

17.0 Aesthetics

17.1 Summary

Overall, the proposed expansion will have a low to moderate visual impact on surrounding areas due to the combination of the following factors:

- The proposed new structures will be located within the visual setting of the existing refinery.
- The scale, shape and colour of the proposed new structures will be similar to the existing structures that they would adjoin.
- While the existing refinery is a visually prominent industrial complex located in a coastal landscape, the proposed new structures represent only an incremental increase in the visual scale and form of the refinery.
- Views of the existing refinery from land-based sites are limited as a result of its location at the end of a peninsula, and the woodland vegetation blocking some views from Melville Bay Road which is the only public road providing access to the peninsula.
- Open views of the refinery from land-based view locations are generally limited to the causeway, a short section of Melville Bay Road adjoining the refinery, and the wharf at the western end of the peninsula.
- Other views of the refinery are generally long distance or partly screened by vegetation and/or landform.
- The number of people exposed to views from the three key land-based view situations is relatively low and the period of view is relatively short.
- The refinery is clearly visible from boats travelling on the areas of ocean adjoining the peninsula. However, the number of viewers is relatively low and the refinery provides a visual marker to assist navigation.
- Parts of the residue disposal area (RDA) are visible from sections of Melville Bay Road, the causeway, Drimmie Arm, and parts of Inverell Bay. The visual effect is primarily caused by the contrast between the red of the residue and the green and blue of the surrounding environment.
- Views of the exposed residue will not be long term and their visual impact will be significantly reduced once the final disposal height has been reached when the residue surface is recontoured and revegetated to blend in with the surrounding landscape.
- Screening of views of the residue disposal area from Melville Bay Road will be improved by increasing the height of the existing roadside earth bund together with additional tree and shrub planting.

17.2 Introduction

This section of the EIS details the visual assessment process undertaken to assess the visual effects of the proposed expansion. Given that the proposed works involve the expansion of an existing refinery, the first step was to determine and describe the existing facilities and the landscape context in which they are located. This provides a baseline against which the potential incremental effects of the proposal can be assessed.

The visual assessment has included both the proposed refinery expansion as well as placement of residue material from the refining process. Potential visual impacts at the RDA include those that occur during the placement of residue material and those following the establishment of vegetation.

Mitigation measures have been identified that could significantly reduce the potential visual impacts.

17.3 Visual Character of the Local Landscape

The landscape of Gove Peninsula is characterised by gently undulating landforms adjoining sections of coastline with extensive stretches of sandy beach alternating with areas of mangroves. Native woodland vegetation covers most of the peninsula with extensive stands of mangrove in bays and lagoons.

The western end of the peninsula forms a narrow point on which the refinery is located. Structures associated with the refinery, together with the ship loading facilities, are visually prominent at this location. The refinery, wharf and ships berthed at the loading jetty form visual landmarks that are visible from surrounding areas of ocean and adjoining coastline. However, views of the refinery from land areas are generally limited. This is due to the extensive areas of woodland vegetation that block views from most of the Melville Bay Road and Nhulunbuy township. In addition, the location of the refinery at the end of a peninsula means that there is no public traffic passing by the refinery and no adjoining areas of urban development. The majority of traffic using the western end of Melville Bay Road is associated with the refinery and wharf facilities, the main exception being residents living on Drimmie Peninsula and people using the Gove Yacht Club.

The generally flat landform and low elevation of the refinery site and adjoining land areas means that views are often blocked by vegetation and/or minor changes in landform. However from those locations where views of the refinery are possible, the geometric form of the various components of the refinery produce a high level of visual contrast with the surrounding areas of ocean and remnant vegetation. The flat landform on which the refinery is located generally results in the upper portions of refinery structures being viewed against a background of sky. Emissions from the power station stack can be seen against the sky resulting in a higher level of visual prominence than would be the case if they were viewed against a background of high landform or other industrial development. However, the relatively compact arrangement of the structures results in the refinery having a high degree of visual harmony. Furthermore, there is a significant level of self-screening due to the effect of some refinery structures blocking views of other structures located behind them.

17.4 Landscape Units

In order to describe the visual character of the landscape in which the refinery and residue disposal area are located, a series of landscape units have been identified and shown on Figure 17.4.1. These units represent areas that are relatively consistent in terms of their combination of landform, vegetation and land use. This combination of factors results in a distinctive visual character that is described in Table 17.4.1.

Table 17.4.1
Landscape Units

Unit No	Description
1	Coastal edge with native vegetation of low woodland/shrubland that partially screens views of ground level components of the refinery from off-shore areas.
2	- Flat landform on which refinery structures, storage tanks and bauxite stockpiles are located. - Visual character dominated by geometric industrial structures that are predominantly grey and bauxite stockpiles that are red. - Emission from power station stack is visible against the sky. - Vegetation generally confined to amenity planting associated with car park and entrance area.

Unit No	Description
3	- Narrow coastal strip with sandy beach and small rocky headland. - Coastal vegetation of low trees and shrub partially screen views of lower portion of the refinery from off-shore views.
4	- Gently sloping land extending to shoreline. - Extensive cover of woodland vegetation with mangroves along western part of the shoreline and sandy beach associated with Yacht Club along south-east shoreline.
5	- Gently to moderately undulating peninsula with central low ridge along which the road runs. - Extensive granite outcrops with sandy beaches along the western edge of the peninsula. - Woodland vegetation covers most of the area with sections of mangroves along northern and eastern edges. - Houses at Gonyangara with a number of single houses at other locations on the western portion of the peninsula.
6	- Low lying coastal estuary area with mangroves. - Strip of coastal land with gentle slopes to coast and woodland vegetation.
7	- Constructed landforms created by disposal of residue from the refinery. - Horizontal bund wall around area used for disposal of residue. - Unvegetated slopes formed by dried residue are visually prominent while revegetated areas are visually integrated with the adjoining landscape.
8	- Flat rehabilitated area with low trees and shrub vegetation. - Buildings associated with works compound and crafts centre buildings located on southern edge of the unit. - Bauxite conveyor runs along southern edge of the unit.
9	- Coastal strip with sand dunes adjoining sandy beach. - Vegetation is coastal scrub and low trees.
10	- Gently undulating landform with Melville Bay Road running generally east-west. - Native woodland with understorey and ground cover vegetation.
11	- Estuarine lagoon area with coastal dune and beach forming southern edge. - Mangroves predominant vegetation in tidal areas.
12	Estuarine lagoon with mangroves predominant vegetation.
13	Gently undulating landform with woodland vegetation.

17.5 Visibility of Existing Facilities

An assessment of the visibility of the existing refinery and RDA is summarised in Figure 17.5.1.

Key aspects of the visibility assessment are given below.

- Potential views of the refinery and RDA from Melville Bay Road between Nhulunbuy and the refinery are generally blocked by woodland vegetation on both sides of the road.
- Partial views of the upper portion of structures at the refinery are available from limited sections of the Melville Bay Road within 3 km of the refinery.
- Glimpses of the tops of the RDA are available from a section of the Melville Bay Road approximately 2 to 3 km from the refinery but most of the potential views are blocked by the road-side earth bund which has been planted with native vegetation.

- Open views are available from the causeway to Drimmie Peninsula. These views are across water to the refinery to the north-west and the top of the RDA to the east.
- Views of the refinery are available from the Gove Yacht Club and boats moored in Inverell Bay.
- The western portion of the refinery is visible from the wharf, which is generally accessible to the public, located at the western end of the peninsula.
- The fuel storage tanks and wharf are visible from Gunyangara but views of the main section of the refinery are generally blocked by landform and vegetation north of the beach.
- The refinery and residue disposal area are generally not visible from the main road running along Drimmie Peninsula due to the visual screening by woodland vegetation.
- The general silhouette of the refinery is visible from East Woody Beach but not visible from Nhulunbuy.
- An occasional glimpse of the refinery through tree canopies is available from the public lookout tower located on Mt Saunders at Nhulunbuy but views of the refinery are generally blocked by tree canopies.
- The refinery is clearly visible from portions of the sea to the north, west and south.

17.6 View Locations

The visual assessment has identified and mapped the various view locations from which the existing refinery is currently visible. This provides a visual baseline against which the proposed expansion work can be assessed.

17.6.1 Refinery

Table 17.6.1 presents the results of the visibility assessment of the refinery from the various view locations that are shown on Figure 17.6.1.

Table 17.6.1
Visibility of Refinery

View Location	Approximate Distance To Site	Category Of Viewer	Approx. Period of View	Relative No. of Viewers	Level of Visibility	Visibility Rating
1. Causeway to Drimmie Peninsula	2.5 km	Motorists and pedestrians	Short term	M	Open view across water to refinery	H
2. Melville Bay Rd adjoining south east corner of refinery	600 m	Motorists	Short term	H	Open view of upper portion of refinery with ground level areas screened	H
3. Wharf – western end of peninsula	500 m	Workers and public using the wharf	Variable but generally less than 4 hrs	M	Open view across water to refinery	H

View Location	Approximate Distance To Site	Category Of Viewer	Approx. Period of View	Relative No. of Viewers	Level of Visibility	Visibility Rating
4. Residences on south-west of Drimmie Peninsula	4 km	Residents	Variable, residents have period of extended view	L	Open view across water to refinery	M
5. Gunyangara	3.8 km	Residents using the beach	Variable, residents have periods of extended view	M	Open view across water to fuel storage tanks and wharf	L
6. Melville Bay south of refinery	0-30 km	Sailors and commercial craft crews	Variable	L	Open views across water to refinery	M
7. Beach on southern edge of Inverell Bay	2.5 km	Visitors	Variable, average approx. 2 hrs	L	Largely unobstructed views across water	H
8. Gove Yacht Club	2 km	Members and guests	Variable, average approx. 2hrs	M	Open view across water to storage tanks with refinery partially screened by vegetation	H
9. Section of Melville Bay Rd north of conveyor	2 km	Motorists	5 seconds	H	Upper portions of refinery visible but lower elements screened by vegetation	M
10. Section of Melville Bay Rd near turn-off to works depot and crafts centre	3.5 km	Motorists	5 seconds	H	Upper portions of refinery visible but lower elements screened by vegetation	M
11. Arafura Sea north of refinery	0-30 km	Sailors and commercial craft crews	Variable	L	Open views across water to refinery	L-H
12. Beach	4.5 km	Visitors	Variable, average approx. 2 hrs	L	Open views across water to refinery	M
13. East Woody Beach	8 km	Visitors	Variable, average approx. 2 hrs	L	Open views across water to refinery	L

17.6.2 Residue Disposal Area

Table 17.6.2 presents the results of the visibility assessment of the RDA from the various view locations that are shown on Figure 17.6.1.

Table 17.6.2
Visibility of RDA

View Location	Approx. Distance To Site	Category of Viewer	Approx. Period of View	Relative No. of Viewers	Level of Visibility	Visibility Rating
1. Causeway to Drimmie Peninsula	1.5 km	Motorists and Pedestrians	Short Term	M	Open view across water to top of disposal area	H
10. Section of Melville Road near turn off to works depot and crafts centre	1 km	Motorists	10 sec.	H	Glimpses of top of residue above roadside bund	L
14. Melville Bay Road	4.5 km	Motorists	5 seconds	H	Glimpses of RDA visible through screening vegetation	M
15. Melville Bay south of Drimmie Bay	5 km	Sailors	Variable	L	View across water to top of disposal area	L

17.7 Refinery Expansion

Details of the various components of the proposed expansion of the refinery are described in detail in Sections 4.0. A summary of the major visual aspects of the proposed new components is presented below and their locations shown on Figure 17.7.1.

- A. Liquor purification plant consisting of tanks, pipes and piping up to approximately 40 m high and a stack 70 m high.
- B. Cooling tower approximately 10 m high and similar in appearance to an existing cooling tower.
- C. Evaporation plant consisting of a row of cylindrical structures similar in shape and size to existing structures immediately to the west.
- D. Power station expansion to include a new boiler inside a building similar in shape and size to the existing building immediately to the north, and an additional 90 m high stack which is the same height as the existing stack and the new stack that is currently under construction. The two new stacks will be single flue stacks and will be thinner than the existing multi-flue stack.
- E. Digestion tanks similar in size and shape to the tanks to the south.
- F. Precipitation area consisting of a row of tall cylindrical structures similar in size and shape as existing structures immediately to the east.
- G. New hydrate filtration building similar to the existing building to the south.
- H. Three new stationary calciners similar in size and shape to the existing stationary calciner to the north. Each will include a 70 m high stack to match the height of the existing stationary calciner stack.

- I. Waste water neutralisation plant consisting of several tanks up to 20 m high and associated pumps and piping

The new structures to be installed as part of the expansion are generally similar in size and shape to existing components of the refinery. Figure 17.7.1 shows the location of the new major structures and indicates that they will occupy a relatively small proportion of the overall site area of the existing refinery.

17.8 Visual Impacts

17.8.1 Introduction

The potential visual impact of the proposed expansion would result from the combination of the following two factors:

- Visibility of the proposed additions; and
- Visual absorption capacity of the existing landscape in which the additions will be located.

17.8.1.1 Visibility

Visibility is a measure of the extent to any proposed addition may be visible from surrounding areas, the relative number of viewers, the period of the view, the view distance and the context of the view.

The underlying rationale for this aspect of the visual assessment is that, if a portion of the new facility is not visible from a particular area then the potential visual impact is nil. Similarly, if the number of people who would potentially see the proposed facility is low, then the visual impact would be low compared to a situation in which a large number of people have the same view. Furthermore, distance is a strong influence on potential visual impact as the proportion of the total view frame occupied by a structure decreases with distance from that structure. In addition, atmospheric influences tend to reduce the level of visual contrast between the development and adjoining structures or landscape. The reduced visual contrast results in a reduced level of visibility.

17.8.1.2 Visual Absorption Capacity

Visual absorption capacity is an estimation of the capacity of the existing landscape to absorb additional development without creating a significant change in visual character or producing a reduction in visual quality. At Gove, the capacity of the landscape to absorb development is dependent on existing structures, vegetation cover and landform. A major factor influencing visual absorption capacity is the level of visual contrast between the proposed new development and the existing elements in that landscape. If for example a visually prominent development already exists, such as the refinery, then its capacity to visually absorb any additional structures of similar character is much higher than a situation in which a new refinery was proposed to be developed in a natural landscape.

17.8.2 Refinery

As described in Section 17.7, the proposed new refinery structures will be similar in size and shape to the existing structures. In addition, these new structures would generally be located alongside the existing structures. Consequently there would be a high degree of mutual screening and visual absorption of the new structures. The potential visual impact of the proposed new structures from three of the key view locations assessed in Table 17.6.1 has been assessed and described in Table 17.8.1 below.

Table 17.8.1
View Location Assessment

View Location	Comments
1. Causeway to Drimmie Peninsula.	- The upper portions of the new cooling tower, waste water neutralisation plant and liquor purification plant (A, B and I on Figure 17.7.1) would be visible at the eastern end of the refinery, with a size and shape similar to existing structures. - The additional 90 m stack associated with the power plant will be visible alongside the existing 90 m stack and second 90 m stack currently under construction. - The three additional 70 m high stacks for the new stationary calciners will be visible alongside the existing stationary calciner stack of the same height. - The new 70 m stack for the liquor purification plant will be visible. - Other new structures would be difficult to visually differentiate due to the screening effect of existing structures. - The cumulative visual impact of the proposed new structures when viewed from the causeway is assessed to be low.
2. Melville Bay Road adjoining south-east corner of the refinery.	- Part of the new liquor purification plant and its 70 m high stack would be visible in front of the existing set of cylindrical thickener tanks along the eastern edge of the refinery that are most visible from the road. - The tops of the new cooling tower and waste water neutralisation plant may be visible through the vegetation screen from some positions. - The additional 90 m stack associated with the power plant will be visible alongside the existing 90 m stack and second 90 m stack currently under construction. - The tops of the three new 70 m stationary calciner stacks will be visible on the western side of the refinery. - The majority of the other proposed new structures would be screened from view by the existing structures or would be seen with a backdrop of existing structures. - The cumulative visual impact of the proposed new structures is therefore assessed as low.
3. Wharf at western end of peninsula.	- The additional 90 m stack associated with the power plant will be visible alongside the existing 90 m stack and second 90 m stack currently under construction. - The tops of the three new 70 m high stationary calciner stacks will be visible alongside the existing stationary calciner stack of the same height. - The new 70 m stack for the liquor purification plant will be visible. - The upper portions of the proposed new structure at locations D, F, and G (refer to Figure 17.7.1) could be partly visible as part of the refinery complex. - The majority of the other proposed new structures would be screened from view by the existing structures or would be seen with a backdrop of existing structures. - The cumulative visual impact of the proposed new structures that would be visible from the wharf is assessed as low.

While the refinery is visible from a number of other land-based view locations identified in Section 17.6.1, the level of visibility is generally low. The tanks, pipes and other structures to be installed as part of the expansion will either be screened by existing refinery structures or will blend in with them so that their visual impacts will be minimal. The potential visual impact of the proposed new structures would therefore be low. In general the degree of change to the visible outline of the refinery, when seen from the various other view situations, would be expected to be low.

The main elements that will be visible from the key view locations will be the new 90 m stack associated with the expanded power station, the 70 m stack at the liquor purification plant, and the three new 70 m high stationary calciner stacks. However, the cumulative visual impact of these proposed stacks compared to the existing stacks is assessed as low to moderate depending on how close to the refinery the viewer is located.

The potential visibility and associated visual impact of the proposed new structures when viewed from the above key viewing locations is illustrated in Figures 17.8.1 – 17.8.3.

17.8.3 Residue Disposal Area

The existing and final proposed heights for the tops of the stacking areas are summarised in Table 17.8.2.

Table 17.8.2
Approximate RDA Pond Heights

Pond	Existing Height (RL m)	Final Height (RL m)	Increase from Existing to Final Height (m)
Pond 3	30	30	0
Pond 4	40	51	11
Pond 5	36.5	51	14.5
Pond 6	27 ¹	51	24

¹ Height of the top of the bund wall as the pond does not yet contain residue

The final heights listed in Table 17.8.2 will not change as a result of the refinery expansion. The only effect of the expansion will be that the final height will be reached sooner.

In designing the RDA there was a trade off made between pond height and pond area. If a lower pond height was selected, it would have resulted in a greater area of land disturbance and vegetation clearing being required.

The red colour of the residue material is very visible while it is being spread and prior to it being vegetated. This high level of visibility is due primarily to the strong colour contrast of the red residue when seen against existing green vegetation on the slopes below and the sky above. However, as soon as a vegetation cover is established the visual contrast is removed and the landform created by the disposal of residue material visually forms part of the adjoining natural landscape. Current disposal of the residue material in a dried form allows it to be spread by machines to create new landforms that are similar in shape to the gently undulating natural landforms in adjoining areas. The straight line along the top of one section of the pond wall is visible from view location No. 1 (causeway to Drimmie Arm) due to the contrast with the adjoining gently undulating landform. Reshaping of the top of the levee would remove this straight line and create a landform that is similar in shape to the adjoining areas. Figure 17.8.4 shows what the RDA will look like from view location No. 1 once the final height of the RDA is reached and the residue surface has been profiled. It also shows the visual effect once the surface has been revegetated. The overall effect is one of blending in with the surrounding environment with a resultant low visual impact.

Figure 17.8.5 shows the view of the RDA at its final height from Melville Bay Road (view location No. 14). Only glimpses of the RDA are available through the trees. Once the RDA has been revegetated, it blends into the surrounding environment with a resultant low visual impact.

17.9 Mitigation Measures

While the potential visual impact that would result from expanding the refinery has been assessed as low to moderate, the following mitigation measures would reduce the visual impact even further.

17.9.1 Refinery

Proposed mitigation measures at the refinery include:

- The texture and form of the new structures will match those of the existing adjoining structures. Initially the colours of the new construction materials will not match those of the existing structures but the new facilities will eventually take on the existing colours as the materials oxidise.
- Lighting associated with the new facilities will be designed to avoid light spill on to the section of Melville Bay Road adjoining the refinery (refer Section 18).
- Additional roadside tree and shrub planting will be developed adjoining the northern side of Melville Bay Road near viewing location No. 2 to provide additional visual screening.

17.9.2 Residue Disposal Area

The visual impact of the residue disposal area primarily results from the strong visual contrast between the red residue and green vegetation on the slope. The normal process of revegetation of the residue disposal area will eliminate that contrast.

Glimpses of the top of the residue disposal landform from Melville Bay Road will be reduced by enhancing the existing vegetation planting along the southern edge of the road in the vicinity of view locations 10 and 14.

As discussed in Section 19.5.1, once the ponds at the RDA have been filled to their final height, the surface will be recontoured and revegetated to enable it to blend in with the surrounding landscape.



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ALCAN GOVE REFINERY EXPANSION ENVIRONMENTAL IMPACT STUDY

Project No. 12373-021-559

Date: 21-08-03

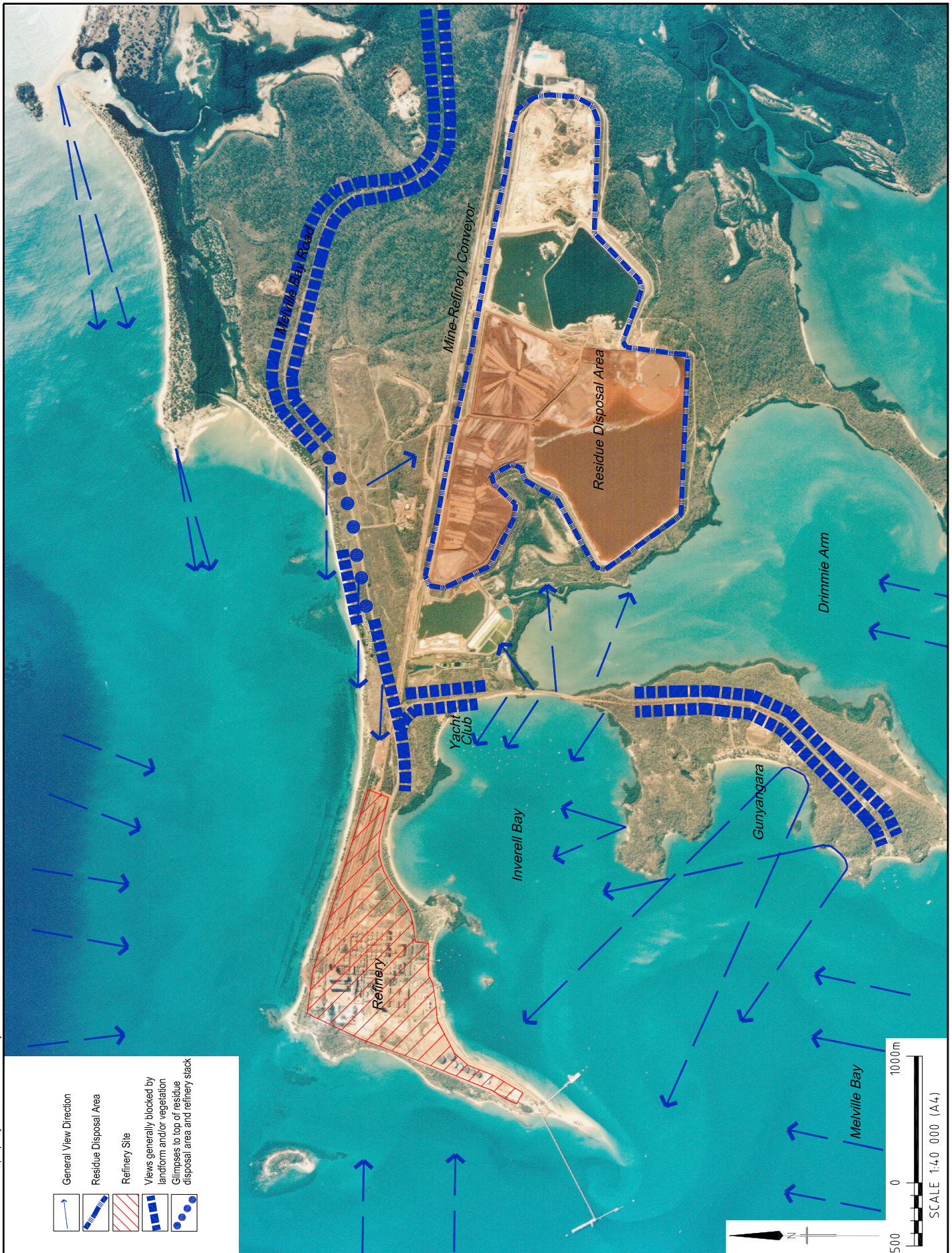
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LANDSCAPE UNITS

Figure 17.4.1



ALCAN GOVE REFINERY EXPANSION ENVIRONMENTAL IMPACT STUDY

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EXISTING VISIBILITY

Figure 17.5.1



ALCAN GOVE REFINERY EXPANSION ENVIRONMENTAL IMPACT STUDY

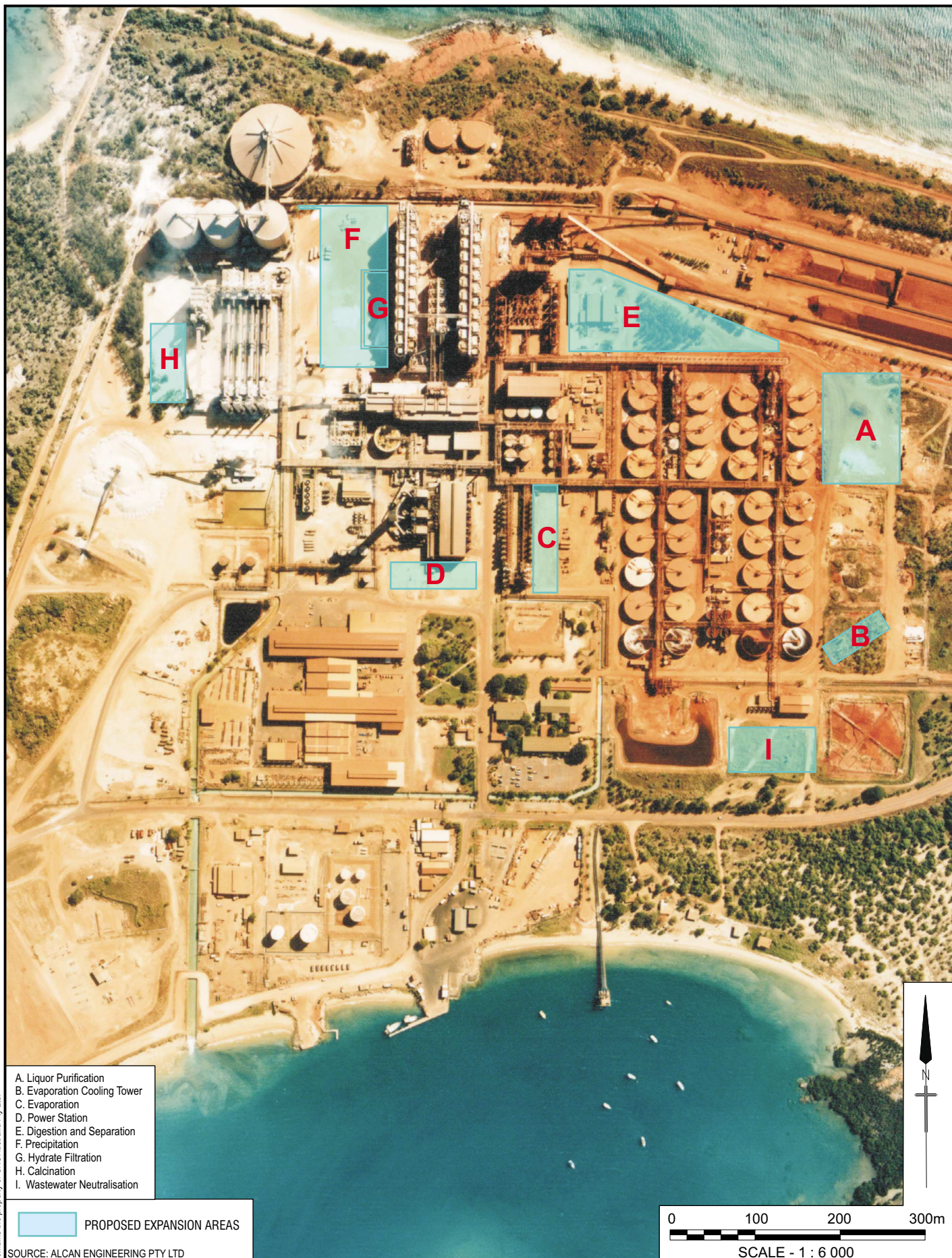
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Figure 17.6.1

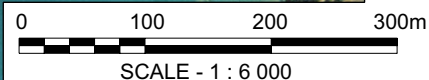
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- A. Liquor Purification
- B. Evaporation Cooling Tower
- C. Evaporation
- D. Power Station
- E. Digestion and Separation
- F. Precipitation
- G. Hydrate Filtration
- H. Calcination
- I. Wastewater Neutralisation

PROPOSED EXPANSION AREAS

SOURCE: ALCAN ENGINEERING PTY LTD



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NEW FACILITIES WITH POTENTIAL VISUAL IMPACT

Figure 17.7.1



EXISTING REFINERY



EXPANDED REFINERY



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**VIEW FROM CAUSEWAY
(LOCATION 1)**

Figure **17.8.1**



EXISTING REFINERY



EXPANDED REFINERY



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**VIEW FROM MELVILLE BAY ROAD
(LOCATION 2)**

Figure **17.8.2**



EXISTING REFINERY



EXPANDED REFINERY



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**VIEW FROM DUNDAS POINT
(LOCATION 3)**

Figure **17.8.3**



RDA AT FINAL HEIGHT WITH PROGRESSIVE REHABILITATION



RDA AFTER REHABILITATION



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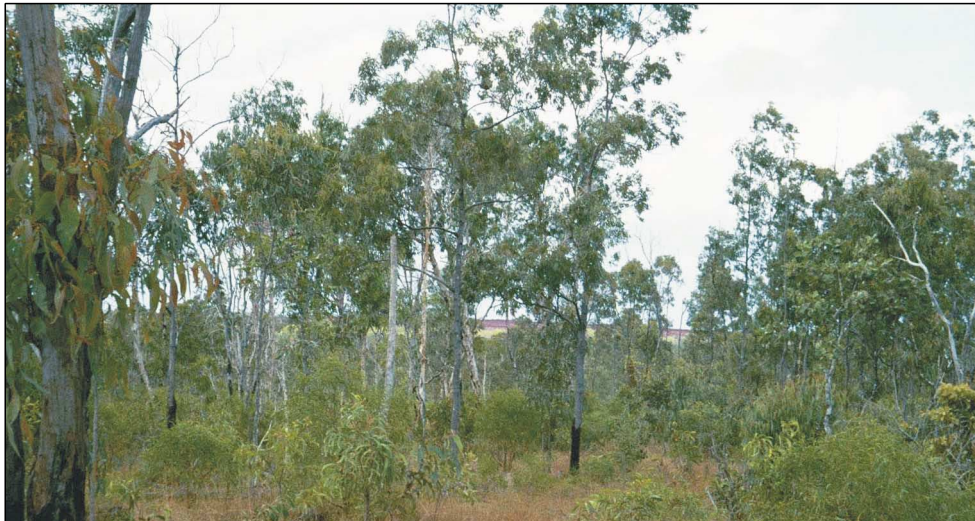
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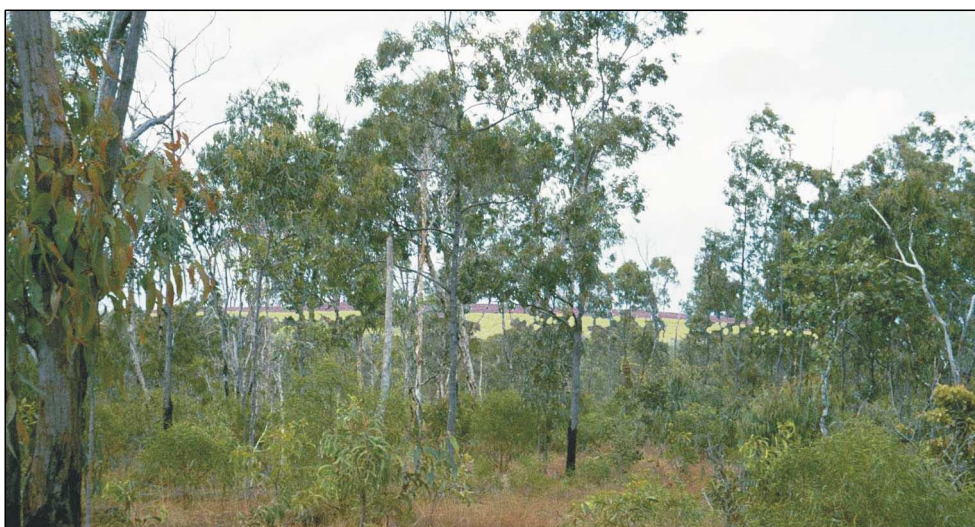
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**VIEW OF RDA FROM CAUSEWAY
(LOCATION 1)**

Figure **17.8.4**



EXISTING RDA



RDA AT FINAL HEIGHT



RDA AFTER REVEGETATION



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**VIEW FROM MELVILLE BAY ROAD
(LOCATION 14)**

Figure **17.8.5**