



Australian Government

BUILDING OUR FUTURE



# Coffs Harbour Bypass

## Environmental Impact Statement

September 2019

### Urban design, landscape character and visual impact assessment

#### Appendix J

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Chapter 6

# Landscape character impact assessment

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06

Landscape Character  
Impact Assessment

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FIG 6.1 LANDSCAPE CHARACTER ZONES

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 0 750 1500 m  
 Grid: GDA 1994 MGA Zone 56

## 6.1 Landscape Character Zones

Landscape character assessment seeks to divide the landscape into distinct, broadly homogeneous units with defining characteristics. In this way each character area should be distinct from an adjoining area which will be defined by a different set of key parameters.

The Landscape character Zones (LCZ) identified as part of this assessment have been derived from a review of planning policy, GIS baseline analysis and site investigations. The extent of character area analysis is informed by an understanding of potential perceived area of change that may arise from the project. This process included a review of the physical extent of the project and visual analysis, discussed in further detail within Chapter 7: Visual Impact Assessment.

Three distinct LCZs have been defined, as illustrated in Figure 6.1. The proceeding pages provide further detailed analysis and subdivision of these LCZs, together with a summary of the sensitivity of each LCZ.

### **LCZ 1: Boambee Valley**

This LCZ encompasses Englands Road roundabout and commercial development, Coffs Coast Resource Recovery Park to the south and extends to Roberts Hill to the north.

The area is characterised by a low-lying valley basin surrounded by hills, including Roberts Hill to the north and Big Boambee to the south and west. The south facing slope of Roberts Hill is characterised by dense vegetation with Roberts Hill pathways and ridgelines being of high cultural significance to the local Aboriginal community.

Within the valley basin, vegetation lines the low creeks that traverse in an east-west direction. Views are contained by this vegetation which provide a variety of scales of spaces. The distribution of vegetation provides a sense of open space in contrast to other sections of the floodplain where vegetation limits the depth of vision.

The area includes scattered residential dwellings that line the access roads across the low lying undulating terrain.

### **LCZ 2: Coffs Harbour Basin and Foothills**

This LCZ is bound by Roberts Hill to the south, Red Hill to the west, Ulidarra National Park to the north and residential development to the north east.

The area is characterised by rural pasture land and banana plantations on the lower slopes with dense native vegetation on the steeper upper slopes. The vegetation on the upper slopes provides a forested back drop in views from the east.

Two distinct valley land forms are present to the north before reaching Ulidarra National Park, including Mackays Road Valley and Gatelys Road valley. Both valleys are defined by two steep spur lines that extend from Ulidarra National Park and Orara East State Forest, creating two localised self-contained valleys to the north of the railway. The landscape both within the rail corridor and the rural holdings limit visibility into these isolated valleys.

The land uses within the valleys includes small rural holdings and hobby farms. This reflects the aspect being more easterly in focus and its reduced suitability for banana production.

Culturally significant pathways are present within this LCZ, extending from Sealy Point to the Orara Valley with branches leading south towards Roberts Hill.

### **LCZ 3: Kororo Basin and Foothills**

This LCZ is located between the Coffs Harbour coastline and the Great Dividing Range and encompasses a stretch of the existing Pacific Highway.

The topography within this zone is undulating to steep and recognised as the point where the Great Dividing Range is closest to the coast.

The land use is a combination of productive banana and blueberry plantations, open grassland paddocks, Kororo Public School and scattered residential properties to the west, with resorts and residential properties primarily situated to the east of the Pacific Highway.

The area holds some important biodiversity and Aboriginal cultural significance, such as the Kororo Nature Reserve and the Gumgali Pathway. The Kororo Nature Reserve, located to the west of the Pacific Highway, is an important Koala refuge and habitat corridor. The Gumgali Pathway located near Bruxner Park Road, is a landscape feature with cultural significance for the native Aboriginal people.

The presence of the resorts and large residential dwellings on small rural holdings take advantage of the elevated views towards the coast.

## Landscape Character Zones Subdivisions

The three distinct LCZs described on the previous page have been subdivided to provide further detail with regards to the defining characteristics, together with a summary of the sensitivity of each LCZ.



### 1A: Englands Road

- This LCZ is associated with the industrial area to the north of Englands Road and the Coffs Coast Resource Recovery Park situated to the south of Englands Road.
- The area comprises of warehouse style buildings, with areas of mature vegetation lining Englands Road screening some of the commercial uses.
- The commercial use is dependent on traffic movement and access with the eastern edge along the Pacific Highway relying on the open visibility.
- The sensitivity of this LCZ is judged to be *Low*.



### 1B: Boambee Basin

- Located on the floodplain of Newport Creek and divided by north Boambee Road, this LCZ is defined by the open agricultural landscape of the valley and the vegetation associated with the creek lines traversing from east to west.
- The land is low lying and is bordered to the east by a small residential area with scattered properties along local roads.
- The sensitivity of this LCZ is judged to be *Moderate*.



### 1C: Boambee and Roberts Hill Southern Foothills

- Associated with the south facing foothills of Roberts Hill and the foothills associated with Big Boambee, this area of North Boambee Valley is steeper and more undulating than the floodplain.
- The south side of Robert Hill ridge is dominated by native vegetation with a few residential properties situated on the elevated slopes and foothills.
- Roberts Hill has Aboriginal cultural significance being part of the culturally significant pathway running from Corambirra Point to the Orara Valley.
- The sensitivity of this LCZ is judged to be *High*.





### 2A: Roberts Hill Northern Foothills

- Located on the northern foothills of Roberts Hill, the area is dominated by banana plantations which take advantage of the northerly aspect.
- The hill marks the southern limits of the Coffs Harbour basin and is joined by residential development to the north east.
- Roberts Hill has Aboriginal cultural significance being recorded as part of the culturally significant pathway running from Corambirra Point to the Orara Valley.
- The sensitivity of this LCZ is judged to be *High*.



### 2B: The Bowl

- The agricultural use of the land is associated more with smaller rural holdings and open pasture lands than the intensive landscape of the banana plantations situated to the south.
- The newer subdivisions that have been developed since the announcement of the preferred route for the project in 2004, bound this LCZ to the east with the Great Dividing Range rising to approx. 240m ASL, defining the western and northern extent.
- The sensitivity of this LCZ is judged to be *Moderate*.



### 2C: End Peak & Mackays Road Valley

- The area is characterised by a spur line that extends from End Peak within Ulidarra National Park, creating a localised contained valley form.
- The steep slopes are typically occupied with banana and blueberry plantations.
- The southern extent of the LCZ is marked by the North Coast Railway.
- The topography provides a forested back drop when viewed from the adjoining residential properties and subdivision
- The sensitivity of this LCZ is judged to be *High*.



## 2D: Gatelys Road Valley

- Gatelys Road Valley is defined by a steep spur line that stretches from Orara East State Forest, creating a localised self-contained valley located north of the railway.
- The topography limits visibility into this isolated valley, offering a degree of capacity to absorb change
- Dominant uses within this valley are small rural holdings and hobby farms with banana plantations and blueberry farms.
- The sensitivity of this LCZ is judged to be *High*.



## LCA 3A: Kororo Basin and Foothills

- The Kororo Basin and Foothills consists of the land between the coastline and the Great Dividing Range and is recognised as the point where the range is closest to the coast.
- The area holds some important biodiversity and aboriginal cultural significance such as the Kororo Nature Reserve and the Gungali Pathway.
- The area is overlooked both by scattered residential dwellings in the hills and the residential properties of the resort.
- The sensitivity of this LCA is judged to be *High*.



## LCA 3B: Kororo Basin Edge

- The Kororo Basin Edge is bound by the Pacific Highway to the west and the coastline to the east.
- Resorts and residential properties are located between the Pacific Highway and the slopes leading to the coastline. Properties are frequently orientated to maximise coastal views.
- Creeklines, including Pine Brush Creek, and waterbodies decline from the foothills, extending a green network towards the coast.
- The sensitivity of this LCZ is judged to be *Moderate*.



## 6.2 Landscape Character Zone Impacts

This chapter documents the elements that have the potential to change or influence the landscape (magnitude of change) and the potential impacts that may arise on the LCZs.

The assessment is undertaken based on the subdivided LCZs defined within the baseline section.



### 1A: Englands Road

#### Magnitude of change

##### Operation

The magnitude of change arising from this project is considered to be *Moderate* due to the following:

- Realignment of Isles Drive and introduction of Englands Road interchange defining the southern edge to the existing commercial area
- Removal of a number of existing commercial properties, redefining the commercial edge

##### Construction

The magnitude of change arising from this project is considered to be *Moderate* due to the following:

- One potential ancillary site will be situated within this LCZ
- It is anticipated that the area will be dominated by construction works, including an increase in construction movements, presence of machinery and construction activities

- The clearance of vegetation and introduction of Englands Road interchange, resulting in the Coffs Coast Resource Recovery Park becoming more evident within this LCZ
- The construction uses and movements are not considered to be incongruous with the existing operations within the Coffs Coast Resource Recovery Park, situated to the south of Englands Road, however there is considered to be an incremental enlargement of the scale and extent of these operations

#### Impact

##### Operation

The *Low* sensitivity and *Moderate* magnitude of change is judged to result in a *Moderate-Low* adverse impact during operation.

##### Construction

The *Low* sensitivity and *Moderate* magnitude of change is judged to result in a *Moderate-Low* adverse impact during construction.



## 1B: Boambee Basin

### Magnitude of change

#### Operation

The magnitude of change arising from this project is considered to be *High* due to the following:

- Introduction of elevated road embankments through an existing low lying agricultural landscape
- Reduction and severance of the agricultural field pattern
- Introduction of six elevated bridge structures considered to be uncharacteristic of the existing environment
- Four-lane divided highway and associated earthworks

#### Construction

The magnitude of change arising from this project is considered to be *High* due to the following:

- Presence of construction machinery and construction vehicle movements
- Vegetation clearance and gradual introduction of the project works
- Two potential ancillary sites have been identified within this LCZ, broadening the extent of vegetation clearance and presence of construction machinery and activities

### Impact

#### Operation and construction

The *Moderate* sensitivity and *High* magnitude of change is judged to result in a *Moderate-High* adverse impact during operation and construction.



## 1C: Boambee and Roberts Hill Southern Foothills

### Magnitude of change

#### Operation

The magnitude of change arising from this project is considered to be *High* due to the following:

- Benched cutting slopes and embankments on approach to Roberts Hill tunnel, altering the existing topography
- Introduction of a tunnel portal to the south of Roberts Hill
- Removal and severance of existing vegetation blanketing the southern slopes of Roberts Hill
- Four-lane divided highway and associated earthworks

#### Construction

The magnitude of change arising from this project is considered to be *High* due to the following:

- Vegetation clearance and the gradual introduction of the project works
- Excavation works at Roberts Hill and gradual introduction of Roberts Hill tunnel and tunnel portal
- Presence of construction machinery with one potential ancillary site situated within this LCZ

### Impact

#### Operation and construction

The *High* sensitivity and *High* magnitude of change is judged to result in a *High* adverse impact on this LCZ during operation and construction.



## 2A: Roberts Hill Northern Foothills

### Magnitude of change

#### Operation

The magnitude of change arising from this project is considered to be *High* due to the following:

- Introduction of a tunnel portal to the north of Roberts Hill (approximately 190m)
- Benched cutting slopes associated with Roberts Hill northern tunnel portal, altering the existing topography
- Removal and severance of existing vegetation, primarily banana plantations, on the northern slopes of Roberts Hill
- Four-lane divided highway and associated earthworks

#### Construction

The magnitude of change arising from this project is considered to be *High* due to the following:

- Vegetation clearance and the gradual introduction of the project works.
- Excavation works at Roberts Hill and gradual introduction of Roberts Hill tunnel and tunnel portal

### Impact

#### Operation and construction

The *High* sensitivity and *High* magnitude of change is judged to result in a *High* adverse impact on this LCZ during operation and construction.



## 2B: The Bowl

### Magnitude of change

#### Operation

The magnitude of change arising from this project is considered to be *High* due to the following:

- Introduction of Coramba Road interchange, including additional lighting, two roundabouts and associated entry and exit ramps
- Removal and severance of existing vegetation along low lying creeklines
- Benched earthworks and cutting slopes to bridge the gap between topographical undulations
- Four-lane divided highway and associated earthworks

#### Construction

The magnitude of change arising from this project is considered to be *High* due to the following:

- The construction phase will involve vegetation clearance and the gradual introduction of the project works, including Coramba Road interchange and extensive cutting and earthworks on approach to Shephards Lane
- Three potential ancillary sites have been identified within this LCZ, broadening the extent of vegetation clearance and presence of construction machinery and activities

### Impact

#### Operation and construction

The *Moderate* sensitivity and *High* magnitude of change is judged to result in a *Moderate-High* adverse impact on this LCZ during operation and construction.



## 2C: End Peak and Mackays Road Valley

### Magnitude of change

#### Operation

The magnitude of change arising from this project is considered to be *Moderate* due to the following:

- Introduction of an extending bridge structure over North Coast Railway
- Introduction of Shephards Lane tunnel (approximately 360m) and tunnel portals
- Removal and severance of existing vegetation and banana plantation
- Benched earthworks and cutting slopes to bridge the gap between topographical undulations
- Four-lane divided highway and associated earthworks

#### Construction

The magnitude of change arising from this project is considered to be *Moderate* due to the following:

- The construction phase will involve vegetation clearance and the gradual introduction of the project works, including Shephards Lane tunnel and tunnel portal, North Coast Railway structure and earthworks on approach to Mackays Road
- One potential ancillary site has been identified within this LCZ, broadening the extent of vegetation clearance and presence of construction machinery and activities.

### Impact

#### Operation and construction

The *High* sensitivity and *Moderate* magnitude of change is judged to result in a *High-Moderate* adverse impact on this LCZ during operation and construction.



## 2D: Gatelys Road Valley

### Magnitude of change

#### Operation

The magnitude of change arising from this project is considered to be *Moderate* due to the following:

- Introduction of two bridge structures over local access roads
- Introduction of Gatelys Road tunnel (approximately 450m) and tunnel portals
- Removal and severance of existing vegetation and blueberry and banana plantations
- Four-lane divided highway and associated earthworks

#### Construction

The magnitude of change arising from this project is considered to be *Moderate* due to the following:

- The construction phase will involve vegetation clearance and the gradual introduction of the project works, including Gatelys Road tunnel and tunnel portals and earthworks on approach to West Korora Road
- Two potential ancillary sites have been identified within this LCZ, broadening the extent of vegetation clearance and presence of construction machinery and activities

### Impact

#### Operation and construction

The *High* sensitivity and *Moderate* magnitude of change is judged to result in a *Moderate-High* adverse impact on this LCZ.



### 3A: Kororo Basin and Foothills

#### Magnitude of change

##### Operation

The magnitude of change arising from this project is considered to be *High* due to the following:

- Expansion of the Pacific Highway and introduction of Korora Hill interchange, including entry and exit ramps, lighting, and bridge structures
- Extensive cutting slopes to the southern and eastern edges of Korora foothills
- Removal and severance of existing vegetation and banana plantation

##### Construction

The magnitude of change arising from this project is considered to be *High* due to the following:

- The construction phase will involve vegetation clearance and the gradual introduction of the Korora Hill interchange, exit and entry ramps and bridge structures

- Six potential ancillary sites have been identified within this LCZ, broadening the extent of vegetation clearance and presence of construction machinery and activities.

#### Impact

##### Operation and construction

The *High* sensitivity and *High* magnitude of change is judged to result in a *High* adverse impact on this LCZ during operation and construction.



### 3B: Kororo Basin Edge

#### Magnitude of change

##### Operation

The magnitude of change arising from this project is considered to be *Moderate* due to the following:

- Incremental expansion of the Pacific Highway corridor, included elevated bridge structures, retaining walls and noise walls
- Introduction and realignment of access roads

##### Construction

The magnitude of change arising from this project is considered to be *High* due to the following:

- Presence of construction activity and machinery and incremental expansion of the Pacific Highway, including construction of noise walls, bridges and retaining walls.

#### Impact

##### Operation

The *Moderate* sensitivity and *Moderate* magnitude of change is judged to result in a *Moderate* adverse impact on this LCZ during operation.

##### Construction

The *Moderate* sensitivity and *High* magnitude of change is judged to result in a *Moderate-High* adverse impact on this LCZ during construction.





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# Visual impact assessment

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An aerial rendering of a highway interchange. A multi-lane highway runs from the top left towards the center. A bridge crosses over the highway, with a road curving around it. The landscape is lush with green grass and scattered trees. In the bottom left corner, the white roof of a building is visible.

07

Visual Impact  
Assessment

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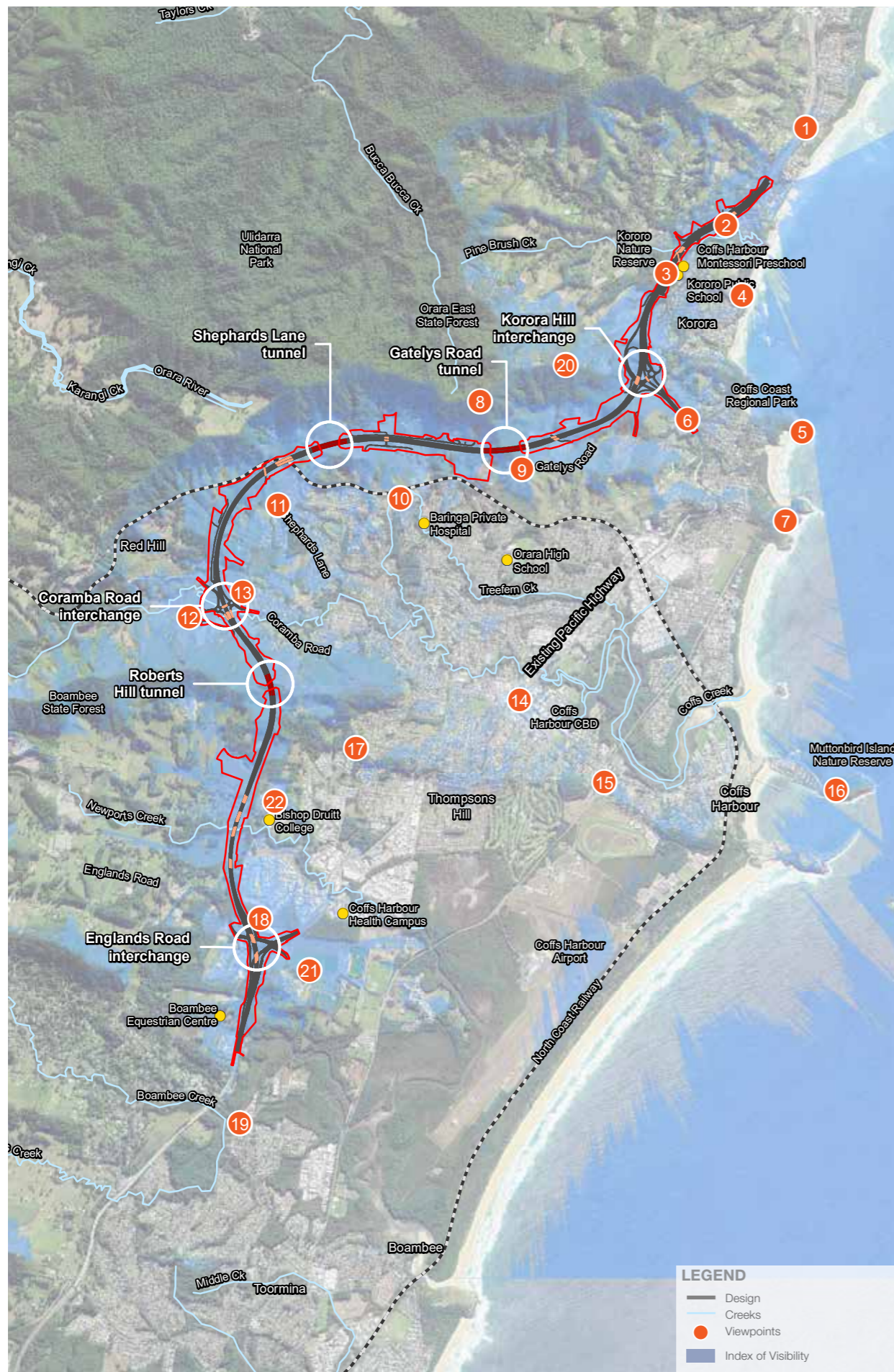
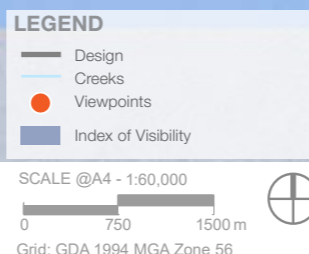


FIG 7.1 INDEX OF VISIBILITY



## 7.1 Visual baseline

### Visual catchment

A Visual Envelope Map (VEM) has been prepared utilising GIS to illustrate the theoretical area from which the project would be visible in the landscape. A summary of the VEM findings has been provided below with reference to the project.

The project would commence at the Pacific Highway and Englands Road roundabout and traverse in a westerly direction. The visual amenity of this area is influenced and contained by an industrial area to the north and stands of dense vegetation within the low lying valley floor. Further north within Boambee basin, the vegetation pattern becomes influenced by creek lines including Newport Creek and associated tributaries, providing a variety of views, from enclosed corridors to open views to agricultural parcels.

Further north, the heavily vegetated southern slopes of Roberts Hill provide a degree of visual enclosure to the valley floor. The northern slopes of Roberts Hill, however are dominated by banana plantations, which take advantage of the northerly aspect. Similarly, to Boambee basin, the low lying, undulating terrain is traversed by a number of tree lined creeks offering varying degrees of visual exposure with the eastern extent marked by an area

of low density residential development.

The foothills of the Ulidarra National Park and Orara East State Forest offer localised valley forms associated with End Peak and Gatelys Road valley. The valley forms offer visual enclosure, with views from within the valley restricted by the south facing slopes.

### Representative viewpoints

The VEM has been analysed to identify 22 representative viewpoints to comprehensively illustrate the visual amenity of the study area. Each viewpoint is accompanied by a visual baseline description to analyse the existing visual composition and an assessment of the level of sensitivity.

- 1 Aqualuna Beach resort
- 2 Coachmans Close
- 3 Kororo Nature Reserve
- 4 Hills Beach Solitary islands coastal walk
- 5 Coffs Coast Regional Park (Diggers Head Trail)
- 6 Residential edge (Charlesworth Bay Road)
- 7 Macauleys Headland walking track
- 8 Sealy Lookout
- 9 Gatelys Road
- 10 Vera Drive
- 11 Shephards Lane
- 12 Bennetts Road
- 13 Spagnolos Road
- 14 Coffs Harbour CBD
- 15 Barrie Street
- 16 Muttonbird Island Nature Reserve
- 17 North Boambee residential
- 18 Isles Drive commercial
- 19 Sawtell Road residential
- 20 Korora lookout
- 21 Coffs Coast Sports and Leisure
- 22 Jock Avenue

## Viewpoint 1: Aqualuna Beach resort



### Baseline description

Aqualuna Beach Resort is situated to the east of Solitary Islands Way. The entrance to the resort is set back from the road in a slightly declined position, nestled between existing vegetation to the south and Sapphire Fuel Station to the north.

The foreground of the view is dominated by road corridors, including Solitary Islands Way and Pacific Highway, separated by a three metre noise wall.

The foothills associated with Orara East State Forest are visible above the noise wall, with mature vegetation blanketing the mountain top with occasional large residential properties orientated towards the coast line.

Powerlines cross the view in a north-south direction.

### Sensitivity

The sensitivity of this receptor is judged to be **low** due to the following:

- Current view includes existing major road infrastructure.
- Offering tourist accommodation.



## Viewpoint 2: Coachmans Close



### Baseline description

A representative view from residential properties situated on Coachmans Close, to the east of the Pacific Highway.

Pacific Highway is situated in a slightly elevated position, with clear views from the properties towards passing vehicles. Further north, a noise wall lines the eastern edge with a transparent panel to the upper section. At this location, vegetation between the Pacific Highway and Coachmans Close begins to filter views slightly towards the highway.

Mature vegetation bounds the highway to the west of the road corridor with rising terrain visible in the distance above the vegetation.

### Sensitivity

The sensitivity of this receptor is judged to be **moderate** due to the following:

- Road corridor currently visible within the view, although limited other built form is visible
- Vegetation at the entrance, the north and in the distance contributes to the visual amenity.

### Viewpoint 3: Luke Bowen footbridge



#### Baseline description

Luke Bowen footbridge provides a pedestrian connection across the Pacific Highway from Kororo Public School and Kororo Nature Reserve. The pedestrian footbridge is enclosed by welded wire mesh panels with views through the panels to the north and south.

The road corridor is enclosed by mature vegetation between Pacific Highway and Korora School Road to the east, and Kororo Nature Reserve to the west. Views to the foothills, east of Orara East State Forest, are evident beyond Kororo Nature Reserve.

#### Sensitivity

The sensitivity of this receptor is judged to be **moderate** due to the following:

- Current view includes existing major road infrastructure.
- View represents pedestrian users.

## Viewpoint 4: Hills Beach Solitary Islands Coastal Walk



### Baseline description

A representative view from Hills Beach Solitary Islands Coastal Walk with a local park to the west and Hills Beach to the east. The view to the west beyond the local park is bound by mature vegetation and properties situated on Norman Hills Drive.

Solitary Islands Coastal Walk joins Hills Beach to the north of this viewpoint with views primarily focused towards the coastline and the sea.

### Sensitivity

The sensitivity of this receptor is judged to be **moderate** due to the following:

- Solitary Islands Coastal Walk is designated as a coastal walk and considered to be of regional importance.
- Coastal views and the absence of built form contribute to the feeling of remoteness with mature vegetation.
- Location within a Regional Park and part of a dedicated walking trail.

## Viewpoint 5: Coffs Coast Regional Park (Diggers Head Trail)

Orara East State Forest

Orara East State Forest



### Baseline description

A panoramic and elevated view from Diggers Head Trail within Coffs Coastal Regional Park. The trail forms part of, and connects to, the Solitary Islands Coastal Walk, a 60km walk that traverses the beaches and rainforest on the Coffs Coast.

The view to the south includes scattered residential properties situated on the eastern edge of Macauleys Headland. The view north includes the blanketed foothills of Ulidarra National Park and Orara East State Forest stretching to the coastline.

Properties along Sandy Beach Road and Shell Cove Lane within Korora are visible at the base of the foothills. The view directly west from this location is restricted by mature vegetation.

### Sensitivity

The sensitivity of this receptor is judged to be **high** due to the following:

- Diggers Head Trail forms part of Solitary Islands Coastal Walk and is designated coastal walk considered to be of regional importance
- Elevated, panoramic coastal views of high scenic value.

## Viewpoint 6: Residential edge (Charlesworth Bay Road)



### Baseline description

A representative view from Pacific Highway looking north. The Pacific Highway road corridor is enclosed at this location, with Bananacoast Caravan Park situated to the west and Pacific Bay Resort entrance to the east. A localised hill is visible to the west of Bananacoast Caravan Park, with a blanket of mature vegetation to the northern slope.

The view to Orara East State Forest and Korora Hill peaks to the west is partially filtered by road side palm tree planting.

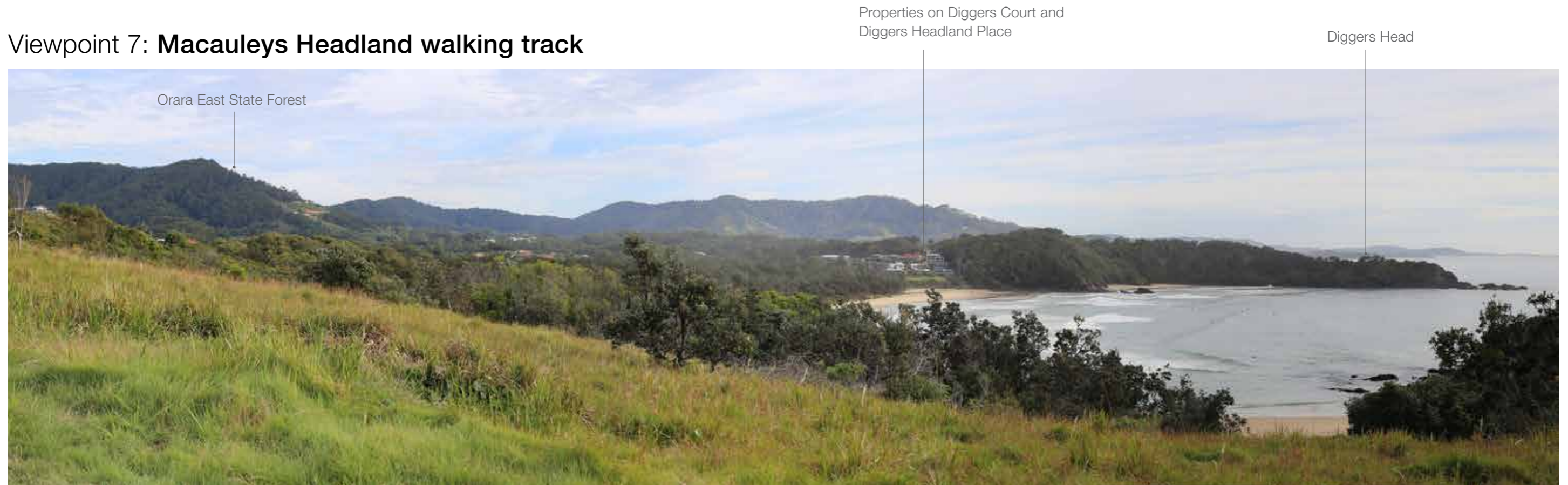
This section of the existing Pacific Highway forms part of the transition and entry to Coffs Harbour CBD.

### Sensitivity

The sensitivity of this receptor is judged to be **moderate** due to the following:

- Current view includes existing major road infrastructure
- Limited built form
- Entrance to Coffs Harbour CBD.

## Viewpoint 7: Macauleys Headland walking track



### Baseline description

A representative view from Macauleys Headland walking trail situated within Coffs Coast Regional Park. The view is primarily orientated towards the coastline with beaches extending and wrapping along the eastern edge. Diggers Beach is visible in the foreground, bound by mature vegetation along the western edge with properties situated on Diggers Court and Diggers Headland Place visible amongst mature vegetation.

The rising hills associated with Ulidarra National Park and Orara East State Forest provide a natural backdrop that extends north along the coastline.

### Sensitivity

The sensitivity of this receptor is judged to be **high** due to the following:

- Macauleys Headland walking track forms part of Solitary Islands Coastal Walk and is a designated coastal walk considered to be of regional importance.
- Elevated, panoramic coastal views of high scenic value.

## Viewpoint 8: Sealy Lookout



### Baseline description

Sealy Lookout is a designated scenic view point from Orara East State Forest that offers a panoramic view from the coastline to the east and to the foothills and blanketed mountain tops of the Great Dividing Range to the west.

Coffs Harbour CBD occupies the low lying basin to the west of the coastline with Coffs Harbour airport visible to the south. The residential areas of North Boambee Valley, Karangi and Upper Orara stretch to the east within Coffs Harbour basin, bound by the foothills and floodplain to the east.

Roberts Hill is a distinct topographical feature that extends from the Great Dividing Range with areas of banana plantation occupying the northern slopes.

### Sensitivity

The sensitivity of this receptor is judged to be **high** due to the following:

- Designated scenic viewpoint from within Orara East State Forest
- Elevated and panoramic nature of the view, stretching from the coastline to the Great Dividing Range.

## Viewpoint 9: Gatelys Road



### Baseline description

A representative view from residential properties situated on Gatelys Road. The location offers an elevated and panoramic view that stretches east to the ocean and the coastline and west to the foothills and blanketed mountain tops of the Great Dividing Range. The hills and mountains associated with the Great Dividing Range define Coffs Harbour basin, with development occupying the low lying terrain.

Treefern Creek traverses within Mackay Road valley, a localised contained valley between the North Coast Railway to the south and Ulidarra National Park to the north.

### Sensitivity

The sensitivity of this receptor is judged to be **high** due to the following:

- Elevated, panoramic, scenic nature of the viewpoint
- Representative view from residential properties with a permanent interest in the surrounding environment.



## Viewpoint 10: Vera Drive



### Baseline description

A representative view from residential properties situated on Vera Drive. The view north includes the blanketed mountains associated with Ulidarra National Park and Orara East State Forest.

Properties situated on Gatelys Road are visible to the east, extending from the Orara East State Forest to an area of clearing.

### Sensitivity

The sensitivity of this receptor is judged to be **high** due to the following:

- Proximity and scenic nature of Ulidarra National Park and Orara East State Forest providing a backdrop to residential views
- Representative view from residential properties with a permanent interest in the surrounding environment.

## Viewpoint 11: Shephards Lane

Ulidarra National Park

North Coast Railway

Properties on Pearce Drive

Properties on Brennan Court



### Baseline description

A representative view from residential properties situated on Shephards Lane. View north towards the forested mountain top of Ulidarra National Park with the undulating foothills extending south.

Recent residential development on Brennan Court and Pearce Drive occupy the northern extent of the foothills, wrapping from west to east.

A small glimpse of the North Coast Railway corridor is visible between mature stands of existing vegetation.

### Sensitivity

The sensitivity of this receptor is judged to be **high** due to the following:

- Proximity and scenic nature of Ulidarra National Park within residential views
- Representative view from residential properties with a permanent interest in the surrounding environment.

## Viewpoint 12: Bennetts Road



### Baseline description

A representative view from residential properties situated on Bennetts Road.

The low lying agricultural land is visible in the foreground of the view with Coffs Creek and surrounding tributaries meandering within these fields in an east-west direction. The forested mountain top of Ulidarra National Park marks the skyline with the foothills extending south. Glimpse views are achievable to recent development that occupies these foothills along Pearce Drive and Brennan Court. Further south, views towards development along Rosina Close and Tiffany Close is also achievable with residential development within Coffs Harbour (west) visible in the distance. Roberts Hill is visible to the south of the view.

### Sensitivity

The sensitivity of this receptor is judged to be **high** due to the following:

- Proximity and scenic nature of Ulidarra National Park within residential views
- Representative view from residential properties with a permanent interest in the surrounding environment.

## Viewpoint 13: Spagnolos Road



### Baseline description

A representative view of west facing residential properties situated on Spagnolos Road. The view south includes the north facing slopes of Roberts Hill dominated by banana plantations.

Gently undulating grazing fields occupy the foreground of the view with the forested mountains of the Great Divided Range evident in the distance.

### Sensitivity

The sensitivity of this receptor is judged to be **high** due to the following:

- Proximity and scenic nature of the undulating topography and Ulidarra National Park within residential views
- Representative view from residential properties with a permanent interest in the surrounding environment.

## Viewpoint 14: Coffs Harbour CBD



### Baseline description

A representative view from Harbour Drive situated in Coffs Harbour CBD.

Coffs Hotel is situated on the northern side of West High Street. Street trees and canopy shade structures enclose the view and direct views along the street with distant views towards Ulidarra National Park.

### Sensitivity

The sensitivity of this receptor is judged to be **moderate** due to the following:

- CBD land use
- Current view includes existing major road infrastructure.

## Viewpoint 15: **Barrie and Victoria Street**



### **Baseline description**

A representative view from residential properties at the intersection of Barrie Street and Victoria Street.

The view east from the apartment building includes distant views towards Ulidarra National Park and Orara East State Forest, above adjacent single storey properties on Barrie Street. To the south, vegetation adjacent to Coffs Creek and North Coast Regional Botanic Garden is a visible features that occupies the basin floor.

### **Sensitivity**

The sensitivity of this receptor is judged to be **moderate** due to the following:

- Representative view from residential properties with a permanent interest in the surrounding environment
- Distant views towards Ulidarra National Park and Orara East State Forest

## Viewpoint 16: Muttonbird Island Nature Reserve and marina



### Baseline description

An elevated, panoramic view from Muttonbird Island Nature Reserve towards Coffs Harbour CBD beyond the marina, with views along the coastline stretching to the north and south.

To the south, residential properties occupy the east facing slopes of Beacon Hill and stretch north along Camperdown Street towards the CBD. The dense vegetation along the streets and the foreshore assist with integrating built development with upper storeys visible above the tree canopies. The rooftops of properties along Orlando Street are visible above the tree canopy, extending to the north.

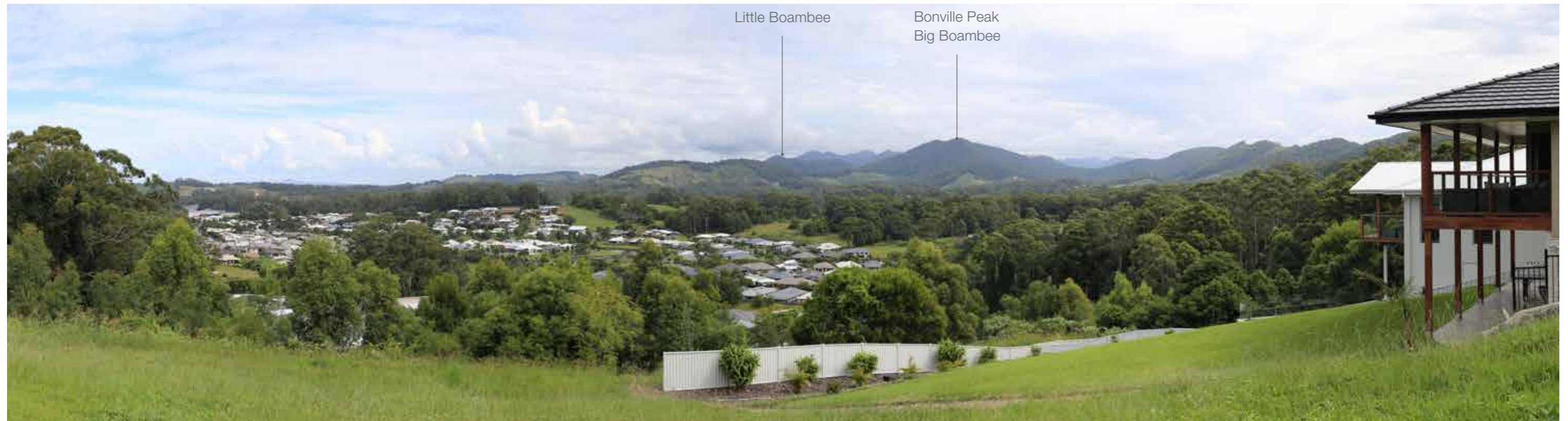
The Great Dividing Range provides a backdrop in views with Bindarri National Park and Dorringo National Park visible in the distance to the south west, Roberts Hill to the west, Bindarri National Park to the north west, and Ulidarra National Park, Orara East State Forest and Sealy Lookout further north.

### Sensitivity

The sensitivity of this receptor is judged to be **high** due to the following:

- Elevated, panoramic and scenic nature of the viewpoint
- The ecological and cultural value of the viewpoint.

## Viewpoint 17: Kratz Drive, North Boambee Valley



### Baseline description

A representative view from residential properties situated on Kratz Road to the south of Roberts Hill.

The residential properties within Boambee Valley are visible on the gently undulating slopes, bound by rising and vegetated slopes to the western edge.

Little Boambee Hill and Big Boambee Hill are visible in the distance, with the topography wrapping to the north towards Roberts Hill.

### Sensitivity

The sensitivity of this receptor is judged to be **high** due to the following:

- Elevated, panoramic, scenic nature of the viewpoint
- Representative view from residential properties with a permanent interest in the surrounding environment.



## Viewpoint 18: Isles Drive commercial



### Baseline description

A representative view from commercial buildings along Isles Drive. View towards Englands Road to the south, with mature vegetation on the southern edge restricting distant views.

The commercial area largely consists of warehouse style buildings with limited views from the buildings to the surrounding environment.

### Sensitivity

The sensitivity of this receptor is judged to be **low** due to the following:

- The inward facing nature of the views from the commercial buildings with limited opportunities or focus on the surrounding environment.

## Viewpoint 19: Sawtell Road residential



### Baseline description

Representative view from properties situated on Sawtell Road. View across Sawtell Road towards Sawtell Road bridge, bound by mature vegetation that lines Boambee Creek.

The mature vegetation limits views to the west and north.

### Sensitivity

The sensitivity of this receptor is judged to be **moderate** due to the following:

- Views and proximity to Sawtell Road
- Representative view from residential properties with a permanent interest in the surrounding environment.

## Viewpoint 20: Korora Lookout



### Baseline description

An elevated and panoramic view from Korora Lookout stretching north along the coastline, including Diggers Beach, Sapphire Beach, Moonee Beach Nature Reserve and Spit Solitary Island.

Pacific Highway lies in a north-south direction and marks the transition point between the foothills to the west and the resorts and residential development to the east.

### Sensitivity

The sensitivity of this receptor is judged to be **high** due to the following:

- Designated scenic viewpoint from within Orara East State Forest
- Elevated and panoramic nature of the view stretching along the coastline.

## Viewpoint 21: Coffs Coast Sports and Leisure Park



### Baseline description

A representative view from Coffs Coast Sports and Leisure Park experienced by sport field users.

View across low lying, flat sports fields towards the existing Pacific Highway and Englands Road roundabout. The western boundary of the sports fields is marked by mature vegetation, filtering views to passing vehicles. Distant views are achievable to the north west towards the forested top of Roberts Hill on the skyline.

Since the time of the site inspection, additional development has occurred, including the construction of the service station on the northern side of Stadium Drive.

### Sensitivity

The sensitivity of this receptor is judged to be **moderate** due to the following:

- Recreational users
- View and proximity to Roberts Hill.

## Viewpoint 22: Jock Avenue



### Baseline description

A representative view from residential properties situated on Jock Avenue. The view west is marked in the foreground by residential properties situated on Highlander Drive. Mature vegetation that lines Newport Creek is visible above the properties with the terrain blanketed in mature vegetation rising in the distance associated with Little Boambee Hill and Big Boambee Hill.

### Sensitivity

The sensitivity of this receptor is judged to be **high** due to the following:

- Proximity and scenic nature of the rising terrain, including Roberts Hill to the east, within residential views
- Representative view from residential properties with a permanent interest in the surrounding environment.

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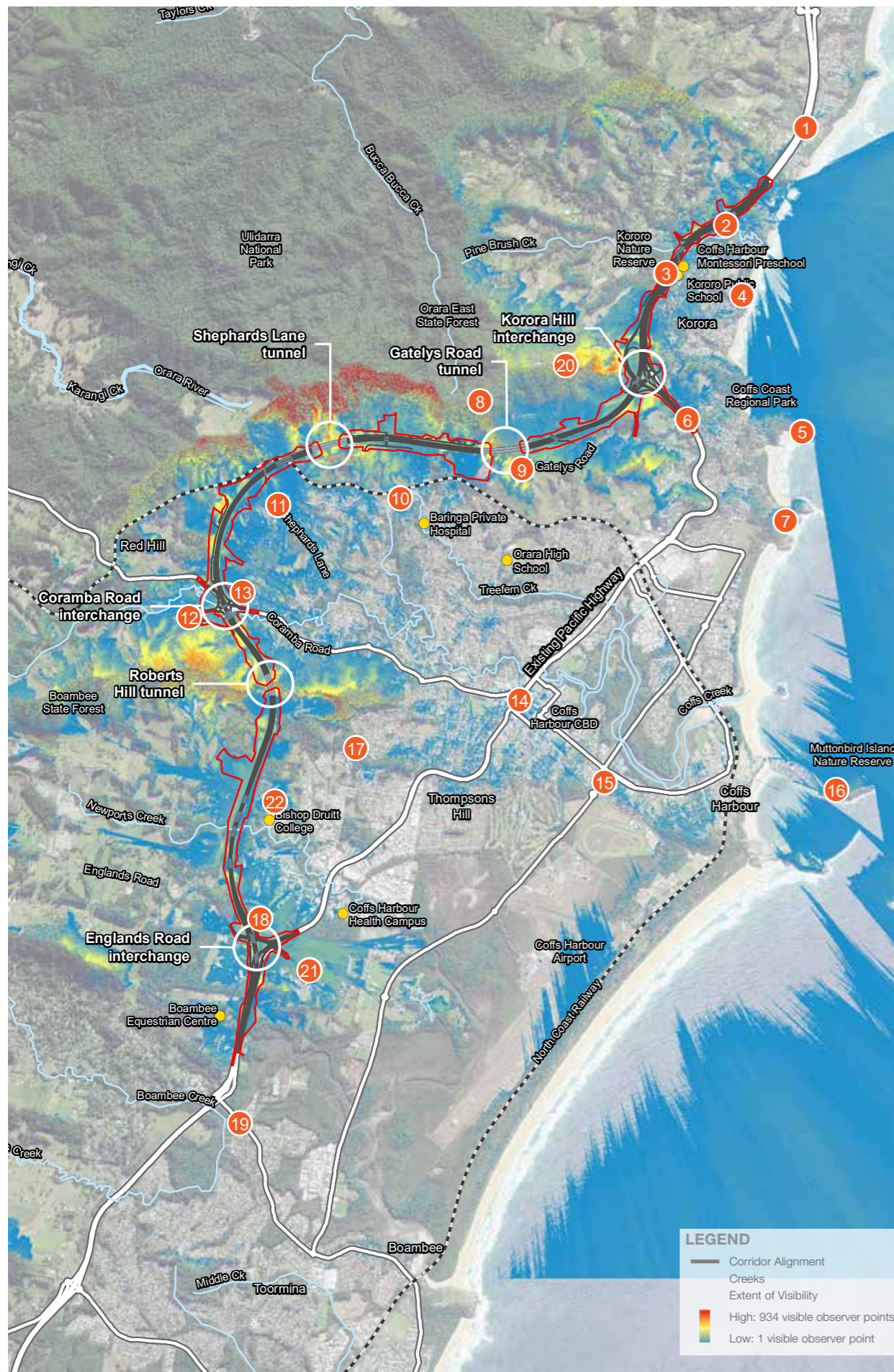


FIG 7.2 INDEX OF VISIBILITY

SCALE @A4 - 1:60,000  
 0 750 1500 m  
 Grid: GDA 1994 MGA Zone 56

- 1 Aqualuna Beach resort
- 2 Coachmans Close
- 3 Kororo Nature Reserve
- 4 Hills Beach Solitary islands coastal walk
- 5 Coffs Coast Regional Park (Diggers Head Trail)
- 6 Residential edge (Charlesworth Bay Road)
- 7 Macauleys Headland walking track
- 8 Sealy lookout
- 9 Gatelys Road
- 10 Vera Drive
- 11 Shepherds Lane
- 12 Bennetts Road
- 13 Spagnolos Road residential
- 14 Coffs Harbour CBD
- 15 Barrie Street
- 16 Muttonbird Island Nature Reserve
- 17 North Boambee residential
- 18 Isles Drive commercial
- 19 Sawtell Road residential
- 20 Korora lookout
- 21 Coffs Coast Sports and Leisure
- 22 Jock Avenue

## 7.2 Visual Assessment

### Representative viewpoints

Consistent with the baseline analysis, the 22 representative viewpoints have been assessed to represent the potential visual impacts that may arise across the study area.

The viewpoints are illustrated on the preceding pages and are accompanied by a description of the embedded landscape and urban design mitigation measures, a description of the design elements that have the potential to change the existing visual composition (magnitude of change) and the potential impacts that may arise. The design treatments illustrated should be considered as indicative and subject to detailed design.

The landscape design, developed to integrate and mitigate adverse impacts, would establish in varying timeframes, with pioneer species establishing more quickly, compared to hardwood species. For the purposes of the assessment, it is assumed that vegetation would reach a suitable level of maturity within approximately ten years. Vegetation within the photomontages has been illustrated to represent approximately five years growth.

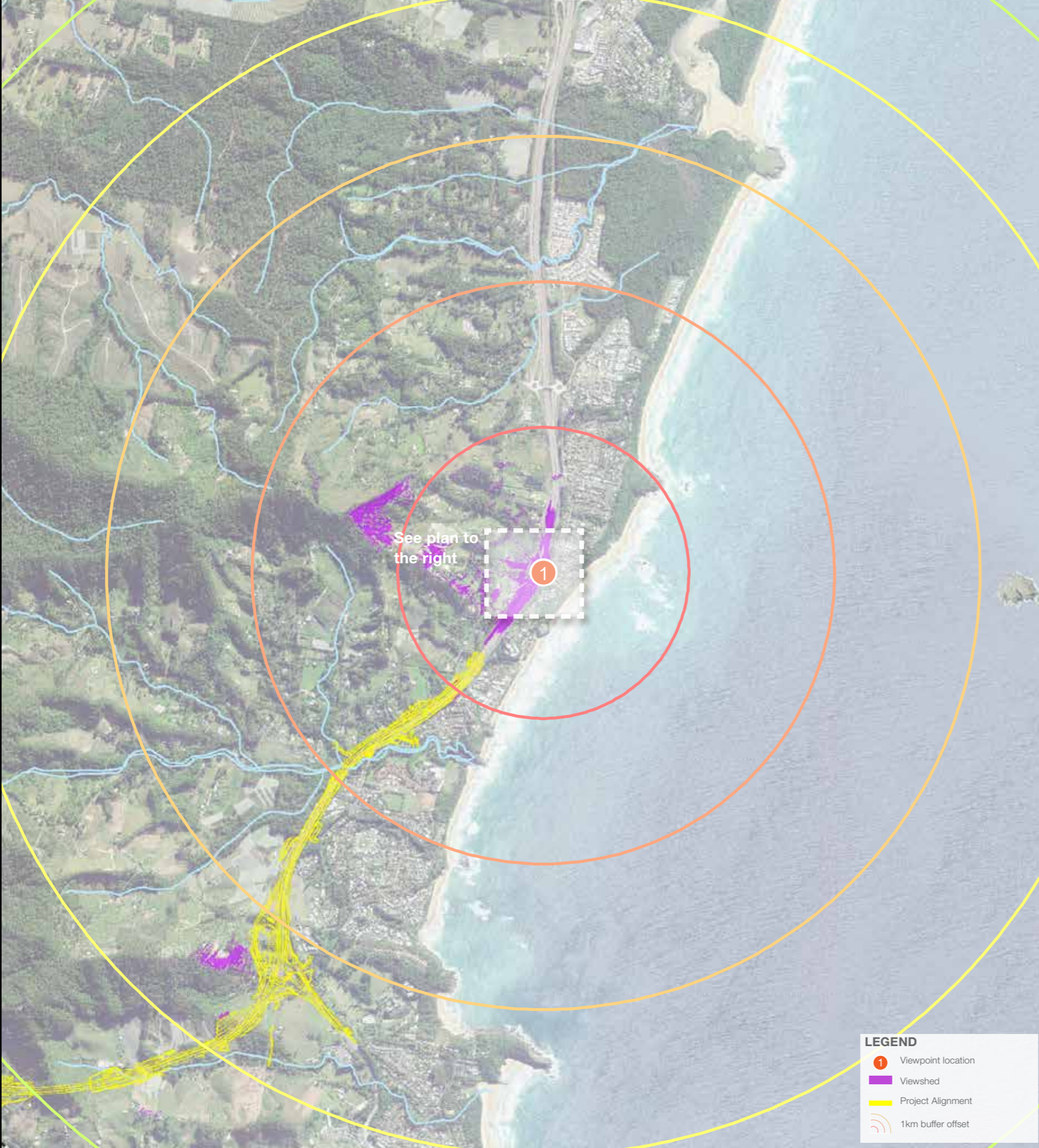


FIG 7.3 VIEWPOINT 1: VIEWSHED ANALYSIS

### Viewpoint 1: Aqualuna Beach resort



Grid: GDA 1994 MGA Zone 56 SCALE @A3 - 1:3,000  
 0 50 100m

### Embedded design mitigation

The project would be situated approximately 700m to the south of this viewpoint. The landscape and urban design response associated with the northern extent of the project is illustrated above and includes:

- Coastal-urban planting mix to integrate the earthworks. Species mix builds upon the CHCC planting list and responds to the character area adjoining the alignment
- Planting to central median to assist with defining the approach to Korora Hill interchange. The planting will be a mix of low maintenance native and culturally important species.

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix





### **Magnitude of change**

The project would join the existing Pacific Highway approximately 700m to the south of the Aqualuna Beach resort entrance.

Narrow, oblique views are anticipated to be achievable to the south. The view would be experienced in the context of the existing highway environment and considered to result in a discernible change to the existing view.

The project is anticipated to result in a *Negligible* change.

### **Impact**

The *Negligible* change is assessed to result in a *Negligible* impact from this location during operation and construction.

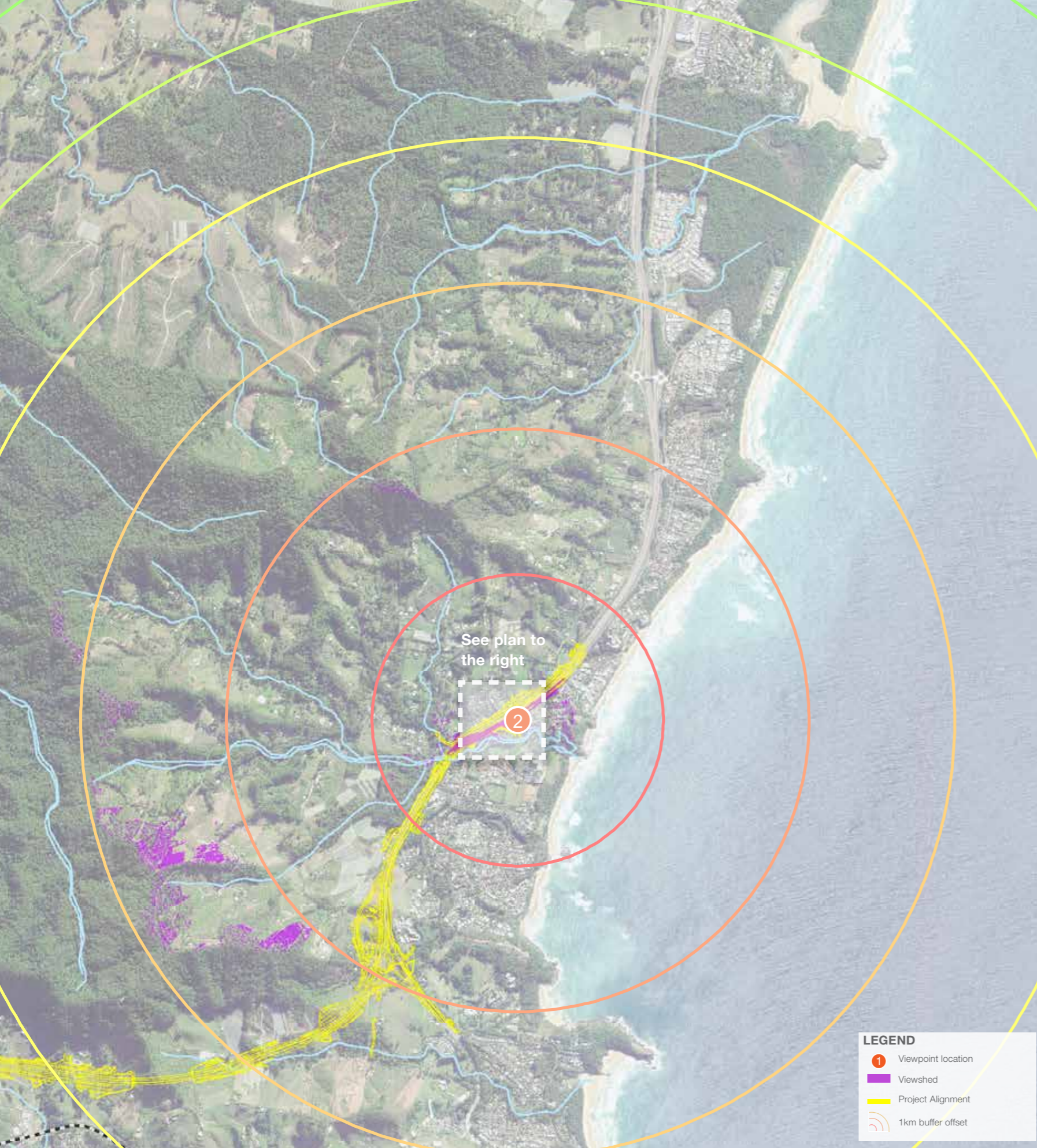


FIG 7.4 VIEWPOINT 2: VIEWSHED ANALYSIS

## Viewpoint 2: Coachmans Close



### Embedded design mitigation

The landscape and urban design response includes:

- Screen planting along the eastern edge of Coachmans Close to screen views of passing vehicles
- Solid noise wall panels to screen views of passing vehicles from adjacent properties

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix



### Magnitude of change

The magnitude of change arising from this project is considered to be *High* due to the following:

- The existing Pacific Highway corridor will increase from approximately 30m to 90m, allowing for the introduction of the service road. Realignment of Opal Boulevard and Coachmans Close.
- The introduction of the service road would bring the road corridor approximately 20m closer to the properties situated on Coachmans Close
- The Pacific Highway would be raised to bridge the local road underpass to the north, with approximately a 9m high retaining wall to the eastern edge. Lighting columns will also be included along the Pacific Highway at this location
- A 4m high solid noise wall will be situated on the retaining wall between the service road and the Pacific Highway, screening views towards passing vehicles from adjacent properties
- The existing vegetation to the west of Coachmans Close and approximately a 45m width of existing vegetation to the east would be removed

### Impact

#### *Day time operation*

The *Moderate* sensitivity and *High* magnitude of change is judged to result in a *Moderate-High* adverse impact during operation.

#### *Night time operation*

The project will result in an increased night time light emittance in a low light environment with the potential to result in a *Moderate* impact in night time views.

#### *Construction*

During construction, the source and nature of the effect will change, with views towards construction activities and machinery. The construction phase impacts are assessed to be of a temporary nature and consistent with the operational phase impacts, resulting in a *Moderate-High* adverse impact during construction.

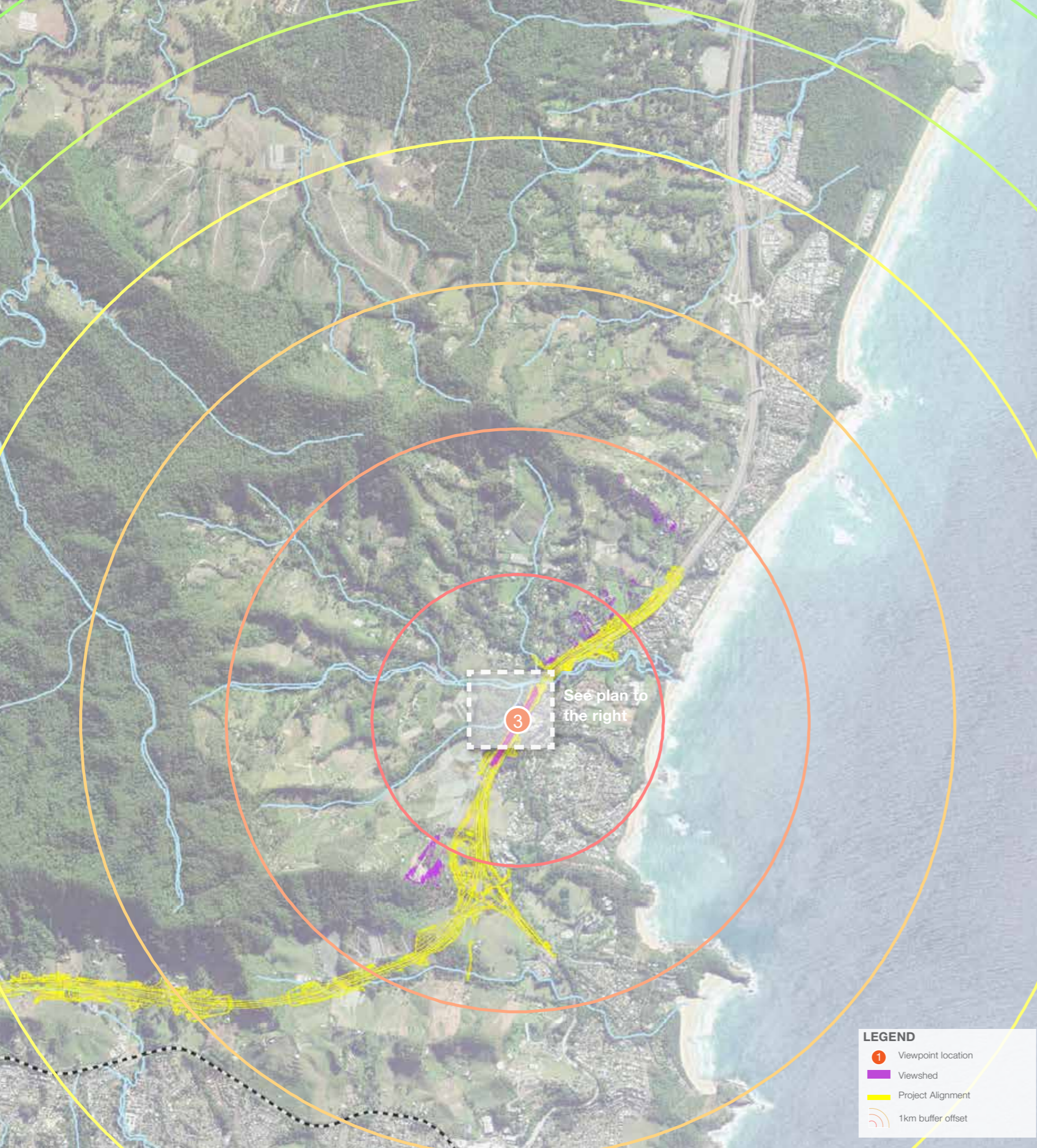


FIG 7.5 VIEWPOINT 3: VIEWSHED ANALYSIS

### Viewpoint 3: Luke Bowen footbridge



### Embedded design mitigation

The landscape and urban design response includes:

- Replacement of Luke Bowen footbridge fitting the highly visible location and the local context
- Screen planting between the new service road and the Pacific Highway where space allows
- Planting to central median to assist with defining the approach to Korora Hill interchange. The planting will be a mix of low maintenance native and culturally important species.

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix



### Magnitude of change

It is intended for the new Luke Bowen footbridge to become a landmark structure highly visible to road users, defining a gateway on approach to Coffs Harbour. The structure is intended to improve the pedestrian experience and achieve a desirable connection for footbridge users. This report acknowledges these benefits, however this representative viewpoint assessment focuses on the view from the bridge structure and how this view could change as a result of the project.

The magnitude of change arising from this project is considered to be *Low* due to the following:

- Replacement and relocation of Luke Bowen footbridge, relocating the bridge approximately 225m to the north

- The existing Pacific Highway corridor will increase in width, allowing for the introduction of the service road
- Removal of vegetation to the east to allow for the realignment of Korora School Road
- Removal of vegetation to the west to accommodate the widening of the Pacific Highway
- Introduction of lighting columns anticipated to be visible to the north on approach to Korora Hill interchange

### Impact

#### *Day time operation*

During operation, the footbridge will be situated approximately 225m to the north, relocating the potential footbridge users.

The *Moderate* sensitivity and *Low* magnitude of change is judged to result in a *Moderate-Low* adverse impact during operation.

#### *Night time operation*

Luke Bowen footbridge has the potential to include lighting to aid pedestrian movement. The addition of lighting is not anticipated to result in night time visual impact to pedestrian users, resulting in a *Negligible* impact.

#### *Construction*

During construction, it is anticipated that the proposed footbridge would be built in advance of Luke Bowen footbridge being demolished to enable footbridge users to be diverted, maintaining connectivity during the construction phase.

With the presence of construction machinery and the anticipated diversion works, the magnitude of change would be elevated to *Moderate*, resulting in a *Moderate* adverse impact during construction.

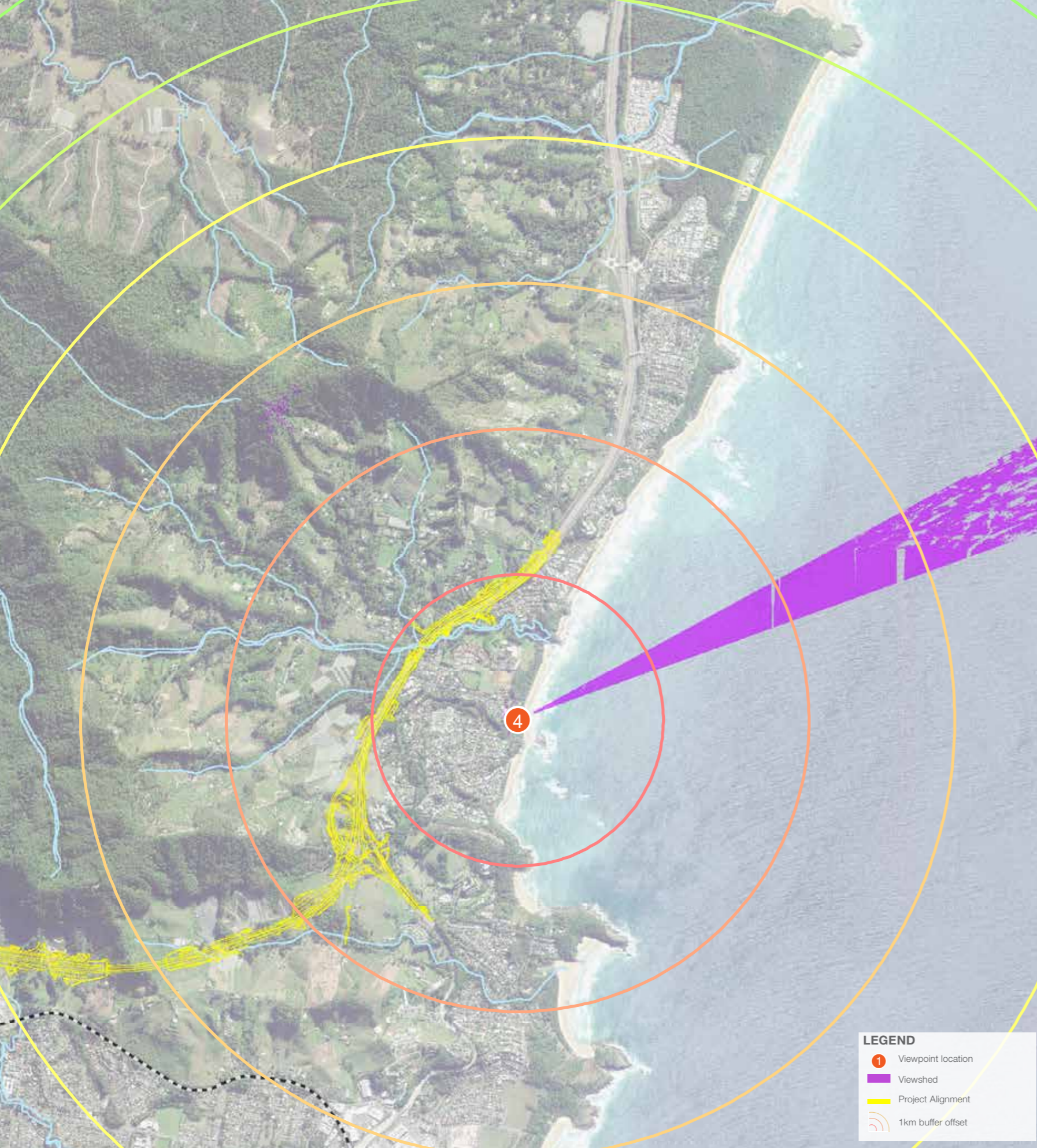


FIG 7.6 VIEWPOINT 4: VIEWSHED ANALYSIS

### Viewpoint 4: Hills Beach Solitary Islands Coastal Walk



#### Embedded design mitigation

As noted in the visual baseline section, the view to the west from this location is bound by mature vegetation and properties situated on Norman Hills Drive. A view towards the project is not anticipated to be achievable.

No embedded design mitigation is proposed for this viewpoint.



### **Magnitude of change**

The project will be situated approximately 1km to the west of this location. The view to the project is restricted by mature vegetation and properties situated on Norman Hills Drive, resulting in a *Negligible* change.

### **Impact**

In the absence of any change, the impact is judged to be *Negligible* during operation and construction.

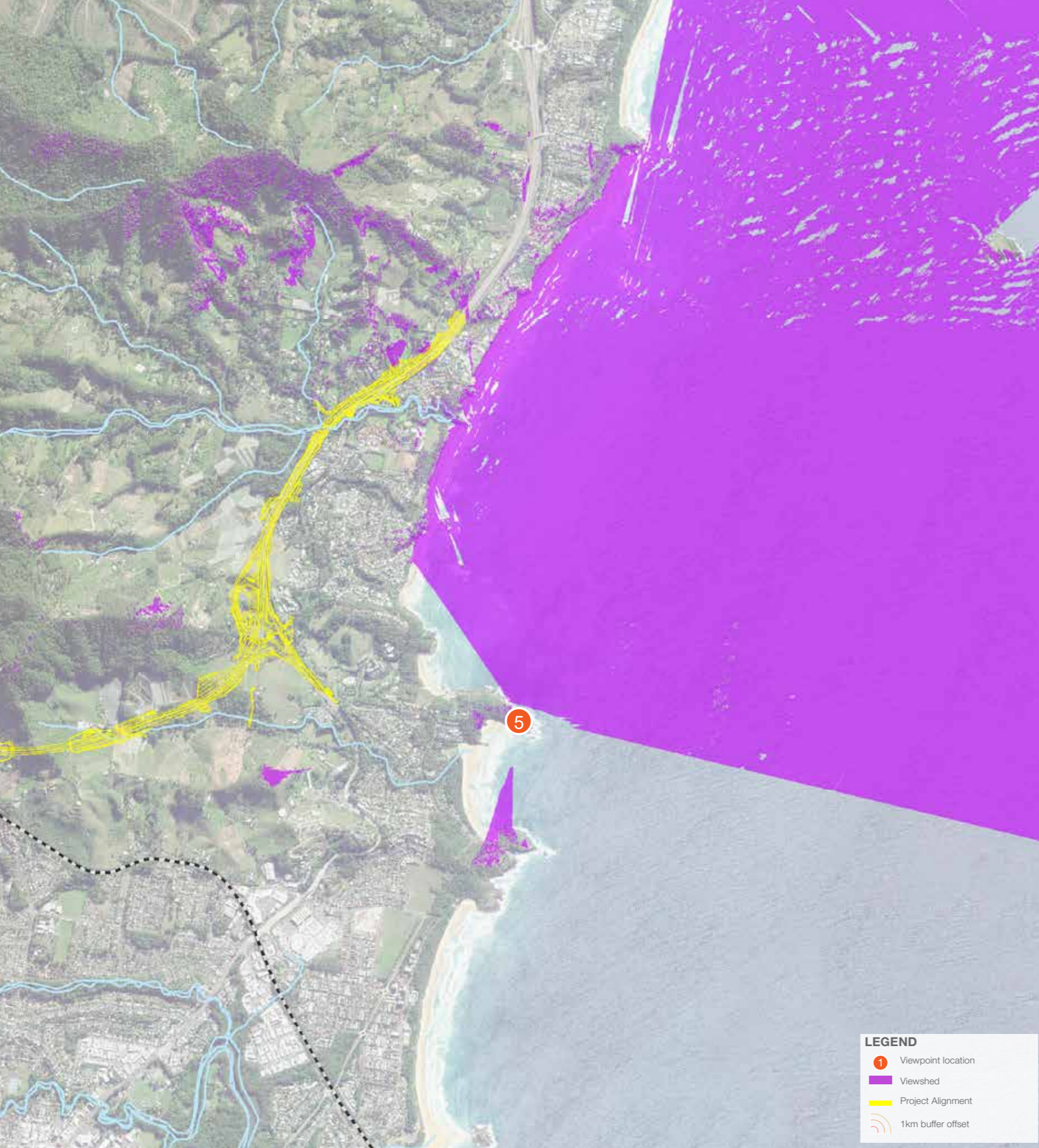


FIG 7.7 VIEWPOINT 5: VIEWSHED ANALYSIS

### Viewpoint 5: Coffs Coast Regional Park (Diggers Head Trail)



#### Embedded design mitigation

As noted in the visual baseline section, the view to the west from this location is largely restricted by mature vegetation with scattered residential properties visible to the south and Orara East State Forest stretching to the coastline in views to the north.

The view towards the project is not anticipated to be achievable from this location. No embedded design mitigation is proposed for this viewpoint.





### **Magnitude of change**

This representative viewpoint is located beyond the visual envelope of the project, resulting in a *Negligible* change.

### **Impact**

The *Negligible* magnitude of change would result in a *Negligible* impact during construction and operation.

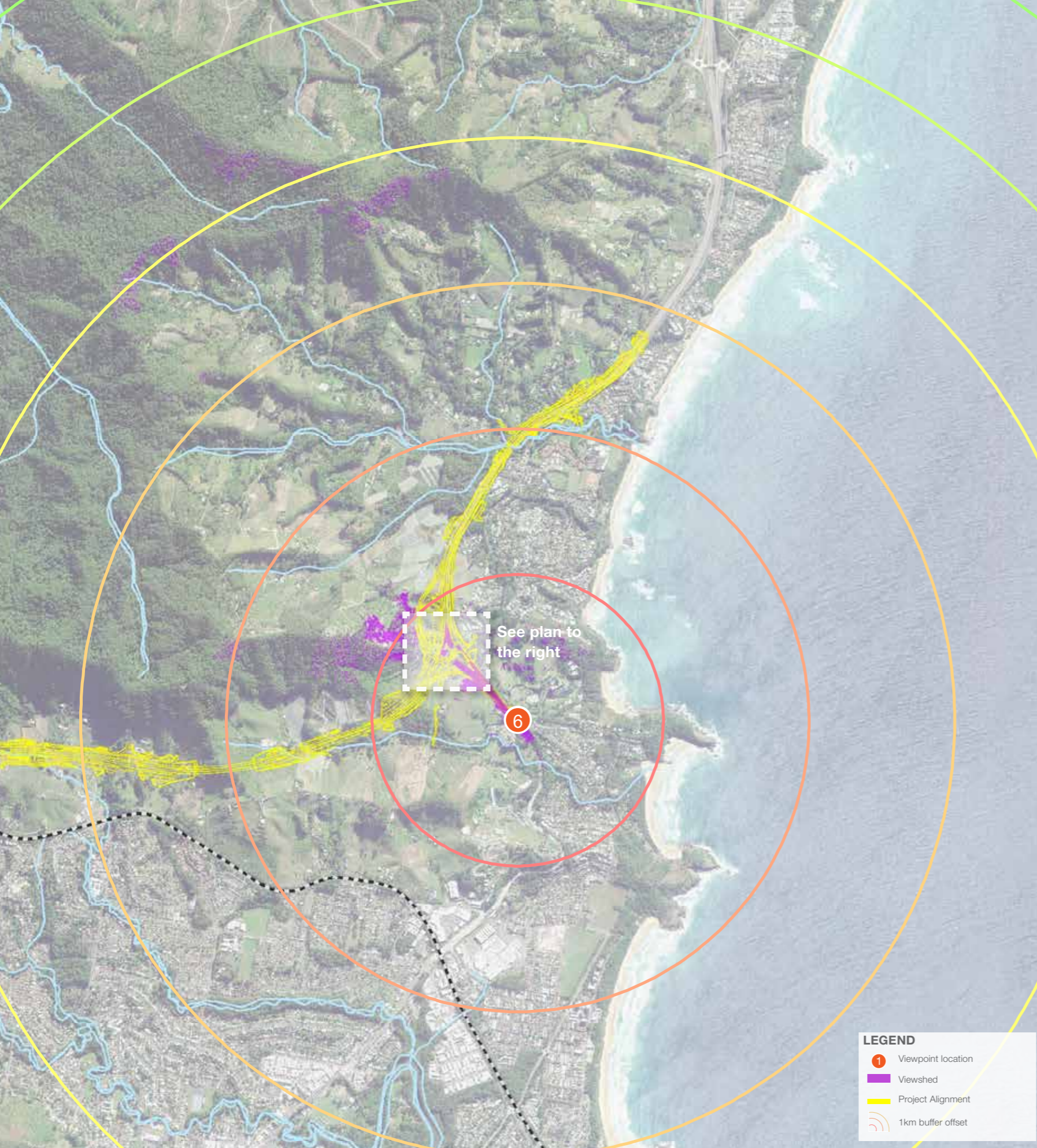


FIG 7.8 VIEWPOINT 6: VIEWSHED ANALYSIS

### Viewpoint 6: Residential edge (Charlesworth Bay Road)



#### Embedded design mitigation

The landscape and urban design response includes:

- Feature planting to Korora Hill interchange to define the northern arrival point and gateway to Coffs Harbour
- Planting to respond to the enclosed, vegetated experience of the Pacific Highway on approach to CBD
- Planting species similar to the form and structure of the banana plantation in the surrounding areas

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix



### Magnitude of change

The magnitude of change arising from this project is considered to be *High* due to the following:

- The Pacific Highway will be raised to the north of this view and join the project at Korora Hill interchange
- The interchange will include James Small Drive roundabout, on and off ramps, a connection to Bruxner Park Road and the introduction of four bridge structures
- To the north of the palm trees, vegetation will be removed to the east and west of the alignment, opening up the road corridor towards the proposed interchange
- It is anticipated that lighting will be required along the interchange on and off ramps and approach roads
- The interchange will increase in scale in comparison to the existing Pacific Highway alignment

### Impact

#### *Day time operation*

The *Moderate* sensitivity and *High* magnitude of change is judged to result in a *Moderate-High* adverse impact during operation.

#### *Night time operation*

There may be a *Low* level of night time visual impact due to increased light emittance associated with the introduction of Korora Hill interchange. Where possible, this will be limited through the use of aeroscreen light fittings combined with sensitive light pole placement. The design of the lighting will also comply with AS/ NZS 1158 which has requirements for minimising the obtrusive effects of road lighting.

#### *Construction*

During construction, the source and nature of the effect will change, with views towards construction activities and machinery. The construction phase impacts are assessed to be of a temporary nature and consistent with the operational phase impacts, resulting in a *Moderate-High* adverse impact during construction.

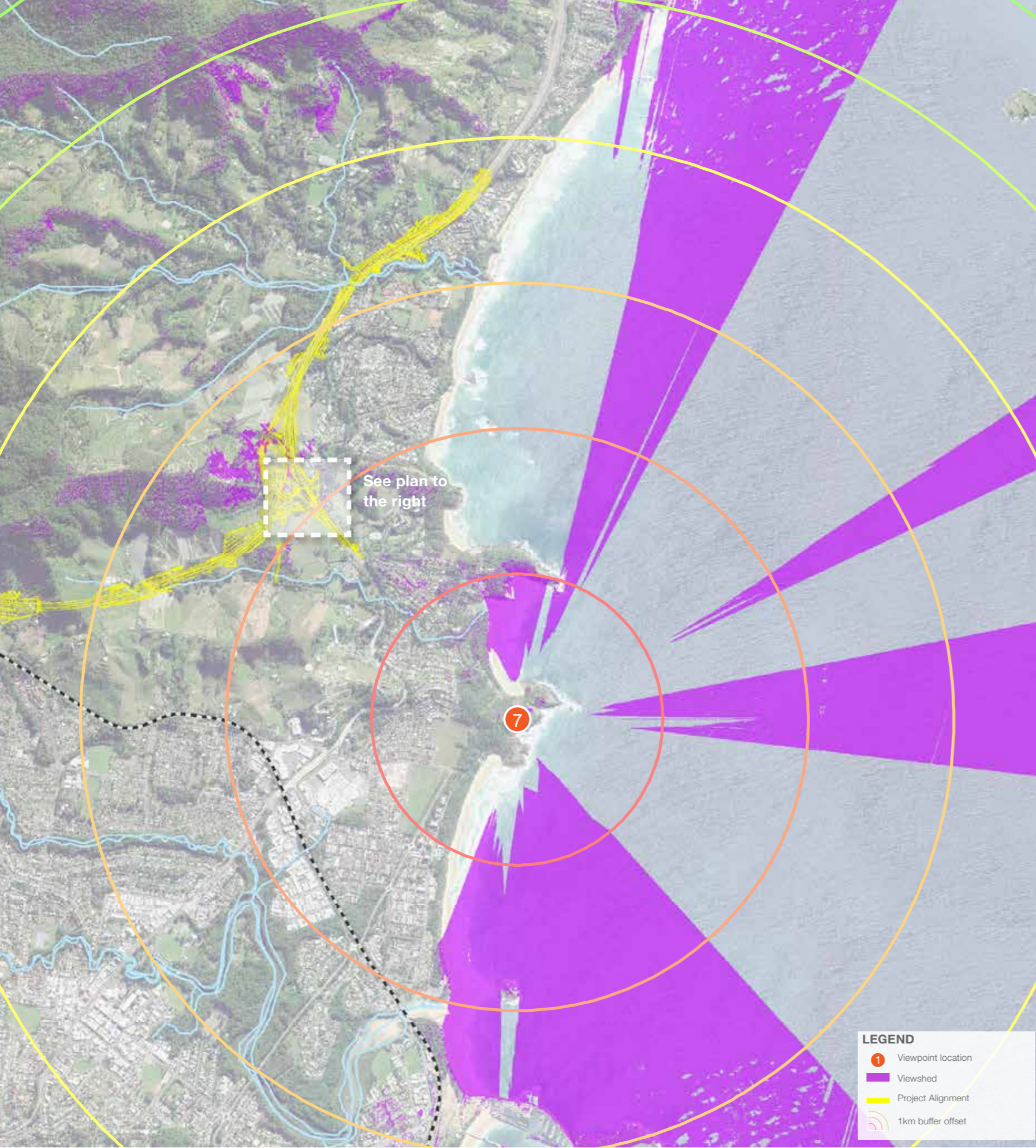
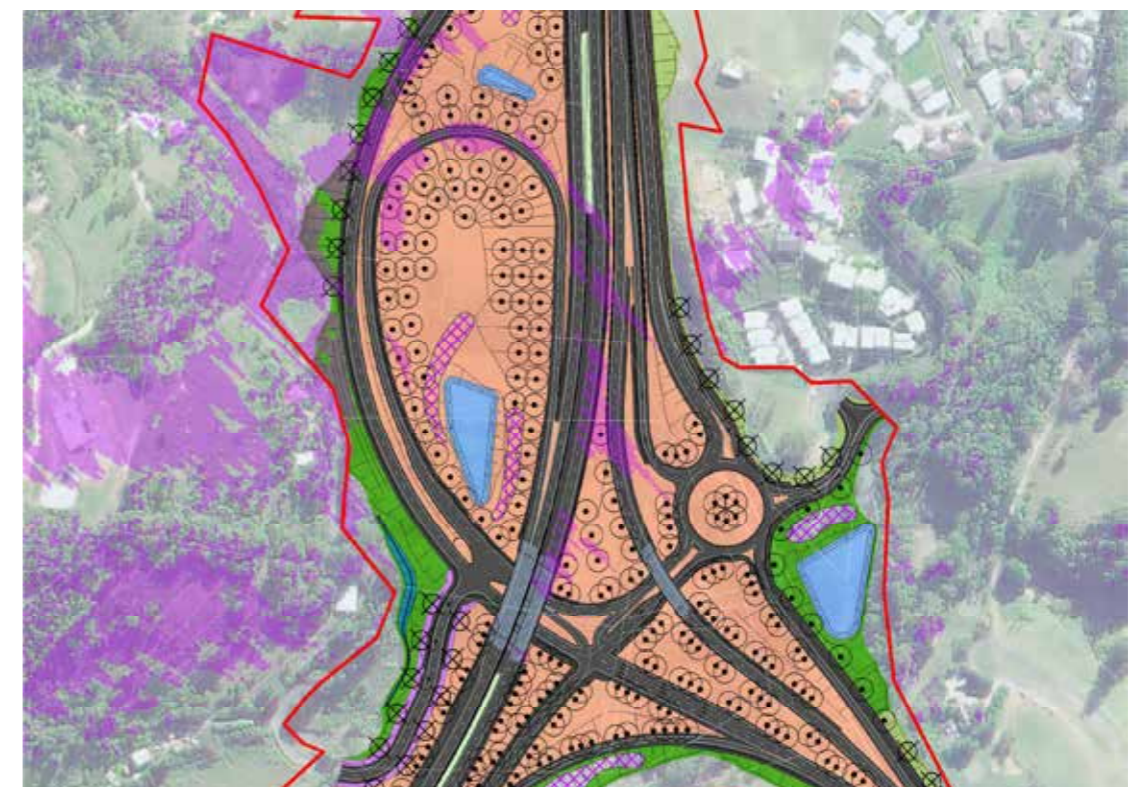


FIG 7.9 VIEWPOINT 7: VIEWSHED ANALYSIS

### Viewpoint 7: Macauleys Headland walking track



### Embedded design mitigation

The landscape and urban design response includes:

- Feature planting to Korora Hill interchange to define northern arrival point and gateway to Coffs Harbour
- Planting to respond to the enclosed, native and rural experience of the Pacific Highway and Coffs Harbour

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix



### **Magnitude of change**

The magnitude of change arising from this project is considered to be *Moderate* due to the following:

- Introduction of Korora Hill interchange including the entry and exit ramps and a bridge over the northbound entry ramp
- It is anticipated that lighting will be required along the interchange on and off ramps and approach roads

### **Impact**

#### *Day time operation*

The *High* sensitivity and *Moderate* magnitude of change is judged to result in a *Moderate-High* adverse impact during operation.

#### *Night time operation*

There may be a *Low* level of night time visual impact due to increased light emittance associated with the introduction of Korora Hill interchange. Where possible, this will be limited through the use of aeroscreen light fittings combined with sensitive light pole placement.

#### *Construction*

During construction, the removal of existing vegetation and the introduction of the earthworks and the Korora Hill interchange bridge structure would be evident in views. The construction phase impacts are assessed to be of a temporary nature and consistent with the operational phase impacts, resulting in a *Moderate-High* impact.



Viewpoint 7: Macauleys Headland walking track (project extents)



Viewpoint 7: Macauleys Headland walking track (embedded mitigation)

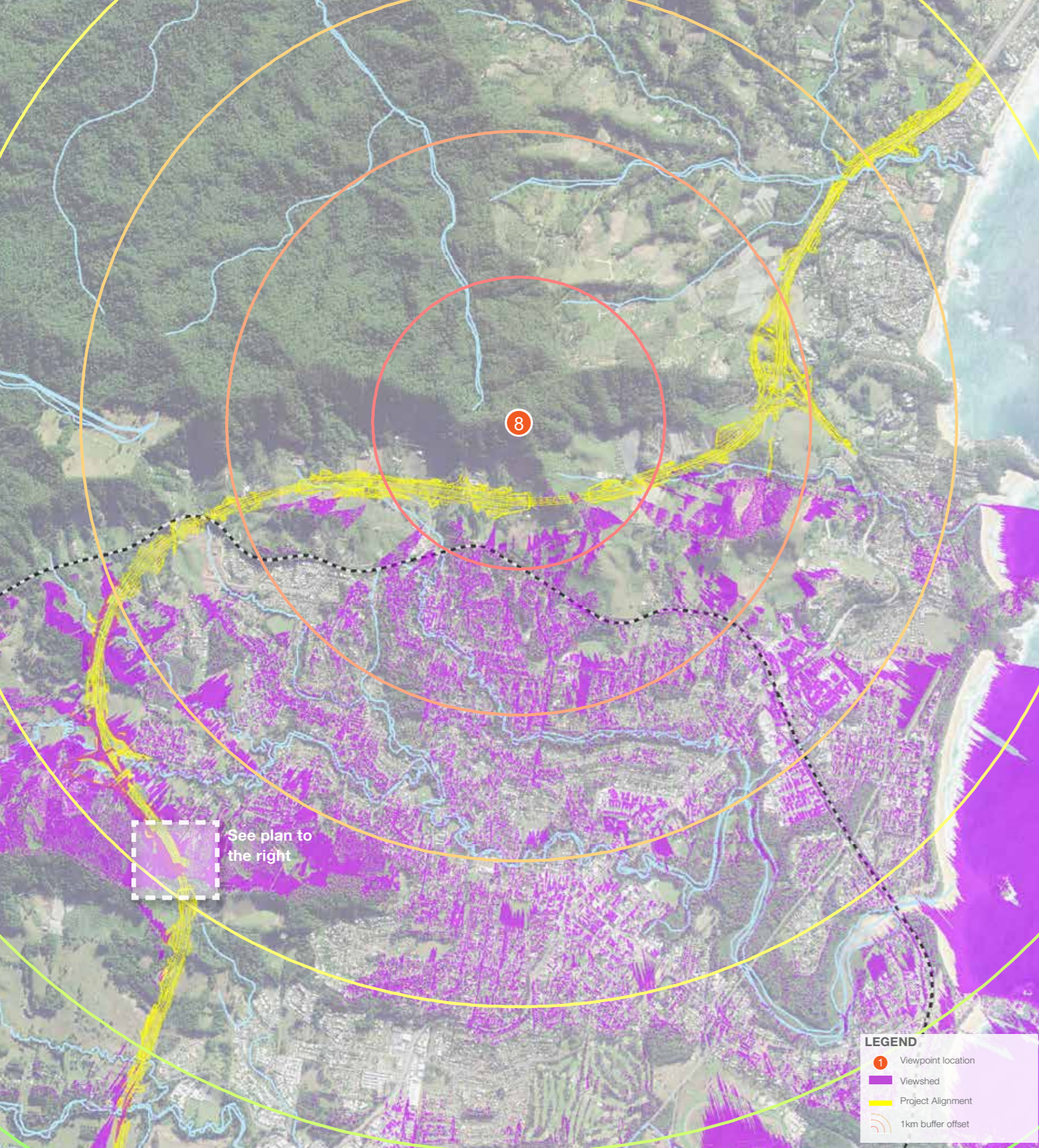


FIG 7.10 VIEWPOINT 8: VIEWSHED ANALYSIS

### Viewpoint 8: Sealy Lookout



Grid: GDA 1994 MGA Zone 56 SCALE @A3 - 1:3,000  
0 50 100m

### Embedded design mitigation

The landscape and urban design response includes:

- Cut slopes to be benched and planted to assist with integrating the cut rock faces
- Sensitive design of the tunnel portals
- Revegetation using native species to strengthen and respond to the existing character





## Magnitude of change

The magnitude of change arising from this project is considered to be *High* due to the following:

- Removal of vegetation within the construction footprint and introduction of earthworks traversing the landscape to the north of Roberts Hill
- Earthworks associated with Roberts Hill tunnel approaches
- Views towards the southern edge of Coramba Road interchange, including lighting columns
- Introduction of infrastructure and vehicles within the rural edge of Coffs Harbour basin

## Impact

### *Day time operation*

The *High* sensitivity and *High* magnitude of change is judged to result in a *High* adverse impact at this location.

### *Night time operation*

There may be a *Moderate* level of night time visual impact due to increased light emittance associated with the introduction Coramba Road interchange, together with head light emittance from vehicles.

### *Construction*

During construction the source and nature of the effect will change, with views towards large earthwork machinery and activities within the construction footprint. The construction phase impacts are assessed to be of a temporary nature and consistent with the operational phase impacts, resulting in a *High* impact.



Viewpoint 8: Sealy Lookout (project extents)

Roberts Hill tunnel portal with landscape and urban design treatments to integrate and soften benched earthworks

Earthworks and the project between Roberts Hill and Coramba Road interchange



Viewpoint 8: Sealy Lookout (embedded mitigation)

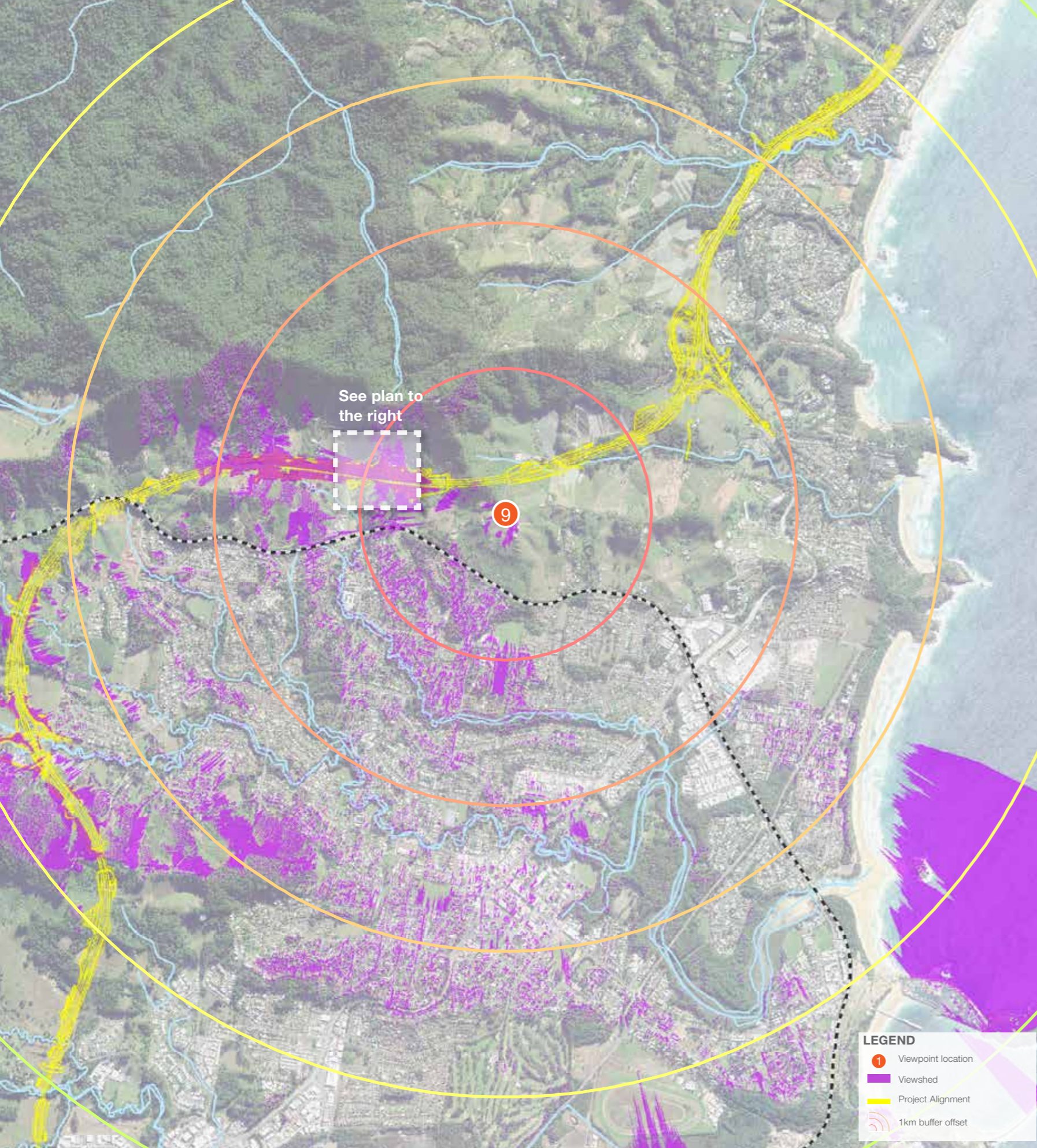
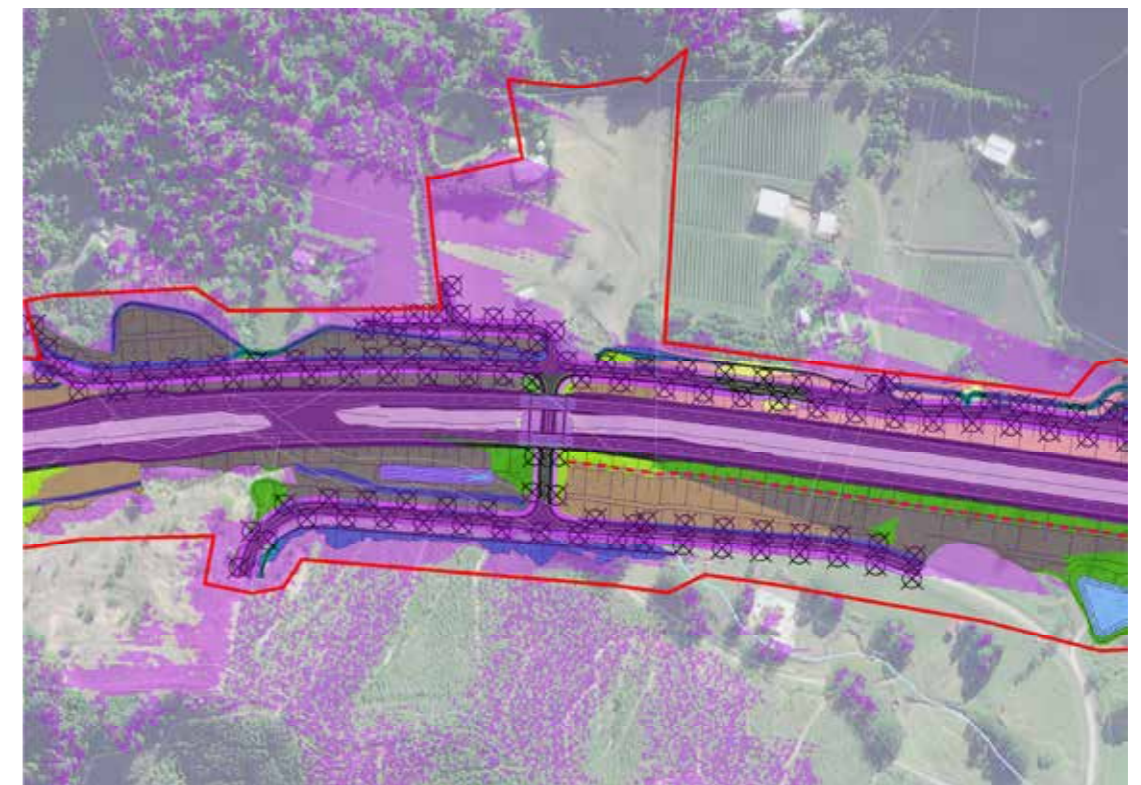


FIG 7.11 VIEWPOINT 9: VIEWSHED ANALYSIS

### Viewpoint 9: Gatelys Road



#### Embedded design mitigation

The landscape and urban design response includes:

- Cut slopes and embankments to be benched and planted to assist with integrating the earthworks. Revegetation using native species to strengthen and respond to the existing character
- Sensitive design of the tunnel portals
- Noise attenuation treatment to consist of a solid noise walls. Noise wall pattern and design to relate to the local landscape character

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix



### Magnitude of change

The magnitude of change arising from this project is considered to be *High* due to the following:

- Embankments and cutting slopes associated with the project traversing the undulating terrain through Mackays Road valley
- Substantial vegetation removal and severance of the existing vegetation patterns
- Introduction of Mackays Road underpass
- Views towards the southern edge of Coramba Road interchange in the distance, including lighting columns
- Introduction of infrastructure and vehicles within the rural edge of Coffs Harbour basin

### Impact

#### *Day time operation*

The *High* sensitivity and *High* magnitude of change is judged to result in a *High* adverse impact at this location.

#### *Night time operation*

There may be a *Moderate-High* level of night time visual impact due to increased light emittance associated with the introduction of Coramba Road interchange, together with head light emittance from vehicles.

#### *Construction*

During construction the source and nature of the effect will change, with views towards large earthwork machinery and activities within the construction footprint, iteratively constructing the project. An ancillary site will also be present to the south of Mackays Road underpass. Vegetation within this area would be retained where possible.

The construction phase impacts are assessed to be of a temporary nature and consistent with the operational phase impacts, resulting in a *High* impact.

Southern edge of Coramba  
Road interchange in the distance

Embankments associated with the project  
traversing the undulating terrain through  
Mackays Road Valley



Viewpoint 9: Gatelys Road (project extents)

Southern edge of Coramba  
Road interchange in the distance

Embankments associated with the project  
traversing the undulating terrain through  
Mackays Road valley



Viewpoint 9: Gatelys Road (embedded mitigation)

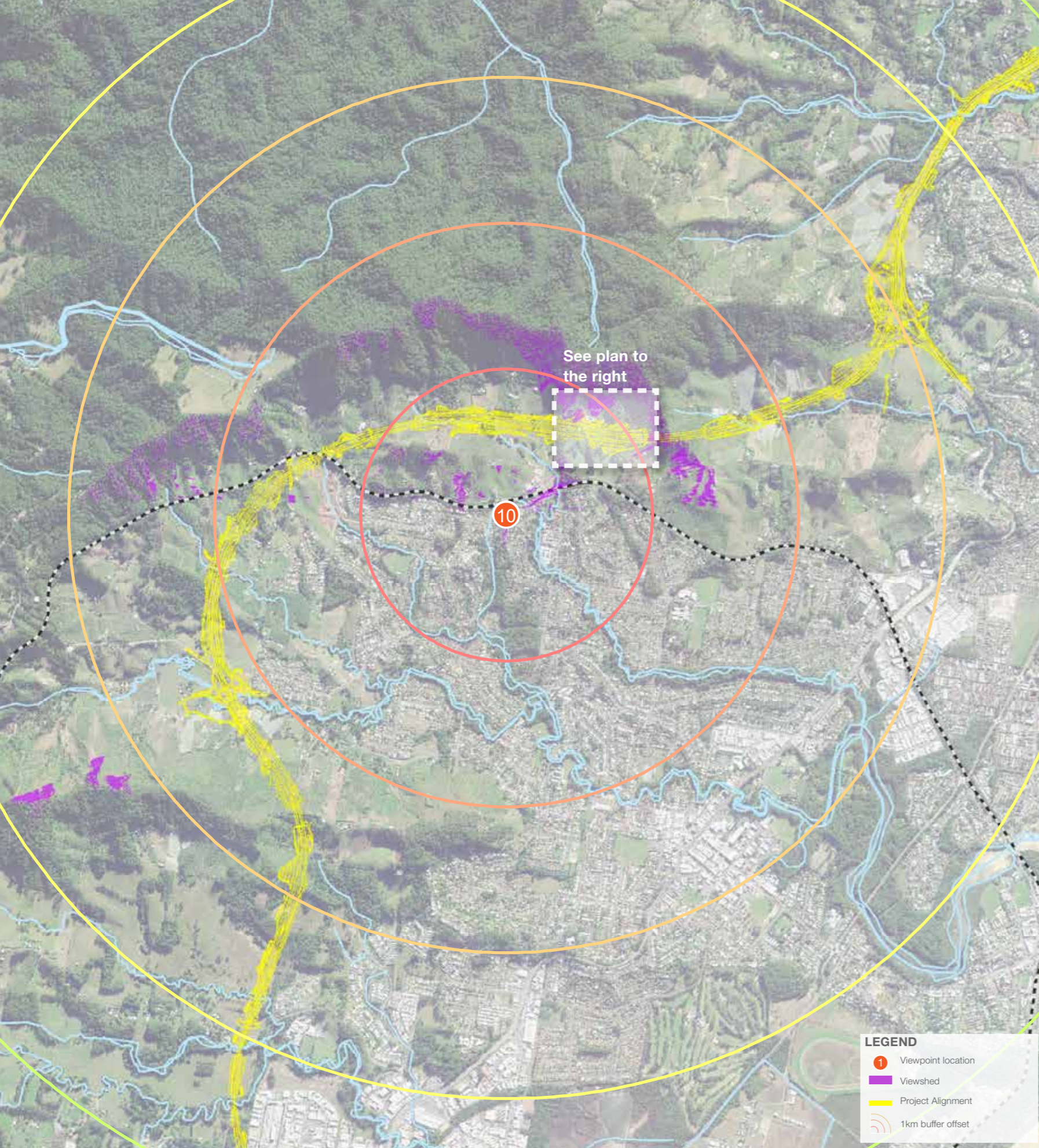
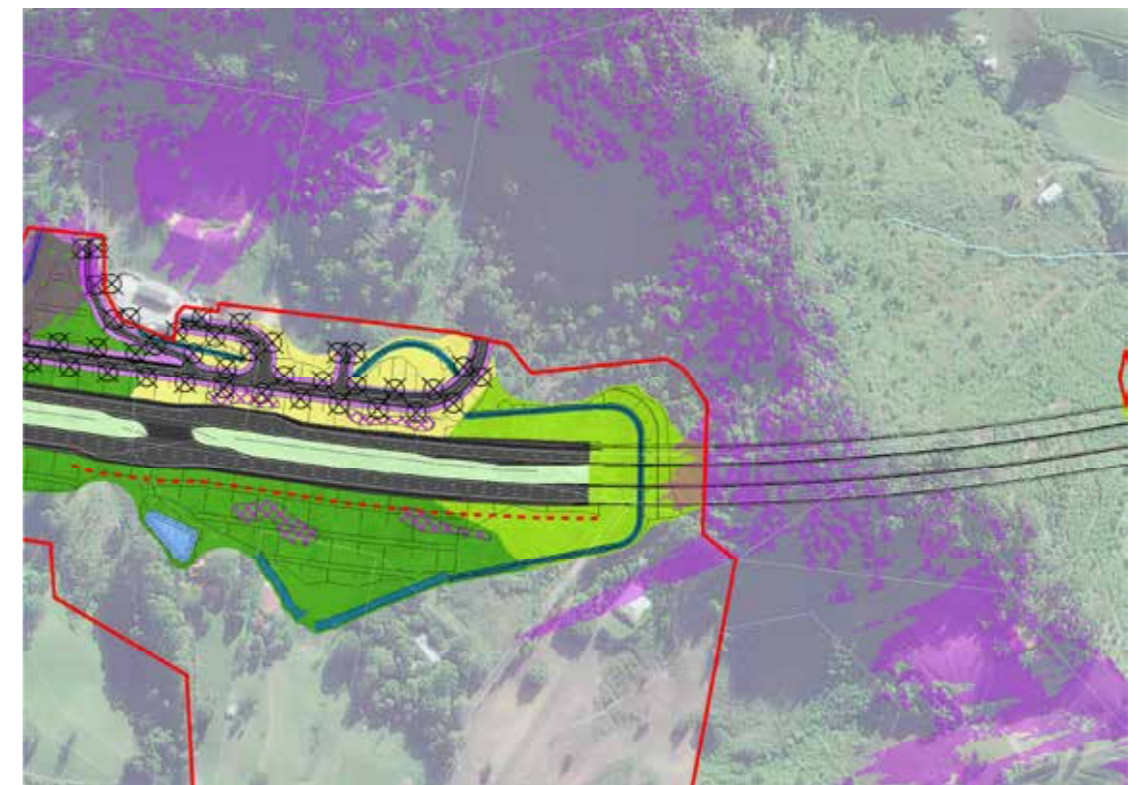


FIG 7.12 VIEWPOINT 10: VIEWSHED ANALYSIS

### Viewpoint 10: Vera Drive



### Embedded design mitigation

The landscape and urban design response includes:

- Embankments to be benched and planted to assist with integrating the earthworks. Revegetation using native species to strengthen and respond to the existing character
- Noise attenuation treatment to be a combination of mounds and solid noise walls. Noise wall pattern and design to relate to the local landscape character with planting to both sides
- Sensitive design of the portals, including landscape terraces where 2:1 gradients are not achievable, accompanied with planting

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix





### Magnitude of change

The magnitude of change arising from this project is considered to be *Negligible* due to the following:

- Removal of vegetation and potential vegetated earthworks to the north along the project is anticipated to be discernible and a small component of the existing view, filtered by intervening vegetation
- The project is not anticipated to be visible at this location

### Impact

#### *Day time operation*

The *High* sensitivity and *Negligible* magnitude of change is judged to result in a *Negligible* impact at this location.

#### *Night time operation*

There may be a *Low* level of night time visual impact due to increased light emittance associated with head light emittance from vehicles.

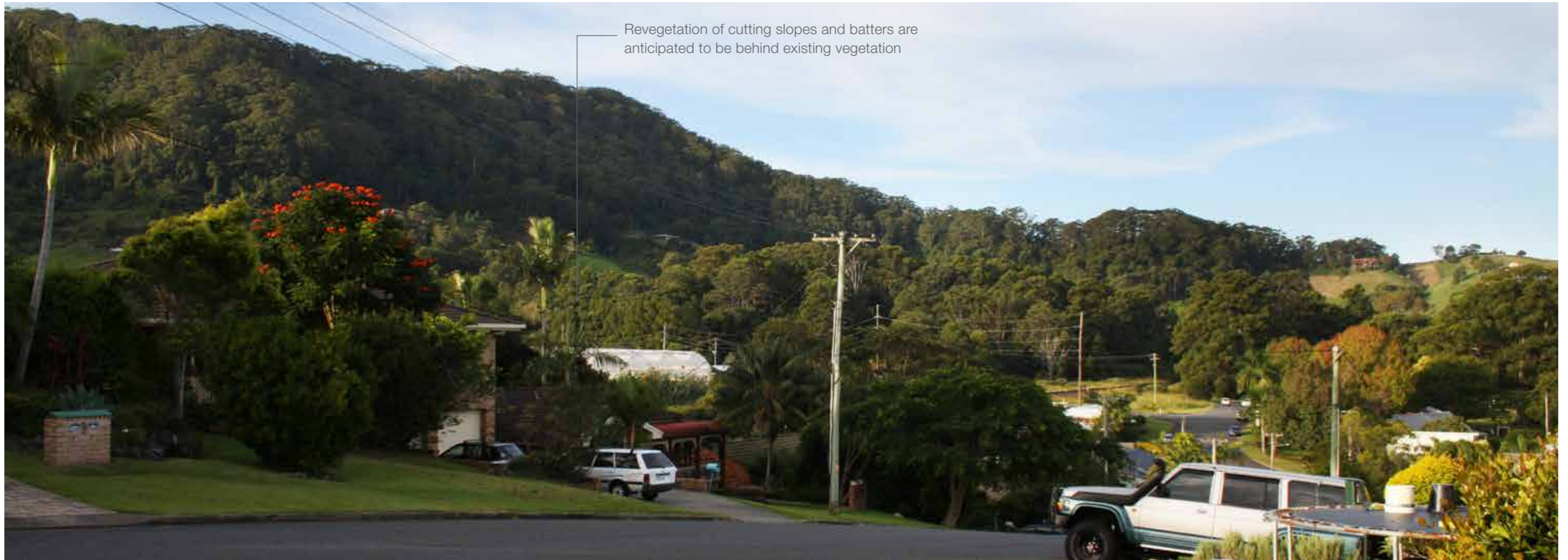
#### *Construction*

During construction the source and nature of the effect will change, with glimpse views towards large earthwork machinery and activities within the construction footprint. The construction phase impacts are assessed to be of a temporary nature and result in a low magnitude of change and a Moderate impact.



Viewpoint 10: Vera Drive (project extents)

*Note:* The dashed yellow lines illustrate earthworks that would be screened by vegetation within the foreground of the view.



Viewpoint 10: Vera Drive (embedded mitigation)

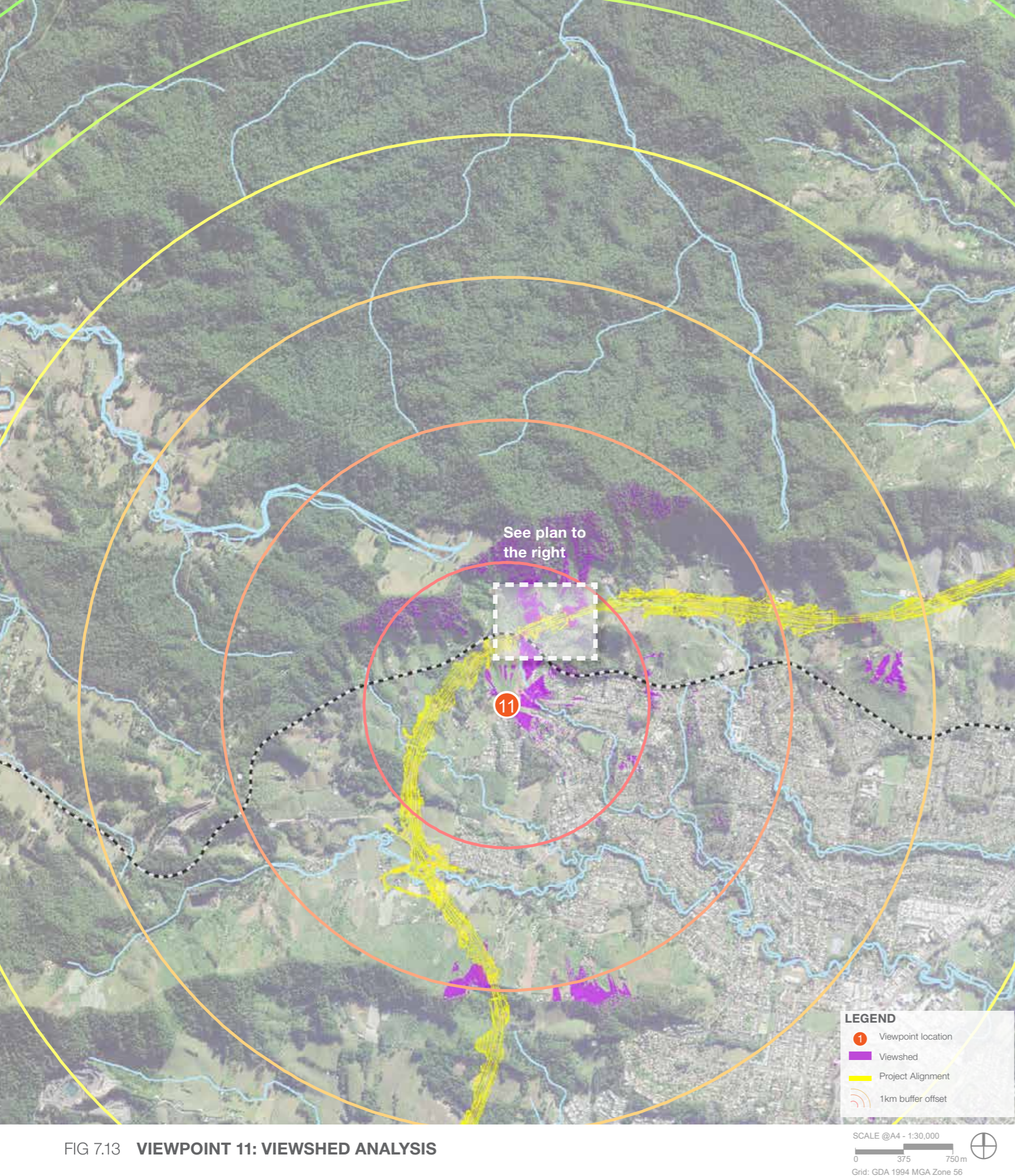
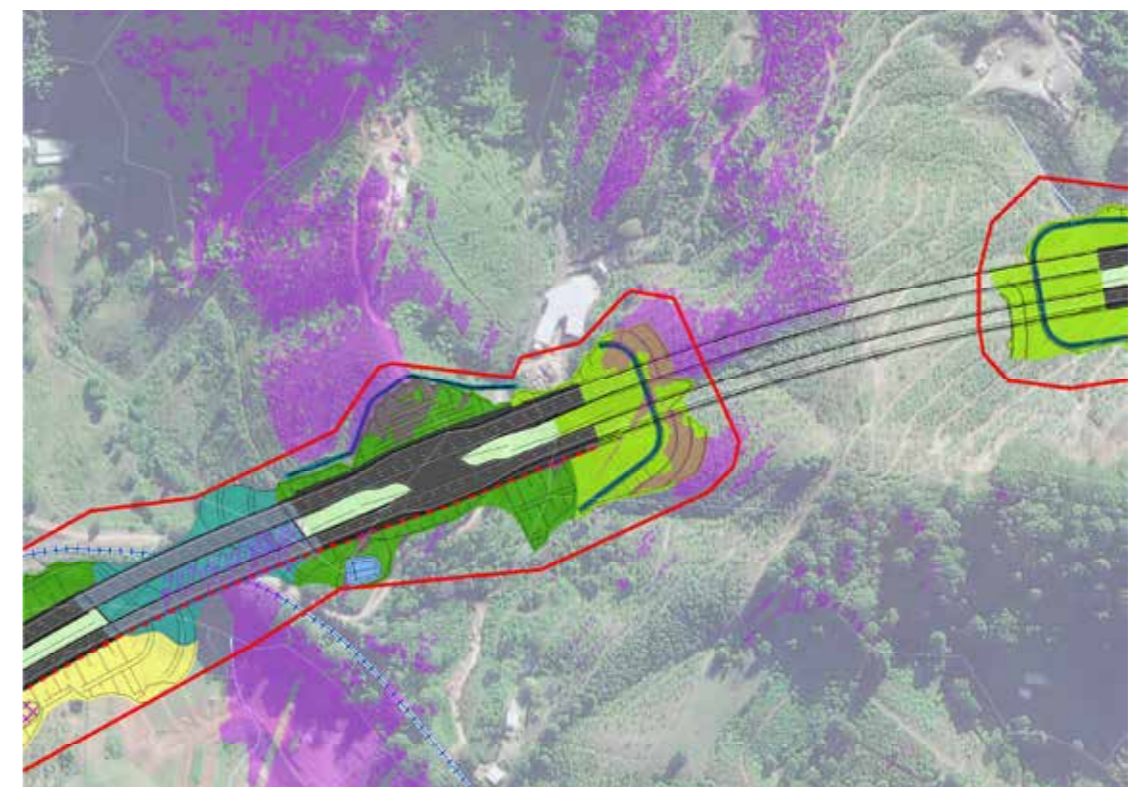


FIG 7.13 VIEWPOINT 11: VIEWSHED ANALYSIS

### Viewpoint 11: Shephards Lane



#### Embedded design mitigation

The landscape and urban design response includes:

- Integration of earthworks where possible to respond to the natural forms of the foothills
- Revegetation using native species to strengthen and respond to the existing character, extending the Ulidarra National Park visual character
- Sensitive design of the portals, including landscape terraces where 2:1 gradients are not achievable, accompanied with planting
- Twin blade piers to minimise visual size and bulk of the bridge structure

LEGEND	
	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix



### Magnitude of change

The magnitude of change arising from this project is considered to be *High* due to the following:

- Introduction of bridge structure over North Coast Railway in the setting of views towards Ulidarra National Park
- Removal of mature vegetation that currently lines the North Coast Railway corridor

### Impact

#### *Day time operation*

The *High* sensitivity and *High* magnitude of change is judged to result in a *High* adverse impact at this location.

#### *Night time operation*

There may be a Moderate-High level of night time visual impact due to light emittance from vehicles passing on North Coast Railway bridge structure.

#### *Construction*

The source and nature of the effect will change, with views towards cranes and construction machinery during the construction of the North Coast Railway bridge. The construction phase impacts are assessed to be of a temporary nature and consistent with the operational phase impacts, resulting in a High impact.



Viewpoint 11: Shephards Lane (project extents)



Viewpoint 11: Shephards Lane (embedded mitigation)

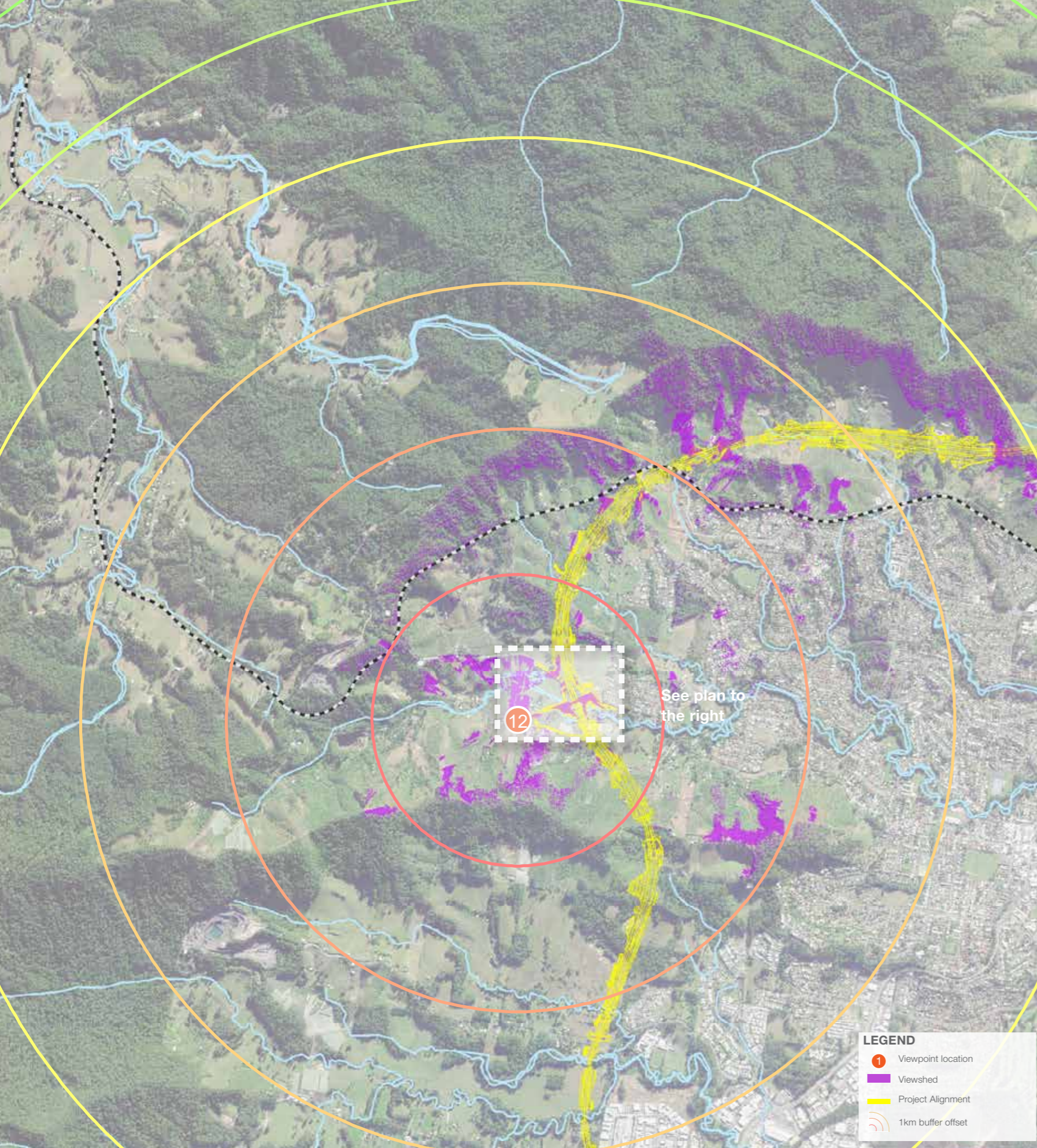


FIG 7.14 VIEWPOINT 12: VIEWSHED ANALYSIS

### Viewpoint 12: Bennetts Road



#### Embedded design mitigation

The landscape and urban design response includes:

- Planting to integrate the proposed earthworks and respond to the low lying flood plain landscape
- Screen planting to mitigate views from adjacent properties
- Riparian planting to Coffs Creek corridor
- Mixture of open forest planting to integrated proposed noise wall to the east of the interchange

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix





### Magnitude of change

The magnitude of change arising from this project is considered to be *High* due to the following:

- Introduction of Coramba Road interchange, including:
  - Two roundabouts
  - Entry and exit ramps
  - Three bridges over Coffs Creek
- One bridge over the project for Coramba Road
- Realigned Coramba Road
- Lighting columns
- Realigned private access road
- Removal of existing vegetation

### Impact

#### *Day time operation*

The *High* sensitivity and *High* magnitude of change is judged to result in a *High* adverse impact at this location.

#### *Night time operation*

The introduction of Coramba Road interchange would provide a source of increased night time light emittance in a previously dark environment. There is likely to be a *Moderate-High* impact on night time visual amenity, although this would reduce over time as screening vegetation matures.

#### *Construction*

The iterative removal of existing vegetation and construction of earthworks would be particularly evident with large scale machinery and equipment present within the construction footprint. The North Coast Railway bridge construction phase would also be evident to the west of the view, with lower level views partially screened by existing vegetation.

The construction phase impacts are assessed to be of a temporary nature and consistent with the operational phase impacts, resulting in a High impact.

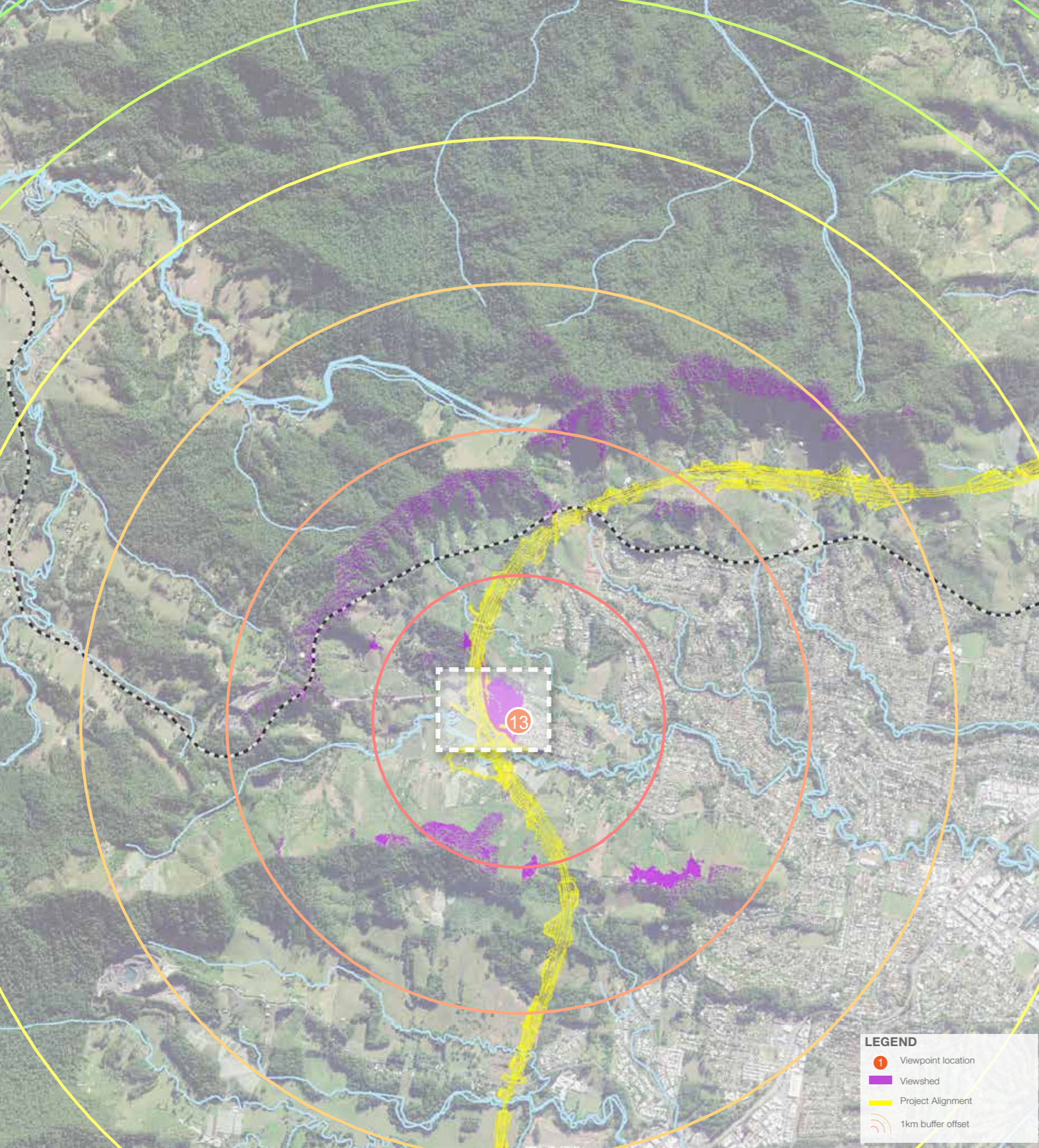


FIG 7.15 VIEWPOINT 13: VIEWSHED ANALYSIS

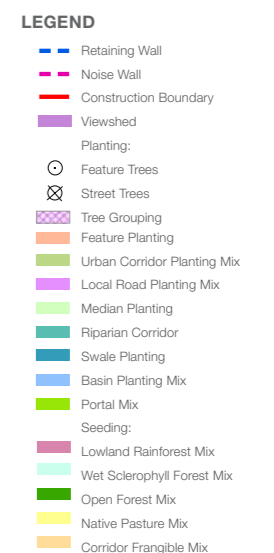
### Viewpoint 13: Spagnolos Road



#### Embedded design mitigation

The landscape and urban design response includes:

- Planting to integrate the proposed earthworks and respond to the low lying flood plain character. Screen planting to mitigate views from adjacent properties
- Rainforest planting mix to the north of Coramba Road interchange to connect fragmented vegetation
- Noise attenuation treatment to be a combination of mounds and solid noise walls. Noise wall pattern and design to relate to the local landscape character with planting to both sides





### Magnitude of change

The magnitude of change arising from this project is considered to be *High* due to the following:

- Introduction of Coramba Road interchange, including:
  - Two roundabouts
  - On and off ramps
  - Three bridges over Coffs Creek

- One bridge over the project for Coramba Road
  - Realigned Coramba Road
- Lighting columns
- Realigned private access road
- Removal of existing vegetation

### Impact

#### *Day time operation*

The *High* sensitivity and *High* magnitude of change is judged to result in a *High* adverse impact at this location.

#### *Night time operation*

The introduction of Coramba Road interchange would provide a source of increased night time light emittance in a previously dark environment. There is likely to be a *High* impact on night time visual amenity, although this would reduce over time as screening vegetation matures.

#### *Construction*

During construction, the area of land to the east of the interchange would be utilised as an ancillary site. Consistent with the operational impact, the iterative construction and introduction of Coramba Road interchange and presence of large scale machinery and equipment will result in a *High* adverse impact during construction.



Viewpoint 13: Spagnolos Road (project extents)



Viewpoint 13: Spagnolos Road (embedded mitigation)

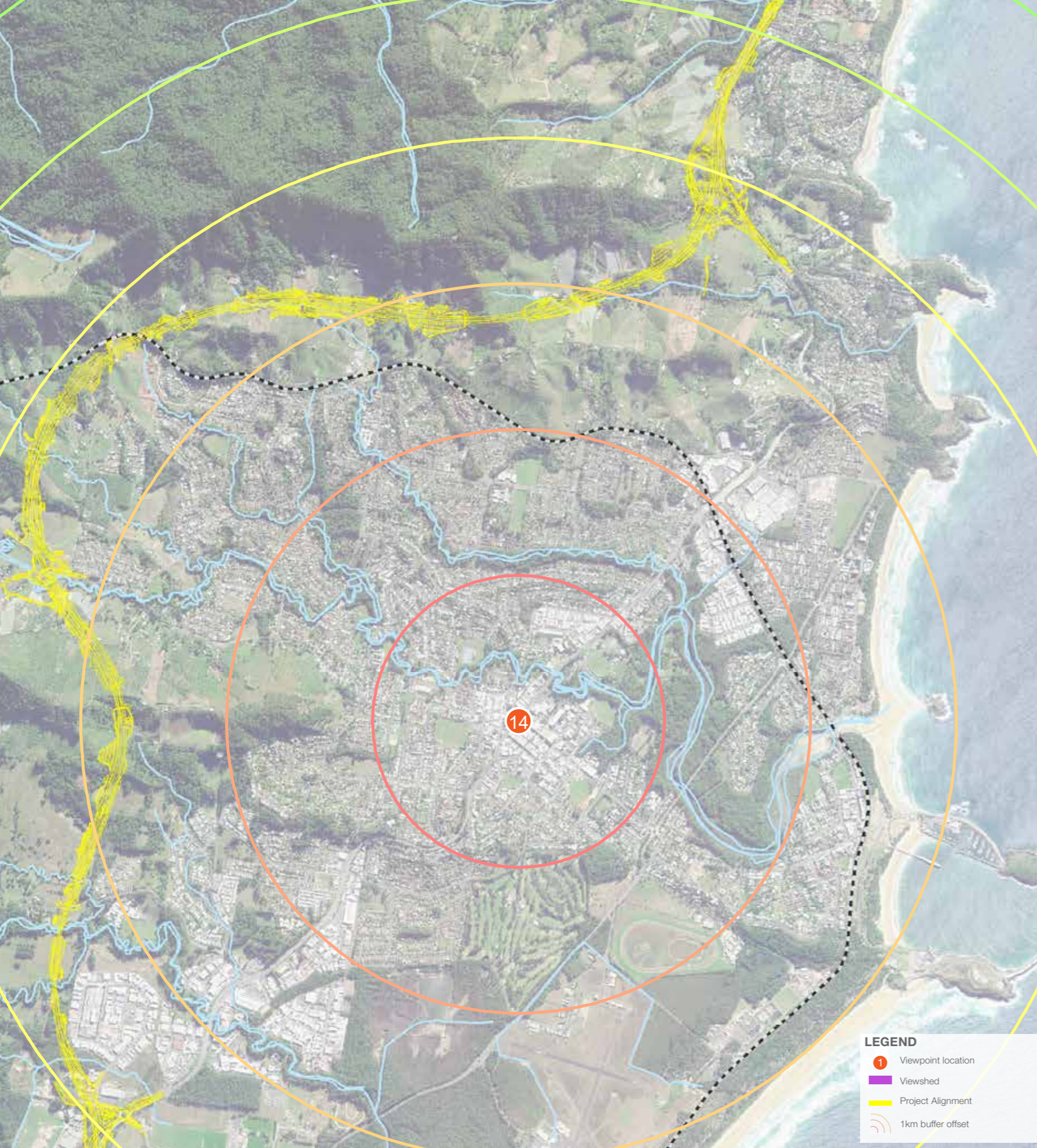


FIG 7.16 VIEWPOINT 14: VIEWSHED ANALYSIS

### Viewpoint 14: Coffs Harbour CBD



#### Embedded design mitigation

As noted in the visual baseline section, the view is enclosed by street trees and canopy structures with Coffs Hotel situated to the northern side of West High Street with a distant view to Ulidarra National Park above local properties.

The view towards the project is not anticipated to be achievable from this location and as a result, no embedded design mitigation is proposed for this viewpoint.



### Magnitude of change

The project will be situated approximately 3km to the west of this location.

A small glimpse view to the Ulidarra National Park is evident between street trees and under the street structural canopy. Views towards the project are not anticipated to be visible from this location resulting in *Negligible* change to the existing view.

### Impact

In the absence of any change, the impact is judged to be *Negligible* from this location during operation and construction.

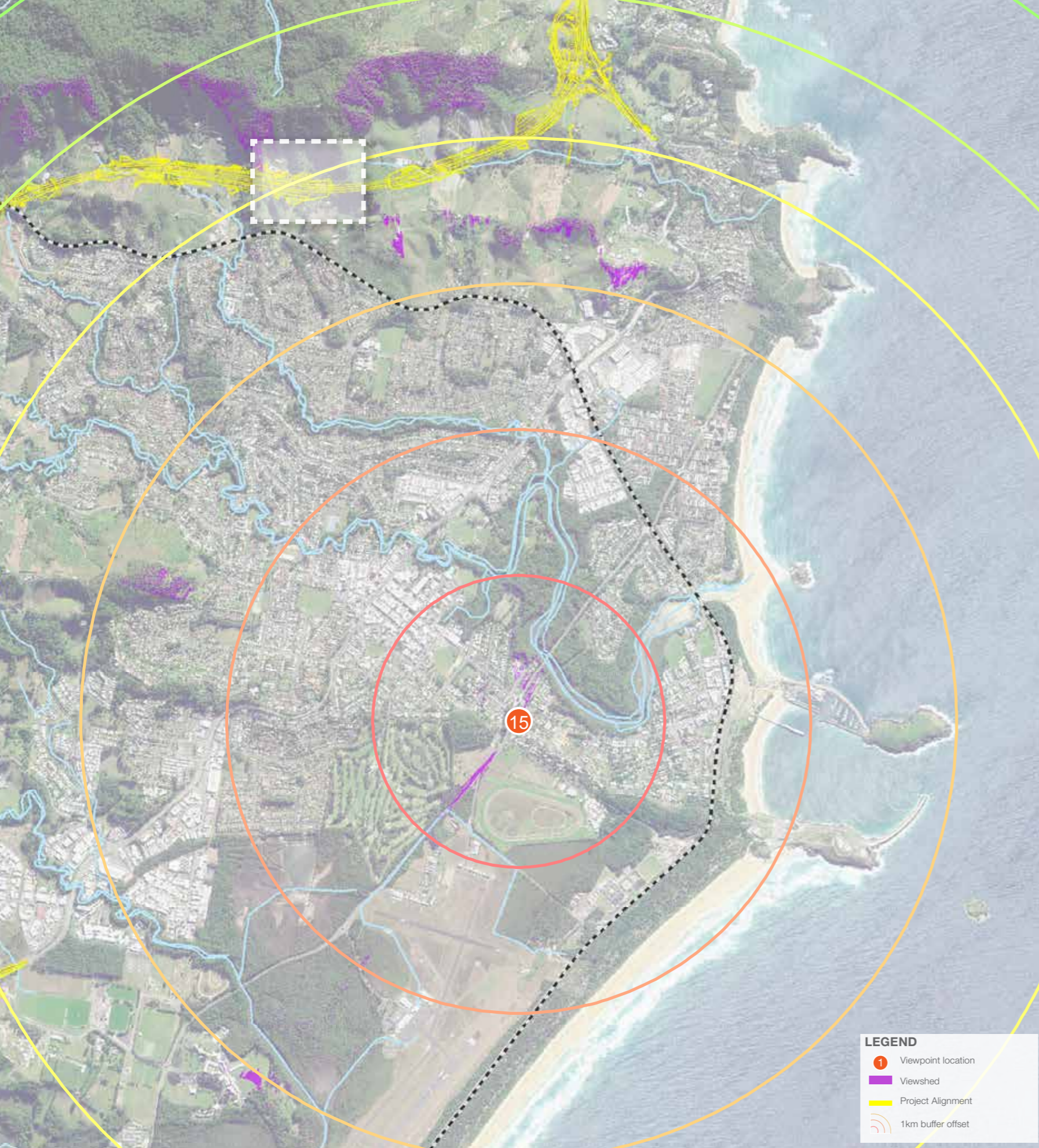
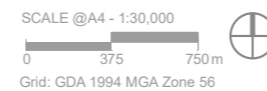
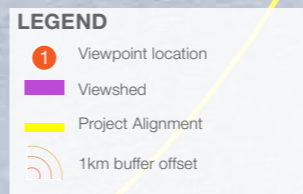


FIG 7.17 VIEWPOINT 15: VIEWSHED ANALYSIS



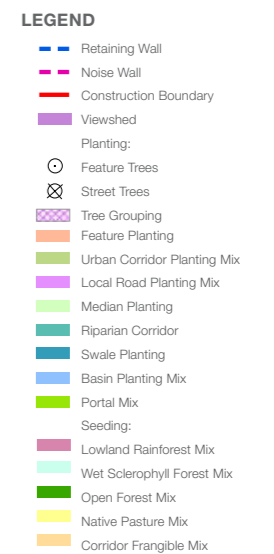
### Viewpoint 15: Barrie and Victoria Street



### Embedded design mitigation

The landscape and urban design response includes:

- Revegetation using native species to strengthen and respond to the existing character, extending the Ulidarra National Park visual character







### Magnitude of change

The project will be situated approximately 2km to the west of this representative viewpoint.

The magnitude of change arising from this project is considered to be *Low* due to the following:

- Limited clearing of vegetation associated with the project traversing through the Ulidarra National Park foothills and introduction of earthworks

### Impact

#### *Day time operation*

The *Moderate* sensitivity and *Low* magnitude of change is judged to result in a *Moderate-Low* adverse impact at this location.

#### *Night time operation*

Additional night time visual impacts are not expected in this location.

### *Construction*

The construction phase impacts are assessed to be of a temporary nature and consistent with the operational phase impacts as a result of the iterative removal of vegetation and construction of the earthworks, resulting in a *Moderate-Low* adverse impact.

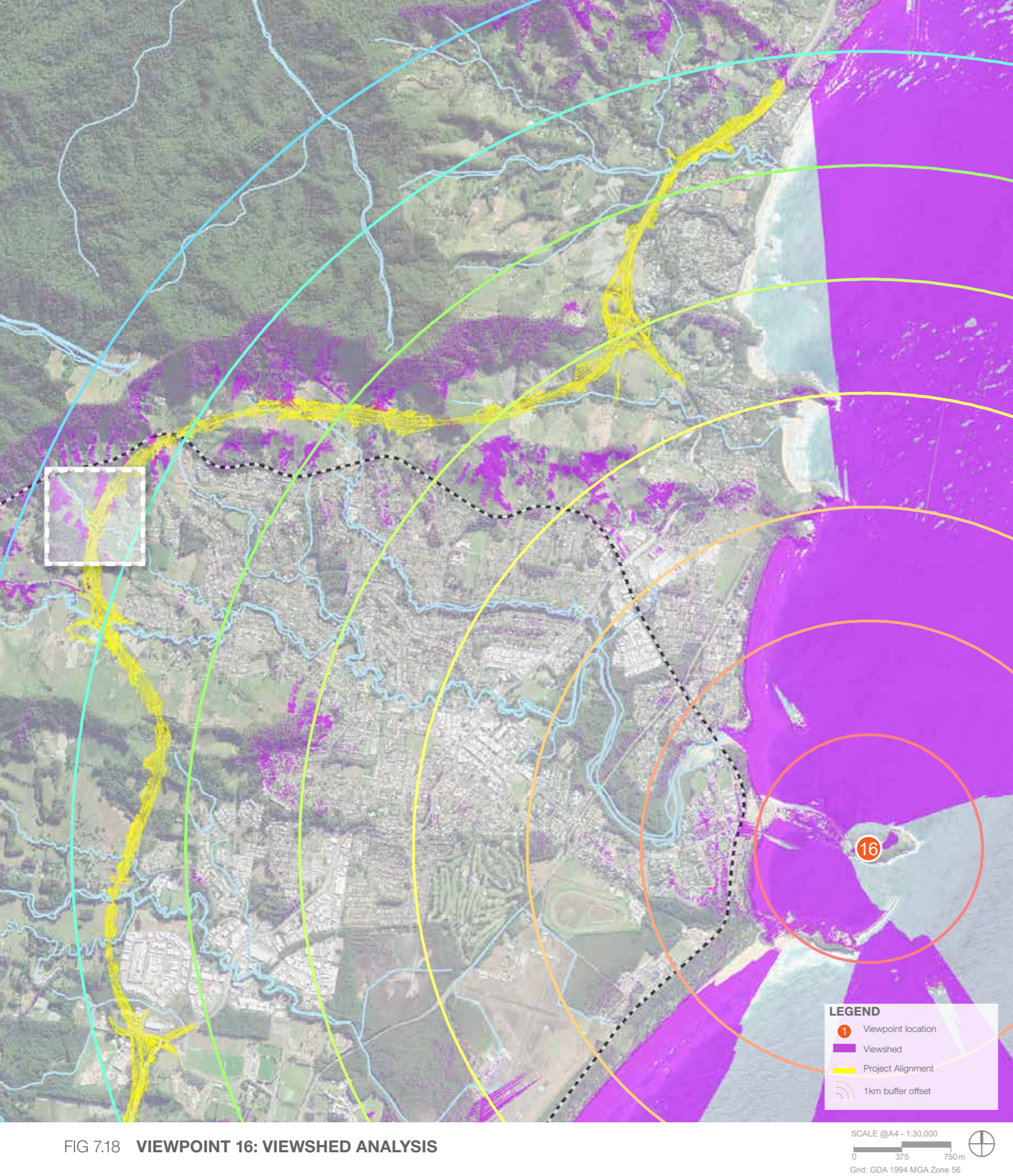


FIG 7.18 VIEWPOINT 16: VIEWSHED ANALYSIS

### Viewpoint 16: Muttonbird Island Nature Reserve and marina



Grid: GDA 1994 MGA Zone 56 SCALE @A3 - 1:3,000  
0 50 100m

#### Embedded design mitigation

The landscape and urban design response includes:

- Planting to integrate the proposed earthworks, particularly the upper slopes that would be visible from this location
- The noise attenuation treatment is not anticipated to be visible from this location.

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix



### Magnitude of change

The magnitude of change arising from this project is considered to be *Moderate* due to the following:

- Embankments associated with the project traversing the Coffs Harbour basin and foothills
- Introduction of the project visible above vegetation moving in a north-south direction

### Impact

#### *Day time operation*

The *High* sensitivity and *Moderate* magnitude of change is judged to result in a *Moderate-High* adverse impact at this location.

#### *Night time operation*

Additional night time visual impacts are not expected in this location.

### *Construction*

The construction phase impacts are assessed to be of a temporary nature and consistent with the operational phase impacts as a result of the iterative removal of vegetation and construction of the earthworks, resulting in a *Moderate-High* adverse impact.



Viewpoint 16: Muttonbird Island Nature Reserve and marina (project extents)



Viewpoint 16: Muttonbird Island Nature Reserve and marina (embedded mitigation)

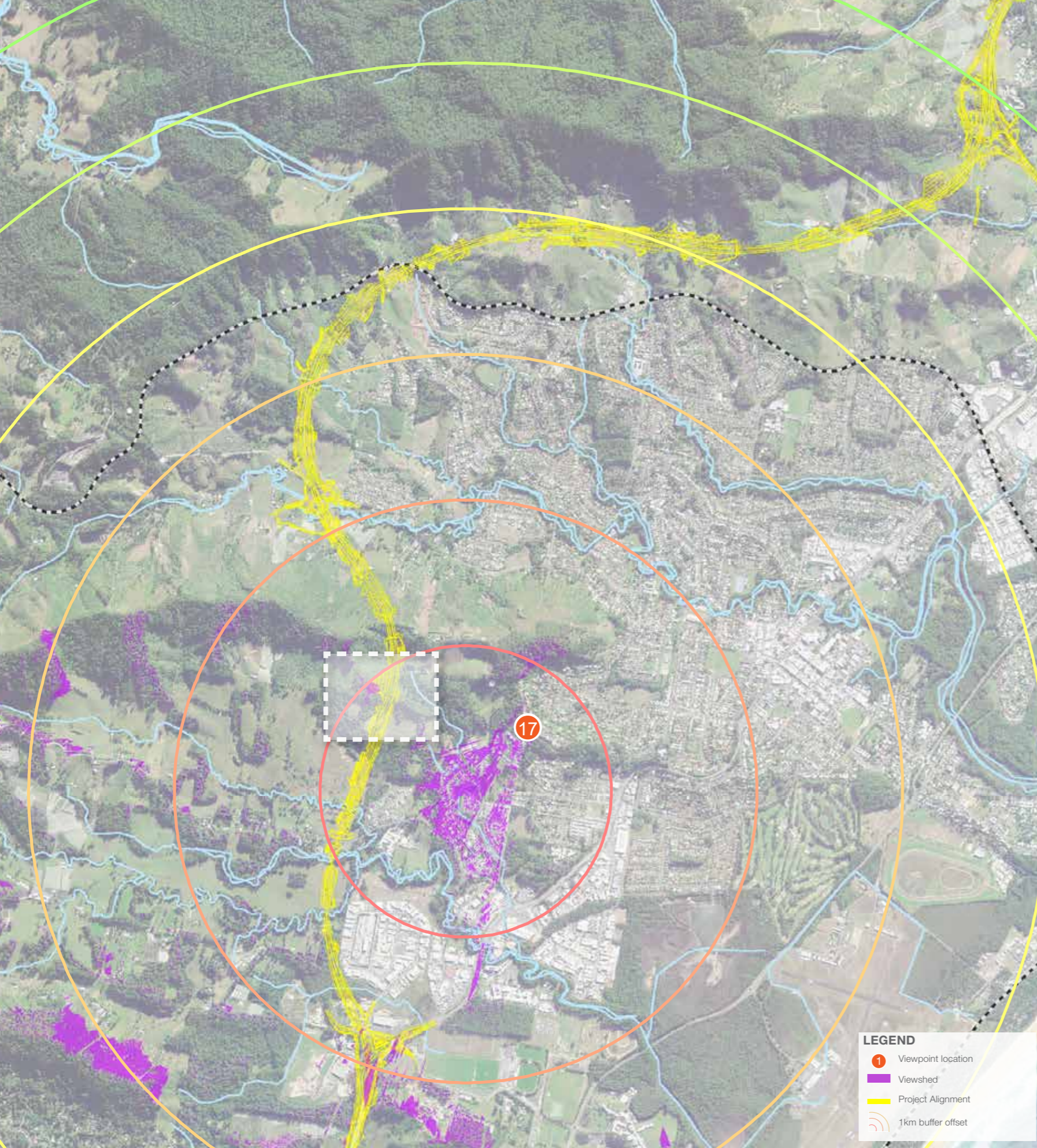


FIG 7.19 VIEWPOINT 17: VIEWSHED ANALYSIS

### Viewpoint 17: Kratz Drive, North Boambee Valley



Grid: GDA 1994 MGA Zone 56 SCALE @A3 - 1:3,000  
0 50 100m

#### Embedded design mitigation

The landscape and urban design response includes:

- Planting to integrate the proposed embankments and screen views to passing vehicles
- The noise attenuation treatment is not anticipated to be visible from this location.

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix



### **Magnitude of change**

The magnitude of change arising from this project is considered to be *Low* due to the following:

- Filtered views to the overbridge at Englands Road interchange
- The project on embankment crossing North Boambee Road

### **Impact**

#### *Day time operation*

The *High* sensitivity and *Low* magnitude of change is judged to result in a *Moderate* adverse impact at this location.

#### *Night time operation*

Additional night time visual impacts are not expected in this location.

#### *Construction*

The construction phase impacts are assessed to be of a temporary nature and consistent with the operational phase impacts as a result of the iterative removal of vegetation and construction of the earthworks.



Viewpoint 17: Kratz Drive, North Boambee Valley (project extents)





Viewpoint 17: Kratz Drive, North Boambee Valley (embedded mitigation)

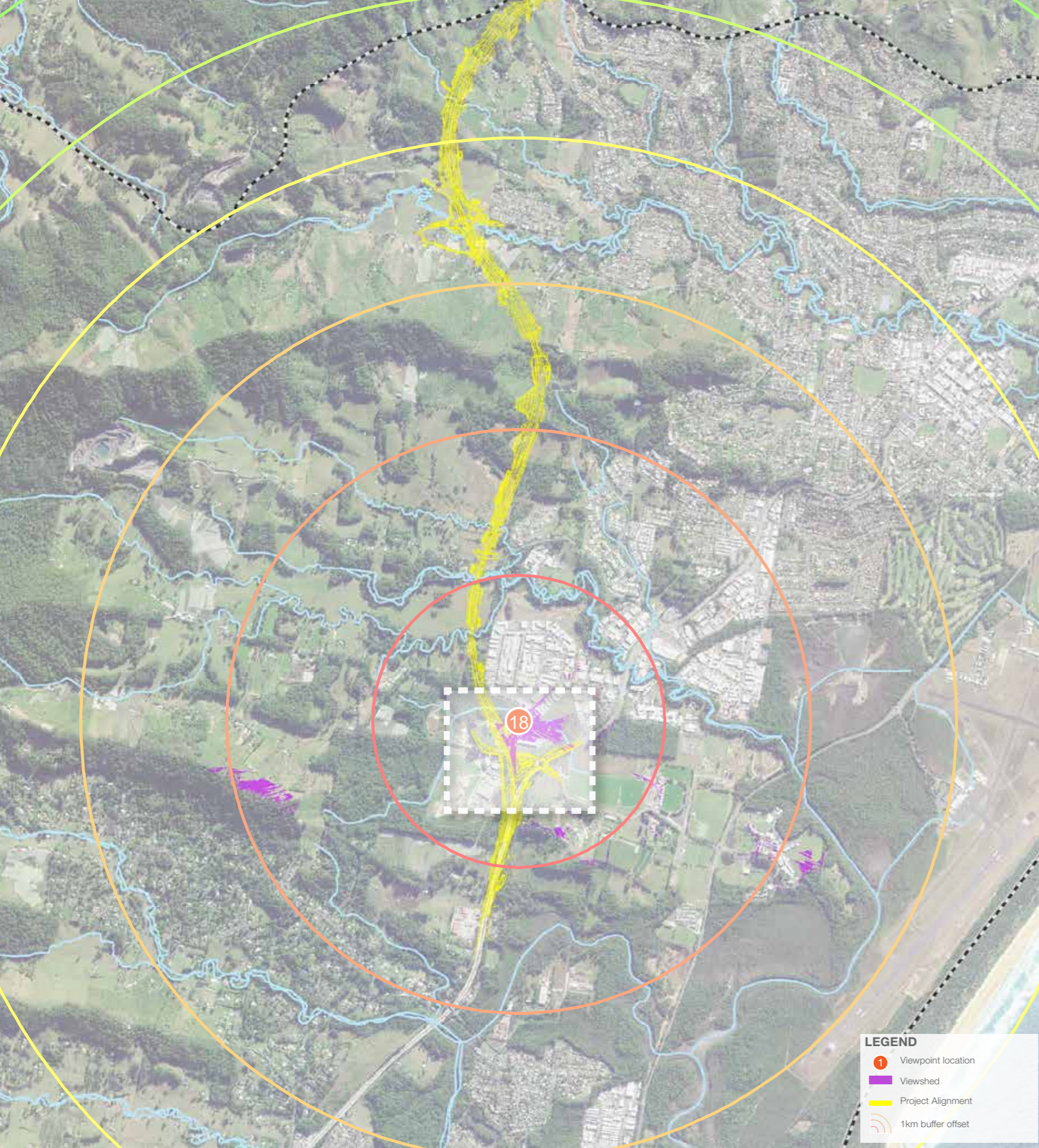


FIG 7.20 VIEWPOINT 18: VIEWSHED ANALYSIS

### Viewpoint 18: Isles Drive commercial



#### Embedded design mitigation

The landscape and urban design response includes:

- Feature interchange planting of wet sclerophyll forest mix to assist with integrating the proposed embankments

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix



### Magnitude of change

The magnitude of change arising from this project is considered to be *High* due to the following:

- Realignment of Isles Drive and introduction of Englands Road interchange exit ramp
- Introduction of a series of elevated bridge structure crossing Englands Road and Pacific Highway exit ramp.
- Clearance of vegetation to the north of the existing Coffs Coast Resource Recovery Park, south of the existing Englands Highway

### Impact

#### *Day time operation*

The *Low* sensitivity and *High* magnitude of change is judged to result in a *Moderate* adverse impact at this location.

#### *Night time operation*

The introduction of Englands Road interchange would provide a source of increased night time lighting, in addition to localised lighting associated with existing commercial buildings. The impact is judged to be *Low* on night time visual amenity from this location.

### *Construction*

The construction phase impacts will include the iterative removal of vegetation and a number of commercial buildings and the construction of the project works. In addition, the area of land to the north of the alignment will be utilised as an ancillary site. The construction phase impacts are assessed to be of a temporary nature and consistent with the operational phase impacts, resulting in a *Moderate* adverse impact.



FIG 7.21 VIEWPOINT 19: VIEWSHED ANALYSIS

### Viewpoint 19: Sawtell Road residential



#### Embedded design mitigation

As noted in the visual baseline section, the view is enclosed by mature vegetation that lines Boambee Creek.

The view towards the project is not anticipated to be achievable from this location and as a result, no embedded design mitigation is proposed for this viewpoint.



### **Magnitude of change**

The project will be situated approximately 300m to the west of this location.

The view towards to project would be restricted by vegetation lining the Sawtell Road bridge overpass and Boambee Creek. In the absence of any views towards to project, the magnitude of change would result in a *Negligible* change to the existing view.

### **Impact**

In the absence of any change, the impact is judged to be *Negligible* from this location during operation and construction.

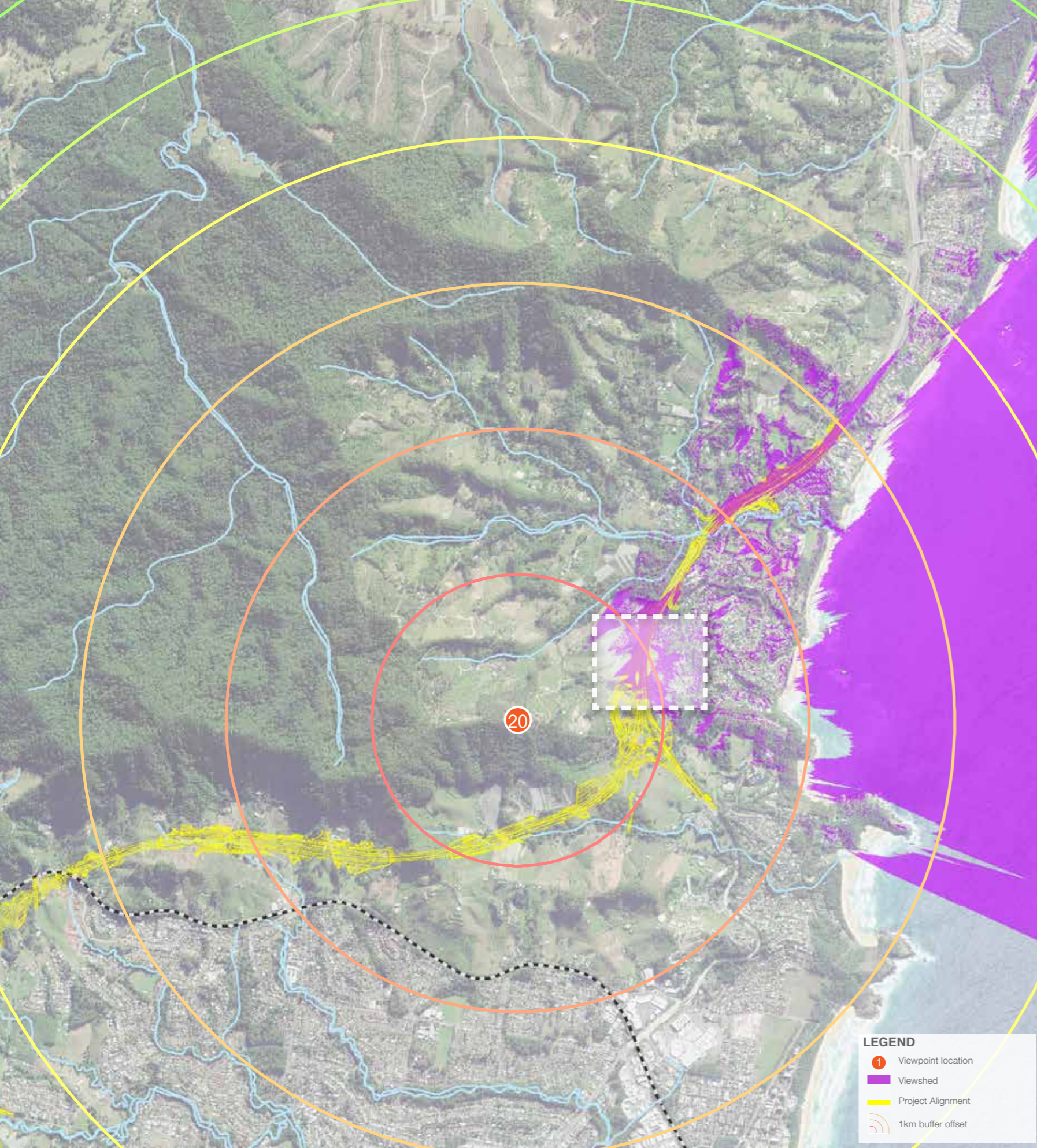


FIG 7.22 VIEWPOINT 20: VIEWSHED ANALYSIS

### Viewpoint 20: Korora Lookout



#### Embedded design mitigation

The landscape and urban design response includes:

- Planting to integrate the proposed embankments, including feature coastal-forest planting mix to strengthen the existing landscape character
- Noise wall pattern and design to relate to the local landscape character with planting to both sides
- Opportunities to explore framing views out from the project across the coastal landscape

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix



### Magnitude of change

The magnitude of change arising from this project is considered to be *Moderate* due to the following:

- Widening of the existing Pacific Highway, increasing the current width
  - Introduction of Korora Hill interchange entry ramp and associated earthworks to the west
  - Introduction of Eastern Service Road
  - New pedestrian bridge at Kororo Public school
  - Introduction of western local access road
- Removal of existing vegetation
  - Introduction of new noise walls

### Impact

#### *Day time operation*

The High sensitivity and Moderate magnitude of change is judged to result in a *High-Moderate* adverse impact at this location.

#### *Night time operation*

The introduction of Korora Hill interchange ramps with lighting columns would provide a source of increased night time light emittance. There is likely to be a Low-Moderate impact on night time visual amenity

#### *Construction*

The construction phase impacts are assessed to be of a temporary nature and consistent with the operational phase impacts as a result of the iterative removal of vegetation and construction of the earthworks, resulting in a *High-Moderate* adverse impact.



Viewpoint 20: Korora Lookout (project extents)





Viewpoint 20: Korora Lookout (embedded mitigation)

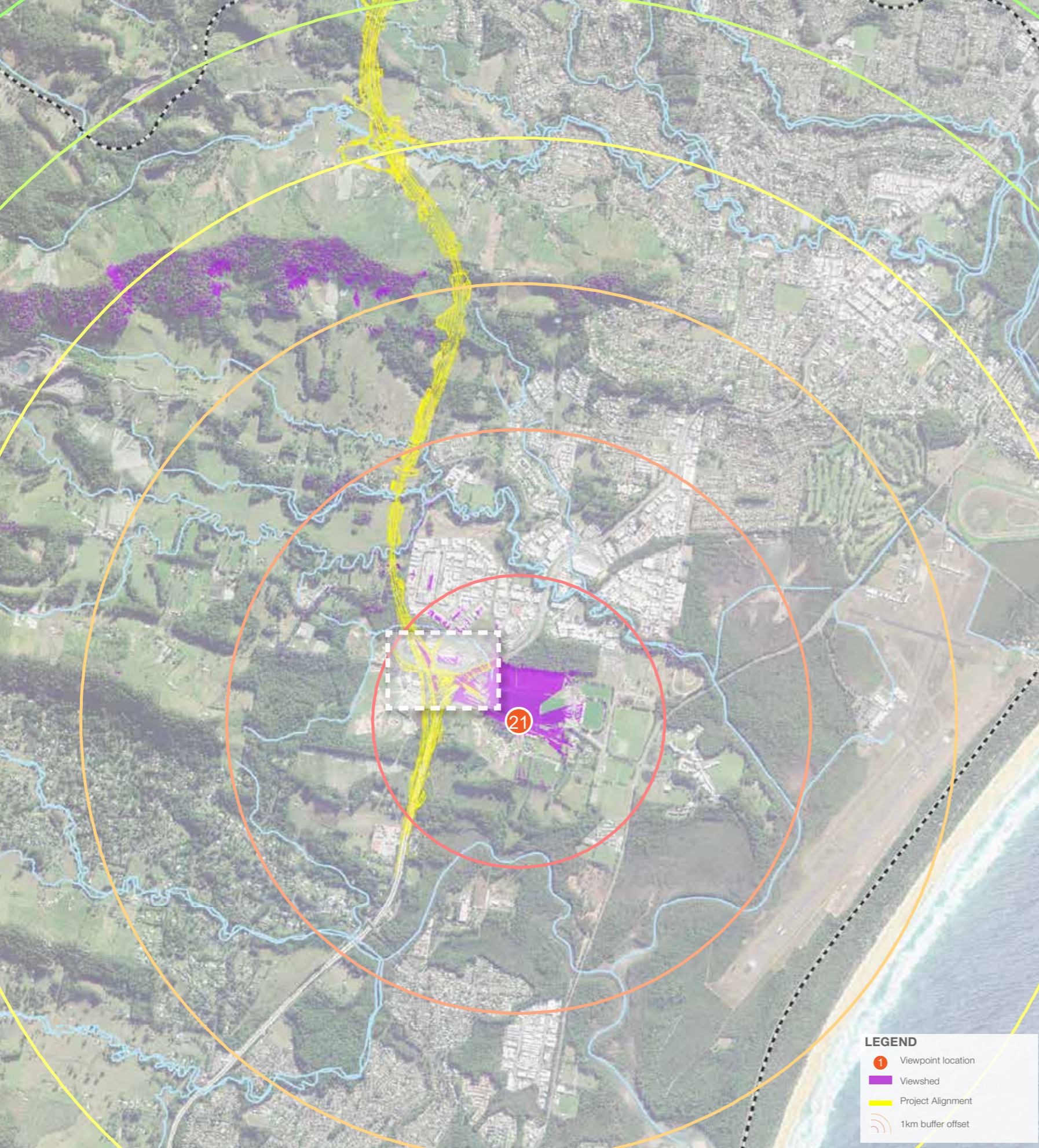


FIG 7.23 VIEWPOINT 21: VIEWSHED ANALYSIS

### Viewpoint 21: Coffs Coast Sports and Leisure Park



#### Embedded design mitigation

The landscape and urban design response includes:

- Planting to integrate the proposed embankments, including feature coastal-forest planting mix to strengthen the existing landscape character
- Noise wall pattern and design to relate to the local landscape character with planting to both sides

LEGEND	
	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix



### Magnitude of change

The magnitude of change arising from this project is considered to be *Moderate* due to the following:

- Widening of the existing Pacific Highway
- Realignment of Stadium Drive and tie in with Englands Road interchange entry ramp and associated earthworks to the west
- Realignment of Pacific Highway entry and exit ramps, including a series of bridge structures

### Impact

#### *Day time operation*

The Moderate sensitivity and Moderate magnitude of change is judged to result in a *Moderate* adverse impact at this location.

#### *Night time operation*

The Pacific Highway and Coffs Coast Sports and Leisure Park are currently lit. The introduction of additional lighting at Englands interchange is not anticipated to result in an adverse night time visual impact.

### *Construction*

The construction phase impacts will include the iterative removal of vegetation and construction of the project works. In addition, the area of land to the south of the realigned Stadium Drive will be utilised as an ancillary sites and batch plant during construction. During this stage, the magnitude of change is assessed to increase to *High*, resulting in a temporary *Moderate-High* adverse impact during construction.

### *Note:*

*Since the time of the site inspection, additional development has occurred, including the construction of the service station on the northern side of Stadium Drive. This development is not reflected in the photomontage on the preceding page.*



Viewpoint 21: Coffs Coast Sports and Leisure Park (project extents)



Viewpoint 21: Coffs Coast Sports and Leisure Park (embedded mitigation)

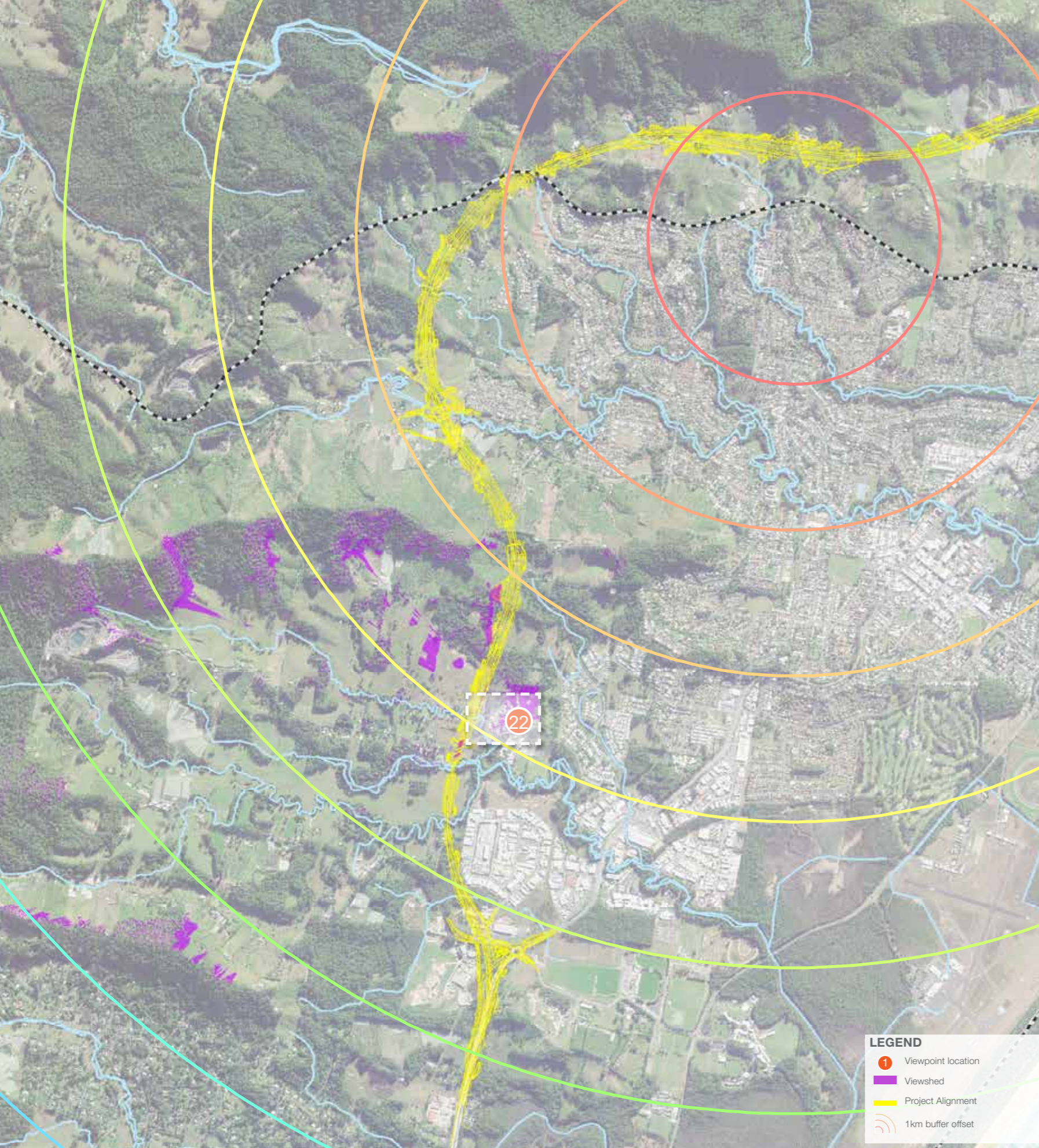
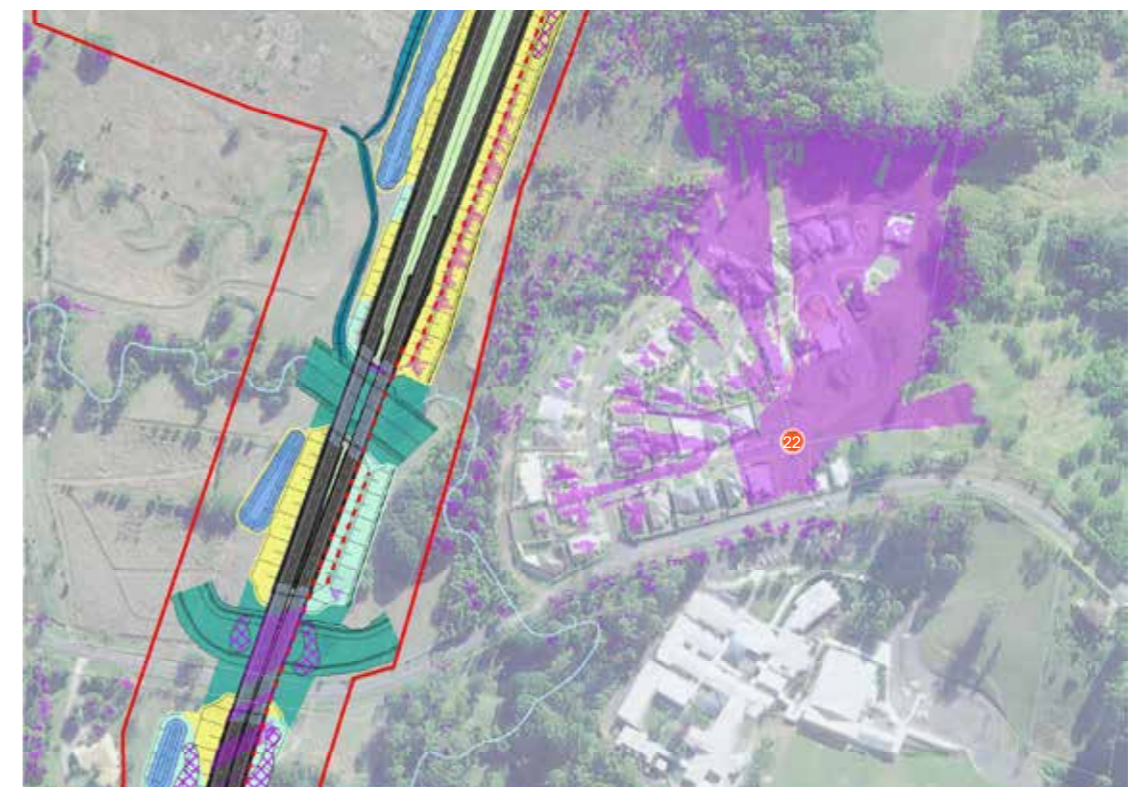


FIG 7.24 VIEWPOINT 22: VIEWSHED ANALYSIS

### Viewpoint 22: Jock Avenue



Grid: GDA 1994 MGA Zone 56 SCALE @A3 - 1:3,000  
0 50 100m

### Embedded design mitigation

The landscape and urban design response includes:

- Planting to integrate the proposed embankments through Boambee basin, including riparian corridor and native pastures mixes with tree groups to frame views out for motorists
- Noise wall pattern and design to relate to the local landscape character. The acoustic mitigation to the north will be a combination of a noise mound and a noise wall

**LEGEND**

	Retaining Wall
	Noise Wall
	Construction Boundary
	Viewshed
Planting:	
	Feature Trees
	Street Trees
	Tree Grouping
	Feature Planting
	Urban Corridor Planting Mix
	Local Road Planting Mix
	Median Planting
	Riparian Corridor
	Swale Planting
	Basin Planting Mix
	Portal Mix
Seeding:	
	Lowland Rainforest Mix
	Wet Sclerophyll Forest Mix
	Open Forest Mix
	Native Pasture Mix
	Corridor Frangible Mix



### Magnitude of change

The magnitude of change arising from this project is considered to be *Moderate* due to the following:

- Removal of vegetation within the construction footprint
- Introduction of the project, earthworks and a noise wall visible to the west and north of Jock Avenue

### Impact

#### *Day time operation*

The High sensitivity and Moderate magnitude of change is judged to result in a *Moderate-High* adverse impact at this location.

#### *Night time operation*

Night time visual impacts are not expected in this location.

#### *Construction*

During construction, the iterative removal of existing vegetation and commencement of earthworks would be particularly evident. Large scale machinery and equipment will be present within the construction footprint during this phase.

The construction phase impact is assessed to be of a temporary nature and consistent with the operational phase impacts, resulting in a *Moderate-High* impact.



Viewpoint 22: Jock Avenue (project extents)





Viewpoint 22: Jock Avenue (embedded mitigation)

# Summary

TABLE 7.1 LANDSCAPE CHARACTER SUMMARY ASSESSMENT - OPERATION

Landscape Character Zone	Sensitivity	Magnitude	Impact
1A: Englands Road	Low	Moderate	Low-Moderate
1B: Boambee basin	Moderate	High	Moderate-High
1C: Boambee and Roberts Hill Southern foothills	High	High	High
2A: Roberts Hill northern foothills	High	High	High
2B: The Bowl	Moderate	High	Moderate-High
2C: End Peak + Mackay Road Valley	High	Moderate	High-Moderate
2D: Gatelys Road Valley	High	Moderate	Moderate-High
3A: Korora basin and Foothills	High	High	High
3B: Korora Basin Edge	Moderate	Moderate	Moderate

TABLE 7.2 LANDSCAPE CHARACTER SUMMARY ASSESSMENT - CONSTRUCTION

Landscape Character Zone	Sensitivity	Magnitude	Impact
1A: Englands Road	Low	Moderate	Low-Moderate
1B: Boambee basin	Moderate	High	Moderate-High
1C: Boambee and Roberts Hill foothills Southern foothills	High	High	High
2A: Roberts Hill northern foothills	High	High	High
2B: The Bowl	Moderate	High	Moderate-High
2C: End Peak + Mackay Road Valley	High	Moderate	High-Moderate
2D: Gatelys Road Valley	Moderate	Moderate	Moderate-High
3A: Korora basin and Foothills	High	High	High
3B: Korora Basin Edge	Moderate	High	Moderate-High

TABLE 7.3 VISUAL IMPACT SUMMARY ASSESSMENT

Representative viewpoint	Sensitivity	Magnitude Operation	Day time operational impact	Night time operational impact	Construction impact
VP 1 Aqualuna Beach resort	Low	Negligible	Negligible	Negligible	Negligible
VP 2 Coachmans Close	Moderate	High	Moderate - high	Moderate	Moderate-High
VP 3 Luke Bowen footbridge	Moderate	Low	Moderate - Low	Negligible	Moderate
VP 4 Hills Beach Solitary islands coastal walk	Moderate	Negligible	Negligible	Negligible	Negligible
VP 5 Coffs Coast Regional Park (Diggers Head Trail)	High	Negligible	Negligible	Negligible	Negligible
VP 6 Residential edge (Charlesworth Bay Road)	Moderate	High	Moderate - High	Low	Moderate - High
VP 7 Macauleys Headland walking track	High	Moderate	Moderate - High	Low	Moderate-High
VP 8 Sealy lookout	High	High	High	Moderate	High
VP 9 Gatelys Road	High	High	High	Moderate-High	High
VP 10 Vera Drive	High	Negligible	Negligible	Low	Moderate
VP 11 Shephards Lane	High	High	High	Moderate-High	High

Representative viewpoint	Sensitivity	Magnitude Operation	Day time operational impact	Night time operational impact	Construction impact
VP 12 Bennetts Road	High	High	High	High	High
VP 13 Spagnolos Road residential	High	High	High	High	High
VP 14 Coffs Harbour CBD	Moderate	Negligible	Negligible	Negligible	Negligible
VP 15 Barrie Street	Moderate	Low	Low-Moderate	Negligible	Moderate
VP 16 Muttonbird Island Nature Reserve)	High	Moderate	High-Moderate	Negligible	Moderate-High
VP 17 North Boambee residential	High	Low	Moderate	Negligible	Moderate
VP 18 Isles Drive commercial	Low	High	Moderate	Low	Moderate
VP 19 Sawtell Road residential	Moderate	Negligible	Negligible	Negligible	Negligible
VP 20 Kororo lookout	High	Moderate	High - Moderate	Low-Moderate	High - Moderate
VP 21 Coffs Coast Sports and Leisure	Moderate	Moderate	Moderate	Negligible	Moderate-High
VP 22 Jock Avenue	High	Moderate	Moderate-High	Moderate	Moderate-High

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# Management of impacts

Chapter 6

Chapter 7

Chapter 8

Chapter 9

Appendix J



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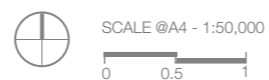
08

Management of impacts

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FIG 8.1 CONSTRUCTION FOOTPRINT



## 8.1 Introduction

This chapter captures ways to manage and mitigate the impacts associated with the design, construction and operation of the project.

## 8.2 Construction impacts

### Construction activities

The area required to facilitate the construction of the project is referred to as the construction footprint. This includes the area required for all work such as temporary and permanent drainage structures, temporary watercourse realignments, ancillary facilities and access roads. The construction footprint covers an area of approximately 282 hectares.

The construction footprint has been used to assess the disturbance of construction and the direct impact of the project. The construction footprint is indicative only and would be subject to refinement during detailed design and construction. Some factors that could affect the final construction footprint include the location and size of sediment basins, the construction methodology and arrangements made with directly affected landowners.

The project would likely be built using conventional methods used on most highway projects. These methods may be modified during the detailed design or construction stages to address site-specific environmental or engineering constraints.



## Assessment assumptions

The key construction activities that have the potential to result in adverse landscape and visual impacts include:

- Pre-construction and site establishment, including vegetation clearance, site establishment works, fencing and signage and establishment of site compounds
- Bulk earthworks, including stripping and stockpiling of topsoil, excavation of cutting, drilling and blasting, establishment of crushing plants, haulage of materials from excavation and construction of fill embankments, including benching and stabilisation
- Bridge works, including establishment of batching plants, preparation of bridge works, construction of foundations, abutments, piers, and superstructures, including deck and pavement works
- Construction of tunnels and tunnel portals
- Demolition of bridges (Luke Bowen footbridge and northern carriageway bridge over Pine Brush Creek) and buildings

- Road work and road surfacing including construction of temporary local traffic management diversions, construction of base and pavement layers, construction of concrete barriers and drainage and installation of traffic signals, road markings, road furniture and lighting
- The progressive delivery of the landscape treatments.

Refer to Chapter 6 of the EIS for further detail on the construction methodology.

## Landscape and visual assessment

The landscape and visual impacts arising from the construction phase have been assessed within Chapter 6 and 7 of this report.

In summary, landscape impacts during construction are anticipated to arise for each LCZ to varying degrees. Works between the operational boundary and the construction footprint are anticipated to be of a temporary nature and broadly allocated for the provision of construction phase activities, including stockpiling, batching plants, crushing plants, stockpiles and precast

facilities. On completion of the construction phase, subject to land owner agreement, these sites will be reinstated to the existing condition or in line with the direction provided within the landscape concept plans.

## Landscape and visual treatments

To mitigate adverse landscape and visual impacts, the following mitigation measures have been embedded in the project construction phase:

- Where feasible, retain and protect existing trees. Limit clearing and earthworks to the minimum required to establish the construction sites. Investigate measures to retain as many mature trees as possible
- In consultation with land owners, restore all areas disturbed by construction in accordance with the landscape concept plans, unless otherwise stated within chapter 9 of this report
- Develop ancillary facilities, including the locations of visible structures and plant and perimeter fencing and treatments to minimise visual impacts for adjacent receivers where feasible and reasonable.
- It is assumed that ancillary areas will be rehabilitated to their previous condition.
- Locate storage areas and associated works in cleared or otherwise disturbed areas away from residential areas where possible
- Consider aesthetics of site hoardings. Preference for neutral colours and designs in proximity help them blend into surrounding environment
- Ensure temporary site hoarding as well as any permanent fencing design is appropriate to the landscape character zone and fits sensitively into its surroundings
- Maintain site hoarding and perimeter site areas regularly to include the prompt removal of graffiti
- Design site lighting to minimise glare issues and light spillage into adjoining properties and be generally consistent with the requirements of Australian Standard 4282-1997 Control of the obtrusive effects of outdoor lighting.

## 8.3 Operational impacts

### **Mitigation incorporated in to the concept design**

As outlined within Chapter 4 of this report, an overarching landscape and urban design strategy has been prepared to ensure the project is sensitively, both physically and visually, integrated into the surrounding topography and landscape and urban setting.

Six landscape and urban objectives were developed based on The Pacific Highway Urban Design Framework. These objectives are to:

- Provide a flowing road alignment that is responsive and integrated within the landscape
- Provide a well vegetated, natural road reserve

- Provide an enjoyable, interesting highway with varied views and vistas of the landscape
- Value the communities and towns along the road
- Provide consistency in road elements
- Provide a simplified and unobtrusive road design.

These objectives have been embedded in the design development process, ensuring adverse impacts are mitigated through the design delivery where possible.

Within chapter 7: Visual Impact Assessment, reference has been made to the embedded mitigation measures for each of the representative viewpoints.

## 8.4 Management measures

The identification of impacts arising from the project that could eventuate during construction and operation of the project is central to the selection of appropriate environmental safeguards. The potential impacts, mitigation measures and future design development considerations have been captured to in Table 8.1.

A reflectivity study will be undertaken during detailed design to identify adverse reflective glare from the use of transparent panels in noise walls on road users and adjacent residential properties. An appropriate glazing design will be considered where issues are identified. The reflectivity study will also investigate the potential for glare impacts on road users associated with the morning sun for Shephards Lane and Gatelys Road tunnel.

The development of a Urban Design and Landscape Plan (UDLP) will be an essential component of the future design development stage.

Impact element	Potential impact	Indicative Mitigation Measures	Further design development and management documentation
Cuttings and cut finishes	<ul style="list-style-type: none"> <li>Landscape and visual impacts with regards to the integration and response to the existing land form</li> </ul>	<ul style="list-style-type: none"> <li>Landscape and rehabilitation plan to integrate earthworks where possible.</li> <li>Typical landscape and urban design treatments embedded within the design response.</li> <li>Revegetation to 2:1 batters to integrate surrounding landscape and provide a green corridor.</li> <li>Where batters are steeper than 2:1, careful consideration to be given to developing a landscape treatment that is complementary to the rural landscape context. Refer to chapter 4.</li> </ul>	<ul style="list-style-type: none"> <li>Design subject to further geotechnical investigations.</li> <li>Further exploration and investigation of appropriate landscape treatments to areas of rock cutting. Refer to chapter 5 for concept design treatments.</li> </ul>
Earthworks	<ul style="list-style-type: none"> <li>Landscape and visual impacts with regards to the integration and response to the existing landform</li> </ul>	<ul style="list-style-type: none"> <li>Embankments will be stabilised by the use of appropriate landscape treatments to 2:1 gradients</li> <li>Where feasible, revegetation to integrate earthworks and soften engineered appearance</li> </ul>	<ul style="list-style-type: none"> <li>Topsoil management plans to be developed to safeguard and support vegetation success.</li> <li>Further exploration and investigation of appropriate landscape treatments to areas of 2:1 earthworks.</li> </ul>
Vegetation removal	<ul style="list-style-type: none"> <li>Exposure to the project and impact on landscape character and existing visual amenity</li> </ul>	<ul style="list-style-type: none"> <li>Where feasible, vegetation will be retained and protected with the clearing and earthworks undertaken within the minimum requirements to establish the construction sites.</li> <li>Revegetation to respond to the landscape character zones and vegetation patterns to reduce landscape impact over time and screen views from visual receptors.</li> </ul>	<ul style="list-style-type: none"> <li>Landscape plans to be developed in line with the landscape and urban design concept, ensuring impacts are minimised where possible.</li> </ul>
Evening / night works	<ul style="list-style-type: none"> <li>Increased night time light emittance in a low light environment.</li> </ul>	<ul style="list-style-type: none"> <li>The use of night lighting will be minimised to that required for security and safety where possible during the construction phase and directed away from residential areas.</li> <li>Site compounds and areas surrounding them will be kept tidy and be regularly cleaned and maintained</li> </ul>	<ul style="list-style-type: none"> <li>Landscape plans to be developed in line with the landscape and urban design concept, ensuring impacts are minimised where possible.</li> <li>Develop ancillary facilities, including the locations of visible structures and plant and perimeter fencing and treatments to minimise visual impacts for adjacent receivers where feasible and reasonable</li> <li>Design site lighting to minimise glare issues and light spillage into adjoining properties and be generally consistent with the requirements of Australian Standard 4282-1997 Control of the obtrusive effects of outdoor lighting.</li> </ul>

Impact element	Potential impact	Indicative Mitigation Measures	Further design development and management documentation
Rehabilitation of disturbed land	<ul style="list-style-type: none"> <li>Clearance of existing agricultural land to accommodate construction activity</li> </ul>	<ul style="list-style-type: none"> <li>Undertake landscape and revegetation works in accordance with the Urban Design and Landscape plans</li> <li>Extent of vegetation clearance to be minimised where possible</li> <li>Locate storage areas and associated works in cleared or otherwise disturbed areas away from residential areas where possible.</li> <li>Use of indigenous plant species within the landscape design. The identification of the plant species will be undertaken in consultation with the identified knowledge holders. Consideration will be given to the engagement of local Aboriginal organisations in the revegetation process.</li> <li>Interpretative signage relevant to the cultural sites will be prepared in consultation with identified knowledge holders. Consultation with the knowledge holders will occur in regard to potential locations for the placement of the signage.</li> </ul>	<ul style="list-style-type: none"> <li>Development of a monitoring and maintenance plan for landscape and revegetation works and weed control to ensure successful rehabilitation outcomes in accordance with an Urban Design and Landscape Plan</li> <li>Develop ancillary facilities, including the locations of visible structures and plant and perimeter fencing and treatments to minimise visual impacts for adjacent receivers where feasible and reasonable</li> <li>Consider aesthetics of site hoardings. Preference for neutral colours and designs in proximity to open space to help them blend into surrounding environment.</li> </ul>
Bridge design	<ul style="list-style-type: none"> <li>Elevated structures resulting in impacts on the existing landscape character and visual amenity</li> </ul>	<ul style="list-style-type: none"> <li>Bridges design options development in accordance with RMS Guidance and Policy</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate design development of bridge structures, building on the landscape and urban design objectives</li> </ul>
Noise wall	<ul style="list-style-type: none"> <li>Elevated structures with a potential impact on the landscape character and visual amenity</li> </ul>	<ul style="list-style-type: none"> <li>Transparent noise walls in areas to reduce impact arising from elevated vertical features</li> <li>Urban design treatments to noise walls to relate the structures to the local landscape context</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate design development of noise walls, building on the landscape and urban design objectives</li> <li>Deliver of combined solid and transparent noise walls, balancing overshadowing and coastal view objectives</li> </ul>
Overshadowing	<ul style="list-style-type: none"> <li>Overshadowing impacts arising from noise walls, earthworks and structures</li> </ul>	<ul style="list-style-type: none"> <li>Implementation of the urban design objectives to reduce the height, scale and bulk of the infrastructure elements</li> <li>Transparent noise walls to reduce overshadowing</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate design development of infrastructure and urban design elements</li> </ul>

FIG 8.1 MANAGEMENT MEASURES

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# Conclusion

Chapter 6

Chapter 7

Chapter 8

Chapter 9

Appendix J



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An aerial photograph of a multi-lane highway interchange with several overpasses, set against a backdrop of rolling green hills and a clear blue sky. A semi-transparent green rectangular box is overlaid on the right side of the image, containing the number '09' in large white font. Below the number, the word 'Conclusion' is written in a smaller white font, followed by a thin white horizontal line.

09

Conclusion

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## 9.1 Integrated design outcomes

This report provides an overarching urban design strategy and concept that sensitively, both physically and visually, integrates the project with its surrounding topography, landscape and urban setting, minimising impact and maximising the scenic and road user experience where possible.

As part of this process the report provides:

- A review of the existing context, landscape character and visual amenity
- A clear vision for the project with clear objectives and supporting principles
- Urban design concept plans to deliver on the urban design vision, objectives and principles and embed the landscape and visual mitigation measures within the project

- An assessment of the potential landscape and visual impacts that may arise as a result of the project
- A summary of the management measures to be included to deliver on the mitigation measures during the future design development

In developing the project, this report has enabled a variety of concepts and initiatives to be tested and reviewed in terms of the ability to mitigate impacts and optimise the overall concept design.

## 9.2 Embedded mitigation

The integration of the engineering and performance objectives with urban and landscape design objectives has aimed to produce a design outcome that fits sensitively with the existing qualities and characteristics of the area. In order to achieve this, a range of mitigation measures have been incorporated into the project as the design developed.

These measures combine to develop a solution that seeks to protect and enhance the existing character of Coffs Harbour, where possible.

The mitigation measures that have been undertaken during the development of the urban and landscape design concept are summarised below.

### Interchanges

Each of the interchanges has been developed to define important markers along the project, providing key entry points to Coffs Harbour.

Englands Road interchange provides a southern entry point for northbound motorists with the provision for a landscape treatment that respects the character of

the area and considered views. Coramba Road interchange responds to the natural wetland landscape with the provision of earthmounding and intermittent trees to frame views out where appropriate. This has been balanced with the requirement to screen views from visual receptors where appropriate. Korora Hill interchange would define a new northern interchange to Coffs Harbour CBD and has been approached as a key landmark on the Pacific Highway journey.

### Noise attenuation

The noise attenuation locations and extents have been determined through a noise and vibration assessment. Based on this information, potential locations for noise wall and mounds have been identified. Exact heights and locations will be further investigated during detailed design. The noise attenuation approach embeds noise mitigation options that are influenced by location, including solid noise walls and transparent noise walls.

### Bridges

The proposed bridge concept designs respond to the degree of visibility of the bridge to maximise urban design outcomes. In general, there are four types of bridges. Higher visibility bridges span over the bypass, local roads or key landscape settings, with lower visibility over creeks. The embedded four bridge types include:

- Landmark bridges
- Bridges over the highway
- Highway bridges over local roads
- Highway bridges over creeks and property access points.

### Retaining walls

The retaining wall extents and locations have been determined through a civil and structural design assessment. Based on this information an urban design strategy has been formulated according to the context of where the wall faces. Five types of finishes have been defined which respond to the location, height, length and structural type. This approach has been embedded within the design development.



## 9.3 Assessment

The project would pass through a series of predominantly rural LCZs, encompassing Boambee Valley, Coffs Harbour basin and foothills and Korora basin and foothills. The contrast between the rural landscape and the introduction of a road corridor results in adverse landscape impacts, with the impacts becoming more elevated where the project is at a variance with the natural topography.

Areas of cuttings and embankments are assessed to appear incongruous with the natural land form, with elevated structures bridging topographical undulations and heightening the presence of the project. Over time, the implementation of the landscape and urban design concept plans will assist with integrating the project and screening views to the project.

The landscape and visual impacts along the length of the project vary and are influenced by the ability for the landscape to accommodate change and screen views.

In summary, the introduction of elevated bridge structures, removal and severance of the existing agricultural field pattern and the introduction of cuttings and embankments to negotiate the undulating terrain, result in moderate to high impacts. Where the project aligns with existing urban features, such as the Pacific Highway tie-in at Englands Road, the landscape would have the ability to accommodate a degree of change, reducing the overall level of impact and resulting in an incremental enlargement of the highway and the associated infrastructure.

In addition to the representative views captured within this report, an analysis of properties with existing coastal views has been undertaken.

In summary, properties analysed to the south are generally positioned on lower terrain with limited opportunities for coastal views. Generally, the introduction of the project is not anticipated to result in a loss to ocean views at this location.

Further north, it is anticipated that a number of properties with glimpse views towards the coastlines would experience a reduction in their coastal view.

On the eastern slopes of Orara East State Forest, the introduction of Korora Hill interchange and the elevated road structure over Fernleigh Avenue have the potential to result in isolated areas of ocean view reduction. Refer to Appendix D Coastal Views for assessment findings.

An overshadowing analysis has been undertaken to identify potential impacts on the surrounding landscape. In summary, the overshadowing primarily occurs within the construction footprint boundary, with isolated areas along the length that extend beyond the boundary as a result of elevated bridges, noise walls and earthworks. This is evident in the vicinity of bridge 23, bridge 05, Tiffany Close, Kororo Public School and potential properties in development at Sunset Ridge. At these locations, solid noise walls have been proposed to capture the potential worst case scenario with regards to overshadowing.

Both the overshadowing analysis and the coastal views analysis identify opportunities for design refinement of the noise walls during the detailed design stage regarding use of transparent panels. However, the use of transparent panels would need to be

considered in conjunction with the potential for associated glare impacts which could result in road user safety concerns or nuisance impacts to adjacent residential properties. The potential for glare impacts arising from full length transparent panels will be considered during this future design stage. In addition, given the alignment of Shephards Lane and Gatelys Road tunnel, the potential for glare impacts associated with the morning sun for northbound road users will also be investigated.

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Sub-appendix A

# Crime prevention through environmental design

Sub-appendix A

Sub-appendix B

Sub-appendix C

Sub-appendix D

Sub-appendix E

Chapter 9



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An aerial photograph showing a multi-lane highway curving through a lush, green landscape. The highway is flanked by dense vegetation and trees. In the background, there are rolling hills and a coastline with buildings and a body of water under a clear blue sky.

## Appendix A

# Crime Prevention through Environmental Design

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# 1.0 Introduction

## 1.1 Overview

The project forms part of the Pacific Highway upgrade program which, when complete, will provide free flowing dual carriageway conditions for the Pacific Highway between Hexham and the Queensland border. The project will upgrade around 14 km of the Pacific Highway at Coffs Harbour, starting from south of the Englands Road interchange connecting with the upgraded Sapphire to Woolgoolga section in the north.

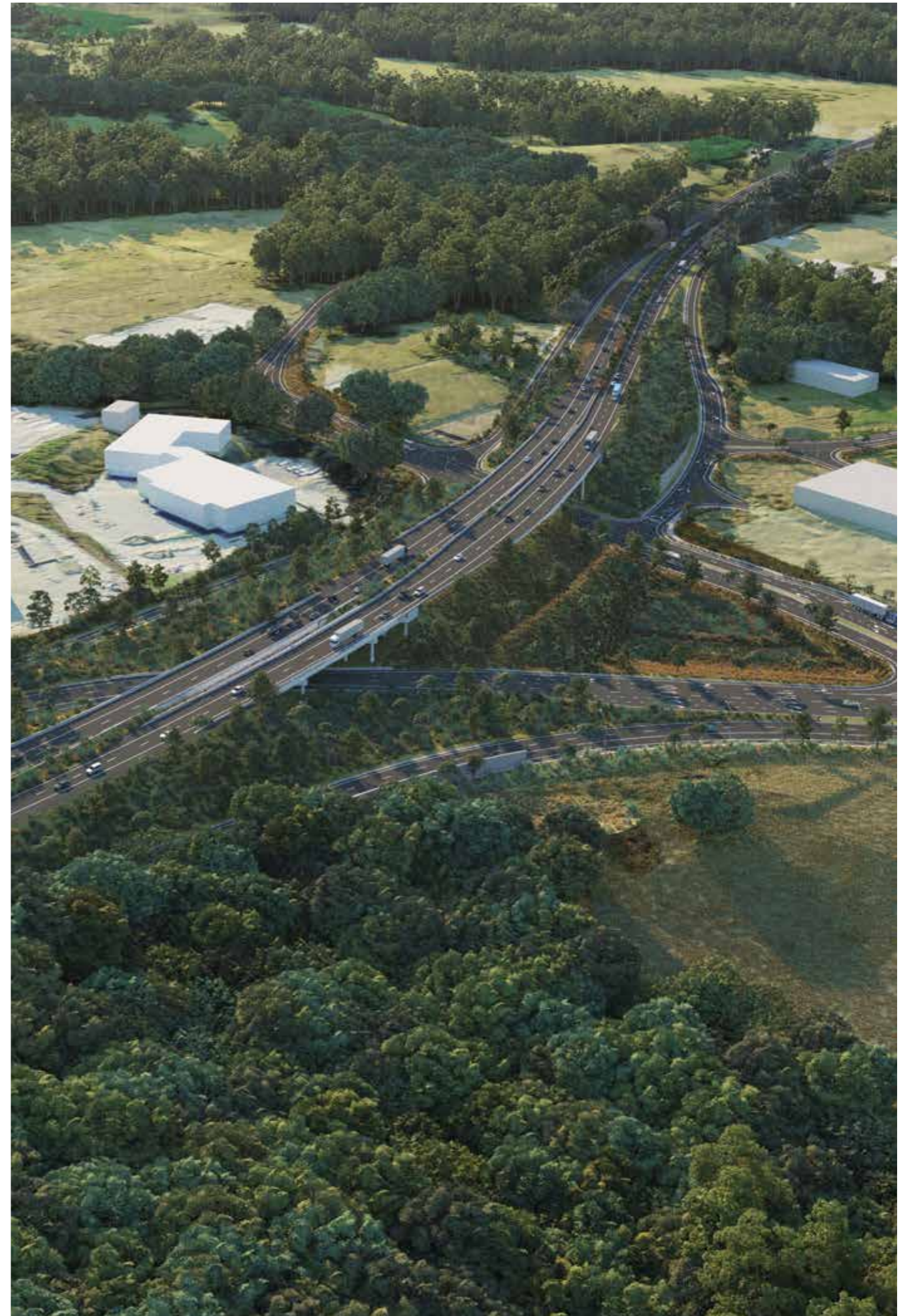
## 1.2 Study purpose

This study has been developed to provide a high level overview of industry accepted Crime Prevention Through Environmental Design (CPTED) guidelines applicable to this project. The study aims to demonstrate how these guidelines should be applied to the project concept design to drive a resilient outcome.

## 1.3 Assumptions

Below are a list of assumptions for this study:

- An in-depth crime analysis will be undertaken for the Coffs Harbour area in collaboration with the local authorities and the NSW Police.
- A full CPTED audit will be developed as part of the detailed next phase of the project, which includes an implementation framework that responds to the crime analysis, outlining specific measures to be delivered for the alignment where there is an identified risk.
- The recommendations in this report convey a 'common sense' approach to implementation of the CPTED guidelines, developing CPTED responses for 'typical' alignment scenarios that will be applicable along the length of the project.



## 2.0 CPTED guidelines

### 2.1 CPTED theory

CPTED is the use of design and space management principles in order to influence human behavior. CPTED is a crime prevention strategy based on the proper planning, design and structure of cities, neighbourhoods, precincts or individual sites to incorporate proactive crime prevention characteristics into the built environment, which can lead to a reduction in the fear and incidence of crime, as well as an improvement in quality of life.

The design of a particular space has to ensure that the intended activity can function properly and directly support the control of behaviour, in order to reduce the opportunity for crime. Any development with a CPTED objective, should therefore attempt to incorporate a broad range of elements that underpin good CPTED design. These are further elaborated in the following sections.

### 2.2 Method

In development of a rigorous framework for a CPTED analysis this study looks to well established industry guidelines to provide the mechanism for analysis. These guidelines include those from NSW and Queensland, which provide a well rounded approach to CPTED.

Research, guidance and experience suggest certain design and policy approaches can be adopted to reduce opportunities for crime. It is not possible to guarantee that actual crime will be reduced or eliminated if these suggestions and/or recommendations are implemented.

In NSW, CPTED requirements are also addressed by the Safer Design programs in each NSW Police Local Area Command.

The need for CPTED is also covered in the North Coast Regional Plan 2036 and in particular Goal 3 Vibrant and Engaged Communities. Further “*Beyond the Pavement 2014*” and “*Safer Designed Places 2018*” also includes direction and guidance for CPTED in RMS road projects.

### Environmental Planning and Assessment Act, NSW

In 2001 the Minister for Planning introduced ‘Crime prevention and the assessment of development applications – guidelines under section 79C of the Environmental Planning and Assessment Act 1979’. These CPTED guidelines define two approaches to CPTED Part A - a crime risk assessment approach, or Part B - a design principle approach used to minimise crime risk. (It is noted that as of 1 March 2018, changes to the EP&A Act 1979 came into effect, with section 79C now being amended to be referenced as section 4.15 of the EP&A Act.)

#### Part A - Crime Risk Assessment

Part A states the following two important steps when assessing crime risk:

- Obtain an understanding of the crime risk of the area, and if required

- Apply CPTED treatments that directly respond to the levels of risk present in the area.

Part A advocates a collaborative approach involving local authorities and the NSW Police. It also recommends CPTED planning be undertaken by designers who have attended the Safer By Design course run by the NSW Police.

#### Part B - Principles for Minimising Crime Risk

The guidelines outlines four principles that need to be used in the assessment of development applications to minimise the opportunity for crime:

- Surveillance
- Access control
- Territorial reinforcement
- Space management.

### CPTED guidelines for Queensland

The principal source for guidelines on the application of CPTED in Queensland is the publication Crime Prevention through Environmental Design: Guidelines for Queensland (Queensland Government, 2007).

This comprises two documents: Part A: Essential features of safer places; and Part B: Implementation Guide.

The Guidelines clarify that: “the word “safety” will be used in the sense of “safety from criminal assault by others” or security. This of course does not lessen the importance of designing our built environments to seek to provide safety from accidental injury.” (Part A, p6)

The Guidelines are structured around six principles, comprising:

- Surveillance
- Legibility
- Territoriality
- Ownership
- Management
- Vulnerability

### DTMR Road Landscape Manual

In addition to the CPTED Guidelines for QLD, The Department of Transport and Main Roads, Road Landscape Manual (DTMR, 2013) identifies that:

“A Crime Prevention Through Environmental Design (CPTED) assessment is required during preliminary and detailed design phases. Issues should be assessed and designs adjusted if required to enable close out prior to implementation” (2.5.2).

The Manual advocates a collaborative approach and notes that “consultation with local authorities, the Queensland Police Service, local schools and community groups may also facilitate awareness of key target areas” (5.3.1).

It identifies that the principles contained in the CPTED Guidelines for Queensland should be applied holistically to any open and/or enclosed publicly accessible space within the road corridor. This includes:

- Parking areas
- Pedestrian walkways
- Cycle routes
- Rest areas
- Bridge overpasses
- Pedestrian underpasses
- Bus shelters/platforms



## 2.3 CPTED principles

Based on the industry standards mentioned under section 2.2 of this study, the following are CPTED principles used as the basis of the assessment:

- Surveillance
- Legibility
- Territoriality
- Ownership
- Management, and
- Vulnerability.

The following provides the framework in which to guide design thinking for the next phase of the project.

### Surveillance

People feel safer in places where they can see and be seen by other people. With this in mind, locations where there is going to be pedestrian/cycle activity along the corridor the design needs to consider this function. The design outcome must maximise surveillance opportunities of all these areas/spaces associated with the alignment. This surveillance is to consider clear vantage points from within the alignment, surrounding roads, footpaths, adjoining homes, and corridor users. This means identifying areas where concealment can occur, or obstructions (such as vegetation) preventing surveillance, and suggesting possible solutions to consider in the next stages of design.

This principle avails decision making and avoidance of potential issues, and fosters user confidence. Note: Discussion of sightlines and surveillance is outside of the requirements associated with road design.

### Access control

Aims to provide reassurance to users that they are not trespassing, or in areas where they should not be, where harm may occur. Defining extents of land, in this case vehicle corridors, ensures safety for pedestrians and cyclists. In addition, defining paths of travel for cycle and pedestrian keeps them out of each other's way. This access control can be achieved through Landscaping or other physical boundaries to channel and group people. Note: Definition of space must also consider other guidelines/requirements.

### Territorial reinforcement

Ownership of space helps people relate to and feel positively about being in that space. This can be achieved through clear definition of what the space is to be used for and clear identification of the boundary between public and private space.

This provides reassurance to users, not only knowing what level of protection/surveillance is being applied to the space, but the rules that govern the use.

### Space management

This is important to keep/maintain surveillance and demarcation of uses to ensure ongoing safety for users. As a secondary benefit to this guideline, neglected spaces also attract /encourage criminal activity. While this is a post construction activity, consideration will be made in the design for ease of maintenance, and highlighting the importance of maintenance.

### Legibility

The outcome should facilitate movement, allowing people to orientate themselves easily while navigating the space, preventing confusion for users, and assist users to find their way from the site to the surrounding area. This guideline includes Wayfinding, appropriate signage and demarcation of uses. A space that is easily interpreted creates user confidence and thus users visiting the space, which assists with surveillance.

### Vulnerability

This principle governs design for vulnerable users of society, or limiting aspects of the design which promote locations or opportunity that make users vulnerable to harm. It is important that the landscape and urban design enables community cohesion and helps to deliver safe, active and lively environments along the project.





## 3.0 Assessment

### 3.1 Local context

The project is located within a mostly rural context with some smaller areas of low density residential adjacent. The stretch of the highway from Coramba Road interchange to the existing Pacific Highway is located in an urban setting with residential and commercial land uses adjacent.

The project is predominantly for vehicle transport, with minimal provision for cyclists outside of road shoulders and pedestrian walkways except in areas where these are existing over-bridges and where provisions have been made at interchanges. The project would provide a bus interchange adjacent to the Kororo Public School and Luke Bowen footbridge.

The likely users of the project would be:

- Through-traffic users of the Pacific Highway
- Visitors to Coffs Harbour accessing the CBD via the interchanges
- Local residents using highway and interchanges to move around Coffs Harbour
- Local residents using private underpasses to access private property
- Public transport users riding buses and accessing the Coramba bus interchange

- Kororo Public School staff and students using buses and walking to and from bus stop
- Local and regional cyclists.

### 3.2 Road elements

The project is made up of the following road elements. Only those with an impact on crime risk have been listed and assessed. These are as follows:

- Road shoulders
- Underpasses
- Over bridges
- Noise walls
- Retaining walls
- Pedestrian bridges
- Bus stops
- Drainage structures
- Maintenance bays
- Emergency stopping/breakdown bays.



### 3.3 Applying CPTED principles

The assessment applies the 6 principles of CPTED to each of the common road elements of the project.

#### Road shoulders

- Clear sightlines to and from all road shoulders to allow passive surveillance from other road users
- Adequate lighting along full length of alignment, lighting levels and design to be confirmed with lighting designer in detailed design stage
- Planting immediately adjacent road shoulders to be kept low and visually permeable, plants to a maximum height maturity of 700mm while trees must be a species capable of having first 3m of trunk clear of foliage
- Limit areas of concealment around batters, tie in points, and interfaces, which may provide opportunity for graffiti, or people throwing items onto the roadway
- Clear definition of space, outlining where it's safe to stop, or spaces where it's unsafe. This could include signage, and or demarcation (line marking)

#### Underpasses

- Clear sightlines through the underpass from the approach on either end and mitigation of concealment areas or compromised sightlines
- Surveillance of underpasses, including approach on both sides, are to be visible from multiple locations/vantage points within the surrounding context.
- Lengths of underpasses to be kept short to improve user confidence, longer underpasses to incorporate additional exit points
- Planting within 25m to be kept low and visually permeable, plants to a maximum height maturity of 700mm while trees must be a species capable of having first 3m of trunk clear of foliage
- The underpasses are to be clearly lit.
- Wing walls and interior surfaces to be painted with graffiti guard or with materials that are easily cleaned to prevent graffiti
- Vandal resistant parabolic mirrors to promote visibility
- Cycle and pedestrian areas are to be clearly marked
- Wayfinding and signage to be included as required
- DDA compliance is a driver of the physical design.



FIG A.1 CLEARLY LIT AND VISIBLE ROAD SHOULDERS.



FIG A.2 PLANTING TO ALLOW FOR SURVEILLANCE, LOW PLANTING ADJACENT TO THE ROADWAY AND TREES WITH HIGHER CANOPY (CLEAR TRUNKS) LIMITING CONCEALMENT.



FIG A.3 WIDE PEDESTRIAN UNDERPASS. WHERE AN UNDERPASS NEEDS TO BE LONG, HAVING A DAY LIGHT OR OPEN SECTION HALF WAS IMPROVES THE USER EXPERIENCE.



FIG A.4 UNDERPASS WITH CLEAR SIGHT LINES, UNOBSTRUCTED APPROACHES AND CLEARLY LIT UNDERNEATH.

### Over bridges

- Urban design elements made from robust materials and well constructed to prevent vandalism
- Surveillance of bridges, including approach on both sides, are to be visible from multiple locations/vantage points within the surrounding context
- A risk assessment should be done to determine the need for throw screens. Visually permeable throw screens will notify drivers below of bridge users.

### Noise walls

- As an impediment to graffiti on noise walls they should be constructed using techniques/materials that deter/repel graffiti such as textured or patterned concrete, and acrylic panels
- Surveillance of noise walls will act as a deterrent to graffiti, or in the case of transparent materials remove the opportunity to hide behind the walls
- The design should restrict access behind noise walls removing opportunity for concealment
- Noise walls are to be painted with a graffiti proof paint or incorporate materials that are easily cleaned
- Noise walls are to be made from robust materials, and be well constructed to prevent vandalism

- Where noise walls are accessible provisions are to be made to allow visual permeability utilising acrylic paneling
- A design solution, either as a physical or painted outcome, should have a local connection to provide a sense of community ownership.

### Retaining walls

- Similar to noise walls, as an impediment to graffiti retaining walls should be constructed using techniques/materials that deter/repel graffiti such as textured or patterned concrete
- Retaining walls are to be painted with a graffiti proof paint or incorporate materials that are easily cleaned
- A design solution, either as a physical or painted outcome, should have a local connection to provide a sense of community ownership.



FIG A.5 AN ACRYLIC NOISE BARRIER.



FIG A.6 A CONCRETE NOISE WALL WITH TEXTURE/PATTERNED FINISH.



FIG A.7 EXAMPLE OF A THROW SCREEN ON A LOCAL ACCESS BRIDGE.



FIG A.8 A THROW SCREEN ADJACENT A BRIDGE WITH PEDESTRIAN FOOT TRAFFIC (BEING INSTALLED).

### Pedestrian bridges

- Pedestrian bridges to be adequately lit for the full length of the bridge and at all approaches
- Throw screens to be installed to both sides of pedestrian bridges
- Design should provide clear sightlines to and along the length of the bridge. Approaches should also be kept clear of obstruction
- Planting within 25m of the approach are to be kept low and visually permeable, plants to a maximum height maturity of 700mm while trees must be a species capable of having first 3m of trunk clear of foliage
- Provide passive surveillance from contextual areas through the use of visually permeable materials, and by positioning the bridge adjacent to roads, the highway, and residential/commercial activity areas
- Create a sense of ownership of the bridge through naming, which provides identification of who manages or owns the bridge. Urban design can provide local connection also

- Cycle and pedestrian areas are to be clearly marked, while wayfinding and signage should be used to inform user decision making/journey planning
- Bridge construction is to consider robust materials, and be well constructed to prevent vandalism. Design should also allow visual permeability for users all along the bridge
- DDA compliance is a driver of the physical design.



FIG A.9 TEXTURED/PATTERNED FINISH TO A WALL.



FIG A.10 A FULLY ENCLOSED PEDESTRIAN BRIDGE WITH VISUALLY PERMEABLE MATERIALS.



FIG A.11 SINGLE SPAN BRIDGE - HOGE BRUGE PEDESTRIAN BRIDGE



FIG A.12 A PEDESTRIAN BRIDGE WITH CLEAR SIGHT LINES ALONG THE LENGTH AND CLEARLY LIT.

### Bus stop and bus interchanges

- Adequate lighting within the interchange, to all bus bays and within bus shelters, lighting levels and design to be confirmed with lighting designer in detailed design stage
- Clear definition of space in terms of where the bus will stop and where the waiting areas are through the use of lines and signage
- Bus stops and waiting areas should be positioned where they have clear visibility from surrounding areas for improved passive surveillance
- Bus shelters should be visually permeable in design and construction materials to allow users to easily see whether there are people present within or around the structures
- Area surrounding the bus shelters area to be clear of obstructions, all furniture elements should also be placed in a way that they don't cause physical or visual obstructions
- Wayfinding and journey planning information should be easily visible and closely located
- Help points located visibly at bus interchange allow active response to crime
- Consider installing CCTV and signs informing people that CCTV will provide reassurance to users and an active deterrent
- Planting should be kept low around bus interchanges positioned in places where they don't cause physical or visual obstructions to the bus shelters. Gardens to be used as a method of controlling pedestrian and user movements
- In the scenario of a forest located adjacent to a bus stops, fencing should be used in between the forest and the bus stop to prevent quick offender attack and retreat. This also provides reassurance to users.



FIG A.13 AN EXAMPLE OF A BUS SHELTER WITH GOOD VISUAL PERMEABILITY AND FREE OF OBSTRUCTIONS.



FIG A.14 A BUS SHELTER WITH LEGIBLE AND WELL LIT SIGNAGE AND INFORMATION.



FIG A.15 CLEARLY LIT BUS SHELTER.



FIG A.16 A BUS INTERCHANGE WITH CLEAR DEFINITION OF WAITING ZONE.

# 4.0 Conclusion

## 4.1 Summary

These CPTED Guidelines have been used to assess generic road elements along the project. These have followed a 'common sense' approach in lieu of a crime risk assessment with the local authorities and NSW Police, and a detailed CPTED audit. Due to the nature of the project, and the likely users to be predominately vehicle traffic, the crime risks and subsequent CPTED responses are rudimentary. The following section will outline the next steps to be taken to provide a more targeted CPTED response, in line with the detailed design of the project.

## 4.2 Next steps

### **Crime assessment**

A concise analysis of the crime risks, involving local authorities and the NSW police, should be undertaken for the areas along the length of the project. This will inform a detailed CPTED audit, assessing the likely risk of crime, and develop targeted measures around any potential crime hot spots.

### **Detailed CPTED Audit**

Using the concise crime assessment as a framework, a detailed CPTED report should be developed for the project. This would identify key areas with an increased risk for crime and detail CPTED counter measures to reduce this risk. This study will also form part of the framework for the detailed CPTED audit.

### **Lighting design**

The detailed design phase of the project should identify a full lighting design for the corridor in accordance with relevant legislation and Australian Standards. The lighting design is to work in collaboration with the detailed CPTED audit, responding to recommendations made in the audit.

### **Integrating CPTED design principles in detailed design**

The detailed design phase of the project should incorporate CPTED design principles as part of the development process, ensuring the principles are integrated into the design effectively.

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Sub-appendix B

# Residual land treatments

Sub-appendix A

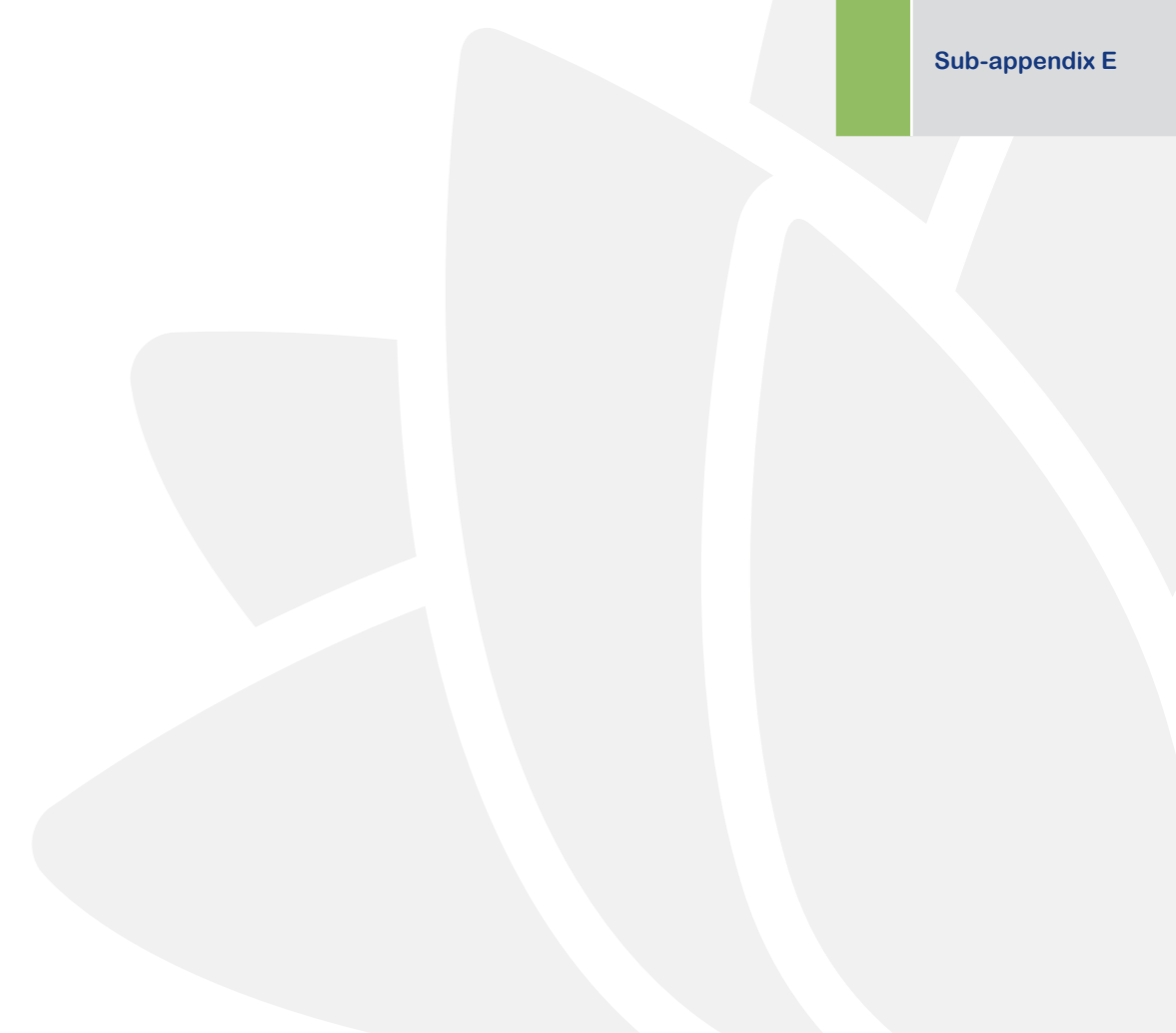
Sub-appendix B

Sub-appendix C

Sub-appendix D

Sub-appendix E

Chapter 9



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# Appendix B

## Residual Land Treatment

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# 1.0 Introduction

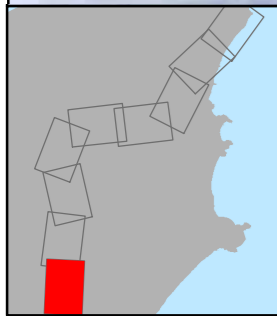
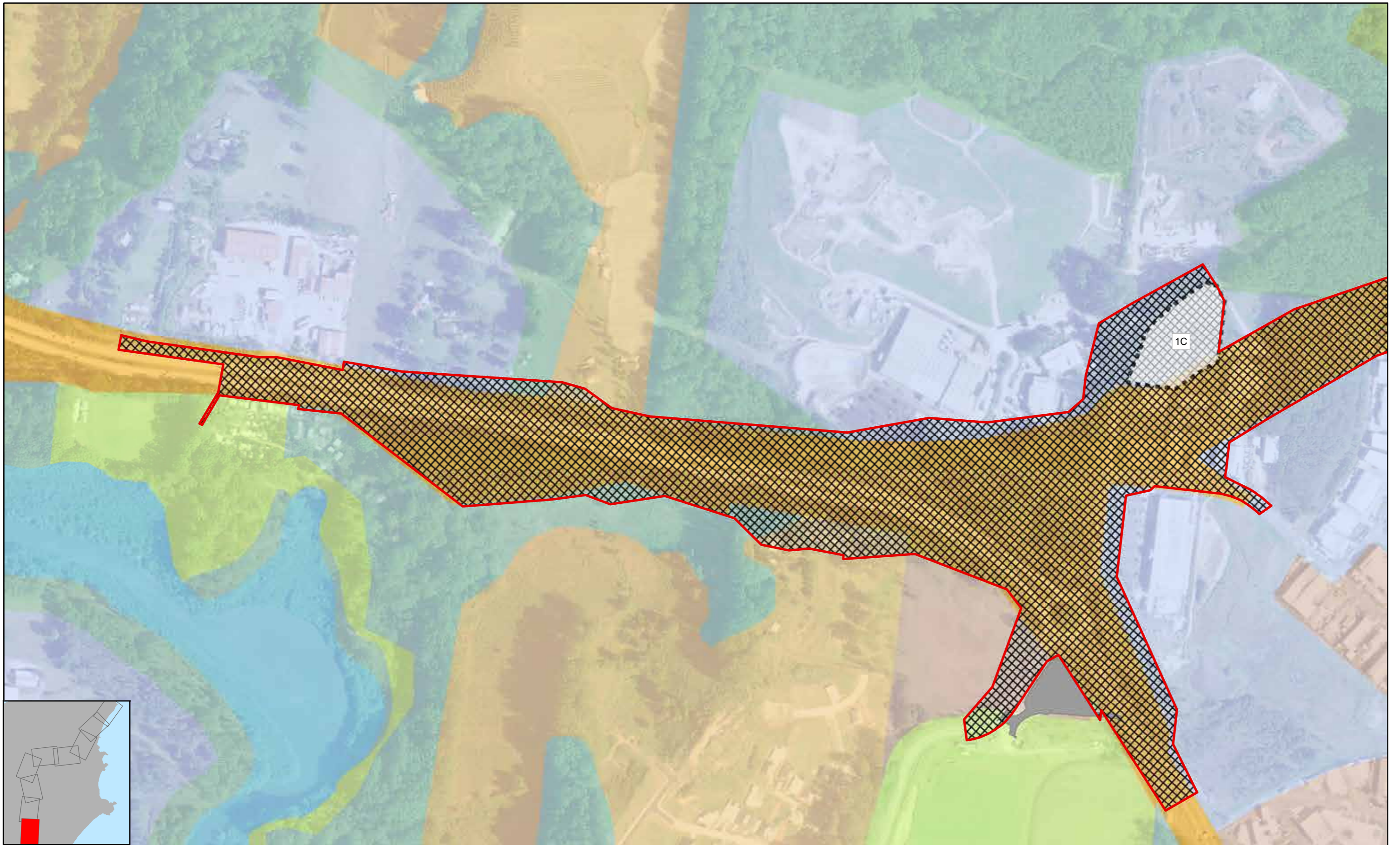
This chapter has been prepared to outline the potential future land use opportunities for acquired ancillary sites on completion of the works.

Refer to table 1 for the potential land use and the following drawings for the ancillary site locations.

Potential future use of potential ancillary site locations	ID
To be disposed of by Roads and Maritime Services completion of the project without change to zoning. End use will be determined by purchaser.	1C
To be disposed of by Roads and Maritime Services at completion of the project without change to zoning. End use will be determined by purchaser.	1D
To be disposed of by Roads and Maritime Services at completion of the project without change to zoning. End use will be determined by purchaser.	1G
Roads and Maritime Services own the land that the detention basin is located on. Anticipated that the land would be transferred to CHCC at completion of the project, subject to agreement.	2A
To be disposed of by Roads and Maritime at completion of the project without change to zoning. End use will be determined by purchaser.	2B
To be disposed of by Roads and Maritime at completion of the project without change to zoning. End use will be determined by purchaser.	2C
To be disposed of by Roads and Maritime at completion of the project without change to zoning. End use will be determined by purchaser.	2D
To be disposed of by Roads and Maritime at completion of the project without change to zoning. End use will be determined by purchaser.	2E
To be disposed of by Roads and Maritime at completion of the project without change to zoning. End use will be determined by purchaser.	2G
To be disposed of by Roads and Maritime at completion of the project without change to zoning. End use will be determined by purchaser.	3B
To be disposed of by Roads and Maritime at completion of the project without change to zoning. End use will be determined by purchaser. If land cannot be sold, would be revegetated as part of the Korora Hill interchange.	3C
To be disposed of by Roads and Maritime at completion of the project without change to zoning. End use will be determined by purchaser.	3D
To be disposed of by Roads and Maritime at completion of the project without change to zoning. End use will be determined by purchaser.	3E
To be disposed of by Roads and Maritime at completion of the project without change to zoning. End use will be determined by purchaser.	3G

TABLE 1. **FUTURE LAND USE CONSIDERATIONS**

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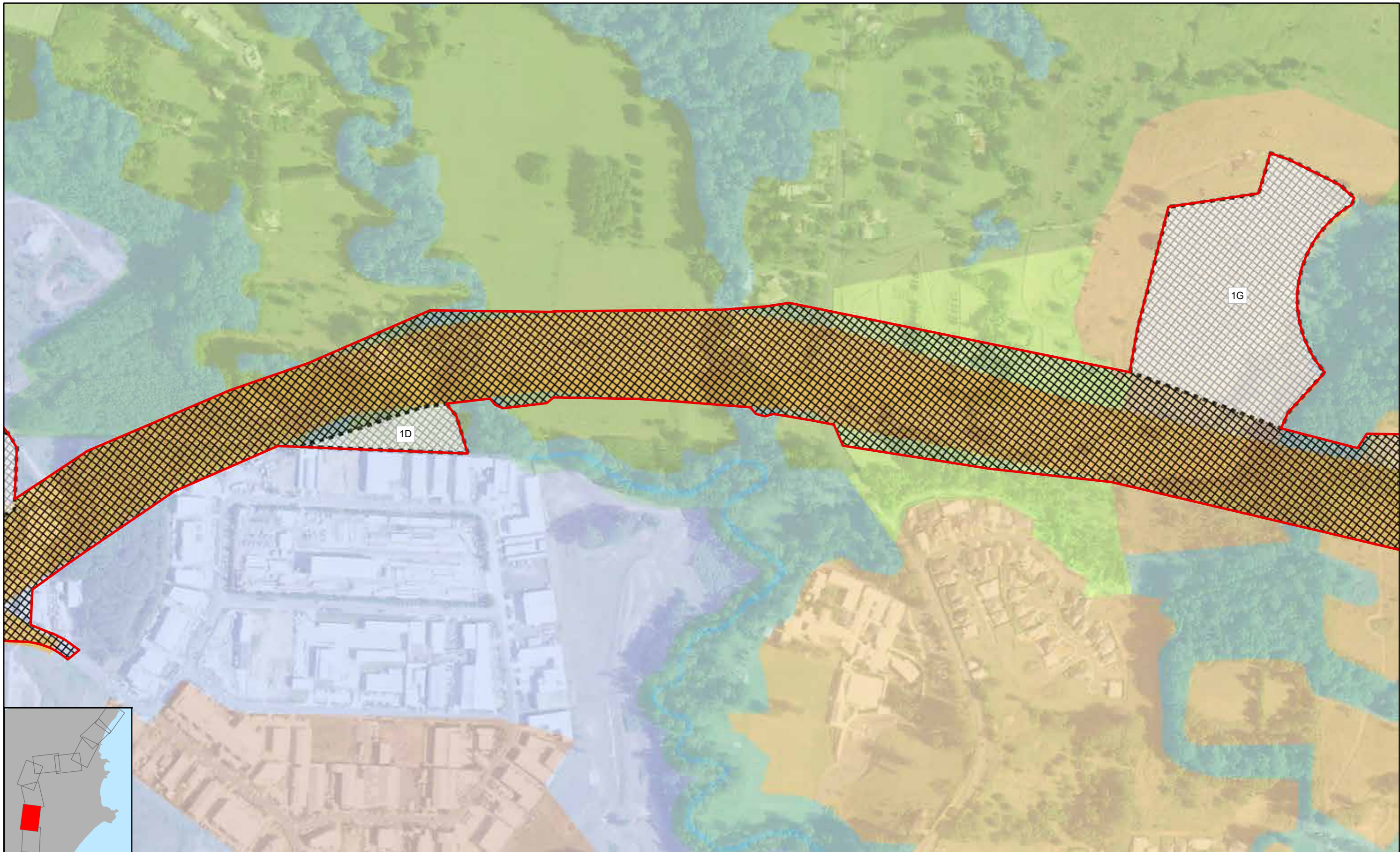
**Legend**

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|-------------------------------|--|-------------------------|-------------------------------|-------------------------------|------------------------|---------------------------|
| Construction Footprint        | <b>Land Zoning</b><br><b>LEP2013_ZNEFULL</b> | B4 Mixed Use            | E2 Environmental Conservation | R2 Low Density Residential    | RE2 Private Recreation | SP3 Tourist               |
| Potential ancillary sites     | B1 Neighbourhood Centre                      | B5 Business Development | IN1 General Industrial        | R3 Medium Density Residential | RU2 Rural Landscape    | W1 Natural Waterways      |
| Acquisition Status Boundaries | B2 Local Centre                              | B6 Enterprise Corridor  | IN3 Heavy Industrial          | R4 High Density Residential   | RU3 Forestry           | W2 Recreational Waterways |
|                               | B3 Commercial Core                           | DM Deferred Matter zone | IN4 Working Waterfront        | R5 Large Lot Residential      | SP1 Special Activities |                           |
|                               | E1 National Park and Nature Reserves         | R1 General Residential  | RE1 Public Recreation         | SP2 Infrastructure            |                        |                           |

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Grid: GDA 1994 MGA Zone 56



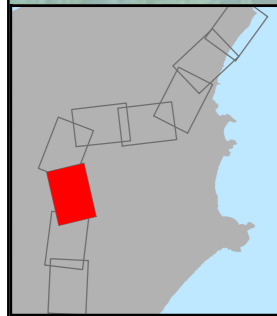
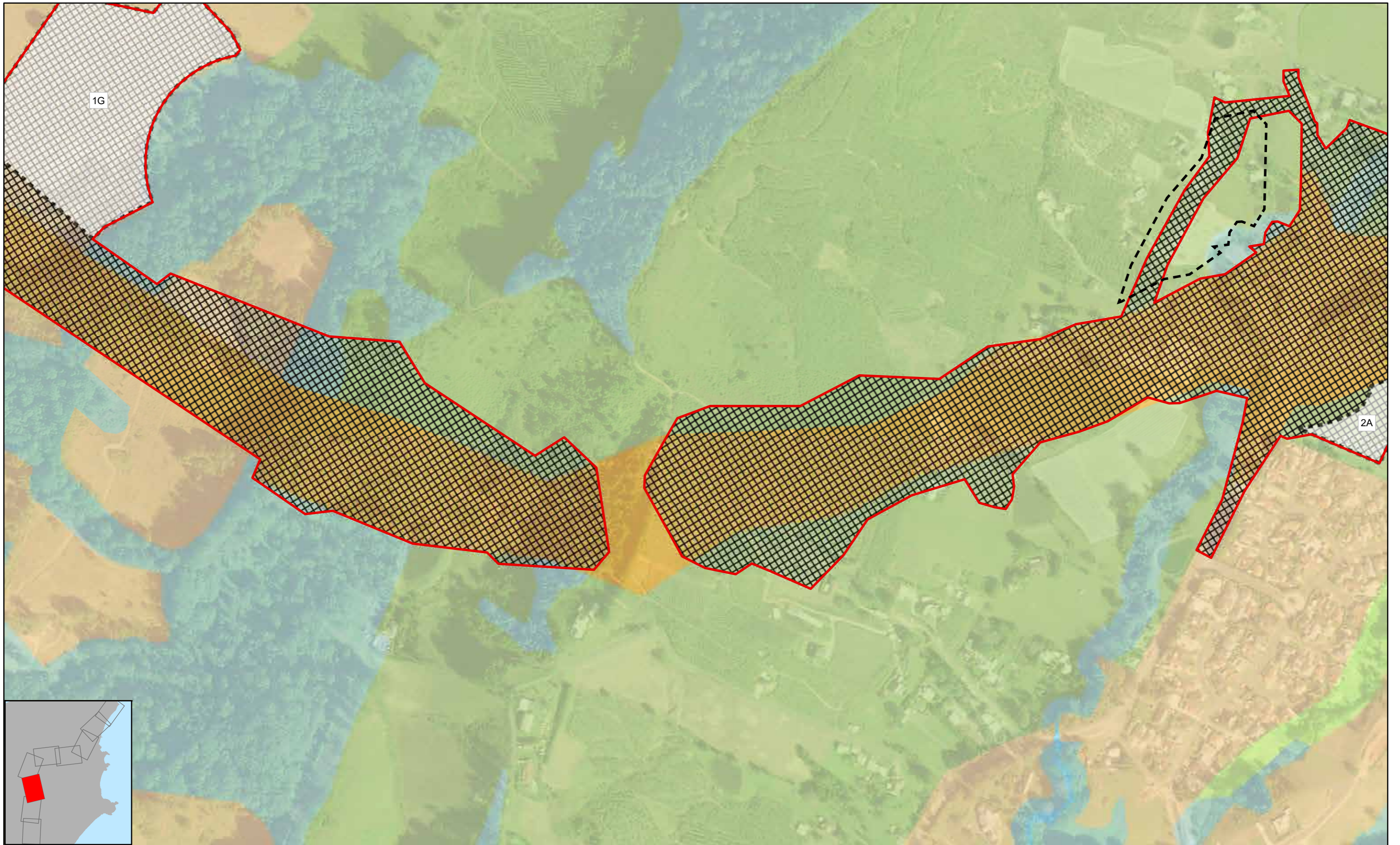
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| Construction Footprint        | <b>Land Zoning</b><br><b>LEP2013_ZNEFULL</b> | B4 Mixed Use            | E2 Environmental Conservation | R2 Low Density Residential    | RE2 Private Recreation | SP3 Tourist               |
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|                               | E1 National Park and Nature Reserves         | R1 General Residential  | RE1 Public Recreation         | SP2 Infrastructure            |                        |                           |

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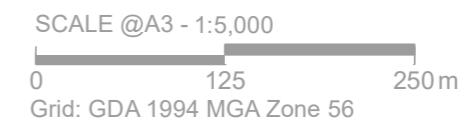


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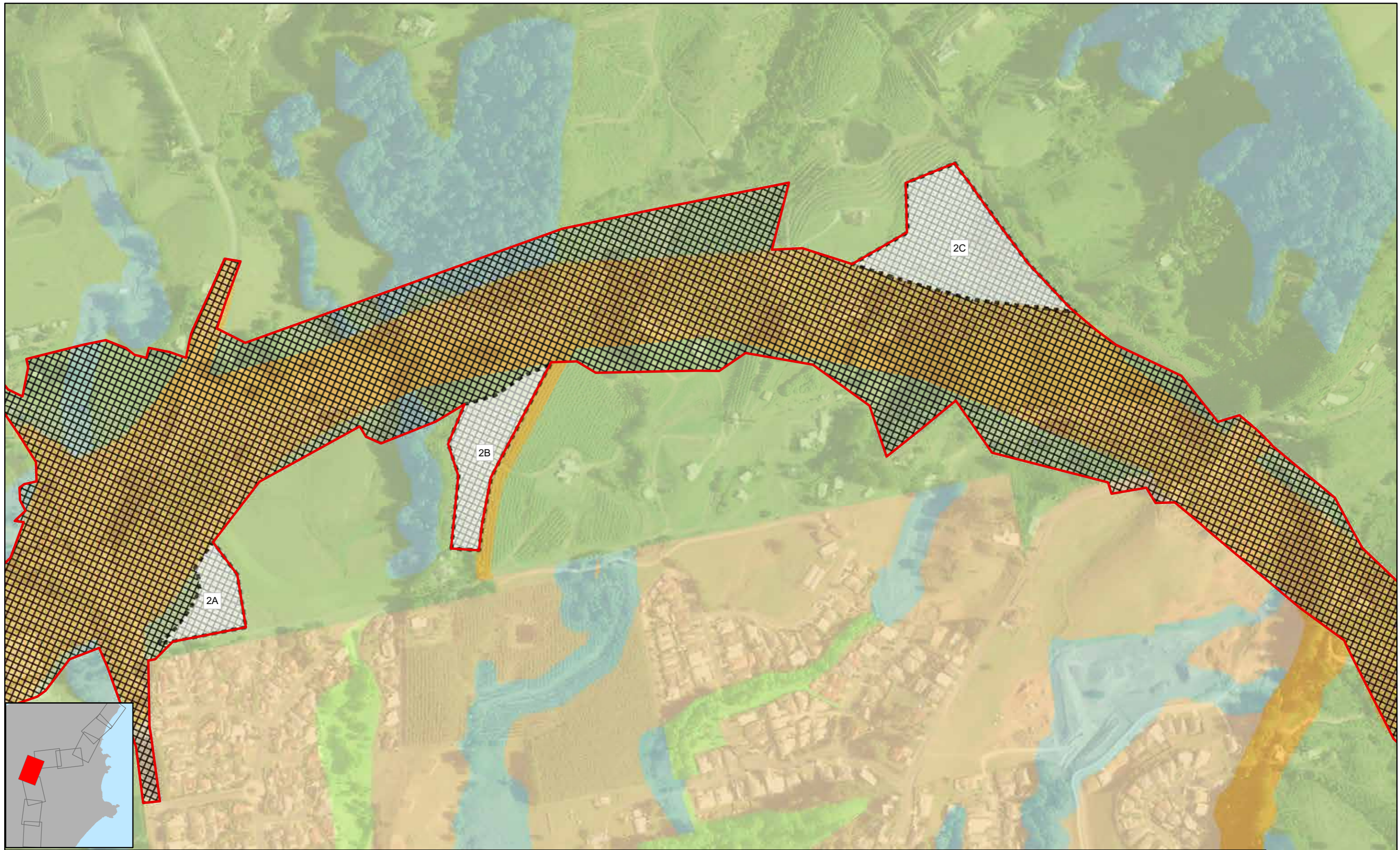


**Legend**

Construction Footprint	<b>Land Zoning</b> <b>LEP2013_ZNEFULL</b>	E2 Environmental Conservation	R2 Low Density Residential	RE2 Private Recreation	SP3 Tourist
Potential ancillary sites	B1 Neighbourhood Centre	IN1 General Industrial	R3 Medium Density Residential	RU2 Rural Landscape	W1 Natural Waterways
Acquisition Status Boundaries	B2 Local Centre	IN3 Heavy Industrial	R4 High Density Residential	RU3 Forestry	W2 Recreational Waterways
	B3 Commercial Core	IN4 Working Waterfront	R5 Large Lot Residential	SP1 Special Activities	
	E1 National Park and Nature Reserves	R1 General Residential	RE1 Public Recreation	SP2 Infrastructure	
	B4 Mixed Use				
	B5 Business Development				
	B6 Enterprise Corridor				
	DM Deferred Matter zone				







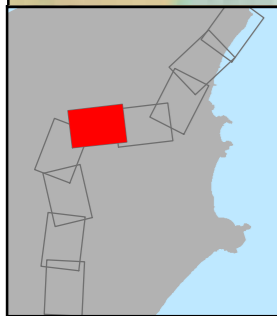
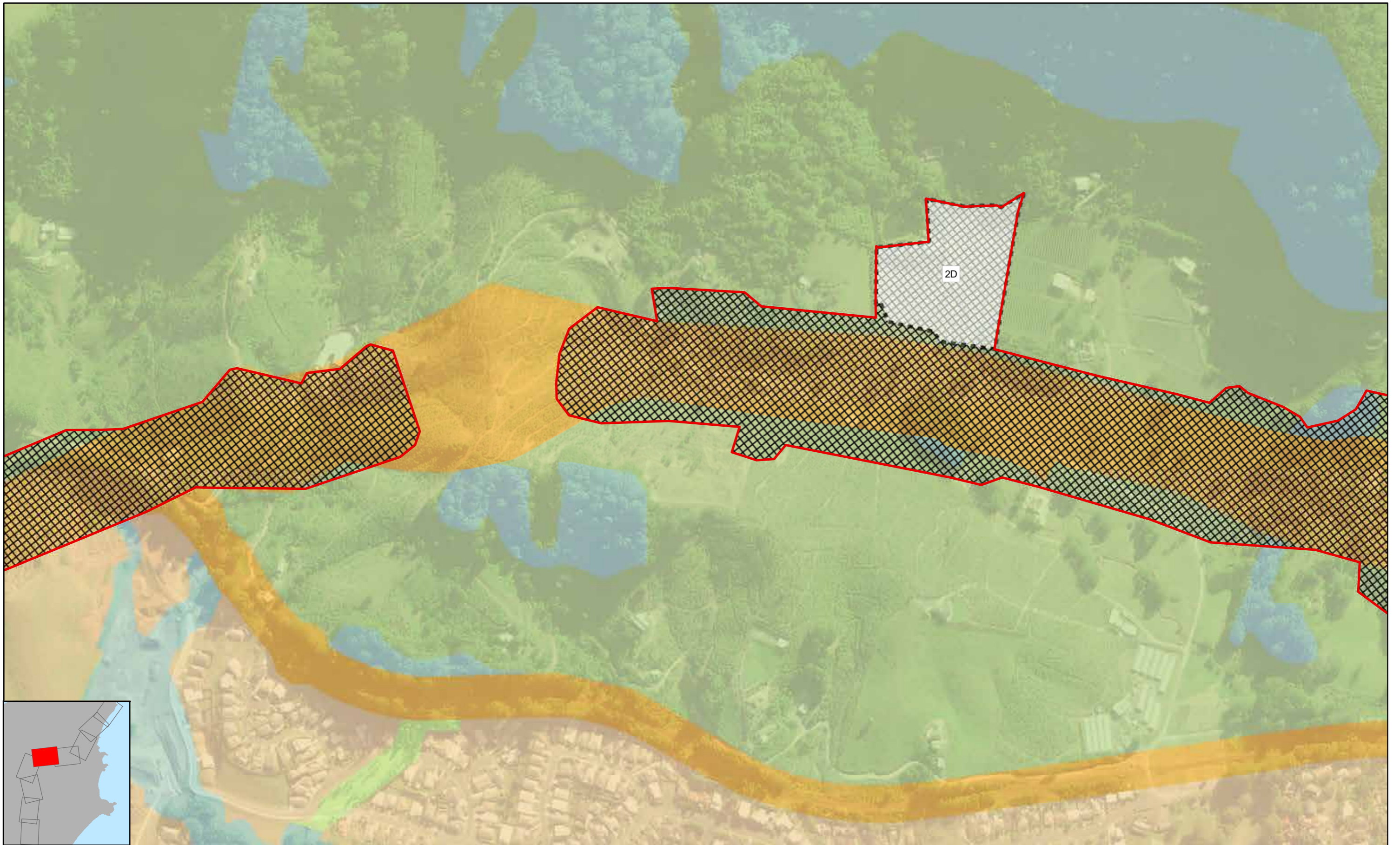
**Legend**

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|-------------------------------|-------------------------|--------------------------------------|-------------------------------|-------------------------------|------------------------|---------------------------|
| Construction Footprint        | <b>Land Zoning</b>      | B4 Mixed Use                         | E2 Environmental Conservation | R2 Low Density Residential    | RE2 Private Recreation | SP3 Tourist               |
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|                               | B2 Local Centre         | DM Deferred Matter zone              | IN4 Working Waterfront        | R5 Large Lot Residential      | SP1 Special Activities |                           |
|                               | B3 Commercial Core      | E1 National Park and Nature Reserves | R1 General Residential        | RE1 Public Recreation         | SP2 Infrastructure     |                           |

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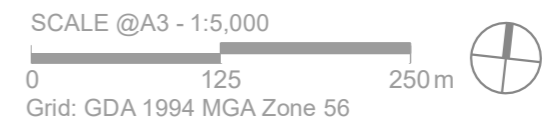


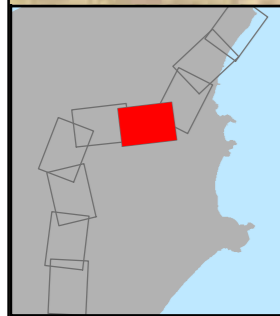
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**Legend**

Construction Footprint	<b>Land Zoning</b> <b>LEP2013_ZNEFULL</b>	B4 Mixed Use	E2 Environmental Conservation	R2 Low Density Residential	RE2 Private Recreation	SP3 Tourist
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	B3 Commercial Core	DM Deferred Matter zone	IN4 Working Waterfront	R5 Large Lot Residential	SP1 Special Activities	
	E1 National Park and Nature Reserves	R1 General Residential	RE1 Public Recreation	SP2 Infrastructure		





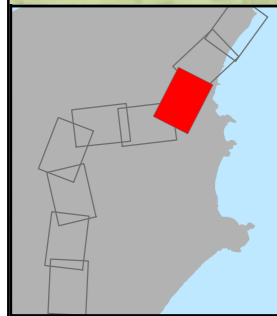
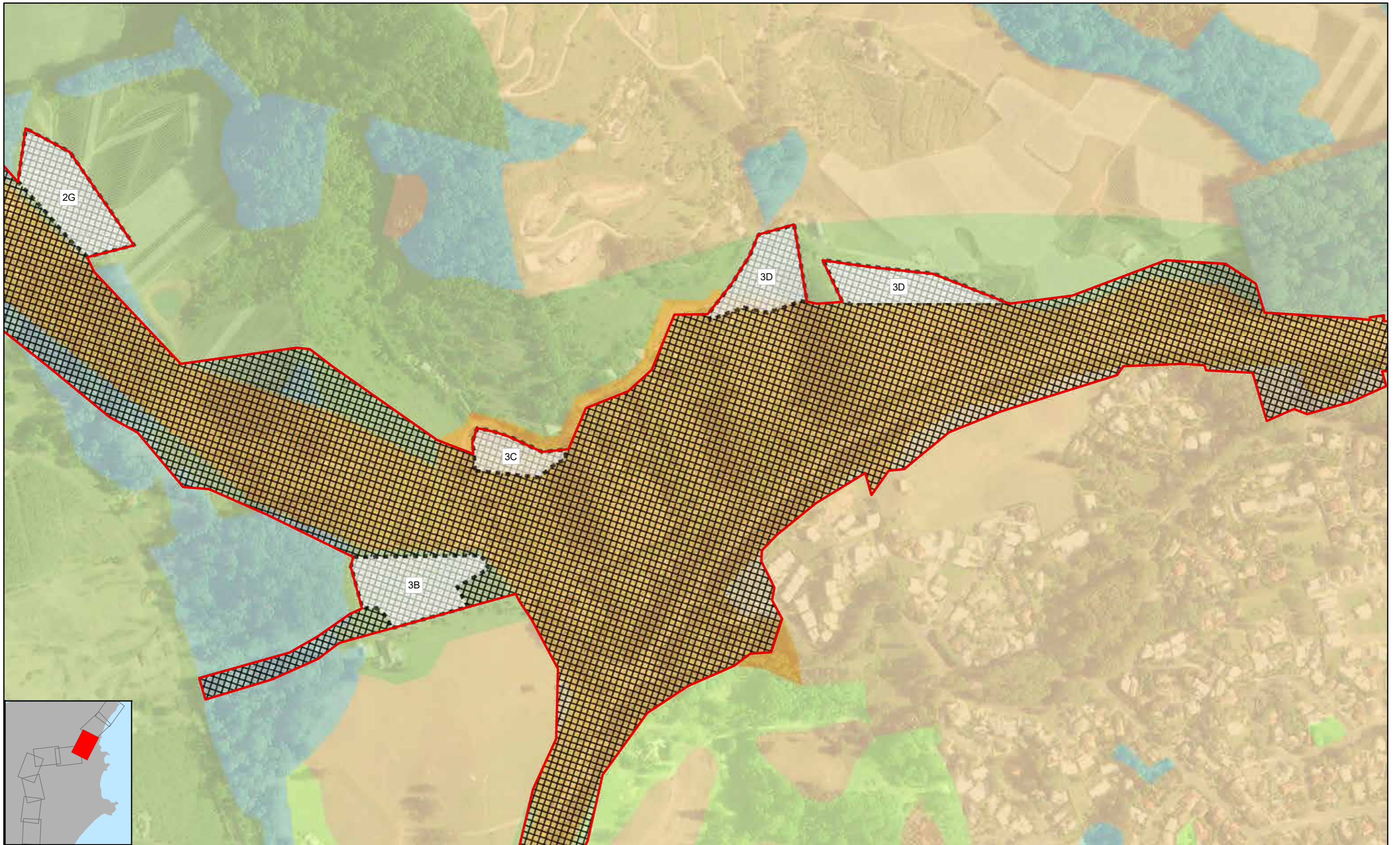
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Grid: GDA 1994 MGA Zone 56

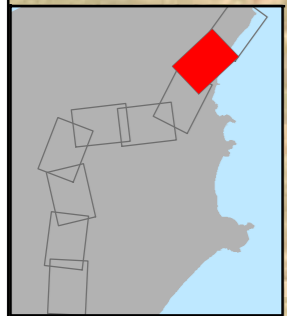
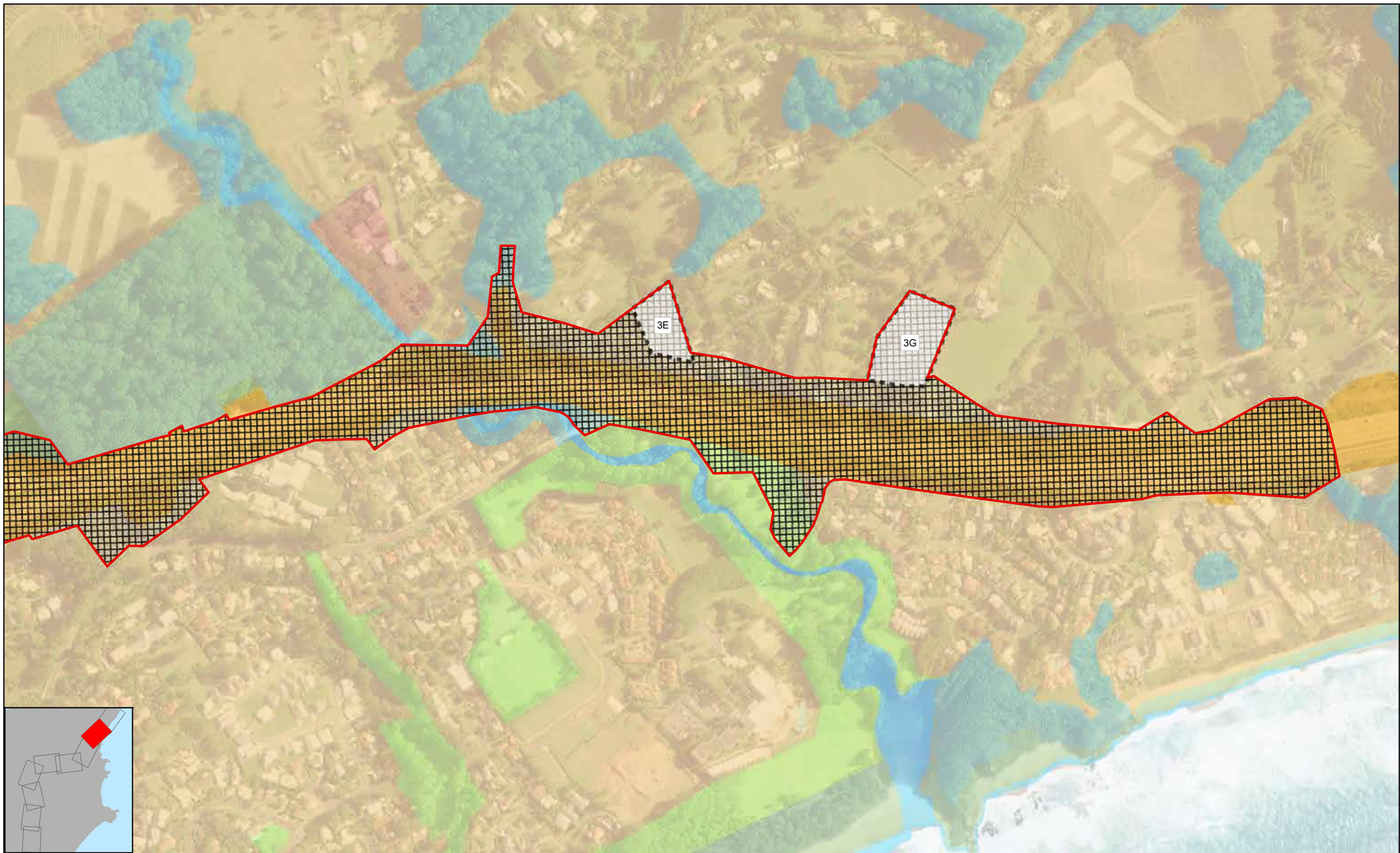


**Legend**

Construction Footprint	<b>Land Zoning</b> <b>LEP2013_ZNEFULL</b>	B4 Mixed Use	E2 Environmental Conservation	R2 Low Density Residential	RE2 Private Recreation	SP3 Tourist
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	E1 National Park and Nature Reserves	R1 General Residential	RE1 Public Recreation	SP2 Infrastructure		

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 Grid: GDA 1994 MGA Zone 56





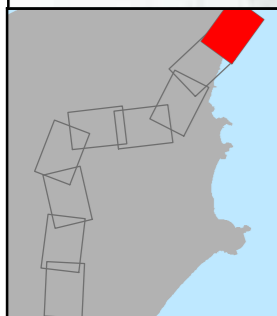
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| Construction Footprint        | <b>Land Zoning</b><br><b>LEP2013_ZNEFULL</b> | B4 Mixed Use            | E2 Environmental Conservation | R2 Low Density Residential    | RE2 Private Recreation | SP3 Tourist               |
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|                               | E1 National Park and Nature Reserves         | R1 General Residential  | RE1 Public Recreation         | SP2 Infrastructure            |                        |                           |

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Grid: GDA 1994 MGA Zone 56



**Legend**

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|-------------------------------|--|-------------------------|-------------------------------|-------------------------------|------------------------|---------------------------|
| Construction Footprint        | <b>Land Zoning</b><br><b>LEP2013_ZNEFULL</b> | B4 Mixed Use            | E2 Environmental Conservation | R2 Low Density Residential    | RE2 Private Recreation | SP3 Tourist               |
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SCALE @A3 - 1:5,000  
 0 125 250 m  
 Grid: GDA 1994 MGA Zone 56



Sub-appendix C

# Overshadowing analysis

Sub-appendix A

Sub-appendix B

Chapter 9

Sub-appendix C

Sub-appendix D

Sub-appendix E

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# Appendix C

## Overshadowing Analysis

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# Overshadowing analysis

The following diagrams illustrate the expected overshadowing impacts of the project.

The overshadowing analysis is based on the winter solstice (21st June), which marks the shortest period of daylight during the year. The sun's elevation in the sky on this day is considered to be at its lowest, representing the worst cast scenario with regards to potential overshadowing impacts.

The overshadowing analysis has informed the design and the development of the noise wall treatments, including consideration for transparent noise walls.

## Methodology

The following methodology has been employed for the assessment:

- A 3D terrain model was created using 1m contour data derived from LiDAR
- A 3D model of the alignment, including noise walls, earthworks and structures, was created and combined with the terrain data
- 3D studio max software was utilised to undertake overshadowing analysis at the times of 7am, 9am 1pm and 3pm on June 21, illustrating a range of times and shadow extents.

## Limitations

Whilst every effort has been used to create an accurate model, the limited resolution of the contour data and the approximation of dwelling height and form means that the overshadowing output should only be used as a guide.

The output is conservative as it does not take into account existing vegetation, minor built form, proposed landscape treatments or opportunities for the noise wall design to consider transparent panels, due to the potential for these items to alter over time. Where transparent noise walls would assist with reducing the extent of overshadowing, this has been referenced in the analysis.

## Design elements

### Noise walls

- Introduction of a solid noise NCA03-SB-01 measured at 5m high with vegetation on both sides where possible.

## Potential impacts

- Noise wall NCA03-SB-01 would be situated to the west of a future development site (Elements Estate), with existing vegetation anticipated to be retained at this location.



FIG C.1 21ST JUNE 7AM



FIG C.2 21ST JUNE 9AM

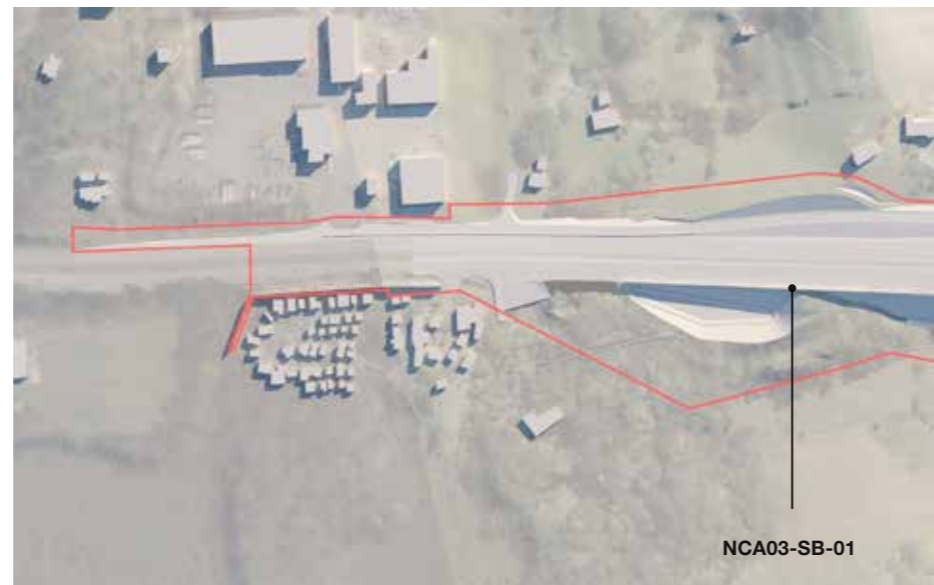
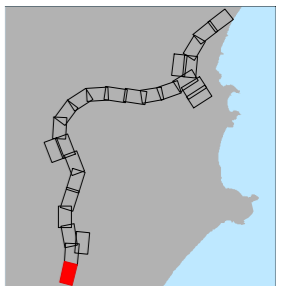


FIG C.3 21ST JUNE 1PM



FIG C.4 21ST JUNE 3PM



## Design elements

### Noise wall

- Introduction of a solid noise wall NCA03-SB-01 measuring 5m high with vegetation on both sides where possible.

### Bridges

- Introduction of twin bridges BR01 over Northbound exit ramp near Englands Road. Introduction of twin bridges BR02 over Englands Road.

### Retaining Wall

- Introduction of the RW72 measuring 1.5m high. Introduction of RW73 measuring 4.1m high.

## Potential impacts

- Noise wall NCA03-SB-01 would be situated to the west of a future development site (Elements Estate), with the potential for overshadowing to occur beyond the construction footprint, however existing vegetation is anticipated to be retained at this location. The existing vegetation is anticipated to generate shadows comparable to the proposed noise wall.
- Bridges BR01 and BR02 would be situated within Englands Road interchange. Overshadowing is anticipated to be limited on the road corridor.

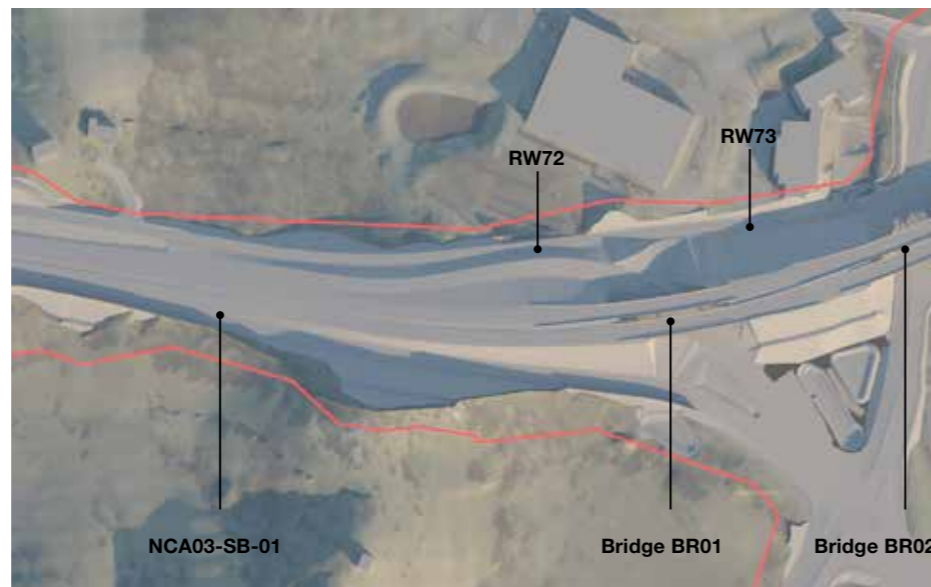


FIG C.5 21ST JUNE 7AM

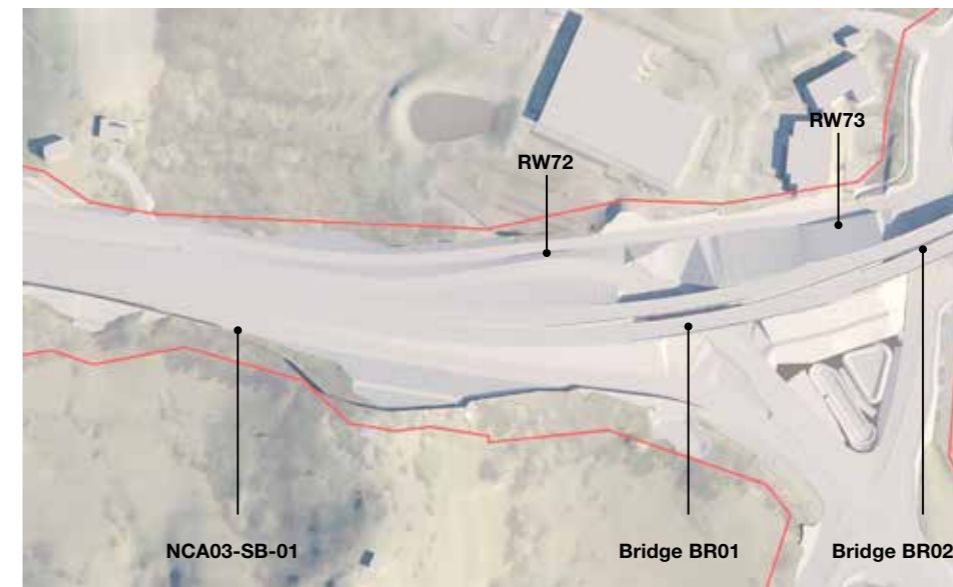


FIG C.6 21ST JUNE 9AM

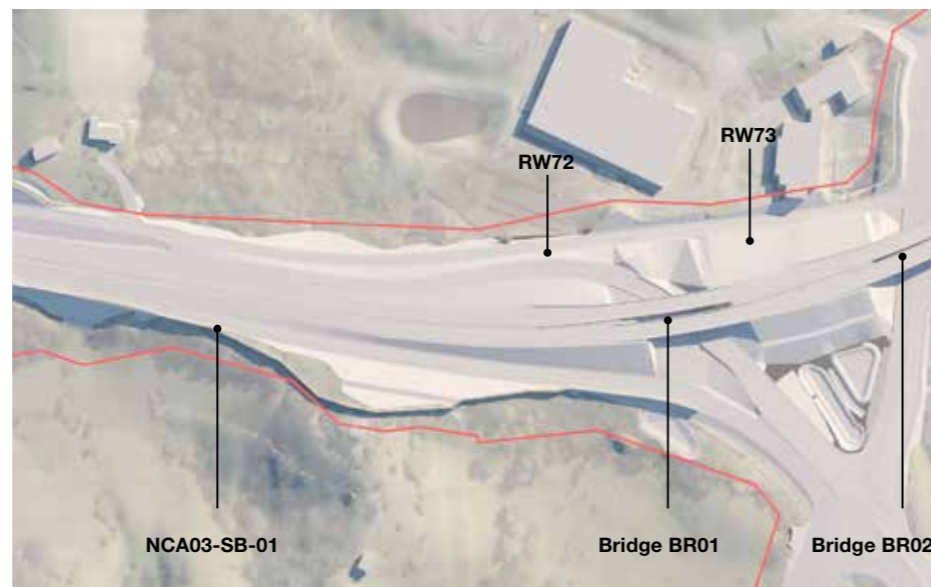


FIG C.7 21ST JUNE 1PM

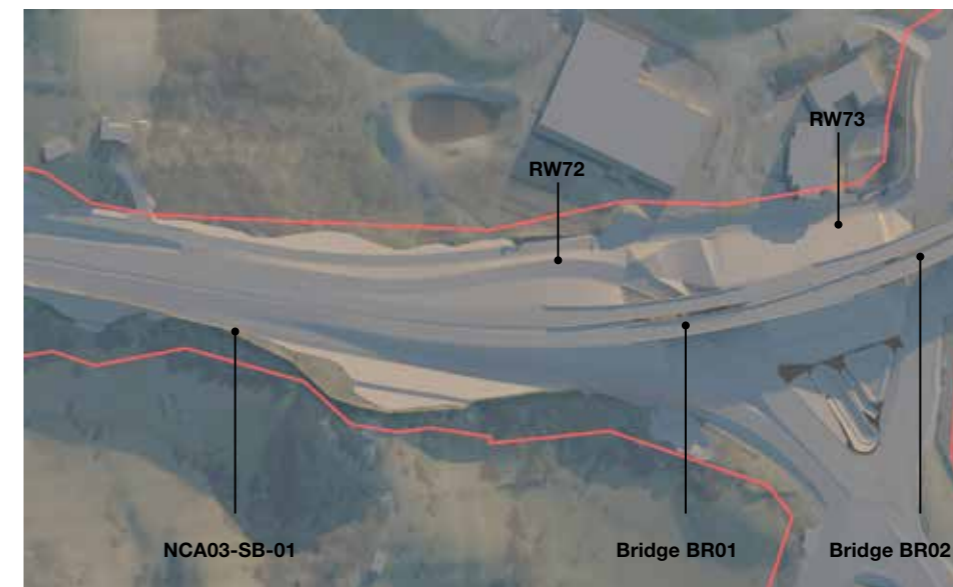
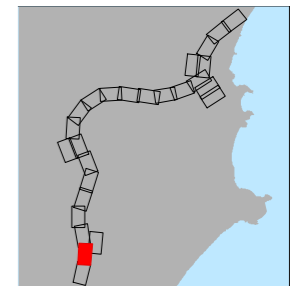


FIG C.8 21ST JUNE 3PM



## Design elements

### Bridges

- Introduction of twin bridges BR02 over Englands Road.

### Retaining Wall

- Introduction of RW74 measuring 3m and RW75 measuring 4.6m.

## Potential impacts

- Bridges BR02 and retaining wall RW74 and RW76 would be situated within Englands Road interchange.
- Overshadowing is anticipated to be predominantly limited to the road corridor with localised overshadowing within the commercial car park to the north of Englands Road interchange during late afternoon and overshadowing to adjacent vegetation during the morning.



FIG C.9 21ST JUNE 7AM

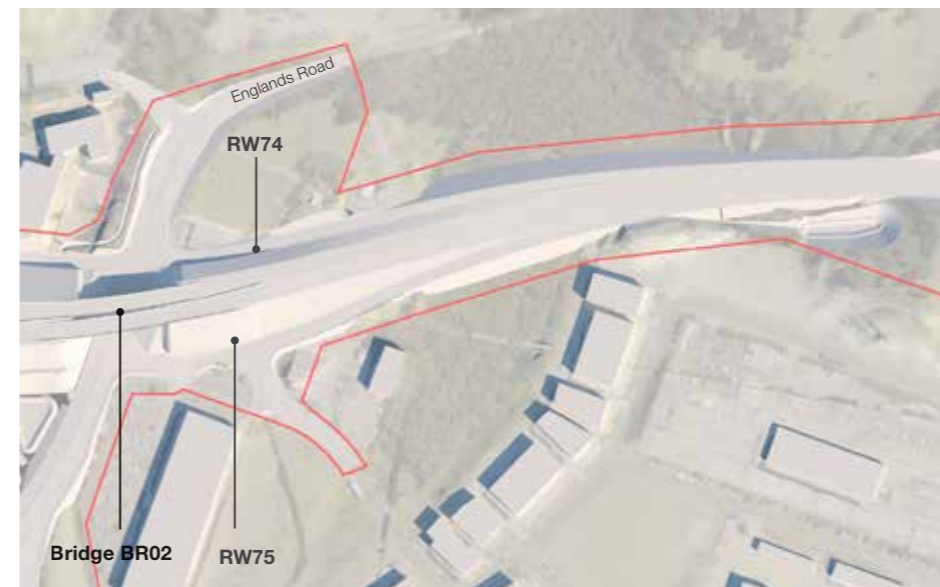


FIG C.10 21ST JUNE 9AM

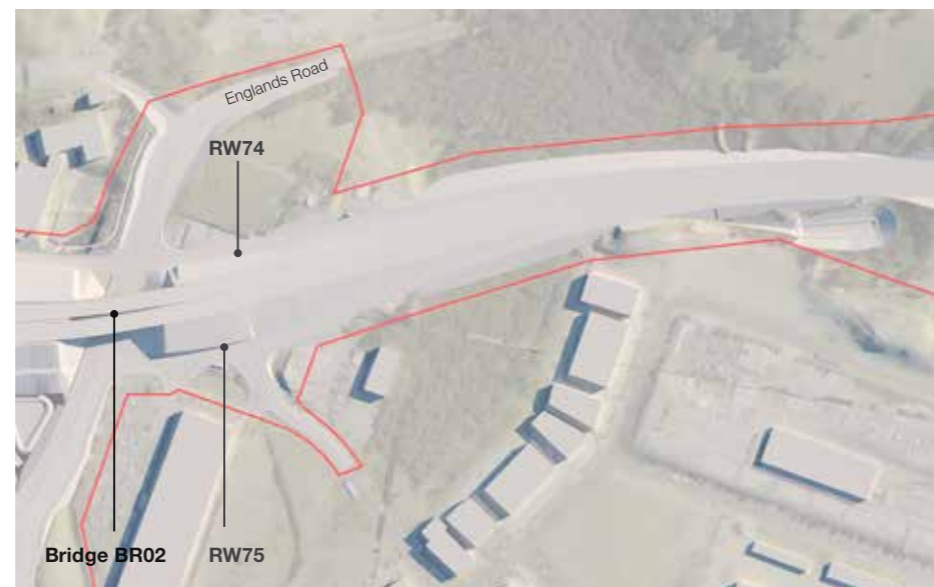
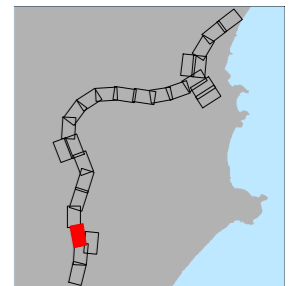


FIG C.11 21ST JUNE 1PM



FIG C.12 21ST JUNE 3PM



## Design elements

No introduced structural elements.

## Potential impacts

- Impacts of overshadowing as a result of the introduced earthworks are anticipated to be limited on the road corridor.



FIG C.13 21ST JUNE 7AM



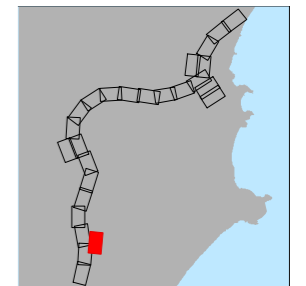
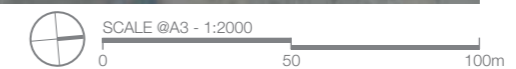
FIG C.14 21ST JUNE 9AM



FIG C.15 21ST JUNE 1PM



FIG C.16 21ST JUNE 3PM



## Design elements

### Noise wall

- Introduction of a solid noise wall NCA06-SB-01 measuring 5m high.
- Introduction of a transparent noise wall NCA06\_SB\_01B measuring 5m high over the bridges.

### Bridges

- Introduction of three bridges including twin bridges, BR03 and BR23 over Newports Creek and BR04 over North Boambee Road. BR23 design includes a noise wall (southbound only). BR04 design includes a noise wall (southbound only).

## Potential impacts

- The introduced noise wall would result in an increase in overshadowing to the ground plane during the afternoon, including existing vegetation and agricultural land. The introduction of transparent noise walls at bridge crossings would reduce the extent of impact, however solid noise walls have been considered at this location to minimise views towards passing vehicles from adjacent properties.
- The earthworks would result in shadows to the east of the project, with shadows cast on adjoining vegetation and agricultural land.

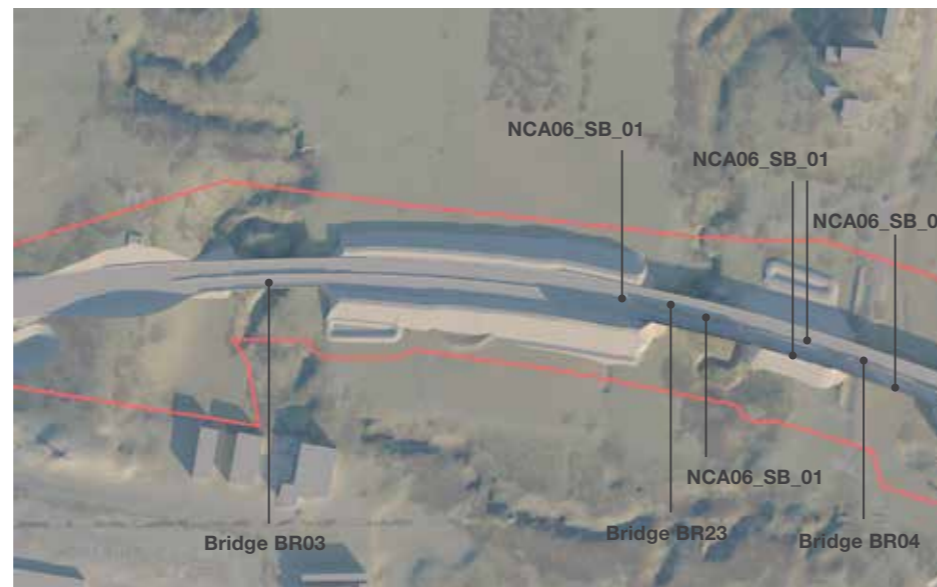


FIG C.17 21ST JUNE 7AM

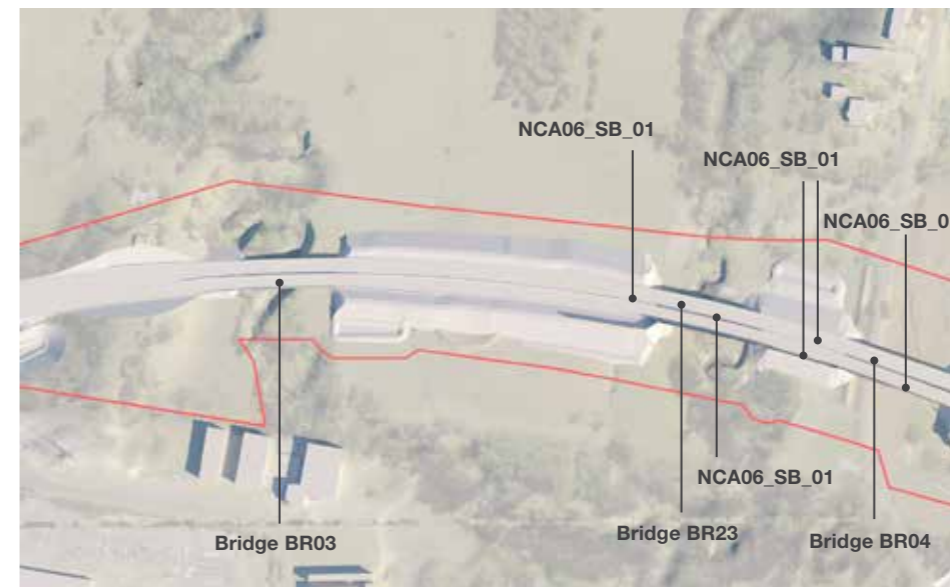


FIG C.18 21ST JUNE 9AM

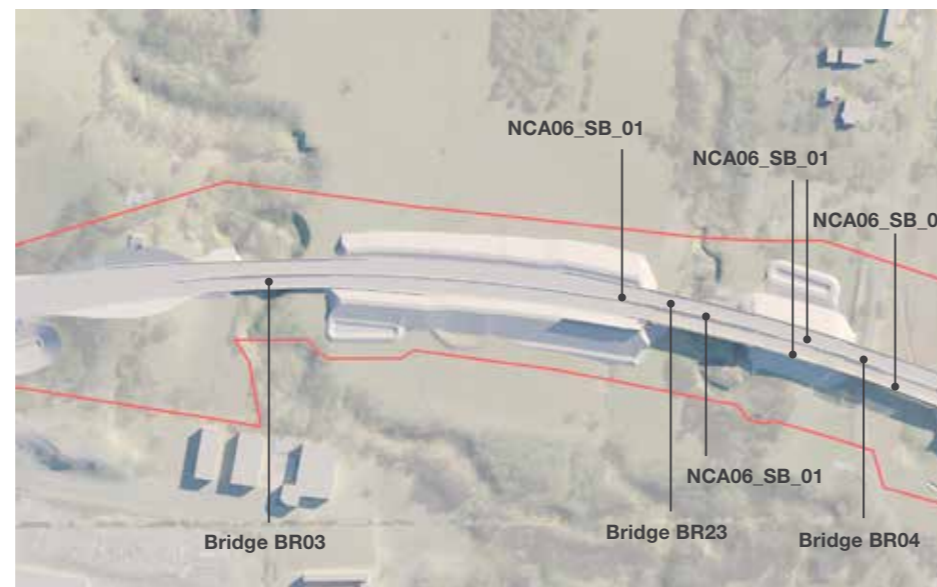
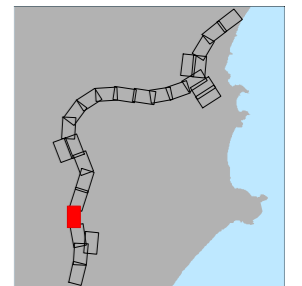
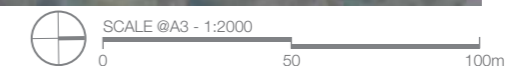


FIG C.19 21ST JUNE 1PM



FIG C.20 21ST JUNE 3PM



## Design elements

### Noise walls

- Introduction of a solid noise NCA06-SB-01 measuring 5m high
- Introduction of a transparent noise wall NCA06\_SB\_01B measuring 5m high over the bridges.

### Bridges (BR04 and BR05)

- Introduction of two twin bridges including BR04 and BR05 over North Boambee Road and BR05 over Newports Creek Tributary
- BR04 design includes a noise wall (southbound only).
- BR05 design includes a noise wall (northbound only).

## Potential impacts

- It is anticipated that an increase in overshadowing would occur during the afternoon, including overshadowing to existing vegetation and agricultural land beyond the construction footprint.
- Impacts are not anticipated to extent to residential properties.

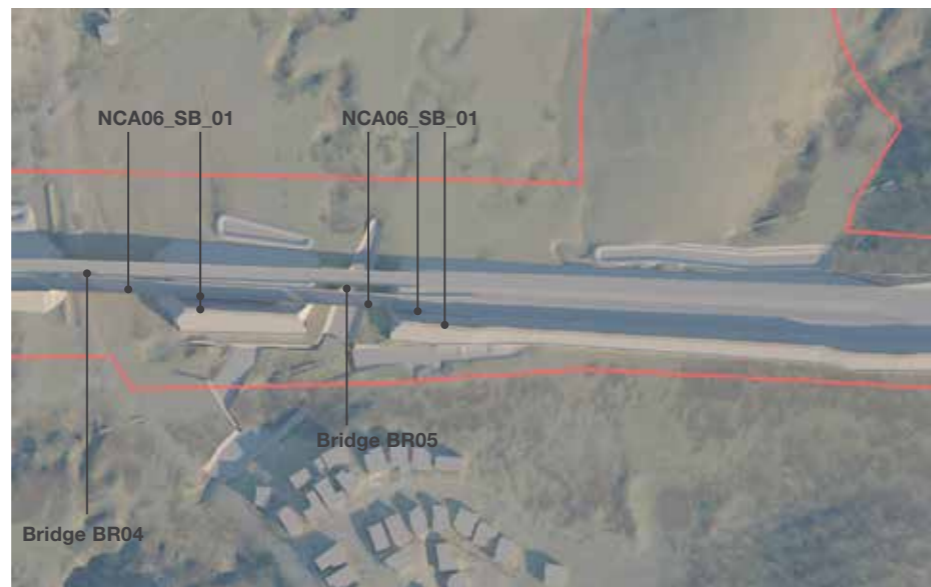


FIG C.21 21ST JUNE 7AM

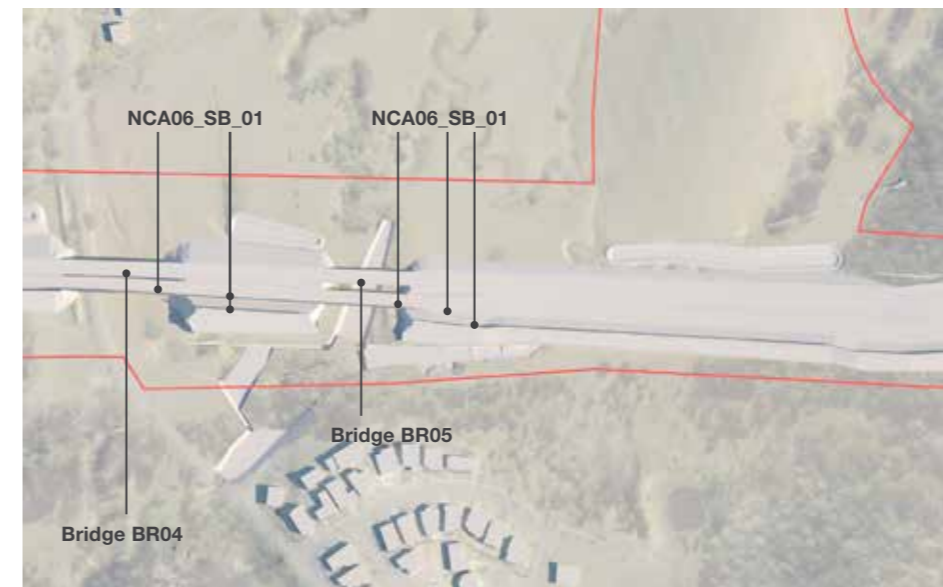


FIG C.22 21ST JUNE 9AM

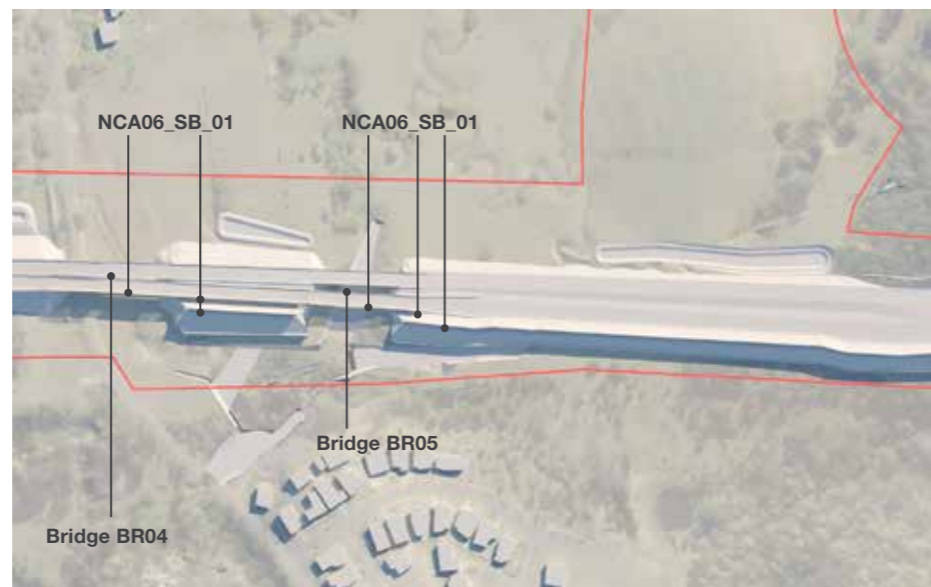


FIG C.23 21ST JUNE 1PM

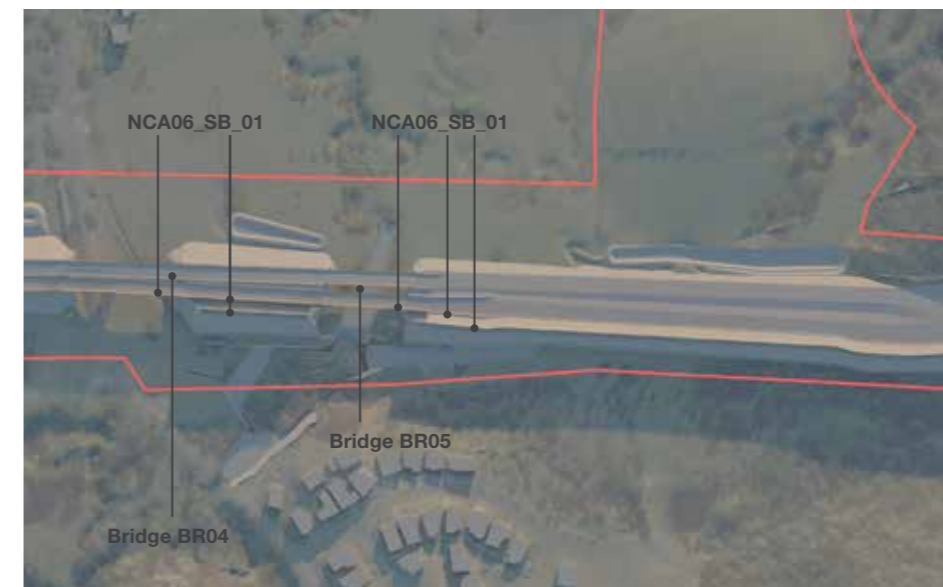
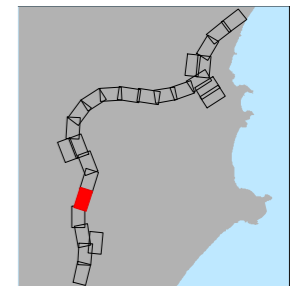


FIG C.24 21ST JUNE 3PM





## Design elements

### Earthworks

- Deep earthwork cutting slopes

## Potential impacts

- Overshadowing arising from the project is anticipated to be limited on the construction footprint.



FIG C.25 21ST JUNE 7AM

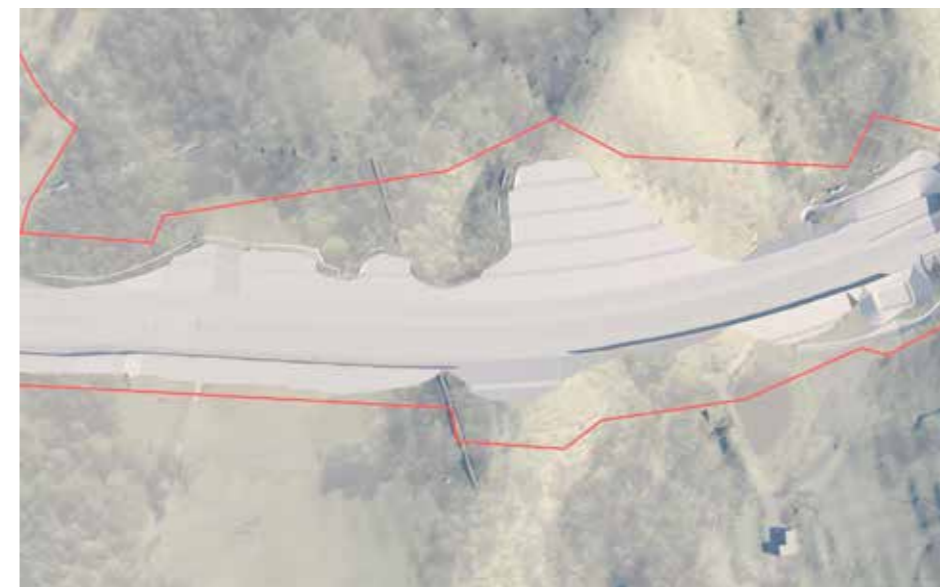


FIG C.26 21ST JUNE 9AM

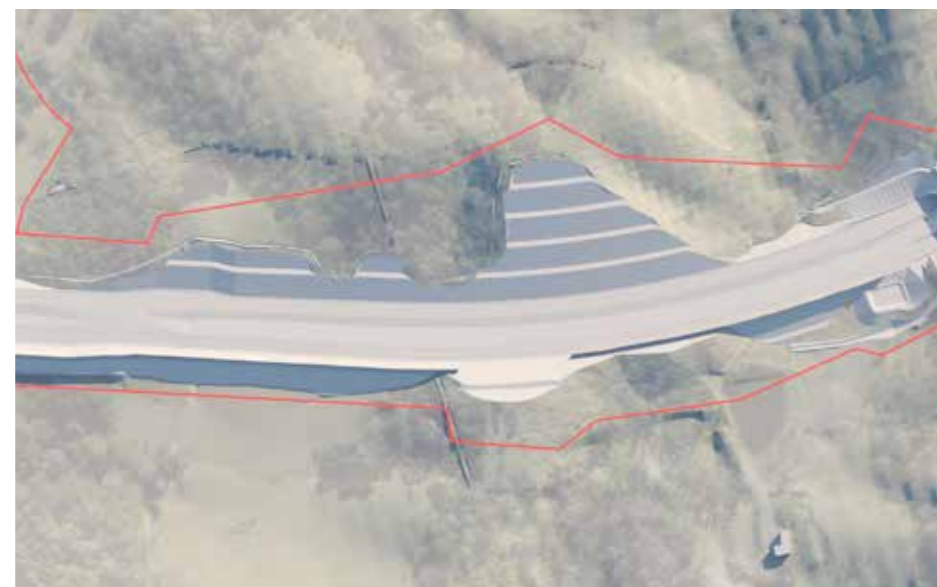
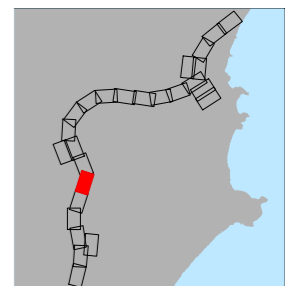
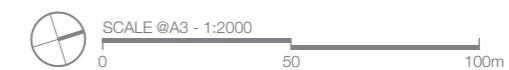


FIG C.27 21ST JUNE 1PM



FIG C.28 21ST JUNE 3PM



## Design elements

### Roberts Hill tunnel

- Reinstatement of the landscape and disturbed areas on completion. Planting to tunnel portals.

### Earthworks

- Deep earthwork slopes around the tunnel.

## Potential impacts

- Overshadowing due to structural elements is anticipated to be limited on the construction footprint.

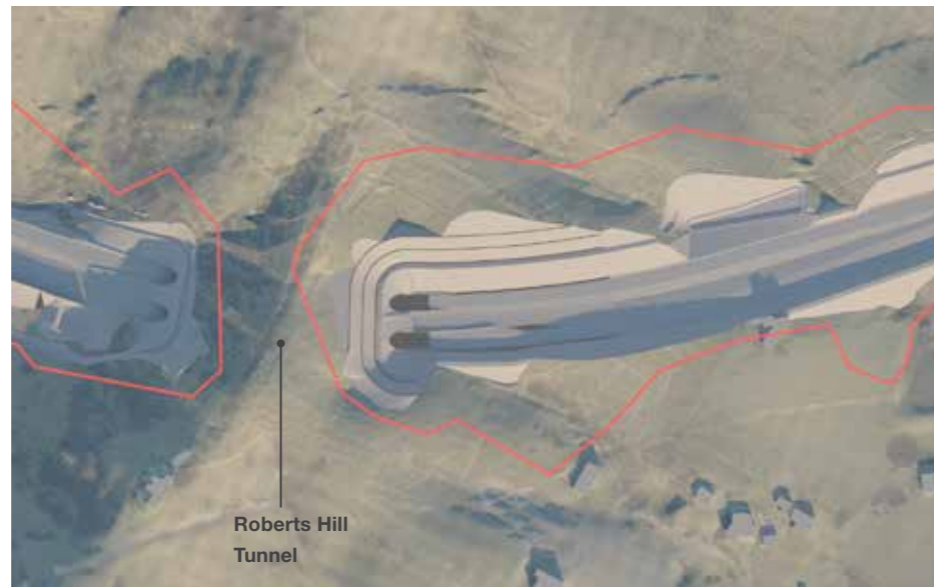


FIG C.29 21ST JUNE 7AM

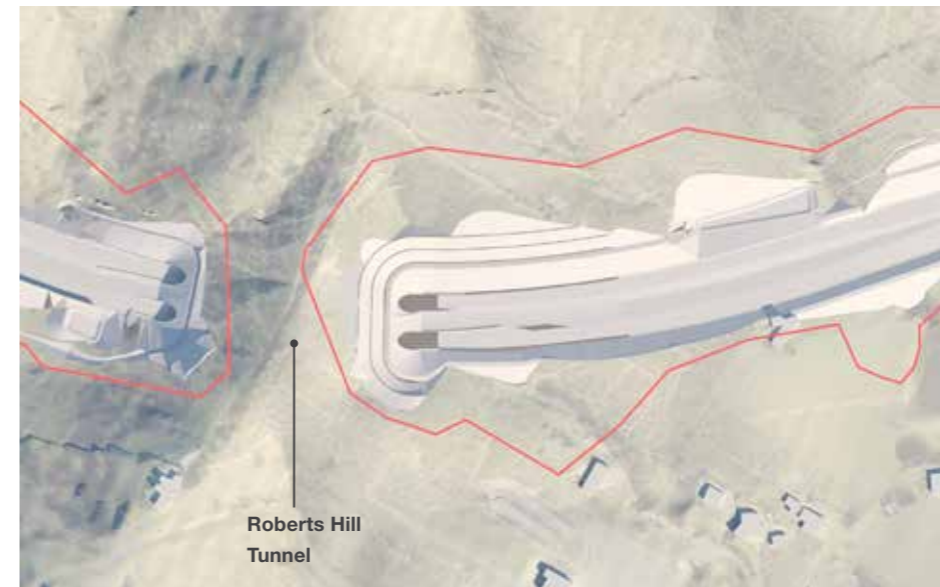


FIG C.30 21ST JUNE 9AM

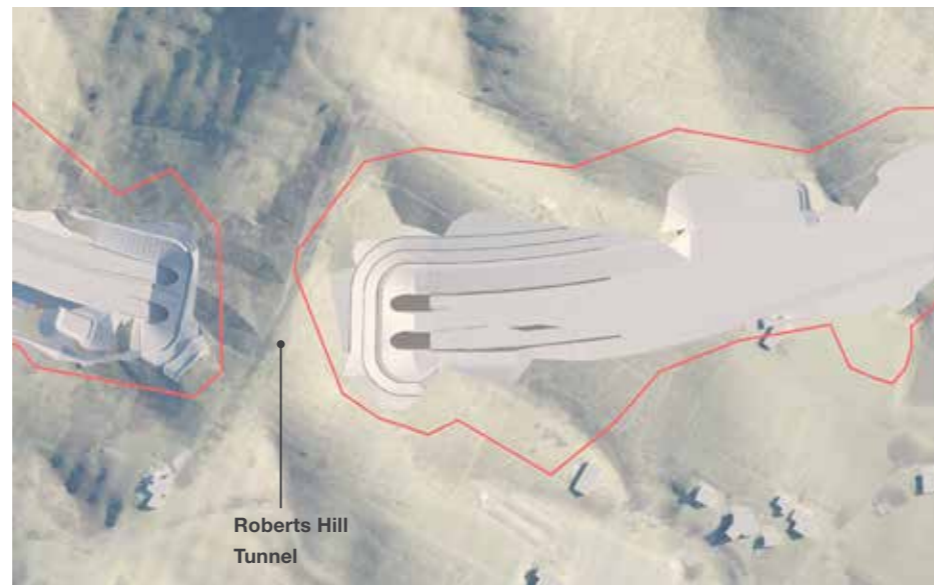


FIG C.31 21ST JUNE 1PM

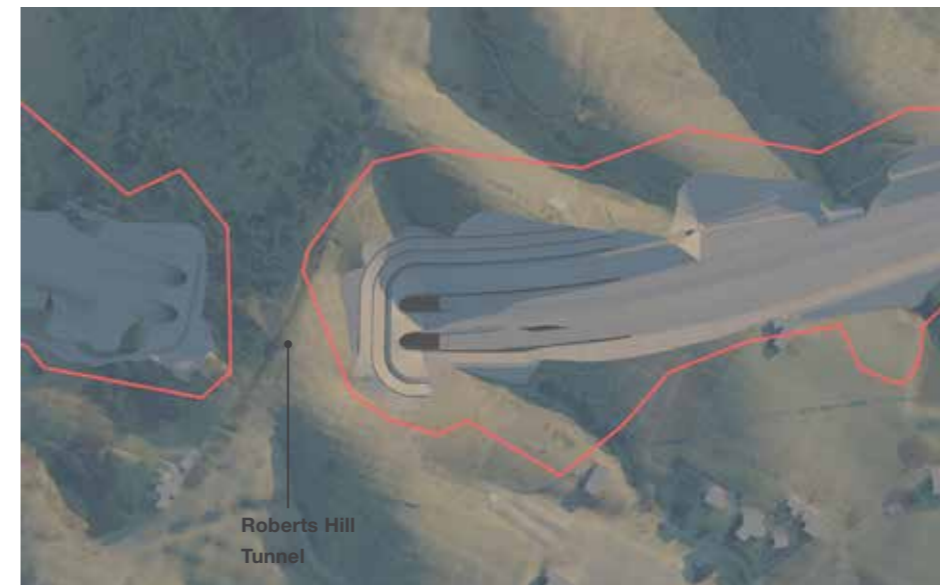
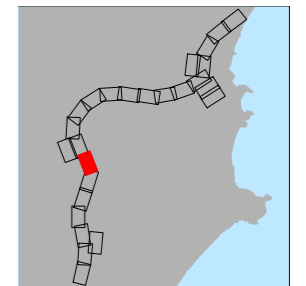
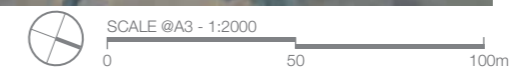


FIG C.32 21ST JUNE 3PM



## Design elements

### Noise walls

- Introduction of a solid noise NCA013-SB-01 measured at 3.5m high with vegetation on both sides where possible.

### Retaining Walls

- Introduction of RW106 measuring 10m and RW109 measuring 1.2m.

### Bridges (BR06, BR07, BR08 and BR09)

- Introduction of twin bridges BR06 over Coffs Creek.
- Introduction of northbound exit ramp BR07 over Coffs Creek.
- Introduction of southbound entry ramp BR08 over Coffs Creek.
- Introduction of BR09 over the highway HW10 on Coramba Road with a throw screen.

## Potential impacts

- Overshadowing due to structural elements is anticipated to be primarily limited to the construction footprint, with localised overshadowing to the ground plane, including the rear of properties situated on Tiffany Close. As the planting associated with the landscape design begins to establish, the potential for overshadowing is anticipated to increase.

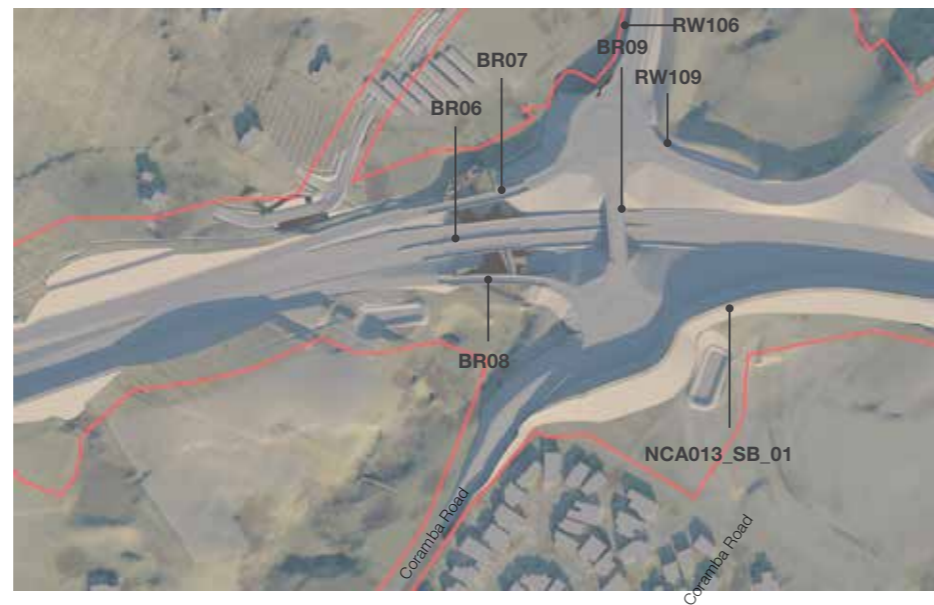


FIG C.33 21ST JUNE 7AM

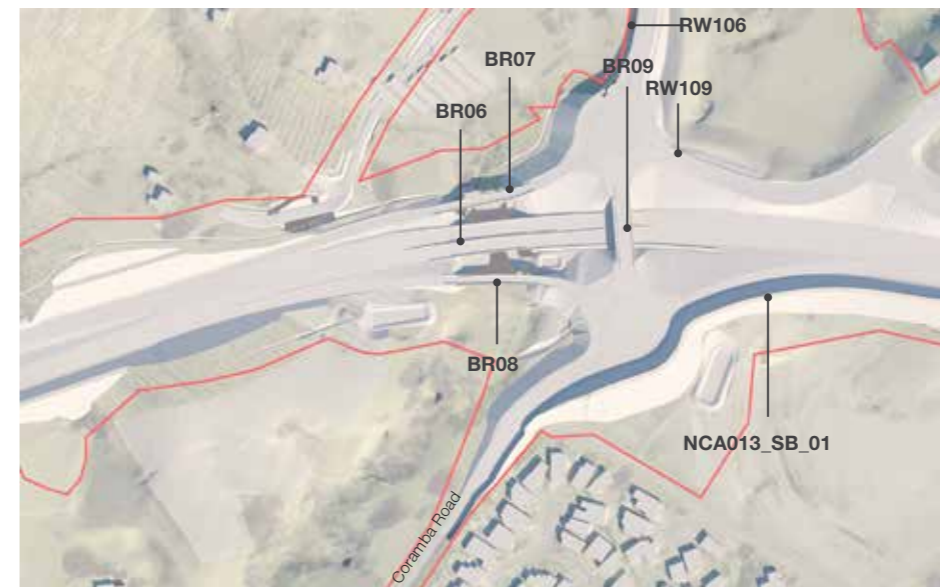


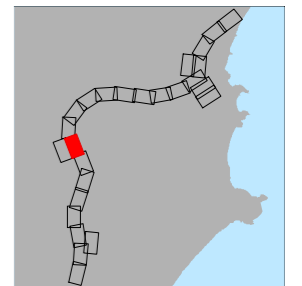
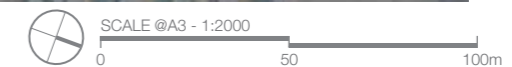
FIG C.34 21ST JUNE 9AM



FIG C.35 21ST JUNE 1PM



FIG C.36 21ST JUNE 3PM



## Design elements

- No structural elements introduced at this location

## Potential impacts

- No overshadowing impacts anticipated at this location.



FIG C.37 21ST JUNE 7AM



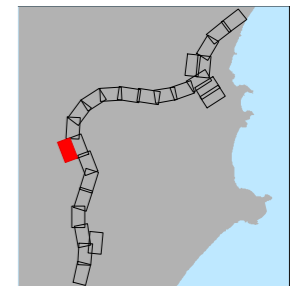
FIG C.38 21ST JUNE 9AM



FIG C.39 21ST JUNE 1PM



FIG C.40 21ST JUNE 3PM



## Design elements

### Noise wall

- Introduction of a solid noise NCA014-SB-01 measured at 4.5m high with vegetation on both sides where possible.

### Earthworks

- Earthwork batters extending east along the highway

## Potential impacts

- Overshadowing due to earthworks and noise walls would be limited to the road corridor during the morning, with shadowing extending to the south of the alignment during the afternoon and early evening.
- The extent of shadowing is anticipated to be limited to the construction footprint



FIG C.41 21ST JUNE 7AM

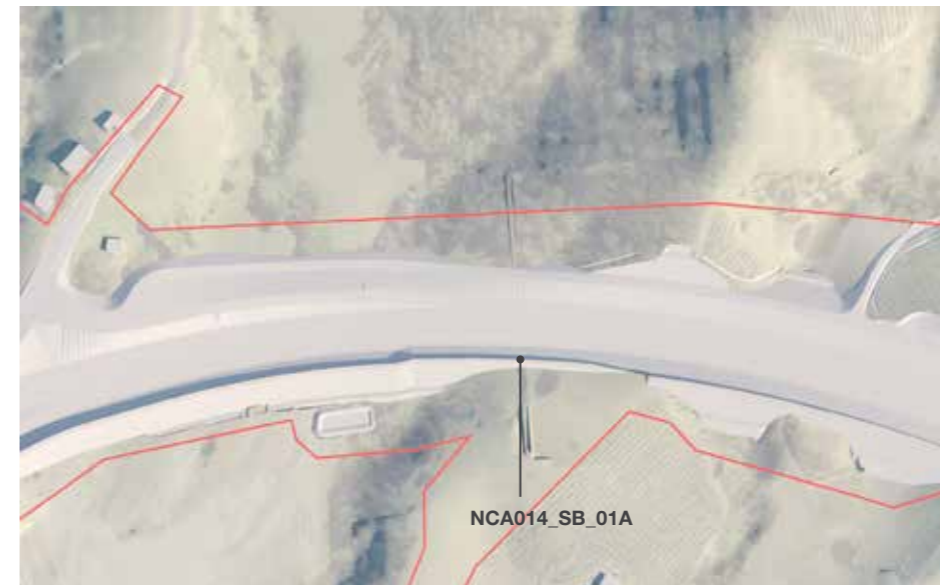


FIG C.42 21ST JUNE 9AM

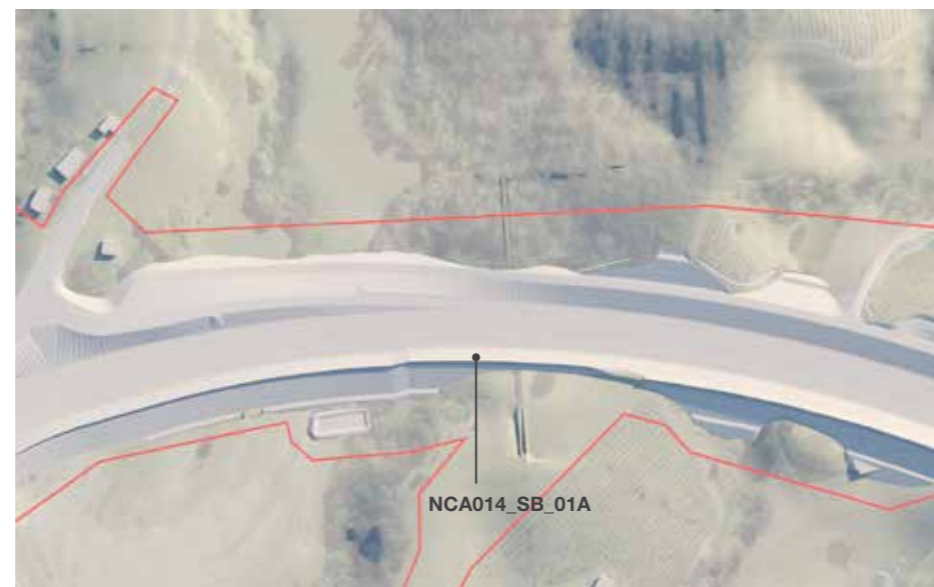
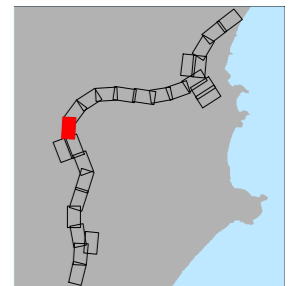


FIG C.43 21ST JUNE 1PM



FIG C.44 21ST JUNE 3PM



## Design elements

### Noise wall

- Introduction of a solid noise wall NCA014-SB-01 measured at 4m high with vegetation on both sides where possible.

### Earthworks

- Deep earthwork slopes along the highway

## Potential impacts

- Overshadowing due to structural elements is anticipated to be limited to the construction footprint.
- The existing surrounding topography casts the project corridor in to shadow towards the evening



FIG C.45 **21ST JUNE 7AM**

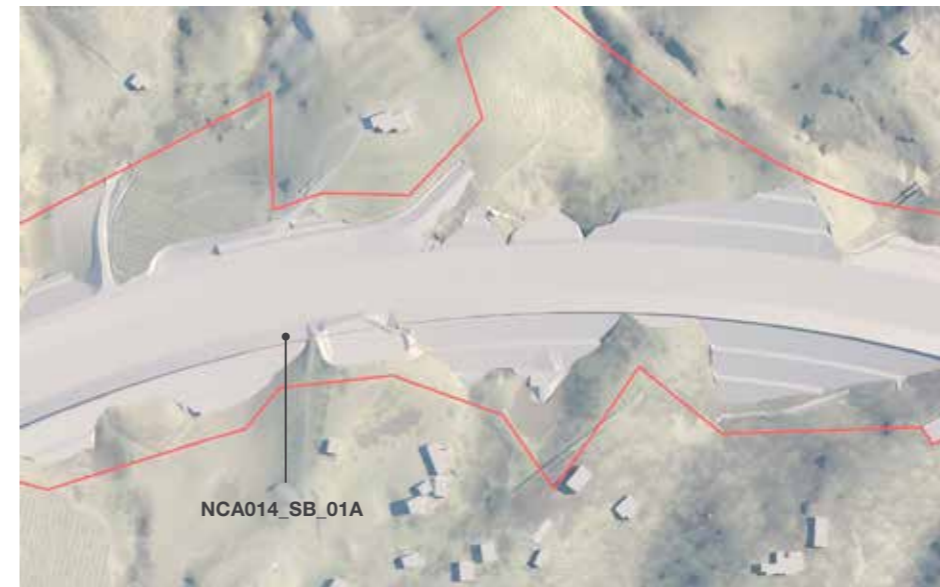


FIG C.46 **21ST JUNE 9AM**

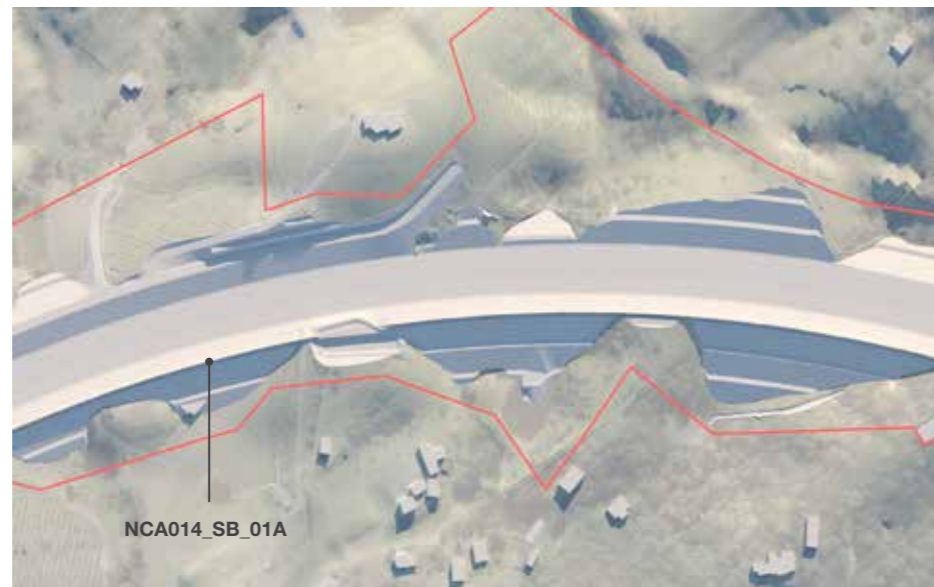
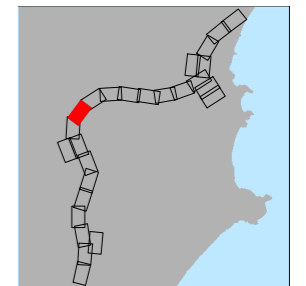
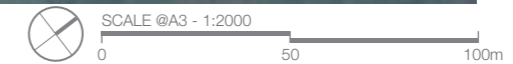


FIG C.47 **21ST JUNE 1PM**



FIG C.48 **21ST JUNE 3PM**



## Design elements

### Noise walls

- Introduction of a solid noise wall NCA013-SB-01 measuring 3.5m and transparent noise wall NCA014-SB-01 measuring 4.5m high over the bridge. Introduction of a solid noise NCA014-SB-01 measured at 4.5m high with vegetation on both sides where possible.

### Bridges (BR11 and BR12)

- Introduction of bridge BR11 over the project on Shephards Lane. Introduction of the landmark twin bridges BR12 over North Coast Railway that includes a noise wall (southbound only).

### Earthworks

- Deep earthwork slopes along the highway

## Potential impacts

- The combination of steep earthworks, noise walls and a bridge structure would result in overshadowing under the bridge structure and along the North Coast Railway corridor. The shadows are anticipated to extend beyond the construction footprint to adjacent residential properties within Sunset Ridge residential lots and agricultural land to the east.
- By 3pm, the existing surrounding topography casts the project corridor in to shadow.

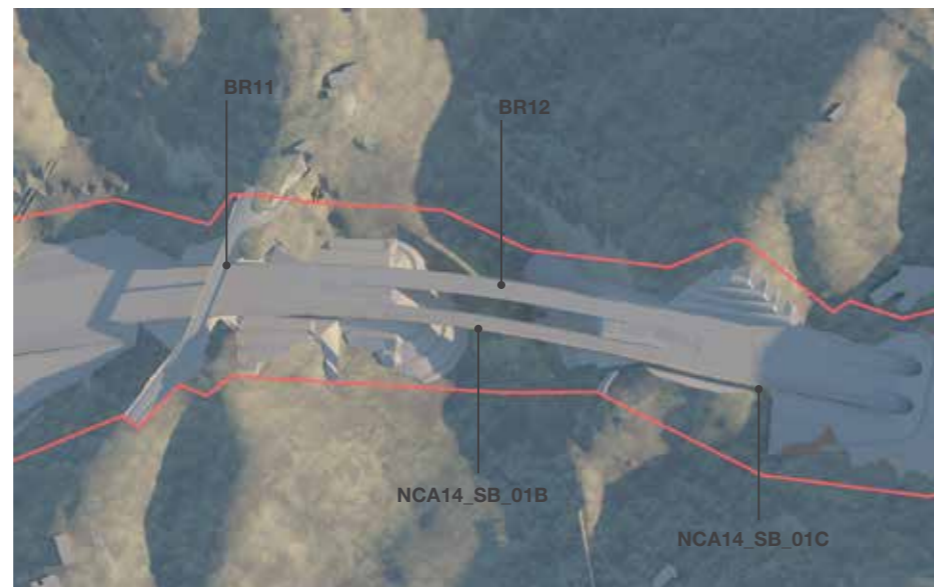


FIG C.49 21ST JUNE 7AM

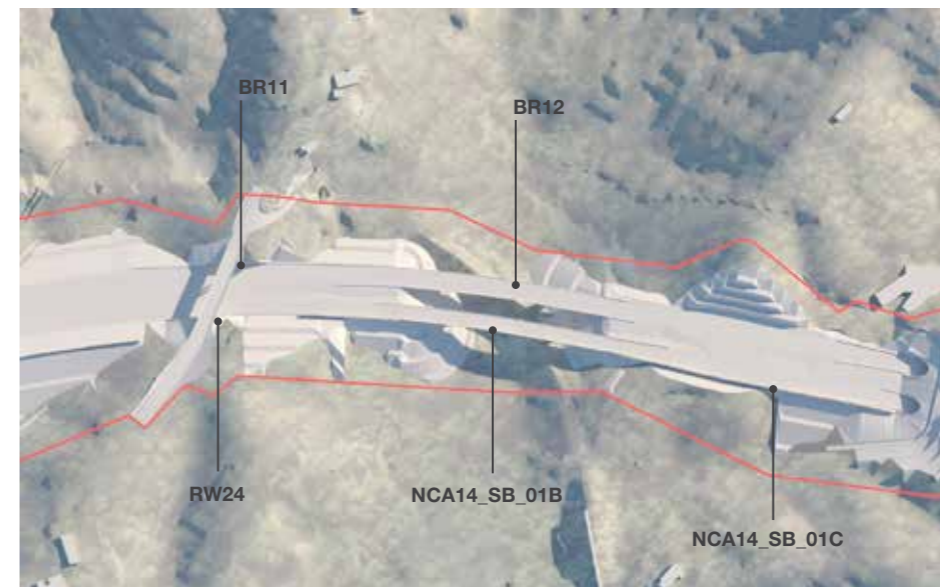


FIG C.50 21ST JUNE 9AM

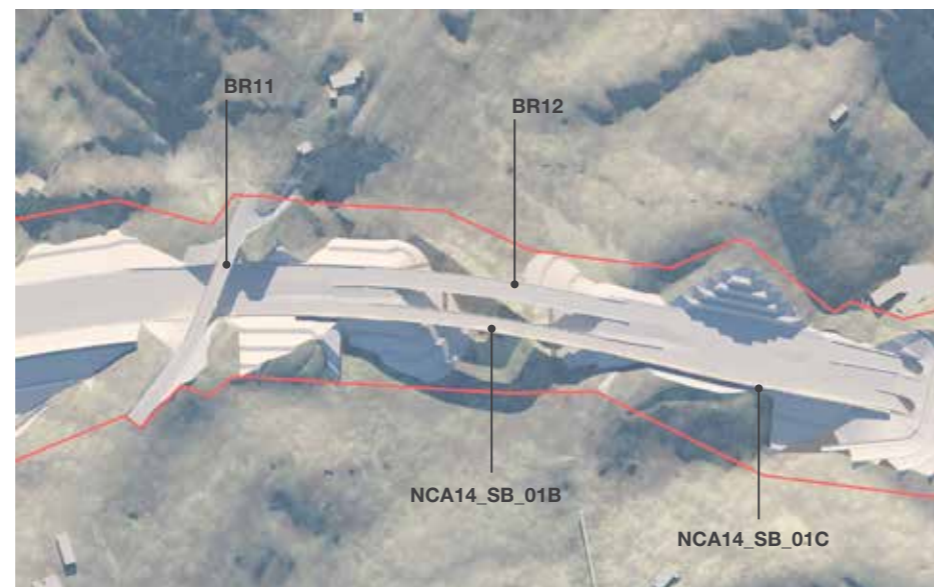
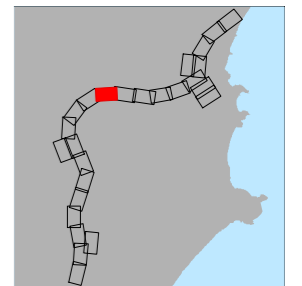
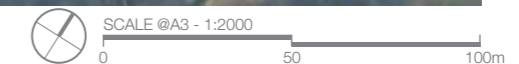


FIG C.51 21ST JUNE 1PM



FIG C.52 21ST JUNE 3PM



## Design elements

### Noise wall

- Introduction of a solid noise NCA014-SB-01C measured at 4m high with vegetation on both sides where possible.

### Earthworks

- Deep earthwork slopes along the highway.

## Potential impacts

- Overshadowing due to structural elements and earthworks is anticipated to primarily be within the construction footprint.



FIG C.53 21ST JUNE 7AM

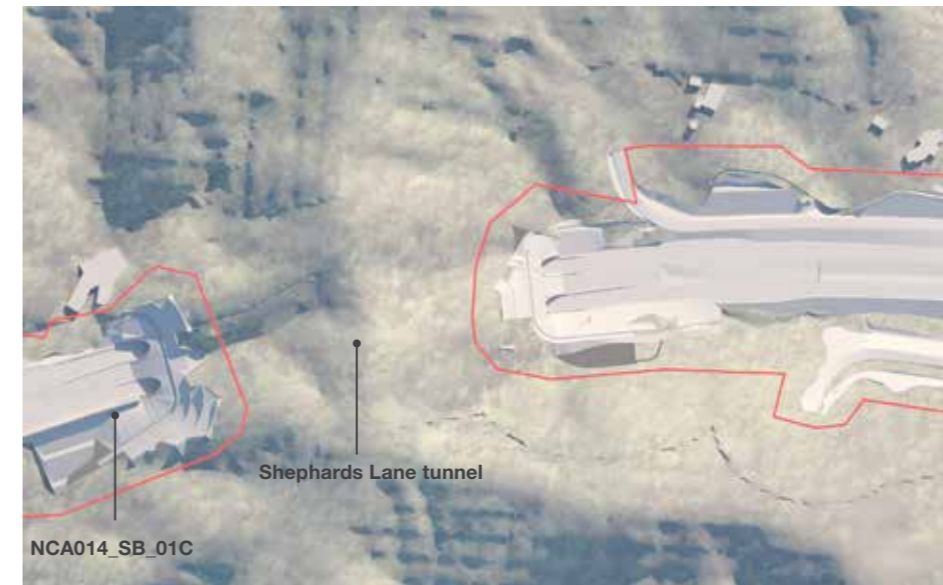


FIG C.54 21ST JUNE 9AM

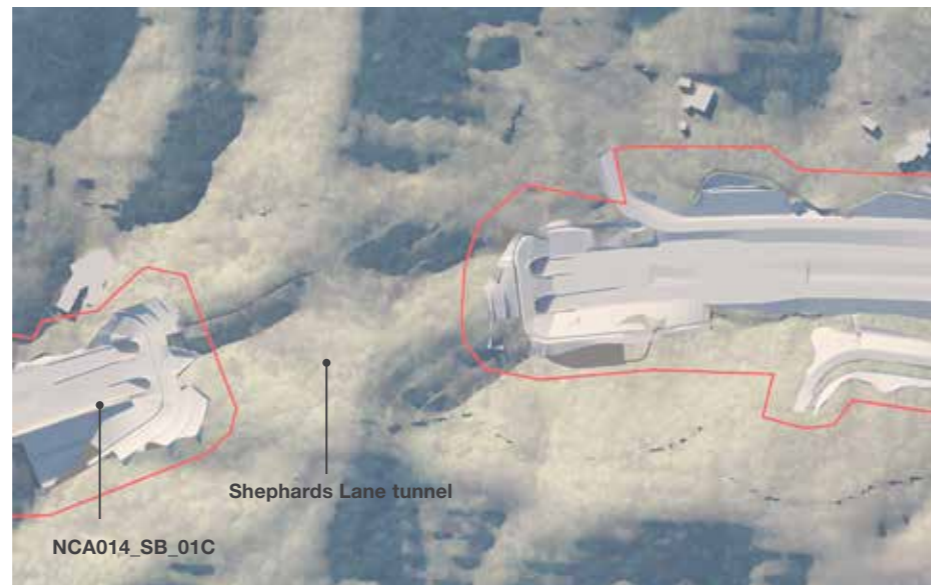
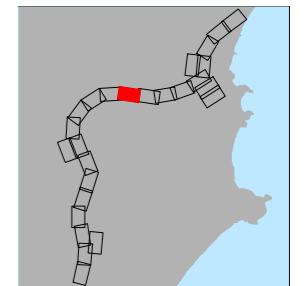


FIG C.55 21ST JUNE 1PM



FIG C.56 21ST JUNE 3PM





## Design elements

### Noise wall

- Introduction of transparent noise wall NCA018-SB-01A measured at 4.5m high.

### Bridge

- Introduction of bridge BR13

## Potential impacts

- The combination of steep earthworks, noise walls and bridge structures would result in overshadowing primarily within the construction footprint.
- By 3pm, the existing surrounding topography casts the project corridor in to shadow.

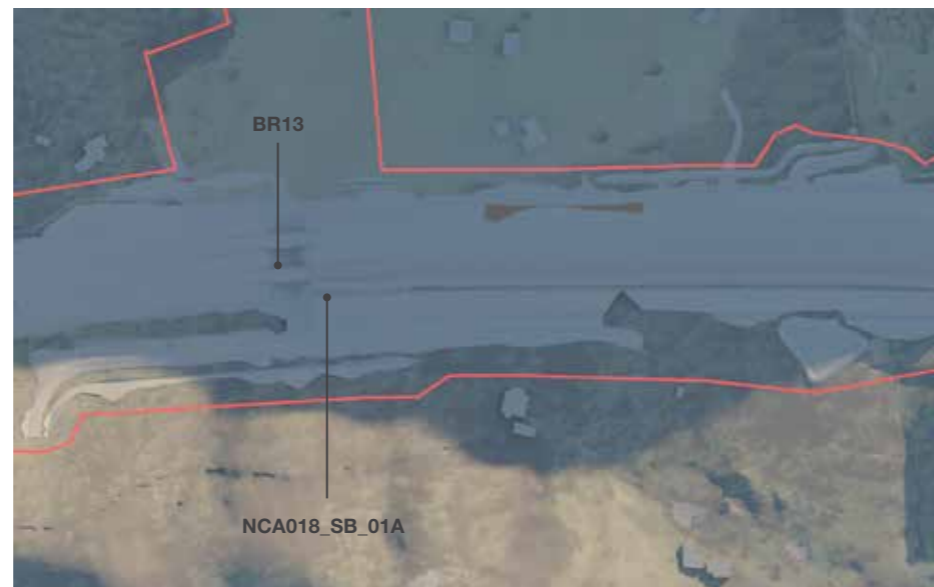


FIG C.57 21ST JUNE 7AM

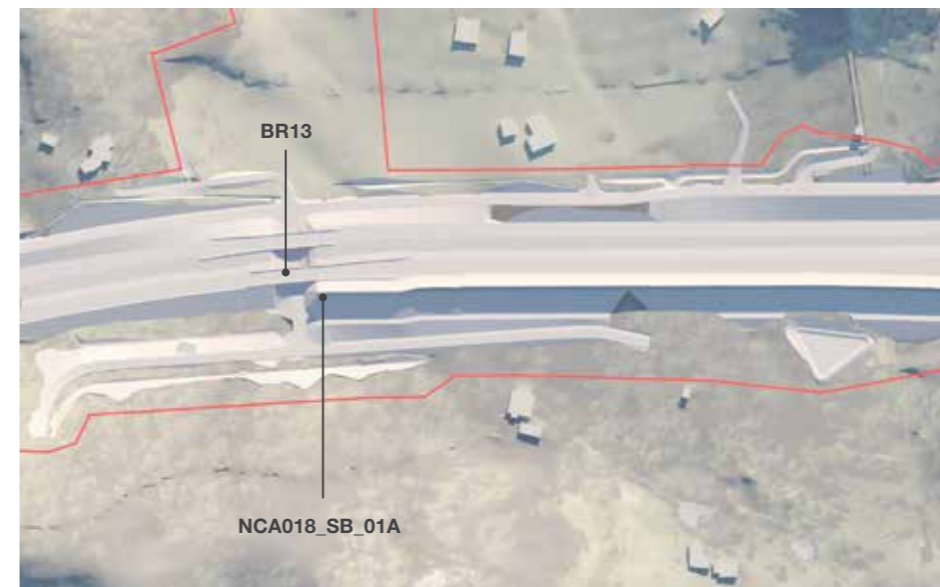


FIG C.58 21ST JUNE 9AM

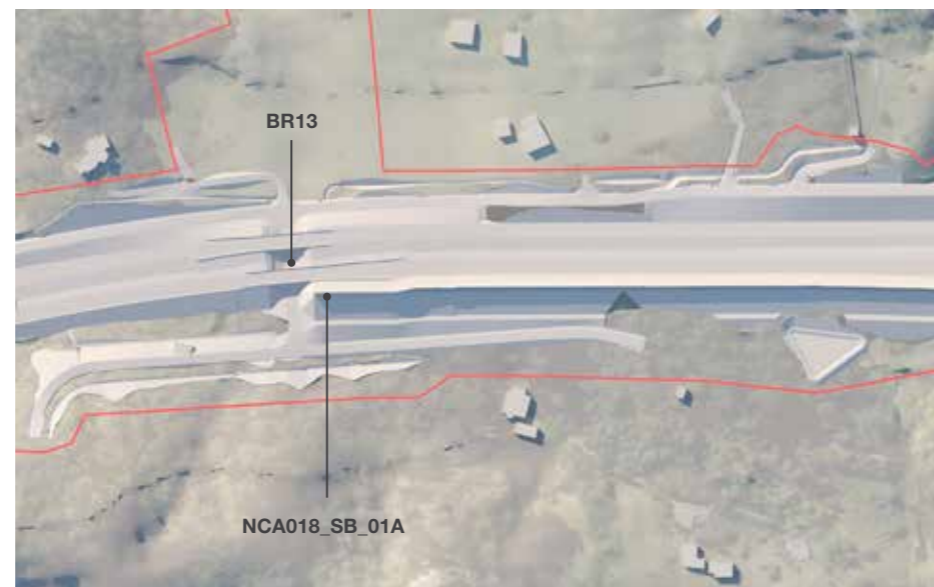
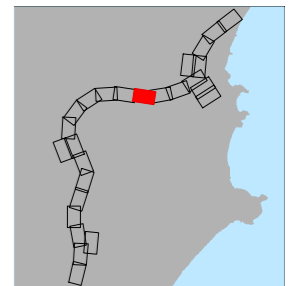
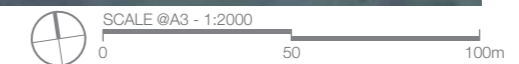


FIG C.59 21ST JUNE 1PM



FIG C.60 21ST JUNE 3PM



## Design elements

### Noise walls

- Introduction of a transparent noise wall NCA18\_SB\_01B measuring 4.5m high.

### Earthworks

- Deep cuttings and high earthworks along the highway

## Potential impacts

- The combination of earthworks and noise walls would result in overshadowing within the construction footprint.
- By 3pm, the existing surrounding topography casts the project corridor in to shadow.



FIG C.61 21ST JUNE 7AM

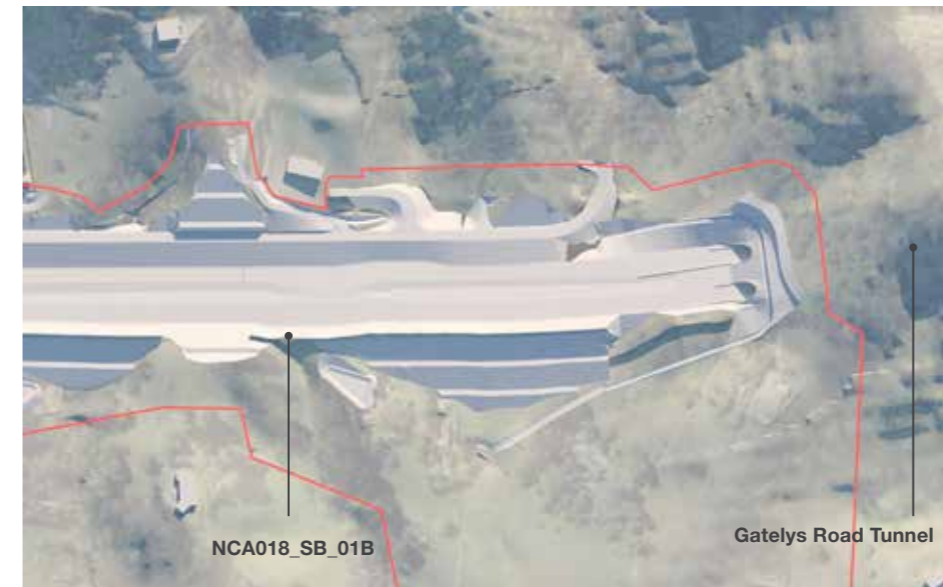


FIG C.62 21ST JUNE 9AM

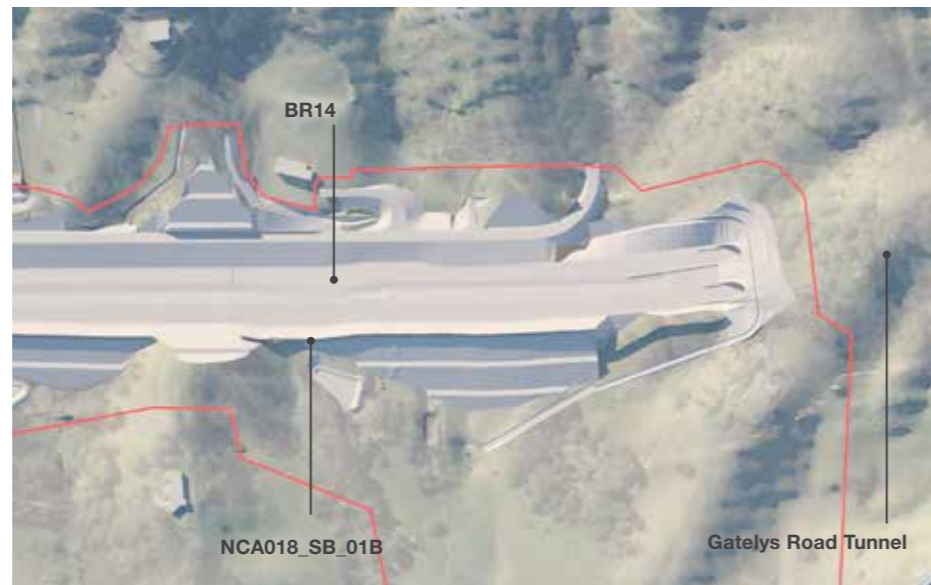


FIG C.63 21ST JUNE 1PM

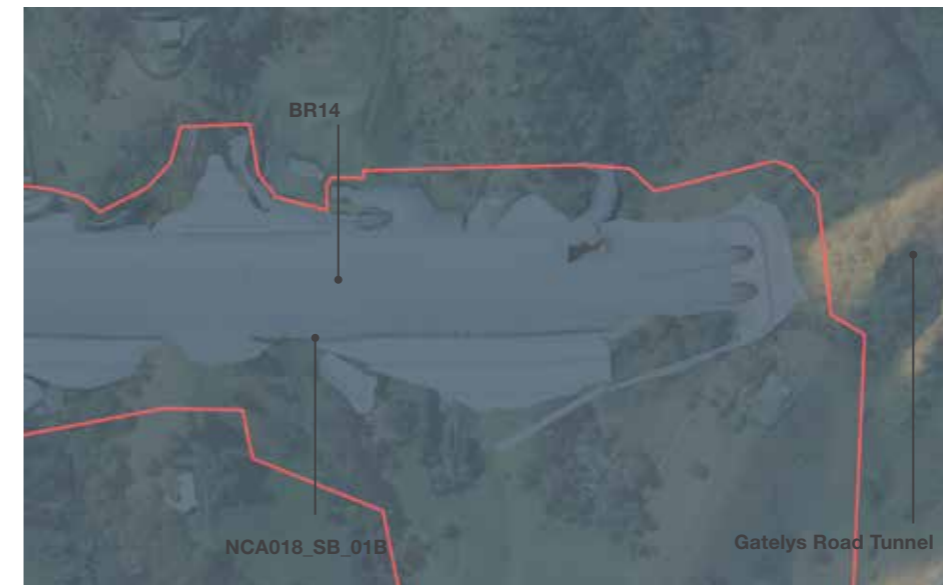
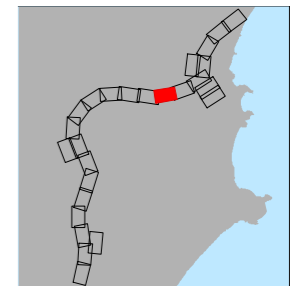
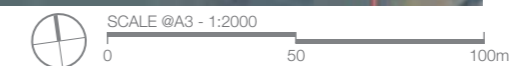


FIG C.64 21ST JUNE 3PM



## Design elements

### Earthworks

- Earthwork slopes along the highway

## Potential impacts

- Overshadowing as a result of the earthworks is anticipated to be within the construction footprint.
- By 3pm, the existing topography is anticipated to cast the project in to shade.

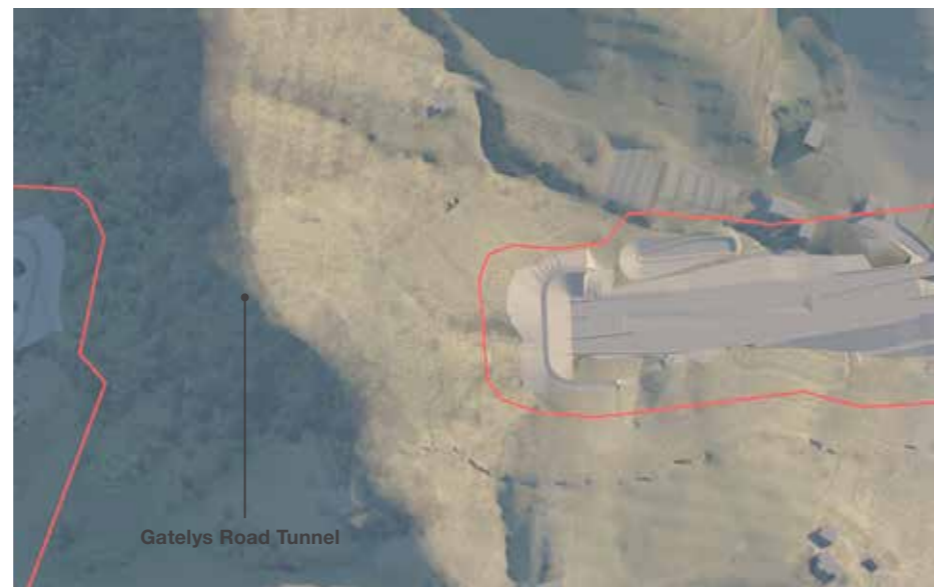


FIG C.65 21ST JUNE 7AM

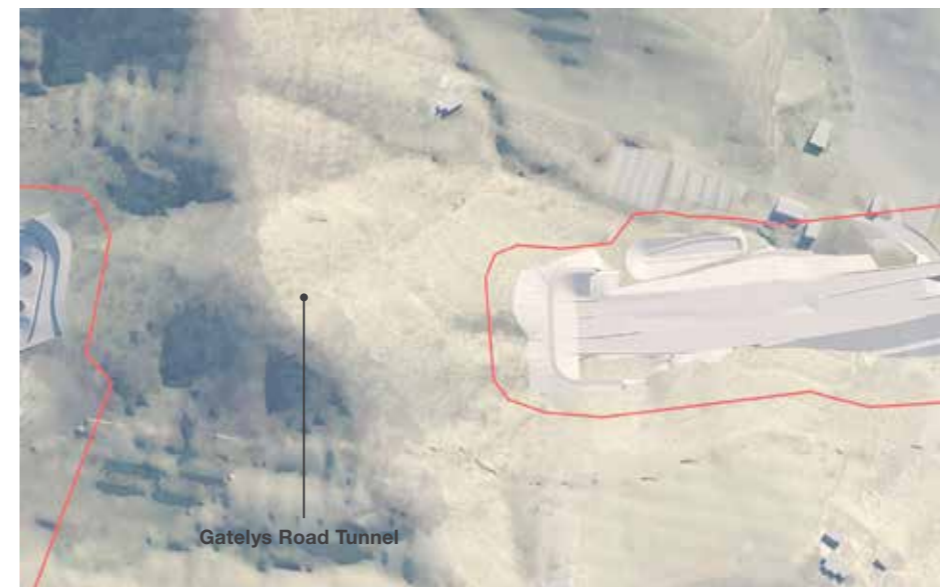


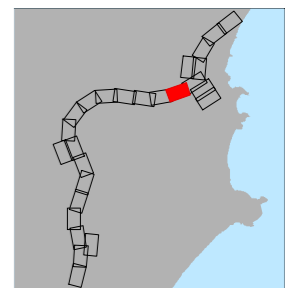
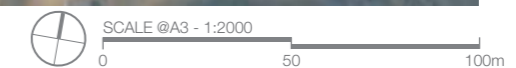
FIG C.66 21ST JUNE 9AM



FIG C.67 21ST JUNE 1PM



FIG C.68 21ST JUNE 3PM



## Design elements

### Bridges (BR16)

- Introduction of bridge BR16 over West Korora Road.

## Potential impacts

- Earthworks on the south-west of the corridor and the introduced structures are considered to produce limited shadows overall. Shadows will primarily be cast within the construction footprint.
- By 3pm, the existing topography is anticipated to cast the project in to shade.

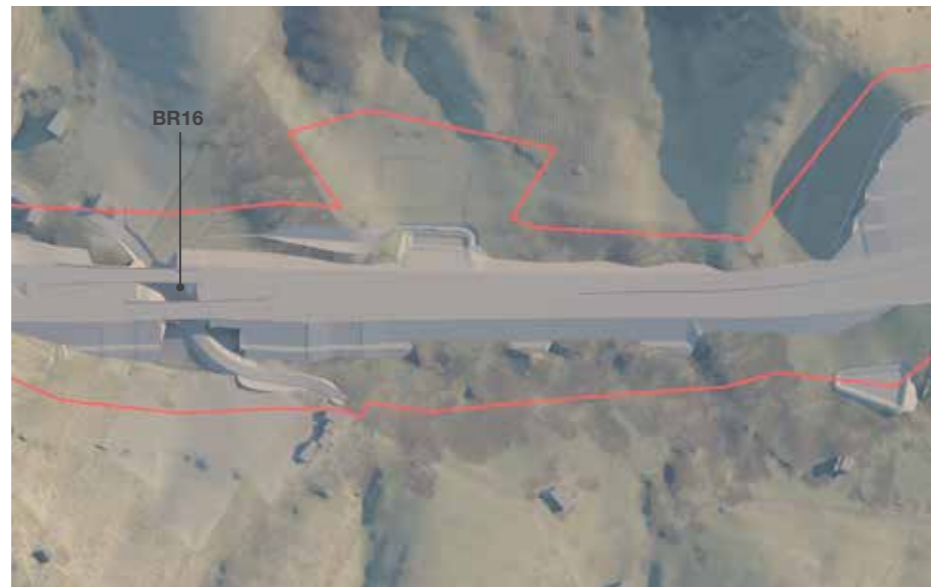


FIG C.69 21ST JUNE 7AM

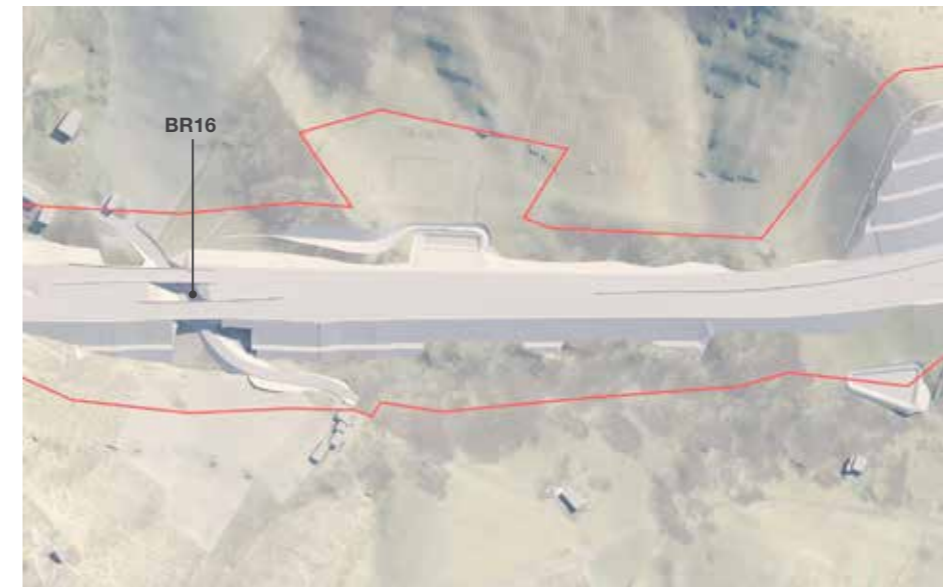


FIG C.70 21ST JUNE 9AM

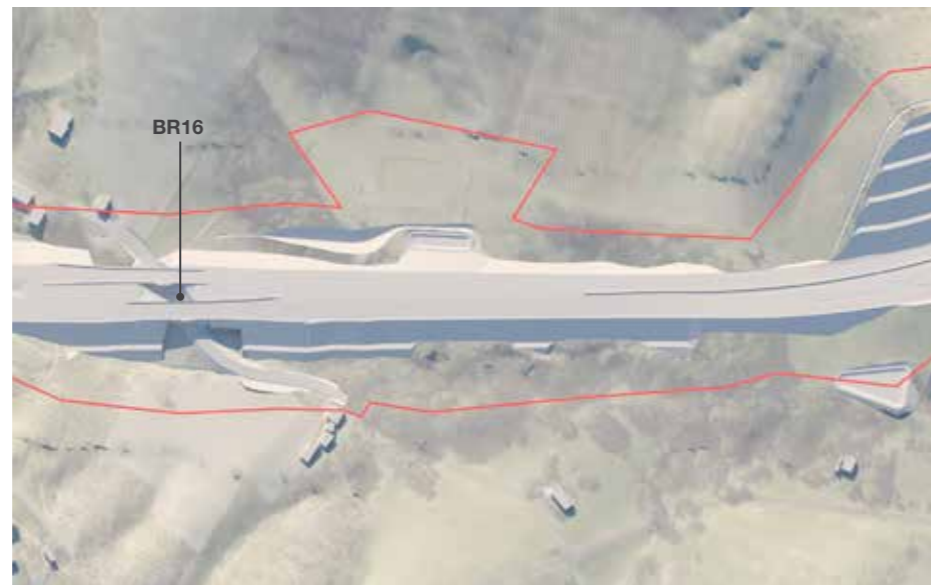
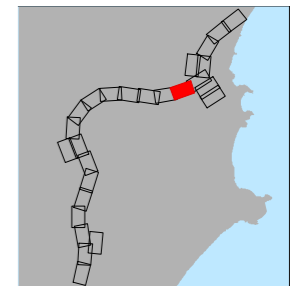
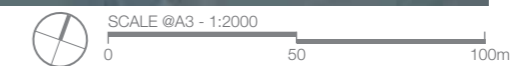


FIG C.71 21ST JUNE 1PM



FIG C.72 21ST JUNE 3PM



## Design elements

### Bridges (BR17 and BR19)

- Introduction of twin bridges BR17 over northbound entry ramp at Korora Hill interchange.
- Introduction of land bridge BR19 over southbound exit ramp at Korora Hill interchange.

### Retaining walls

- Introduction of RW40 measuring 7.3m and RW47 measuring 2.4m.

### Earthworks

- Deep earthwork slopes along the highway

## Potential impacts

- The shadows anticipated as a result of the introduced structural elements and earthworks would be limited to the construction footprint.
- By 3pm, the existing topography is anticipated to cast the project in to shade.

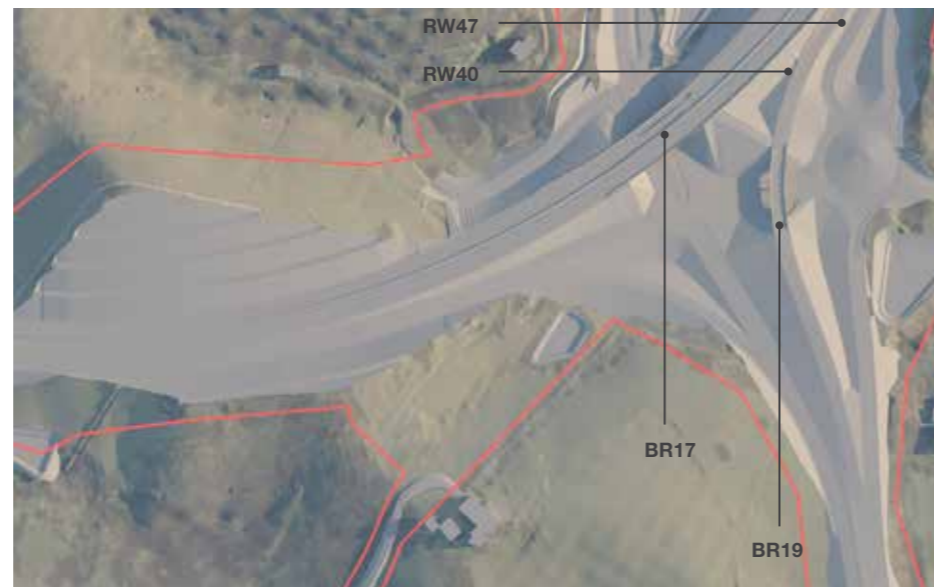


FIG C.73 21ST JUNE 7AM

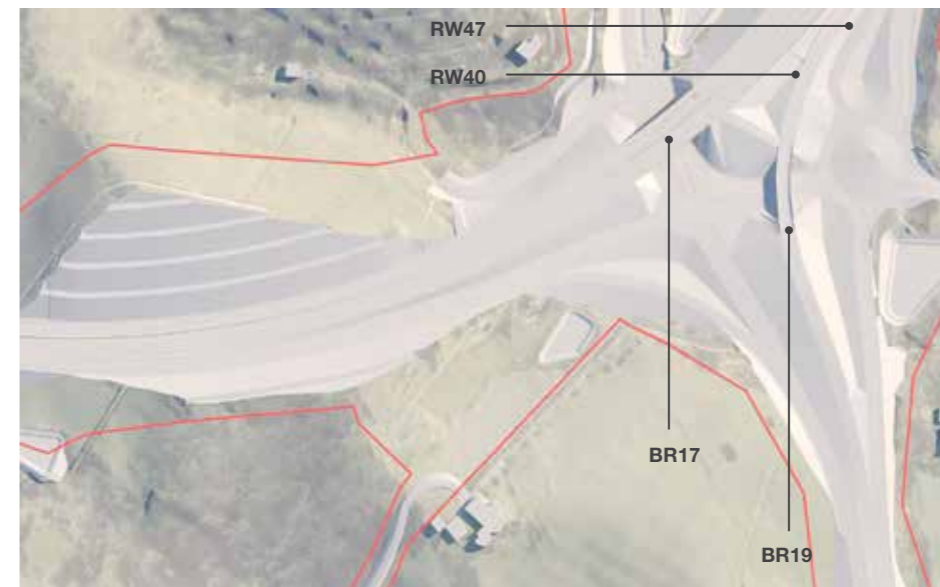


FIG C.74 21ST JUNE 9AM

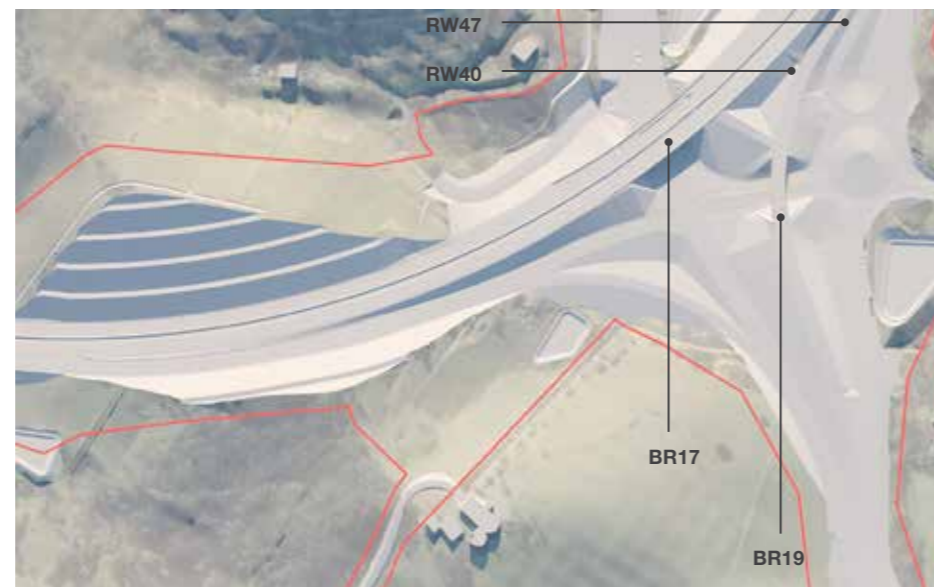
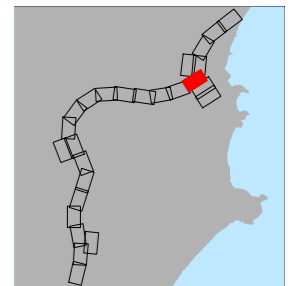
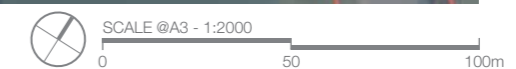


FIG C.75 21ST JUNE 1PM



FIG C.76 21ST JUNE 3PM



## Design elements

## Potential impacts

- Overshadowing due to structural elements, particularly the introduced earthworks is anticipated to primarily be within the construction footprint.



FIG C.77 21ST JUNE 7AM



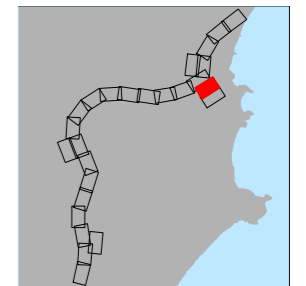
FIG C.78 21ST JUNE 9AM



FIG C.79 21ST JUNE 1PM



FIG C.80 21ST JUNE 3PM



## Design elements

### Bridges (BR17 and BR19)

- Introduction of twin bridges BR17 over northbound entry ramp at Korora Hill interchange.
- Introduction of land bridge BR19 over southbound exit ramp at Korora Hill interchange.

### Retaining walls

- Introduction of RW40 measuring 7.3m, RW44 measuring 3.9m, RW46 measuring 1.7m and RW47 measuring 2.4m.

## Potential impacts

- The overshadowing will primarily be contained within the construction footprint
- By 3pm, the existing topography is anticipated to cast areas of the project and the surrounding landscape in to shade.

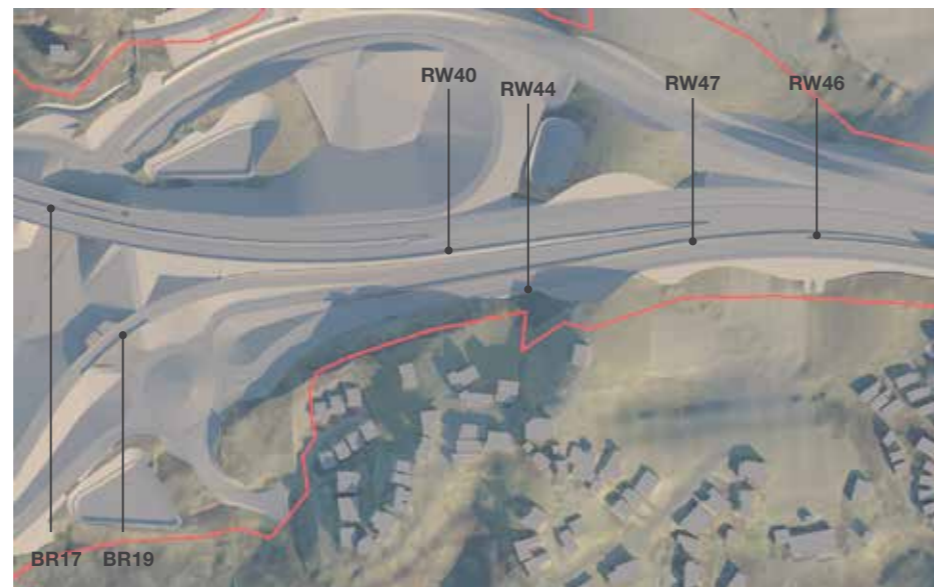


FIG C.81 21ST JUNE 7AM

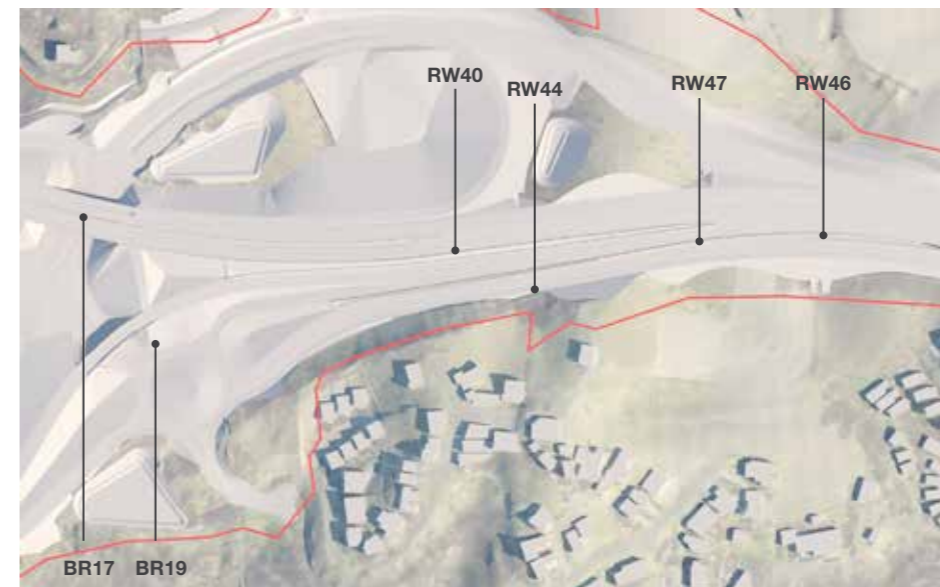


FIG C.82 21ST JUNE 9AM

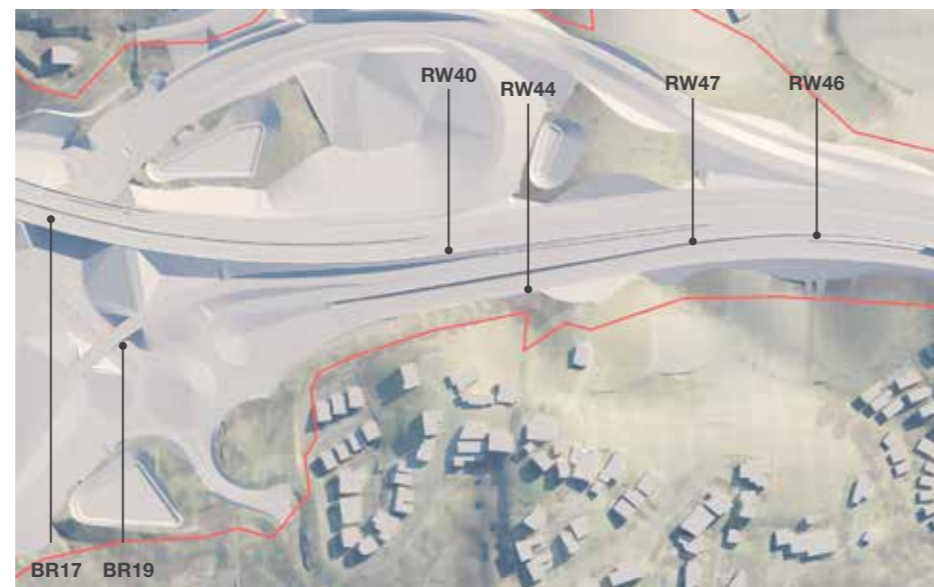


FIG C.83 21ST JUNE 1PM

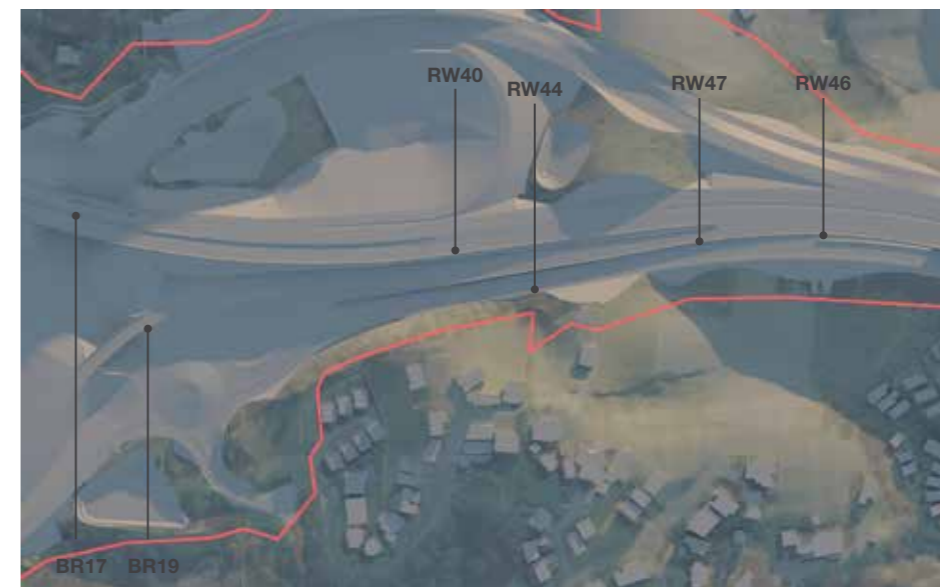
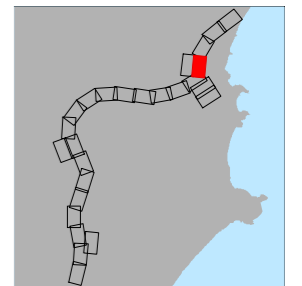


FIG C.84 21ST JUNE 3PM



## Design elements

- No structural elements introduced at this location.

## Potential impacts

- Earthwork batters have a minimal impact on the overshadowing as a result on the introduced structural elements.



FIG C.85 21ST JUNE 7AM



FIG C.86 21ST JUNE 9AM

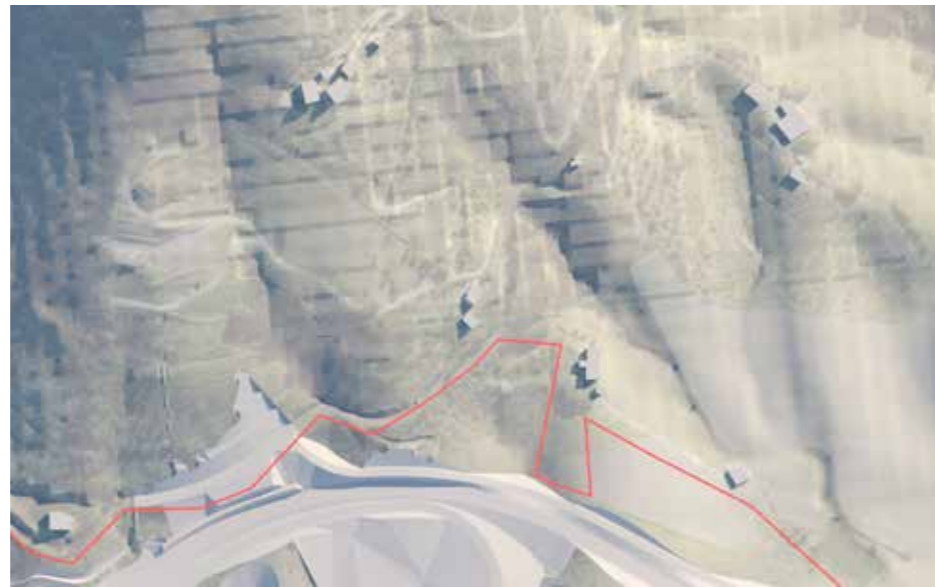
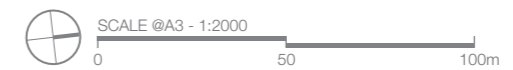
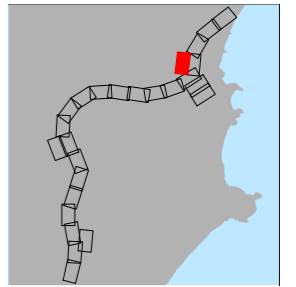


FIG C.87 21ST JUNE 1PM



FIG C.88 21ST JUNE 3PM





## Design elements

### Noise walls

- Introduction of a solid noise wall NCA26\_SB\_01B measuring 5m high.

### Retaining walls

- Introduction of RW04 measuring 3.3m, RW41 measuring 7.4m, RW43 measuring 1.9m and RW46 measuring 2.4m.

## Potential impacts

- Overshadowing due to structural elements is anticipated to be limited to the construction footprint, with shadows extending beyond the construction boundary in the late afternoon, as a result of RW41 and noise wall NCA26\_SB\_01B.
- The noise wall illustrated consists of a solid wall, representing the worst case scenario. During detailed design, consideration to be given to the upper sections of the noise wall being transparent to reduce the extent of potential overshadowing, with the lower levels remaining as solid to mitigate the impact on views from Kororo Public School. Refer to chapter 5 for further detail.

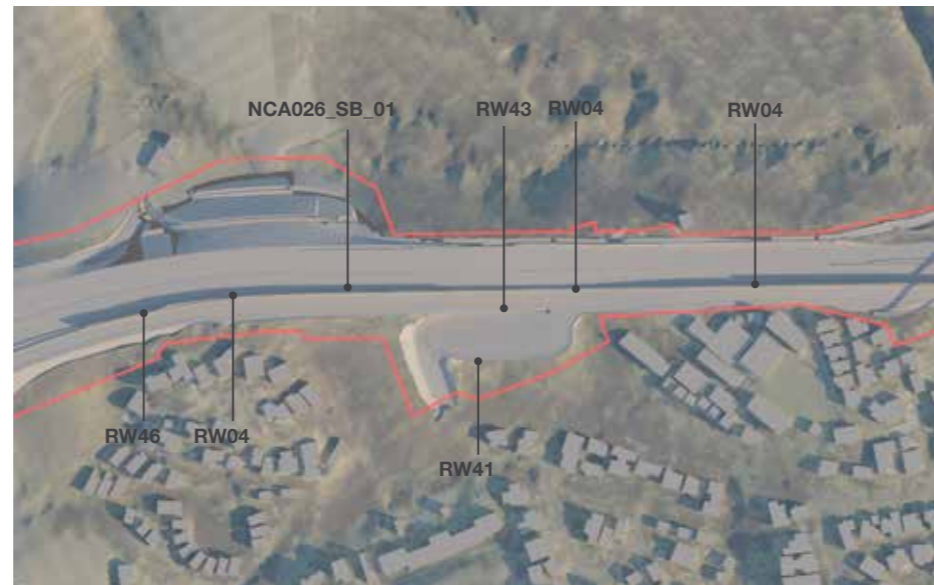


FIG C.89 21ST JUNE 7AM

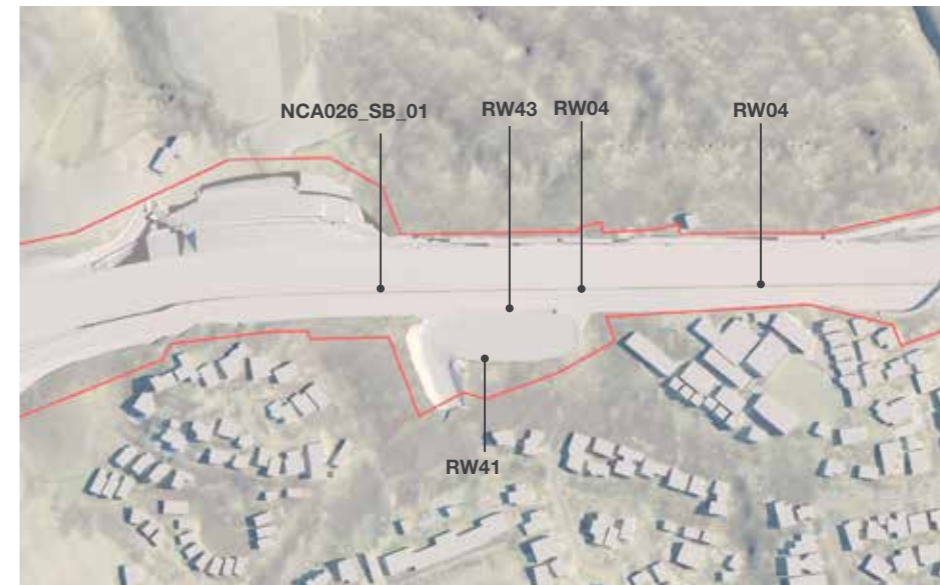


FIG C.90 21ST JUNE 9AM

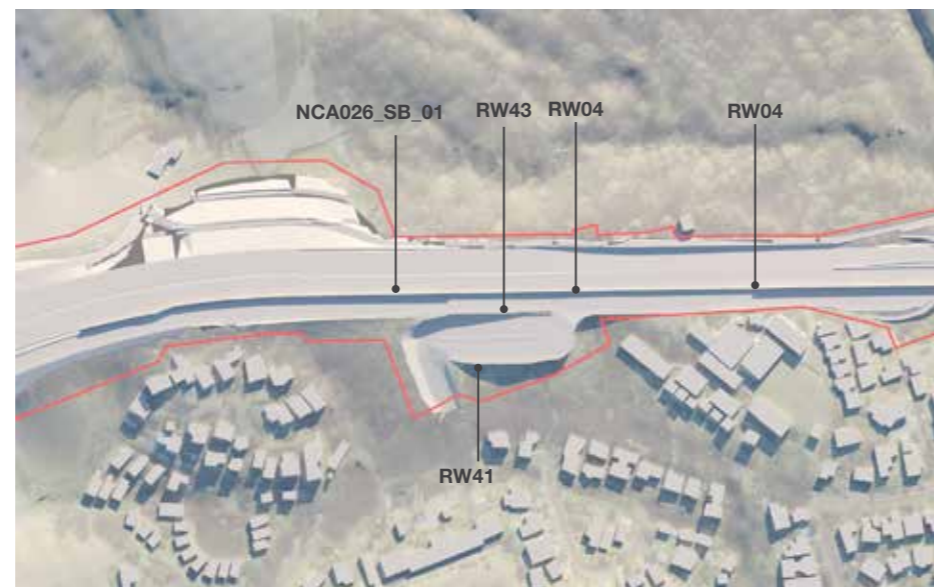


FIG C.91 21ST JUNE 1PM

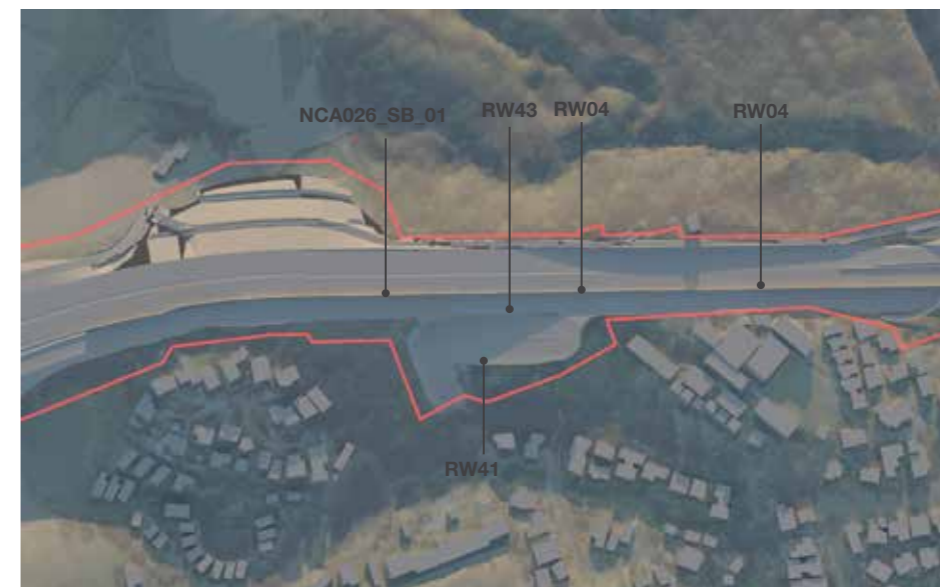
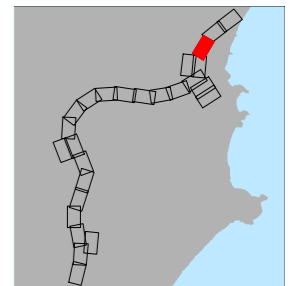


FIG C.92 21ST JUNE 3PM



## Design elements

### Noise walls

- Introduction of a solid noise wall NCA26\_SB\_01B measuring 5m high with transparent wall to bridge above Pine Brush Creek

### Bridges

- Introduction of twin bridges BR21 over Pine Brush Creek entry ramp at Korora Hill interchange with a noise wall (northbound only).

### Retaining walls

- Introduction of RW01 measuring 3.3m and RW05 measuring 8.3m.

## Potential impacts

- Overshadowing due to structural elements is anticipated to be limited to the construction footprint during the morning. During early afternoon, figures illustrate shadows extending beyond the construction footprint.
- The noise wall illustrated consists of a solid wall, representing the worst case scenario. During detailed design, consideration to be given to the upper sections of the noise wall being transparent to reduce the extent of potential overshadowing, with the lower levels remaining as solid to mitigate impact on views from adjacent properties.

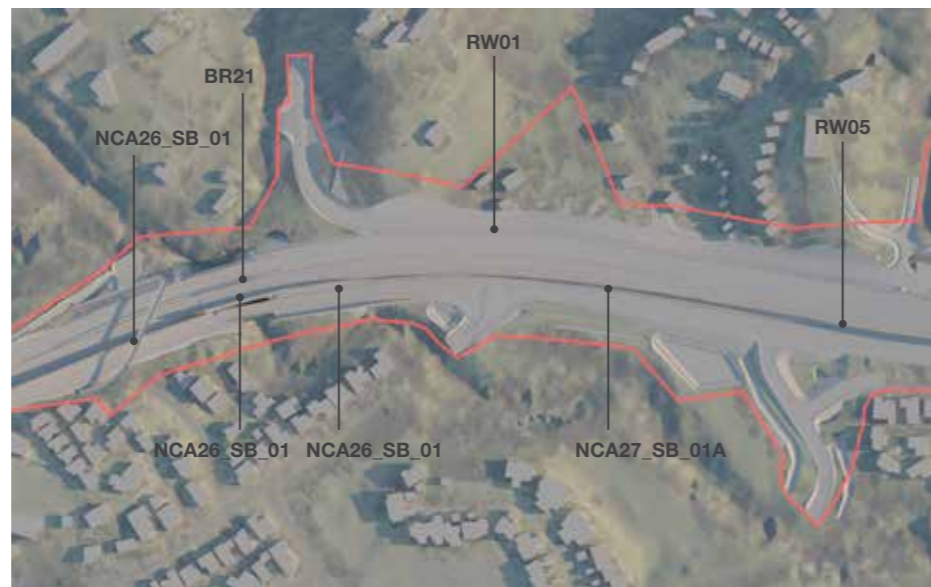


FIG C.97 21ST JUNE 7AM

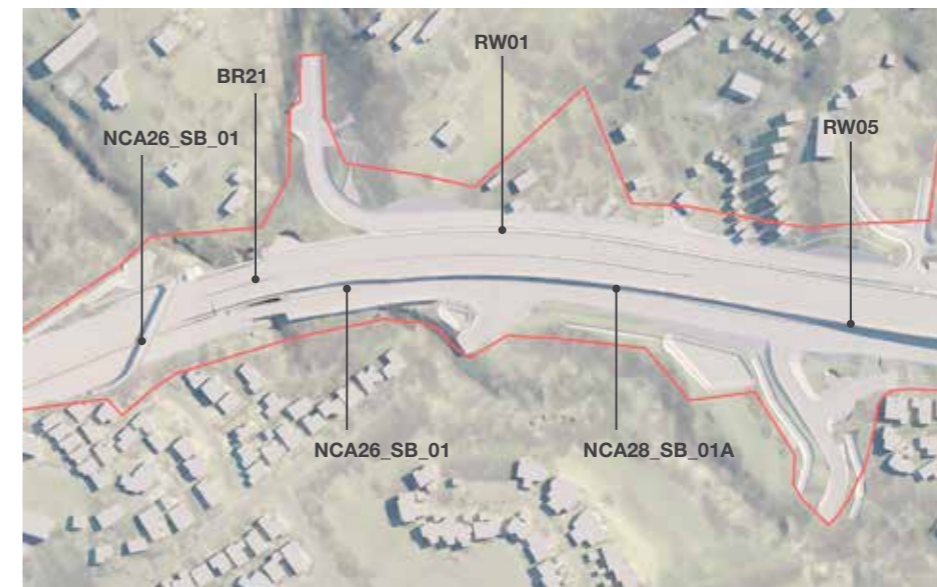


FIG C.98 21ST JUNE 9AM

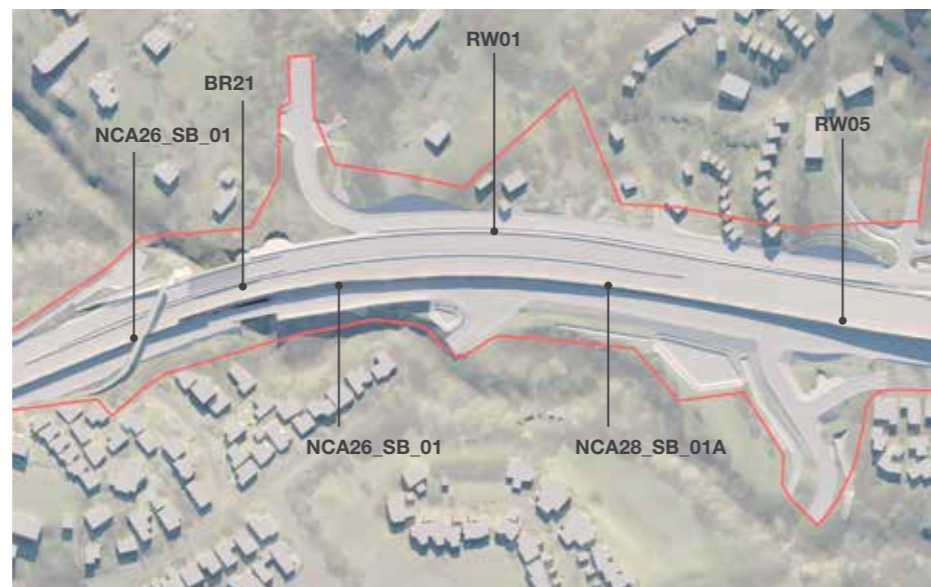
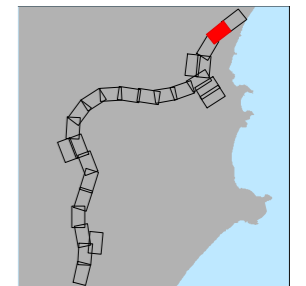


FIG C.99 21ST JUNE 1PM



FIG C.100 21ST JUNE 3PM



## Design elements

### Noise walls

- Introduction of a solid noise wall NCA28\_SB\_01B measuring 3m high.

### Retaining walls

- Introduction of RW01 measuring 3.3m, RW02 measuring 5.5m, RW03 measuring 7.2m, RW05 measuring 8.3m, RW06 measuring 9m RW45 measuring 7m and RW50 measuring 10m.

### Bridges (BR22)

- Introduction of twin bridges BR22 over Fernleigh Avenue with a noise wall (northbound and southbound).

## Potential impacts

- Overshadowing due to structural elements is anticipated to be limited to the construction footprint prior to 9am. Shadows are likely to be cast beyond the construction footprint by 3pm.
- Shadows from retaining wall RW05, RW06 and bridge BR22 have the potential to extend to properties within Coachmans Close.

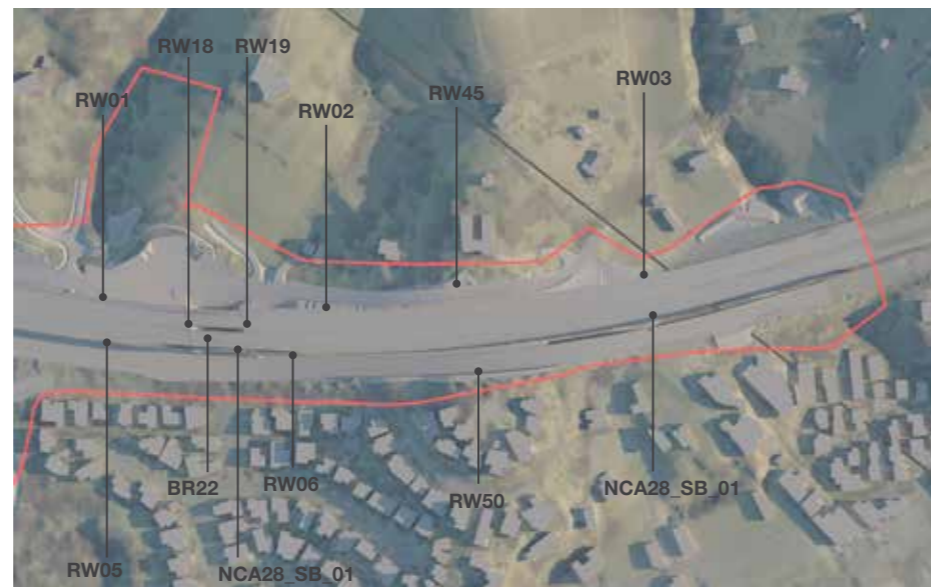


FIG C.101 21ST JUNE 7AM

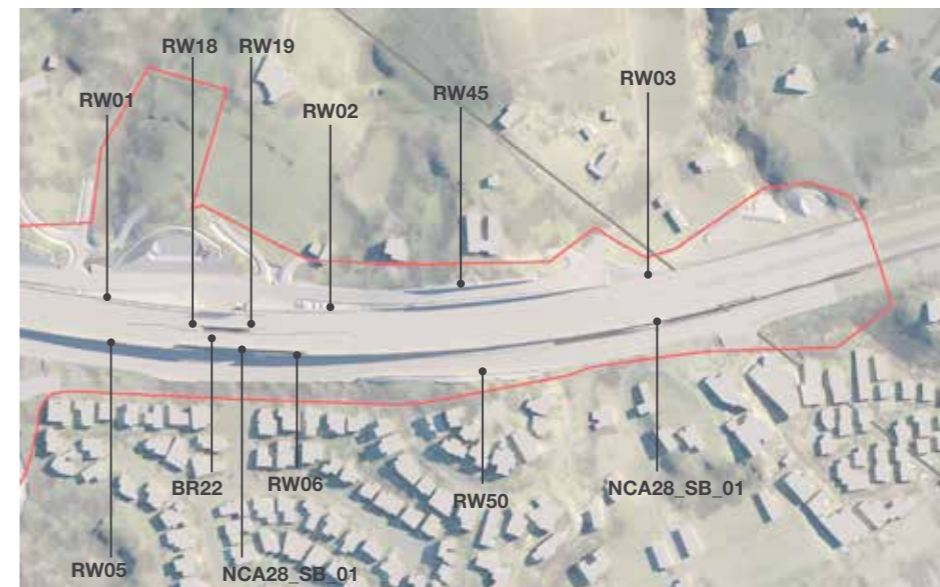


FIG C.102 21ST JUNE 9AM

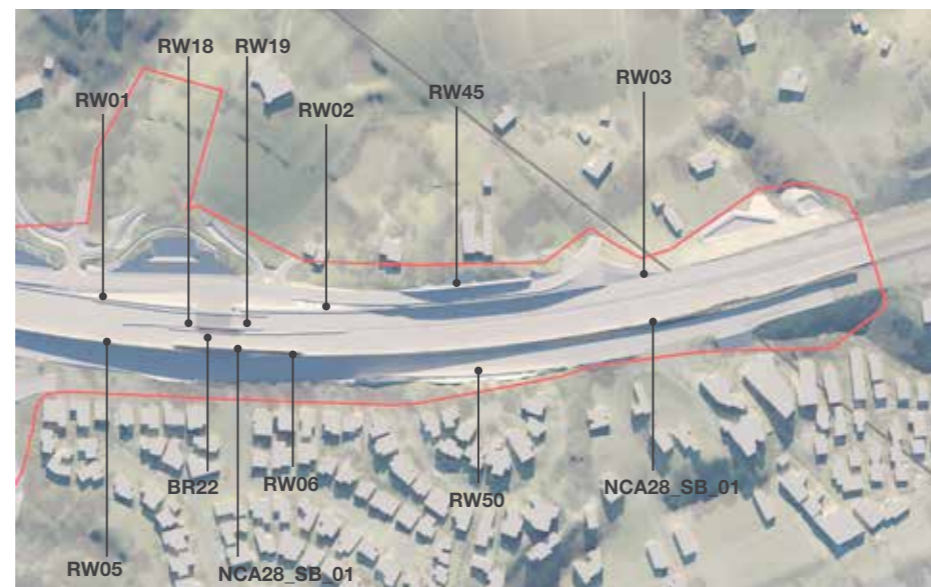
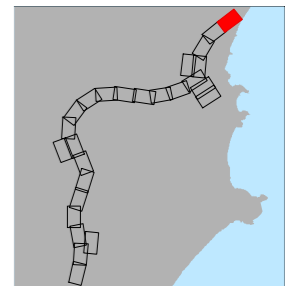
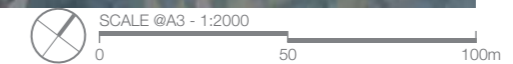


FIG C.103 21ST JUNE 1PM



FIG C.104 21ST JUNE 3PM



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Sub-appendix D

# Coastal view analysis

Sub-appendix A

Sub-appendix B

Sub-appendix C

Sub-appendix D

Sub-appendix E

Chapter 9

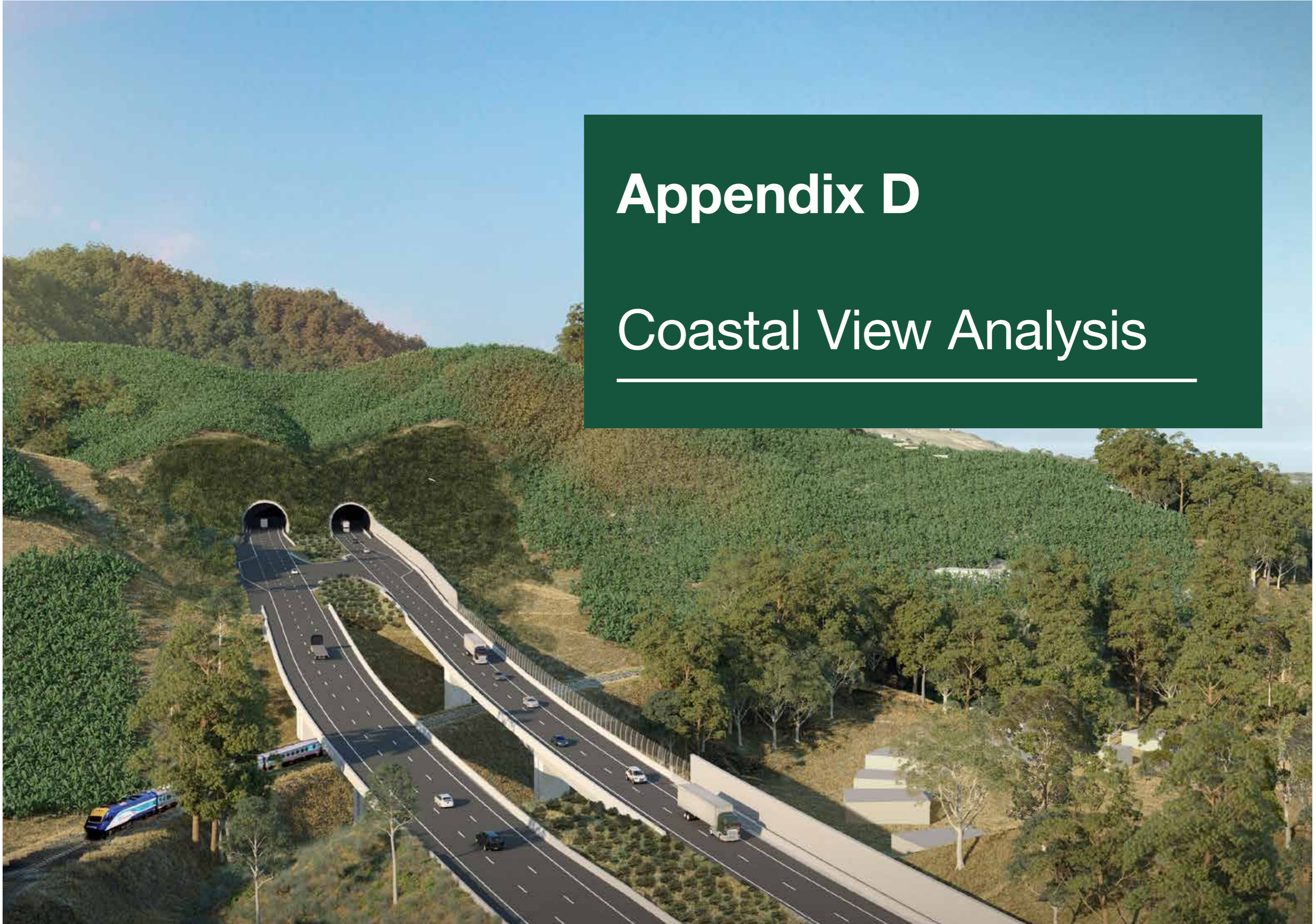


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# Appendix D

## Coastal View Analysis

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# Coastal views

In general, people commonly have close affinities with coastlines for recreation and admiring their inherent natural beauty. As a consequence, research shows that properties with ocean views have an increased economic value.

The inherent sensitivity of properties with coastline views has been analysed to determine potential impact or loss of coastal views.

## Methodology

The following methodology has been employed for the assessment;

### Existing visual analysis

- A 3D terrain model was created using 2m DEM derived from C3 LIDAR data downloaded from ELVIS - Elevation and Depth - Foundation Spatial Data (<http://elevation.fsdf.org.au>)
- Viewsheds have been generated from properties situated to the west of the project, representing the extent of visibility

## Limitations

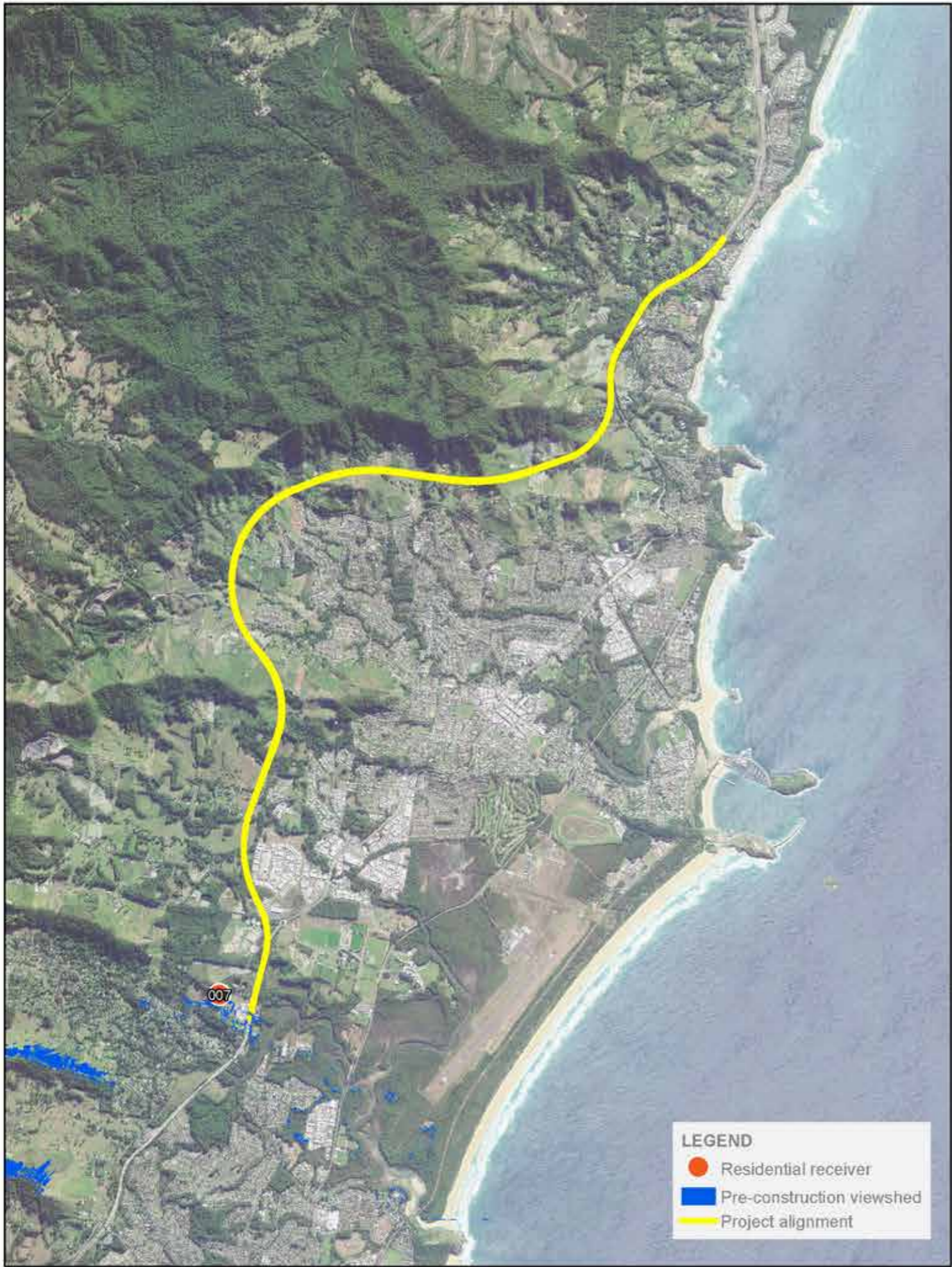
- Whilst every effort has been used to create an accurate model, the approximation of dwelling height and form means that the output should only be used as a guide.
- The proposed landscape planting illustrated within the landscape design has not been included within the 3D analysis due to the variation in vegetation establishment and to assist with analyse coastal views on completion of the works. It should be noted that the proposed planting has the potential to screen or filter coastal views as the vegetation matures.
- The purpose of this study is to determine impacts on properties with existing coastal views. Properties without views of the coastline and the ocean have not been included within this study.

## Summary

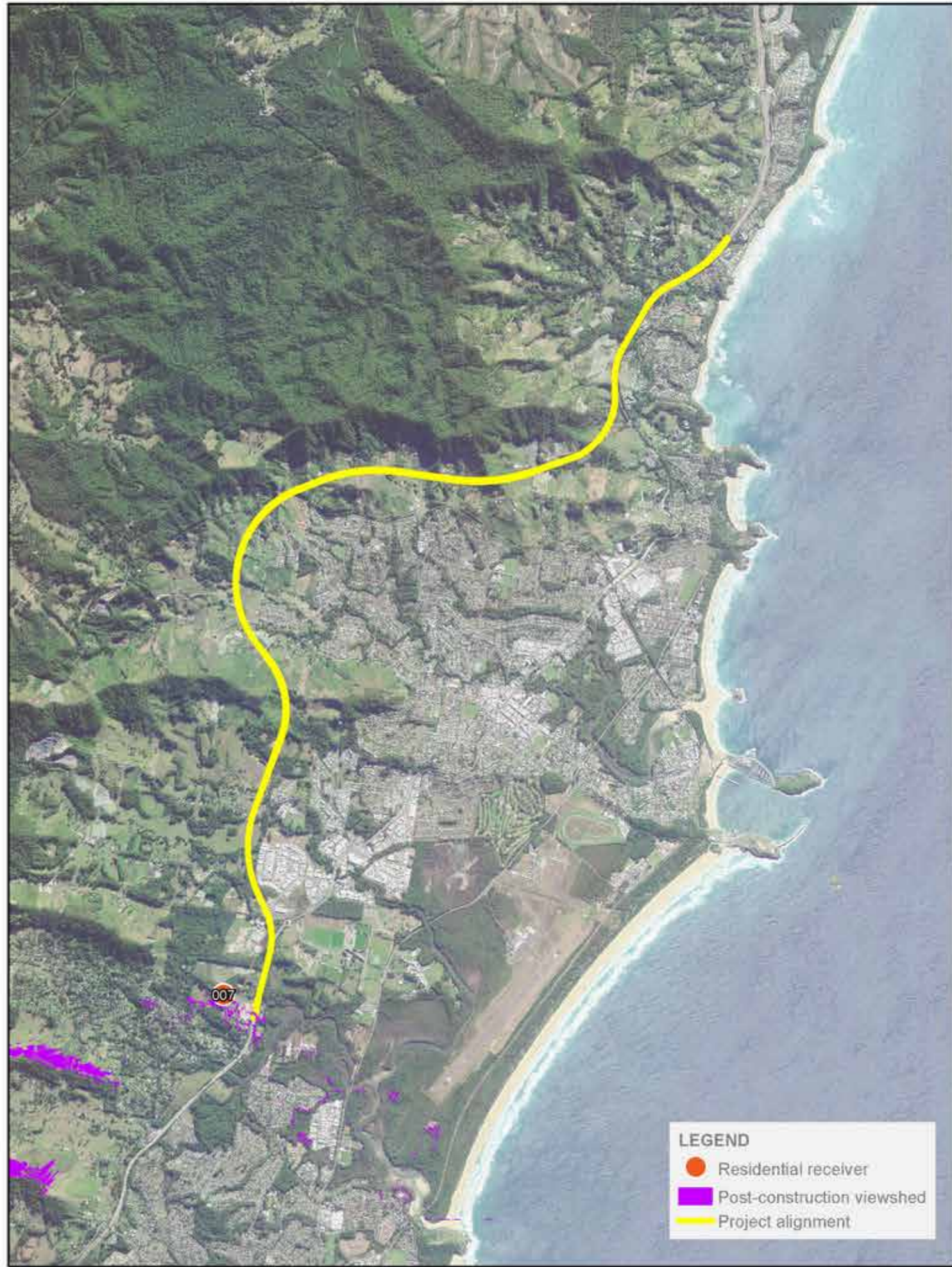
Properties analysed to the south are generally positioned on lower terrain with limited opportunities for coastal views. Generally, the introduction of the project is not anticipated to result in a loss to ocean views at this location.

Further north, it is anticipated that a number of properties with glimpse views towards the coastlines would experience a reduction in their coastal view, specifically property 54, 55, 57, 61, 66 and 67.

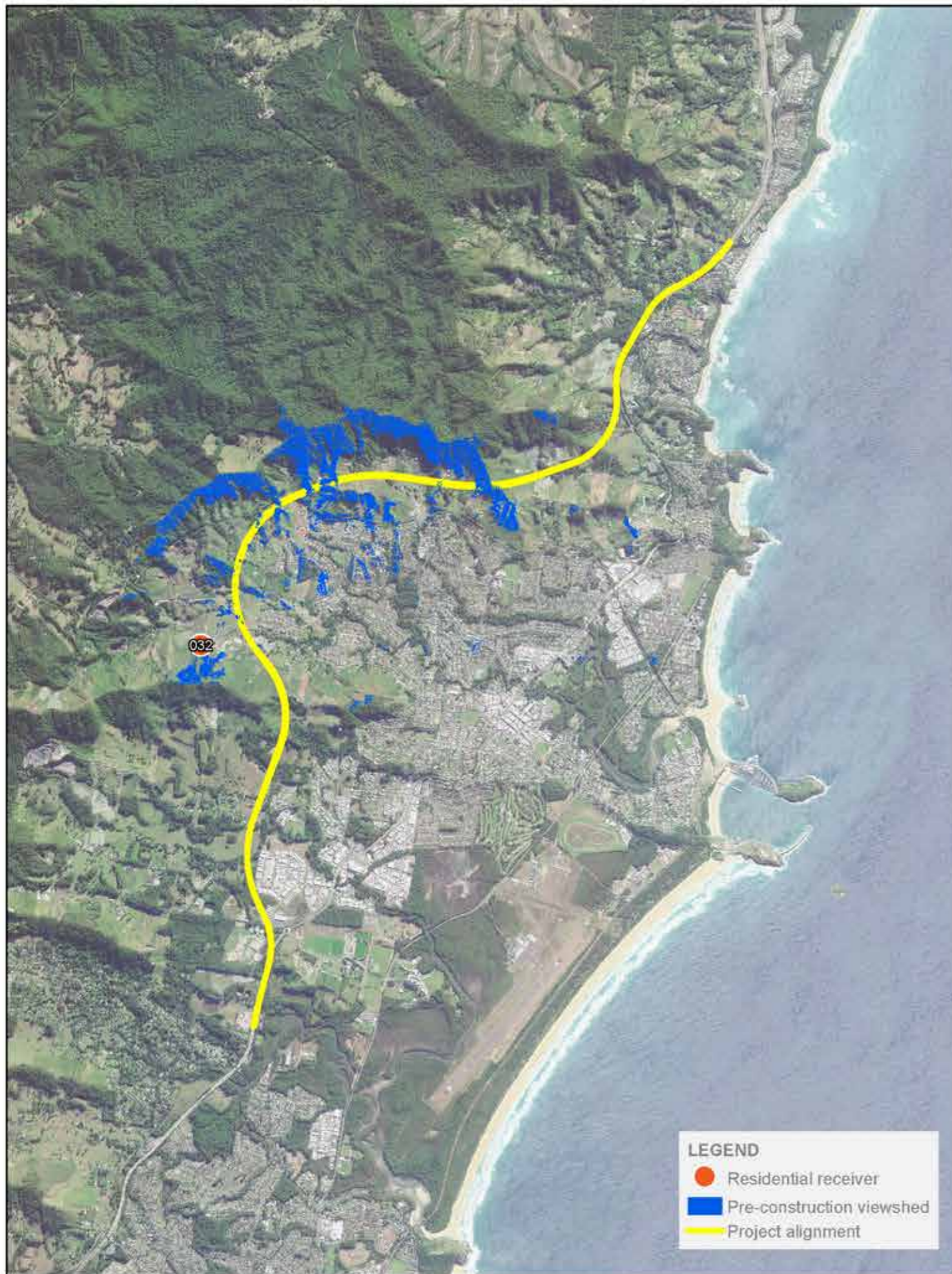
On the eastern slopes of Orara East State Forest, the introduction of Korora Hill interchange and the elevated road structure over Fernleigh Avenue have the potential to result in isolated areas of ocean view reduction, specifically for property 170.



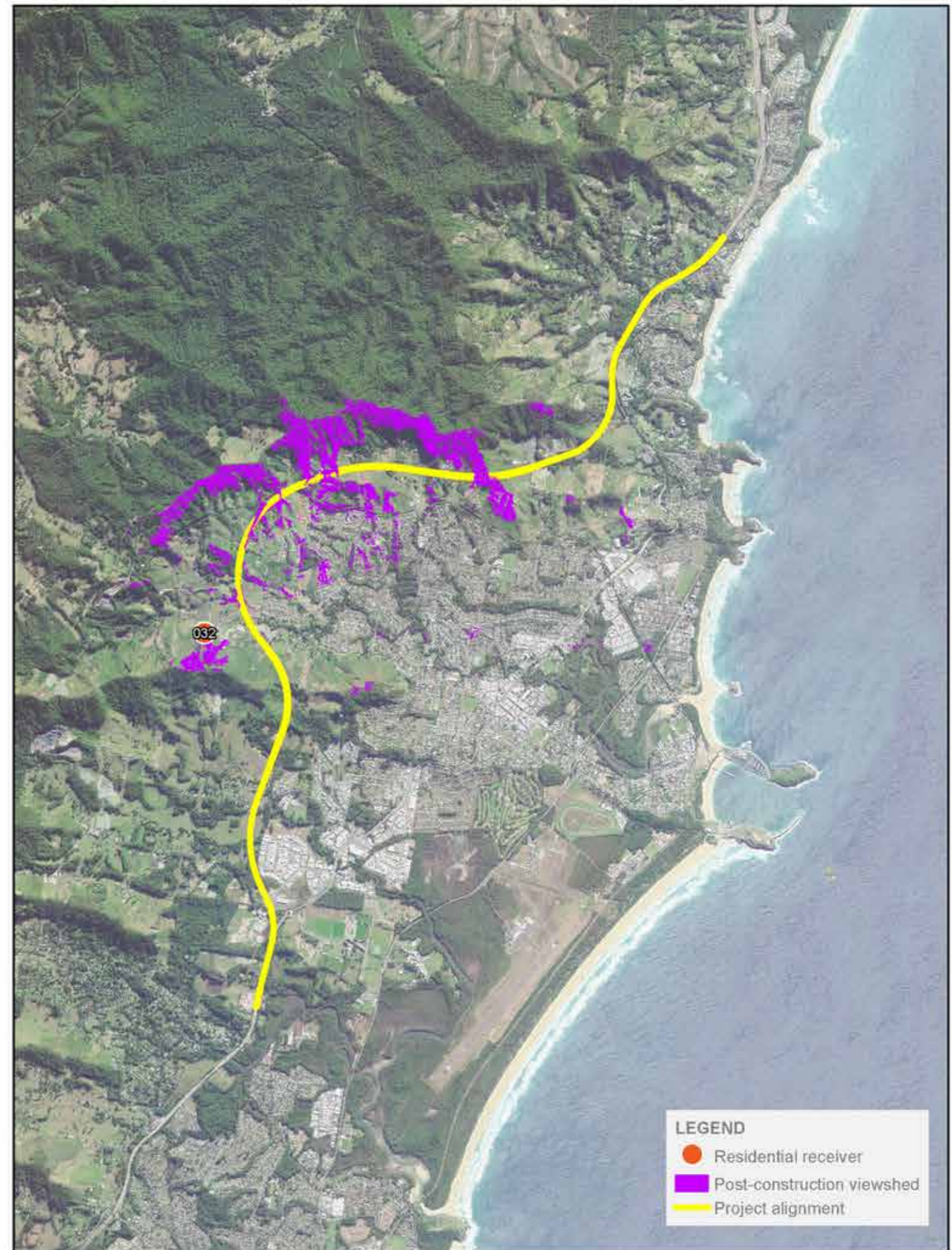
Property ocean view analysis run on a pre-construction elevation model



Property ocean view analysis run on a post-construction elevation model

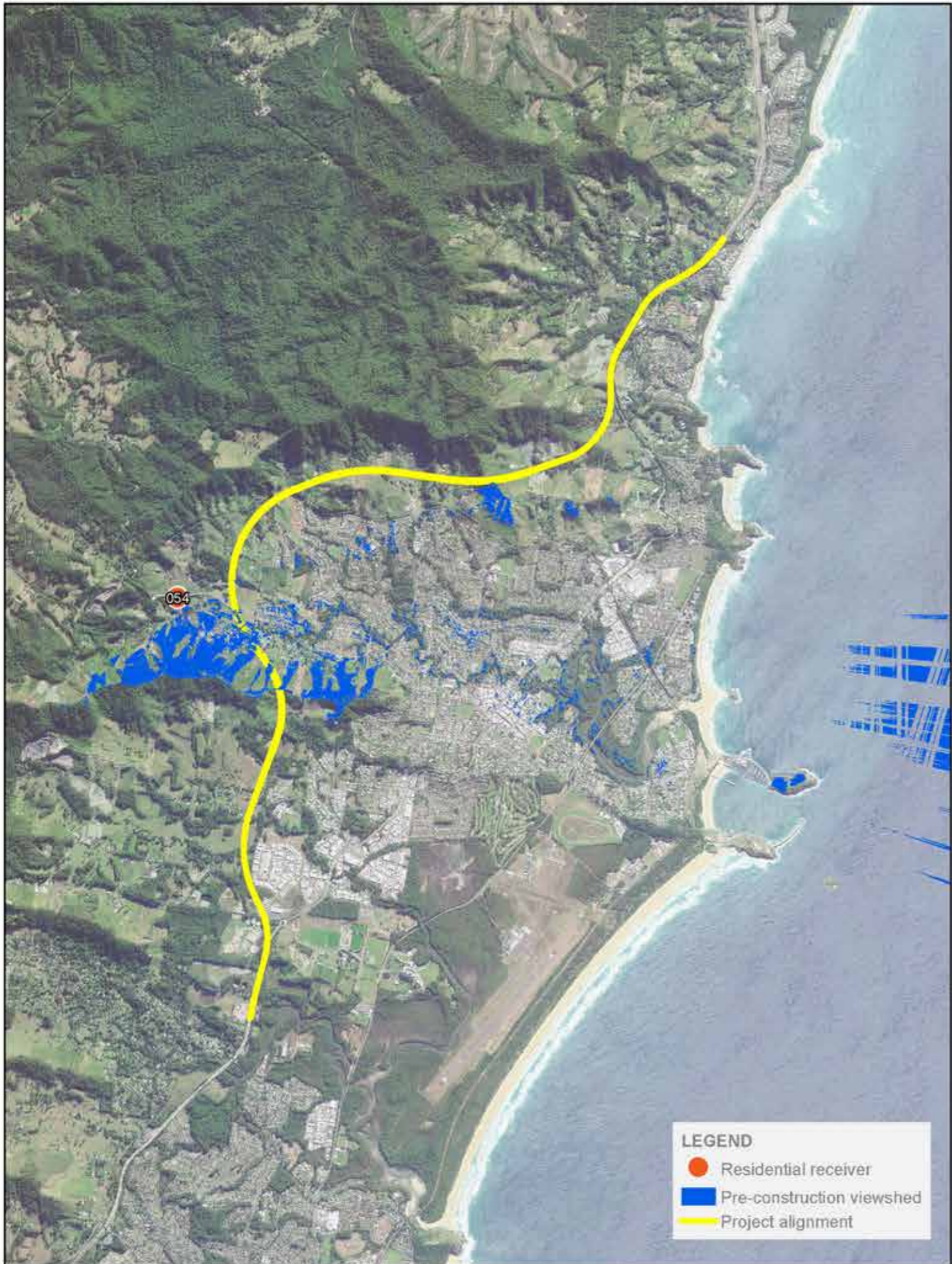


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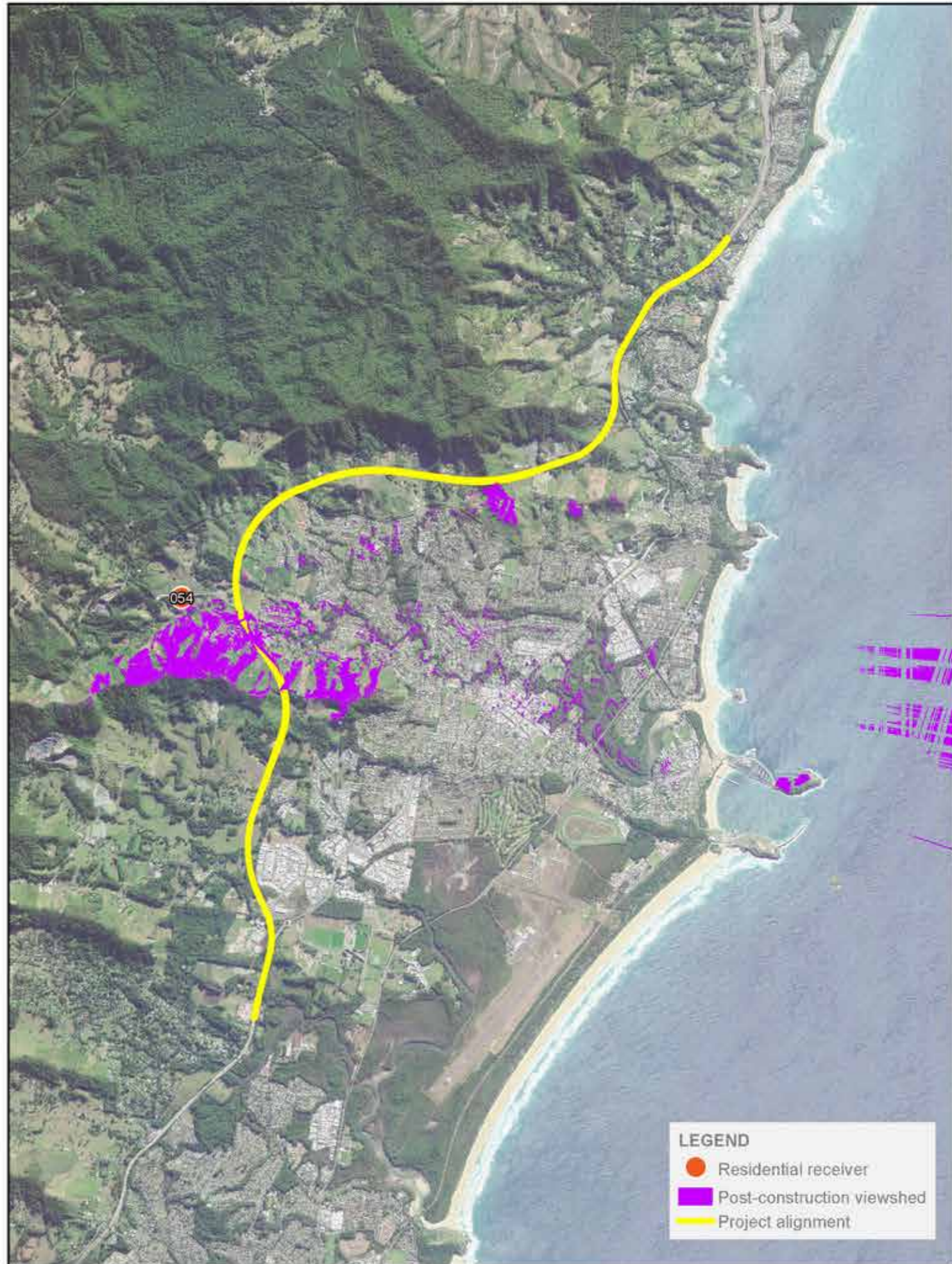


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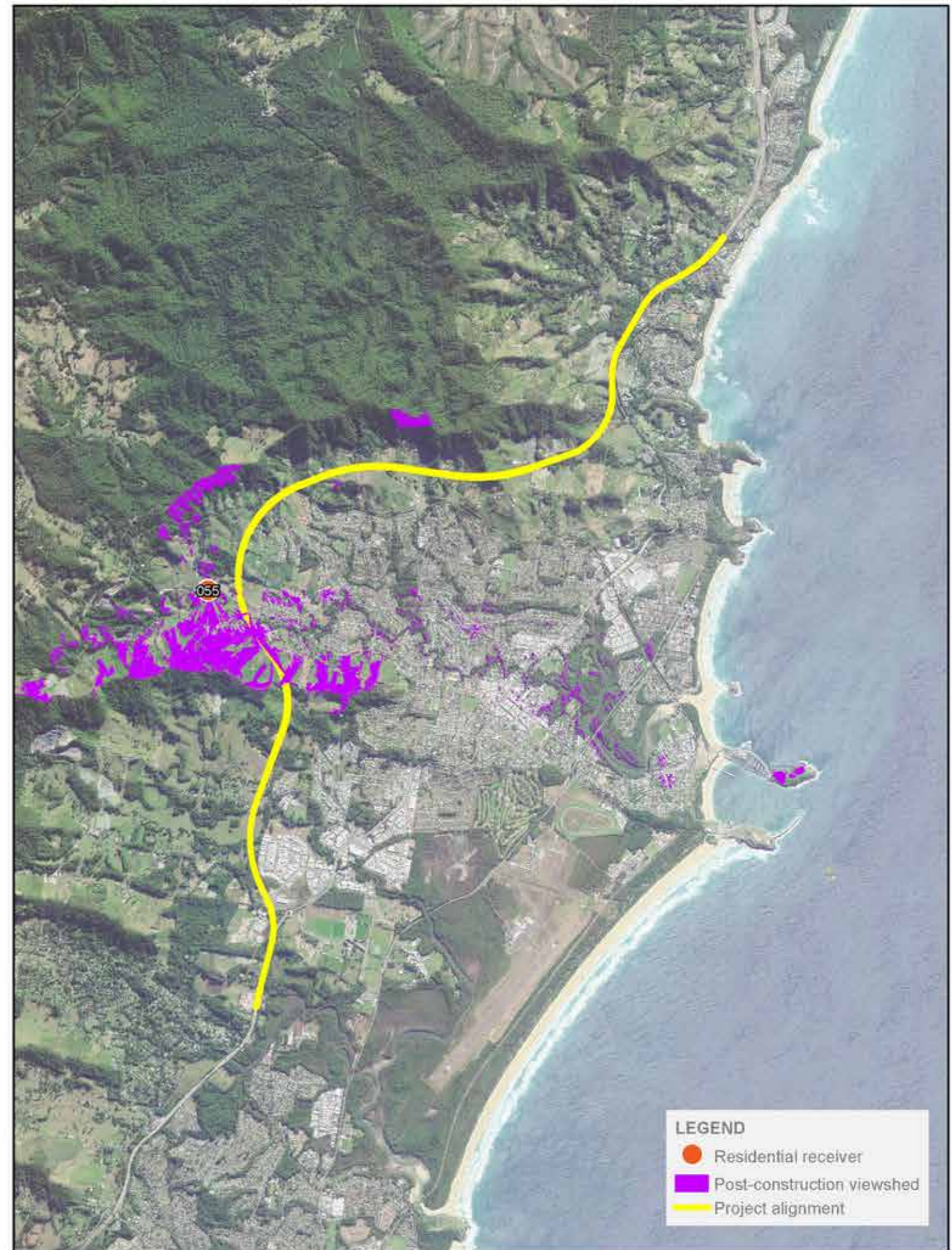
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Property ocean view analysis run on a post-construction elevation model

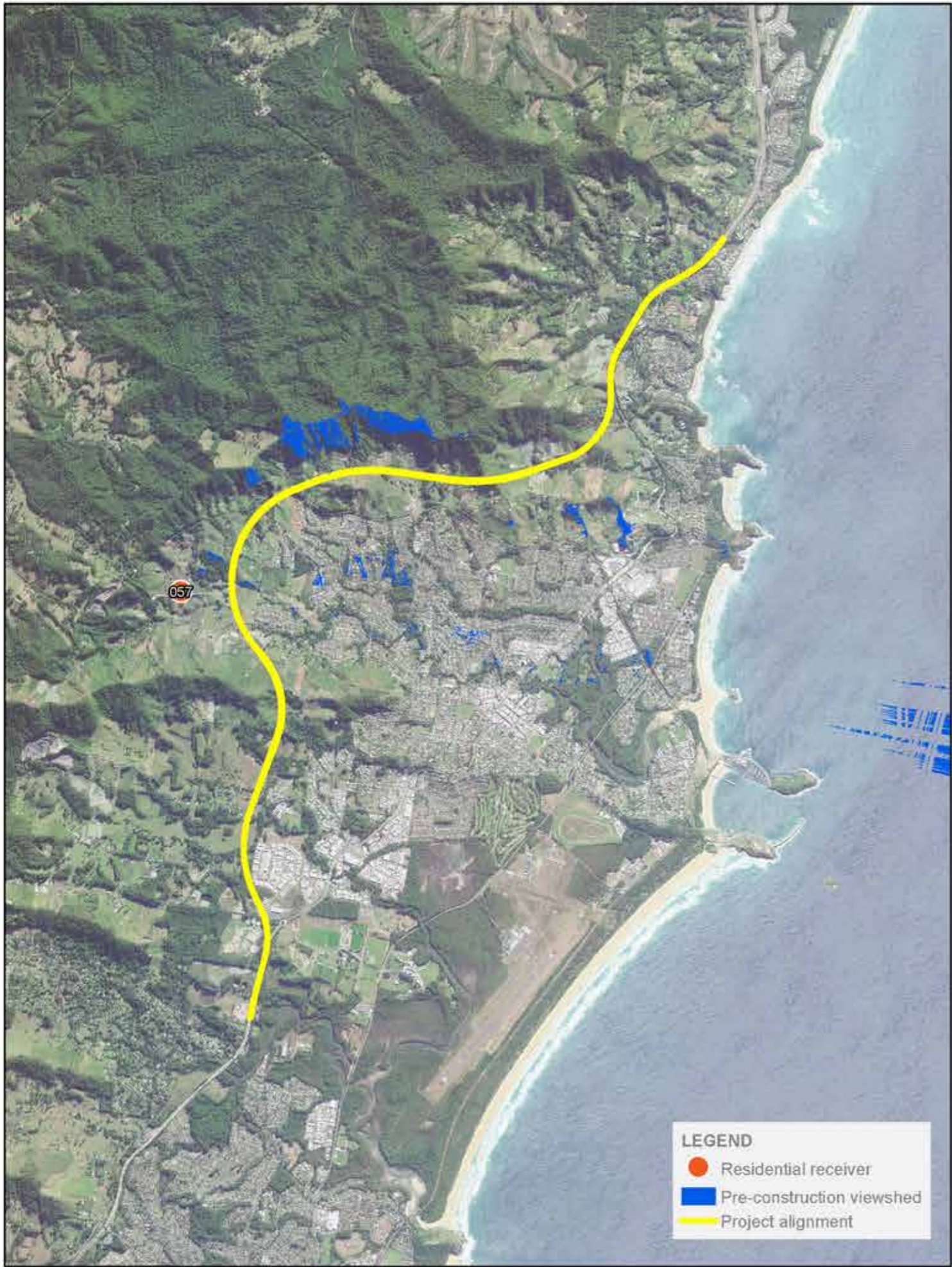


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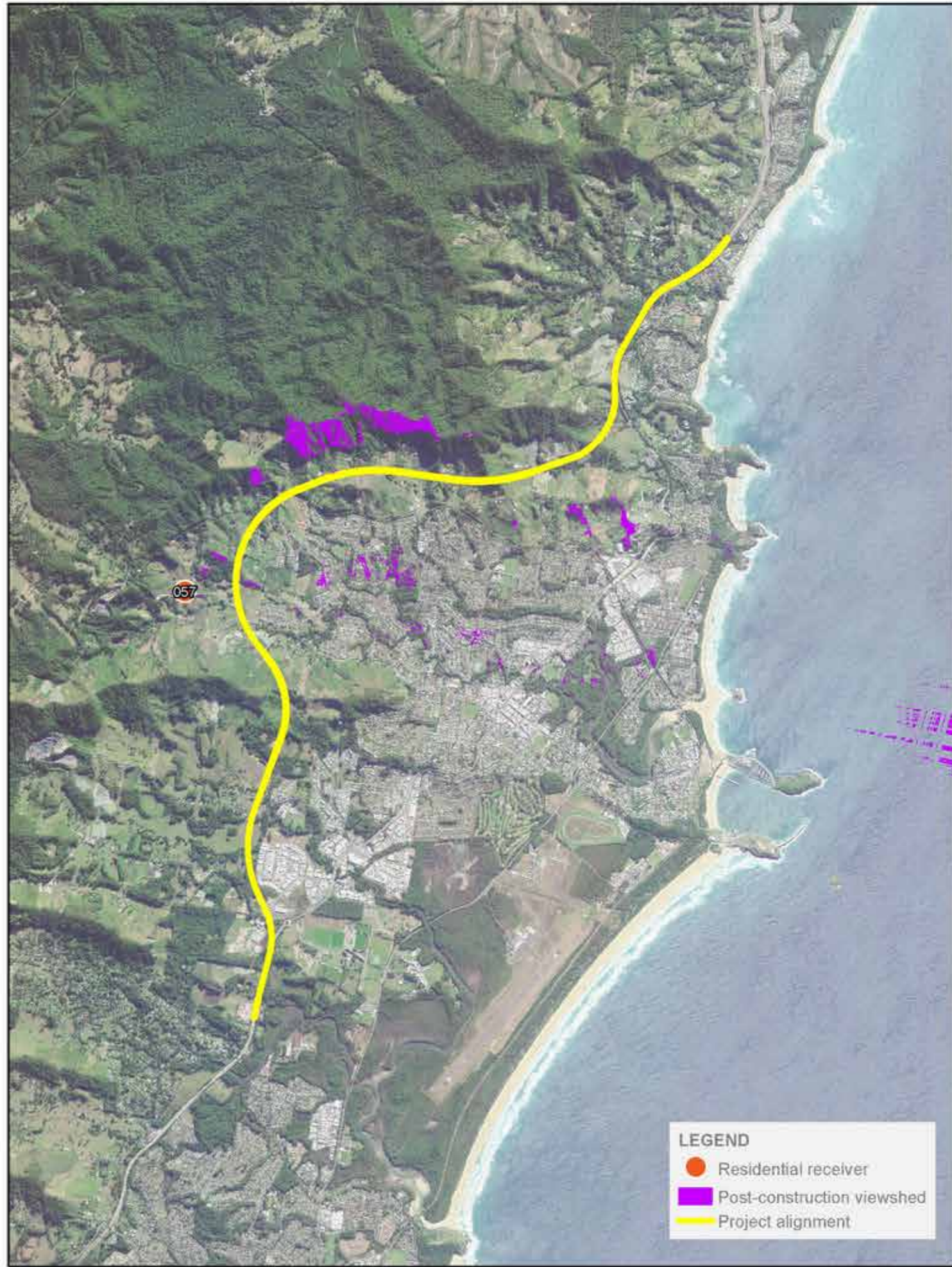


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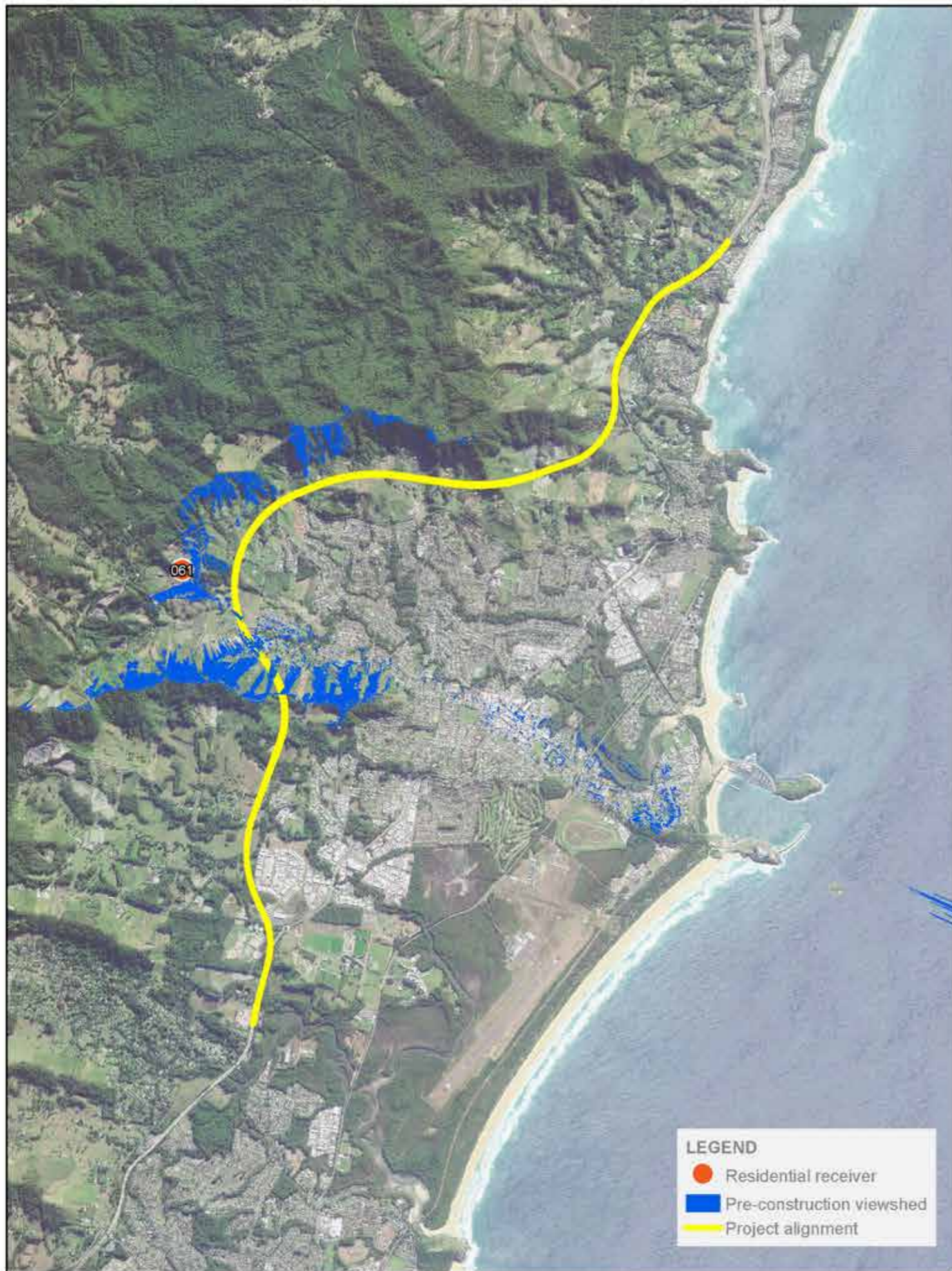




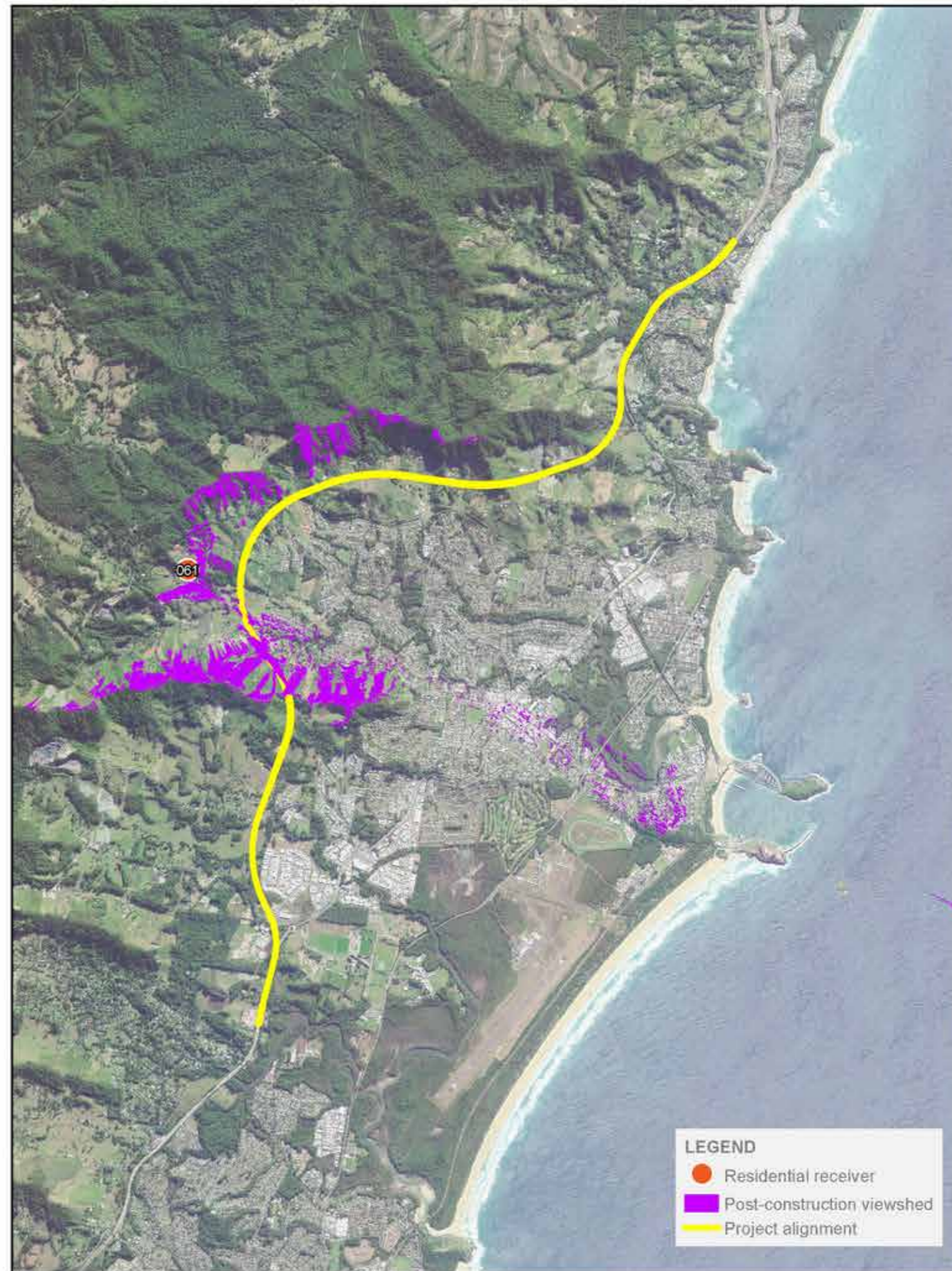
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Property ocean view analysis run on a post-construction elevation model

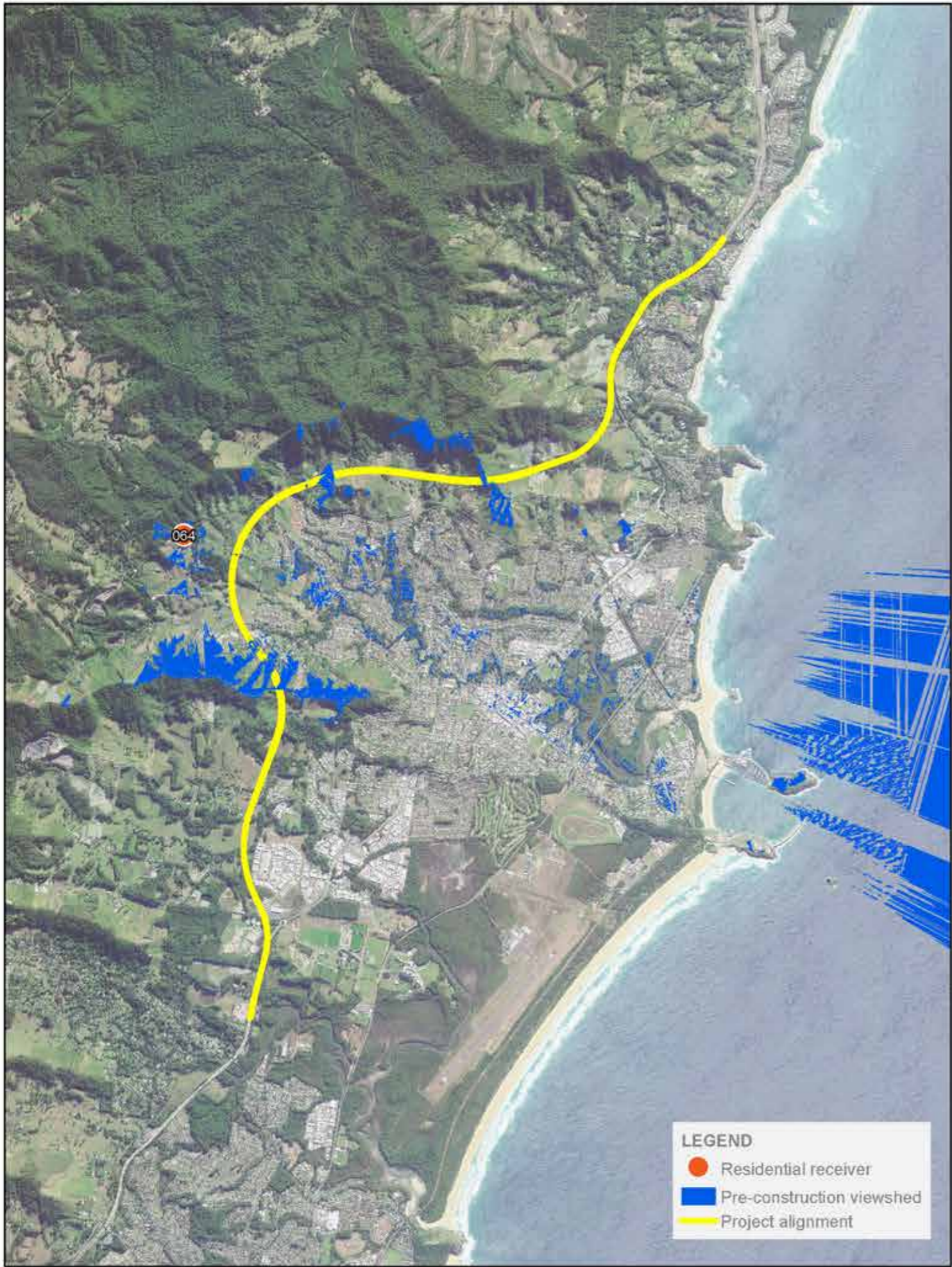


Property ocean view analysis run on a pre-construction elevation model

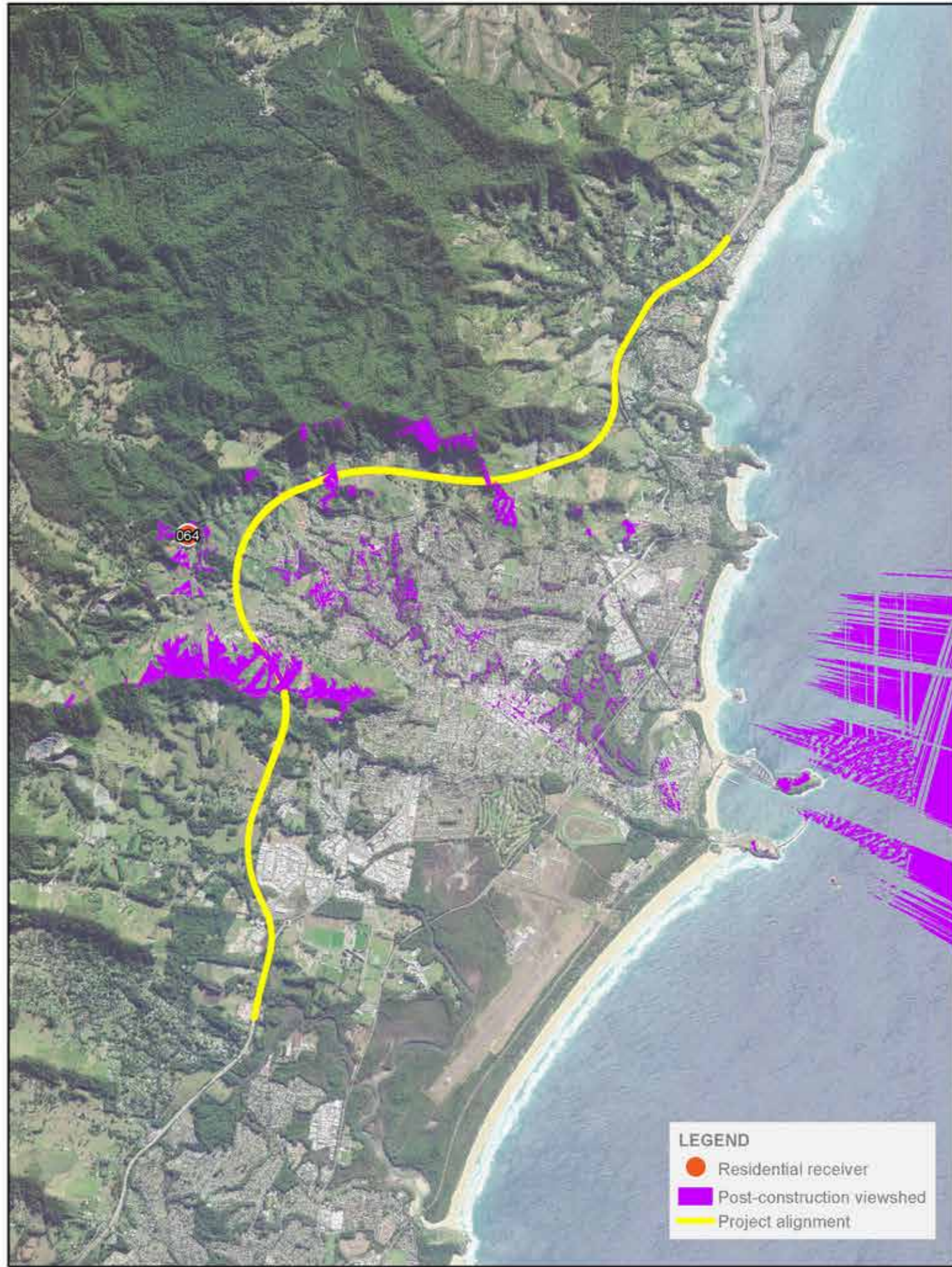


Property ocean view analysis run on a post-construction elevation model



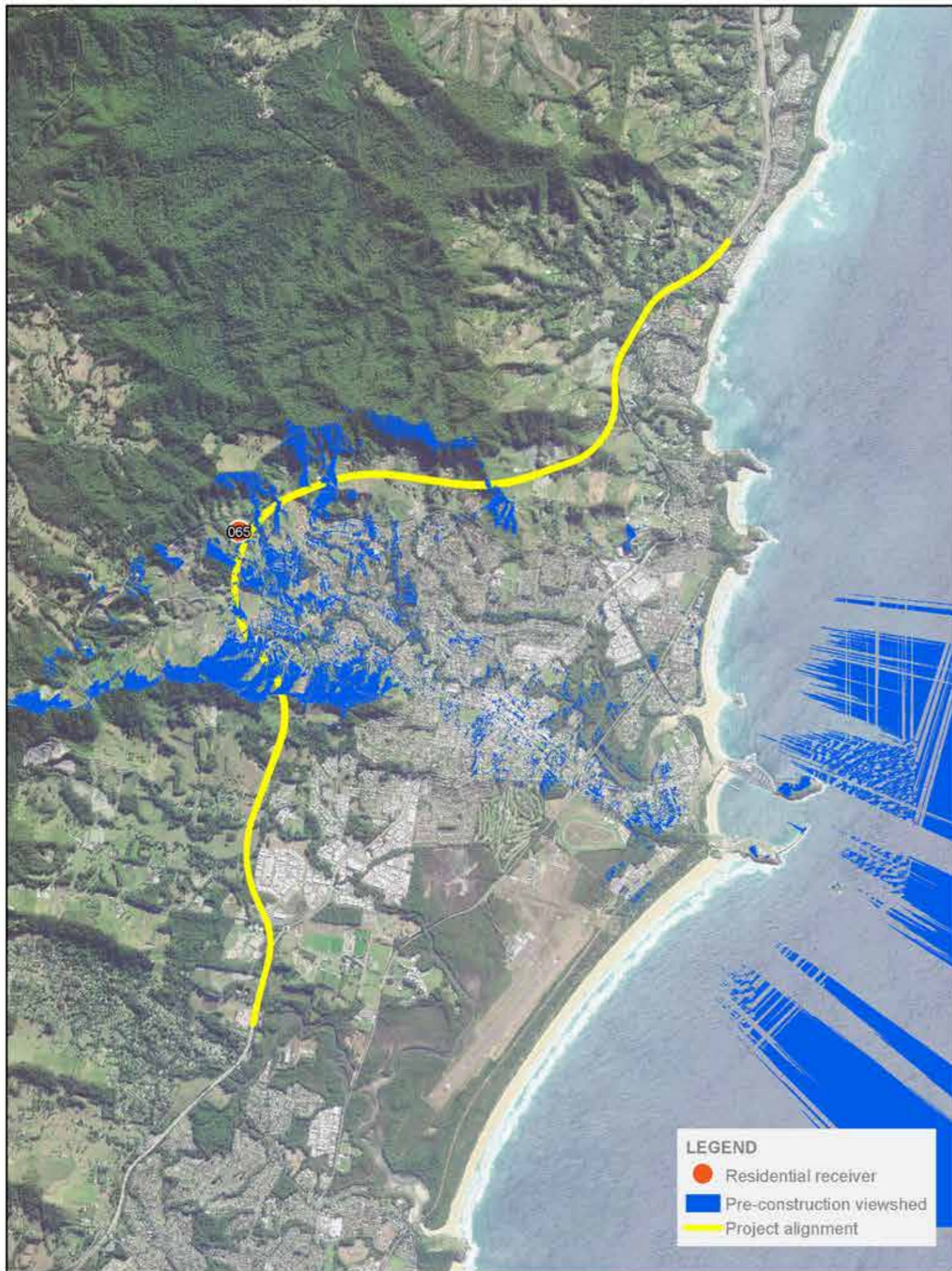


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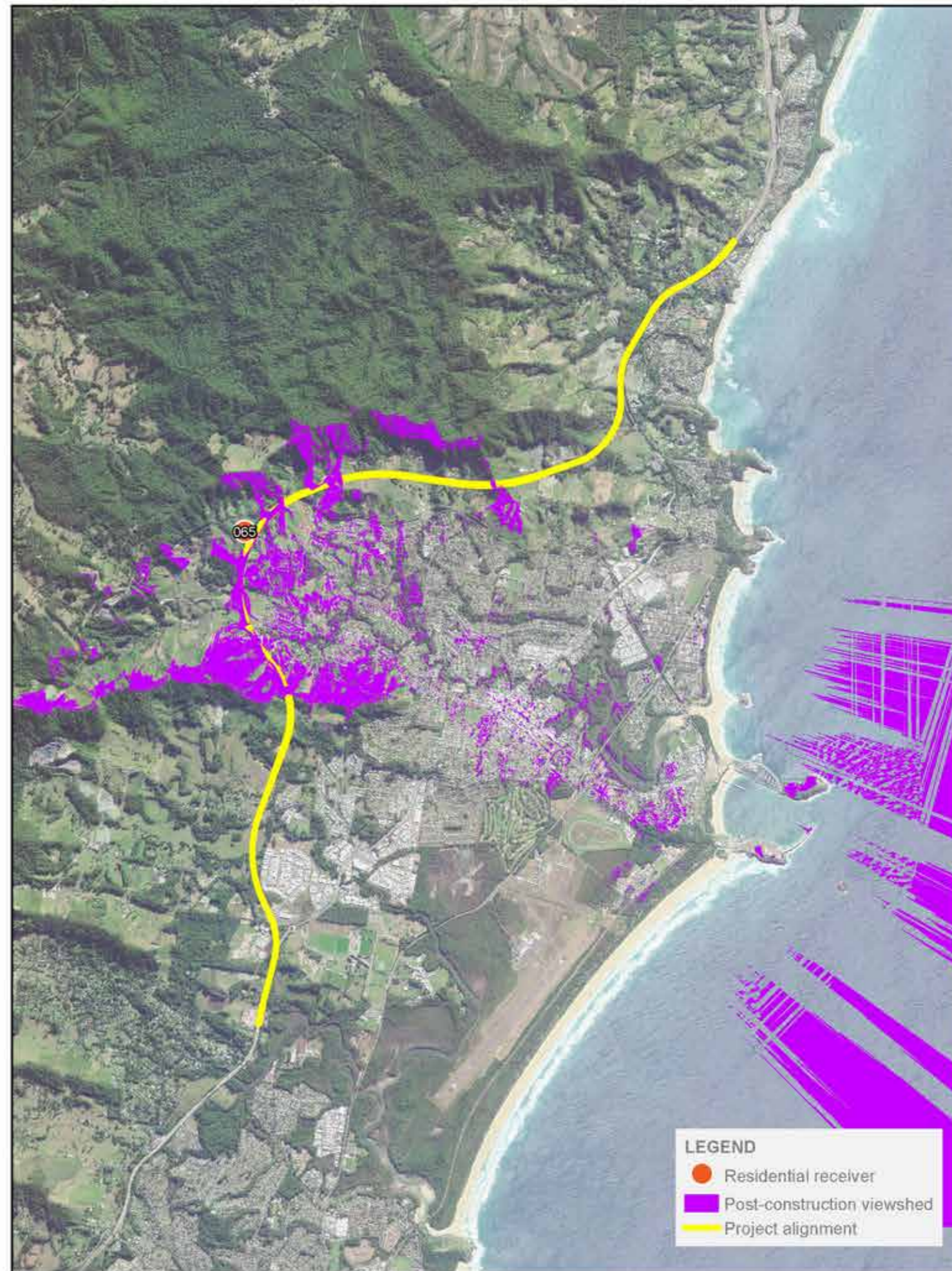


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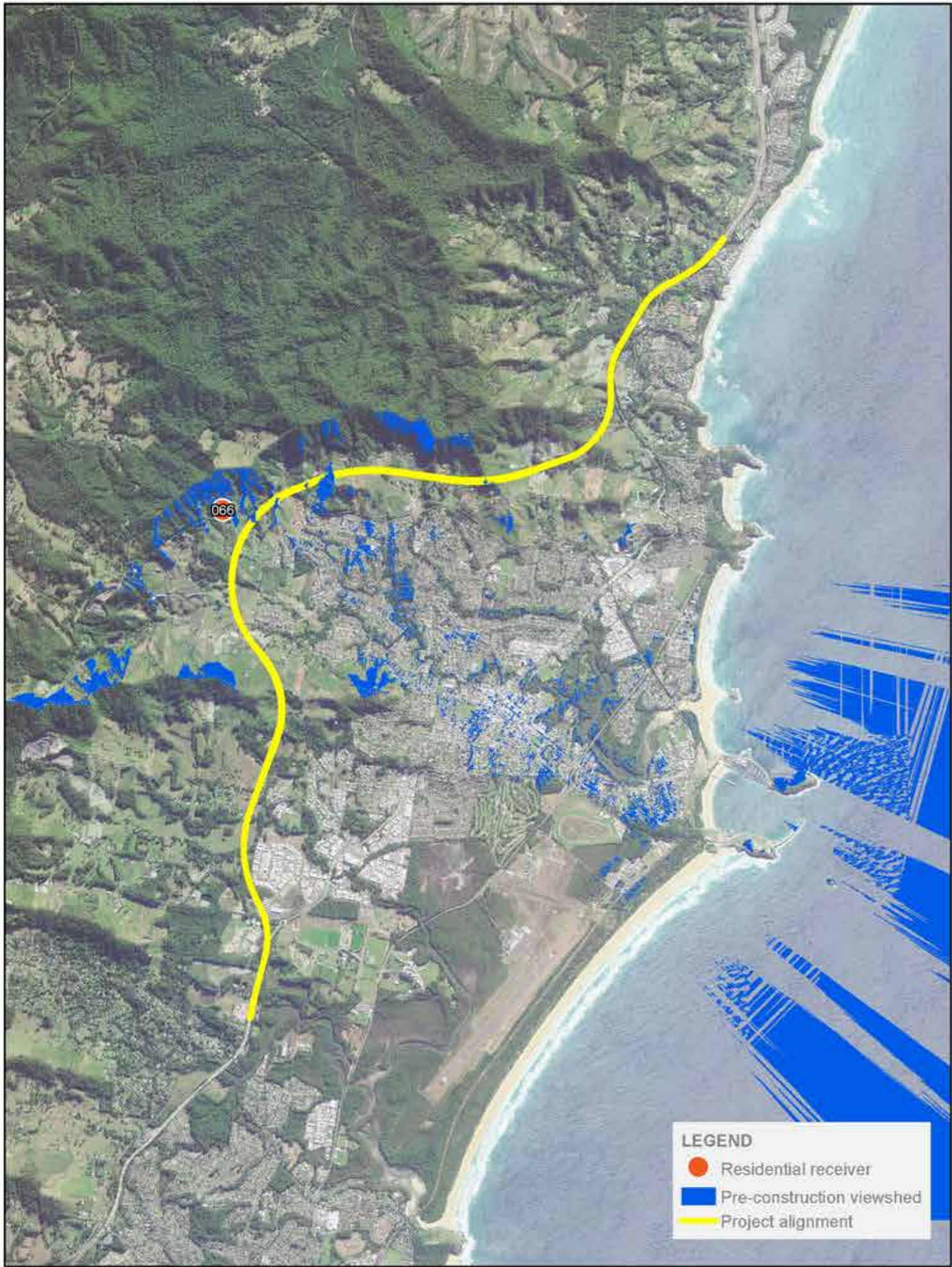


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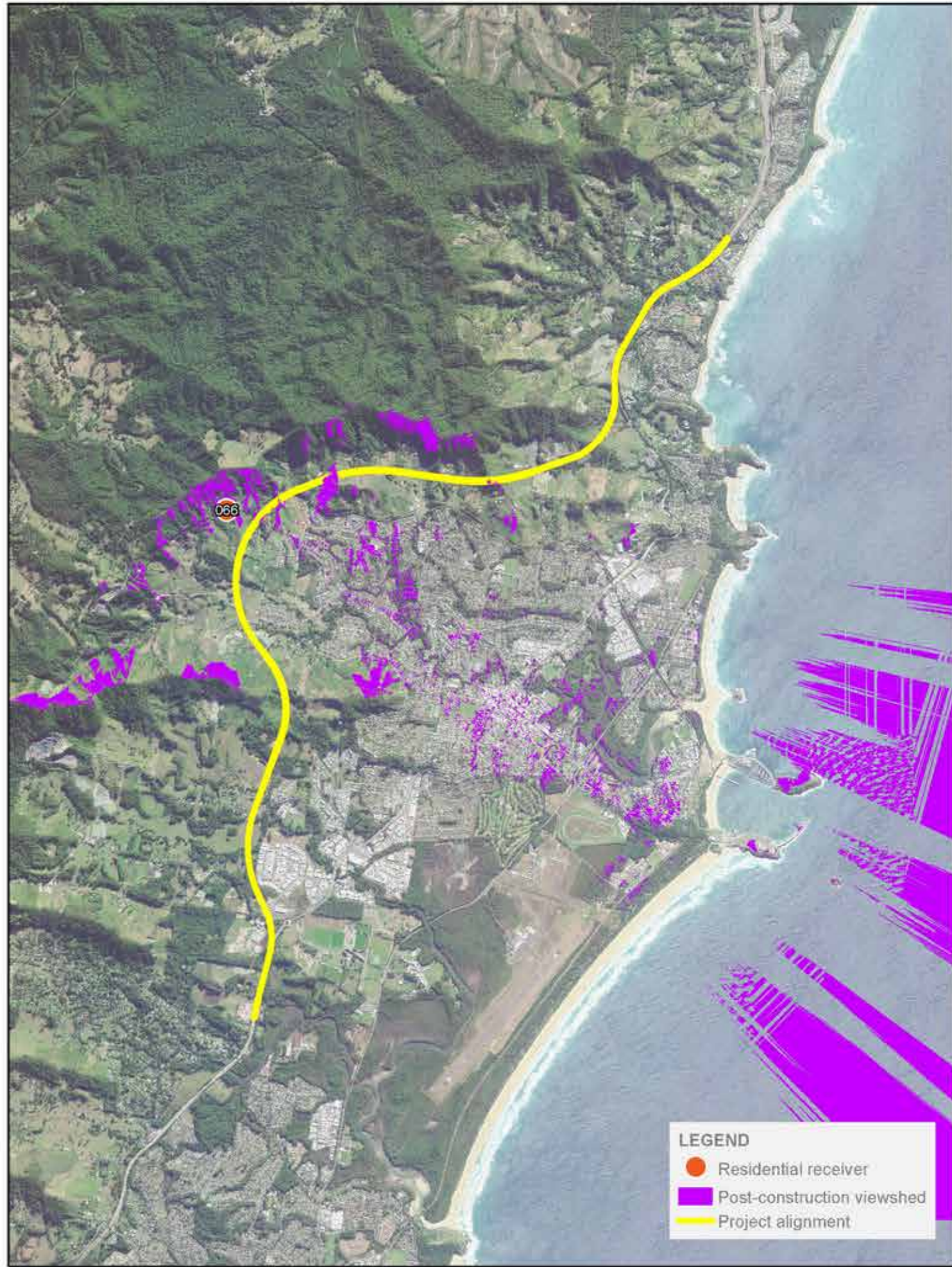


Property ocean view analysis run on a post-construction elevation model



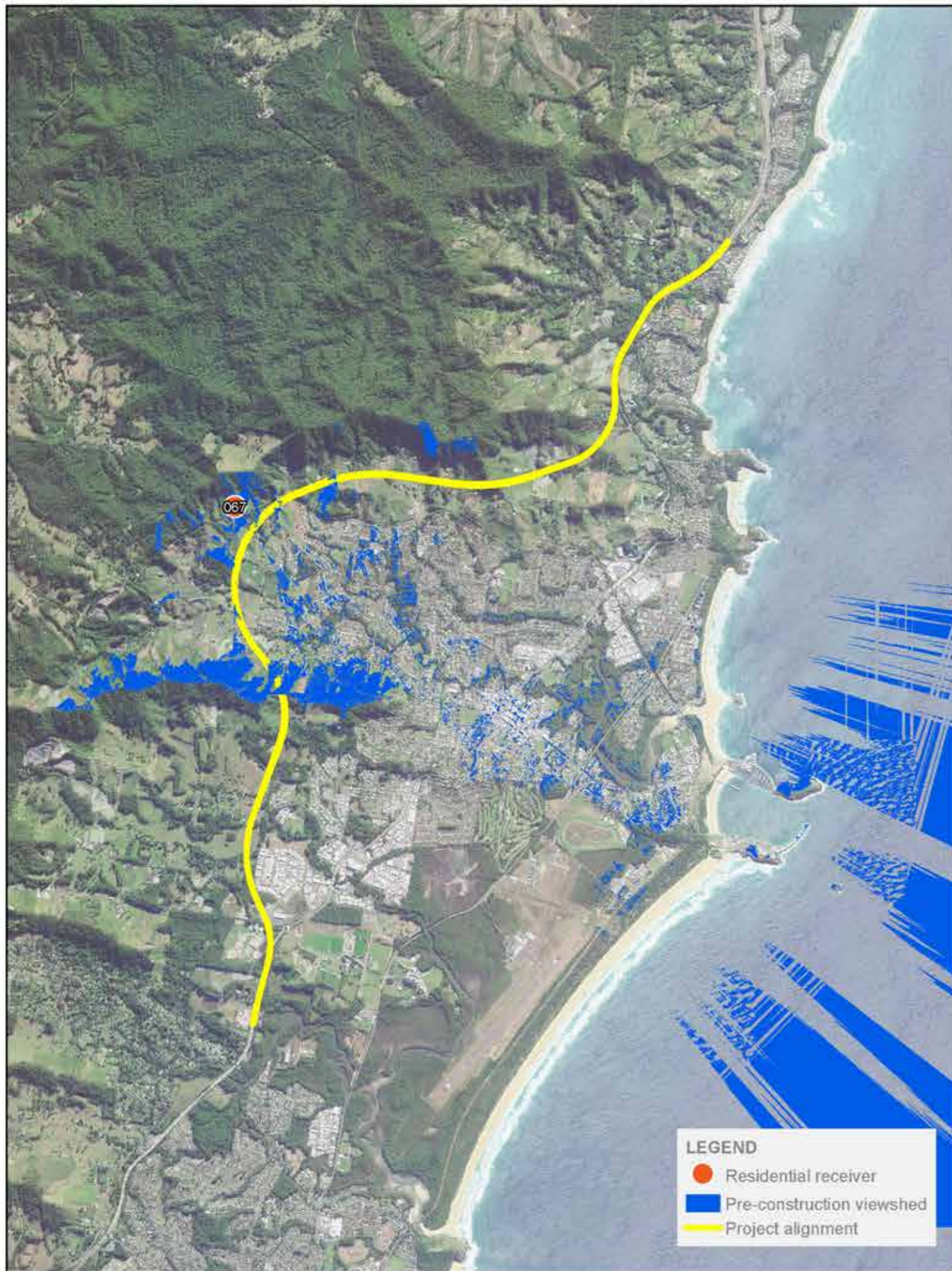


Property ocean view analysis run on a pre-construction elevation model

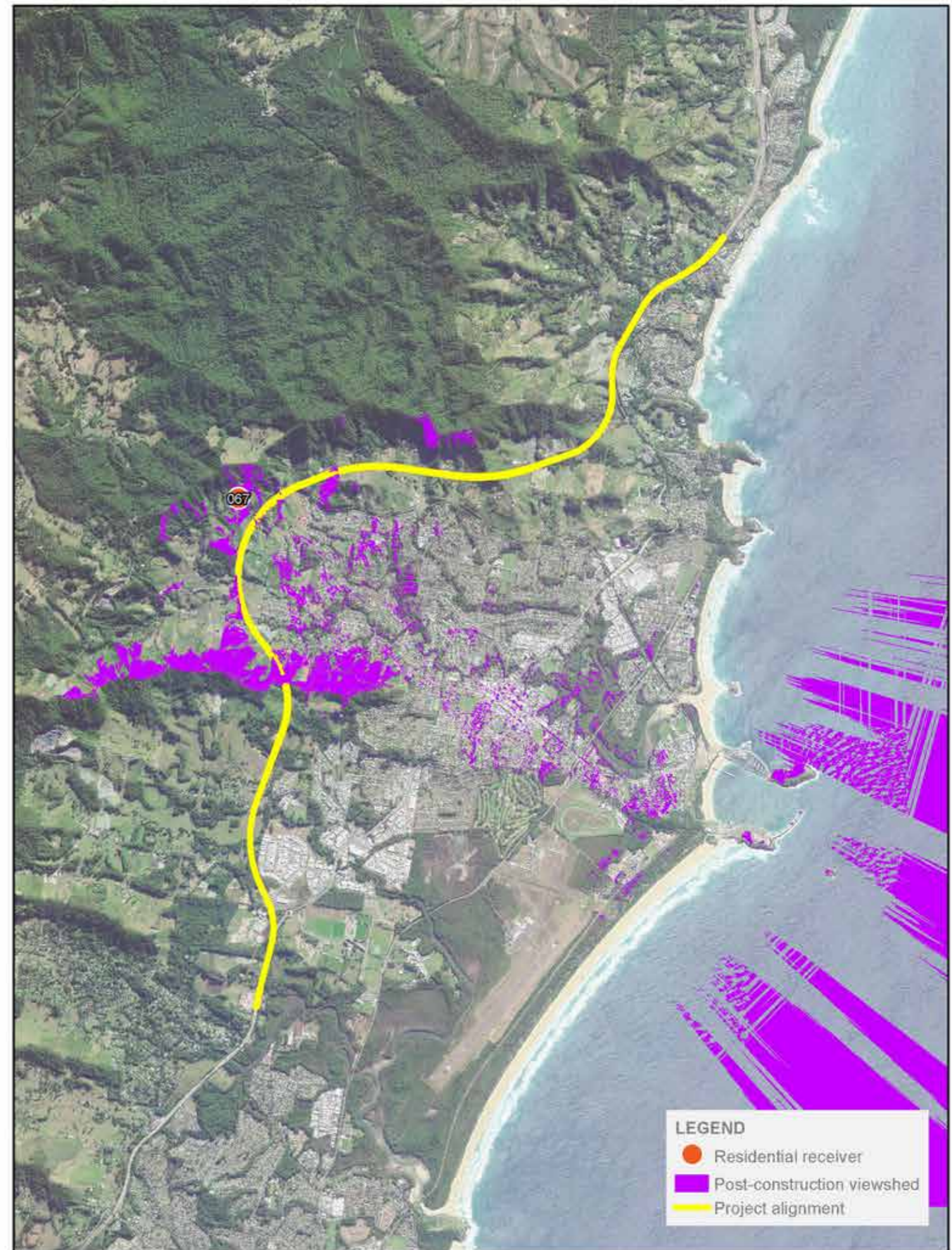


Property ocean view analysis run on a post-construction elevation model



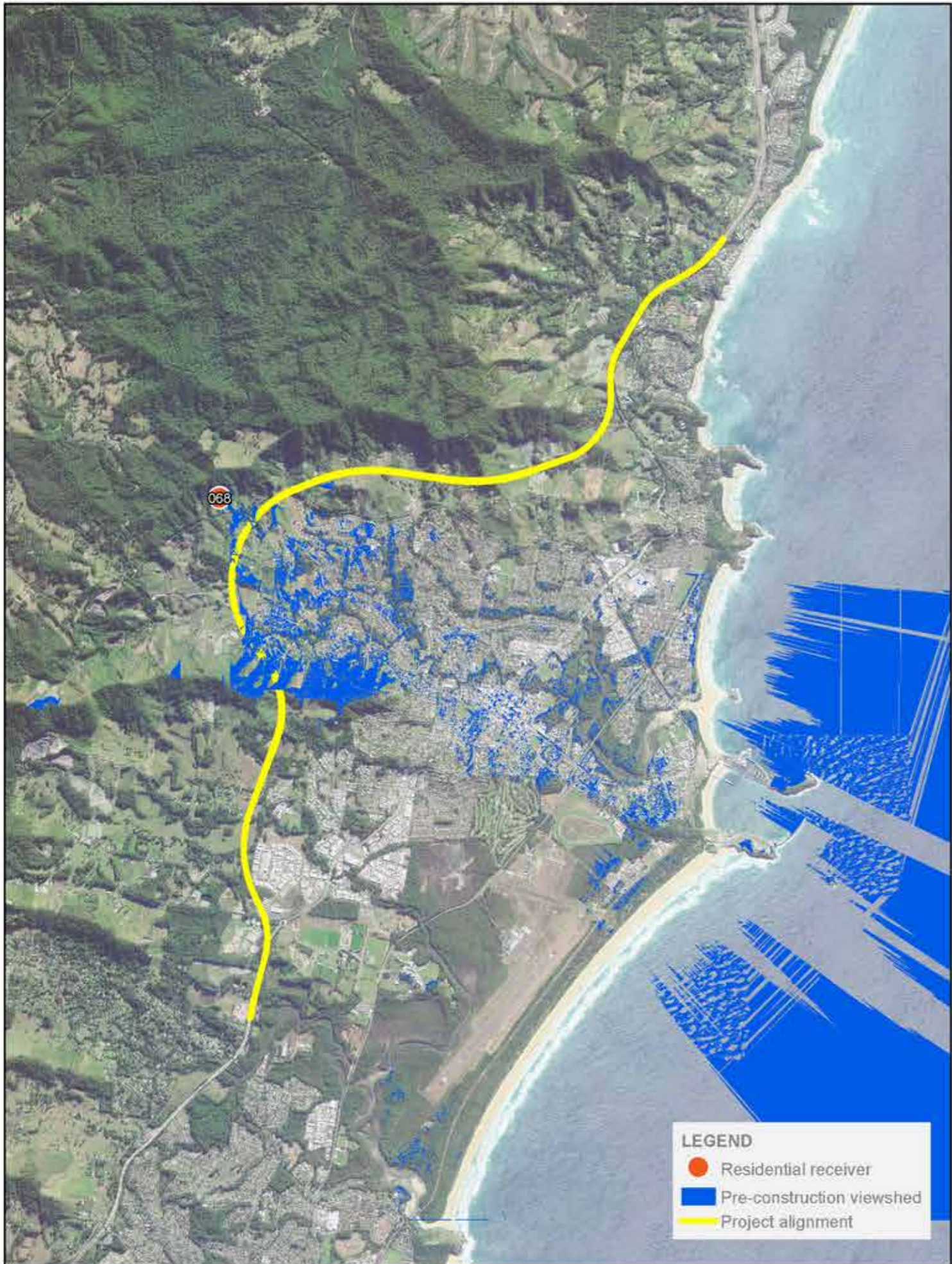


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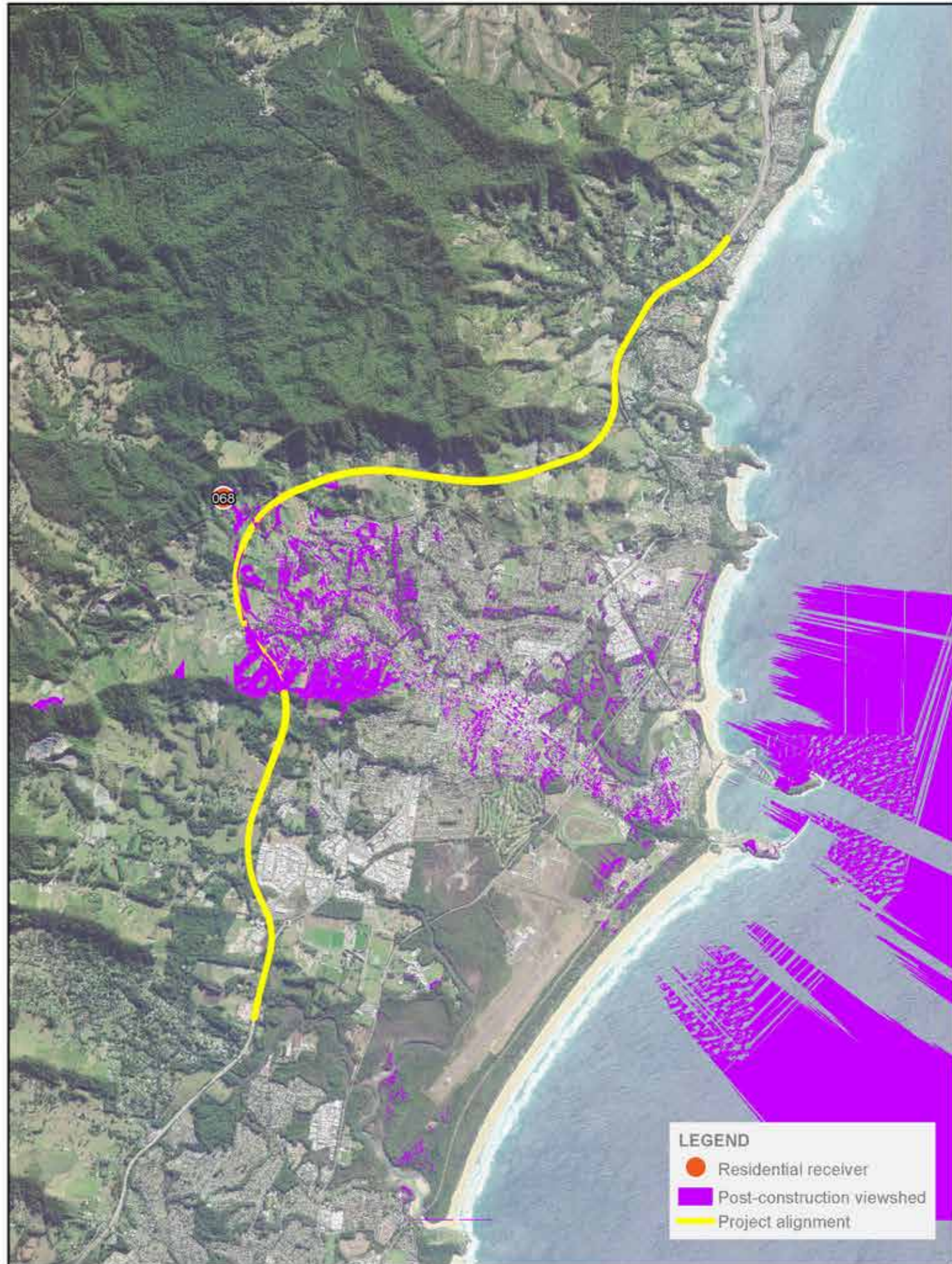


Property ocean view analysis run on a post-construction elevation model



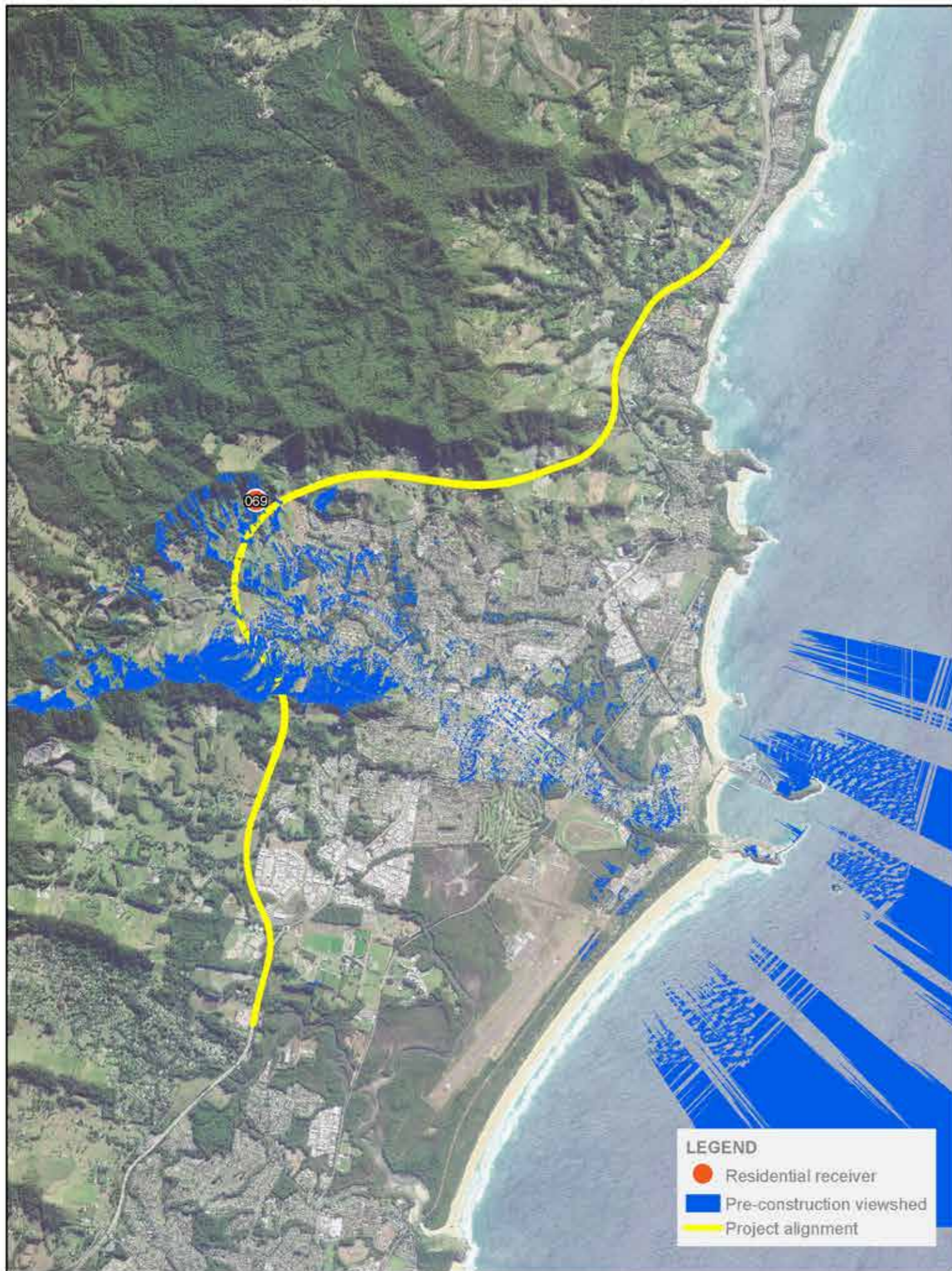


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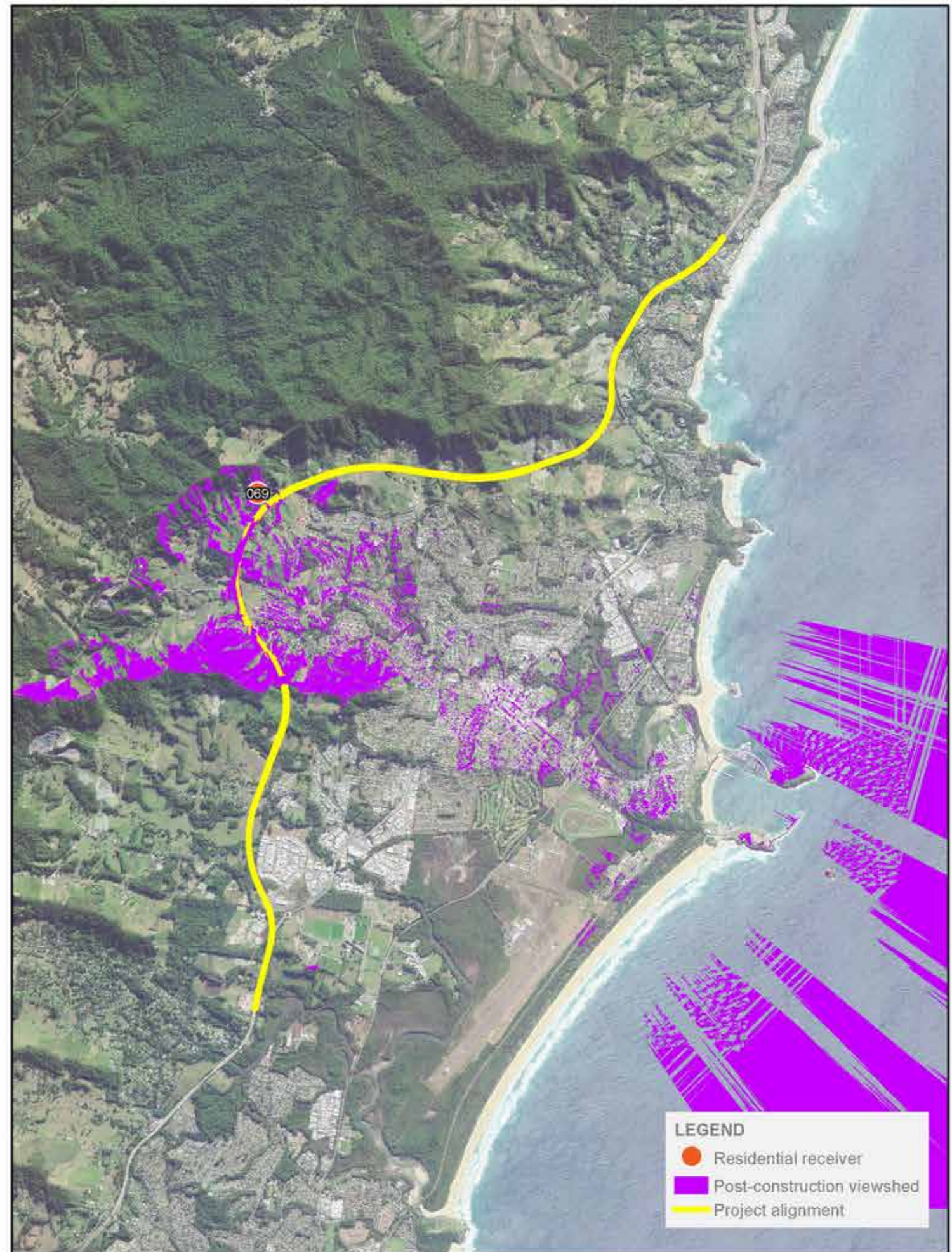


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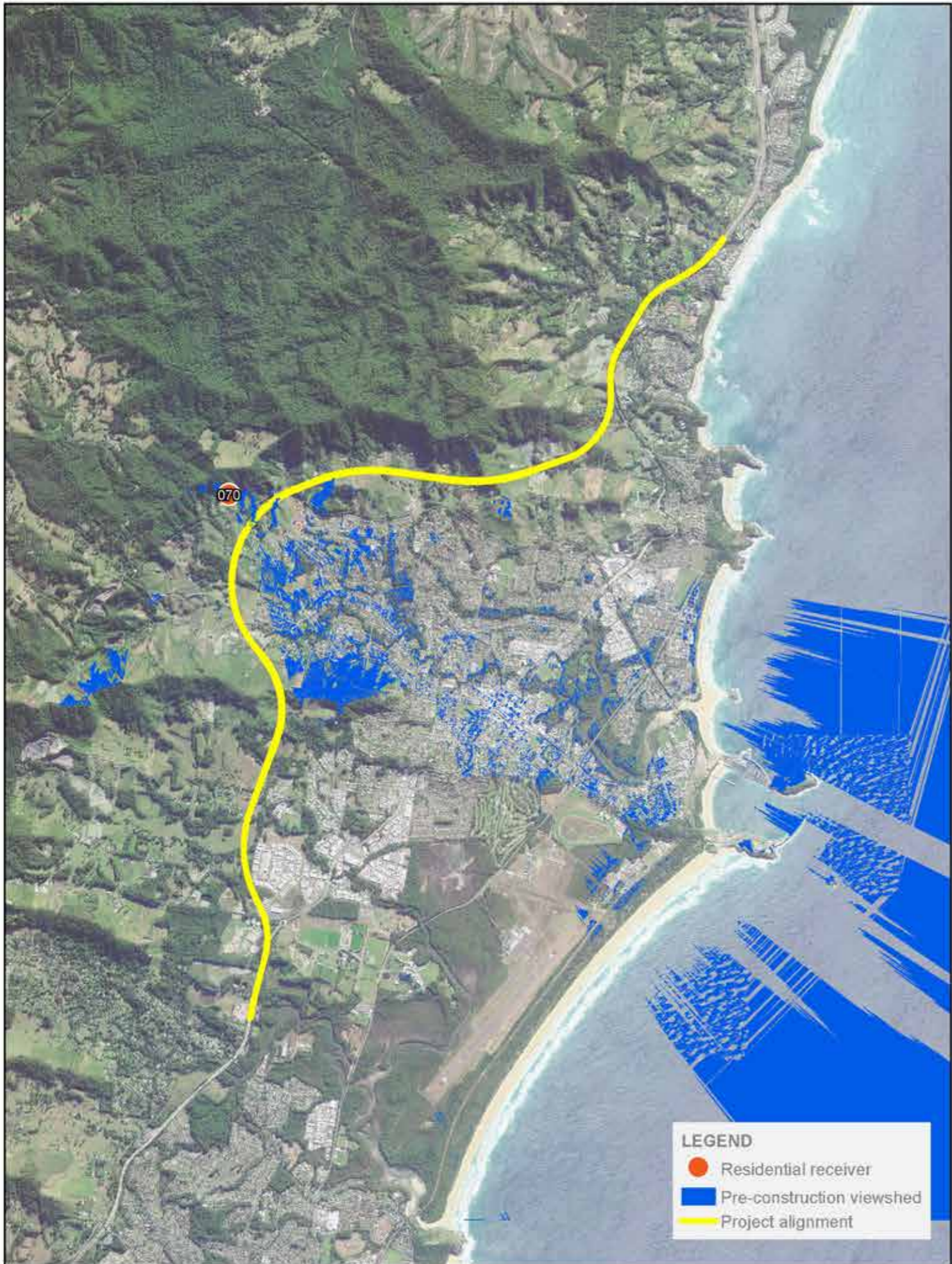


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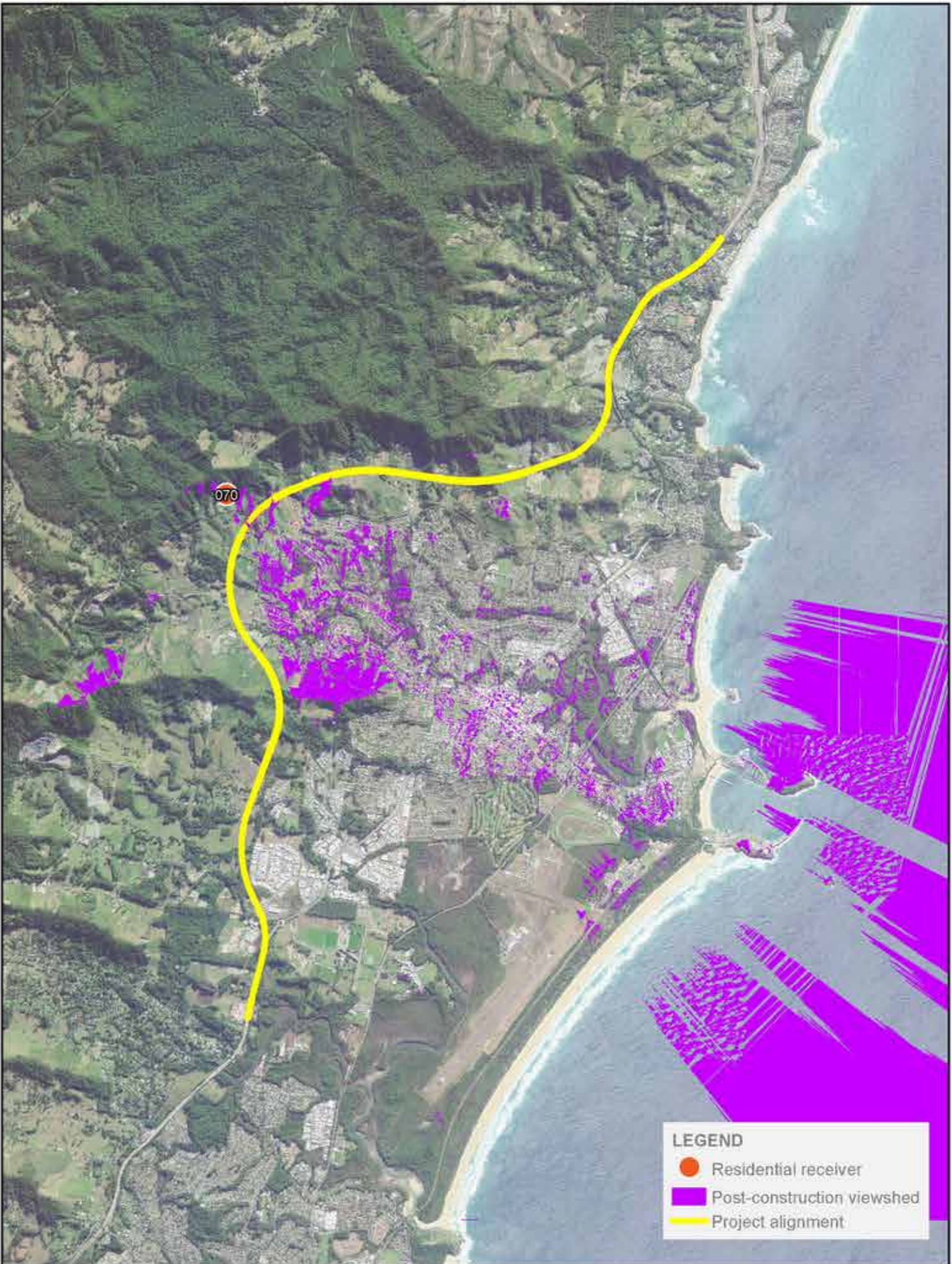


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Property ocean view analysis run on a pre-construction elevation model

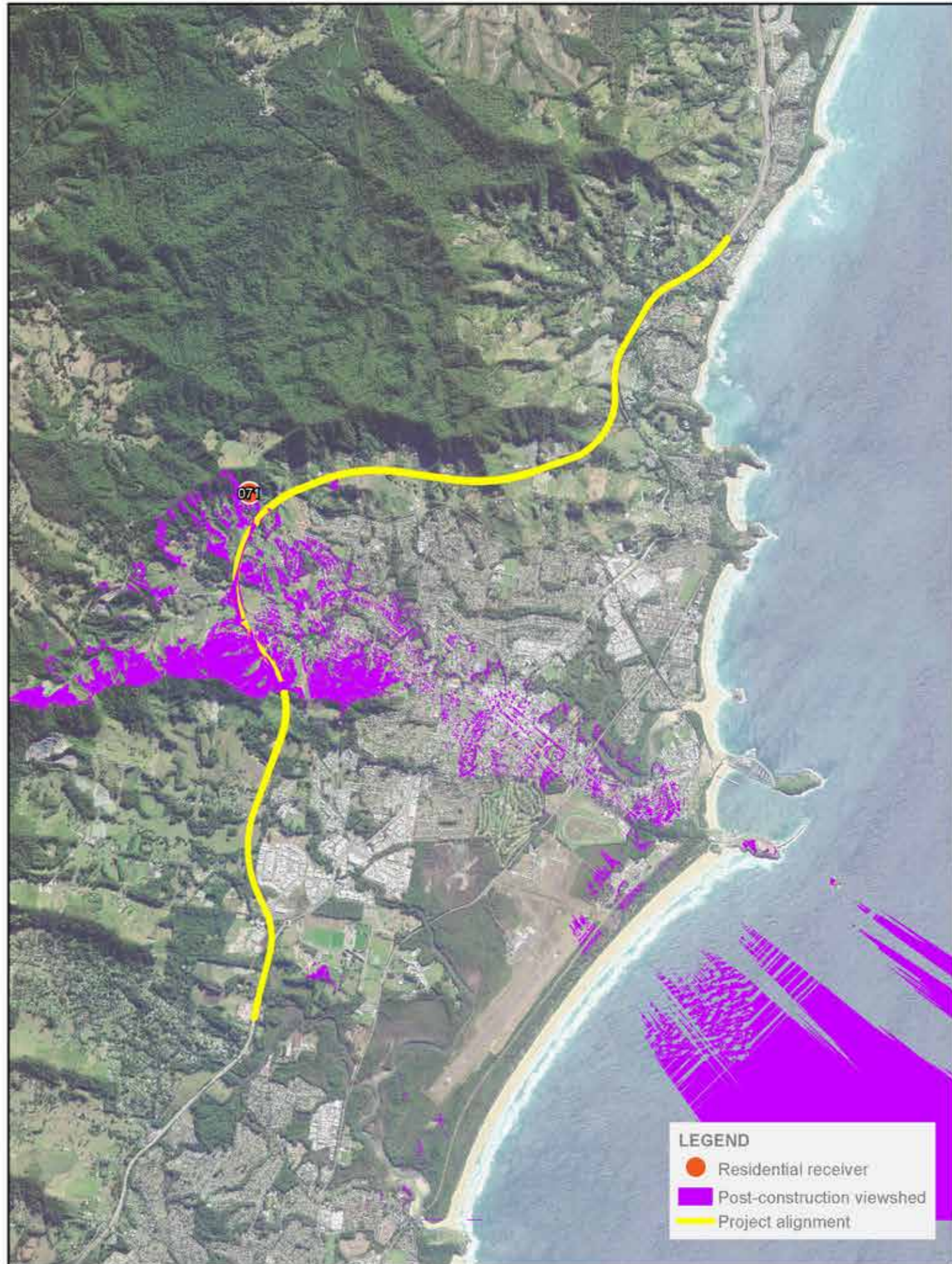


Property ocean view analysis run on a post-construction elevation model



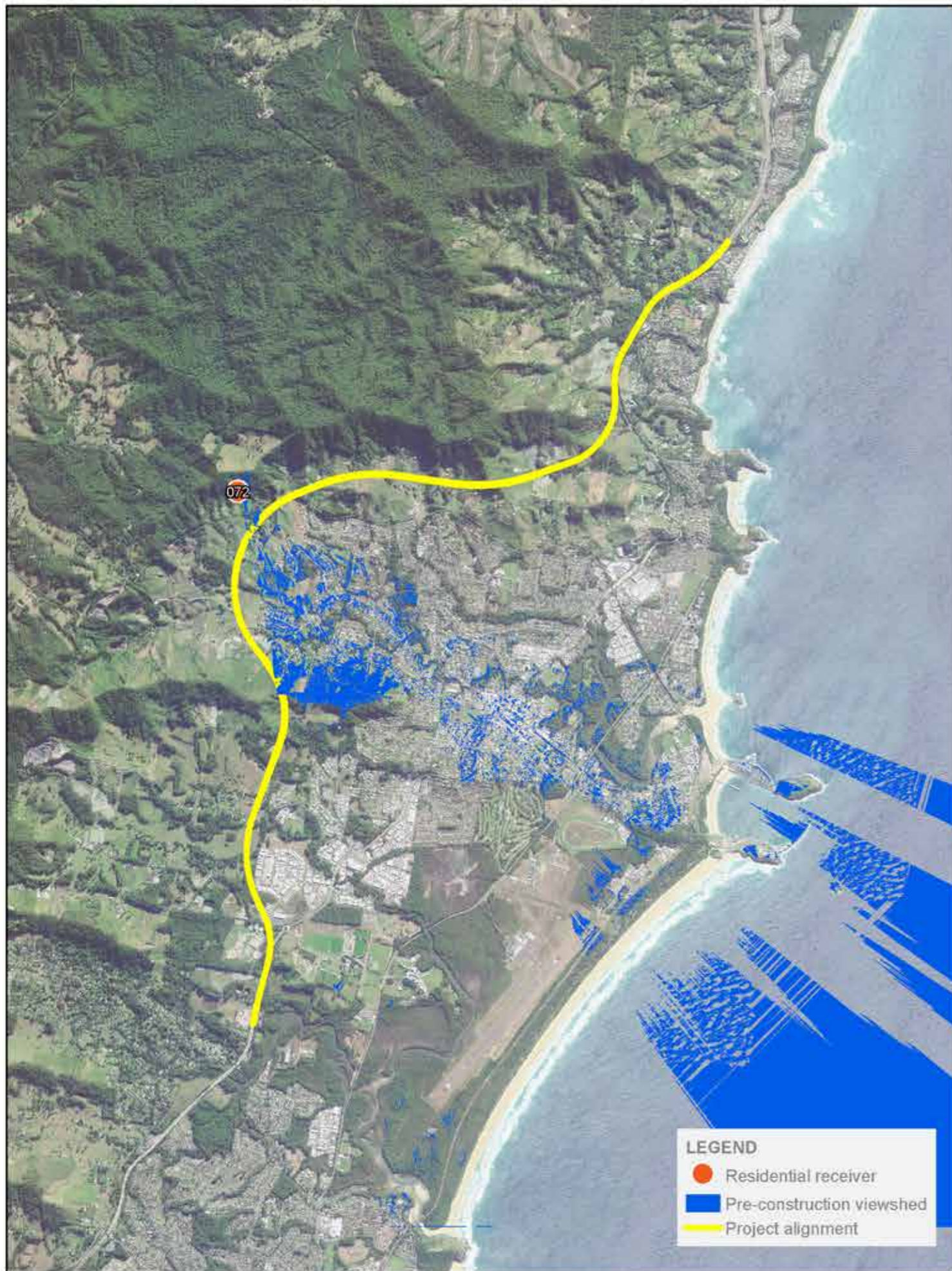


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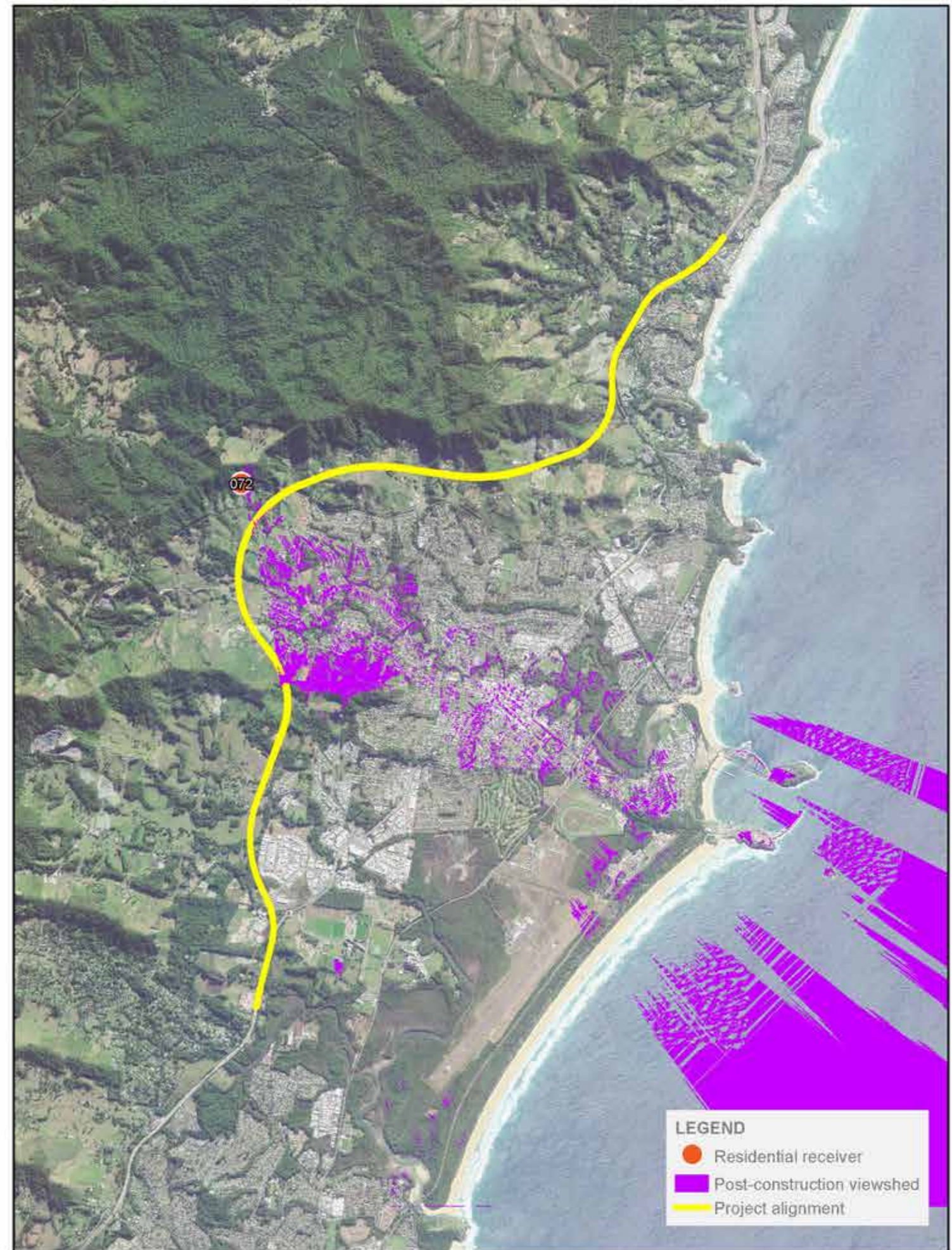


Property ocean view analysis run on a post-construction elevation model





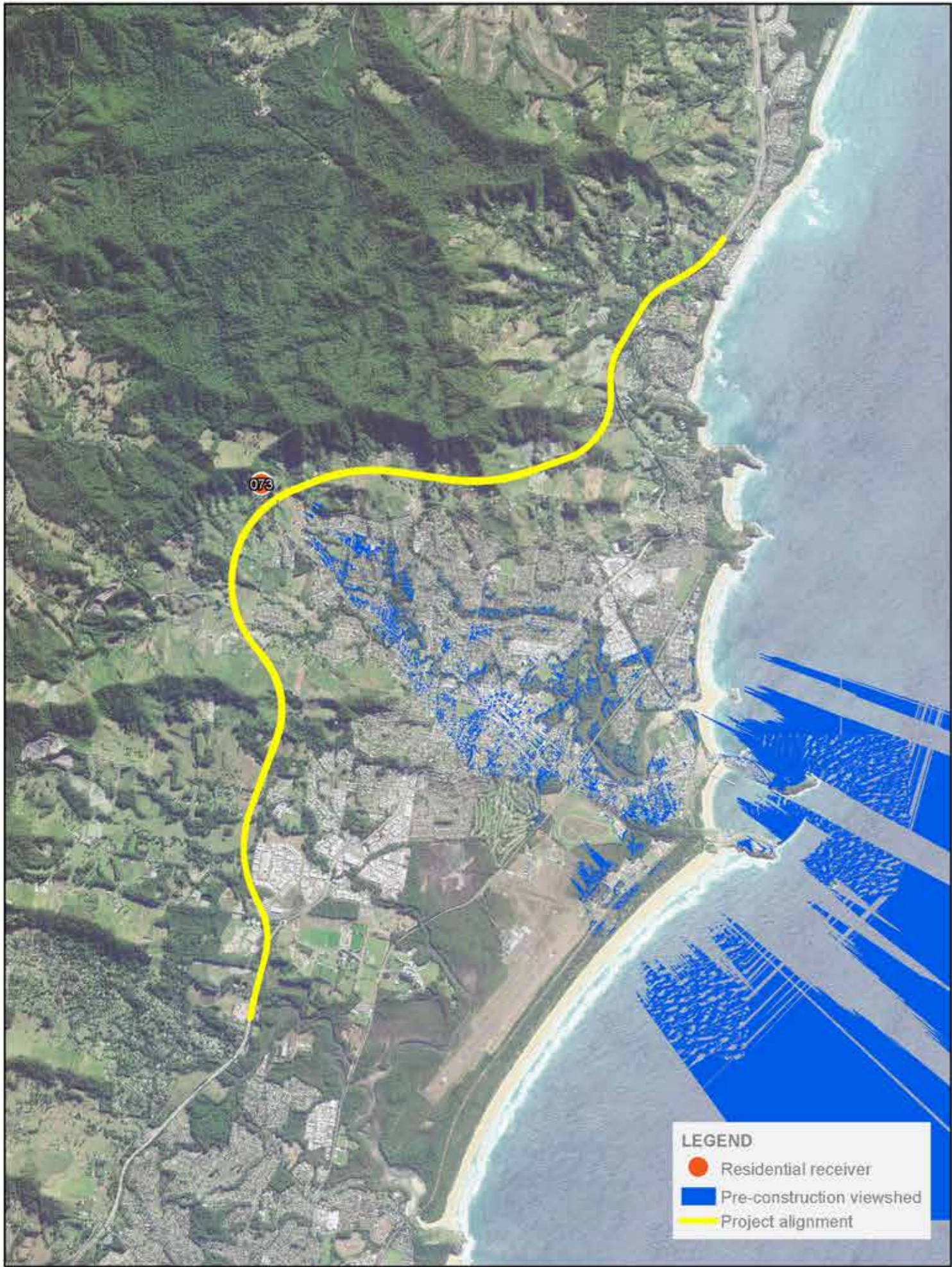
Property ocean view analysis run on a pre-construction elevation model



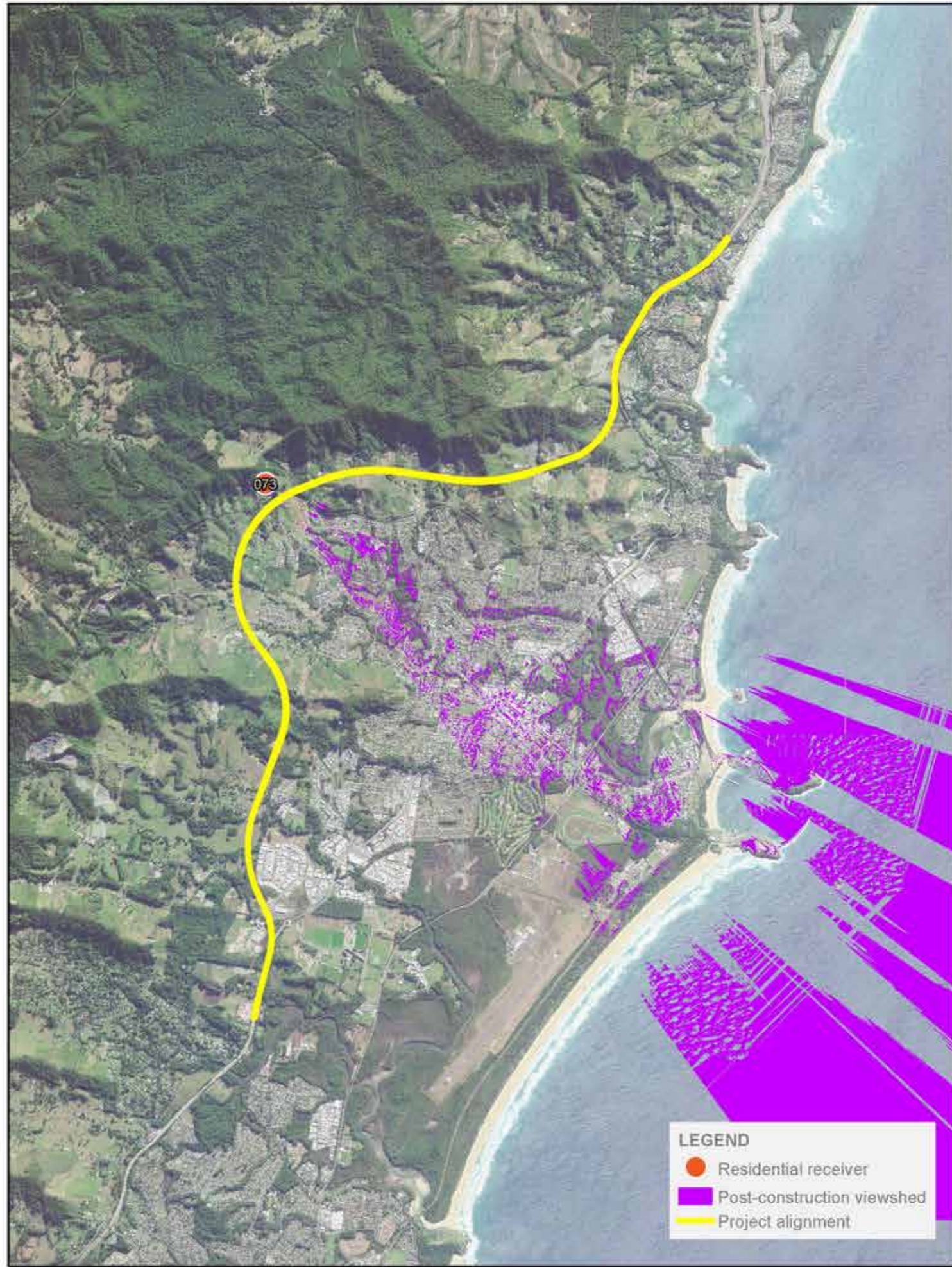
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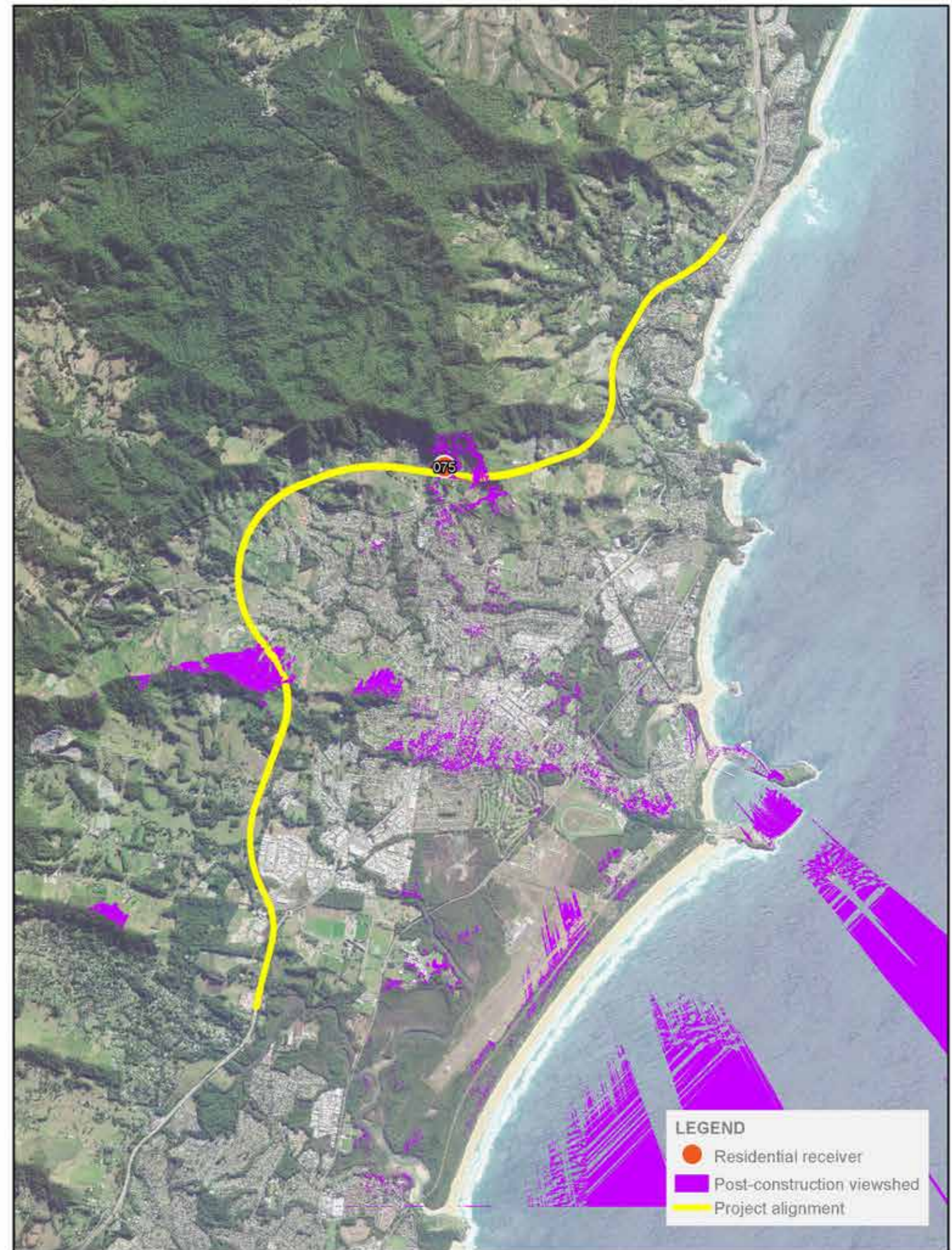


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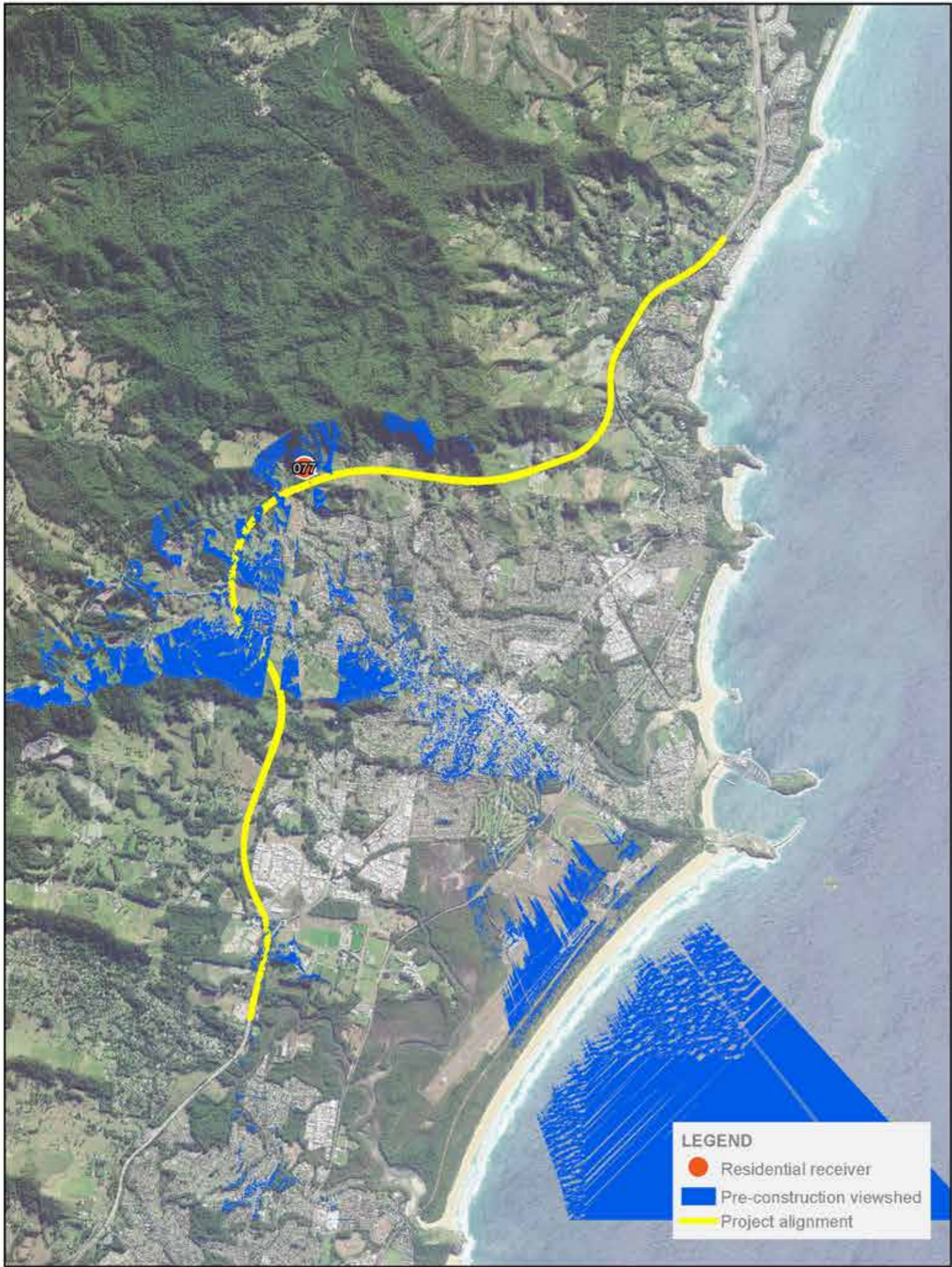




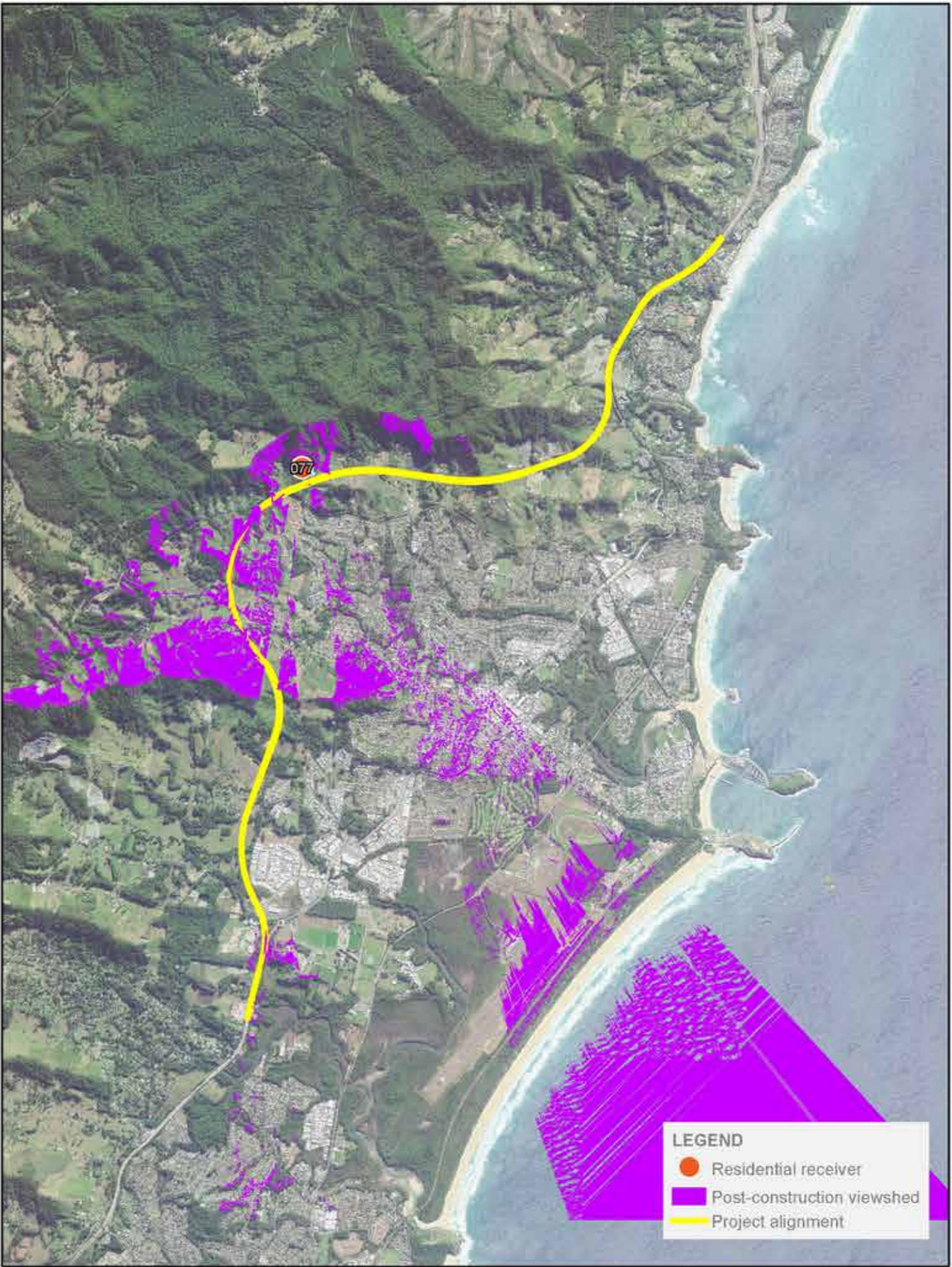
Property ocean view analysis run on a pre-construction elevation model



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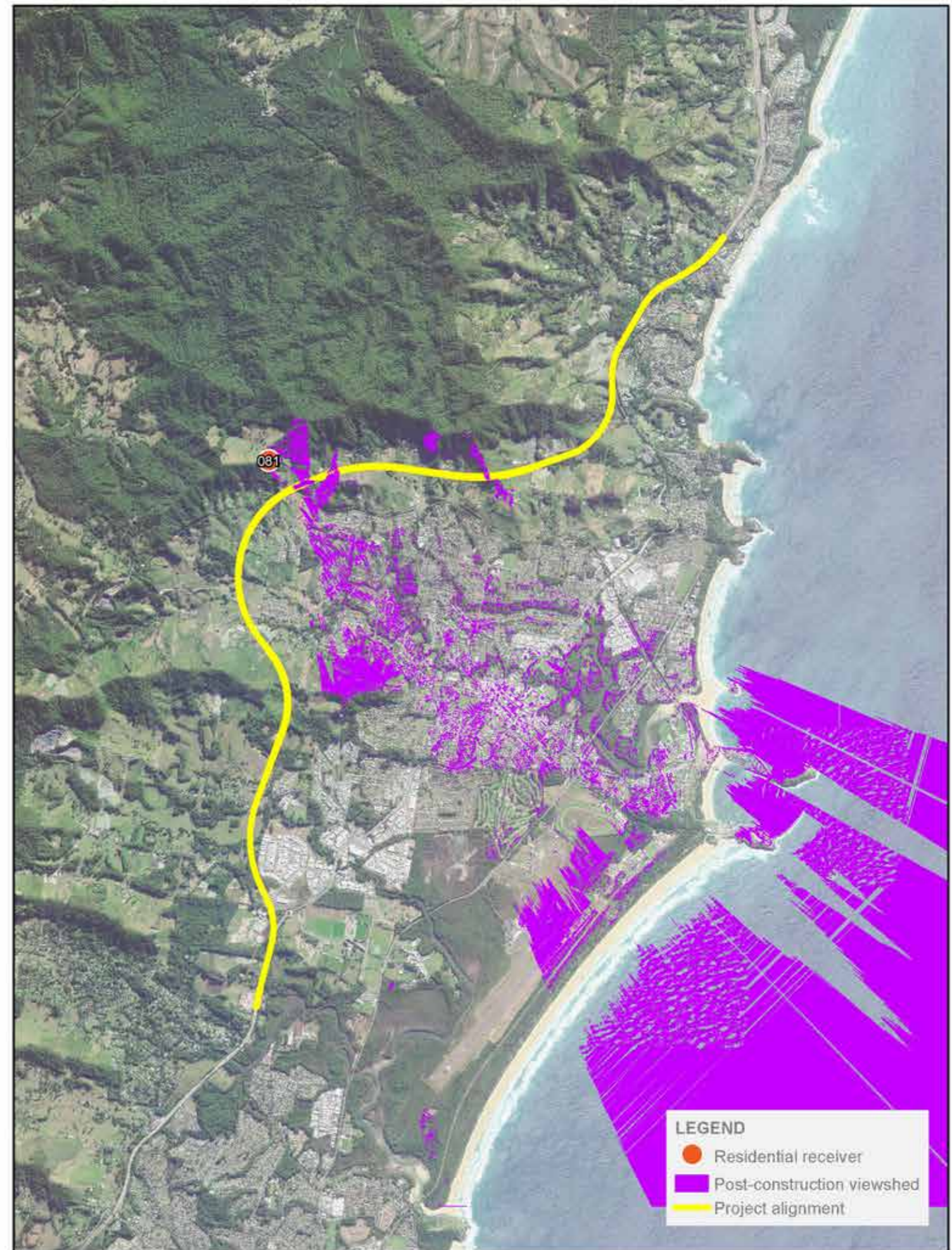


Property ocean view analysis run on a post-construction elevation model





Property ocean view analysis run on a pre-construction elevation model

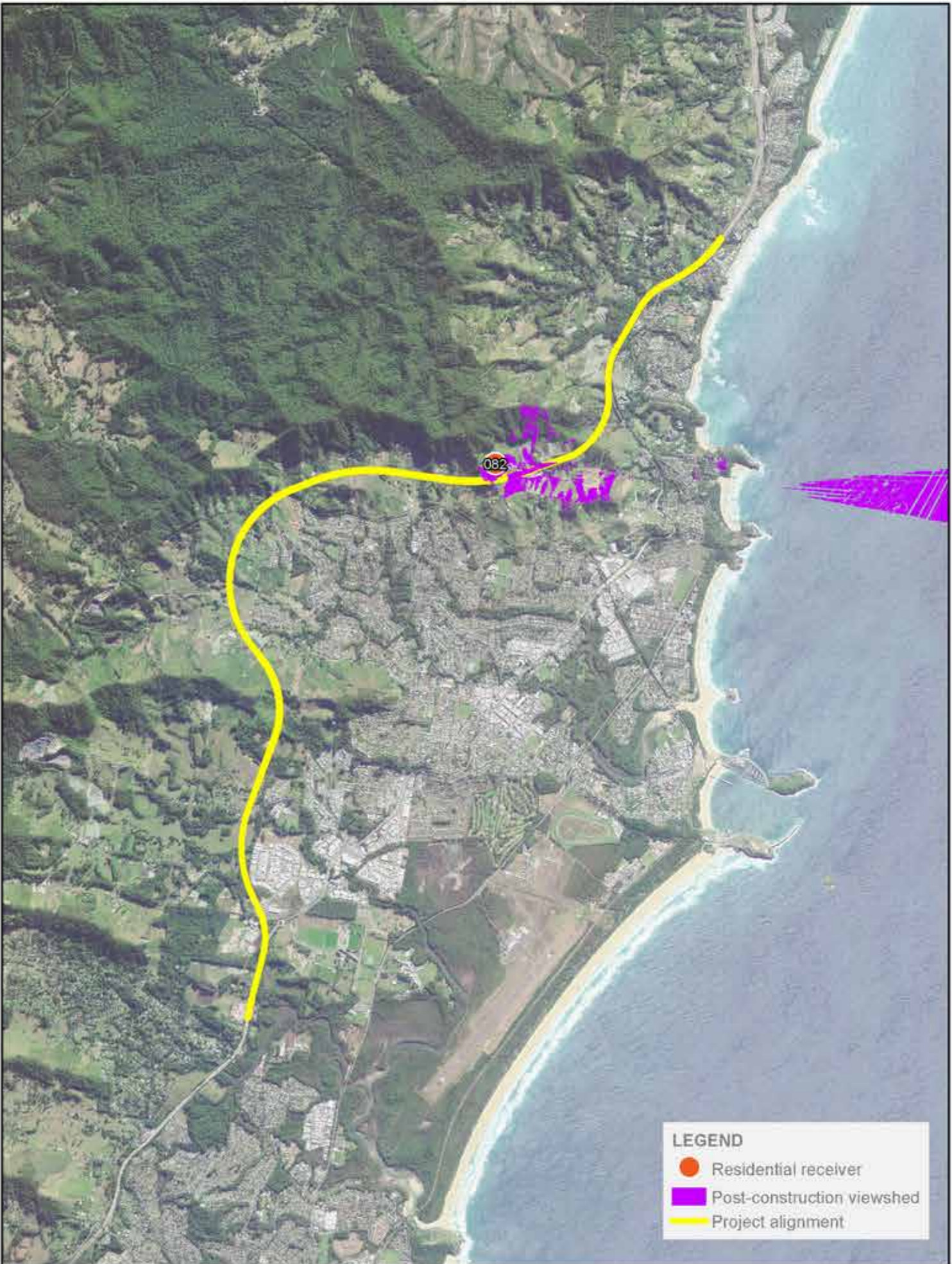


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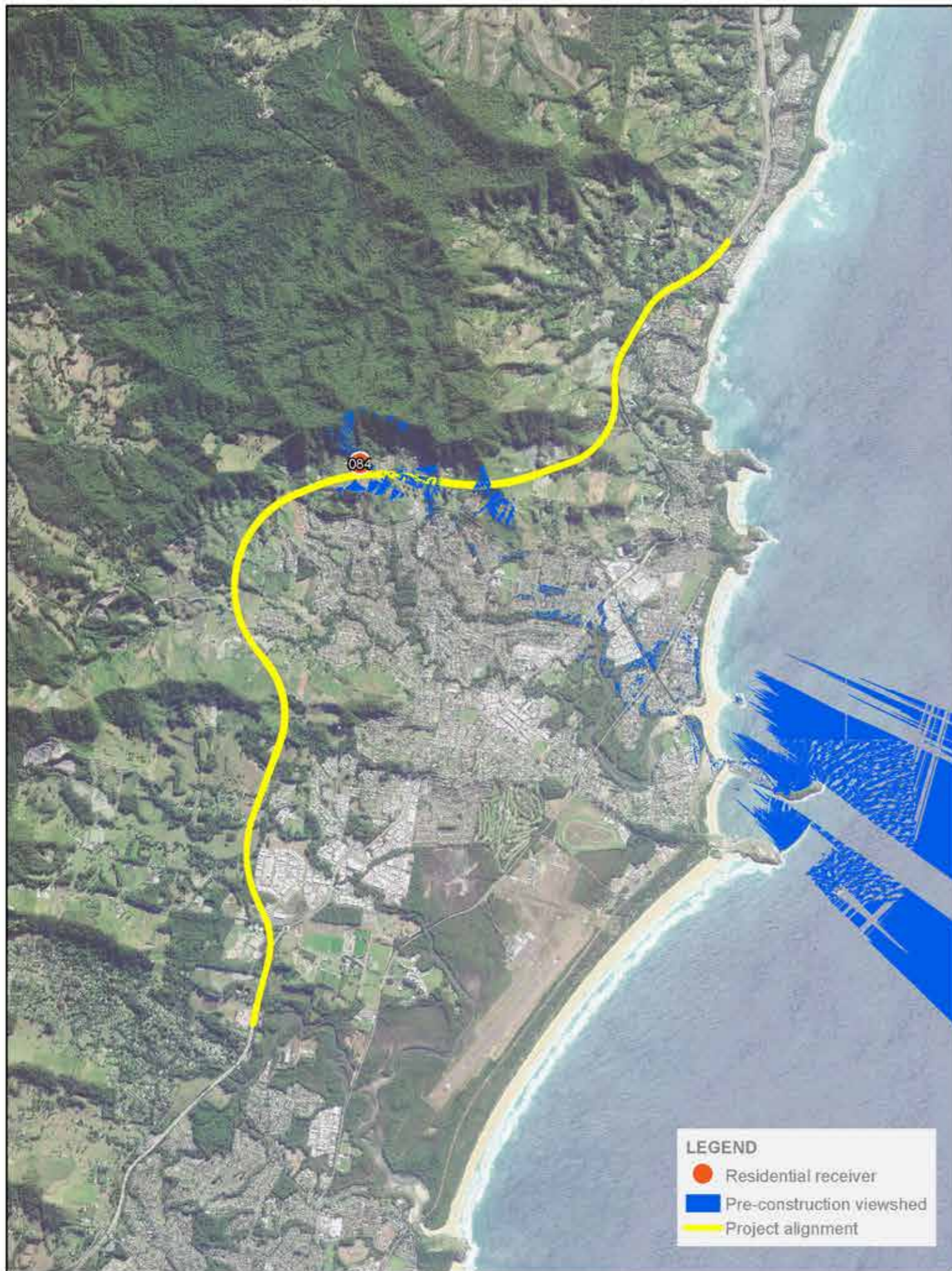


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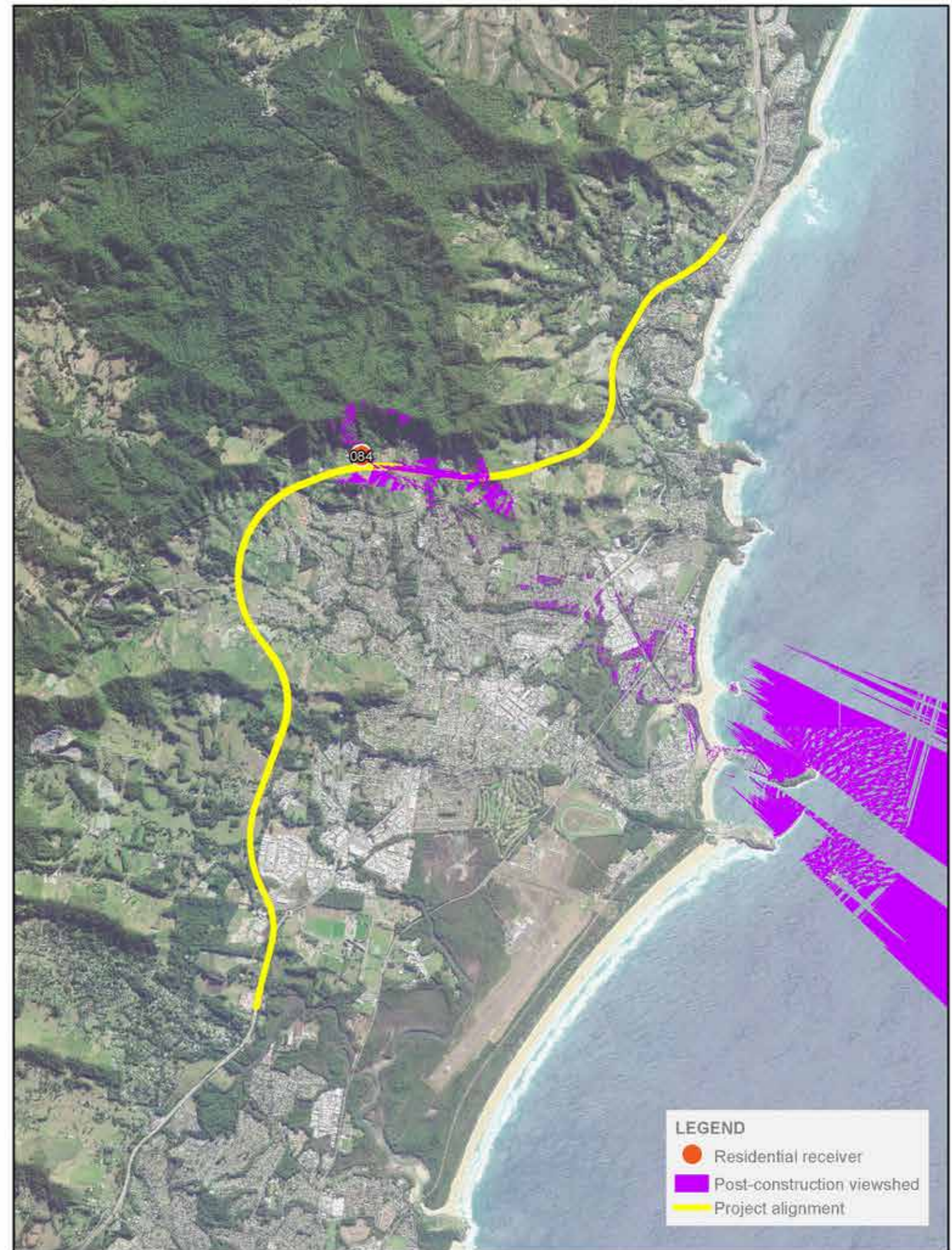


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Property ocean view analysis run on a pre-construction elevation model



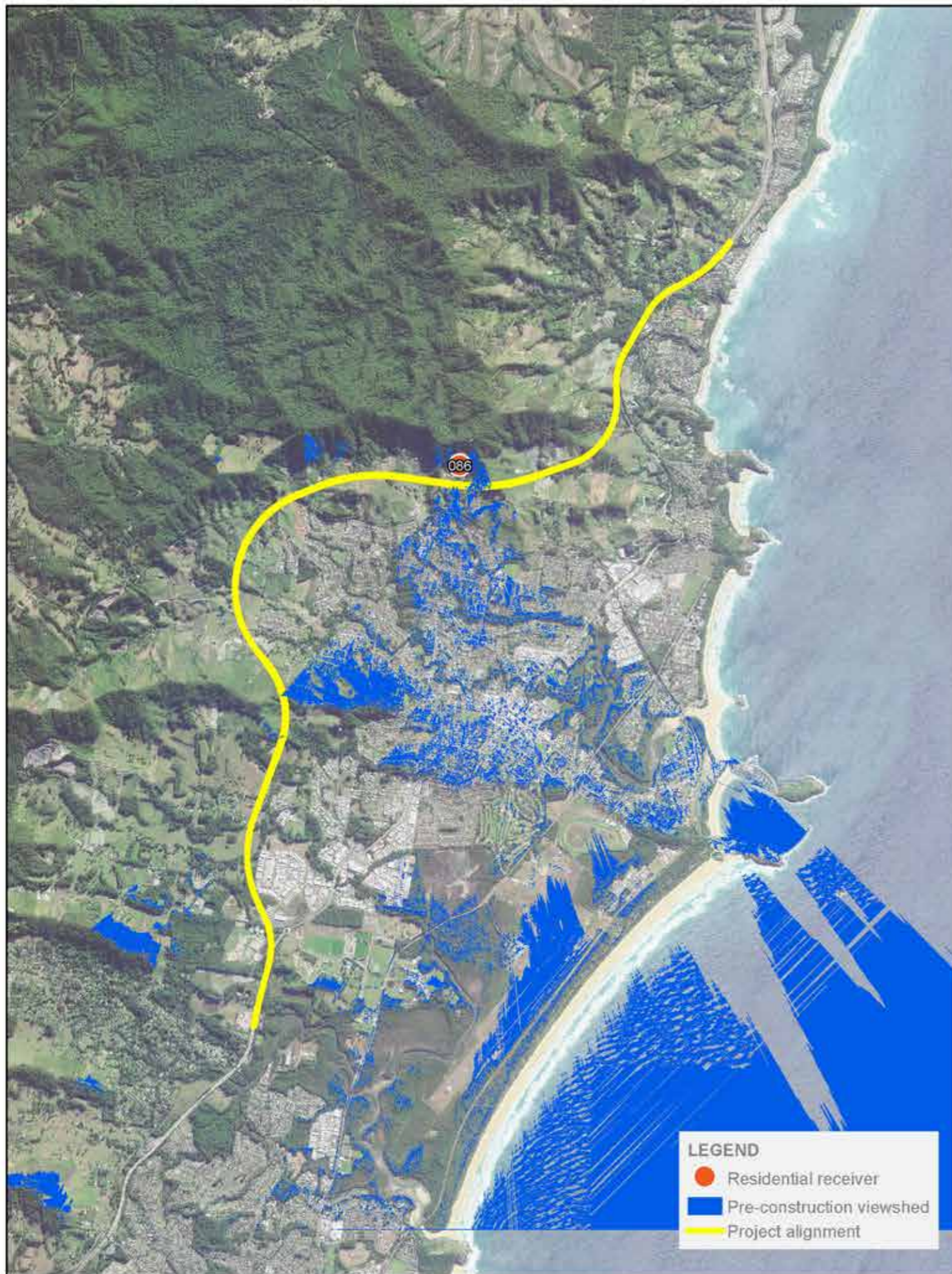
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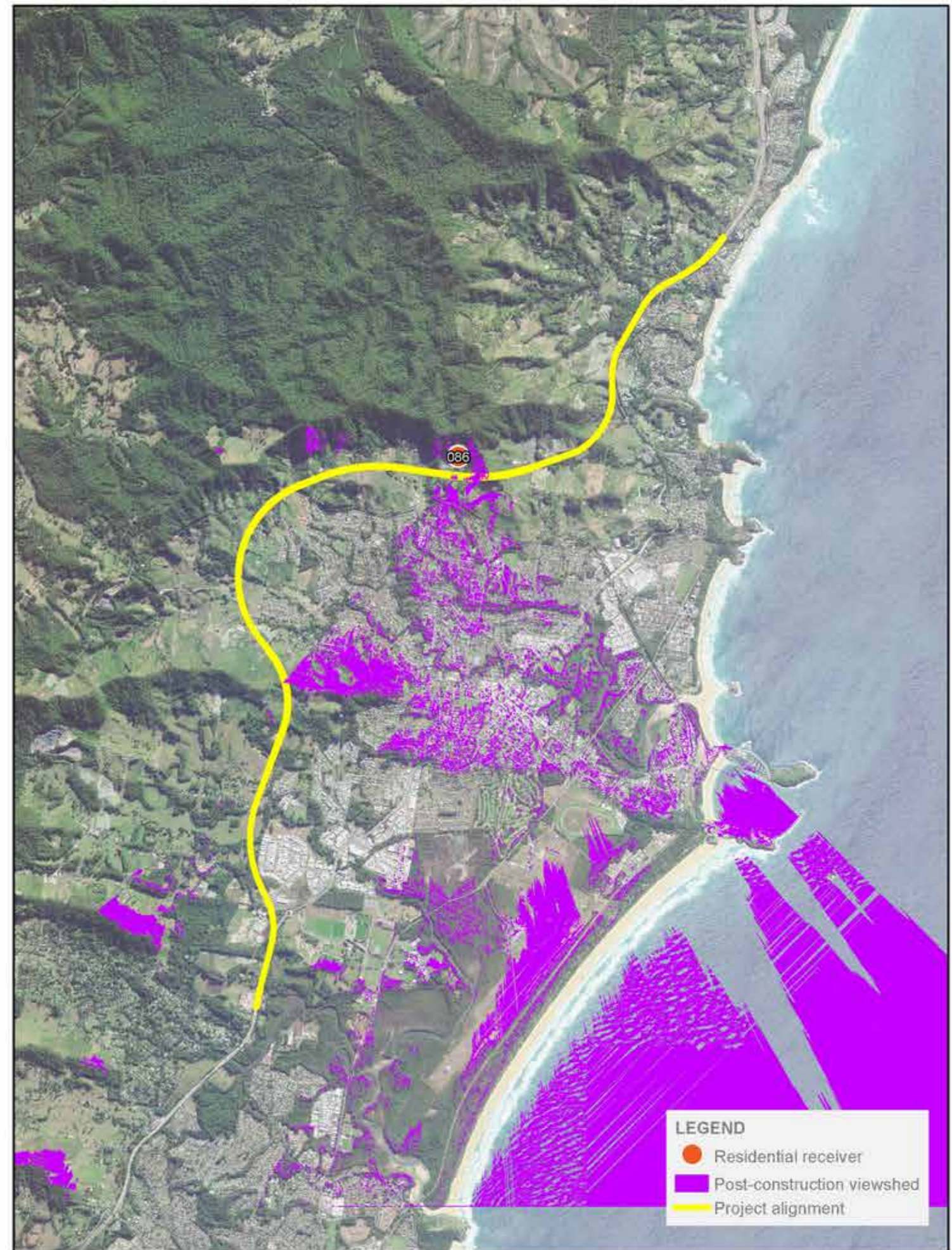
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Property ocean view analysis run on a post-construction elevation model



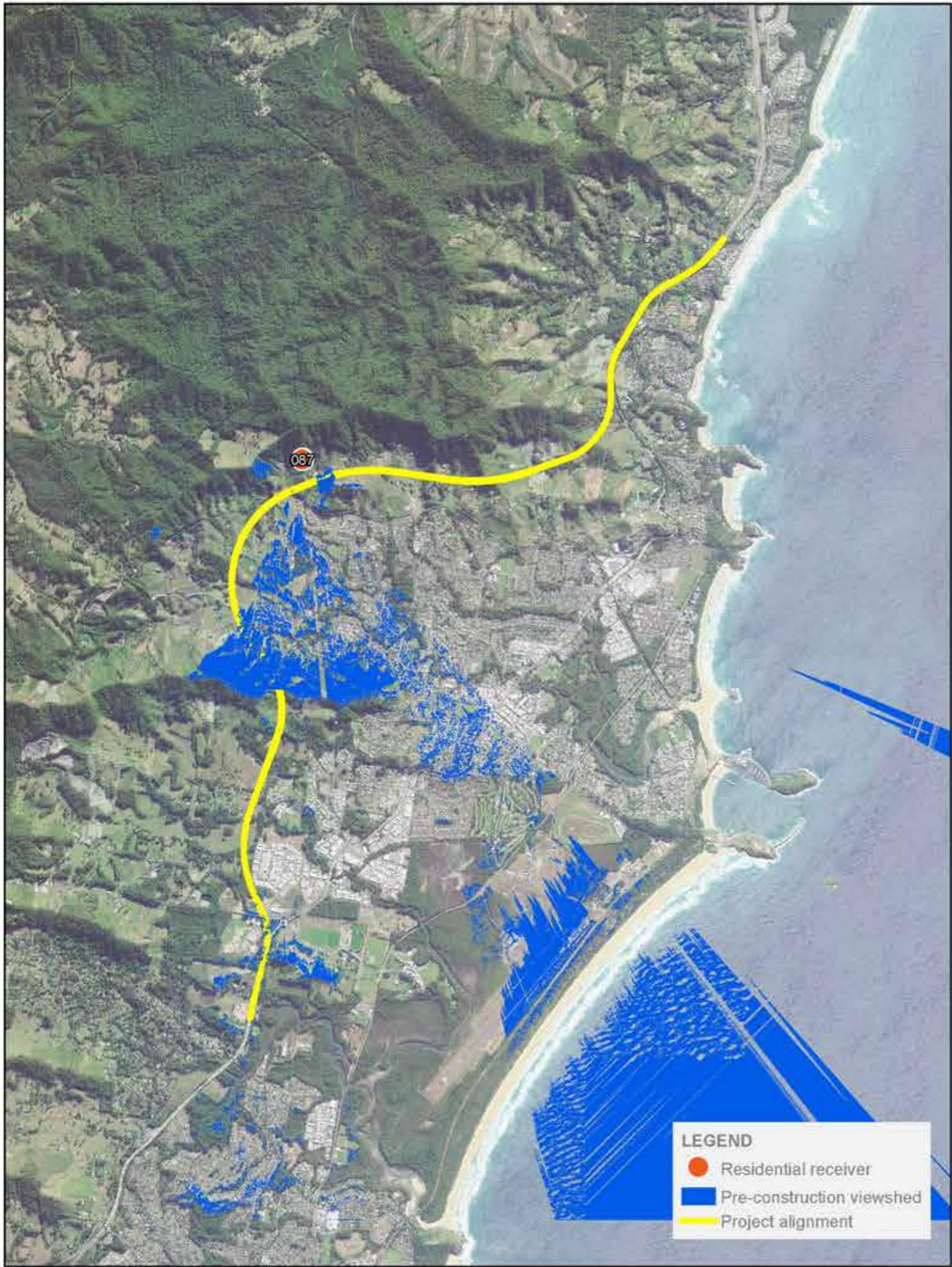
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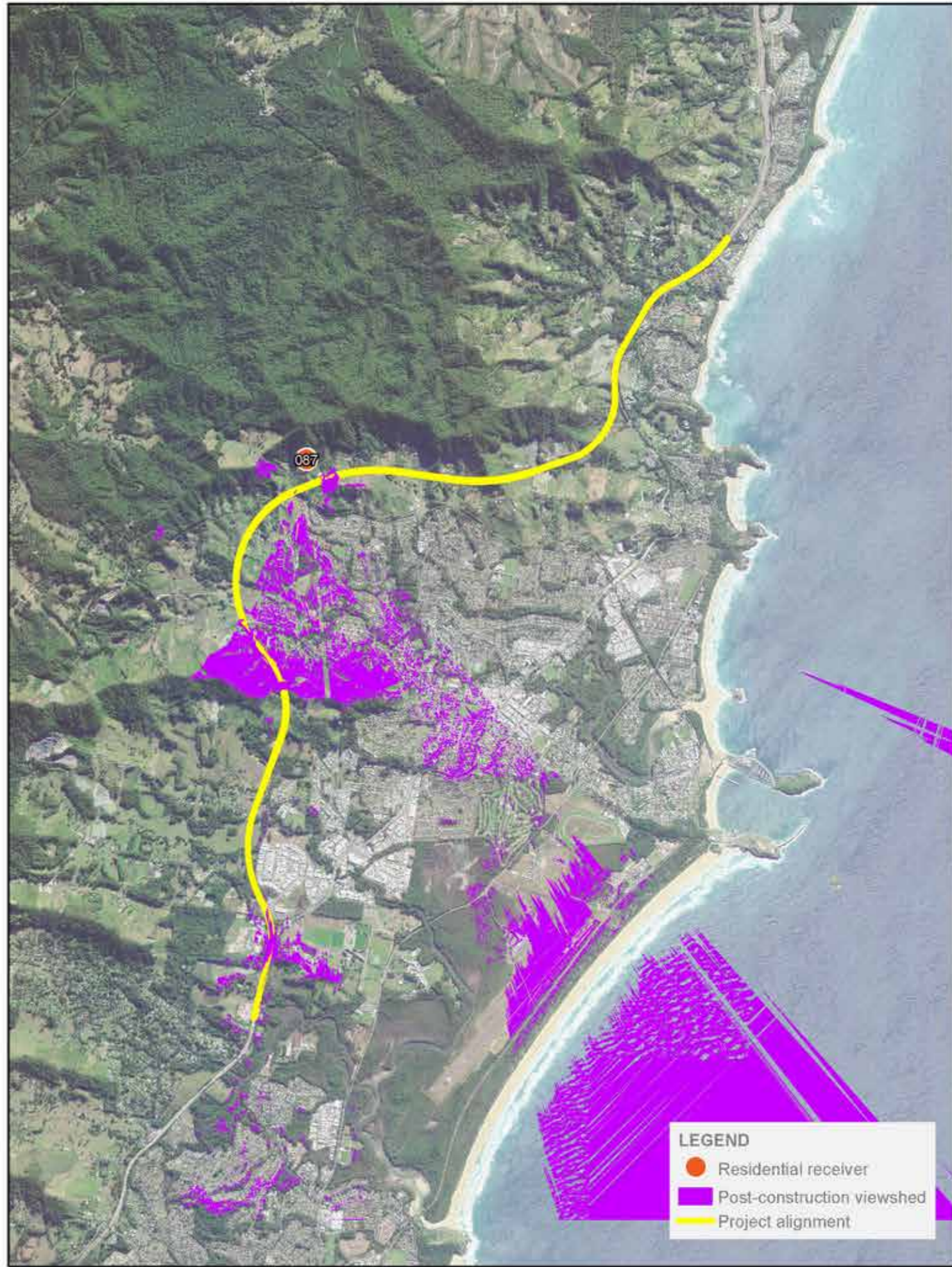




**LEGEND**

- Residential receiver
- Pre-construction viewshed
- Project alignment

Property ocean view analysis run on a pre-construction elevation model



**LEGEND**

- Residential receiver
- Post-construction viewshed
- Project alignment

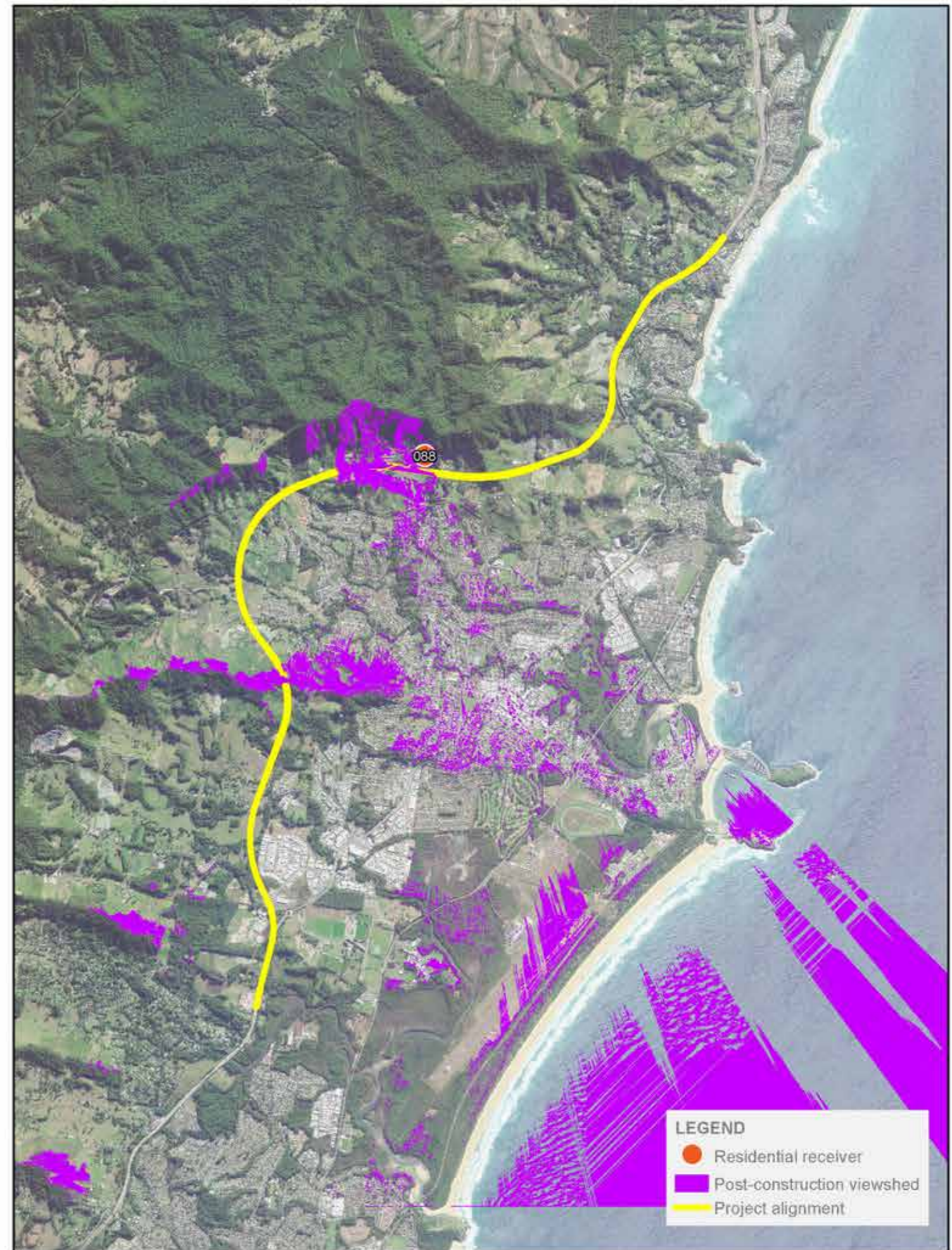
Property ocean view analysis run on a post-construction elevation model





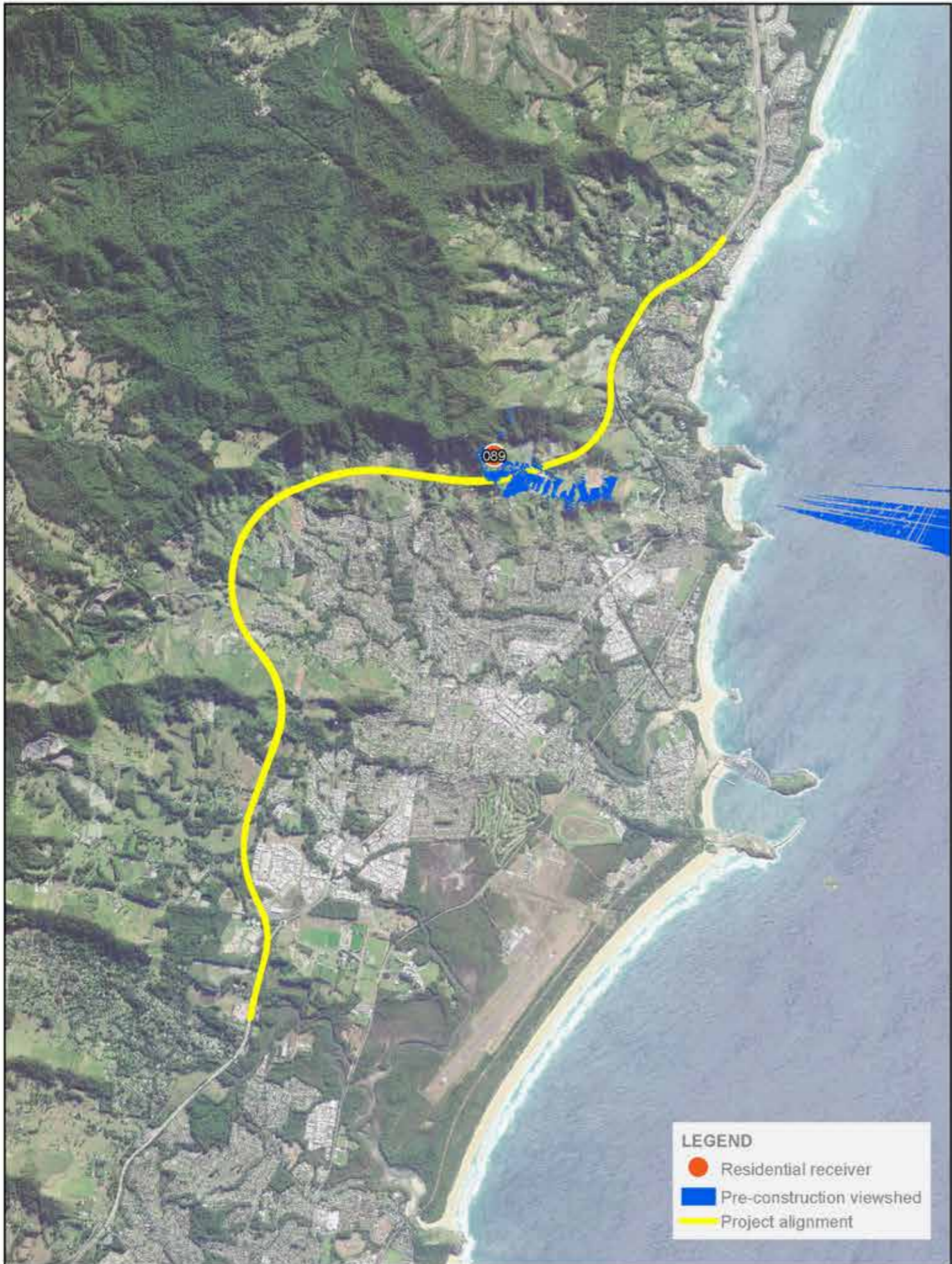
Property ocean view analysis run on a pre-construction elevation model

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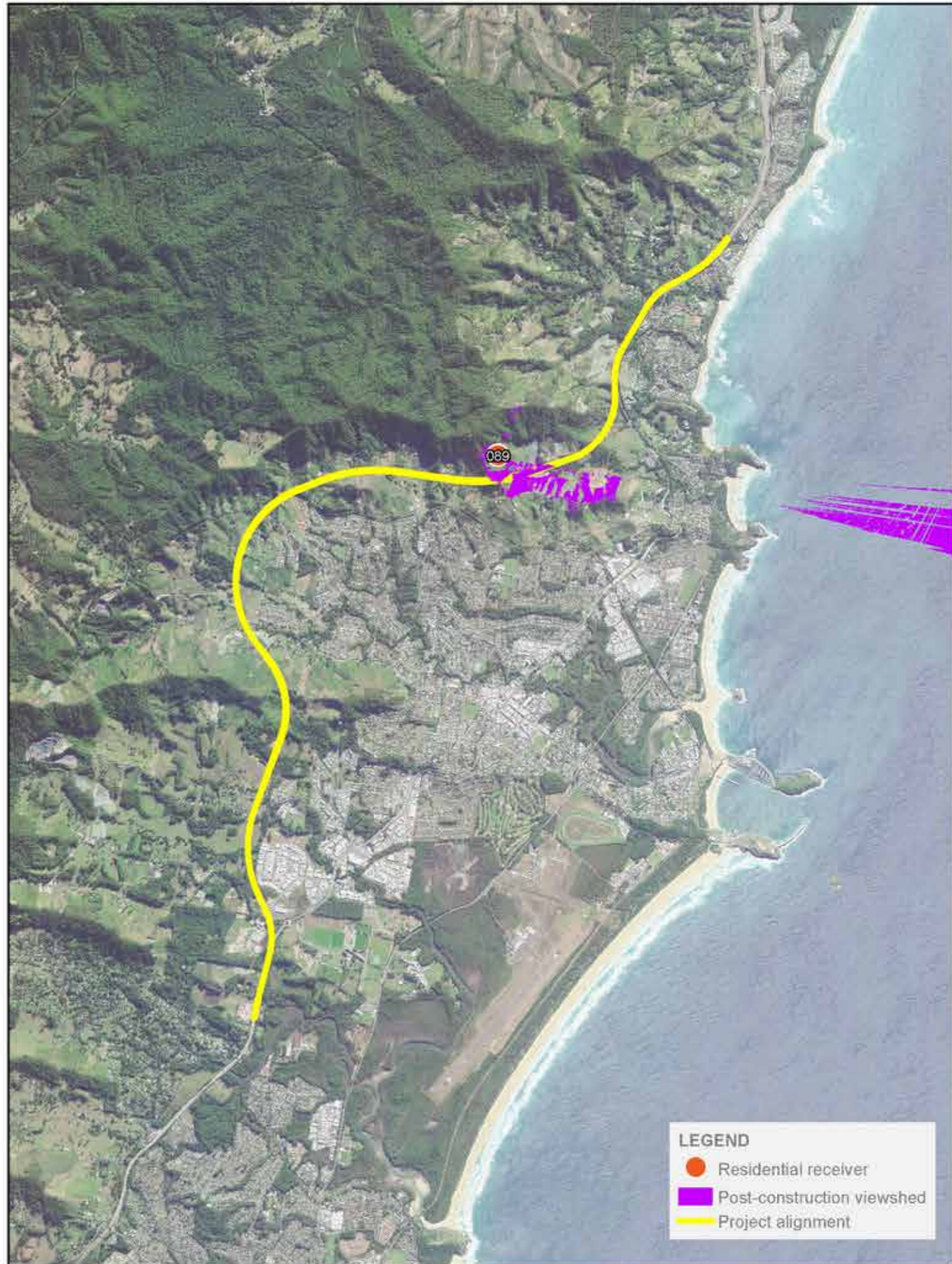


Property ocean view analysis run on a post-construction elevation model

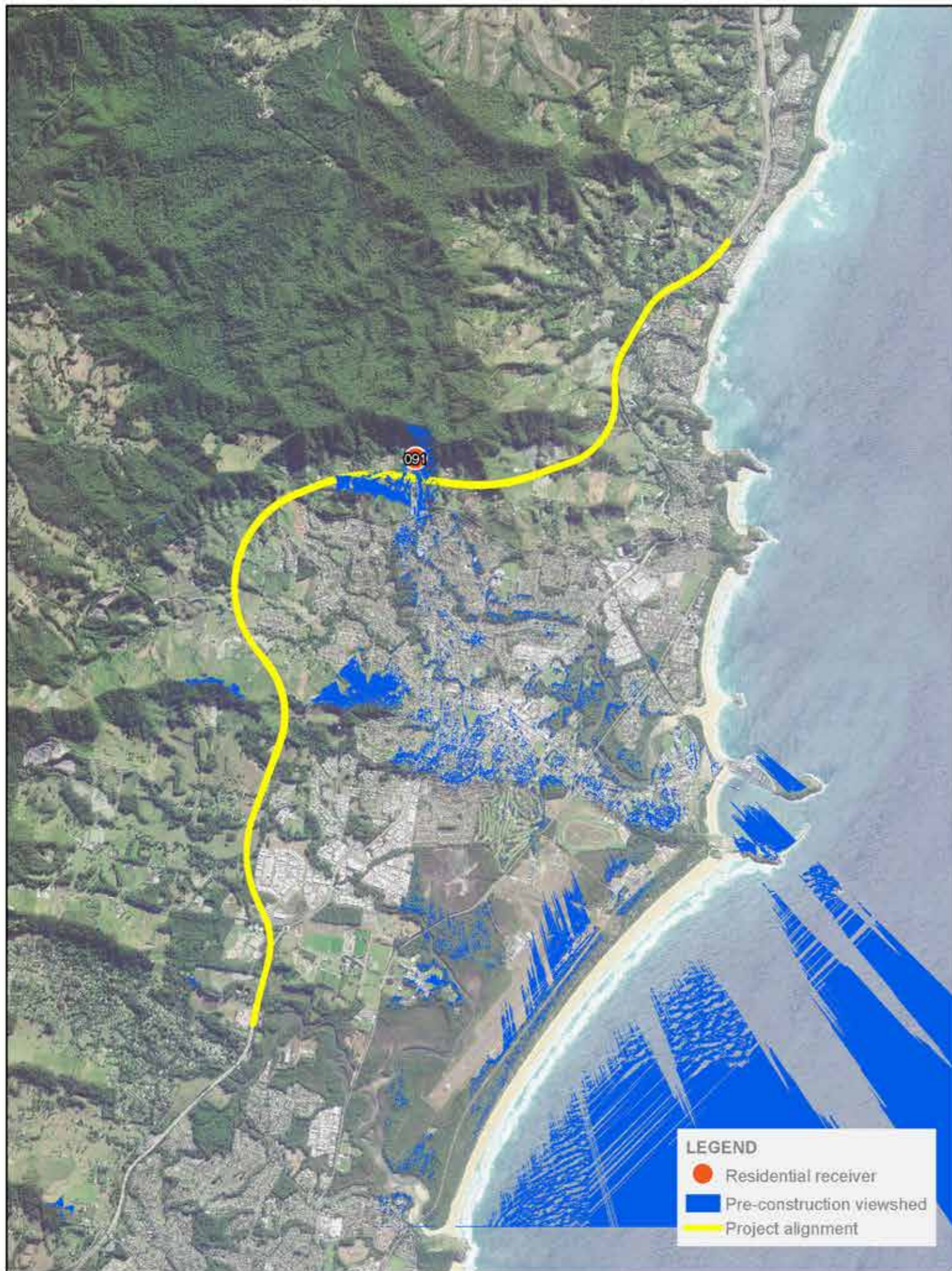
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 Grid: GDA 1984 MGA Zone 88



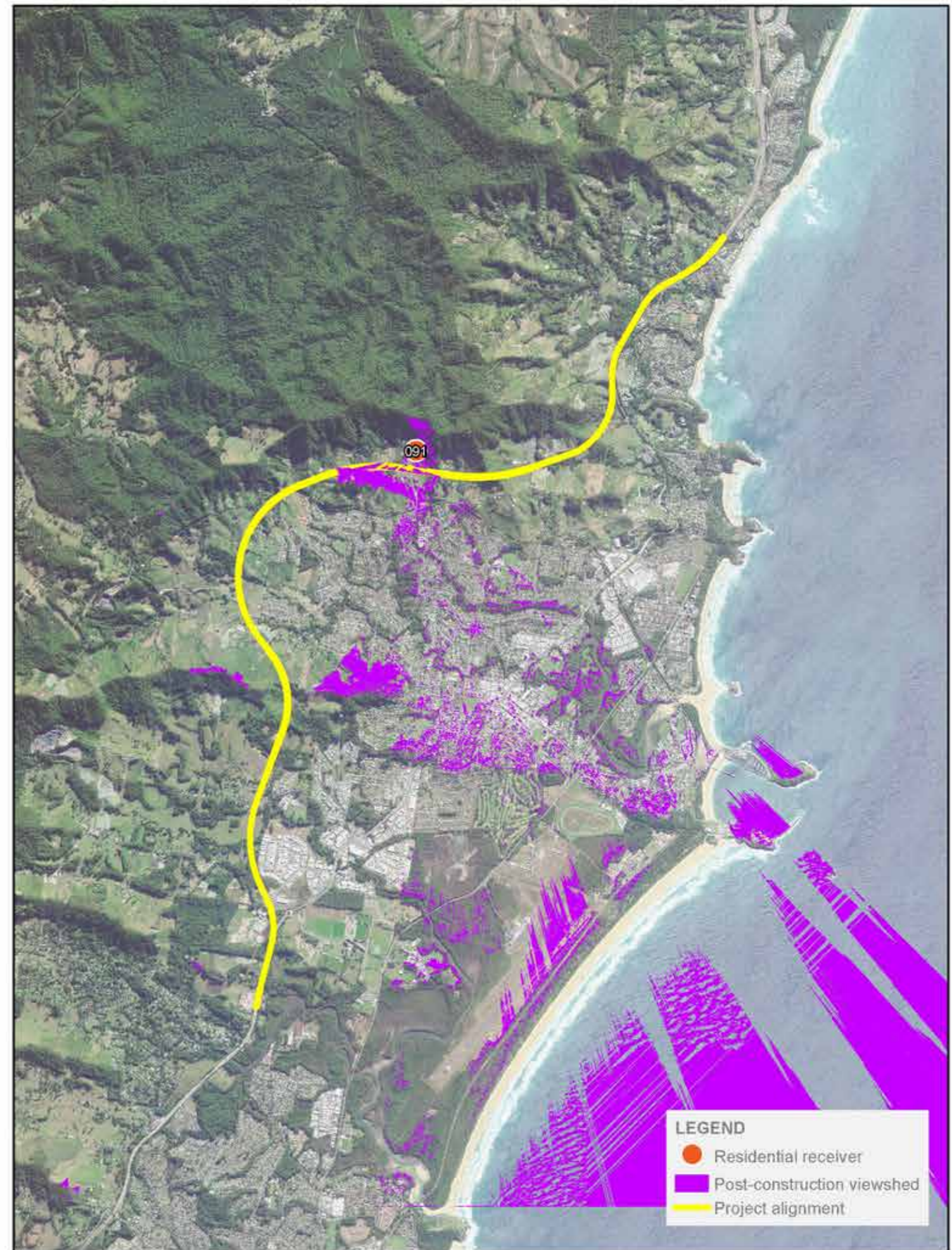
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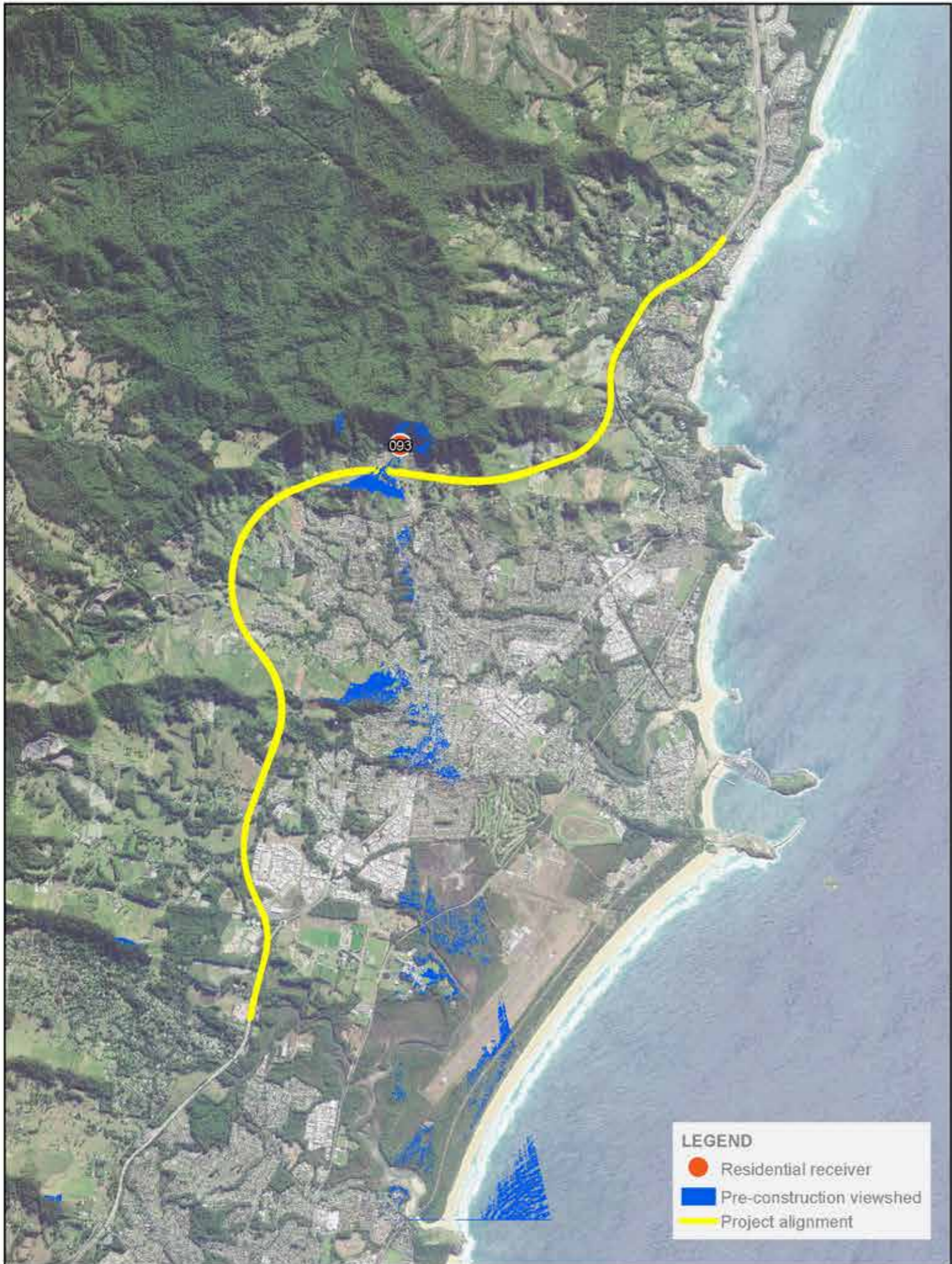


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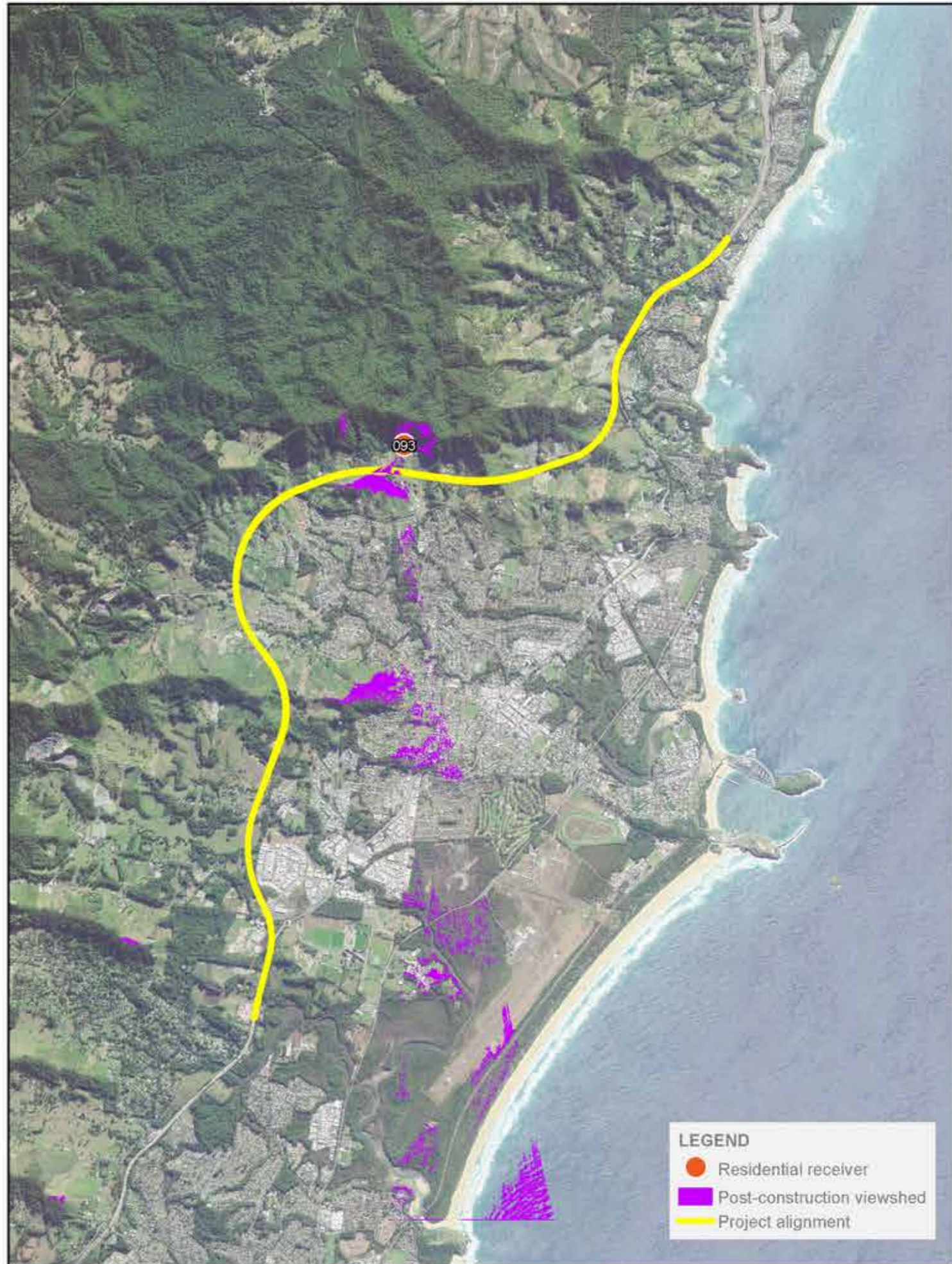


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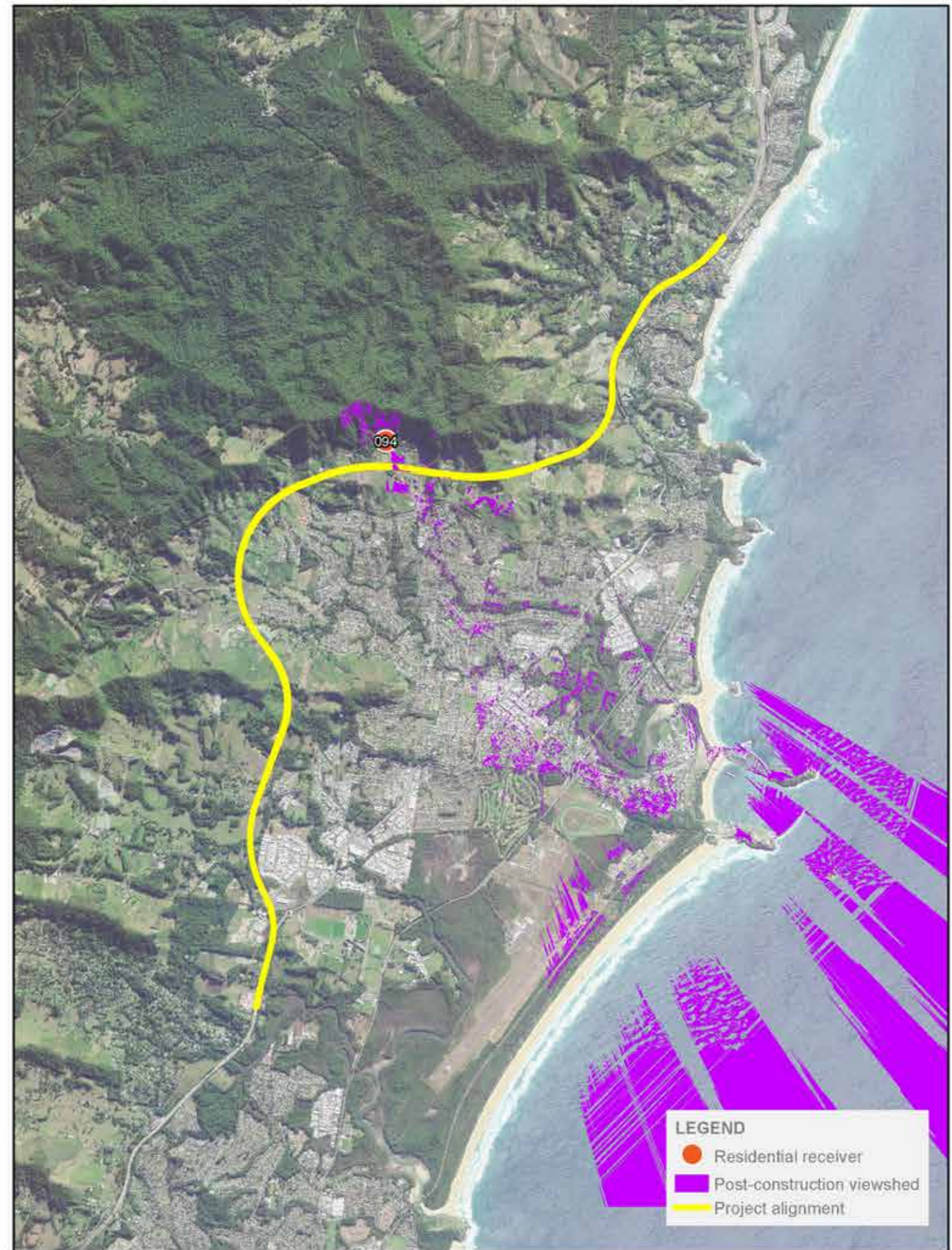


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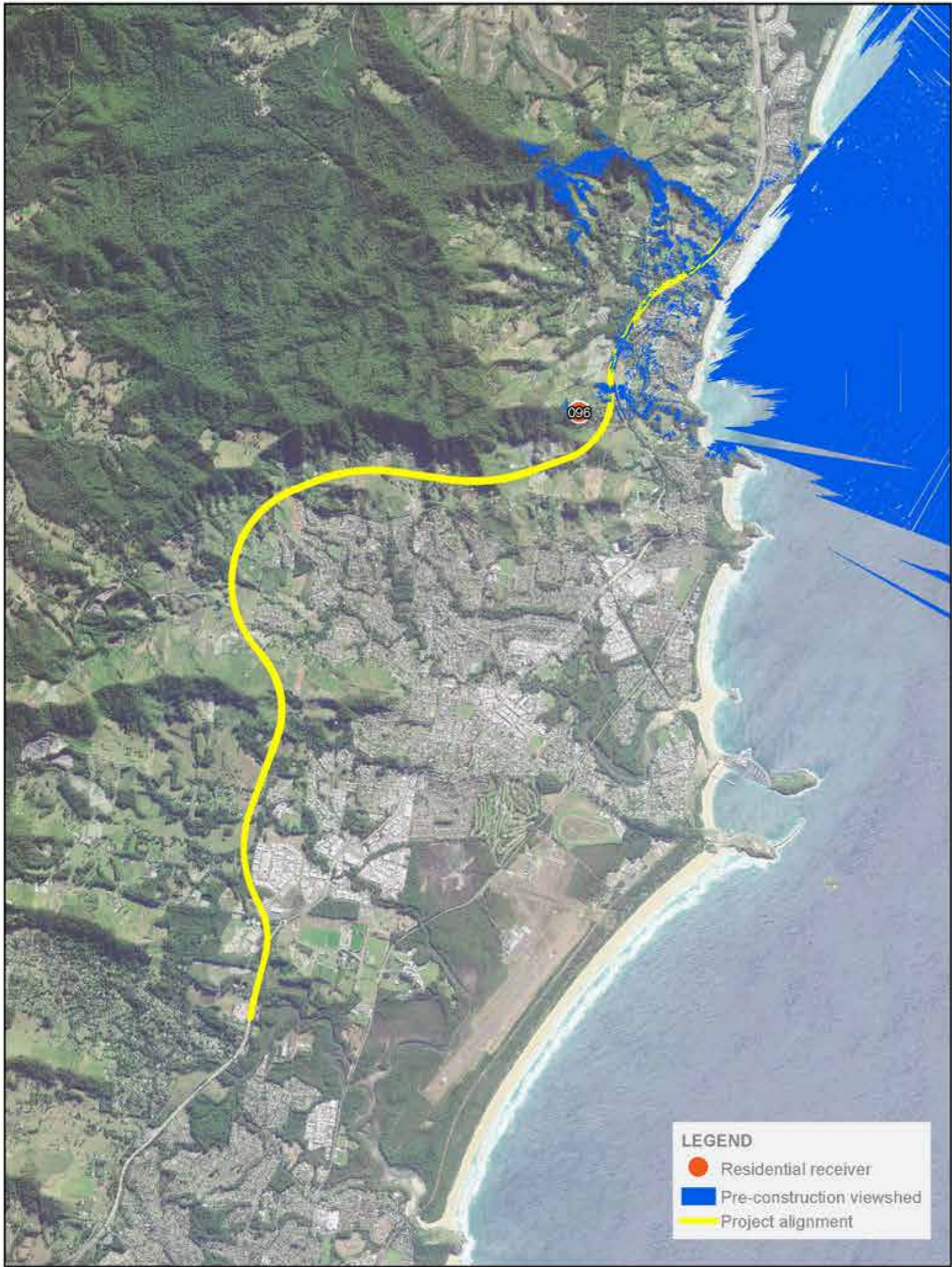


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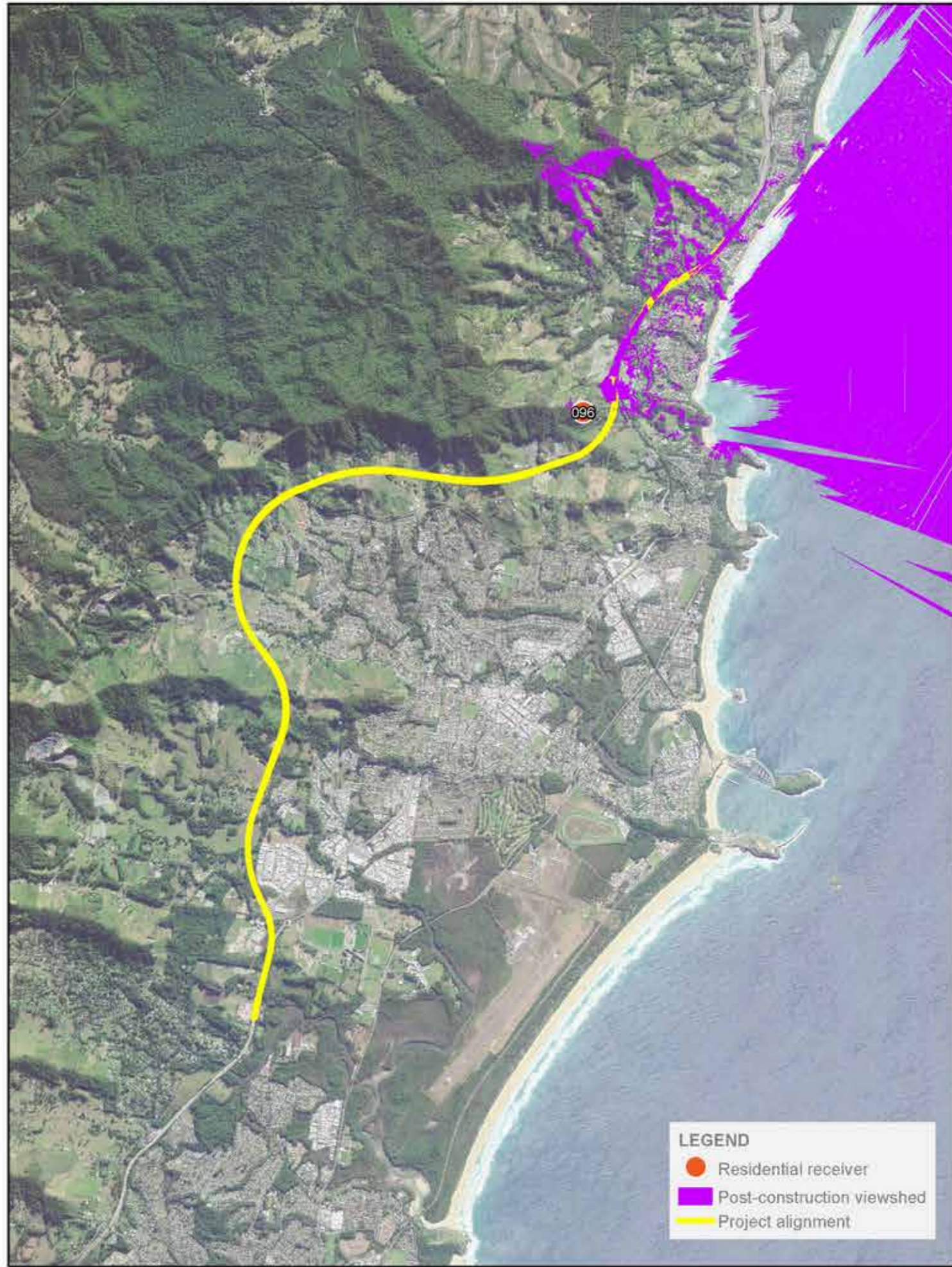


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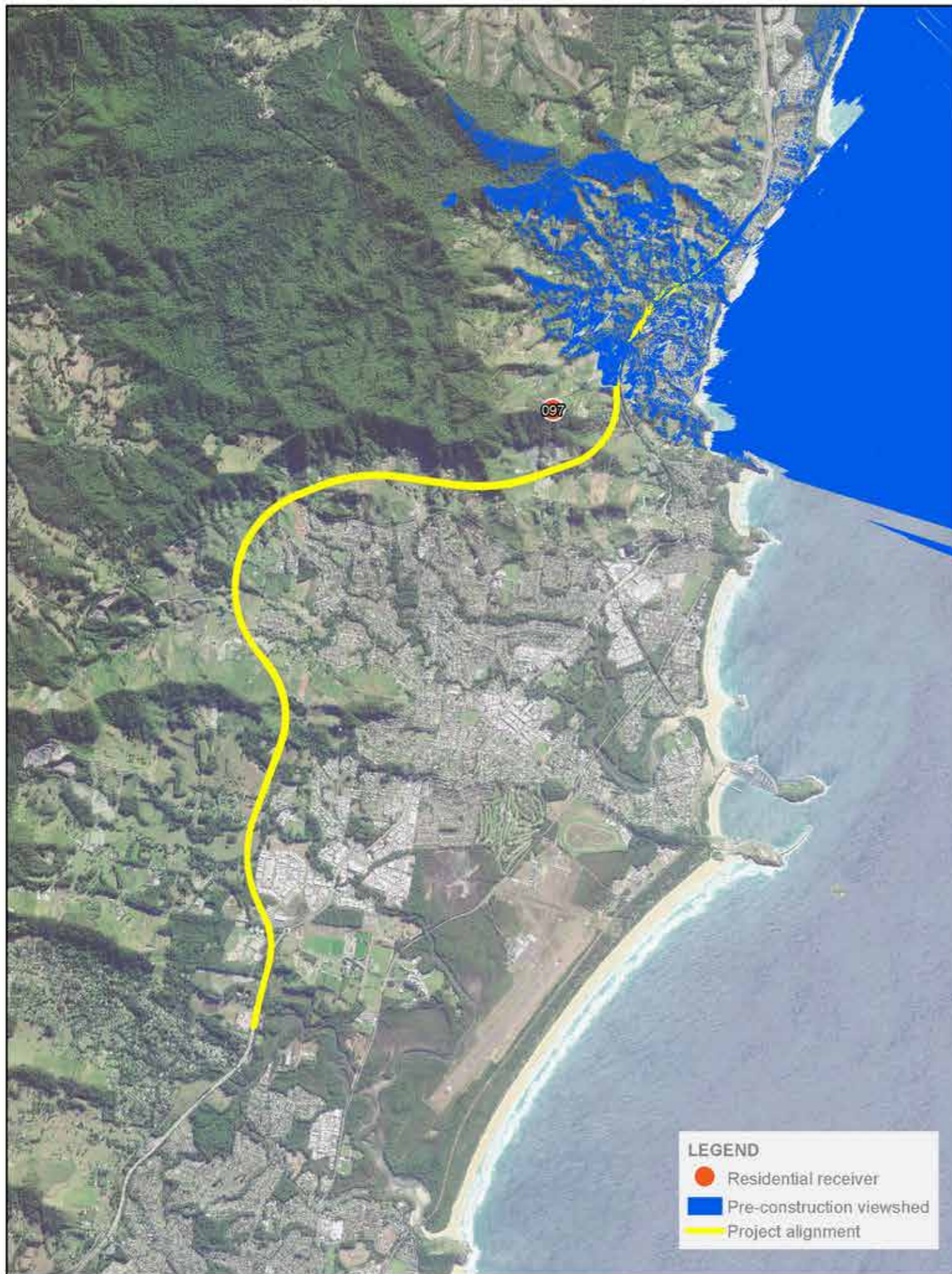


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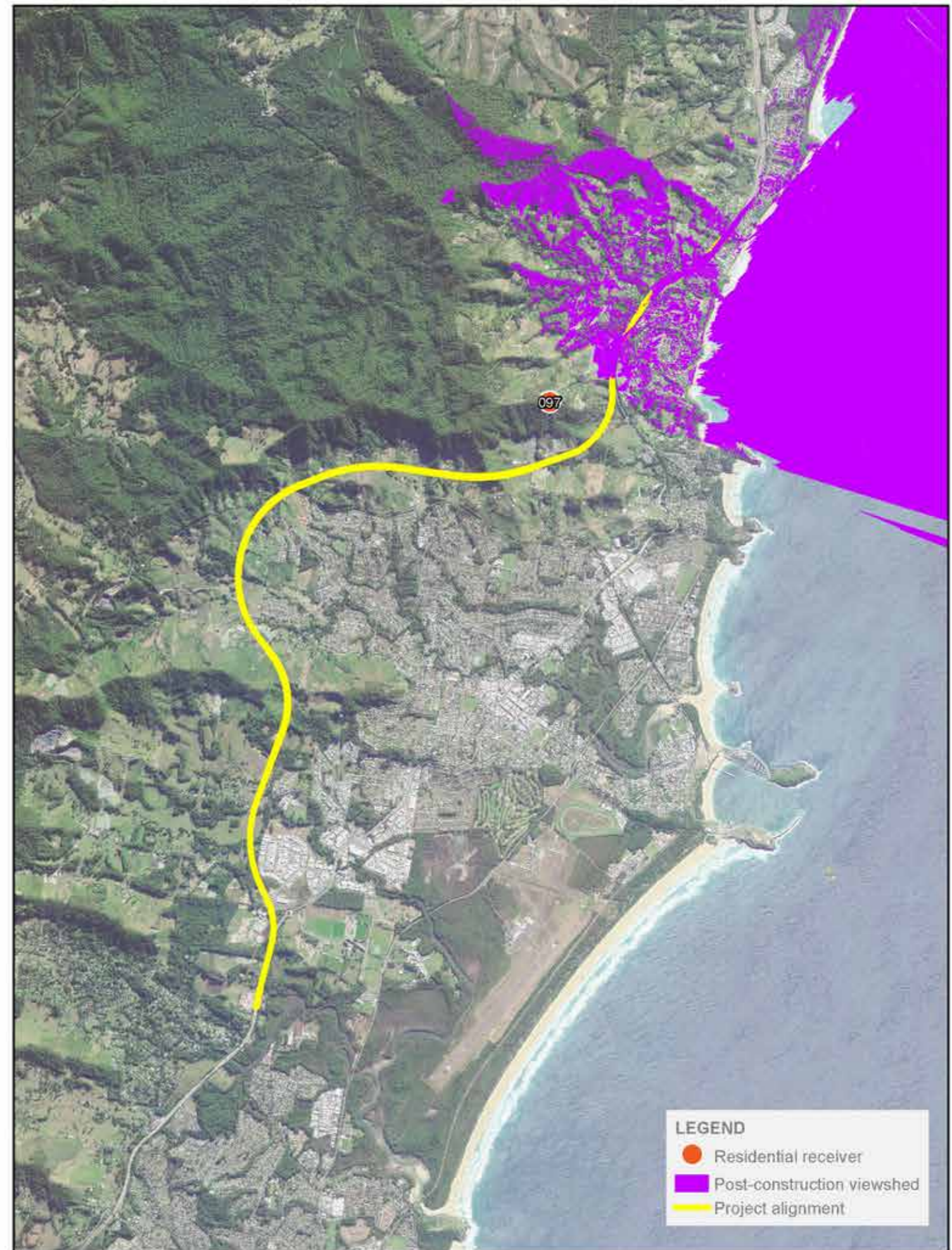


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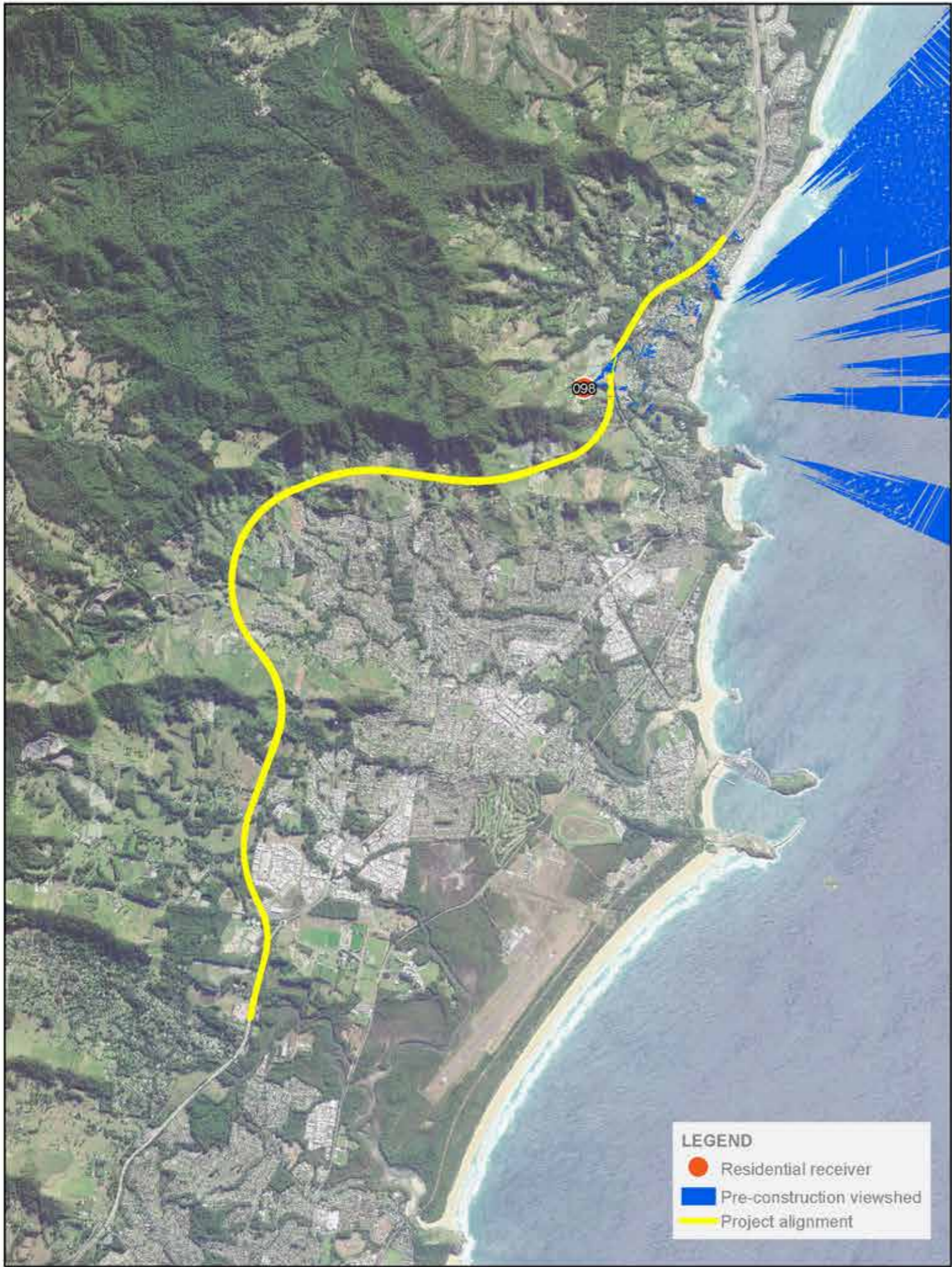


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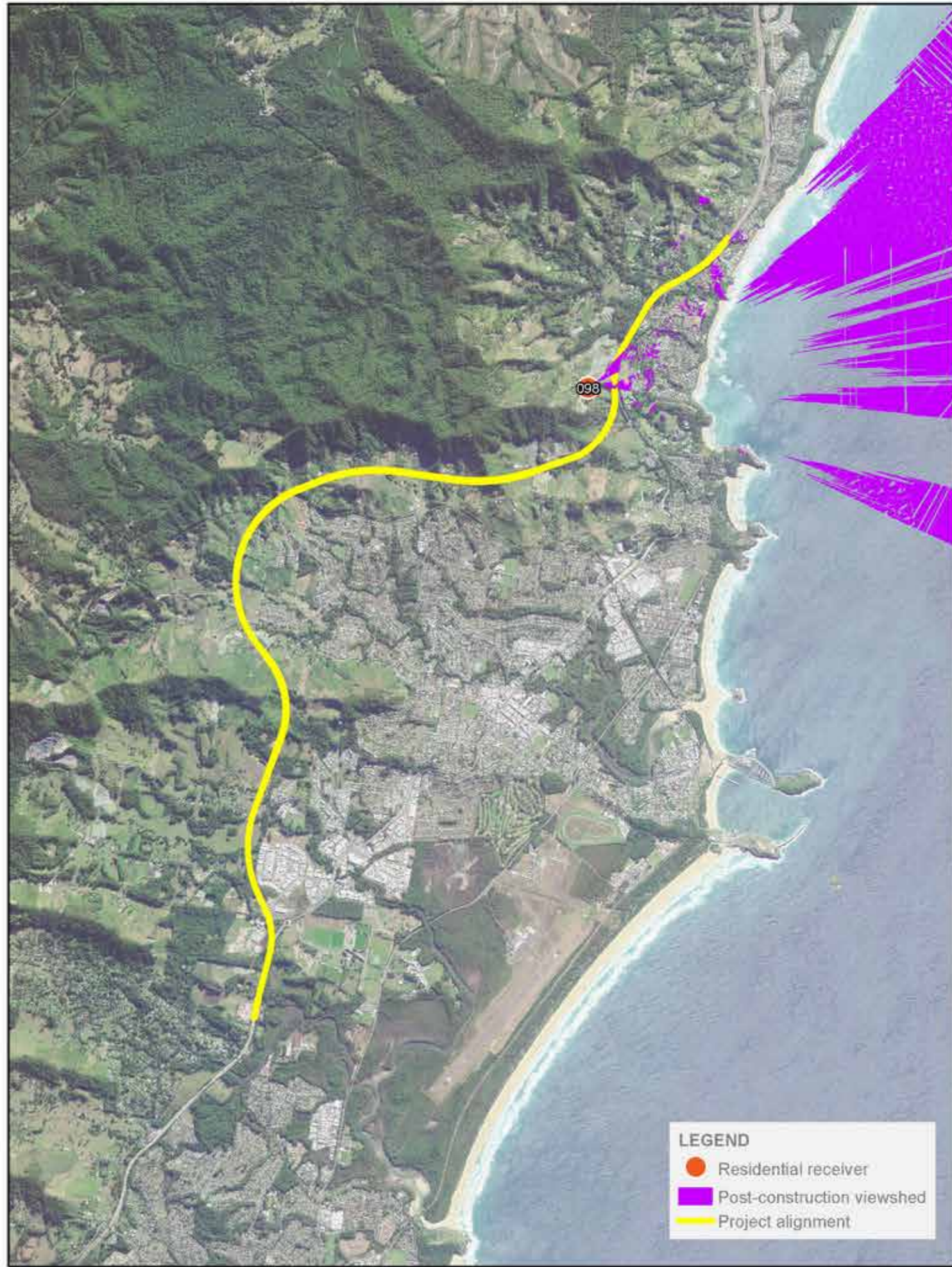


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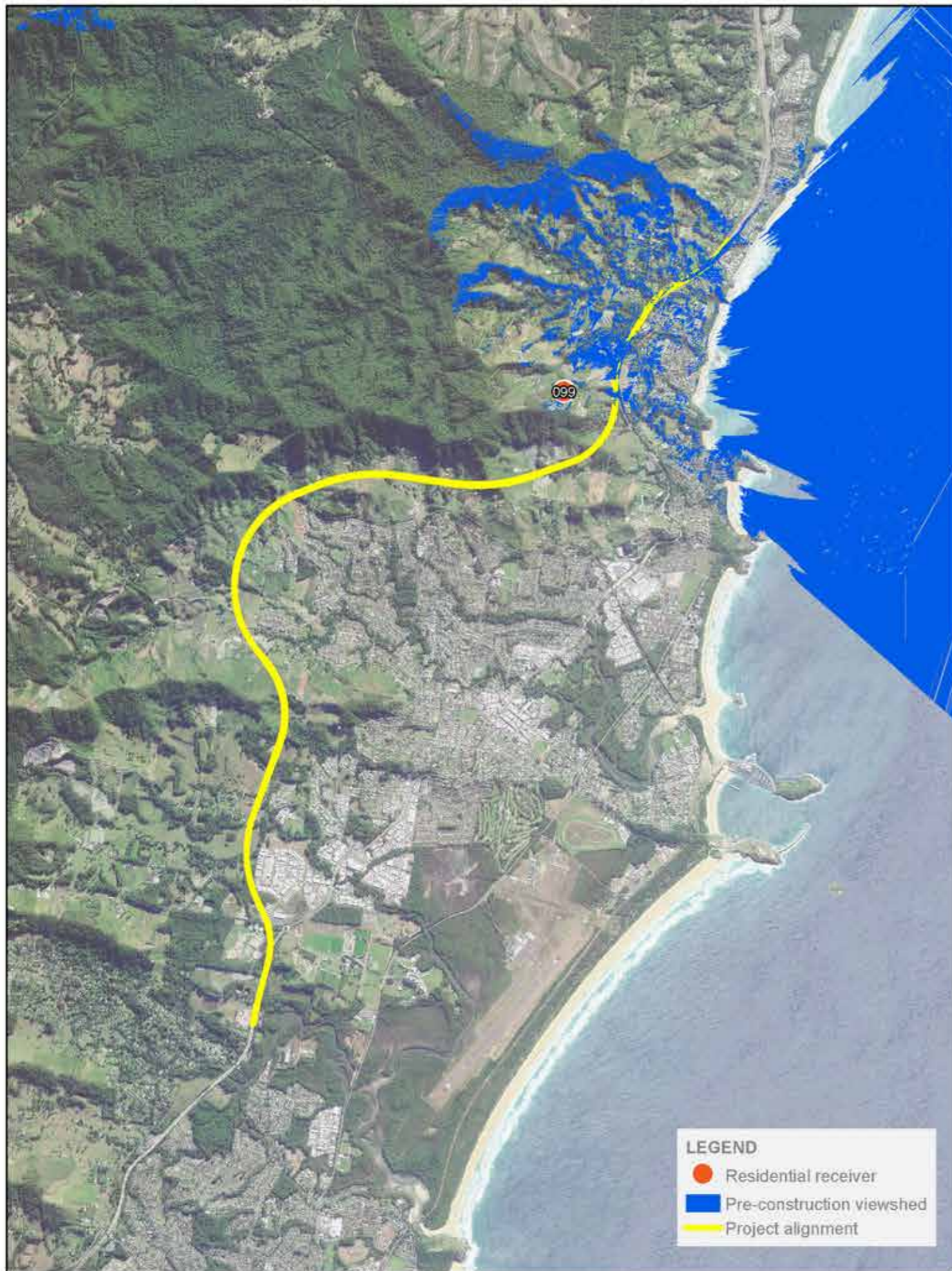


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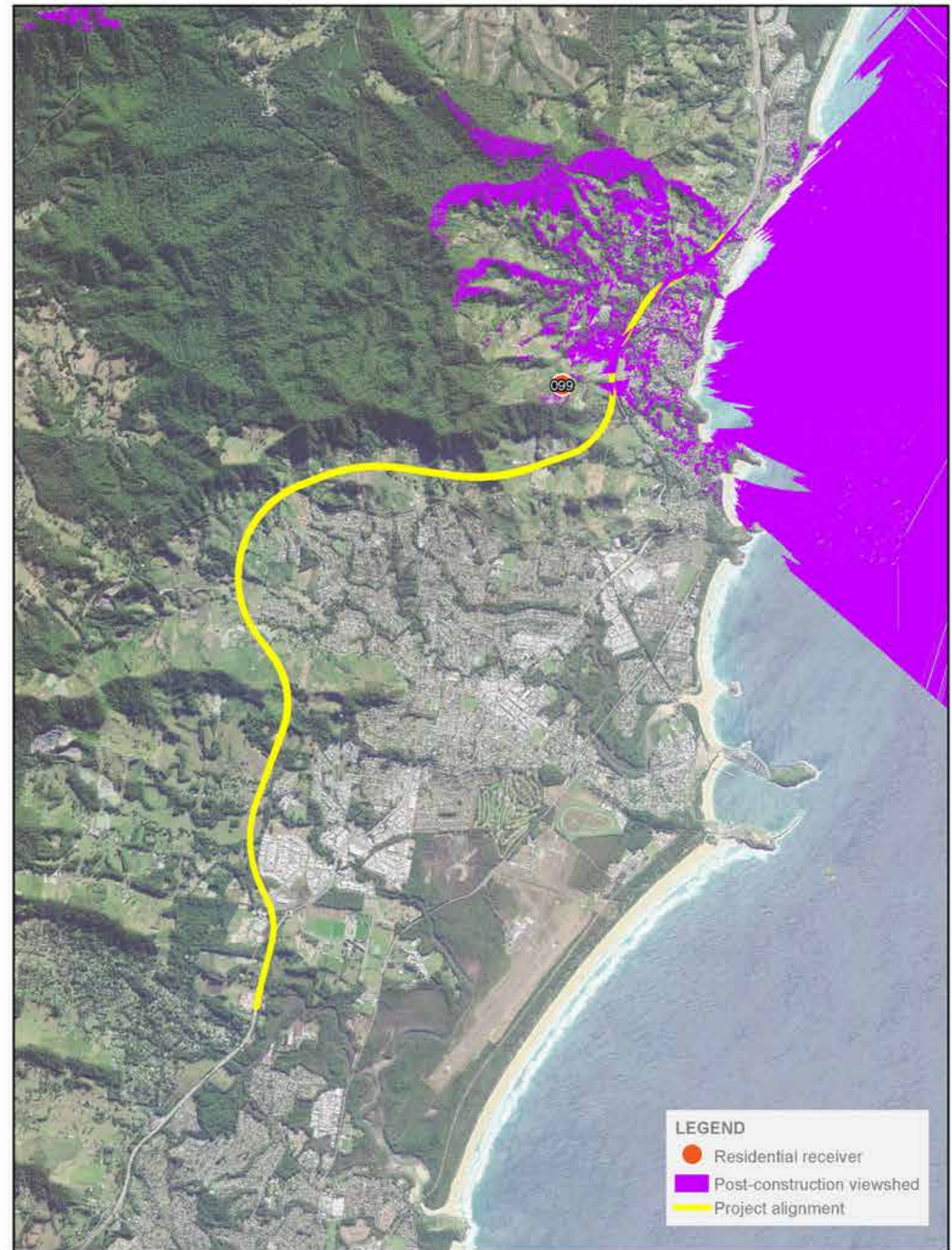


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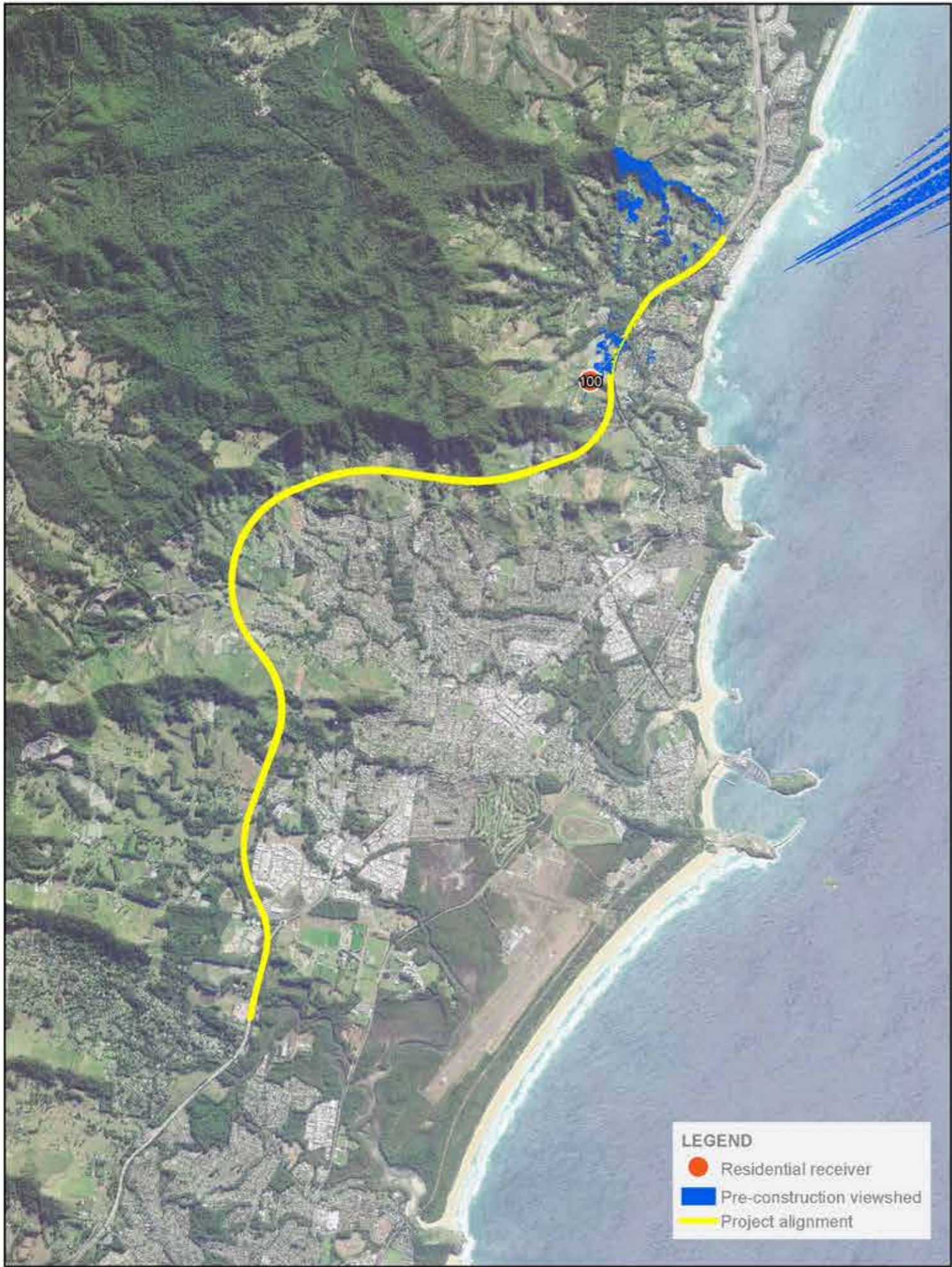




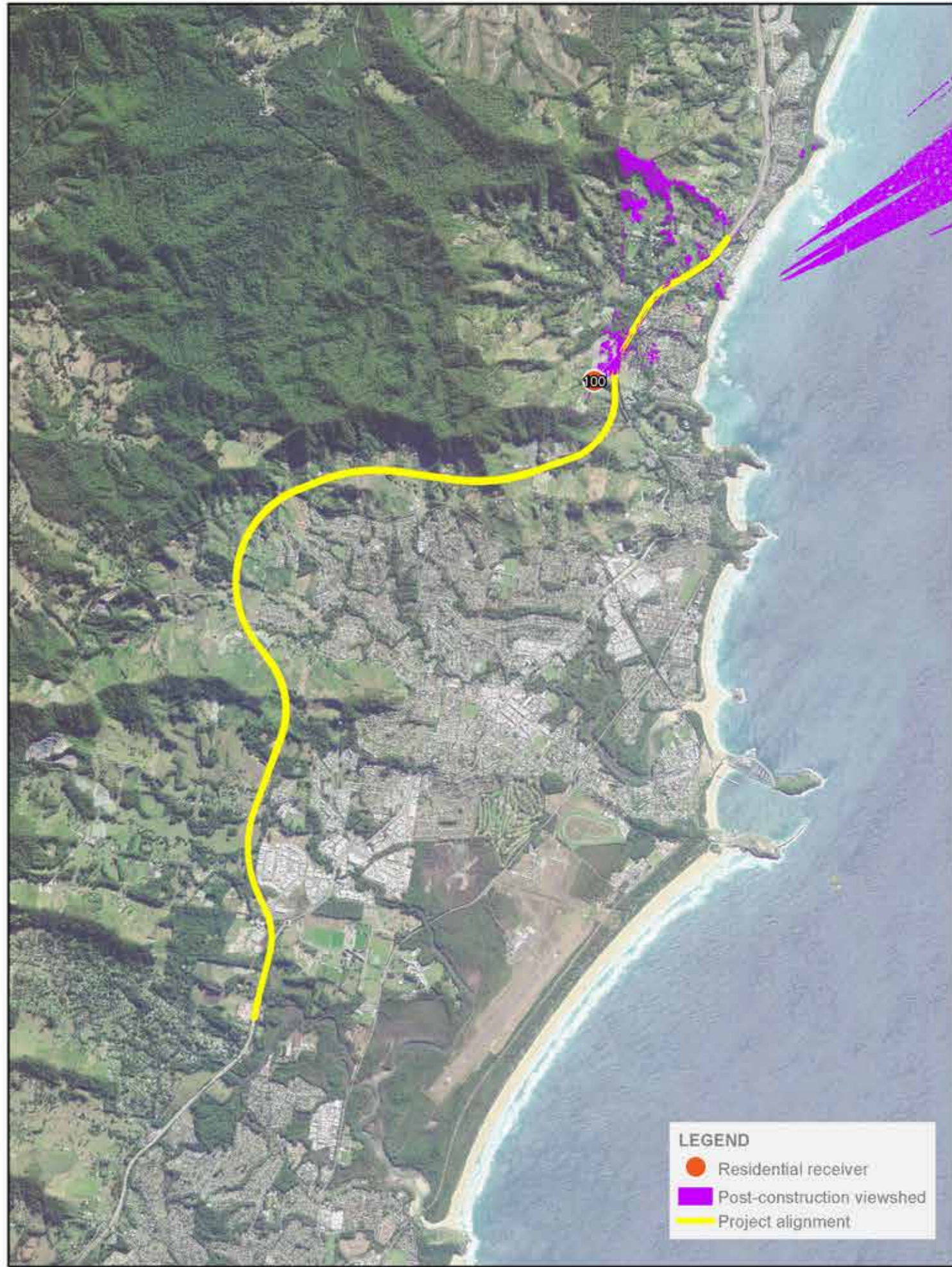
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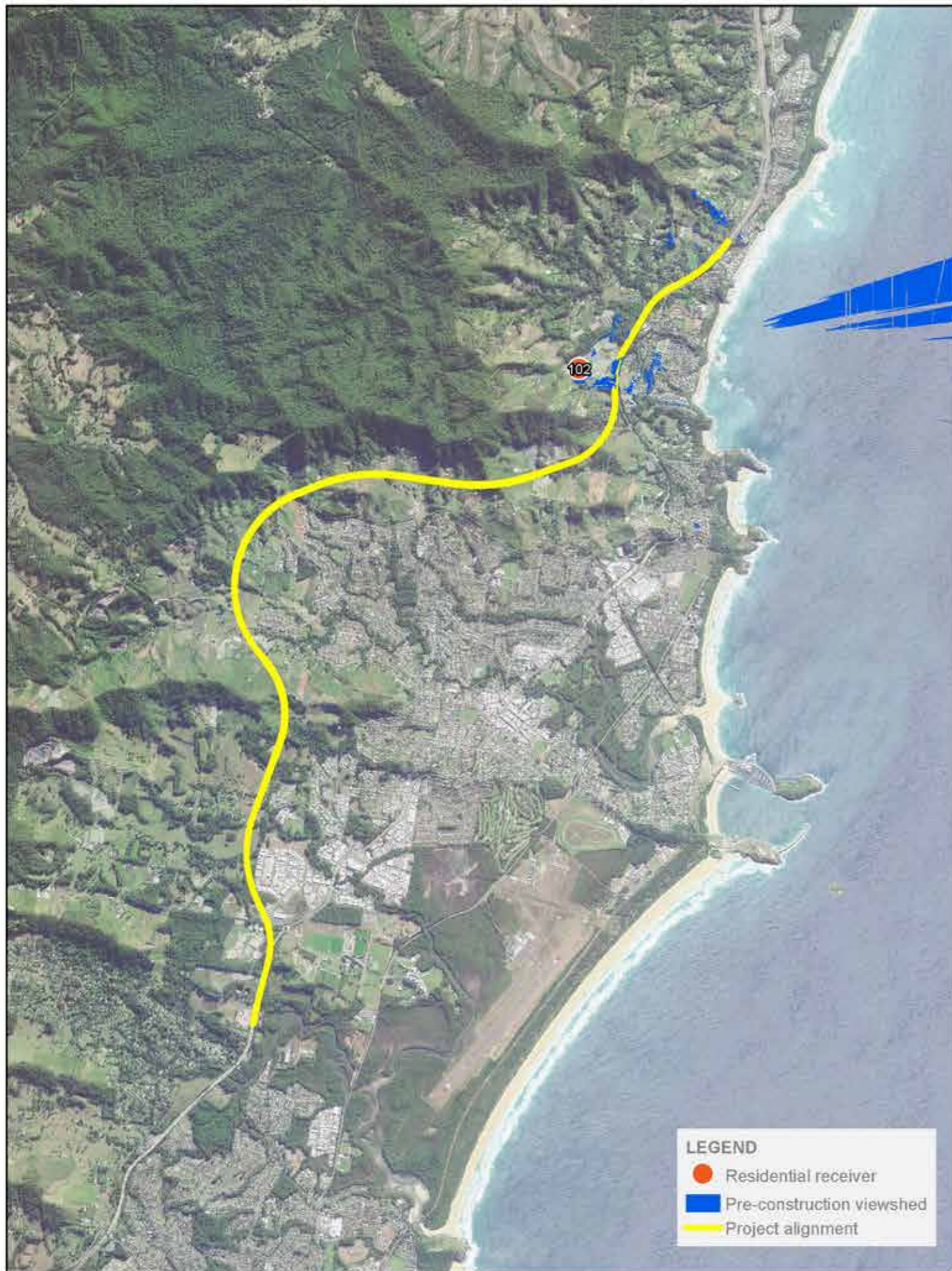
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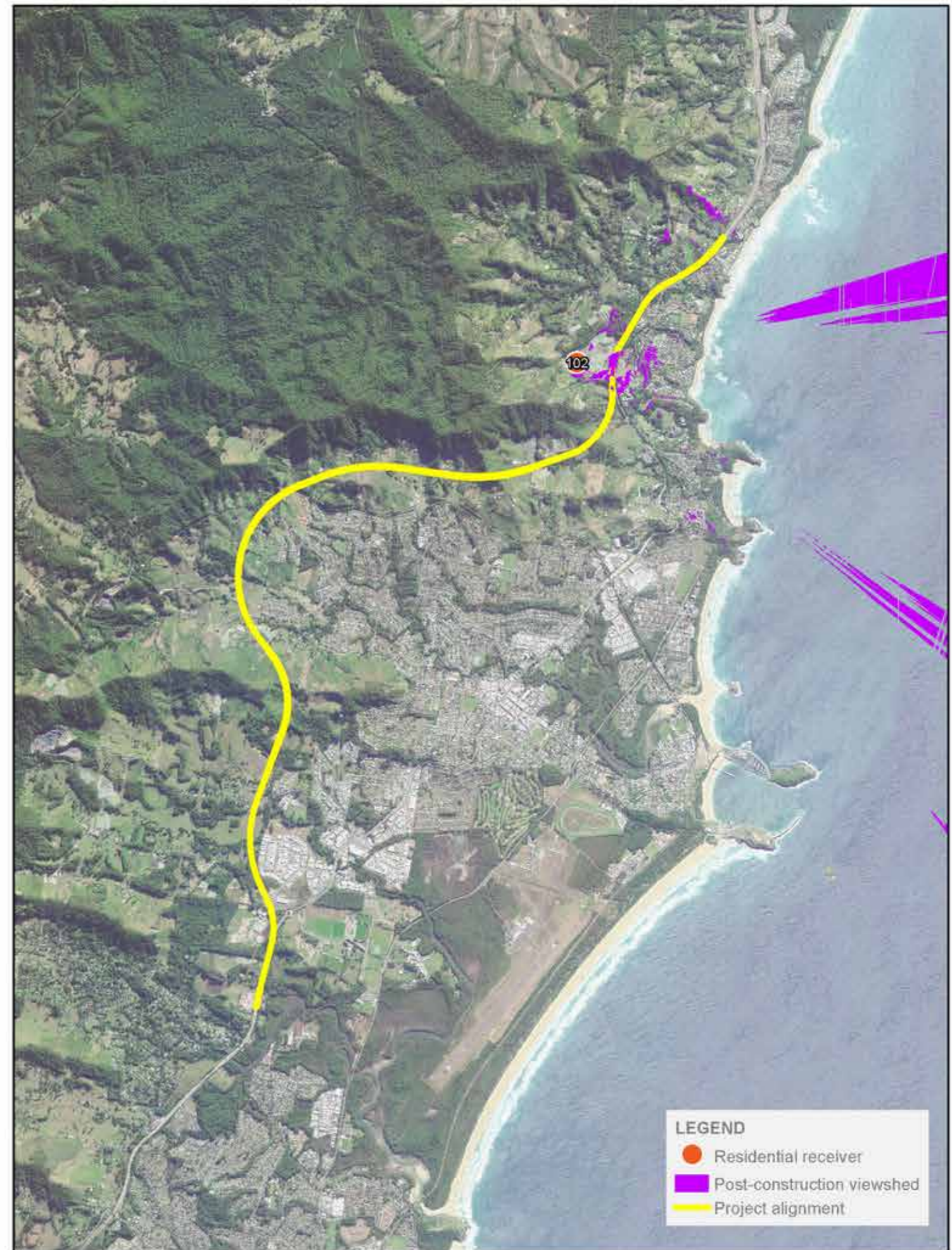
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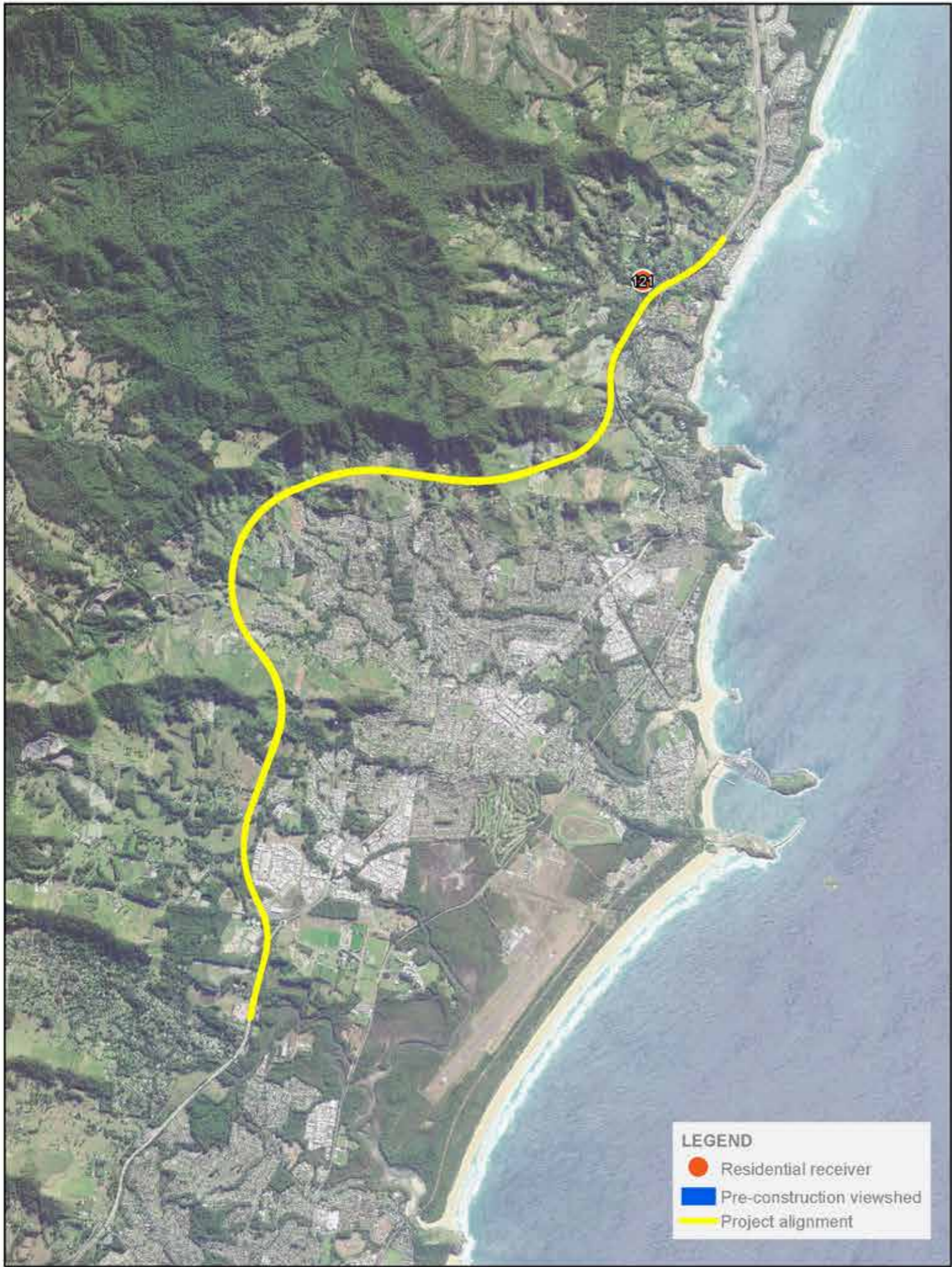
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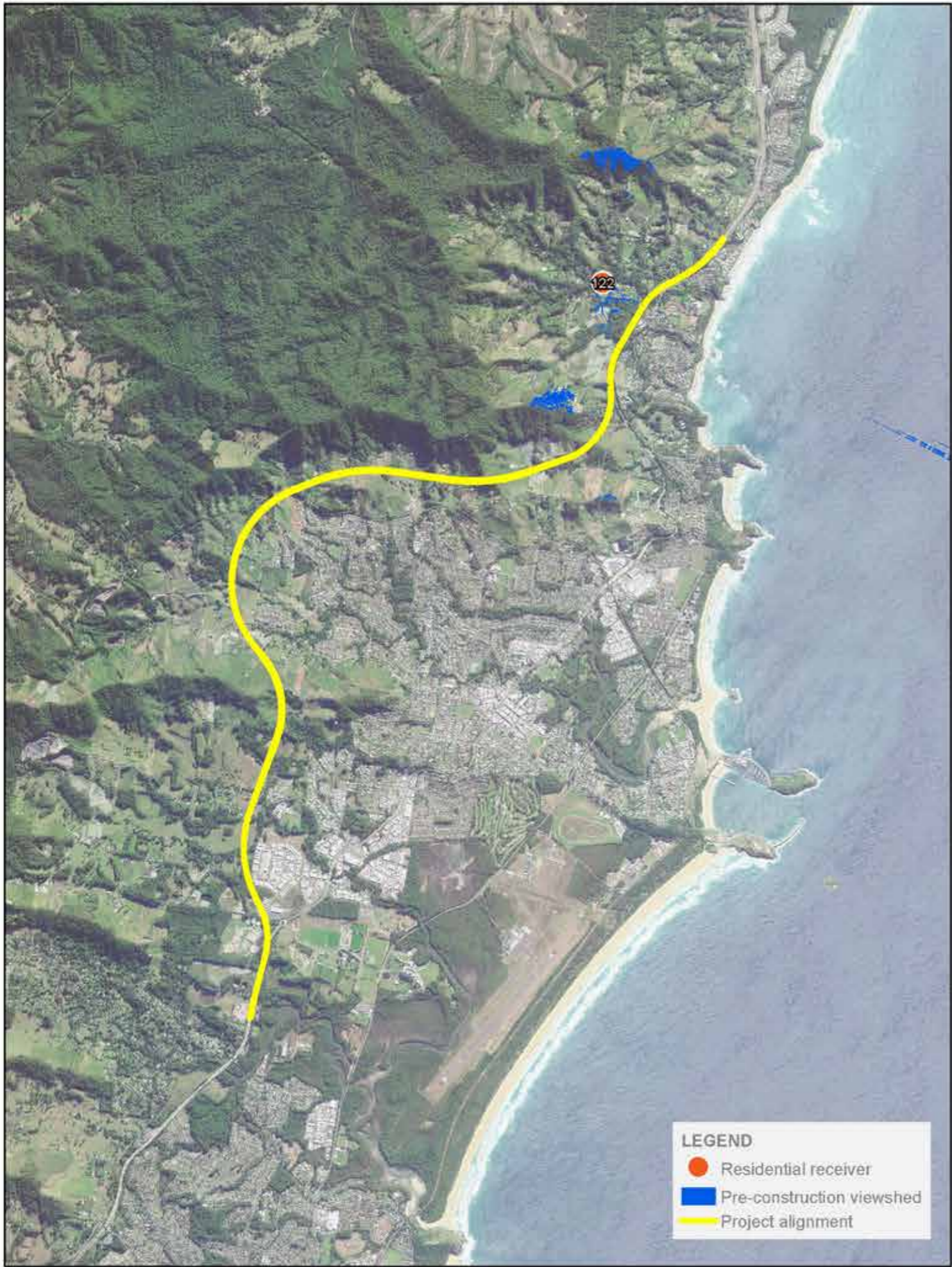
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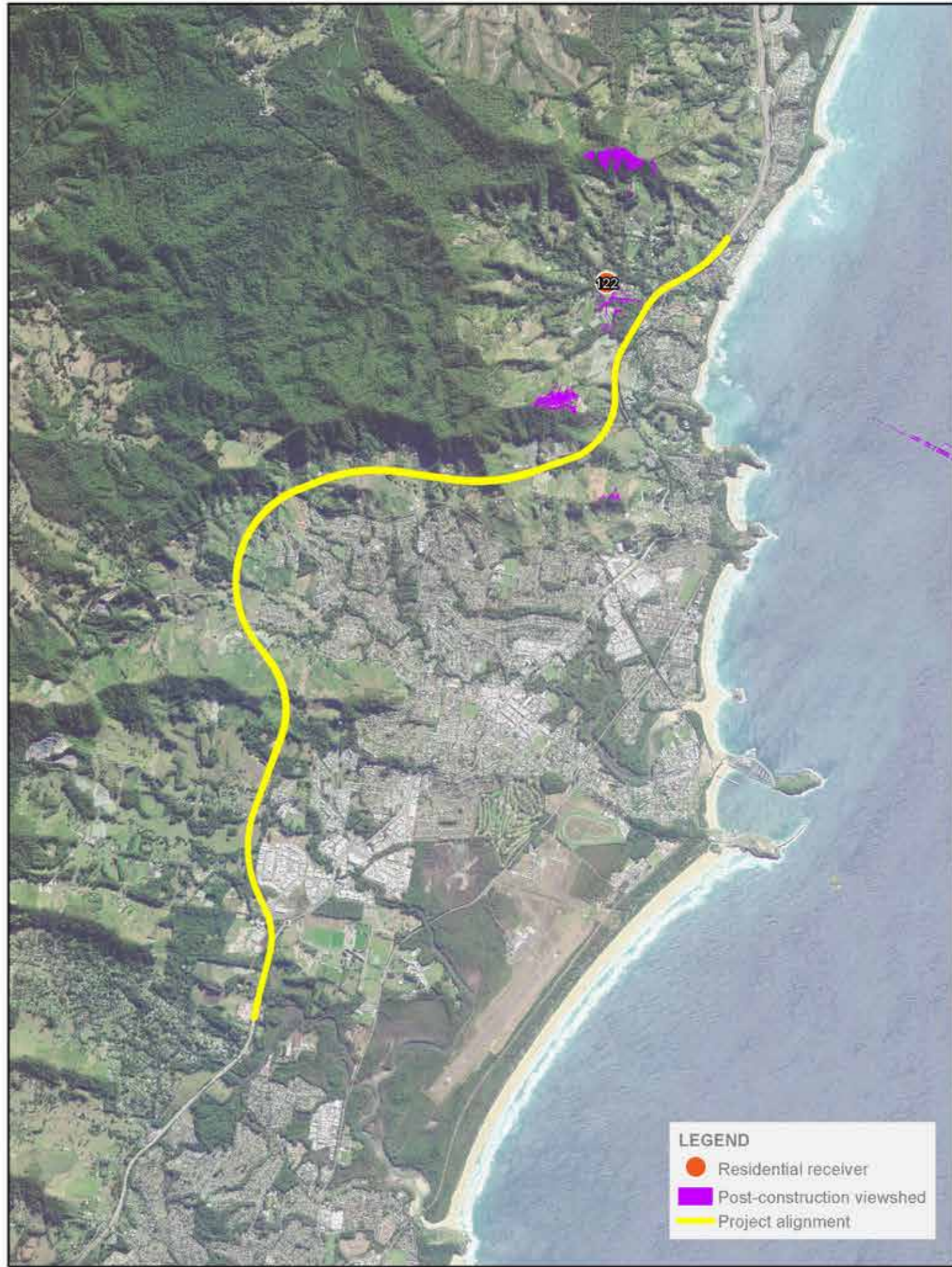
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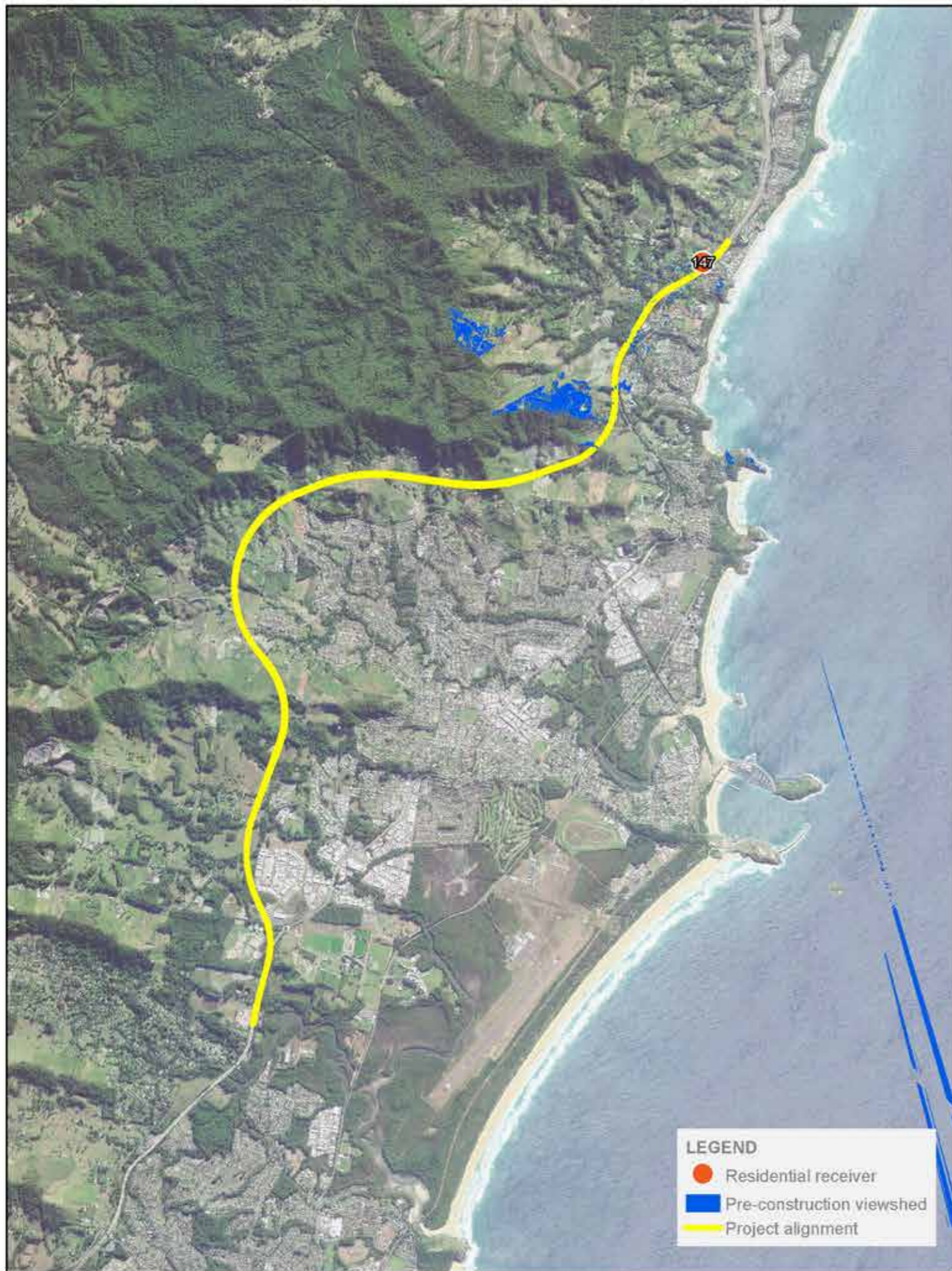
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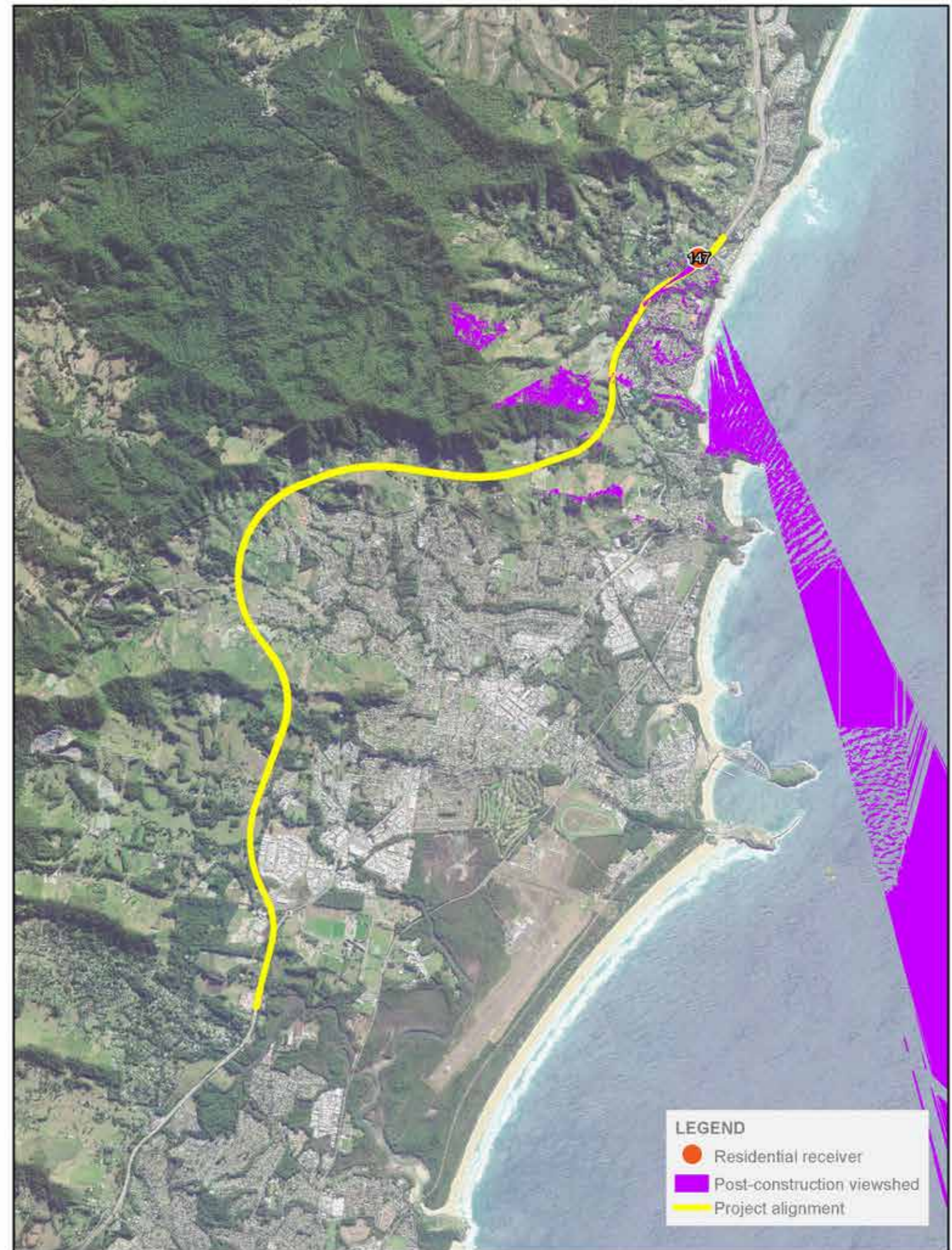
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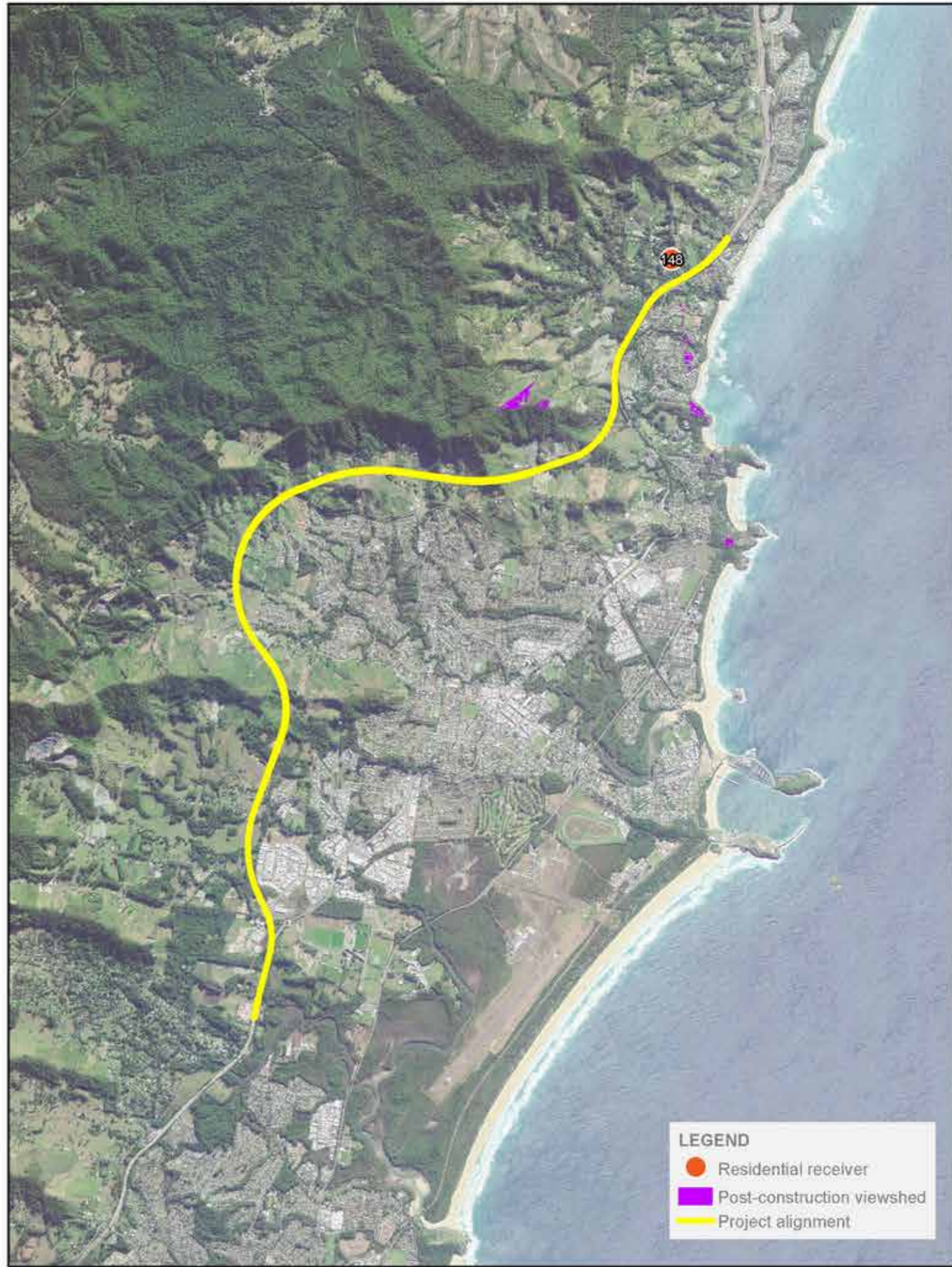
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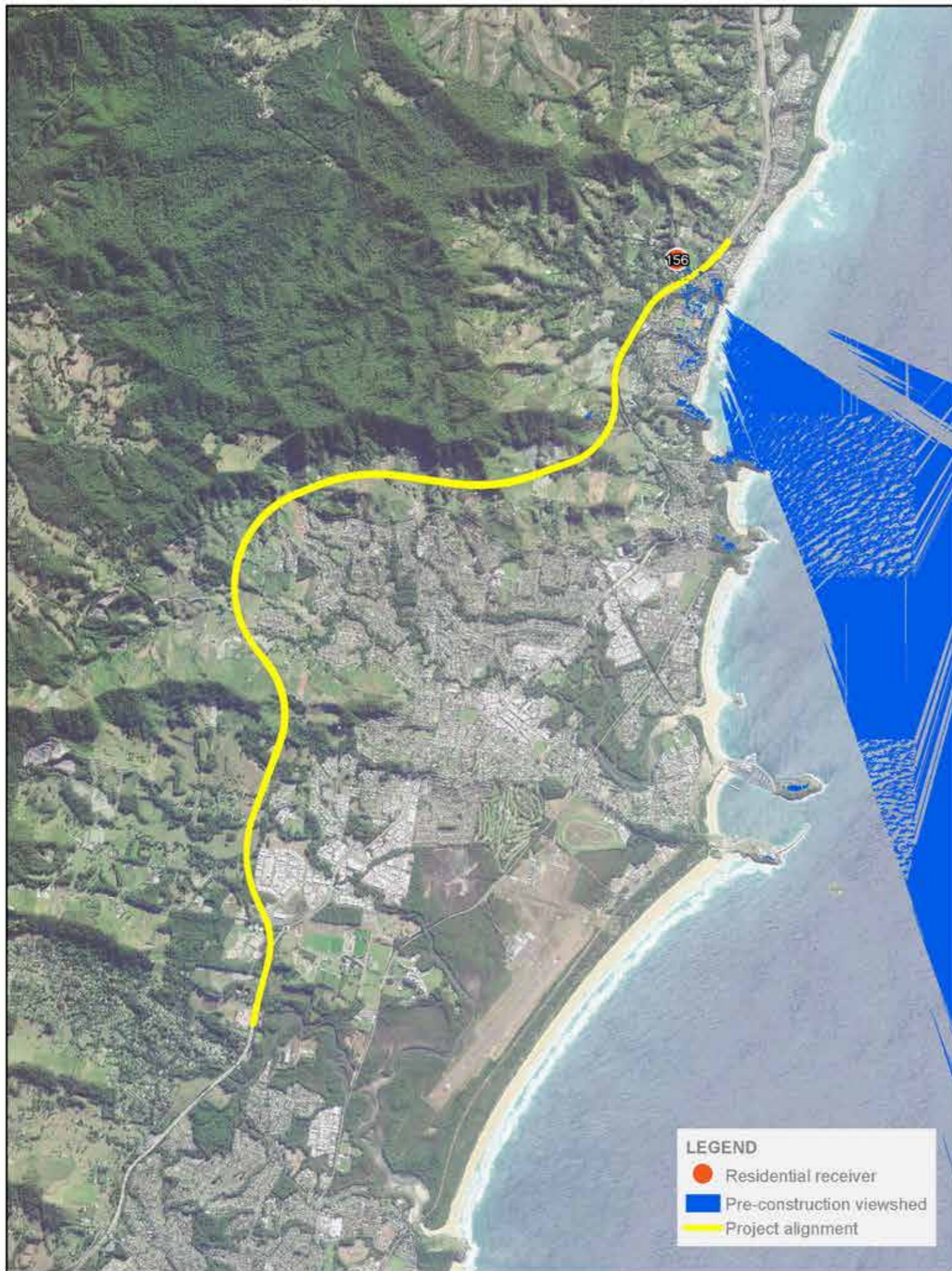


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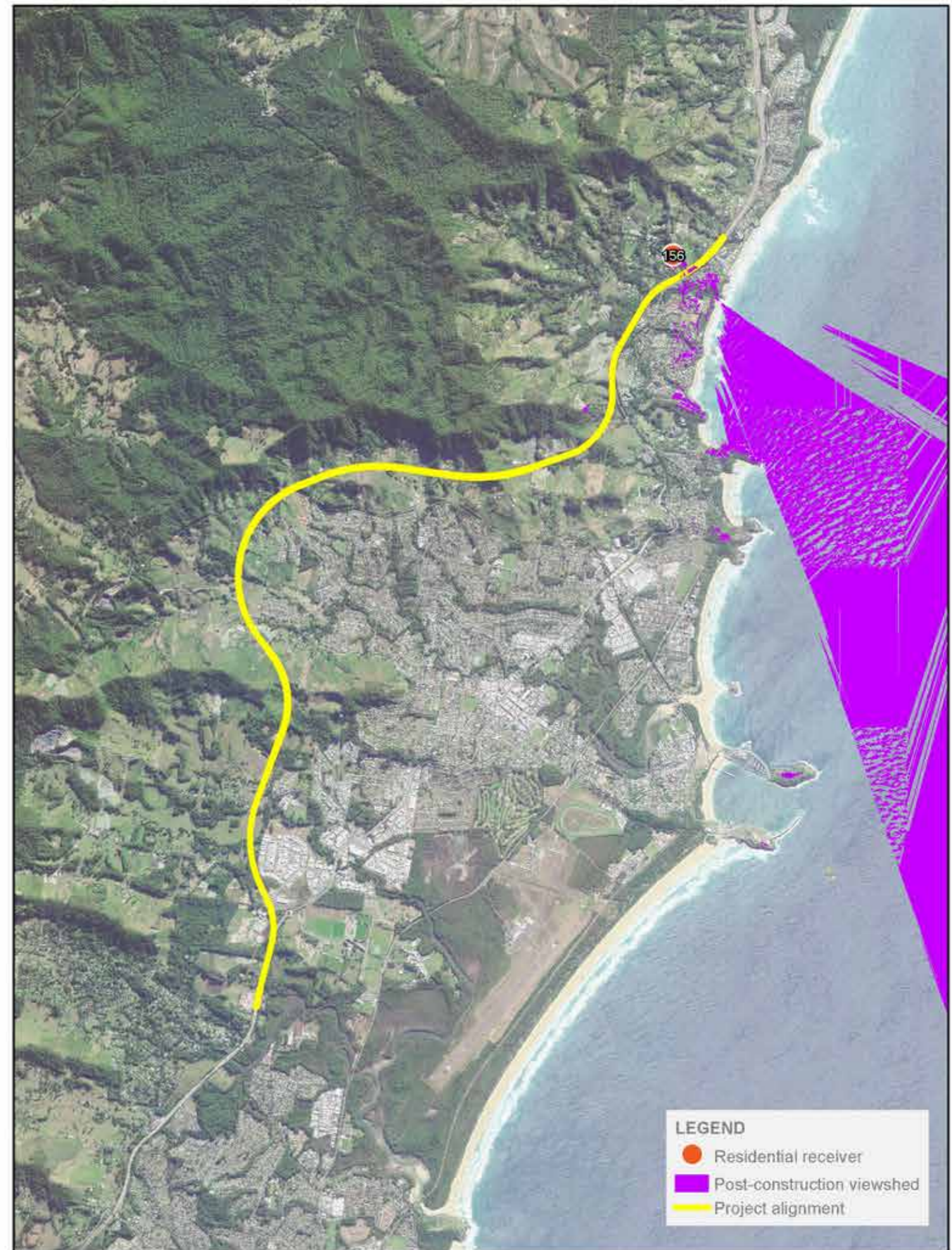


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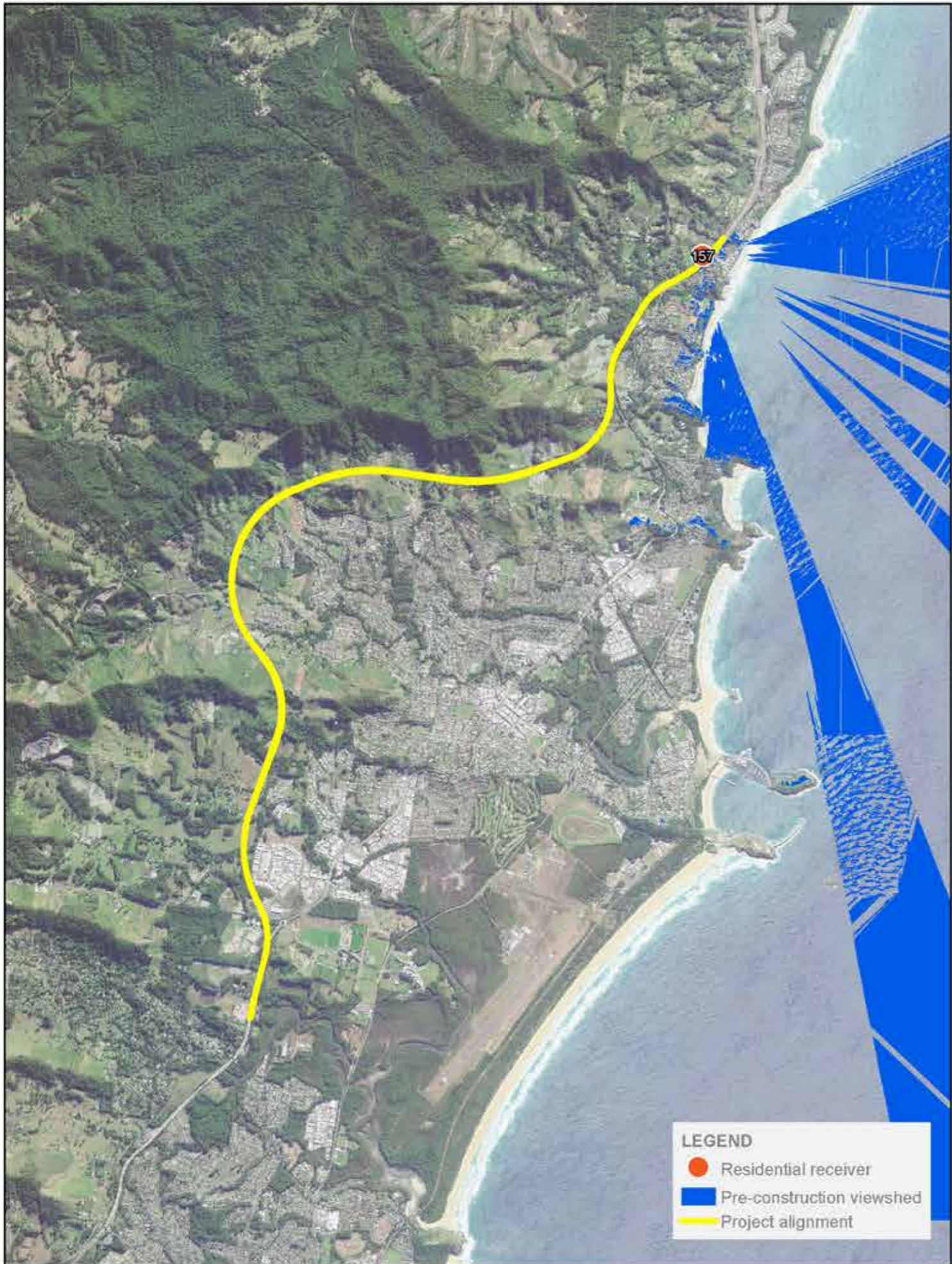




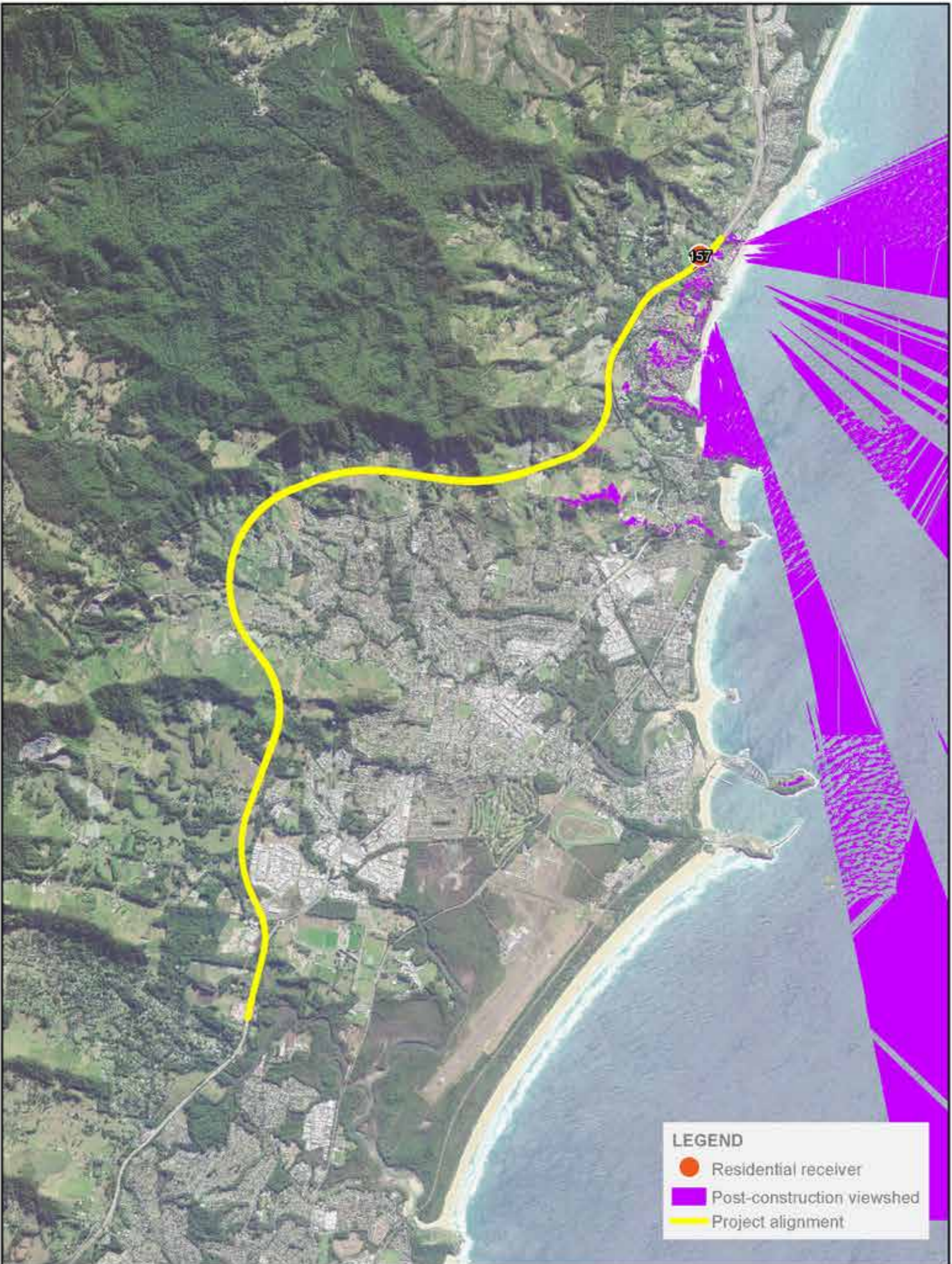
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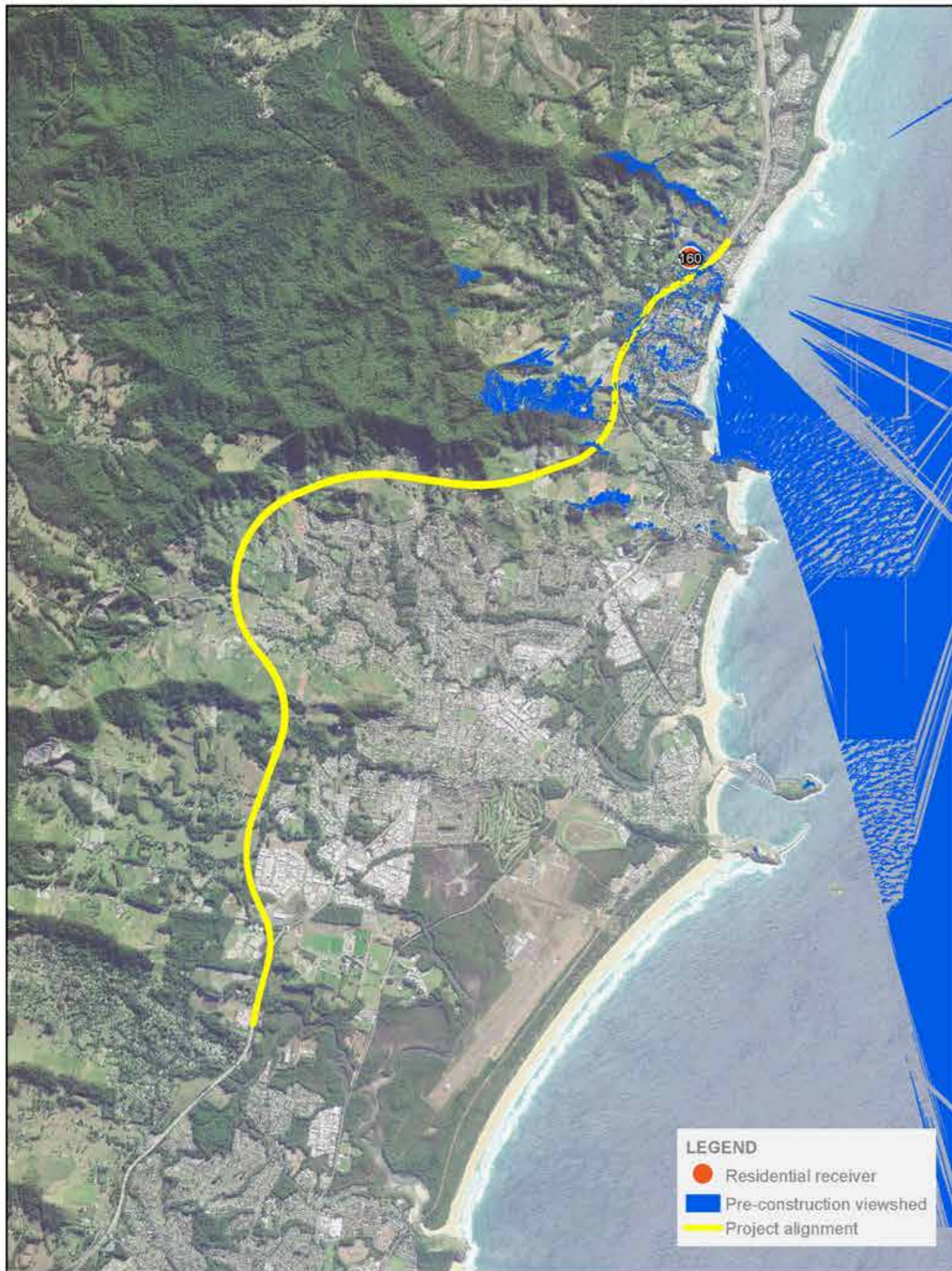


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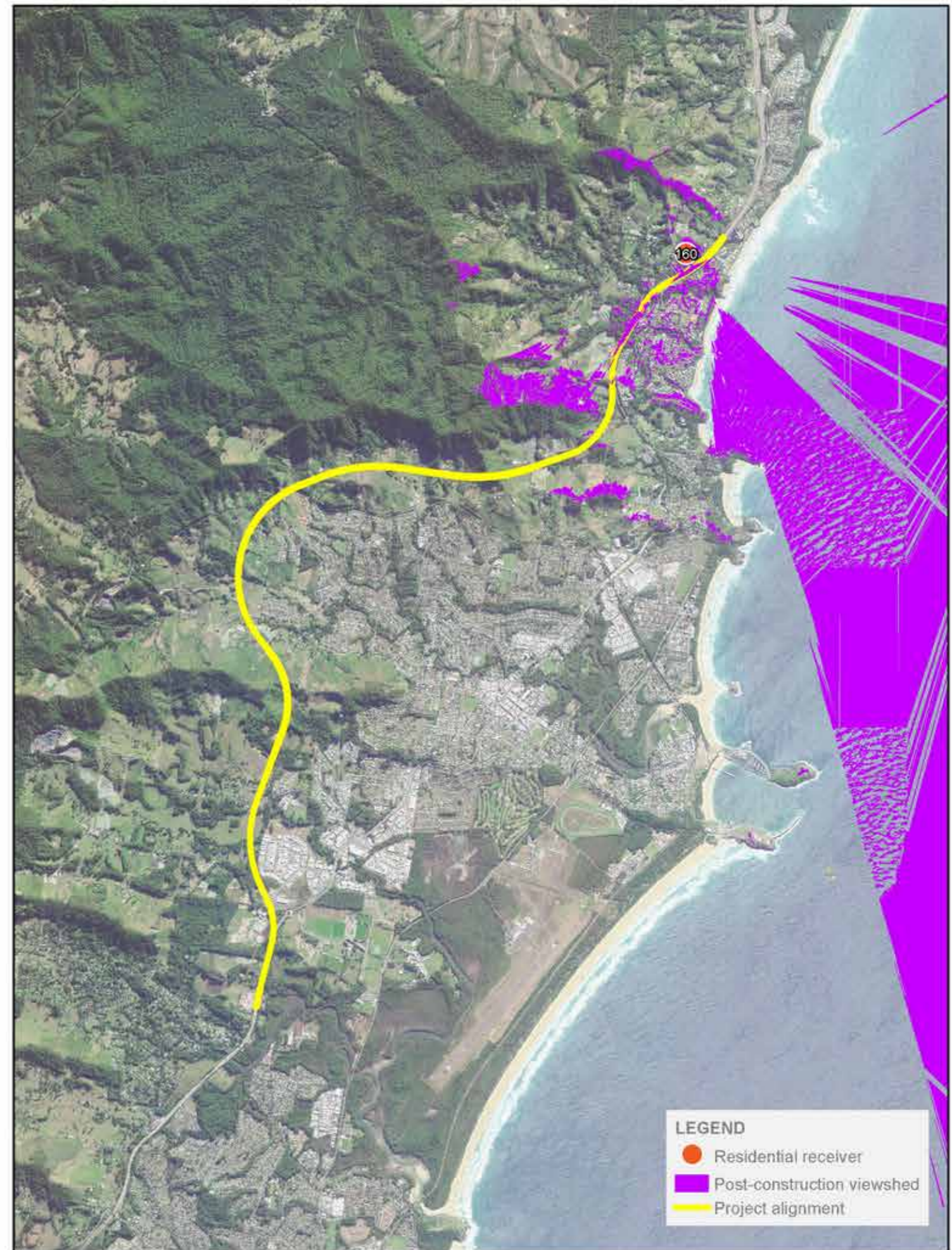


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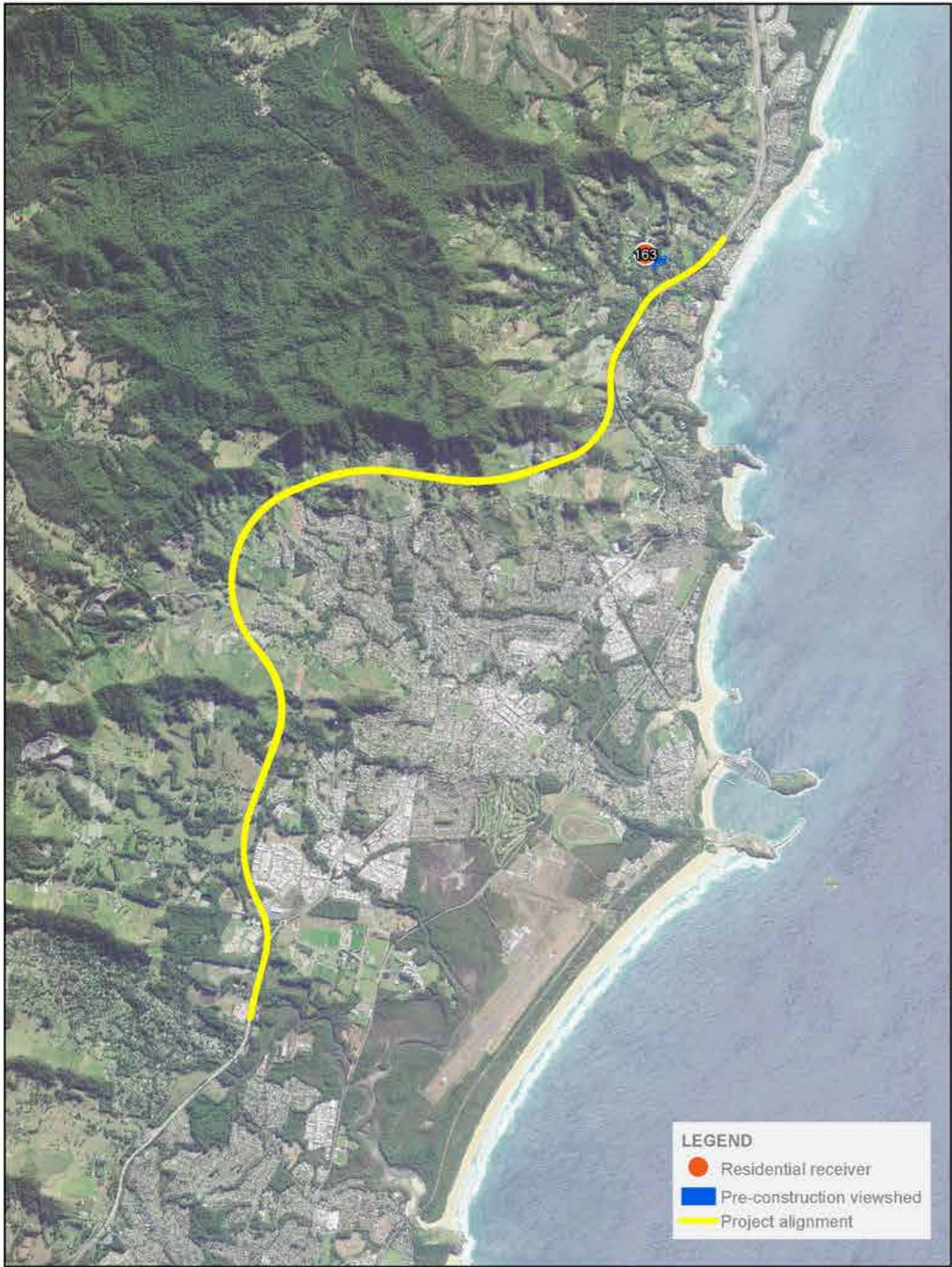


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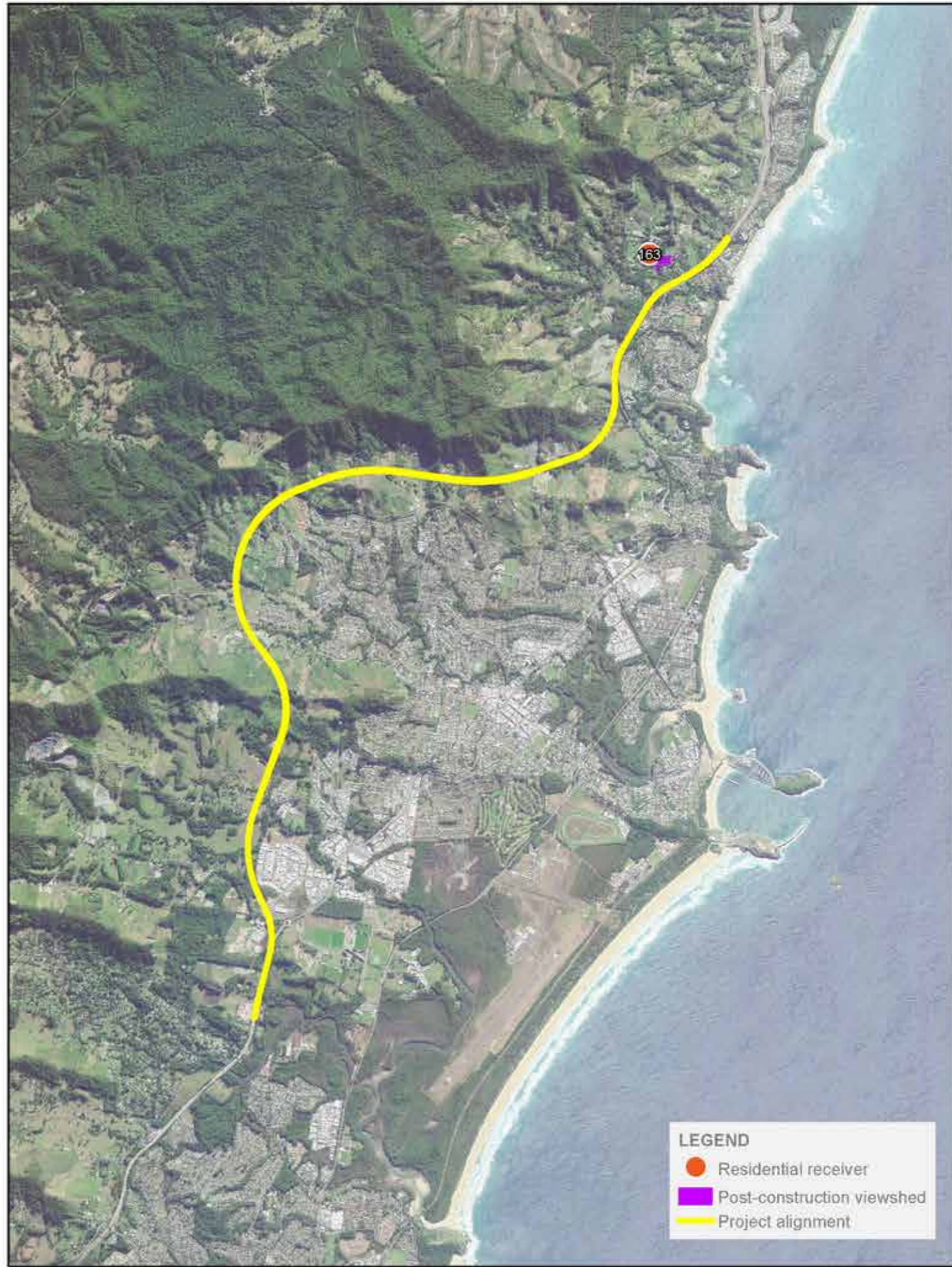


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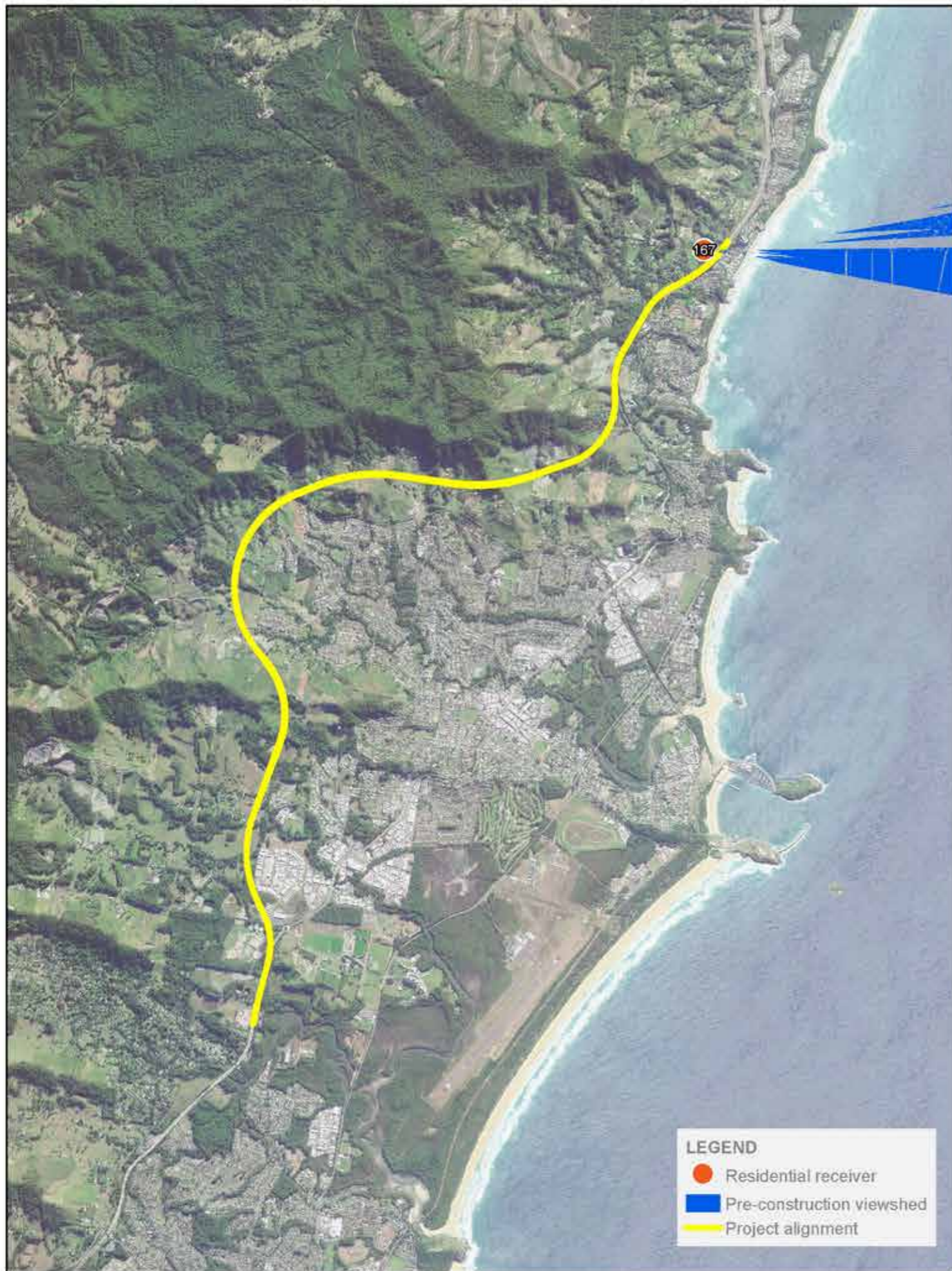




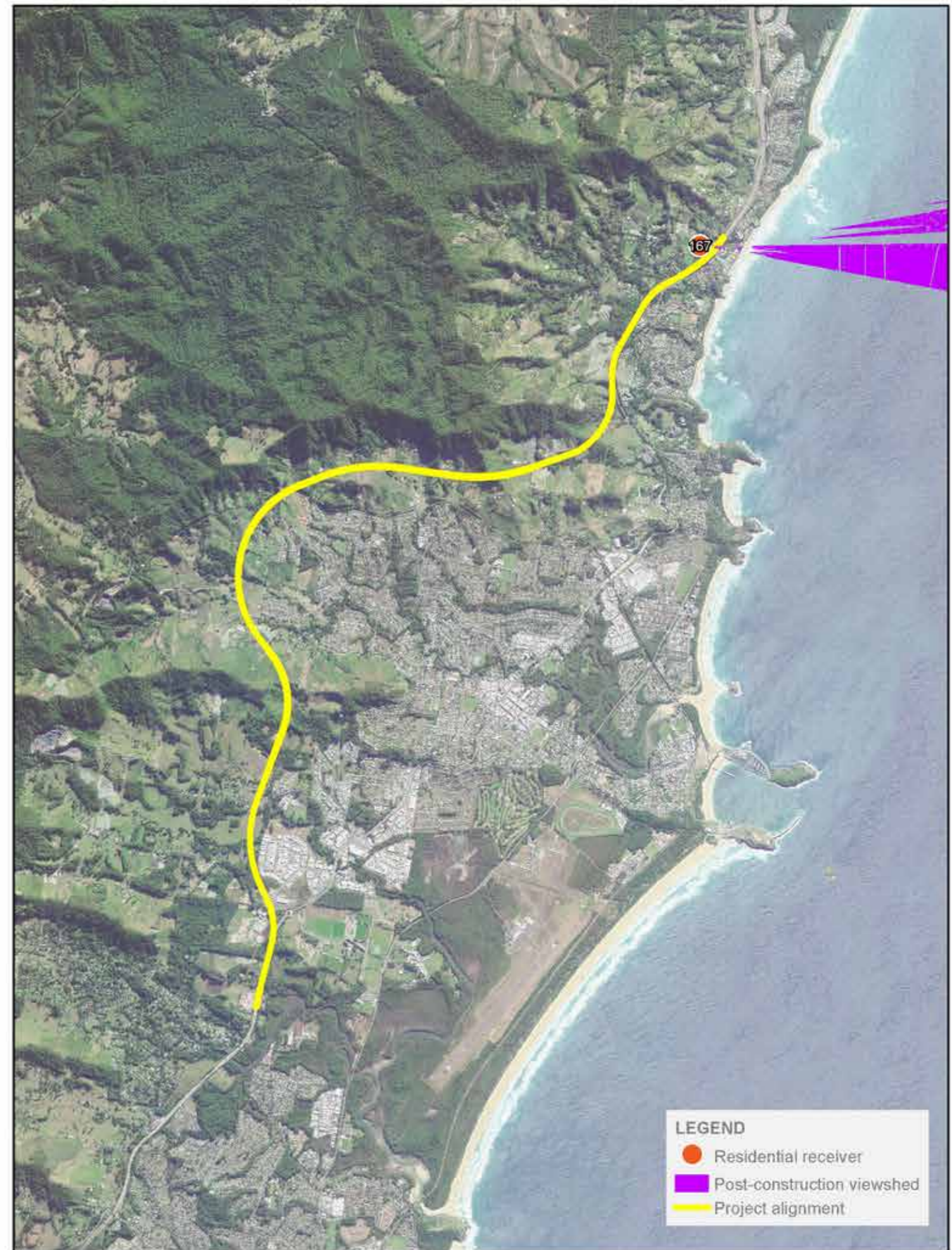
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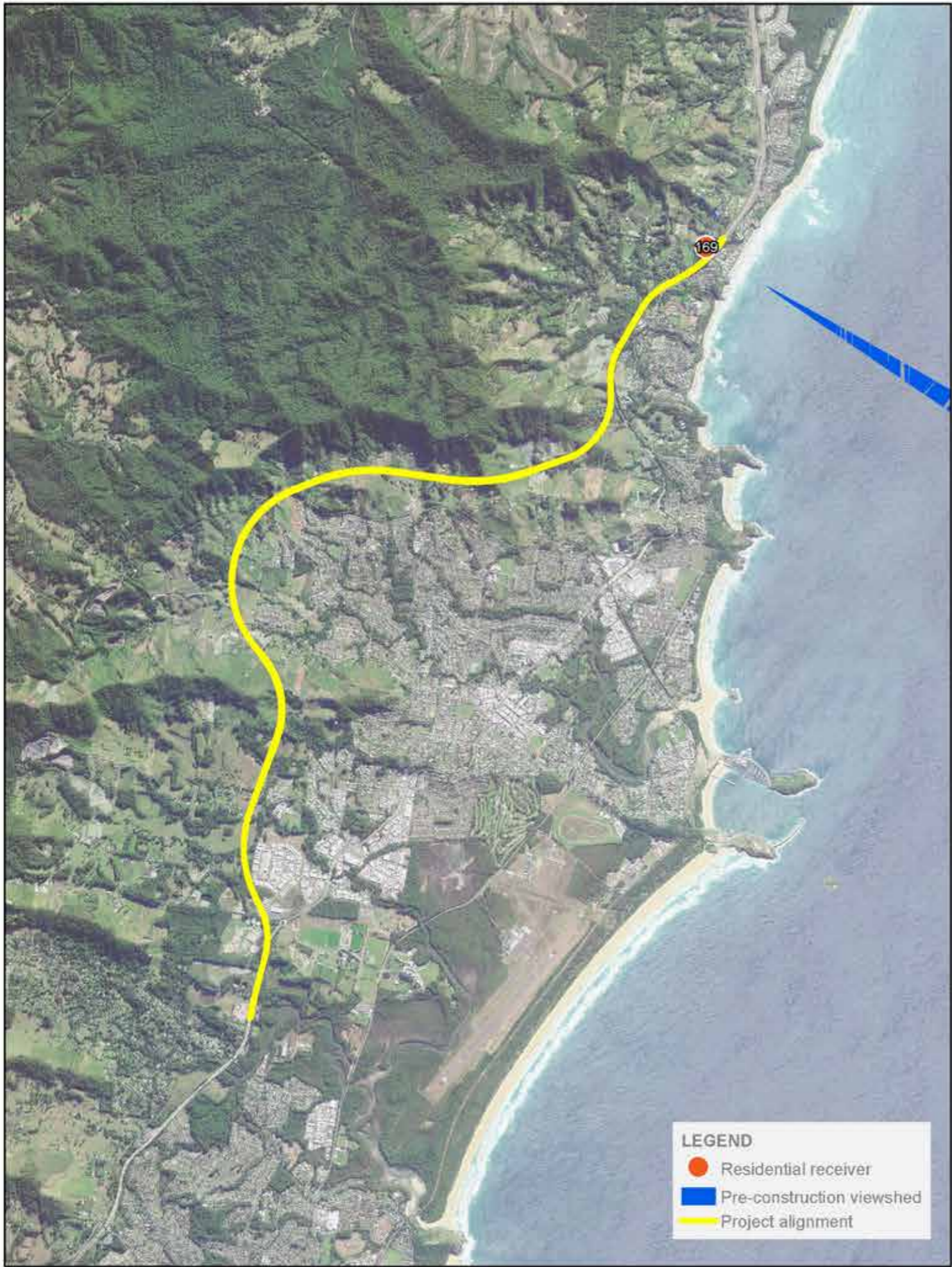
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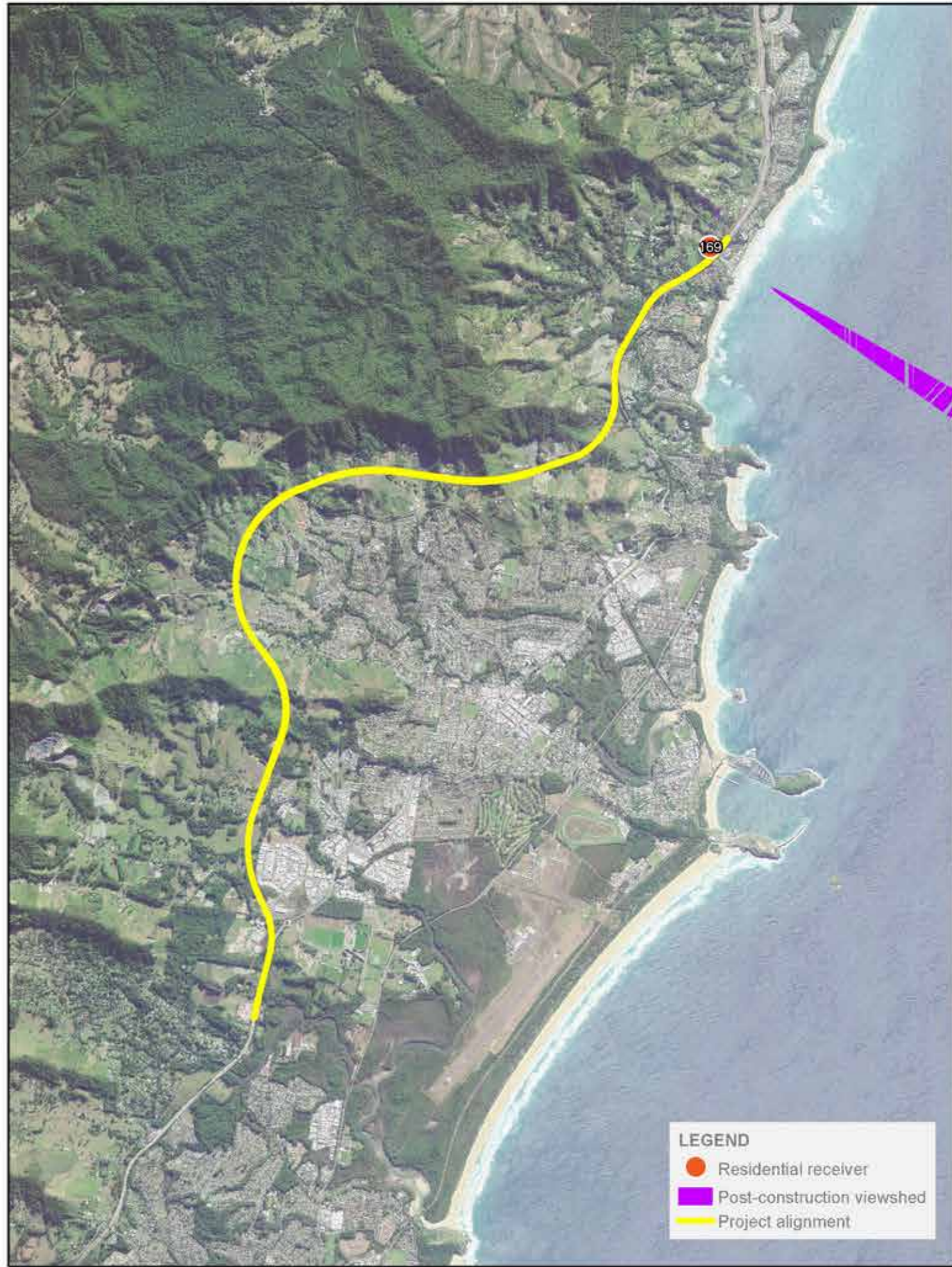
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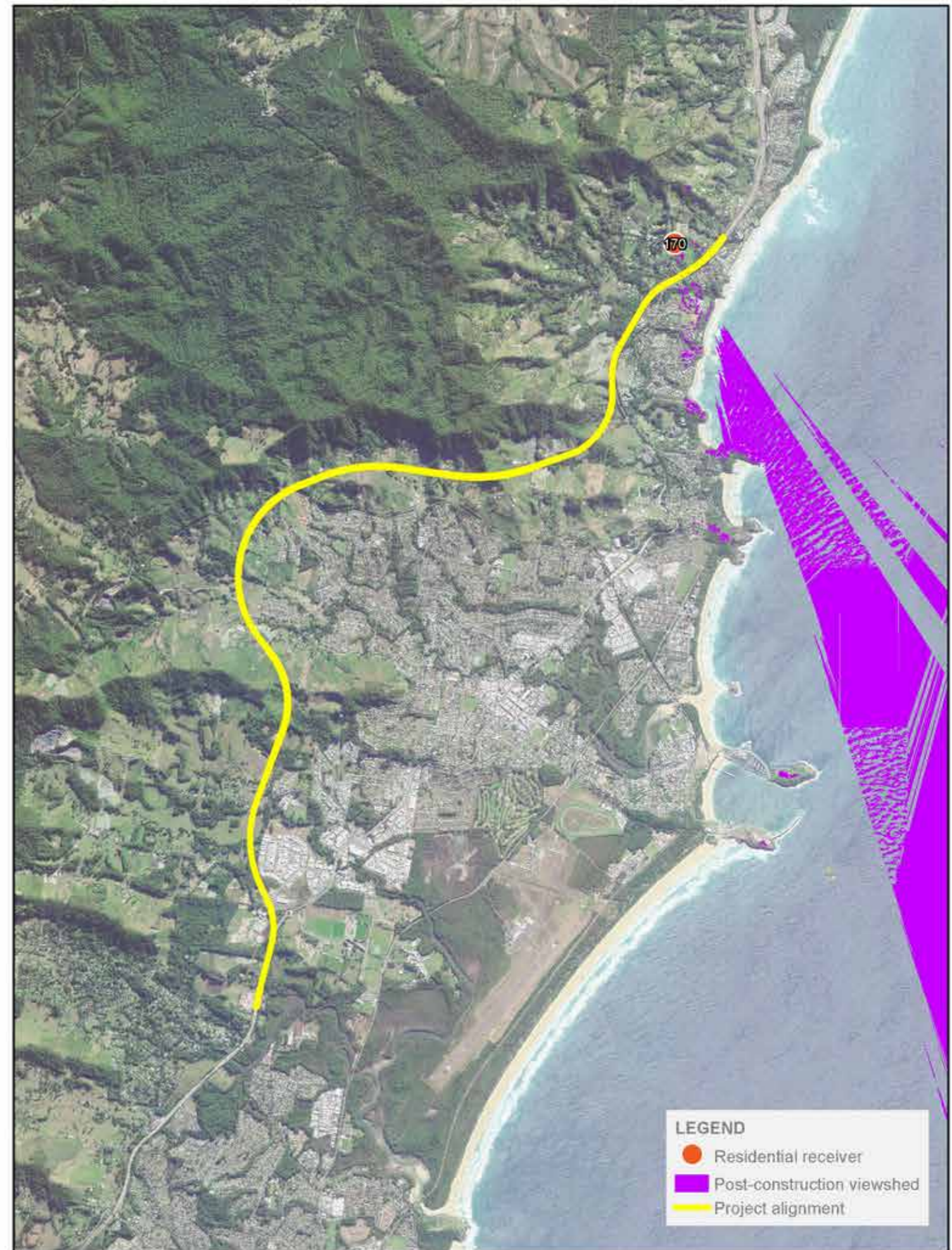


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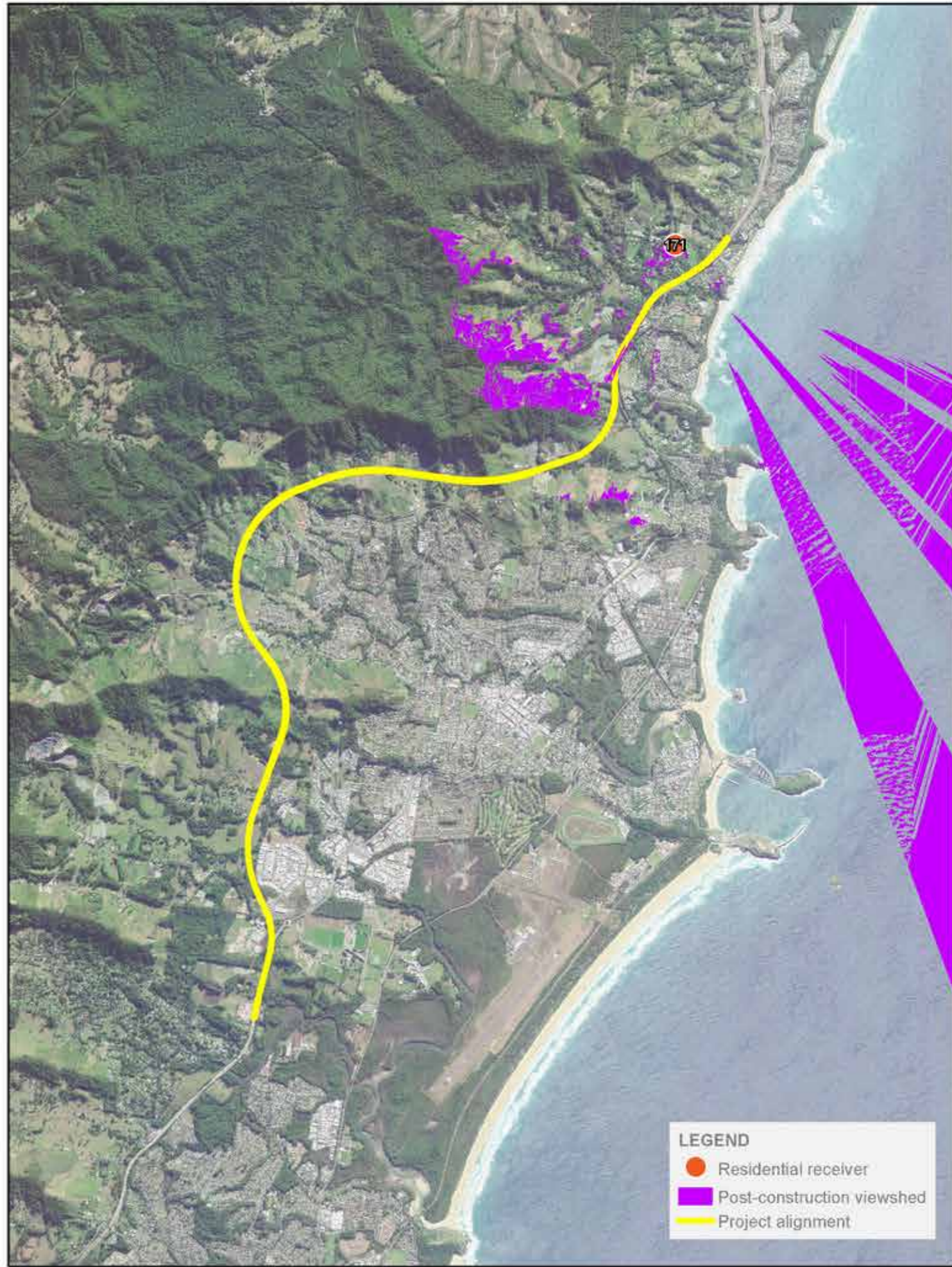
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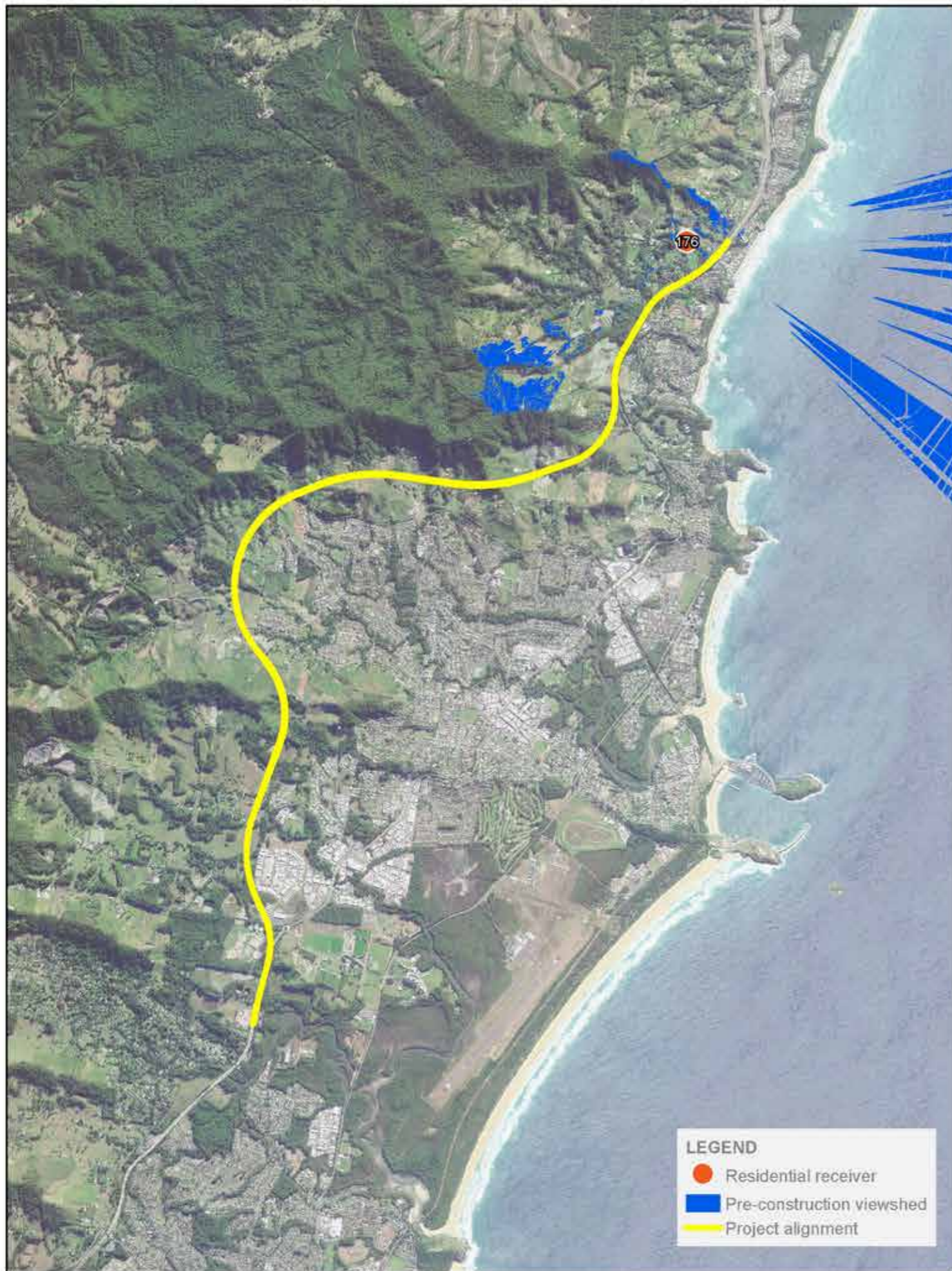
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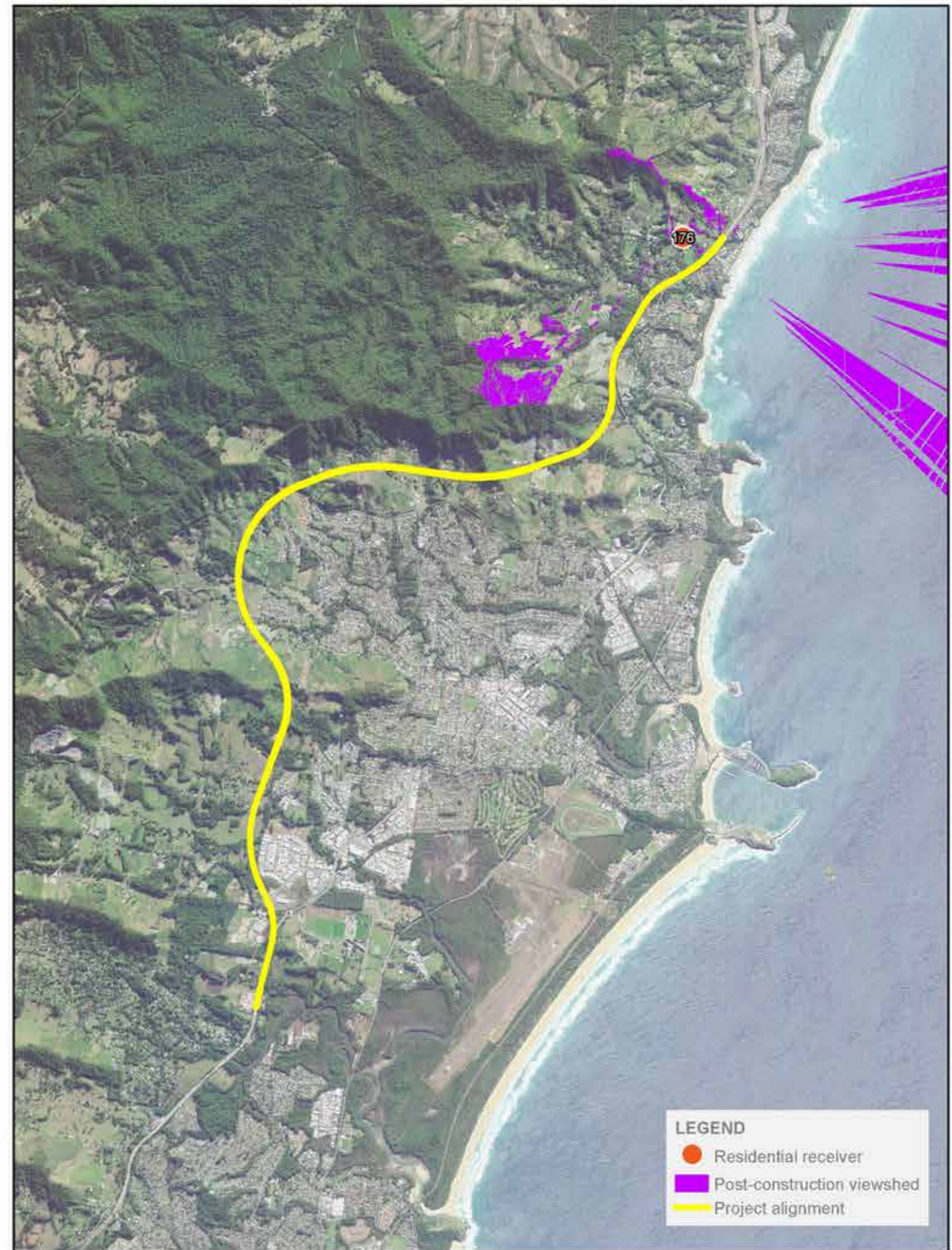
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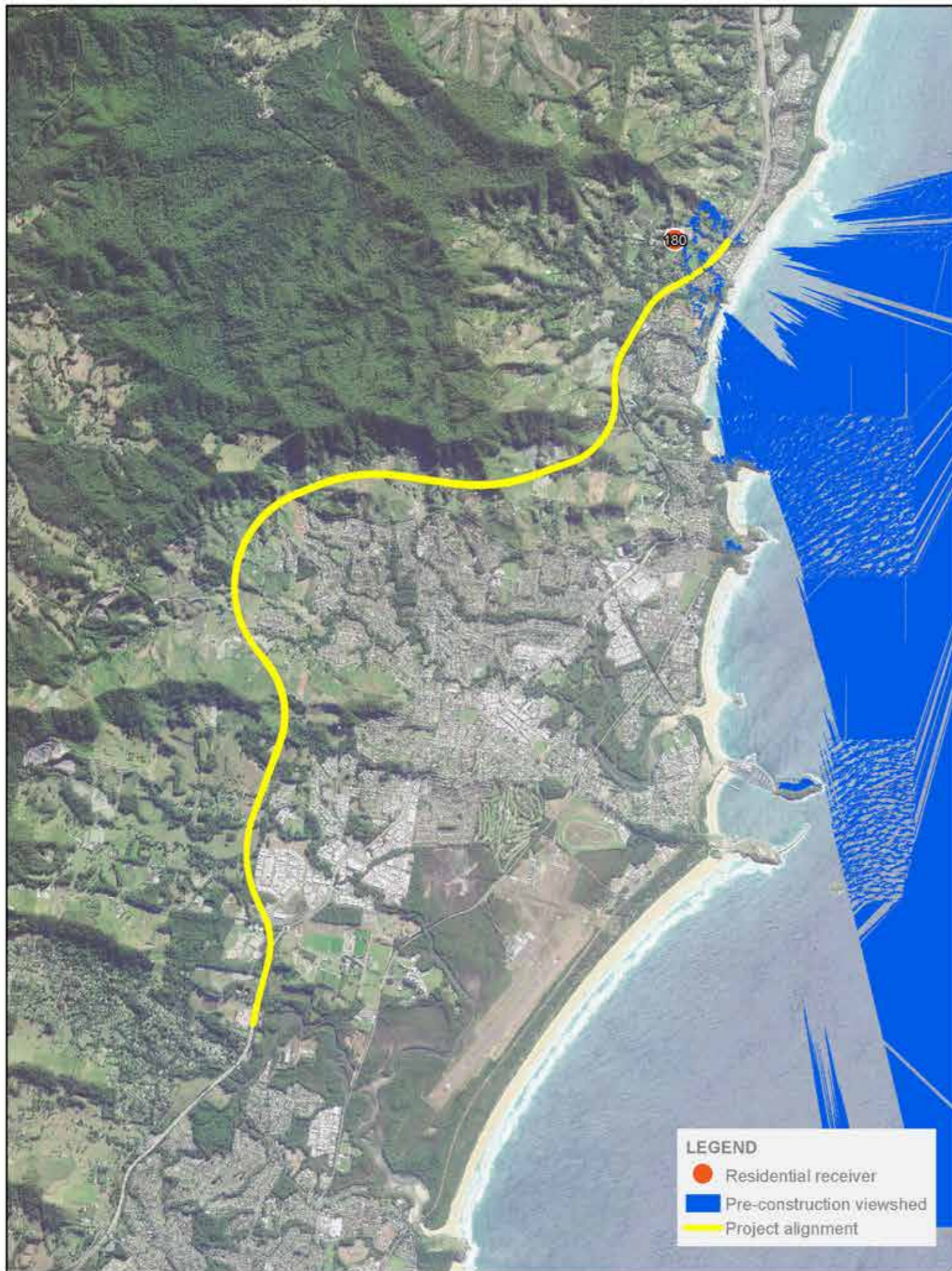


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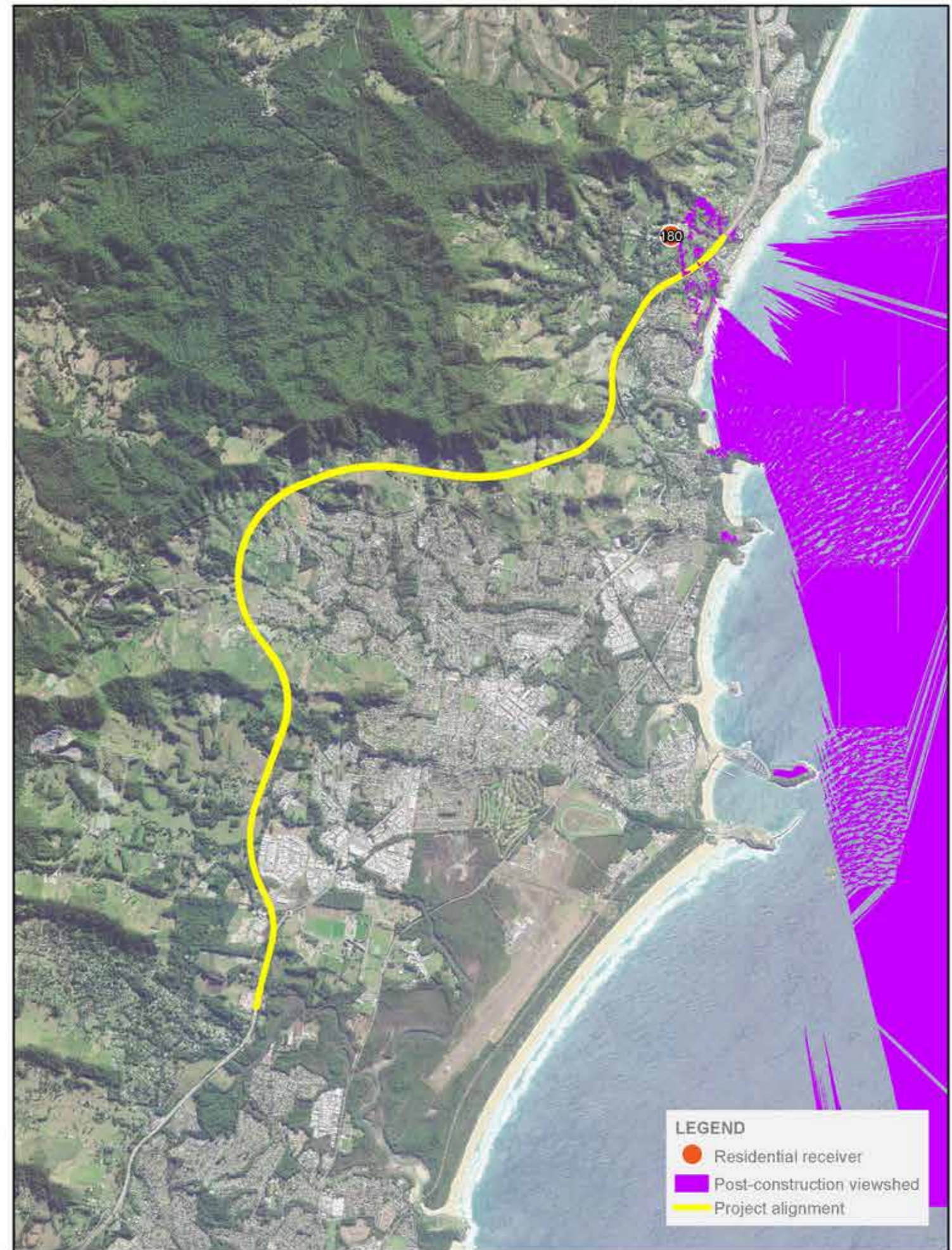


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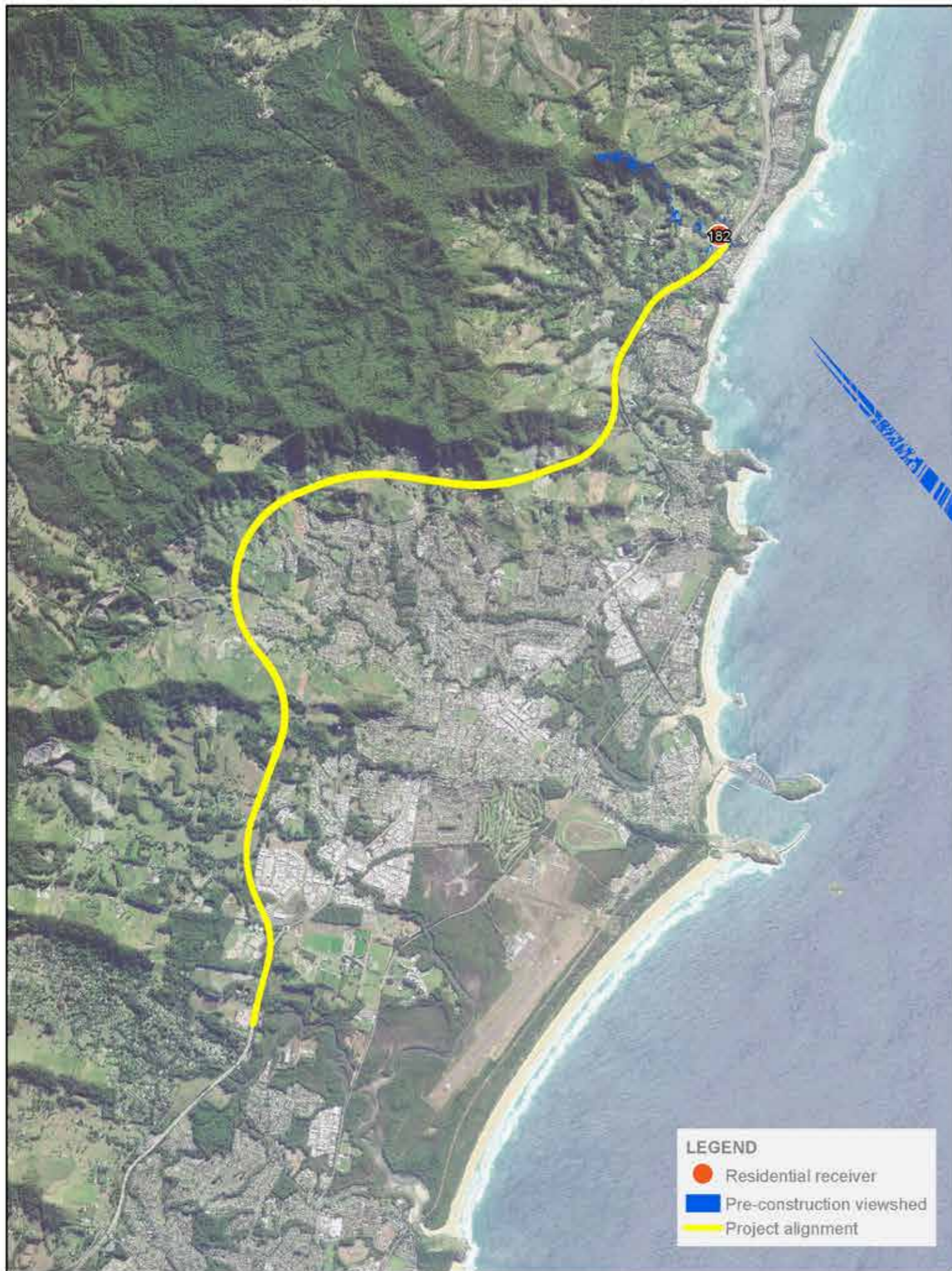




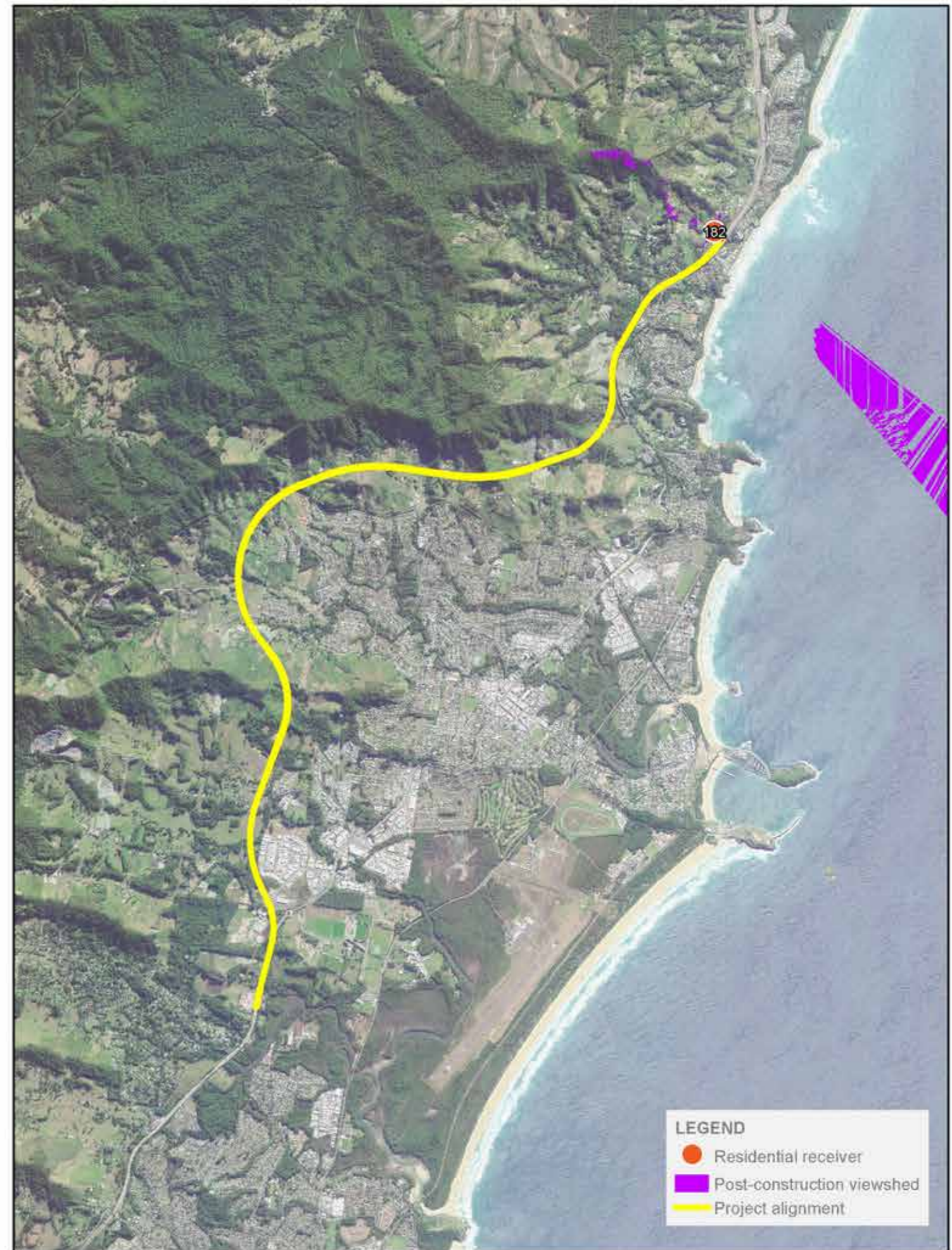
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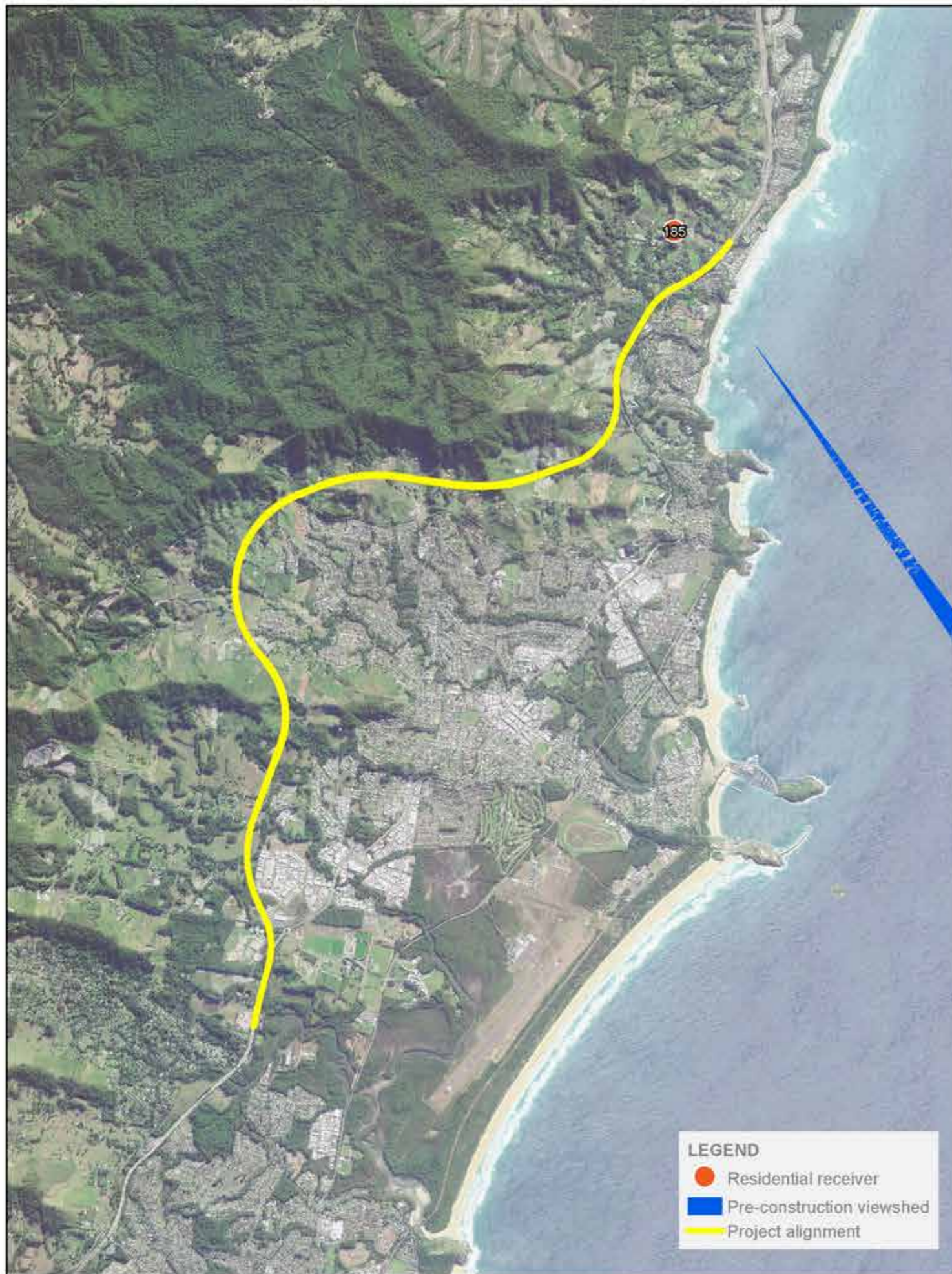
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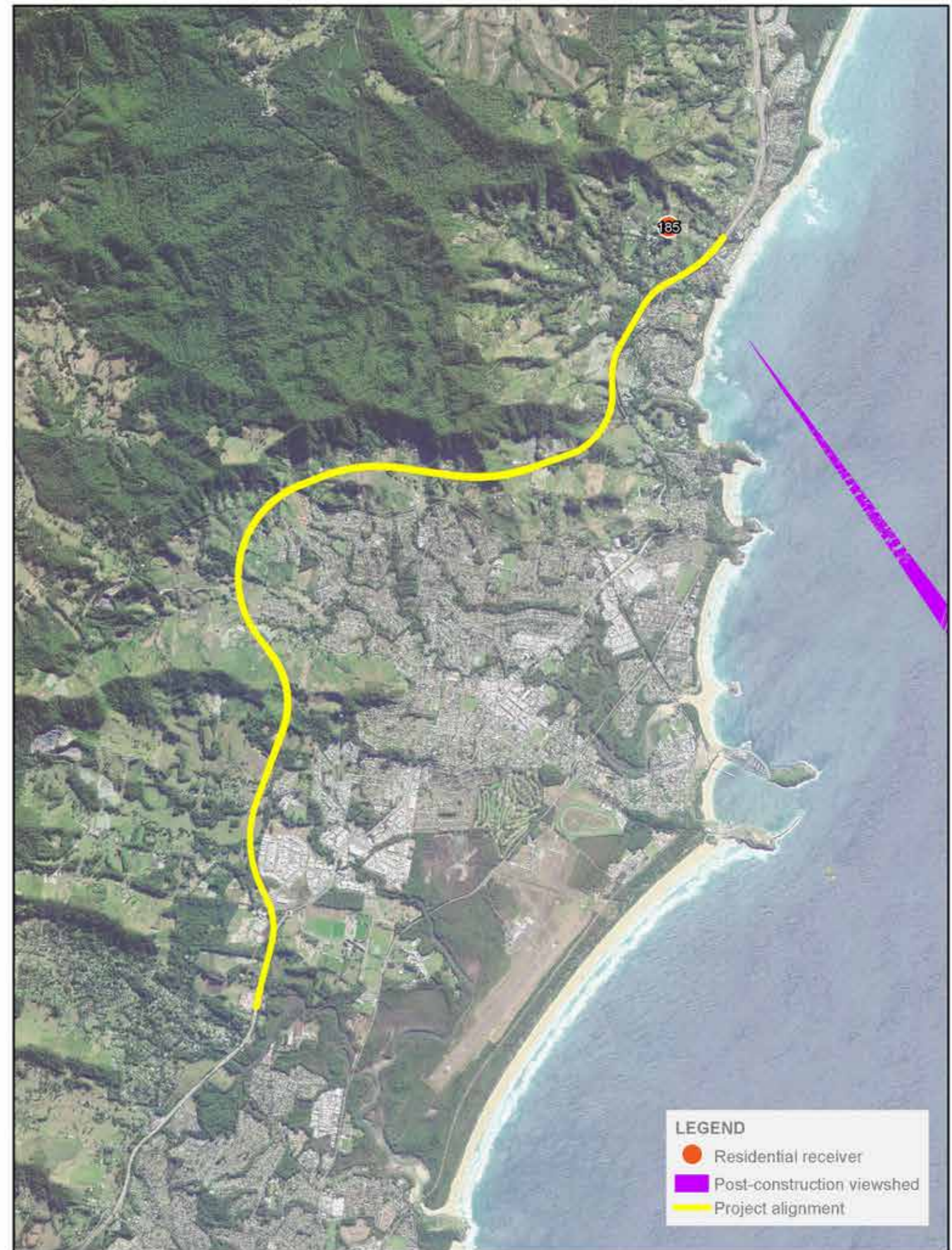
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Property ocean view analysis run on a post-construction elevation model



Property ocean view analysis run on a pre-construction elevation model



Property ocean view analysis run on a post-construction elevation model



Sub-appendix E

# Assessment criteria

Sub-appendix A

Sub-appendix B

Sub-appendix C

Sub-appendix D

Sub-appendix E

Chapter 9



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An aerial photograph of a landscape. In the foreground, a multi-lane highway with a concrete median and overpasses runs through a dense green forest. The middle ground shows a mix of green fields, some with white structures, and scattered trees. In the background, rolling hills and mountains are covered in thick green forest under a blue sky with light clouds.

# Appendix E

## Assessment criteria

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# Landscape Assessment approach

## Landscape sensitivity

A record of the inherent and intrinsic sensitivity of the landscape and the degree to which it can accommodate change.

- Value
  - The importance of the landscape to society
- Components
  - Contributing components, such as trees, woodlands, land use, heritage.
- Characteristics
  - Patterns, scenic quality, tranquillity etc
- Landscape Character Areas
  - Homogenous areas with defining characteristics
- Replacement or substitution
  - The degree to which inherent components or characteristics can be reserved
- Trends of change
  - An account of the natural or human activities that may alter the landscape

<b>High sensitivity</b>	<p>Landscapes which by nature of their character would be unable to accommodate change of the proposed type. Typically these would be:</p> <ul style="list-style-type: none"> <li>• Of high value of high value with distinct elements and features making a positive contribution to character and sense of place</li> <li>• Likely to be designated, but the aspects which underpin such value may also be present outside designated areas, especially at the local scale</li> <li>• Areas of special recognised value, through use, perception or historic and cultural associations.</li> <li>• Likely to contain features and elements that are rare and could not be replaced</li> </ul>
<b>Moderate sensitivity</b>	<p>Landscapes which by nature of their character would be able to partly accommodate change of the type proposed. Typically these would be;</p> <ul style="list-style-type: none"> <li>• Comprised of commonplace elements and features creating generally unremarkable character but with some sense of place.</li> <li>• Locally designated, or their value may be expressed through non-statutory local publications.</li> <li>• Containing some features of value through use, perception of historic and cultural associations.</li> <li>• Likely to contain some features and elements that could not be replaced.</li> </ul>
<b>Low sensitivity</b>	<p>Landscapes which by nature of their characteristics would be able to accommodate change of the type proposed. Typically these would be;</p> <ul style="list-style-type: none"> <li>• Comprised of some features and elements that are discordant, derelict or in decline, resulting in indistinct character with little or no sense of place.</li> <li>• Not designated.</li> <li>• Containing few, if any, features of value through use, perception or historic and cultural associations.</li> <li>• Likely to contain few, if any, features and elements that could not be replaced.</li> </ul>

## Magnitude of change

The scale, nature and duration of the change and the degree to which the effect can be mitigated

- The scale
  - Small, medium or large
- Nature
  - Negative (adverse) or positive (beneficial)
- Duration
  - Short, medium, long term permanent or temporary
- The mitigation
  - The degree to which mitigation would reduce the effect

<b>High adverse</b>	Total loss or large scale damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic conspicuous features or elements.
<b>Moderate adverse</b>	Partial loss or noticeable damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic noticeable features and elements.
<b>Low adverse</b>	Slight loss to a barely noticeable loss of damage to existing character or features and elements, and/or the addition of new but uncharacteristic features or elements.
<b>No change</b>	No noticeable loss, damage or alternation to character or features or elements.
<b>Low beneficial</b>	Barely noticeable or slight improvement of character by the restoration of existing features, and/or the removal of uncharacteristic features, or by the addition of new characteristic features.
<b>Moderate beneficial</b>	Partial or noticeable improvement of character by the restoration of existing features, and/or the removal of uncharacteristic features, or by the addition of new characteristic features.
<b>High beneficial</b>	Large scale improvement of character by the restoration of features, and/or the removal of uncharacteristic features, or by the addition of new distinctive features.



## Visual Assessment approach

### Visual sensitivity

A record of the visual receptors within the study area and an analysis of the visual sensitivity

- Define visual study area

The areas within which the view is expected to be of concern of importance

- Identify the representative viewpoints

Record important public and provide view points.

- The expectation and occupation or activity to inform level of sensitivity

The most sensitive receptors may include residential and public outdoor facilities. Industrial areas may have a low level of visual sensitivity

- The importance of the view

Views that may be designated to safeguard their value or locations that are valued by the communities

High sensitivity	<p>Examples may include:</p> <ul style="list-style-type: none"> <li>• Residential properties</li> <li>• Users of public footpaths or other recreational trails (e.g National Trails)</li> <li>• Users of recreational facilities where the purpose of that recreation is the enjoyment of the landscape (e.g. National Parks and designated scenic lookouts)</li> <li>• Users of designated tourist routes</li> </ul>
Moderate sensitivity	<p>Examples may include:</p> <ul style="list-style-type: none"> <li>• Outdoor works</li> <li>• Users of scenic roads, railway corridors or waterways</li> <li>• Schools and other institutional buildings, and their outdoor areas</li> </ul>
Low sensitivity	<p>Examples may include:</p> <ul style="list-style-type: none"> <li>• Indoor workers</li> <li>• Users of main roads or arterial roads</li> <li>• Users of recreational facilities where the purpose of that recreation is not related to the views</li> </ul>

### Magnitude of change

The scale, nature and duration of the change and the degree to which the effect can be mitigated

- Scale

With respect to the loss of addition of features in the view and changes in its composition

- Degree of contrast or integration

Form, scale and mass, line, height, colour, texture

- Nature of view in relation to the proposal

Angle, distance and extent

Mitigation

The degree to which mitigation would reduce the effect

High	The project, or part of it, would become the dominant feature or focal point of the view.
Moderate	The project, or part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor.
Low	The project, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view
Negligible	The project is not visible, or a very small part of the project would be discernible, or it is at such a distance that it would form a barely noticeable feature or element of the view.

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