Technical Paper 4

VISUAL ASSESSMENT

KEEPIT DAM UPGRADE

Prepared for
Parsons Brinkerhoff
and
State Water

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O'HANLON DESIGN PTY LTD
LANDSCAPE ARCHITECTS

60 GLADESVILLE ROAD
HUNTERS HILL NSW 2110
Ph. (02) 9816 5883
Fax. (02) 9816 4179
ohd@qoh.net.au

VISUAL IMPACT ASSESSMENT

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Section 1 Executive Summary

Executive Summary

The Keepit Dam Upgrade (the Project) is located off the Oxley Highway approximately 54 km west of Tamworth adjacent to Lake Keepit State Park. Construction of any part of The Project would result in visual changes to the dam and associated infrastructure.

Three upgrade options were investigated for visual assessment. Each of the options includes raising the main and subsidiary dam walls and construction of additional spillways or saddle dams.

Each option would provide the same capacity to pass a probable maximum flood in the Keepit Dam catchment using differing solutions to various dam elements.

The methodology used for the visual impact assessment is based on the model developed by the Forest Commission of Victoria and the landscape assessment techniques of the U.S. Department of Agriculture (U.S.D.A.), and has been adapted as necessary by O'Hanlon Design Pty Ltd to suit the requirements of this project. Viewpoints of the proposed works have been selected that are representative of the variety of viewing opportunities that are available. An assessment of the scenic quality of the area and surrounds has been included and it is noted that the water body of Lake Keepit and the associated water edge is an area of high scenic value. Recommended landscape management zones are included in Section 3. The proposed works for all three upgrade options fall within the zone of high concern for visual resources.

The visual elements of the proposed development works are described in detail in Section 4. The most significant difference between the three options is the location and construction of the extra spillways required for the upgrade. Option B1 locates a new spillway at the location of the existing subsidiary dam wall on the southern edge of Lake Keepit whilst both Options D2 and D3 locate new spillways on two sites adjacent to the existing boat ramp and sailing club.

The assessment of visual impacts is detailed in Section 5. The visual impacts of Option B1 vary from the impacts of the other two options most significantly at the existing subsidiary dam wall. The impacts of Options D2 and D3 vary from Option B1 most significantly within the boat ramp and sailing club area, with Option B1 not requiring any spillways to be constructed in this area. The effects of all options on water users are dependant on water user location but the options for each of the new spillway elements have generally similar impacts. Option D3 has slightly greater visual impacts than Option D2 due to the greater height of the proposed new infrastructure.

It is concluded that Option B1 would have the least visual impacts of the three options and Option D3 would have the greatest visual impacts.

Edward O'Hanlon RAIA
Reg Architect 4306

O'HANLON DESIGN PTY LTD
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Section 2 Introduction

2.1 The Project

The Keepit Dam Upgrade (the Project) is located off the Oxley Highway approximately 38 km east of Gunnedah and 54 km west of Tamworth in the area surrounding the existing Keepit Dam and Lake Keepit State Park. The Project incorporates an increase in height to the existing main and subsidiary dam walls, an auxiliary spillway and saddle dams or spillways in the low ridges between the main and subsidiary dam walls.

2.2 Objectives

The objectives of this Visual Impact Assessment report are:

- To analyse the visual character of the regional and local landscape with reference to the Study Area.
- To assess the visual impact of the proposed dam wall increases, new spillways and associated saddle dams.

2.3 Methodology

This Visual Impact Assessment has been divided into five sections:

1. Introduction
2. Landscape Assessment
3. Visual Quality Assessment
4. Outline Of The Proposed Development
5. Visual Impact Assessment

The methodology outlined in Figure 1.1 is based on the model developed by the Forest Commission of Victoria and the landscape assessment techniques of the U.S. Department of Agriculture (U.S.D.A.), and has been adapted for the purpose of this project. The method of assessment of visual impact has been the subject of professional discussion and analysis since the early 1970s. Much of the work on visual impact has been carried out by the Forest Service of the U.S.D.A. (U.S.D.A. Forest Service). The U.S.D.A. Forest Service has issued the following documents amongst others to describe an appropriate method of impact assessment:

- "Forest Landscape Description and Inventories A basis for Land Planning and Design" U.S.D.A. Forest Service Research Paper PSW-49 R. Burton Litton Jr.

- National Forest Landscape Management Handbook U.S.D.A Forest Service No. 434 February 1973;

- U.S.D.A Forest Service, Agricultural Handbook No. 462, "National Forest Landscape Management" Volume 2 Chapter1 The Visual Management system - April 1974;

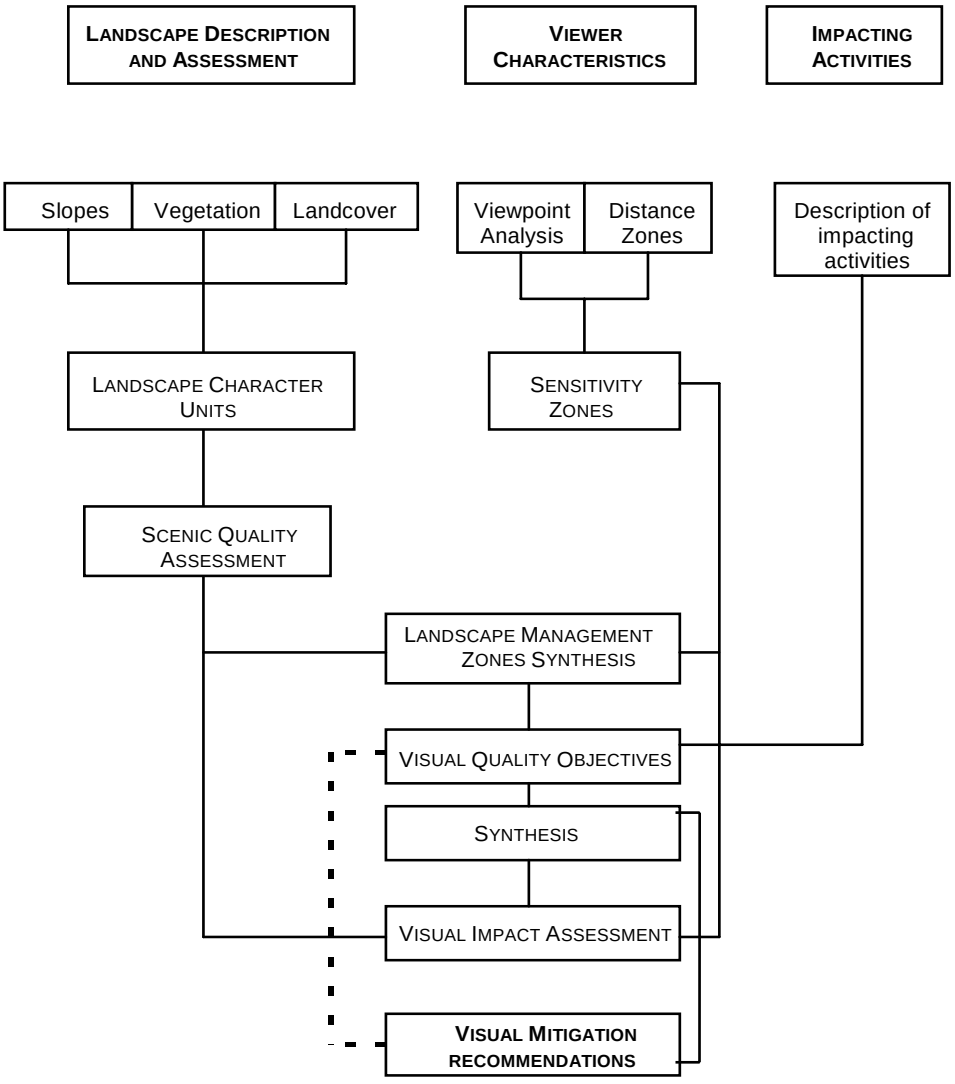
- "National Forest Landscape Management" Volume 2 Chapter 2 Utilities, U.S.D.A Forest Service - July 1975;

- U.S.D.A Forest Service "National Forest Landscape Management" Recreation Volume 2 Chapter 8, Forest Service Agricultural Handbook No. 666 - December, 1987.

The scenic assessment method used by the U.S.D.A. Forest Service is a systematic approach to visual assessment using quantitative measures. It was devised to assess developments in areas of predominantly natural landscape. It assesses the influence of landform, vegetation, water and other landscape factors on scenic quality with refinement applied for the sensitivity levels of the viewers from various selected viewpoints.

Early attempts to assess visual impact contained a very high level of subjectivity. The search for a quantitative assessment of visual impact seeks a higher level of objectivity in determining visual impact of any particular project or development. The U.S.D.A. Forest Service system has become a benchmark for the quantitative measurement and assessment of the visual impact. The Forest Commission of Victoria has also developed a programme of scenic management policies and guidelines. As an initial basis for assessment the Commission has adapted descriptive criteria used by the U.S.D.A. Forest Service. This approach is described in the article entitled “Scenic Perceptions of Australian Landscapes” by Dennis Williamson in Landscape Australia published April, 1979.

Figure 2.1
Methodology



Section 3 Landscape Assessment

3.1 The Existing Environment

3.1.1 Regional Landscape Character

The landscape character of the region surrounding the Lake Keepit area is typical of the areas immediately west of the Great Dividing Range. In these areas the topography is a mixture of undulating hills and expansive plains as the landform gradually falls to the west into the upper reaches of the Darling/Barwon system river basin. The Great Dividing Range is supplemented in this area by two primary ridge systems running west from the Range. To the north the Nandewar Range runs west from Armidale toward Bringara; to the south the Liverpool Range commences at Murrurrundi, runs west to Coonabarabran and terminates in the Warrumbungle National Park area. Between these two ranges is a gently undulating area known as the Liverpool Plains. The Namoi River runs west draining the Liverpool Plains area and has its headwaters in the area above Keepit Dam. Rainfall in the region is low at around 500-600mm per annum spread relatively evenly throughout the year and temperatures average well above 30^{o} in the summer.

The resultant vegetation was originally dry sclerophyll forest of the plains with sporadic areas of thicker vegetation in the steeper valleys and slopes of the upper ranges. Following two hundred years of settlement and intensive farming, the remnant vegetation is sparse across the river plains areas with the steeper areas and gullies still covered with significant remnant vegetation. Many areas have extensive stands of Eucalypt sp. and Cupressus sp. Remnant understorey planting is primarily restricted to steep uncultivated areas. Most understorey areas have introduced grass species for grazing and in many areas since construction of the dam system ,grazing has been replaced by irrigation and cotton plantations. Residential areas are restricted to major towns such as Gunnedah, Narrabri, Wee Waa and Tamworth, with relatively little expansion in the last 20-30 years. Cultural modifications, such as mines, buildings and infrastructure, are generally well spread out and do not detract from the landscape of the region but are not as regular features in the landscape as further south around the Hunter River. Local rural infrastructure is common with fencing, silos, residences and farm buildings dotting the landscape. Land holdings are moderately large spreading the infrastructure widely across the landscape.

The landscape is generally scenic without particular dominance by any section or form. The landscape is generally open and bounded at distances of around 8-10km by ridges and undulating hills.

3.1.2 Local Landscape Character

The local visual character is similar to the regional character but more closely tied to the course of the Namoi River. Remnant vegetation appears to be evenly balanced between farming and grazing areas with regular sets of undulating hills closing down the view catchments and vistas. Some localised elevated areas west and south of Orange Grove Road provide a visual backdrop to the landscape. Ridges are heavily wooded and have relatively constant crest levels. As the topography rises toward the headwaters of the Namoi River, the river course becomes more torturous and cuts more deeply into the landscape, ridges and valleys become steeper and more interesting when viewed as foreground elements. The river catchment areas reduce in size and become more detailed and interesting. The local landscape is highly scenic and the predominant scenic

element is the water body of Lake Keepit and the scenic opportunities created by the associated land to water interface. The water body and the associated dam infrastructure are cultural modifications to the original landscape that have increased the scenic quality and enhanced the scenic value of the local landscape.

3.2 The Study Area

For the purposes of this Visual Impact Assessment, the Study Area is defined as the total visual catchment of the Keepit Dam Project Area.

The Study Area is bounded to the north by the Lake Keepit Sport and Recreation Centre area; to the Oxley Highway: to the east by Rushes Creek Road; and to the west by the ranges west of Orange Grove Road (see Figure 01). The Study Area includes the whole of the Lake Keepit State Park and all of the associated recreation areas.

The State Park forms the dominant cultural elements of the Study Area. The Park is a result of the construction of Keepit Dam which commenced in 1938 and was completed in 1960. The landscape quality derives from the original line of the Namoi River and the Keepit Area appears to have gained its name from an Aboriginal term meaning 'Many bends in the River'. The Study Area focuses on Lake Keepit and its vast expanse of water. To the east and south the landscape is relatively flat, to the north and west the landscape is more rugged and heavily vegetated. Correspondingly the water/land junction of Lake Keepit is shallow and flat to the east and south, but steeper and more scenic to the north and west. The western edge of the lake around the dam wall, boat ramp and sailing club are the most visually prominent elements on the dam shoreline and contribute to the scenic quality. Areas within the visual catchment west of the Main Dam Wall are undulating and strongly directed by the Namoi River, creating a scenic and constantly changing landscape.

Lake Keepit, Keepit Dam and its associated left (southern) embankment, the State Water Employee Housing Areas and the infrastructure on the west bank of the dam for the Lake Keepit Sport and Recreation Centre are the primary cultural modifications in the Study Area.

3.2.1 Lake Keepit State Park

Lake Keepit State Park is a major recreational facility for residents of the towns of Tamworth and Gunnedah as well as local visitors. Advise from the reception area staff at the Park suggests that the Park receives around 250,000 visitors per annum concentrated mainly between October and April. The Park has a wide range of facilities and outdoor recreational opportunities, most of which are enhanced by the existing scenic quality of the lake particularly the water/land interface areas. The recreational facilities include fishing, boating, water skiing, swimming, cycling, camping, walking trails, scenic lookouts, gliding and a range of more structured facilities including tennis and golf. The park caters for travellers, day visitors and campers. The experience of each of the park user groups is enhanced by the relatively open and natural surrounds of the Lake Keepit State Park Area. The more structured areas for camping and activities are located south of the main dam wall and north of the Entry Gate in a zone approximately 3km long.

The camping grounds fall into three groups. Free camping is primarily at the Hawkes Nest camping area on the eastern shore up to Corrigan's Camp on Goora Bay. Drive-in camping for approximately 200 sites is available north of the Entry Gate in the Lakeside Caravan Park, and more permanent relocatable styled camping accommodation is available in 'The Gums' camping area

immediately adjacent to the proposed Caravan Park saddle dam. One large self contained cabin is available adjacent to Tolcumbah lookout and immediately north of the Sailing Club saddle dam/spillway with views into the proposed spillway and flow entry widening.

3.3 Landscape Description and Visual Character of the Study Area

The Study Area can be broken into broad homogenous landscape units of slope, vegetation type and landscape cover. The landscape units are described below in terms of their visual components of form, line, colour and texture and cultural modifications. Cultural modifications are assessed to ascertain the degree of change that has occurred to the predominant character of the area.

See **Figures 03 and 04** for Slope Analysis and Vegetation of the Study Area.

3.3.1 Ridgeline And Upper Wooded Slopes

This landscape unit forms a visually prominent backdrop to the western and southern boundaries of the Study Area. Slopes range from 20 to 30% and the unit has a maximum height of approximately RL 400-500 on the western ranges and is approximately 150 metres higher than the full supply level of water on Lake Keepit.

Form:	The higher slopes, rock outcrops and high elevation form a strong visual element in this landscape unit. The prominence of the ridgeline and upper slopes is strengthened in contrast to the more gentle slopes and alluvial areas
Line:	Line is an important visual element for this unit as the ridgeline forms the silhouette against the skyline
Colour & Texture:	The vegetation particularly on and adjacent to the ridgelines: results in a dark ragged edge silhouette and provides a contrast in colour and texture to the surrounding cleared areas. There is also a colour and textural contrast at the horizon line
Cultural Modifications:	The natural character is dominant in both areas and existing cultural elements appear to be insignificant

3.3.2 Undulating Foothills (Vegetated And Cleared)

Undulating foothills form the prominent landscape unit of the Study Area. Consequently this unit contributes significantly to the overall character of the Study Area. This unit comprises slopes in the range of 10 to 20%.

Form:	Form is the dominant visual element of this landscape unit, although it is less distinctive than the steeper ranges and alluvial plain. With a significant diversity in shape, orientation and dissection, these undulating foothills provide a source of interest to the viewer as foreground elements and contribute to a higher visual absorption capacity
Line:	The undulations of the foothills also make line an important visual element in this unit, however due to the random nature of the line elements the overall form of the foothills visually dominates this landscape unit
Colour & Texture:	Vegetation contributes significantly to the colour and texture perceived in this unit. The extensive areas of remnant woodland south-west and north-west of the Keepit Dam area provide a

contrast to the cleared pasture lands of the west

Cultural Modifications:	A moderate number of cultural modifications exist and are limited to some rural residential properties and some obvious fencing. The most significant element is the current dam wall, left abutment and associated infrastructure

3.3.3 Low Level Slope Areas (slopes less than 10%)

The main body of this unit is located on the eastern shore of Lake Keepit and to the south around the subsidiary dam wall. The Namoi River and several smaller creeks also have low lying areas of reduced size.

Form:	The form is relatively unimposing and due to the horizontal line of the landform, any vertical elements situated on this landform gain some visual prominence in the landscape due to contrast with this flat form
Line:	The horizontal plane of the landform makes line a strong visual element in this landscape unit. Line is also emphasised by the edge of Lake Keepit and the course tree lines and fencing
Colour & Texture:	Colour is a distinctive visual element in this landscape unit. The contrast of dark trees with the light green grasses creates clear distinctions of vegetation. These contrasts create visual variety of the low lying areas
Cultural Modifications:	Agricultural land, exotic plantings and fencing add to the visual variety of this landscape unit

3.3.4 Water Bodies

The main water bodies within the Study Area are Lake Keepit and the Namoi River meandering through the western corner of the Study Area. For the purpose of this visual assessment, the built dam infrastructural elements have been considered as cultural modifications as they are obviously man made modifications to the landscape. The water body of Lake Keepit and the water/land interface are elements that appear as natural and could occur naturally in the landscape. Those elements have therefore not been assessed as cultural modifications.

Line:	The edge of the Lake is a strong element accentuated by vegetation, especially trees, along the water edge
Form, Colour & Texture:	Water by virtue of its liquidity forms a significant contrast to the surrounding land mass in terms of form, colour and texture and creates the dominant element in the landscape. In this case the scale is large and the dominant form in the landscape
Cultural Modifications:	The main and subsidiary dam walls are strong elements in the landscape. The inundation of the dam area has resulted in large numbers of dead trees visible in the water when storage levels are below full supply and these are incongruous elements

3.3.5 Other Cultural Elements

Small residences are widely scattered throughout the Study Area. Local roads are secondary elements in the landscape. Some minor infrastructure such as power lines and low level bridges are obvious as foreground elements from some viewing locations.

Section 4 Visual Quality Assessment

4.1 Assessment Criteria

The basic premise of visual quality assessment is that all landscapes have some value, but those with the highest diversity have the greatest potential for high scenic quality.

Scenic quality is the combination of elements used to identify the importance of the proposed development to potential viewers. The assessment of scenic quality is performed by assessing the landscape character units in scenic quality classes eg. high, moderate, low. These classes are based on the diversity of form, line, colour and texture, prominence of landform, prominence of vegetation and geology, and water forms.

4.2 Scenic Quality Assessment

Based on the description of the landscape units in Section 3, the scenic quality assessment of the Study Area is summarised in **Tables 4.1** and **4.2**.The scenic resource values are based on Williamson's (1979) findings for landscape dimension scenic quality relationships that are based on earlier research studies. Those studies identify that scenic quality increases as:

- Topographic ruggedness and relative relief increase
- Presence of water forms, water edge, and water areas increase in volume
- Patterns of grasslands and forest become more diverse
- Natural and agricultural landscapes increase and man-made landscapes decrease
- Land use compatibility increases and land use edge diversity decreases

Source: Williamson, Dennis. Scenic perceptions of Australian Landscapes, LANDSCAPE AUSTRALIA, 1979 vol. 2

See **Figure 05** for the Scenic Quality Assessment of the Study Area.

Table 4.1
Scenic Quality Assessment

Landscape Rating Unit	**Scenic Quality Criteria** Proportional Prominence of				Scenic Quality Classes
	Diversity of Landscape Elements	Landform	Vegetation	Water	Result
Ridgeline & upper wooded slopes	Moderate	Moderate	Moderate	-	MODERATE
Undulating foothills and elevated outcroppings	High	Moderate	Low		MODERATE
Low lying areas	Low	Low	Low	Low	LOW
Water bodies	High	High (at junction with land)	-	High	HIGH
Impact of cultural modifications including dam infrastructure	Moderate	Low	Low	High	MODERATE

4.3 Viewer Characteristics

Viewer characteristics of the landscape are specific to the Project Area and are determined by individual viewing points, distance to the object and sensitivity of the viewer. Visibility of the landscape elements and visual prominence is determined by the individual viewing points selected within the Study Area. Locations have been selected from which the major views of the various dam walls and disturbed areas would be prominent. The locations are considered representative of a general location or group of locations. They are grouped according to relative distance. When using the U.S.D.A. system for impact assessment the viewpoints are generally limited to public roads and accessible public areas as these are locations that affect the general community. Note that any perceived impacts can change with only slight modification to the viewing points.

4.4 Viewpoints

The selection of viewpoints is specific to the Project Area and is determined by the angle and elevation of the view and distance to the object. Distance definitions have been determined from those listed in Table 3.2. These distance definitions are used throughout this assessment to identify how far elements are from viewpoints or frequently used viewing locations. When using the U.S.D.A. system for impact assessment the viewpoints are generally limited to public roads and accessible public areas as these are locations that affect the general community.

Table 4.2
Distance Definitions for Landscape Assessment

	Foreground	Close Middleground	Distant Middleground	Background
Distance	0-400/800m	400/800m -2/3km	2/3km - 5/8km	5/8km-infinity
Viewing capacity	Detailed	Detail and general	General	General - no detail
Object viewed	Rock outcrop	Hill or small valley	Entire ridge	Ridge system
Visual characteristics	Species of individual plants	Textures (palms and hardwoods)	Course textures (grass to tree cover)	Patterns (light and dark)

Source: Forest Commission, Victoria, 1981 - Visual Absorption Capability in the Blue Range Study Area. Adapted by O'Hanlon Design Pty. Ltd. January 2006 to suit the Anvil Hill Study Area and subsequent studies.

THE VIEWPOINTS: (See **Figure 02** for locations)

VP 1 - Lookout No 1 – the peninsula east of the main dam wall RL 340

VP 2 - Orange Grove Road – 220 metres north of cutting RL 315

VP 3 - Orange Grove Road – approx 1000 metres south-west of Tolcumbah homestead RL 340

VP 4 - Lake Keepit State Park: Entry Road – Administration Building RL 340

VP 5 - Lake Keepit State Park: kiosk area RL 335

VP 6 - Lake Keepit Water Users RL varies: around RL 330

VP 7 - State Water Employee Housing: west of Tolcumbah Lookout RL 340

VP 8 - NSW Sport and Recreation Centre RL 345

VP 9 - The Oxley Highway at the Peel River Bridge RL 295

4.5 Sensitivity Levels

Sensitivity levels are a measure of people's concern for the scenic quality of an existing environment. They are based upon the scenic quality of the landscape unit, distance, zone and type of travel routes or location of viewpoints, and the number and type of potential viewers.

Major roads and primary use areas carry a higher number of viewers than secondary roads and use areas. Generally, tourists and residents have a higher concern for visual quality than commuters. Residents have a high concern for the scenic quality of their visual catchment if it is threatened by perceived detrimental changes. Residents are generally more concerned with foreground and middleground impacts. Commuters are generally more concerned with foreground elements.

Very little research has been carried out in Australia to determine the public sensitivity to visual impacts generally or to the visual impact of dams specifically. Most assessments are based on overseas research and anecdotal evidence. Public sensitivity levels have been assessed against the criteria shown in Table 4.3 and estimates of viewer numbers, and the assessment of levels of concern generally anticipated from work we have assessed in similar communities.

Table 4.3
Sensitivity Levels - General Criteria

	Sensitivity Levels		
Use/viewer numbers	1	2	3
Primary travel routes, sport and recreation facilities, historical sites, urban residential areas, national parks, or state recreation areas and associated water bodies	At least 25% of users have MAJOR concern for scenic qualities of the area	Less than 25% of users have MAJOR concern for scenic qualities of the area	Not applicable
Secondary travel routes, rural residential areas and other water bodies	At least 75% of users have MAJOR concern for scenic qualities of the area	At least 50% and not more than 75% of users have MAJOR concern for scenic qualities of the area	Less than 50% of users have MAJOR concern for scenic qualities of the area
Rural roads and outlying areas	Not applicable	At least 75% of views have MAJOR concern for scenic qualities of the area	Less than 75% of users have MAJOR concern for scenic qualities of the area

In **Table 4.3** primary travel routes are considered to be highways, freeways and motorways carrying high volumes of traffic or routes designated as scenic highways.

Source: **Table 4.3** is based on tables and percentages quoted in U.S.D.A. Forest Service, Agricultural Handbook No. 462, "National Forest Landscape Management" Volume 2 Chapter 1 The Visual Management system - April 1974 and, as suggested therein, modified by O'Hanlon Design Pty. Ltd. (2006) to suit the visual study of the Keepit Dam Upgrade Project.

Table 4.4
Sensitivity Levels - Keepit Dam Upgrade Project

	Sensitivity Levels		
Use/viewer numbers	1	2	3
Oxley Highway, Lake Keepit Sport and Recreation Centre facilities, or Lake Keepit State Park areas and Lake Keepit	Lake Keepit State Park (VP1,VP4,VP5, VP6) and Lake Keepit Sport and Recreation Centre (VP8) Oxley Highway (VP9)	Not applicable	Not applicable
Rural residential areas (density >1/ha)and secondary travel routes	Not applicable	State Water Employee Housing (VP7)	Not applicable
Rural roads and outlying areas	Not applicable	Not applicable	Orange Grove Road (VP2 and VP3)

Note: VP – viewpoints as indicated in **Figure 02**.

4.6 Landscape Management Zones

The assessment of the degree of visual impact of the dam and earth work areas and the related facilities is based on the perceived severity of the developments within the landscape from selected viewpoints, the number of viewers expected to experience the changes and the capacity of the landscape to absorb the proposed changes.In order to determine the absorption capacity of the landscape the areas affected have been divided into Landscape Management Zones. These Landscape Management Zones are an indication of the perceived ability of the area to absorb visual change.

In the following **Table 4.5** the Scenic Quality Class determined in **Table 4.1** is matrixed against the distance definitions in **Table 4.2** combined with the sensitivity levels determined using **Table 4.3** to indicate the level of potential concern for the visual resource of the area. This level of concern is viewpoint specific and is used to determine the potential capacity to absorb the proposed changes without significant levels of impact when viewed from a specific viewpoint.

Table 4.5
Landscape Management Zones

		LANDSCAPE MANAGEMENT ZONES						
		Sensitivity Level / Distance Definition						
		1 Fg	1 Mg	1 Bg	2 Fg	2 Mg	2Bg	3
Scenic Quality Class	**High**	A	A	A	A	B	B	B
	Moderate	A	A	B	B	B	C	C
	Low/Mod	B	B	C	C	C	C	C

O'Hanlon Design Pty Ltd 2006 (visual study of the Keepit Dam Upgrade)
In the table above Fg, Mg and Bg stand for Foreground, Middleground and Background respectively.

Landscape Management Zones as noted in the above table are described as follows:

Zone A - High concern for visual resources

In this zone the ability to absorb change without significant impact is low. If possible, mitigation methods should be used to significantly reduce the impact of any change. This zone is primarily along residential access roads, Lake Keepit, along the foreshore areas and ridgelines and the upper wooded slopes and includes views of local features.

Zone B - Moderate concern for visual resource

In this management zone the ability to absorb change is moderate. Therefore greater levels of modification are possible before the new elements become intrusive. This zone comprises the bulk of the Study Area visible from secondary roads and rural residences.

Zone C- Low concern for visual resource

In this zone the ability to absorb the proposed change is high, due to the lower number of viewers and/or their locations and the overlaying topography. This zone is comprised largely of the immediate foothills behind the ridgelines away from the secondary roads.

Summary

The various elements of the project fall across all Landscape Management Zones depending on the viewer location. However, given that all elements are close to the primary recreational areas and are visible from the primary recreation resource of Lake Keepit itself, **all the elements of the Keepit Dam Upgrade fall within Zone A – the zone of high concern for visual resources.** See **Figure 05** for Landscape Management Zones. This indicates that the ability of this landscape to absorb change without significant impact is low: that where possible the lowest impact options should be used and where possible mitigation methods should be used to significantly reduce the impact of the proposed changes.

Section 5 Outline Of The Proposed Development

5.1 The Project

State Water has analysed a range of options for the Keepit Dam Upgrade and arrived at a short-list of three dam upgrade options. The three short-listed options are composed of six individual elements:

- The A Right-Hand Abutment Spillway;
- Raising the main dam wall and left abutment;
- A boat ramp saddle dam/spillway;
- A sailing club saddle dam/spillway;
- A caravan park saddle dam; and
- Raising the subsidiary dam wall and, for Option B1 only, incorporating a spillway.

The extent of works for each element will be determined by the required increase in capacity and dam wall height for flood conditions at Lake Keepit. Following analysis of a series of options, three options have been short listed. Each option has slightly differing visual impacts for some or all of the elements. Each option is proposed to provide the same capacity to pass a probable maximum flood of Lake Keepit using differing solutions to various dam elements.
The three short-listed dam upgrade options are:

- Option B1
- Option D2
- Option D3

5.2 Option B1

Option B1 proposes raising the main and subsidiary dam walls by approximately 3.4 metres to RL 337.7. Option B1 is a relatively simple solution involving smaller structures and less change to the overall environment of Lake Keepit. The required change to each of the development elements is outlined below.

5.2.1 The Right-Hand Abutment Spillway (B1)

It is proposed to create a new spillway north of the main dam wall. The spillway would be approx 220 metres long with a finished level of RL 332.0.

Construction of the spillway would require clearing of the ridge and valleys either side of the ridge running north from the main dam wall; widening of the entry channel and earthworks adjacent to Lookout No 1; clearing and filling of the valley west of the spillway ridge; reducing the height of the ridge and creation of a widened and cleared channel from the spillway back to the Namoi River adjacent to the foot of the main dam wall.

As a result of these works the landscape would change visually. The existing headland on which Lookout No1 is located would have a more vertical, man made south face toward the main recreation areas of Lake Keepit. The existing vegetation along the ridge north of the main dam wall and into the valley on both sides would be removed. The east face of the ridge would be a broken rock structure of varying visible height dependant on dam water level. The west face of the ridge and the filled valley would be reconstituted with grassland facing downstream. The lineal appearance of the crest of the main dam wall would be extended by 30 metres to the north creating a relatively larger man made element in the landscape. The northern end of the spillway would have a concrete facing over the cut rock edge. This facing would be approx 6 metres

high and 5 metres wide facing south toward the main dam wall, residential areas and the main section of Lake Keepit State Park.

5.2.2 The Main Dam Wall (B1)

The main dam wall, which has an existing height of approximately 60 metres would be raised approximately 3.4 metres. Therefore the additional height would be an incremental increase of approximately 5%. The wall would be concrete and similar in appearance to the existing wall. The dam wall extension runs north/south and is visible primarily from the Lake Keepit and areas to the west. The extension would be visually complementary to the existing main dam wall.

5.2.3 The Boat Ramp Saddle Dam (B1)

The boat ramp saddle dam is located at the crest of the ridge south of the boat ramp and approximately 50 metres east of the State Water residential area. The saddle dam would be approximately 30 metres wide and 5 metres high. The dam would be faced on the northern and southern sides with grass. An access road to the boat ramp would cross the saddle dam. The saddle dam proposed in Option B1 does not require removal of vegetation along the east and west faces of the boat ramp valley, nor the widening of the valley or creation of rip rap rock face surfaces to the east and west faces of the valley.

5.2.4 The Sailing Club Saddle Dam (B1)

The sailing club saddle dam is a modest dam compared to those proposed in Options D2 and D3. The saddle dam is located on the low ridge west of the sailing club and where the road divides to access both the boat ramp and Tolcumbah Lookout. The saddle dam would have an overall length of approximately 30 metres and would have a height above the existing level at its crest of approximately 5 metres. The saddle dam would be faced on both sides with grass. The creation of this saddle dam requires the removal and remodelling of a small area of the ridgeline at each end of the junction of the saddle dam to the existing ridge. A small amount of vegetation would also be removed. The dam face to the east would be a visual extension of the existing grass areas within the sailing club precinct. The saddle dam would be visible from the lake and the areas surrounding the existing sailing club.

5.2.5 The Caravan Park Saddle Dam (B1)

The caravan park saddle dam is located on top of a saddle to the west and at the rear of the fixed unit caravan park. The saddle dam requires the relocation of the boat storage and one row of fixed caravan dwellings. The saddle dam has a crest level of RL 337.65 with a maximum site level of approximately RL322. At its highest point the dam would be approximately 4-5 metres high with a minimum base width of around 30 metres. On the northern side the existing topography falls away steeply at a similar slope to the dam wall requiring significant clearing and down slope earthworks to the west of the dam ridge. Significant vegetation removal would be required at both ends of the saddle dam and on the western slope down toward Keepit Dam Road. The dam would have a rock filled face on both sides.

5.2.6 The Subsidiary Dam Wall (B1)

The subsidiary dam wall works proposed in Option B1 comprise construction of a spillway and the raising of the dam wall. The embankment and dam wall raising would lift the existing crest height by approximately 3.4 metres and would have an extension of the rip rap face to the north approximately 2.5 metres high and a similar rockfill extension to the south. The extension of the abutment to the east and west is therefore relatively short, approximately 15 to 20 metres at each end.

The proposed subsidiary dam wall spillway would have a variable final level between RL 334.35 and RL 336.35. These levels are below the existing dam crest level of 336.58. The spillway is approximately 425 metres long, divided into four equal sections. The subsidiary dam wall spillway has concrete gravity end walls and three concrete gravity divider walls at approximately 106 metre centres. The amount of visible concrete varies depending on the location of the divider and the relative height of the crest with a maximum visible concrete surface of approximately 4 metres. Construction of the subsidiary dam wall spillway also requires some excavation on both the north and south side of the wall down to the RL 325 contour. This would slightly increase the perceived height of the subsidiary dam spillway over its width of 425 metres, the increase would be minimal. The facing of the spillway would be rock fill on the north face and gravel on the south face.

5.3 Option D2

Option D2 proposes raising the dam walls by approximately 4.6 metres to RL338.1. As a result the works on the individual saddle dams and proposed spillways would be higher than that proposed under Option B1. The overall effect of this change on some elements such as the raising of the main dam would be minimal, however, some elements vary significantly from Option B1.

5.3.1 The Right-Hand Abutment Spillway (D2)

Construction of the right-hand abutment spillway for Option D2 is very similar to Option B1. A similar spillway design is proposed with almost identical levels; dam facings are identical; the installation of rip rap and channel widening are similar; and filling of the western valley is similar. The only notable difference is the base level of excavation for the spillway is approximately 1.7 metres higher, reducing the volume of cut.

5.3.2 The Main Dam Wall and Left Abutment (D2)

Construction of the main dam wall and left abutment are also similar to Option B1, with an approximate extra 4.6 metres height required above the existing dam levels.

5.3.3 The Boat Ramp Spillway (D2)

Construction of the works adjacent to the boat ramp for Option D2 would vary significantly from Option B1 and would include a spillway. The spillway would have a crest level of RL 336.7 and would have a concrete gravity end wall at the east end and a concrete lining wall at the west end of the spillway. Construction of the spillway would require widening of the throat of the boat ramp valley to provide a minimum width of 95 metres and excavation of the floor to an even level of approximately RL 327.5 on both sides of the spillway over its total width. The crest of the spillway would not be trafficable due to the slopes of the end walls. The faces of the spillway would be rockfill. The overall length of excavated area would be approximately 200 metres. The spillway level would be approximately 3 metres lower than Option B1, although have a greater apparent height due to the additional excavation at the base.

5.3.4 The Sailing Club Spillway (D2)

The works at the sailing club saddle would be significantly greater in Option D2 than in Option B1. A new spillway approximately 287 metres long is proposed with varying crest heights from RL 335.2 to RL 336.3. The spillway is evenly divided into three sections of approximately 95 metres long separated by concrete cantilever divider walls. Similarly to the boat ramp spillway, excavation of the base level would be necessary to RL 327.8. The concrete end linings of the spillway would be at slopes of 4:1 and blended into the ridges at each end of

the spillway with a visible concrete face approximately 5 metres wide along the junction face.

5.3.5 The Caravan Park Saddle Dam (D2)

The caravan park saddle dam proposed for Option D2 is similar to that proposed in Option B1 with an increased crest height of 1.1 metres. The increased crest height also proportionally increases the overall base width. The overall appearance is similar.

5.3.6 The Subsidiary Dam Wall (D2)

The works proposed at the subsidiary dam wall for Option D2 varies considerably from Option B1; primarily as Option D2 does not propose a spillway and the associated concrete end walls and dividers. Option D2 proposes an extension to the subsidiary earth dam by removal, extension and increasing the height of the crest by approximately 1.2 metres. The south face would be refaced with rockfill and the northern face would be extended with rip rap. The east and western ends would be extended by approximately 30 metres at each end to meet the existing landforms. The resultant dam faces would be similar to the existing subsidiary dam wall in appearance and form.

5.4 Option D3

Option D2 proposes raising the dam walls by approximately 5.5 metres to RL339.0. As a result the works on the individual saddle dams and proposed spillways would be higher than that proposed under Options B1 and D2. Option D3 is otherwise similar to Option D2.

5.4.1 The Right-Hand Abutment Spillway (D3)

Construction of the right-hand abutment spillway for Option D3 is similar to both Options B1 and D2. The volume of excavation required for Option D3 is less than either of the other options with a base level of approximately RL329.4. This results in slightly less earthworks and, with a similar overall spillway height, the actual overall height would be marginally lower than Option B1. This difference is unlikely to be discernable to any viewers.

5.4.2 The Main Dam Wall and Left Abutment (D3)

Construction of the main dam wall and left abutment of Option D3 are visually similar to Option D2. The gravity wall is proposed to be raised 5.5 metres to RL 339.56 and the top of the left embankment is proposed to be raised to a similar height. Construction of the parapet wall on the east side of the embankment would be slightly higher and more intrusive than Option D2.

5.4.3 The Boat Ramp Spillway (D3)

The boat ramp spillway for Option D3 is visually similar to that proposed for Option D2. The spillway would have concrete lining walls, a gravity end wall and the spillway would not be trafficable. A new access road is required from Tolcumbah Lookout. This access road would also increase the earthworks and resultant visible cut surfaces.

5.4.4 The Sailing Club Spillway (D3)

The sailing club spillway proposed for Option D3 is similar to Option D2. It is composed of three individual release plug spillways separated by concrete cantilevered divider walls. The extent of excavation, road relocation and visible concrete elements are also similar to Option D2.

5.4.5 The Caravan Park Saddle Dam (D3)

The caravan park saddle dam has a form identical to Options B1 and D2. However, the extra height required for this saddle dam increases the footprint and the length of the saddle dam marginally. The additional crest height is approximately 1.6 metres and the additional width of the footprint (allowing for crossfalls) would be around 10-12 metres. The overall height would be in the order of 7.5 to 8 metres when viewed from the adjacent caravan area. When viewed from Lake Keepit Road to the east the apparent height would be significantly more as the western toe chases the slope down toward Lake Keepit Road.

5.4.6 The Subsidiary Dam Wall (D3)

The works proposed for the subsidiary dam wall for Option D3 are similar to Option D2. The crest would be 1.2 metres higher than Option D2 and would require a deeper rock fill level on the southern face. The eastern abutment junctions would also be at levels approximately 1.1 metres higher, again increasing the overall length of the subsidiary dam crest by approximately 30 metres. These differences would be difficult to identify and visually the wall would be similar to Option D2.

5.5 Associated Works

Each of the three short-listed dam upgrade options requires a number of smaller adjustments to access roads and these would result in the clearing of vegetation and creation of raw surfaces that would be obvious cultural modifications to the existing landscape. The construction stage of the works in each area would also create a number of raw surfaces. Most of these changes are relatively short term. Most of the surfaces would be rehabilitated and in time the appearance of those surfaces would become more natural. The placement of concrete aprons at the edges of several of the spillways and saddle dams would emphasise the man made appearance and lineal edge created by the crest of the wall elements. It is assumed that only grasses would be suitable for long term vegetation on the spillways, saddle dams and in the cut areas of the spillway aprons.

Each of the three short-listed dam upgrade options also requires the clearing and filling of the valley north west of the main dam wall above the right hand abutment to function as a stockpile area. The stockpile area is marked **D** on **Figure 1**. This is a short to medium term visual impact. It is proposed that this area will be revegetated on completion of the project. It is likely that revegetation will take approximately 10 years to reach a density that will completely ameliorate the use of the stockpile area. At that time is is anticipated that the area will be visually blended into the existing environment.

Section 6 Visual Impact Assessment

6.1 General

The assessment of the degree of visual impact of the Keepit Dam Upgrade is based on the perceived severity of the works and location of the facilities within the landscape from selected viewpoints and the number of viewers expected to experience the visual changes.

As all of the proposed upgrade elements are generally located between Lake Keepit State Park and Lake Keepit and are visible from the lake and many of the high use recreational areas, all elements fall within Landscape Management Zone A – the zone of high concern for visual resources. Each of the three options has some common and unique elements, and all elements are located in the same areas. Therefore the assessments are grouped and related to each element and the differences are highlighted as part of the assessment of the upgrade element.

Factors included in the assessment are as follows:

(a) Selection of viewpoints, which offer prominent views of the work, that are also representative of a potential set of viewers within the Study Area.

(b) Consideration of the various landscape components and the likely visual impact of the proposed development components.

It is important to note that;

These viewpoints do not represent all possible views attainable from each viewing direction; the visual impact would vary according to the viewer elevation, viewing position, screening and specific site conditions. The assessments are a guide to the likely level of impact based on distance and the specific management zone in which the viewer is located.

The description of the visual impacts and relevant assessments is contained in the following sections and should be read in conjunction with the description of the relevant elements of the proposal described in Section 5. The assessment of the impact of each element is charted at the end of the description to allow for comparison between the assessed impacts of each of the three options. The charted assessment of each visual impact for each development option is ranked from 0 to 8 on an even scale where 0 is Not visible, 2 is Low, 4 is Moderate, 6 is High and 8 is Severe.

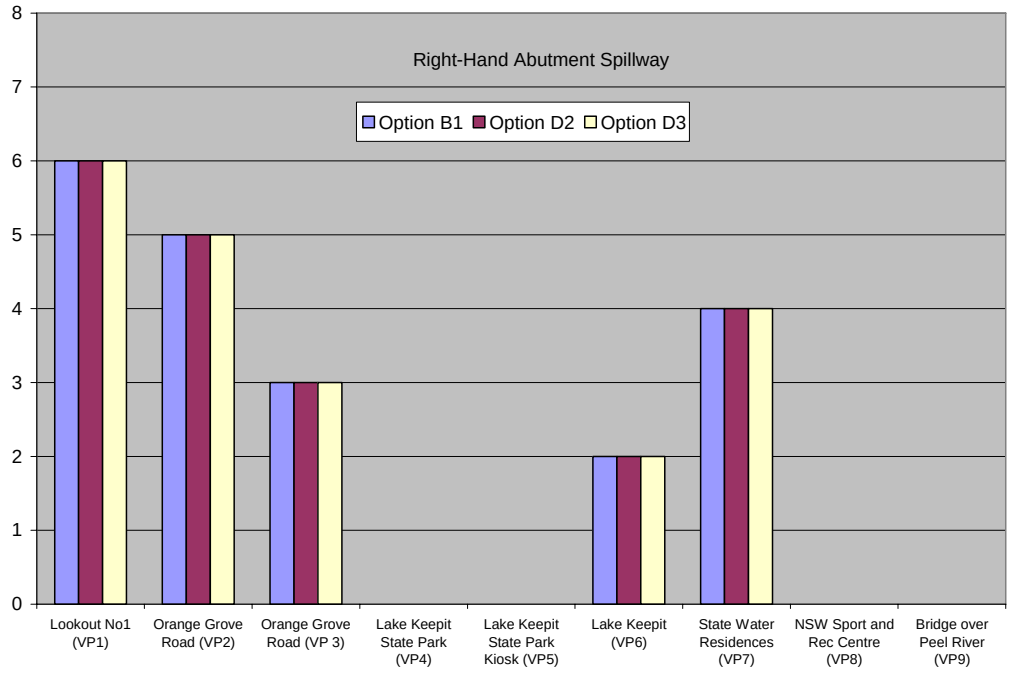
6.2 The Right-Hand Abutment Spillway

The right-hand abutment spillway area and associated site works would be visible from many areas of Lake Keepit State Park and surrounding districts including Lookout No 1 (VP1), Orange Grove Road (VP2 and VP3) and areas south-west of the main dam wall, parts of Lake Keepit adjacent to Gascoyne Cove and the boat ramp and the areas in and around the State Water Employee Housing (VP7) and the main dam wall. The area of the proposed works is heavily vegetated and forms part of the existing curtilage of the main dam wall.

Visually the existing area and the valley to the west that would be filled as part of the spillway works appear relatively natural. The resultant landform would be strongly discordant with the existing area. The spillway itself would not be revegetation but the stockpile area would be revegetated. Revegetation would mean that within a 10 year period the stockpile would resemble the surrounding areas of existing vegetation. The stockpile is proposed to be revegetated with seed of species that comprise White Box Yellow Box Woodland, the same ecological community that would be cleared to enable emplacement of the stockpile. In time the stockpile would resemble a natural environment and it is expected that only viewers aware of the existing landform would realise that what will become a mound/hill was once a gully.

The excavation to open the throat of the spillway would be permanent and obviously man made. The work would double the apparent visible length of the crest of the dam with a small natural hill left at the main visitor viewpoint for the dam. Visually there would be no significant difference between Options B1, D2 and D3 at this location.

Table 6.2



Conclusion: All these options have similar impacts.

6.3 The Main Dam Wall and Left Abutment

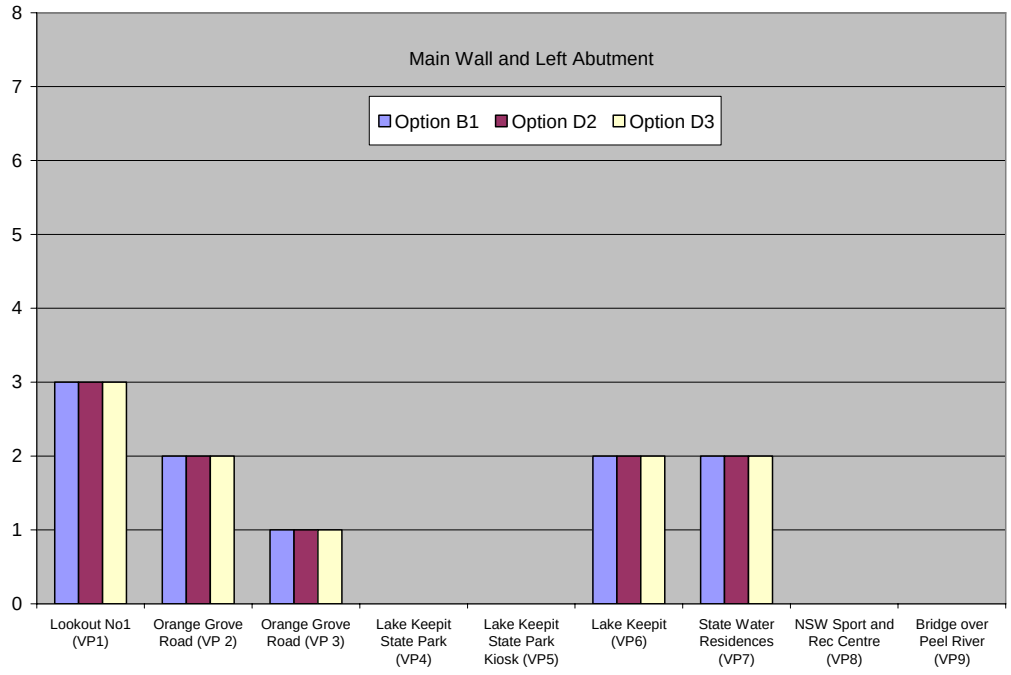
The main dam wall and left abutment are visible from:

- Many areas of Lake Keepit State Park
- Lookout No 1 (VP1)
- Orange Grove Road (VP2 and VP3)
- Lake Keepit, Gascoyne Cove and the boat ramp area
- Areas around the State Water Employee Housing
- Recreation areas on the eastern side of Lake Keepit around Point Pritchard.

The raising of the main dam wall and left abutment are similar in form for each of the three options. Each option proposes raising of the main dam wall with a post tensioned concrete structure. The variation in height for each option would not be visually significant. The extension of the wall at the left abutment is visually highly compatible with the existing main dam wall. Raising the left abutment is similar in all three options and incorporates a new concrete upstand along the crest of the embankment. The left abutment is most visible from Keepit Dam Road and Lake Keepit in the area of Gascoyne Cove and the boat ramp. Viewers in both locations are below the crest of the embankment and are unlikely to discern significant difference between the existing embankment and the new works.

Viewers located at Lookout No.1 can take in the full extent of the works as an elevational set with some tree screening softening the view. Viewers at the main visitor view point located north of the existing dam wall are in a superior viewing location to the work on the main wall and left abutment. This superior position allows them to look down on the dam wall and along the length of the wall to the south. These viewers would not notice a significant change in the view except that the concrete and rock facing work will appear new.

Table 6.3



Conclusion: All these options have similar impacts.

6.4 The Boat Ramp Saddle Dam/Spillway

The boat ramp works have relatively limited visibility within the Lake Keepit State Park area. The boat ramp is visible from:

- Gascoyne Cove
- Lookout No 1
- Parts of the State Water Employee Housing Area
- Tolcumbah Lookout
- Users of the boat ramp.

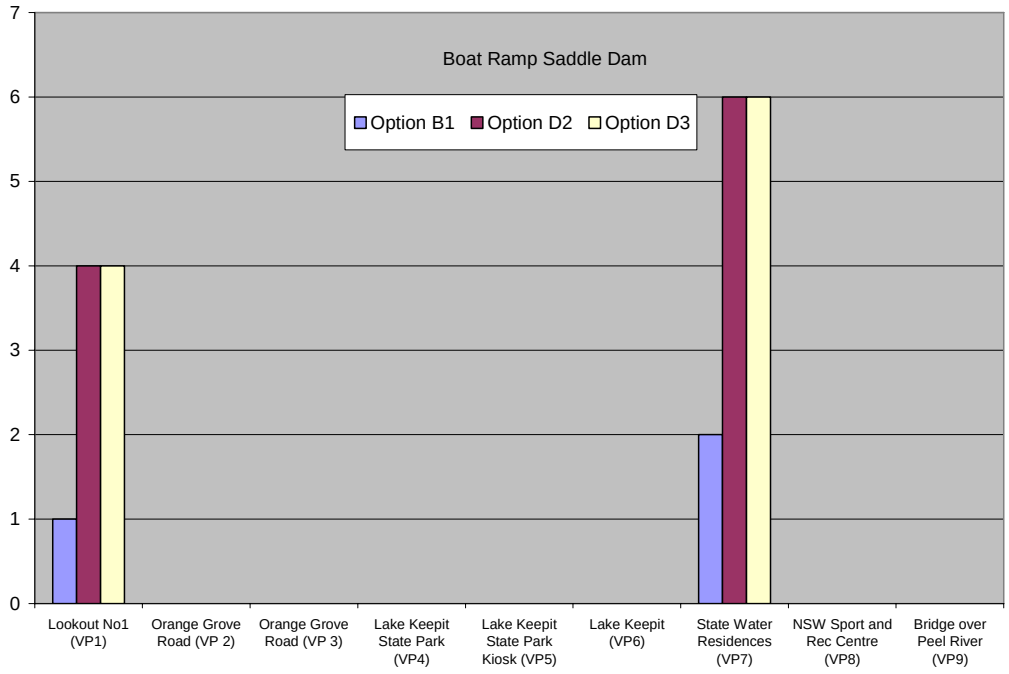
The existing environment at the boat ramp is predominantly natural with limited cultural modifications. The boat ramp area is a foreground element for all viewers except for those at Lookout No1, where it is a close middleground element.

Viewers at Tolcumbah Lookout and the State Water Employee Housing view from the east and north-west respectively at levels higher than the proposed works. Views from the boat ramp, Lookout No 1 and Gascoyne Cove are looking from the north toward the works at inferior levels.

Option B1 is smaller and significantly less intrusive than Options D2 and D3, would require less earthworks and would not require any cutting along the east and west sides of Gascoyne Cove. For viewers generally from the east and west, this results in significantly lower impacts.

The concrete apron and mass end walls proposed in Options D2 and D3 would be significantly more intrusive than the existing natural edges that would remain in Option B1. The additional height and form of the spillway propose in Options D2 and D3 is similarly more intrusive. Option B1 therefore mitigates long term potential impacts by avoiding construction of the hard concrete edges and cut rock faces.

Table 6.4



Conclusion: Option B1 significantly mitigates potential impacts at VP7.

6.5 The Sailing Club Saddle Dam/Spillway

The sailing club area is the proposed location of a saddle dam in Option B1 and a spillway in Options D2 and D3. For Option B1 the saddle dam would be visible from:

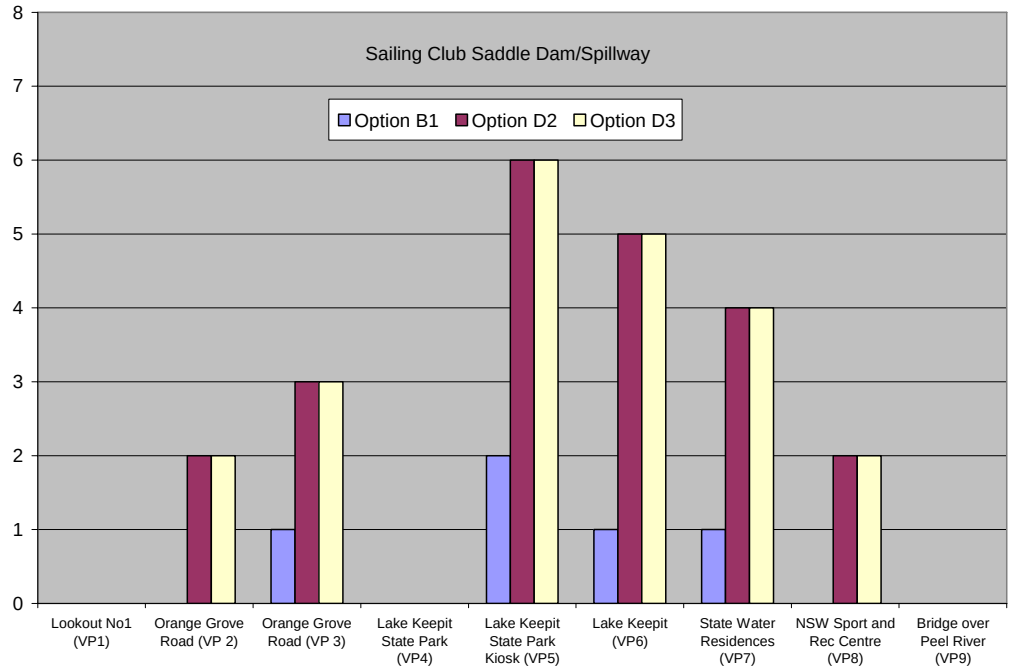
- Lake Keepit
- The recreation area immediately adjacent to the sailing club; and some recreation areas north of the kiosk.

The spillway and flow entry widening proposed in Options D2 and D3 is significantly larger and involves greater associated earthworks. The spillway would be visible from:

- Lake Keepit
- All recreation areas adjacent to the kiosk
- The access road to the boat ramp
- Keepit Dam Road
- The eastern shore access of Lake Keepit
- The State Water Employee Housing Area.

Most viewers would be at inferior viewing levels and would read the new crest of the spillway as a lineal horizon line. The clearing and creation of the concrete cantilevered divisions would also emphasise the man made nature of the landform. For most viewers the spillway would be a significant element in an otherwise relatively natural and intermittently vegetated landscape. The clearing required for the flow entry and exit from the spillway would further emphasise the incongruous appearance of the spillway, particularly when viewed from the western shore and the waterway. Most viewers would view the spillway as a dominant foreground element.

Table 6.5



Conclusion: Option B1 significantly mitigates potential impacts at VP3, VP5, VP6, VP7.

6.6 The Caravan Park Saddle Dam

The caravan park saddle dam is similar in design for Options B1, D2 and D3, although varies in height and footprint. The caravan park saddle dam is visible from:

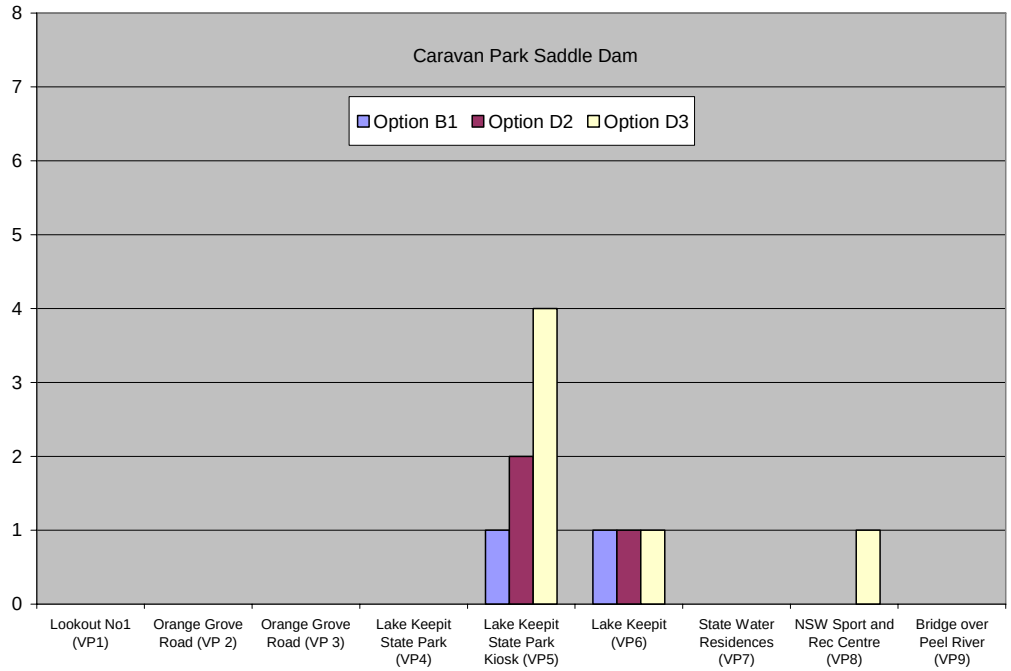
- The kiosk area
- The eastern shore of Lake Keepit
- The caravan park residents
- Keepit Dam Road
- Orange Grove Road around VP3 (not shown in Table 5.6).

For all the viewers noted above except those along Orange Grove Road, the works would be a foreground element and viewers would be located at inferior to similar viewing levels. As the level of the raising of the saddle dam wall increases, so to does the required height and footprint of the Caravan Park Saddle Dam. The visual impact increases proportionally except when viewed from Keepit Dam Road.

Option D3 is potentially of significantly greater visual impact when viewed from Keepit Dam Road as the base level of Option D3 will follow the contours of the face of the hill down to the west. This will require proportionally greater clearing and earthworks and it is possible that a significant new area of rock fill will be visible from Keepit Dam Road. The degree of impact will depend on the specific shape of the saddle dam toe and the detailed topography in that location.

Some caravans on the east side of the saddle dam would require relocation to accommodate the footprint of each Option. Viewers in and around the caravans will be significantly closer to the saddle dam than VP5 that would have impacts mitigated by the existing trees and caravans. Those caravans that remain will be within 80m of the saddle dam and significantly more highly impacted by the proposed works, which will be up to 8m in height, than viewers at VP5. Impacts at the vans will be high to severe depending on specific distance orientation and individual screening.

Table 6.6



Conclusion: Option B1 has less impact at both VP5, the remaining caravans and along Keepit Dam Road.

6.7 The Subsidiary Dam Wall

The subsidiary dam wall area is visible from a large part of Lake Keepit State Park and surrounding area including:

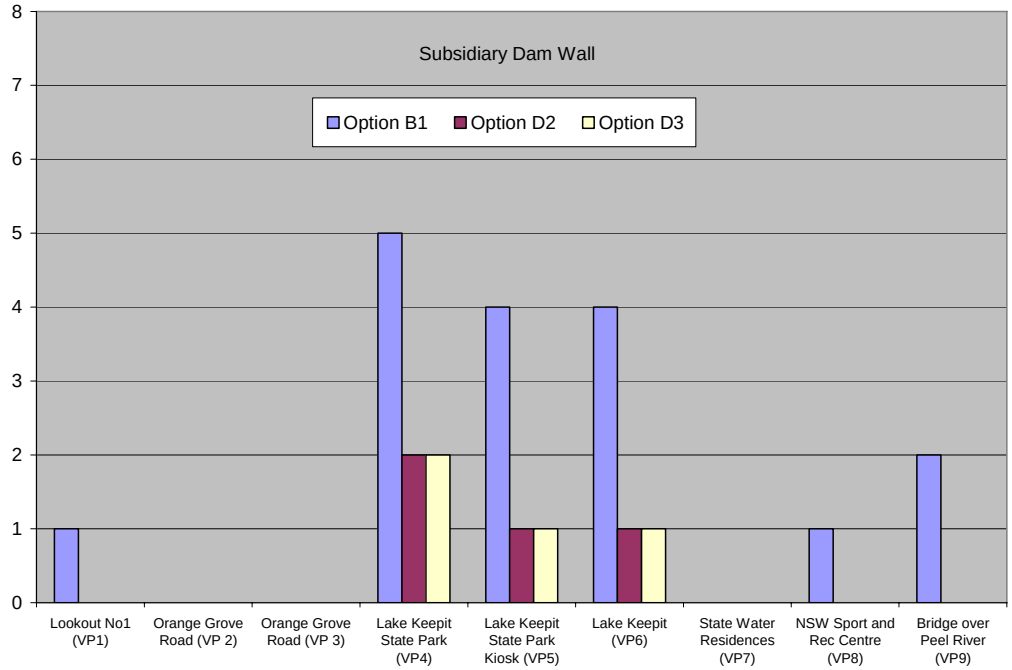
- All the eastern and western recreation areas
- Lake Keepit
- Areas around the Entry facilities
- The golf course
- Lake Keepit Sport and Recreation Centre.

All options propose raising the height of the wall and Option B1 proposes the installation of a spillway and gravity concrete fins at regular intervals along the wall. All options would extend the length of the crest of the wall and involve new works on the faces of the subsidiary dam wall. The lengthening and increases in height of the wall are complementary to the existing form. Earthworks for the proposals do not require extensive vegetation removal. The increased height would impact slightly on the visual quality of the entry road to Lake Keepit State Park facilities and the lineal nature of the crest would be further emphasised.

Option B1 has a significantly greater visual impact than the other two options. Option B1 proposes the conversion of the dam to a spillway with the construction of a series of four concrete gravity divider walls, different spillway heights and concrete end walls, and toe aprons. The elements would appear as a dominant cultural modification in an otherwise relatively natural grassland environment.

It is significant to note that the subsidiary dam wall is itself a cultural modification of the existing landscape and that the impact of the Option B1 spillway is a change to an existing modified element.

Table 5.7



6.8 Other Infrastructure

The amendments to the road works associated with Options D2 and D3 also create additional cultural modifications to the surrounds of Lake Keepit State Park. However these changes are compatible with the general principle of access encouraged in State Parks and as individual elements do not create significant impacts. Around the boat ramp and sailing club this extra work would add to the scale of overall works proposed in Options D2 and D3 and create a continuity with the cultural modifications by tying them together visually. For Options D2 and D3 the overall impact of the road works becomes significant as the total curtilage of the works are extended and this reduces the natural appearance of the landscape.

The creation of a stockpile area in the valley north west of the main dam wall above the right hand abutment has moderate visual impacts for a limited time during construction as a working area and for up to approximately 10 years after completion of the works as an area where vegetation regrowth is progressing. Following that time the impacts should be completely ameliorated by the maturity of the proposed revegetation.

Section 7 Conclusion

7.1 Summary and Conclusion

The three upgrade options have a number of similar and complementary elements that create a variety of visual impacts.

Option B1 has a proposed new spillway located at the existing subsidiary dam wall. This allows complimentary works at the caravan park, the sailing club and the boat ramp to be minimised to a series of saddle dams. These saddle dams are relatively small, have little exposed concrete and require relatively little earthworks and vegetation removal.

Options D2 and D3 both locate new spillways adjacent to the existing boat ramp and sailing club. Option D3 also requires a slightly large saddle dam at the caravan park than Options B1 and D2 with greater associated earthworks. These two options do not require a spillway at the subsidiary dam wall and do not create the hard edged concrete lines on the subsidiary dam wall that would occur with Option B1.

All three options require similar dam and earth works around the main dam wall and the right-hand and left abutments. All options require similar works at the right-hand abutment spillway and the adjacent stockpile areas. Although there are slight variations in the heights of the main dam wall raisings and right-hand abutment spillway and the area of the stockpile of each option, the overall visual impacts would be similar. It is also important to note that works to the existing dam elements are generally minor changes to existing cultural modifications within the original landscape.

Due to the nature of the works, all works are close to the land water interface which places them in a high scenic category and within the heaviest visitor use areas within Lake Keepit State Park.

Similarly, all works fall within landscape management zone ‘A’: ‘high concern for visual resources’. This zoning is applicable primarily due to the proximity of all the works to Lake Keepit State Park and the sensitivity of viewers in that area.

It is important to note that works to the subsidiary dam, the existing main dam and southern abutment are small extensions to the existing infrastructure in all cases except the addition of the spillway to the subsidiary dam as part of Option B .

Given that the subsidiary dam wall already exists and that the proposed new saddle dams and spillways at the sailing club, caravan park and boat ramp are new elements, it is considered that the imposition of new and larger structures at these locations would constitute more significant impacts. The works at the boat ramp, saddle dam and the caravan park in Options D2 and D3 all involve more significant earthworks and disturbance of the existing topography than Option B1. Option D3 has slightly greater visual impacts than Option D2 due to the greater height of the proposed new infrastructure. The works at the boat ramp are also located adjacent to the State Water Employee Housing and the more heavily used areas of Lake Keepit State Park and are therefore more sensitive to visual receivers than the proposed works at the main and subsidiary dam walls.

Therefore, it is concluded that Option B1 would have the least visual impacts of the three options and Option D3 would have the greatest visual impacts.

Section 8 References

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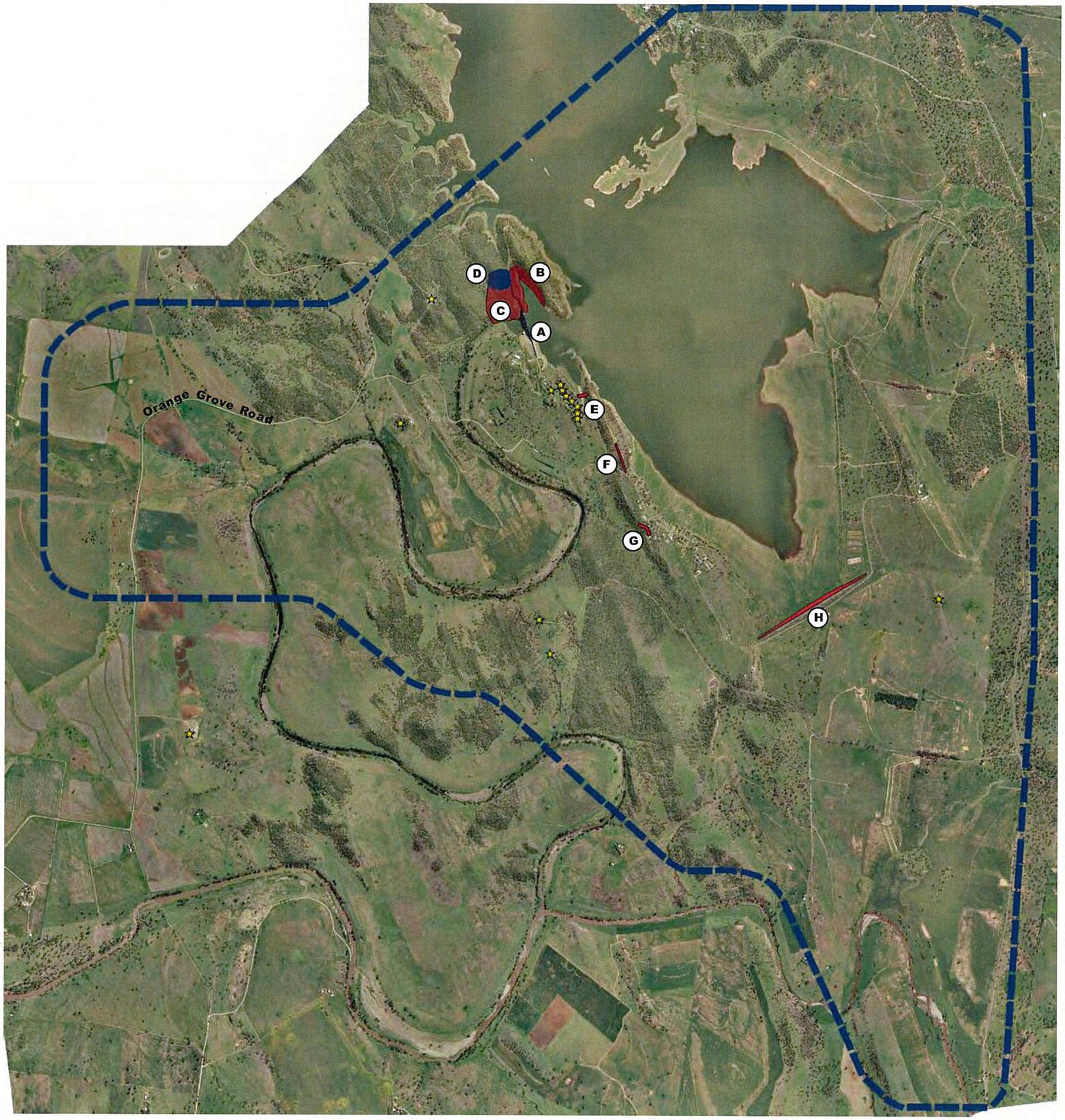


O'HANLON DESIGN
Pty Limited

LANDSCAPE ARCHITECTS
60 Gladesville Road Hunters Hill NSW 2110
Tel: 9816 5883 Fax: 9816 4179 email:goh@goh.net.au

KEEPIT DAM UPGRADE
Lake Keepit State Park, Tamworth

LEGEND:

- A: MAIN DAM WALL & LEFT ABUTMENT
- B: RIGHT-HAND ABUTMENT SPILLWAY & PENINSULA RESHAPING
- C: SPILLWAY EXCAVATION & VEGETATION REMOVAL
- D: STOCKPILE AREA
- E: BOAT RAMP SADDLE DAM/SPILLWAY
- F: SAILING CLUB SADDLE DAM/SPILLWAY
- G: CARAVAN PARK SADDLE DAM
- H: SUBSIDIARY DAM WALL
- RESIDENCES
- STUDY AREA (SHOWN DASHED)

SCALEBAR (km)

.5 .4 .3 .2 .1 0 0.5 1

DRAWING TITLE

FIGURE 1: VISUAL STUDY AREA

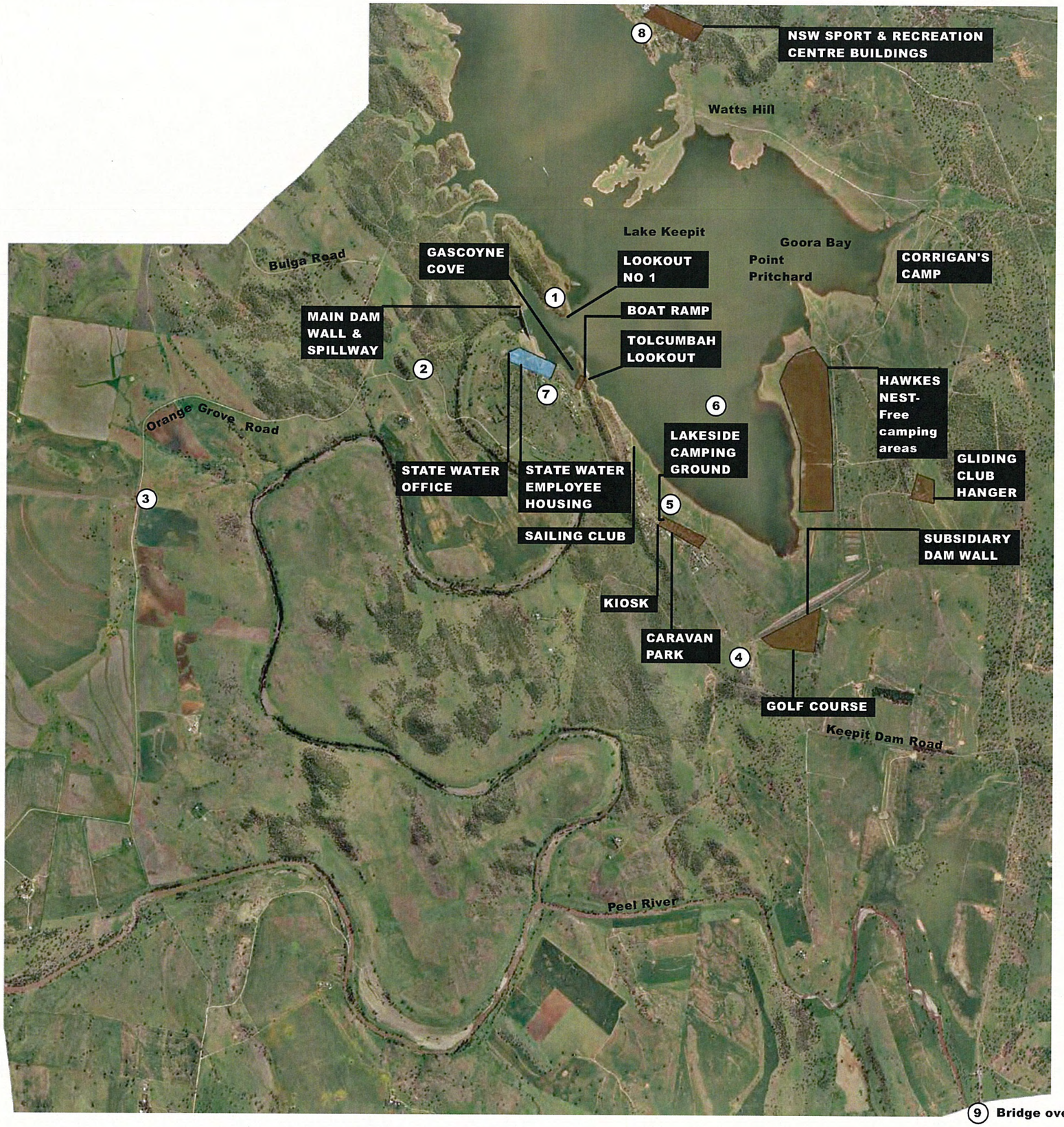
JOB NUMBER	DRAWING NUMBER	ISSUE
792	01	C

DRAWN BY *KO*
DATE *SEPT 2006*

NORTH

DATE	REVISION	ISSUE
SEPT 06	FINAL VISUAL IMPACT ASSESSMENT	C
AUG 06	2ND DRAFT	B
AUG 06	DRAFT VISUAL IMPACT ASSESSMENT	A

JANE O'HANLON
O'HANLON DESIGN - DIRECTOR
AILA REGISTRATION NO: 395



O'HANLON DESIGN Pty Limited

LANDSCAPE ARCHITECTS

60 Gladesville Road Hunters Hill NSW 2110
Tel: 9816 5883 Fax: 9816 4179 email:goh@goh.net.au

KEEPIT DAM UPGRADE

Lake Keepit State Park, Tamworth

VIEWPOINTS LEGEND:

(1) VIEWPOINTS EXAMPLE

POTENTIAL VISUAL RECEIVERS LEGEND:

STATE WATER OFFICE & STATE WATER EMPLOYEE HOUSING

LAKE KEEPIT STATE PARK FACILITIES

SCALEBAR (km)

.5 .4 .3 .2 .1 0 0.5 1

DRAWING TITLE

FIGURE 2: VIEWPOINTS

JOB NUMBER	DRAWING NUMBER	ISSUE
792	02	C

DRAWN BY KO

DATE SEPT 2006

NORTH

DATE	REVISION	ISSUE
SEPT 06	FINAL VISUAL IMPACT ASSESSMENT	C
AUG 06	2ND DRAFT	B
AUG 06	DRAFT VISUAL IMPACT ASSESSMENT	A

JANE O'HANLON
O'HANLON DESIGN - DIRECTOR
AILA REGISTRATION NO: 395