

Dundee City Centre Lighting Strategy

June 2025

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1 Introduction

1 Introduction

The City Centre Lighting Strategy provides a unique opportunity to improve and strengthen the appeal of the city for residents and visitors for night time uses. Strategic lighting at key sites across the city will improve safety, legibility and enhance the night time experience of the city. This lighting strategy sets out the key improvements that can be made to provide an improved nighttime environment for residents and visitors to the city. Dundee is undergoing considerable development and change at this time and it is key that visitors to the city can move around safely with enjoyment during the evening as well as during the day. The V&A Dundee, Slessor Gardens, Waterfront Place, LiveHouse Entertainment Venue and new Eden Project planned for the Eastern Quarter all provide new destinations for the city where an increase in visitors to the city is anticipated. Along with proposed improvements to active travel, this lighting strategy will assist in the implementing safer routes for city residents and visitors to orientate and navigate the city at night.

Vision

To Lighting Strategy aims to deliver a creative, safer and sustainable approach for lighting across the city centre, where light and dark are balanced to provide an inviting and enjoyable night time experience for all.

Objectives

The lighting principles have been informed by qualitative research analysing key existing areas of the city environment and lighting infrastructure at night both from a technical perspective and from public engagement to understand the social impact of how the city is currently perceived and how spaces are being used. Sustainability is at the forefront of all considerations in approach and application. We have provided guidelines within the strategy that will ensure future lighting installations are in alignment with the City's Net Zero Carbon goals.

Aim

This Lighting Strategy document has been developed to provide guidance and an evidence based framework for which lighting designs for the city centre can be designed from. The lighting strategy seeks to reveal and enhance the existing character and heritage of the city at night, provide a visual hierarchy and promote better movement across the city centre.

This Lighting Strategy Aims will be achieved by:

- Identifying key opportunities across the city centre where lighting interventions will improve the use of a space and encourage night time economy in the area.
- Reveal the heritage of the city and provide key destination spaces at night.
- Enhancing the public realm routeways to break down the existing ring road barrier for a more connected city centre.
- Enhancing safety perception that will create a more active night time economy.
- Creating visual interest and engagement that will contribute to a sense of place.
- Bringer greater cohesion to the night-scape of Dundee to provide safe routes and night and a more inviting nighttime experience.



Figure 1: Dundee Cityscape



Figure 2: Consultant Masterplan Extract - Public spaces within the city centre

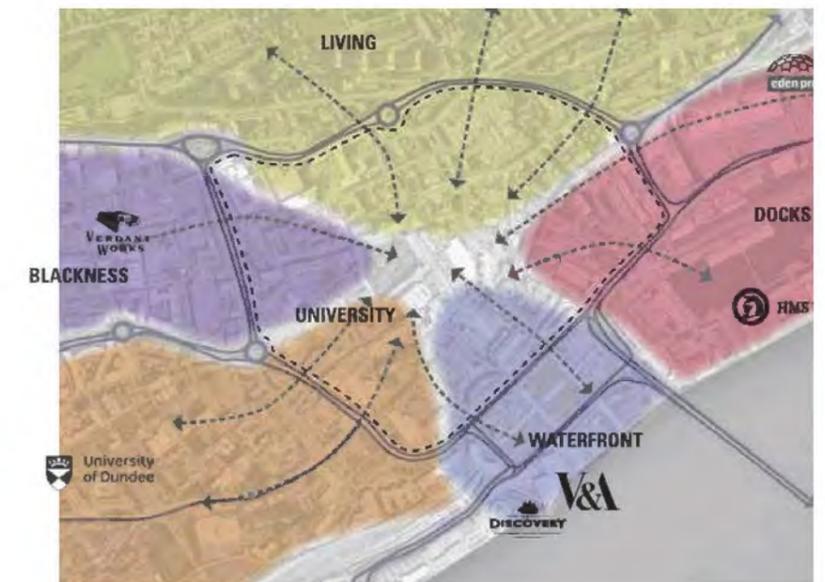


Figure 3: Consultant Masterplan Extract -Improved connectivity across the ring road for pedestrians and cyclists, enabling surrounding areas to better contribute to the identity and character of the city centre core

1.1 Background and key priorities

The Lighting Strategy is focused on the City Centre, identified by the red boundary line in Figure 4. Some of the ideas and principles can be carried into other areas of Dundee, however we would recommend that a level of public engagement and analysis is undertaken for any spaces outside the city centre before any designs are produced to ensure proposals meet local community needs.

The main aim of the Lighting Strategy is to support and enhance the delivery of The City Centre Strategic Investment Plan 2050 (CSSIP 2050) published in 2023 by Dundee City Council. This ambitious 30 year plan sets out a long-term vision and identifies a wide variety of opportunities based on comprehensive consultation.

The key objectives of the CSSIP are to :-

- Improve Connectivity across the City
- Make the City Centre more attractive for living and working
- Improve the quality and level of public realm spaces
- Enhance the visitor experience to the City
- Attract new investment and business to Dundee

The plan also identified strategic development areas that can help respond to the challenges the city faces. Dundee City Council have been working alongside the plan's vision on developing other City Centre projects, such as store-front improvement, the pedestrianisation of Union Street, traffic calming measures for key streets, alongside the larger scale developments at the Waterfront. The lighting proposals set out in this document look to consider these wider concerns and issues.

The plan also outlines Carbon Reduction and Climate Change targets that it plans to achieve by increasing population density in the city centre, strengthening active travel routes and public transport networks, and better utilising disused buildings in the centre. This lighting strategy outlines considerations that can help achieve these targets by reducing energy and carbon consumption outlined in the technical recommendations. These aspirations will also be driven by the world context of the climate emergency as our nation

moves towards its Net Zero Carbon by 2045. This will provide opportunity for the City of Dundee to become the example and lead the way for sustainable inclusive living by improving active travel networks and connected public realm

The CSSIP 2050 states:

'Not everything in this plan will happen. It is intended to start a conversation about options for the future.'

The plan also identified strategic development areas that can help respond to the challenges the city faces. Dundee City Council have been working alongside the plan's vision on developing other City Centre projects, such as store-front improvement, the pedestrianisation of Union Street, traffic calming measures for key streets, alongside the larger scale developments at the Waterfront.

Key Lighting Priorities

The appraisal of the existing city centre spaces at night has key recommendations fall into three key needs :- Functional, Cultural and Sustainable.

- Provide legibility within the city centre at night to assist with way finding and orientation for visitors.
- Ensure the key heritage and cultural buildings are lit to provide a welcoming appearance for night-time uses.
- Improve the lit character of main retail routes within the city centre to allow safer movement and to encourage walking and cycling in areas of the city at night.
- Use light to create night-time zones within the proximity of cultural hubs across the city centre, that are active at night.
- Ensure a level of flexibility is built into any proposals to allow lighting to be adapted and changed where required as needs change over time.



Figure 4: Study area and development plots

30
Year Vision

Double
Resident Population

3,000
Jobs Created and Safeguarded

Double
Visitor numbers and visitor spend by 2034

Potential development sites identified in the CSSIP 2050 are shown in **Figure 4**:

1. West Port
2. Overgate North
3. Office Regeneration
4. Sustainable Transport Hub
5. Wellgate Centre
6. Keiller Court
7. East Port
8. Central Waterfront

Background and key priorities

1.1.1 City Centre Character Zones

Five distinct city centre zones have been identified across the city, in line with the Consultant Masterplan. These sub areas help the lighting strategy to identify user groups, expected footfall, and have informed the night walk routes and engagement exercises around the city centre. These have also influenced the opportunities and ultimate projects recommended and identified within the document.

The five zones are :-

- Western Quarter
- Learning Quarter
- Commercial Core
- Eastern Quarter
- Central Waterfront

To support the Strategic Investment Plan, Stellan-Brand Architecture and Design produced a Consultant Masterplan. The masterplan provides more in depth proposals for the five key zones outlined by the council, and aims to inform development of and investment in projects that will have the most positive impact.

The Consultant Masterplan focuses specifically on the City Centre, within the Inner City Ring Road. This lighting strategy considers the same study area, outlined in Figure 5. The larger scale potential developments are highlighted, and are the key sites that were identified in the Future Investment Plan as strategic development sites.

Many of the development areas are focused on improving the public realm, bringing in more greenery, creating new destinations in the city centre, as well as the transition and active travel routes across the city ring road which is identified as a key navigational challenge.

At the time of the production of this lighting strategy, there is a focus on projects that will enable a legible connection from the city centre to the site of the Eden Project, which is out to the East of the ring road. These projects all sit in the Eastern Quarter.



Figure 6: Zone 1: Western Quarter developments

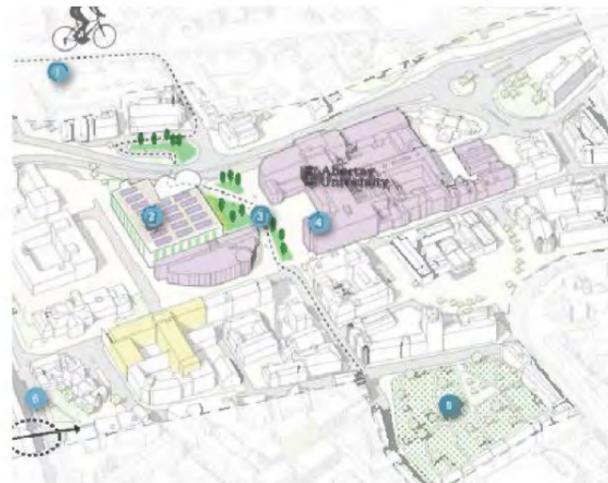


Figure 7: Zone 2: Learning Quarter developments



Figure 8: Zone 3: Commercial Core developments

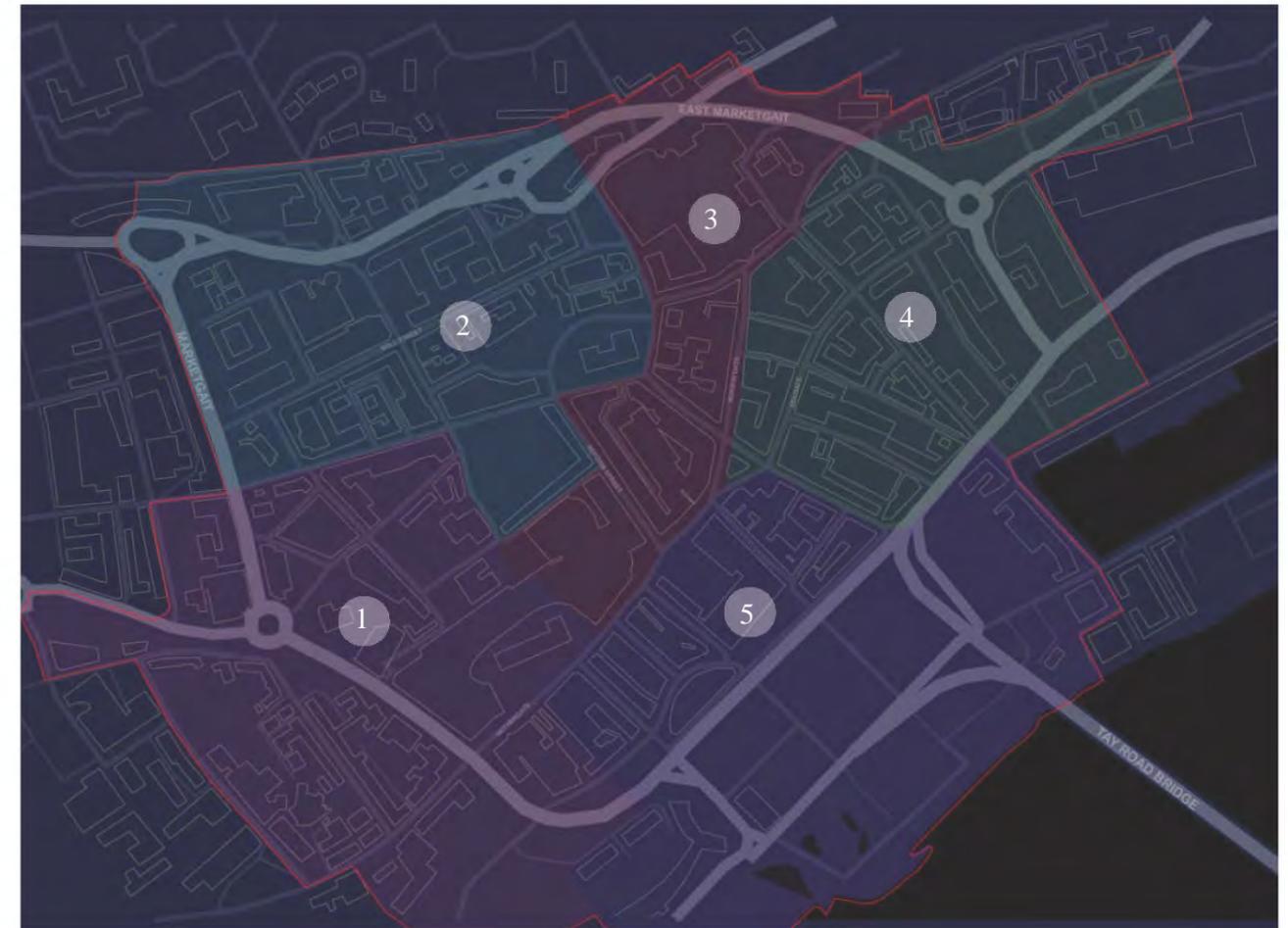


Figure 5: Identified character areas



Figure 9: Zone 4: Eastern Quarter developments



Figure 10: Zone 5: Central Waterfront developments

1.2 Light : A Catalyst for Change

Dundee City Council has been working through various development plans and through this have invested in a number of lighting initiatives across the city centre. With a number of developments underway it was considered that a Lighting Strategy would at this time be beneficial to provide a more cohesive approach to lighting proposals in various parts of the City Centre.

The recent re-illumination of The McManus and the lighting schemes as part of the waterfront such as Slessor Gardens, Waterfront park, V&A Dundee and soon to be installed Caird Hall facade demonstrate the positive impact considered lighting can have on city occupants and visitors, where the majority of residents are indicating they prefer to walk and cycle in these areas at night. Lighting has also been added to this installation to complement the Tay Road Bridge artworks and create moving shadows that gradually change colour. These public spaces can now be used all year round for various events where lighting has been considered as an integral part of their design.

Since the regeneration of the Waterfront, Caird Hall is now a key view from the station and approach roads into the city centre on arrival to Dundee. An architectural lighting scheme by Arup has been proposed to enliven the back of the Caird Hall and provide a backdrop to Slessor Gardens for events. The new lighting of this important historic building will create a new night-time vista, where the crown of the building, which can be lit with different colours, will be a focal point within the cityscape.

The investment in the Bell Street Active Travel Hub will encourage greater active travel routes promoting sustainable travel choices within the city where key routes if properly lit at night will encourage active travel at all times making the city more liveable and accessible to all.

These existing lighting improvements form the basis for the lighting strategy within this document. Working with Dundee City Council Street Lighting team practical issues have been considered and proposals put forward aim to provide maximum impact with minimal spend ensuring best value to the City.



Figure 11: V&A Design Museum



Figure 12: Waterfront regeneration and lighting schemes



Figure 13: The McManus Art Gallery & Museum



Figure 14: Caird Hall Visual - Crichton Street View

2 Public Engagement

2 Public Engagement

2.1 Introduction

Lighting plays a key role in enhancing the experience of urban spaces for users at night.

It is key that before a designer considers lighting for public realm that users and stakeholders are properly consulted. Users bring unique knowledge and understanding to the design and can often allow the design team to explore more meaningful solutions to specific challenges. Not only does this provide a more considered design but gives users agency of their spaces and ensures a human centred approach is carried out.

Public consultation is paramount to understanding the perception of a space to users. It allows designers to produce an informed capture of a night-time environment, including perceptions of safety and accessibility of a space, to supplement technical lighting data. Prior to any ideas being generated for the city centre lighting a series of public consultations were carried out.

Three surveys were carried out to support this lighting strategy document:

- **Night Walks** to engage with users and key stakeholders.
- **Online Survey** to engage with residents and interested parties.
- **Technical Lighting Survey** to gather technical data allowing baseline conditions to be established and qualitative results from initial night walk to be quantified numerically.

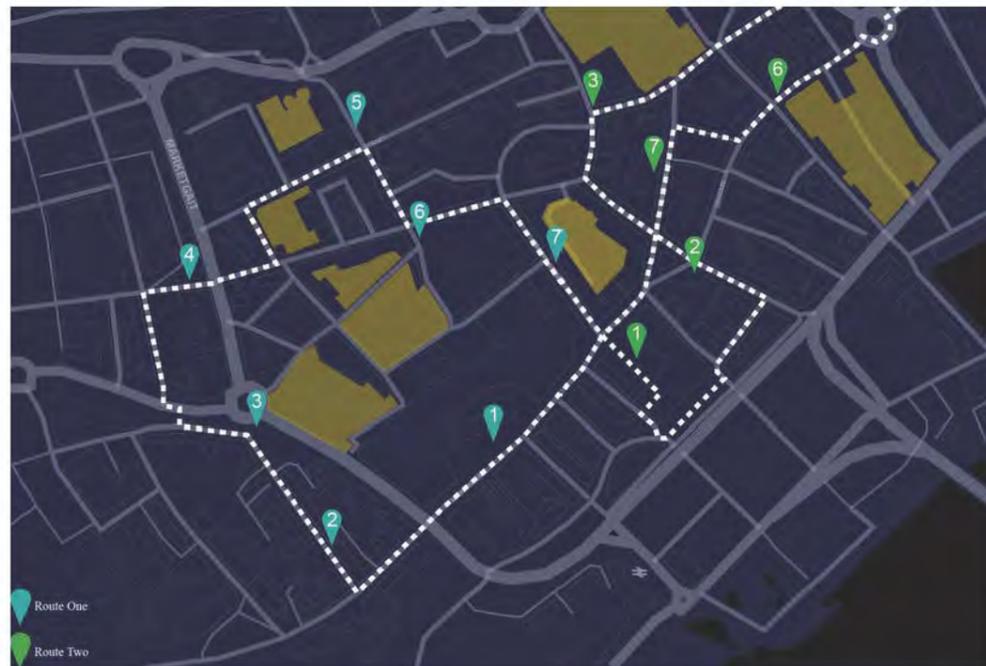


Figure 15: Night Walk routes

2.2 Night Walks

Two night walks were completed in October 2024. The full set of data collected can be found in **Appendix A.4**.

The night walks facilitate an on-site consultation to understand people's perception of lighting and safety within the study area. The walks are split into two routes to capture city character areas, development areas in the CSSIP 2050, and key routes, gathering points, and buildings that were identified in the city analysis.

Stakeholders invited included representatives from:

- Dundee City Council
- DUSA (Dundee University Student Association), and ASA (Abertay Students' Association)
- Dundee Access Group
- Dundee Safe Zone
- Charities, clubs and youth groups such as the Hot Chocolate Trust
- Dundee Historic Environment Trust

On each walk, stakeholders were asked to record their observations of the viewpoints, and give a 1-10 rating at each viewpoint for a series of descriptive words. These ratings were used to create comparative diagrams as found in the **Appendix A.4**.

Figure 15 indicates the two key routes of the night walks. These routes were selected with reference to the Consultants' Masterplan and CSSIP 2050 and taking into account concerns for safer routes through various areas of the City Centre. Two groups provided the night walk feedback on the two specific routes.

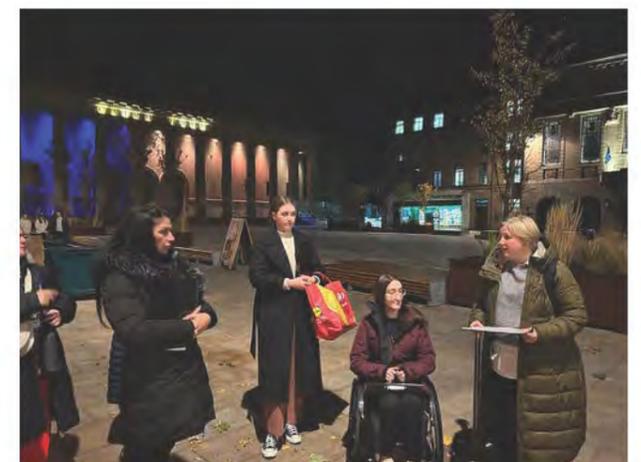


Figure 16: Night Walk photographs

2.2.1 Observations

The recorded 1-10 scores from stakeholders helped supplement the written observations to identify any areas with problems or that were characterised in specific ways. Some key observations are summarised below:

- Route One, through the Learning Quarter, was generally perceived to be safer. Areas with RGB lighting such as the Dundee Rep Theatre and Abertay University Library were perceived positively.
- Areas that were perceived as unsafe on Route One included Guthrie Street and Barrack Street, where a high level of contrast was observed between the lit streets and the unlit surrounding buildings.
- Route Two went through the Commercial and Learning Quarters, and stakeholders generally found areas in these quarters to feel less safe, such as the Kings Street Underpass, Seagate, and Murraygate. These areas were identified to have less consistent lighting levels and/or a higher level of contrast.
- Whilst there was often a correlation between spaces that felt unsafe and spaces that were perceived to be darker by the stakeholders, this was not always the case. For example, Guthrie Street was lit to a high and uniform level, but was not perceived to be safe by stakeholders because of the street context.
- There is also an observed link between safety and perceived dullness of an area. Viewpoints that were categorised as dull by stakeholders typically had lower safety scores.

2.2.2 Key Suggestions

Key written recommendations recorded by stakeholders include:

- Lighting heritage buildings at key junctions
- Lighting buildings of significant cultural and heritage importance across the city
- Designing to allow a base level of illuminance at concealed entrances
- Review existing lighting provision across the city to enhance wayfinding
- Add visual interest through interactive lighting or light art on key travel routes

"Illuminate landmarks"

Lighting is necessary to the Old Steeple.
Lighting of heritage buildings around Abertay University.
Adding lighting to the old City Chambers to highlight the building

"Adding interest and fun"

Opportunity to do something fun on Guthrie Street.
Art could be added into the underpasses.

"Lighting for safety"

Lighting needed beside car park adjacent to West Port Roundabout.
Lighting needs to be added to alleyways and cut throughs to improve safety.

"Lighting for way-finding"

Improving lighting and removing clutter around Old Steeple will improve wayfinding along the busy Nethergate
Lighting sculptures and existing artwork will aid navigation

2.3 Online Survey

A questionnaire was hosted on Dundee City Council's website for from 16th September and 11th October 2024. The questionnaire received 145 responses from both locals and visitors to Dundee, and the results were used to inform this Lighting Strategy document. The full set of survey questions and results can be found in **Appendix A.3**.

The participants ranged from under 18 and over 85. 41% of participants visit Dundee City Centre daily, and most participants visit Dundee more during the day than at night-time.

2.3.1 Key Observations

Overall Appearance 66% of participants are very unsatisfied/unsatisfied with the overall appearance of Dundee city centre.

Overall Safety 67% participants described their perception of overall safety to be either very unsafe or unsafe in a night-time environment. This is 39% more than during the day.

Key Words Survey participants indicated that the key words 'dark', 'unfriendly', 'concealed', 'unsafe', and 'fun' applied to their experience of Dundee at night-time than during the day. The city was described to feel louder, busier, open and more dull during the day.

Key Barriers The survey identified the three key barriers to be lighting (44% of participants), inadequate maintenance (67%), and fear (44%). 23% of participants believe unsuitable segregation between vehicles, cyclists, and pedestrians is a key barrier due to the busy ring road.

What Works Well Lighting to areas of recent investment was identified as a positive across the City Centre, such as the McManus Building and the V&A Dundee.

2.3.2 Key Suggestions

"More lighting needed"

Add fun pedestrian streets like Union Street.
Display some of the beautiful buildings at night by lighting them.

"Safety"

Improve the spread and reach of light from posts, illuminating under the lamppost and dark spots in-between is poor.
Improve lighting on Seagate and Cowgate, currently feels derelict and unsafe.
Increase lighting of alleyways and concealed areas that feel creepy to walk past.

"Accessibility"

Use of colour to assist with wayfinding and provide visual effects.
Replace lighting which is currently overshadowed by trees with lighting that improves light levels for pedestrian movements.

"Detailed recommendations"

More cosy lighting to be added to the catenary over exchange street, similar to Ashton Lane or Royal Exchange Square in Glasgow.

2.4 Technical Lighting Survey

2.4.1 Summary

This section summarises the data collected during the lighting technical survey, completed in October 2024. The purpose of this assessment of the night-time conditions was to establish the baseline conditions of the city centre lighting. This helps identify any viewpoints or areas that are particularly dark, bright, contrasting, or where the lighting doesn't align with what it should be. This data can help explain why a space is perceived in such a way.

The full set of technical survey data can be found in **Appendix A.5**.

2.4.2 Survey Process

The survey was carried out between the hours of 8.00pm and 11.00pm, to ensure 'true night' conditions.

The 14 key viewpoints are aligned with the Stakeholder Night Walks, and were selected due to the significance of user approach. The results for each viewpoint are summarised in **Appendix A.5**.

Measurements

- **High Dynamic Range (HDR) Imagery** for each viewpoint was produced from digital photographs, to present the luminance profile of the nocturnal scene (luminance describes the 'brightness' of the scene i.e. what the eye sees).
- **Correlated Colour Temperature measurements** were taken at each unique fitting type present at a viewpoint. These measurements help support the data presented in **Appendix A.6**, of the existing lighting provision, and to provide a capture of how warm/cool the lighting feels in an area.
- **Average horizontal illuminance measurements** (incident light, a metric used in design standards for public realm lighting) were recorded at each viewpoint. 13 of the 14 measurements lay in the 1 - 20 lux range, although some areas are excessively illuminated.

2.4.3 High Dynamic Range Imagery

The HDR images provide a capture and visual summary of the lighting conditions at each viewpoint that was surveyed. The images are useful in representing characteristics such as high levels of lighting contrast.

The full set of images for every viewpoint can be found in **Appendix A.5**. Below are some example observations of what the HDR images can show:

- Where church steeples are unlit, there is a high level of contrast between the luminance at the side of the street, and nearer to the steeple, as shown in **Figure 17**.
- **Figure 18** demonstrates how the luminance profile along Murraygate varies because of the irregularity of lighting.
- Streets across the City Centre are generally lit to a high and uniform street, particularly Guthrie Street and Reform Street.

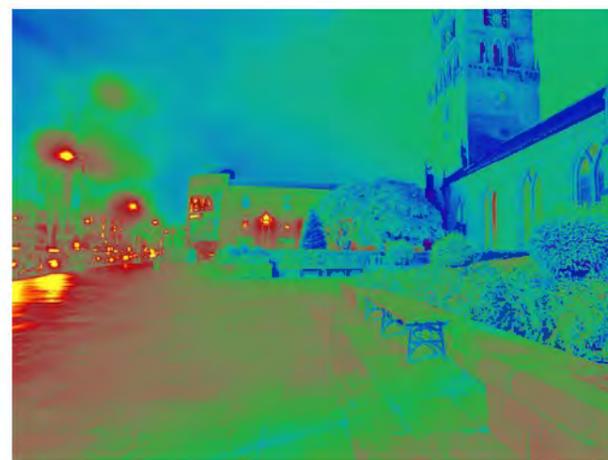


Figure 17: HDR Imagery of the Old Steeple on Nethergate

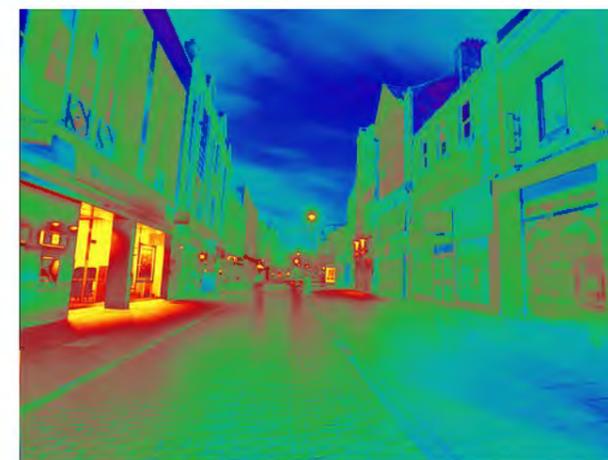


Figure 18: HDR Imagery of Murraygate

2.5 Key Findings

2.5.1 Summary

This section summarises the combined findings of the site visits, Stakeholder Night Walks, Online Survey, and Technical Lighting Survey, and identifies the emerging challenges that are experienced across Dundee City Centre.

2.5.2 Key Findings

- Dundee City Centre is generally perceived by the public to be safer during the day.
- Stakeholder Night Walks and the Online Survey demonstrated that there is often a link between darkness and perceived safety, but this is not always the case.
- In some areas of Dundee City Centre, lighting is not the issue.
- Most key routes into the City Centre, and previously identified problem areas, are lit to a high and uniform level.
- However, some streets that were well lit felt less safe to stakeholders due to the adjacent context being left in complete darkness.
- Parts of the City Centre where street lights are out, or have a poor optical distribution, tended to be perceived as less safe.
- A lack of fun and vibrancy in a lot of areas was noted in the public consultations.
- There are a high number of shop fronts closed up and dark at night, leading to a less active night-time economy.
- Some streets have a previously pre-conceived idea of safety due to their historical reputation.
- Most of the City Centre light fittings have been upgraded to LED, excluding a few areas around Murraygate and City Square.
- The public consultations yielded a positive user response to key and heritage buildings being lit across the City Centre, as well as pealights and other playful interventions.

Area Recommendations

Learning Quarter

- The learning quarter was generally perceived positively in the public consultations.
- There are a large number of heritage buildings, many of which are unlit.

Western Quarter

- Key routes into the City Centre such as Nethergate and West Port roundabout present navigational problems because of street clutter and a lack of focal points.
- The current level of contrast at Guthrie Street between the bright street lighting and dark surrounding buildings is considered 'eery' by stakeholders, and the street is also considered historically unsafe by local users.
- The Old Steeple is not lit, and encourages antisocial behaviour.

Commercial Core

- The lighting along Murraygate is poor, and the area suffers from shopfront closures.
- The lighting on Panmure Street is perceived positively by stakeholders.
- Reform Street feels unsociable despite uniform lighting.

Central Waterfront

- City square felt clean and safe, but was not perceived as fun or friendly by stakeholders.
- Although the rest of the Waterfront development is not considered as part of this lighting strategy, the Online Survey recorded a strong positive response to the recent developments.



Figure 19: Character areas

Eastern Quarter

- The area does not feel suited to pedestrians to the public, with narrow pavements along Seagate and East Port roundabout feeling disorientating.
- The East Marketgait underpass is lit to a high level, but the surrounding context is very dark.
- St Paul's Cathedral at the corner of Commercial Street and Seagate is not lit.

Key Findings

2.5.3 Emerging Themes

The key findings from the Online Survey, Stakeholder Night Walks, and Technical Lighting Survey provided some key challenges and emerging themes that the lighting strategy needs to address :

- High levels of contrast in light levels
- Night-time economy and lack of character at night
- Lack of control of saturated coloured lighting
- Lack of lighting at human scale

The strategy will go on to address these challenges in **Section 4**, in the context of lighting to the City Centre's heritage, public realm spaces, and art opportunities.

Contrast

In some parts of the City Centre, the light levels feel 'unbalanced'. In some areas this is due to street lighting being out, causing dark patches like on Peter Street in **Figure 20**.

In other areas like Guthrie Street and the Kings Street Underpass in **Figure 21**, this is due to the thoroughfare itself being lit to a high and uniform light level, but the surroundings being left in darkness, causing a high level of contrast. On Guthrie Street the surroundings are mostly old or disused industrial buildings and with these unlit stakeholders noted it felt 'eery' and led to a feeling of being 'spotlit' on the well lit roadway.

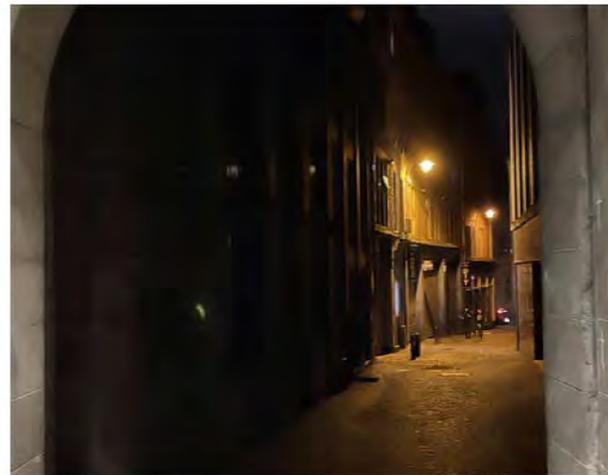


Figure 20: Photograph of Peter Street cut-through



Figure 21: HDR Imagery of Kings Street Underpass

Night-time Economy and Character

The lack of vibrancy and character in the City Centre at night is not helped by the closing of many shops and businesses, leaving façades and shopfronts in darkness along key pedestrian streets. The closure of several venues between the Dundee Contemporary Arts and Rep Theatre has left the street between feeling quiet and dull, shown in **Figure 22**.

There are key buildings, churches, monuments and artworks that aren't being lit at night, resulting in the city character not being emphasized or shown off as it is during the day. **Figure 23** shows the McManus Collection building in darkness.



Figure 22: HDR Imagery of Kings Street Underpass



Figure 23: Key buildings unlit: McManus Collection Building

Vibrancy and Lighting for People

The lighting provides functional illumination, often from high level building mounted fittings or column mounted floodlights. The lighting often feels like it is designed more for vehicular traffic like at East Port roundabout (**Figure 24**), and lighting interventions at a more human scale proved popular on the stakeholder Night Walks, such as the tree pea lights on High Street and the in-ground LEDs at Dundee Rep Theatre.

The lighting tends not contribute to the City Centre's vibrancy, or add 'fun' - Abertay University Library is an example of where this is done well, shown in **Figure 25**.



Figure 24: 12m columns at East Port roundabout



Figure 25: Colour changing lighting at Abertay University

3 Place Analysis

3 Place Analysis

Key Considerations

3.1 Key Routes

It is key when we consider uses of each space to first establish the route hierarchy of the City. **Figure 26** shows this information. The A991 that forms the Inner City Ring Road is the main road around the City Centre, and connects vehicular traffic to the A90 South to Edinburgh and North to Aberdeen, as well as across the Tay Road Bridge. The Tay Road bridge provides key views of the city, most notably of Caird Hall for cars entering Dundee.

Key vehicular routes that pass across the ring road and into the centre include Nethergate, Ward Road and Seagate, which have bus routes along them. A one-way system is in operation around the Caird Hall area, and several streets in the centre are open to buses and taxis only.

An increasing percentage of the City Centre roads are becoming pedestrianised, such as Union Street, encouraging the day and night-time economy to grow, introduce more greenery and public realm interventions to the City



Figure 26: Definition of routes

Higher light levels are maintained around the Inner City Ring Road, and should be in line with BS-13201 guidance for motorised traffic.

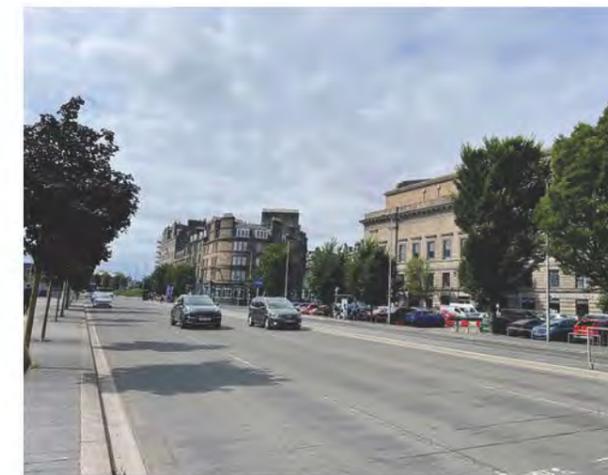


Figure 27: Wider street types

Pedestrianised routes across the city should have adequate ambient lighting levels for facial recognition and safety.



Figure 28: Wider street types

The other vehicular routes around the city should have adequate lighting provision for conflict areas between pedestrians and vehicular traffic, as per BS-13201.



Figure 29: Narrower street types less generous for walking

Underpasses have been identified in the CCSIP 2050 as key areas for development, as it has been identified as a navigational barrier to pedestrians.

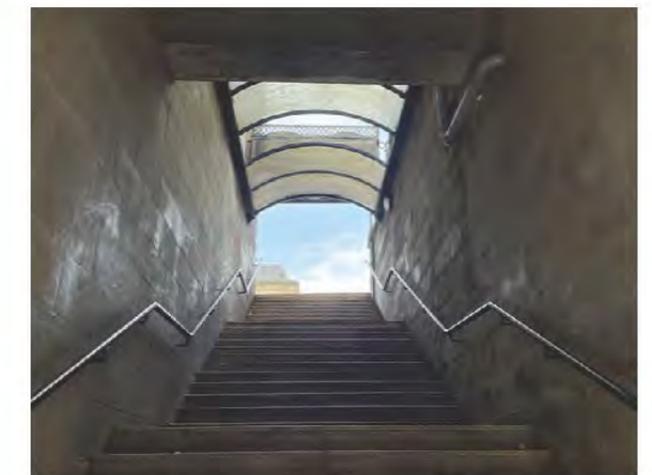


Figure 30: Narrower street types less generous for walking

Key Considerations

3.2 Public Realm

The public realm spaces within Dundee play a critical role in providing social spaces for those living in the city centre. There are a range of public spaces within Dundee as indicated in **Figure 31**. These can be categorised in several ways: larger formal public spaces, parks, landscape nodes, where areas of pavement are widened at roadways to create spaces and pedestrian routes. The uses of these spaces include safe pedestrian movement, social gathering, rest areas, wayfinding and opportunities for events. While many of these spaces are working during the day many of these spaces are not utilised well at night and greater consideration should be given to how lighting can better serve the specific use of each space.

An example of where this has worked already is Slessor Gardens where as part of the Waterfront regeneration project a new park with lighting has been created. The gardens now provide key meeting and gathering spaces for the public, and create a pleasant walk within the City. While this is a new green space more can be done to optimise the existing public realm spaces to make them more attractive and inviting for residents and visitors. The City Square is a generous public space which hosts markets and a wide variety of events. It is used as a meeting point for tours and events, as well as for individuals, and is a key destination node in the city.

Another space that would benefit from a night time treatment is the Murraygate a key pedestrian route through the City, which has previously relied on lighting from shops but now requires greater identity day and night to make the space more welcoming and to ensure the cut throughs to Seagate. There are a myriad of gathering points along the Nethergate due to the numerous venues, including the soon-to-open Dundee Livehouse and city taxi rank. The space outside the St Mary's Old Steeple is used as a meeting point in both day and night because of the Overgate Shopping Centre, taxi rank, and groups that host in the church itself.

There are several outdoor seating areas for pubs and restaurants at the end of Reform Street, abutting Albert Square. The area is also a junction of four main pedestrian routes, making this a key area for activity in the public realm, particularly in the milder weather when people are sat outside. The area outside shops at restaurants at Hawkhill would benefit from considered lighting and landscaping. In some instances it may be appropriate to leave a space unlit to discourage use at night such as the The Howff, the 16th century burial ground area which is Category A listed, which is closed to the public at night.

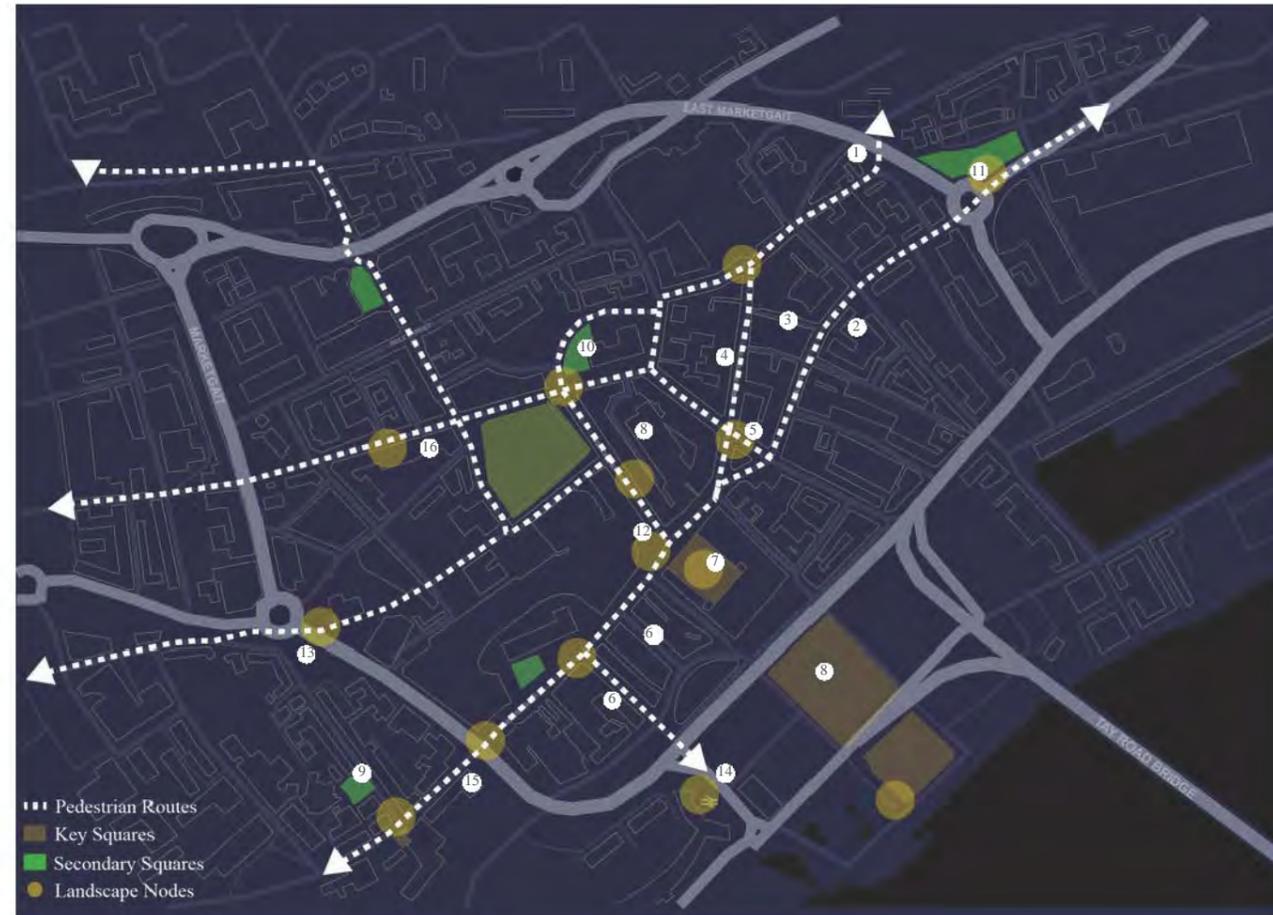


Figure 31: Public Realm map

Pedestrian Routes

1. East Marketgait Underpass
2. Seagate
3. Peter Street cut-through
4. Murraygate
5. Commercial Street

Key Squares

7. City Square
8. Waterfront

Secondary Squares

9. Tay Square
10. Albert Square

Landscape Nodes

11. East Port Roundabout
12. Boots Corner/ Reform Street
13. West Port Roundabout
14. Dundee Station
15. Nethergate
15. Ward Road / North Lindsay Street

Key sites



Figure 32: Murraygate



Figure 33: Union Street



Figure 34: Slessor Gardens

Key Considerations

3.3 Heritage

Dundee's has a rich heritage rooted in its industrial past, particularly the textile industry and its maritime history and shipbuilding. In the late 20th Century Dundee was well known for journalism and publishing and in recent years has been recognized for its innovative spirit, including its role as a UNESCO City of Design and its contributions to journalism, technology, medicine, and life sciences.

The heritage buildings and associated public realm including the waterfront and various passage ways and vennels are a key part of the character of Dundee's City Centre. Many of the key heritage buildings are located on key routes and help reinforce the form and architecture of the City Centre. Illuminating select facades will assist with the perception of safety within the City at night and assists with orientation for visitors less familiar with their surroundings.

Figure 38 shows the Category A Listed Buildings in the City Centre and how they sit within the cityplan. Those that are illuminated even partially are highlighted in yellow. Key Category A listed buildings that are currently unlit include St Mary's Old Steeple and St Paul's Cathedral, Chamber of Commerce Building, and the heritage façades on Constitution Road.

St Mary's Old Steeple and St Paul's Cathedral are the oldest churches in the city centre, although neither of the original buildings survived after being burnt down in 1841. They were rebuilt in 1844 and 1855 during the Gothic revival architectural period, evident in their architecture. Both church steeples provide landmarks within the city and are very visible from key streets and views in the city at night.

Constitution Road runs through Abertay University area and around the Dundee High School, completed in 1834, there are a number of key heritage buildings in the area and an opportunity to reveal the heritage of the area and improve the streetscape at night for pedestrians. At present the focus is mainly on functional streetlighting which is adequate but puts all the facades into complete darkness.

The McManus: Dundee's Art Gallery and Museum, originally known as the Albert Institute, was completed in 1867 and features similar Gothic architectural elements. The McManus underwent significant expansion and refurbishment in 1989 and 2010, and an update to the lighting scheme was completed in 2023.



Figure 38: Interrogation of the City Centre heritage buildings

- | | |
|--|------------------------------|
| 1. St Paul's Cathedral | 9. Dundee High School |
| 2. Caird Hall | 10. Watson's Bond & The Bond |
| 3. City Chambers | 11. Former Clydesdale Bank |
| 4. McManus Gallery, Albert Square | 12. St Mary's Old Steeple |
| 5. DC Thomson | 13. St Paul's Church |
| 6. St Andrew's Parish | 14. St Andrew's Cathedral |
| 7. Constitution Road | |
| 8. McManus Collection / Former Library | |

Key Sites



Figure 35: McManus Gallery, Albert Square



Figure 36: St Mary's Old Steeple



Figure 37: City Square

Key Considerations

3.4 Culture & Public Art

Art, monuments, and other key vistas are key in assisting wayfinding and creating a sense of place in a city centre. They can help connect users to the rich heritage and culture of Dundee, as well as making the city more accessible and vibrant. **Figure 39** locates the monuments and statues across the city, as well as other opportunities and areas where sense of place is important.

The Tay Road Bridge mural has been created in collaboration with local artists, and creates a recognisable piece that helps orientate pedestrians and drivers alike, as well as make the area more vibrant.

The city is peppered with statues and monuments, including the Dundee Dragon: currently guarding the east end of the High Street, it is based on the local legend of a dragon that terrorised the area. Most other statues are to historical figures like Queen Victoria and Adam Duncan.

When crossing the main roads it is important to have key views and vistas to aim for to aid navigation, particularly in areas like the West Port roundabout, where wayfinding is harder. The two underpass crossings at the ring road also present opportunity for colour or art to create a sense of place; previous projects at the East Marketgait underpass have included murals in collaboration with the local college of Art & Design.

A key architectural theme emerging across the city that contributes to its sense of place, are the industrial frames and pends, often present in the fine red-brick warehouse façades. These red brick façades reflect the industrial past of the city, and present opportunity for creative intervention.

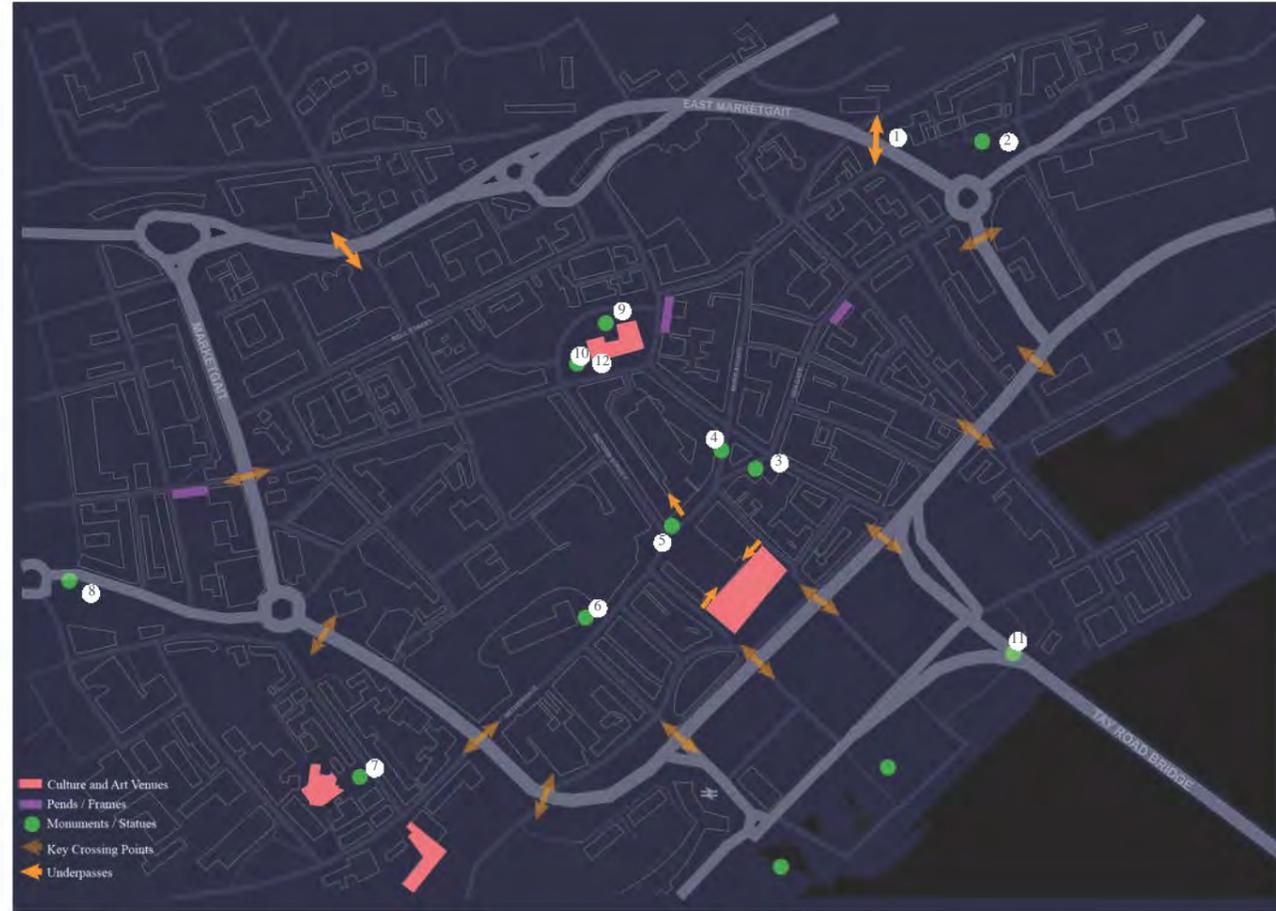


Figure 39: Interrogation of the City Centre areas of activity

- | | |
|---------------------------------|---------------------------|
| 1. East Marketgait Underpass | 9. Queen Victoria statue |
| 2. Wishart's Arch | 10. Robert Burns statue |
| 3. Admiral Adam Duncan Statue | 11. Tay Road Bridge mural |
| 4. Dundee Dragon | 12. Oor Wullie statue |
| 5. Desperate Dan Statue | |
| 6. March of the Penguins Statue | |
| 7. The Wave sculpture | |
| 8. Pyramid and Canopies | |

Key Sites



Figure 40: 4 - Dundee Dragon and Murraygate clock



Figure 41: 11 - Tay Road Bridge Mural



Figure 42: Tay Whale by Lee Simmons

Key Considerations

3.5 Existing Lighting Infrastructure

Understanding the existing lighting provision is an important consideration in making new proposals. In some instances some lighting may need to come away to make an area more distinct where new lighting is proposed. This would need to be sent to the lighting team at Dundee City Council for consideration and review. In areas where a space is going to be used permanently as a pedestrian route then it may be possible to remove roadlighting.

Any new lighting interventions or proposals need to work with the existing streetlighting, much of which has been converted to LED. There is an array of existing column luminaires which is captured below. It would be beneficial for Dundee City Council's ongoing maintenance to rationalise numbers and types of fittings where possible and for any new column lighting proposed to consider which existing visual language is appropriate.

The following should be considered :-

- Mounting height of equipment
- Colour temperature (most streetlighting is 4000k but some areas could be 3000k if in heritage zone).
- Column design - does an existing column type work for the design
- Lighting control

Asset data of the current lighting column types has been reviewed alongside photographs taken during the on-site surveys, to represent the different luminaire types on **Figure 43**. The figure shows there is more variety in

A variety of types were recorded, with heritage-style fittings located around Murraygate, City Square, Panmure Street, and High Street.

Taller, more modern style fittings are found more on the outskirts of the City Centre, and around the Inner Ring Road.

Figure 44 visually represents each of the key fitting types, and demonstrates the lighting hierarchy in relation to human scale.



Figure 45: Photos taken of existing street lights during site surveys

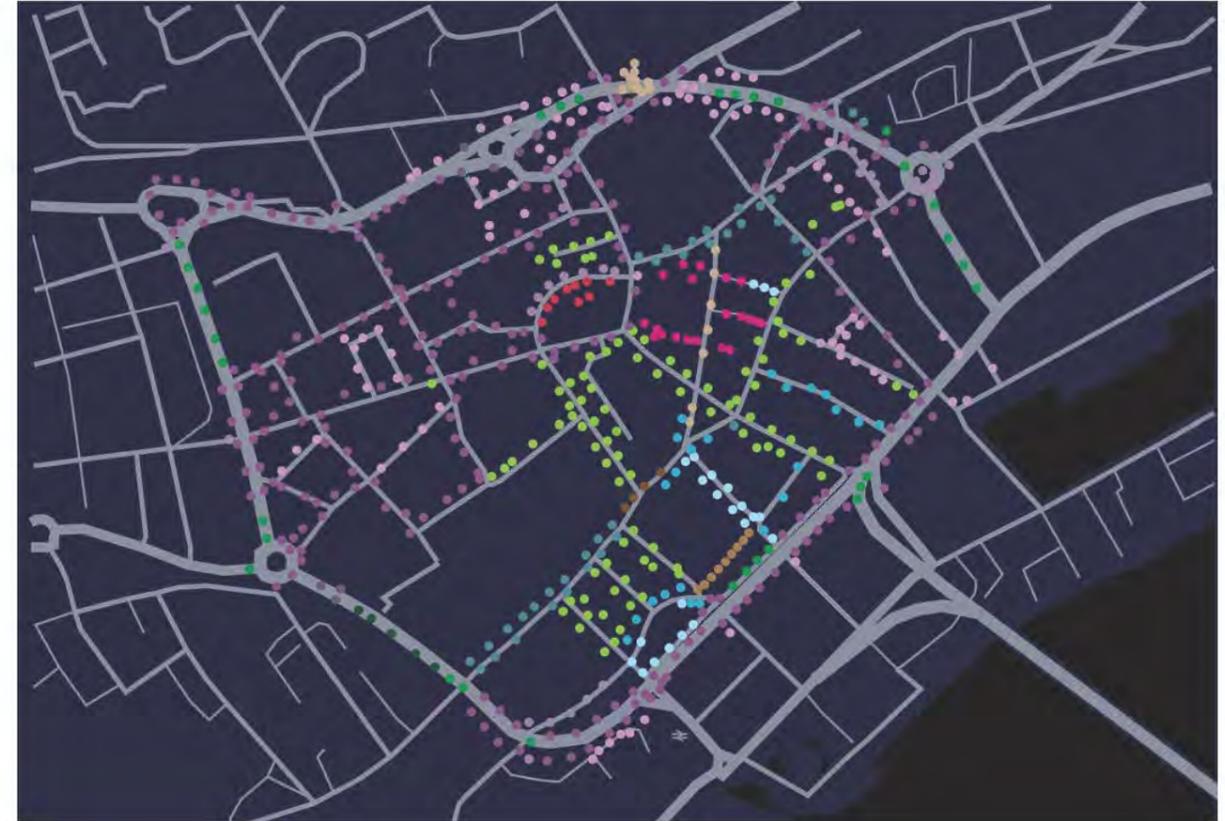


Figure 43: Lighting fitting types across the City Centre

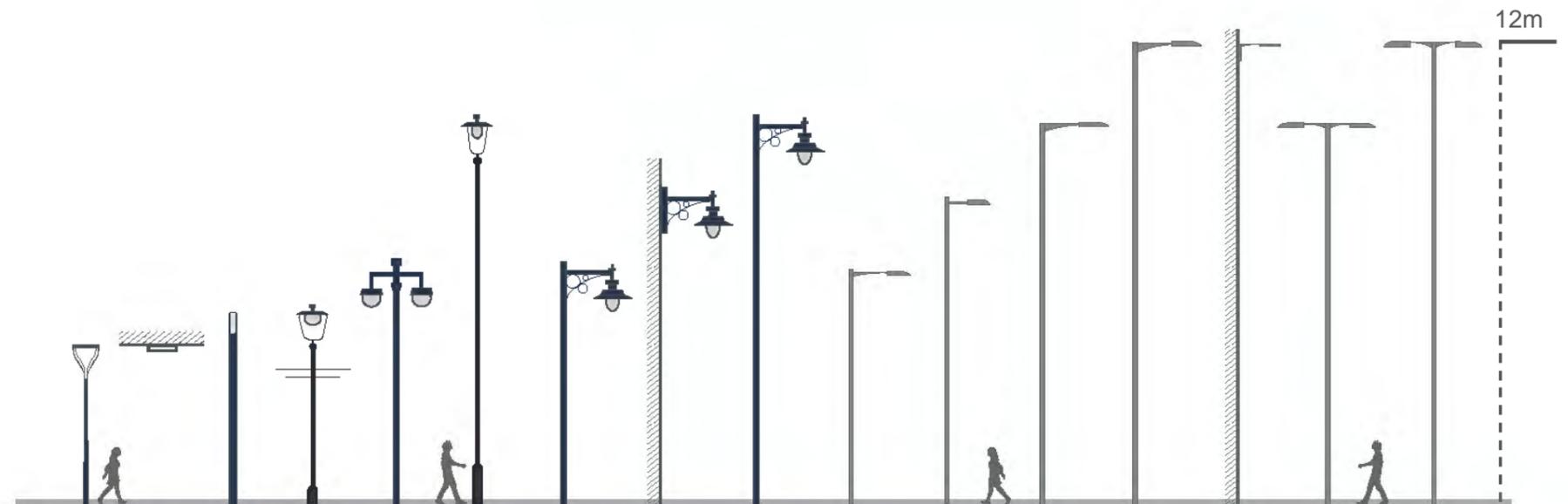


Figure 44: Lighting fitting types

4 Lighting Strategy

4.1 Lighting Strategy

4.1.1 Lighting Strategy

This Lighting Strategy for the city centre aims to hi-light key lighting projects that will both support and reinforce the urban developments planned for the city, and will improve access and safety for the public using the city centre at night. The Lighting Strategy aims to work with the existing streetlighting strategies that provide a level of amenity lighting to the city. While Dundee City Council streetlighting team will continue to implement their city centre LED upgrade to existing columns and building mounted fittings this Lighting Strategy provides and overlay to bring greater emphasis to areas of the city where the lighting is currently inadequate or not serving to provide a sense of safety. Very often this is an area where orientation or direction is unclear or where lighting and buildings create too strong a sense of contrast making the space feel unsafe to users.

The Lighting Strategy aims to provide ideas for consideration to inform approaches to spaces across the city centre and sets out a series of priority lighting projects, that have been developed in response to the feedback received from the surveys and consultation process carried out in 2024.

Through the place analysis there are a number of key opportunities that were identified. These were heritage, public realm interventions, culture and sense of place and temporary opportunities.

4.1.2 Heritage

The city of Dundee has many historical buildings which are not celebrated or revealed at night, lighting of key facades can assist with night-time legibility and orientation for visitors. Recommendations have been made to light some key buildings across the city centre where these buildings have particular significance in terms of their heritage and their placement within the city plan, helping reinforce specific views and vantage points.

Lighting enhancements can also significantly assist with the quality of the public realm spaces provided across the city. Improved public realm is key to a developing city where open space, wider walkable areas and dwell spaces all improve the quality of city life for occupants and their health and wellbeing. Allowing these spaces to be enjoyed in the winter months when it is dark early as well as lighter summer evening is key to supporting the city's night time economy. Public realm spaces can be lit in a number of ways however success is often attributed to a more layered approach where surfaces both horizontal and vertical are considered and a range of techniques are applied to provide a more sophisticated and visually stimulating space. Colour temperature must be carefully considered to render materials and surfaces properly and

light sources need to be shielded and directed properly so as not to generate glare for those in the space which will make the space less usable. In many of the good examples provided in this Lighting Strategy, it is clear that incorporating lighting into seating or planting features provides a much richer environment and experience for users. While this can bring some maintenance consequences if this is considered carefully during the design process and workable solution can be reached.

The variety of public realm spaces across the City is unique and we would suggest some of the lighting treatments look to reveal this. This could be the backlighting of gates or textured lighting through trees within a park. Having different qualities and characters of light to bring out the unique features of a space does not necessitate the use of different lighting fittings. We would recommend a range of products are considered that provide a toolkit for Dundee City Council to hold spares and therefore ease with maintenance requirements. It is essential to consider what the lighting can do to the existing landscape and urban features rather than thinking of light as a feature itself. It is essential for any designer looking at the lighting for the City to consider what features and surfaces need illuminated within a space to provide both functional and spatial lighting.

4.1.3 Temporary Lighting

Lighting that is engaging and playful can also enliven the night-time atmosphere to encourage participation in the after-hours economy of a city. The existing cultural activities of the city provide a strong sense of place and within Dundee there are various characters of different spaces that offer opportunities to reinforce the identity of an area and provide a sense of place within the city centre. The lighting project proposals consider the areas of the city that provide the best opportunities to anchor and strengthen the city-plan and improve connections and routes through the city at night. When people do not feel safe walking at night, they are less likely to participate in outdoor activities or use public transport. Therefore, incorporating pedestrian-centric lighting interventions can enhance personal security and safety.

Lighting the urban night-time goes beyond providing a practical solution "to light an area"; when lighting considers human interaction and human behaviour it enhances and activates a space that can ultimately improve community and economic outcomes.



Figure 46: Precedent: Heritage lighting example

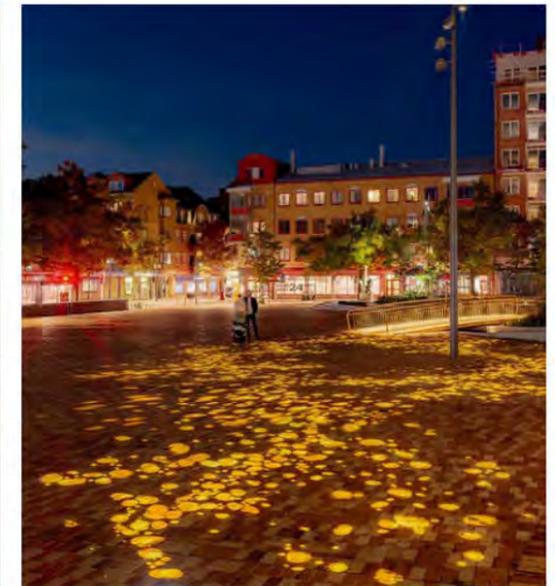


Figure 47: Precedent: Public Realm lighting example



Figure 48: Precedent: Sense of Place lighting example



Figure 49: Precedent: Temporary lighting example

4.2 Public Realm

4.2.1 Open Spaces and Squares

City centre squares and open spaces are defined by pedestrian activity, serving as recognisable meeting and gathering spots for wayfinding and events. It's crucial for these areas to maintain a night-time presence to encourage evening gatherings and businesses into the area.

City Square, shown in **Figure 50**, is the largest public square in Dundee City Centre. Other similar but smaller spaces include the areas around the McManus, and Tay Square outside the Dundee Rep Theatre.

As a key public realm space type, squares benefit from having interventions like fountains, planters, and benches. As well as the lighting, consideration should be given to the materiality of the floor and the public realm interventions.

Lighting to squares should provide adequate lighting for safety and accessibility, but does not need to be uniformly lit across the entire open space. Variations in lighting and how the spaces feel can add to the character and uniqueness of a place.

Lighting Objectives

- Accentuate public realm interventions like benches
- Bring out the square character
- Encourage night-time gatherings

Lighting Considerations

- **Flexible design**

The lighting design should avoid erecting any permanent columns or fittings in the centre of open squares, to allow for continued flexible use of the space and future proof the design.

- **Lighting key buildings**

Key buildings and other architectural features around the edge of squares can increase ambient light levels, as well as bringing out the character of the architecture. By ensuring key arcades and building entrances are lit, it discourages antisocial behaviour in these darker spaces around the edges of squares.

- **Linear lighting to benches**

Controlled integrated lighting to benches will encourage gathering in the area.

- **Uplighting to fountains/planters**

Concealed uplighters can be used to uplight fountains or planters, to add a more dynamic feel to the areas. The fittings should be carefully selected to avoid glare into the eyes of the public, and have a suitable IK rating to avoid damage.



Figure 50: Open spaces and squares sketch: City Square



Figure 51: Precedent: fountain lighting



Figure 52: Precedent: bench uplighting

Public Realm - Lighting Treatment

4.2.3 Key streets and pedestrian routes

With an increasing number of the City Centre streets becoming pedestrianised, it is important to design these key pedestrian streets and gathering spaces with more of human scale lighting interventions in mind. This can encourage users to interact with what is happening at street level, and boost the night-time economy.

Murraygate and Reform Street are key pedestrian streets that would benefit from more varied lighting treatment to encourage interaction with shopfronts.

Lighting Objectives

- Encourage the public to walk into the City Centre
- Promote engagement with shopfronts and boost the night-time economy
- Accentuate key gathering points
- Improve safety and accessibility on pedestrianised streets

Lighting Considerations

- **Linear lighting to benches and fountains**

Controlled integrated lighting to benches and concealed uplighting to planters will help create visual interest as the public walk along the street.

- **Multi-head lighting columns**

Multi-head lighting columns can provide a variety of different lighting interventions at once. Diffuse elements can provide a level of diffuse illumination and create visual interest, and carefully angled spotlights can provide general illumination for the street. Additional spotlights can be used to light other parts of the street, such as façades or monuments.

- **Lighting at shopfront level**

Lighting at a lower level should be considered, to improve interaction and eliminate dark doorways.

In-ground uplights can be used to highlight architectural doorways or other key features. Alternatively, fittings can be mounted above doors or other architectural features .



Figure 53: Key streets and pedestrian routes sketch: Union Street



Figure 54: Precedent: lighting columns



Figure 55: Precedent: wall mounted fittings

4.3 Heritage - Lighting Treatment

4.3.1 Heritage Buildings

The heritage façades and spires across the City Centre are key to the city character and creating a sense of place, and yet the number of beautiful buildings in Dundee City Centre that are currently unlit was identified in both the Stakeholder Night Walks and the Online Survey. The 19th century architecture of the buildings down Constitution Road was particularly noted.

Figure 56 shows the large impact small interventions can have in areas like Consitution Road.

By lighting key vistas like the spires, you are creating navigational aids and a sense of place across the City Centre.

Lighting Objectives

- Assist wayfinding
- Create enjoyable night-time destinations around the churches
- Accentuate the heritage architecture
- Bring out the city character
- Increase ambient brightness in areas like Barrack Street that border The Howff.

Lighting Recommendations

- **Accent key architectural features**

Lighting should avoid floodlighting entire façades or churches, to avoid excessive light spill, glare into buildings and excessive energy usage.

Lighting should be focused on accentuating key architectural features, such as the spire tops, pilasters, porticos, building crowns, and window reveals. A soft, considered wash on some façades is suitable, but the lighting should be focused to avoid light spill.

- **Lighting entrances**

Lighting elements should be considered at building entrances, to improve the street level user experience. This can help with navigating into the building at night, as well as eliminating any dark corners or doorways that may end up being used for unsociable activities.

In some areas with more grand entrances, uplighting may be effective. Building mounted fittings with light output both upwards and downwards (direct/indirect) are another option to improve facial recognition at doorways.

- **Fittings with good optical control**

Where possible uplighters should not be pointed directly into the sky, to avoid light spill. Carefully selected optics will also reduce the number of fittings required.

- **Warm white colour temperature**

Lighting should consider using a colour temperature of 2700-3000K to façades. Colour should be used sparingly, to ensure the Gothic architecture and heritage character of the buildings are not lost.



Figure 56: Heritage buildings sketch: Constitution Road, towards Barrack Street



Figure 57: Precedent: spires



Figure 58: Precedent: façades

Heritage - Lighting Treatment

4.3.2 Lighting to Pends and Archways

The distinctive red-brick industrial buildings across the city centre, most notably in the Bond on Seagate, are key recognisable architectural features of the city. These façades often feature a series of archways and pends.

'In Scotland, a pend is a passageway through a building, often from a street through to a courtyard'

These architectural features are repeated all over Dundee, along Guthrie Street, Seagate, Panmure Street, and further. They are a key part of the City Centre heritage, but are currently mostly in darkness or used for antisocial behaviour.

Lighting Objectives

- Create a rhythm across the city by lighting the pends and archways in a consistent manner
- Bring out the industrial heritage and character of the city

4.3.3 Laneways and underpasses

Laneways, cut-through connections and underpasses can often feel unsafe at night due to the routes being narrow and enclosed. However, they present a valuable opportunity for a creative or innovative lighting intervention.

There are two underpasses identified in Section 3 that link the City Centre across the ring road to the wider city, on East Marketgait and Dudhope Crescent. These underpasses are key to pedestrian movement across the ring road, and are both being developed as key and active travel routes into the City Centre in the CSSIP 2050. As part of these developments, the Dudhope underpass will also become pedestrianised.

The laneways and 'cut-throughs' between Seagate and Murraygate are generally darker than the main thoroughfare, and the existing lighting has not been upgraded to LED.

Lighting Recommendations

- **Uplighting to pend pilasters**

In-ground uplights with carefully selected optics can be used to uplight the pilasters either side of pends.

- **Considered use of colour**

A considered use of colour can help create a sense of place, by using the same colour as underpasses or other frames and pends in that area of the city.

- **Considered wallwash optics**

A fitting with a wallwash optic will help reduce glare for pedestrians passing by.

- **Careful positioning of luminaires**

This strategy recommends that where possible, fittings are kept out of reach of the public. This may mean positioning luminaires on the other side of a gate, as shown in **Figure 59**.

- **Potential for art**

The lighting has the potential to collaborate with local artists and schools to create light art that reflects the industrial past of candle making from whale blubber, or jute and marmalade production.



Figure 59: Pends and Archways sketch: Watsons Bond on Seagate



Figure 62: Pends and frames across the city

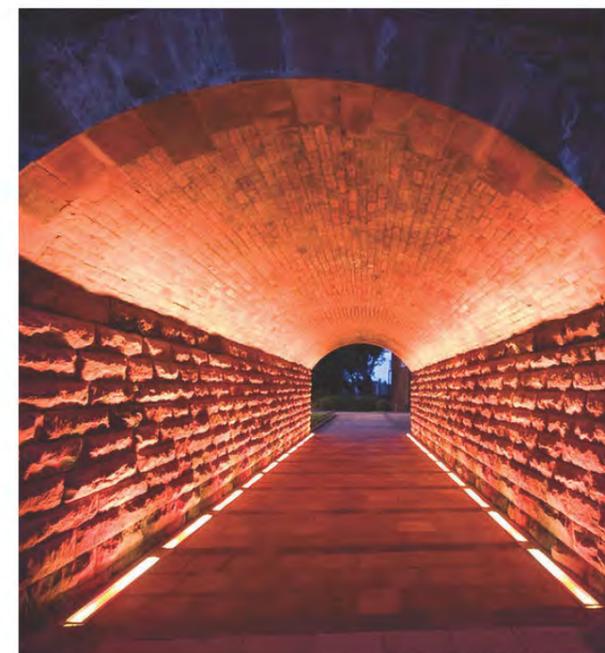


Figure 60: Precedent: linear in-ground lighting

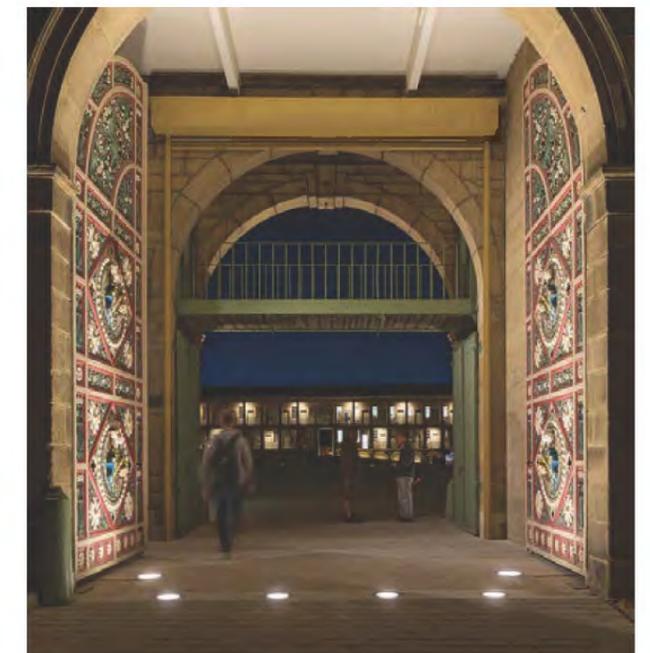


Figure 61: Precedent: in-ground uplights

4.4 Culture and Sense of Place

4.4.1 Monuments and Art

Ensuring the lighting takes account of the existing monuments, statues, and public art across the City Centre will help to bring out Dundee's character and history, and promote a continue the sense of pride in the City. This is not to say all public sculptures and art should be illuminated rather it should be assessed and considered when lighting is being considered. It would be preferable to curate a lit route of artworks at night and consider those that lend themselves to be lit, this may be down to their importance, scale and materiality.

Existing Art

There are some key landmarks that are not currently lit, such as the Wishart Arch - the only remaining piece of the city walls and a key part of the city's history. This provides an interesting opportunity to provide some further interpretation of the city to visitors.

A listing and map of statues and monuments is included in **Section 3.3.1** of this report. A number of statues, such as Oor Wullie and the Dundee Dragon, are located in or around Reform Street, High Street and Murraygate, areas of high footfall and during the night walks these artworks are not legible.

Lighting Considerations

- **Integrating colour**

Using colour can be an exciting way to illuminate statues and monuments. This should be done in a considered manner so as not to take away from the existing landmark, and have suitable lighting controls so the colours may be changed to suit events.

- **Positioning and number of fittings**

Carefully selected optics should be utilised to reduce glare into the users' eyes, and minimise the number of fittings needed. Fittings should be concealed if possible, or matched to the stone colour on which they are mounted, as shown in **Figure 64**.

Lighting Considerations

- **Emphasizing the architecture**

The architecture of the arched cut-throughs or sweeping underpasses can be emphasized, to draw pedestrians through the connections.

- **Colour and Interactivity**

Consider using colour in a creative manner to help give users a sense of place and orientation. Lighting can be interactive to reflect movement through the connections.

- **Materiality**

The materiality of the inside of the underpasses can be varied to give different reflections and effects of the lighting, to give a sense of movement.

- **Art**

Artwork can be integrated and lit with simple and effective white light.

- **Robustness of luminaires**

Careful consideration to selection and positioning of luminaires should be made. If in-ground fittings in reach of the public are used, a suitably IK rated fitting should be used. If possible, fittings should be concealed.



Figure 65: Precedent: interactive underpass LED wall

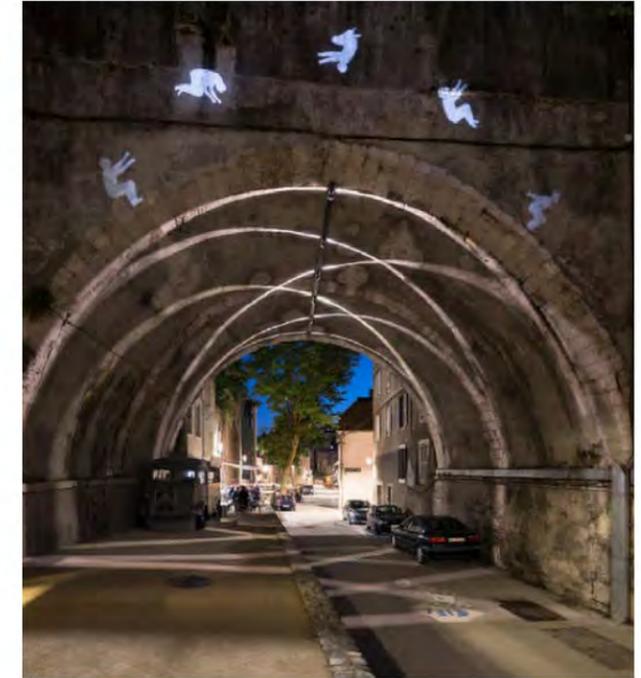


Figure 66: Precedent: projections to laneways



Figure 63: Precedent: archway lighting



Figure 64: Precedent: lighting to statues

4.5 Temporary Lighting

4.5.1 Temporary Lighting Treatments

Temporary lighting is being discussed in the context of embellishments to the cityscape or specific building facades for celebration purposes or to support particular events in the City. Dundee City Council should be contacted in the first instance for any temporary lighting installations to review if they are appropriate for the context of the area and to check how bright they will be. Dundee City Council will provide guidance on how any temporary lighting is to be installed.

A number of temporary lighting treatments are shown opposite these can be suspended festoon lighting, light sculptures, coloured lighting overlays and projection. Whatever is being considered it should be submitted to Dundee City Council for consideration to ensure it is in keeping with the area and consideration must be given to how the lighting will be automatically switched off at night and that the brightness of the lighting is in no way detrimental to traffic or residents in the form of light spill.

Temporary lighting for events, festivals, holidays, and regional or national celebrations can bring interest to an area and social and economic benefits to a city but this must be done in balance with those that live in the vicinity and with a consideration for ecology as well should an installation be within a park or near a waterway.

Temporary installations can range from dynamic coloured lighting, festoon lighting, meanwhile lighting for pop up such as Christmas markets and lighting projections for events. The following recommendations should be considered when relevant during the planning process.

The use of temporary or event lighting can be used as a method to test an idea and receive feedback or as a meanwhile solution. Short-term initiatives with alignment to long-term visions for safe, enjoyable and activated urban spaces, can provide quick, cost-effective and tangible benefits for all – enabling community to contribute to the development of their future place, alongside public and private stakeholders

Recommendations

- Carefully consider saturated colour to heritage facades - does it portray the building fabric favourably.
- Consider the brightness of the temporary lighting and carry out mock-ups, tests if required. Contact DCC for agreement and involve neighbours and local stakeholders to check they are in agreement.
- Consider how long temporary lighting will be installed and how it will be taken down.
- Minimise light spill - temporary installations must avoid directing fittings upward into the sky where possible, to reduce sky glow, as well as into adjacent buildings.
- Avoid covering permanent lighting - temporary Lighting should not detract from the general lighting of a street or building.
- Suitable lighting controls should ensure lighting is only on when required.



Figure 67: Self illuminated objects



Figure 68: Food market temporary lighting treatment - Sheffield



Figure 69: Projections to facades



Figure 70: Christmas display Oxford Street

5 Lighting Project Proposals

Murraygate

City Square

East Market Underpass

Reform Street

St Mary's Old Steeple

St Paul's Cathedral

Dundee Rep Theatre

Guthrie Street

5 Project Proposals

5.1 Murraygate and High Street

Murraygate is one of Dundee's most historic and well known streets. It is central to the city and has been a key commercial street for decades. Historically it was a major tram route through the city and remains the last part of Dundee to retain tramlines embedded in its cobbled street.

Although now pedestrianised, Murraygate has been notably affected by the decline of high streets across the UK, with major retailers opting for the nearby Overgate Centre instead.

Figures 72 and 73 are photographs from the mid-20th century, that show Murraygate with lighting columns running down the centre of the street, approximately 8m in height, to accommodate the double decker trams. Following the removal of the trams it is believed that the current lighting provision was installed, maintaining a similar design but at a reduced height of 5 meters.

During the Stakeholder Night Walks, Murraygate was designated as Viewpoint 7 on Route Two. Stakeholders observed that the street felt dark and unsafe, with the central lighting providing insufficient illumination to the edges of the street.



Figure 72: Trams on Murraygate during the 1900's and light columns



Figure 73: Murraygate in the 1970's showing columns and tram lines



Figure 74: View of seating area and artwork on High Street



Figure 75: Murraygate during the day



Figure 76: Murraygate at night

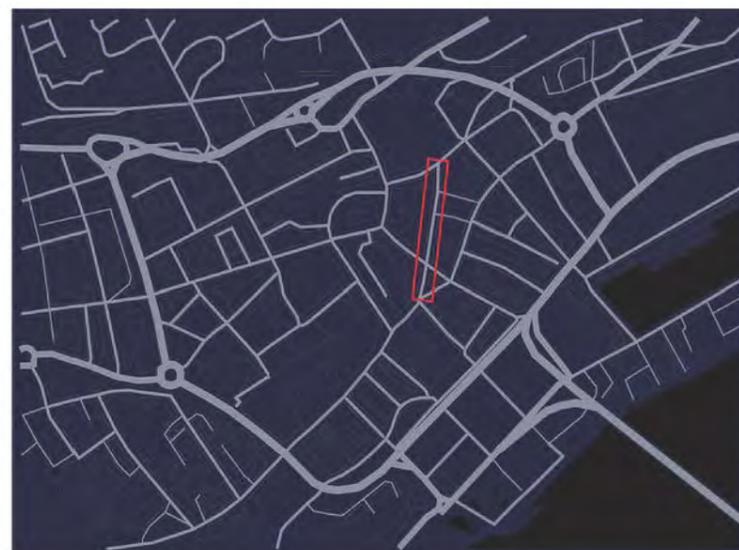


Figure 71: Project location

Murraygate and High Street

Lighting Objectives

- Enhance the street's functional lighting and add in aesthetic elements to create a welcoming environment.
- Paying homage to the history of the street, which was a key tram route.
- Encourage night-time activity along the street.

Lighting Design Intent

- Retain the central position of the existing column along the street, replacing it with a taller 8-meter column.
- Add a diffuse light element at the top of the lighting column. This feature draws the eye upwards, reducing the perceived height difference between lighting features and the tops of buildings.
- Light columns can be fitted with multiple, adjustable heads. This design allows for the addition of more heads when required, such as for festive lighting or to temporarily highlight a facade.
- Retain pea lights to selected trees around designated seating areas. This will create a warm and inviting atmosphere, encouraging people to utilise these areas.
- Illuminate the local sculpture of a dragon with an adjustable head from the lighting column.

Other Recommendations

- Potential to add gobo lights to the lighting columns. This will allow the pavement to display information and can be used for festive or event lighting.



Figure 78: Precedent images



Figure 77: Lighting design intent at High Street

Murraygate and High Street

Lighting Columns

- Utilising 8 meter tall columns with a glow top element provides diffuse light from 5.5m to 7.5m.
- Columns shall be fitted with any number and configuration of heads, providing flexibility and future proofing the design. A standard two sources are recommended, located at 3m and 4m in height to provide suitable light levels at street level.
- Additional heads shall be added to light building façades and highlight the architecture of the street.
- Projectors/gobos can also be used to provide projections on the ground. These can feature patterns, designs and logos.

Some potential lighting column types are shown opposite.



Figure 80: Precedent images



Figure 79: Lighting design intent at Murraygate

Murraygate and High Street

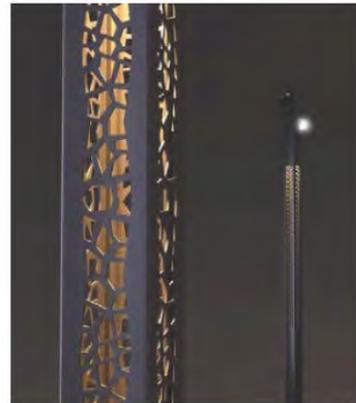
Lighting Controls and Scenes

The central intelligent column proposal for Murraygate provides a range of scenes for the street across the course of the evening and provides flexible uses across the year. The columns have a range of sources that provide not only general lighting for safe movement within the street but have the ability to create more dynamic elements of light to draw people down the street at night to a particular event or venue. Over night the lighting can be dimmed down to provide an overnight safety scene and useful light for deliveries in the winter months during the hours of darkness.

Lighting controls can allow for scene setting throughout an evening. Some potential evening scenarios are:

- Twilight scene
- Night time scene
- Weekend evenings and events

Possible Luminaire Types



Twilight



Night time



Events

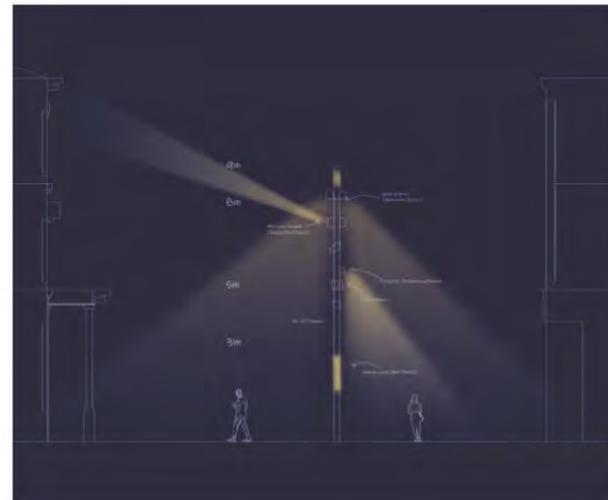


Figure 81: Twilight lighting scenario

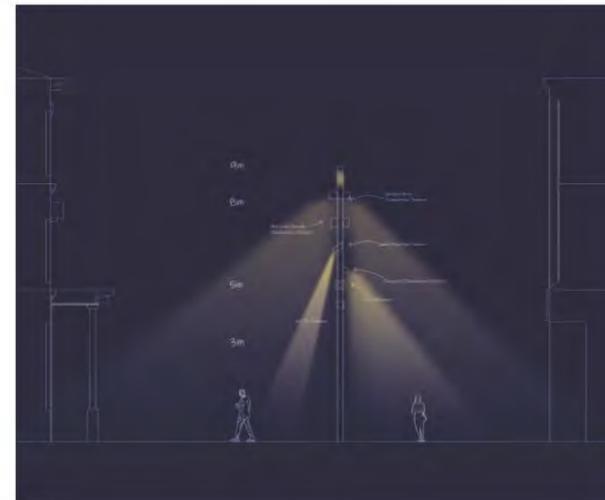


Figure 82: Night time lighting scenario



Figure 83: Weekend evenings with wayfinding - lighting scenario



Murraygate

5.2 City Square

City Square is located at the heart of Dundee, at the junction of High Street and Reform Street, and bordered by Caird Hall and City Chambers.

Caird Hall is a Category A listed concert venue that hosts comedians, musicians and variety acts. The main entrance and box office to which is accessed from City Square.

City Chambers represents and hosts flags for each of the four cities Dundee is linked to: Alexandria, VA; Orleans, France; Nablus, Palestine; Wurzburg, Germany.

Both Stakeholder Night Walks began at City Square, as it is considered a key meeting point and conflict area (an area where different classes of traffic and pedestrians meet). The square itself is notably empty in the centre, with lighting limited to wall mounted fittings around the perimeter of the square. Stakeholders reported that while the area felt dark, it did not feel unsafe or concealed.

The street lighting fittings used within the square are of a very warm colour temperature which was preferred over the harsh cool colour that can be seen on Reform Street nearby. Enhancing the lighting in the square could significantly improve the ambiance of the square at night.

At night City Chambers fades into the background due to the chosen locations of the facade lighting, illuminating only the central two pillars on the centre of the elevation as shown in **Figure 86**. Inconsistencies in colour temperature

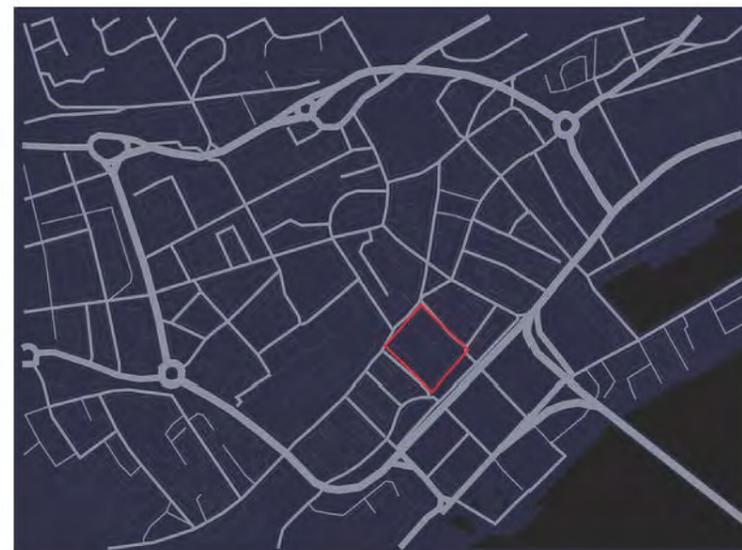


Figure 84: Project location

between the facade lighting and street lighting are noticeable and create a disconnected feel between the City Chambers and the rest of the square.

Caird Hall's colour changing lighting adds a visually interesting element to the square. However, the rest of the square remains inadequately lit with little illumination on the horizontal plane at ground level (**figure 88**).

Improving the overall lighting levels in the area and adding facade lighting to the City Chambers would enhance the visibility of the square, making it more inviting and vibrant at night.



Figure 85: View looking to Dundee City Chambers during the day



Figure 86: View looking to Dundee City Chambers at night



Figure 87: City Square during the day



Figure 88: City Square at night

City Square

Lighting Objectives

- Create visual prominence for the City Chambers at night.
- Increase illumination levels of City Square.

Lighting Design Intent

- Adding an uplight detail to the crown section of City Chambers, accentuating the cornicing detail.
- Back-lighting the stained glass windows at the front of the City Chambers.
- Add lighting to the archways at the bottom of the City Chambers, illuminating a previously dark and concealed area. This will enhance safety and provide spill light to the square.
- Wall washing to the central section corners, creating a visual element that can be seen when walking down Reform Street at night and adding depth to the facade at night.
- Add lighting to the fountains in City Square to highlight this feature. The illuminated fountain will drawing attention and enhancing the square's ambiance.
- Retain and upgrade the existing heritage fittings in the city square to LED sources, preserving the historical character of the area.

Other Recommendations

- There is the potential to incorporate a colour changing element to the archway lighting, mimicking the colour changes on neighbouring building Caird Hall.



Figure 89: Precedent images





City Square

5.3 East Marketgait Underpass

East Marketgait Underpass is a pedestrian walkway beneath the inner ring road of Dundee, the A991. It connects the two sections of Cowgate which are separated by the A991 and is a crucial transportation route within the city.

Located in Dundee's Eastern Quarter, an area currently undergoing significant development, the underpass is poised to become a key route between the city centre and the Eden Project.

During the stakeholder night walks, the East Marketgait Underpass was viewpoint 4 on route two. Key observations from this walk highlighted a stark contrast between the brightly lit underpass and its poorly illuminated surrounding. This creates feelings of unease and makes the area feel unsafe, resulting in some pedestrians avoiding the underpass altogether.

Figure 93 demonstrates the extent of this contrast, showing the underpass itself illuminated with cool toned, bright luminaires while the surrounding areas are lit with warmer, lower intensity lighting. These differences in both light level and colour temperature contribute to feelings of discomfort and unease among pedestrians.

For individuals with accessibility needs the underpass is the only viable route as the nearest alternative is not step-free. However the accessible route on the far side of the underpass is currently inadequately lit at night and is considerably longer than the stepped route.



Figure 91: Inside East Marketgait Underpass

The existing underpass doesn't feature any artwork, instead utilising static poster locations to display advertisements. At the top of the stepped access to the underpass the 'Ring-O-Roses' art installation by J. Keith Donnelly can be seen, see **Figure 94**. This installation links to the history of Dundee and the nine incorporated trades. There is potential to display more local artwork within the underpass, improving the aesthetic appeal and cultural value of the space.



Figure 92: East Marketgait Underpass during the day

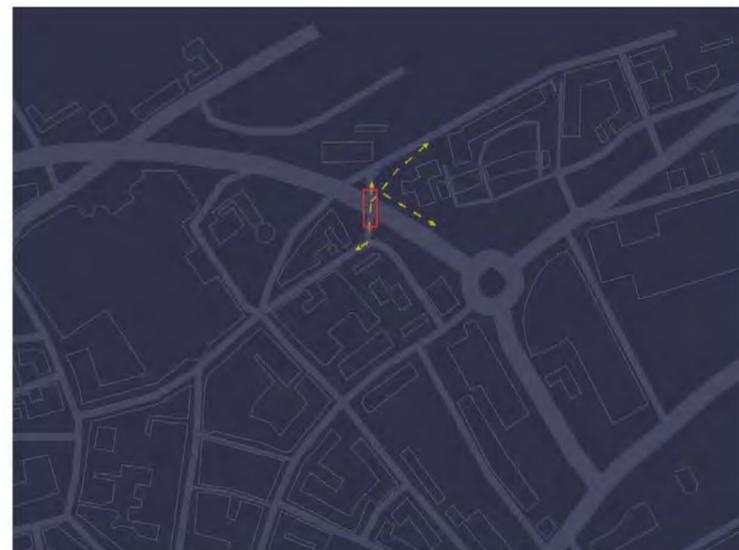


Figure 90: Project location



Figure 94: 'Ring'O'Roses'



Figure 93: East Marketgait Underpass at night

East Marketgait Underpass

Lighting Objectives

- To reduce contrast between the underpass and surrounding areas.
- Improve wayfinding, directing traffic through the underpass instead of around.
- Add visual interest to the area.

Lighting Design Intent

- Linear detailing extending from the exterior to the interior of the underpass. This will seamlessly connect both areas and establish a clear, navigable pathway for pedestrians.
- Introduce colour to the interior walls of the underpass. This will enhance visual appeal and reduce the contrast between the underpass and its surrounding environment.
- Install electronic billboards on the exterior of the underpass to provide dynamic visual elements and information.
- Add handrail lighting to the steps on the far side of the underpass. This will improve way finding and reduce contrast, ensuring safer passage for users.

Other Recommendations

- There is the potential to incorporate art installations within the underpass. Utilising gobos or projectors, these installations can be displayed alongside the electronic billboards, adding a dynamic and artistic element to the space.
- Projector displays could mirror or complement those found in other parts of the city. This approach will create a cohesive and unified aesthetic throughout the urban landscape.

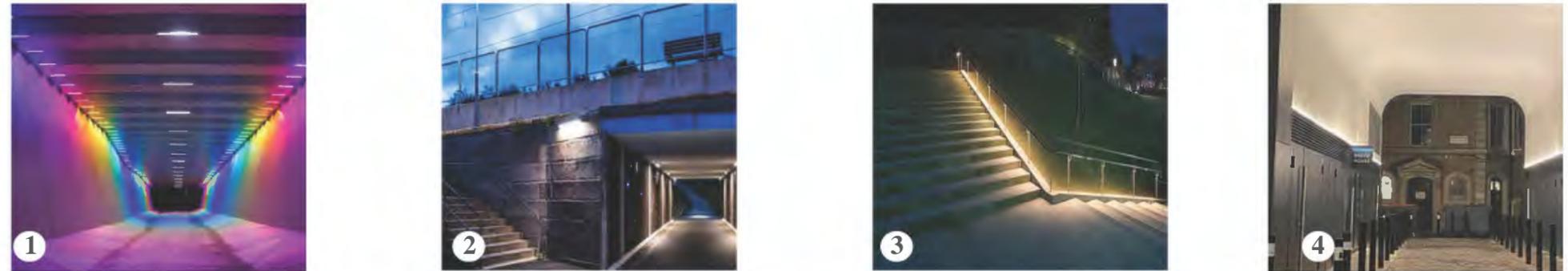


Figure 96: Precedent images

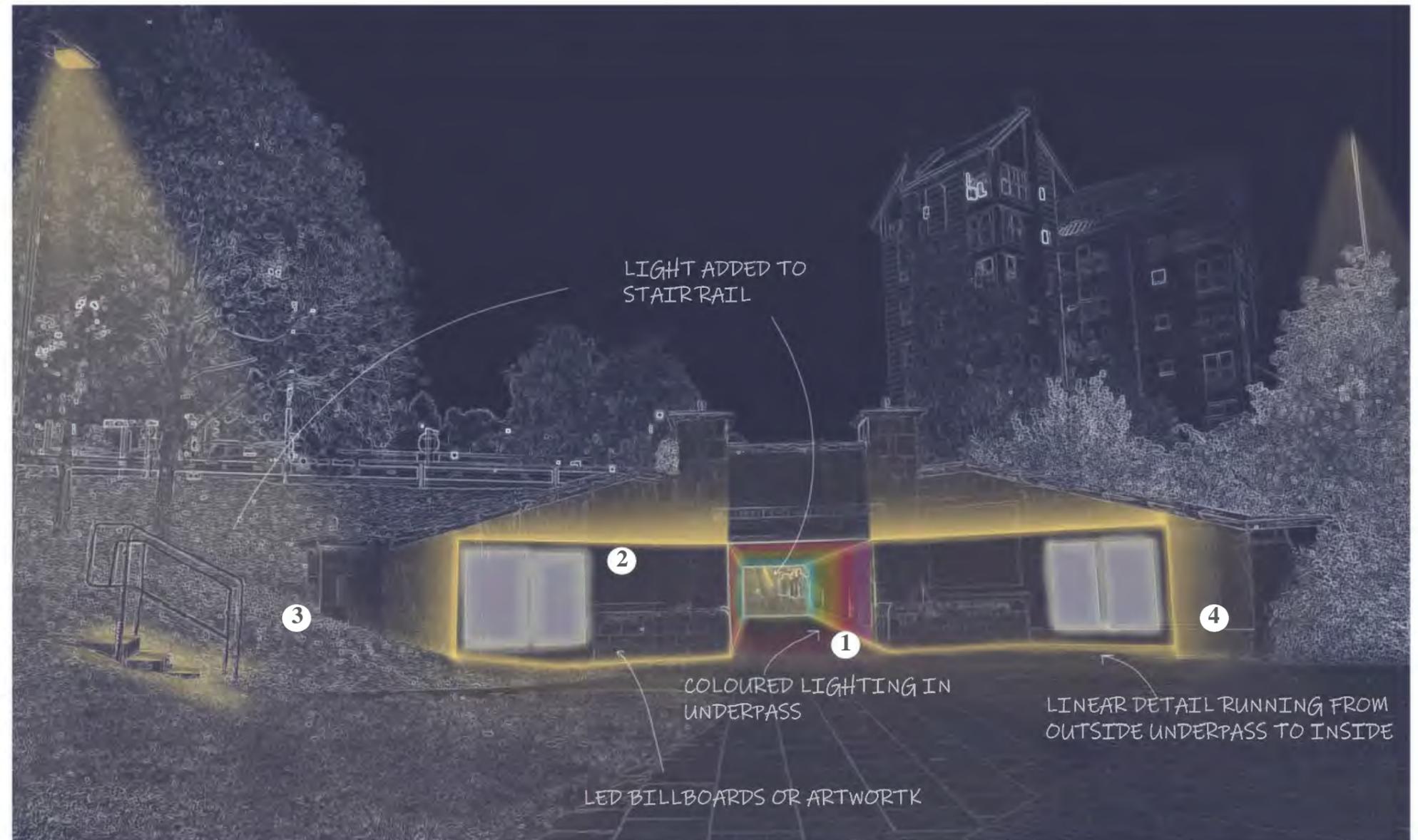


Figure 95: Lighting design intent at Murraygate

East Marketgait Underpass

Alternative design possibilities

There are several design possibilities for enhancing the area inside the underpass, one shown in **Figures 97**, featuring coloured light panels within the underpass, creating a vibrant and dynamic environment.



Figure 98: Precedent images



Figure 97: Underpass precedents

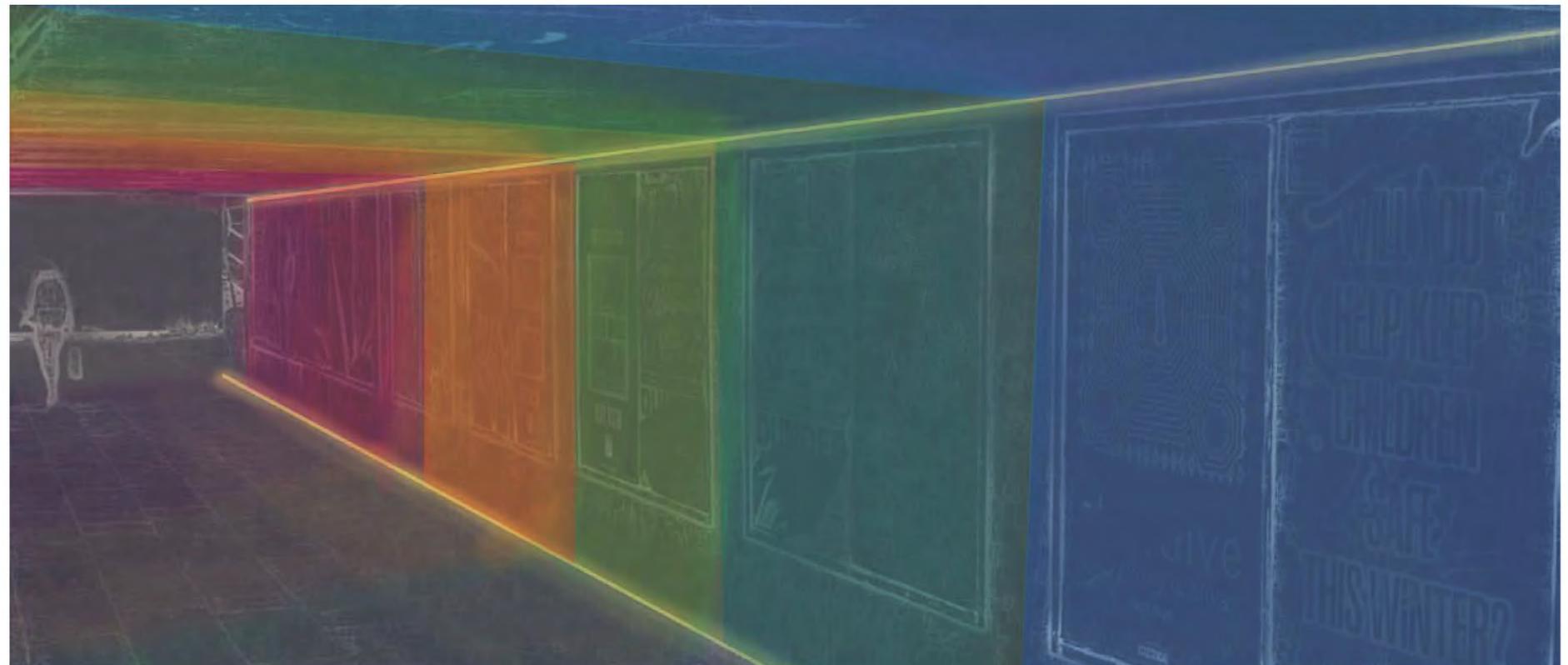


Figure 99: Concept sketch



East Marketgait Underpass

5.4 Reform Street

Reform Street is centrally located in Dundee city Centre, serving as a vital link between High Street, Meadowside and Panmure Street. This historic street is home to a number of significant buildings which have listed building status. The street also offers a view to the High School of Dundee, with its colour changing columns that add a vibrant and dynamic feel to the area at night. However the rest of the Reform Street lacks the same level of visual interest after dark. City Square can also be seen when walking down Reform Street with colour changing aspects on Caird Hall.

There are few businesses open on the street during the evening, limiting its contribution to the night-time economy of the city. Enhancing the streets lighting could play a crucial role in revitalising the area, making it more inviting and encouraging more businesses to operate later into the night.

During the Stakeholder Night Walks, Reform Street was Viewpoint 7 on Route One. Observations from these walks highlighted that while the street is well lit, the lighting is not at a human scale and tends to feel cold and uninviting. Lighting on the street is currently mounted at 10m FFL.

Historical images of Reform Street show catenary lighting suspended between buildings and should be considered as potential design inspiration for future improvements to lighting along the street.

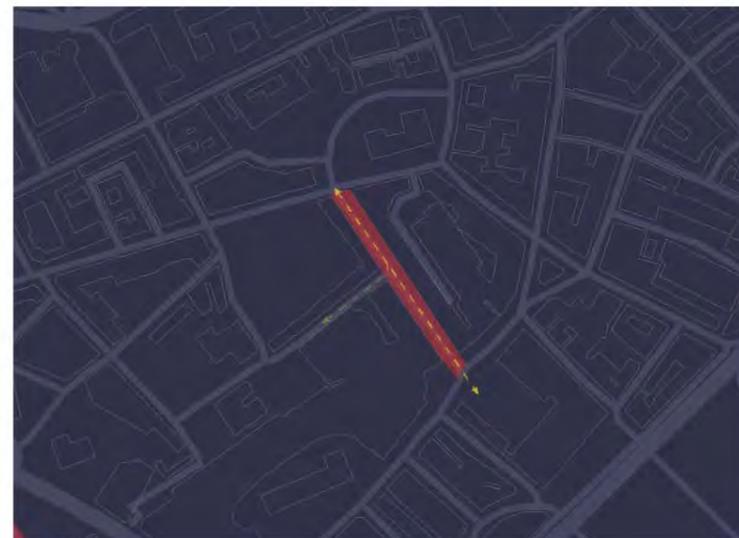


Figure 100: Project location



Figure 101: Colour change elements on the High School of Dundee



Figure 102: A look towards City Square from Reform Street



Figure 103: Historical image of Reform Street with catenary lighting



Figure 104: Reform Street during the day



Figure 105: Reform Street at night - currently very flat and featureless

Reform Street

Lighting Objectives

- Celebrate the unique scale and heritage of the street
- Encourage night-time activity
- Create visual interest

Lighting Proposal - Option 1

- Catenary lighting system to provide illumination to the centre of the street, whilst creating a visual point for the eye to focus on along the street. This design choice pays homage to the historical use of catenary lighting on the street, and a heritage style fitting can be utilised.
- Linear fittings to the stone balcony detail along the façades of the street, highlighting the architectural detail and adding depth to the facade. This lighting will also provide visual connection between the wall mounted fittings and catenary system.
- Implement uplighting to archways along the street to create a rhythmic and visually appealing effect.

Other Recommendations

- Introduce some additional public realm interventions such as benches or hanging baskets/planters that could have lighting integrated into them.
- Painting the façades a warmer/brighter colour

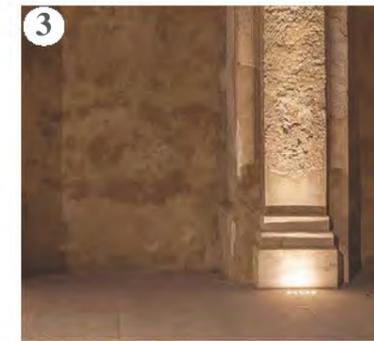


Figure 107: Precedent Images

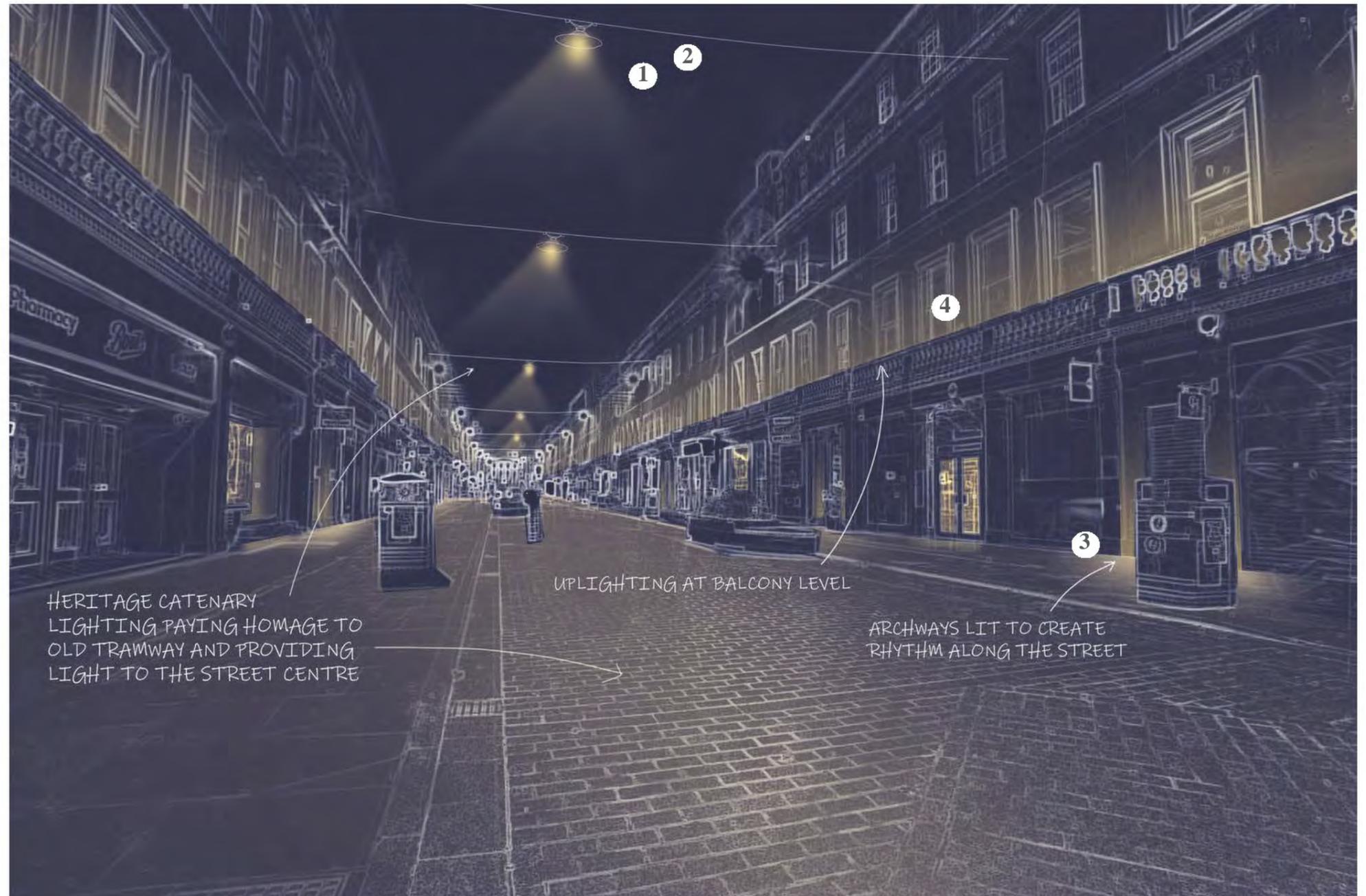


Figure 106: Lighting design intent at Reform Street

Reform Street

Lighting Design Proposal - Option 2

- Heritage style wall mounted fittings with an LED source installed at first floor level, above doorways, will bring the lighting on the street to a more appropriate human scale. These can sit above doorways, to add visual interest to shopfronts and encourage their night-time usage. By extending the wall mounted fittings away from the wall and towards the centre of the street, visual interest is created for users as they walk along the street, as well as helping light the central area of the street
- Uplighting to archways along the street to create a rhythmic and visually appealing effect.
- Linear fittings to the stone balcony detail along the façades of the street, highlighting the architectural detail and adding depth to the facade.
- Retain existing street lighting to provide additional general illumination.

Other Recommendations

- Introduce some additional public realm interventions such as benches or hanging baskets/planters that could have lighting integrated into them.
- Painting the façades a warmer/brighter colour

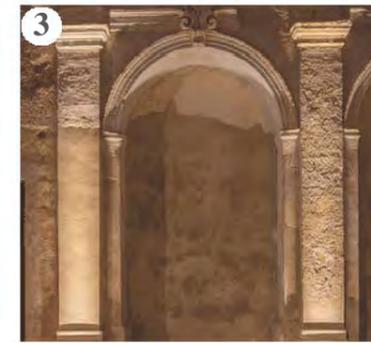


Figure 109: Precedent Images



Figure 108: Lighting design intent at Reform Street



Reform Street

Figure 110: Lighting design visualisation

5.5 St Mary's Old Steeple

St Mary's Old Steeple is located at Viewpoint 1 on Route One of the Night Walks, as shown in **Figure 111**. The church sits in front of the Overgate Shopping Centre, through which there is high footfall during the day. At night, the areas around the Old Steeple are quieter, as the centre closes.

The area is on a key route into the city centre along Nethergate, leading to City Square and central destinations. The Old Steeple is also opposite the junction to Union Street, a recently pedestrianised street. The area is a busy area for picking up/dropping off with the taxi rank directly adjacent to the Old Steeple. The route is expected to become busier with the opening of the Dundee Livehouse opposite the church. The church hosts a variety of groups, some of which meet at night, including youth clubs like the Hot Chocolate Trust and activities such as Bellingring.

Stakeholders on the Night Walks identified the area to be chaotic and wayfinding to be difficult, due to street clutter like bus shelters, and the busyness of the street. This lack of wayfinding and visual aids make the area difficult to navigate for those who are visually impaired. Feelings of safety varied depending on their proximity to the darker areas at the church.

The current lighting to the road is to a high level, but drops off suddenly towards the church, creating large dark areas around the building entrances. This high contrast ratio is demonstrated in HDR photography in **Figure 112**, produced from the lighting technical survey. The steeple itself is also not lit, creating a high contrast ratio with the busy road. Stakeholder representatives from the Hot Chocolate Trust highlighted that there have been issues with facial recognition at the doorways and recesses on the CCTV. The lights are only on inside the church when there is a session or meeting inside, so normally the windows are not backlit.

The fittings that abut the public realm area around the Old Steeple are owned by Overgate Shopping Centre, and have not been operational for several years. There are now building mounted fittings on the Overgate centre.

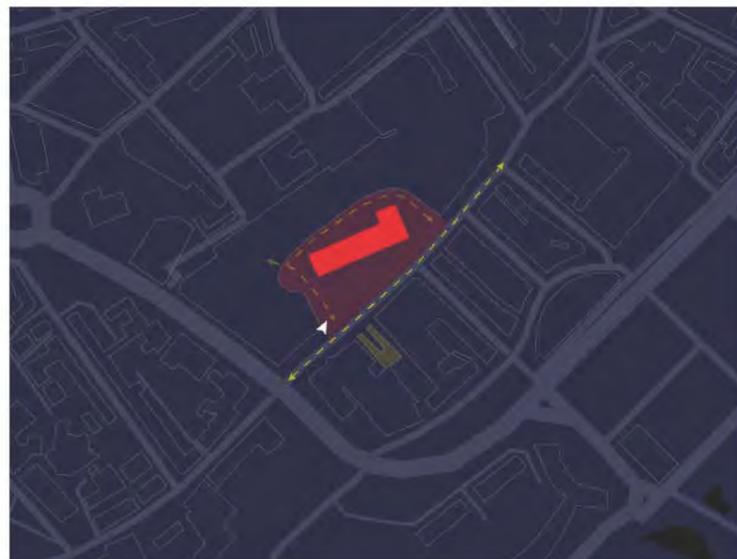


Figure 111: Project location



Figure 112: HDR photography of the viewpoint



Figure 113: Old Steeple during the day



Figure 114: Old Steeple at night

St Mary's Old Steeple

Lighting Objectives

- Light the steeple to aid navigation and create a viewpoint
- Improve facial recognition by increasing light levels at the building entrances and around the church
- Reduce levels of contrast

Lighting Design Intent

- Backlight the main South window to highlight the architectural features and give the Old Steeple a sense of activity
- Projectors mounted on lighting columns to illuminate the steeple
- In-ground mounted linear fittings aligned with each window bay to increase ambient light levels and accent the window tracery.
- Linear fittings mounted in upper parapets to provide accents to the windows and louvres at the top of the steeple
- Wall mounted heritage fittings to light building entrances
- Bench integrated lighting to provide visual interest in the plaza
- Handrail lighting to stairs to generate movement and promote safety around the church.
- Wall mounted fittings on Overgate to become up/down

Other Recommendations

- Reduce street clutter like bus stops and bins, and consider further pedestrianising the space.



Figure 116: Precedent Images

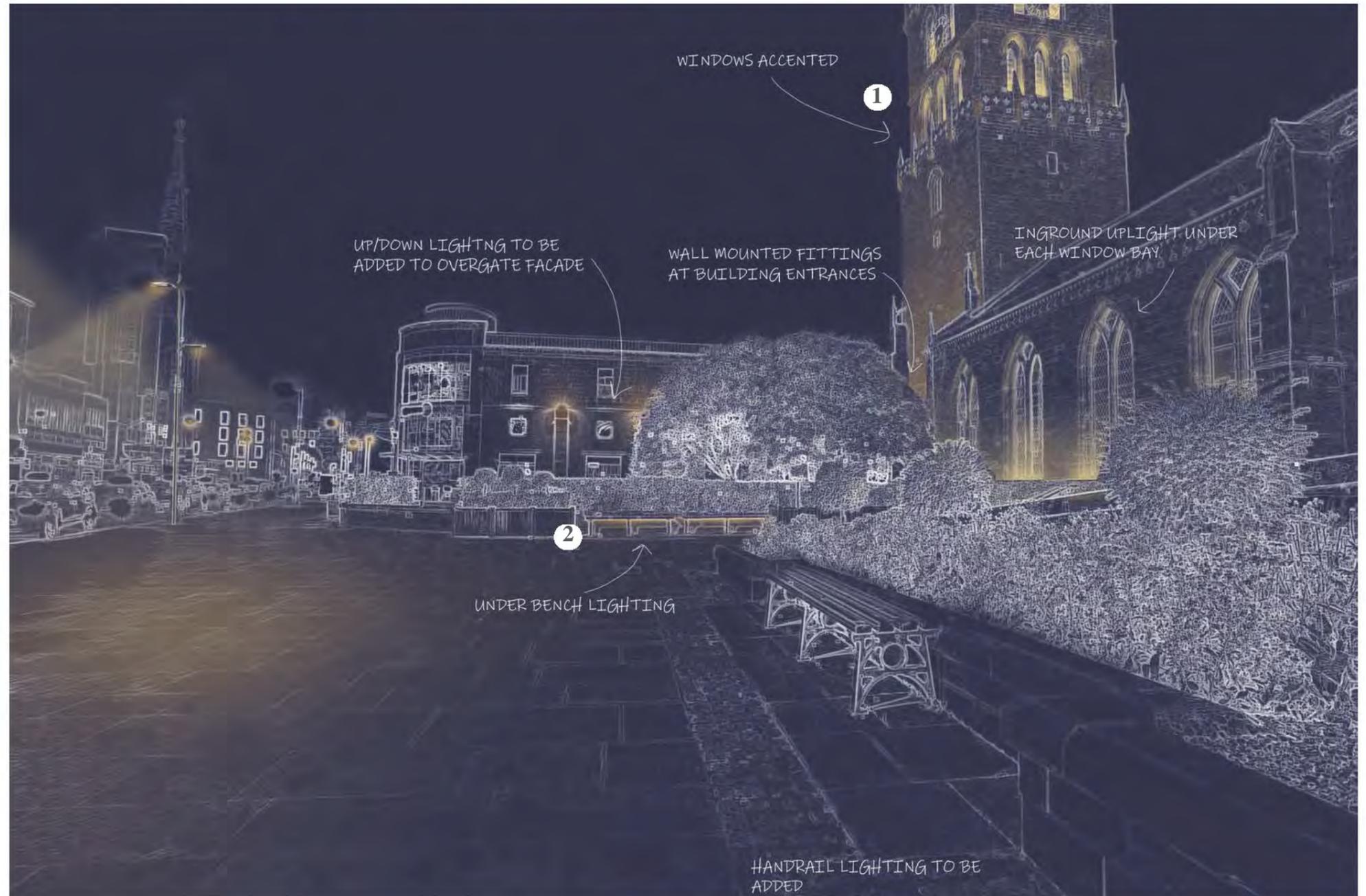


Figure 115: Lighting design intent at St Mary's Old Steeple



5.6 St Paul's Cathedral

St Paul's Episcopal Cathedral was completed in 1855, and is now a Category A Listed Building. It hosts a set of bells used for change ringing, and other activities that may happen after dark.

The Cathedral sits on the junction between Commercial Street and Seagate, as located in **Figure 117**, which are key routes into and around the City Centre. The Cathedral is a key vista for pedestrians and cyclists coming down Seagate towards the City Centre during the day, however is unlit at night. These routes are likely to experience increased footfall with the development of the Eastern Quarter, as Seagate will be the main route from the train station out to the Eden Project.

St Paul's Cathedral was Viewpoint 2 on Route Two on the Night Walks, and feedback from stakeholders was mainly focused on the Cathedral spire being unlit. This hinders wayfinding at the junction, and can create a feeling of 'eeriness'.

The street outside the Cathedral is lit to a high level, as shown in **Figure 118**, but the absence of light on the Cathedral spire creates a high contrast ratio.

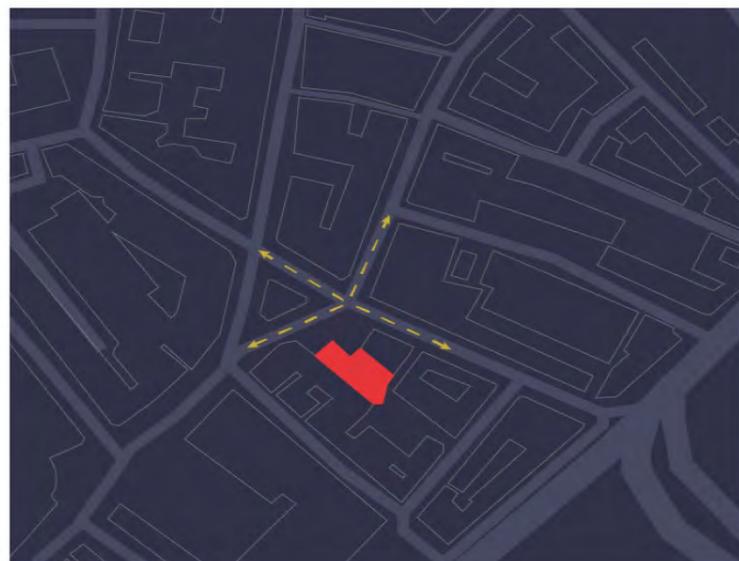


Figure 117: Key Plan Location

In the area and pavement immediately adjacent to the Cathedral, there is an unlit statue, and the trees are only lit from the street lights. **Figure 120** shows the effect of the trees being lit from above, casting patchy shadows on the ground.

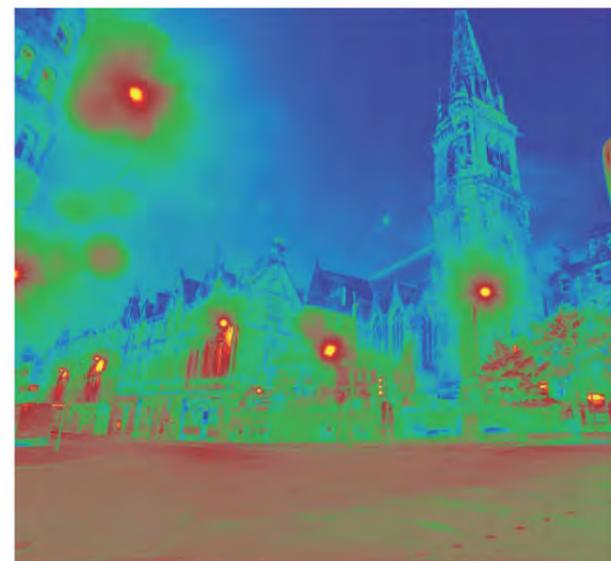


Figure 118: HDR photograph of St Paul's Cathedral



Figure 119: View of St Paul's Cathedral during the day



Figure 120: View of St Paul's Cathedral at night-time

St Paul's Cathedral

Lighting Objectives

- Create a vista for pedestrians and cyclists using Seagate as they head towards the city centre.
- Improve pedestrian experience immediately outside the Cathedral.
- Highlight existing architecture and heritage.
- Use carefully selected fittings and optics, and considered design to minimise upwards light spill and reduce sky glow.

Lighting Design Intent

- LED upgrades to existing heritage fittings at the bottom of the steps.
- Asymmetric handrail or wall recessed lighting at the main stairs, with directed downwards light.
- Minimalistic lighting to the statue.
- Uplighting to window frames.
- Controlled lighting to the spire top, with potential for a cool white to distinguish between other lighting and accentuate the feature.
- Uplighting to corner stair turret.

Other Recommendations

- Replace the building mounted fitting in the Cathedral gardens with a fitting with less glare.



Figure 122: Precedent Images

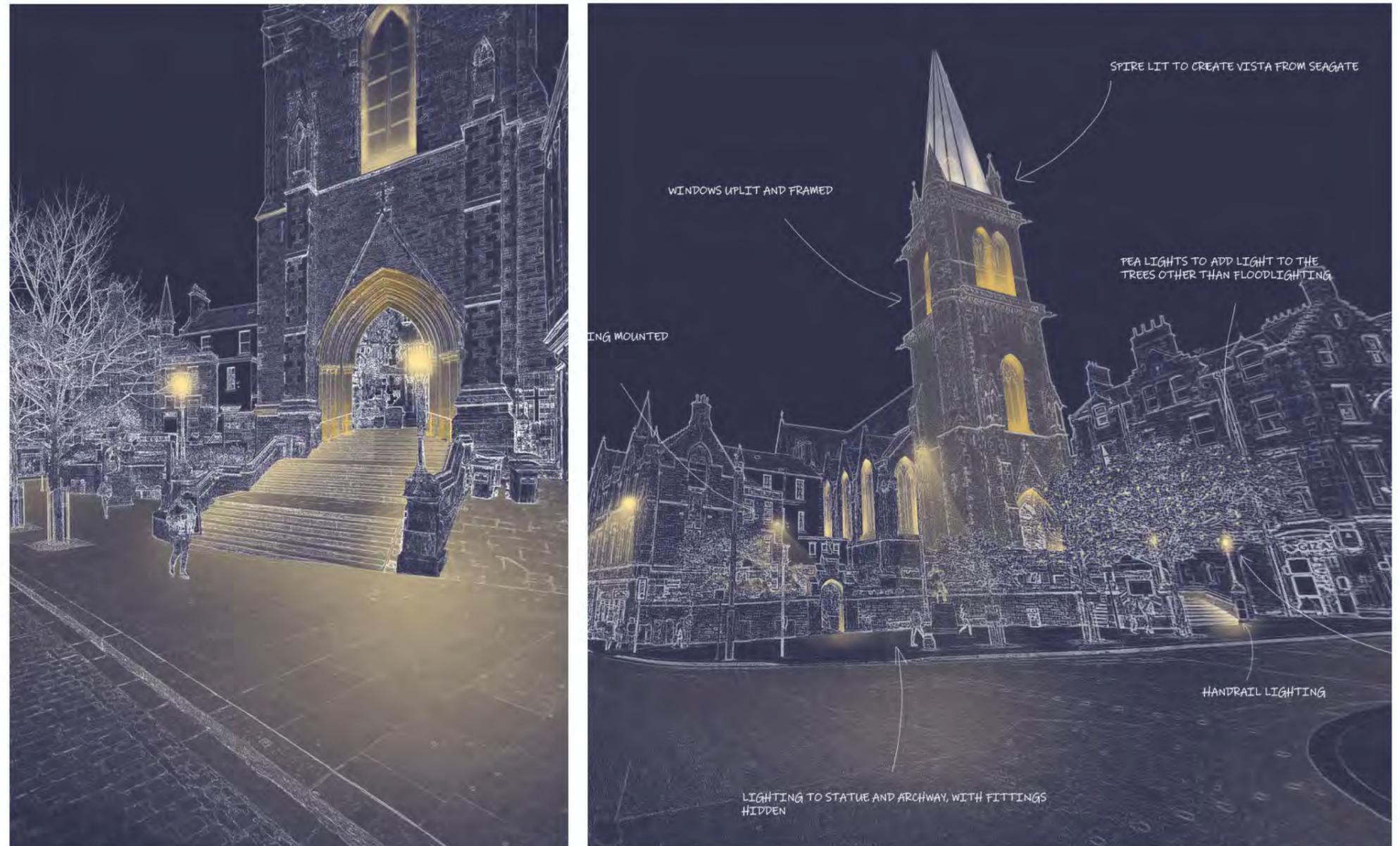


Figure 121: Design Intent at St Paul's Cathedral



St Paul's Cathedral

5.7 Dundee Rep Theatre and South Tay Street

Dundee Rep Theatre sits on South Tay Street, just off Nethergate. Nethergate is a key route from the University of Dundee and other areas to the West of the city, into the centre, and experiences high volumes of pedestrian traffic. The footfall is expected to increase with the opening of the Dundee Livehouse, the refurbished Mecca Bingo site as indicated in **Figure 125**.

Leading the user onto the Nethergate from the city centre are seven columns with colour change LEDs, which also link the Dundee Contemporary Arts Centre (DCA) and the Dundee Rep Theatre. The DCA sits at the junction between Nethergate and South Tay Street, and has a regular night-time presence with shows, a cinema, and bar. The colour change columns turn the corner into Rep Theatre, and from the viewpoint in **Figure 127** the user can see both theatres. This relationship has lately become less strong due to the closing of several night-time venues on South Tay Street.

Figure 123 shows Viewpoint 2 on Route One, and stakeholders identified on the Night Walks that due to these closed venues and some fittings along South Tay Street being out, the street feels dark and 'lifeless' when there is not an event on at either theatre. Other comments recorded related

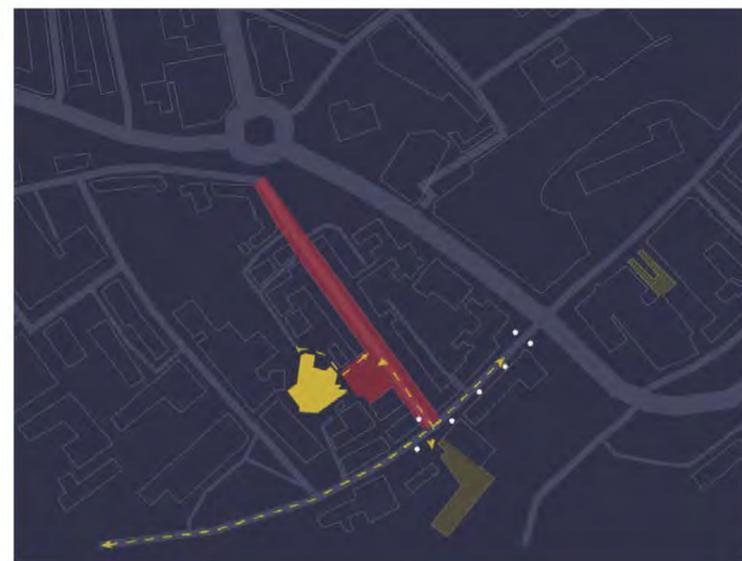


Figure 125: Location of Dundee Rep Theatre site and key routes and destinations

to the 'eerie' feel to the street, potentially due to the green content of some of the light sources, and how quiet the street feels. There is also a key cut through from the Dundee Rep Theatre to the university, which is particularly dark when compared to surrounding roads.

In the square outside the theatre itself, as shown in **Figure 126**, there are existing in-ground LED strips with colour change facilitated. These were noted as 'fun' and 'vibrant' by stakeholders, but will cease to function in the coming years due to unavailability of parts.



Figure 126: Existing Dundee Rep Theatre lighting interventions



Figure 127: View of the DCA from the Dundee Rep Theatre



Figure 124: View of the Dundee Rep Theatre during the day



Figure 123: View down South Tay Street from the Dundee Rep Theatre at night

Dundee Rep Theatre and South Tay Street

Lighting Objectives

- Create visual interest in the lighting, that will eventually come to replace the RGB in ground fittings.
- Make the streets surrounding the square in front of the rep feel safer.

Lighting Design Intent

- Illuminated canopy / catenary lighting. This can be in the form of a festoon, circular pendants, or bespoke catenary elements that could be designed via community engagement or artist commission.
- New columns to host catenary system, and floodlights to increase ambient light levels on adjacent roads and cut through to Dundee University.

Other Recommendations

- Update the LED sources in the current wall mounted fittings to a more standard colour temperature with less green content.
- The floodlights have the potential to completely replace these wall mounted fittings.
- Replacement of fittings along South Tay Street that are not currently working.



Figure 129: Precedent Images



Figure 128: Catenary system at the Dundee Rep



Tay Square

5.8 Guthrie Street

Guthrie Street is a key pedestrian and cycle route into the city centre from student accommodation and other housing to the West of Dundee, and as part of the City Centre Strategic Investment Plan, and is proposed to become a key active travel route into the city centre.” Currently where Guthrie Street connects to the Inner Ring Road the junction is blocked off, creating a dead end for cars and preventing through traffic.

The street was along Viewpoint 4 on Route One of the Night Walks, and stakeholders observed the feeling of being 'spotlit', owing to the road being lit to a high level while the surrounding empty buildings are left in darkness.

The contrast can be seen in the HDR image in **Figure 133**, produced from the lighting technical survey. The road is brightly lit with the buildings in darkness. This sharp level of contrast draws attention to the lack of activity in the surrounding area, making the street feel both exposed and deserted. This duality creates an uneasy feeling which contributes to the eeriness and unsafe feelings the stakeholders noted during the night walk.

Historically the street has a history of incidents which contribute to a perception of unsafety and 'eeriness', so the

lighting has the opportunity to create something fun and playful out of the surroundings.

A creative lighting solution which reimagines the use of light in the area can help the street feel more welcoming and engaging. The solution should aim to shift the perception of Guthrie Street from a place of unease to one of vibrancy and community, aligning with broader efforts to revitalise the area



Figure 134: Guthrie street and connection with the Inner Ring Road



Figure 130: Guthrie Street looking West during the day

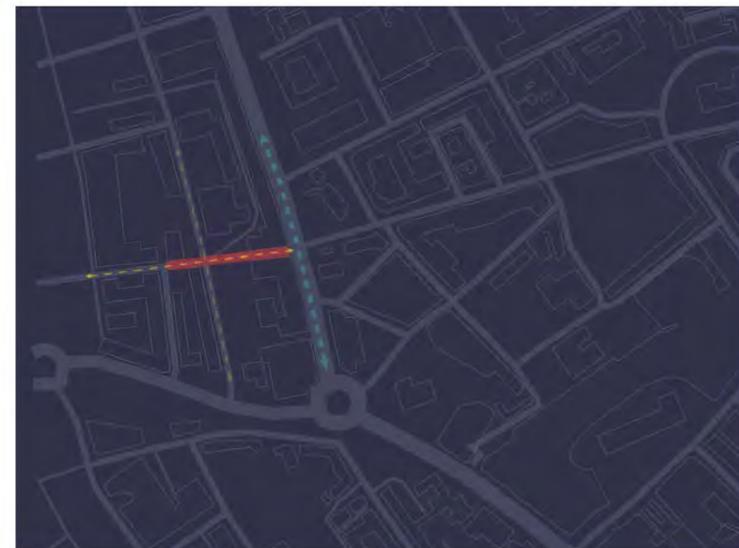


Figure 132: Project location

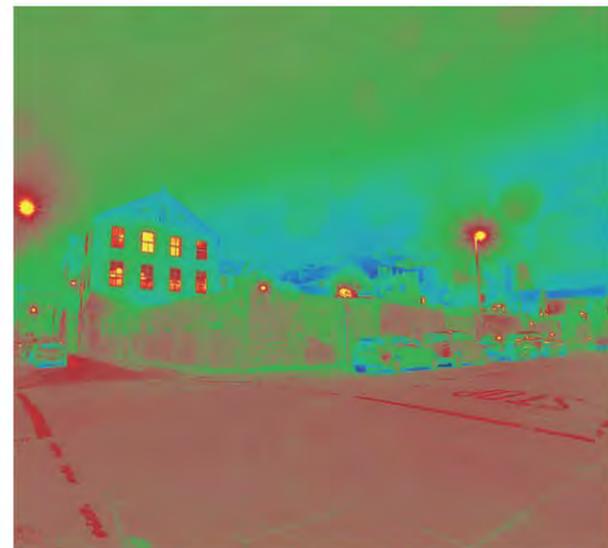


Figure 133: HDR photography of the viewpoint



Figure 131: Guthrie Street looking East at night

Guthrie Street

Lighting Objectives

- Create visual interest somewhere other than the road
- Bring out the rich heritage and industrial themes of the area, including the old cotton mill along this street.
- Lighting should be fun and playful, and even interactive with passers by

Lighting Design Intent

- Colour change lighting to the bricked up frames in the walls.
- Potential for Gobo projections on the empty facade. This can host as art installations designed through community engagement or local artist commissions, as well as any commissions or advertising for upcoming events.

Other Recommendations

- Swap street lighting fittings to an optic with a less sharp cut-off. This will create some light spill onto the surrounding unlit buildings and reduce the contrast ratio with the well-lit street.

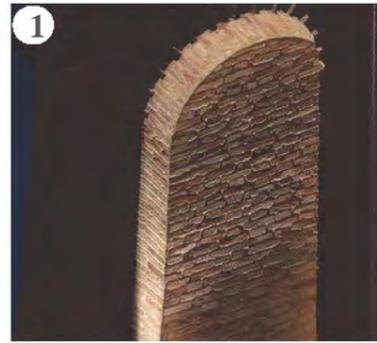


Figure 136: Precedent Images



Figure 135: Lighting design intent at Guthrie Street



Guthrie Street

6 Technical Recommendations

6 Technical Recommendations

6.1 Technical Recommendations

This section outlines general recommendations for the any new lighting design scheme that is implemented. These recommendations can come to inform future developments and projects across Dundee City Centre, and include technical guidance that can be applied to a variety of projects.

- General considerations
- Sustainability and Climate Change
- Vibrancy and Local Distinctiveness
- Safety

These recommendations can be referred to when a lighting scheme is being considered for planning, and include reference to the design and delivery of the schemes. More specific recommendations for key themes can be found in **Section 4**.

6.1.1 General Considerations

This section summarises the key considerations that should be taken into account when designing a new lighting scheme, including the standards and guidance that should be followed and the technical requirements. A full glossary of technical terms can be found in **Appendix A.1**.

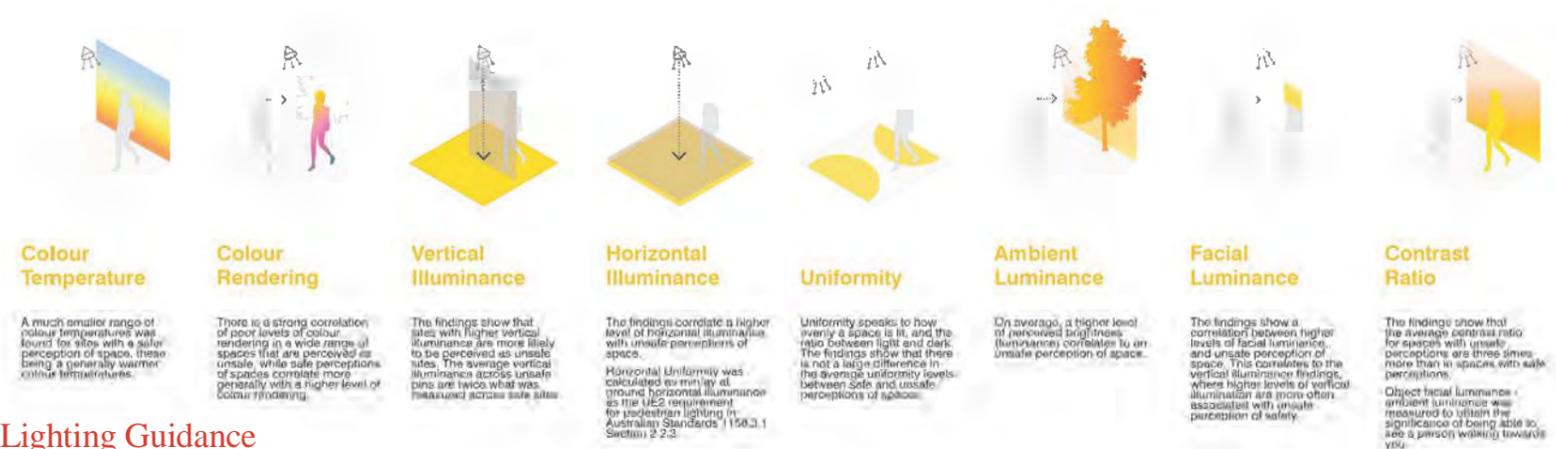
General guidance for lighting types of areas considers perceived safety, general illumination levels, purpose of a space, and energy efficiency. The following standards should be referenced when considering the appropriate level of light and uniformity:

- BS EN 5489-1:2020 Design of Road Lighting
- BS EN 13201:2015 Road Lighting: Performance Requirements
- SLL LG06 - The exterior environment
- ILP GN01 2021 Guidance Note for the Reduction of Obtrusive Light
- ILP PLG04 2013- Guidance on Undertaking Environmental Lighting Impact Assessments
- CIBSE LG06 2016 - The Exterior Environment

Lighting Technology

Designers should consider the following:

- **Source type** - including the colour appearance and the colour rendering of the source
- **Luminaire efficiency** - including the source efficacy (the light output with respect to the energy used)
- **Light distribution** - appropriate luminaire optics for the purpose.
- **Whole life carbon** - the energy associated with luminaire materials, construction, installation, operation, maintenance and end of life.
- **Luminaire mounting** - fixing requirements.
- **Data connection and controllability** - to allow for customised dimming, colour control, and adaptability, and time clock options.
- **Robustness of luminaires** - an appropriate IK and IP rating to protect against vandalism and environmental conditions.



Lighting Guidance

Figure 137: Arup Copyright - Key considerations for external lighting

Technical Recommendations

6.1.2 Sustainability and Climate Change

To align with the City Centre Strategic Investment Plan 2050, it is important for any future lighting schemes to consider their energy and carbon consumption. Careful consideration should be made that compares the socio-economic benefits of new lighting designs, with their environmental impact.

The first question should be:

Do we need to light it?

The following section outlines some key recommendations that can be used to guide the design of future lighting schemes, to ensure they are guided by sustainable thinking.

Lighting Objectives

- Minimise embodied carbon to help reduce carbon emissions
- Minimise energy consumption associated with operation of lighting schemes.
- Minimise light spill and unwanted light that may cause sky glow, glare, adverse effects on biodiversity

Minimising energy and carbon consumption

Artificial lighting has high associated energy consumption, which contributes to climate change. This can be in the form of operational energy, or embodied energy, which together form the Whole Life Carbon of a scheme. Operational energy is the usage associated with the electricity required while the artificial lights are on in their operational lifetime, and the embodied energy, or carbon, is the amount associated with the product materials, construction/installation, transport to site, and maintenance.

The LETI Climate Emergency Design Guide outlines the general recommendations for reducing whole life carbon as: building less, building light, building wise, building low carbon, and building collaboratively.

Lighting Recommendations

- **Light Source**

LED light sources are the most appropriate in reducing operational energy. One of the existing 150W sodium fittings on Murraygate would consume approximately 625 kWh per year if on for 12 hours a day, whereas an LED alternative with a similar light output would consume approximately 275 kWh.

- **Considered Design**

Careful consideration should be given to the justification for the need for a new lighting scheme, whether for function, safety, aesthetics or other. Carefully selected optics can also reduce the number of fittings required by optimising the spread of light.

- **Lighting controls**

A lighting control system is essential to ensure lighting is only on during hours of darkness. Lighting control systems also have the potential to allow for monitoring of luminaires for maintenance.

- **Re-use or refurbishing old fittings**

Heritage Fitting Refurbishment

Re-using or refurbishing existing fittings is a key sustainability principle, and re-using heritage fittings can also help communicate a city's character.

There is an extensive network of unused decorative cast-iron brackets, flower baskets and columns across Dundee City Centre.

Lighting Recommendations

- **Re-use**

The brackets like those in **Figure 138** can be removed and re-homed across the city.

- **Refurbishment**

The heritage fittings that still have high-pressure sodium light sources, as identified in Section 3.5, can be upgraded to LED sources rather than replacing the whole fitting. Lighting manufacturers like DW Windsor offer LED upgrades.

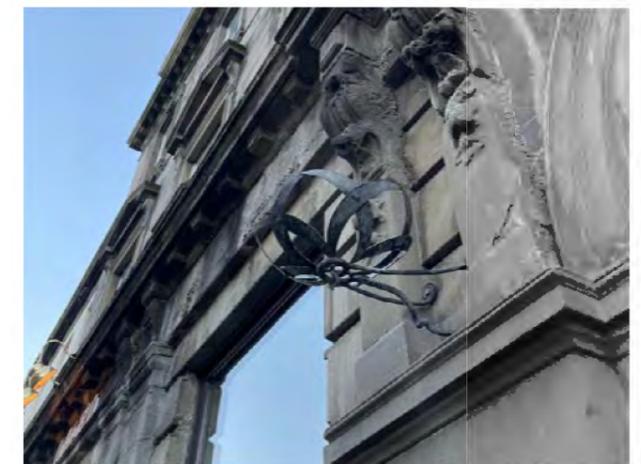


Figure 138: Existing heritage fitting in Dundee City Centre

Technical Recommendations

Minimising Light Spill

Obtrusive light can be caused by all kinds of artificial lighting, including internal lighting schemes. When considering a new lighting scheme for planning, the following lighting recommendations should be observed.

Lighting Recommendations

- **Source Intensity**

Source intensity is how bright a light source appears to the user. Fittings should not be pointed directly in the user's field of view where possible, but when unavoidable a fitting with a low UGR should be selected to reduce glare and therefore discomfort to the public.

- **Avoid directly uplighting into the sky**

When uplighting façades or monuments, fittings directly pointed to the sky should be avoided.

- **Optics and Accessories**

Lighting solutions should carefully select the fitting optics depending on the situation, to limit light spill. Where appropriate, external fittings should be fitted with accessories such as shields.

- **Lighting Controls**

A lighting control system is essential to ensure lighting is only on during hours of darkness.

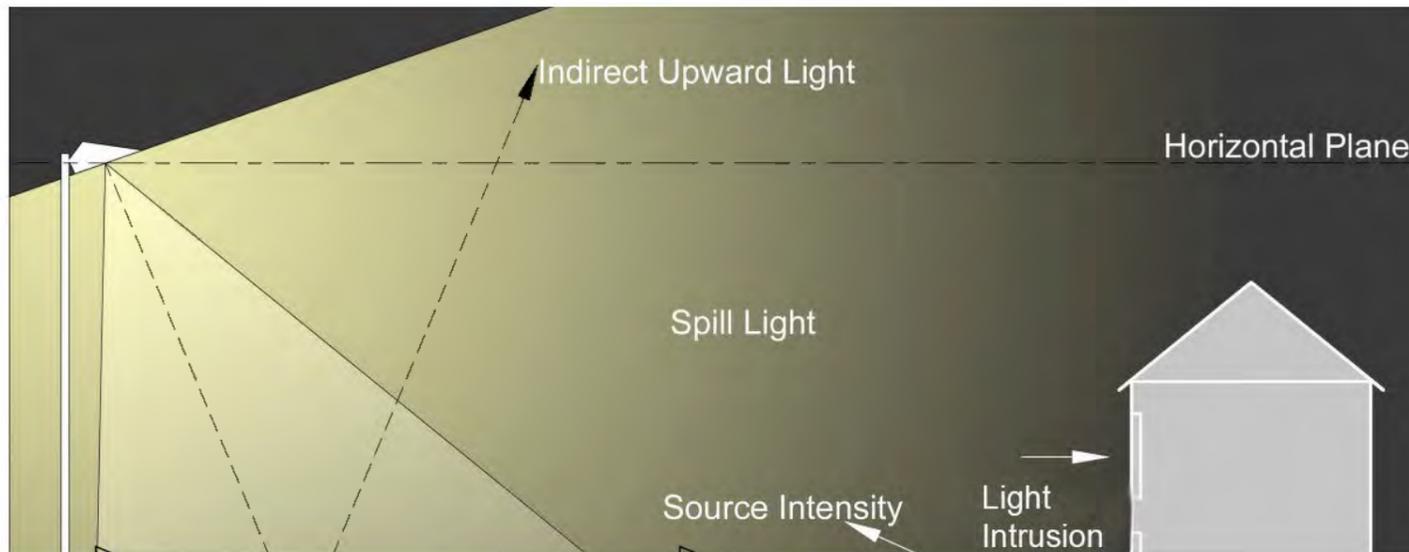


Figure 139: Lighting principles diagram

Ecological Consideration

Dundee City Centre is located within an Urban area, making it an Environmental Zone E4. Although this is an area of high-district brightness, and there are minimal habitats within the City Centre, any future lighting design should consider any ecologically sensitive areas, as exposure to light at night-time can potentially have adverse effects on wildlife.

Lighting Recommendations

- **Considered Design**

Around areas of greenery or planting, light levels should be kept as low as possible if it is not possible to retain darkness. Careful selection of optics can help reduce light spill into flora and fauna when it is adjacent to a space that requires lighting for functional or safety reasons.

Developments next to the River Tay should minimise spill into the river.

- **Colour Temperature**

A lower correlated colour temperature (CCT) is recommended for sensitive ecological sites, where there are expected to be habitats. This strategy recommends between 2700K and 3000K for external lighting out-with street lighting columns.

- **Lighting controls**

A lighting control system is essential to ensure lighting is only on during hours of darkness.



Figure 140: Correlated Colour Temperature

Technical Recommendations

6.1.3 Vibrancy and Local Distinctiveness

The night-time experience of Dundee City Centre has been identified as a key target for improvement by both the public, who feel the city feels dull, dark, and unsafe, and by stakeholders and investors who would like to encourage and rejuvenate the night-time economy.

As more and more businesses are moving out of the City Centre and closing down, areas like Seagate, Murraygate and Reform Street can feel 'eerie' and 'deserted'. Distinctive urban lighting can help enhance night-time vibrancy, as well as improving wayfinding and orientation with features and vistas.

Lighting Objectives

- Encourage night-time economy in the city centre
- Create desirable night-time destinations through exciting lighting schemes
- Enhanced sense of city character

Lighting for Vibrancy and Local Distinctiveness

The lighting should promote a sense of 'belonging to a place', and provide a dynamic and lively image of the city centre. The lighting should create an appropriate ambience and mood, while aiding wayfinding.

Lighting Recommendations

- **Appropriate functional light levels**

In areas where shops and businesses close at night and turn their lights off, safe and functional light levels should be maintained, so there is not a noticeable shift in dark areas from during the day to at night-time.

- **Lighting key views and vistas**

Buildings and shops that are distinctive to Dundee City Centre should be lit,

- **Projections on shop buildings that close at night**

Simple Gobo or video projection on building façades that close at night can help them retain a night-time presence.

- **Lighting artworks**

Lighting existing artworks will help enhance a sense of culture around the city, at relatively low cost. It should be ensured that the mounting of the fittings is to be discreet and considerate to the artwork.

- **Commissioning artworks or light installations**

Future commissions can be collaborated on with local artists or schools in the area. 'Mirror Mirror' by SoftLab sits in Alexandria, Virginia, one of Dundee's twinned cities, as shown in **Figure 143**.

Precedents



Figure 141: Lighting key vistas



Figure 142: Store-front projections



Figure 143: Art Installation: Mirror Mirror by SoftLab

Technical Recommendations

6.1.4 Safety

Safety and accessibility are key considerations within the city centre.

It was observed from the Stakeholder Night Walks, that 'dark' does not always mean 'unsafe', and there are other factors to consider when designing a lighting scheme. This section outlines some key recommendations to take into account.

Lighting Objectives

- Ensure spaces in the city centre promote a feeling of safety for everyone
- Ensure lighting is implemented so spaces are accessible for everyone
- Create safe active travel routes and public transport access
- Improve experience of using the streets

Lighting for Safety and Accessibility

Lighting should be designed to ensure accessibility and safety for all individuals, including those with reduced mobility, visual impairments, older adults, children, and neuro-divergent people. Public consultations have demonstrated that perception of safety can vary due to influences other than lighting, and in some spaces lighting is not the root problem.

Lighting Recommendations

- **Appropriate functional light levels**

In areas where shops and businesses close at night and turn their lights off, safe and functional light levels should be maintained, so there is not a noticeable shift in dark areas from during the day to at night-time.

- **Reduce contrast ratios**

Lighting should be implemented in areas where there is a large contrast ratio, to make the areas more accessible for visually impaired. Interventions can be small, or involve dimming the high level lighting.

- **Considered design**

Avoid lighting interventions that produce glare or reflection off glass surfaces. Careful direction of light fixtures should be given to ensure fittings are not pointing directly into people's eyes and causing glare.

- **Appropriate vertical illumination**

Lighting should work in conjunction with CCTV: fittings should not be pointed directly at cameras, and lighting schemes should facilitate appropriate vertical illumination for facial recognition.

- **Colour Rendering Index (CRI)**

Colour Rendering Index (CRI) measures how accurately a light source makes the colour of objects appear compared to natural light. **Figure 144** shows how a good CRI can enable users of a space to better distinguish colours and textures, and therefore objects and hazards around them. Light fixtures should use a CRI ≥ 80 .

Other recommendations to improve accessibility

- Reducing street clutter in busy conflict areas, such as the Nethergate taxi rank, where there are multiple lighting types including car headlights and wayfinding is difficult for individuals with visual impairments.



Figure 144: Contrast between CRI 25 and CRI 80

Dundee City Centre Lighting Strategy Appendix

June 2025

A.1 Glossary of terms

Lighting Terminology

Glare	The disturbance of perception caused by high contrasts in luminance.
Light Intrusion	The spillage of light beyond the area which is intended to be lit.
Sky Glow	The increase in apparent brightness of the sky at night from light spill.
Illuminate	The light intensity which reaches a surface and is a measure of how well a space is lit.
Luminaire	A luminaire is the name for a lighting unit which consists of a lamp or LED source, distribution object and the housing of these parts.
Luminaire Efficiency	The ratio of luminous flux (lumens) emitted by a luminaire to that emitted by the lamp or lamps used within.
Lumens	A unit of luminous flux; the overall light output of a luminous source is measured in lumens. Amount of light lamp emits once it's started.
Diffuse Light	Light that is not predominantly incident from any particular direction.
Colour Temperature	A specification of the colour appearance of a lamp relating its colour to that of a reference source heated to a particular temperature, measured in degrees Kelvin (K); CCT generally measures the "warmth" or "coolness" of light source appearance.
Vertical Illuminance	The amount of light that is received on a vertical surface, such as a wall.
Horizontal Illuminance	The amount of light that is received on a horizontal surface, such as a roadway.

Lighting Abbreviations

SDCM	Standard Deviation Colour Matching
DALI	Digitally Addressable Lighting Interface
DMX	Digital Multiplex
IP	Ingress Protection
IK	Aptitude of equipment to resist mechanical impacts
CCT	Correlated Colour Temperature
CRI	Colour Rendering Index
HID	High Intensity Discharge
HDR	High Dynamic Range
LED	Light Emitting Diode source

A.2 Crime Data

Data Analysis

To understand the background of the site and how the site is currently used, information on the crime reported within the area was analysed. The data comes from datamap-scotland.co.uk.

Findings

Crime within the Maryfield area of Dundee follows the same trends as the wider city area. Crimes of dishonesty are the largest category, followed by miscellaneous crimes and other crimes in both areas.

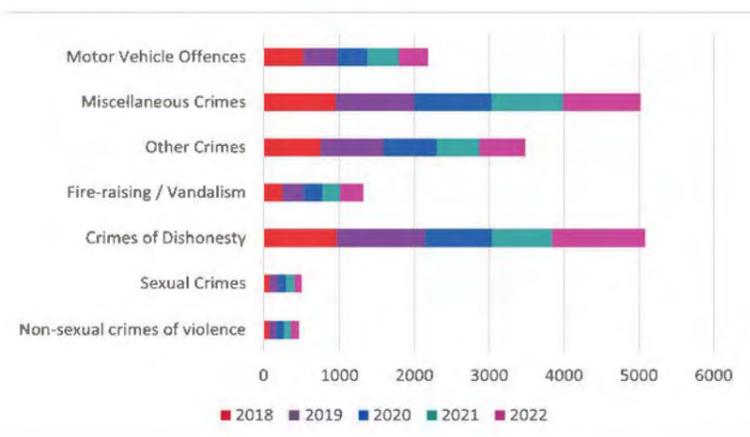


Figure 148: Maryfield crime statistics

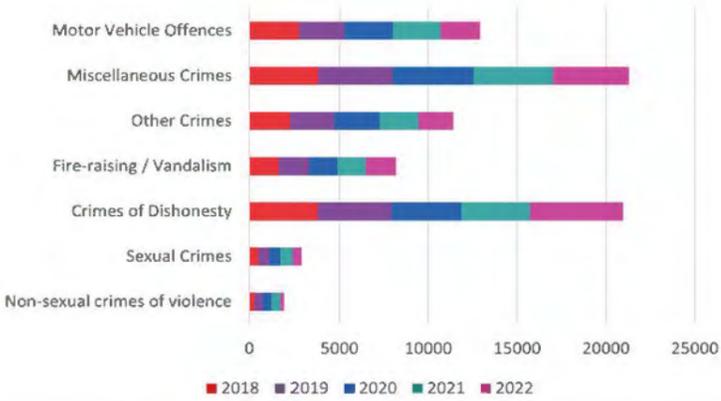


Figure 147: Dundee wide crime statistics



Figure 146: Map of Maryfield crime area, Datamap Scotland.

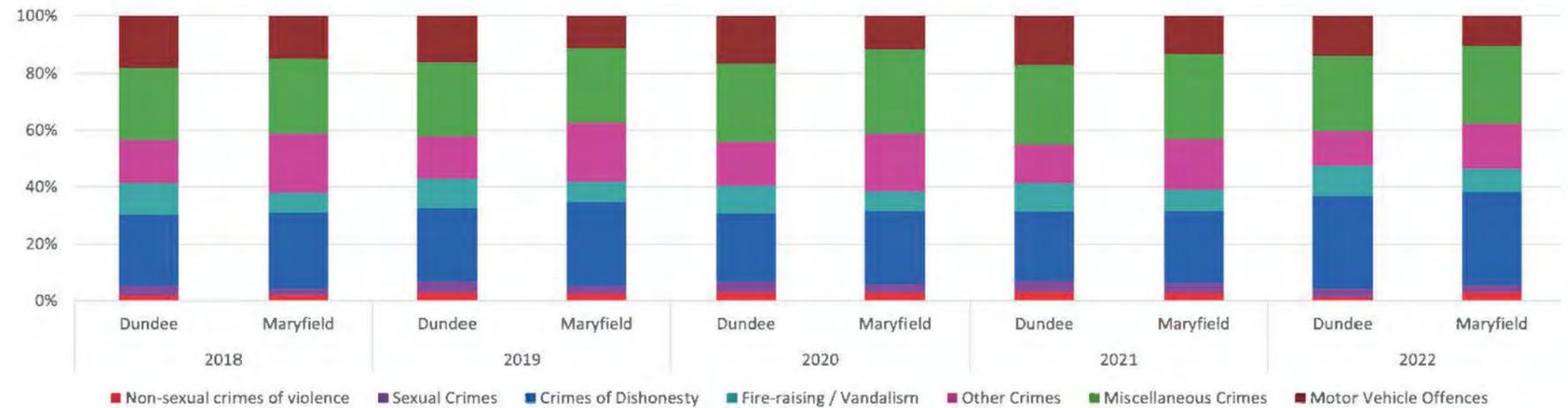


Figure 145: Crime statistics

A.3 Online Survey

Online Survey

A questionnaire was hosted on Dundee City Council's website for from 16th September and 11th October 2024

Much of this lighting study is informed by the LDA and Stallan-Brand Consultant Masterplan document, produced in conjunction with Dundee City Council to pick out and explore the key opportunities within the city centre.

Demographics

A summary of the key demographics is below:

- 148 participants completed the survey.
- More females answered the survey (48%) compared to others.
- The survey was answered by the full range of age groups, from Under 18 to 85+.
- Most participants visit the city centre more regularly during the day than at night.
- 41% of participants visit Dundee City Centre daily.

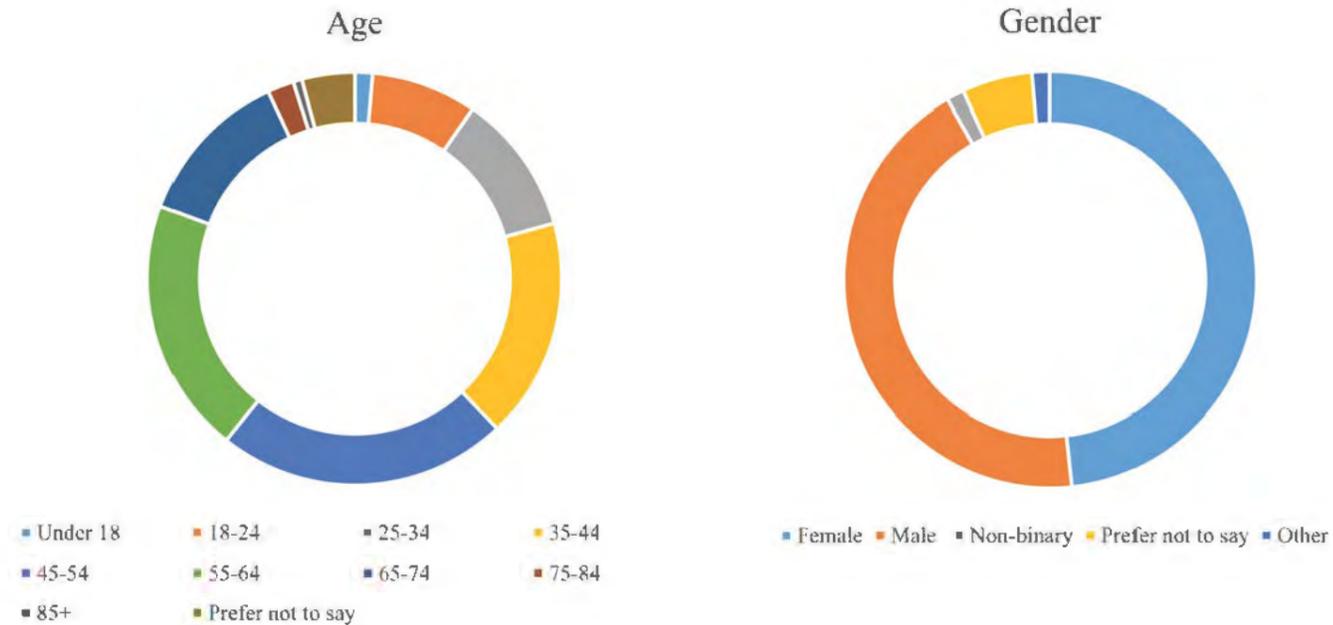


Figure 149: Consultation Participant Demographics

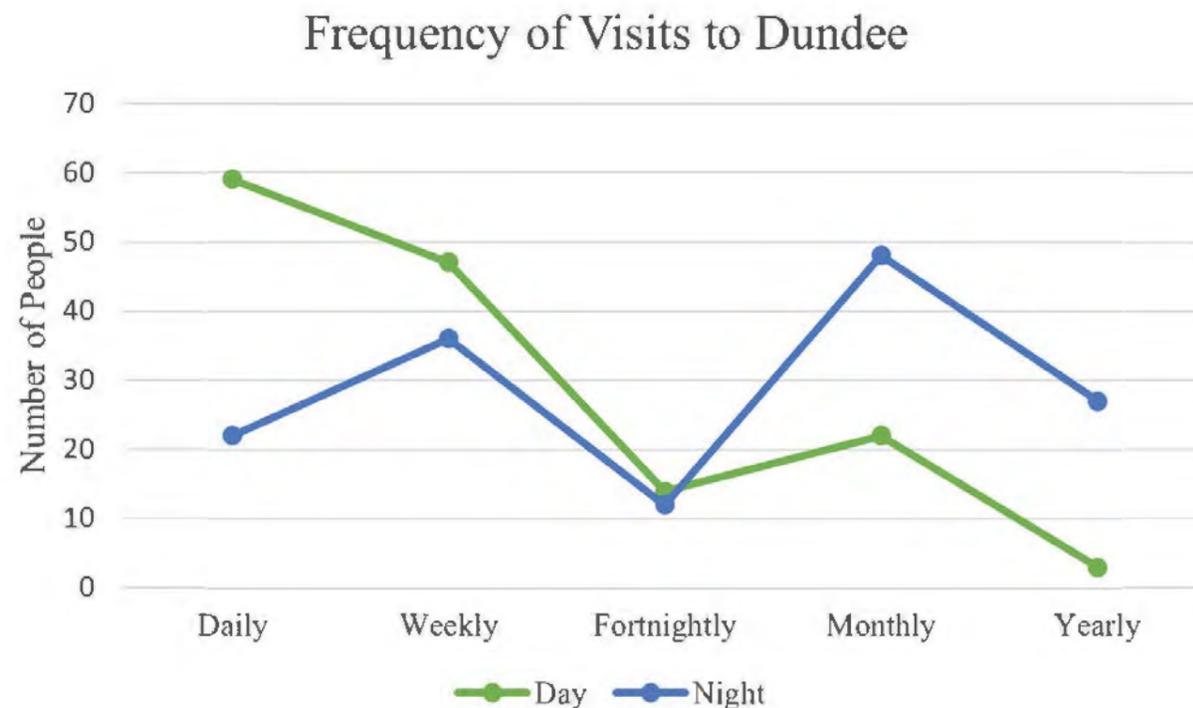


Figure 150: Frequency of participant visits to Dundee

Public Consultation

6.1.5 Overall Perception of Dundee

The survey asked participants to rate their overall satisfaction with Dundee (on a scale of very dissatisfied to very satisfied). Participants were then asked to rate their overall impression of safety in Dundee (on a scale of very unsafe to very safe), for during the day, and then during the night.

The next question asked participants to select from a list of words, 'What comes to mind when you think of Dundee?', both during the day and at night. The responses show how the perception of Dundee shifts at night time.

These questions aim to determine whether the lighting masterplan could improve the perception of Dundee at night.

Summary

Overall Appearance

- 66% of participants are very satisfied/unsatisfied with the overall appearance of Dundee city centre.
- 13% of participants were neither dissatisfied or satisfied
- 20% of participants were satisfied with the overall appearance of Dundee.
- No participants responded that they were very satisfied with the overall appearance.

Overall Safety

- 67% participants described their perception of overall safety to be either very unsafe or unsafe in a night-time environment. This is 39% more than during the day.
- 16% and 8% of participants felt neither safe nor unsafe during the day and at night, respectively.
- 59% of participants stated they felt safe or somewhat safe during the day, compared to 33% at night.
- Participants generally felt more safe during the day.

Key Words

- The key words that participants were asked to choose from can be found in the full questionnaire.
- The responses to the 'negative' key words can be found in **Figure 153**.

Two thirds of the negative words were used more to describe the night-time environment, the most notable shifts being in dark, unfriendly, unsafe, and concealed.

However, the city was described to feel louder, busier, and more dull during the day.

- The responses to the 'positive' key words can be found in **Figure 154**.

70% of the positive words were used less to describe the night-time environment, with the most notable shifts in safety and openness.

The city was then described to be less fun and exciting during the day.

Not many of the positive words scored highly, and could be considered an opportunity to inject some fun into the city.

Satisfaction with Overall Appearance

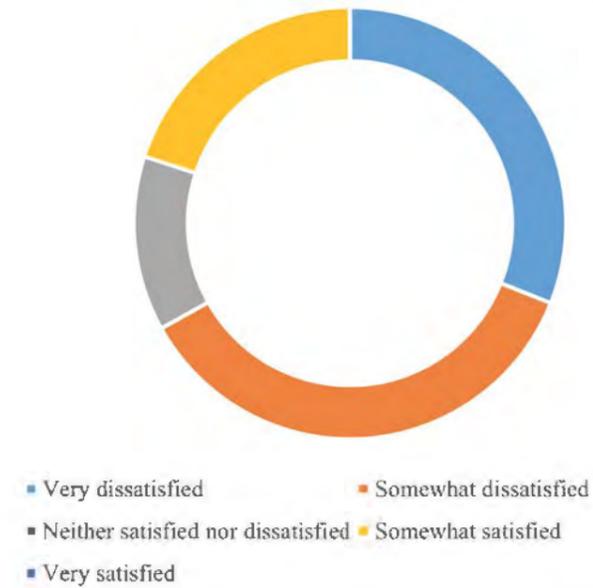


Figure 151: Participant responses to satisfaction with overall appearance

Perception of Overall Safety

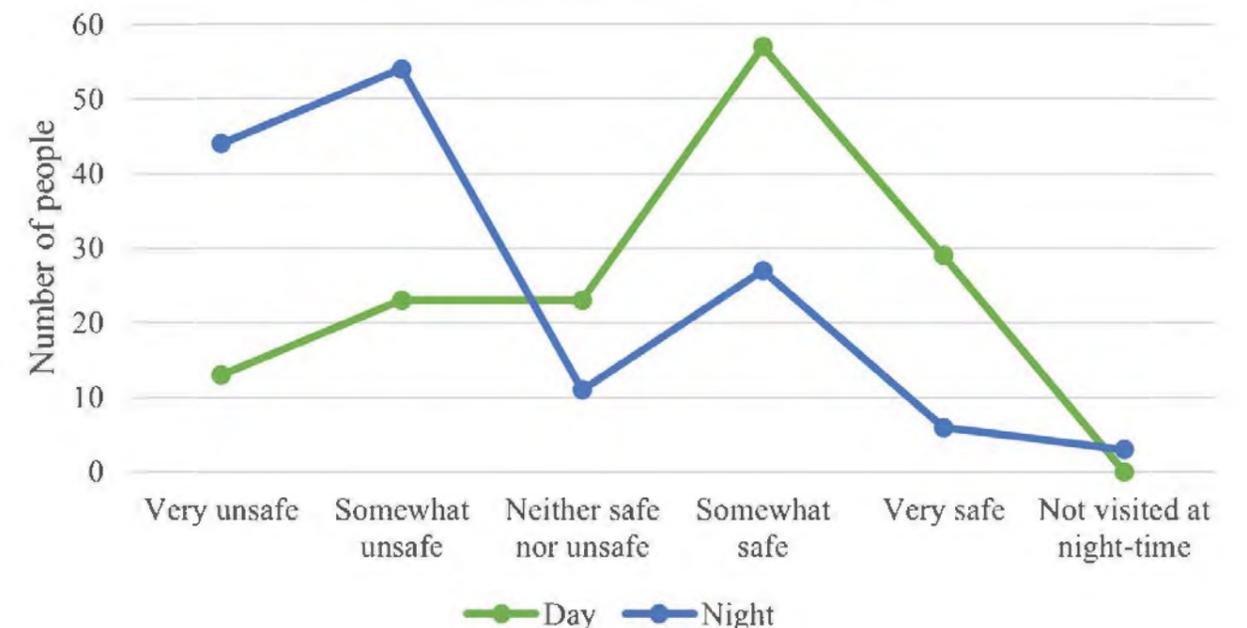


Figure 152: Participant responses to satisfaction with overall safety, during both day and night

Public Consultation

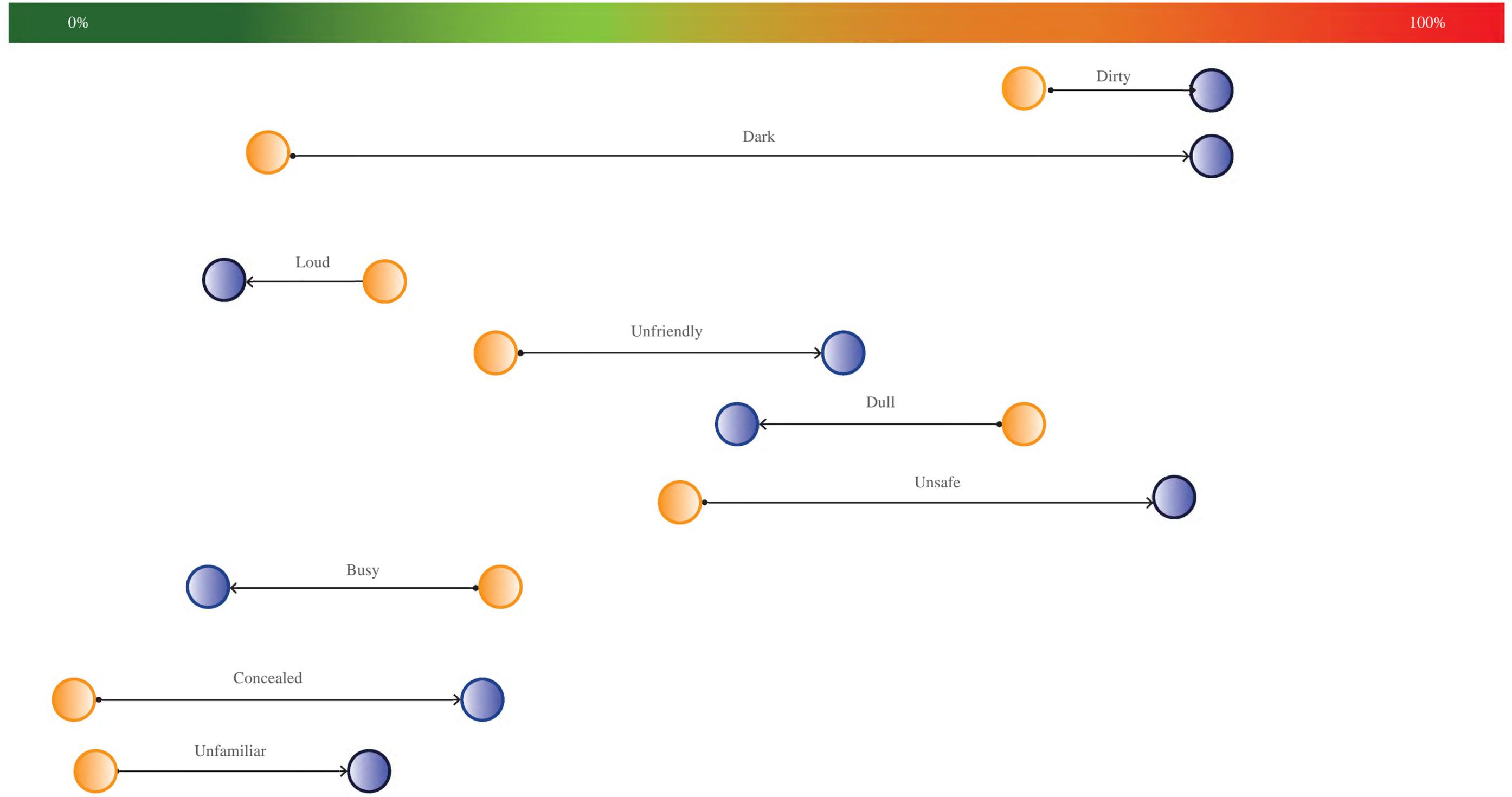


Figure 153: Participant responses to 'negative' key words during the day and at night

Public Consultation

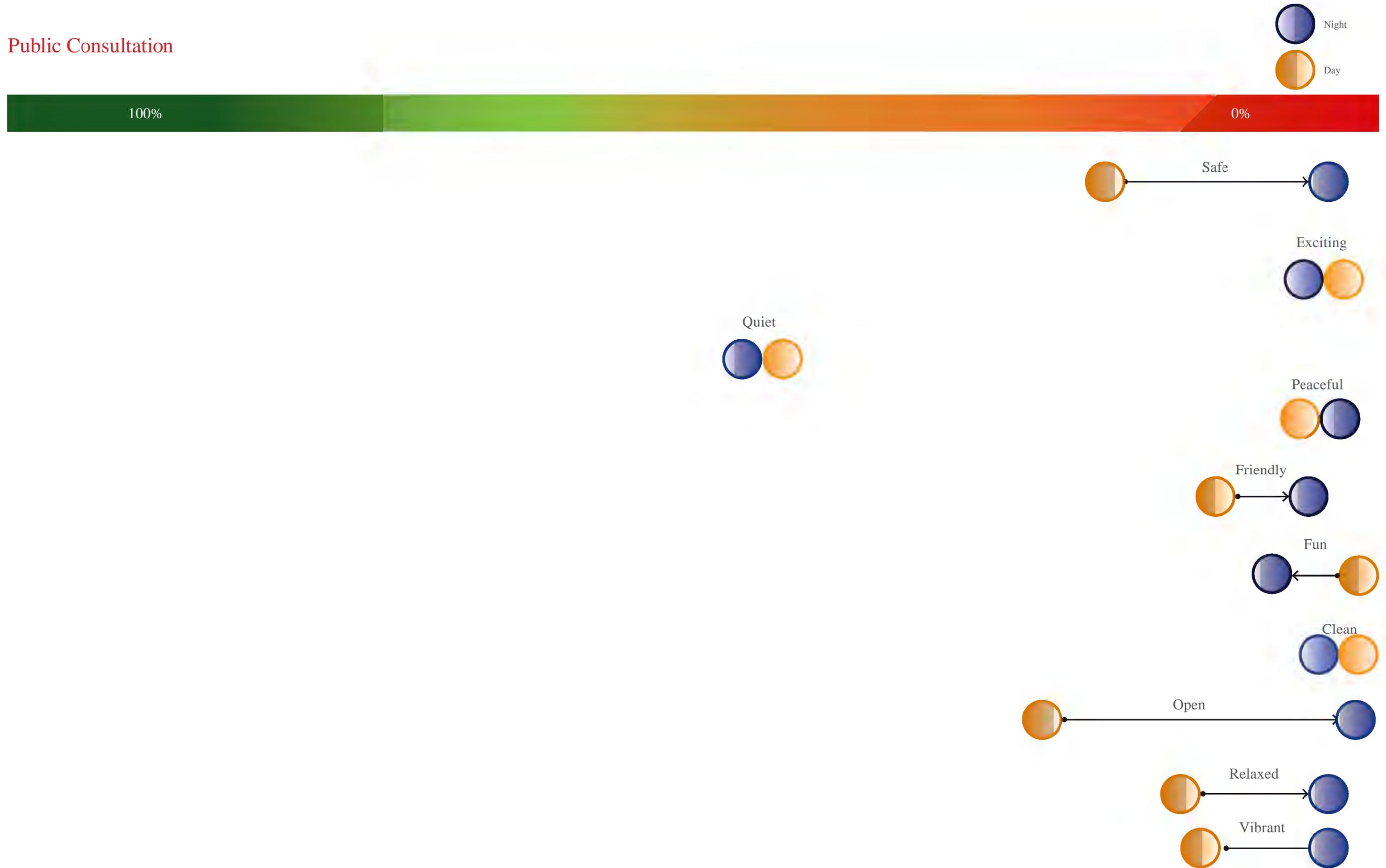


Figure 154: Participant responses to 'positive' key words during the day and at night

Public Consultation

Barriers and Potential Improvements

The second half of the survey invited participants to share what they believe to be specific barriers in the city centre, what works well with the current lighting, and what suggestions they had.

Summary

Perceived Barriers

- The survey identified the three key barriers to be lighting (44% of participants), inadequate maintenance (67%), and fear (44%).
- 23% of participants believe unsuitable segregation between vehicles, cyclists, and pedestrians is a key barrier due to the busy ring road.
- Other barriers that were identified included the Low Emission Zone, anti-social individuals and groups, lack of CCTV, too many taxis/cars parked, empty shops, and uneven pavements.

Other comments and improvements

- Participants highlighted that the lighting to key areas and buildings like the V&A, Waterfront and McManus, was a key positive. Figure 155 summarises the observations.

Barriers while navigating the city centre

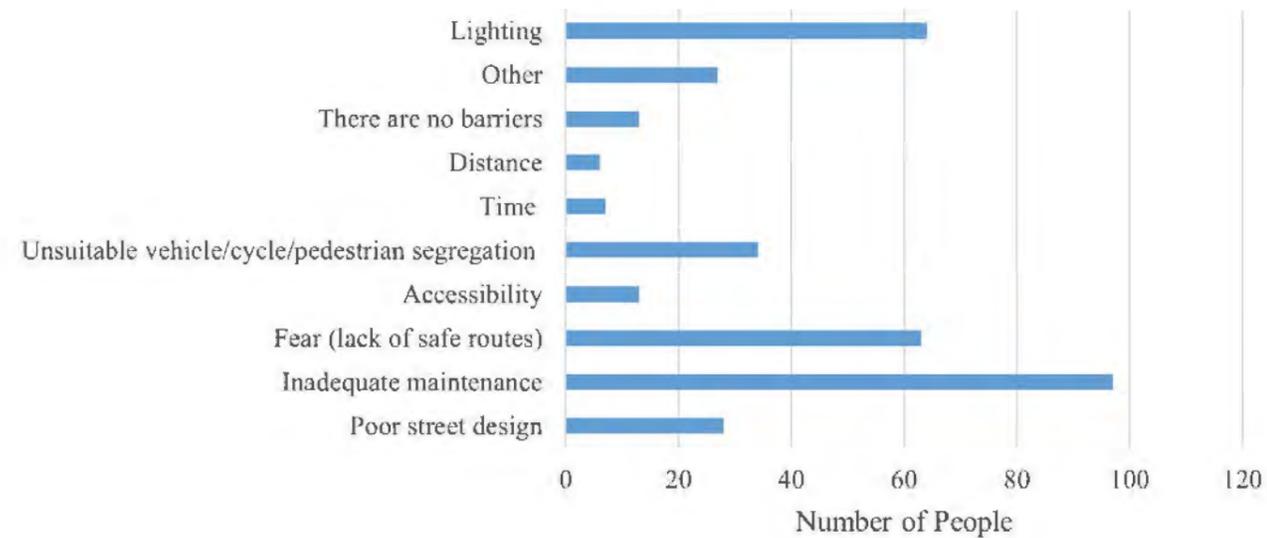


Figure 155: Participant responses to what they believe to be barriers to navigation

Summary of lighting aspirations

Questions 7 asked 'is there anything you would want to see improved with the Dundee City Centre lighting?'. Participant's responses are collated below.

"more lighting needed"

Current lighting in Murraygate is poor for such a central location.

Caird Hall and monuments around the city should be lit.

Colourful lighting on buildings and more vibrant colours to differentiate which are you're in.

Lighting footways and paths.

Add fun pedestrian streets like Union Street.

Add brighter lights to dark spots across the city.

Create spaces that can add colourful lighting to on occasions or festivities rather than year round.

Display some of the beautiful buildings at night by lighting them.

"Accessibility"

Use of colour to assist with wayfinding and provide visual effects.

Replace lighting which is currently overshadowed by trees with lighting that improves light levels for pedestrian movements.

Improving lighting on key pedestrian routes including side streets, corners and junctions.

"Safety"

Improve the spread and reach of light from posts, illuminating under the lamppost and dark spots in-between is poor.

Improve lighting on Seagate and Colgate, currently feels derelict and unsafe.

St Andrews Street lighting currently feels very dark and unsafe.

Increase lighting of alleyways and concealed areas that feel creepy to walk past.

Keeping lighting on in the early mornings until the sun is fully up.

"Detailed recommendations"

More cosy lighting to be added to the catenary over exchange street, similar to Ashton Lane or Royal Exchange Square in Glasgow.

Light monuments such as St Paul's Cathedral, Wishart Arch, Steeple church and Murraygate.

Add a laser light display and a beacon from Lawhill to illuminate Dundee from afar.

Ensure that colour temperature is kept warm on feature lighting around Christmas time.

Lower column heights to prevent light pollution whilst better illuminating the street level.

Lighting could be improved on High Street – the section between Castle St and City Square and bus stops, the stretch going past Robertson and Watt is pretty dark. City Square – half way up the square doesn't look inviting as it is much darker than the steps and the D section. Dock St and Seagate would benefit from being better lit.

A.4 Stakeholder Night Walks

Executive Summary

On the 9th of October consultants from Arup lead a night-time walk through Dundee City Centre alongside stakeholders from key groups and organisations across the city. The walk was completed after twilight, in the night phase to ensure complete darkness. The purpose of the walk was to gain an understanding of how participants felt and perceived the environment.

The walk was attended by 14 stakeholders and were split into two groups of 7 each, lead by 2 consultants from Arup. One group followed route one, covering the Western and Learning Quarters of Dundee City Centre. Stakeholder representatives from the university community council and access groups attended this walk. The other group followed route two, covering the Eastern and Commercial Quarters of Dundee City Centre. Stakeholder representatives from the City Council, Dundee Historic Environments Trust and LDA Design attended this walk. Each walk contained 7 viewpoints where each group stopped to complete a survey.

The participants of both walks were provided with a survey to complete, consisting of two sections. Section one was a numerical survey where participants were asked to indicate how they perceived the safety of the area based on word associated and a scale of 0 to 10. One example was asking if the area was perceived to be dark or light with dark assigned 0 and light 10. The second section consisted of space to fill in observations and recommendations for each viewpoint. The data and comments have been analysed to reveal key trends in how each viewpoint is perceived.

Results from route one show that viewpoints 2 (Dundee Rep Theatre) and 5 (Abertay University Library) were perceived positively, with stakeholders describing these areas as quiet, safe, friendly and clean. There was feature RGB lighting in both locations, being described as vibrant and fun.

Guthrie Street and Barrack Street (Viewpoints 4 and 6) were perceived negatively, being described as unsafe and dull. In both locations there were unlit buildings that caused contrast with the street lighting by being left in darkness.

Results from route two show that viewpoints 4 (East Marketgait Underpass), 6 (Seagate) and 7 (Murraygate) were perceived as unsafe and unfriendly. In these locations there was high contrast between the dark surroundings and street lighting, particularly at the underpass and low street lighting levels at Seagate and Murraygate.

Across both routes the viewpoints perceived to be the safest were South Tay Street (85%), Abertay University (85%), Reform Street (70%) and West Port Roundabout (70%). These viewpoints are all on route one, and in general viewpoints on this route were perceived as more safe than those on route two.

Perception of safety was generally lower on route two, with the darkest viewpoints as indicated by the stakeholders being Seagate (100%), Murraygate (70%), St Paul's Cathedral (70%) and City Square (55%). Generally viewpoints on this route were perceived as darker and poorly lit in comparison to those on route one.

There was a correlation noted between perceived darkness and safety, with viewpoints that were well lit receiving higher scores for safety and friendliness. Safety concerns can detract from the overall perception of an area, regardless of other positive attributes as viewpoints that had low safety scores generally had lower overall scores for positive words and higher for negative words.

There is also a link between safety and perceived dullness of an area. Viewpoints that were categorised as dull by stakeholders typically had lower safety scores.

Written observations highlight why viewpoints received the scores they did, with the Abertay area viewed as positive with fun colour changing elements. There were also areas highlighted which felt concealed, unsafe and unhygienic including the car park by the West Port Roundabout and the Old Steeple. Inconsistent lighting temperatures on South Tay street contributed to an eerily quiet atmosphere and negatively impacted the sense of safety. Additionally poor wayfinding around the Old Steeple and West Port Roundabout were noted as significant concerns.

Recommendations focus on enhancing lighting to improve safety and aesthetics of the city. Key suggestions include illuminating heritage building at key junctions and buildings of importance across the city. Concealed entrances which are dark and perceived to be unsafe should be designed to receive a base level of illuminance. Utilising lighting to enhance wayfinding and add visual interest to key travel routes was also recommended.

Background

Stakeholders invited included representatives from:

- Dundee City Council
- DUSA (Dundee University Student Association), and ASA (Abertay Students' Association)
- Dundee Access Group
- Dundee Safe Zone
- Charities, clubs and youth groups such as the Hot Chocolate Trust

Route One: West

- 1.Old Steeple Church
- 2.South Tay Street (Dundee Rep Theatre)
- 3.West Port Roundabout
- 4.Guthrie Street
- 5.Abertay
- 6.Constitution Road
- 7.Reform Street

Route Two: East

- 1.City Square
- 2.St Paul's Cathedral
- 3.Panmure Street
- 4.East Marketgait Underpass
- 5.East Port Roundabout
- 6.Seagate (and Bus Station)
- 7.Murraygate

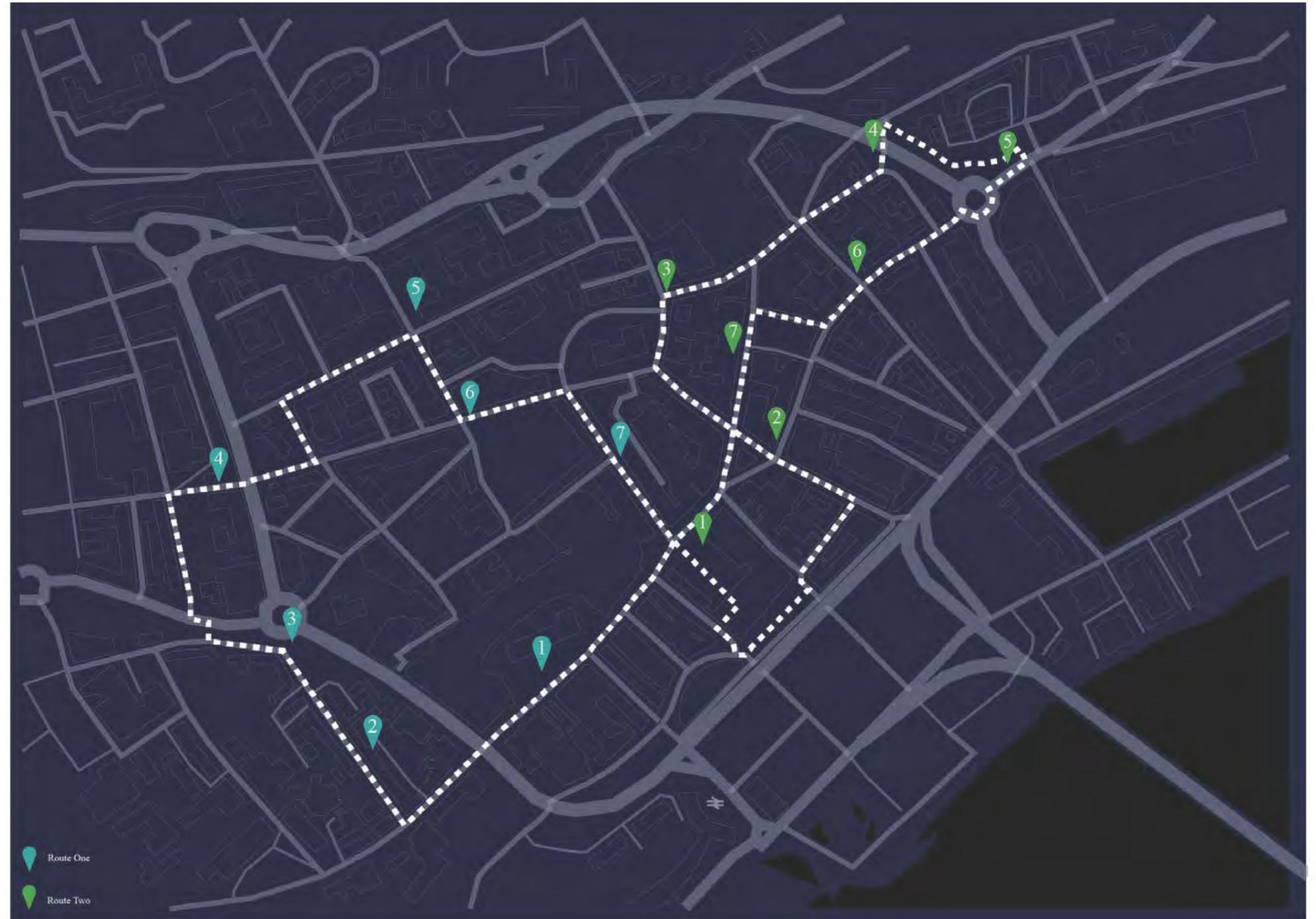


Figure 156: Night Walk routes

Route Two Stakeholder Suggestions

The following page categorises the stakeholder recommendations into four groups.

"Illuminate landmarks"

- 1- Lighting is necessary to highlight the Old Steeple
- 2 - Heritage buildings around Abertay University could be lit.
- 3 - Opportunity to illuminate a selection of the historic and interesting façades that can be seen across the city.
- 4 - The McManus Collection building should be lit.

"Adding interest and fun"

- 5 - Opportunity to do something fun and connect to the history of Guthrie Street
- 6 - Opportunity to light some trees and sculptures around west port roundabout and South Tay Street.
- 7 - Opportunity to inject more colour into Reform Street, and implement some public realm interventions like benches/planters.

"Lighting for safety"

- 8 - Lighting needed beside car park adjacent to West Port Roundabout.
- 9 - Greater illumination needed around the Old Steeple and Overgate Centre.

"Lighting for way-finding"

- 10 - Improving lighting around Old Steeple will improve wayfinding.

11 - Adding an interactive element or something to emphasise the active travel route down Guthrie Street.

12 - Lighting the McManus collection building or another building along Barrack street would help highlight the route to the help centre.

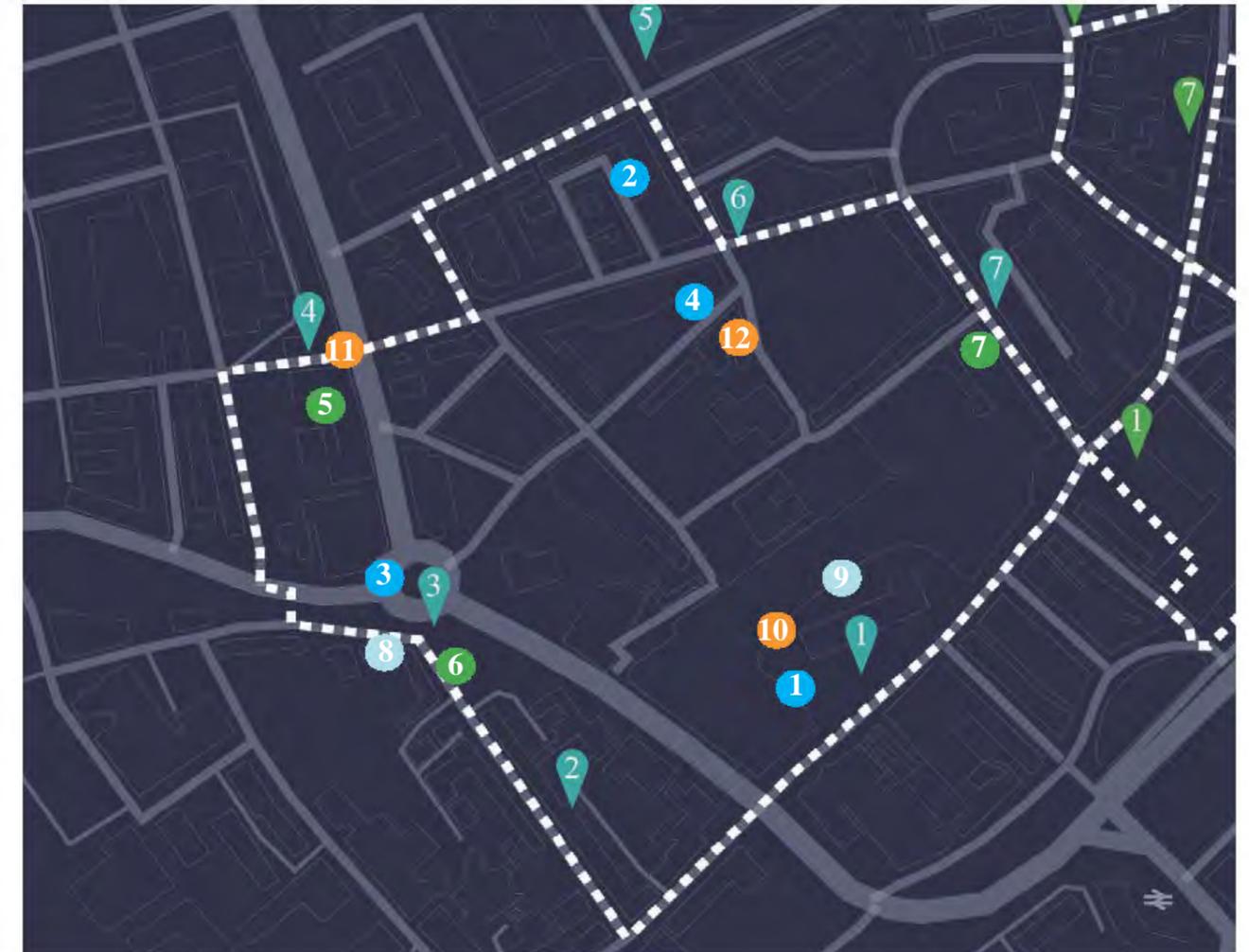


Figure 158: Stakeholder Recommendations located along the route

Legend

- | | |
|--|---|
| ● Illuminate landmarks | ● Lighting for safety |
| ● Adding interest and fun | ● Lighting for wayfinding |

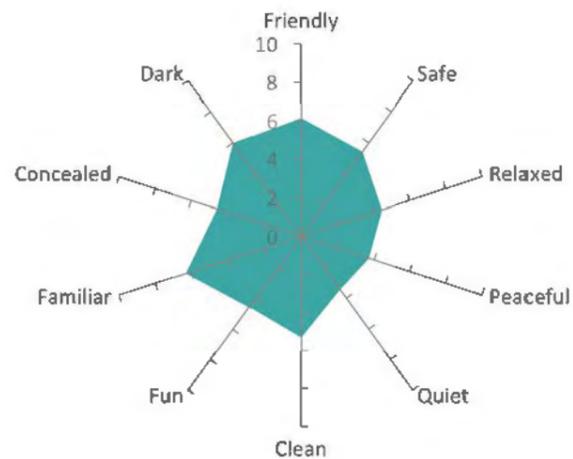
Figure 157: Participant recommendations

Stakeholder Perceptions

The following section presents the perceptions of the stakeholders at each viewpoint, by rating on a scale of 1 to 10 for a variety of categories.



VP1 - Old Steeple



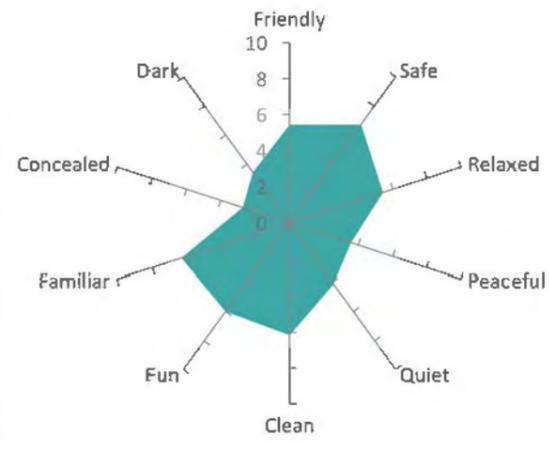
Viewpoint 1 was perceived to be vibrant and dark rather than peaceful and light by stakeholders, but received mixed scores across other categories.

VP2 - South TAY Street



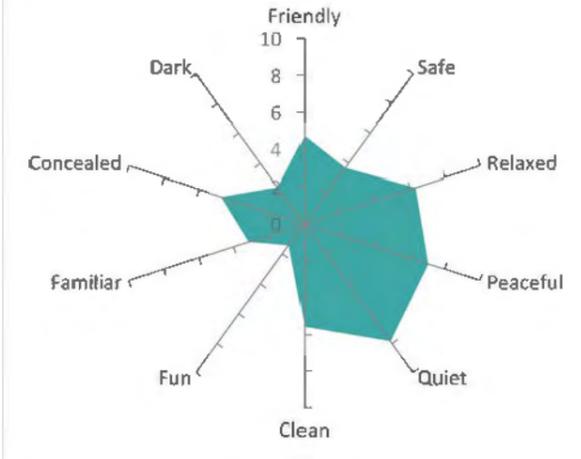
Viewpoint 2 was seen as a quiet, safe and friendly space by over 85% of stakeholders. Despite this over 55% still reported that the space felt dark and 30% said it felt concealed.

VP3- West Port Roundabout



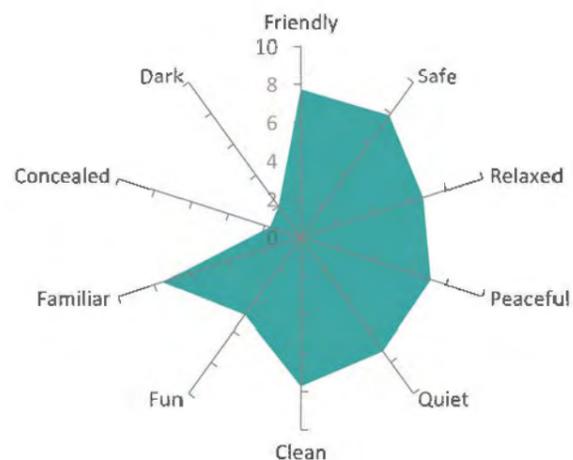
The majority of stakeholders found Viewpoint 3 to be loud and vibrant with well lit and open surroundings.

VP4 - Guthrie Street



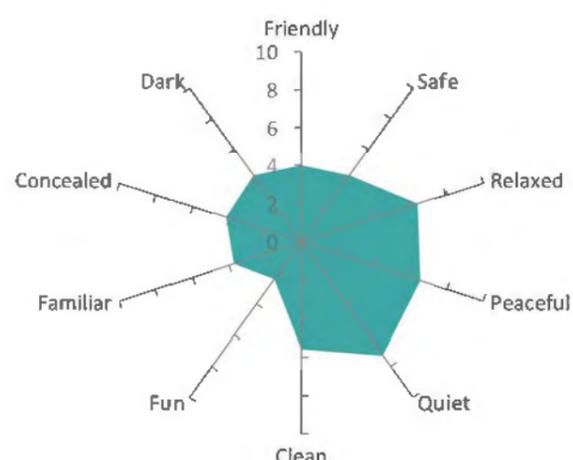
Viewpoint 4 was found to be very well lit by all respondents, but lacked in communicating a safe, familiar or fun feeling.

VP5 - Abertay University



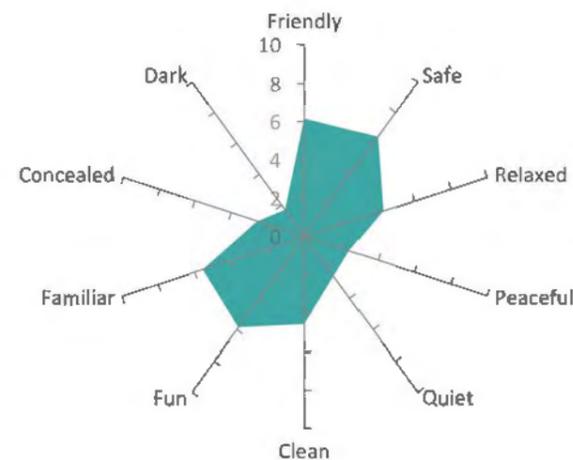
All stakeholders felt that Viewpoint 5 was friendly and clean, with the majority feeling safe here.

VP6 - Constitution Road



Viewpoint 6 was perceived to be quiet but felt generally the surroundings were dull and unsafe. No stakeholders found this area to be fun and only 30% said it felt friendly.

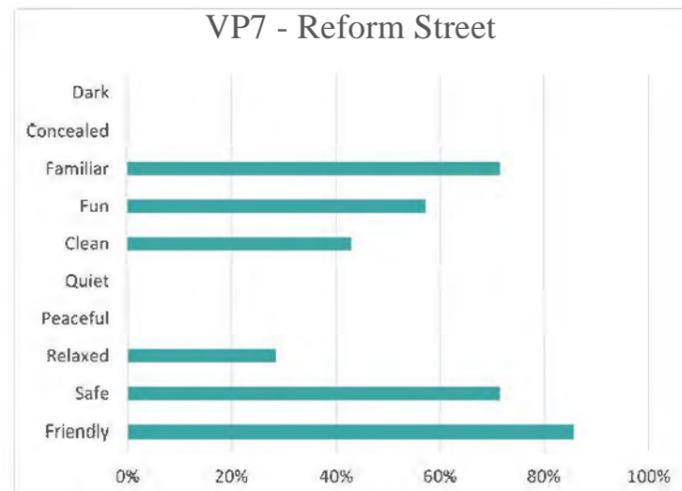
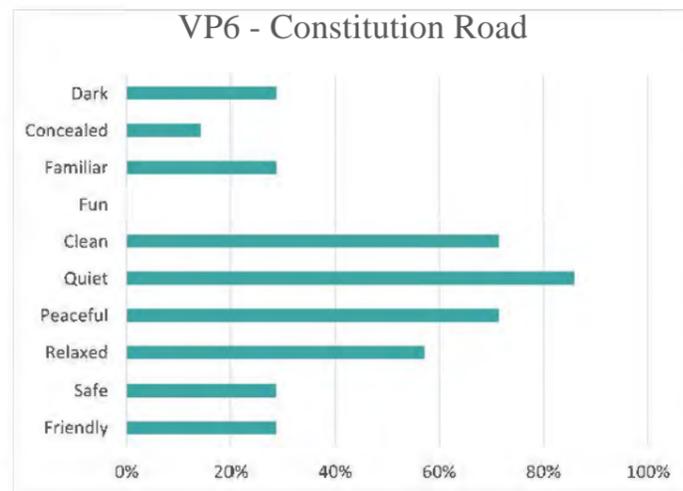
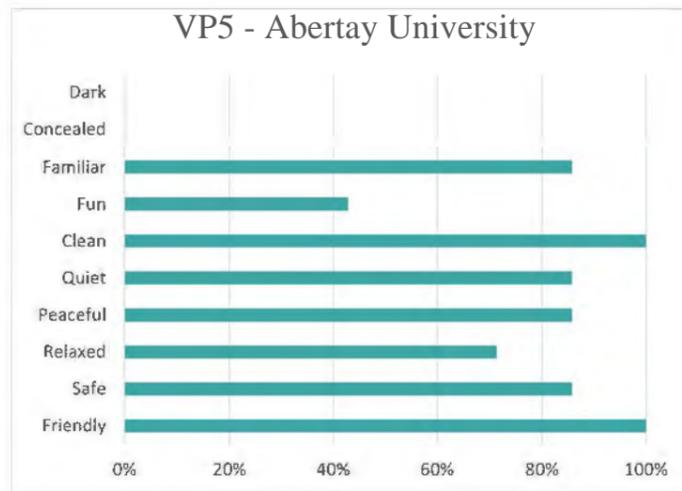
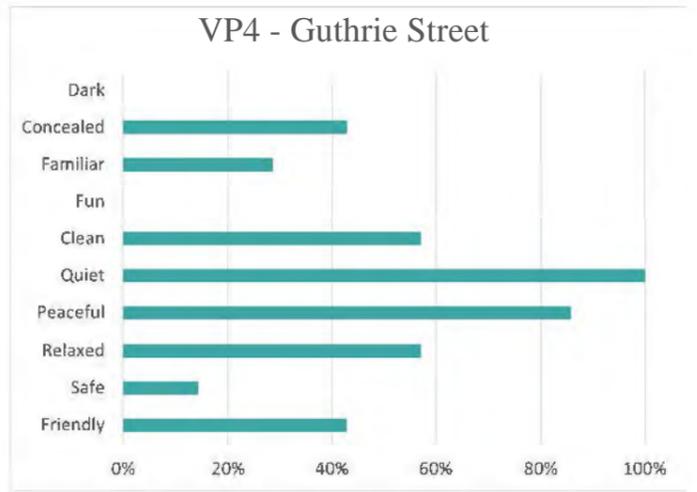
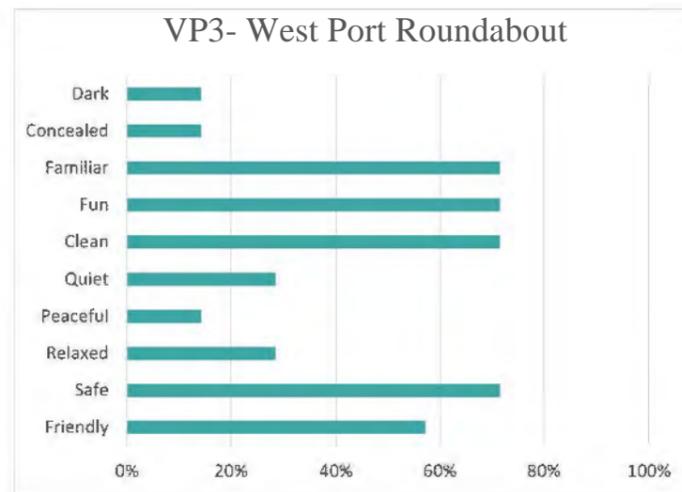
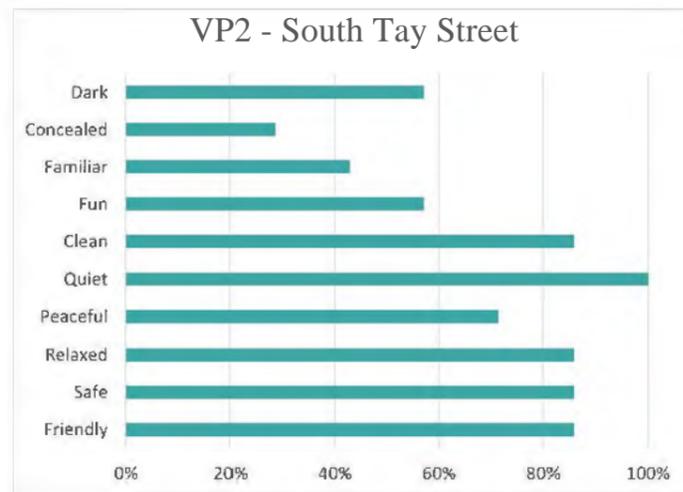
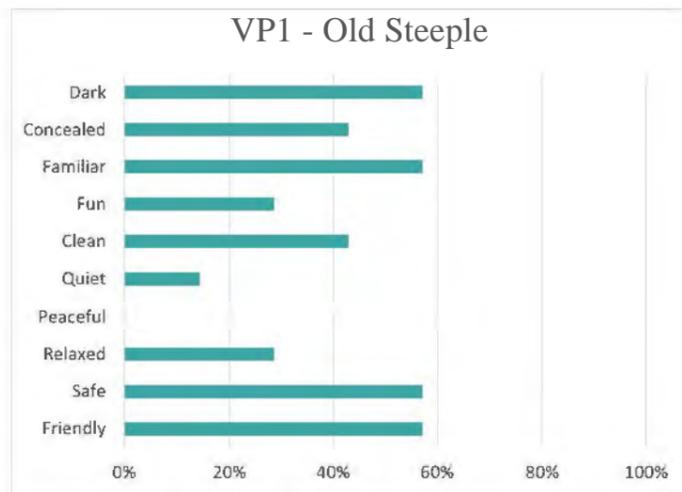
VP7 - Reform Street



Stakeholders perceived Viewpoint 7 to be well lit and open and safe, but loud and vibrant.

Stakeholder Perceptions

The following section presents the perceptions of the stakeholders at each viewpoint, by rating on a scale of 1 to 10 for a variety of categories.



Route Two Stakeholder Observations

The following section categorises the stakeholder observations from Route 2.

"Bright and busy"

- 1 - The colour temperature in City Square was preferred by most stakeholders.
- 2 - Tree lighting around City Square is liked but feels slightly random.
- 3 - Panmure Street is quite open so feels generally safe.
- 4 - Exchange street feels fun and a nice space but not much night-time activity.

"Dark, threatening areas"

- 5 - Unlit, recessed entrances on Panmure Street feel unsafe.
- 6 - The over lit East Marketgait Underpass and dark surroundings make the area unappealing less likely to be used.
- 7 - The area around East Port Roundabout feels like it is lit for cars and motor traffic rather than pedestrians.
- 8 - An ambient lighting source around East Port Roundabout is Olympia building which turns off at 10pm.
- 9 - Narrow pavements and proximity to traffic feels unsafe on Seagate.

"Difficult wayfinding"

- 10 - Cathedral steeple is a key landmark which is in total darkness at night and not visible when walking up Seagate.
- 11 - Poor lighting at new junction on Murraygate and Commercial Street.

"Buildings disappear into the night"

- 12 - No light to the cathedral steeple or statues at base.
- 13 - Trees around the McManus are large and dominate the Panmure Street elevation.
- 14 - Old City Chambers building is unlit and fades into background with brightly lit street lamps.
- 15 - The lighting outside the bus station is poor.

"Lacking in illuminated features"

- 16 - Features in City Square, such as fountains, are not obvious at night.
- 17 - Central run of street lighting on Murraygate is not aesthetically pleasing and leaves buildings poorly lit.
- 18 - Shop-fronts on Murraygate are left in relative darkness throughout the night.

"Too much contrast"

- 19 - Colour temperature on Castle Street is too warm in comparison to surrounding streets.
- 20 - There is too much contrast between underpass which is brightly lit and surrounding area in darkness.
- 21 - Cut through and alleyways don't feel safe with some having no lighting and others having too much contrast between bright light and darkness.

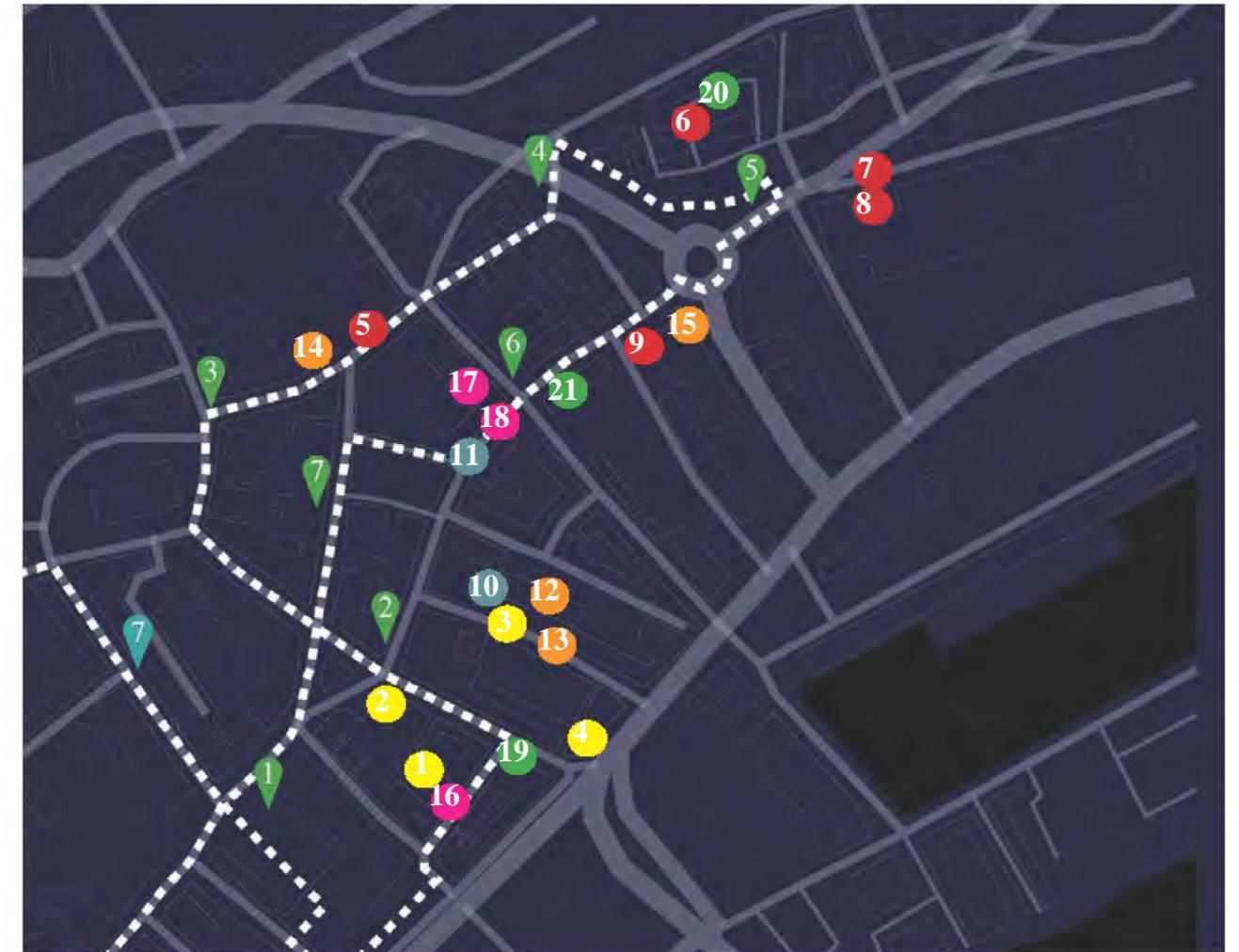


Figure 159: Stakeholder Observations located along the route

Legend

- Unsafe feeling
- Inconsistent lighting
- Difficult way-finding
- Positives
- Not aesthetically pleasing
- Landmarks/Focal points do not stand out

Route One Stakeholder Observations

The following section categorises the stakeholder observations from Route 1.

"Vibrant illumination"

- 1 - Abertay area feels quite well lit and safe.
- 2 - Colour change lighting to the library is fun.
- 3 - In-ground lighting to the front of the Dundee Rep feels vibrant and fun.
- 4 - Guthrie Street, as well as other previously poorly lit areas are lit much more uniformly and to a higher level.

"Dark and concealed areas"

- 5 - Car park area by the roundabout feels concealed and unsafe.
- 6 - Shut venues down South Tay Street have negatively impacted feelings of safety by creating an 'eerily quiet' atmosphere when there are no shows on.
- 7 - Dark corners around the Old Steeple are unhygienic and do not feel safe
- 8 - Barrack Street is used as a key route by vulnerable people to the help centre but feels unsafe
- 9 - Loud groups made the space feel less unsafe. User groups tend to be there after a night out or for McDonald's.

"Unclear wayfinding"

- 10 - The church steeple is not lit.
- 11 - West port roundabout feels chaotic with a lack of clear routes for pedestrians.
- 12 - Area around Old Steeple and Overgate has poor wayfinding.

"Beautiful but hidden landmarks"

- 13 - The current in ground lighting of the Dundee Rep will not work for much longer and needs replaced.
- 14 - Key heritage buildings around Abertay University and Guthrie Street are not currently lit.
- 15 - Across the city there are some amazing façades that are not being lit.

"Dull lighting"

- 16 - Reform street feels colder than surroundings due to colour temperature of street lights and colour of façades
- 17 - The McManus Collection building is poorly lit, with bright floodlights lighting the road instead of the building.

"Lighting from all directions"

- 18 - Street lighting on Guthrie Street features a tight optic and sharp cut off leaving adjacent industrial buildings in darkness.
- 19 - The lighting on South Tay Street is inconsistent in optic and colour.

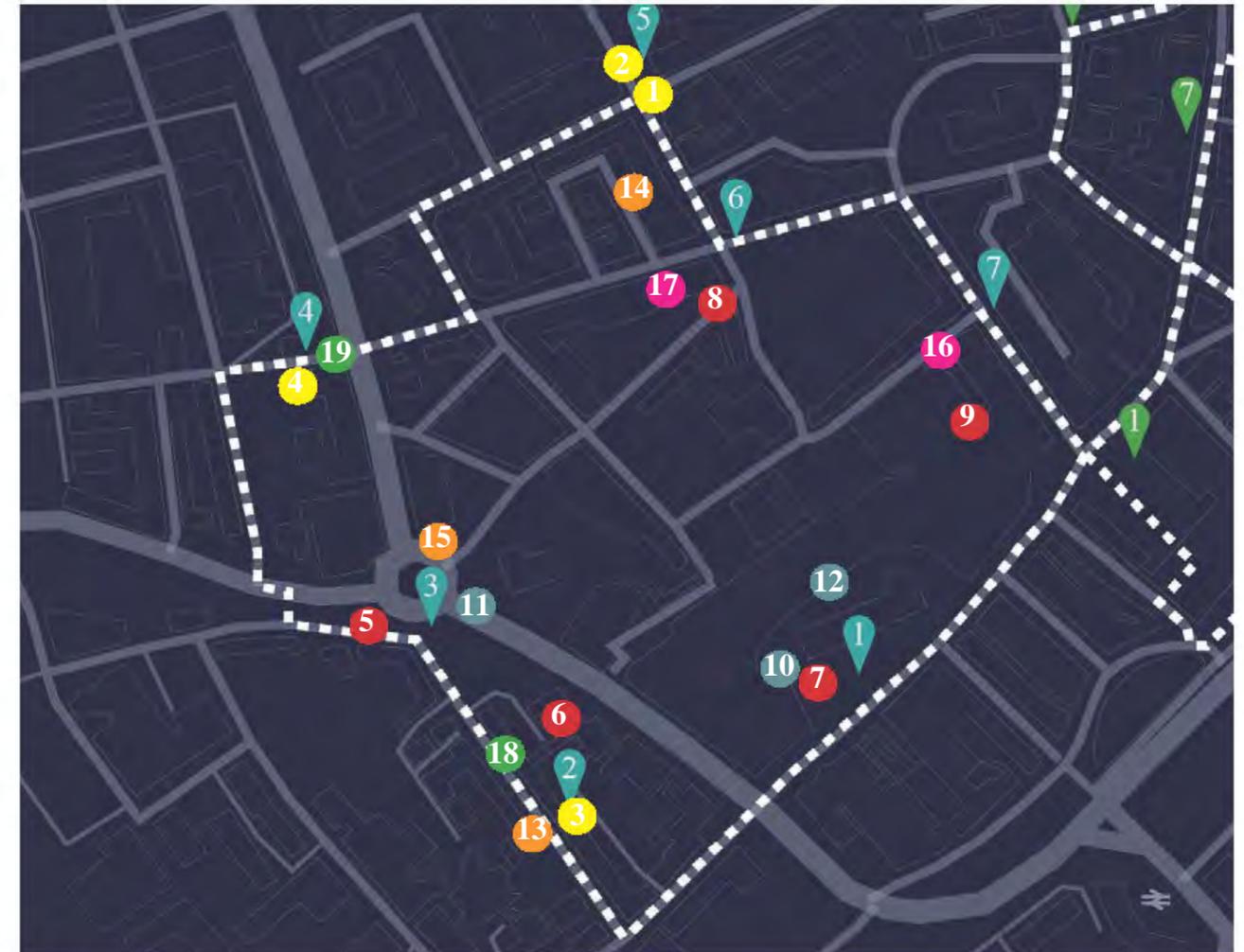


Figure 160: Stakeholder Observations located along the route

Legend

- Unsafe feeling
- Inconsistent lighting
- Difficult way-finding
- Positives
- Not aesthetically pleasing
- Landmarks/Focal points do not stand out

Route Two Stakeholder Suggestions

The following page categorises the stakeholder recommendations into four groups.

"Illuminate landmarks"

- 1 - A small amount of lighting on St Paul's Cathedral.
- 2 - Adding lighting to the old City Chambers to highlight the building and reduce levels of street lighting nearby as it's very bright.
- 3 - Lighting needs to be improved outside the bus station at junction.

"Adding interest and fun"

- 4 - Art could be added to underpass, making use of advertisement spaces .
- 5 - East Port Roundabout could feature a lit sculpture or lighting art.
- 6 - Light Admiral Duncan statue.

"Lighting for safety"

- 7 - Lighting needs to be added to alleyways and cut throughs to improve safety.
- 8 - Decrease contrast between underpass and surrounding areas by reducing level within and increasing lights at surroundings.

"Lighting for way-finding"

- 9 - Lighting top of St Paul's so is visible when walking up Seagate.
- 10 - Add lighting to new junction on Murraygate.

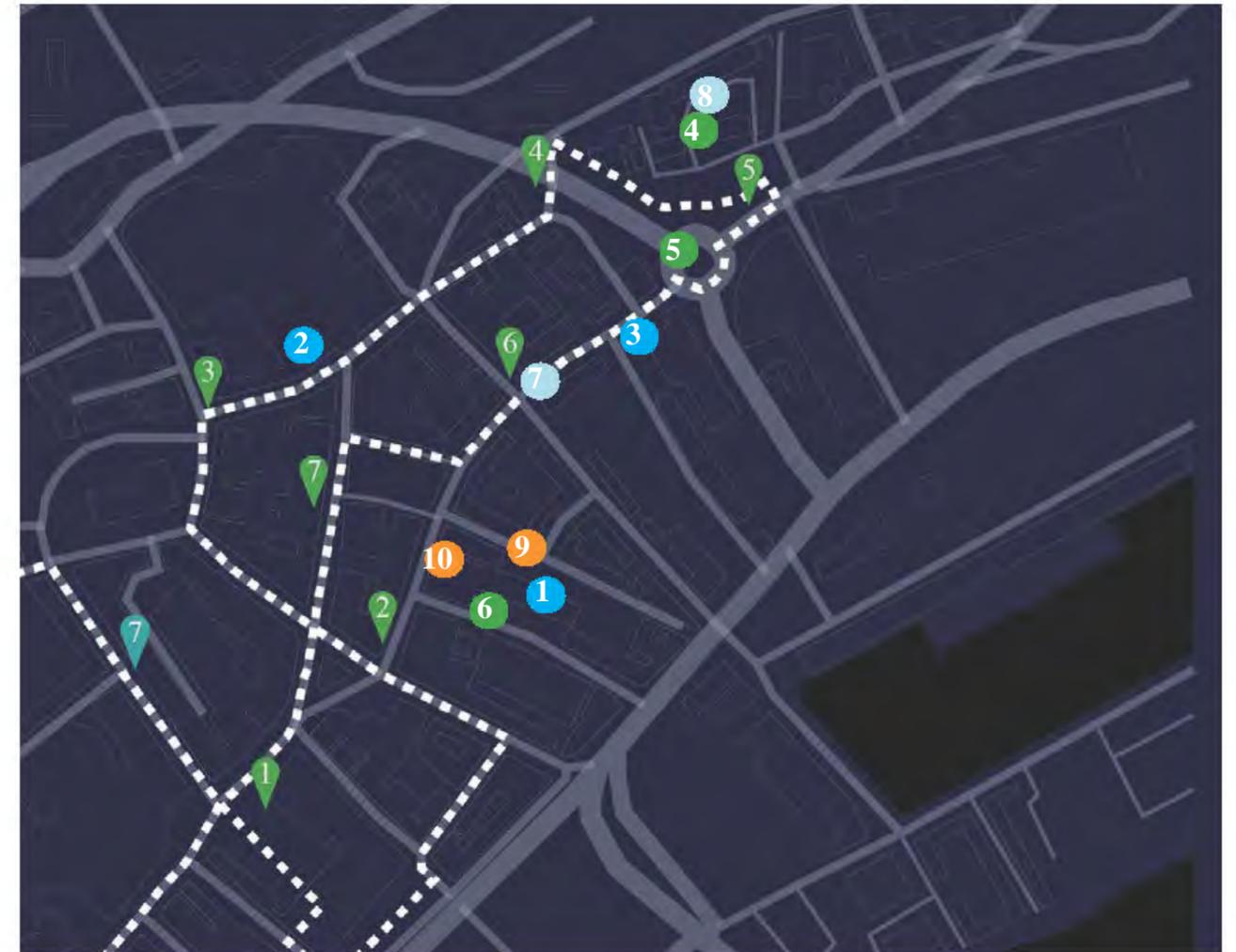


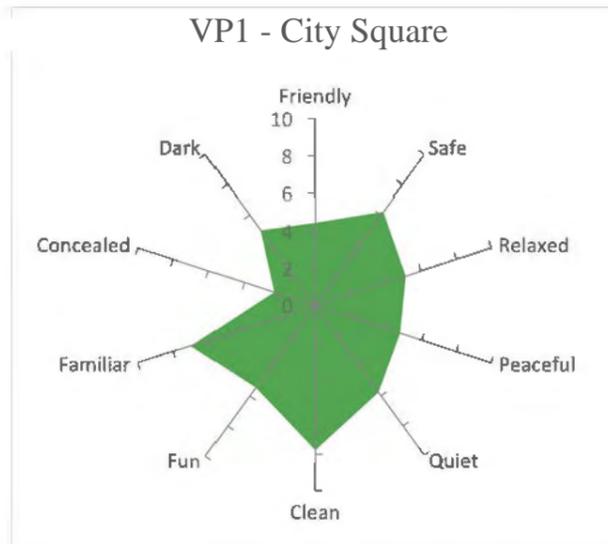
Figure 161: Stakeholder Recommendations located along the route

Legend

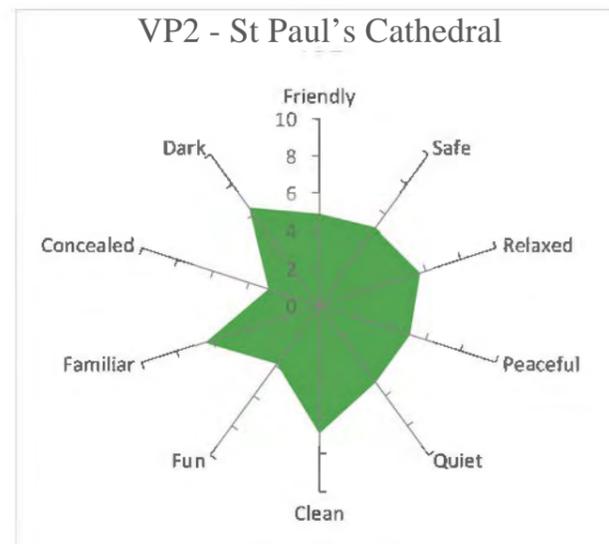
- | | |
|--|---|
| ● Illuminate landmarks | ● Lighting for safety |
| ● Adding interest and fun | ● Lighting for wayfinding |

Stakeholder Perceptions

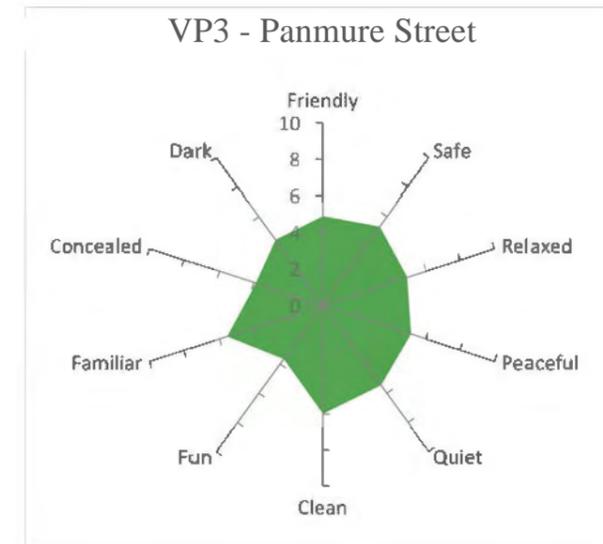
The following section presents the perceptions of the stakeholders at each viewpoint, by rating on a scale of 1 to 10 for a variety of categories.



- Viewpoint 1 was perceived to be not at all peaceful by all participants. 55% of respondents said they felt the area was dark but a majority reported the area felt safe.



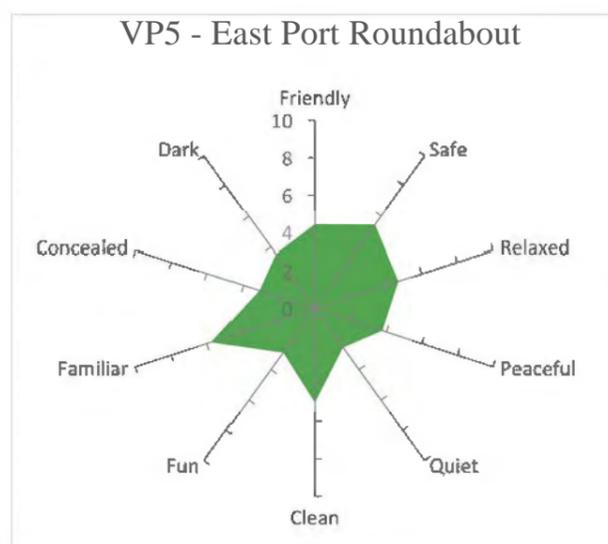
- Stakeholders generally perceived Viewpoint 2 to be dark but clean, with all finding it to be dull.



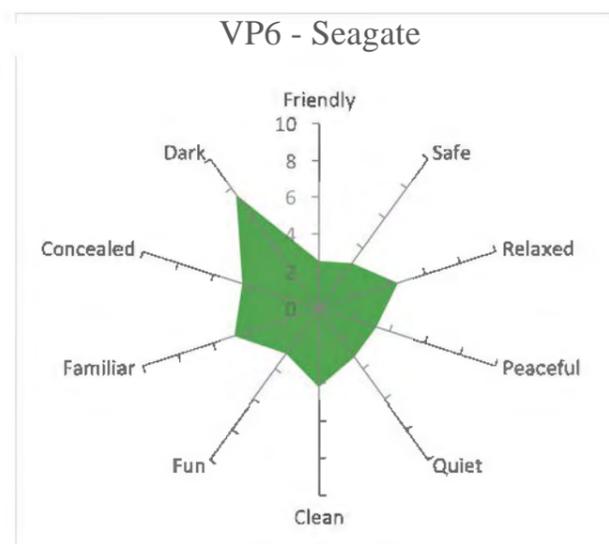
- Viewpoint 3 was perceived to be safe and quiet by a majority of stakeholders. It was also seen as dull with no interesting or fun features.



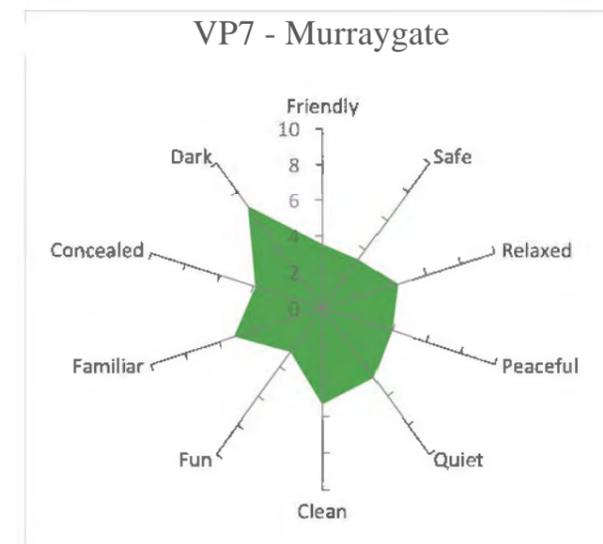
- Stakeholders generally found Viewpoint 4 to be clean, although reported feeling unsafe and concealed.



- Viewpoint 5 was perceived to be bright, vibrant and loud by most stakeholders. However the area did not feel particularly safe or friendly to most stakeholders.



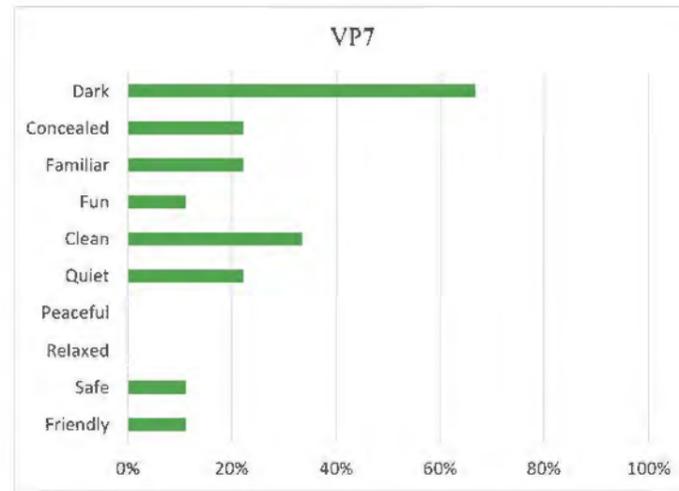
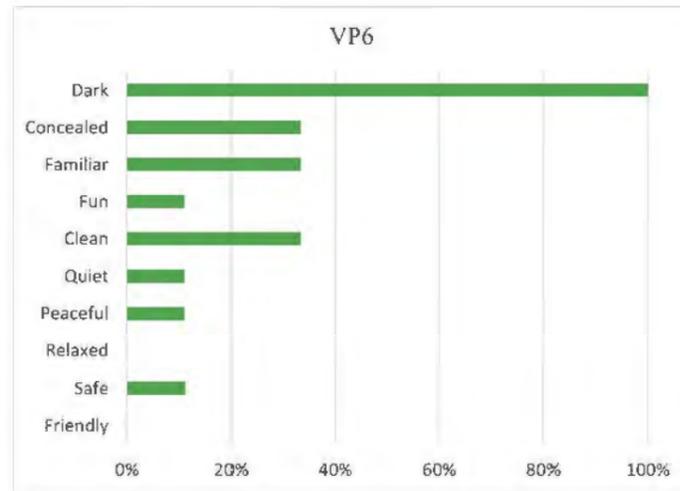
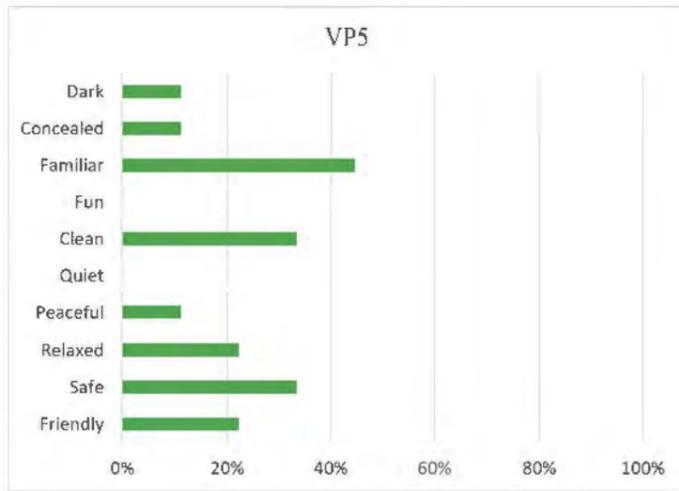
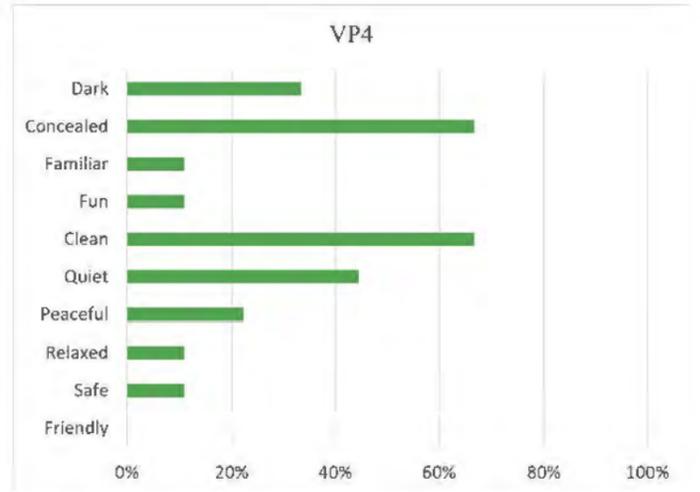
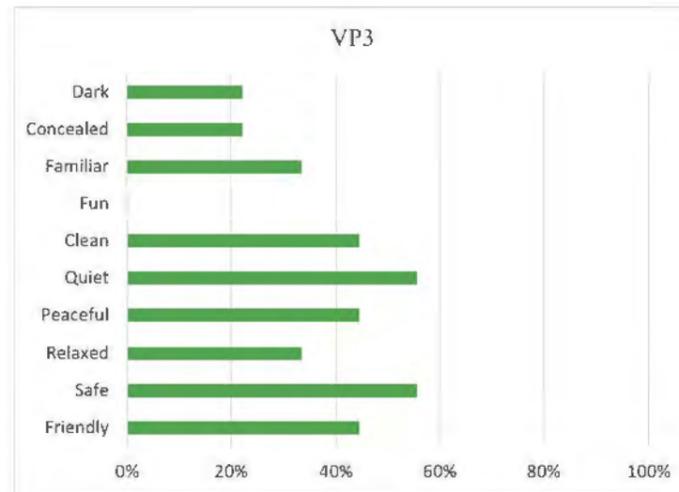
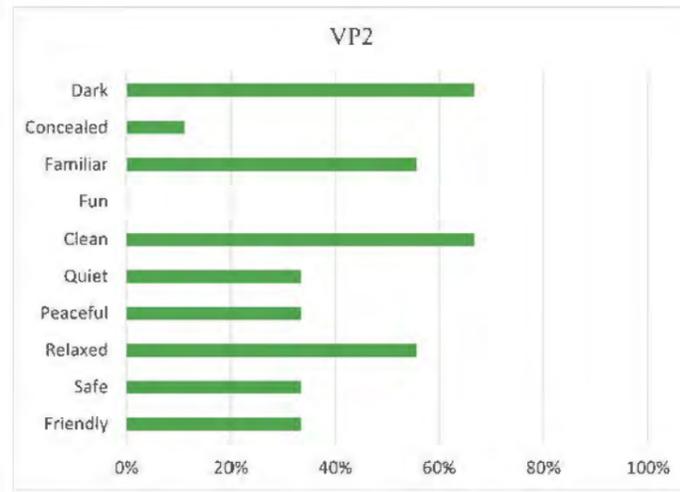
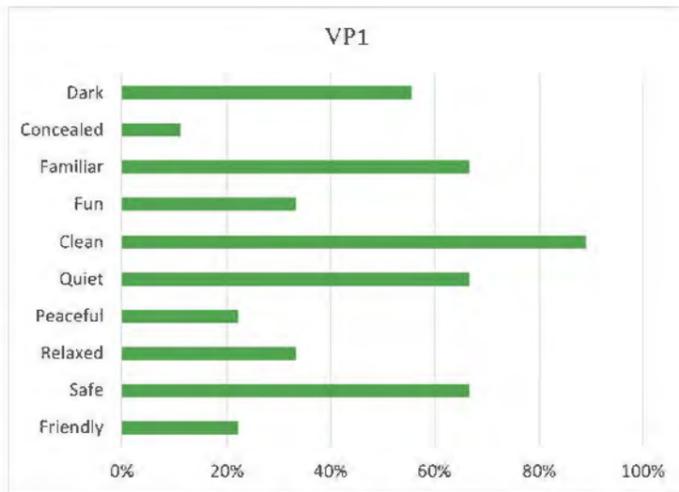
- Viewpoint 6 was found to be dark by all stakeholders with the surrounding area loud, unsafe and unfriendly.



- Viewpoint 7 was perceived as dark and unsafe by a majority of stakeholders. The majority of stakeholders found the area as loud and dull.

Stakeholder Perceptions

The following section presents the perceptions of the stakeholders at each viewpoint, by rating on a scale of 1 to 10 for a variety of categories.



A.5 Technical Lighting Survey

This section summarises the data collected during the lighting technical survey, completed in October 2024.

The survey was carried out between the hours of 8.00pm and 11.00pm, to ensure 'true night' conditions.

Survey Process

The technical data collected during the lighting survey enables Arup to establish the baseline lighting conditions of the city centre. The 14 key viewpoints are aligned with the Stakeholder Night Walks, and were selected due to the significance of user approach. These points are highlighted in **Figure 162**.

Measurements

Average horizontal illuminance measurements (incident light, a metric used in design standards for public realm lighting) were recorded at each viewpoint. 13 of the 14 measurements lay in the 1 - 20 lux range, although some areas are excessively illuminated.

High Dynamic Range (HDR) Imagery for each viewpoint was produced from digital photograph, to present the luminance profile of the nocturnal scene (luminance describes the 'brightness' of the scene i.e. what the eye sees).

Correlated Colour Temperature (CCT) measurements were taken at each unique fitting type present at a viewpoint. These measurements help support the report of the existing lighting provision, and to provide a capture of how warm/cool the lighting feels in an area.

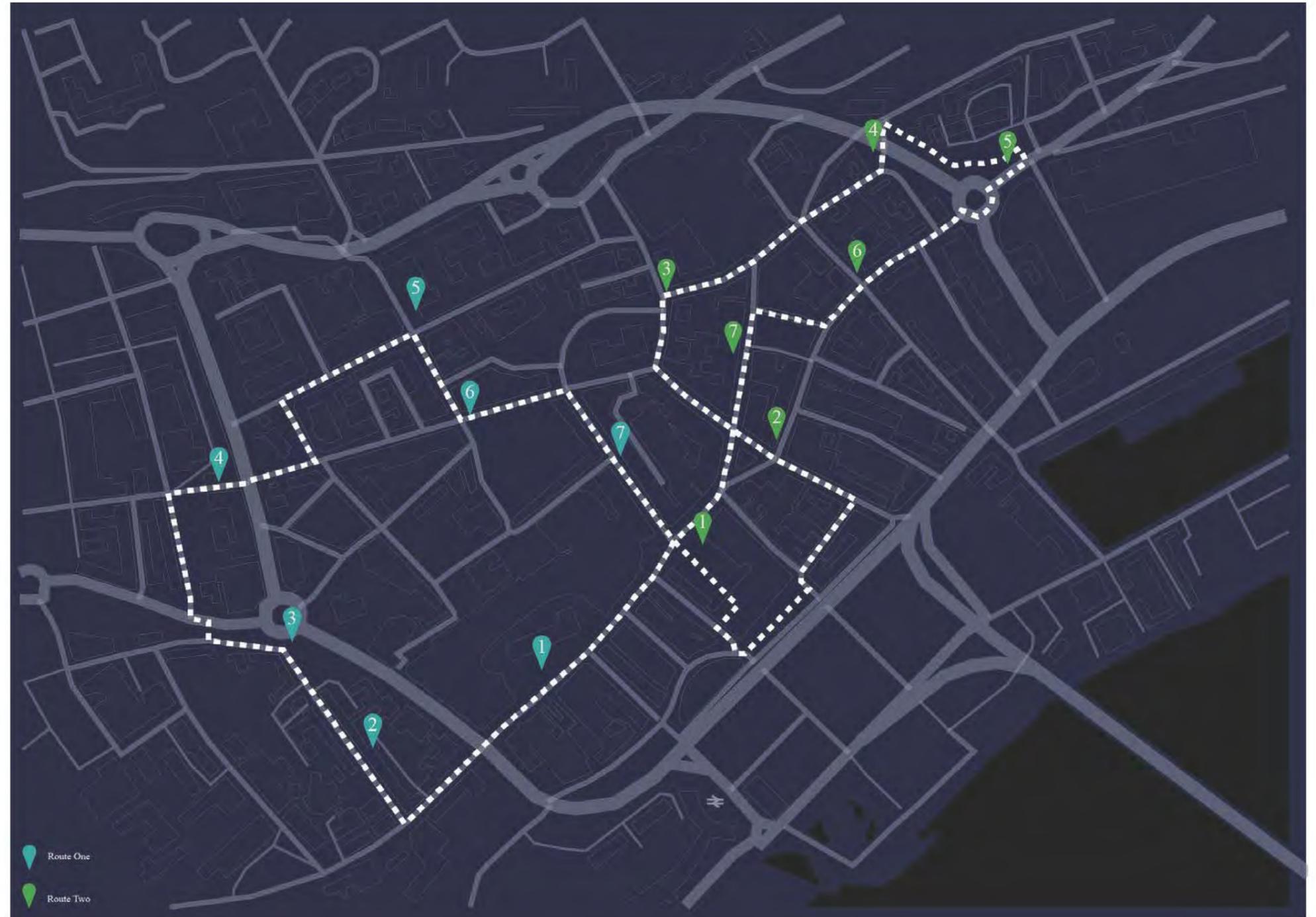


Figure 162: Viewpoints Surveyed

Technical Lighting Survey

Route One

Route One starts at the Old Steeple and covers the Western and Learning Quarters. It includes key routes from the universities and accommodation into the city, which are being developed as active travel routes as part of the Dundee City Masterplan.

Along the route, average horizontal illuminance levels vary from 32lux down to <6lux. The levels are recorded on the graph in **Figure 163**.

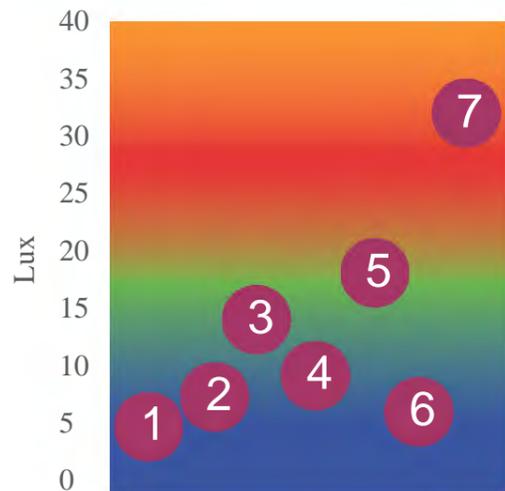


Figure 163: Average horizontal illuminance at each viewpoint

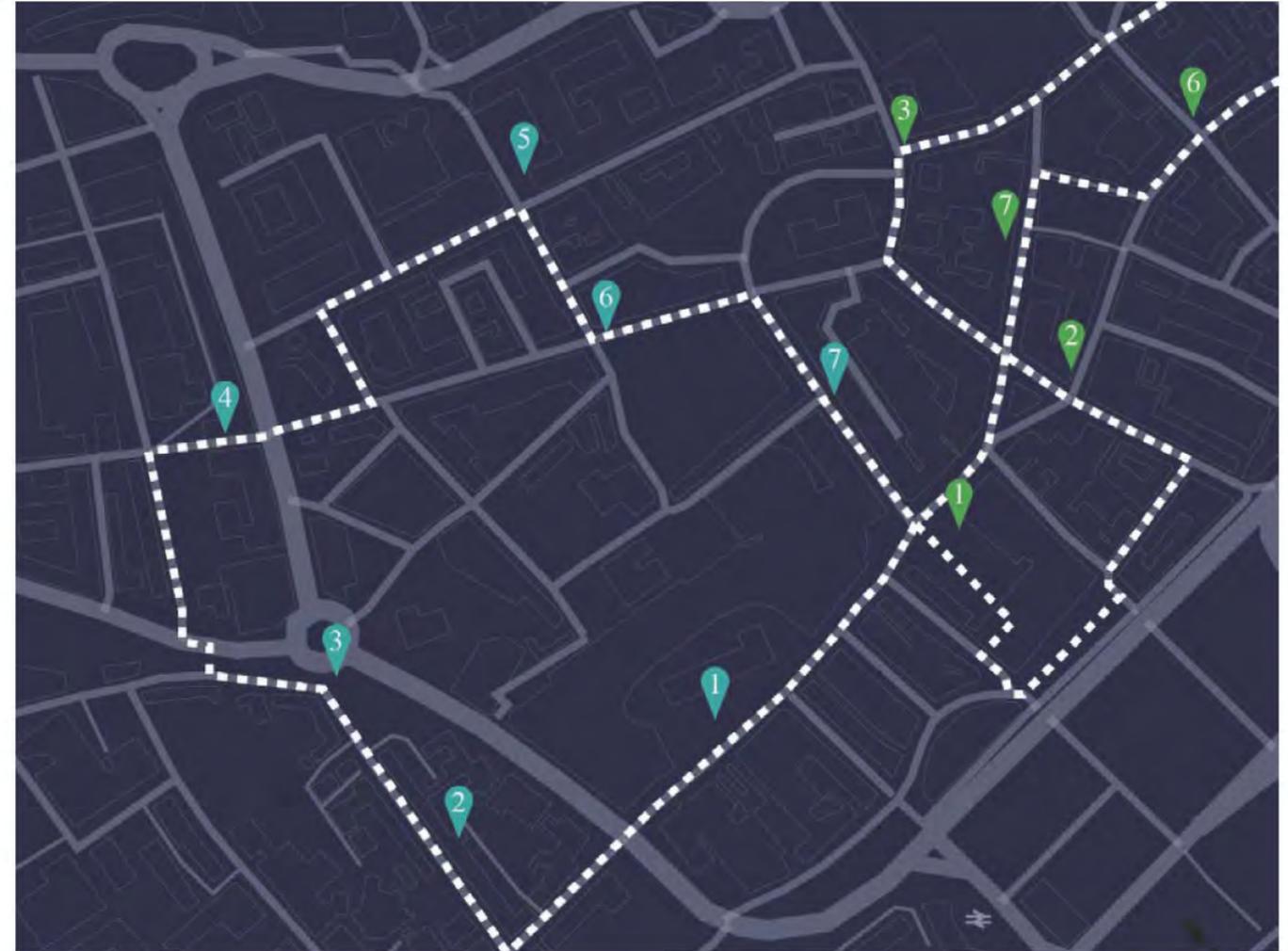


Figure 164: Route 1 views

Lighting Technical Survey

HDR Imagery

The HDR images shown in the following section were produced from a series of photographs taken and calibrated with on site luminance measurements.

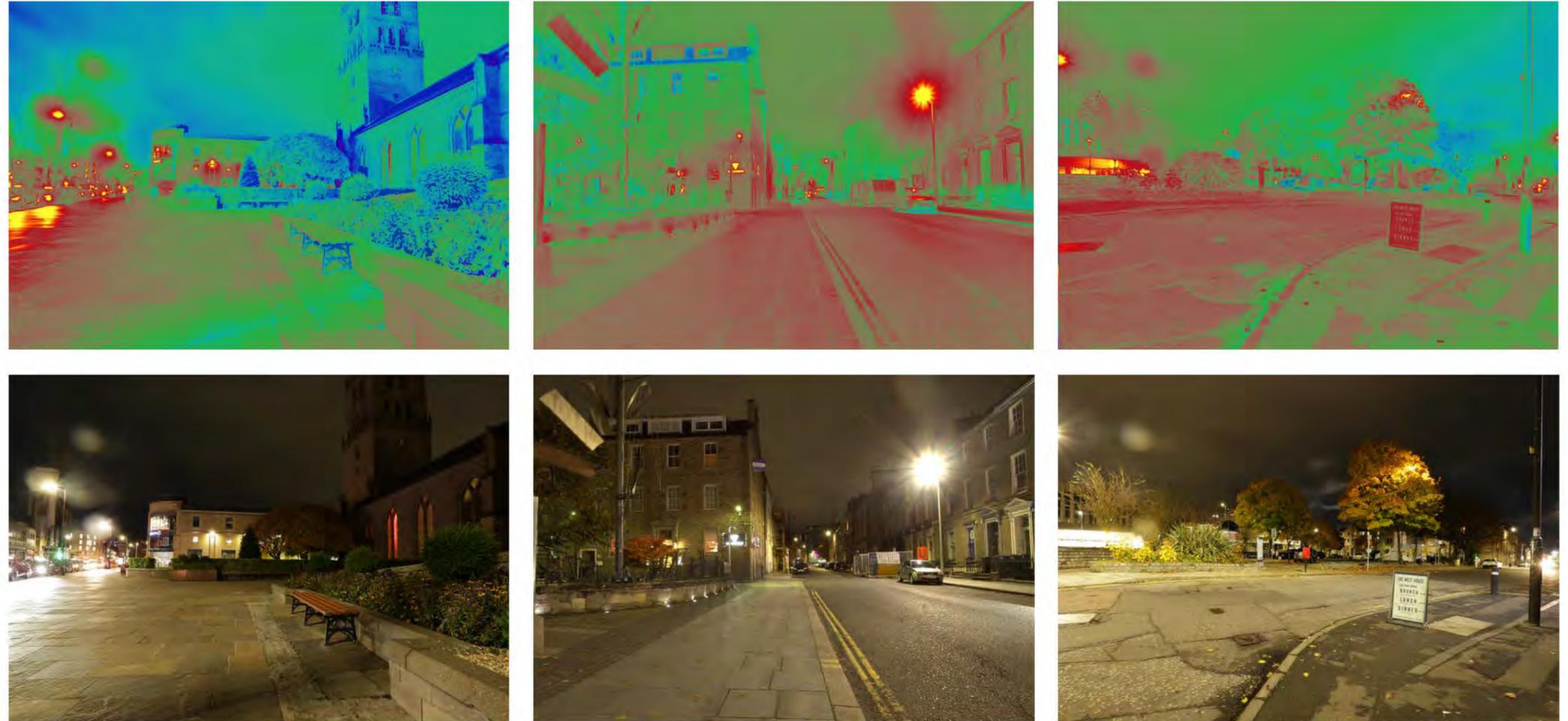
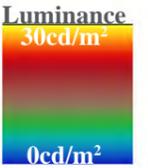


Figure 165: HDR images of Route 1 Viewpoints 1-3

Viewpoint 1: Old Steeple

Key observations:

- The church steeple itself is not lit at all and becomes an object looming in the dark.
- The light levels drop off quite suddenly from the edge of the pavement towards the church.
- There is some back-lighting on the Overgate shopping centre behind the church.
- The street scene is quite chaotic with a variation of light fittings.

Viewpoint 2: South Tay Street/ Dundee Rep

Key observations:

- The street itself is lit to a high level.
- The buildings are only lit by light spill from the street lighting columns.
- Buildings further down the street are in darkness, showing that a street lighting column is out.
- The courtyard is in darkness relative the street, so it has no presence.

Viewpoint 3: West Port Roundabout

Key observations:

- The street itself is lit to a high level.
- The shops across the other side of the roundabout are the brightest elements in the scene.

Lighting Technical Survey

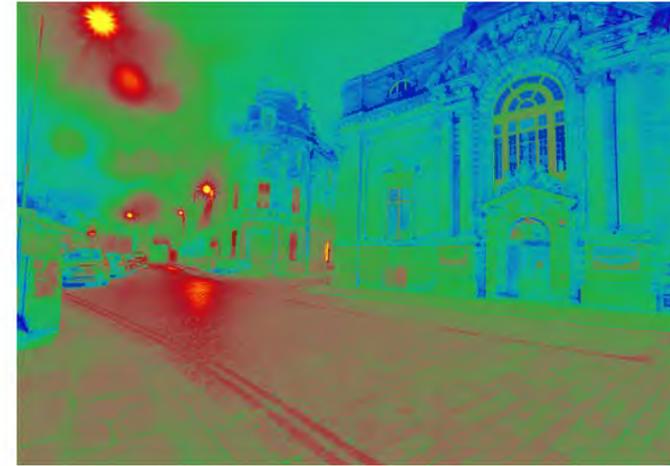
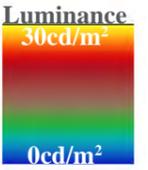


Figure 166: HDR images of Route 1 Viewpoints 4-7

Viewpoint 4: Guthrie Street

Key observations:

- The streets are lit to a very high and uniform level.
- The surrounding buildings are left in darkness due to the sharp cut-offs of the street lighting columns.

Viewpoint 5: Abertay

Key observations:

- The streets are lit to a high level.
- The surrounding university buildings have lighting to them so there is a low level of contrast.

Viewpoint 6: Barrack Street

Key observations:

- The street is not uniformly lit.
- The McManus Collection building is not lit at all, so is in darkness which creates a high level of contrast in the scene.

Viewpoint 7: Reform Street

Key observations:

- The street is lit to a high level.
- The buildings themselves also have high luminance.
- The closed shops create slightly darker pockets/doorways.

Lighting Technical Survey

Route Two

Route Two starts at City Square at the heart of the City Centre, where key shopping routes and routes into the city meet. The lighting in the square is warmer than that around it.

Along the route, average horizontal illuminance levels vary from 21lux down to <2lux. The levels are recorded on the graph in **Figure 167**.

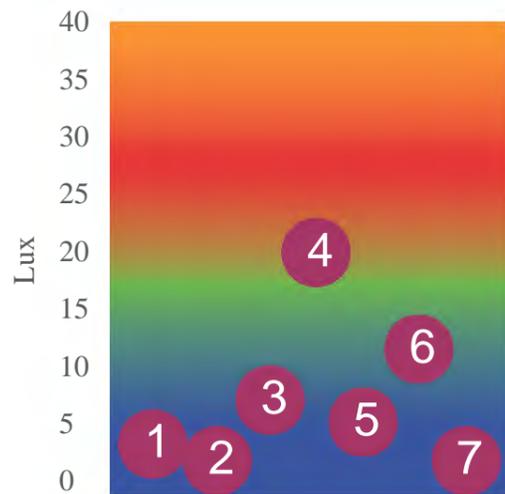
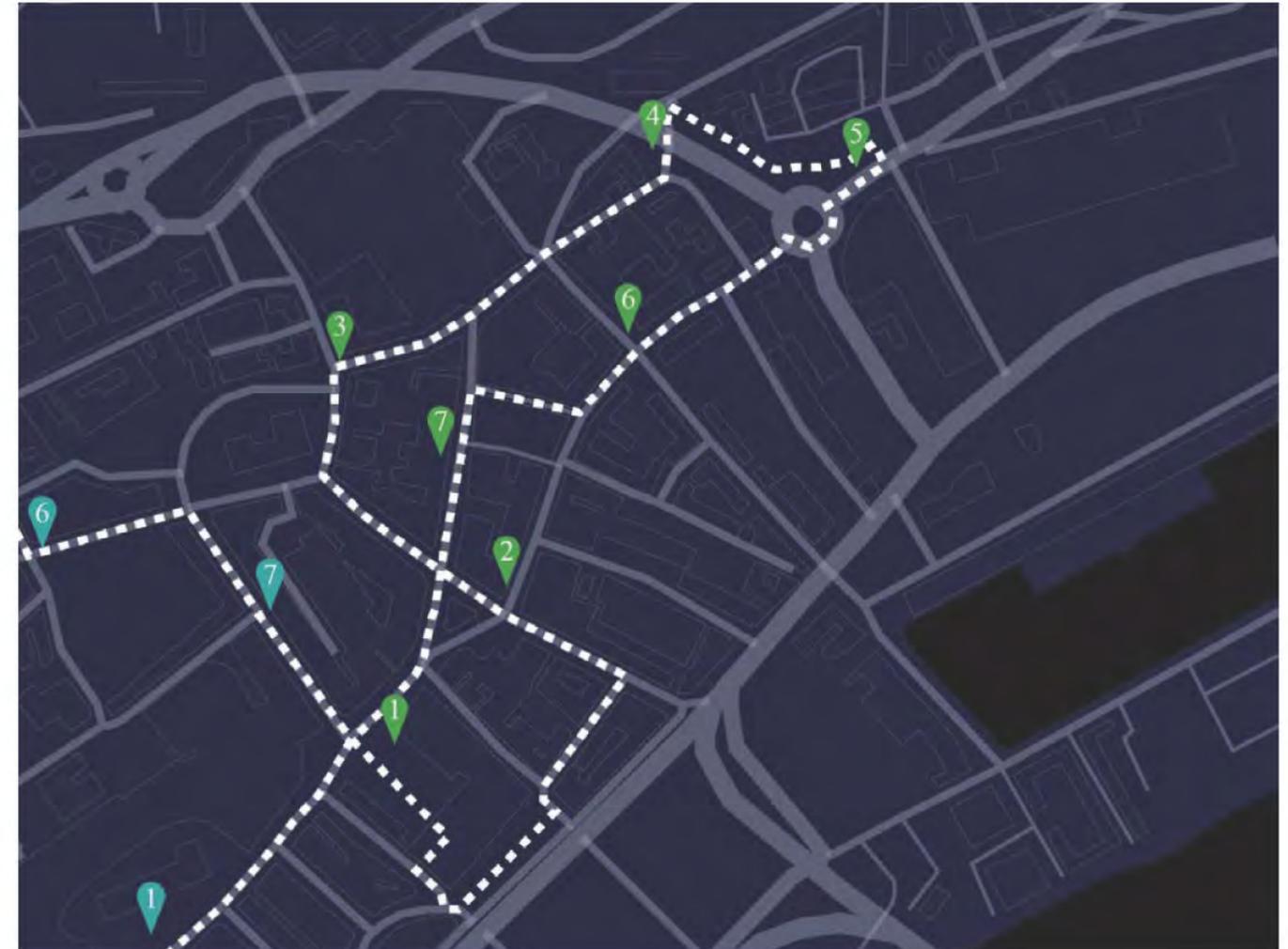


Figure 167: Average horizontal illuminance at viewpoint



Figure 168: Route 2 views

Lighting Technical Survey

HDR Imagery

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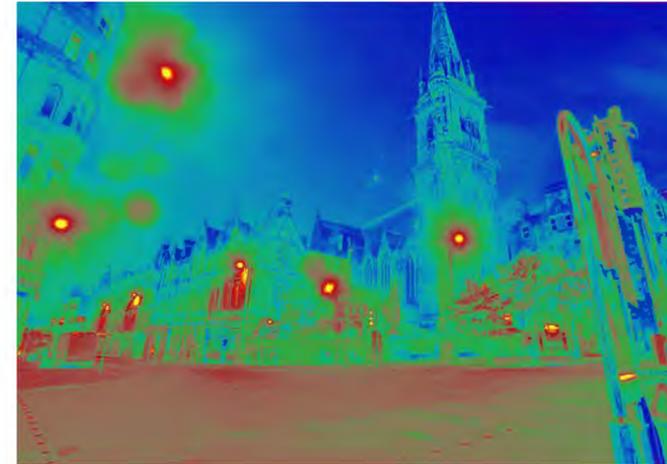


Figure 169: HDR images of Route 1 Viewpoints 1-3

Viewpoint 1: City Square

Key observations:

- The light levels drop off in the centre of city square, as the fittings are all wall mounted to buildings around the edge.
- Public realm features/fountains are not lit.
- Reform Street is very bright so guides the viewer towards it.

Viewpoint 2: St Paul's Cathedral

Key observations:

- The St Paul's Cathedral is not lit.
- There is a high level of contrast between the street and the steeple.

Viewpoint 3: Panmure Street

Key observations:

- The street itself is lit to a high level.
- The buildings around Albert Square are not lit.
- There are particularly dark areas at the unlit archways.

Lighting Technical Survey

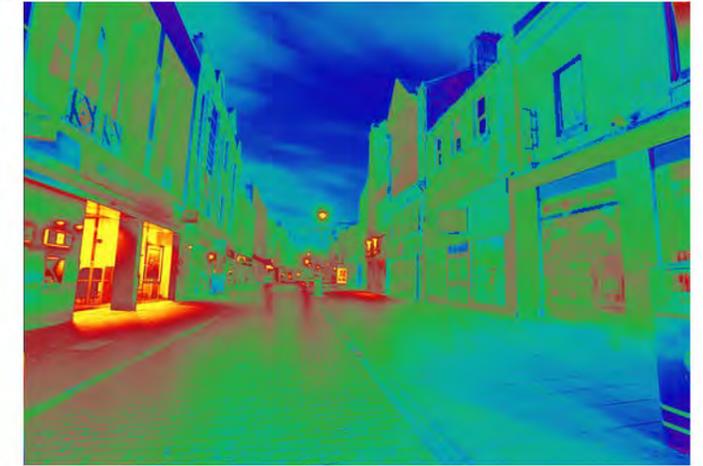
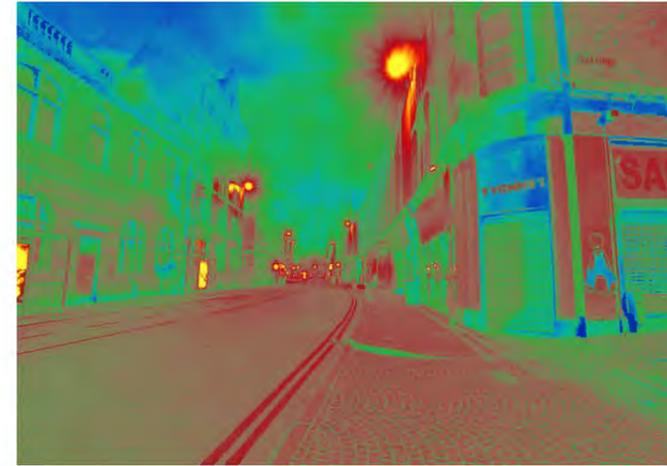
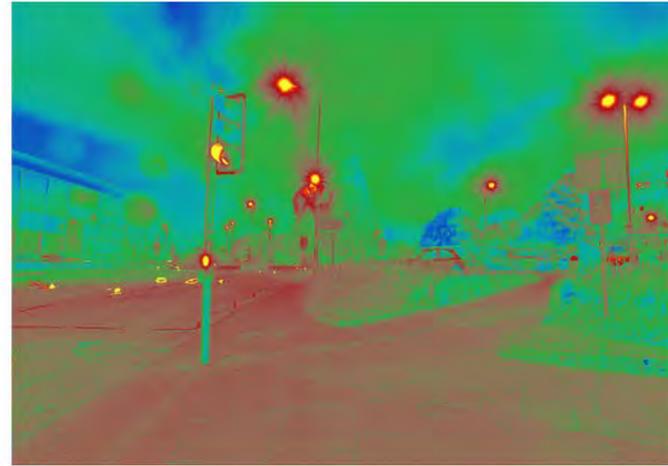
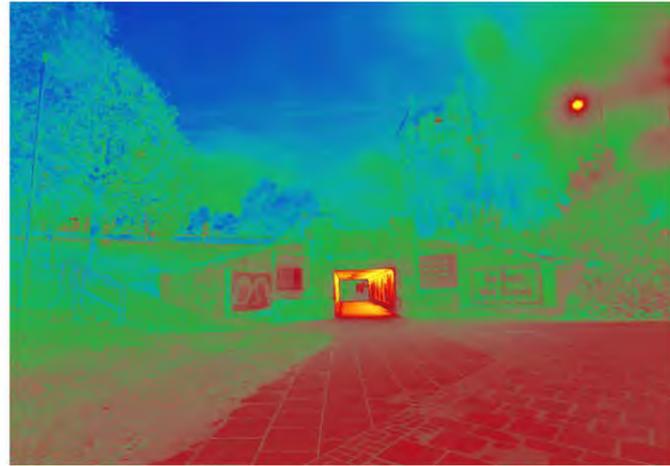
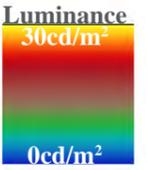


Figure 170: HDR images of Route 1 Viewpoints 4-7

Viewpoint 4: East Marketgait Underpass

Key observations:

- The underpass is lit to a very high level and does aid wayfinding.
- The street and pavement are uniformly lit.
- The grassy area adjacent to the underpass is in darkness.
- There is a high level of contrast in the scene.

Viewpoint 5: East Port Roundabout

Key observations:

- When Olympia is not lit, there is a lack of wayfinding.

Viewpoint 6: Seagate

Key observations:

- The street is lit uniformly.
- The adjacent industrial buildings are not lit.
- St Paul's Cathedral at the end of Seagate is not lit, so there is no landmark to aim for.

Viewpoint 7: Murraygate

Key observations:

- The lighting is inconsistent and there are large areas of darkness.
- When the shops are closed the buildings are not lit.

Lighting Technical Survey

Illuminance Levels

Illuminance level measurements were taken on the pedestrian areas around the study area at pavement level to compare with the road lighting class guidance from BS EN 13201. **Figure 171** highlights the range of illuminance levels experienced along the routes.

Murraygate and St Paul's Cathedral/Commercial Street have lower lighting levels than the rest of the study area. Other darker areas include Barrack Street/Constitution Road, City Square, the Old Steeple, and West Port Roundabout - City Square had several lights out which likely contributes to the low levels.

The lighting levels on Guthrie Street, South Tay Street, and the East Marketgait Underpass hugely vary across the study areas, which may contribute to a poor perception of safety in the area due to inconsistent lighting and high levels of contrast. The areas adjacent to the underpass are illuminated to 10% of the underpass itself.

It is important to note that it is not recommended to over-illuminate streets to increase the perception of safety. Brighter does not equal safer. A successful lighting strategy manages the transition between low and high levels of light.



Figure 171: Illuminance measurements

Lighting Technical Survey

Colour Temperature Measurements

Correlated Colour Temperature (CCT) measurements were taken with a spectrometer at each unique fitting type present at a viewpoint. Values typically varied between 1500K and 5000K, with 1500K being 'warmer' light and 5000K 'cooler'.

Figure 172 locates the measurements taken - at three of the viewpoints multiple measurements were taken, where there were varying sources.

These measurements can start to explain patterns in perceived safety, and also act as a sense check to the asset data provided by Dundee City Council. 14 of the 17 measurements were between 3500 and 4500K, as most of the fittings in the city centre are ~4000K.

Areas that have not yet been upgraded to LED, such as the cut-throughs between Murraygate and Seagate have fittings with readings ~1800K.

The spectral distribution of each measurement can then be presented in graphical form, to show the colour content of each fitting. **Figure 173** shows the spectral distribution graph for City Square where the lighting is visibly warmer to the viewer, and this represented on the graph by the higher red content.

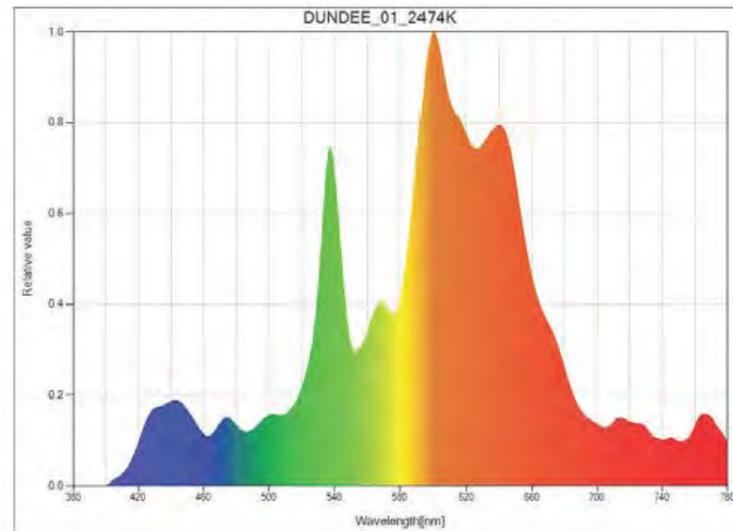


Figure 173: Spectral distribution for City Square

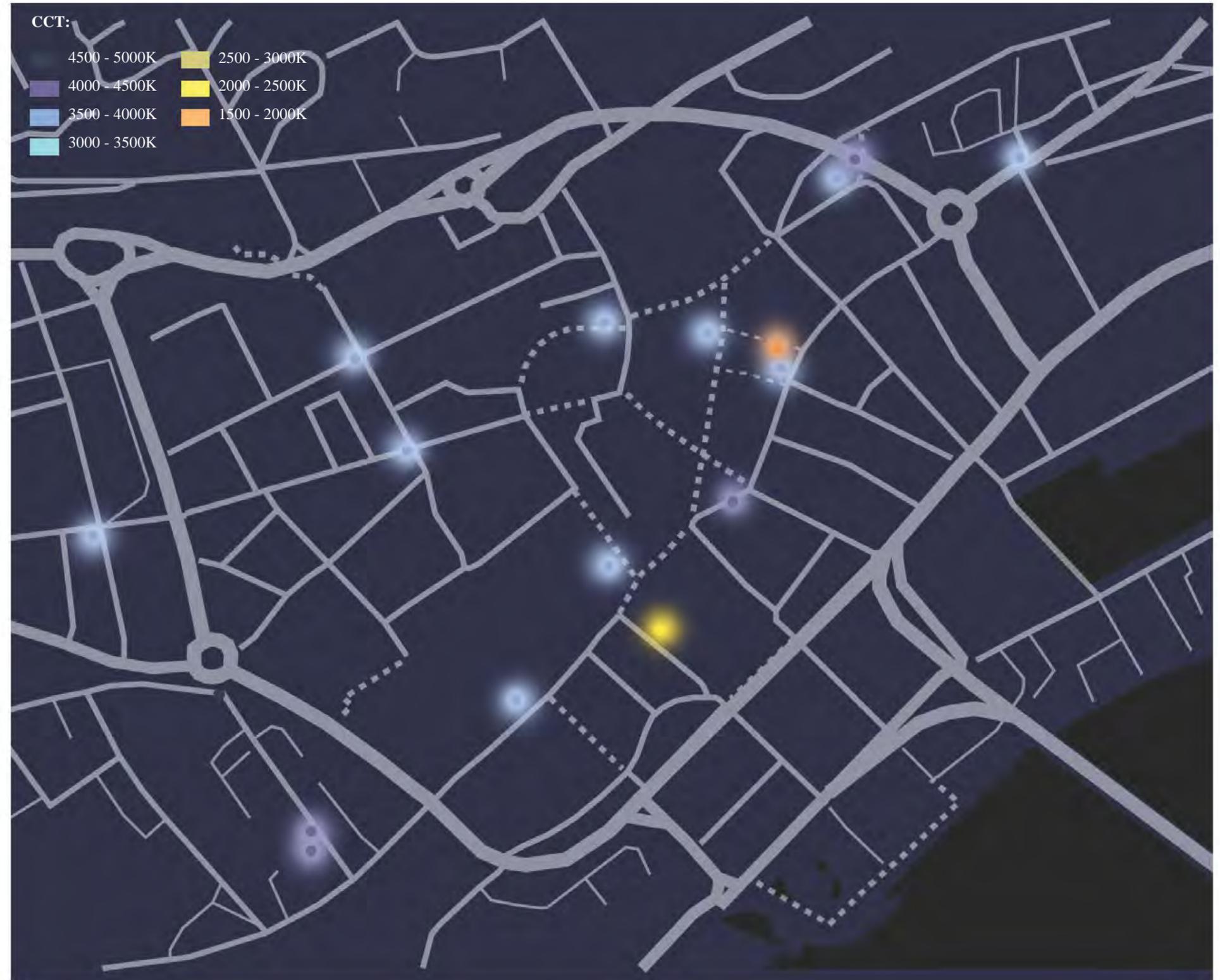


Figure 172: CCT measurements

Lighting Technical Survey

Dundee Rep Theatre/ South Tay Street

Two measurements were taken at Viewpoint 2 on Route 1, outside the Dundee Rep, which are located on **Figure 174**:

A: Directly beneath a street lighting column opposite the theatre

B: Directly beneath a building mounted fitting on X road, running down the side of the theatre courtyard.

Multiple readings were taken due to the visible differences in lighting colour, with the fittings at point B appearing to give off a 'green glow', which contributed to feelings of 'eeriness' and being 'unsafe' on the cut-throughs/side roads by the stakeholders that participated in the Night Walks.

This is demonstrated in **Figure 175**, where the green part of the spectrum is much more prominent than the blue part at point B.



Figure 174: CCT measurements taken at Dundee Rep Theatre/ South Tay Street

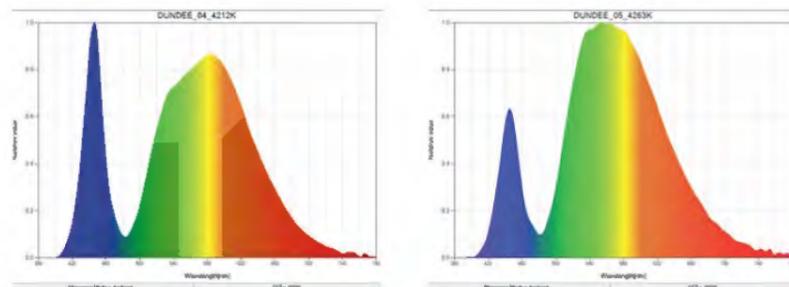


Figure 175: Spectral distribution at measurement points A and B

East Marketgait Underpass

Two measurements were taken at Viewpoint 4 on Route 2 by the East Marketgait Underpass, shown on **Figure 176**:

A: Directly beneath a street lighting column on the road

B: Directly beneath the ceiling mounted fittings in the underpass

Multiple readings were taken due to the visible contrast in illuminance levels inside and outside of the underpass.

However, **Figure 177** shows that although the underpass (point B) is much brighter, the two points have light sources with very similar colour content.

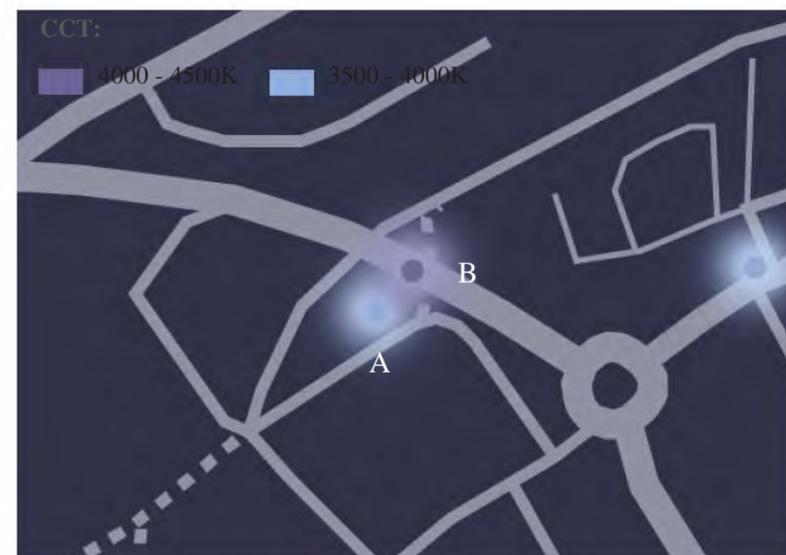


Figure 176: CCT measurements taken at East Marketgait Underpass

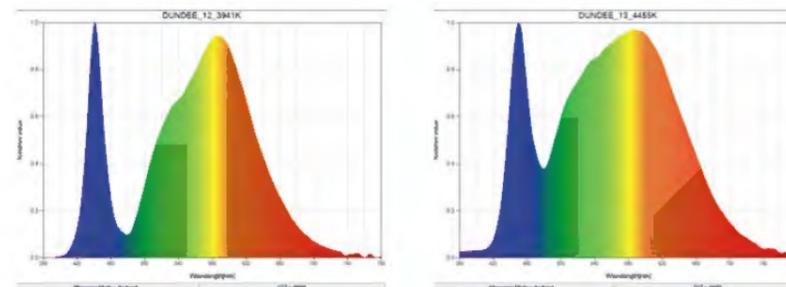


Figure 177: Spectral distribution at measurement points A and B

Seagate and surrounding streets

Two measurements were taken at Viewpoint 6 on Route 2 along Seagate, which are shown on **Figure 178**:

A: Directly beneath a street lighting column on the road

B: Directly beneath a wall mounted halogen fitting on Peter Street, a cut-through to Murraygate

Figure 179 shows the large contrast between the spectral distribution of a 4000K LED and an old sodium fitting. Combined with multiple fittings being out on Peter Street, the contrast in colour temperature between points A and B is likely to lead to feelings of being unsafe.

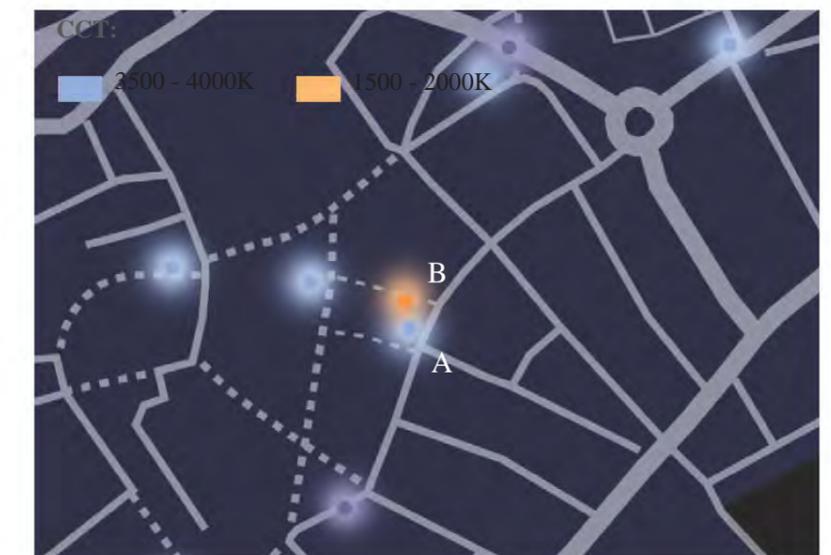


Figure 178: CCT measurements taken at Seagate

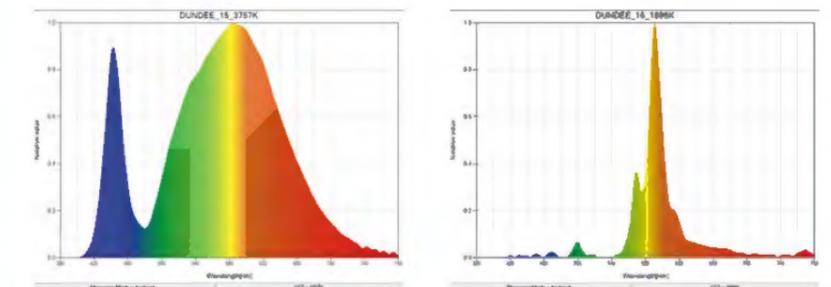


Figure 179: Spectral distribution at measurement points A and B

A.6 Existing Street Lighting Provision

Understanding the existing lighting provision is an important part of the design analysis process.

Asset data of the current lighting column types has been reviewed alongside photographs taken during the on-site surveys, to represent the different luminaire types on **Figure 180**. The figure shows there is more variety in lighting types in the very centre around the City Square and Seagate areas.

A variety of types were recorded, with heritage-style fittings located around Murraygate, City Square, Panmure Street, and High Street.

Taller, more modern style fittings are found more on the outskirts of the City Centre, and around the Inner Ring Road.

Figure 181 visually represents each of the key fitting types, and demonstrates the lighting hierarchy in relation to human scale.



Figure 182: Considerations for LED retrofit to existing lanterns

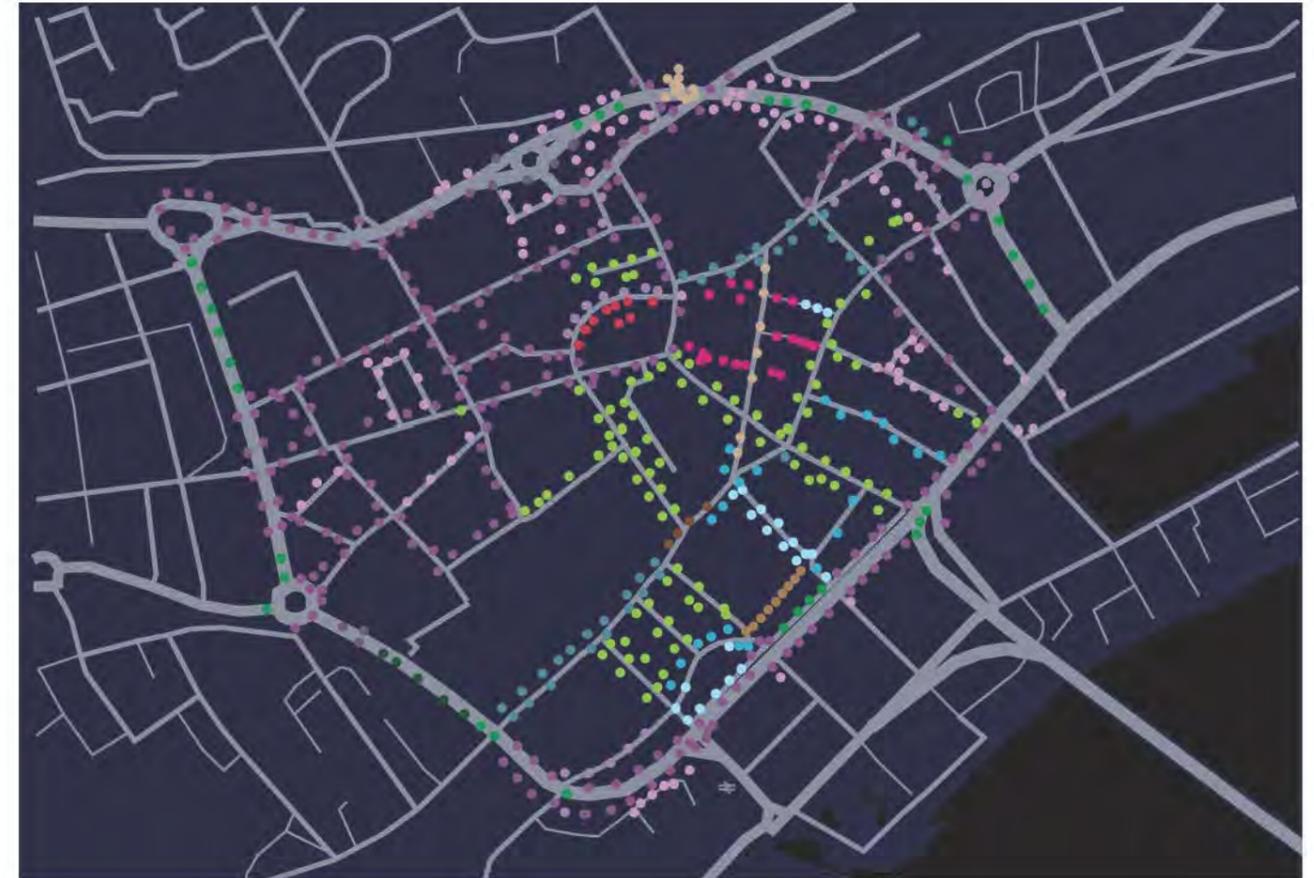


Figure 180: Lighting fitting types across the City Centre

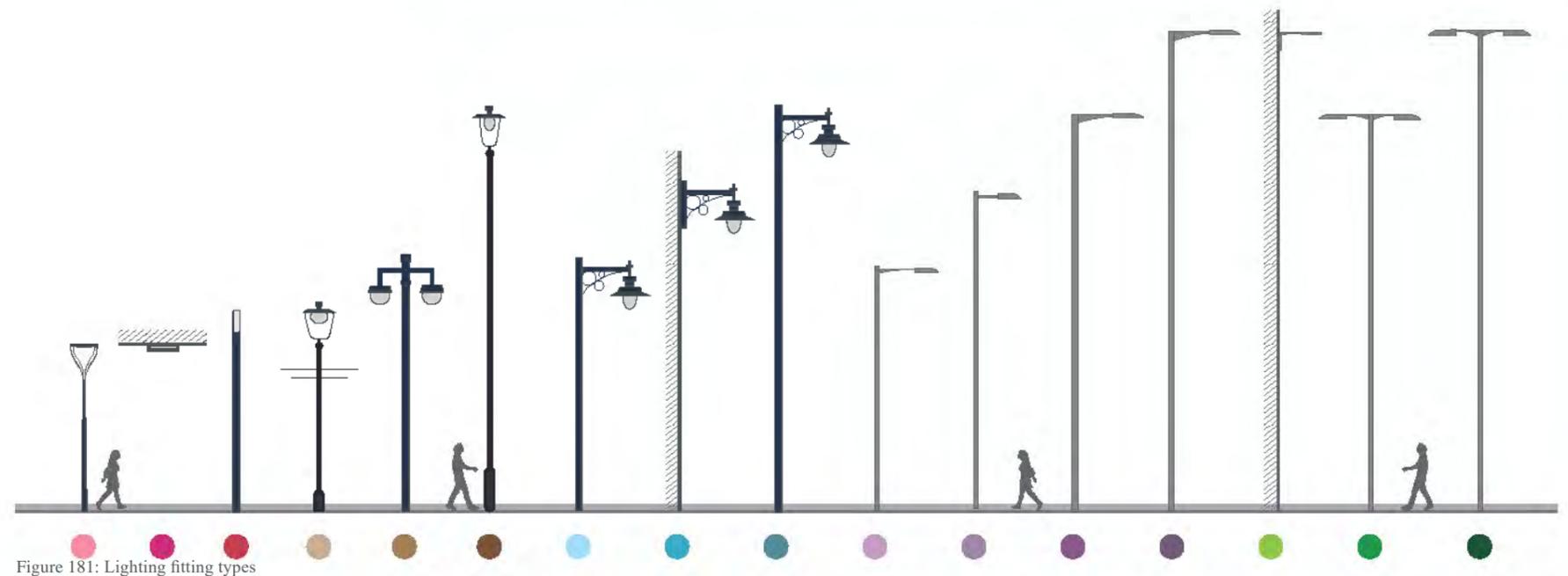


Figure 181: Lighting fitting types

Existing Lighting Provision

Lighting Column Types



Figure 183: Lighting fitting types

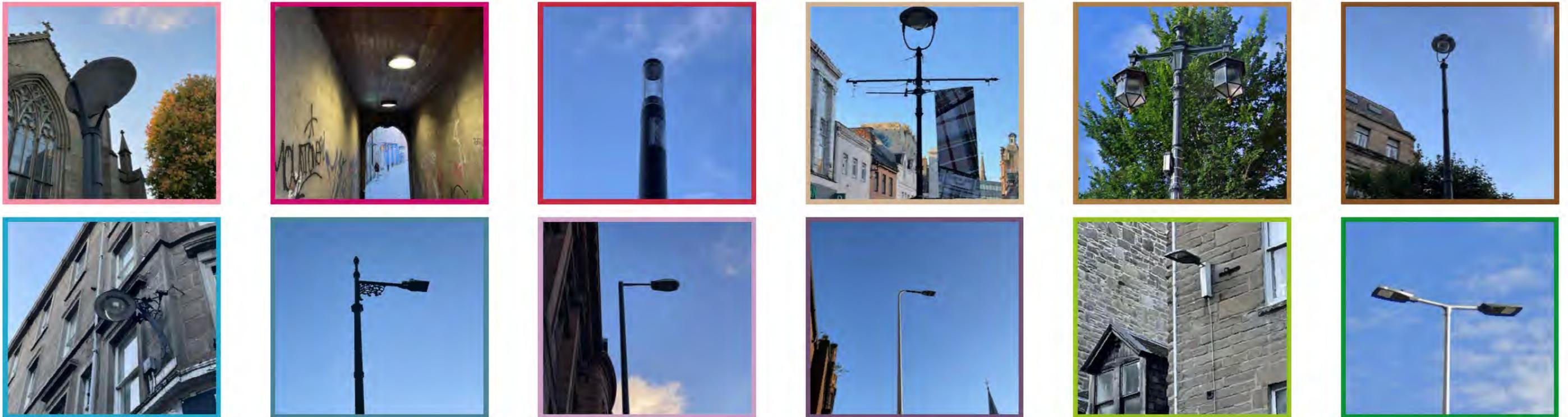


Figure 184: Daytime photography of existing luminaires

Existing Lighting Provision

Light Source Type and Colour Temperature



Figure 185: Light source type and colour temperature plan

Dundee City Council have completed an extensive LED upgrade programme across much of the city, as illustrated in **Figure 185**. The initiative involved replacing over 19,000 street lights with LED light sources, significantly reducing the city's energy consumption and carbon footprint.

Small sections of the city centre area remain incomplete, corresponding with areas where heritage fittings are present. These fittings maintain a traditional appearance, akin to fittings that would have been present in Dundee in the 1900's. It is unknown what portion, if any, are replicas or if there are any genuine heritage fittings remaining.

In some areas of the city centre, the heritage fittings have been upgraded to LED. Where upgrades have not been implemented the fittings are a mix of metal halide and high pressure sodium light sources. High pressure sodium lights emit an amber-orange colour with a temperature of 2300K, appearing very warm in comparison to the surrounding 4000K LED sources. Metal halide lights, whilst less orange, still have a warmer colour temperature of 2800K.

Lighting Column Heights



Figure 186: Fitting mounting heights plan

Column heights for street lighting across the city range from 4 meters to 12 meters across the city. Variations in height are needed to meet specific lighting needs of different areas throughout the city.

The outer sections of the city and along main roads, taller columns are utilised. These columns are between 10m and 12m in height to provide better illumination to high traffic areas and faster moving roads. The increased height allows for a broader spread of light, improving uniformity and overall visibility for drivers.

Areas closer to the city centre have shorter columns typically between 6m and 8m in height. These shorter columns are more suitable for pedestrian zones and lower traffic areas. The reduced height ensures adequate illumination of street and pavement whilst reducing excessive glare.

A.8 Image Appendix

External Image Sources

Figure	Source
1,12	Ben Hirst, Tayside In Pictures
2,3,6,7,8,9,10	LDA Design
11	Ross Fraser McLean
39	Fraser Gray
40	Lee Simmons
49,51	Selux Lighting
52	Selbach, Arthur F
54	Coventry Telegraph
55	iGuzzini
57	Color Kinetics
58	We-Ef
62	University of Calgary
63	Light Zoom Lumiere
60	iGuzzini
61	Armadillo Lighting
64	Spectral Lighting
65	Cambridge Collective, Sheffield
66, 133	Double Take Projections
67	GetYourGuide
69	Dundee University
70	Murrygate in the 1970s
71,72, 82, 84, 88, 89, 91,99,101, 110,116,121,127, 131	Google Maps Street View
75	Friends of the Public Garden
75,77	Schreder
86	Simes
93	Coolon LED, White Arkitekter
94	Speris + Major
95	Darrell Godliman
98	Dundee High School
104	Studio Tech
106	DW Windsor
119	India Hobson
126	Deta Light
140	SoftLab

