



# Landscape and Visual Assessment

This chapter provides a review of the existing visual features of the Project area, the visual elements that would be introduced into the landscape, an analysis of the extent of the visibility of these components and an assessment of their visual impact on sensitive receptors and relevant stakeholders. The assessment has drawn on available mapping, photography, three dimensional modelling of the Project and surrounding area, and computer graphics to represent the visual elements.

## 15.1 Key features of the existing environment

The landscape character of the Dungog to Barrington Tops locality varies from extensive cleared agricultural land to the forested land on more elevated and steeper country. The locality ranges in elevation from 10 metres AHD at Seaham Weir to over 1,500 metres AHD at Barrington Tops. The natural vegetation cover for the locality would have once been predominantly woodland and temperate rainforest of various densities. However, many of the woodland and forest areas have been cleared since European settlement commenced in the early 1800s. The changes have provided a degree of contrast between the cleared agricultural land and remnant woodland vegetation. Barrington Tops National Park, which is approximately 10 kilometres to the north of the proposed Tillegra Dam site, has been listed as a World Heritage Area.

The Bandon Grove to Salisbury locality, where the dam and storage would be located comprises the Williams and Chichester River valleys and surrounding hills and ridges. These areas have been extensively cleared and retain only small areas of remnant woodland and scattered trees. An exception is Tillegra Nature Reserve, a small parcel of heavily forested area located near Tillegra Bridge.

Settlement within the Project area is typical of a rural environment, mainly comprising scattered residences, but also with the small settlement of Salisbury. The site of the dam wall and the inundation area comprise pastoral scenes with moderate-to-large sized properties scattered throughout the area. Views in the area consist primarily of grass-covered paddocks,

scattered trees, occasional rural residences, farm buildings, churches, a cemetery, fencing, roads, access tracks, bridges, overhead power lines and the CTGM pipeline.

These various features are seen by local residents, visitors to residences and short-term accommodation, and tourists travelling through the area or visiting Chichester Dam and/or Barrington Tops National Park. Views of the elevated, more distant features such as Barrington Tops, Mount Butterwicki and Mount Toonumbe are significant visual elements in the local landscape.

Representative viewpoints of the Project area which exhibit a range of elements present in the rural surrounds are shown in a series of photomontages in Figure 15.1. The locations of the representative viewpoints shown in this figure were selected for their maximum visual exposure to the proposed dam wall and storage. Locations where views of the dam would be constrained by topography or trees were not selected for inclusion in the photomontages.

### 15.1.1 Natural elements of the existing landscape

The Project area consists of undulating spur and valley formations, with the Williams and Chichester Rivers cutting through the landscape. The rivers are subdued visual features compared to the steep slopes and ridges that form the catchment divides.

The predominant landform elements through the Project area include:

- the Williams River and its connecting tributaries and drainage channels
- the low lying floodplains and gently sloping valley floor
- surrounding steeper and elevated slopes and ridgelines (eg Mount Butterwicki and Mount Toonumbe).

Within the Project area, the Williams River passes through mostly residential properties meaning that the river is not highly visible from public areas, except for areas where Salisbury Road passes near or over the river such as at Tillegra Bridge. The Williams River is bordered by riparian vegetation which provides partial or full screening of the river from public areas. There are a number of tributaries that lead into the Williams River of where the lower reaches would be located within the inundation area. These include Moolee Creek, Sheep Station Creek, Quart Pot Creek, Black Camp Creek, Taylors Creek and Native Dog Creek.

### 15.1.2 Land use and vegetation

Land use within the immediate Project area is predominantly rural, with cleared pastures and grassed steep hill slopes used predominantly for dairy production. There are also heavily forested areas to the north and the northeast of the Project area which connect with the State forests of the lower Barrington Tops and Barrington Tops National Park. Native vegetation within the Project area is limited to a few remnant patches (including Tillegra Reserve), scattered trees and riparian vegetation along the Williams River and various tributaries.

Cultural features of the landscape include scattered rural residences and sheds, fencing, local power lines, bridges and a number of roads which include:

- Salisbury Road
- Chichester Dam Road
- Upper Chichester Road



**FIGURE 15.1** PANORAMAS OF LOCAL VIEWS

- Myall Creek Road (unsealed)
- Quart Pot Creek Road.

These are predominantly local roads (with the exception of Salisbury Road which connects Dungog to the west and Upper Chichester Road which leads to Chichester). Traffic on these roads typically comprises local residents, occasional workers and tourists. These roads would provide a variety of views of elements of the Project.

Concentrated settlement in or around the vicinity of the Project area includes Salisbury in the upper Williams River valley. Dungog is more distant and situated beyond the visual catchment of the Tillegga Dam project. Places closer to the Project area that act as community assembly areas include churches at Bandon Grove and Underbank, as well as the Tillegga cricket ground. These locations would have varying degrees of exposure to elements of the Project.

## 15.2 Visual assessment methodology

The Tillegra Dam project would introduce a range of new features into the existing landscape. The methodology developed to assess the visual impacts associated with the Project comprised:

- description of existing landscape elements including landform and land use features
- classification of the existing visual features of the area
- description of the visual impacts of the Project components (including the storage, dam wall, realignment of Salisbury road and other ancillary works)
- undertaking a visibility assessment for each sensitive receptor
- generation of simulated views from a 3D model to indicate likely viewpoints from sensitive receptors
- identification of other opportunities (such as recreational) that could result from the Project and which could have a potential visual impact
- identification of appropriate measures to minimise negative visual impacts that may result from the Project or which would take advantage of interesting visual elements.

## 15.3 Key visual features of the Tillegra Dam project

The water impounded behind the dam would fill the valley which is constrained mostly by the Chichester ranges, Mount Butterwicki and other hilly terrain. At FSL the storage would have a total surface area of 2,100 hectares. The shoreline of the storage would have a number of 'inlets' reflecting the pre-inundation topography. It would also visually reduce the height of the surrounding hills when viewed from the water at the higher storage levels.

Infrastructure associated with the construction of the dam would become new visual elements within the landscape. Aspects of relevance to the visual assessment are described briefly as follows, noting that these would be subject to final design.

### 15.3.1 Dam wall and spillway

The dam wall and spillway would be located where Salisbury Road currently crosses the Williams River at Tillegra Bridge. Their construction would result in the removal of vegetation at the Tillegra Nature Reserve. The height and width of the dam wall (approximately 76 metres by 800 metres) and spillway (600 metres long with a 40 metre wide crest contracting to a 20 metre wide chute) would create a new large feature within the existing rural environment. A multi-level offtake tower to draw water from the storage would be located in the storage near the dam wall.

The spillway and the downstream face of the dam wall would both be large structures. Their bulk would contrast with the surrounding landscapes and they would be prominent features for viewpoints in the eastern view field.

It is anticipated that the dam wall and spillway would result in the greatest visual impact of the Project components due to their scale and co-location in the landscape. In view of this, separate visibility assessments have been undertaken for residences to the east of the dam wall and spillway (refer Section 15.7).

### 15.3.2 Outlet works and mini hydroelectric power plant

The mini hydroelectric power (HEP) plant would be associated with the outlet works which would be located between the dam wall and the spillway. Relative to these two structures, the outlet works

would have a low profile, and would appear to be an integral component of the dam and spillway rather than a separate feature in the landscape. As such, the visual impact of these components would only have a minor visual impact on the immediate surrounds.

### 15.3.3 Connection to the Chichester Trunk Gravity Main

The design provides for a pipeline connecting the dam to the CTGM to provide an alternative water supply for Dungog WTP in the event of water quality problems at Chichester Dam. The pipeline would be buried within the road reserve, the only visible part being where it would connect to the CTGM. This connection would introduce a new feature into the landscape but its immediate proximity to the larger bulk of the CTGM would reduce its visual impact. Construction of the pipeline would include rehabilitation of the disturbed area. The appearance of this would lessen over time as vegetation is re-established.

### 15.3.4 HWC Office and storage buildings

An office and storage building would be constructed near the dam wall (refer Figure 3.3 of Working Paper N *Draft Integrated Land Use Plan*). These would be designed to integrate with other structures within the vicinity. Screening of these facilities with mounds and/or vegetation may be possible and would be considered as part of the relevant management plans.

### 15.3.5 Caretaker cottages

Operation of the dam would require a small on-site presence. Caretakers' cottages would need to be constructed to provide both permanent and temporary accommodation as required.

The new buildings would complement other nearby buildings and would be located on higher ground near other existing cottages (refer Figure 3.3 of Working Paper N). These may be visible from the surrounding hill slopes. However, being small in scale (particularly relative to the dam and spillway), it is not anticipated that they would have a large visual impact.

### 15.3.6 Relocation of RFS station

The Bendolba RFS station is located within the proposed inundation area. The current building is essentially a large green steel shed. A new location has been identified for the station, this being adjacent to where the northern end of the new section of Salisbury Road connects to the existing Salisbury Road. This location was selected in consultation with the RFS and is considered suitable in terms of providing good access and minimising the risk of vandalism when the station is not manned. The new building would be similar in design to the existing structure with planting undertaken to complement the existing rural nature of the surrounds.

### 15.3.7 Conservation of Munni House

The relocation of Munni House (and its outbuildings) is being considered due to its significant heritage value. The preferred option is to move it to a location near the dam wall for use as an interpretive centre. Further details are provided in Working Paper N *Draft Integrated Land Use Plan*.

### 15.3.8 Provision of alternative access

Salisbury Road acts as a regional route providing access from Dungog to residences and settlements further west, such as Salisbury. The current route takes it directly through the dam site itself and the inundation area. Its realignment is necessary to maintain suitable access to the upper Williams River valley.



The route of the realigned section of Salisbury Road is shown in Figure 6.5. Moving south to north, the road would leave the existing Salisbury Road approximately 1,500 metres to the east of the dam site, cross the Williams River via a new bridge, and then run for approximately 2,500 metres up the eastern side of the ridge that would form part of the eastern margin of the storage. Once up on the ridge, the road would broadly follow the eastern shoreline of the storage in a northwest direction, eventually turning west and crossing Moolee Creek and the Williams River respectively, also on new bridges, before connecting back to the existing Salisbury Road.

The new section of Salisbury Road would be approximately 17 kilometres in length, comprising one lane in each direction, with 3.5 metre wide lanes and 1.5 metre shoulders/verges. The bridges would be generally similar in appearance to other recently constructed bridges in Dungog shire.

The new section of Salisbury Road would be visible to residences in certain locations, most notably where it would diverge from the existing Salisbury Road at the southern end of the new alignment and traverse up the eastern ridgeline of the storage. This section would include a number of areas of cut and fill in order to optimise the gradient which would break up its appearance in the landscape. Construction of the road would include landscaping which over time would also soften the prominence of the road in the landscape.

Access to the Quart Pot Creek area would also be affected. Currently, access to properties is via Quart Pot Creek Road which runs off the section of Salisbury Road in the inundation area. Consequently, alternative access is required and a preferred route has been identified (refer Figure 6.5). This would be a local road similar in scale and appearance to other local roads in the Shire. Use is expected to be generally limited to local residents given that it is not a through route.

### 15.3.9 Carbon offset initiatives

The Project includes a number of initiatives to offset the carbon emissions associated with its construction and operation. One initiative is the establishment of a habitat corridor, principally along the eastern margin of the storage, connecting the Williams River to the Chichester Dam catchment area and beyond to Barrington Tops National Park. The corridor would also extend around the southern part of the storage to the Mount Butterwicki area. The corridor would be established by a combination of natural regeneration and supplementary planting.

## 15.4 Potential visual impacts of construction phase

Visual impacts associated with construction of the Project would, for the most part, generally be temporary (but noting that the construction period is approximately four years in length) and limited to the duration of construction activities. These types of impacts could include:

- the presence of construction sites and compounds
- the presence of construction plant and machinery
- exposure of extensive areas of bare ground at and in proximity to the dam construction site
- other features associated with construction activities, eg temporary spoil and materials stockpiles.

Impacts would be greatest for permanent receptors in close proximity to construction areas such as nearby residences. Impacts would generally be lesser for receivers transiting the area (such as visitors in vehicles).

Some impacts could extend into the operational phase of the dam, for example areas where vegetation is required to be removed for construction and where re-establishment of vegetation is largely a factor of time. These types of impacts are considered in the following section.

## 15.5 Potential visual impacts of operational phase

The dam is anticipated to have a life span of approximately 100 years and quite likely could be longer than this. By way of example, the nearby Chichester Dam was constructed between 1917 and 1926 and is still operational some 80 years later. It will effectively be a permanent feature in the landscape and represent a significant change to the existing visual amenity. The Project features that would primarily contribute to this are:

- the dam wall, spillway and other associated built structures
- the storage (approximate surface area of 2,100 hectares), noting that this would vary over time with fluctuations in water level
- the new section of Salisbury Road (and to a lesser extent, the new access to the Quart Pot Creek area), including the three new waterway crossings.

Other Project features that would contribute to changed visual amenity include:

- changes in the type and distribution of vegetation in and around the storage area, this being associated with clearing and reestablishment through natural regrowth and supplementary planting
- the establishment of recreational areas and associated facilities.

There may be other consequential, longer term changes that could occur indirectly as a consequence of the Project, such as changes in land use or settlement patterns.

## 15.6 Visibility from areas surrounding the dam

The viewshed of the Tillegra Dam project is defined as the area of surrounding land from which the dam wall and storage may be partially or wholly visible. Residences within approximately five kilometres of the storage are shown in Figure 15.2. As a general comment, those residences to the east and south of the storage would not have views of the storage due to the intervening topography. Residences to the east of the dam wall within a distance of approximately three kilometres would have views of the dam wall and spillway with the level of visibility at individual residences dependent on intervening topography and vegetation.

For the purposes of the assessment this area has been divided into four visual catchments which are illustrated in Figure 15.3. The characteristics of each together with a summary of the potential visibility of different Project components are outlined as follows. It is noted that the natural topography would provide some screening of the dam from residences situated further afield.

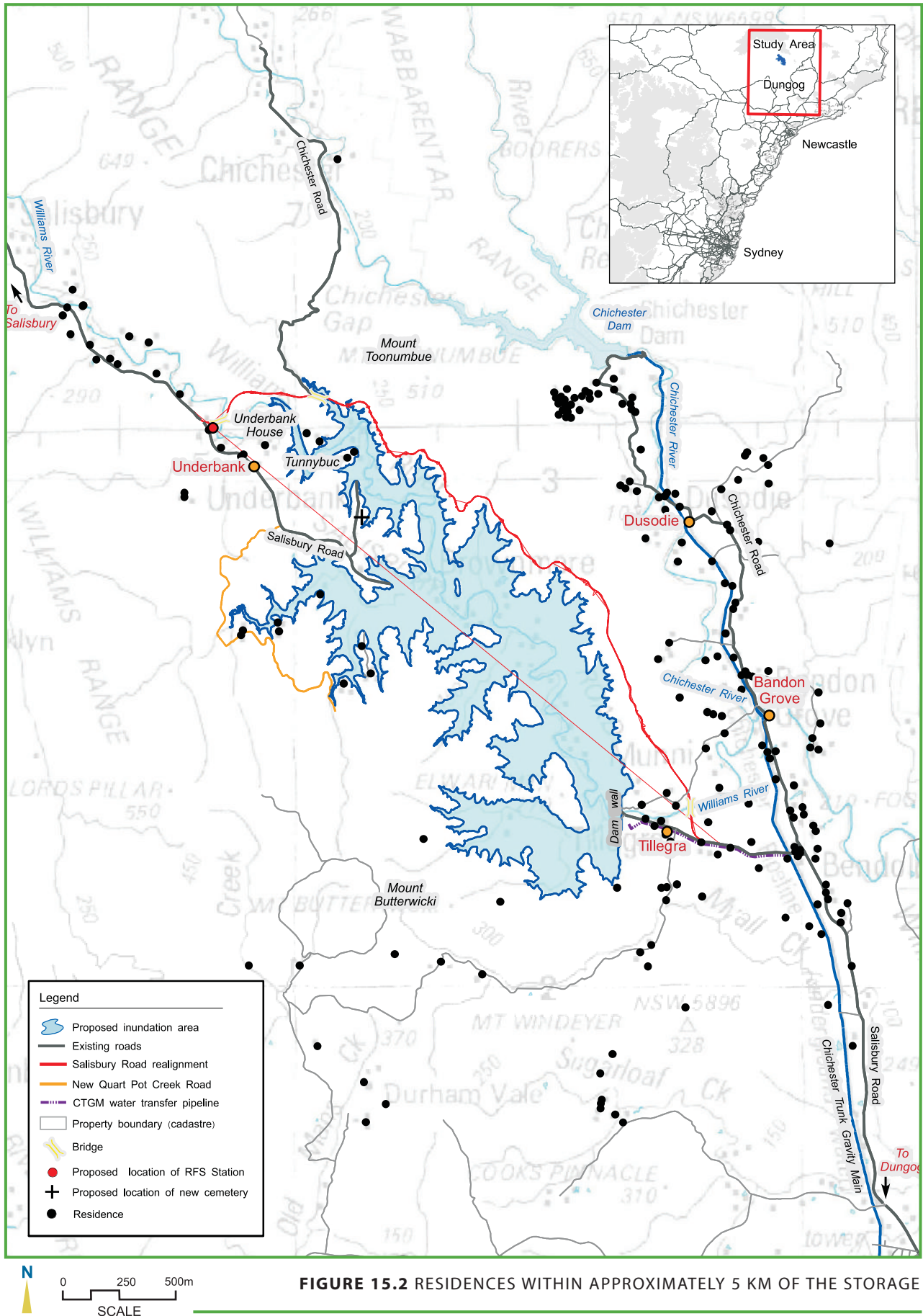
### **Southern side of storage**

To the south of the proposed dam wall and storage is Mount Butterwick. Slopes range from 10° to greater than 40° and this has no doubt contributed to discouraging development on the flanking slopes, the northern sides of which (facing the storage) are heavily vegetated. Access to the area is limited.

The area to the southwest has slopes predominantly ranging from 10° to 30°. Closer to the storage, the land is flatter generally comprising rural properties. Glimpses of the storage would be available from some privately owned rural properties in this area. Only local/property access roads occur in this area so there would be limited visual impact on road traffic.

### **Western side of storage**

Most properties in this area would have views of the storage, though some could be interrupted by a number of ridges running northwest to southeast. At specific locations, the relocated Quart Pot/Munni Cemetery and RFS station would be visible.





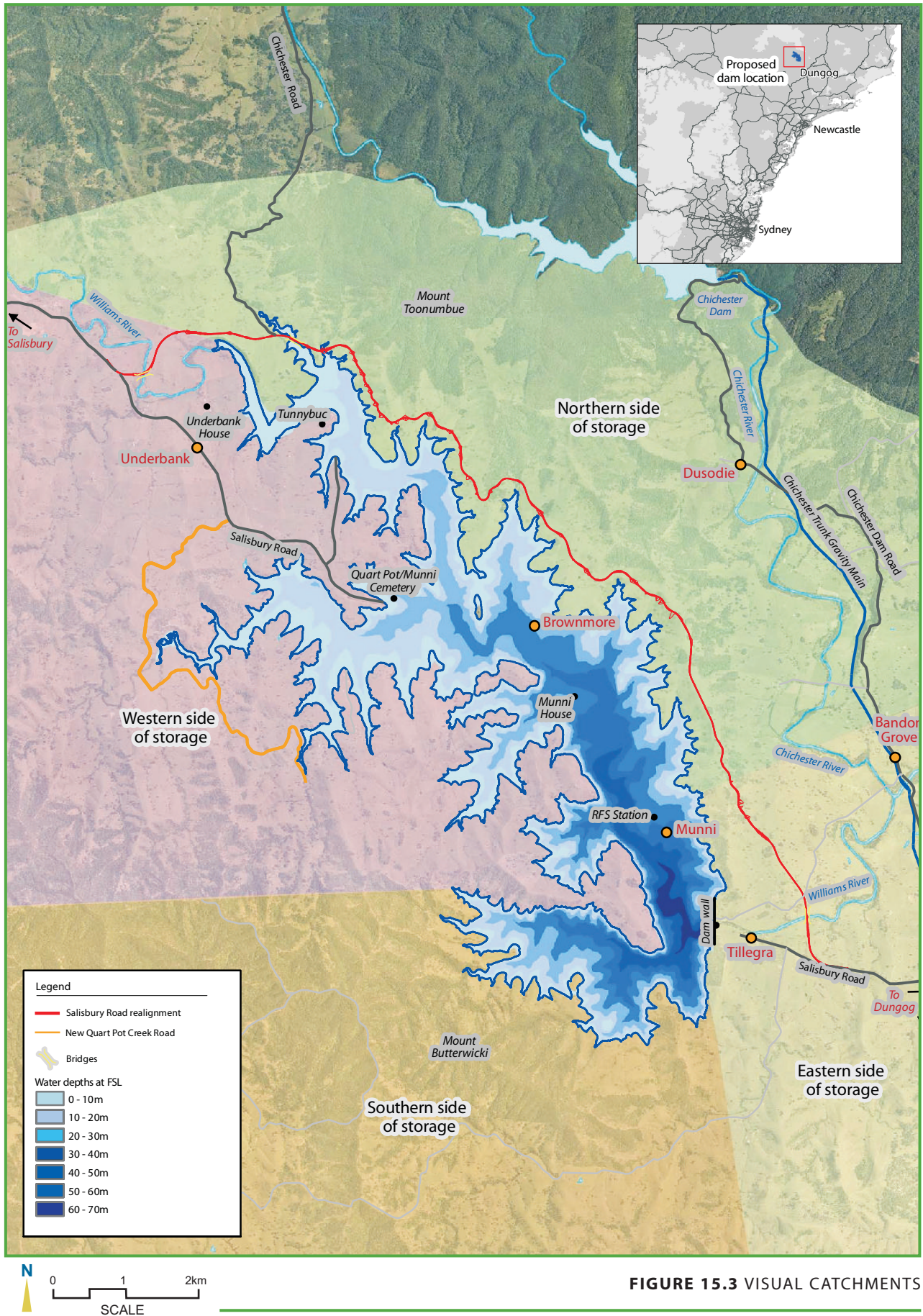


FIGURE 15.3 VISUAL CATCHMENTS

A clear view of the storage to the east and southeast would be available from the proposed recreation area on its northern side (to the north of the current location of Quart Pot/Munni Cemetery).

Simulated views generated from a three dimensional visualisation model developed for the Project are provided in Figure 15.4. Location A depicts the view looking roughly southeast from the existing section of Salisbury Road above the FSL. Location C depicts a view looking north-northwest from the western side of the storage.

#### **Northern side of storage**

The Chichester Range at the south of Barrington Tops extends from north to northeast of the storage and would serve to minimise the visual impact of the storage on properties located beyond this ridge. Many properties in this area are surrounded by significant vegetation which would similarly limit the visibility of the storage.

The storage would also be visible from various locations along the new section of Salisbury Road, the nature of views being dependent on final design and the number and extent of cuttings. Location B in Figure 15.4 depicts a view to the southeast from the northern end of the storage. Towards the northeast, the new section of Salisbury Road runs along a ridge which would provide views to the storage from the road. The character of these views would likely change over time from vegetation growth between the road and the storage.

A clear view of the storage to the west and southwest would be available from the proposed recreation area on its eastern side.

#### **Eastern side of storage**

The dam wall, spillway and other Project components in the vicinity of the dam wall would be visible to many properties located to the east of the dam wall. A number of private properties with a west-facing aspect would also be in view of the changed landscape. Due to the relatively flat topography in this area, the dam wall and spillway are likely to be visible from a number of residences in this valley. Due to the presence of a ridgeline, it is unlikely that views of the dam wall and spillway would be possible beyond Chichester Dam Road.

Additional facilities in the vicinity of the dam wall such as the outlet works, office and cottages, potential interpretive centre and picnic areas would also alter the existing visual environment though, overall, this would be dominated by the dam wall and spillway. The southern section of the Salisbury Road realignment, which would pass near this area, would also contribute to visual impact.

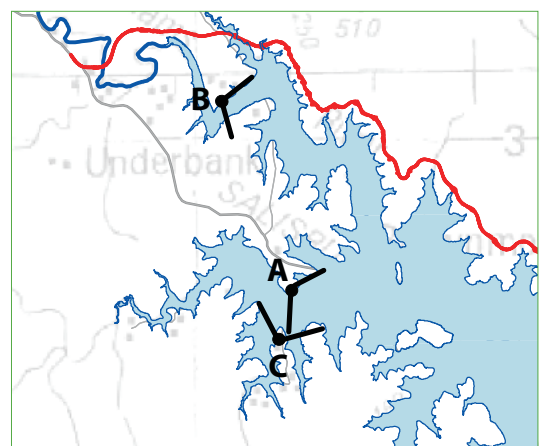
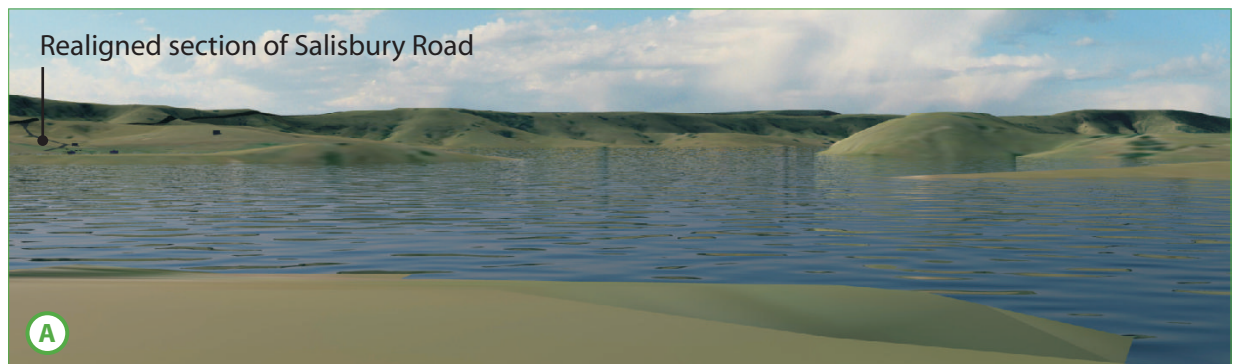
Residences in this visual catchment are likely to experience a greater impact compared to the three other catchments.

#### **Factors which may restrict visibility of the dam and storage**

A buffer zone with a nominal width of 50 metres would be established around the entire perimeter of the storage as a mechanism to protect water quality. The width may vary in some areas depending on local conditions. Vegetation would be permitted to regenerate in this buffer zone with supplementary planting as required. In some locations, it may be fenced to prevent access by cattle and other livestock. In addition to assisting with maintaining water quality, the buffer zone would aid shoreline stability and provide habitat for native fauna. As vegetation becomes established over time, it would also provide screening and filtering of views to the storage.

As noted previously, the Project includes the establishment of a habitat corridor running north from the Williams River along the eastern margin of the storage eventually to the Mount Toonumbue area, and south from the Williams River around to the Mount Butterwick area. In addition to its value as an ecological and carbon offset, it would also contribute to reducing the visual impact on viewpoints, particularly to the east and northeast of the dam wall.





**FIGURE 15.4** SIMULATED VIEWS OF STORAGE

## 15.7 Visual impact assessment

### 15.7.1 Visual impact criteria

In order to facilitate objective assessment of visibility, a set of key assessment criteria was developed. The key criteria against which the visibility of the Project was assessed are as follows:

- distance from the dam wall
- view field angle
- presence of any screening.

The distance of each assessment site from the dam wall was used as a principal factor to rank visual prominence which decreases with distance. Distance can also be used to classify whether the dam would be viewed within the:

- foreground (less than one kilometre) – the zone of greatest reduction in scenic impact
- mid-ground (one to three kilometres)
- background (more than three kilometres).

While the Tillegra Dam project would span a wide area, the main visual impact would result from the dam wall and spillway and would impact residents to the east. A secondary consideration for visual impact would be the construction of Salisbury Road with the main area of interest being the section of road from below the dam leading up onto the ridgeline.

In this regard, there are a number of privately owned properties within one to two kilometres of the site of the dam wall and which are likely to experience the greatest visual impact. A number of these properties may also have viewpoints of the realigned Salisbury Road which would cross within approximately 1,500 metres of the dam wall site.

In general, the view field angle can be described as the angle subtended by, in this case, the dam wall and spillway at the observer's location. This angle varies for different viewpoints and is influenced by distance and orientation of the dam wall relative to the viewer and intervening topography. A larger angle would correspond to a greater visual impact as more of the observer's view field is occupied by the dam wall and spillway. The angle between the left and right hand edge of the view field of the dam wall defines the affected proportion of the viewpoint.

The third criterion for the visual assessment is screening, which relates to existing vegetation such as trees or buildings that could reduce the potential visual impact. A lack of screening could also contribute to a greater visual impact.

### 15.7.2 Visibility ranking

The above criteria were used to assign a relative ranking of the visibility of Project components from potentially affected residences into three classes: high, moderate and low, as described below. For the purposes of the assessment the following descriptors were adopted:

- High visibility–assigned to viewpoints within one kilometre and viewpoints up to two kilometres depending on the dam wall view field angle (a view field angle of or greater than 45° is likely to result in a high visibility impact)
- Low visibility–assigned to all viewpoints beyond three kilometres and viewpoints between two and three kilometres depending on the dam wall view field angle (a view field angle of less than 15° is likely to result in a low visibility impact). It should be noted that low visibility does not necessarily



correspond to low visual impact.

- Moderate visibility—applies to viewpoints intermediate between the low and high classifications with a view field angle between 15° and 45°.

### 15.7.3 Visual impacts on sensitive receptors

The visual assessment utilised aerial photography, topographic maps and images generated from a 3D terrain model to assess potential visual impacts and to assign a visibility impact rank (low, medium, high) to all privately owned residences (sensitive receptors) within two kilometres of the dam wall.

The first step involved generation of a 'zone' of potential visibility using the ArcGIS 3D/Spatial Analyst program. A digital terrain model of the dam wall and surrounds was created at a 20 metre pixel grid and based on an initial 10 metre contour base (which means that there is likely to be some small variability in the generated visibility zone). Next, an approximation of areas that could be viewed from a central position at the top of the dam wall was generated. These are shown as the shaded white areas in Figure 15.5. Areas not shaded could not be viewed in the model from a location on top of the dam wall (denoted by a cross). The shaded white areas therefore provide an indication of the parcels of land from which it would potentially be able to view the dam wall and spillway. This is conservative as the model does not allow for screening by trees and other structures.

A visual assessment was undertaken for the privately owned residences within this visibility zone. A total of nine sensitive receptors were assessed. The locations of these relative to the dam wall are also shown in Figure 15.5.

The visual assessment did not extend to properties outside this area nor to any HWC-owned properties. Properties beyond two kilometres may encounter a small view field angle of the dam wall and spillway while those located north of the dam wall may have views of the realigned Salisbury Road. Given the distance, the presence of intervening ridge lines and vegetation which would act as a visual screen, the predicted visual impacts for residences beyond two kilometres has been classified as moderate or low and therefore not assessed in any further detail. Any visual impact experienced by residences beyond three kilometres of the dam wall and spillway would be minimal, and most are not expected to have views of the Project elements.

Information generated from the visual assessment of the nine sensitive receptors is summarised in Table 15.1. Photomontages of the dam wall and spillway from the viewpoint of each of the sensitive receptor locations are shown in Figures 15.6a to 15.6d.

### 15.7.4 Other areas around the storage

While the dam wall would be the most visually prominent element of the Project, it is acknowledged that all locations surrounding the storage could be affected by the change in the existing landscape. However, these visual changes (the storage and any planting) were considered complementary to the existing rural surrounds and would provide a new element in the landscape that could interest many viewers.

As may be seen from Figure 15.2, there would be a number of residences within close proximity to the storage at its northern and western margins, and which would have varying views of the storage. A large proportion of residences within close proximity and effective views of the storage are owned by HWC. Simulated views from locations in this area are provided in Figure 15.4. As indicated in Section 6.8, the intended operational regime would see water level kept at 90–100 per cent outside of drought periods therefore the water surface of the storage would essentially be a permanent feature in the views of these residences. Views of the water surface of the storage would be moderated as the vegetated buffer zone establishes. As indicated in Section 6.7.6, this would have a nominal width of 50 metres.