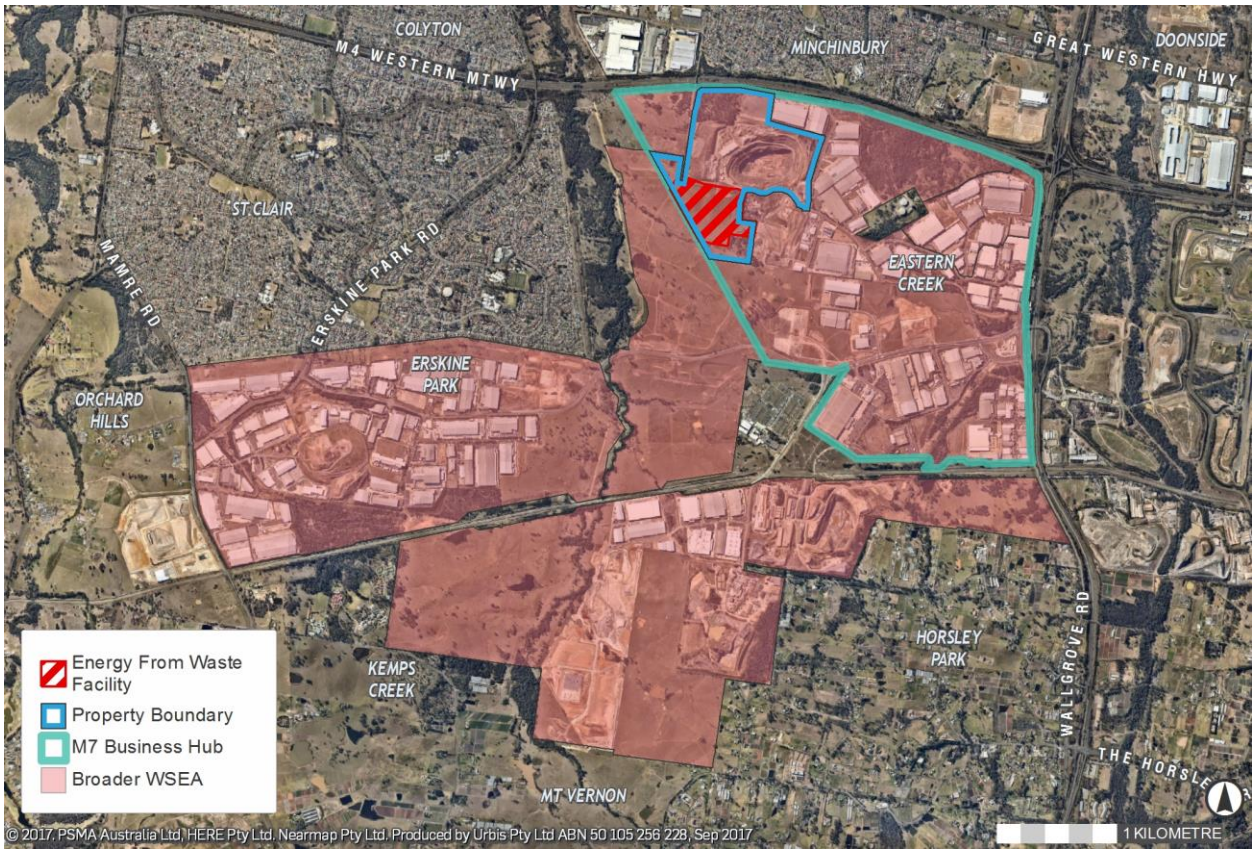

FIGURE 1 – REGIONAL CONTEXT

1.3 STUDY METHOD

The study approach has been based on an analysis of the visual setting and an assessment of the potential impacts of the development of the Project on its viewshed. The urban viewshed assessed is primarily the area where highest impacts are likely to occur, typically within 2.5 km of the Project Area boundary. The methodology is comprised of a number of components. These are:

- **Qualitative Assessment (*Section 1.3.1*)**
  - Visual modification – How does the proposed development contrast with the landscape character of the surrounding setting?
  - What is the quality of the landscape setting?
  - Sensitivity – How sensitive will viewers be to the proposed development?
  - Impacts of Night Lighting **(*Section 1.3.3*)**.
- **Quantitative Assessment (**refer to ***Section 1.3.2*** and ***Appendix A*****)**
  - How much of the proposed development is visible from particular viewpoints?

1.3.1 APPROACH TO QUALITATIVE ASSESSMENT

The methodology employed by Urbis is based on the Landscape Aesthetics Handbook (United States Department of Agriculture [USDA] Forest Service, 1995) methodology. The basis of this Visual Management System methodology is that the visual impact of a proposed development is determined by evaluating the degree of visual modification/fit of the development in the context of the visual sensitivity of surrounding land use areas from which a proposed development may be visible. The visual impact resulting from the combination of visual modification and visual sensitivity, or viewer sensitivity, is illustrated in ***Table 1*** and ***Figure 2***.

Level of Visual Impact VL = Very Low, L = Low, M = Moderate, H = High		**Viewer Sensitivity**		
		H	M	L
Level of Visual Modification	H	H	H	M
	M	H	M	L
	L	M	L	L
	VL	L	VL	VL

TABLE 2 – VISUAL IMPACT MATRIX

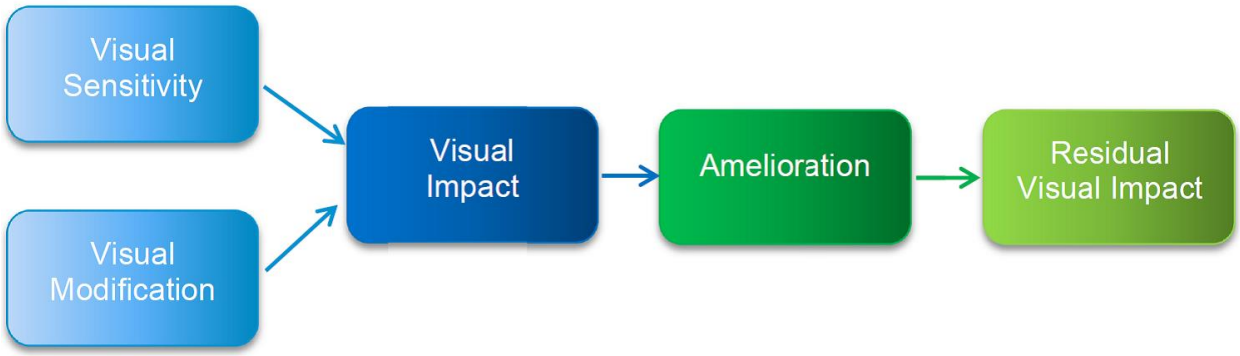

FIGURE 2 – VISUAL ASSESSMENT PROCESS

VISUAL MODIFICATION

The visual modification level of a proposed development can be best measured as an expression of the visual interaction, or the level of visual contrast between the development and the existing visual environment (Zube *et al.,* 1976). Throughout the visual catchment the level of visual modification generally decreases as the distance from the development to various viewpoint locations increases, and is categorised as follows:

- Negligible (or very low) level of visual modification – where the development is distant and/or relates to a small proportion of the overall viewscape.
- Low level of visual modification – where there is minimal visual contrast and a high level of integration of form, line, shape, pattern, colour or texture values between the development and the landscape. In this situation the development may be noticeable, but does not markedly contrast with the existing modified landscape.
- Moderate level of visual modification – where a component of the development is visible and contrasts with the landscape, while at the same time achieving a level of integration. This occurs where surrounding topography, vegetation or existing modified landscape provide some measure of visual integration or screening.
- High level of visual modification – where the major components of the development contrast strongly with the existing landscape.

The quantitative assessment of visual prominence, as outlined in the section following, is considered in the assessment of visual modification in terms of the quantum of viewshed subjected to change. However, the assessment of visual modification also considers the level of visual compatibility of the Project with the existing visual landscape.

VISUAL SENSITIVITY

Visual sensitivity is a measure of how critically a change to the existing landscape will be viewed from various use areas (Brush and Shafer, 1975). Different activities undertaken within the landscape setting have different sensitivity levels. For example, tourists who are using the surrounding landscape as a part of the holiday experience will generally view changes to the landscape more critically than agricultural or industrial workers in the same setting. Similarly, individuals will view changes to the visual setting of their residence more critically than changes to the visual setting of the broader setting in which they travel or work.

The visual sensitivity of the development depends on a range of viewer characteristics. The primary characteristics used in this study are:

- Land use and the expectation of the viewer of a particular visual experience.
- Distance of the development from viewers.

The visual sensitivity of land uses were assessed to assist in determining the visual impact of the development. As distance from the viewer to the proposed development increases, the level of sensitivity reduces.

Typical levels of viewer sensitivity for the assessed visual setting of the Project are based on levels of visual significance as described in the Visual Management System, and are outlined in ***Table 3***.

VISUAL USE AREA	FOREGROUND		MIDDLEGROUND		BACKGROUND
	Local Setting		Sub- Regional Setting		Regional Setting
	0 - 0.5 km	0.5 – 1 km	1 - 2 .5 km	2.5 - 5 km	> 5 km
Residential Areas / Local Streets	H	H	H	M	L
Parks - Recreation	H	H	H	M	L
Motorways / Highways	H	M	M	L	L
Parks - Sporting	M	M	L	L	VL
Industrial Areas	L	L	L	VL	VL
Landfill Areas	VL	VL	VL	VL	VL
Legend - H = High, M = Moderate, L = Low, VL = Very Low					

Source: United States Department of Agriculture Forest Service (1974)

TABLE 3 – TYPICAL VISUAL (VIEWER) SENSITIVITY

1.3.2 QUANTITATIVE ASSESSMENT - VISUAL PROMINENCE & RELATIONSHIP WITH VIEWSHEDS

This report defines a number of viewsheds, or visual settings, based on distance from the Project for the purposes of assessment. The methodology is based on the reduction of impact with an increase in distance between a given viewpoint and the Project. The potential visual impact of the Project will also, to a large extent, depend on how much of the central field of vision it occupies (Refer to ***Table 4***, ***Table 5*** and ***Appendix A***).

Throughout the visual catchment, the degree of visual prominence will generally decrease as the distance from the development site to various viewing locations increases.

The quantitative assessment of visual prominence, i.e., how much is potentially visible, is intertwined with the distribution, height and density of vegetation as well as topography throughout the visual catchment , elements which can screen views of a development from a particular viewpoint. Visual prominence helps inform the process of determining the visual modification level as previously outlined in the above section.

Degrees of Field of View Occupied	Potential Visual Prominence – Horizontal Field of View
Less than 5º	***Insignificant – Low Visual Prominence*** The development may not be highly visible in the view unless it contrasts strongly with the background.
5º – 30º	***Potentially Noticeable – Moderate Visual Prominence*** The development may be noticeable. The degree that it intrudes on the view will be dependent on how well it integrates with the landscape setting.
Greater than 30º	***Potentially Dominant – High Visual Prominence*** The development will be highly noticeable.

TABLE 4 – HORIZONTAL LINE OF SIGHT – VISUAL IMPACT / VISUAL PROMINENCE

Degrees of Field of View Occupied	Potential Visual Prominence – Vertical Field of View
Less than 0.5º	***Insignificant - Low Visual Prominence*** A small thin line in the landscape.
0.5º – 2.5º	***Potentially Noticeable – Moderate Visual Prominence*** The development may be noticeable. The degree that it intrudes on the view will be dependent on how well it integrates with the landscape setting.
Greater than 2.5º	***Potentially Dominant – High Visual Prominence*** The development will be highly noticeable, although the degree of visual intrusion will depend on the landscape setting and the width/spread of the object.

TABLE 5 – VERTICAL LINE OF SIGHT – VISUAL IMPACT / VISUAL PROMINENCE

Distance from Object	Potential Visual Prominence
5000 metres (Regional viewshed)	***Visibility Diminishing*** The visual prominence of the element progressively diminishes over distance.
1000 – 5000 metres (Sub-regional viewshed)	***Potentially Noticeable*** The development will be noticeable. The degree that it intrudes on the view will increase as distance reduces.
Less than 1000 metres – (Local viewshed)	***Potentially Dominant*** The development may be highly noticeable.

TABLE 6 – VISUAL PROMINENCE IN RELATION TO DISTANCE AND VIEWSHED SETTINGS – BASED ON STACK HEIGHT OF 100M

1.3.3 IMPACTS OF NIGHT-LIGHTING

Given the lack of Australian standards for the assessment of lighting impacts, the assessment of the impacts of lighting at night-time has been based on the UK's *Guidance Notes for the Reduction of Obtrusive Light* (Refer to ***Appendix B***).

2 The Existing Landscape

This assessment has been undertaken for the following viewsheds or visual settings:

- ***Sub–regional*** – between 1 km and 5 km from the Project:
- ***Local*** – within 1 km of the Project.

2.1 SITE CONTEXT

The Project is located at Eastern Creek, approximately 36 km west of the Sydney CBD within the Western Sydney Employment Area (WSEA).

2.2 SITE LAND USE

The site, which is accessed off Honeycomb Drive at Eastern Creek, is surrounded by land owned by the Corporate Group Alexandria Landfill Pty Ltd, ThaQuarry Pty Ltd, Australand, Hanson, Jacfin, the Department of Planning and Infrastructure and Sargents. The site and surrounding land is identified as part of the 'State Environmental Planning Policy (Western Sydney Employment Area) 2009 (WSEA SEPP)' to be redeveloped for higher end industrial and employment uses over the next decade.

The site is comprised of an existing land fill operation of previously quarried voids.

2.2.1 SUB–REGIONAL SETTING (1 TO 5 KM)

The sub-regional setting to the east and south is primarily comprised of large form industrial buildings (***Figure 3***).

The residential suburbs of Minchinbury, Colyton and Erskine Park are located to the north, north-west and west respectively. The suburban residential character is primarily comprised of single storey residences with construction typically of brick veneer with tiled roofs with scattered canopy tree planting throughout.

The infrastructure associated with the setting includes the M4 Motorway and high voltage powerlines which traverse the setting.

2.2.2 LOCAL (< 1 KM)

The eastern part of the local setting is comprised of industrial uses with large form industrial buildings constructed typically of tilt concrete slabs with metal deck roofs. The undeveloped areas are comprised of open paddocks.

High voltage powerlines diagonally traverse the setting to the east of the Project in a north-west to south-east direction.

The western part of the setting comprises an area of undeveloped open space along Ropes Creek, comprised of remnant and regrowth riparian vegetation up to 15 m in height.

2.3 LANDSCAPE ABSORPTIVE CAPABILITY

The definition of landscape absorptive capability is closely related to that of visual modification levels, as described in ***Section 1.3.1***. It is generally applied at a broader scale than visual modification and is an assessment of how well a landscape setting is able to accommodate change or a development.

The key factors considered in determining absorptive capability are topography and vegetation. In areas of flatter topography, overlooking is not possible and a low and thin band of vegetation is able to screen views to a development from a given viewpoint. In areas of undulating or elevated topography, overlooking can occur and vegetation needs to be higher and denser to achieve effective screening. Intervening undulating topography also has the potential to block views in certain landscapes.

The study area generally has a high level of absorptive capability in areas of high visual sensitivity due to the relatively flat topography, which reduces changes of overlooking, and the presence of built form and vegetation which effectively screens views.

FIGURE 3 – LOCAL CONTEXT AND LANDUSE PATTERNS

3 Description of Project Form

3.1 BROAD DESCRIPTION OF THE PROJECT

The proposed development involves the construction and operation of an electricity generation plant, which will allow for non-recyclable combustible waste material from the Genesis Xero Material Processing Centre (MPC) and Waste Transfer Station (WTS) to be used for generation of electrical power.

The Project will provide treatment of 552,500 tonnes per annum of residual waste fuels (engineering capacity for approximately 405,000 to 675,500 tpa with an optimum expected throughput of 552,500 tpa).

The proposed EfW Facility will provide employment for a total of up to 55 staff upon operation, working over three shifts (i.e. not on site at any one time).

The site has a total area of approximately 56 hectares (ha) including the Riparian Corridor, with a specific development area of 9 ha.

The main components of the EfW Facility which are of a form and scale most relevant to visual assessment are:

- Buildings of varying footprints and heights ranging from approximately 20 m above ground level (AGL) to 52 m AGL including:
  - A tipping hall (108 m long [l]x 51 wide[w] x 14-19 high [h]);
  - A waste bunker (108 m long [l]x 39 wide[w] x 40-44 high [h]);
  - A boiler house – (50 m long [l]x 50 wide[w] x 47-52 high [h]);
  - Flue gas treatment system – (47 m long [l]x 44 wide[w] x 33-35 high [h]);
  - Turbine hall – (33 m long [l]x 46 wide[w]) x 22-26 high [h];
  - Air cooled condenser – (51 m long [l]x 51 wide[w]) x 22 high [h]; and
- Vent stack to 100 m AGL.

The proposed works will, in addition to the EfW Facility, include the adoption of a plan of subdivision and the following ancillary works:

- Earthworks associated with the balance of the site;
- Internal roadways;
- Provision of a direct underpass connection (Precast Arch and Conveyor Culvert) between TNG Facility and the Genesis Xero Waste Facility;
- Staff amenities and ablutions;
- Staff car parking facilities;
- Water detention and treatment basins; and
- Services (Sewerage, Water Supply, Communications, Power Supply).

Further to the above physical works associated with the proposed Energy from Waste Facility, this application seeks approval for the subdivision of Lot 1, 2 and 3 in DP 1145805 in order to create a

separate lot of approximately 10,000m² for the Transgrid Switching or Substation and additional lots to allow for future development of land not associated with the Energy from Waste Facility and the Genesis Xero Material Processing Plant.

It should be noted that from a viewer perception perspective, the vent stack will not emit a visible plume.

Figure 4 shows the general arrangement of the Project and ***Figures 5*** to ***7*** indicates the locations and sizes of key components.

3.1.1 LIGHTING

Operations would occur 24 hours a day. Lighting emissions would be of three types:

- *Fixed*
  - Main facility, administration and ancillary support buildings.
  - Aviation navigation warning lights.
- *Mobile* – fleet headlights.

3.1.2 DURATION OF OPERATION

The Project is expected to operate 24 hours per day, seven days a week.

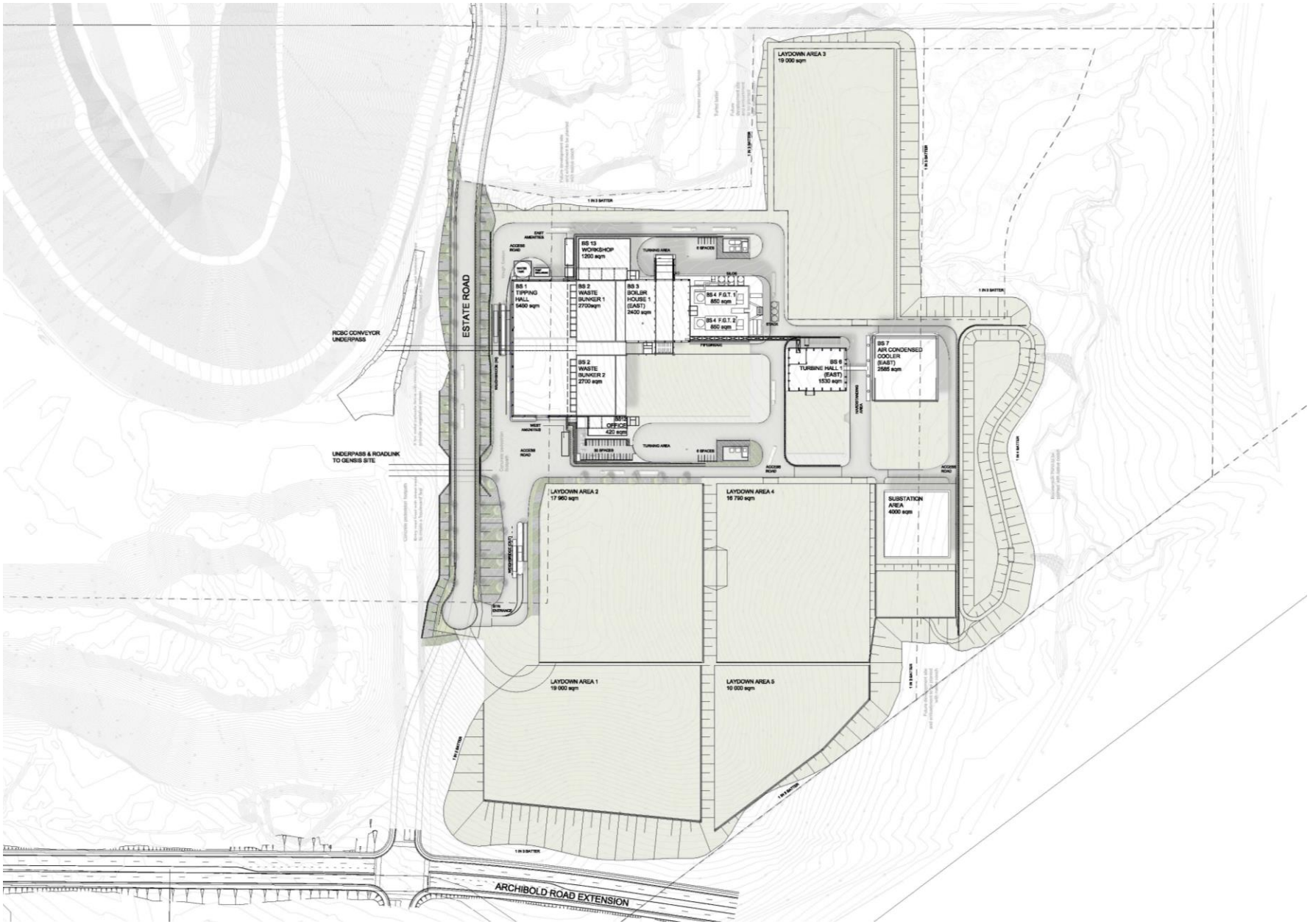

FIGURE 4 – PROJECT GENERAL ARRANGEMENT (SOURCE: KTA)

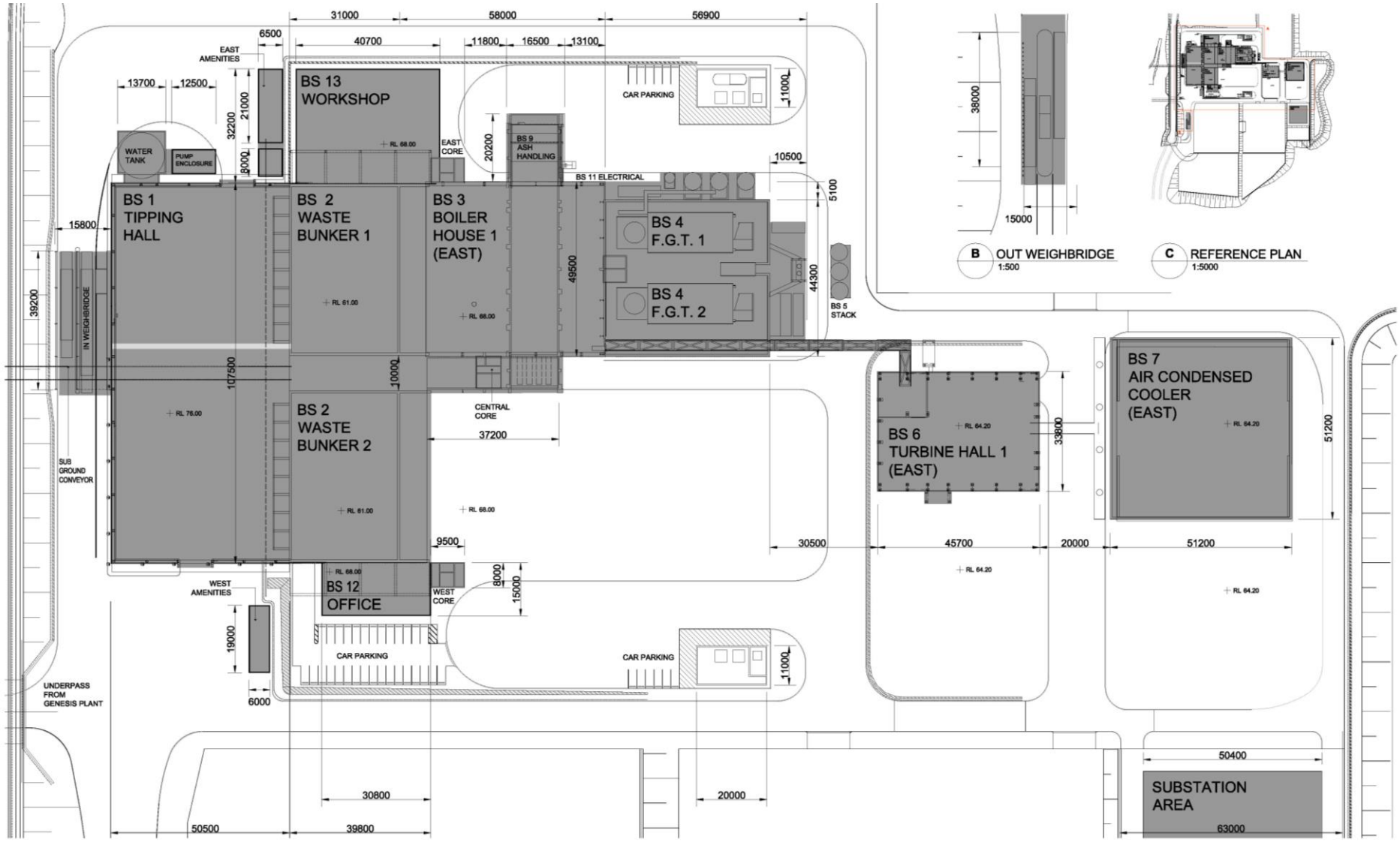

FIGURE 5 – DIMENSIONS OF PROJECT COMPONENTS (SOURCE: KTA)

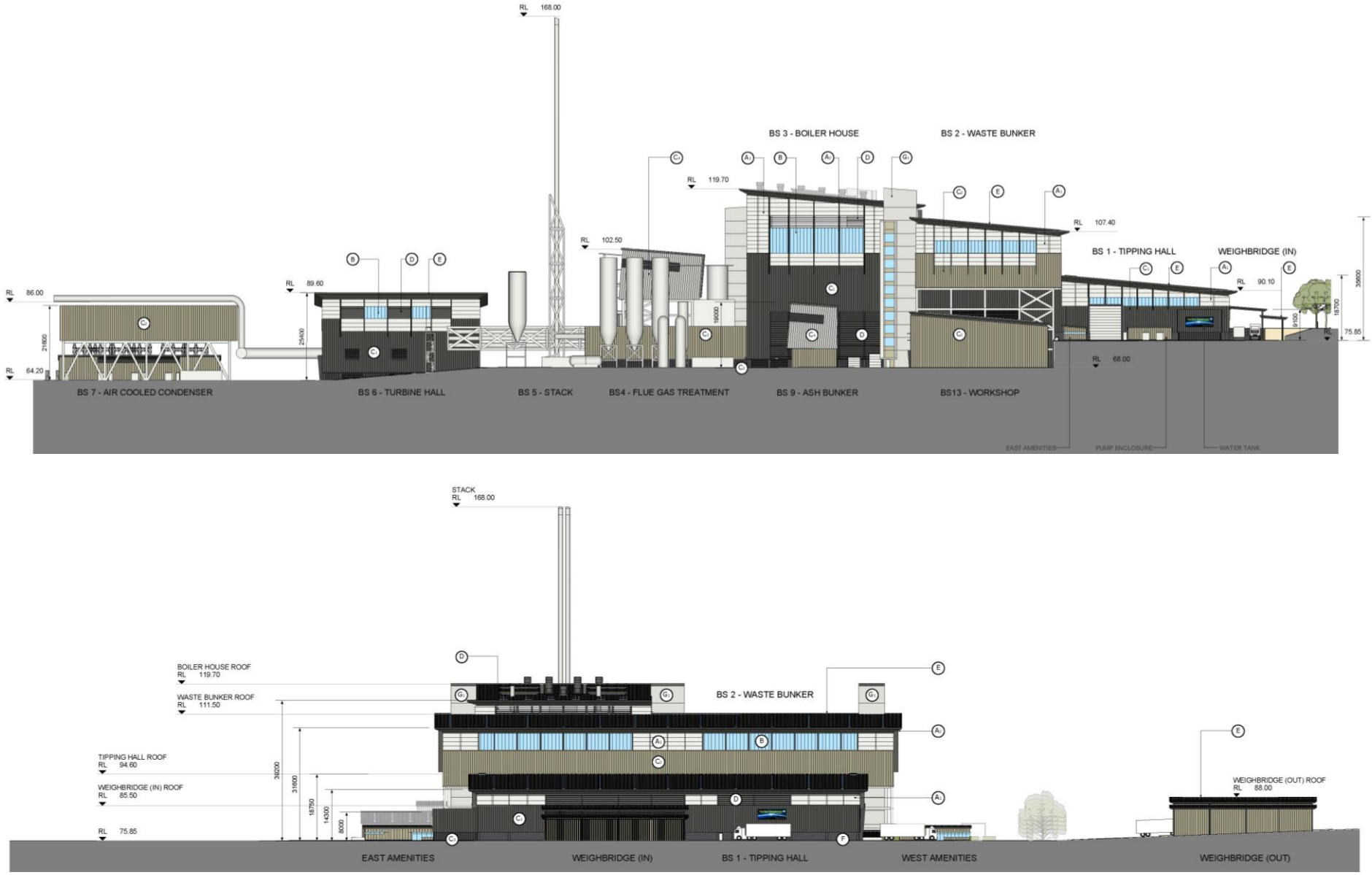

FIGURE 6 – PROJECT ELEVATIONS – EAST (UPPER) AND NORTH (LOWER) (SOURCE: KTA)

FIGURE 7 – PROJECT ELEVATION – WEST (UPPER) AND SOUTH (LOWER) (SOURCE: KTA)

4 Assessment of Potential Impact

This assessment has been prepared to define areas of highest visual impact and to assist in the mitigation of impacts of the proposed works from sensitive viewpoints.

4.1 QUANTITATIVE VISUAL IMPACT – PRIMARY VIEWPOINTS

The critical issues to consider in the assessment of visual impact are:

- Degree to which the proposed works are visible from representative sensitive viewing locations; and
- The degree to which the Project integrates within the character of the existing setting

The method assumes that if the Project is not seen, then there is no resulting impact.

Analysis was undertaken to identify sensitive viewpoints in the vicinity of the Project. Viewpoints located within the local and near sub-regional settings of the Project were chosen for detailed assessment based on their higher levels of viewer sensitivity:

- Residences and the local road network;
- Transport and Tourist Routes, e.g., motorway; and
- Open Space and recreation areas.

The quantitative assessment process has focussed on the visual modification that may result on views for the most sensitive visual settings/land uses, applying the visibility method as described in ***Section 1.3.1*** and ***Appendix A***. Low sensitivity visual settings, such as existing landfill areas or industrial land uses have not been considered. The quantification of horizontal and vertical angle is based on the widths and heights of the tallest elements of the Project (e.g., the tallest buildings from 40-52 m in height and the vent stack at 100 m). The quantification of vertical and horizontal prominence assists with the determination of visual modification. However, it does not take into account aspects such as visual contrast or visual integration which are assessed as part of the qualitative assessment process.

Distances expressed in the quantitative assessment are based on those from the viewpoint to the most visible components of the Project, either the vent stack or main building structure.

A quantitative assessment of these viewpoints is given in ***Table 7*** and the locations of viewpoints are shown in ***Figure 8***.

TABLE 7 – QUANTITATIVE ASSESSMENT

VIEWPOINT *(REFER FIGURE 8)*	VIEWSHED	HORIZONTAL DISTANCE FROM VIEWER (TO CLOSEST COMPONENT)	HORIZONTAL ANGLE	*HORIZONTAL POTENTIAL VISUAL PROMINENCE*	VERTICAL ANGLE	*VERTICAL POTENTIAL VISUAL PROMINENCE*	*VISUAL MODIFICATION LEVEL*
EASTERN ASPECT							
Viewpoint 1 Roper Road Overpass	Sub-Regional	1.8 km (Waste Bunker)	4º Minimal Views – Mostly screened by vegetation	Insignificant	2º Minimal Views – Mostly screened by vegetation	Potentially Noticeable	Low to Moderate
Viewpoint 2 Peppertree Drive (Near Phoenix Crescent)	Sub-Regional	2.0 km (Waste Bunker)	No View – Screened by built form and vegetation	No Impact	No View – Screened by built form and vegetation	No Impact	No Impact
Viewpoint 3 Peppertree Park	Sub-Regional	1.9 km (Waste Bunker)	5º	Potentially Noticeable	3º	Potentially Dominant	Moderate to High
Viewpoint 4 Minchin Drive	Sub-Regional	1.6 km (Waste Bunker)	No View – Screened by topography and vegetation	No Impact	No View – Screened by topography and vegetation	No Impact	No Impact
Viewpoint 5 McFarlane Drive	Sub-Regional	1.3 km (Waste Bunker)	No View – Screened by topography	No Impact	No View – Screened by topography	No Impact	No Impact
Viewpoint 6 Indus Street	Sub-Regional	1.6 km (Vent Stack)	<1º Minimal Views – Mostly screened by vegetation	Insignificant	2º Minimal Views – Mostly screened by vegetation	Potentially Noticeable	Low to Moderate
Viewpoint 7 Old Wallgrove Road	Sub-Regional	1.6 km (Air Cooled Condenser)	6º	Potentially Noticeable	4º	Potentially Dominant	Moderate to High

VIEWPOINT *(REFER FIGURE 8)*	VIEWSHED	HORIZONTAL DISTANCE FROM VIEWER (TO CLOSEST COMPONENT)	HORIZONTAL ANGLE	*HORIZONTAL POTENTIAL VISUAL PROMINENCE*	VERTICAL ANGLE	*VERTICAL POTENTIAL VISUAL PROMINENCE*	*VISUAL MODIFICATION LEVEL*
Viewpoint 8 Blackbird Lane Path	Sub-Regional	1.3 km (Waste Bunker)	<1º Minimal Views – Mostly screened by vegetation	Insignificant	2º	Potentially Noticeable	Low to Moderate
Viewpoint 9 Sennar Road Pathway	Sub-Regional	1.3 km (Waste Bunker)	No View – Screened by vegetation	No Impact	No View – Screened by vegetation	No Impact	No Impact

4.1.1 VISUAL SIMULATIONS

Visual simulations (based on a computer generated three dimensional [3D] model) have been created for the selected locations shown on ***Figure 8*** by Orbit Solutions.

Initial verification 3D model views of the Project were prepared by Urbis and Orbit Solutions, based upon the current design model, supplied by Krikis Tayler Architects. These models all portrayed the Project at the same scale or proportion within the field of view for each of the selected viewpoints.

The vertical location of the 3D model within the photo was calibrated by Urbis using a number of elements of known height within the visual setting. These were:

- The HV pylons, where the height was determined using software that calculated height based on length of shadow for a given time of day.
- Mobile phone towers – where Urbis has a data base of specification (and height) of all Telco towers in Australia.

The photo simulations based on photography from typical sensitive viewpoints are included within the following analysis section. The images that the photo simulations have been based on have been captured with a Canon 6D single lens reflex (SLR) full format digital camera, fitted with a Canon GP-E2 GPS unit, with a lens of 50 millimetres (mm) focal length which would result in an image very close to the recognised standard that closely represents the central field of vision of the human eye. Photomontages have been prepared for a range of indicative sensitive viewpoints that represent a variety of distances from the Project as well as locations with differing viewing aspects.

4.1.2 THEORETICAL VIEWSHED

The theoretical viewshed or theoretical zone of visual influence (TZVI) is the area from which views of a particular proposed development may be possible. The viewsheds of the main components of the Project are shown on ***Figures 8*** to ***11***. The contour interval of the digital terrain model was 2 m.

The TZVI has been generated for the top of the vent stack, and the main buildings and assumes a viewing height for surrounding areas of 1.5 m above ground level.

The TZVI could be considered to be a worst case (i.e. conservative) scenario, with a greater extent of viewshed identified than would actually exist, as it does not take into account the effects of screening of views by existing vegetation. Its primary purpose is to identify locations from which a proposed development may be visible in a worst case scenario.

SUMMARY OF RESULTS

The TZVI analysis demonstrates that where there is no vegetation or built form, the flat topography allows for distant views.

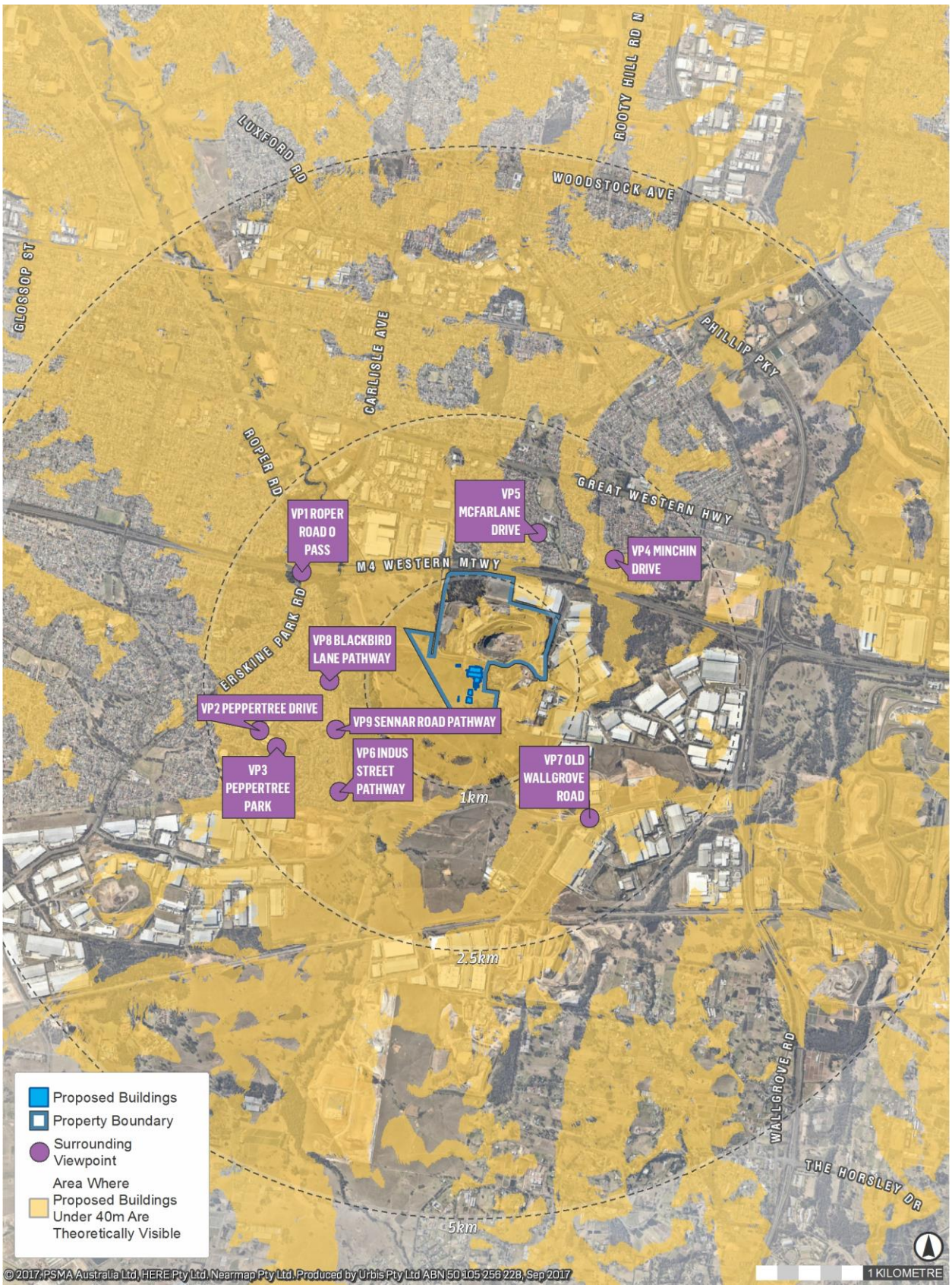

FIGURE 8 – VIEWPOINTS AND TZVI OF AREAS FROM WHICH BUILDINGS UNDER 40M HEIGHT ARE THEORETICALLY VISIBLE

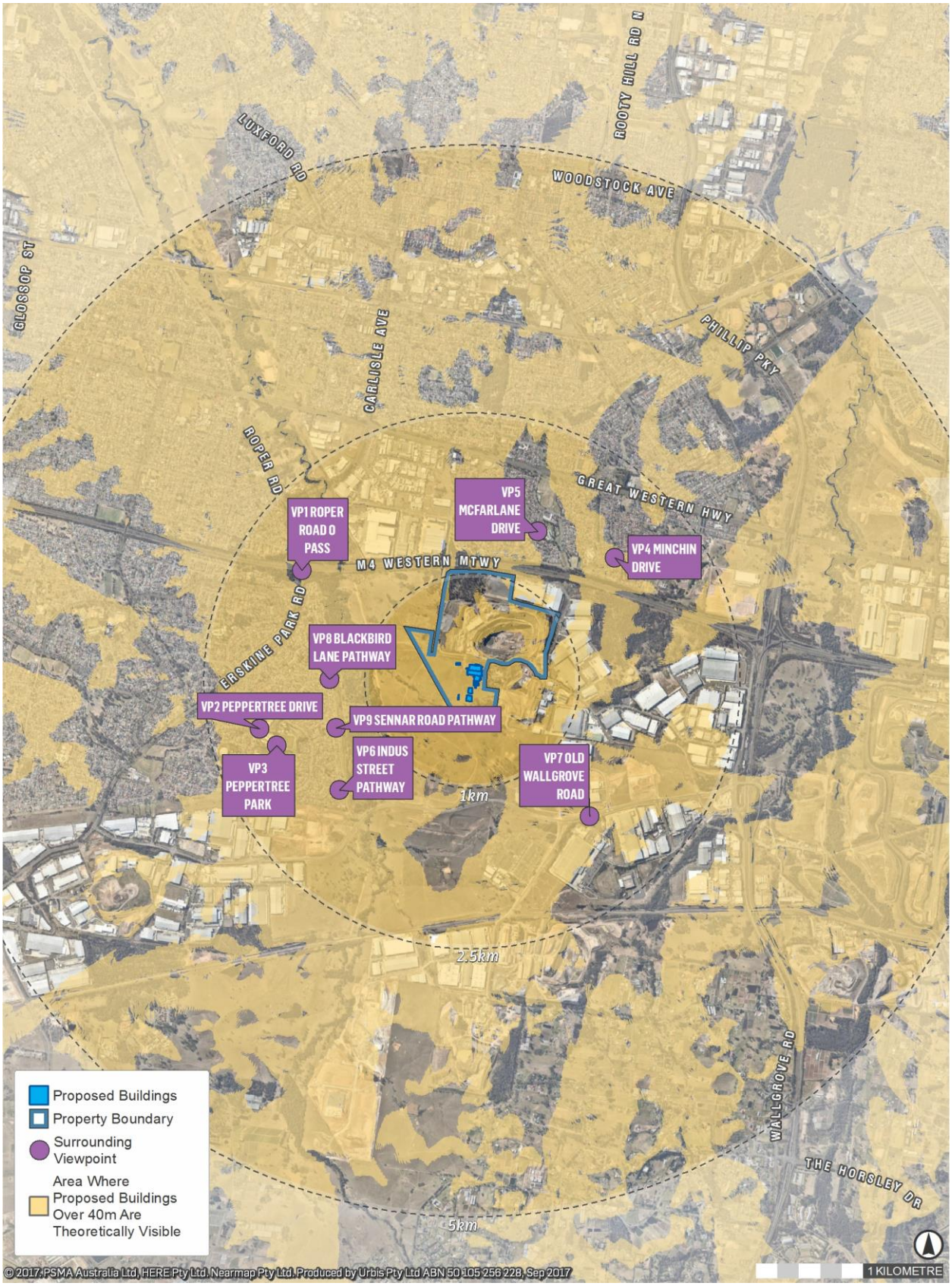

FIGURE 9 – TZVI OF AREAS FROM WHICH BUILDINGS OVER 40M IN HEIGHT ARE THEORETICALLY VISIBLE

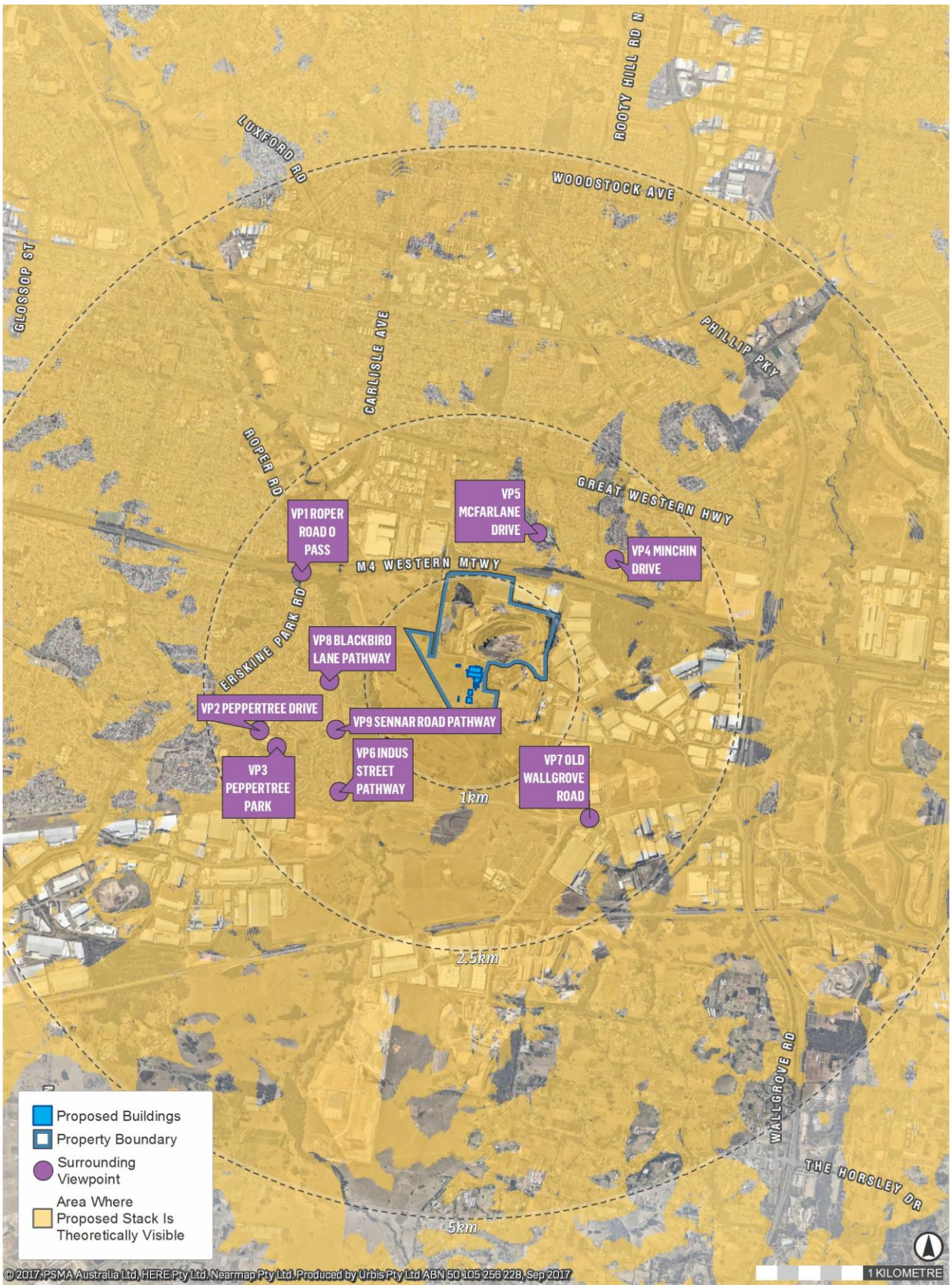

FIGURE 10 – TZVI OF AREAS FROM WHICH VENT STACK (100M HEIGHT) IS THEORETICALLY VISIBLE

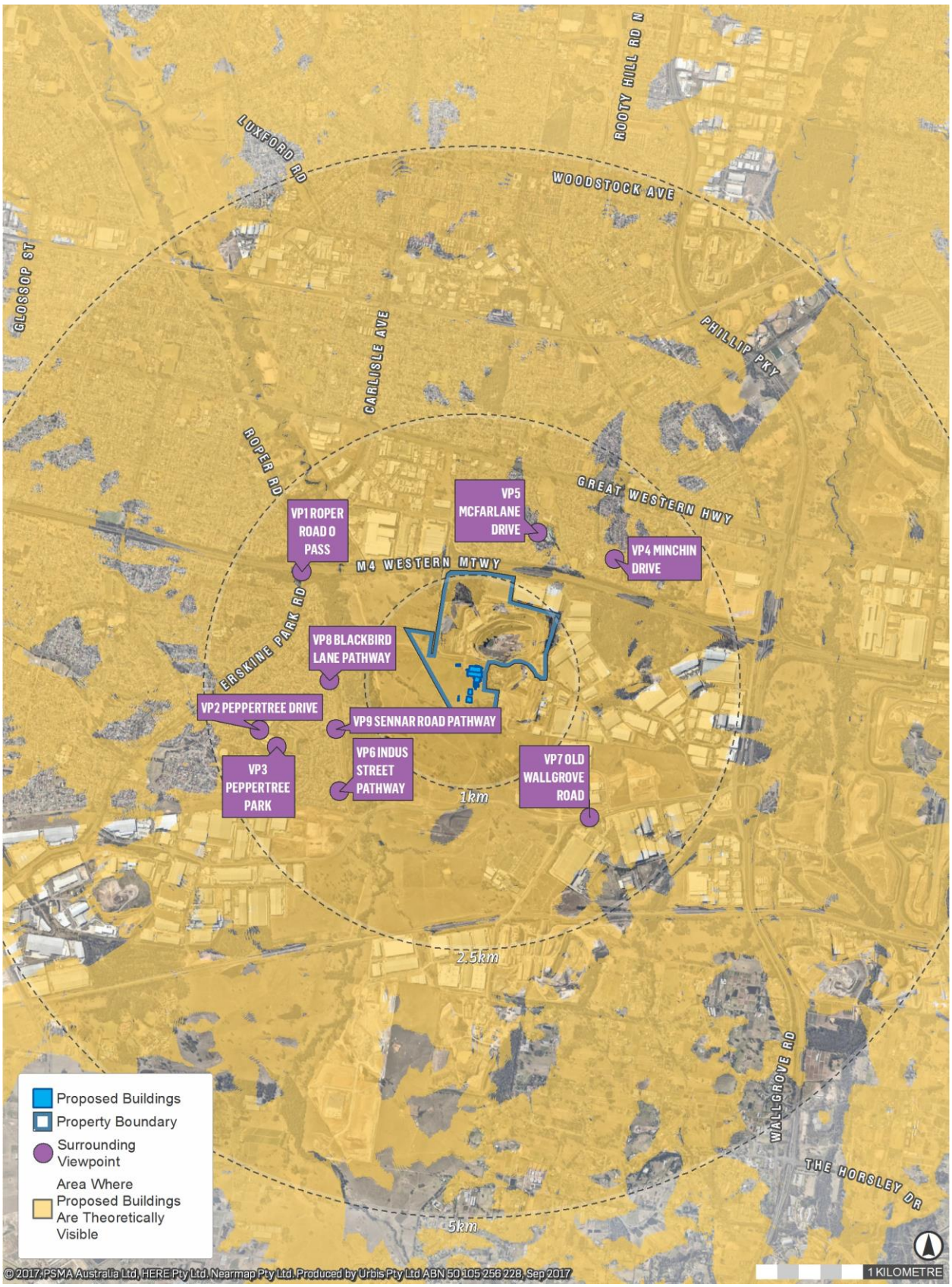

FIGURE 11 – TZVI OF ALL COMPONENTS OF THE PROJECT.

4.2 QUALITATIVE ASSESSMENT

The following section assesses the potential visual impact of the Project on the sensitive viewpoints described in ***Section 4.1***. Distances expressed in the qualitative assessment are based on those from the viewpoints to the most visible components of the Project, the vent stack and main buildings.

The assessment has been undertaken for a range of individual viewpoints which are representative of other similar viewpoints within the setting with a similar aspect to the Project.

Viewpoints were selected on the basis of their sensitivity (land use and user experience dependant) and radius from the Project. Within 2.5km, residential uses are deemed to be of a high sensitivity. Beyond this distance the level of sensitivity falls and, commensurate with this, the visual modification level or visual prominence level also falls. Additional assessed viewpoints within this area beyond 2.5km would be determined as having a lower level of impact due to residential visual sensitivity reducing to moderate.

All selected viewpoints are located within the near sub-regional setting (i.e., between 1km and 2.5km of the components of the Project). No viewpoints exist in the local setting and viewpoints within the regional setting are considered to be too distant for the impacts to be significant.

VIEWPOINT 1 – ROPER ROAD OVERPASS	
Viewing Location	Footpath on south side of bridge (***Figure 8***).
Viewing Distance	1.8 km to the Project – waste bunker.
Visual Setting	Sub-regional.
Landscape Setting	The viewpoint is located on a road bridge over the M4 Western Motorway connecting the residential areas of Colyton and Erskine Park, which abut the Motorway to the north west and south west of the bridge. The landscape character of the Motorway is dominated by six traffic lanes, centrally divided by a wide, grassed and lightly planted median. Four high voltage transmission lines traverse the Motorway 500 m south of the viewpoint (***Figures 12*** and ***13***).
Visual Modification	The tops of the higher buildings, the waste bunker and the boiler house buildings, as well as the vent stack will be visible protruding above the existing foreground vegetation which will screen views to the lower parts of the Project (***Figure 15***). The landscape character of views from the bridge is defined by the Motorway and its associated infrastructure as well as the high voltage powerlines. Given the distance of the viewpoint from the Project and the visual fit of the project with existing, large scale infrastructure, there is anticipated to be a low visual modification resulting to the views from this viewpoint.
Land Use	Local Connector Road.
Visual Sensitivity	High.
Duration of View	Moving.
Potential Visual Impact	The high visual sensitivity combined with a low visual modification level will result in a moderate visual impact.

FIGURE 12 - CHARACTER OF SETTING – ROPER ROAD OVERPASS – RESIDENTIAL INTERFACE

FIGURE 13 – CHARACTER OF SETTING – ROPER ROAD OVERPASS – MOTORWAY INTERFACE

FIGURE 14 – EXISTING VIEW SOUTH EAST TOWARDS PROJECT - ROPER ROAD OVERPASS

FIGURE 15 – PHOTOSIMULATION VIEW SOUTH EAST TOWARDS PROJECT – ROPER ROAD OVERPASS

VIEWPOINT 2 – PEPPERTREE DRIVE (NEAR PHOENIX CRESCENT)	
Viewing Location	Edge of roadway (***Figure 8***).
Viewing Distance	2.0 km to the Project (waste bunker).
Visual Setting	Sub-regional.
Landscape Setting	Suburban street primarily comprised of single storey residences with construction typically of brick veneer with tiled roofs. Vegetation throughout the residential area is mixed native and exotic, deciduous and evergreen species with a sparse canopy cover throughout (***Figure 16***).
Visual Modification	Built form and canopy trees throughout the residential area between the viewpoint and the Project generally screen views. Views to the top of the vent stack may be possible where gaps in buildings and vegetation allow for distant unobstructed views (***Figure 17*** and ***18***). As a result, the overall visual modification level is considered to be low to non-apparent.
Land Use	Residential area / local street.
Visual Sensitivity	High.
Duration of View	Stationary - Residences / Moving – Vehicles, pedestrians and cyclists.
Potential Visual Impact	The high visual sensitivity combined with a low or non-apparent visual modification level will result in a generally non-apparent visual impact.

FIGURE 16 – CHARACTER OF SETTING - PEPPERTREE DRIVE

FIGURE 17 – VIEW EAST TOWARDS PROJECT – PEPPERTREE DRIVE

FIGURE 18 – BUILDING OUTLINE VIEW WEST TOWARDS PROJECT – PEPPERTREE DRIVE

VIEWPOINT 3 – PEPPERTREE PARK	
Viewing Location	North eastern corner of park (***Figure 8***).
Viewing Distance	1.9 km to the Project (waste bunker).
Visual Setting	Sub-regional.
Landscape Setting	The park is an open playing field with trees bordering its southern boundary and residences abutting the parks eastern boundary. The Erskine Park community centre abuts the park's north western boundary. With the opportunity for viewpoints setback from intervening foreground objects, views out from the space are expansive (***Figure 19***).
Visual Modification	The upper parts of the main buildings and the vent stack will be visible from this viewpoint above intervening vegetation and built form (***Figure 20*** and ***21***). As a result, there is anticipated to be a moderate to high visual modification resulting to the viewshed from this viewpoint.
Land Use	Recreational.
Visual Sensitivity	High.
Duration of View	Stationary.
Potential Visual Impact	The high visual sensitivity combined with a moderate to high visual modification level will result in a high visual impact.

FIGURE 19 – CHARACTER OF SETTING – PEPPERTREE PARK

FIGURE 20 – VIEW EAST TOWARDS THE PROJECT FROM PEPPERTREE PARK

FIGURE 21 – PHOTOSIMULATION VIEW EAST TOWARDS THE PROJECT – PEPPERTREE PARK

VIEWPOINT 4 – MINCHIN DRIVE	
Viewing Location	Minchin Drive edge of roadway (***Figure 8***).
Viewing Distance	1.6 km to the Project (waste bunker).
Visual Setting	Sub-regional.
Landscape Setting	Suburban street primarily comprised of single storey residences with construction typically of brick veneer with tiled roofs. Vegetation throughout the residential area is mixed native and exotic, deciduous and evergreen species with a sparse canopy cover throughout (***Figure 22***).
Visual Modification	Built form and canopy trees throughout the residential area between the viewpoint and the Project generally screen views. Views to the top of the vent stack may be possible where gaps in buildings and vegetation allow for distant unobstructed views (***Figure 23*** and ***24***). As a result, the overall visual modification level is considered to be low to non-apparent.
Land Use	Residential area / local street.
Visual Sensitivity	High.
Duration of View	Stationary - Residences / Moving – Vehicles, pedestrians and cyclists.
Potential Visual Impact	The high visual sensitivity combined with a low or non-apparent visual modification level will result in a generally non-apparent visual impact.

FIGURE 22 – CHARACTER OF SETTING – MINCHIN DRIVE

FIGURE 23 – VIEW SOUTH WEST TOWARDS THE PROJECT FROM MINCHIN DRIVE

FIGURE 24 – PHOTOSIMULATION WITH BUILDING OUTLINE VIEW SOUTH EAST TOWARDS THE PROJECT – MINCHIN DRIVE

VIEWPOINT 5 – MCFARLANE DRIVE	
Viewing Location	McFarlane Drive edge of roadway (***Figure 8***).
Viewing Distance	1.3 km to the Project (waste bunker).
Visual Setting	Sub-regional.
Landscape Setting	Suburban street primarily comprised of single storey residences with construction typically of brick veneer with tiled roofs. Vegetation throughout the residential area is mixed native and exotic, deciduous and evergreen species with a sparse canopy cover throughout (***Figure 25***).
Visual Modification	Built form and canopy trees throughout the residential area between the viewpoint and the Project generally screen views. Views to the top of the vent stack may be possible where gaps in buildings and vegetation allow for distant unobstructed views (***Figure 26*** and ***27***). As a result, the overall visual modification level is considered to be low to non-apparent.
Land Use	Residential area / local street.
Visual Sensitivity	High.
Duration of View	Stationary - Residences / Moving – Vehicles, pedestrians and cyclists.
Potential Visual Impact	The high visual sensitivity combined with a low or non-apparent visual modification level will result in a generally non-apparent visual impact.

FIGURE 25 – CHARACTER OF SETTING – MCFARLANE DRIVE

FIGURE 26 – VIEW SOUTH-SOUTHWEST TOWARDS THE PROJECT FROM MCFARLANE DRIVE

FIGURE 27 – BUILDING OUTLINE VIEW SOUTH-SOUTH WEST TOWARDS THE PROJECT – MCFARLANE DRIVE

VIEWPOINT 6 – INDUS STREET - PATHWAY	
Viewing Location	From the eastern end of the street at the intersection of the pathway (***Figure 8***).
Viewing Distance	1.6 km to the Project (vent stack).
Visual Setting	Sub-regional.
Landscape Setting	The eastern edge of Erskine Park interfaces with an area of open space along Ropes Creek. The suburban residential character is primarily comprised of single storey residences with construction typically of brick veneer with tiled roofs. The open space along the creek is undeveloped and is comprised of remnant and regrowth riparian vegetation up to 15 m in height. The tallest vegetation is offset between 150 m and 300 m from the viewpoint, with rough grassland and small trees to 5 m in height located in between the tallest vegetation and the informal pathway, which is located along the rear of the residential fences, running north to south along the length of the interface of the residential area and open space area (***Figure 28***).
Visual Modification	The existing vegetation between the viewpoint and the Project generally screens views to the main buildings. However, views of the tops of the taller buildings will be possible. Views to the top of the slender vent stack above the main buildings will be possible above vegetation (***Figure 29*** and ***30***). The built form of the Project will contrast with the natural landscape of the open space area in the foreground. However, the extent visible is likely to be relatively minimal. As a result, the overall visual modification level is considered to be low.
Land Use	Residential area / recreational path.
Visual Sensitivity	High.
Duration of View	Stationary to slow moving – Pedestrians and cyclists.
Potential Visual Impact	The high visual sensitivity combined with a low visual modification level will result in a moderate visual impact.

FIGURE 28 – CHARACTER OF SETTING – INDUS STREET PATHWAY

FIGURE 29 – VIEW NORTH EAST TOWARDS THE PROJECT FROM INDUS STREET PATHWAY

FIGURE 30 – PHOTOSIMULATION AND BUILDING OUTLINE VIEW NORTH EAST TOWARDS THE PROJECT – INDUS STREET PATHWAY

VIEWPOINT 7 – OLD WALLGROVE ROAD	
Viewing Location	Old Wallgrove Road, edge of roadway (***Figure 8***).
Viewing Distance	1.6 km to the Project (air-cooled condenser).
Visual Setting	Sub-regional.
Landscape Setting	Industrial area comprised primarily of large form industrial buildings constructed typically of tilt concrete slabs with metal deck roofs. The landscape is generally open with minimal vegetation. Significant areas of undeveloped land, primarily open paddocks, exist between buildings (*Figure 31*).
Visual Modification	The open landscape and flat topography allows for views to the Project as well as other buildings in the viewshed, the presence of such elements creating an already modified landscape character which is consistent with the form of proposed development (***Figure 32*** and ***33***). As a result, the overall visual modification level is considered to be low to moderate due to visual fit.
Land Use	Industrial area.
Visual Sensitivity	Low.
Duration of View	Stationary – Industrial sites / Moving – Vehicles.
Potential Visual Impact	The low visual sensitivity combined with a low to moderate visual modification level will result in a low visual impact.

FIGURE 31 – CHARACTER OF SETTING – OLD WALLGROVE ROAD

FIGURE 32 – VIEW WEST TOWARDS THE PROJECT FROM OLD WALLGROVE ROAD

FIGURE 33 – PHOTOSIMULATION VIEW WEST TOWARDS THE PROJECT – OLD WALLGROVE ROAD

VIEWPOINT 8 – BLACKBIRD LANE - PATHWAY	
Viewing Location	From the eastern end of the lane at the intersection of the pathway (***Figure 8***).
Viewing Distance	1.3 km to the Project (waste bunker).
Visual Setting	Sub-regional.
Landscape Setting	The eastern edge of Erskine Park interfaces with an area of open space along Ropes Creek. The suburban residential character is primarily comprised of single storey residences with construction typically of brick veneer with tiled roofs. The open space along the creek is undeveloped and is comprised of remnant and regrowth riparian vegetation up to 15 m in height. The tallest vegetation is offset 50 m from the viewpoint, with rough grassland located between it and the informal pathway, which is located along the rear of the residential fences, running north to south along the length of the interface of the residential area and open space area *(**Figure 34**)*.
Visual Modification	The existing vegetation between the viewpoint and the Project generally screens views to the main buildings. However, views of the tops of the taller buildings will be possible. Views to the top of the slender vent stack above the main buildings will be possible above vegetation (***Figure 35*** and ***36***). The built form of the Project will contrast with the natural landscape of the open space area in the foreground. However, the extent visible is likely to be relatively minimal. As a result, the overall visual modification level is considered to be low.
Land Use	Residential area / recreational path.
Visual Sensitivity	High.
Duration of View	Stationary to slow moving – Pedestrians and cyclists.
Potential Visual Impact	The high visual sensitivity combined with a low visual modification level will result in a moderate visual impact.

FIGURE 34 – CHARACTER OF SETTING – BLACKBIRD LANE PATHWAY

FIGURE 35 – VIEW EAST TOWARDS THE PROJECT FROM BLACKBIRD LANE PATHWAY

FIGURE 36 – PHOTOSIMULATION AND BUILDING OUTLINE VIEW EAST TOWARDS THE PROJECT – BLACKBIRD LANE PATHWAY

VIEWPOINT 9 – SENNAR ROAD - PATHWAY	
Viewing Location	From the eastern end of the lane at the intersection of the pathway (***Figure 8***).
Viewing Distance	1.3 km to the Project (vent stack).
Visual Setting	Sub-regional.
Landscape Setting	The eastern edge of Erskine Park interfaces with an area of open space along Ropes Creek. The suburban residential character is primarily comprised of single storey residences with construction typically of brick veneer with tiled roofs. The open space along the creek is undeveloped and is comprised of remnant and regrowth riparian vegetation up to 15 m in height. The tallest vegetation is offset 50 m from the viewpoint, with rough grassland located between it and the informal pathway, which is located along the rear of the residential fences, running north to south along the length of the interface of the residential area and open space area *(**Figure 37**)*.
Visual Modification	The existing vegetation between the viewpoint and the Project generally fully screens views to the main buildings. (***Figure 38*** and ***39***). As a result, the overall visual modification level is considered to be low to non-apparent.
Land Use	Residential area / recreational path.
Visual Sensitivity	High.
Duration of View	Stationary to slow moving – Pedestrians and cyclists.
Potential Visual Impact	The high visual sensitivity combined with a low or non- apparent visual modification level will result in a generally non-apparent visual impact.

FIGURE 37 – CHARACTER OF SETTING – SENNAR ROAD PATHWAY

FIGURE 38 – VIEW EAST TOWARDS THE PROJECT FROM SENNAR ROAD PATHWAY

FIGURE 39 – PHOTOSIMULATION AND BUILDING OUTLINE VIEW EAST TOWARDS THE PROJECT – SENNAR ROAD PATHWAY

4.3 IMPACTS OF NIGHT LIGHTING

Operations for the Project would be undertaken 24 hours a day, seven days a week. The methodology applied in this study is drawn from the Institute of Lighting Engineers' (ILE) *Guidance Notes for the Reduction of Obtrusive Light,* and includes a range of categories with which to describe the lit situation of the landscape. These environmental zones are supported by design guidance for the reduction of light pollution which can then inform proposed mitigation techniques (***Appendix B***).

4.3.1 THE EXISTING SETTING

The surrounding lighting environmental zones of the Project include the following settings as identified in the *Guidance Notes for the Reduction of Obtrusive Light* (ILE, 2005):

- Residential Areas:
  - Sub – regional setting:
    - Environmental Zone E3: Medium district brightness area.
  - Regional setting:
    - Environmental Zone E3: Medium district brightness area.
- Existing Industrial land uses :
  - Local setting – Undeveloped land and Industrial uses - Environmental Zone E2: Low district brightness area.
  - Sub – regional setting – Industrial uses - Environmental Zone E3: Medium district brightness area.

4.3.2 LIGHTING SOURCES

The lighting proposed to be employed by the Project would be emitted from three sources:

FIXED/PERMANENT LIGHTS

This is lighting that is installed as part of the permanent infrastructure of the development to allow for safe operations to occur at night as well as for security reasons.

AVIATION HAZARD LIGHTS

Given the height of the vent stack, flashing red lights will be required to identify the top of the stack as an aviation hazard.

VEHICLE MOUNTED LIGHTS

Headlights mounted on trucks and management vehicles. Vehicles operating within the Project area would have headlights and hazard lights operating at all times due to occupational health and safety requirements.

4.3.3 EFFECTS OF LIGHTING

The exact impact or acceptability of night-lighting is difficult to define as it is dependent on individual perceptions and sensitivities as well as the presence of existing light.

From most locations in the sub–regional and regional setting, direct views to the lighting sources would be obscured from view by built form and vegetation within the landscape and around residences.

The management of night time operations, such as baffling and the use of motion sensors, will reduce impacts on adjacent sensitive viewpoints, particularly those within the near subregional setting. However, the local, sub regional and regional settings all contain lighting sources of a similar intensity emitted from both residences and other industrial uses and the nature of the night-lighting for the Project would be similar to that of the existing night-time setting. Therefore any change in potential night lighting impacts would be relatively minor for most viewpoints.

Mitigation measures to reduce the potential impacts of night-lighting from the Project are described in ***Section 5.3***.

5 Amelioration of Visual Impacts

A Site Landscape Concept Plan has been prepared for the Project by Site Image (***Figure 40***). The primary ameliorative actions include canopy tree planting along the northern interface with the future Estate Road.

5.1 CONSTRUCTION MATERIAL SELECTION

The visual impact has been reduced through the cladding of the buildings with non-reflective materials with subdued colours that mimic those found in the landscape of the setting, for example greys, browns and olive greens. The design uses this range of complementary muted colours of slightly lighter and darker shades to provide a dappled effect to improve visual integration.

Given that the vent stack will be a tall element within the landscape and will be primarily viewed with the sky as a backdrop, the visual impact has been further reduced through selection of a light grey finish which aids visual integration in range of atmospheric conditions. Bright, un-natural colours have been avoided.

5.2 VISUAL SCREENING

While not able to fully screen the proposed 50 m high buildings and 100 m vent stack, the canopy tree planting proposed for the north eastern boundary of the Project area should be extended to provide visual softening of the bulk of the buildings and assist them to "settle" within the landscape.

A landscape plan was prepared for the Project by Site Image. Their description to the approach to the design of the landscape is:

"The ground plane and landscape treatments shown on the masterplan are in proportion to the buildings and site, reducing the apparent scale of the built forms. The 8m wide bands of ballast rock create a rhythm that is relevant to elevated truck views, and for aerial views of the site. The entry, arrival road, office and weigh-station areas are the principal areas to receive finishes in excess of concrete and bitumen pavements."

5.3 MANAGEMENT OF POTENTIAL LIGHTING IMPACTS

The proponent would seek to minimise light emissions from the Project by carefully selecting the sites where lights would be placed, and by use of physical barriers and/or operational measures to reduce light 'spill' without compromising operational safety. Measures that would be employed to mitigate potential impacts from night-lighting would include the following, where practicable:

- All external lighting associated with the Project would comply with Australian Standard AS 4282: 1997 – *Control of the Obtrusive Effects of Outdoor Lighting*.
- Restriction of night-lighting to the minimum required for operations and safety requirements.
- Use of directional lighting techniques.
- Use of light shrouds and reflectors to limit the spill of lighting.

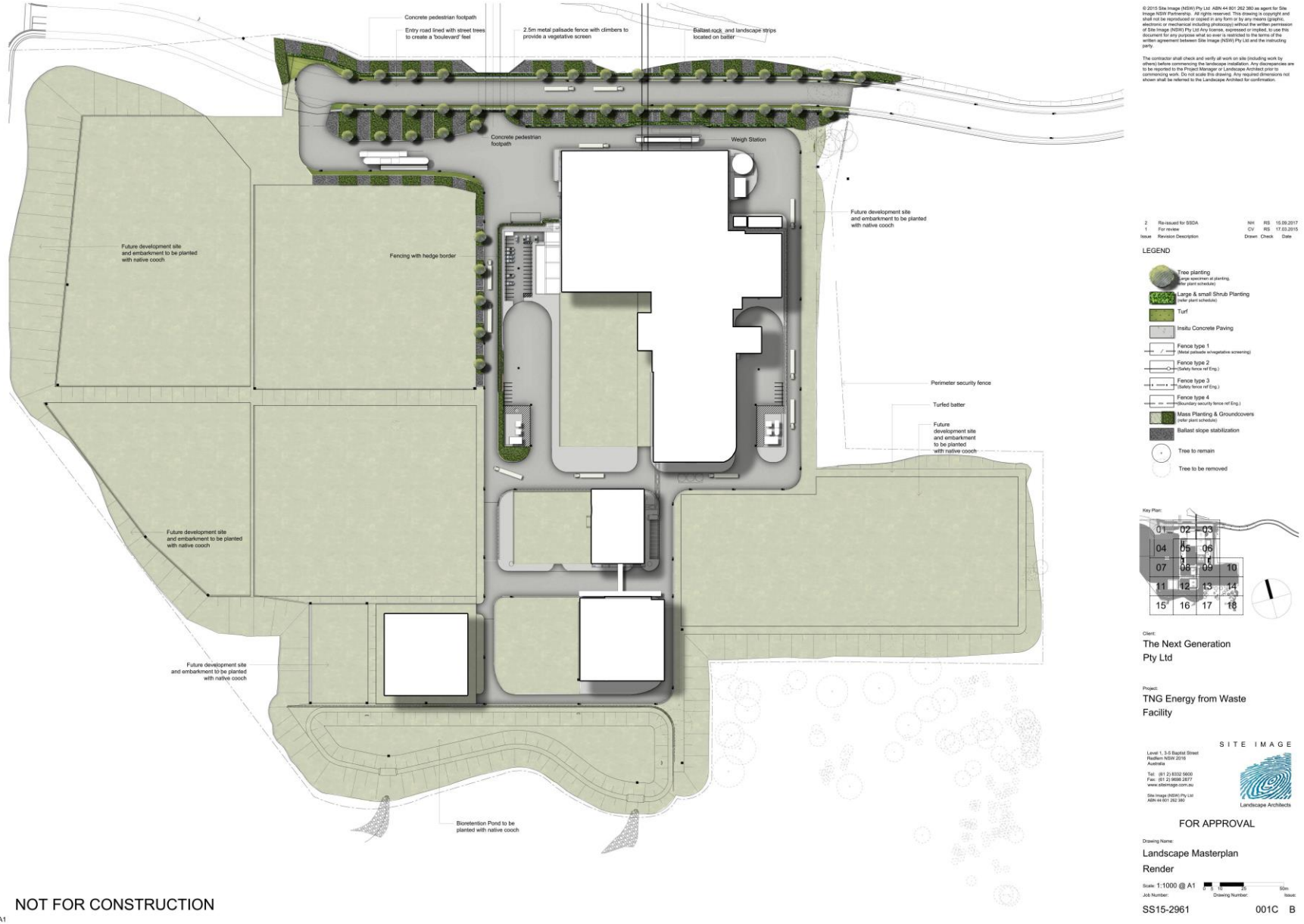

FIGURE 40 – SITE LANDSCAPE MASTER PLAN (SOURCE: SITE IMAGE)