WALLACIA MEMORIAL PARK

LANDSCAPE & VISUAL IMPACT ASSESSMENT

20TH OCTOBER 2017
SA6970
FINAL
PREPARED FOR CATHOLIC METROPOLITAN CEMETERIES TRUST

URBIS

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1. INTRODUCTION

1.1. OVERVIEW

Urbis Pty Ltd was commissioned by the Catholic Metropolitan Cemeteries Trust to undertake a landscape and visual appraisal of the land at Wallacia Golf Course, Wallacia, (the Site) to assess the suitability of the location for a new cemetery (the Project).

1.2. THE PROPOSAL

It is planned to develop the Site for the purposes of a memorial park (refer to ***Section 4***).

1.3. PURPOSE AND SCOPE OF THIS REPORT

This report outlines the findings of the Landscape and Visual Impact Assessment (LVIA) of the Project.

The objectives of this landscape and visual appraisal are to assess the landscape characteristics of the existing Wallacia Golf Course and its surrounding, and to consider the landscape and visual quality of the Site, its function in the landscape, and its relative qualities within the wider landscape. The work undertaken included an assessment of the existing landscape features of the Site, together with a visual appraisal of the Site and its context. The next step was to identify any landscape mitigation for the proposed development.

The process that Urbis used to undertake this landscape and visual impact assessment included desk-top research and field survey, identification of the landscape and visual values and the analysis and documentation of the findings.

1.3.1. Evaluation objective

The evaluation objective for landscape and visual amenity is to minimise adverse impacts on the built and natural environment (including public open space) and capitalise on opportunities to improve visual amenity.

1.3.2. Structure of this report

The structure of the report is outlined below.

- Section 1 – introduces the report;
- Section 2 – describes the methodology for the assessment;
- Section 3 – describes the context and landscape of the Site;
- Section 4 – describes the components of the Project;
- Section 5 – identifies relevant landscape and visual policy and legislation pertinent to the Project;
- Section 6 – assesses the potential visual impacts of the Project;
- Section 7 – describes the mitigation actions; and
- Section 8 – summarises the assessment findings.

2. APPROACH

While there are no specific legislative requirements for the methodology of an assessment such as this in New South Wales, the industry typically refers to the guidance offered by:

- Guidance note EIA-N04 Guidelines for Landscape Character and Visual Impact Assessment, NSW State Government, Roads and Maritime Services (2013).
- The Guidance for Landscape and Visual Impact Assessment (GLVIA), Third Edition, Landscape Institute and Institute of Environmental Management & Assessment (2013).

The methodology used for this Project is described below, and conforms generally to the direction offered by these guidelines.

This report assesses the visual impact assessment of the Project, that is the day to day visual effects on people's views. Assessment methodology is further outlined in Section 4 of the Guidance note EIA-N04 (RMS 2013).

The method to measure visual impacts is based on the combination of the sensitivity of viewers to the proposed change and the magnitude of the Project on that visual setting or view.

2.1. ASSESSMENT OF VISUAL IMPACTS

The visual impact assessment was based on a detailed analysis of the visual setting and an assessment of the potential impacts of the Project on its viewshed.

The viewshed assessed is primarily the area where highest impacts would be likely to occur. In the context of typically low rise built-form in an urban context and a broader landscape comprised of bands and groups of tall trees, this is typically within 500 metres (m) of a Project and would mainly occur where views are possible along roads and other visually open corridors.

The critical issues considered for this LVIA were:

- The number and location of sensitive viewing locations;
- The duration of the view – either static (generally long term - > 1 hour) and mobile (generally short term continually moving and static for no longer than 5 minutes);
- The degree to which the proposed works would be visible; and
- The degree to which the Project contrasts or is compatible with the visual character of the urban setting – degree of magnitude or visual modification level.

The assessment method assumed that if the works would not be seen, there is no impact.

2.1.1. Significance of impacts

The determination of the impacts is based on two criteria:

- the visual sensitivity (refer to ***Section 2.1.2***); and
- the level of the magnitude of change, or degree of visual modification to a setting (refer to ***Section 2.1.3***).

The visual impact of a proposed development is determined by evaluating the degree of visual modification/fit of the development within the context of the visual sensitivity of surrounding land use areas from which a proposed development may be visible. The visual impact resulting from the combination of visual modification and visual sensitivity, or viewer sensitivity, is illustrated in ***Table 1***, which is consistent with the impact grading matrix provided in the NSW Roads and Maritime Services practice note[1].

[1] Environmental Impact Assessment Note, Guideline for Landscape Character and visual Impact Assessment. Roads and Maritime Services (2013).

Table 1 – Impact Determination Matrix

SENSITIVITY	MAGNITUDE			
	High	Moderate	Low	Negligible
High	High	High - Moderate	Moderate	Negligible
Moderate	High - Moderate	Moderate	Moderate - Low	Negligible
Low	Moderate	Moderate -Low	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

2.1.2. Visual Sensitivity

In this report, the approach to the visual sensitivity is consistent with the visual management system (United States Department of Agriculture Forest Service, 1995), Landscape Aesthetics – A Handbook for Scenery Management, Agricultural Handbook No. 701.

The visual sensitivity of development depends on a range of viewer characteristics. The primary characteristics used in this report include:

- Land use;
- Distance of the development from viewers; and
- Visibility from sensitive land use areas.

Visual sensitivity is a measure of how critically a change to the existing environment would be viewed from various land uses (refer to ***Table 2***). Different activities have different sensitivity levels. For example, tourists on holiday would generally view changes to a landscape more critically than industrial workers in the same area. Similarly, individuals would view changes to the visual setting of their homes more critically than changes to the broader area in which they travel or work.

The next critical component to rating the visual sensitivity is the distance of the development from the identified visual use area. There are three viewing situations to consider:

- foreground (0-250 metres);
- middleground (250-1,000 metres), and
- background (> 1,000 metres).

As the distance increases from a proposed development to a sensitive land use area, the level of viewer sensitivity decreases based on a perceptual dis-association based on a reduction in relative proximity.

Table 2 – Typical viewer (visual) sensitivity

VISUAL USE AREA	FOREGROUND		MIDDLEGROUND		BACKGROUND
	0 – 100 m	100 – 250 m	250 – 500 m	500 – 1000 m	> 1000 m
Residential / Accommodation	H	H	H	M	L
Parks and open space	H	H	H	M	L
Community facilities	H	M	M	L	L
Urban road - Secondary	H	M	L	L	L
Rural road - Secondary	M	M	L	L	L
Local road	L	L	L	L	L
Agricultural areas	L	L	L	L	L
Legend - H = High, M = Moderate, L = Low					

2.1.3. Magnitude of change – visual modification to the existing setting

The level of magnitude of change resulting to a setting from a proposed development, or the degree to which the setting is modified, can be best measured as an expression of the visual interaction, or the level of visual contrast between the project and the existing visual environment.

A high level of magnitude, or a high degree of visual modification, will result if the major components of the project contrast strongly with the existing landscape.

A low level of magnitude, or a low degree of visual modification, will occur if there is little or minimal visual contrast and a high level of integration of form, line, shape, pattern, colour or texture values between the proposed development and the environment in which it sits. In this situation, the proposed development may be noticeable, but does not markedly contrast with the existing, already modified landscape.

The degree of magnitude or modification would generally decrease as the distance from the Project to various viewing locations increases.

2.2. LIGHTING IMPACTS

Australia does not have standards for the assessment of lighting impacts. Therefore, the assessment of the impacts of lighting at night-time has been based on the UK's Guidance Notes for the Reduction of Obtrusive Light (refer to ***Appendix A***). This guidance note identifies four environmental zones for exterior lighting which are categorised by the degree of artificial lighting within an area. For example, national parks would be categorised as an intrinsically dark landscape (Category E1), where as a city centre with high levels of night-time activity would be categorised as a high district brightness area (Category E4).

The applicable environmental zones for the proposal area would include Category E3, which is a medium district brightness area, that would apply to residential areas, and Category E2, which are low level lighting areas, that would apply to the rural residential areas adjacent to the Project.

Australian Standards do exist for the minimisation of light spill. Regardless of the existing brightness of a particular setting, it is a widely-accepted principal that light spill, particularly upward light spill, be minimised wherever possible.

2.2.1. Lighting impact scenarios

Glow
Light glow is typically an upward projection of light that results in illumination of the night sky above a lighting source. It is intensified, or more visually apparent when foggy or cloudy as the light reflects or disperses of water droplets in the atmosphere. Glow is visible over significant distances.

Spill
Spill is light that falls on adjacent sensitive surfaces, both vertical and horizontal, and is most intrusive where it illuminates private open spaces or spills through windows.

Hot spots
Hot spots relate to concentrated areas of bright light in an otherwise less well illuminated setting. Hot spots will be most visible where are elevated.

Kinetic / movement
Lights that change colour or flash can draw the attention of a viewer. As the speed of the colour change or blink increases in speed, so too will its prominence of ability to draw attention.

2.3. LIMITATIONS OF THE ASSESSMENT

There are the following limitations associated with this assessment:

- There is no guidance on the assessment of landscape and visual impacts specific to Australia. Additionally, as mentioned above, there are no specific legislative requirements for the methodology of an assessment such as this in New South Wales. Therefore, the Guidance note EIA-N04 Guidelines for Landscape Character and Visual Impact Assessment prepared by Roads and Maritime Services (2013) and the Guidance for Landscape and Visual Impact Assessment (GLVIA), Third Edition prepared by

Landscape Institute and Institute of Environmental Management & Assessment (2013) has been used as a basis for the methodology for this assessment;

- The VIA process aims to be objective and, as such, seeks to describe any changes factually. Potential changes resulting from the project have been defined. However, the significance of these changes requires qualitative (subjective) judgements to be made. Therefore, the conclusions to this assessment combine both objective measurement and subjective professional interpretation. This assessment has attempted to be objective, however it is recognised that visual assessment can be highly subjective and individuals are likely to associate different visual experiences to the study area;
- This LVIA is based on the master plan prepared by Florence Jaquet, Drawing No. 1703-01, 02/10/2017;
- The impact assessment is focused on the current land uses and zoning; and
- Methodology, program and timing of the construction works are currently unknown and dependent upon planning approvals. Consequently, construction impacts are not able to be assessed in this report. However, it would be acceptable to predict that there would be impacts during construction and would be similar degree of visual impact to the operational phase assessment findings.

3. SITE CONTEXT AND APPRISAL

3.1. SITE CONTEXT

The Site is located within the suburb of Wallacia, which is situated approximately 18 km south of the Penrith central business district.

Wallacia is a modestly sized, low density residential area. The township runs north-south along Greendale Road, which is adjacent to the Nepean River. The Site is located at the northern end of the township and is surrounded by semi-rural uses to the north and east (refer to ***Figure 1***).

To the north of the Site are rural uses, including creeks and dams, and cleared land. To the east of the Site are larger lot residential uses. To the south of the Site is Park Road. The following uses are located immediately adjacent to the southern boundary:

- Residential dwelling located at 21 Park Drive;
- Wallacia Christian Church located at 23-25 Park Drive; and
- The Wallacia Fire Brigade at 27 Park Road

Low density residential uses front Park Road to the south.

Adjacent to the Site to the west are residential uses, the Wallacia Hotel, and commercial uses fronting Mulgoa Road. Further to the west are low density residential uses (refer to ***Figure 2***).

The landscape in the vicinity of the Site is undulating in character with two ridgelines crossing the landscape setting (refer to ***Figure 3***). To the west of the Site lies the Nepean River at a low-lying elevation of 20 metres (m) Australian Height Datum (AHD). Continuing westward, the land significantly climbs to form the Blue Mountains National Park South which rises to elevations above 200 m AHD forming the western ridgeline (refer to ***Figure 4***).

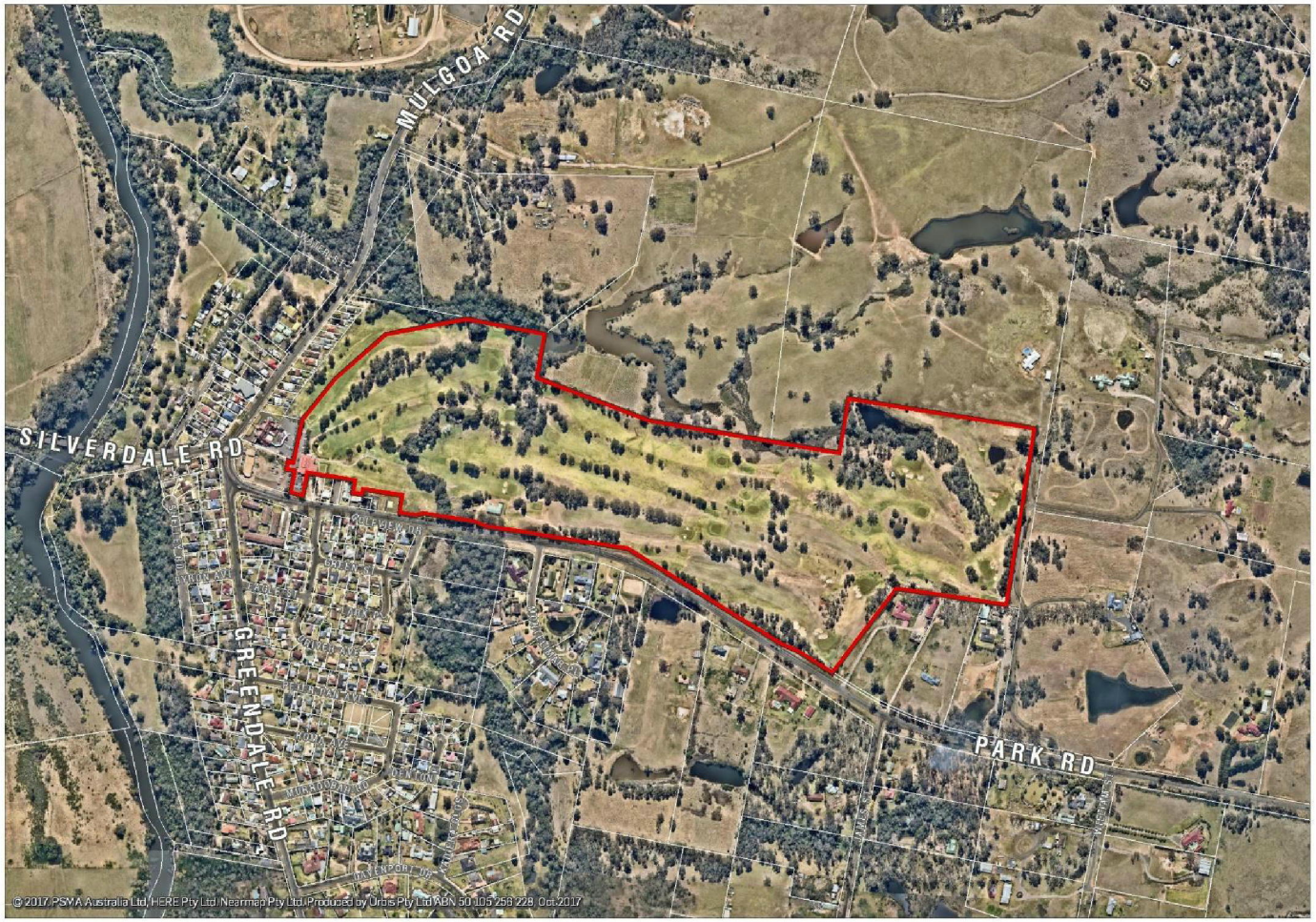
To the east of the Site, the land gradually rises from 60 m AHD to approximately 100 m AHD forming the eastern ridgeline.

There are three reserves within close proximity to the Site. Crossman Reserve is located immediately to the south across Park Road. This reserve forms part of Jerrys Creek. Fowler and Blaxland Crossing reserves are located to the west of the Site, to the east of Nepean River.

There are no items of heritage located on the Site. However, the site is located immediately adjacent to the following items of heritage (refer to ***Figure 5***):

- Wallacia Hotel (item 325);
- Archaeological heritage on Luddenham Homestead site (item A849);
- St Andrew's Anglican Church (item 326).

Figure 1 – Project area



LEGEND

SITE BOUNDARY

URBIS

WALLACIA GOLF COURSE

AERIAL PHOTOGRAPH

PRELIMINARY

DATE: 17.10.2017
JOB NO: SA6970
DWG NO: 001-001

1:10,000 @ A4

0 40 80 120 160

Figure 2 – Land use zoning

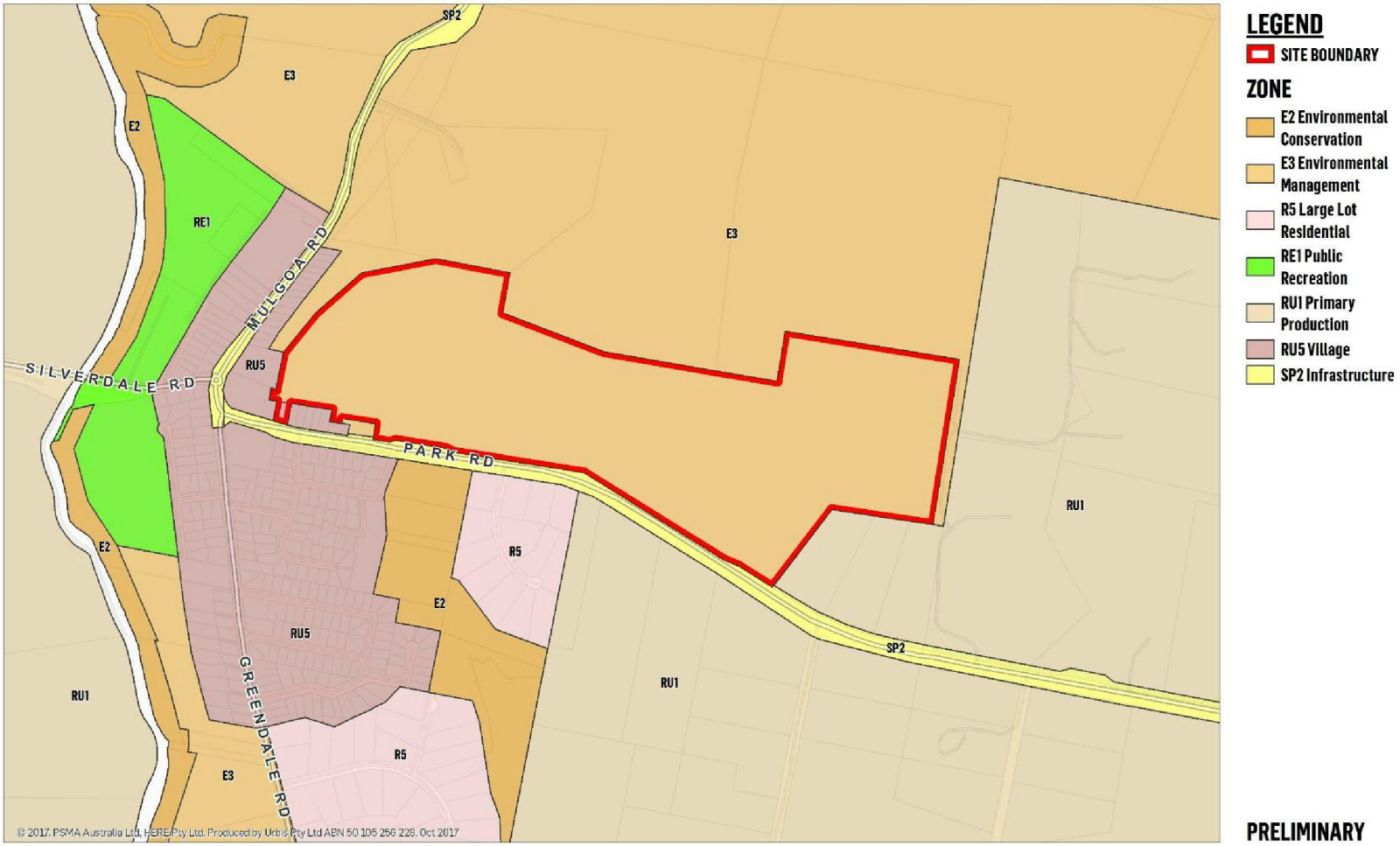
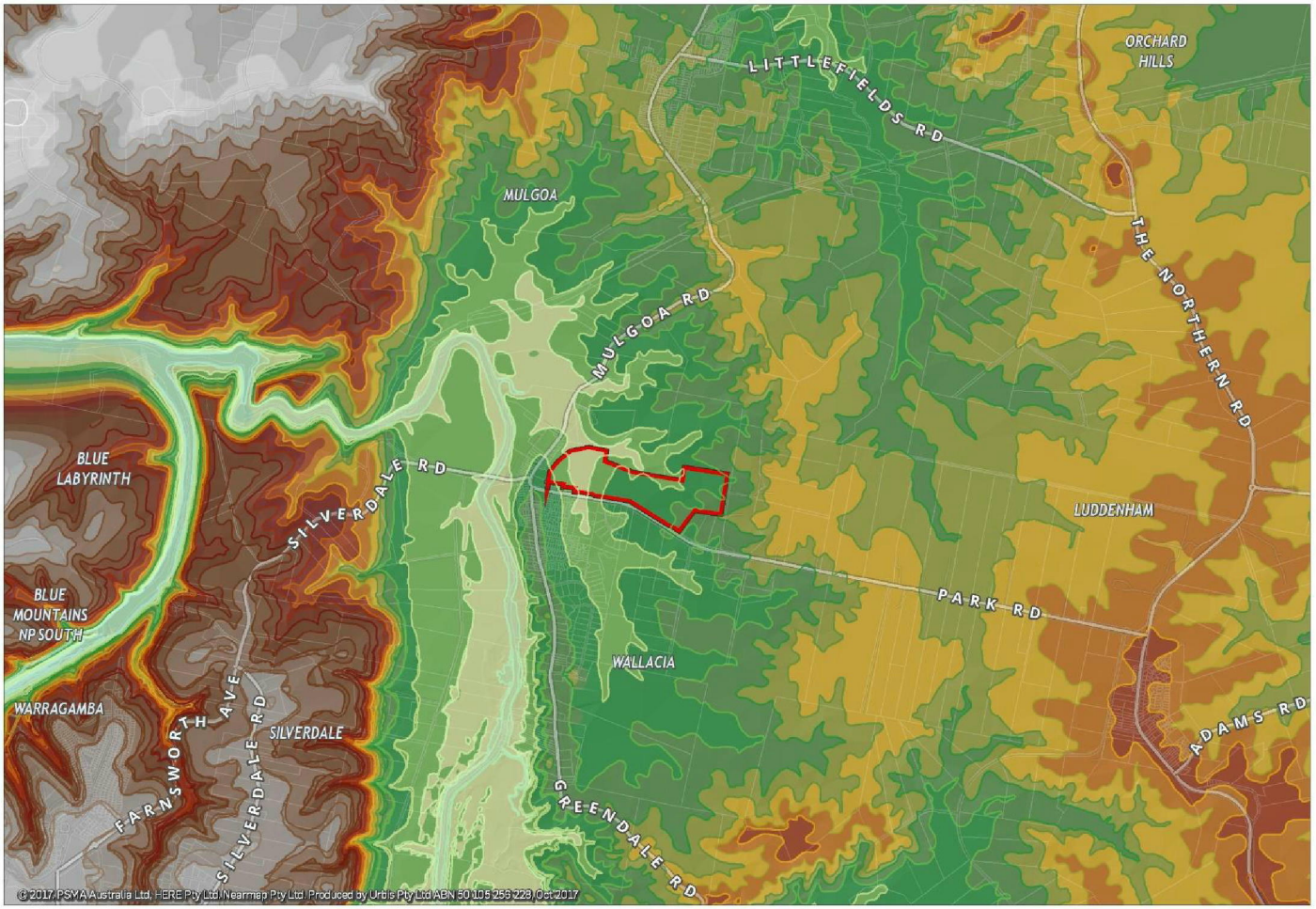


Figure 3 – Topography and elevation



LEGEND

- SITE BOUNDARY
- Less than 10m
- 10m - 20m
- 20m - 30m
- 30m - 40m
- 40m - 50m
- 50m - 60m
- 60m - 70m
- 70m - 80m
- 80m - 90m
- 90m - 100m
- 100m - 110m
- 110m - 120m
- 120m - 130m
- 130m - 140m
- 140m - 150m
- 150m - 160m
- 160m - 170m
- 170m - 180m
- 180m - 190m
- 190m - 200m

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WALLACIA GOLF COURSE

TOPOGRAPHY AND ELEVATION PLAN

1:40,000 @ A4

0 0.2 0.4 0.6 0.8

PRELIMINARY

DATE: 17.10.2017
JOB NO: SD6970
DWG NO: 001-001

Figure 4 – Scenic and landscape values

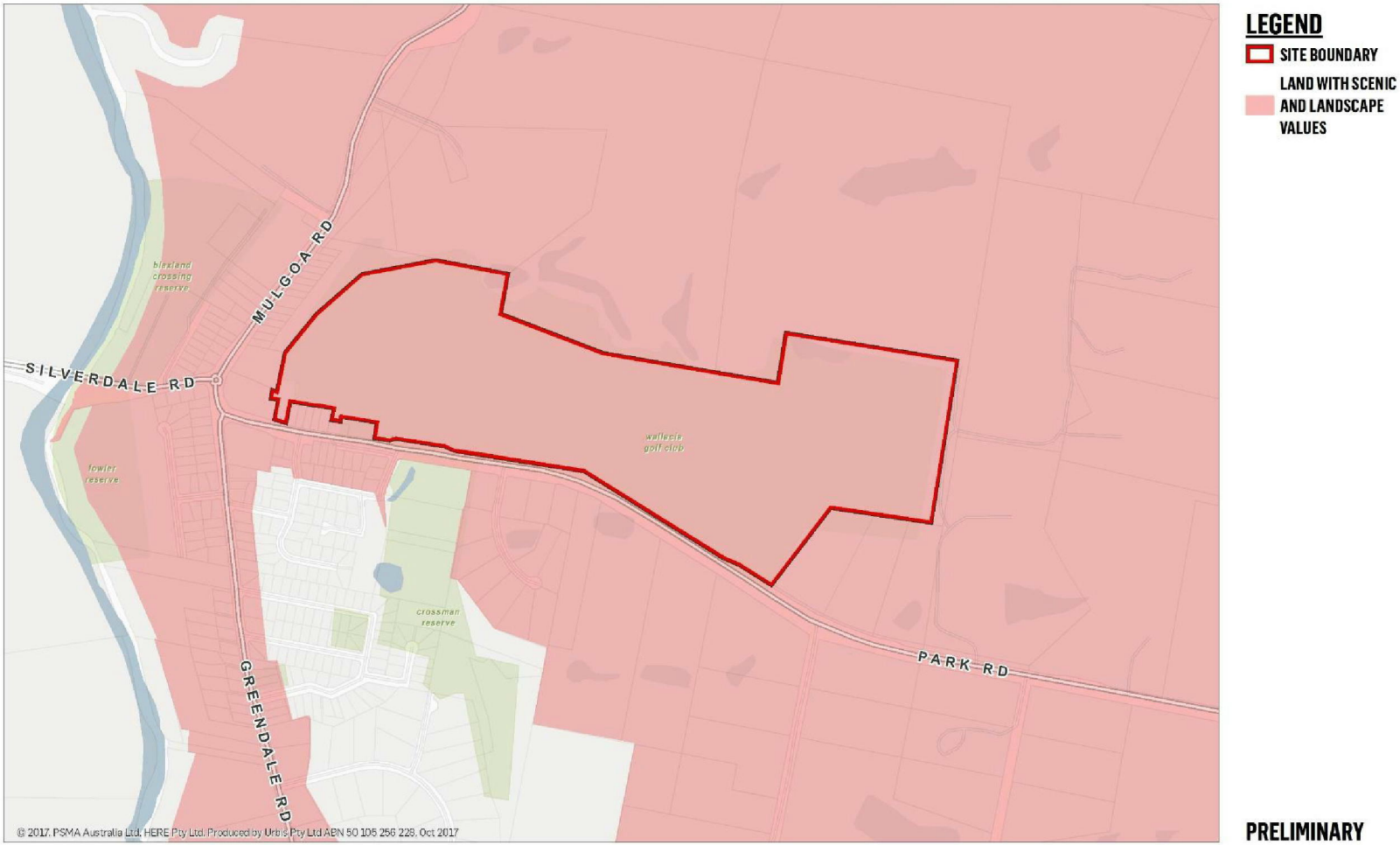
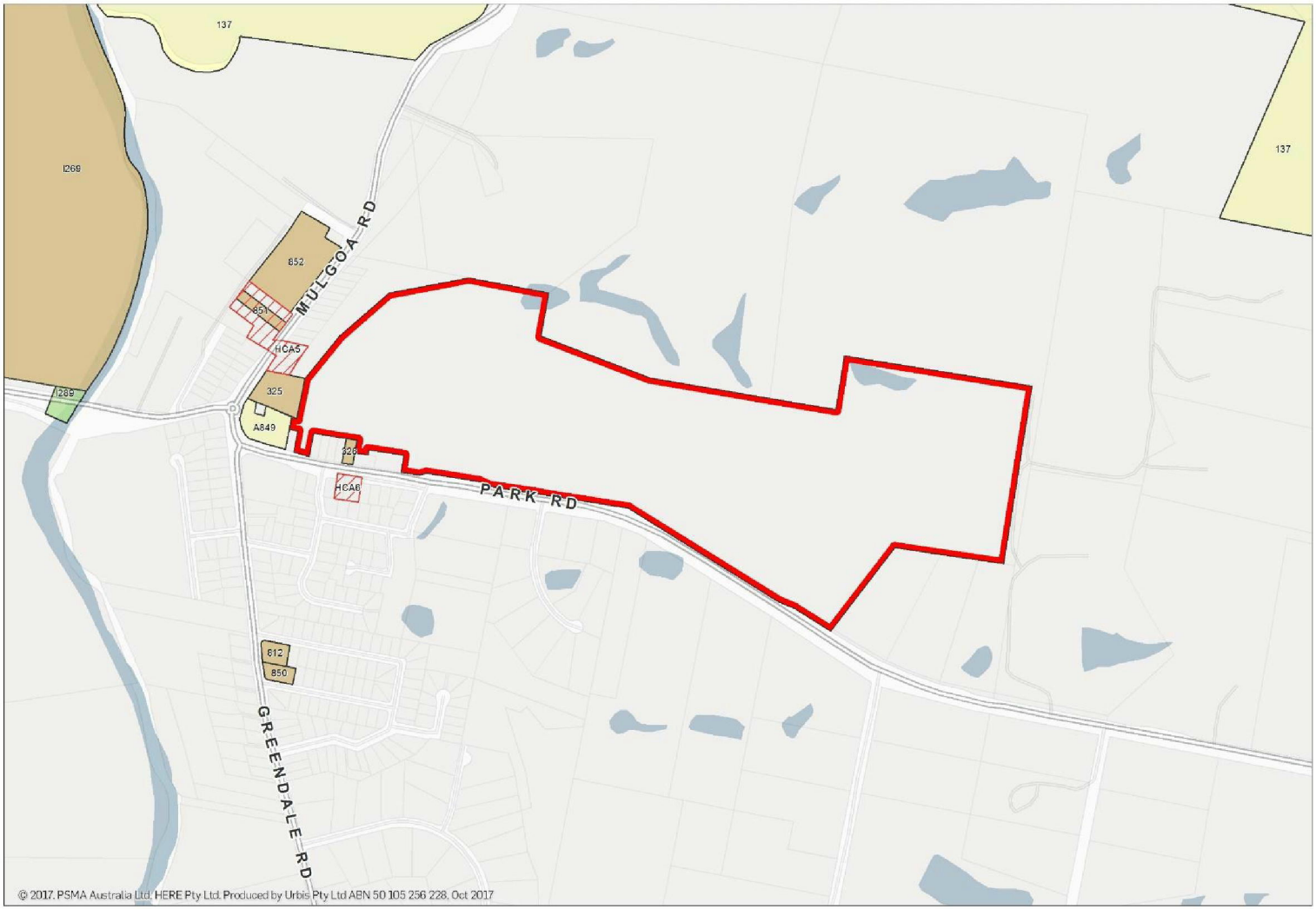


Figure 5 – Heritage



LEGEND

SITE BOUNDARY

HERITAGE ITEM

- Conservation Area - General
- Item - General
- Item - Archaeological
- Item - Landscape

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HERITAGE

1:10,000 @ A4

0 40 80 120 160

PRELIMINARY

DATE: 17.10.2017
JOB NO: SA6970
DWG NO: 005-001

Figure 6 – Flood planning

LEGEND

- SITE BOUNDARY
- FLOOD PLANNING AREA

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WALLACIA GOLF COURSE

FLOOD PLANNING

1:10,000 @ A4

0 40 80 120 160

PRELIMINARY

DATE: 17.10.2017
JOB NO: SA6970
DWG NO: 002-001

Figure 7 – Environment

LEGEND

- SITE BOUNDARY
- NATURAL RESOURCES AND SENSITIVE LAND
- PARKS & OPEN SPACE

PRELIMINARY

DATE: 17.10.2017
JOB NO: SA6970
DWG NO: 004-001

URBIS

WALLACIA GOLF COURSE
ENVIRONMENT

1:10,000 @ A4
0 40 80 120 160

3.2. THE SITE

The Site is approximately 42 hectares (ha) and is roughly an irregular rectangular shape. It currently accommodates the Panthers Wallacia Golf Course, comprising the golf course, a clubhouse building and car park.

The Site itself lies at an elevation of between 40 to 70 m) AHD rising predominately in an easterly direction (refer to ***Figure 3***). The highest point of the Site is located in the south-east corner with an elevation of approximately 70 m AHD. The western area of the Site falls in a north-westerly direction towards the Nepean River with an elevation of approximately 40 m AHD. This low-lying topography is flood prone, with the western part of the Site predominantly lying within the floodplain (refer to ***Figure 6***).

The Site is located within Environmental Management Zone (E3) (refer to ***Figure 2***).

Jerrys Creek runs through the Site in a north-south orientation (refer to ***Figure 8***). The land surrounding Jerrys Creek is identified as 'natural resources sensitive land' (refer to ***Figure 7***).

Within the Site there are windrows of tall native canopy vegetation that cross the landscape particularly in the vicinity of Jerrys Creek in the west, and around the existing dam in the north-eastern area of the Site. A scattering of smaller groups of vegetation exists along boundaries and within the centre of the Site (refer to ***Figure 9***).

There are views towards the rising Blue Mountains National Park South to the west (refer to ***Figure 10***).

Figure 8 – View of Jerrys Creek that traverses the Site north to south

Figure 9 – Canopy trees, either specimen plantings or in groups, are located across the Site

Figure 10 – Views to the Blue Mountains National Park South from within the Site

4. COMPONENTS OF THE PROJECT

4.1. KEY FEATURES

As illustrated in ***Figure 12***, the proposed development comprises the construction of a memorial park which includes:

- A new chapel and crematorium;
- A new office building;
- Retention of existing staff/workshop facility;
- New internal road network;
- Refurbishment of the existing golf club function rooms;
- Enhancement of existing dams along the northern boundary;
- Creation of two new dams within the area around Jerrys Creek;
- Augmentation of existing boundary planting and inclusion of new vegetation such as buffer and screen plantings, and avenue trees; and
- Ancillary elements such as sculptures and pedestrian paths and boardwalks.

Figure 11 – Precedent image of the landscape character of a memorial park

4.2. CONSTRUCTION STAGING

The Project is to be staged over a period of approximately 120 years. Staging will progress in an east to west direction, with Stage 1 comprising the eastern half of the Site including the new chapel, crematorium, and office building (refer to ***Figure 13***). Stage 2 extends west to include the land around Jerrys Creek. The final Stage, Stage 3, incorporates the western area adjoining Wallacia township and includes the refurbishment of the existing golf club function rooms.

The detailed staging breakdown of dates and components of the project are as follows:

Stage 1 (from 2023 to 2113)

- Administration and Chapel/Crematorium Complex;
- Golf Club refurbishment;
- New eastern entrance;
- All roads within Stage 1;
- All landscaping and furniture within Stage 1; and
- Golf Course redesigned to smaller footprint and refurbished.

Stage 2 (from 2114 to 2138)

- All roads within Stage 2;
- All landscaping and furniture within Stage 2; and
- Western part of the site developed as a Public Open Space.

Stage 3 (from 2139 to 2150)

- All roads within Stage 3; and
- All landscaping and furniture within Stage 3.

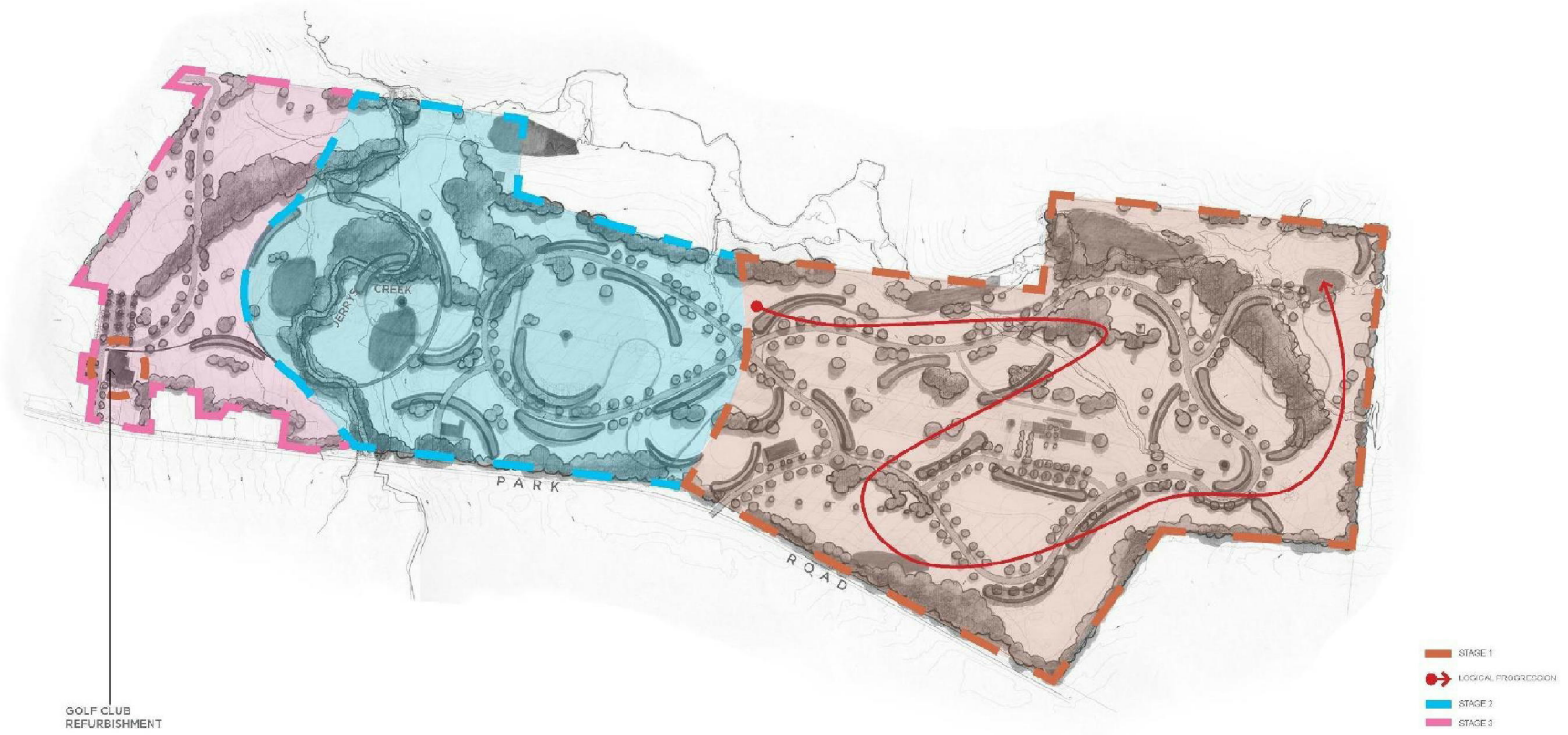
4.3. OPERATION

The hours of operation for the Project will be primarily during the daylight hours of 8 am to 6 pm, and will occur seven days a week.

Figure 12 – Landscape Masterplan for the Project

Florence Jaquet Landscape Architect Cemetery Specialist	PROJECT NAME: WALLACIA MEMORIAL PARK	SCALE: 1:4000 @A3	ISSUE / INFO.	DESCRIPTION / CLIENT	DATE / 02.10.2017	REVISION	CLIENT: THE CATHOLIC METROPOLITAN CEMETERIES TRUST	DATE: 02.10.2017 TITLE: MASTERPLAN PROJECT NO:1703	DRAWN BY: JM SHEET NO: 01	A: 8 Rowell Av Camberwell 3124 E: flo@fjla.com.au M: 0419 983 641

Figure 13 – Project Staging



Florence Jaquet Landscape Architect Cemetery Specialist	PROJECT NAME: WALLACIA MEMORIAL PARK	SCALE: 1:4000 @A3	ISSUE INFO	DESCRIPTION CLIENT	DATE 02.10.2017	REVISION	CLIENT: THE CATHOLIC METROPOLITAN CEMETERIES TRUST	DATE: 02.10.2017 TITLE: STAGING PLAN PROJECT NO:1703	DRAWN BY: JM SHEET NO: 02	A: 8 Rowell Av Camberwell 3124 E: flo@fjla.com.au M: 0419 983 641

5. PLANNING CONSIDERATIONS FOR THE FUTURE DEVELOPMENT

The Site is subject to the provisions of the Penrith Local Environmental and Development Control plans. The following section summaries the key planning policies and controls which are of relevance to this LVIA.

5.1. PENRITH LOCAL ENVIRONMENTAL PLAN 2010

RELEVANT CONTROL	OBJECTIVES
Zone E3 – Environmental Management	• *To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.* • *To provide for a limited range of development that does not have an adverse effect on those values.* • *To minimise conflict between land uses within the zone and land uses within adjoining zones.* • *To ensure development is compatible with the environmental capabilities of the land and does not unreasonably increase the demand for public services or public facilities.* • To preserve and improve natural resources through appropriate land management practices.
Natural Recourses Sensitive Land	Land surrounding Jerrys Creek (running through the site in a north-south alignment) is identified as '**natural resources sensitive land**', as such clause 7.3 of the PLEP 2010 applies. The clause relates to subdivision, any earthworks, the carrying out of work, clearing vegetation and irrigation. *(1) The objectives of this clause are as follows:* *(a) to protect, enhance and manage the ecological, hydrological, scientific, cultural and aesthetic values of biodiversity and wildlife habitat corridors, natural waterways and riparian land,* *(b) to enhance connections between remnants of indigenous vegetation,* *(c) to prevent the fragmentation and degradation of remnant vegetation,* *(d) to ensure that clearing and other development is located and designed to avoid or minimise the impact on the ecological, hydrological, scientific, cultural and aesthetic values of biodiversity and wildlife habitat corridors, natural waterways and riparian land.* As per clause 7.3, when assessing a DA for **any earthworks, the carrying out of work, clearing vegetation or irrigation**, the consent authority must consider whether the development meets the objectives of the clause and the following considerations: *(a) the condition and significance of the vegetation on the land and whether it should be substantially retained in that location,* *(b) the importance of the vegetation in that particular location to native fauna,*

	(c) the strategic importance of the land as part of a biodiversity corridor, *(d) the sensitivity of the land and the effect of clearing vegetation,* *(e) the relative stability of the bed and banks of any waterway that may be affected by the development, whether on the site, upstream or downstream,* *(f) the effect of the development on waterway health, including pollution of the waterway, a significant increase or decrease in the amount or velocity of runoff entering the waterway, or a significant increase in siltation of the waterway,* *(g) the effect of the development on the functions of aquatic ecosystems (such as habitat and connectivity).* *(5) Development consent must not be granted to development mentioned in subclause (3) unless the consent authority is satisfied that:* *(a) the development is designed and will be located and managed to avoid any potential adverse environmental impact, or* *(b) if a potential adverse environmental impact cannot be avoided, the development:* *(i) is designed and located so as to have minimum adverse impact, and* *(ii) incorporates effective measures to remedy or mitigate any adverse impact caused.*
Scenic and Landscape Values	The site is identified as land with Scenic and Landscape Values as per clause 7.5. *(1) The objectives of this clause are as follows:* *(a) to identify and protect areas that have particular scenic value either from major roads, identified heritage items or other public places,* *(b) to ensure development in these areas is located and designed to minimise its visual impact.* *(2) This clause applies to land identified as "Land with scenic and landscape values" on the Scenic and Landscape Values Map.* *(3) Development consent must not be granted for any development on land to which this clause applies unless the consent authority is satisfied that measures will be taken, including in relation to the location and design of the development, to minimise the visual impact of the development from major roads and other public places.*
Flood Planning	The western portion of the site is identified as a flood planning area. The consent authority must be satisfied that any proposed development is compatible with any flood hazards of the land and is not likely to adversely affect the safe use and evacuation of the land.

5.2. PENRITH DEVELOPMENT CONTROL PLAN 2014

RELEVANT CONTROL	OBJECTIVES
Part C2, Vegetation management	Vegetation within 'natural recourses sensitive land corridor' (identified above) is to be retained as far as possible to avoid fragmentation
Part C3 Water Management	Jerrys Creek is classified as a third order stream. Where possible, the natural (or historic) alignment of an existing wetland or watercourse should be retained, along with its natural dimensions and flow regimes. Third order streams are to comprise a 30m vegetated buffer zone along each side of the waterway
Part D, 5.8 Cemeteries and, crematoria and Funeral Homes	**Objectives** *a) To ensure the operation of cemeteries, crematoria and funeral homes does not have a significant negative impact on the surrounding area, including properties used for agriculture;* *b) To ensure sufficient buffer zones are provided around the edge of sites to minimise impact on adjoining land uses; and* *c) To ensure that uses locate on roads with sufficient capacity to accommodate likely traffic generation.* **Controls** *1) Cemeteries, crematoria and funeral homes may not locate immediately adjacent to properties used primarily for residential development only (including rural residential/rural living or seniors housing) unless a sufficient separation can be obtained between any buildings on the site and any adjacent dwellings. The extent of the separation needed will vary with the scale of the proposed development.* *2) Sufficient separation should also be provided to minimise potential conflicts between cemeteries and crematoria and properties used for agriculture in rural areas.* *3) Cemeteries and crematoria must locate on a site with a minimum area of 10 hectares.* *4) A landscaped buffer zone 15m wide must be provided to the side and rear boundaries of the site.* *5) Cemeteries, crematoria and funeral homes must locate on a road with sufficient capacity to accommodate likely traffic generation.* *6) A traffic impact assessment may be required for the development of a cemetery, crematorium or funeral home.* *7) Cemeteries and crematoria must comply with relevant legislation including the Public Health Act 1991 and Protection of the Environment Operations Act 1997 and supporting regulations*
Part E9 Mulgoa Valley	**Mulgoa Road** 1) Mulgoa Road shall be maintained as a rural road and shall not be improved to the level of a major regional thoroughfare.

	2) Consent shall not be granted to development in the Mulgoa Valley Precinct if: a) The safety and efficiency of Mulgoa Road will be adversely affected by the design and siting of the proposed access and by the nature, volume and frequency of vehicles using Mulgoa Road to gain access to the development; and b) Any upgrading or strengthening of Mulgoa Road required to maintain its safety and efficiency detracts from the present rural character and function of Mulgoa Road.

6. VISUAL IMPACT ASSESSMENT

6.1. VISIBILITY OF THE PROPOSAL

The viewshed or visual catchment is the area from which views of a proposed development may be possible.

As demonstrated through the site analysis process, given the relatively low elevation of the components of the proposal above ground level, the visual catchment is highly constrained by the presence of vegetation and built form (refer to ***Figure 14***). As a result, perpendicular views are only possible from a limited number of roadways aligned adjacent to the Project. The main interfacing road is Park Road and views from the roadway to the Project area are heavily, to partially screened. Silverdale Road has the greatest length of roadway aligned towards the proposal. However, all views are screened by intervening vegetation or built form, most notably the existing Wallacia Golf Course clubhouse which is located at the axis of the viewline.

6.2. SENSITIVE VIEWPOINTS

The viewpoint (VP) locations that are included in this assessment are from uses considered to be of higher sensitivity, such as secondary urban roads and urban and rural residential areas (refer to ***Table 2*** and ***Figure 15***). However, the surrounding screening provided by built form or vegetation results in limited views. The locations that have been assessed are representative of a number of typical viewpoints of similar sensitivity.

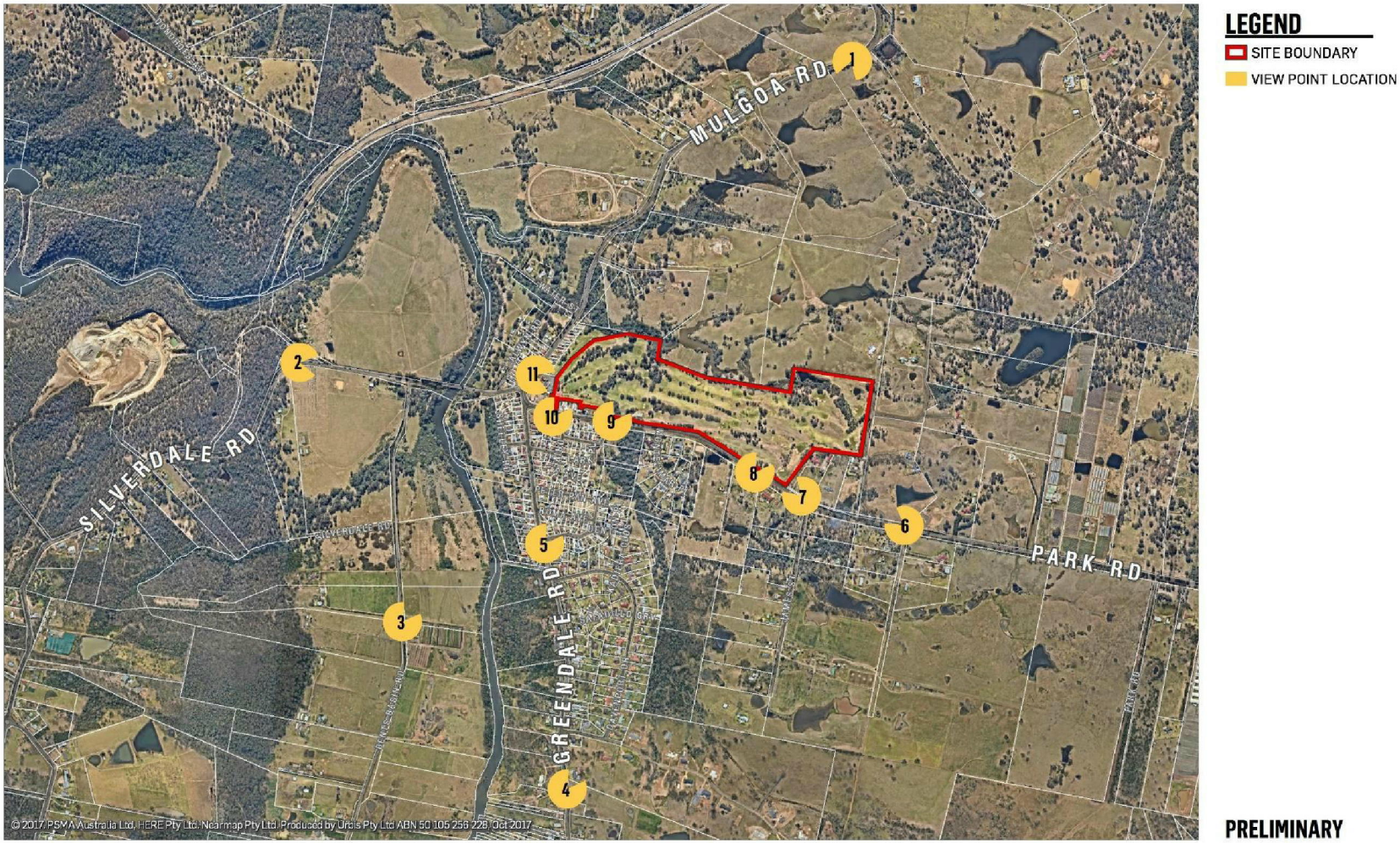
The locations selected for photography and assessment are within the public realm, within proximity to the sensitive visual use area.

6.3. VISUAL IMPACT

This section includes a detailed assessment of the proposal from the selected, highest sensitivity viewpoints, with a rating given for magnitude and sensitivity, which when combined, result in a determination of the degree of overall visual impact for each viewing location.

Figure 14 – Viewline analysis from sensitive interfaces

Figure 15 – Key sensitive viewpoint locations



LEGEND

- SITE BOUNDARY
- VIEW POINT LOCATION

PRELIMINARY

DATE: 18.10.2017
JOB NO: SA6970
DWG NO: 001-001

URBIS

WALLACIA GOLF COURSE

VIEWPOINT LOCATION PLAN

1:21,121 @ A4

0 100 200 300 400

VIEWPOINT 1 – MULGOA ROAD

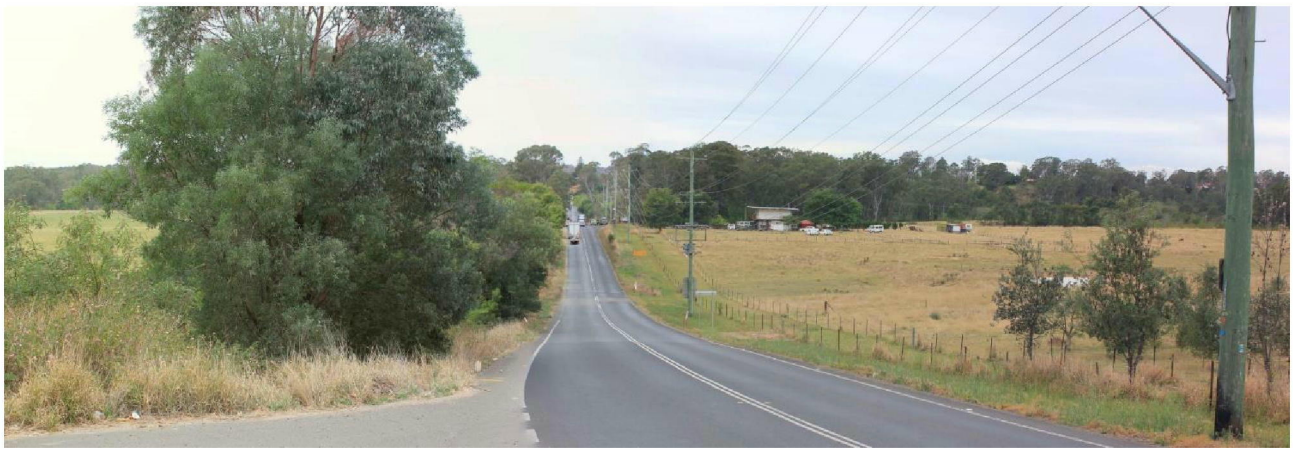
Viewing Location	Roadway to the north of the Project site at a point where the curve in the road is aligned to the Project.
Viewing Distance	1.3 km to the Project.
Duration of View and Frequency of View	Duration: Mobile. Frequency: Medium.
Visual Use Area	Secondary road through rural residential area.
Visual Sensitivity	**MODERATE** - Sensitivity of users is moderate based on the rural residential use of a local road between residential areas.
Magnitude	**NEGLIGIBLE** – From this viewpoint, the Project is completely obscured from view by intervening bands of vegetation on rising topography in the middleground of the rural landscape (refer to ***Figure 16***). As a result, it is anticipated that the magnitude of change to the visual setting from this viewpoint will be negligible.
Visual Impact	**NEGLIGIBLE** – Given the resultant lack of visibility of the Project, it is anticipated that the potential visual impact will be negligible.

Figure 16 – VP1: Existing view towards proposal site

VIEWPOINT 2 – SILVERDALE ROAD

Viewing Location	Roadway to the west of the proposal site aligned directly towards the Project.
Viewing Distance	1 km to the Project.
Duration of View and Frequency of View	Duration: Mobile. Frequency: Medium.
Visual Use Area	Secondary road through rural residential area.
Visual Sensitivity	**MODERATE** - Sensitivity of users is moderate based on the rural residential use.
Magnitude	**NEGLIGIBLE** – From this viewpoint, the Project is completely obscured from view by intervening vegetation on rising topography to the east of the Nepean River (refer to ***Figure 17***). As a result, it is anticipated that the magnitude of change to the visual setting from this viewpoint will be negligible.
Visual Impact	**NEGLIGIBLE** – Given the resultant lack of visibility of the Project, it is anticipated that the potential visual impact will be negligible.

Figure 17 – VP2: Existing view towards proposal site



VIEWPOINT 3 – Bents Basin Road

Viewing Location	Roadway to the southwest of the proposal site with viewline aligned well to the west of the Project site.
Viewing Distance	1.1 km to the Project.
Duration of View and Frequency of View	Duration: Mobile. Frequency: Low.
Visual Use Area	Local road through rural area.
Visual Sensitivity	**LOW** - Sensitivity of users is low based on the use of a local road through a predominately rural area.
Magnitude	**NEGLIGIBLE** – From this viewpoint, the Project is completely obscured from view by intervening vegetation along the Nepean River (refer to ***Figure 18***). As a result, it is anticipated that the magnitude of change to the visual setting from this viewpoint will be negligible.
Visual Impact	**NEGLIGIBLE** – Given the resultant lack of visibility of the Project, it is anticipated that the potential visual impact will be negligible.

Figure 18 – VP3: Existing view towards proposal site

VIEWPOINT 4 – Greendale Road

Viewing Location	Roadway to the south - southwest of the Project site with viewline aligned towards the western boundary of the Project site.
Viewing Distance	1.6 km to the Project.
Duration of View and Frequency of View	Duration: Mobile. Frequency: Moderate.
Visual Use Area	Secondary road through rural residential area.
Visual Sensitivity	**MODERATE** - Sensitivity of users is moderate based on the transition from lower sensitivity rural uses to higher sensitivity residential local road use.
Magnitude	**NEGLIGIBLE** – From this viewpoint, the Project is completely obscured from view by intervening vegetation and rising topography in the middleground (refer to ***Figure 19***). As a result, it is anticipated that the magnitude of change to the visual setting from this viewpoint will be negligible.
Visual Impact	**NEGLIGIBLE** – Given the resultant lack of visibility of the Project, it is anticipated that the potential visual impact will be negligible.

Figure 19 – VP4: Existing view towards proposal site

VIEWPOINT 5 – Greendale Road

Viewing Location	Roadway to the southwest of the Project site with viewline aligned towards the western boundary of the Project site.
Viewing Distance	0.6 km to the Project.
Duration of View and Frequency of View	Duration: Mobile. Frequency: Moderate.
Visual Use Area	Secondary road through residential area.
Visual Sensitivity	**HIGH** - Sensitivity of users is high based on the residential local road use.
Magnitude	**NEGLIGIBLE** – From this viewpoint, the Project is completely obscured from view by built form in the foreground, combined with vegetation (refer to ***Figure 20***). As a result, it is anticipated that the magnitude of change to the visual setting from this viewpoint will be negligible.
Visual Impact	**NEGLIGIBLE** – Given the resultant lack of visibility of the Project, it is anticipated that the potential visual impact will be negligible.

Figure 20 – VP5: Existing view towards proposal site

VIEWPOINT 6 – PARK ROAD

Viewing Location	Roadway to the east of the Project site aligned along the southern boundary of the Project.
Viewing Distance	500 m to the Project.
Duration of View and Frequency of View	Duration: Mobile. Frequency: Medium.
Visual Use Area	Secondary road through rural residential area.
Visual Sensitivity	**MODERATE** - Sensitivity of users is moderate based on the rural residential use of a local road.
Magnitude	**NEGLIGIBLE** – From this viewpoint, the Project is completely obscured from view by middleground vegetation surrounding intervening rural residential properties (refer to ***Figure 21***). As a result, it is anticipated that the magnitude of change to the visual setting from this viewpoint will be negligible.
Visual Impact	**NEGLIGIBLE** – Given the resultant lack of visibility of the Project, it is anticipated that the potential visual impact will be negligible.

Figure 21 – VP6: Existing view towards proposal site

VIEWPOINT 7 – PARK ROAD

Viewing Location	Roadway immediately adjacent to the south of the Project site.
Viewing Distance	100 m to the Project.
Duration of View and Frequency of View	Duration: Mobile. Frequency: Medium.
Visual Use Area	Secondary road through rural residential area.
Visual Sensitivity	**MODERATE** - Sensitivity of users is moderate based on the rural residential use of a local road.
Magnitude	**NEGLIGIBLE** – From this viewpoint, the Project is partially screened from view by foreground vegetation around the perimeter of the Project site (refer to ***Figure 22***). As a result, it is anticipated that the magnitude of change to the visual setting from this viewpoint will be negligible to low.
Visual Impact	**NEGLIGIBLE** – Given the relative lack of visibility of the Project, it is anticipated that the potential visual impact will be negligible to low.

Figure 22 – VP7: Existing view towards proposal site

VIEWPOINT 8 – PARK ROAD

Viewing Location	Roadway immediately adjacent to the south of the Project site.
Viewing Distance	5 m to the Project.
Duration of View and Frequency of View	Duration: Mobile. Frequency: Medium.
Visual Use Area	Secondary road through rural residential area.
Visual Sensitivity	**MODERATE** - Sensitivity of users is moderate based on the rural residential use of a secondary road.
Magnitude	**LOW** – From this viewpoint, the Project is partially screened from view by foreground canopy vegetation around the perimeter of the Project site. Views to part of the Project site are possible beneath the canopy and through tree trunks (refer to ***Figure 23***). As a result, it is anticipated that the magnitude of change to the visual setting from this viewpoint will be low.
Visual Impact	**LOW** – Given the relative lack of visibility of the Project, it is anticipated that the potential visual impact will be low.

Figure 23 – VP8: Existing view towards proposal site

VIEWPOINT 9 – PARK ROAD

Viewing Location	Roadway immediately adjacent to the south of the Project site.
Viewing Distance	5 m to the Project.
Duration of View and Frequency of View	Duration: Mobile. Frequency: Medium.
Visual Use Area	Secondary road through residential area.
Visual Sensitivity	**HIGH** - Sensitivity of users is high based on the residential use of a secondary road.
Magnitude	**NEGLIGIBLE** – From this viewpoint, the Project is screened from view by foreground vegetation around the perimeter of the Project site (refer to ***Figure 24***). As a result, it is anticipated that the magnitude of change to the visual setting from this viewpoint will be negligible.
Visual Impact	**NEGLIGIBLE** – Given the relative lack of visibility of the Project, it is anticipated that the potential visual impact will be negligible.

Figure 24 – VP9: Existing view towards proposal site

VIEWPOINT 10 – PARK ROAD

Viewing Location	Roadway immediately adjacent to the south of the Project site.
Viewing Distance	5 m to the Project.
Duration of View and Frequency of View	Duration: Mobile. Frequency: Medium.
Visual Use Area	Secondary road through urban residential area.
Visual Sensitivity	**HIGH** - Sensitivity of users is high based on the residential use of a secondary road.
Magnitude	**NEGLIGIBLE** – From this slightly elevated viewpoint, views are over the site and its canopy of trees. Views to the ground plane are completely screened by vegetation in the fore and middle ground, as well as buildings in the foreground (refer to ***Figure 25***). As a result, it is anticipated that the magnitude of change to the visual setting from this viewpoint will be negligible to low.
Visual Impact	**NEGLIGIBLE to LOW** – Given the relative lack of visibility of the Project, it is anticipated that the potential visual impact will be negligible to low.

Figure 25 – VP10: Existing view towards proposal site

VIEWPOINT 11 – MULGOA ROAD / RESIDENTIAL AREA

Viewing Location	Roadway immediately adjacent to the south of the Project site.
Viewing Distance	Road - 40 m to the Project. Residences – Immediately adjacent to the Project
Duration of View and Frequency of View	Duration: Road - Mobile. Residences - Stationery Frequency: Medium.
Visual Use Area	Secondary road through residential area and abutting residential uses.
Visual Sensitivity	**HIGH** - Sensitivity of users is high based on the residential use.
Magnitude	**LOW** – The single storey residences and their associated vegetation screen views to the Project from Mulgoa Road. The standard height, 1.8 m high fencing around the rear yards of the residences screens views to the ground plane of the Project from both the interiors of the residences as well as the rear yards. From the rear yards, the Project is partially screened from view by foreground canopy vegetation around the perimeter of the Project site (refer to ***Figure 26***). As a result, it is anticipated that the magnitude of change to the visual setting from this viewpoint will be negligible to low.
Visual Impact	**LOW to MODERATE** – Given views of the Project will be largely screened, it is anticipated that the potential visual impact will be low to moderate for adjacent residences. The impact on views from Mulgoa Road will be negligible.

Figure 26 – VP11: Existing view towards proposal site

6.3.1. Lighting impacts

The applicable environmental lighting zones for the proposal area would include Category E3, which is a medium district brightness area which would apply to residential areas and Category E2, which is a low district lighting area, which would apply to the adjacent rural residential areas.

Within both the Category E2 and E3 areas the proposal does not result in a lighting impact due to the primarily daytime use of the proposed activity. The lighting requirement would be very similar to that of the existing golf course operations.

The limited amount of lighting associated with the project is unlikely to result in glow into the night sky. Minor hot spots may result where there are views through vegetation to driveway or building lighting. Lighting impacts resulting from moving vehicles are also expected to be minimal.

7. AMELIORATION STRATEGIES

A Landscape Masterplan has been prepared for the Project by Florence Jaquet (*Error! Reference source not found.*). The primary ameliorative actions include perimeter screen planting along the Project's boundaries, particularly Park Road.

7.1. BUILT FORM SITING AND DESIGN

The location of built form on the site, as well as its scale and form, will play a significant role in the integration within the visual setting, as well as the resulting level of visual impact. Key considerations are:

- Size and proportion of built-form in relation to the tree canopy height – built form should not exceed the height of the surrounding vegetation on the Project site.
- Location of built form - built form should be either located proximate to existing larger built form elements, or be positioned to ensure adequate separation for the establishment of softening vegetation to assist with integration within the landscape setting.
- Response / contribution to local architectural character – the architectural response should seek to provide for expression of form and materiality that is consistent with, or sympathetic to, the character of the area.

7.2. CONSTRUCTION MATERIAL SELECTION

The visual impact would be reduced through the cladding of the buildings with non-reflective materials with subdued colours that mimic those found in the landscape or urban setting, for example greys, browns and olive greens. Bright, un-natural colours have been avoided.

7.3. VISUAL SCREENING

The canopy tree and shrub planting proposed for the boundaries of the Project would provide visual screening of much of the site and would assist in "settling" new buildings within the landscape.

7.4. MANAGEMENT OF POTENTIAL LIGHTING IMPACTS

It is not anticipated that the level of lighting would be significantly different to that of the existing golf course uses. However, the proponent should seek to minimise light emissions from the Project by carefully selecting the sites where lights would be placed, and by use of physical barriers and/or operational measures to reduce light 'spill' without compromising user safety. Measures that could be employed to mitigate potential impacts from night-lighting may include the following, where practicable:

- All external lighting associated with the Project would comply with Australian Standard AS 4282: 1997 – Control of the Obtrusive Effects of Outdoor Lighting.
- Restriction of night-lighting to the minimum required for operations and safety requirements.
- Use of directional lighting techniques.
- Use of light shrouds and reflectors to limit the spill of lighting.

8. CONCLUSION

8.1. LANDSCAPE CHARACTER IMPACTS

The Project is of a character which is very similar to the existing golf course landscape. Both are comprised of an undulating, natural landform, with curving, lineal bands of trees in a predominately open grassed setting. Built form in both the existing and proposed scenarios is limited to small, isolated buildings set in the round.

The proposal will also comprise low walls for memorial plaques and plaques or headstones at ground level. The low profile of these components will ensure that there will be no interruption to views over the tree canopy line.

Based on the assessment of visual compatibility with the existing landscape of the surrounding setting, the components of the project will result in a landscape not dissimilar to the golf course landscape.

8.2. VISUAL IMPACTS

The Project is assessed as having a negligible to low visual impact on surrounding sensitive uses and viewpoints. Views to the Project are typically screened by either perimeter or on-site vegetation, or built form along its western and south western interfaces.

Adjacent elevated areas to the north and west are not elevated enough to allow for overlooking of the project.

Views from the southern boundary along Park Road are typically screened or filtered by vegetation. A few limited locations allow for unobstructed views to the foreground. Banded vegetation within the project site prevent more extensive views.

Views from Mulgoa Road and Greendale Road are screened mainly by built form. The single storey residences fronting Mulgoa Road and immediately adjacent to the Project, are surrounded by standard height, 1.8 m high fencing around the rear yards of the residences. This screens views to the ground plane of the Project from both the interiors of the residences as well as the rear yards. From the rear yards, the Project is also partially screened from view by foreground canopy vegetation around the perimeter of the Project site

Views from surrounding scattered rural residences to the east and north are typically either screened, or heavily filtered by surrounding vegetation.

There are potentially views from a limited number of residences at the eastern end of Donahoes Avenue, 1.8 km from the project area. However, based on the distance, as well as the presence of vegetation throughout the Project site, any visual impacts will be limited.

8.3. LIGHTING IMPACTS

Within both the Category E2 and E3 areas of the setting the Project will not result in a lighting impact due to the primarily daytime use of the proposed activity. The lighting requirement would be very similar to that of the existing golf course operations and consequently, any lighting impact would also be very similar.

DISCLAIMER

This report is dated 14 February 2017 and incorporates information and events up to that date only and excludes any information arising, or event occurring, after that date which may affect the validity of Urbis Pty Ltd's (**Urbis**) opinion in this report. Urbis prepared this report on the instructions, and for the benefit only, of Catholic Metropolitan Cemeteries Trust (**Instructing Party**) for the purpose of Planning Approval (**Purpose**) and not for any other purpose or use. To the extent permitted by applicable law, Urbis expressly disclaims all liability, whether direct or indirect, to the Instructing Party which relies or purports to rely on this report for any purpose other than the Purpose, and to any other person which relies or purports to rely on this report for any purpose whatsoever (including the Purpose).

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APPENDIX A GUIDANCE NOTES FOR THE REDUCTION OF OBTRUSIVE LIGHT

GUIDANCE NOTES FOR THE REDUCTION OF OBTRUSIVE LIGHT

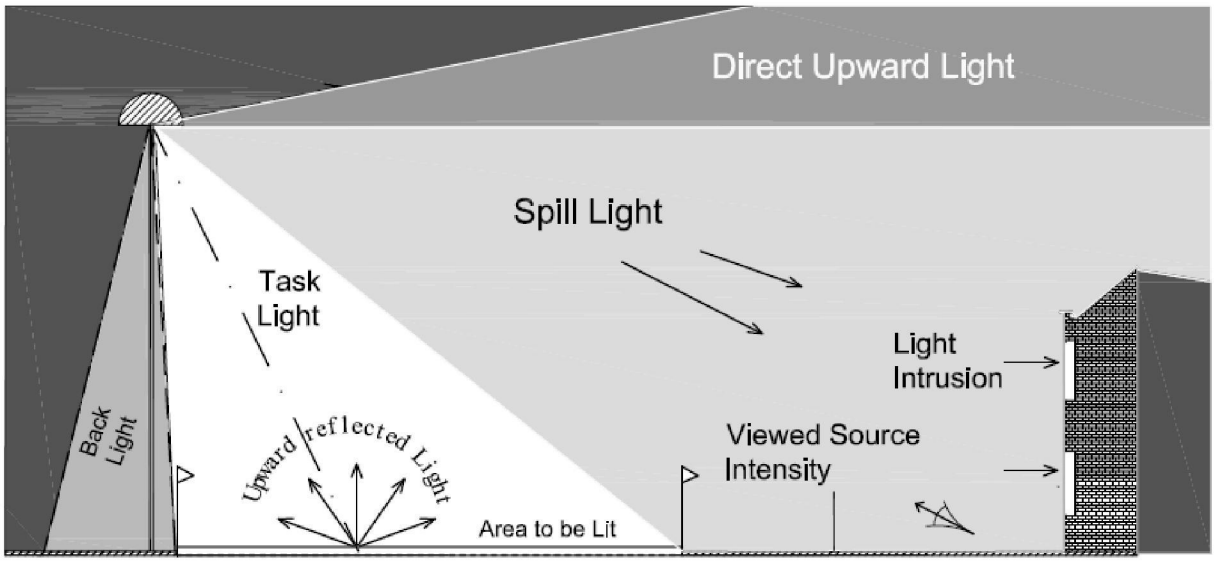
"Think before you light - The right amount of light, where wanted, when wanted."

Man's invention of artificial light has done much to safeguard and enhance our night-time environment but, if not properly controlled, **obtrusive light** (sometimes referred to as light pollution) can present serious physiological and ecological problems.

Obtrusive Light, whether it keeps you awake through a bedroom window or impedes your view of the night sky, is a form of pollution, which may also be a nuisance in law and which can be substantially reduced without detriment to the lighting task.

Sky glow, the brightening of the night sky, **Glare** the uncomfortable brightness of a light source when viewed against a darker background, and **Light Intrusion ("Trespass")**, the spilling of light beyond the boundary of the property or area being lit, are all forms of obtrusive light which may cause nuisance to others and waste money and energy. Think before you light. Is it necessary? What effect will it have on others? Will it cause a nuisance? How can you minimise the problem?

Figure 1 – Types of obtrusive light



Do not "over" light. This is a major cause of obtrusive light and is a waste of energy. There are published standards for most lighting tasks, adherence to which will help minimise upward reflected light. Organisations from which full details of these standards can be obtained are given on the last page of this leaflet.

Dim or switch off lights when the task is finished. Generally a lower level of lighting will suffice to enhance the night time scene than that required for safety and security.

"Good Design equals Good Lighting"

Any lighting scheme will consist of three basic elements: a light source, a luminaire and a method of installation.

Light sources (Lamps)

Remember that the light source output in LUMENS is not the same as the wattage and that it is the former that is important in combating the problems of obtrusive light.

Most nightime visual tasks are only dependant on light radiated within the visual spectrum. It is therefore NOT necessary for light sources to emit either ultra-violet or infra-red radiation unless specifically designed to do so. It is also understood that light from the shorter wavelengths of the spectrum has important effects on both flora and fauna that should be considered.

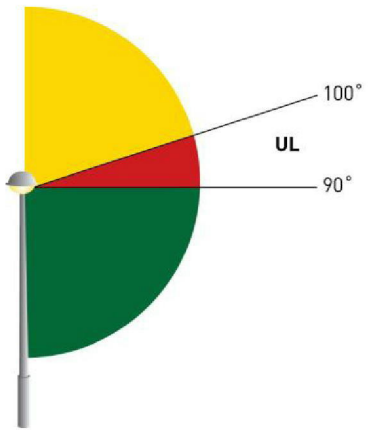
Research indicates that light from the blue end of the spectrum has important non-visual effects on the health of the human body, in particular in our sleep/wake patterns. It is therefore important to appreciate that while in obtrusive light terms the use of blue light should be minimised, there are many night-time tasks such as driving and sports where to be fully awake is an important aid to safety.

Luminaires

Care should always be taken when selecting luminaires to ensure that appropriate products are chosen and that their location will reduce spill light and glare to a minimum.

Use specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal. The most sensitive/critical zones for minimising sky glow are those between 90° and 100° as shown in Figure 2 and referred to as the lower, upward light output zone (UL).

Figure 2 – Critical luminaire angles For minimising sky glow



For most sports and area lighting installations the use of luminaires with double-asymmetric beams designed so that the front glazing is kept at or near parallel to the surface being lit should, if correctly aimed, ensures minimum obtrusive light.

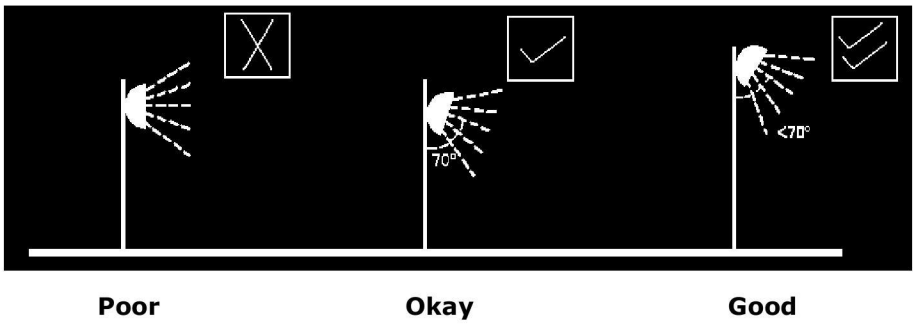
Appendices 1 and 2 to these notes gives more details of how to choose and if necessary modify luminaires.

Installation

In most cases it will be beneficial to use as high a mounting height as possible, giving due regard to the daytime appearance of the installation. The requirements to control glare for the safety of road users are given in Table 3.

Keep glare to a minimum by ensuring that the main beam angle of all lights directed towards any potential observer is not more than 70°. Higher mounting heights allow lower main beam angles, which can assist in reducing glare. In areas with low ambient lighting levels, glare can be very obtrusive and extra care should be taken when positioning and aiming lighting equipment. With regard to domestic security lighting the ILP produces an information leaflet GN02:2009 that is freely available from its website.

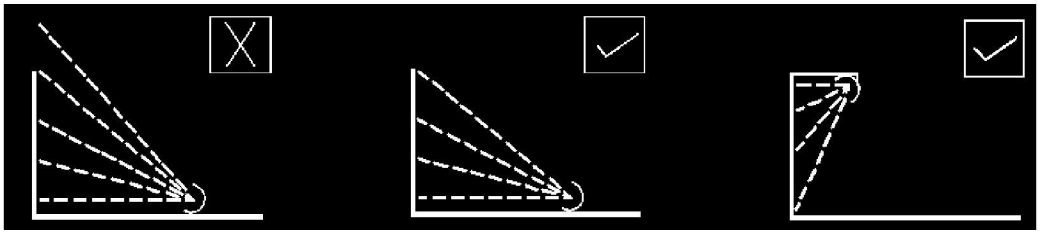
Figure 3 – Luminare aiming angles



When lighting vertical structures such as advertising signs, direct light downwards wherever possible. If there is no alternative to up-lighting, as with much decorative lighting of buildings, then the use of shields, baffles and louvres will help reduce spill light around and over the structure to a minimum.

For road and amenity lighting installations, (see also design standards listed on Page 5) light near to and above the horizontal should normally be minimised to reduce glare and sky glow (Note ULR's in Table 2). In rural areas the use of full horizontal cut off luminaires installed at 0° uplift will, in addition to reducing sky glow, also help to minimise visual intrusion within the open landscape. However in some urban locations, luminaires fitted with a more decorative bowl and good optical control of light should be acceptable and may be more appropriate.

Figure 4 – Façade Illumination



Poor Good Good

Since 2006 "Artificial Light" has been added to the list of possible Statutory Nuisances in England, Wales and Scotland. The monitoring of such nuisances will be the responsibility of Environmental Health Officers (EHOs) for which separate guidance is being produced.

With regard to the planning aspect, many Local Planning Authorities (LPAs) have already produced, or are producing, policies that within the planning system will become part of their local development framework. For new developments there is an opportunity for LPAs to impose planning conditions related to external lighting, including curfew hours.

The Scottish Executive has published a design methodology document (March 2007) entitled "Controlling Light Pollution and Reducing Energy Consumption" to further assist in mitigating obtrusive light elements at the design stage.

ENVIRONMENTAL ZONES

It is recommended that Local Planning Authorities specify the following environmental zones for exterior lighting control within their Development Plans.

Table 1 – Environmental Zones

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty etc
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

Where an area to be lit lies on the boundary of two zones the obtrusive light limitation values used should be those applicable to the most rigorous zone.

NB: Zone E0 must always be surrounded by an E1 Zone.

DESIGN GUIDANCE

The following limitations may be supplemented or replaced by a LPA's own planning guidance for exterior lighting installations. As lighting design is not as simple as it may seem, you are advised to consult and/or work with a professional lighting designer before installing any exterior lighting.

Table 2 – Obtrusive Light Limitations for Exterior Lighting Installations – General Observers

Environmental Zone	Sky Glow ULR [Max %](1)	Light Intrusion (into Windows) E_v [lux] (2)		Luminaire Intensity I [candelas] (3)		Building Luminance Pre-curfew (4)
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average, L [cd/m^2]
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

ULR = **Upward Light Ratio of the Installation** is the maximum permitted percentage of luminaire flux that goes directly into the sky.

E_v = **Vertical Illuminance in Lux -** measured flat on the glazing at the centre of the window.

I = **Light Intensity in Candelas (cd)**

L = **Luminance in Candelas per Square Metre (cd/m^2)**

Curfew = **the time after which stricter requirements (for the control of obtrusive light) will apply**; often a condition of use of lighting applied by the local planning authority. If not otherwise stated - 23.00hrs is suggested.

***** = **Permitted only from** Public road lighting installations

(1) Upward Light Ratio – Some lighting schemes will require the deliberate and careful use of upward light, e.g. ground recessed luminaires, ground mounted floodlights, festive lighting, to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.

(2) Light Intrusion (into Windows) – These values are suggested maxima and need to take account of existing light intrusion at the point of measurement. In the case of road lighting on public highways where building facades are adjacent to the lit highway, these levels may not be obtainable. In such cases where a specific complaint has been received, the Highway Authority should endeavour to reduce the light intrusion into the window down to the post curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.

(3) Luminaire Intensity – This applies to each luminaire in the potentially obtrusive direction, outside of the area being lit. The figures given are for general guidance only and for some sports lighting applications with limited mounting heights, may be difficult to achieve.

(4) Building Luminance – This should be limited to avoid over lighting, and related to the general district brightness. In this reference building luminance is applicable to buildings directly illuminated as a night-time feature as against the illumination of a building caused by spill light from adjacent luminaires or luminaires fixed to the building but used to light an adjacent area.

Table 3 – Obtrusive Light Limitations for Exterior Lighting Installations – Road Users

Road Classification (1)	Threshold Increment (TI)	Veiling Luminance (Lv)
No road lighting	15% based on adaptation luminance of 0.1cd/m^2	0.04
ME6/ ME5	15% based on adaptation luminance of 1cd/m^2	0.25
ME4/ ME3	15% based on adaptation luminance of 2cd/m	0.40
ME2 / ME1	15% based on adaptation luminance of 5cd/m^2	0.84

TI = **Threshold Increment** is a measure of the loss of visibility caused by the disability glare from the obtrusive light installation

Lv = **Veiling Luminance** is a measure of the adaptation luminance caused by the disability glare from the obtrusive light installation

(1) = **Road Classifications** as given in BS EN 13201 - 2: 2003 Road lighting Performance requirements. Limits apply where users of transport systems are subject to a reduction in the ability to see essential information. Values given are for relevant positions and for viewing directions in path of travel. For a more detailed description and methods for determining, calculating and measuring the above parameters see CIE Publication 150:2003.

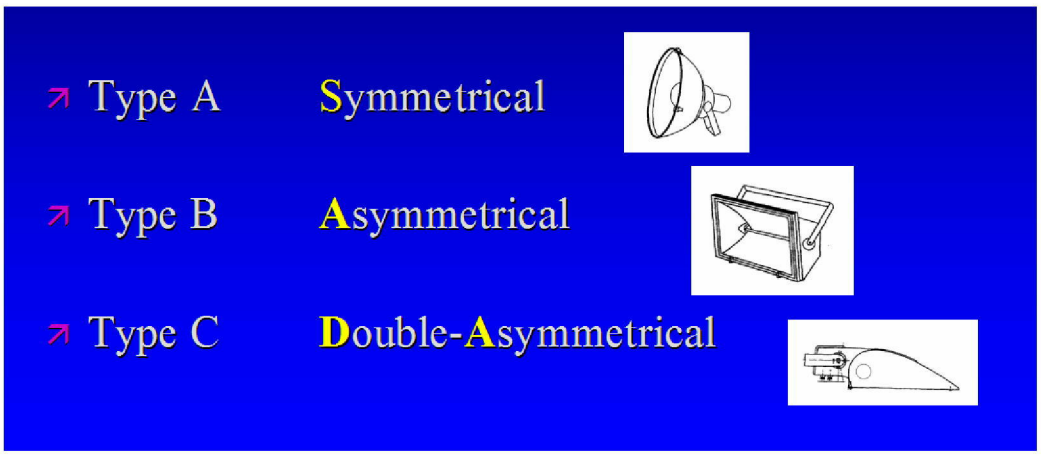
RELEVANT PUBLICATIONS AND STANDARDS:

British Standards: www.bsi.org.uk	BS 5489-1: 2003 Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas BS EN 13201-2:2003 Road lighting – Part 2: Performance requirements BS EN 13201-3:2003 Road lighting – Part 3: Calculation of performance BS EN 13201-4:2003 Road lighting – Part 4: Methods of measuring lighting performance. BS EN 12193: 1999 Light and lighting – Sports lighting BS EN 12464-2: 2007 Lighting of work places – Outdoor work places	
Countryside Commission/ DOE	Lighting in the Countryside: Towards good practice (1997) *(Out of Print but available on www.communities.gov.uk/index.asp?id=1144823)*	
UK Government / Defra www.defra.gov.uk	Statutory Nuisance from Insects and Artificial Light – Guidance on Sections 101 to 103 of the Clean Neighbourhoods and Environment Act 2005 Road Lighting and the Environment (1993) (Out of Print)	
CIBSE/SLL Publications: www.cibse.org	CoL	Code for Lighting (2002)
	LG1	The Industrial Environment (1989)
	LG4	Sports (1990+Addendum 2000)
	LG6	The Exterior Environment (1992)
	FF7	Environmental Considerations for Exterior Lighting (2003)
CIE Publications: www.cie.co.at	01	Guidelines for minimizing Urban Sky Glow near Astronomical Observatories (1980)
	83	Guide for the lighting of sports events for colour television and film systems (1989)
	92	Guide for floodlighting (1992)
	115	Recommendations for the lighting of roads for motor and pedestrian traffic – Second Edition (2010)
	126	Guidelines for minimizing Sky glow (1997)
	129	Guide for lighting exterior work areas (1998)
	136	Guide to the lighting of urban areas (2000)
	150	Guide on the limitations of the effect of obtrusive light from outdoor lighting installations (2003)
	154	The Maintenance of outdoor lighting systems (2003)
ILP Publications: www.theilp.org.uk	TR 5	Brightness of Illuminated Advertisements (2001)
	TR24	A Practical Guide to the Development of a Public Lighting Policy for Local Authorities (1999)
	GN02	Domestic Security Lighting, Friend or Foe
ILP/CIBSE Joint Publications	Lighting the Environment - A guide to good urban lighting (1995)	
ILP/CSS Publications	Joint Code of Practice for the installation, maintenance and removal of seasonal decorations. (2005)	
ILP/CfDS Joint Publication www.dark-skies.org	Towards Understanding Sky glow. 2007	
IESNA www.iesna.org	TM-15-07 (R) Luminaire Classification System for Outdoor luminaires	

NB: These notes are intended as guidance only and the application of the values given in Tables 2 & 3 should be given due consideration along with all other factors in the lighting design. Lighting is a complex subject with both objective and subjective criteria to be considered. The notes are therefore no substitute for professionally assessed and designed lighting, where the various and maybe conflicting visual requirements need to be balanced.

APPENDIX 1 - PROPOSED OUTDOOR LUMINAIRE CLASSIFICATION SYSTEM

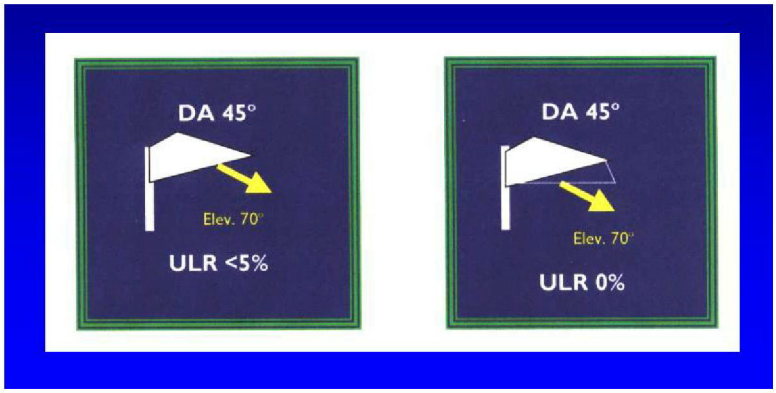
Variable Aim Luminaires – General Classifications:



Proposed labelling System:

Fixed Position luminaires

Variable Aim Luminaires
(Shown here for a 45° Double-Asymmetric luminaire aimed at 70° – with and without a cowl).



APPENDIX 2 - ILLUSTRATIONS OF LUMINAIRE ACCESSORIES FOR LIMITING OBTRUSIVE LIGHT (images provided by Philips and Thorn)

Cowl (or Hood)

External Louvre

SHIELD

SHEILD "Barn Doors"

Double Asymmetric Luminaire

Simple Hood

Circular Louvre

Cowl & Louvre

Internal Louvre (horizontal)

Internal Louvre (vertical)