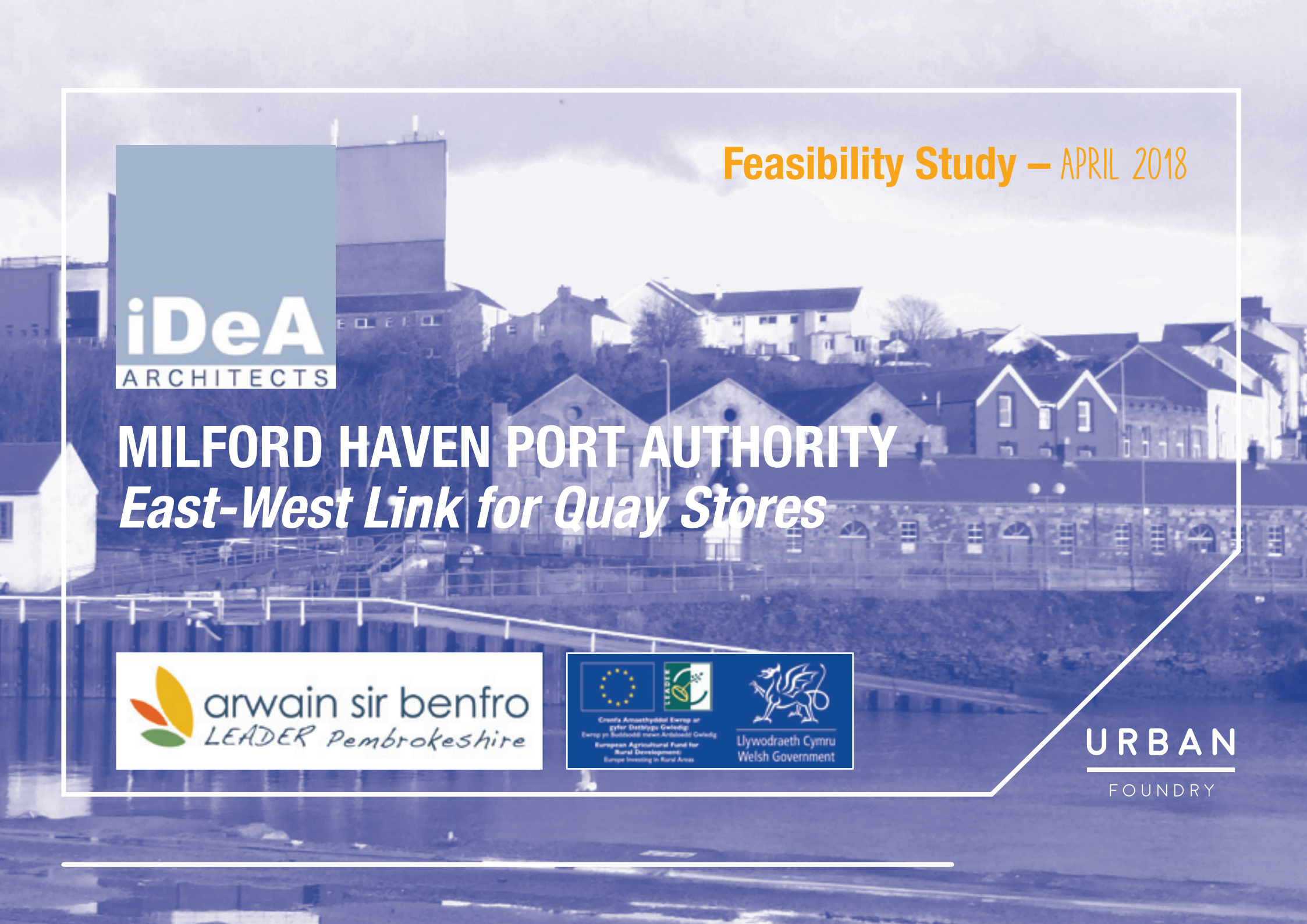


iDeA ARCHITECTS

Feasibility Study – APRIL 2018

MILFORD HAVEN PORT AUTHORITY

East-West Link for Quay Stores

arwain sir benfro
LEADER Pembrokeshire

Llywodraeth Cymru
Welsh Government

URBAN FOUNDRY

CONTENTS

INTRODUCTION

ONE

iDeA Architects and Urban Foundry [Formerly Trilein] ('we'/'the consultants') were commissioned by the Port of Milford Haven ('MHPA'/'the client') to develop a feasibility study on the viability of a mechanical transport link as part of the development of an East-West link route through the Quay Stores site, which emerged as a recommendation of our previous Feasibility Report for the Quay Stores Cultural Centre undertaken by iDeA Architects and Trilein [Urban Foundry] for MHPA and completed in April 2017 (See Option 6A Phase 2 in appendices)

This study is in the context of Phase 1a development within the Milford Waterfront Regeneration Masterplan, and focuses on the area between the Quay Stores site and the West end of Charles Street adjacent to the Torch Theatre which is part of a steep tree lined escarpment at right-angles to the proposed East-West route

The Brief

The brief required:

- appraisal of site constraints
- comparison of pedestrian transport methods to suit the geography of the site
- concept design options
- cost estimates
- visitor attraction potential & funding options

Our Approach

We began by researching the following methods of moving pedestrians between different levels:

- funicular railway/cable tramway
- escalators
- inclined lift
- vertical lift combined with horizontal walkways

We identified and contacted manufacturers of the above including KONE and MESPERATO to establish technical limitations such as length, height, maximum incline etc. together with requests for budget supply prices.

A further site appraisal was carried out to identify potential routes and obstacles, including a further meeting with Peter Doran of the Torch Theatre to obtain details of the layout and levels of the theatre complex, and to explore the pros and cons of a public route linking the Quay stores site with Torch and/or the adjoining site (Cliff House). Additional discussions were held with Councillor Colin Sharp, Milford Haven Town Council, and officers of Pembrokeshire County Council (see Appendices).

A recent example of an inclined lift/cable car at Ebbw Vale was identified and we arranged a site visit to meet the owners (Blaenau Gwent CC) to inspect the installation and inform a case study.

We concluded the first phase with an interim meeting with MHPA to discuss the concept design options thus far, and received updated third party designs for the Quay Stores building which resulted in the request for further Options 5A, 5B and 5C (see section 5)

Limitations

The study is limited on plan to the zone between the Northern and Southern boundaries of the Quay Stores site, because a key aim is to generate footfall to the Quay Stores development.
There are very few examples of contemporary Funicular railways and inclined lifts in the UK, and no UK manufacturers have been identified. Consequently it has been difficult to obtain cost information and it is beyond the scope of this study to provide full cost estimates for each concept design option and exclusions are noted.

The Report structure

The next section considers the constraints and opportunities at key points along the proposed route.

Section 3 compares the different types of mechanical transport and considers the operational implications, together with the Ebbw Vale case study.

Section 4 compares the basic supply and fit costs for each type of installation.

Section 5 comprises a range of design options for an infrastructure link between Charles Street and the Quay Stores site, with an evaluation of each.

Section 6 provides summary conclusions, with recommendations for MHPA. Supporting documents are included as appendices.

SITE CONTEXT

TWO

Background

A key conclusion of our earlier feasibility Study for the Quay Stores site was that the site with its existing difficulties and barriers to development made the conversion and re-use of the listed building unviable in terms of a commercial project that could repay the capital cost to redevelop in revenue income over a reasonable term. A wider and more strategic approach to improving footfall on the site was proposed that included a link with the town and surrounding amenities, improving the site's viability and ultimately, the real estate value.

To achieve this, two new routes were proposed: the 'green ravine' running North -South and the East -West link route crossing over each other at the Quay Stores. These routes link the site to the surrounding venues, amenities and communities in close proximity including:

- The harbour and waterfront development
- Surrounding cultural venues and amenities - eg. The Library, the Museum and Visitor Centre and the Torch Theatre,
- Residential areas in Milford Haven and Hakin
- National public transport infrastructure - The railway station

The consultants have only been asked to consider the East-West route in this study

Constraints and opportunities for the East-West link

The site barriers created by topography and existing road infrastructure have encouraged developments around the site that reinforce car culture and do not mitigate the effects of heavy traffic on the trunk road crossing over to Hakin and the extensive areas of retail and commercial office parking in the retail park. Alternatives have been proposed for linking the waterfront with cycle and walking routes to currently under-utilised amenities and public transport all within a short distance of Quay Stores

Constraints and physical barriers (see Site Constraints Plan)

Torch Theatre & Cliff Cottage

The site environs at the West end of Charles Street contain the service yard of the Torch Theatre with split-levels serving the stage and below stage levels. The lower level contains mobile phone equipment. There is a small gap between the stairwell on the South end of the Torch and the adjacent property (Cliff Cottage). This makes a public route difficult to achieve without either making alterations to the Torch Theatre building, or the purchase of Cliff Cottage on the adjoining site.

Figure 1, Constraints plan

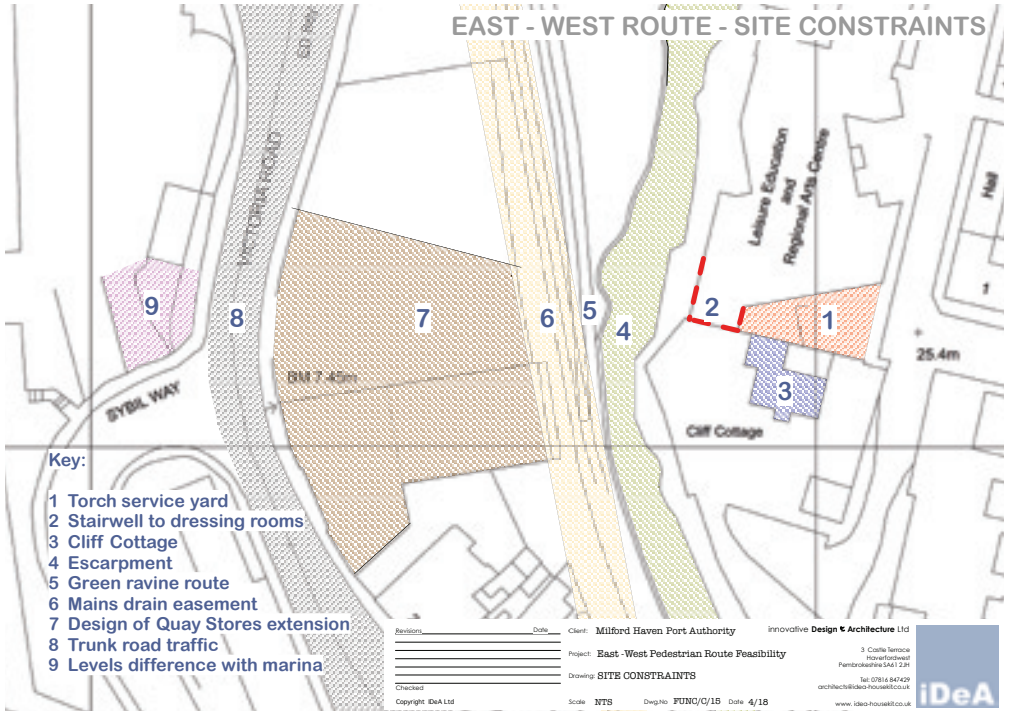


Figure 2, Torch service yard

Figure 3, Plan of Torch Theatre at south end

There is a potential noise issue for the theatre stage and interior of the main theatre auditorium if the link and public route is too close to the rear stage door.

The Escarpment

This is a natural feature with mature tree cover, changes to which may have implications for protected species and habitats. Some proposals will be more intrusive than others to the existing habitat. This study does not consider the geology of the escarpment and any further detailed design would require a ground investigation study tailored to the preferred design option.

The 'Green Ravine'

Existing roads and car parking around the site make the prospect of yet another road particularly unattractive. An adoptable service road serving the Quay Stores is now proposed which could further erode the north-south green route. As this route is tight to the base of the escarpment there is little or no space to accommodate the footprint of structures associated with the various means of transport such as lobbies, undercrofts or terminal buildings.

Main Drainage Easement

The easement for the main drainage route running approximately parallel to the old railway tracks adds a further complication. The width of the easement stretches from the rear of the building design for the Quay Stores extension to the base of the escarpment to the East. No structures or supports are allowed within this zone making structural design of platforms, decks or link bridges more complicated and expensive. This also implies that the footprint of any lift tower or terminal lobby is likely to require the removal of some of the escarpment at the base.

The Quay Stores Extension

The proposed East-West route was predicated on the concept of a flexible, permeable arcaded building at ground level (see previous Option 6A in appendices). The latest design proposals show the site reverting to its original boundary with Costa Coffee and a proposed arcaded route at second floor/loft level (see appendices). This raises questions as to the visibility of the route to pedestrians, and the permeability of the building in terms of whether it would remain open 24/7 or whether it would have controlled opening hours, with use of an alternative route around the North side of the building.

The Trunk Road

This remains a major barrier – if shared space is not an option to be pursued, a pedestrian crossing is still required to complete the East-West link between the town and the waterfront harbour. If the trunk road remains a barrier without a suitable crossing, the creation of an alternative route to the marina via the 'green ravine' and tunnels under this road becomes even more desirable, though the 'green ravine' and trunk road crossings should not be seen as 'either/or' options – both warrant attention in order to improve connectivity. The improvement of a direct pedestrian link can be characterised in terms of enhancement of 'active travel' – walking and cycling – options. PCC are actively looking at improvements to active travel routes in Milford Haven, with the change in levels a constraint for them, and this scheme has clear potential to assist PCC in realising their strategy. As a trunk road, it falls under Welsh Government control, but PCC would welcome the opportunity to calm it and should be involved in discussions.

Levels between road and marina

The level difference to enter the harbour at the entrance interferes with direct access along the route. A new urban design scheme incorporating landscaping/ramps and steps is needed to create a sense of arrival and to avoid having to negotiate the road access and boat ramp. [NB. The consultants have since been advised of the proposal to move the Trunk Road access bellmouth to opposite the Quay Stores site. The creation of a (likely) larger junction at this point creates significant issues for pedestrian and cycle movement around and through the Quay Stores site and surrounding area and needs careful study in terms of preserving pedestrian 'desire lines' and ease of crossing]

Opportunities

- The 'green ravine'; creating a pedestrian/ cycleway connection along a green corridor would re-purpose the historic infrastructure to link up leisure and cultural amenities around the Waterfront independently from the busy road system. With careful design and appropriate finishes both cycleway/ pedestrian and occasional delivery vehicles can be accommodated.
- The Hakin– side of the Dock is underused – extending the e-w route in a short cut across the water could create footfall and a development site here. This could be done irrespective of other parts of East-West route.
- Partnering with local and national organisations in developing the link transport infrastructure to the mutual benefit of the town and the Waterfront.

COMPARISON OF TRANSPORT OPTIONS CONSIDERED IN THIS REPORT

THREE

Funicular

A funicular (/fəˈnɪkjʊlər/) is one of the modes of transport, along with a cable railway and an inclined elevator, which uses a cable traction for movement on a steep slope.

A pair of vehicles are pulled on a slope by a cable which loops over a pulley wheel at the upper end of a track. While one vehicle is ascending the other one is descending the track and thus they are counterbalancing each other. Both vehicles are permanently attached to a cable, which distinguishes them from a cable railway.[1]

The name "funicular" itself is derived from the Latin word funiculus, the diminutive of funis, which translates as "rope".

The Wikipedia definition above distinguishes between a 'Funicular' and the other modes of inclined transport that on first hand appear similar but are in fact different, having characteristics and governing criteria that affect the choice between all three. The categories are:

- Funicular
- Cable railway – sometimes referred to as a tramway
- Inclined lift

Two further two modes of passenger transport are considered:

- Moving escalator steps
- Vertical Lift with horizontal connections

The aim of creating the link is to help to regenerate the town and improve connectivity for visitors to the Quay Stores and the Waterfront, without the need to drive short distances from one location to another in the town.

This feasibility study report evaluates the options, based on the following design parameters:

- An estimate of the capital cost of basic lift or carriage systems
- Potential for levering-in funding partners
- Satisfying the legislation and need for access for all,
- Creating a user-friendly link in the public realm that is functional and visually clear.
- Determining the 'best fit' with the redevelopment of the Quay Stores building.
- Proposing a solution that will benefit and enhance the Torch Theatre.

Many working examples of funicular railways remain in use from the Victorian era and early C20 when they were at the height of their popularity and are a testament to C19 engineering and enterprise. As the definition explains, these consist of two passenger cars that are attached to one continuous rope or cable and the weight of the descending car is used to counterbalance and assist in raising the other uphill. Very little additional energy is required to operate the system and early examples typically used water- power to provide this. Water pumped to a header reservoir as part of the operational cycle and piped to tanks in the descending car increases weight for the momentum to begin a controlled descent.

In 1990 a new water-balanced funicular was installed in the Centre for Alternative Technology in Machynlleth. The CAT water-balanced cliff railway was developed to provide an accessible link for visitors arriving in the Centre car park, taking passengers up to and down from the main reception and site, which is in the former slate quarry above. Based on the Victorian water-balanced funicular between Lynton and Lynmouth in Devon, the £1m CAT water-balanced funicular was the first to be built in decades, with the cost divided about equally between the cable railway infrastructure at £500,000, and the upper and lower stations designed by Pat Borer totalling £500,000.

Figure 4, CAT Funicular

Figure 5, Funicular example at Niagara with canopy entrance

No recent examples were found to be able to directly compare the cost of a funicular with other categories of lift, However the cost of the scheme built in 1990 would equate to a multi-million pound scheme to develop a similar funicular today in Milford Haven. Besides cost, the design and engineering expertise assembled by CAT to build their project is dispersed and CAT is not able to offer consultancy on a similar project today.

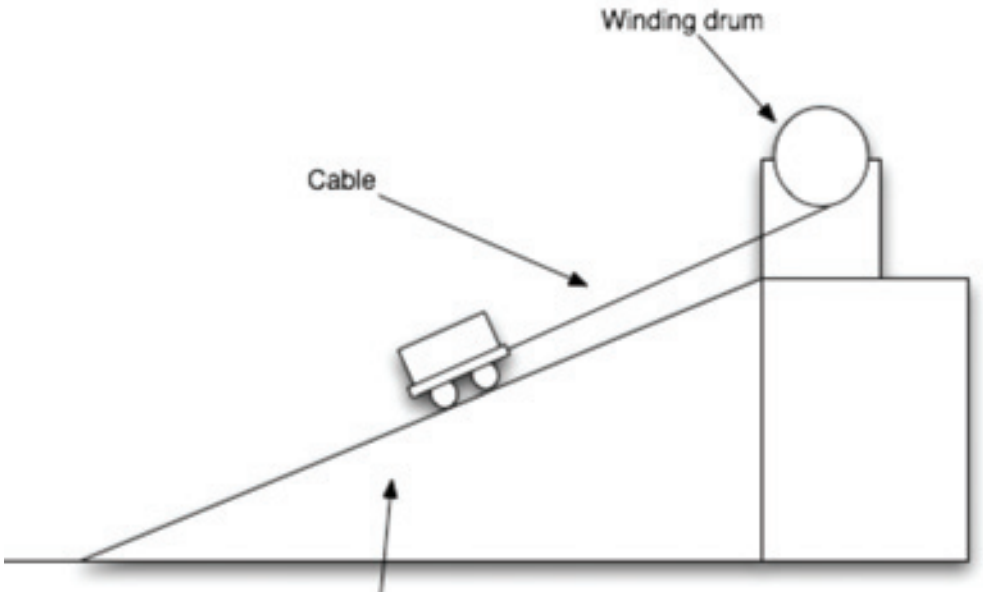
As well as the high capital cost envisaged there are onerous regulations governing the operation of cable and tramway passenger transport that add to their cost in use. The implications of choosing a cable -driven solution was reflected in the cable-driven rail transport link at Ebbw Vale. For these reasons a Funicular, whether water-balanced or electric-powered is unlikely to be a viable option for the east-west link in Milford Haven. For a full description of the CAT cliff railway see Appendix 1.

Cable railway / tramway

Cable railways employ a stationary engine/ motor and winding drum to haul a wagon or passenger car attached to a cable up a steep incline and to lower it down again. They are similar to funiculars but in this case the cable is attached to a single car and wound or released as necessary.

Cable-driven cars, like funiculars, come into their own on long inclines in locations such as ski resorts in mountainous regions where the use of wound / moving cables to haul the carriage are not limited by distance. The mechanical passenger lift at Ebbw Vale fits into this category but the 43m long incline at Ebbw Vale is quite short for this type of technology, and is on reflection not the most appropriate technology in use (See appendices for the case study on Ebbw Vale)

Figure 6, Cable tramway



Both funiculars and cable railways come under international regulations that apply for operating tramways / cableways and the stringent inspections and checks contribute to additional running costs over and above more conventional lift mechanisms. These reasons work against the choice of a cable railway when compared with the other options for a link at Milford Haven.

Escalators

It is feasible to make the ascent up the escarpment via a series of escalators and intermediate landings, Option 2 in section 5. The moving escalator could be supplemented with flights of steps, but this does not meet the legislative requirement to provide universal access, as there is no alternative for wheelchair- bound users who would be excluded from using the link.

In addition, the construction of a raking route for escalators at a maximum of 30 degrees incline would cut into the cliff along the east-west axis and would require extensive excavations extending back almost as far as Charles Street. This would not only be expensive to form but would be very intrusive to the Torch Theatre, the existing cliff geology and the natural habitat along the green corridor and the cliff escarpment.

There are very successful examples of outdoor escalators in cities such as Barcelona but the physical scale of excavations, the local climate, as well as the access issues mentioned all work against this as a proposal for the link in Milford Haven.

Figure 7, Outdoor escalators to Park Guell, Barcelona

Vertical lift

In comparison with the other link options, the vertical lift represents a more straightforward solution using widely available standardised components for the lift gear and car, with all the advantages of an 'off the peg' solution. This option was originally proposed within a much larger new-build scheme, located inside a tower structure with access gained at the upper level by long horizontal corridor bridging across from the Torch and its service yard to Charles Street. Disadvantages were that apart from having to build a very expensive new building to put it in, the lift would be located away from the public realm and therefore less likely to be used by the public.

Here, an alternative proposal is put forward to site the lift in a feature tower structure in a prominent location outdoors rising from the cliff face and linked at high-level to a viewing platform or ramp that provides access from Charles Street and connects with the existing cliff-top terrace at the Torch Theatre café/ reception.

A vertical lift is the most cost effective in use, with parts and service maintenance undertaken using local firms. The capital cost is also the lowest of the options considered but this does not account for the tower structure within which the lift will travel, and the viewing platform needed to gain access to the lift. A more ambitious proposal to enhance the tower and treat this sculpturally as a feature landmark is shown in Option 5B. This proposal scheme would require another level of design input and multi -million pound funding.

Figure 8, Example of stand-alone external lift tower

Inclined Lift

An inclined elevator car is either winched up to the station at the top of the incline where the cable is collected on a winch drum, or the single car is balanced by a counterweight.

Most common inclined lifts are constructed from steel or aluminium materials, are powered by electric motors and operate with push button electronic controls. Common drive systems include cable- winding drums and continuous loop traction drives.

Figure 9, Example of contemporary inclined lift at Lubliana

The key difference is that these are in the 'lift' category and come under the standards and regulations for lifts. National standards, regulations, and safety codes specific to inclined elevators are provided in ASME A17.1 "Safety Code for Elevators and Escalators" under Part 5.1.These are universally adopted and less onerous than the regulations that apply to funicular and cable railways.

Inclined lifts are more unusual than vertical lifts with fewer manufacturers in the field. However, the budget cost estimate obtained for this study suggests that they are far more affordable than funiculars, cable tramways and escalators (see section 4)

It must be borne in mind that both vertical and inclined lifts will require additional civil engineering and support structures, which will add to the costs given by the lift manufacturer. In the case of a vertical lift, a tower and bridge link(s) are required. These will increase the overall cost depending on the type and extent of construction. Similarly an inclined lift will require civil engineering and groundworks to support the cable track, as well as to create housings for the car under carriage and winding gear. In addition further building construction costs will be incurred if stations are required at top and bottom.

OUTLINE CAPITAL COST COMPARISONS

FOUR

The cost estimates here compare prices for vertical and inclined lifts, and escalators for the Milford site , together with the Ebbw Vale case study. It should be noted that the elevator and lift option prices are for the supply and installation of the lift / escalator kit and motor components and do not include the associated engineering/ ground works and/or structural built elements such as lift towers and/or stations that form the completed installation.

These costs apply to the notion of linking two levels e.g. from the Torch/ Charles St to the Quay Stores and Green Ravine at ground level, however discussions in an interim meeting with the Destination Director regarding the current proposals for the Quay Stores building have resulted in further design options where budget price estimates would vary.

Figure 10, Capital cost comparisons

Cost info/ budget estimates:

	Type	Length	Lift	Angle	Cost	Notes
Ebbw Vale	Cable Lift	43m	23m		£2.3 million	Lift system £1 million Total cost Includes terminal buildings and groundworks, design and engineering fees etc
CAT Machynlleth	Funicular	53m	30m	34 deg.	£1million	Travel system £500,000 Upper and lower stations £500,000
Maspero elevators (Italy)	Vertical Glass Lift	18m o/a	14m	90 deg.	£200,000	Excludes structural frame/tower and connecting deck/balcony
	Inclined Lift		14m	50 deg.	£240,000	Excludes groundworks
	Inclined Lift		17m	42 deg.	£250,000	" " "
Kone GB	Escalator Up	29m	17m	30 deg.	£440,000	Excludes groundworks
	Escalator down	29m	17m	30.deg	£440,000	" " "
	Total				£880,000	

DESIGN FEASIBILITY OPTIONS

FIVE

Six design feasibility options have been developed which relate to the different types of transport link described above. These options were presented to the Destination Director, Neil Jenkins at an interim meeting on 3 April and are as follows:

OPTION 1 – FUNICULAR TO GF ARCADE BUILDING

This option shows a funicular link close to or adjoining the Torch backstage dressing room block at right angles to it. A wider corridor is required for a funicular system compared with a single inclined lift. Level entrance canopies or lobbies are shown at the bottom and top, with the former reducing the width of the pedestrian/ service route running North to South ('green ravine'). The footprint of the canopy at this lower level overlaps the drainage easement zone and it not clear at this stage whether a lightweight canopy with shallow isolated pad footings would be allowed.

At the top level a ramped connecting route to Charles Street would require the demolition of Cliff House (current market value estimated at £155,000 according to Zoopla, however it may be possible to resell the residual site as a residential plot or negotiate a price with the Torch Theatre if it was of interest to them).

At the lower level a direct route through the Quay Stores extension is shown, consistent with Option 6A from the previous study (appendix i)

Benefits:

- May attract tourists

Disadvantages:

- Requires acquisition of Cliff Cottage
- Requires space at top and bottom for entry/exit
- Requires wider corridor than inclined lift

Cost elements subject to scheme / detail design:

- Site clearance
- Groundworks/civil engineering
- Funicular cars and rail system (no budget costs currently available)
- Canopies or lobbies at top and bottom (optional)
- Acquisition of Cliff Cottage (approx £155,000)
- Ramp zone at East end

OPTION 1A – FUNICULAR TO CLOSED BUILDING

Identical to Option 1 except that this shows an alternative lower level route around the North side of the Quay Stores extension if this building is closed or when a performance is taking place and a route through at ground level is prohibited.

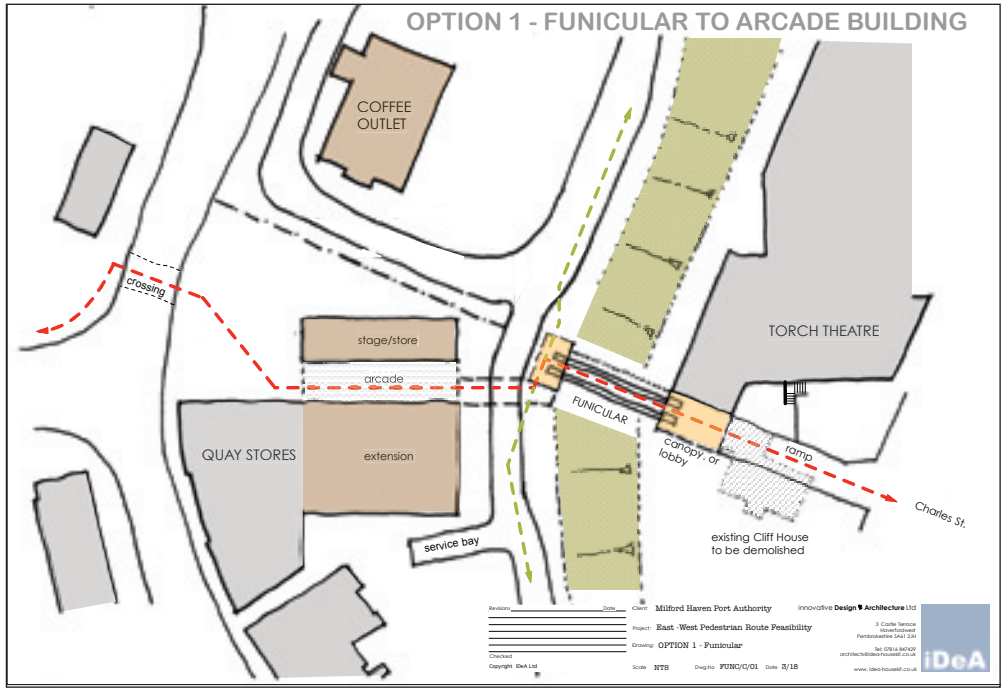


Figure 11, Option 1 Plan

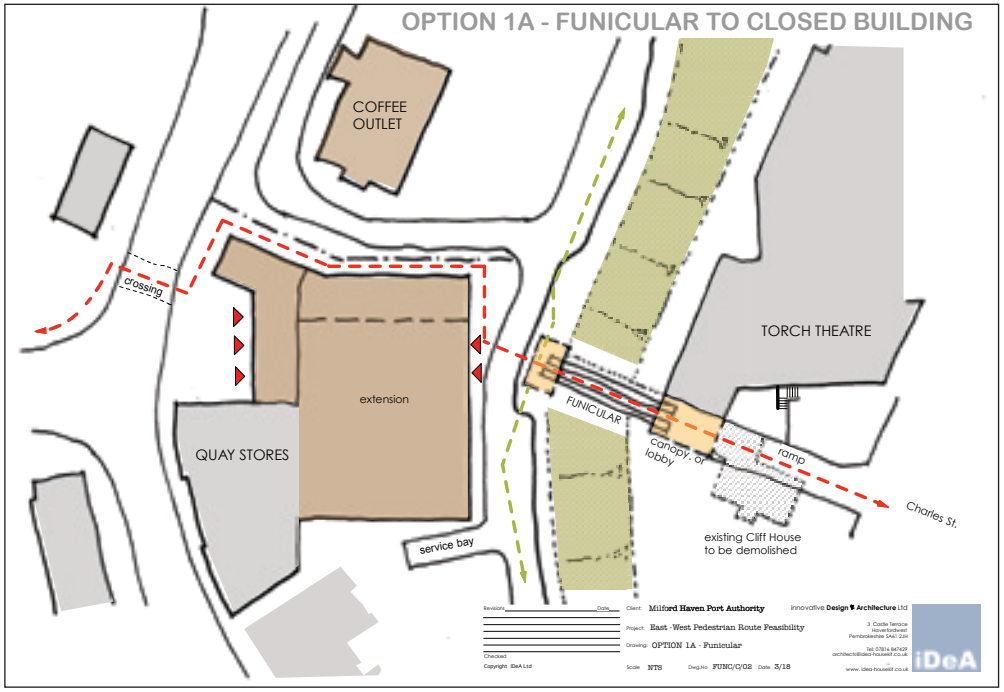


Figure 12, Option 1A Plan

OPTION 2 – ESCALATORS TO GF ARCADE BUILDING

This option shows a pair of escalators at the maximum height of 18m and the maximum pitch of 30 degrees. Extensive excavations would be required into the existing escarpment to create the cutting and embankments required to accommodate this layout and Cliff Cottage would need to be acquired as in previous options.

The escalators would need to be sited some distance from the Torch Theatre in order to create the cutting, and boundary/retaining walls would need to be rebuilt along the Southern boundary of the Torch service yards. The layout is based on 2no. KONE TransitMaster escalators costing £400,000 each.

Height 18m, Length 37.3m
Pitch 30 degrees, Max speed 0.75m/s

Benefits

- No entrance/exit structures required

Disadvantages

- Requires acquisition of Cliff Cottage
- Requires extensive excavations
- Alignment away from Charles Street
- Expensive supply cost

Cost elements subject to scheme/detail design:

- Site clearance
- Groundworks/civil engineering
- Escalators 2no. KONE TransitMaster 2 x £400,000 = £800,000
- Acquisition of Cliff Cottage (approx £155,000)

OPTION 3 – VERTICAL LIFT TOWER AND VIEWING DECK

This option shows a somewhat difficult route via the existing Torch Theatre service yards through the narrow gap between the stairwell projection and the corner of Cliff House, leading to a deck connecting with a vertical lift tower.

At the upper level a platform lift would be required to allow wheelchair users to travel between the upper and lower yard levels, and

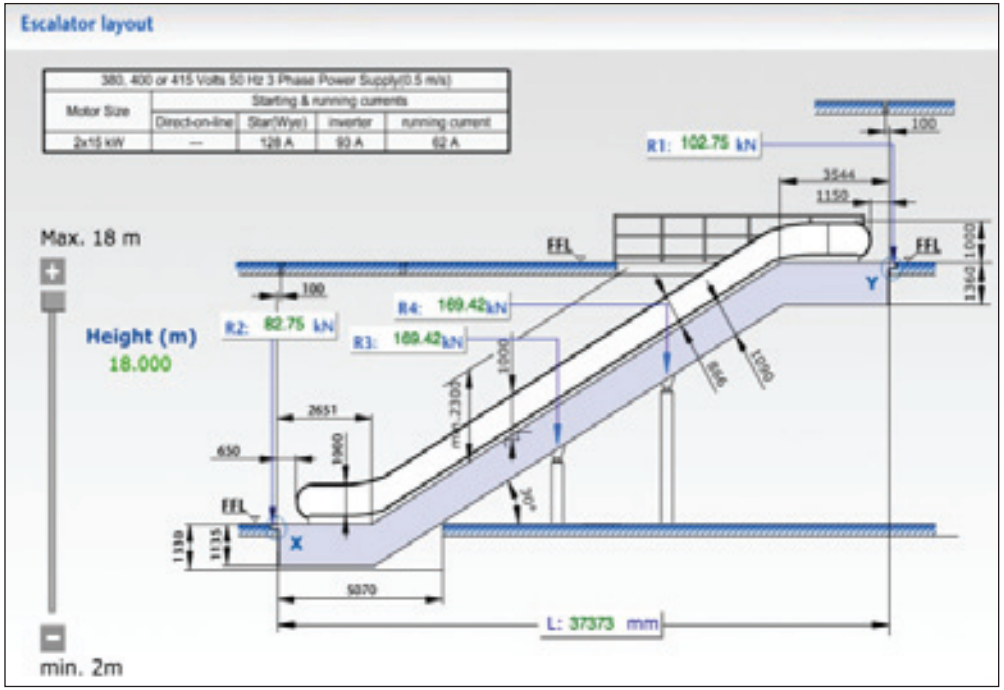


Figure 13, Kone Transitmaster section

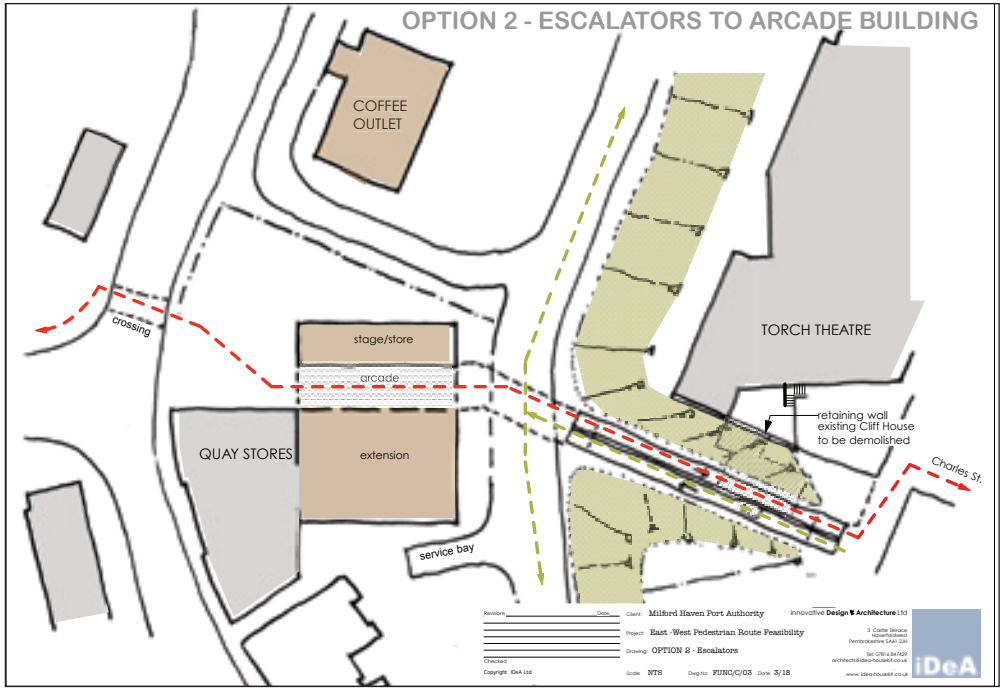


Figure 14, Option 2 Plan

in order for the lift tower to avoid the drainage easement zone, a section of the escarpment would need to be removed at the base. The route also strays into the Cliff House site and a small strip of land would need to be acquired for the deck connection. These obstacles, together with the cost of relocating mobile phone equipment from the lower yard, makes it an unsuitable option for a public route.

Benefits

- Cliff House not required to be demolished
- Avoids main drain easement
- Connects with 'green ravine'

Disadvantages

- Requires excavations into escarpment
- Requires adaptations to Torch service yard
- Not visible from Charles Street

Cost elements subject to scheme/detail design:

- Platform Lift and associated builders work
- Relocation of mobile phone transmitter equipment
- Acquisition of strip of land from Cliff Cottage plot
- Groundworks at base of lift tower
- Glass lift supply and install £200,000 (excluding structural support)
- Deck and balustrade structure

OPTION 3A – VERTICAL LIFT TOWER AND ALTERNATIVE VIEWING DECK

Similar to Option 3 but with the deck level connecting to the existing Torch rear balcony level and Cliff Cottage removed to allow the deck and ramp to wrap around the southern end of the Torch Theatre, thus avoiding issues with the service yards.

Benefits

- Avoids main drain easement
- Connects with 'green ravine'
- Connects with Torch balcony

Disadvantages

- Requires excavations into escarpment
- Requires acquisition of Cliff Cottage
- Additional cost of deck and ramp areas

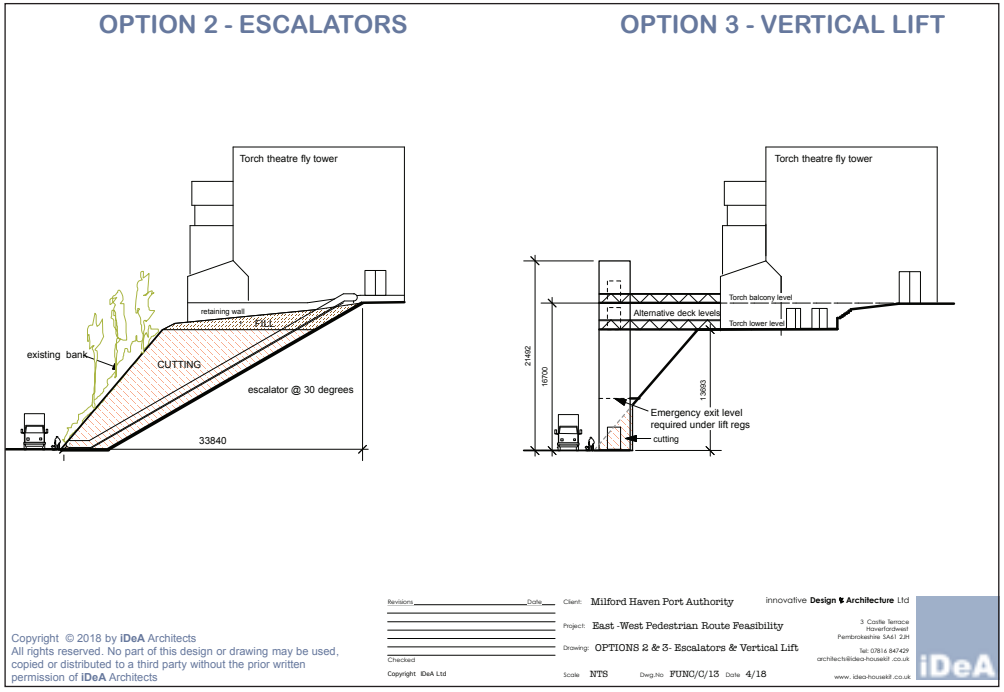


Figure 15, Option 2 & 3 sections

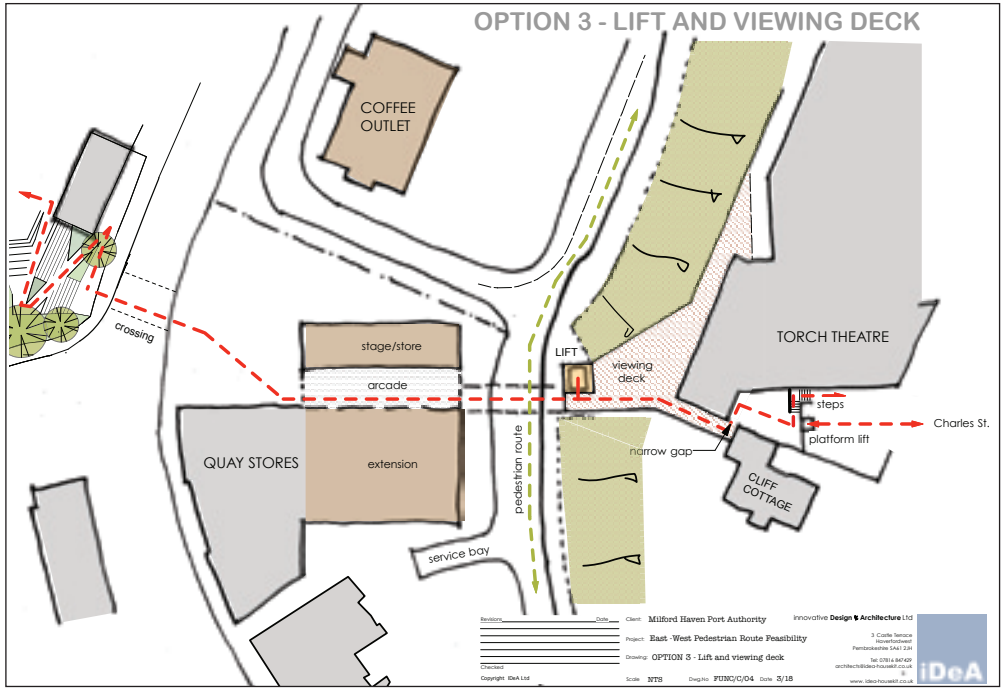


Figure 16, Option 3 Plan

Figure 17, Option 3A Plan

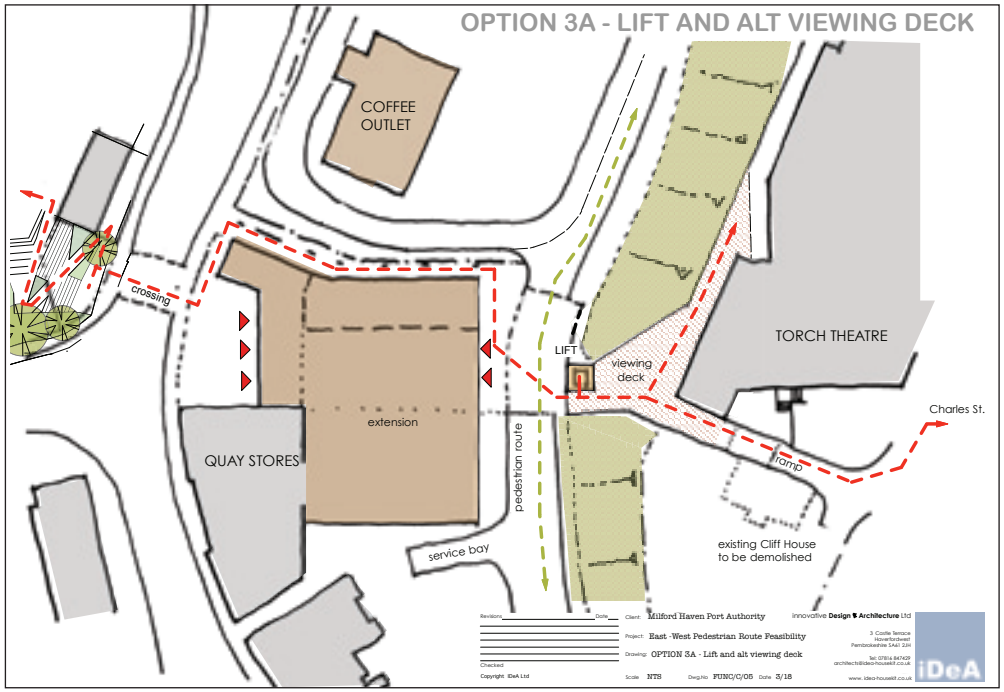
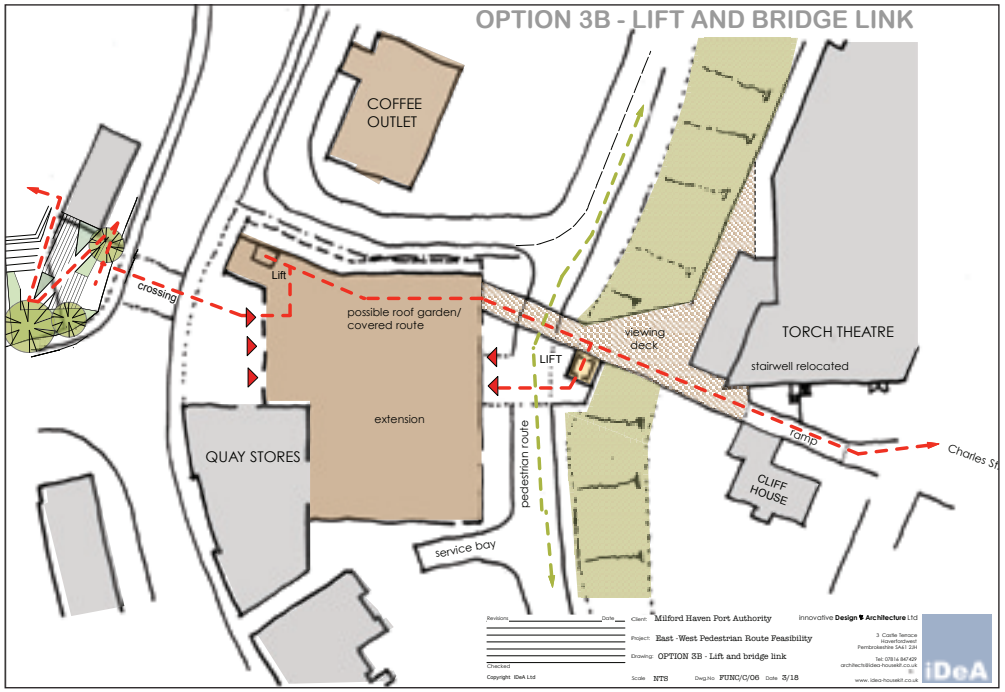


Figure 18, Option 3B Plan



OPTION 4 – INCLINED LIFT AND TERMINAL BUILDINGS

This option shows an inclined lift with terminal buildings at top and bottom similar to the Ebbw Vale example. The significant difference is that inclined lifts are ruled by specific regulation EN 81.22 which shares 80% of its content from the generic regulation of vertical lifts. The same can be said about the technology of the components and this allows an inclined lift (although more expensive than a vertical lift) to be far cheaper than a cable car.

With the removal of Cliff Cottage there would be ample space to create an approach and entrance building visible and accessible from Charles Street, with the position dependant on the angle of the installation. The problem is lack of space at the bottom of the escarpment to accommodate a landing platform and entrance/exit lobby without overlapping the main drain easement. One way of making sufficient space would be to set the inclined lift into a recessed concrete channel as shown in figure 17 but this would add additional excavations and civil engineering cost.

Benefits

- Visible from Charles Street
- Connects with 'green ravine'
- Possible visitor attraction
- No deck/bridge links needed

Disadvantages

- Requires excavations into escarpment
- Requires acquisition of Cliff Cottage

Cost elements subject to scheme/detail design:

- Inclined lift supply & install £250,000*
- Excavations/civils work subject to surface mounted or recessed channel design
- Terminal buildings
- Acquisition of Cliff Cottage £155,000 (less any residual value recovered)

* Ancillary costs not included in lift cost:

- Design, approvals and tender preparation
- Electrical works (power feed, telephone and alarm lines, CCTV line)
- Emergency stair, balustrades and fencing
- Tower crane to assist site assembly

Figure 19, Masperato example in concrete channel

Figure 20, Example of Mesperato panoramic glass cabin

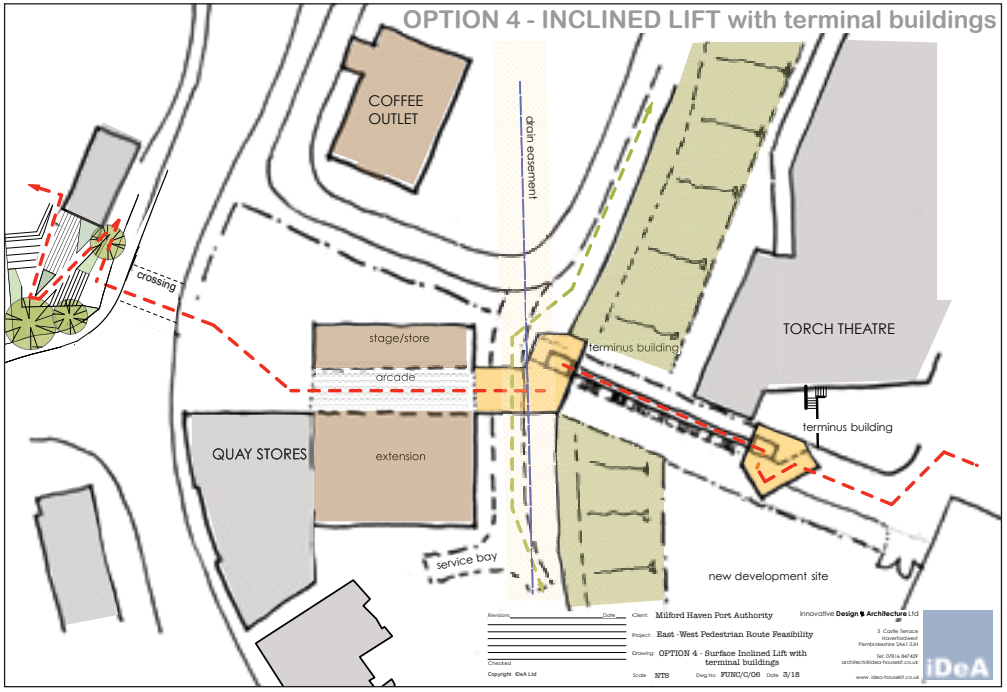


Figure 21, Option 4 Plan

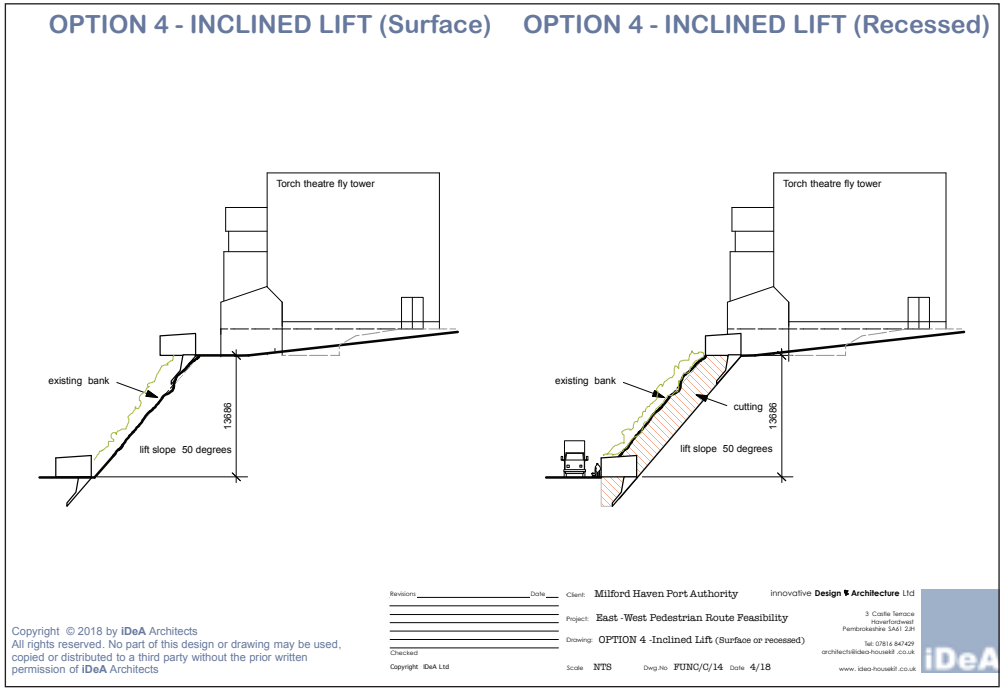


Figure 22, Option 4 sections

CONSULTATIONS WITH MHPA AND STAKEHOLDERS

SIX

MHPA

Our meeting with Neil Jenkins, Development Director for the Port of Milford Haven and our client contact on Tuesday, April 3 revealed the latest design proposals for the Quay Stores building and extension, which Neil shared with us.

Our design feasibility options for the link, initially tabled in our earlier meeting with Peter Doran in the Torch Theatre all show the link connecting with the ground level. This is taken from the Quay Stores feasibility study which recommended a route through the new extension shown in Option 6A .

The route was envisaged at ground floor level, with a flexible use of the space to either side and occasionally to close the route when a larger auditorium was required. The solution proposed in 6A requires sophisticated mobile bleacher seating and on-going management of the building interior space to get the most out of its flexibility.

In the latest design proposals produced by a third party, a version of our 6A concept has been developed whereby the East-West route is elevated, and taken through the building within the loft space of one of three pitched roofs over the extension that echo the Quay Stores multi-pitched roofline. The walkway runs via an aerial gallery, top-lit and enclosed above the larger auditorium space beneath. The route then emerges onto a rooftop terrace with steps and lift down to the road and dock entrance.

This arrangement changes the possibilities and options for the link and during the meeting further options were suggested as the most appropriate for linking both to ground and to the Quay stores building at loft level (see section 7)

The Torch

Chris Evans and Kevin Thompson (iDeA Architects) met with Peter Doran, artistic director at The Torch Theatre on 28 March, joined by Dr Ben Reynolds (Urban Foundry) in conference via speaker-phone to discuss the further development of link proposals arising from the earlier Quay Stores Feasibility study, in which Peter was originally consulted. The meeting gave the opportunity to:

- Review the potential benefits of an east-west link to the Theatre.
- Consider how this could physically fit with the existing theatre complex
- Review design options for inclined and vertical lifts with routes via the Theatre environs to the south and deck links to the Theatre's café and reception.
- Hear and digest Peter Doran's comments on the on-going development of the Quay Stores.

The meeting reinforced the need not only to create an effective link between Quay Stores and the Torch Theatre but also to develop a cultural venue that will complement and build upon the Torch Theatre's existing offer with facilities that the Torch would find genuinely useful. The Torch's main concern would be to avoid duplication of the existing facilities and artistic programme and to retain a single administrative organisation and box office. We began with a short walkabout to look at the peripheral spaces and external environs of the theatre before sitting down to discuss the proposals and sketch design options.

The need for a 400 seat Theatre auditorium remains questionable to the Torch. However, replacing the existing dance studio facility with a new purpose -built studio space is a much more attractive proposal to them. Demolishing the current rehearsal studio (in a converted WW2 building) would create a potential site for the link at the northern end of the Torch complex, see Figure 23. This would be remote from the theatre/ stage service access at the opposite end, avoiding potential noise issues within the theatre auditorium.

We have not considered this option in the report thus far since the focus has been on creating a direct East- West link between Charles Street and the Quay Stores site. However, the question arose, what is going to be left to rejuvenate in Charles Street in the future? What will the town centre become bearing in mind the loss of retail that is occurring now? A link to the north end of the Torch at Robert Street is a possibility being close to town centre parking and to residential areas. This option is difficult at the lower level however, due to the Costa Coffee development. Furthermore, this would effectively be a link with the station rather than Quay Stores, unless the lift route ran diagonally SW across the cliff escarpment toward the Quay stores site.

Pembrokeshire County Council (PCC)

We held discussions with officers from PCC (appendix 2). There is an emerging regeneration framework for Milford Haven, which the Port Authority is party to – the re-emergence of the Town Team approach (which had folded prior to the commencement of our last study for MHPA) is intended to result in the production of a strategic regeneration framework for the town. MHPA is clearly a key body for this process and likely to be heavily involved, but it is important that in the overall strategy clear priority and some detail is given to connectivity and movement lines, which will provide the strategic/policy case for financial support for measures to enable this.

The South West Wales Regional Retail Study conducted by Carter Jonas and referenced

in our previous report highlighted a declining retail sector and effectively a downgrading Milford Haven within the local retail hierarchy of centres. Current thinking is to consolidate the retail on Charles Street to reflect a diminished retail and service offer, with likely conversion of many units back to primarily residential accommodation. Absent of the detail of these proposals, which are still in development, it is difficult to provide much commentary save that an increase in the residential density of the town centre (provided that there is a mix of type and tenure) should be a positive change, enhancing the immediate market for local amenities and to feed down to a rejuvenated waterfront (and within it the Quay Stores site). This too strengthens the case for an east west linkage past the Quay Stores site. Further discussions were held in relation to funding – this is included in section 8 of this report.

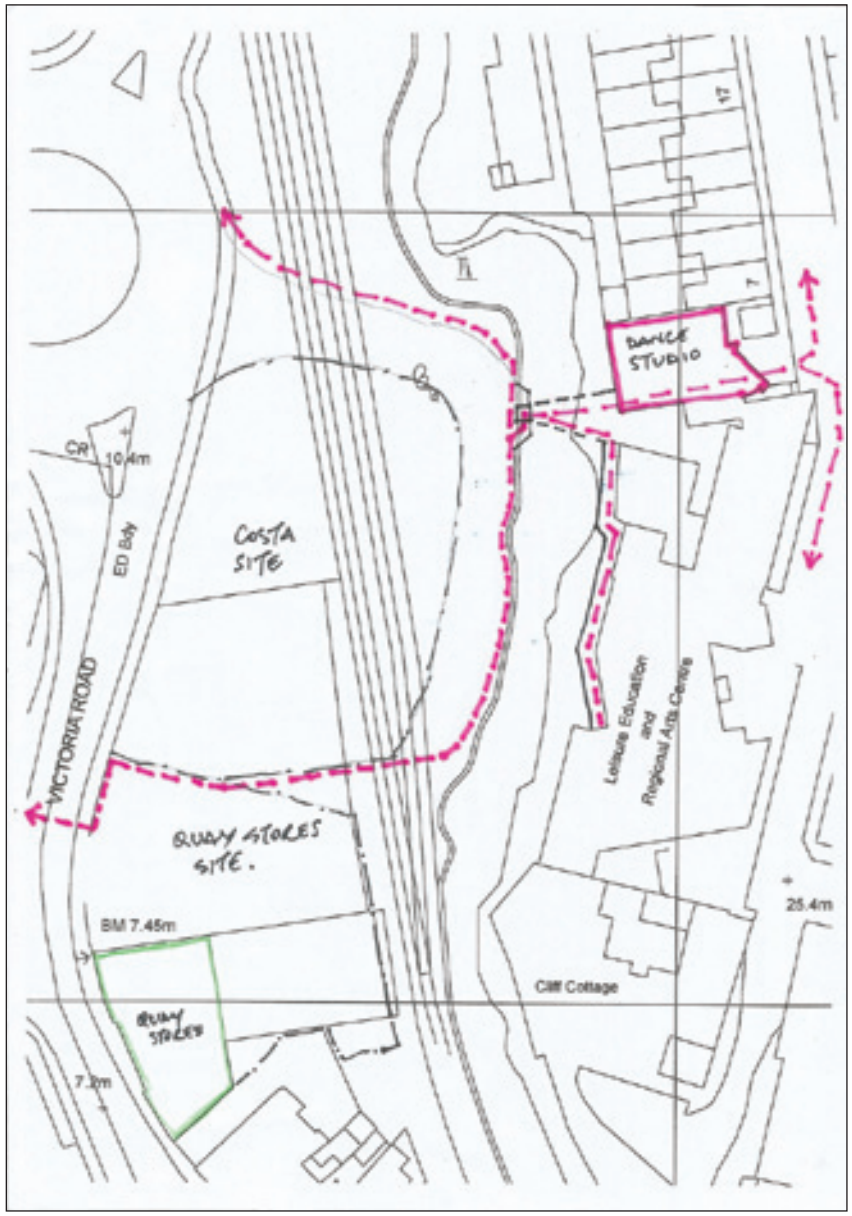


Figure 23, An Alternative option for the east-west link via the Torch / Robert Street but not directly connected to Quay Stores. This would require demolition of the existing Dance Studio which could relocate into Quay Stores.

FURTHER DESIGN OPTIONS

SEVEN

OPTION 5 – INCLINED LIFT CONNECTING WITH QUAY STORES AT SECOND FLOOR/ LOFT LEVEL

This option shows an inclined lift from Quay Stores loft level to the Torch/Charles Street

The Inclined lift follows the cliff profile and could terminate at the top of the escarpment or continue up to connect to the Torch balcony level.

The rear of the Quay Stores loft level is shown extended to provide a landing platform. The glazed roofing could also be extended to provide a covered access to the inclined lift cabin.

The extended loft level would be supported on pylons to bridge across the ravine. These would need to avoid the main drain easement, which may prove difficult. There would be issues of differential settlement, which would need to be designed for.

This option provides a transport link and covered route through Quay Stores to the entrance to the dock but relies upon opening hours of the building to provide the link. This option does not connect directly with the 'green ravine'.

Benefits

- Avoids clash with drain easement

Disadvantages

- Does not connect with 'green ravine'
- Requires extension to Quay stores gallery
- Requires structural support for lower landing

Cost elements subject to scheme/detail design:

- Extension to Quay Stores loft gallery level
- Acquisition of Cliff Cottage plot
- Structural pylons to support lower landing/ extension platform
- Inclined lift supply and install approx. £250,000 (excluding structural support of track)

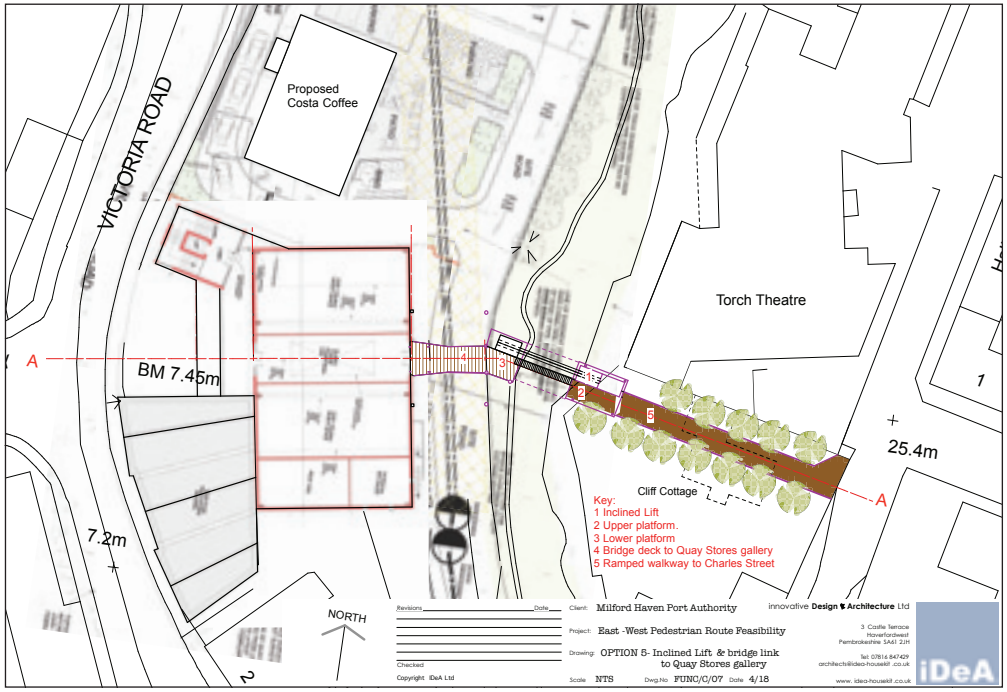


Figure 24, Option 5 Plan

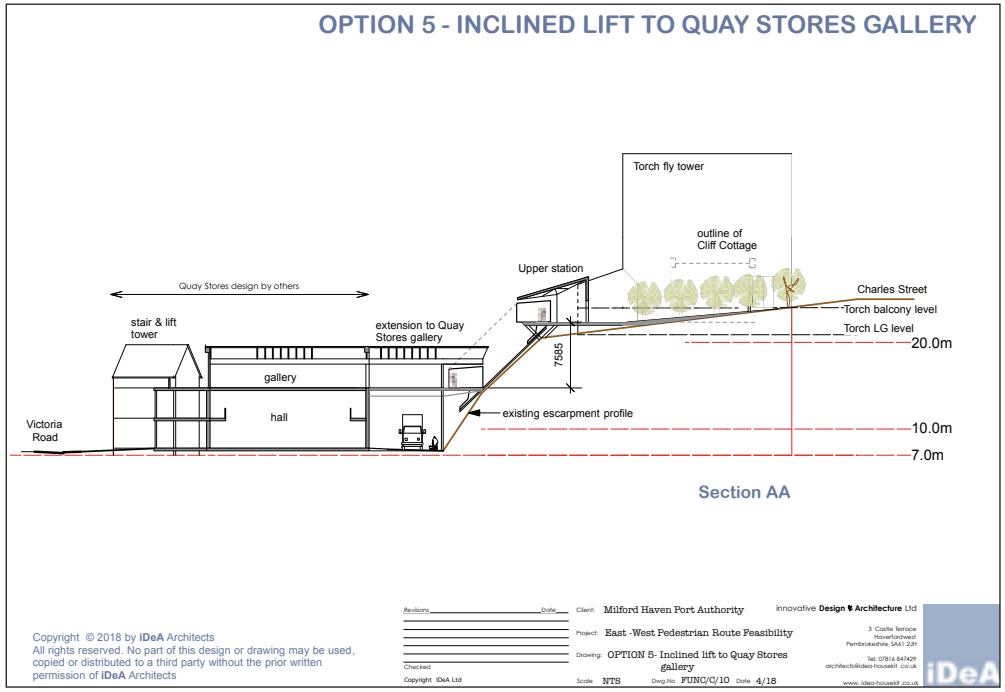


Figure 25, Option 5 section

OPTION 5A – VERTICAL LIFT CONNECTING WITH THE 'GREEN RAVINE', LOFT LEVEL AND TORCH

This option shows a vertical feature lift tower, which could connect to the 'green ravine' at ground level, the Quay Stores at loft level and either the top of the escarpment or the Torch balcony level.

If the lift tower is positioned in line with the Quay stores loft it would act as a pivot point with the connecting upper deck, and provide support for the extension of the loft arcade level. This option would allow for movement in all directions and access to the waterfront could be maintained at all times if the East-West route through the Quay stores is closed.

Benefits

- Avoids clash with drain easement
- Connects with all levels
- Could provide landmark feature
- Glass lift provides panoramic views

Disadvantages

- Requires acquisition of Cliff Cottage
- Excavation into escarpment required
- Requires extension to Quay stores loft gallery
- Upper deck/bridge connection required

Cost elements subject to scheme/detail design:

- Design and provision of extension to Quay Stores loft gallery level
- Acquisition of Cliff Cottage plot £155,000
- Structural design and provision of feature tower
- Excavations associated with lift tower base and foundations
- Panoramic lift supply and install approx. £200,000
- Deck/bridge connection to upper or lower Torch level

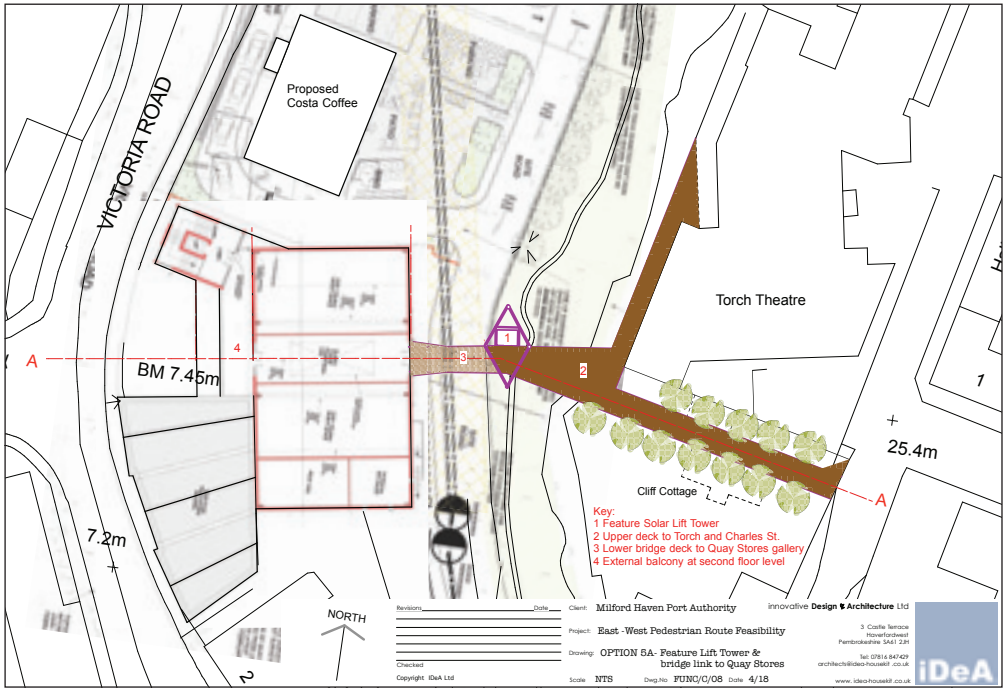


Figure 26, Option 5A Plan

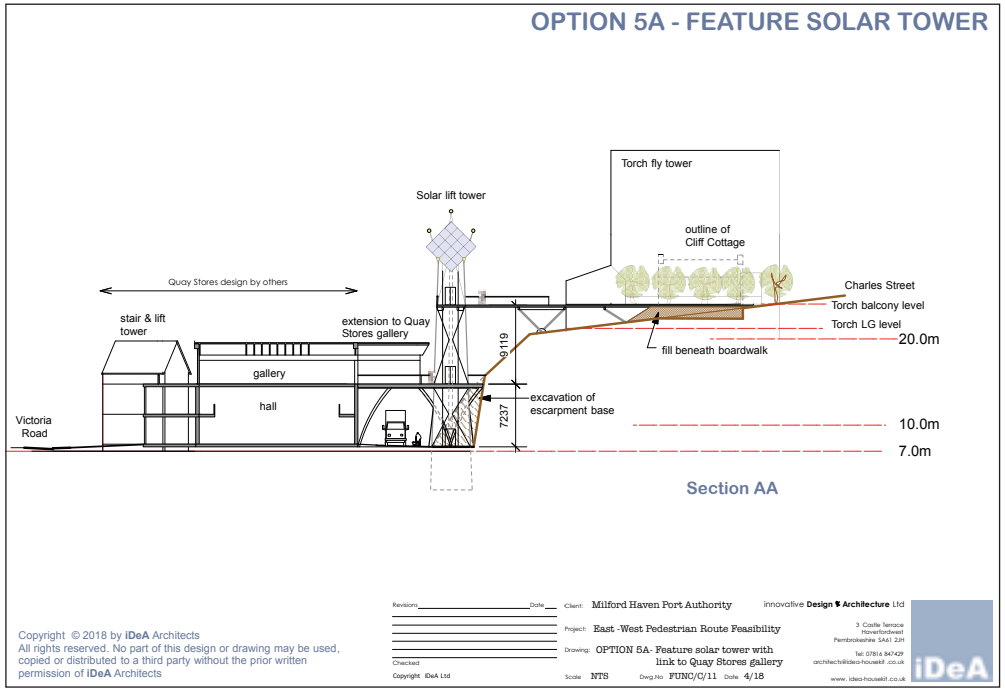


Figure 27, Option 5A section

OPTION 5B – A COMBINATION OF 5 and 5A

This option shows a hybrid or combination of 5 and 5A and combines an inclined lift and walkway deck with a lift tower. The lift tower could provide structural support for the lift car platform above the 'green ravine' as well as connecting with ground level to allow pedestrians to go North to the rail station and South to the Marina.

Apart from increasing capital costs by having two mechanical modes of transport, if the Quay Stores building was closed, pedestrians would need to transfer between the inclined lift and vertical lift to reach ground level.

Options 5A and 5B have the potential to deliver:

- A landmark feature
- A tourist attraction as well as link infrastructure
- A celebration of the Port's self-sufficiency in green energy with a 'solar sculpture'.

Further design development of the preferred option is needed to work up scheme cost estimates including the following:

- Design team/ professional fees- Architect/ Structural Engineer/ QS/ specialist solar engineer
- Foundations
- Groundworks including rock stabilisation
- Superstructure- solar tower sculpture and link decks
- Solar panels: design and installation

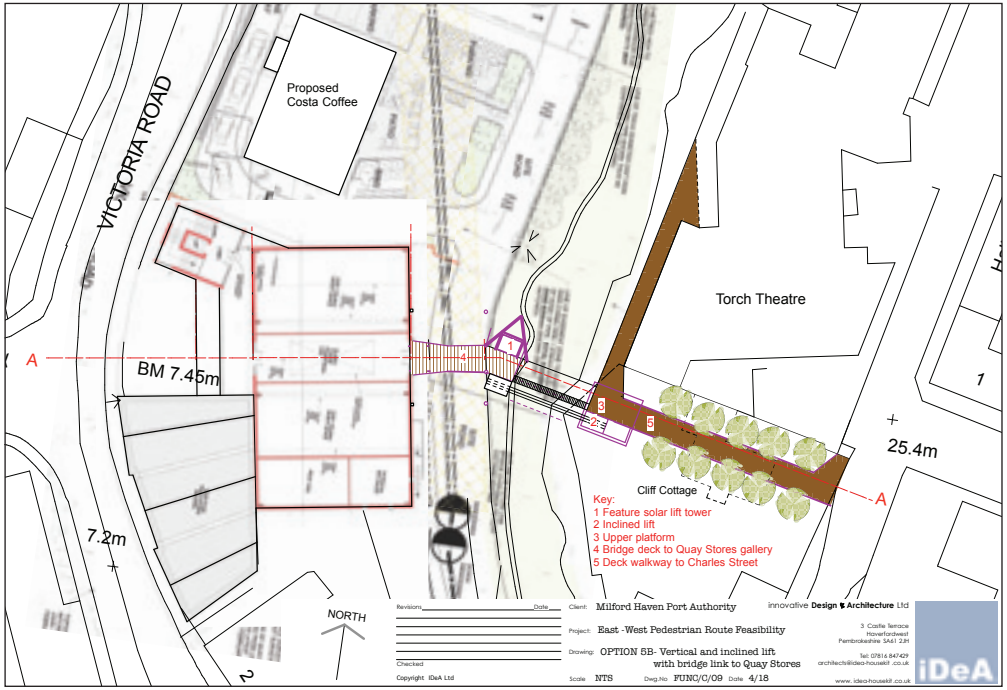


Figure 28, Option 5B Plan

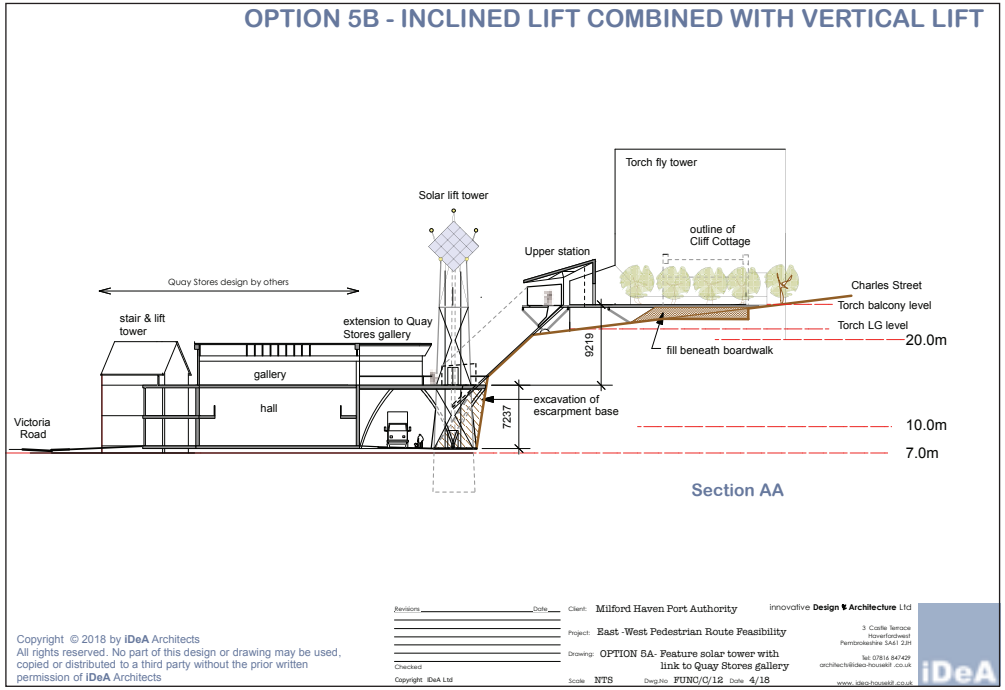


Figure 29, Option 5B section

VISITOR ATTRACTION POTENTIAL

EIGHT

Figure 30, Ljubljana's inclined lift is both functional and a popular attraction

The idea of a funicular-type link began with the example of the passenger lift to reach the castle in Ljubljana, the capital of Slovenia. Since its commission in 2006 the funicular has proved enormously successful as a tourist amenity linked to an attraction, return ticket costs 4 Euros, with family tickets priced at 10 Euros. The passenger car can accommodate up to 33 persons capacity and it is astonishing to read the statistics of the visitor numbers who have used the funicular over the last decade.

"At the end of 2006, the Municipality of Ljubljana connected the Ljubljana Castle with the old town centre with an urban means of passenger transport. Due to spatial and design requirements, the best solution proved to be a cable car or, more specifically, a funicular railway. At the end of 2010, we transported the millionth passenger to the castle, in the middle of August 2014 the two millionth, and already in May 2017 the three millionth."

The Ljubljana inclined lift has proved itself to be a successful business model as well as a design icon, winning awards shortly following its inception in 2008 placing it in the first rank of tourist attractions such as the Millennium wheel on London's south Bank. The need for the link however was to reach the Castle that overlooks the city without having to undertake an arduous climb. It is not a direct comparator as the Castle is in itself a major tourist attraction and significantly fuels the user demand for the lift.

The new inclined cableway link at Ebbw Vale is much nearer to Milford Haven – both geographically, located in South Wales, and in terms of its purpose to link two areas of the town via a steep change in level equivalent to several storeys height, rather than as a tourism attraction. The case study for Ebbw Vale follows in the appendices but in summary, the Ebbw Vale example has been successful in creating a link between the town centre and a regenerated former industrial area below, with good usage numbers reported. There is some evidence of people visiting to see and ride the cableway, but the majority of users are undertaking local trips as part of everyday life in the town. Local Authority officers from Blaenau Gwent Council reported that it had been impactful on the town centre by encouraging footfall between the two locations, as well as enhancing the regenerated site of the former steelworks at the foot of the link.

There are several examples across the UK of mechanisms (whether funiculars, inclined lifts of similar) to create pedestrian linkages via steep terrain. In all of the operational coastal examples we found open to the general public there was a (generally modest) charge for use. For those that would provide the information (several deemed it commercially sensitive) their running costs, which did not include any repayment of capital, were largely or entirely covered by their earned income. However, they were all heavily (or totally) reliant on unpaid volunteers to operate them, generally drawing on heritage enthusiasts and/or those with environmental interests. We do not consider this a viable model for a newly created system in Milford Haven. A summary of these other examples, with links to relevant websites, is attached as Appendix 3.

In the Ebbw Vale case, there is no charge for use – in part this related to capital funding constraints as a condition of grant. Officers in Ebbw Vale cautioned that the creation of a charging process likely requires staffing for the facility, which itself creates costs and may outweigh the revenue generated. Furthermore, the overhead costs in the Ebbw Vale example

appear far more significant than others we have looked at. An automated solution with ticket barriers at the top and bottom with a London Transport style contactless payment option (not presently costed in the capital costs) could remove the need for staffing. If a coin element is included then machines will need regular emptying/maintenance.

There may be scope for purchased ticketing from the Torch at the top and the refurbished Quay Stores at the bottom (with some form of revenue split to cover their additional costs of operating this), though the need to make even a small detour to purchase a ticket may put some people off using the system.

The Lubliana example is in a high-profile historic capital city location with tourism high on the agenda and Milford Haven by comparison is commercially less vibrant and is not at present a high priority on the tourist trail. Whilst other examples do carry a modest charge, and with the completion of the waterfront destination in Milford Haven, it is reasonable to assume visitor uplift, tapping into the strength of the wider tourism in the county. However, in the shorter term prior to completion of the waterfront and its establishment as a visitor destination, usage of a funicular/inclined lift in isolation is likely to be restricted to existing markets, both of visitors and local residents. The view of officers from Blaenau Gwent, where the majority of use is by local residents, is that charging would be counter-productive and likely to deter local users and our view is that in the short-term it is unlikely that the link could sustain any appreciable commercial model. If earned income is a requirement (as opposed to treating the facility purely as infrastructure and absorbing running costs), then the timing of its creation will dictate the viability of charging. Appendix v considers income generation from a funicular/inclined lift – our view is that it is very unlikely, even with a significant tourism uplift that such a facility could be self-sustaining but there is scope to reduce running cost.

The provision of such features as public infrastructure demonstrates change and the aspiration to put the town on the visitor map in Pembrokeshire. The county as a whole has a thriving tourist economy and the Waterfront development will need to provide incoming tourists and visitors with attractive short walking routes as a means of getting around the venues, without the need for returning to their cars and driving back and forth during their stay. Whilst there is a strong visitor focus to the connections, the enhancement of this route is also about local people going about their daily tasks and improving connectivity between Hakin and the town centre as well as linkage between the town centre and those residents that will be living in newly created waterfront accommodation.

Funding

Pembrokeshire County Council has no internal funds to allocate towards the scheme. Additionally, the Welsh Government's successor regeneration programme to the Vibrant and Viable Places (VVP) funding is the Targeted Regeneration Investment (TRI) fund. Pembrokeshire County Council's priority areas for TRI funding are Haverfordwest and Milford Haven and it is unlikely that there will be any significant spend in Milford Haven.

However, PCC have been asked to prepare business cases as reserve options for any potential City Deal underspend. Milford Haven waterfront is already on the list of reserves and these business cases are in development presently. If MHPA determines that the link to Charles Street is to be pursued then incorporating this clearly into such proposals needs swift attention – PCCs intention is to get the underspend options to Cabinet for the summer so that they are ready go should funding become available, meaning that business cases are close to completion now. This is a possible option for capital and potentially some (short term) revenue funding.

Local authorities are generally the principal bodies responsible for movement in and around places – PCC officers reported that most funding for councils for connectivity projects is currently focused on sustainable transport routes, which are typically much more smaller scale in terms of costs, with some capital costs for signage and mapping and very modest (if any) revenue elements.

Welsh Government are keen, through the LTF, to consider alternative transport modes. LTF has contributed capital funds towards the lift as part of the multi-storey car park in Tenby, which was linked to a transport interchange - there remains an aspiration by PCC (but presently no clear funding allocation or plan) to develop Milford Haven train station as a transport interchange. A strong argument could be made for the funicular/inclined lift as part of a wider strategy for the train station/ravine/lift at Milford Haven and LTF funds could potentially contribute towards the capital costs. This will be subject to negotiation with both PCC and Welsh Government and a more detailed proposal submission for their consideration following discussion; it will also be dependent on available funding at the time of submission. It is not possible at this stage to give a steer on likely funding levels from this source, but this is a route that should be pursued directly with PCC and Welsh Government.

During the course of the current study we highlighted the potential underspend within the Building for the Future (BFF) fund and its potential as a funding source for the Quay Stores building – European funded at source, it is a scheme designed to bring empty

commercial spaces back into active use, with the principal outcome of 'jobs accommodated'. Currently, the scheme is fully subscribed but there is a likelihood that some schemes will drop out creating spare capacity and reserve lists are being compiled. PCC has other priority buildings, but the Quay Stores is on this reserve list and PCC would be supportive of an application to BFF should there be a call for further projects. Whilst the funicular/inclined lift would not be eligible under this scheme as a stand-alone provision, there may be scope to combine the Quay Stores site and lift into one scheme, with BFF funds going towards the building and providing part of the match funding for an overall project. BFF is a wholly capital fund, with no revenue components.

PCC have recently implemented a 150% Council Tax levy on second homes, which PCC anticipate will raise around £1m of additional funding per annum county-wide. Each community will be eligible to apply for funds raised, with the focus on negating the impact of second homes. It is a little tenuous but there may be an argument to be made in Milford Haven under this scheme, for funds towards improved connectivity. Much like Section 106 funds, the closer the proximity of second homes to the site of the scheme the easier it will be to make a case for funding from this pot (this would also apply to any second homes constructed elsewhere within MHPAs waterfront development). PCC officers reported that the funding is available to any community group and non-business, so MHPA should be eligible but this will need confirming once funds become available. It is presently unclear whether this is both capital and revenue, but is likely to incorporate both.

Furthermore, Section 106 funds are worthy of consideration as a contribution towards capital costs – PCC are currently reviewing the Local Development Plan for candidate housing sites. The key issue will be to make a connection between the need for improved connectivity between the town centre and the waterfront and new sites of housing, most of which are likely to be located on the outskirts of existing settlements. Again, any new housing within MHPAs wider waterfront development will also count, and MHPA should negotiate with PCC to target as much of the Section 106 funds from the existing development as possible to other, non-commercial schemes of community benefit within the overall scheme.

Whilst it is unlikely for this type of project to be funded from Trusts and Foundations, we conducted a funding search using the Directory of Social Fund (DSC) www.Trustfunding.org.uk data base, which has over 4,500 grant making organisation on it. We also checked the DSC's www.Governmentfunding.org.uk dataset. Neither returned any results of funds that could contribute towards this type of scheme.

We also spoke to the Big Lottery about its Coastal Communities Programme in Wales to ask in particular if a new round will open this year – a decision as to whether a further round will happen in Wales is currently with Welsh Government. If it is decided to have a sixth round it would go live sometime in the spring of 2019 with criteria for the scheme announced then – depending on whether the criteria are changed, there may be scope to draw on this funding stream. However, it is most likely that any external funding would need to come from one or more governmental sources.

Regardless of funding source availability, it is highly unlikely that there will be any future funding source that will provide medium to long term subsidy for revenue costs – if funding can be sourced it is likely to either be exclusively capital funding, or predominantly capital with a very modest (short-term) revenue component.

SUMMARY

NINE

The design options presented in sections 5 and 7 explore the alternatives for a transport link and some of the permutations for ways in which the East-West link could be achieved. They show how the link through Quay Stores would enhance and/ or affect the Torch Theatre, and how each would work with the proposals to extend the Quay Stores building . The proximity of the site to the Torch is a key factor in consultation and input from the Torch is welcomed at this stage to get 'the best fit' at the upper level. Adaptation of the Torch building interior- to remove and relocate the stairwell was considered but is not included. A route through the Torch site is constrained with numerous obstacles and services in the existing yard that make it an unattractive proposal for siting the station. A far better solution would be to purchase Cliff cottage and its site immediately south of the Torch and to use this for the link and upper landing station.

The choice of link should be intimately connected with and support the proposed development of the Quay Stores. The idea of a transport link was initially proposed, along with traffic calming (shared space) and a designed entrance into the harbour to increase connectivity and footfall through the site and in so doing enhance the commercial viability of the Quay Stores development.
Taking the link at high level through the proposed extension loft does complicate the clarity and asks a lot of the user to keep going toward an unseen destination. It also could mean that people passing through are oblivious to the offer at ground level to engage in leisure or cultural activities or shopping.

Choice will also depend on cost. It is hoped that a basic, functional link in the form of a vertical lift or inclined lift should be achievable for less cost than the Ebbw Vale link project (£2.3million overall, £1million for the lift system).The cost estimates given show that a range between £200-250,000 will deliver a vertical or an inclined lift installation, but there are other additional construction costs to consider in providing the lift tower and/ or constructing the cliff engineering and groundworks to install an inclined lift, as well as the aerial decks and bridges that would access a lift tower.

Further work to include a design that creates a 'Landmark'*

An additional piece of work came out of consultation with Neil Jenkins, to produce a concept design for a landmark structure that incorporates vertical links to the ground and to the loft level – as shown in the latest design proposals for the Quay Stores extension (see appendices)

The concept design* shows a more iconic scheme. This proposes an open steel frame structure that echoes the Torch symbol, or an opening flower in its shape and supports a diamond -shaped solar array facing to the south. The tower extends high enough for the 'solar cap' and finials to be seen from Charles Street on approaching East towards the Torch. The steel ribs would extend higher as finials and light the corona at night as a beacon style feature

Well known landmark projects of this kind exist across UK – Gateshead bridge -Wilkinson Eyre Architects, Bankside footbridge - Foster associates, the London eye- Barfield Marks, Spinnaker tower , the Olympic tower etc.

Costs increase significantly where the design of the link is conceived of as a 'landmark' and a focal point, with presence and a more iconic role as an attraction in itself. The quality of design needed, and the ambition and scale of engineering required make this a multi-million pound scheme, putting the project into another category in terms of how it will be paid for. However, we have responded to this with a landmark design a result of our meeting with Neil Jenkins.*

MHPA must decide whether cost is a priority in determining whether the proposed scheme should be developed in its simplest form as a utilitarian link or progressed as a more iconic and image -conscious piece of contemporary design. A vertical glass lift installation would be a relatively small proportion of the cost of the structure that holds it – the vertical lift will be the cheapest to install and maintain, but it will then be a piece of infrastructure; it would not be viable to charge for use of a vertical lift. For an inclined lift or funicular there is scope for a modest charge, but the cost of collecting fees needs to be balanced against the likely revenue generated, which will be relatively modest. In any instance, a subsidy will be required to cover revenue costs and MHPA should consider the development as a piece of infrastructure.

The balance here would be to achieve the scale and impact of these with the most efficient and cost-effective construction. The technical challenges of this further design option would need to be assessed and costs developed beyond the feasibility study*

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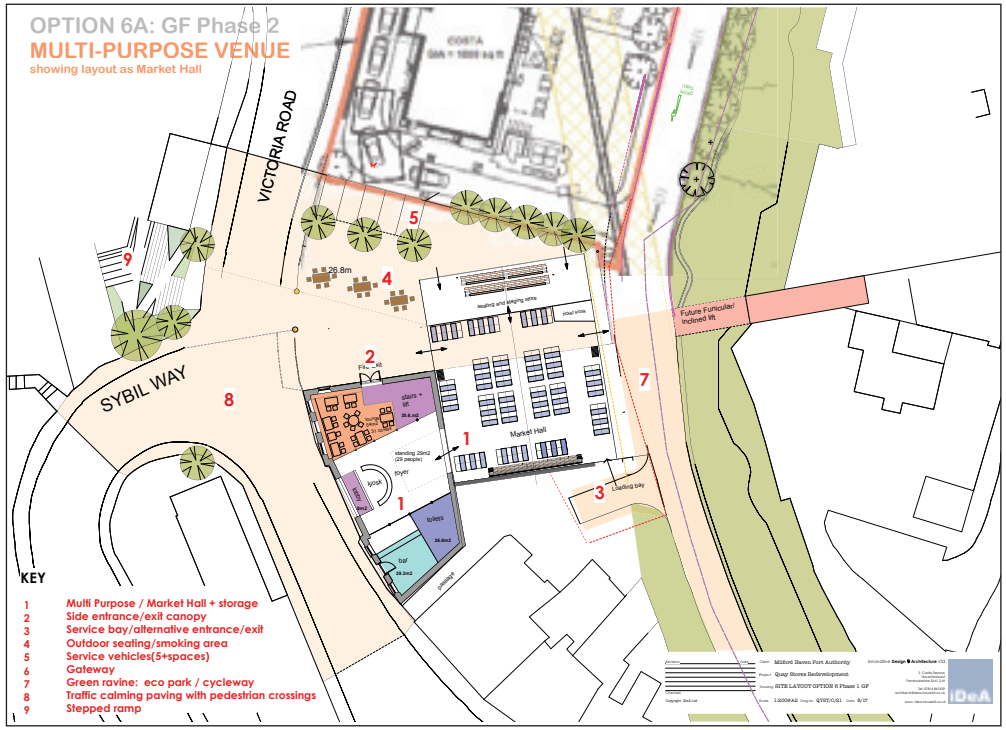
APPENDICES

TEN

Figure 31, Option 6A Phase 2 from previous study
(other layouts included 400 seated or standing performance)



ii

Current GF and SF plans for Quay Stores extension by others

Figure 32, Current GF plan

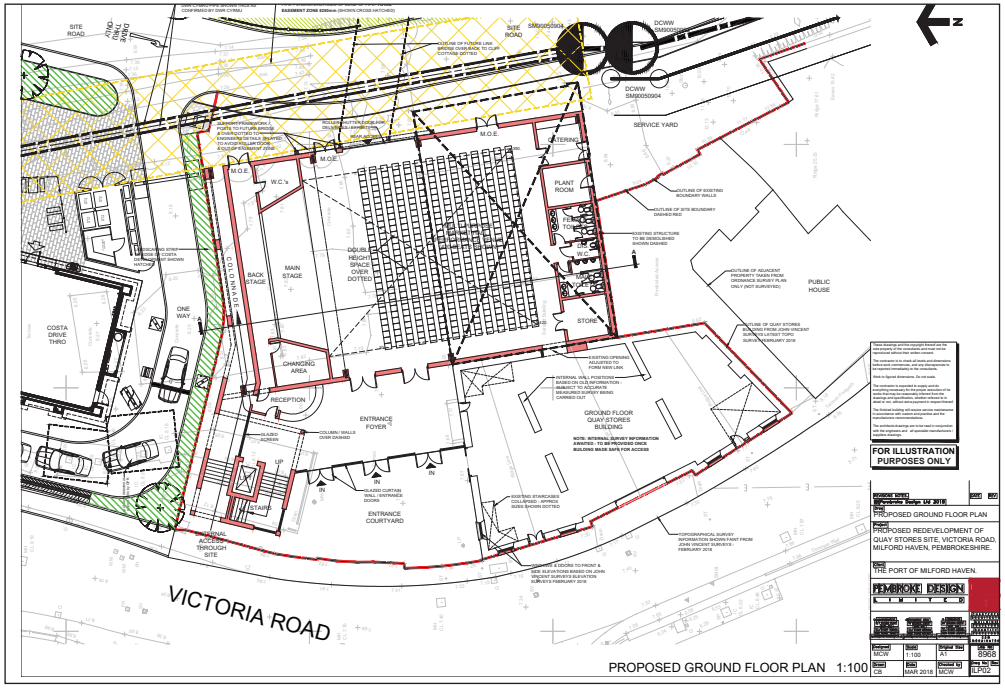
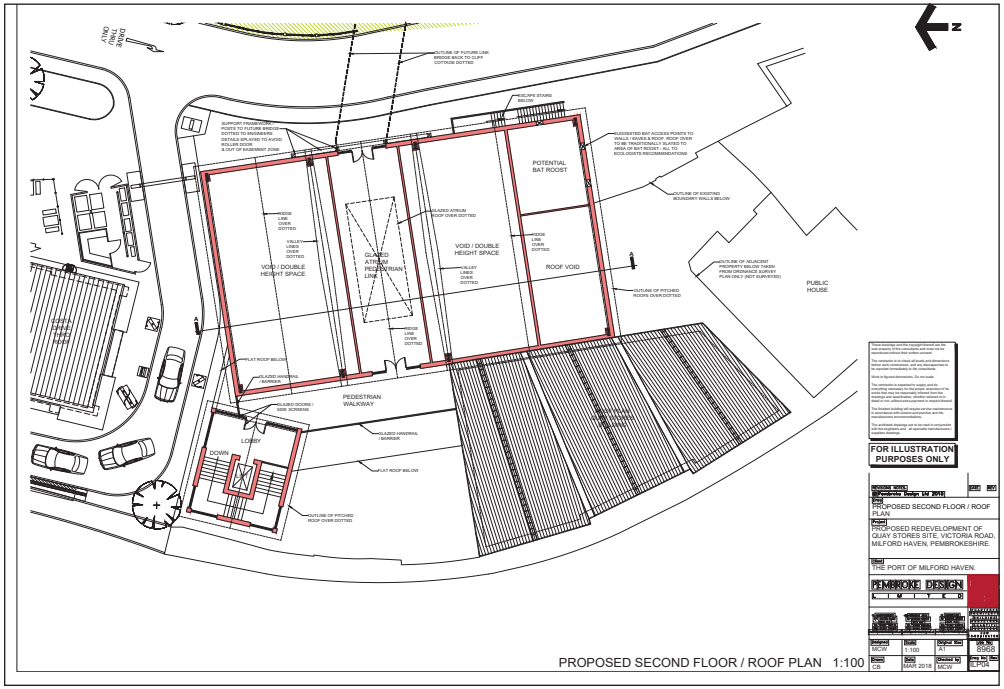


Figure 33, Current SF plan



iii
Consultees

Matteo Schiatti
Maspero Elevatori
http://www.maspero.com/eng/

Bruce Groom & Thomas Darren
KONE Lifts & Escalators
http://www.kone.com/en

Paul Colston
Blaenau Gwent CC

Peter Doran
Artistic Director, TORCH Theatre

Ceri Evans
Transport Strategy and Project Co-ordinator,
Pembrokeshire County Council

Sinead Henehan
Community Safety, Poverty and Regeneration
Manager, Pembrokeshire County Council

Neil Jenkins
Destination Director, MHPA

Colin Sharp
Town Councillor

Martin White
Head of Regeneration,
Pembrokeshire County Council

iv
CASE STUDY: EBBW VALE

In June 2015 Blaenau Gwent District Council opened the Ebbw Vale Cableway (also known as Mechanical lift). The single -car lift has is relatively short journey -143 feet (43m) up the incline, equating to a vertical rise of 75 feet (23m), and is intended to improve access between levels to link the 'Works' site and Coleg Gwent with the town centre. The 'Works' site is the site of the former steelworks, which has been redeveloped to include a new college campus.

We chose Ebbw Vale as a local example that we could go and see at first-hand and also because of its similarity to the proposal at Milford Haven, having a short lift and journey distance and as an example of linking a regenerated area with the existing town centre across a steep, difficult to negotiate change in height equivalent to several storeys.

The project was funded by the Welsh European funding Office (WEFO), with a total project cost of £2.32million (lift element £1million). The design and build contract included an upper and lower station building with associated landscaping to the upper street entrance.

We met with officers of Blaenau Gwent Council in March (2018) to gain more insight into the project, to find out about the pros and cons of such an amenity, and to evaluate its success in terms of its performance and popularity in use. We also discussed the on-going running costs with a view to whether the choices and type of transport provided were the right ones and the most appropriate for this situation.

Figure 34, Mechanical lift at Ebbw Vale

The team currently in charge of the inclined ' mechanical link' described issues around the on-going maintenance and repair not just due to 'wear and tear' but more fundamentally to the specification of a cable- driven installation that comes under the 'tramway' regulations which require safety measures to be put in place and which we were told, are more onerous in terms of meeting operational and safety standards in use.

The facility has numerous safety measures that if triggered cause the car to stop and this has led to situations where people have had to be evacuated down the steps alongside. Following instances such as these, the Council have decided to man the lift in operation even though the lift is fully automated, which adds to the running costs'.

The council's team have had instances of this occurring where occupants have leaned on doors. Teething troubles have largely been ironed out, but it remains that this is a specialist cable- way installation, produced to high standards but supplied by a German company having only a few approved contractors to

maintain in UK, and none in Wales. Where components fail (these can be small) we were shown an example of a mechanical switch in the head-gear to operate door open/ closing. When this happens, the facility has to remain out of commission until parts can be supplied from Germany.

The council try to mitigate this happening with a stock of parts but told us that they now recognise the disadvantages in terms of the on-going running costs in having such a bespoke-engineered facility where in hindsight a more 'off the peg' lift installation could have sufficed.

At the other end of the spectrum, and in the overall view Blaenau Gwent are very proud of their achievements to redevelop the Works site, of which the link is a part. The link facility is reasonably well-used by students on campus to visit the town but its difficult to assess the footfall and how this translates into economic benefit for the town centre.

There has been an element of wow -factor bringing people into visit Ebbw Vale but the location although close to the Brecon Beacons geographically, isn't known as a destination for tourists and the link, positioned to serve a new campus, has no obvious venues or residential developments in the immediate vicinity around it (bounded by a busy road at elevated level).

The clear message from Blaenau Gwent council officers was the importance of making the right decision regarding the type and category of transport link for the situation. This is important when considering the nature of the link. E.g.:

- Is it a ride/ attraction? In which case a cable or tramway may well be the better choice - especially where longer distances are involved.
- Is it a functional piece of infrastructure? In which case a less 'wow factor' but more easily maintained and functional and less costly choice would be better.

Depending on which category applies, broadly speaking the choice falls between 'lift' technology (vertical and the more specialist-inclined) falling under the lift regulations, and cable or tramway – including 'funicular' railways falling under another set of regulations for these types of passenger transport.

Costs

There was little information remaining from the original feasibility study and no copies were available – officers we talked to were not involved in the formative stages and there was little institutional memory of the details of the initial stages of the scheme.

Capital and start-up costs

Item	*£*
Lift and equipment	1,000,000
Groundworks and associated capital works	1,300,000
Initial licensing costs	15,000
Retained capital for replacement items	18,000
TOTAL	2,333,000

Running costs (per annum)

NB An annual figure of £70,000 was provided by Blaenau Gwent officers, but only part of this breakdown was available as follows:

Item	*£*
Lift operator (it is staffed whilst in operation)	16,000
Maintenance contract with supplier for regular checks	12,500
Electricity	7,000
Business rates	12,000
TOTAL	47,500

Additional costs, which we were not able to get accurate figures for, but which relate to the facility included:

- retention of a 4 person rescue team within easy reach (staff had other roles and so this would be an apportioned amount and not necessarily an additional cost if they were in full time roles already, nevertheless it is in principle a direct cost of maintaining the facility);
- CCTV;
- security;
- outsourced cleaning; and
- parts.

No sinking fund is budgeted for – Blaenau Gwent CC purchase parts as and when required.

Income generation potential:
Any uplift in visitors to Milford Haven will be largely contingent on the wider redevelopment of the waterfront – the funicular/inclined lift will not in itself be a significant tourist attractor (though it would add to tourist visit experiences and should create added value by encouraging those coming to use more of the local area).

To model potential spending on a funicular/ inclined lift (short of the creation of a landmark tourist attraction structure it is not credible to consider that people will pay to ride a vertical lift purely for reasons of connectivity), the usage figures for the railway station offer a starting point. The usage figures have been drawn from the Office of Rail and Road, which produce annual statistics for rail station usage (the most current statistics are for the 2016-17 year). Current figures are 64,092 uses of Milford Haven train station in the year (which is broadly in line with the previous year's figures so suggesting a relatively stable user number for modelling).

There is no data set that gives us a reasonable steer for how many of these people currently visit or go via the town centre (whether on their way to or from the station) but it is reasonable to assume a relatively large number will. Many will remain car borne (or changing to a bus) as they will come from/need to go a further distance away. Absent of more detailed data sets, some assumptions need to be made to estimate potential for income. For now, it is assumed that 20% of train station users annually could descend from the town centre to the station or go the other way on foot and that 50% of that number (so, 6,409 people) are willing to pay a modest fee of £1.50 each way to ride the funicular/inclined lift, and that everyone who goes up, comes back down for a return trip or vice versa. That would generate an annual income figure of £19,227. This increases to £25,636 per annum if a £2 each way fee is applied but the higher the charge the greater the disincentive for day to day and regular users.

Some examples of other operational funicular/inclined lifts from across the UK are provided below. Fees for other funiculars/inclined lifts in operation in seaside locations are generally modest, with a return trip cost of between £2 and £4 (with the CAT example in Machynlleth more expensive at £6.50). Concessions are available for children and some of the examples below offer reduced rate (significantly so in some instances) for season passes. – a flat rate is assumed above for a barrier system similar to the Transport for London system for the underground, but there are many iterations of ticketing that could be implemented, including offering combination train tickets that include riding the funicular/inclined lift. But it should be noted that these examples are less infrastructural, and more attractions in their own right – the Milford Haven example is principally about connectivity and so charges would likely have to be modest. Clearly, for daily use by local people, the more modest the charge, the more likely it will be used for day to day use – it may be feasible to introduce a local card that carries a one-off annual fee (or perhaps that could be provided for free or a nominal charge in return for some modest subsidy of running costs from the Town Council and/or other sources).

Charging comparisons from similar facilities across the UK

Each of the following examples is a working cliff railway / cable hauled tramway in the UK and each is open to the public (as opposed to other examples that are focused on private/lifeboat)

1. BABBACOMBE

Adult
Single..... £2.00
Return..... £2.80
Child (Over 2 years)
Single..... £1.60
Return..... £2.00

2. BOURNEMOUTH CLIFFS

www.letsgoout-bournemouthandpoole.co.uk/cliff-lifts/
Adult..... £1.50
Child £1.10
Family (2 adults and 3 children under 16)..... £4.90
One week pass (unlimited use for 1 person). £9.00
Season ticket (per person) £25.00
Children under 5 and permanent wheelchair users plus one carer travel FREE

3. SALTBURN CLIFF TRAMWAY

Single fare or one way only:
Adults £1.00
Children (aged 4 – 16) 50p
Children aged 3 and under .....free
Family ticket (2 adults and 3 children or 1 adult and 4 children) £2.50

4. SCARBOROUGH CLIFF RAILWAY

www.scarborough.gov.uk/home/roads-highways-and-pavements/cliff-lifts
Cost to travel .....75p each way

5. MACHYNLLETH

http://visit.cat.org.uk/index.php/whats-to-see/14-water-balanced-cliff-railway
Adult..... £6.50
Concession* £5.50
Child** £4.00
Under 4's .....Free
Visitors living in the SY19 and SY20 postcode have FREE entry. It is not however the only water balance railway in Europe as they state in their literature, as the Lynton and Lynmouth railway also boasts this method of locomotion.

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CAT Funicular data sheet

THE WATER-BALANCED CLIFF RAILWAY
Centre for Alternative Technology, Machynlleth, Powys SY20 9AZ, UK.

PROJECT COST:
£l million. Including upper and lower stations

INTRODUCTION
The Cliff Railway was opened at CAT in May 1992. It was developed to carry passengers up from the car park to the visitor site some 30 metres above thus improving access to the site, especially for disabled visitors, by eliminating the need to walk up the 30-metre path.

To finance all of 'Gearchange's' projects – including the Cliff Railway – it was decided to turn part of the Centre into a public company and launch a share issue to raise a million pounds. The response was fantastic, and soon the target was reached. An additional boost came from the Wales Tourist Board who gave a grant of £150,000.

DESIGN AND OPERATION
The cliff railway runs on two straight and parallel 1.6m gauge tracks, which are laid on a reinforced concrete ladder up the 34-degree slope. The ladder is anchored both at the top and the bottom to massive reinforced concrete blocks. A timber rail, which is used for emergency braking purposes, is laid up the centre of each track. There are two carriages, one for each track, which are both attached with a 32mm steel rope to the winding drum at the top. The ropes are arranged so that when one carriage is at the top the other is at the bottom.

Underneath each of the carriages is a tank, which can be filled with water to increase the weight of the carriage. When passengers have embarked, a computer dictates the point at which just enough water is in the top carriage to more than counterbalance the weight of the lower carriage. The top carriage will then descend, pulling the lower carriage up in the process. There are stations at the top and bottom of the track with a platform for each carriage. Access to the carriages is via a gate in the hand- rail which surrounds each platform.

STAFFING
There are normally two operating staff on duty, one at each station. During peak periods an extra member of staff is employed at the bottom station to load the passengers. In addition, there is a duty Site Manager and a duty engineer on call should the operators require assistance. Staff are trained should evacuation of the train become necessary

FACTS
The Water-Balanced Cliff Railway:

- is unique in Europe
- is 30m (100ft) high
- travels a distance of 53m (175ft)
- carriages weigh 3.5 tonnes each, plus up to 1.5 tonnes for the water tanks
- makes an average 10-12 runs per hour or 100 runs per day typically in summer season

Its average speed is 0.7m/s + 20%

- On average 100,000 litres of water is sent down daily 10% of which is then pumped back up
- It takes 50 seconds to completely fill the tank with 1600 litres
- There are 189 steps from the bottom station to the top station

Edited / adapted excerpts from the CAT Factsheet written by Tom Barker, Cindy Harris & Rob Gwillim, February 2003

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