

Cleary Bros (Bombo) Pty Ltd

ABN: 28 000 157 808



**CLEARY BROS**

# Albion Park Quarry Extraction Area Stage 7 Extension

## Visual Impacts Assessment

Prepared by



**R.W. CORKERY & CO. PTY. LIMITED**

**February 2022**

**Specialist Consultant Studies Compendium  
Part 3**

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ABN: 28 000 157 808

# Albion Park Quarry Extraction Area Stage 7 Extension

## Visual Impacts Assessment

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**Prepared for:**

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Ref No: 1004/02

**February 2022**



Addendum: The Visual Impacts Assessment identifies that Cleary Bros were continuing discussions with the owners of "Figtree Hill" regarding Project-related impacts, and an agreement had not been reached at the time the assessment was finalised. As identified in Section 2.5 of the EIS, a negotiated agreement has since been finalised between Cleary Bros and the owners of "Figtree Hill". As such, the "Figtree Hill" property is now considered Project-related for the purposes of this assessment. Under that agreement, the owners have agreed to accept Project-related impacts to the extent identified in the Visual Impacts Assessments.

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## **Executive Summary**

The proposed Stage 7 extension of the current extraction area within the Albion Park Quarry is located largely on a ridge within the Wentworth Hills, south and west of the Princes Highway. The ridgeline slopes gradually southward from its northern end at an elevation of 125m AHD to 65m AHD at its southern end.

A series of 3D visibility software tools were used to establish where the ridge and the proposed extended extraction area could be viewed from. This analysis established that views towards the Project Area are present from three key visibility catchments.

1. Immediately north of the Project Area predominantly on the "Figtree Hill" property. Much of this area occurs at elevations higher than the land within the Project Area. Cleary Bros have discussed with the owners of "Figtree Hill" the range of potential visual impacts and mitigation measures that would be adopted in order to minimise the visual impacts upon the "Figtree Hill" property throughout the Project life.
2. The western side of Dunmore Road within Shell Cove West where elevations vary from approximately 35m AHD to 56m AHD. This area is currently being developed for residential housing and is 1.5km to 1.7km east of the Project Area. The Shellharbour Anglican College is also located within this catchment.
3. A recently developed residential area centred on the Glades Parkway and Fairways Drive in Shell Cove West. Elevations in this area vary from approximately 40m AHD to 72m AHD and the area is 2.2km to 2.4km east-southeast of the Project Area. It is noted that views of sections of the Holcim Albion Park Quarry and the Boral Dunmore Quarry are present from this catchment.

The Project Area is not visible from Albion Park Rail, Blackbutt and most areas within Flinders, Shellharbour and Shell Cove. The intervening topography and existing vegetation prevents views from most of the rural land east and northeast of the Project Area. No views of the Project Area are present from the Shellharbour Junction railway station and most of the Princes Highway given their low topographic setting.

The visual analysis established that a range of design and operational safeguards are required to minimise the visual impacts of the Project, particularly from the three key visibility catchments. The safeguards proposed comprise the following.

1. Extraction would be staged so that for the first 10 to 15 years, extraction activities would be largely shielded by the ridge itself together with two amenity barriers and tree screens.
2. Vegetation would be established on all extraction benches to reduce the visual impacts when the eastern side of the ridge within the Project Area is lowered.
3. The final upper extraction benches on the western side of Stage 7 and northern side of Stage 7d would be reduced to 7m high to optimise vegetation screening of the completed benches.



4. Extraction within Stages 7c and 7d would be undertaken in a manner which leaves the extraction of the Eastern Rim until the latter stages of the Project life. Extraction would then be undertaken in an easterly direction largely behind the eastern side of the ridge.

Detailed cross-sections between the three key visibility catchments and the Project Area together with 3D modelling and photomontages established the following visual impacts would occur.

- During the first 10 to 15 years, visual impacts would be minimal from all three key visibility catchments.
- Beyond about Year 15, various heights of the upper western extraction faces would become visible to varying degrees from the three key visibility catchments. However, their impact would be substantially reduced by the dark grey colour of the exposed rock and the established vegetation.
- Throughout the Project life, mobile equipment would be visible for comparatively short periods from the key visibility catchments, the impacts of which would be acceptable given the considerable distances between the observers and the equipment.

The visual impacts of dust plumes from blasting has been assessed to be minor given the Company's consideration of prevailing winds, the depth of most blasts within the extraction area and the short duration when the plumes are visible.

Overall, the proposed visual impacts generated by the Project have been assessed to be acceptable given the extent of visual mitigation that would be adopted in the context of the quantity of resources that would be recovered to provide the high quality raw materials for the ongoing development of the Illawarra and Greater Sydney Regions.





# **1 INTRODUCTION**

This report has been prepared to address the visual impacts of the proposed Stage 7 extension of the Albion Park Quarry Extraction Area at Croom (“the Project”). The Planning Secretary’s Environmental Assessment Requirements (SEARs) for the Project nominate the following visibility-related matters that need to be addressed.

- A detailed assessment of the likely visual impacts of the development (before, during and post-mining) on private landowners in the vicinity of the development and key vantage points in the public domain, paying particular attention to any new landforms.

This report presents:

- an overview of the components of the Project that would influence the visual impacts of the Project;
- the existing topographic setting focussing upon the landforms within the Project Area and the surrounding visual catchments;
- the mitigation measures required to minimise the visual impacts of the Project; and
- an assessment of the Project’s impacts assuming the adoption of the visual mitigation measures.

This report has been prepared with reference to site inspections to view the Project Area from surrounding vantage points (with photographs) combined with 3D software processing to identify potential visual catchments and to define from where and when, and the extent to which, the Stage 7 extraction operations would be seen from locations beyond the Project Area. It is noted that a number of the photographs included in this report were taken adjacent to private residences generally within the nearby road reserve. As such, the photographs equally relate to views experienced by occupants of private residences and motorists travelling in the subject direction along the subject public roads.



## 2 THE PROJECT

Cleary Bros proposes to extend the operational life of the Albion Park Quarry through the extension of its current extraction area which originally commenced operations in 2006. The current extraction area comprises six stages covering approximately 16ha and it is proposed to extend the extraction area into an adjoining area covering approximately 20ha referred to as Stage 7. For the purposes of the proposed development application for the Project, Stages 1 to 7 are collectively referred to as the “Project Area” (see **Figure 1**). Stages 1 to 6 are included in the Project Area as a quantity of rock remains to be extracted in those stages and greater efficiencies would be achieved by extracting the remaining rock currently in Stages 4, 5, 6 in conjunction with Stage 7. Some recoverable rock also remains to be extracted in Stage 2. Furthermore, some of the overburden and soil from Stage 7 would be used for the rehabilitation of Stages 1 to 4.

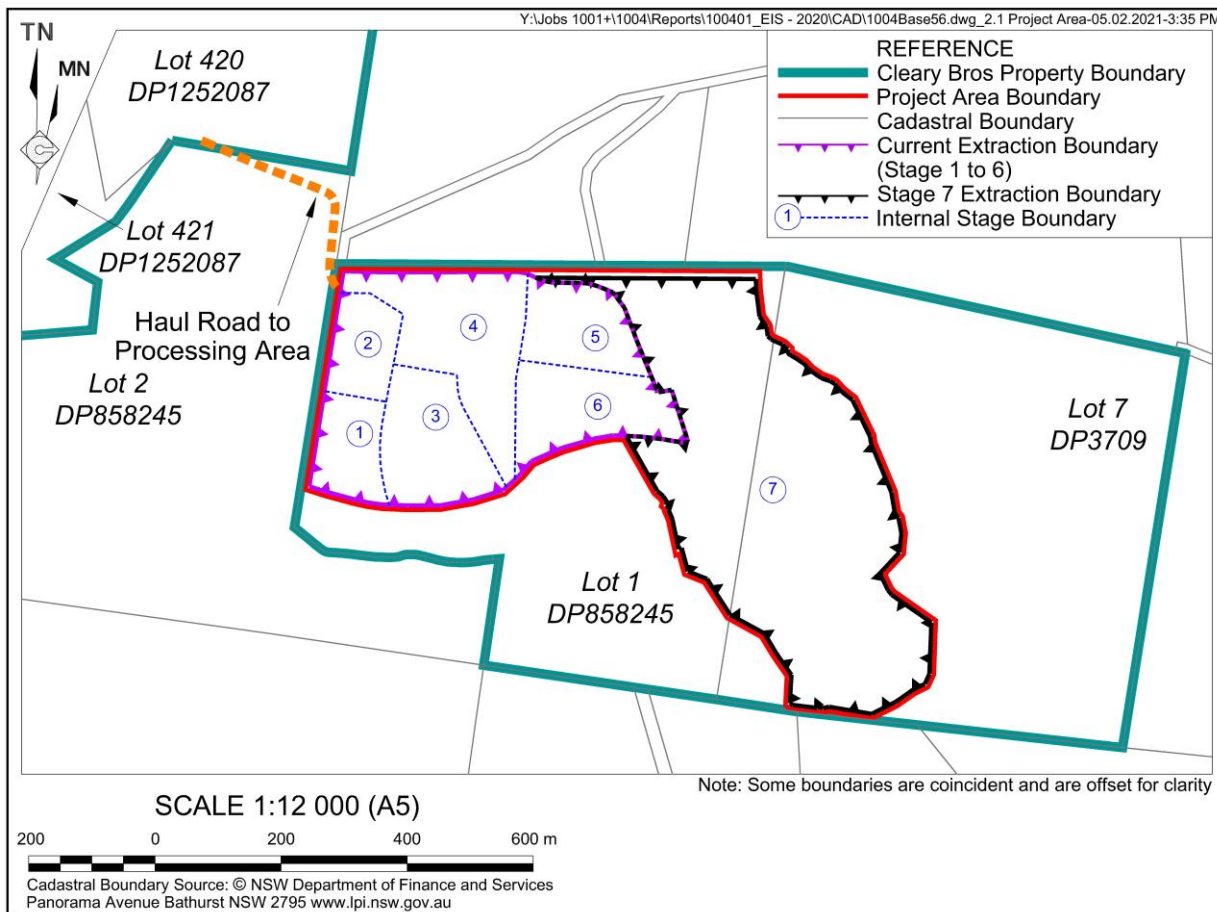
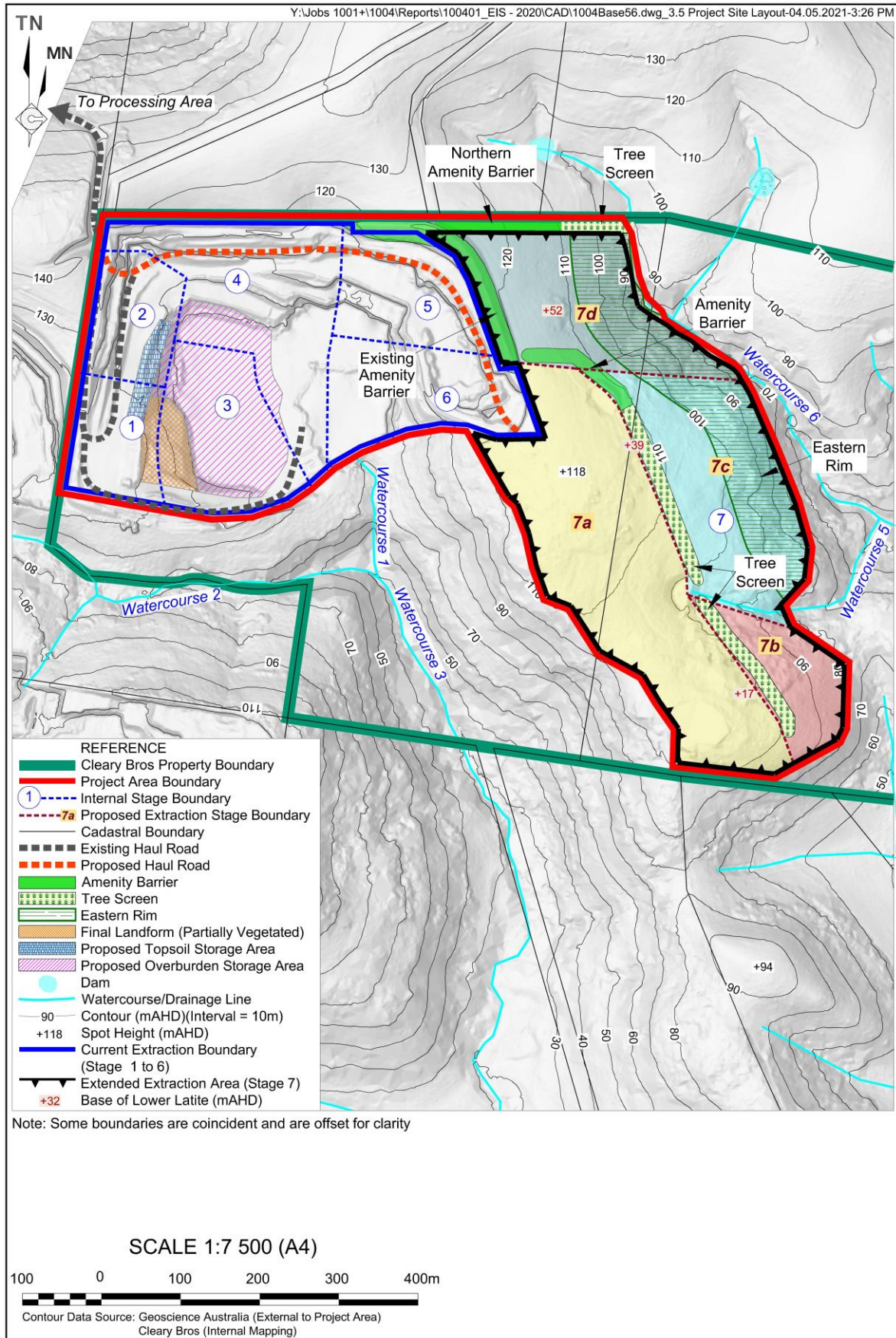


Figure 1 Project Area

**Figure 2** displays the layout of the Project Area and the internal stage boundaries with the key components being the amenity barriers, tree screens and proposed haul road. Extraction within Stage 7 is proposed to occur within four substages 7a, 7b, 7c and 7d. It is noted that extraction in Stages 7c and 7d would initially be confined to the western side of both substages with extraction concluding in the Eastern Rim (see **Figure 2**). This area would be the final area extracted in order to minimise views of the extraction operations from the east.



**Figure 2 Indicative Project Area Layout**



It is proposed that the extraction of the hard rock materials in Stage 7 (latite and agglomerate) would generally continue as it has in the past in Stages 1 to 6 with the rock removed by blasting. Primary crushing and screening of the majority of blasted material would be undertaken by a mobile jaw crusher and screen within the Project Area. These processed materials would be loaded into haul trucks and transported to the fixed processing plant for additional processing as necessary, stockpiling and load-out for delivery to customers.

Additional mobile secondary crushing and screening plant would continue to be used on a campaign basis within the Project Area



## **3 METHODOLOGY TO DETERMINE VISUAL IMPACTS**

### **3.1 INTRODUCTION**

Reliance has been placed upon the use of a range of 3D visibility software tools with Geographic Information System (GIS) capability to assist in the design of the Project and to determine its visual impacts. Initially, the Study Area for this assessment was selected to cover the area readily seen from the Project Area itself, i.e. largely to the north, east and south which in turn meant the observers in these areas could potentially view activities within the Project Area. Although emphasis was initially placed upon views from locations within approximately 2.5km of the Project Area, it was recognised that the detailed assessment would be undertaken for those closer areas with a high potential level of impact within the Study Area.

The key inputs into the visual assessment analysis were topographic and vegetation data surrounding the Project Area and the stages of extraction within the Project Area.

### **3.2 TOPOGRAPHIC AND VEGETATION DATA**

The topographic data for the area around the Project Area was downloaded from the ELVIS data portal in a digital elevation model (DEM) with 1m resolution (**Figure 3**) and Point Cloud formats. The data was acquired during 20/12/2010 and 22/03/2011 with the assistance of LiDAR instruments. The downloaded datasets are the tiles of Raster ASCII files.

As a preliminary step, both datasets were mosaiced to prepare the format required for analysis. Additionally, the point cloud dataset was converted into a digital surface model (**Figure 4**) which represents the surface elevation with vegetation cover and building structures in 3D format.

Topographic data within the Stages 1 to 6 area was captured as part of a site survey on 19/01/2021 and incorporated into the DEM to account for quarrying-related changes within the Project Area since 2010.

### **3.3 EXTRACTION AREA DESIGN**

Details of the current extraction area layout and the proposed substages within Stage 7 produced by RPM Global were embedded into the digital surface model for the Project (see **Figure 5**).

### **3.4 SEEN AREA ANALYSIS**

Visibility tools of ArcGIS were used to assess the areas within the surrounding landscape that, in the absence of vegetation or other factors limiting views, could be seen from the perimeter of each substage within the Project Area. Conversely, a person standing within the seen area in the surrounding landscape could see the perimeter of that particular substage within the Project Area.

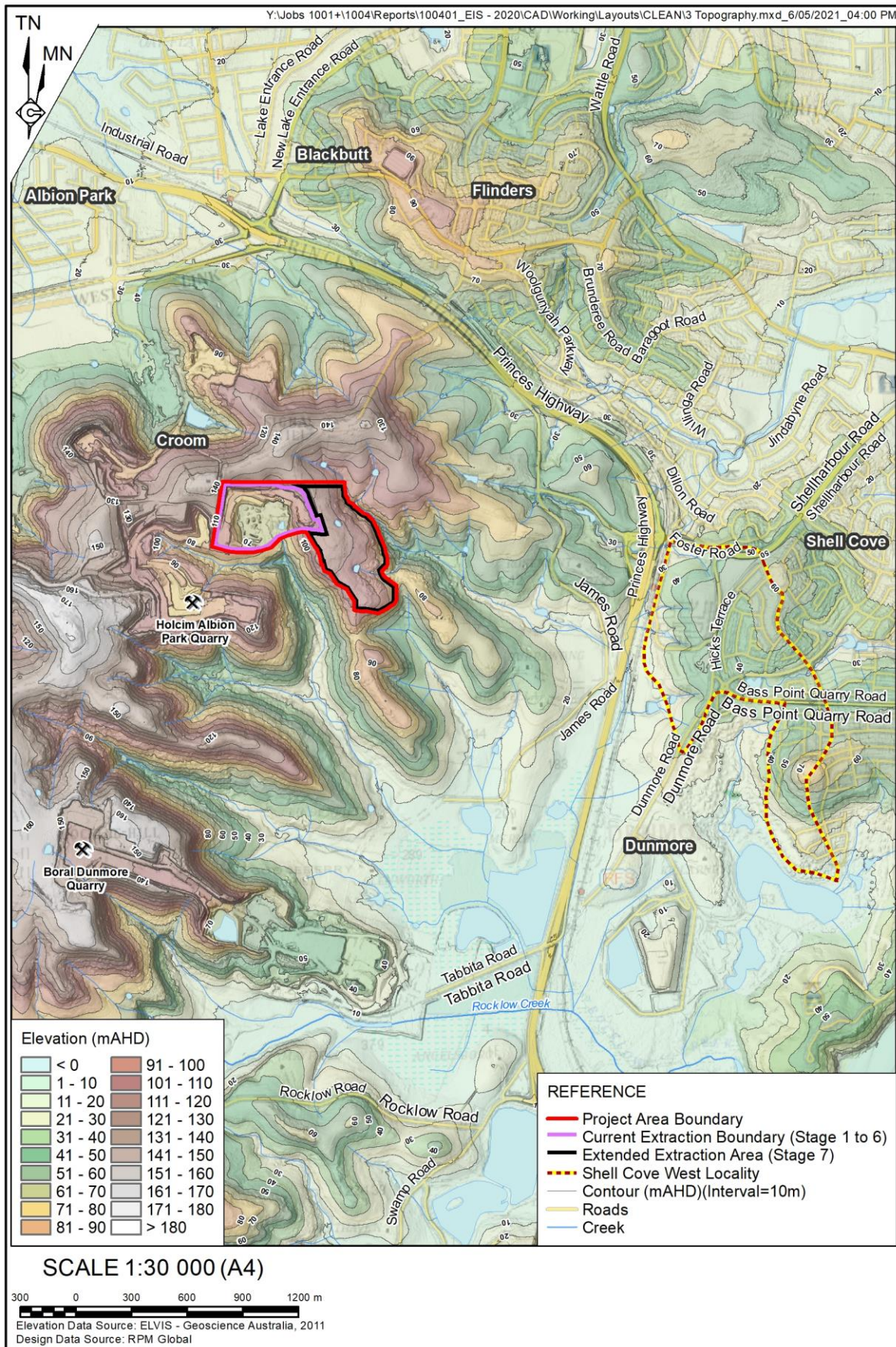


Figure 3 Local Topography

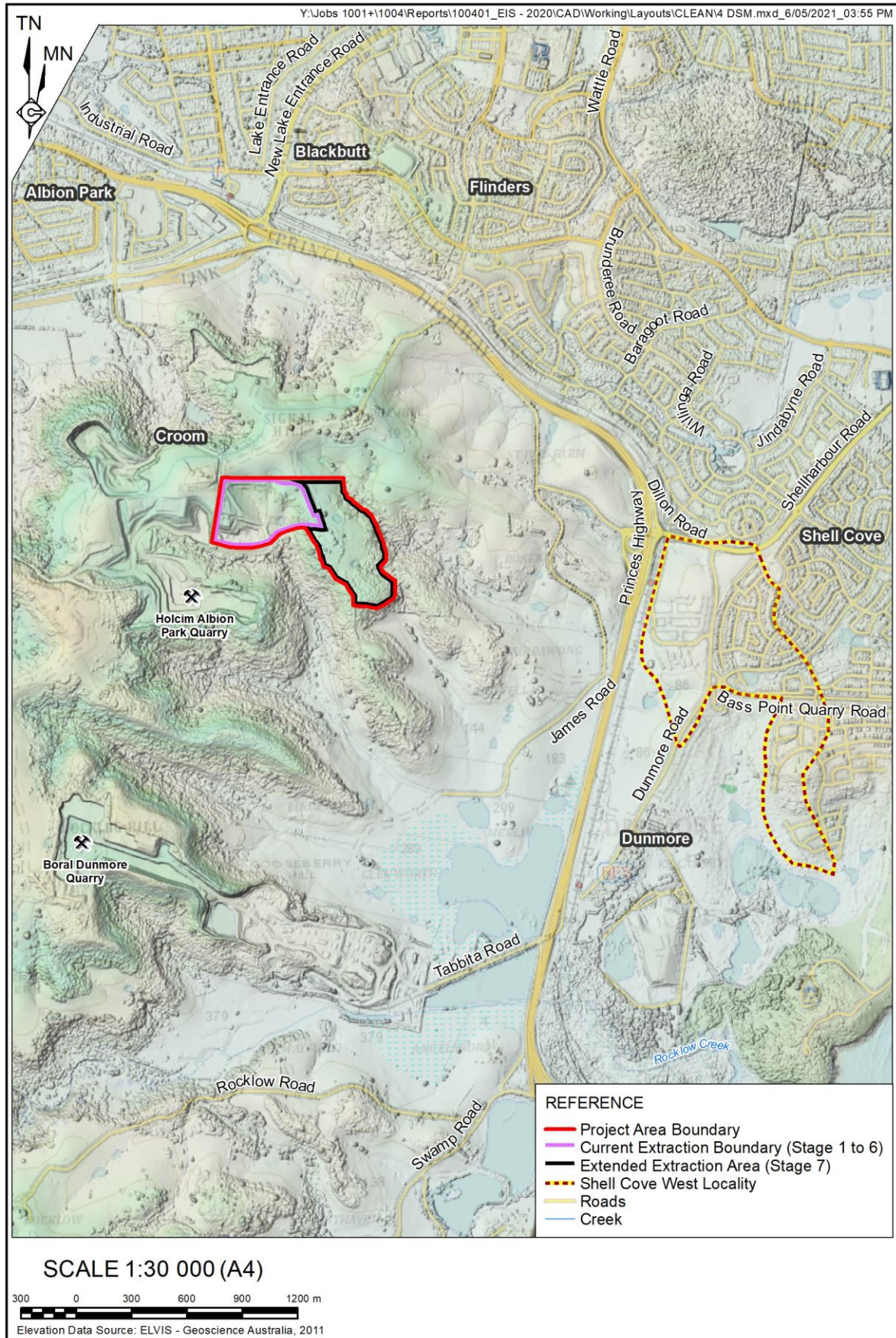
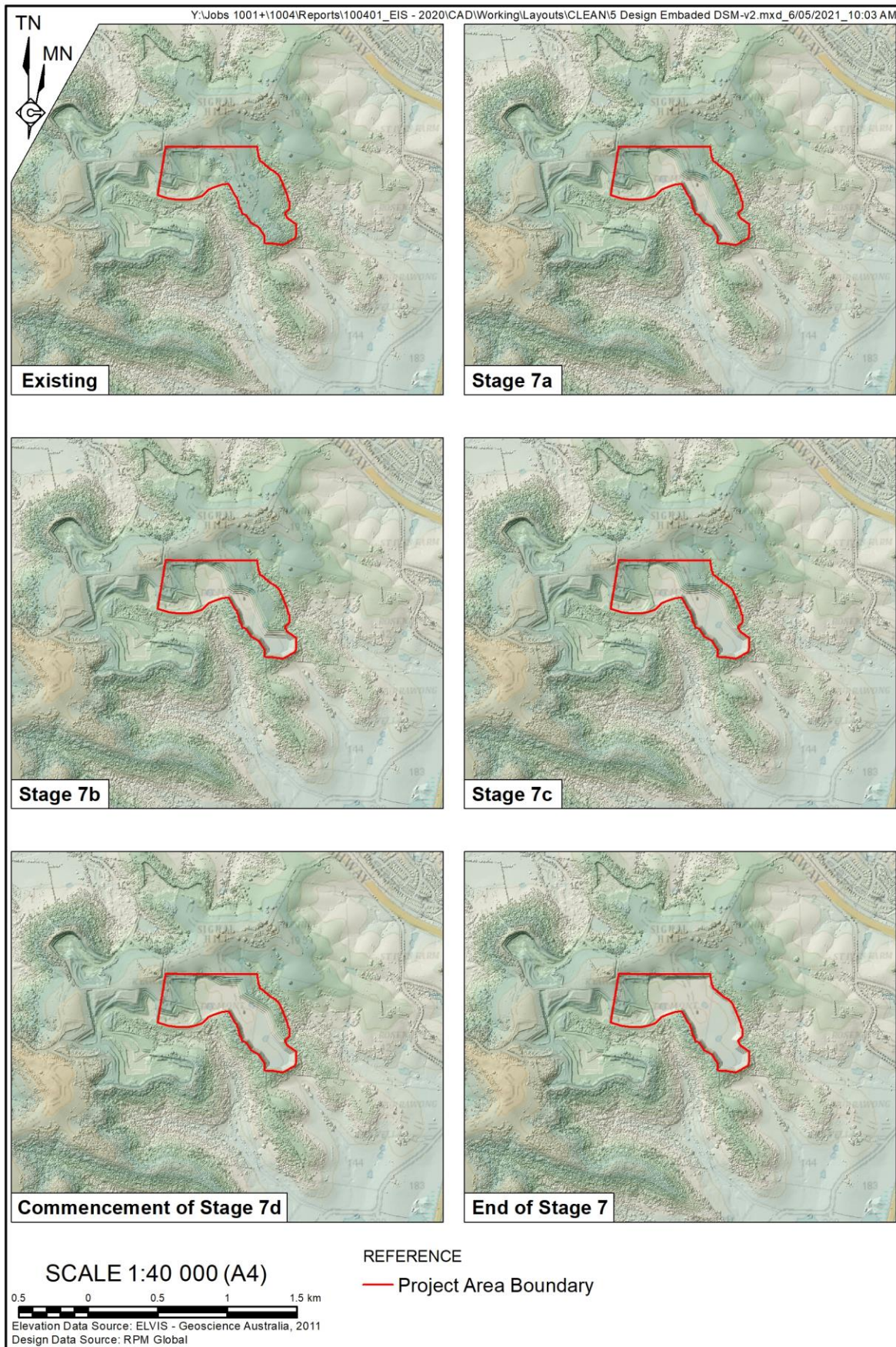


Figure 4 Digital Surface Model



**Figure 5      Extraction Area Design Embedded within the Digital Surface Model**



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It is noted that observer locations can just be an individual vantage point or an area with common views of the Project Area.

**Figures 6 to 10** display the results of the seen area analysis for each of the five extraction stages.

The majority of the land from which the stages of extraction would be visible from is private property. No public lookouts or vantage points are within these catchments although views would be possible for motorists travelling on a range of local public roads and a small section of the Princes Highway.

### 3.5 POTENTIAL LEVEL OF VISIBILITY AND VISUAL CATCHMENTS

In order to quantify the level of visibility of the proposed extraction operations, the visibility tools of ArcGIS were used to determine how much of each substage would be visible from surrounding areas. An algorithm was then used to establish the potential level of visibility of extraction operations within the Project Area from the surrounding landscape based on the following categories.

- Not Visible
- Very Low Visibility
- Low Visibility
- Moderate Visibility
- High Visibility
- Very High Visibility

Areas with very low visibility would have limited views of one sub-stage only. By contrast, areas with very high visibility would have extensive views of multiple sub-stages.

**Figure 11** displays the potential level of visibility surrounding the Project Area based upon the subsequent analysis. Three key visibility catchments were identified and are displayed on **Figure 11**, each of which display a moderate to very high level of visibility towards the Project Area. **Figure 12** displays the potential level of visibility from the residences on rural properties south and west of the Princes Highway.

Within each of the three key visual catchments, a range of individual locations were examined to identify the locations which were representative of a number of residences whose occupants could potentially experience a moderate to very high level of visibility in the absence of the adoption of mitigation measures. The selected locations or sites are also displayed on **Figure 11**.

**Table 1** lists the distance between the selected locations and the closest point to Stage 7.

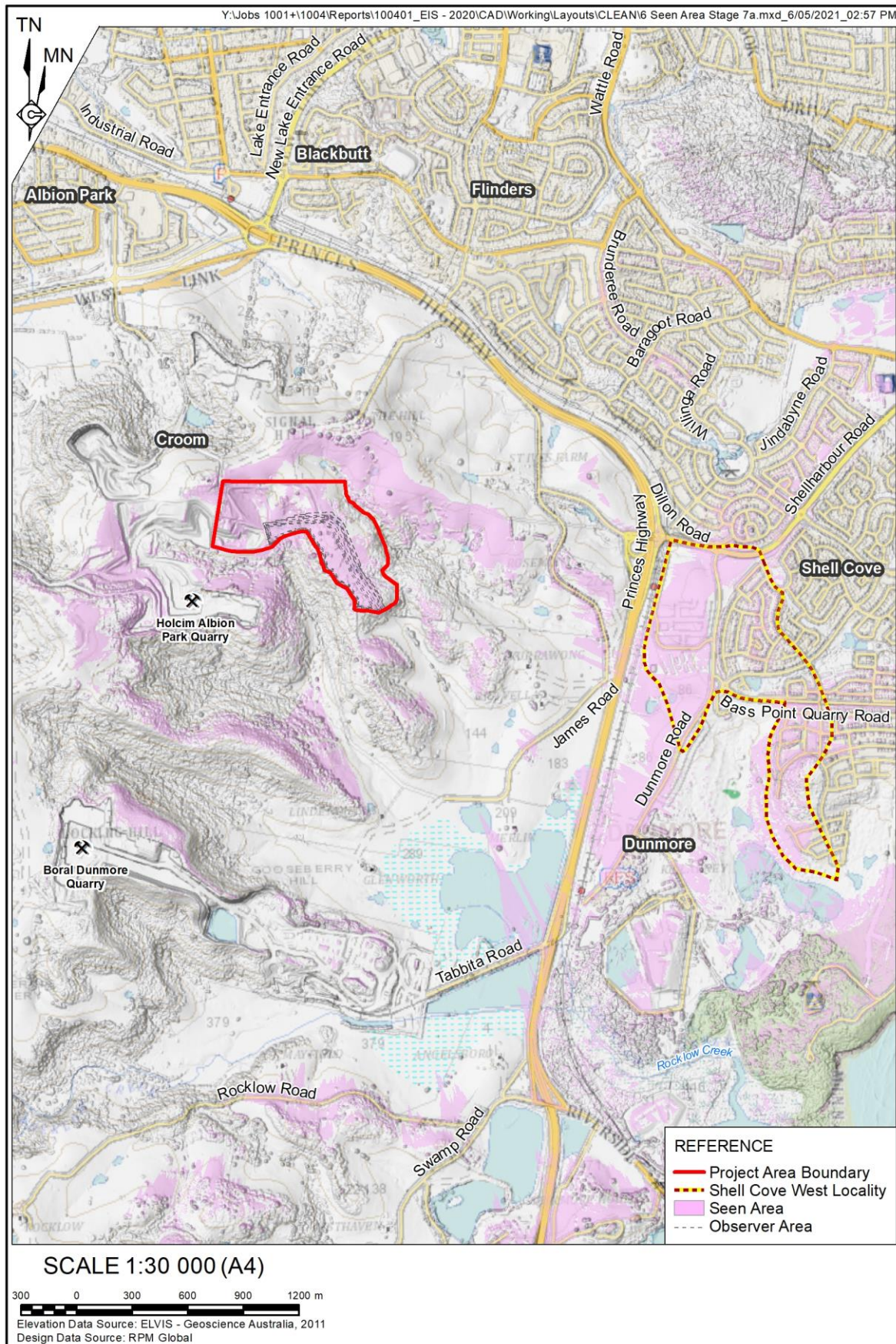


Figure 6 Seen Area for Stage 7a



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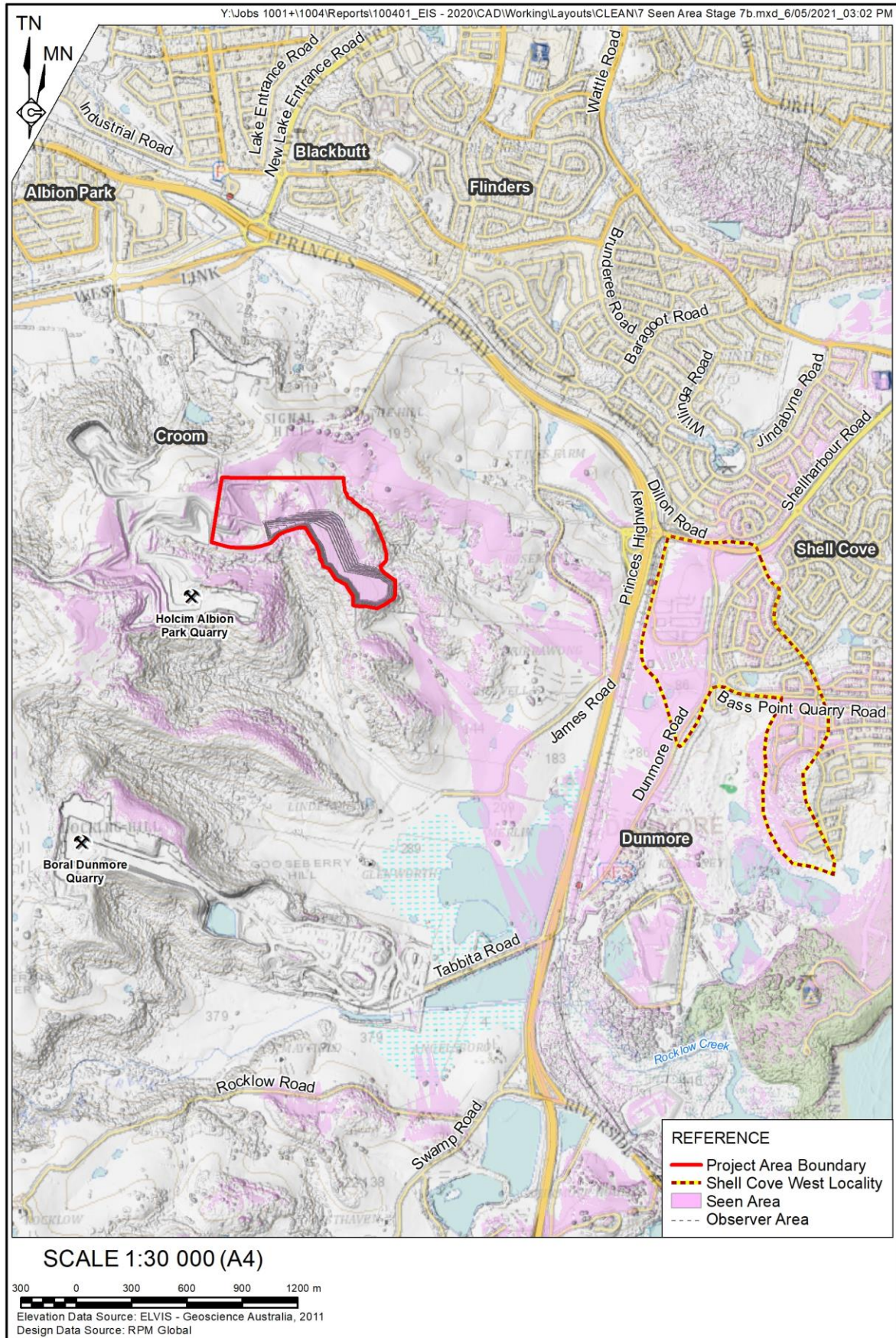


Figure 7 Seen Area for Stage 7b

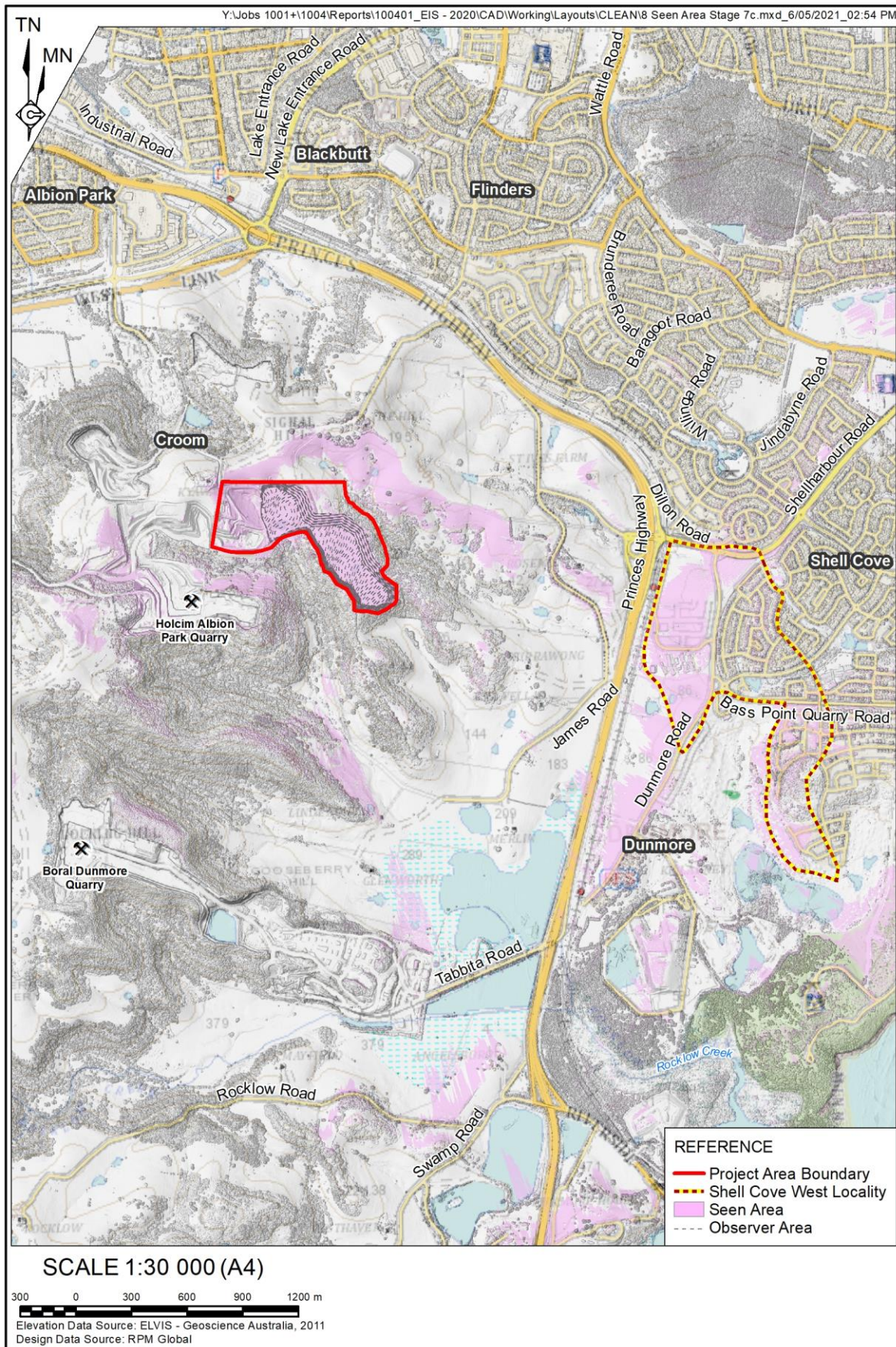


Figure 8 Seen Area for Commencement of Stage 7c

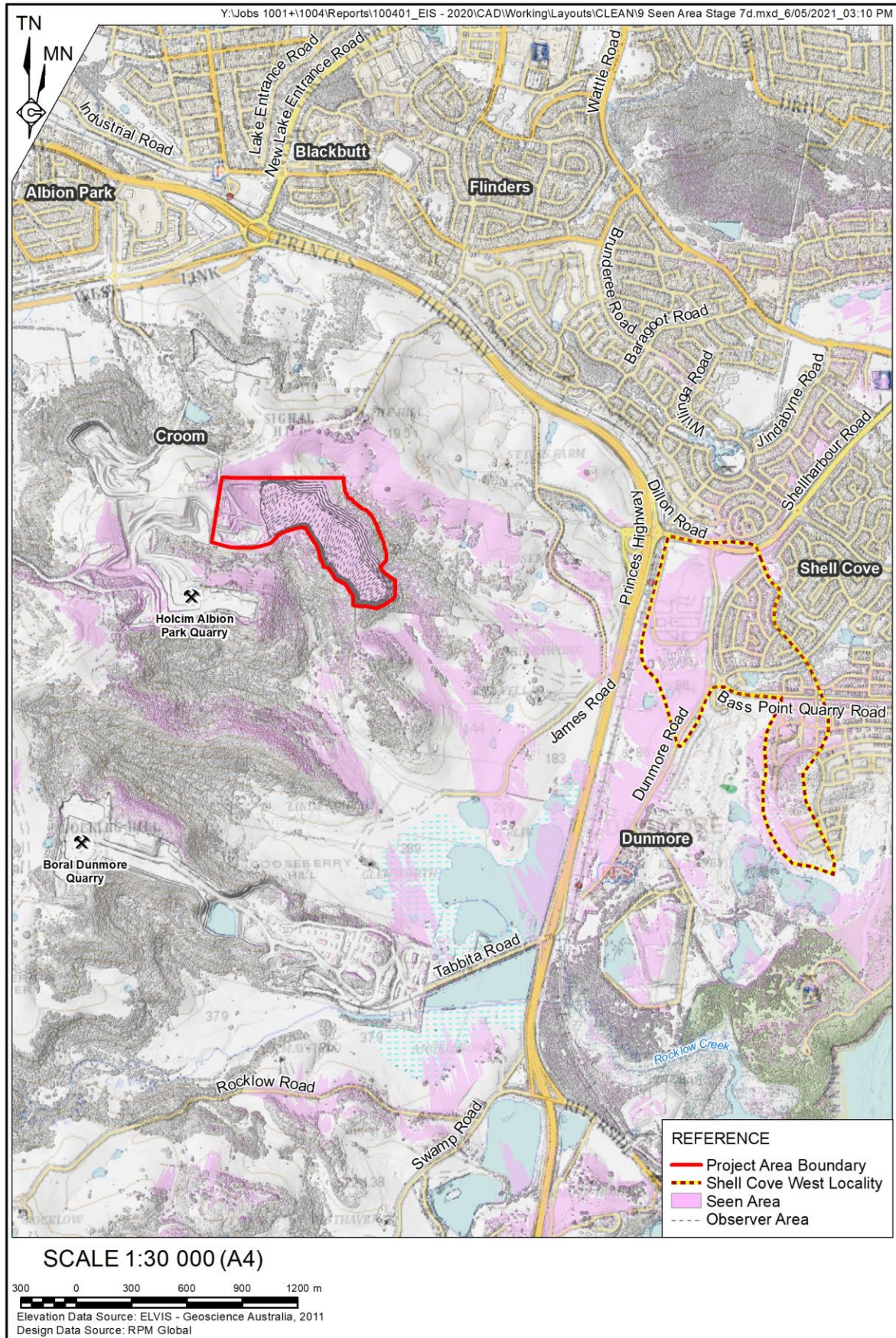


Figure 9 Seen Area for Commencement of Stage 7d

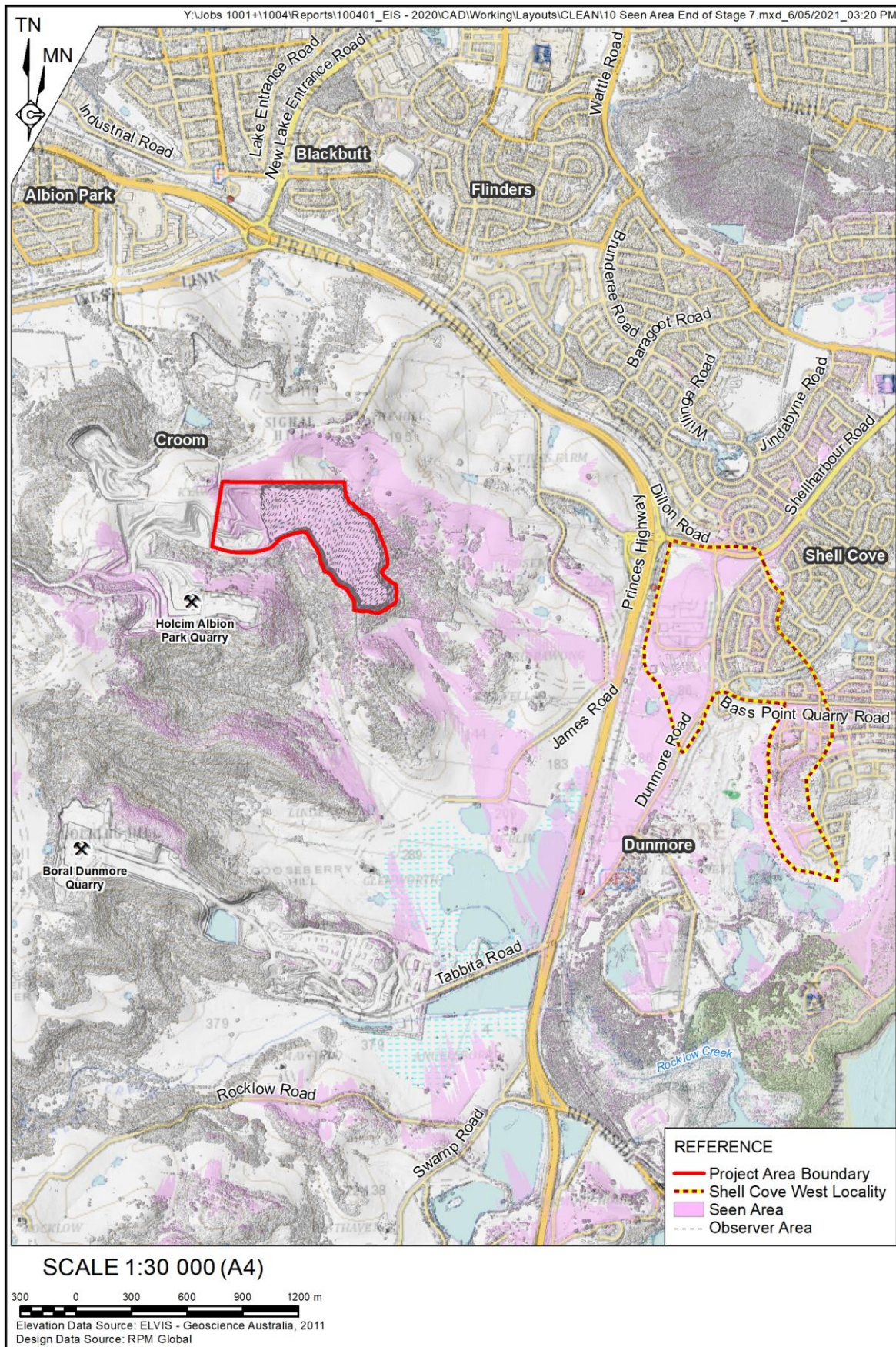


Figure 10 Seen Area for end Stage 7d

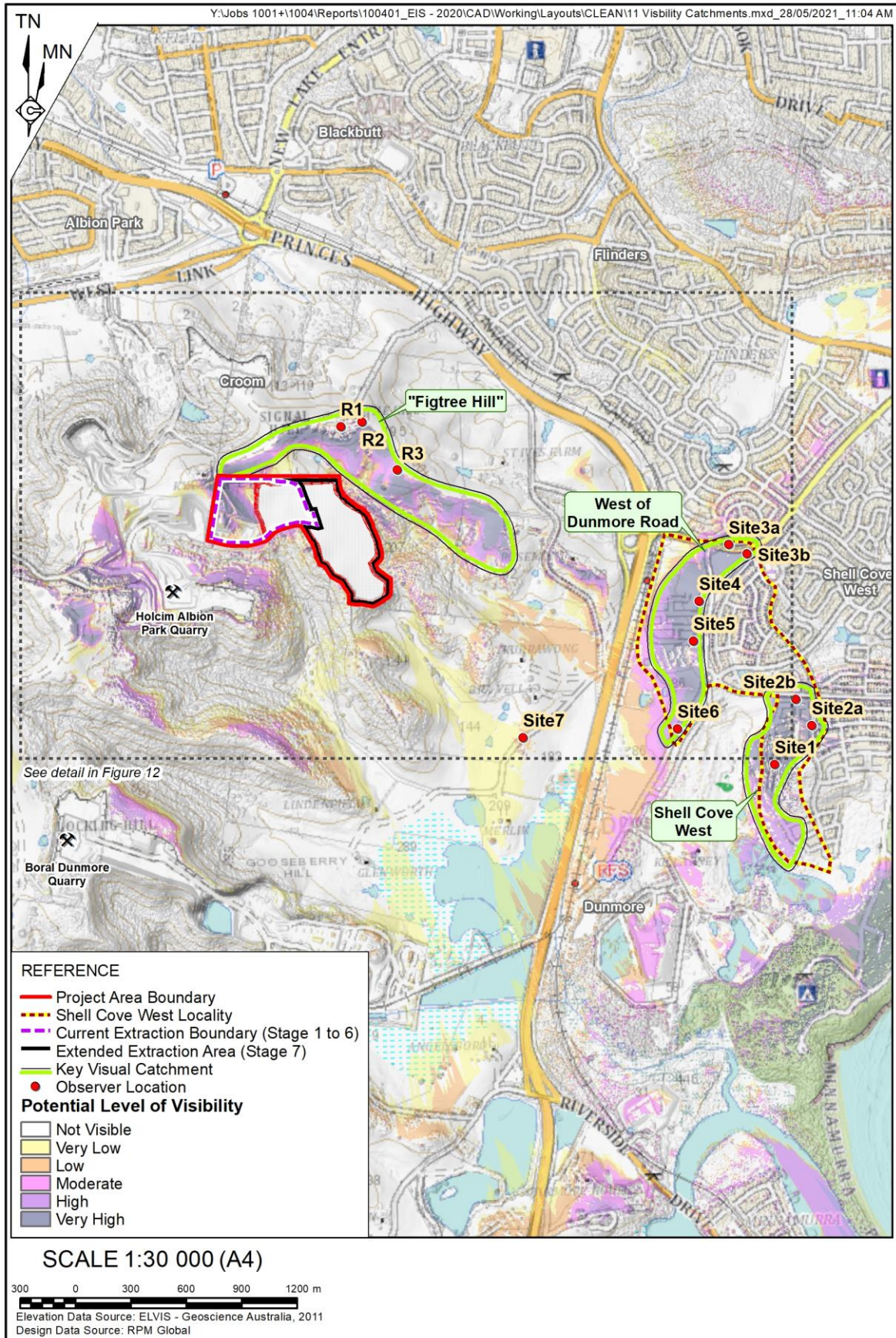


Figure 11 Potential Level of Visibility and Visibility Catchments

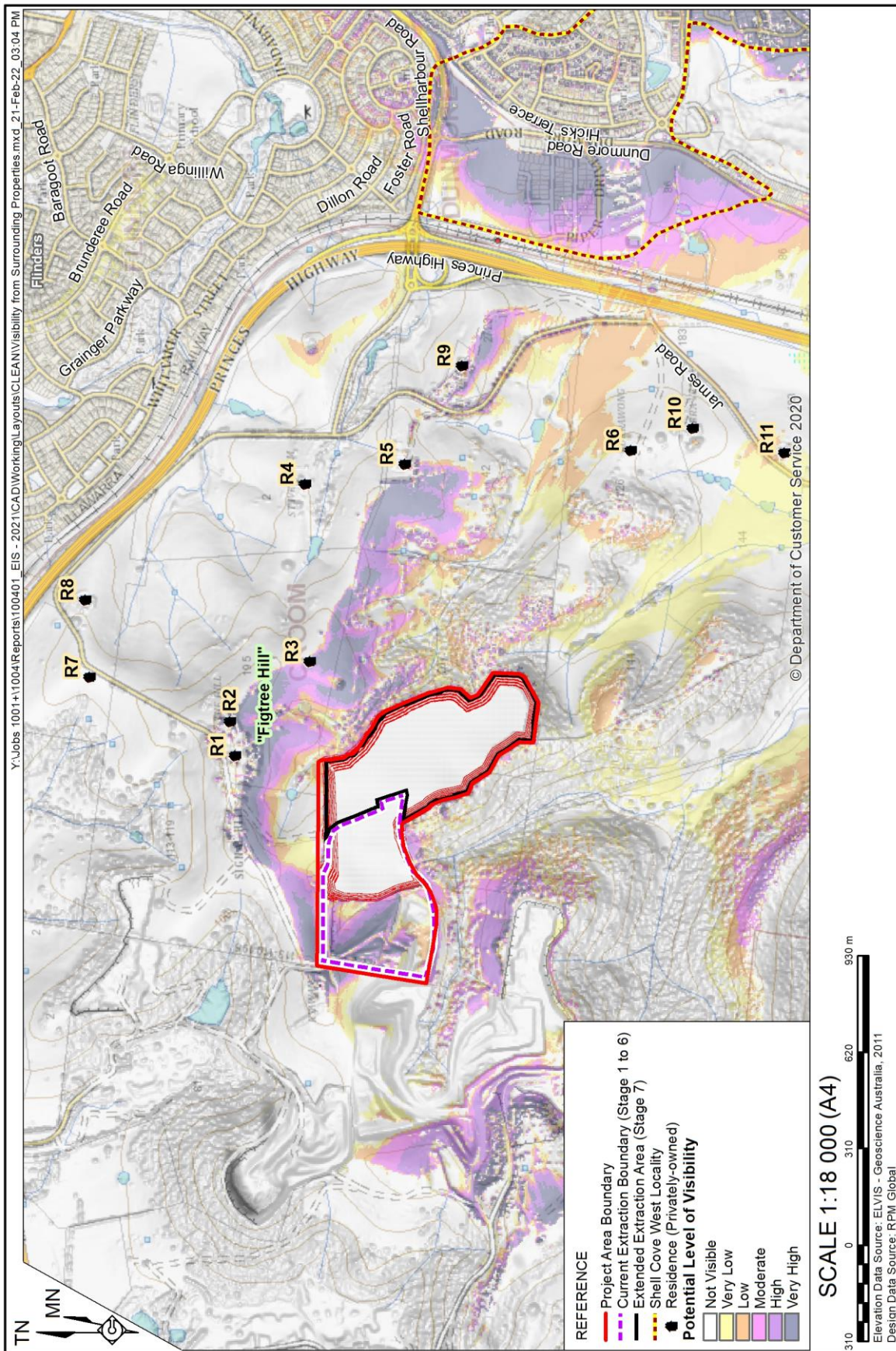


Figure 12 Potential Level of Visibility from Surrounding Rural Land





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**Table 1**  
**Distance of Selected Observer Locations from the Stage 7 Extraction Area**

Figure No.*	Area	Site Reference		Distance from Stage 7 Extraction Area (m)
2.13	"Figtree Hill" Property	R1	"The Cottage"	260
2.14		R2	"The Hill"	320
2.15 – 2.17		R3	Approved Residence	250
2.18	Shell Cove West	Site 1	Bonville Parkway	2 280
-		Site 2a	Bass Point Quarry Road	2 390
2.19		Site 2b	Bass Point Quarry Road	2 270
2.20	West of Dunmore Road	Site 3a	Shellharbour Road	1 840
-		Site 3b	Shellharbour Road	1 940
-		Site 4	Aurora Avenue	1 670
2.21		Site 5	Piper Drive	1 660
2.22		Site 6	Dunmore Road	1 720
-	James Road	Site 7	James Road	1 050

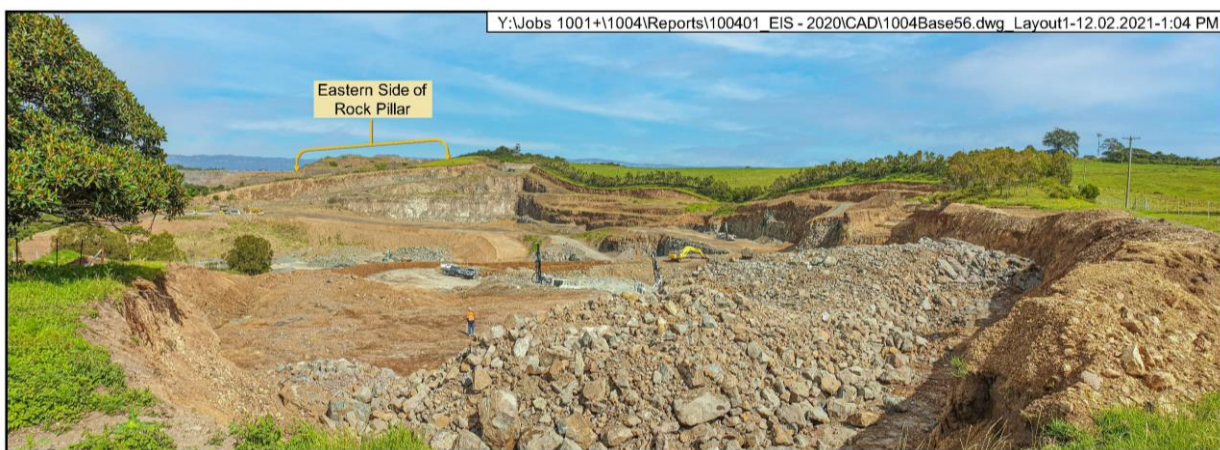
\* Cross-sections prepared from these locations – Figure numbers relate to the figures in this report.



## 4 THE EXISTING SETTING

**Figure 3** shows the Project Area is located within the elevated rural land south and west of the Princes Highway. The main ridge within the Project Area trends north-northwest to south-southeast and varies in elevation from approximately 125m AHD in the north to 65m AHD in the south. The centreline of the ridge traverses generally through Stage 7a. The land on the eastern side of the ridge falls steeply for the last 150m to elevations on the eastern boundary of between approximately 90m AHD in the north and 75m AHD in the south.

The western side of Stages 1 and 2 is currently part of the overall remnant extraction face adjacent to the current haul road to Stages 1 to 6. This face is located on the eastern side of a pillar of rock between Stages 1 and 2 and part of an active extraction area within the adjoining extraction area managed by Holcim (Australia) Pty Ltd (see **Plate 1**).



**Plate 1** A view to the northwest across the current extraction area from its southeastern corner (Ref: CB-1.1)

Features of the existing setting beyond the Project Area are as follows.

1. Elevations within Albion Park northwest of the Project Area vary from 10m AHD to 30m AHD. The Project Area is not visible from this area.
2. The land immediately to the north and northeast of the Project Area within "Figtree Hill" is topographically higher than the land within the Project Area. As a consequence, this land has a high to very high potential for visual impacts.
3. The land to the north of the Princes Highway in Flinders has elevations between 30m AHD and 90m AHD. The Project Area is not visible from most of Flinders.
4. The topography of the rural land east of the Project Area and west of the Princes Highway has elevations of approximately 30m AHD to 50m AHD. None of the residences in this area have views of the Project Area due to the intervening topography and vegetation (see **Figure 12**).
5. The eastern side of the Project Area is visible from elevated land to the east of the Princes Highway in Shell Cove West. It is noted that the area is topographically lower than the proposed eastern rim of the Project Area, however, the ridge within the Project Area effectively forms the skyline when viewed from the bulk of this area.

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6. The elevated land in Shell Cove West, east of Dunmore Road would have similar views to the Project Area as the area west of Dunmore Road, however, the entire ridge within the Project Area is positioned below the skyline formed by the distant Illawarra escarpments.
7. Elevations within and surrounding Dunmore are typically between 10m AHD and 30m AHD. The level of visibility of the Project Area from this area is either low or not visible.

**Figure 11** displays the potential level of visibility of the Project Area and the three key visibility catchments within the elevated areas to the north, northeast and east that currently have views of the land surface within the Project Area. Those areas without direct views of the Project Area have intervening topography and/or vegetation preventing or obscuring their views.

The three key visibility catchments that have views facing the Project Area are as follows.

1. The “Figtree Hill” property to the north and northeast of the Project Area  
Elevations of the land where the two existing residences on “Figtree Hill” are located are 139m AHD (“The Cottage” – R1) and 140m AHD (“The Hill” – R2). The owners of “Figtree Hill” have a current development consent to construct a third residence on the property at a location approximately 350m southeast of “The Hill” at an elevation of approximately 117m AHD. The respective distances of the three residential locations on “Figtree Hill” from the closest boundary of the Stage 7 extraction area are 260m (R1 – “The Cottage”), 320m (R2 – “The Hill”) and 250m (R3 – Approved Residence).

**Figure 11** also displays an area of moderate to very high level visibility on sections of the rural land within the “Figtree Hill” property.

2. Shell Cove West  
This area has recently been developed for housing and a considerable number of residences have been completed to date. Elevations within this key visibility catchment from where the Project Area is highly visible vary from 35m AHD near Glades Parkway and 72m AHD near Fairways Drive.  
Distances from this area to the closest boundary of the Project Area vary from approximately 2.2km to 2.4km.

3. Western side of Dunmore Road  
This area has also recently been subdivided for housing and considerable housing construction has already been completed. The proximity to the new Shellharbour Junction Railway Station has promoted residential growth in this area. The Shellharbour Anglican College is also located within this key visibility catchment.  
Elevations on the western side of Dunmore Road from where the Project Area is highly visible vary from 40m AHD to 56m AHD. Distances from this area to the closest boundary of the Project Area vary on its western side from approximately 1.5km to 1.7km. This entire key visibility catchment has views directly to the west towards the Project Area.



## 5 EXISTING VIEWS OF THE PROJECT AREA

**Plate 2** displays views from each of the three residential locations within the “Figtree Hill” property towards the Project Area. The existing views from the two existing residences, “The Cottage” and “The Hill”, are only partial views due to the perimeter vegetation around both residences although greater visibility occurs during the winter as some of the trees around “The Hill” are deciduous jacaranda. The Belmont Main House within the Project Area is visible from both residences, albeit through breaks in the perimeter vegetation. Direct, unobstructed views are present from the site of the approved residence towards the Project Area including the Belmont Main House. This view is comparable to those from other rural grazing land on the “Figtree Hill” property.

**Plates 3 and 4** display the views from the two key visibility catchments to the east of the Princes Highway. Each of these views are similar, with the ridge within the Project Area in the foreground of more distant landforms on the skyline. It is noted that a number of residences within Shell Cove West already have views to the west and southwest of the extraction areas operated by Boral Resources (NSW) Pty Ltd (Boral) and Holcim (Australia) Pty Ltd (Holcim).

**Plate 5** displays further photographs displaying views towards the Project Area from other areas in Flinders, Shell Cove and Dunmore. Invariably, intervening topography and/or vegetation obscures views of the Project Area from these observation locations.

**Plate 6** displays a view of sections of the Boral Dunmore Quarry which reveals historic extraction areas that display the dark colour of the latite rock extracted and vegetation near the surface covering the previously exposed overburden.

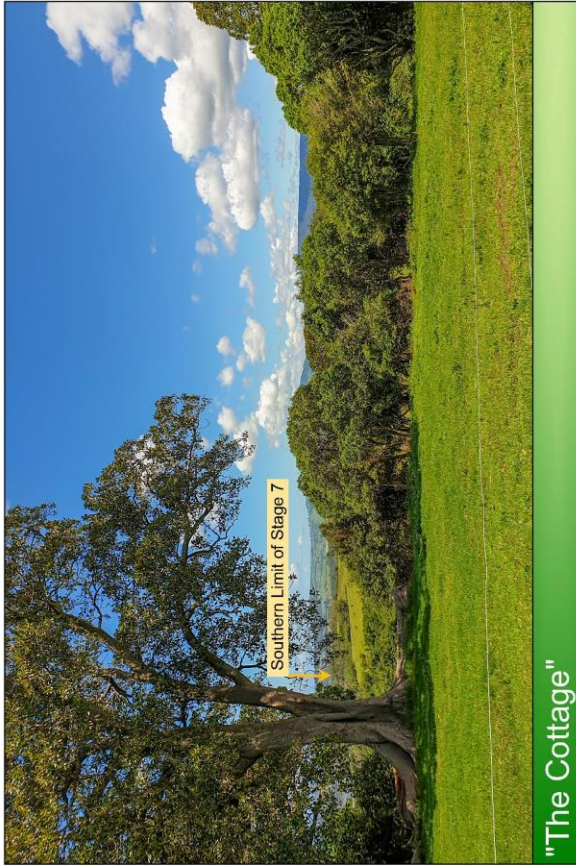
The views of the Holcim Albion Park Quarry reveal more recently extracted areas where horizontal benches created by blasting are discernible together with the red/light brown overburden which is noticeable given its contrast with the green vegetation and dark colour of the latite.

The Project Area is not visible from the Shellharbour Junction Railway Station nor most of the Princes Highway given their low elevation and the intervening topography and vegetation. Small sections of the southern side of the Project Area are visible from the northbound lanes of the Princes Highway near Tabbita Lane (2km from the Project Area) although the views are momentary for motorists due to the presence of roadside vegetation on the western side of the highway.

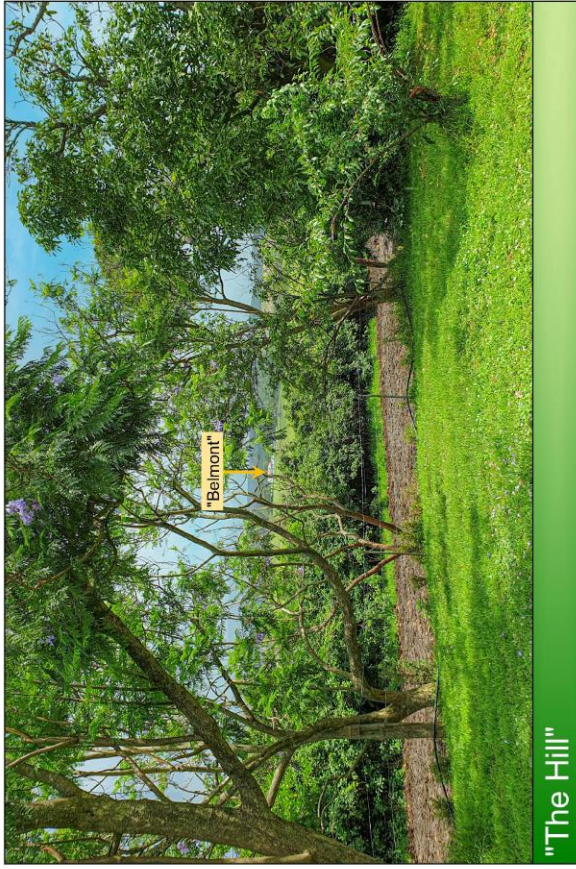
It is noted that visibility from the east looking westward towards the extraction activities and the rehabilitated benches within extraction areas within the Albion Park and Dunmore areas is invariably optimal in the morning. Visibility conditions, do however, change substantially and viewing clarity often decreases in the afternoon as the clarity is diminished by the presence of the afternoon sun. Reduced visibility also occurs during periods of low cloud and sea mist accompanied by northeasterly winds.



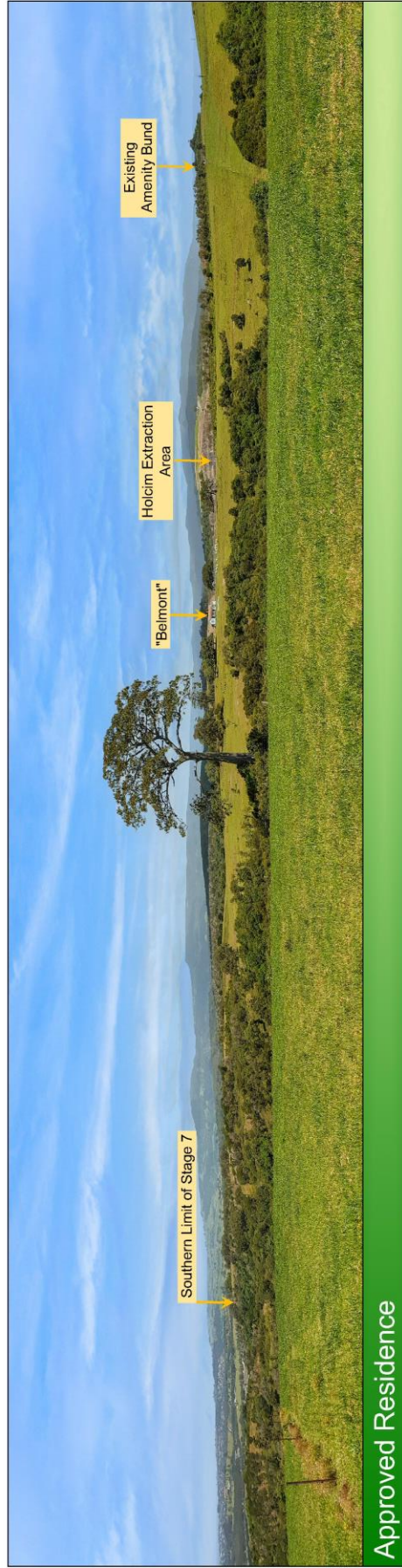
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"The Cottage"



"The Hill"



Approved Residence

Plate 2

FIGTREE HILL RESIDENCES



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Site 1



Site 2a



Site 2b

Plate 3  
SHELL COVE WEST



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Site 3a



Site 4



Site 5

Plate 4  
WEST OF DUNMORE ROAD



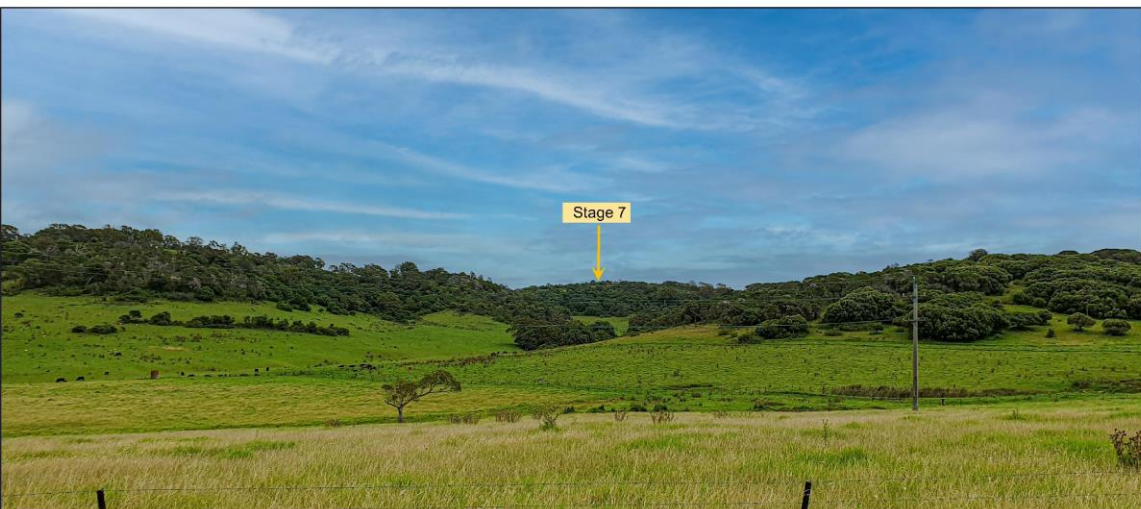
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Flinders



Site 6



Site 7

Plate 5  
OTHER LOCATIONS





**Plate 6 View from Shell Cove West towards exposed extraction faces in Boral Dunmore Quarry**



## 6 POTENTIAL VISUAL IMPACTS

The potential visual impacts generated by the Project are as follows.

1. Earthmoving equipment, principally a bulldozer, would periodically be visible on the eastern side of the ridge when constructing the amenity barrier on the northern and eastern sides of Stage 7a and when operating on the land surface during subsequent vegetation removal and soil stripping campaigns. A drilling rig would also be present at least 2m below the land surface for short periods prior to blasting the near-surface areas.
2. The amenity barriers within the Project Area would be constructed largely on the top of the ridge within Stage 7. Whilst the barriers are intended to provide visual protection in the medium to long term, they would themselves be discernible for a period up to 3 months until they are sufficiently vegetated.
3. As the eastern side of Stage 7 is progressively lowered, i.e. in Stages 7b, 7c and 7d, the upper extraction faces on sections of the western side of Stage 7 would be progressively exposed to views from the east. The top level of these faces would vary from approximately 100m AHD to 110m AHD, i.e. at elevations higher than all observer locations to the east.
4. Blasts initiated within the Project Area would generate a plume of dust and gases immediately following each blast. The extent of the plume's visibility would depend on the quantity of rock blasted, direction and strength of the prevailing winds, the depth of the blast within the extraction area and composition of the gases generated.



## 7 RECOMMENDED VISUAL MITIGATION MEASURES

As a result of the visual assessment and the identification of those areas that would have views of the Project Area at some time during the Project Life and the extent of those views, the following mitigation measures are recommended to reduce and/or remove the visual impacts of the Project.

### 1. Extraction Staging

The potential visibility of the completed upper benches in Stage 7 was recognised during the initial stage of the extraction area design. This enabled the substage boundaries within Stage 7 to be positioned to visually shield extraction activities as much as possible. Hence, the first substage of extraction (Stage 7a) would be confined largely to the western side of the central ridge within the Project Area, albeit with a strategically located amenity barrier and tree screens (see 2. below). Extraction in a north to south direction in Stage 7a would result in the creation of benches along the entire western side of Stage 7 before extraction then turns northwards towards the northern boundary of the Project Area.

### 2. Amenity Barriers and Tree Planting

In 2008, Cleary Bros constructed a 4m to 5m high amenity barrier on the eastern side of Stages 5 and 6 to limit views from the "Figtree Hill" property into the active extraction area. This barrier (as displayed in **Plates 7** and **8**) was immediately hydromulched and planted with a range of shrubs and trees which, after approximately 10 years, have now attained an average height of 4m to 6m above the top of the barrier. Consequently, the effective height of the amenity barrier is currently approximately 8m to 10m.

The northern amenity barrier would extend to the east on the northern side of Stage 7d for a distance of approximately 160m from the existing amenity barrier. Beyond that point, the effectiveness of the barrier would diminish as the land falls relatively quickly towards the eastern side of Stage 7. In order to provide some visual shielding in that area, Cleary Bros would need to plant a tree screen up to 10m wide for a distance of approximately 90m. It is conservatively estimated that the tree screen would attain effective heights of 3m, 5m and 10m in 5, 10 and 15 years respectively.

Cleary Bros proposes to construct a 170m long amenity barrier during the early stage of extraction in Stage 7 in the location north and northeast of Stage 7a as displayed on **Figure 2**. This barrier would assist to minimise noise and reduce the opportunity for observers within the "Figtree Hill" property to view extraction activities underway in Stage 7a. The barrier would be constructed to a height of approximately 5m and with vegetation growth conservatively extending the effective height to approximately 8m in 5 years and 10m in 10 years.



**Plate 7 View to the south along the western side of the existing amenity barrier east of Stage 5 with shrubs and trees (E1004D\_035)**



**Plate 8 Tree growth on the eastern slopes of the existing amenity barrier (E1004C\_025)**



In order to reduce and/or remove the visibility of the upper western extraction faces when viewed from east of the Princes Highway, it is recommended that a tree screen is planted on the eastern side of Stage 7a from the southern end of the proposed amenity barrier discussed above to the existing regrowth vegetation near the southern end of Stage 7a. The tree screen on the eastern side of Stage 7a would cover a length of approximately 500m and width of approximately 10m and should attain an effective height of 3m, 5m and 10m in 5, 10 and 15 years respectively. It is noted that the tree screens would comprise both trees and appropriate shrubs to ensure that the maximum visual protection is achieved by the screen. The southernmost section of the tree screen would comprise the existing regrowth vegetation to be cleared during Stage 7b.

3. Vegetation on the Upper Extraction Benches

Beyond the completion of Stage 7a, the progressive extraction of the eastern side of the ridge within Stages 7b and 7c would progressively expose the completed upper extraction faces and benches on the western side of Stage 7a to views from the east. In order to mitigate the visual impacts of these exposed extraction faces and benches, Cleary Bros would need to undertake the following vegetation treatments.

- a) Once the 45° side slopes are created within the overburden, topsoil would need to be placed on the final surface and the surface hydromulched with a native grass and shrub/tree seed mix.
- b) The upper 14m extraction bench would need to be split into two x 7m benches to allow vegetation to be grown on each final bench. The practice of establishing vegetation on benches would continue on lower benches to soften views from the "Figtree Hill" property and to improve the ecological outcomes for the final landform.

Details of the methodology for the revegetation of the benches is presented in Section 3.11.6.2 of the EIS.

4. Eastern Rim

Preliminary designs involved extracting Stages 7c and 7d in one strip from south to north. Initial photomontages prepared for Stage 7c identified considerable views of the active extraction areas would occur when viewed from elevated areas east of the Princes Highway. The adoption of the Eastern Rim stage and extraction operations proceeding in an easterly direction across the rim would largely remove these views of the active extraction area, with only minor views of the active extraction faces during Stages 7c and 7d from those areas east of the Princes Highway.

5. Dust Plumes from Blasting

Cleary Bros' experience with blasting within Stages 1 to 6 would assist in minimising the visual impacts of blast plumes from blasts initiated in Stage 7. The key control apart from ensuring the blast design is appropriate is the planned avoidance of blasting during periods when strong winds are blowing towards the residences on "Figtree Hill" and minor adjustments to the time of blast initiation to a period when wind speeds are lower.



## 8 ASSESSMENT OF IMPACTS

### 8.1 INTRODUCTION

This section draws together the analyses undertaken for the assessment and addresses the potential visual impacts outlined in Section 6. The impacts have been assessed assuming that each of the mitigation measures outlined in Section 7 are fully implemented.

### 8.2 VISIBILITY EXTENT

With the adoption of the mitigation measures outlined in Section 7, the extent of visual impacts can be ascertained for each of the individual or representative locations both during and after the Project life. A series of cross-sections were generated from 17 observer locations within the three key visibility catchments towards the Project Area. A representative selection of the cross-sections are presented in **Figures 13 to 22** with areas visible from each observer location marked on each cross-section based on the line-of-sight during relevant substages.

Cross-sections relating to the extent of visibility of the upper western benches in Stage 7a have been compiled based on the intervening vegetation which is comparable in height to the projected elevation of the proposed amenity barrier and/or tree screens after 15 years.

In order to assist with the understanding of the extent of what would be visible from the various observer locations, a series of photomontages have been prepared.

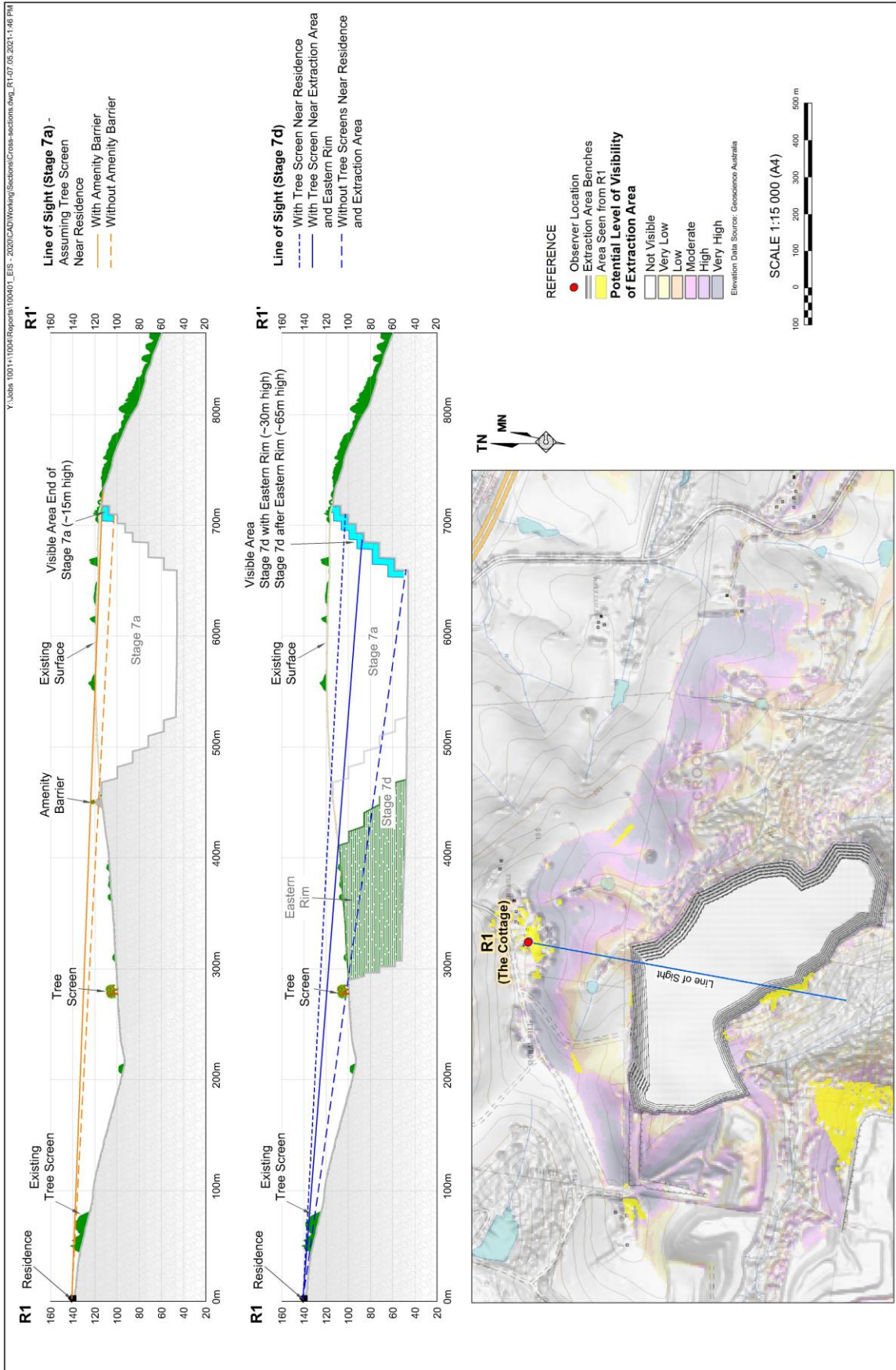
Photomontage No. 1: displays the existing view and the proposed view from Observer Location Site 2b near the northern end of Shell Cove West (**Figure 23 and 24**).

Photomontage No. 2: displays the existing view and the proposed view from Observer Location Site 3a near the northern end of Dunmore Road (**Figure 25 and 26**).

Photomontage No. 3: displays the existing view and the proposed view from Observer Location Site 5 (see **Figure 27 and 28**).



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**Figure 13 Visual Impact Assessment R1 – “The Cottage”**

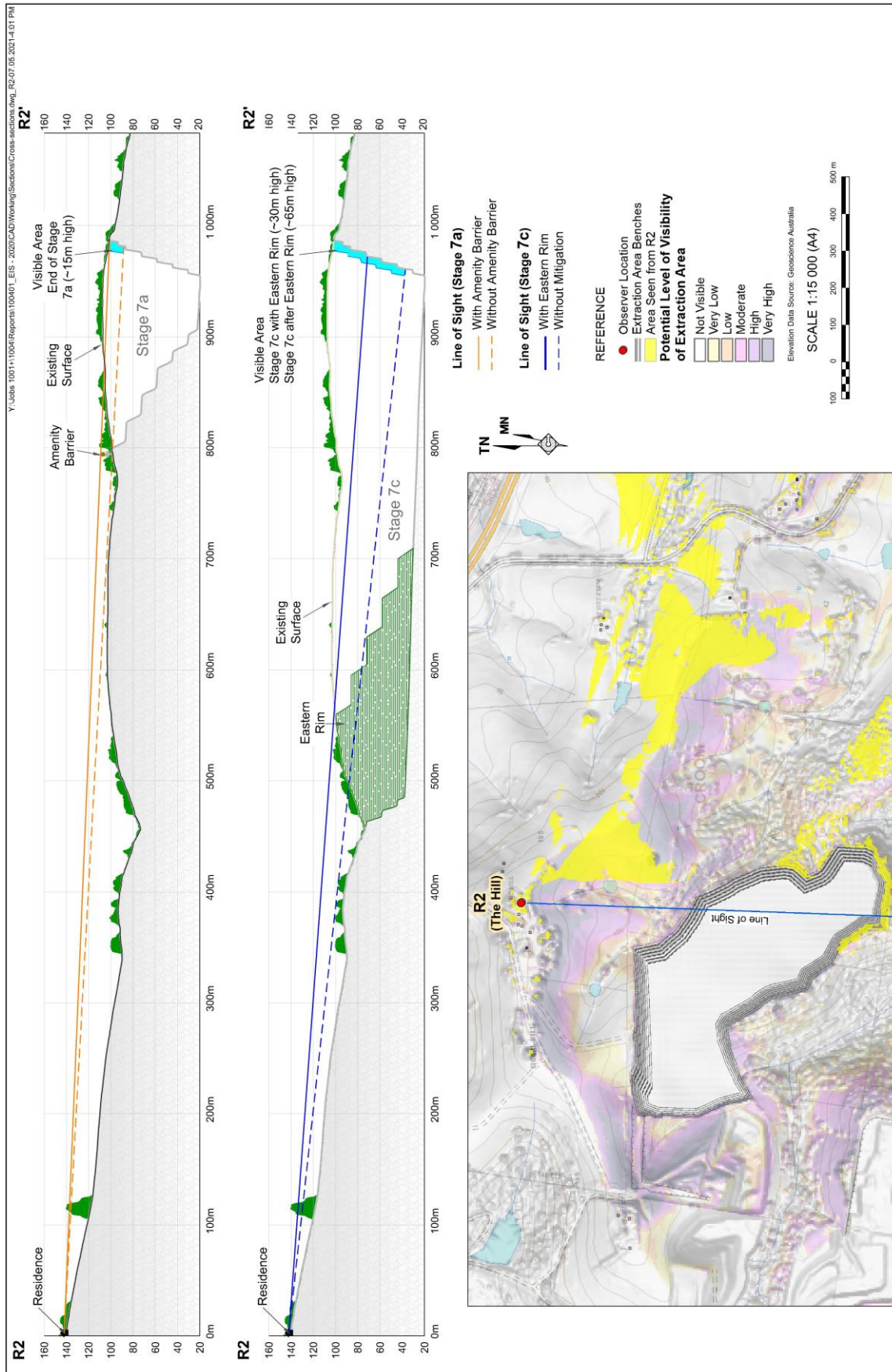


Figure 14 Visual Impact Assessment R2 – “The Hill”





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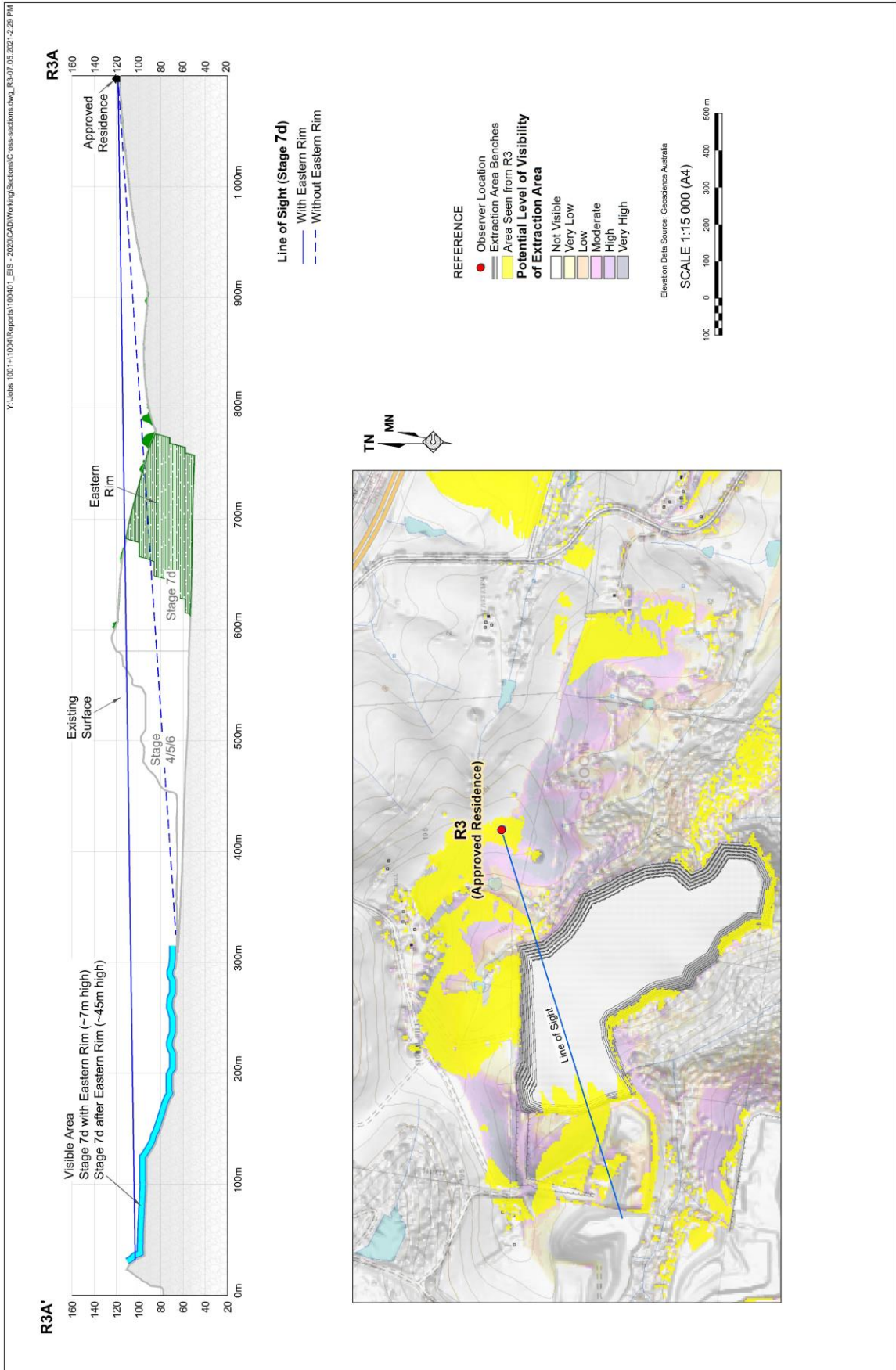


Figure 15 Visual Impact Assessment R3A – Approved Residence

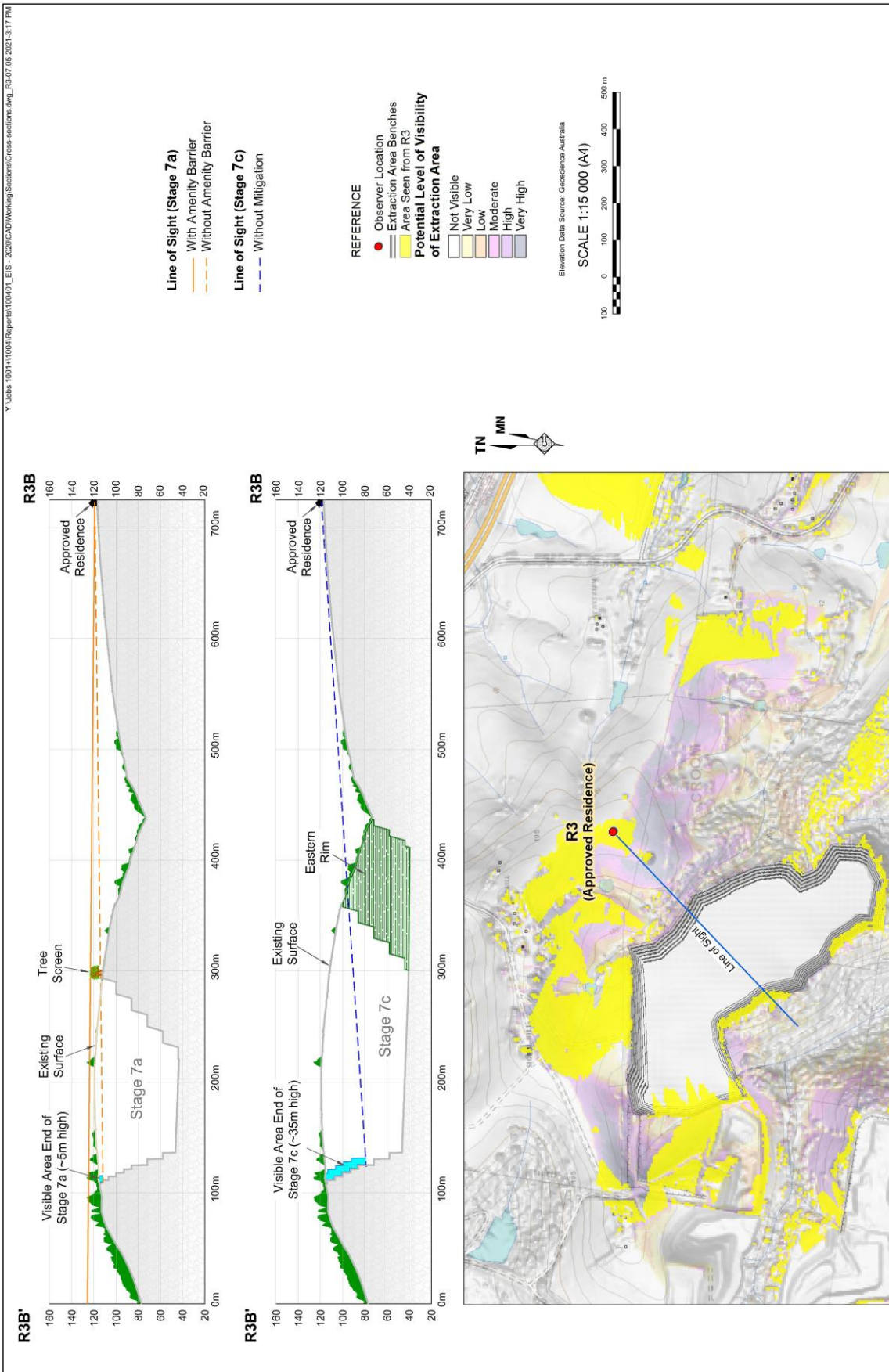


Figure 16 Visual Impact Assessment R3B – Approved Residence

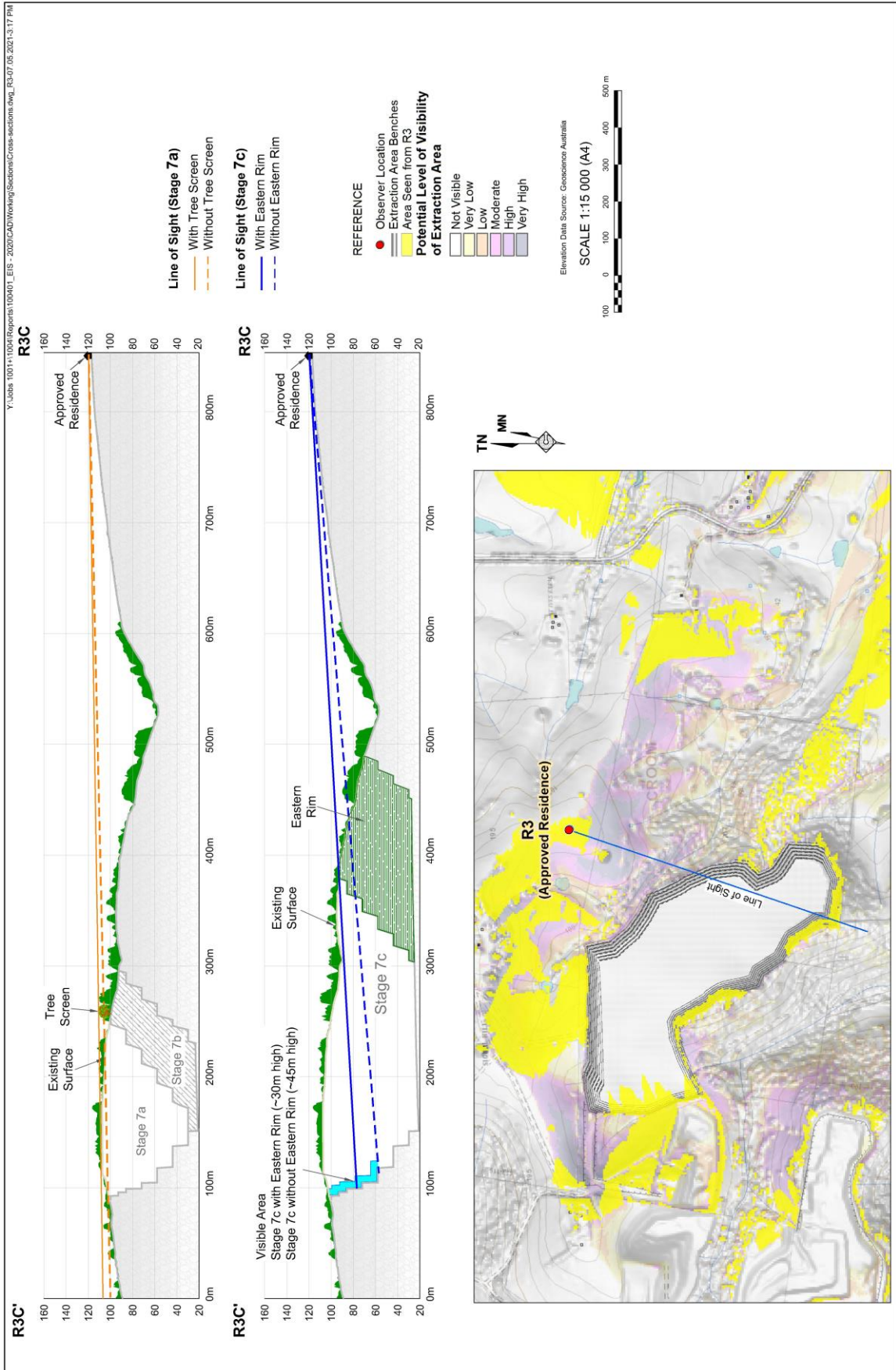
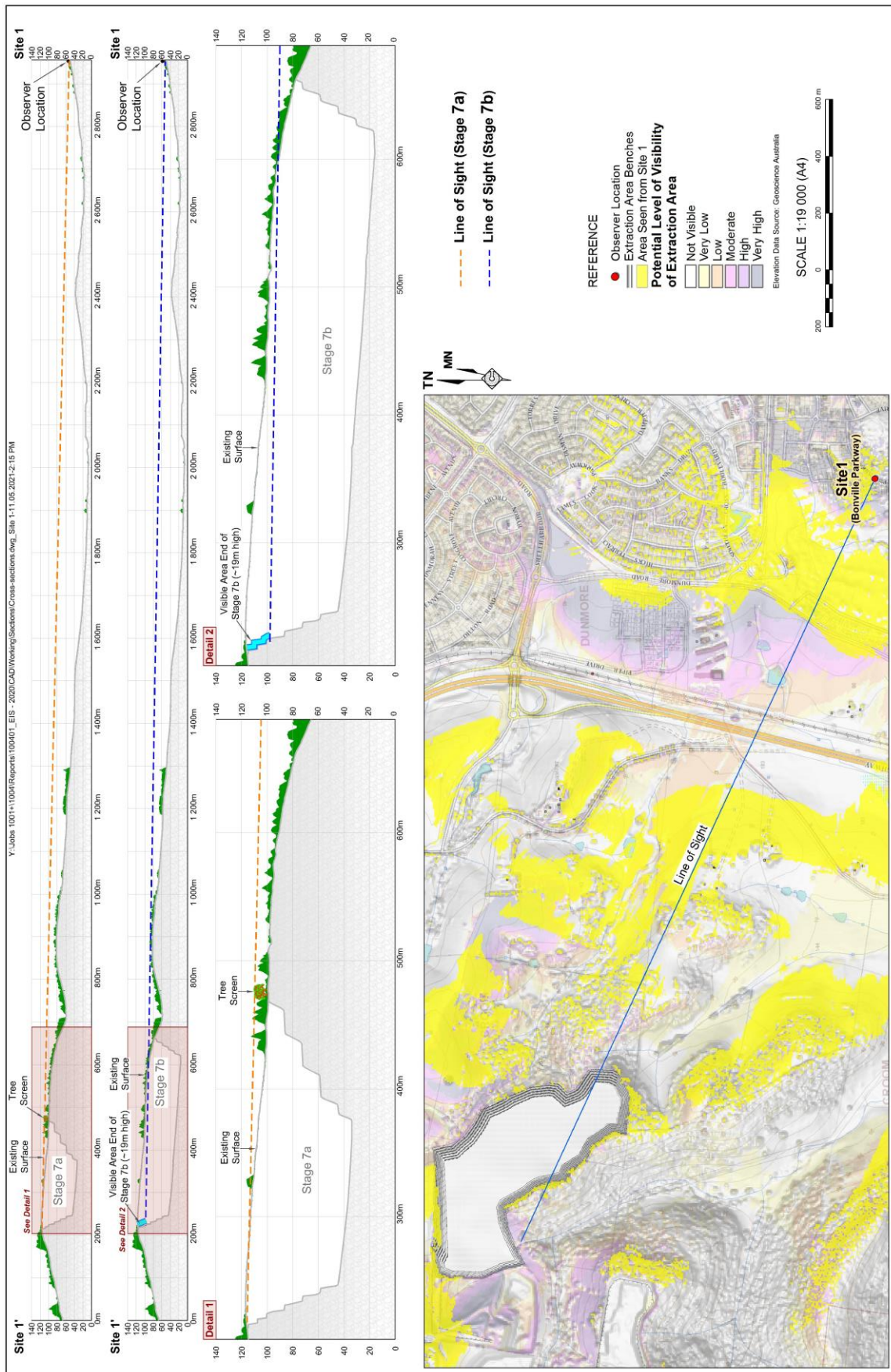
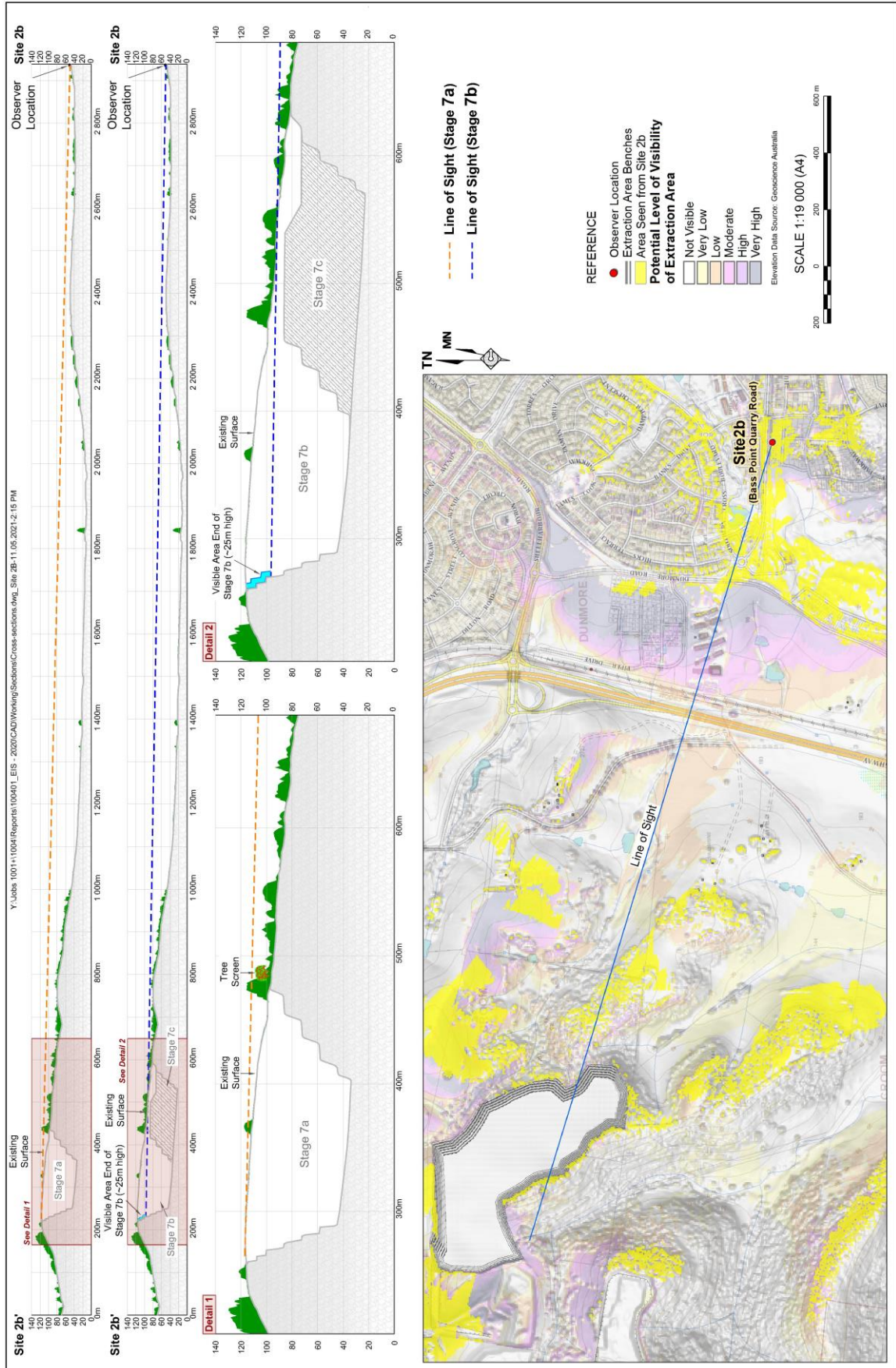


Figure 17 Visual Impact Assessment R3C – Approved Residence

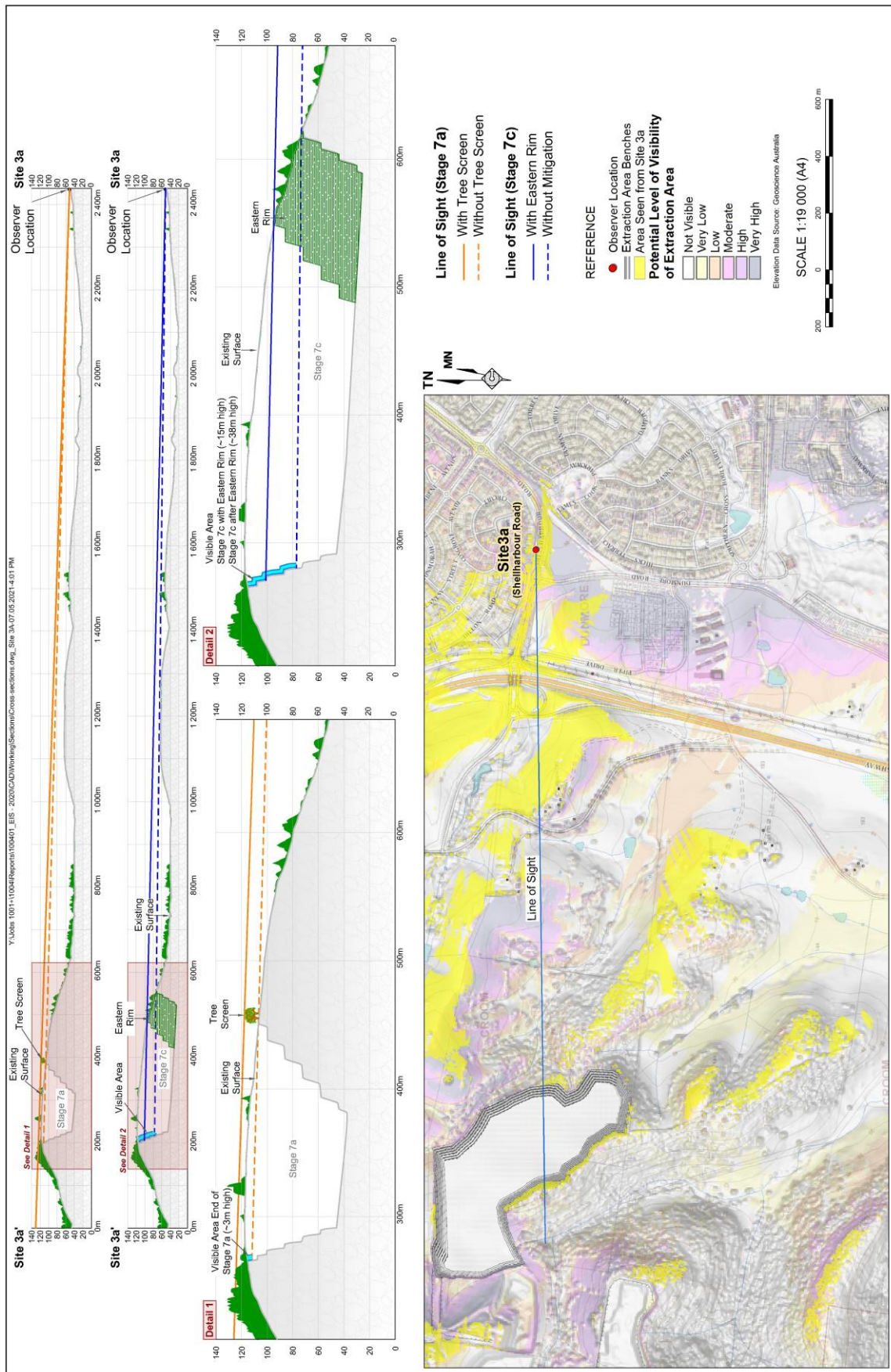




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**Figure 19 Visual Impact Assessment Site 2b – Bass Point Quarry Road**



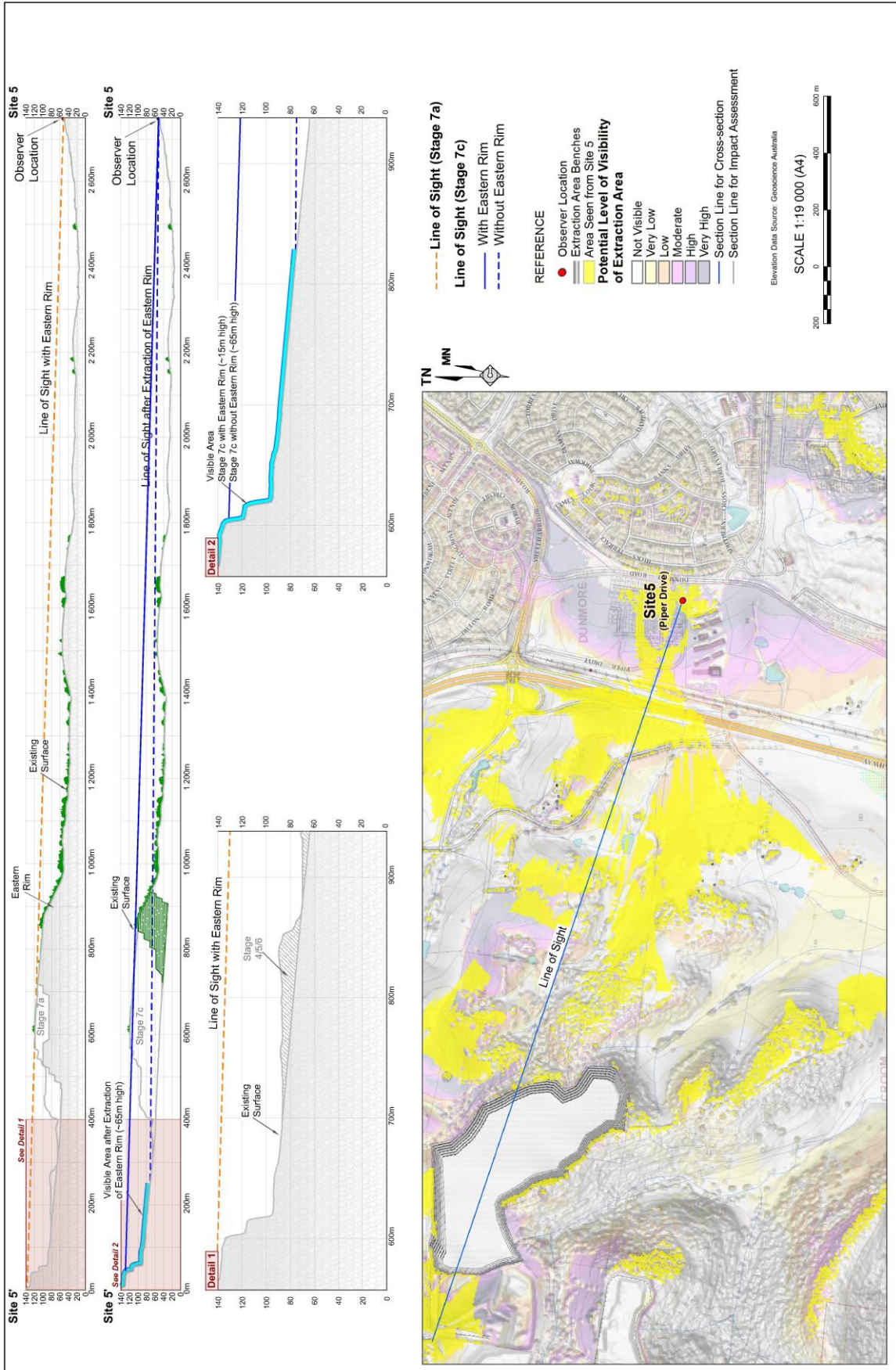


Figure 21 Visual Impact Assessment Site 5 – Piper Drive

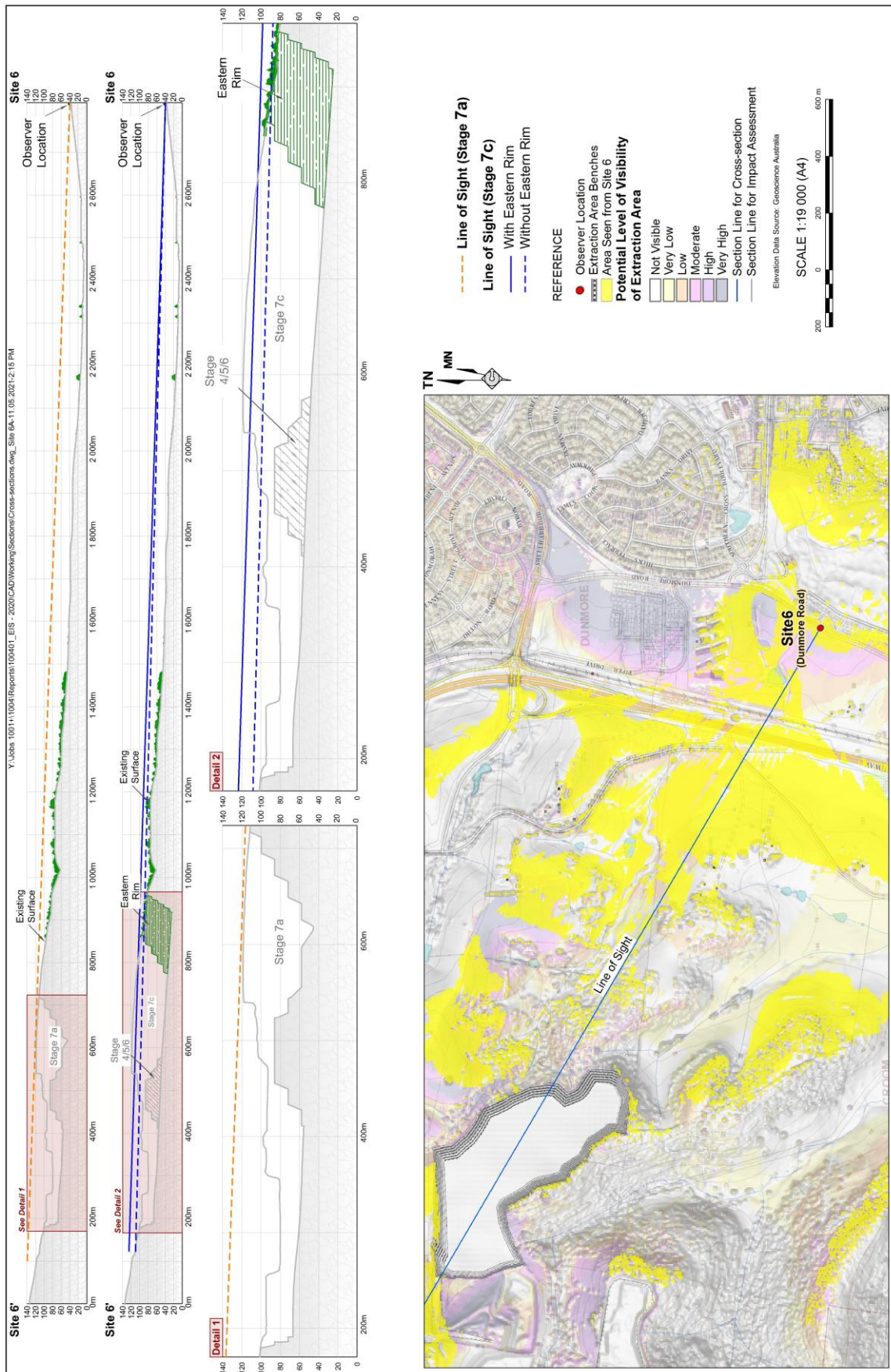


Figure 22 Visual Impact Assessment Site 6 – Dunmore Road





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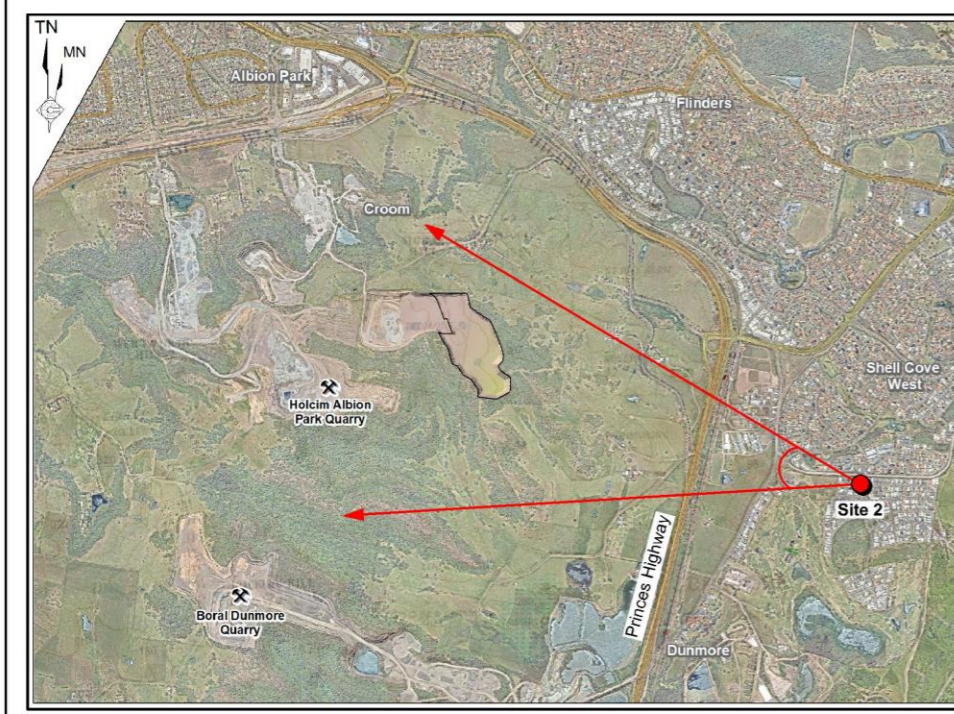


Figure 23  
VIEW FROM SITE 2 -  
EXISTING

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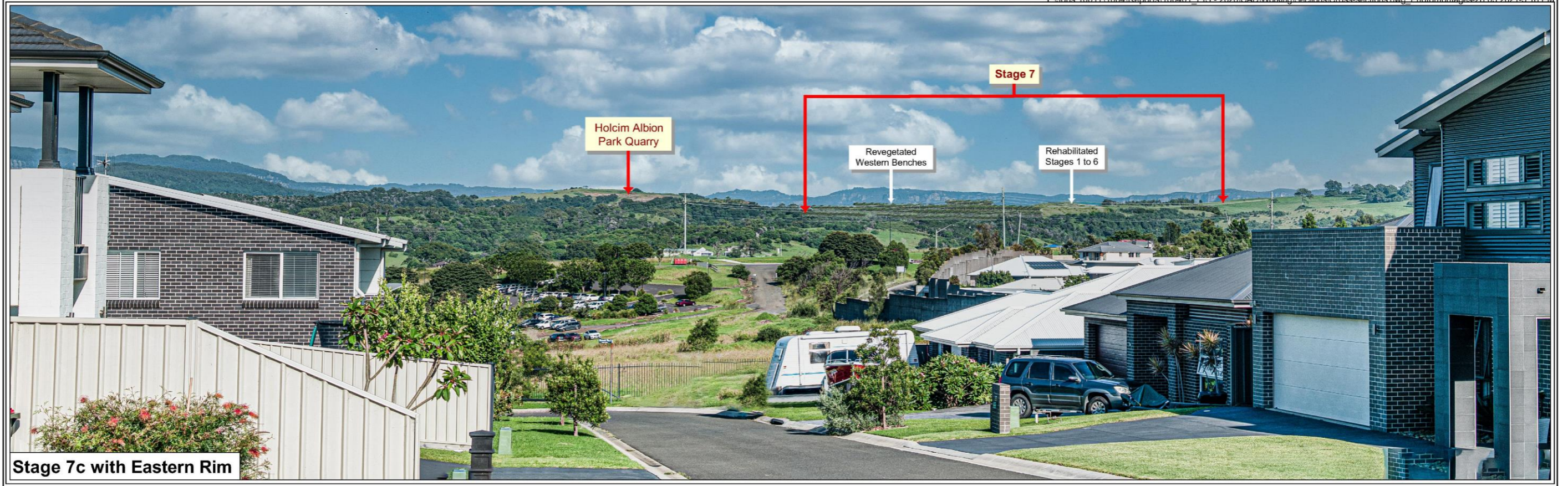


Figure 24  
VIEW FROM SITE 2 - STAGE 7C WITH  
EASTERN RIM AND END OF STAGE 7

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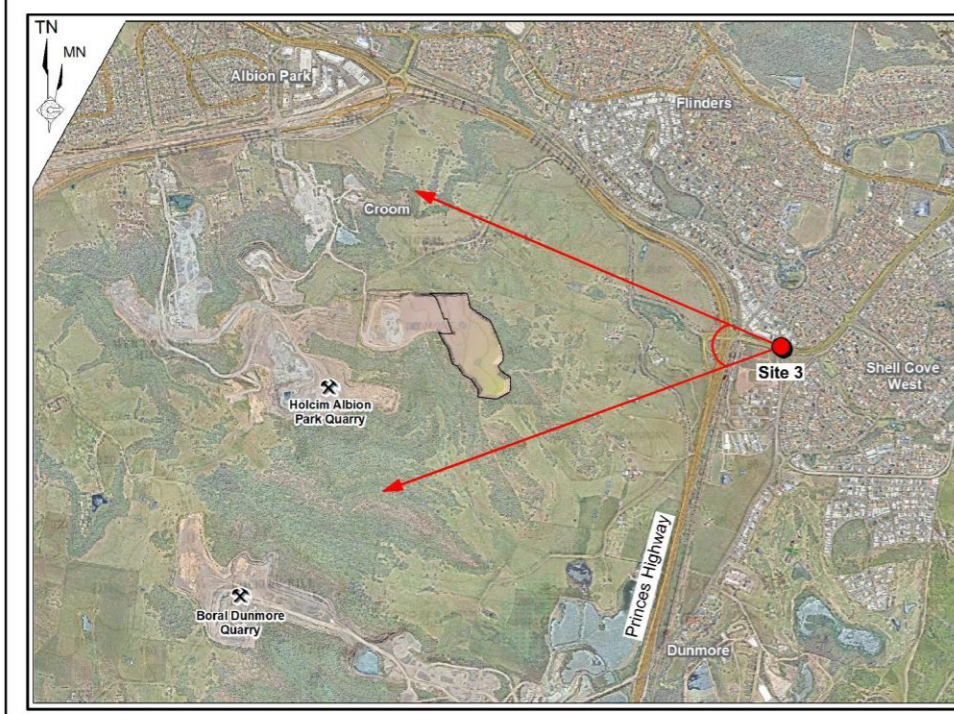


Figure 25  
VIEW FROM SITE 3 -  
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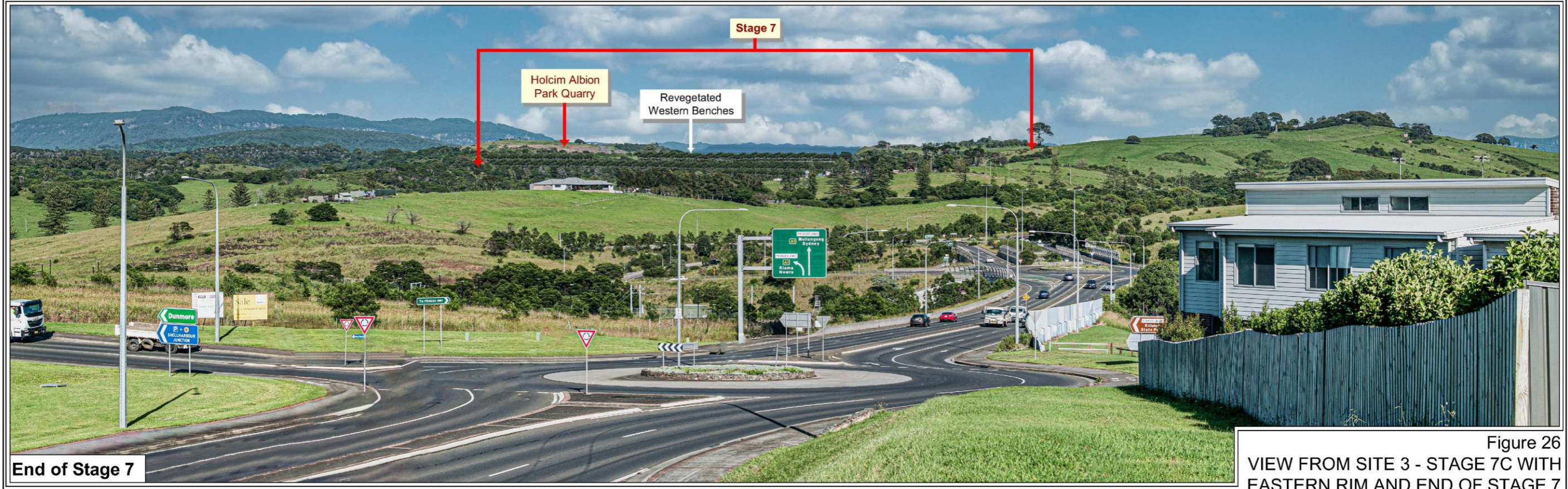
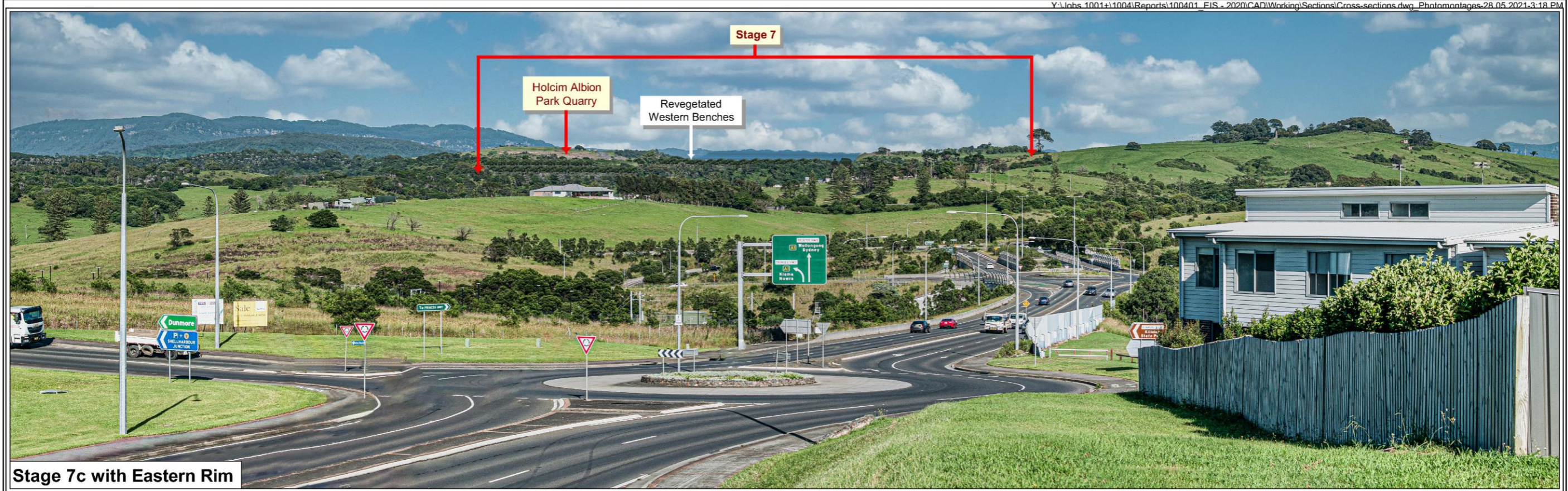


Figure 26  
VIEW FROM SITE 3 - STAGE 7C WITH  
EASTERN RIM AND END OF STAGE 7

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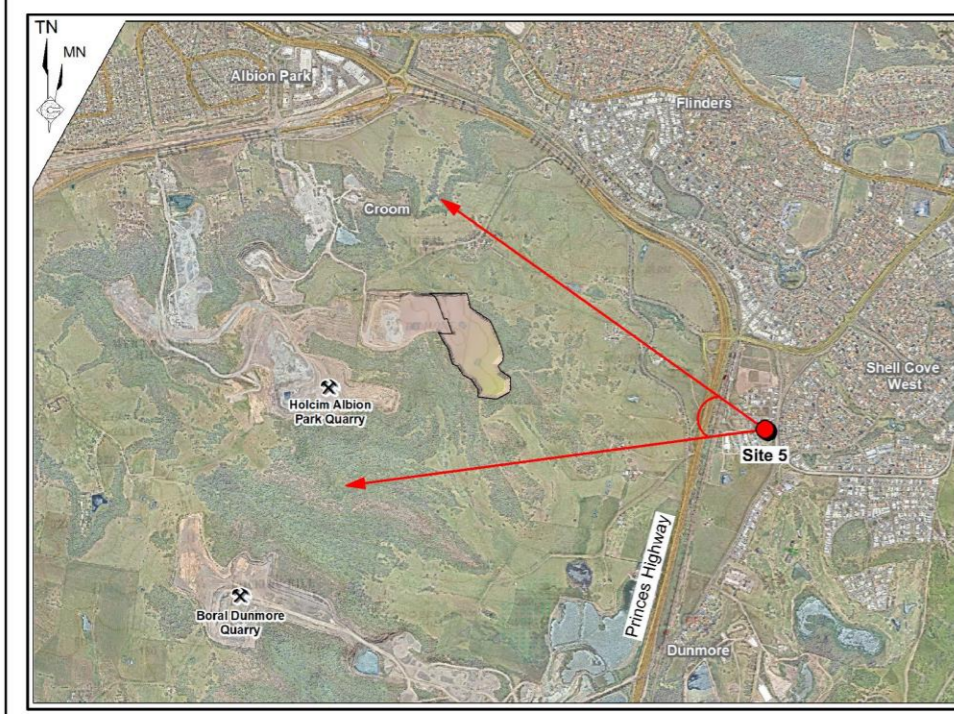


Figure 27  
VIEW FROM SITE 5 -  
EXISTING

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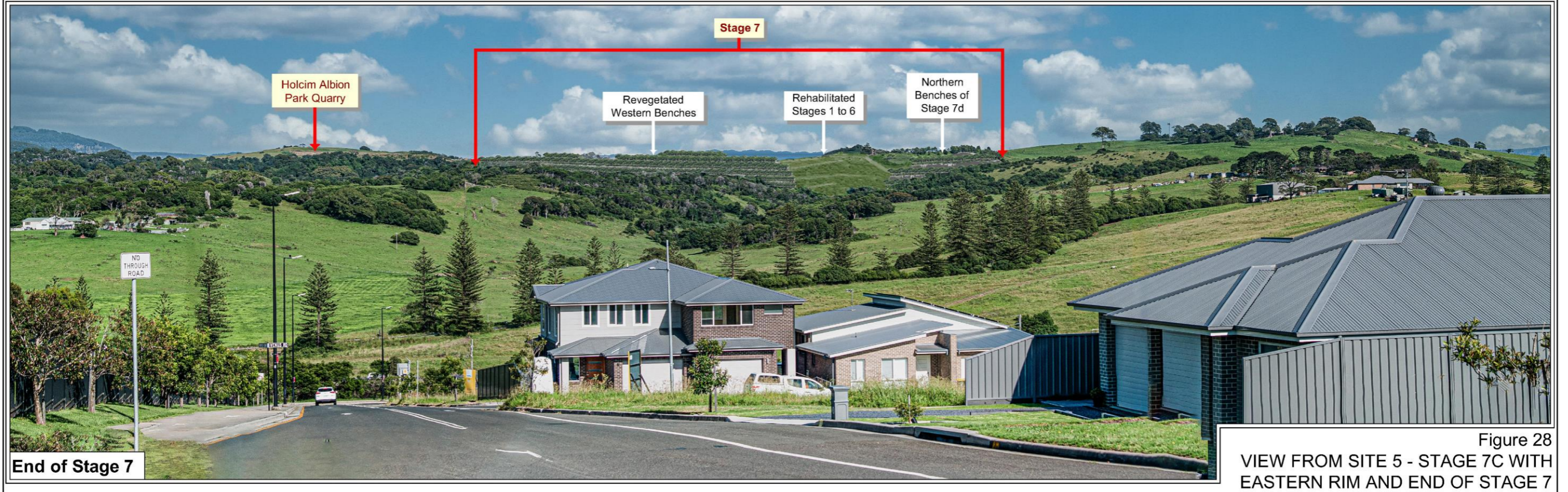
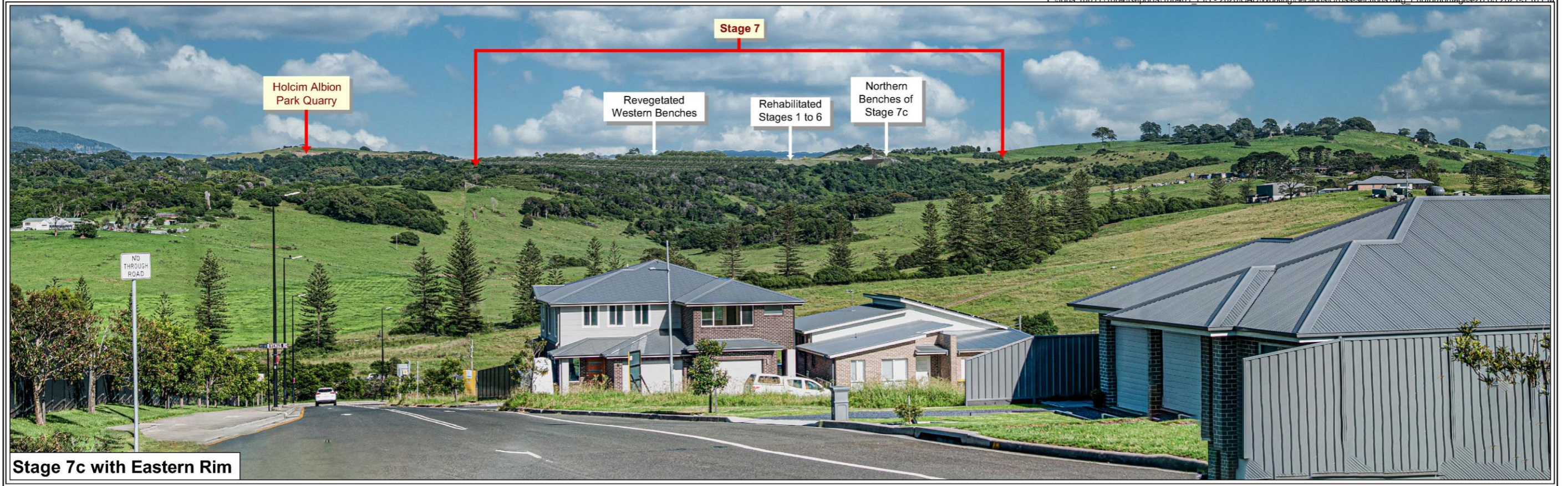


Figure 28  
VIEW FROM SITE 5 - STAGE 7C WITH  
EASTERN RIM AND END OF STAGE 7

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**Table 2** summarises each of the assessed observer locations and the estimated height of visible faces during the respective substages. It is noted that the estimated heights for Stage 7d is also the height that would be visible (with vegetation) beyond the end of the Project life. Furthermore, by the time extraction proceeds through Stages 7c and 7d, most of the visible faces would be rehabilitated and therefore not providing much colour contrast and as such would not significantly detract from the landscape. The estimated heights of visible extraction faces have been colour coded to assist with the impact assessment as follows.

- **Not visible** – no impact
- **<28m** – minor visibility (<2 benches)
- **>28m** (>2 benches) – moderate to high visibility

At distances of 1.6km to 2.4km from observation areas within Shell Cove West and west of Dunmore Road, the vertical component of the observed rehabilitated extraction faces would appear comparatively small in the context of the overall view.

**Table 2**  
**Heights of Visible Extraction Faces from Representative Locations<sup>1</sup> (m)**

Location		Stage 7a	Stage 7b	Stage 7c <sup>2</sup>	Stage 4/5/6	Stage 7d <sup>2</sup>
"Figtree Hill"	R1	0	0	0	0	46
	R2	7	7	68	68	68
	R3a	0	0	0	0	20
	R3b	0	0	45	45	45
	R3c	0	8	42	42	42
Shell Cove West Locality	Site1	0	19	19	19	19
	Site2a	0	22	22	22	22
	Site2b	0	24	24	24	24
	Site3a	0	3	38	38	38
	Site3b	0	5	36	36	36
	Site4a	0	0	32	32	32
	Site4b	0	14	14	14	14
	Site5	0	0	45	45	22
	Site6a	0	0	16	16	16
	Site6b	7	12	12	12	12
James Road	Site7a	0	0	0	0	0
	Site7b	5	5	5	5	5

Note 1: Assuming the presence of either amenity barriers or tree screens  
Note 2: Following extraction of the Eastern Rim.

Not Visible
  Extraction Faces <28m
  Extraction Faces >28m

The key impacts drawn from the cross-sections, photomontages and **Table 2** are as follows.



### **“Figtree Hill” Property (R1, R2 and R3)**

The extraction activities for the first approximately 15 years in Stages 7a and 7b would be substantially shielded from the residence locations on the “Figtree Hill” property. Small exposures of the overburden above the upper hard rock benches may be visible, however, their grassed appearance would generate minor visual impacts from these locations, once revegetated.

The elevated location of the two existing residences within the “Figtree Hill” property (i.e. “The Cottage” and “The Hill”) would provide occupants with obscured views at the end of Stages 7c and 7d into the extraction area through the perimeter vegetation around the residences. **Figures 13** and **14** display sections of the extent to which the extraction faces would be visible within those narrow views into the Project Area at the end of Stages 7c and 7d. It is acknowledged that the views from “Figtree Hill” towards the Project Area would change substantially, mainly in the final years of the Project life.

Observers from “The Cottage” would view up to 65m vertical height of the western faces along an approximately 200m length of Stage 7a approximately 0.5km from the residence (see **Figure 13**). Importantly, by the time these views occur, vegetation would be well established on the final benches. A similar view of the extraction area would occur from “The Hill” from which observers would be able to see the southern end of the extraction area, at a distance of approximately 0.9km. Whilst retaining the near horizontal appearance of the benches within the extraction area, the overall views from both residences would be softened with the advanced vegetation.

The elevated area for the approved residence and the absence of surrounding vegetation would result in views from this location into the extraction area principally during Stages 7c and 7d. **Figures 15, 16** and **17** display sections from the approved residence location in three different directions. An observer at this location would ultimately be able to see between 35m and 45m of extraction faces in the latter half of the Project life.

### **Shell Cove West (Sites 1, 2a and 2b)**

During Stage 7a, the existing vegetation, amenity barrier and tree screen on the eastern side of Stage 7 would fully screen or minimise the extent of western faces within Stage 7a that would be visible. As extraction proceeds in Stage 7b, the lowering of the eastern section of the Project Area would expose the upper 20m to 25m of the western faces in Stage 7a. However, given the planned planting program on the western benches, the trees established by that time (approximately 10 to 15 years), would reduce the visual impacts as the view would be comparable to other nearby vegetation areas near the skyline.

Similar visual impacts are predicted for extraction operations later in Stages 7c and 7d, during extraction of the Eastern Rim, and by that time the vegetation on the upper benches would be well established.

### **West of Dunmore Road (Sites 3a, 3b, 4, 5 and 6)**

During Stage 7a, the current topography, amenity barrier and tree screens on the eastern side of Stage 7a and revegetation of the overburden, would minimise the extent of the western faces within Stage 7a that would be visible. As extraction proceeds in Stage 7c, retention of the Eastern Rim would minimise the visibility of the western faces of the Stage 7 extraction



area until the later part of the Project. The exposure of these faces would be mitigated through the proposed revegetation of the benches within the extraction area, with those trees well established by the time the Eastern Rim is extracted.

### **8.3 VISIBILITY OF EARTHMOVING EQUIPMENT**

The removal of vegetation, soil stripping and overburden extraction would be undertaken in short campaigns throughout the Project life principally through the use of a bulldozer and an articulated truck and excavator fleet. This equipment would be present during each campaign for comparatively short periods as these activities would be undertaken over a comparatively small area in readiness for the subsequent hard rock extraction in that area.

It is noted that, with the exception of some areas within the "Figtree Hill" property, the distance between the operating equipment and the observers would be sufficient for the equipment not to be visually obtrusive. Observers within the "Figtree Hill" property would be able to see the equipment at distances typically between 0.5km and 0.9km. As discussed in Section 1.5, the overall design of the Project Area focussed upon minimising the extent to which "Figtree Hill" residents could view operational areas.

It is possible that a drilling rig used to drill holes for blasting the hard rock would periodically be visible for short periods following the removal of vegetation, soil stripping and overburden extraction campaigns. However, the extent of visibility may be limited as the drilling rig may be located between 2m and 8m below natural ground level as they would only be used after the removal of the overburden that does not require blasting.

It is recognised that quarrying operations in the Albion Park and Dunmore area west of the Princes Highway has been an ongoing activity for many years and the periodic views of equipment is acknowledged as an appropriate activity in this important resource area.

### **8.4 VISIBILITY OF AMENITY BARRIERS**

The amenity barrier and tree screen on the eastern side of Stage 7a and northern side of Stage 7d are proposed to assist with the attenuation of both noise and visual impacts. The barriers would need to be constructed so that they are themselves visually appealing with their outer face vegetated. The recommended growth of trees and shrubs would soften the views of barriers and they would effectively become part of the landscape when viewed from outside the Project Area. Their appearance would be similar to the vegetation observed near the existing skyline.

For most viewing locations around the Project Area, the barriers and their vegetation would remain below the skyline. Where the barriers and their vegetation rise above the skyline, the change would be very small and unlikely to create any adverse visual impacts.



## 8.5 BLAST EMISSIONS

The predicted impacts of blasts initiated within the Project Area has been assessed principally based upon the experience of blasts initiated within Stages 1 to 6 over the past 14 years.

The key impact would relate to dust being generated which would be continue to be influenced by the type of rock, the depth within the extraction area, the absence of significant groundwater and the types of explosives used. Blast within Stages 1 to 6 have resulted in negligible NO<sub>2</sub> being generated and hence no noticeable orange gases have been generated.

It is anticipated that dust plumes from blasting would be visible from within the "Figtree Hill" property when blasts are initiated on the upper benches within Stage 7. The visibility of blasts initiated on the lower benches are likely to be considerably lower when viewed from "Figtree Hill". Cleary Bros endeavours to blast within the existing extraction area when winds are not blowing directly towards the two existing residences on "Figtree Hill". In the event the winds are blowing in that direction, the exact time of blasting is adjusted to a period of lower wind speeds given the observed variability in wind speeds in the area.

Potential exists for dust plumes from blasting within Stage 7 to be seen from Shell Cove West when blasts are initiated on the upper benches, however, the rapid dispersion of the plume and the considerable separation distances involved would result in the dust plume being visible for only a short period.

Overall, the visual impacts of dust plumes from blasting has been assessed to be minor given the Company's consideration of prevailing winds, the depth of most blasts within the extraction area and the short duration when the plumes are visible.

## 8.6 SUMMARY OF IMPACTS

The visibility assessment has established that extraction activities within Stage 7a would not be visible from most surrounding residences or public land for the first 10 to 15 years of the Project life. The exposure of overburden may be visible from some locations during this period, however, its height of approximately 5m and its stabilisation with grasses and shrubs/trees would effectively remove any adverse visual impacts.

The progression of extraction from Stages 7b to 7d would progressively expose various heights of extraction faces previously extracted on the western side of Stage 7a. The western extraction faces of Stage 7a would be most visible from the existing residences on the nearby "Figtree Hill" property, albeit being partly obscured by existing vegetation around the residences. Whilst these faces would be progressively exposed, to varying degrees, the planned delayed extraction of the Eastern Rim and design and revegetation of the benches would substantially reduce their visual impact(s). In effect, the vegetation established would soften the dark grey colour and introduce colours that would blend with the natural colours and textures of vegetation in the foreground adjacent to the Project Area and in the far distance.

The impacts of the mobile equipment operating for comparatively short periods on the surface and within view from the key visibility catchments, are assessed as acceptable given the considerable distances between the observers and the equipment.





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The impacts of the constructed amenity barriers are assessed to be acceptable given the manner in which they would be vegetated and become part of the overall landscape.

Overall, the proposed visual impacts generated by the Project have been assessed to be acceptable given the extent of visual mitigation that would be adopted in the context of the quantity of resources that would be recovered to provide the high quality raw materials for the ongoing development of the Illawarra and Greater Sydney Regions.



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