

Mid Ulster District Council

Davagh Forest Observatory External Visitor Experience

Scoping Study

Issue 1
08.08.18



Comhairle Ceantair
Lár Uladh
Mid Ulster
District Council

Tandem[™]

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1 Project Overview

The Davagh Forest Project has been identified by Mid Ulster District Council as a core project within its Tourism Strategy to 2021. The Council's Tourism Strategy was developed following extensive consultation and engagement with key tourism stakeholders and the proposed project has linkages to two of the strategy's three themes; 'Heritage' and 'Outdoor Hubs'.

The Davagh Forest Project in its current state will comprise a visitor centre/observatory that will offer a unique indoor, immersive visitor experience based around telling the stories of the richness of both the astronomy and the archaeological heritage of the area.

The Council aims to continue the visitor experience outdoors; further enhancing and enriching the overall visitor experience by utilising the local environment around the Centre as a backdrop. It is anticipated that this type of innovative outdoor experience will be a combination of audio-visual, digital media and outdoor 3D projection, using the latest technology to provide an offering which is unique and totally engaging with the visitor.

By using such technology a number of shows could be developed taking into consideration the seasonal patterns of the constellations and movement of the stars and planets and how it has influenced early inhabitants of the area, which date back 5,000 years. It is envisaged that additional shows would be developed over time, further enhancing the longevity of the product which would contribute to repeat visitors over time, delivering an experience that will be exciting, engaging, stimulating, informative and fully immersive.

Due to the setting and uniqueness of the site both from a natural and built heritage point of view, this proposition could only be considered at this location and will be a continuation which complements the Dark Skies / Davagh Forest Observatory and Visitor Centre project.

Tandem have undertaken a scoping study to identify the potential scale and scope of such a project including locations and costs to install all elements, to enable Council to fully avail of the maximum budget available and provide a spectacular out-of-this-world outdoor visitor experience that is remembered, talked about and shared.

2 Visitor Numbers & Target Market Segments

2.1 Project Context

Within Mid Ulster District Council's Tourism Strategy to 2021, a need was identified to develop and establish a year round attraction which would link historic sites, generate profile and attract visitation by the introduction of the 'Dark Sky' experience. The level of tourism in the area is low with little 'dwell time' in Davagh Forest. Currently the only provision available is for mountain bikers. The implementation of the proposed project is unlikely to result in any significant degree of displacement either at a local or national level but would fill the gap for an international Tourist attraction which is needed in this area.

The proposed project has the potential to generate significant additional economic and tourism benefits for the Mid Ulster District Council area, as follows:

- Attract an additional 9,000 out-of-state visitors per annum from a baseline of 7,271, resulting in additional economic benefits of at least £286,528 per annum in the Mid Ulster District Council area (from a baseline of £9,265). It is estimated that 18,000 people will benefit from this improved Tourism infrastructure.
- The total project will attract an additional 28,680 visitors from outside the District (i.e. domestic visitors from elsewhere in NI) per annum from a baseline of 11,714, resulting in additional tourism benefits of at least £461,628 per annum in the Mid Ulster District Council (from a baseline of £14,926) within 72 months of the requisite funding approvals.

In addition, the project will contribute towards a number of non-monetary benefits including:

- Enhance the tourism product within the district and create a short-break destination which Davagh Forest currently doesn't offer;
- Increase the physical health of local people and visitors through walking and cycling;
- Act as a catalyst for social, cultural and economic regeneration of the rural area;
- Contribute to a positive image of Northern Ireland;
- Create opportunities for formal education and informal learning from the external exhibition and within a forest environment.
- Provide emotional and well-being benefits from experiential contact with nature through outdoor recreation and leisure

The proposed project (i.e. development and delivery of an outdoor AV show at the new Visitor Centre site and associated infrastructure, with an outdoor activity area on adjacent ground) has the potential to further develop the proposition and to increase Davagh Forest's appeal to the established target audiences.

2.2 Target Markets

The target market profile has been developed and outlined in the Economic Appraisal, and in line with the Mid Ulster Tourism Strategy and Tourism Northern Ireland guidelines.

Taking the aims in relation to audiences stated in the MUDC Tourism Strategy and the Economic Appraisal into account, the following hierarchy of target audiences for the exhibition experience had been identified.

The segment would also be the target audience segments for the proposed outdoor experience.

Primary target audience:

- Great Escapers
- Social Energisers
- Family Fun

Secondary target audience for exhibition experience:

- *‘Professional Amateur’ Astronomers*

‘Professional Amateur’ Astronomers will visit Davagh for the purpose of pursuing their already well-developed interest through the use of their own equipment. The exhibition will strengthen the product Dark Sky product generally, adding to the appeal of Davagh to this segment. Although the exhibition will not be specifically targeted at this segment, this audience will appreciate the merits of a well-designed exhibition and appreciate its function in interpreting their specialist interest for a non-specialist audience.

Exhibition topics which are unique to Davagh, such as information about the Dark Sky Park’s particular qualities in relation to astronomy and the alignments of the Beaghmore Stones will hold particular appeal.

- *Young and Lively*

Visits to Davagh Forest by the ‘Young and Lively’ segment is likely to be particularly motivated by special events. These visitors are likely to engage with the exhibition as secondary activity during an event, if it features the ‘wow’ factor as required for engaging Social Energisers.

- *Schools*

The schools audience will be mainly engaged via the activities of the schools outreach programme. The exhibition space will cater for schools through the provision of sufficient gathering/seating space. Exhibition features designed to cater for the needs of the Family Fun segment will cross over well with this audience.

Other segments:

By sufficiently addressing the needs of the three primary target audience segments through the creation of a high quality product, it is likely that the Davagh Forest Observatory will have crossover appeal to the secondary segments, and will contribute to the needs of other audiences, including Culturally Curious, Mature Cosmopolitans, Time Together.

2.3 Key Target Audience Needs

Segment	Tone	Visuals	Information	Might want to experience...	Likely to pay more for...	Key statistics	At a glance:
Great Escapers: What are they looking for? Visitors that we call 'Great Escapers' are those seeking breaks that allow them to become immersed in beautiful natural environments where they can escape the stress of their daily lives and reconnect with their partners and/or young children. They are likely to be in their thirties looking for experiences that send them home completely revitalised. They want their holiday to be relaxed and easy but need some 'wow' moments to emphasise the special nature of their holiday together.	Inspiring, energetic and informed. Emphasise the opportunities to explore landscapes easily and be rewarded by beauty or exhilarated by remoteness.	The design and visuals that you use should communicate a sense of authenticity and unique beauty. Keep them simple but inspiring.	Focus on natural attractions with a sense of history and unique qualities that will make the visitor feel awestruck. You should communicate that your product will provide the customer with a holiday that provides easy ways to get to wonderful places and be rewarded afterwards with good food and drink	<ul style="list-style-type: none"> Breath-taking landscapes Remote and exciting places Gentle exploration – walking, cycling, boating 	<ul style="list-style-type: none"> Superior service Things that reduce hassle Something out of the ordinary 	<p>Average age of 37</p> <p>40% are couples, 20% are young families</p>	<p>Key Words: Slow travel, relaxation, rebalancing, getting away from it all, connecting with loved ones</p> <p>Focus: Breath-taking landscapes, ancient sites, remote places, landmarks, restaurants offering fresh, local food, authentic pubs, ease of getting away</p>
Social energisers: What are they looking for? 'Social Energisers' are visitors who want action-packed days as well as fun-filled nights, and who holiday in groups and couples. They are often friends or colleagues seeking a cool, exciting trip somewhere new and different. They like having a laugh and sharing adventurous new experiences but it is good if they don't have to travel too far to locations or plan too much to get there.	Immediate, lively and informal. Emphasise the range of experiences near your location.	The design and visuals that you use should communicate a sense of energy and enjoyment as well as being in tune with contemporary attitudes and style.	You should communicate that your product will provide the customer with a holiday that is jam-packed with things to do and that getting to and from these activities will be simple. [...]	<ul style="list-style-type: none"> Lively pubs, good food, talking to locals Festivals, entertainment, street art, comedy The cool places to eat and shop Fun visitor attractions with a wow factor 	<ul style="list-style-type: none"> Something out of the ordinary Holidays offered by well-known brands Great atmosphere and good cocktails 		<p>Key Words: Excitement, energy, fun and laughter, adventure, spontaneous, social, the 'wow' factor</p> <p>Focus: Entertainment, festivals, contemporary culture and music, clubbing, water sports, the pub experience, shopping, sightseeing</p>
Family Fun: The 'Family Fun' market segment represents family units for whom the happiness and amusement of their children is a priority. The parents know that if their children are content and occupied they will also be able to have a relaxing time. [...]	Lively, energetic and friendly. Emphasise the value and quality of your product and opportunities for children to be engaged and enthused in a safe environment where they can expend their energies and satisfy their curiosity.	The design and visuals that you use should communicate a sense of fun and vibrancy. Emphasise energy, enjoyment, interaction and excitement.	You need to communicate that your product is the perfect one for families seeking a fun time where children will be fully entertained but that there is also ample opportunity for parents to relax and enjoy their holiday. [...]	You can help them with making their children the priority by providing them with as much information as you can about the venues that welcome children and in which families will feel at home. [...] Making recommendations for things to do on a rainy day.			<p>Key Words: Fun, quality time, safe, child orientated attractions and entertainment, memories</p> <p>Focus: Value for money offers, family accommodation, café, activities</p>







Source: TNI




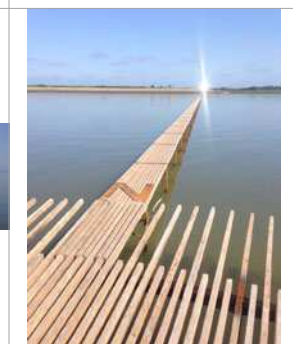

2.4 Audience Needs for the Davagh Outdoor Experience

Based on the analysis above, the outdoor experience requires the following features and characteristics:

- An energetic look and feel to activities and installations
- A lively tone of voice for scripting
- Assumes visitors have little or no base knowledge of the subjects interpreted
- Engenders informal learning by communicating self-contained messages in innovative and entertaining ways
- Layered interpretation media that takes into account the range of learning styles and abilities of the target audiences
- Beautiful and exhilarating high-quality imagery that surprise and capture visitors' imaginations.
- Communicate and celebrate Davagh's special unique qualities directly through interpretative content and indirectly through other design features.

3 Comparators

	Outdoor Multimedia/Light shows and Illuminated night time experiences		
	Description	Image 1	Image 2
Stone Mountain Park, Georgia, USA	On summer evenings the mountain hosts the Stone Mountain Laser Show Spectacular, a fireworks and laser light display projected to the side of the mountain. The laser lightshow projects moving images of the Deep South as well as Georgia history onto the Confederate Memorial carving on the side of the mountain. During Memorial Day Weekend of 2011, Stone Mountain unveiled its overhaul of the laser show, dubbed Mountainvision. This incorporates digital projectors, lasers, special effects, and pyrotechnics. Three flame cannons were added to send a trio of flames nearly one-hundred feet into the air in 2015. In 2017, two-dozen robotic drones donning lights that sync to music were added to the Drone Wars segment in the show. The Lasershow is now so spectacular, the FAA must be consulted to ensure airplanes don't become blinded by lasers.		
Enchanted Forest/ Forestry Commission of Scotland	The Enchanted Forest is an outdoor sound and light show which takes place at Forestry Commission Scotland's Faskally Wood near Pitlochry. Visitors will be treated to a series of choreographed sound and light shows while they follow the path around the forest. Set amidst the stunning Autumn woodland The Enchanted Forest is Scotland's premier sound and light event. Current winner of UK's Best Cultural Event, the Scottish Outdoor Leisure Award for Best Outdoor Festival as well as Scotland's Best Large Event. Dwell time is recommended 60 to 90 minutes to fully appreciate the show. Most visitors walk around the forest more than once during their visit. Once visitors arrive in the forest they can stay as long as you like. The show closes at 10.30pm. The Enchanted Forest appointed an independent environmental and wildlife impact assessor in 2016 to carry out a full wildlife and environmental impact assessment on the show. Their findings concluded that all possible measures to minimise impact on the forest environment were taken and that the wildlife in the forest show no signs of being affected by the activities surrounding the event. Ticket prices: Child Under 3: free; Child 3 – 15: £10; Adult: £20; Family Ticket: £55		
Illuminight, Dean Castle, Kilmarnock, Scotland	An unaccompanied night-time tour of the grounds following a designated route with installations, hands on activities, illuminations and lighting. The Illuminight experience is a one and a half kilometre trail (approx.) and involves being outdoors for approximately one and a half hours. Each timed session has a set capacity and visitors are advised to book in advance to avoid disappointment. Ticket prices: Midweek: Full Price: £12.00 (includes all fees), Child (under 16): £6.00, 2x Adults & 2x Children: £33.00. Groups (10+ Adults): £10.50 each. Local Discount: £10.80 (limited availability). Infant (0 – 2 years): Free, but still require an event ticket. Carers of visitors with accessibility requirements: Free, but still require an event ticket. Weekend: Full Price: £13.00, Child (under 16): £7.00, 2x Adults & 2x Children: £37.00, Groups (10+ Adults): £12.00 each. Please note all group tickets must be purchased as one transaction. Local Discount: £11.70 (limited availability). Infant (0 – 2 years): Free, but still require an event ticket. Carers of visitors with accessibility requirements: Free, but still require an event ticket.		

	Outdoor interpretative and sculptural elements		
Cameron Park Community Observatory	The Community Observatory is located on an isolated parcel of land away from city lights and the noise of city life. On any evening one can hear many wildlife sounds like frogs croaking, crickets chirping, owls screeching, coyotes howling, and geese honking as they fly high overhead. This quiet location is perfect for a relaxing evening of enjoyment and fun. Telescope observation is also a quiet activity that takes intense concentration. The observer and staff have quiet conversations about what is being observed in the telescope. Other staff and visitors may be viewing photographs taken with the telescope and being displayed on attached screens or computers. Visitors can also stand outside the observatory viewing the skies with binoculars, more observatory telescopes, or their own telescopes.		
De Streken, the Netherlands	Marc van Vliet has installed a floating observatory in the north of the Netherlands called 'De Streken' that changes with the tides. A wooden structure, placed in the centre of 'zeven streken' (seven illuminated points of the compass), observers find themselves in the middle of a large entity that occupies the landscape out as far as the horizon. With each passing hour of the day, the project reveals different aspects of its sand flats location, that serves as a meeting location illuminated by the sun. The form and function of the installation draw on the breadth and openness of the Wadden sea landscape. Anything placed here is lost in the void, making the horizon a determinant, because depending on how the object is placed, its form will change with the tide. The almost imperceptible variation takes place twice per day, directing the visitor's gaze outwards during the ebb tide, and inwards during the flood one.		
Sundials	A sundial can form the ideal basis for an imaginative and dynamic sculptural piece. The example on the near right is located in Rio de Janeiro. The far right depicts an example of a 'human sundial' in Wellington, New Zealand, where visitors stand at a central point to act as the sundial pointer by casting their own shadow over a an inlaid pavement piece. This particular example has a certain harmony with the forms of the Beaghmore Stones.		
John Glenn Observatory and Astronomy Park, Hocking Hills, Ohio, USA	At the new Dark Sky Observatory in Hocking Hills, an adjacent, 80-foot Solar Plaza has been designed with six different sun slots to capture the sun's rays on key days—a tradition that has been practiced at Stonehenge, England; Machu Picchu, Peru; Chaco Canyon, New Mexico; and elsewhere for centuries. Additionally, the park has a sphere at its heart that represents the Earth. By gazing through a small window in the axis of this sphere, you can see the top of the nearby flagpole mark the point in the sky which all the stars seem to revolve around—the North Celestial Pole. This image on the far right shows this alignment.		

4 Aims & Objectives for the Outdoor Experience

4.1 Aims

The outdoor experience will serve to support MUDC's objectives for the project by supporting the visitor centre in its function as the core visitor attraction at Davagh Forest, by expanding the overall offering - increasing appeal to the target audiences, maximising dwell time and improving the potential of the site's facilities to host special events.

The outdoor experience will aim to:

- Cultivate a 'sense of place' for visitors, and ultimately contribute to the creation of a vibrant visitor facility and community venue;
- Create an exciting and inspiring experience for visitors of all ages and backgrounds, with the processes of informal learning at its core;
- Provide multimedia, including AV facilities, that will act to directly and indirectly support events and activities that will take place in the centre;
- Give staff and/or volunteers the inspiration and tools to actively engage with the public and encourage interest and understanding of the Dark Sky Park's and Davagh Forest's stories;
- Raise awareness of the Dark Sky project and the Heart of Ancient Ulster Landscape Partnership scheme;
- Interpret themes that can easily relate to visitors' experience in the immediate environment of Davagh Forest and the locality;
- Encourage visitors to explore of Davagh Forest, Beaghmore Stones and other visitor attractions in the region;
- Satisfy visitors' curiosity and fire their imagination by telling interesting and relevant stories about the area's Dark Sky Park status as well as related stories about Davagh Forest's archaeology and natural history;
- Through interpretation, give visitors the opportunity to tangibly explore and understand aspects of the nature of the solar system and the wider universe;
- Utilise the interpretation of the Beaghmore Stones to highlight the role of astronomy in the cultures of our ancestors;
- Utilise best practise methods for interpretive design, presenting the narrative in an innovative and accessible way that will appeal to the target audiences;
- Encourage engagement of children with the key themes communicated at the site, through self-led discovery and through facilitation from their carer(s) and siblings/peers;
- Create opportunities for adults in family groups to take time to engage with interpretative materials on their own terms.

4.2 Objectives

The proposed project consists of two main elements, namely the development and delivery of an outdoor AV show at the new Visitor Centre site, and an outdoor activity area on adjacent ground.

1. Outdoor Audio Visual show

This feature functions as a night-time attraction. It will act as the basis for special evening events in Davagh Forest, increasing the appeal of a night-time visit to the Forest, and potentially acting as a cloudy-weather alternative to stargazing activities.

From a messaging perspective, it works in tandem with the interpretative exhibition at the Visitor Centre, helping to deliver on the core interpretative objectives outlined in the Interpretative Strategy:

Core objectives

- Learning and behavioural: Promote learning and engagement with the field of astronomy by simply encouraging observation of the night sky
- Emotional: To inspire a sense of wonder and awe in visitors at the inherent beauty and vastness of the universe and our place within it

The laser-mapped show will be projected to one side of the building. An exciting visual spectacle, 20 minutes in duration, the show's content will be developed in line with the core objectives above.

For example the show's narrative could bring visitors on an imaginary whirlwind tour of Mid-Ulster's skies. As the show begins, the Visitor Centre building appears to disappear leaving only a view of the stars behind. Visitors fly through the universe, getting a close up view of the moon, the Northern Lights, and other remarkable features.

Davagh's unique sense of place can also be reflected, with the Dark Sky theme complemented with elements of the area's natural and archaeological history, e.g. featuring the appearance of local wildlife such as otters, Sika deer and linking the archaeological features of the Davagh and Beaghmore Stones with their astronomical alignments. The visual show will be accompanied by an environment-appropriate, low level musical sound track, with some supporting narration appearing as captions on the projection surface.

2. River-side activity area

This area functions as a facility for use during daylight hours.

From a messaging perspective, it works in tandem with the interpretative exhibition at the Visitor Centre, helping to deliver on the secondary interpretative objectives outlined in the Interpretative Strategy:

Secondary objectives

- Learning and behavioural: Encourage visitors to compare their own experience in Davagh and the Mid Ulster region and those of our ancestors
- Emotional: Promote an appreciation of Davagh Forest's natural resources and outdoor recreation facilities (this objective will have particular emphasis in the River-side area).

These objectives will be achieved through the provision of interpretative media featuring themes relating to Natural History, Archaeology and Dark Skies.

This will allow the interpretative offer to be extended inwards and outwards between the Visitor Centre and River-side area.

The area will consist of a hard-landscaped area to be inserted into a green space located between the car park and the Davagh River. For safety, it will feature a metal railing along the river bank and bollards along the portion that borders the car park. The landscaped area will contain a number of interesting features.

Climbing Frame 'Play Planetarium'

The Play Planetarium is a unique play equipment and learning environment. As the name implies, the frame allows children to see and learn the stars and constellations during daylight in the most fun way.

- Learning whilst having fun outdoors
- See the night sky, day or night
- Accessible and inclusive play
- All weather play

The dome shaped multi-functional play equipment consists of eight sections with different climbing functions such as nets, ladders and climbing walls. Explore the night sky inside Play Planetarium, as the stellar patterns are repeated accurately within the dome. Sunlight shines through the star shaped holes in the dome, and thus creates glittering stellar patterns on the dome ceiling. Children will learn to recognise different constellations and practice navigation with stars. Above the dome is made for climbing, which also promotes proven learning.

Interpretative Elements

A range of artistic and imaginative interpretative features will provide points of interest in this area. This could include, for example, sculptural elements incorporated into fencing, typographic and illustrative elements inlaid into bench seating and paving, and lectern-style interpretative panels.



5 Physical Interventions

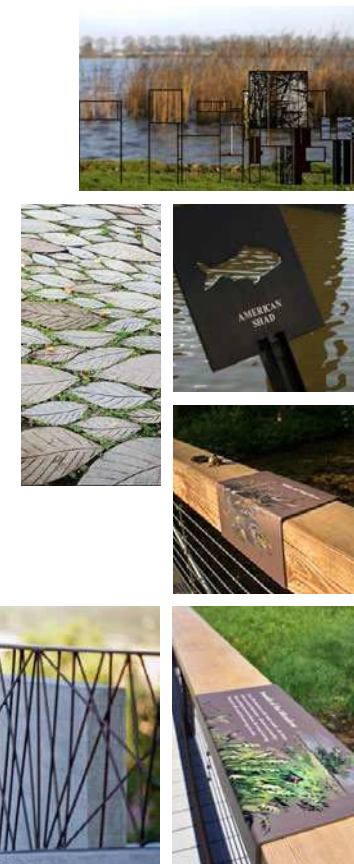
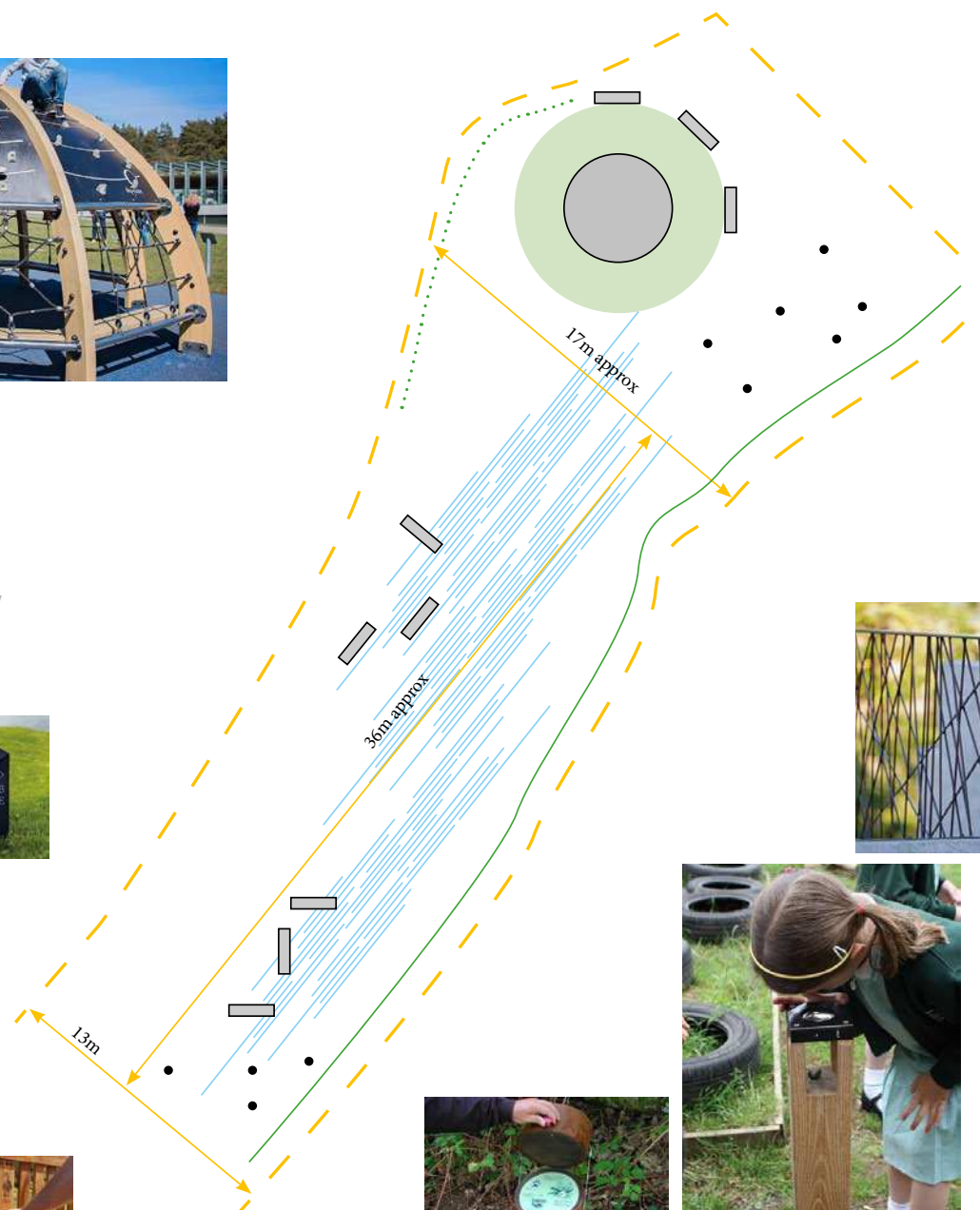





Mid Ulster District Council

Scoping Study for the external Visitor Experience at Davagh Forest Observatory


03.08.18



Scale 1:200 (Approx)

 2m x 0.5m Bench

 Bollards or equivalent

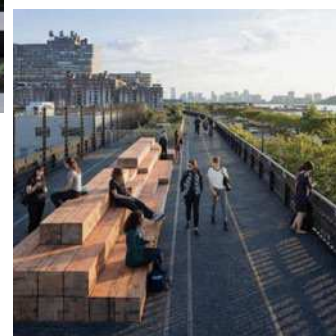
 Railing with interpretative function

 Paving

 Wildlife Discovery Point







6 Digital Interventions

6.1 Projection Mapping

Projection Mapping is a new and exciting technique which harnesses the recent advances in high powered projection equipment to allow venues to animate any surface, and radically alter the character of an environment or object by projecting from different angles onto a variety of surfaces.



6.2 Specialists Consulted

Tandem consulted with a number of projection specialists working across the full spectrum of project scales to establish the technical requirements and specifications for a potential exterior experience at Davagh Forest Park:



Double-Take Productions Ltd

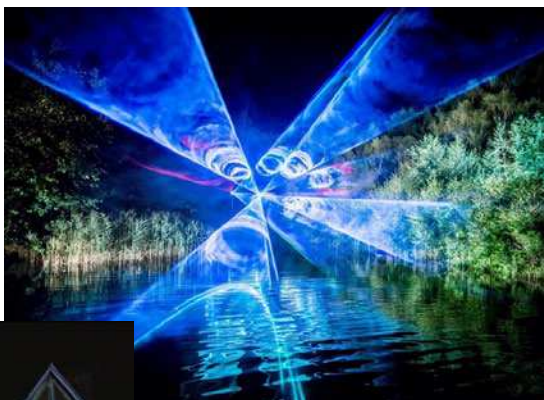
Double Take Productions Ltd is an innovative Scottish design consultancy specialising in creating immersive visual experiences and unique one-off spectacles using Projection Mapping techniques. Video mapping creates an illusion, with moving images, which will captivate live audiences, leaving them with an unforgettable impression of your brand or event.





Visual Poke

Visual Poke was formed by Ram and Gino Malocca, with extensive knowledge of the entertainments industry dating back to the 80s. Since inception Visual Poke has advised clients on the best possible creative and technical solutions to satisfy their visual requirements. This includes video projection and building mapping, laser shows and effects, hologram technology, control solutions and interactive custom displays.



Event Projection

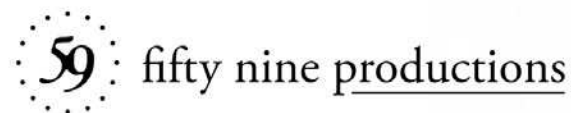
Event Projection is a leading London-based technical production company. Born in 2008 and based in London, Event Projection quickly became established as experts in the field of large scale digital projection and video display technologies. Using the latest in digital projection, video walls, touchscreens and interactive technology Event Projection put the pieces together for spectacular effect with creative lighting, set and staging and first-class audio systems to provide a complete solution to clients' events or production requirements.





Motion Mapping

Using original motion graphics and project mapping, Motion Mapping can turn any surface into a jaw dropping animated scene through projection mapping whilst creating motion graphics in 2D or 3D for use anywhere. They work on a smaller scale compared to larger companies within the industry.



59 Productions

59 Productions is the Olivier and Tony Award-winning company of artists behind the video design of the Opening Ceremony of the London 2012 Olympic Games, globe-trotting smash hit, War Horse, the design and creative direction of the record-breaking David Bowie is exhibition and the decor concept design for The Met Ball, hosted by Anna Wintour. 59 are world-leading specialists in design for stage and live events, the go-to team for generating creative and technical ideas to realise ambitious artistic projects. Building on a decade of experience making theatrical work for some of the world's greatest venues – including the National Theatre, the Royal Opera House, The Metropolitan Opera and the Salzburg Festival – the Company has more recently become renowned for creating spectacular public artworks, projection-mapping some of the world's most iconic buildings, including the Sydney Opera House, Edinburgh Castle, and the United Nations Headquarters in New York.



6.3 Technical Requirements

What is Projection Mapping?

Projection, or video mapping, is a projection technique used to turn objects, often irregularly shaped, into a display surface for video projection. These can potentially be any object, from small items to cars, theatrical sets and spectacular shows onto buildings. The most exciting 3D mapping can be used to create optical illusions, playing with the shape and form of structures to give the perception of motion to previously stationary objects.

The design process works in much the same way as conventional AV content – starting from concept development, through to storyboarding and content completion, and finally technical production and installation.

In this section, we describe the various ways that content can be created and used from re-appropriating stock content and highlighting the differences between 2D and 3D content mapping. It is not uncommon to utilise a combination of these techniques to meet your requirements.

Stock content

Depending on the show requirements, existing assets can be used, be it video or imagery that is already owned or stock content purchased online. The pre-production involved in this process is at a minimum. It may be as simple as cropping and masking the existing content, assembling this on a timeline and editing into a sequence to be mapped on a given structure.

This option although simpler and more affordable due to lower scope of pre-production, is not advisable because it fails to take advantage of the unique features of the building or object to be projected onto. For instance, on more complex structures such as intricate buildings, stock content will simply get lost in the structure and be indecipherable. However, it could be highly appropriate in areas like branding exercises projected onto simple objects or buildings where there are tight budget constraints.



2D content

2D content, as the name suggests is flat, utilising only the x and y axes. It does not have depth or perspective achieved only by incorporating the z axis. This content is typically created by tracing the features of a photograph of a building or object to create a 2D template. Then, using motion graphics software such as photo and video editing packages imagery is made and animated around fitting the features such as windows or pillars of a building.

This option can be chosen to achieve effective content utilising and unique to the shape of the structure or object to be projected onto. This is a common choice avoiding the lengthy process of 3D modelling and animation making the process quicker and less resource-intensive than 3D animation but maintaining site specific nature of the content that makes mapping projects so exciting. 2D projection mapped content can be beautiful and stunning but the most exciting effects and optical illusions are only possible when working in a 3D environment. There is by no means less creativity involved however, therefore suitable time and resources should be allowed for developing ideas into a brief like any other creative process.



3D content

The greatest and most awe-inspiring projection mapped content can be created when introducing the z axis, depth. This is achieved by recreating the structure or object in a computer-modelled, virtual 3D world. This is then textured and animated to create life-like content in the same way that CGI is used in movies using the same high-end 3D animation software and methods.

Whilst the most resource intensive option, it is the most visually impressive option presenting the highest level of entertainment value. This option opens up a depth of creativity to be harnessed, limited only by imagination.

Unlike 2D content where a simple traced template is all that is required for content creation, a 3D template is much more complex to create. This can be done in a number of ways such as extruding 2D plans such as blueprints or sets or by taking precise measurements using more modern methods such as photogrammetry or laser scanning, often used by architects and surveyors.



6.4 Projection Mapping at Davagh Forest

Practicalities

All specialists consulted were confident that projection mapping at Davagh Forest is achievable – the building itself would make the most suitable canvas for mapping more so than the surrounding trees.

Because trees are never truly stationary, such projections risk being a bit ‘hit and miss’. While it would be possible to make out pictures and video from a distance it would not be the best use of budget. The building on the other hand, has a reasonably simple architecture in mapping terms, and is not too big to make the costs prohibitively expensive.

Given that it is also going to be very dark at Davagh Forest with little to no ambient light, smaller than average projectors (and therefore more cost-effective) could be used. Projecting to the trees would require brighter projectors, and we have been advised that the content would need to be lighter overall to be visible.

The use of exterior lighting around the building – and how this may compete with an exterior projection – would need to be considered in consultation with the project architect.

Equipment Hire vs Purchase

All specialist companies consulted agreed that the most cost-effective route would be to purchase the equipment outright, rather than to hire or lease as required once factoring in the costs for set-up and disassembly.



Content

As with all types of AV content, the quality varies from one supplier to another. In addition, projection mapping comes in many guises – cheaper alternatives are available whereby content would be ‘masked’ to the shape of the building, rather than mapped, though it should be noted that there will be an obvious difference in look and feel.

As the desire is to create high-end 3D effects, giving the illusion of manipulating the structure of the building or incorporating custom designed content, with up to six content variations per year, the cost will be significantly higher.

In addition, the longer the show duration, the higher the cost will be, as this is subject to the complexity of the brief. A 20-minute presentation for example will likely require not just 3D mapping but an informative narrative. If this is multiplied over 2-4 updates for example, the costs for future content updates could escalate heavily.

Note:

- All costs are indicative and subject to complexity of brief
- Costed duration ranges between 10-20 minutes run time
- With the desire for content updates up to six times a year, the original content should be designed with this in mind from the off. It may be that certain elements are then easier to re-work – therefore the first round of content would be cheaper than future similar spec'd content as the specialists learn more about what works and doesn't work visually on site from client and audience feedback.
- It would be worth considering developing content that is generative, dynamic and ever-changing. This could mean that instead of just loops, the content could become more organic and most importantly, interesting to watch for a prolonged period or multiple visits.

Basic Option e.g. aurora borealis visual only	£20,000
Medium Option e.g. slightly more engaging projection with seasonal variation, 4 times a year	£40,000 to £50,000
High End Option e.g. 3D custom designed multiple shows with real time information fed in showing location of stars, planets etc	£70,000 to £120,000
Premium Option (e.g. 59 Productions) e.g. bespoke show, with dynamic content	£200,000 to £350,000



6.5 Hardware

Projectors

Given that this is likely to be a permanent installation, we recommend using as few different spec projectors as possible as it will make maintenance and installation easier and would therefore suggest using 12,000 Lumen WUXGA machines for everything over 10,000 ANSI Lumens.

It is more sensible to use brighter projectors and run them at a lower power rather than using projectors that are only just capable. For best results, it is recommended to use 3-Chip DLP machines, however 1-Chip projectors will present a considerable saving. As this is a permanent installation it is strongly recommended to use laser light-source machines for reliability and reduced maintenance.

5000 Lumen projectors are generally 1-Chip DLP and costs are relatively low between £3,000 and £10,000 each

12000 Lumen projectors are available in 1-Chip and 3-Chip DLP and cost between approx £15,000 - £50,000 each

Super-bright 20,000-30,000 Lumen projectors will cost upwards of £50,000 - £70,000 each



Enclosures

All projectors will require their own climate controlled, weather-proof enclosure. These are tough boxes that regulate temperature and humidity. They can also offer some protection against theft and vandalism. There are several manufactures of these and they are usually customised for particular projectors and how they are intended to be installed.

Enclosures cost from £4,000 for smaller enclosures up to £7,000 for larger units which house 3-Chip Projectors.

It is recommended that projector enclosures are camouflaged or concealed by screens for extra security. A platform or base, power and data supply should be delivered by the main contractor for the building.



Projector Specifications

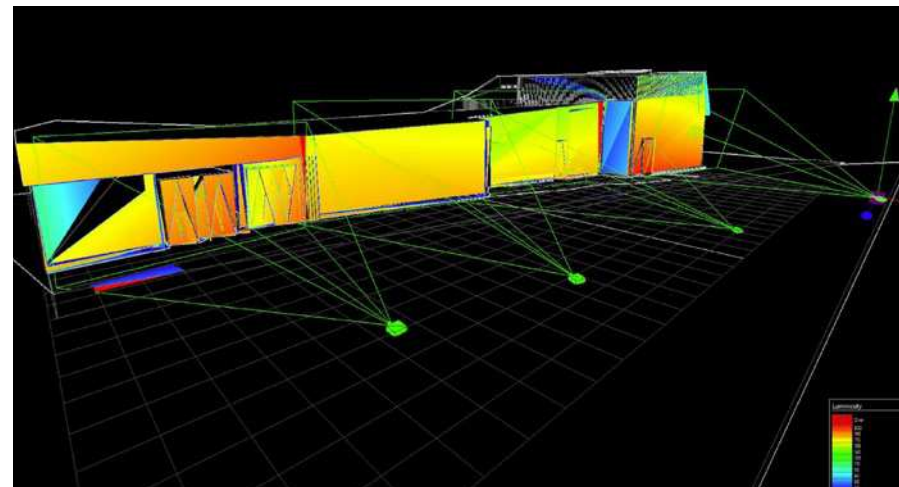
Heat Mapping Approach

Taking the 3D architectural model as a basis, projection mapping specialists were able to use their software to position projectors around the building, allowing them to account for projector brightness (lumens) and consider equipment required.

They have assumed and set the surface to a gain level of 0.7. This means that the building is considered 70% reflective and the heat map data visualises this in the lux (unit of illuminance and luminous emittance) readings.

They have aimed for a projection level of around 150 lux which should be plenty for the requirements and be suitable for detailed content. Potentially, it will also allow projectors to run at lower power.

Please note that these are initial findings undertaken purely for cost estimating and should not be used for planning. The recommendations are based on experience and the knowledge that the installation will take place in an area with particularly low ambient light. No consideration has been made for any other ambient lighting sources that may affect the overall performance. For the purposes of costing, we have concentrated on filling the large timber-clad surfaces only, not smaller details like pillars etc.



Projection Summary

Following a site visit to assess the optimum viewpoint and viewing angle, it was agreed with the Council that the best side of the building for projection mapping would be the east face.

Side 2 Elevation (left side on image)

Option 1: 4 projectors

Best Quality (Panasonic 3-Chip Projectors):

- 1 x 21000 ANSI Lumen HD
- 3 x 12000 ANSI Lumen HD

£200,000 including enclosures & media server

Option 2: 7 projectors

Good Quality (Mix of Panasonic 3-Chip & 1-Chip Projectors):

- 1 x 21000 ANSI Lumen HD
- 1 x 12000 ANSI Lumen HD
- 1 x 9700 ANSI Lumen HD
- 4 x 8700 ANSI Lumen HD

£255,000 including enclosures & media server

Good Quality Low Cost (Digital Projection 1-Chip Projectors):

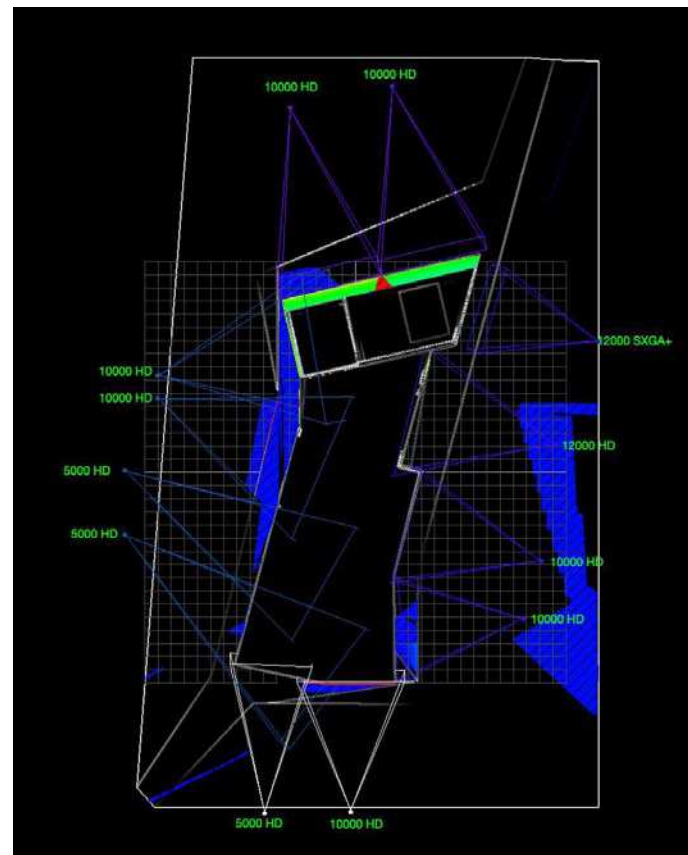
- 1 x 18000 ANSI Lumen HD
- 2 x 10000 ANSI Lumen HD
- 2 x 8500 ANSI Lumen HD
- 2 x 6500 ANSI Lumen HD

£200,000 including enclosures & media server

Note:

- All projectors shown in the following plans use “standard” lenses and they have been priced with these. Should it transpire that ultra-short throw lenses are required, there will be increase in lens and enclosure costs (approx £6,500 per projector).

Heat mapping analysis for the other three sides of the building are included for reference in Appendix 1.



Media Servers / Cabling

A dedicated internet connection to the control and projector setup will allow Remote Data Management of the system/s. All projectors would be linked by dual CAT6 cabling from a single control position if possible.

Installation

2-3 days installation at a rate of approx £450 per day per technician is advised.

Side 2 Elevation

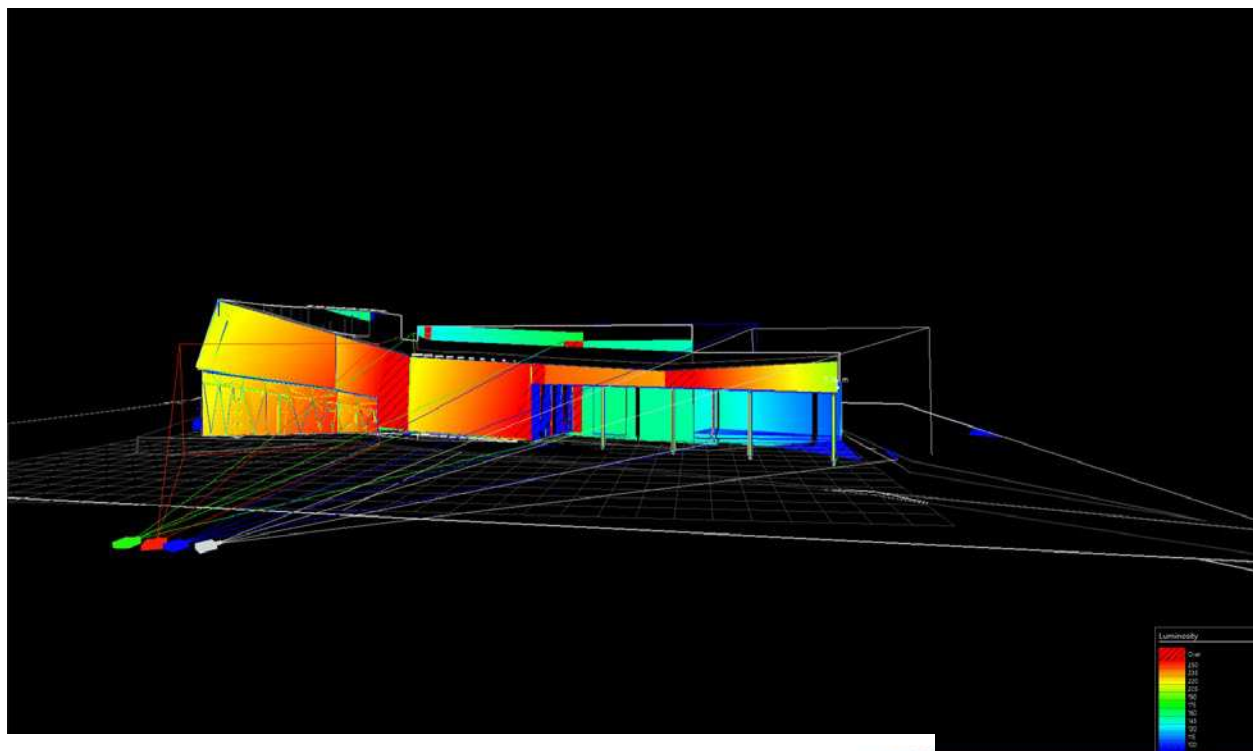
To fill this side of the building, there are two options to choose from – this is due to the difference of depth (approx 5m) from the ‘roof face’ to the ‘wall face’ underneath the canopy. It is not possible to get sharp focus above about 1m from the same projector, so to circumvent this issue and minimise the shadow cast from the pillars, extra projectors must be added to enhance the clarity of this area of the projection.

Option 1 uses a total of four projectors. Light will reach the lower section but content will be out of focus and therefore limited in this area.

Best Quality (Panasonic 3-Chip Projectors):

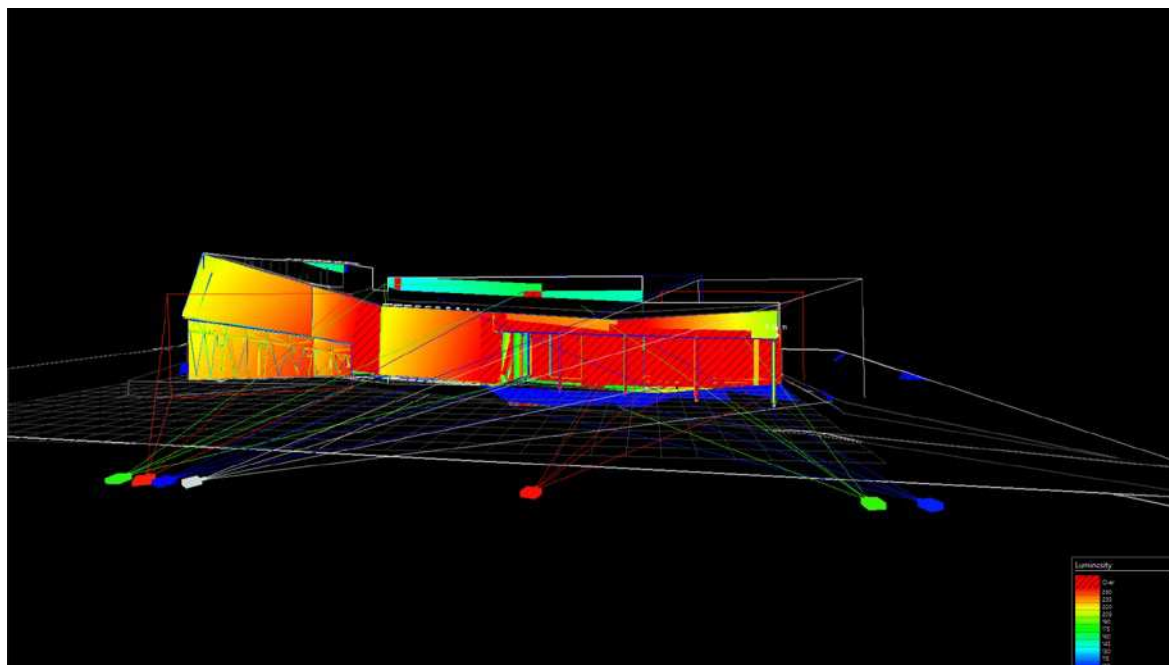
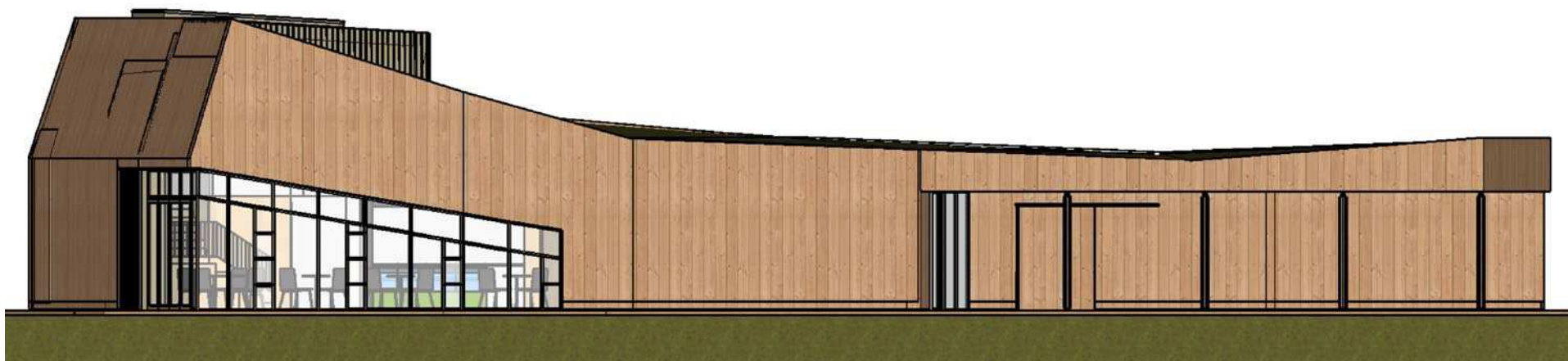
- 1 x 21000 ANSI Lumen HD
- 3 x 12000 ANSI Lumen HD

£200,000 including enclosures & media server



Side 2 Perspective Projection
Option 1

Side 2 Elevation



Side 2 Perspective Projection Option 2

Option 2 uses a total of seven projectors to maintain the projection sharpness along the whole side. Windows will reflect some of the light, but can be projected on to directly without issue.

From left to right, projector options are as follows:

Good Quality (Mix of Panasonic 3-Chip & 1-Chip Projectors):

- 1 x 21000 ANSI Lumen HD
- 1 x 12000 ANSI Lumen HD
- 1 x 9700 ANSI Lumen HD
- 1 x 8700 ANSI Lumen HD

£255,000 including enclosures & media server

Good Quality Low Cost (Digital Projection 1-Chip Projectors):

- 1 x 18000 ANSI Lumen HD
- 2 x 10000 ANSI Lumen HD
- 2 x 8500 ANSI Lumen HD
- 2 x 6500 ANSI Lumen HD

£200,000 including enclosures & media server

Optional

BOREALIS

Borealis is an artwork by Swiss artist Dan Acher, produced by Happy City Lab. It brings the experience of the Northern Lights to the heart of cities whose skies don't naturally harbour this magical phenomenon. Borealis is supported by a soundtrack composed by musician OXSA, amplifying its emotional and monumental aspects.

How does it work?

Dan Acher's simulation is obtained through a strategic positioning of high powered lasers. The laser beams' movements and colour variations are programmed and air density is transformed via particle clouds. The beams travel through and interact with this natural 'matter', creating the illusion of Northern Lights. Borealis also displays in rain and snow. Weather conditions make for a constant evolution in the work and give infinite variations.



Borealis is presented on large open air spaces, up to 100m x 100m or more. 40m x 40m is usually a minimum surface but we can accommodate smaller spaces. Borealis comes with an accompanying sound track and sound system.

Cost for one location / 1 day is €33,750 euros. After this, there is a decreasing daily fee depending on duration (per day, week, month).

Not included: shipping, staff travel, electric distribution, scaffolding tower and hotel nights.

Borealis travels with the necessary technical gear, technicians and laser safety manager.

The producer is responsible for obtaining all necessary permissions, including from the aviation authority having jurisdiction such as the FAA & CAA. Assistance and technical support is provided. The producer is held fully responsible for the final authorization.

Ideal wind conditions are from 0 to 15 km/h so one should be careful about choosing a space not open to strong wind. Another thing to take into account is ambient lighting: the less light the better. Rain and snow weather conditions are fine and actually add to the beauty of the artwork.

6.6 Site Considerations

MUDC to input re: light and sound restrictions reviewed with environment officer

Ecological Survey & Otter Report

The Ecological Survey and Otter report advises against night time activity and the use of artificial lighting – but this has only so far been stated in relation to the construction works phase. It is advisable that the Council explore whether night time activity in terms of stargazing events and/or light shows create a similar risk and whether can this be mitigated against e.g. by restricting access/impact to a certain area. Otter evidence is mostly concentrated along the river immediately to the south-southwest of Hub site, rather than at the Glamping site or Aire de Service.

Environment Protection

There is an area of fragmented, but active, cutaway blanket bog which will be overlooked by the Hub decking once the centre is complete. The bog will need to be protected (cordoned off from works and creating waterproof barriers etc) and potentially rewetted if it is to survive the construction phase, but if it does it will present an excellent opportunity for amenity/ education/interpretation purposes. The Council should confirm if and which of the Ecological Survey and Otter report recommendations they intend to implement in this regard.

7 Resource Requirements

7.1 Maintenance

Physical Interventions

Maintenance information for the Lappset Play Planetarium is included in Appendix 2 for reference. Outdoor interpretation and elements within the Discovery Zone will require cleaning as part of a regular programme of maintenance for the building and its environs.

Digital Interventions

In terms of maintenance, digital equipment used today is more reliable today than ever. Projectors now use laser/LED technology so there are no lamp changes to worry about. A regular programme of operational maintenance and cleaning of the lenses should be implemented by staff on-site.

It is advisable to network the system and set-up alerts should something go wrong, allowing for remote diagnosis and resolution in most cases. As part of the Davagh Forest Observatory project, Tandem have already investigated the bandwidth required for the AV remote support for the internal exhibition and have confirmed that basic 8mb single line internet access is sufficient for general remote support for the outdoor experience also.

A maintenance SLA including bi-annual visits would cost approx £2,000 per annum and would cover networking the projectors and associated equipment and setting up things remote log-ins and alerts if something required physical maintenance.

Ad hoc site visits cost approx £850 per calendar year.

7.2 Activities & Events

The council has indicated that it would host/facilitate a number of events each year at the Dark Sky Observatory.

Based on discussions with representatives from Armagh Observatory and Planetarium, the typical events to be held are Summer and Winter Solstice, Around North, BBC Star Gazing, What's in the Sky, Links with the Star and Archaeology, and The Sounds of the Sun Solar event. It is envisaged that approx four content shows will be developed and projected onto the building – these will run in conjunction with the planned events. The events will include the use of telescopes with experts on-site to discuss what you can see in the sky. As there is a lot of cloud coverage in Northern Ireland, we will have the ability to project real time footage onto the observatory building. This can be made possible by purchasing live footage from around the world.

Patrons attending these events will be given red torches by event marshals so as to limit the amount of light pollution. This will add to the Dark Sky experience.

This is a sample of external events to be held annually in Davagh Forest, as the product develops so will the volume of events.

Phase 3 of the Dark Sky project will see the unique development of a Davagh Solar Walk which will be a 4.25km walkable scale model of the solar system, located between Davagh Forest and Beaghmore Stone Circles.

This project will compliment the current development of the Davagh Dark Sky Observatory, the animated walk will be a digital guide of the solar system helping to explore space and planets in real time, whilst linking the uniqueness of the sky to the uniqueness of our heritage.

8 Budget & Timescales

Recommendations

From our discussions with the projection specialists, we recommend that the Council consider having a regular programme of screenings to really see the cost to benefit. The projector hardware needs to be run on a regular basis for maintenance alone, so we would advise having between 4-6 content changes within a year year (aligned to specific events in the astronomical calendar for example), but with multiple screenings factored into an ongoing programme of events to into ticketing and revenue streams. In the winter months when the nights are longer, there could be multiple screenings for groups of 30 each per night if the demand was there and/or increases.

Our opinion is that for the one-off cost for one day, the borealis artwork is probably best suited to an urban environment – a projection onto clouds to emulate something that you can actually see in real life in Davagh (at times) also is a little counterintuitive. As it is also a passive light show, there is little to no interpretive value versus the cost.

Timescales

An indicative programme for development of the external visitor experience at Davagh Forest is approx 12-18 months in total, allowing for:

- Procurement – 3 months
- Design Development – 8 months
- Production – 4 months
- Installation – 2 months

Physical Interventions	£
Site Prepration Works	
Protecting existing features	£1,000
Earthworks / excavation & disposal off-site	£1,500
Boundary Work & Fencing	
Railing / balustrade (including foundations)	£30,000
Interpretation elements on railing	£1,250
Hard Landscape	
Feathered stone paving (inc mortar bedding & sub-base)	£46,800
Concrete edge to safety surface	£600
Soft Landscape	
Grass reinstatement	£2,500
Reinforced grass on desire lines	£3,000
Fixtures & Fittings	
Wildlife discovery points	£3,500
Large timer benches	£13,500
Bollards	£2,000
Play Planetarium	£17,500
Installation (to include impact surface, single colour)	£7,630
Amphitheatre Viewing Area (structural frame timber surface, accommodates approx 30 people)	£42,000
Preliminaries	£7,000
Contingency	£10,000
Digital Interventions	£
Hardware	
Projectors (Option 1 or 2), Enclosures and Media Server including Installation and Year 1 Maintenance SLA	£250,000
Content	
High End Option	£120,000
Architectural	£
Window Screens	£2,000
Total	£561,780

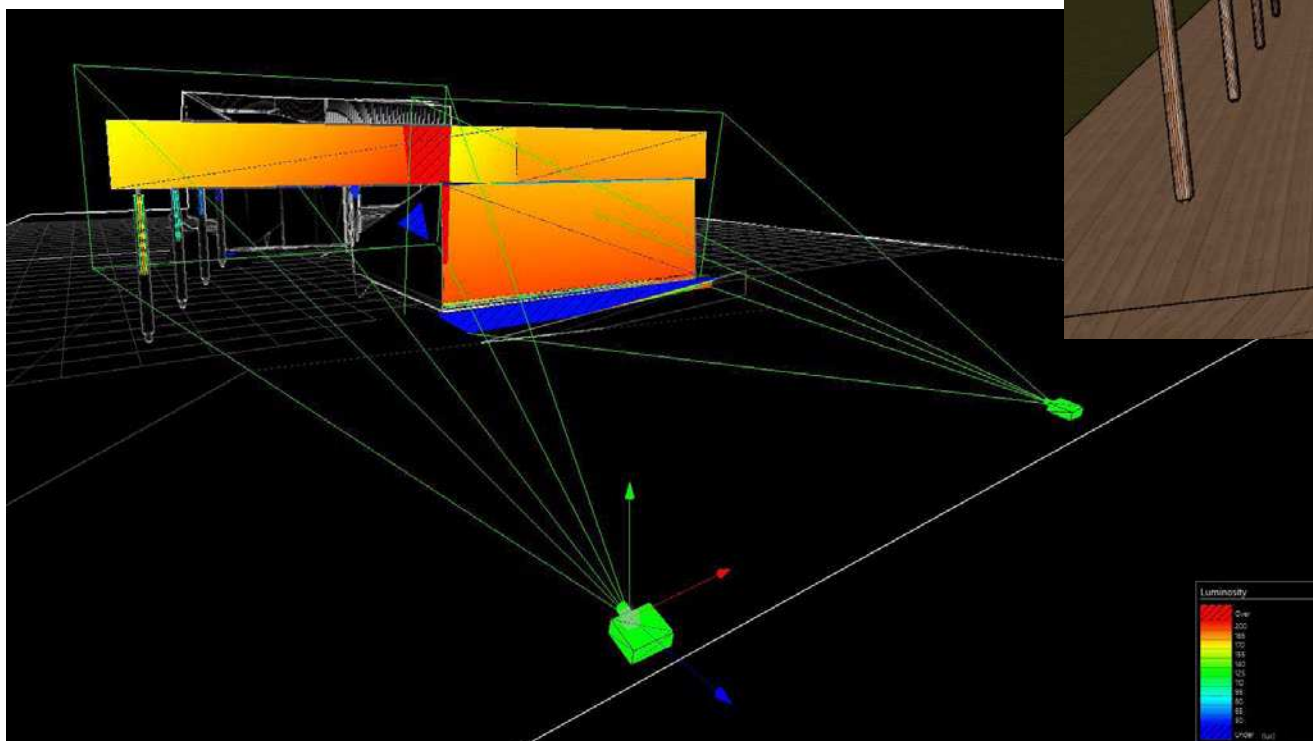
9 Appendix 1

Projector Specifications (Heat Mapping)

Front Perspective Projection

For the front of the building we have shown a 10000 ANSI Lumen HD projector for the larger surface on the right of the image.

The smaller area on the left shows a 5000 ANSI Lumen HD projector.

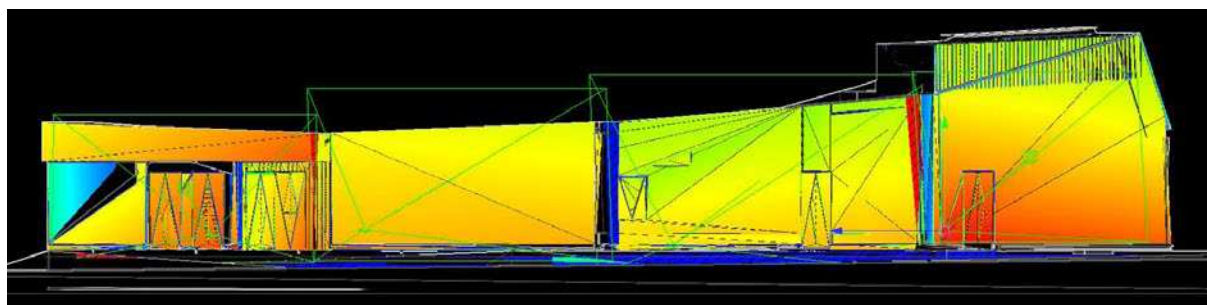
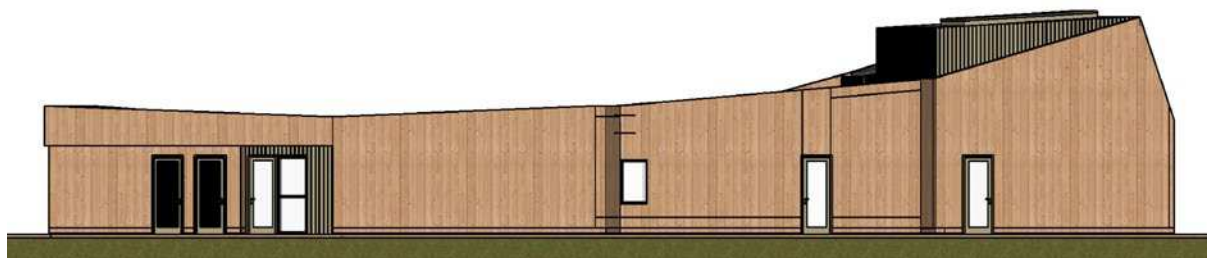


Side 1 Elevation

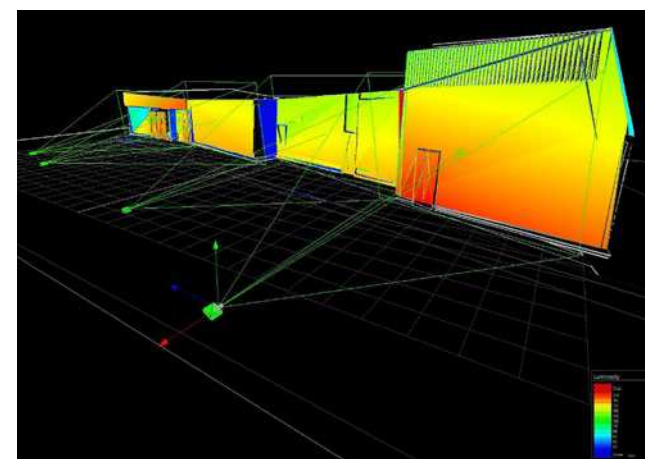
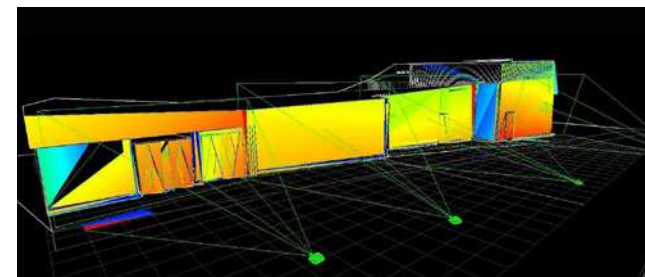
This side of the building we have used several different spec projectors than the other sides. This is not essential, but is a very efficient way to fill the space.

From left to right, we have illustrated the following in the heat maps:

- 10000 ANSI Lumen HD
- 10000 ANSI Lumen HD
- 12000 ANSI Lumen HD
- 12000 ANSI Lumen SXGA+



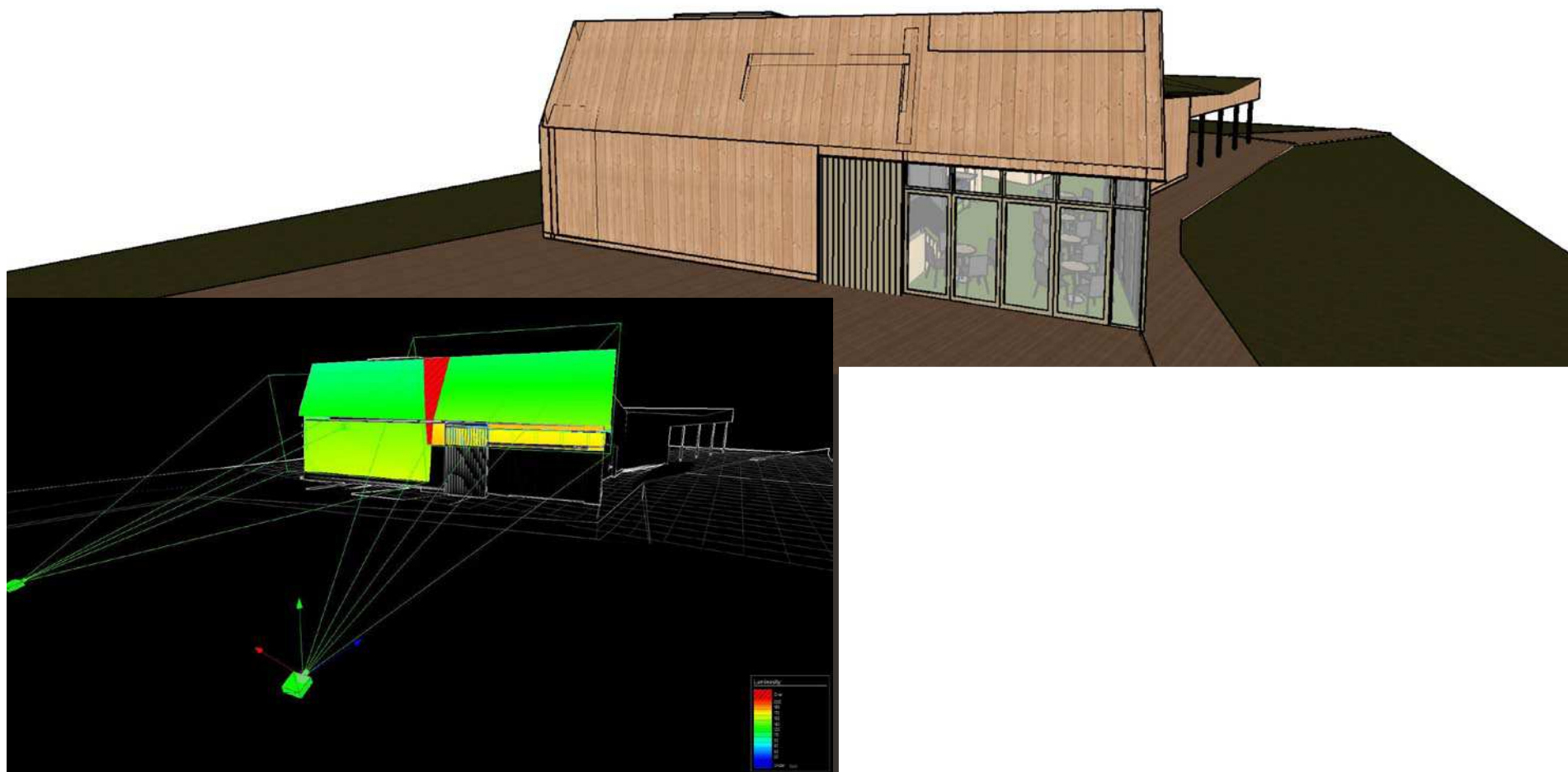
Side 1 Parallel Projection



Side 1 Perspective Projection

Rear Perspective Projection

For the rear of the building we have shown two 10000 ANSI Lumen HD projectors



10 Appendix 2

Lappset Play Planetarium Maintenance Information



Congratulations on choosing a high-quality equipment!

With proper maintenance, your equipment will have a long life span.

We design and manufacture all our play and sport equipment with safety in mind, taking the users' age group into consideration and assessing risks on the basis of current standards. Please note that as the owner, you are responsible for the maintenance of the equipment and the area around it.

Warranty is valid only if the equipment has been properly maintained

It is crucial to conform to these inspection and maintenance instructions so as to prevent hazardous situations on, below and around play and sport equipment. Lappset takes no responsibility for any damage or injuries caused by non-compliance with these instructions. Lappset's general product warranty is subject to compliance with these maintenance instructions. This manual describes how to properly inspect and maintain Lappset equipment.

The warranty terms for all Lappset equipment are available on our website at www.lappset.com/Services/For-designers/warranty

All public playgrounds must be inspected in accordance with the EN 1176-7 standard:

- Routine visual inspection (daily to monthly)
- Operational inspection (every 1 to 6 months)
- Annual main inspection (every year)

The inspection frequency of play equipment depends on the type of equipment, level of use, level of vandalism and location (e.g. harsh climate conditions). If equipment is subject to heavy use, harsh climate conditions or vandalism, inspection and maintenance work should be carried out more frequently than recommended in these instructions.

If you have any questions or need advice, please contact your local distributor or our customer service.



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Customer Service

+358 (0)20 775 0100
lappset@lappset.com
www.lappset.com

Spare part service

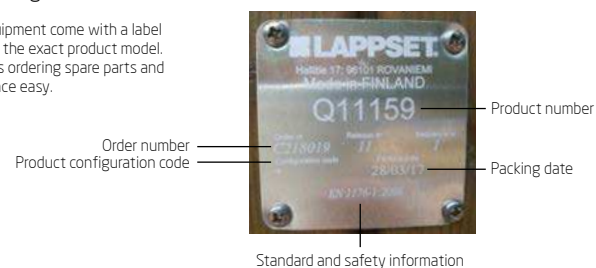
Parts must occasionally be replaced due to damage or wear. This must be done without delay so as to prevent hazardous situations. Repairs must be carried out in accordance with this manual and installation instructions.

If repairs cannot be made immediately, access to the part in question or, if necessary, the entire piece of equipment, must be prevented.

When you need a spare part for a Lappset equipment, please contact your local salesperson. We kindly ask you to note that the delivery time of spare parts for equipment that are no longer included in the current equipment range can be longer.

Product sign

All our equipment come with a label specifying the exact product model. This makes ordering spare parts and maintenance easy.



3

General

General			Routine visual inspection	Operational inspection	Annual main inspection
Subject	Inspection	Maintenance	Daily to monthly	Every 1 to 6 months	Every year
Cleanliness of equipment	Check the cleanliness of the equipment.	Remove all dirt, leaves and litter from the structures and the area around the equipment. If necessary, wash the parts using mild soap and water.	x	x	x
Broken or missing parts	Inspect the equipment for loose, broken or missing parts.	If necessary, replace or tighten parts.	x	x	x
Foreign objects	Inspect the equipment for any foreign objects tied or attached to it.	Remove foreign objects.		x	x
Connections	Check that all bolted joints are securely tightened. Check that rivets are not loose or broken.	Tighten connections or, if necessary, replace old parts with new ones. See installation instructions for the correct torque settings. It may be necessary to remove bolt covers – replace damaged covers with new ones.		x	x
	Check that there are no gaps in which clothes can become trapped close to slides, barriers, roofs or guard rails.	Tighten any parts that are loose or have moved.			x

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Moving parts			Routine visual inspection	Operational inspection	Annual main inspection
Subject	Inspection	Maintenance	Daily to monthly	Every 1 to 6 months	Every year
Springs and rubber parts	Check the operation of rotating and moving parts and inspect them for wear. Ensure that all covers are intact and have not moved.	If necessary, tighten connections. If there are signs of corrosion, replace or repair the parts.		x	x
Aerial runways	Inspect cables for wear, damage or corrosion.	Replace the cable if it is worn or damaged.		x	x
	Check the sag of the cable.	Adjust as needed in accordance with the installation instructions.			x
	Check the operation of the traveller.	See p. 9		x	x
Chains	Inspect chains for damage or wear.	Chains must be replaced when less than 70% is left of the original thickness.		x	x
Ropes and nets	Inspect ropes for wear.	Steel may be visible but strands must not be broken.		x	x
Bearings, rotating parts and swing suspension.	Check the operation of rotating and moving parts and inspect them for wear. Ensure that all covers are intact and have not moved.	Replace parts if movement is prevented partly or wholly or is uneven.		x	x
Spinning pivot break**	Check the operation of the break.	See p. 9		x	x

5

Materials			Routine visual inspection	Operational inspection	Annual main inspection
Object	Inspection	Maintenance	Daily to monthly	Every 1 to 6 months	Every year
Aluminium components	Check components for damage and wear.	If necessary, replace a component.		x	x
Galvanised steel components	Check components for scratches, Bar and first signs of rusting.	Small scratches do not need to be repaired, but deep scratches can cause rusting if left untouched. If necessary, replace a component.			x
High-pressure laminate elements (HPL)	Check panels for excessive wear, sharp edges and other damage caused by vandalism.	If necessary, replace a panel.	x	x	x
Painted steel components	Check components for scratches, wear and first signs of rusting.	If necessary, pretreat and paint components in accordance with the maintenance painting instructions for metal components .			x
Metal components in general	Check components for sharp edges. Check welded joints for cracks or gaps.	If necessary, repair or replace a component.			x
Plastic and rubber parts	Check plastic and rubber parts for wear, damage or cracks.	If necessary, replace a part.		x	x
Wooden parts	Check wooden parts for cracks, splintering or wear. Wood is a natural material that cracks as time goes on, but small cracks will not affect product quality or safety. Read more: https://www.lappset.com/Services/For-designers/Materials Inspect plywood boards for wear.	If necessary, replace or repair a board. Painted wooden parts: If necessary, pretreat and paint parts in accordance with the maintenance painting instructions for wooden parts .			x

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Foundations

			Routine visual inspection	Operational inspection	Annual main inspection
Object	Inspection	Maintenance	Daily to monthly	Every 1 to 6 months	Every year
Equipment foundations	If necessary, remove safety surfacing and inspect the foundations below the surfacing for wear. Pay special attention to structures that rely on one post.	If necessary, repair or replace foundations.			x
	Check that all foundations are securely in place and the surfacing material covers any sharp edges and concrete.	If necessary, stabilise the foundations and repair the surfacing material.		x	x

7

Safety surfacing

			Routine visual inspection	Operational inspection	Annual main inspection
Object	Inspection	Maintenance	Daily to monthly	Every 1 to 6 months	Every year
Loose fill safety surfacing: Softex™ chips, gravel or sand	Check the depth of the loose fill surfacing using the level marks in product structures.	If necessary, add material. Pay special attention to areas subject to heavy use, such as under swings and at slide exits.		x	x
	Check the loose fill surfacing for foreign objects.	If necessary, remove these.	x	x	x
	Check the depth of the loose fill surfacing against Table 4 of the EN 1176 standard.	If necessary, add material.			x
Rubber surfacing: Softex™ Wetpour safety surfacing and Softex™ safety tiles	Check the surfacing for gravel or litter.	If necessary, remove these.		x	x
	Check for damage or wear.	If necessary, repair the surfacing.			x
	Check that the rubber tile surfacing is even and there is no tripping points.	If necessary, re-install tiles.			x
Sand-filled artificial grass	Check that the artificial grass is clean and flexible.	If necessary, wash the turf and add sand.		x	x

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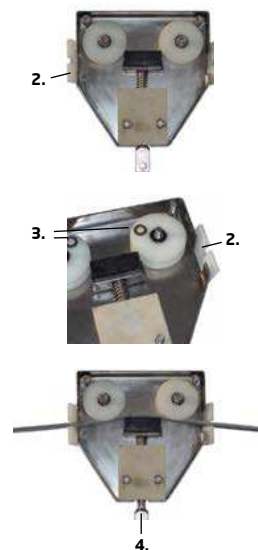
8

Aerial runway maintenance*

1. Remove the side plate to open the traveller.
2. Check that the finger guards are in the correct position. The groove on the guard must point outwards.
3. It is crucial to check that a washer has been placed on either side of the wheel. If the washers are incorrectly installed, the traveller will be damaged when it is used.
4. Cable installation: Pull down the chain to release the break and install the cable.

The aerial runway must be installed in accordance with the EN 1176 standard. The traveller must be inspected as a part of Operational inspection. Use only spare parts provided by Lappset.

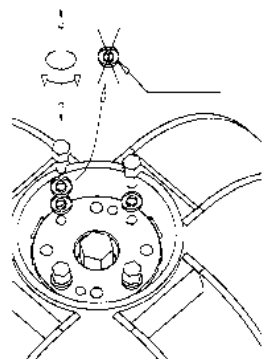
Standard products concerned:
160050M AERIAL RUNWAY
220082 MERCURY



Spinning pivot maintenance**

To increase the braking force, remove one or two washers from all of the four screws.

Standard products concerned:
112341 WALTZ
137042M XSPEED
220041 XSPEED FOR 2



9

Recycling of products



Lappset product packaging and products at the end of their life cycle can be recycled and/or used to generate energy. The materials collected and collection instructions can vary from one location and company to the next. The below instructions have been drawn up following the usual practice. However, you should always check the local recycling and collection instructions.

Material	Recycling or disposal
Impregnated wood	Impregnated wooden parts can be reused in structures or used for energy recovery at a hazardous waste incineration plant. Parts for disposal are taken to a collection point for impregnated wood.
Laminated panels	Laminated panels can be reused in structures or used for energy recovery at a licensed waste incineration plant. Panels for disposal are taken to an incineration plant.
Metals	Metals are recyclable and can be processed for use as recycled raw material by industry. Metal parts are sorted and taken to a metal collection point.
Plastic parts	Most plastic parts bear a material marking code on the basis of which they can be used as recycled raw material or for energy recovery at a licensed waste incineration plant. Plastic parts are taken to a plastic collection point.
Paper, paperboard and cardboard	Paper, paperboard and cardboard is delivered to a waste treatment plant for recycling. Paper, paperboard and cardboard is sorted and taken to a collection point.
Wooden packaging and painted wooden products that have not been impregnated	Wooden packaging and wooden parts can be partly recycled. Wood for disposal can be used as a fuel to replace fossil fuels in the generation of energy and heat. Depending on the type of wood waste, it can be used at a biomass-fired energy plant alongside other fuels or at a licensed waste incineration plant. Wood waste is taken to a collection point for wood waste to energy.
Tyres and safety surfacing tiles	Crushed tyres are used in structural layers in various earthwork projects, the drainage layers of landfill sites and as filler mass in environmental construction projects. Rubber and tyre chippings are used to replace non-renewable natural materials. Tyres and surfacing materials are taken to a tyre collection point.
Steel-reinforced ropes and nets	Ropes and nets can be crushed so as to sort out plastic and metal. Plastic is used for energy recovery and metal as a recycled material. Ropes and nets can usually be taken to a metal collection point.