# EAST TULLOS BURN RESTORATION

## Draft Conditions Report

ETZ Ltd

cbec eco-engineering UK Ltd and Walking-the-Talk

December 2023

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| | | |
| | | |

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## 1. INTRODUCTION

Energy Transition Zone (ETZ) Ltd have engaged cbec eco-engineering UK Ltd (cbec) and Walking-the-Talk, to develop a second phase of restoration proposals for the East Tullos Burn through St. Fitticks Park, Aberdeen (Figure 1.1). This follows on from an initial phase of restoration work, delivered by cbec and project partners Salix and Walking-the-Talk in 2014, which saw the realignment of an extended section of the burn, the construction of a series of online and offline wetlands and scrapes, as well as associated riparian planting and footpath/footbridge improvements.

Whilst the initial project delivered a vast improvement in biodiversity and amenity value to the site, issues such as water quality and silt accumulation have since been identified and need addressed in order to restore the original design functionality.

This latest phase of work forms part of a wider scheme, linked to the Aberdeen City Local Development Plan, which identifies the park as an Opportunity Site (integral to the delivery of the Energy Transition Zone). The scheme commits to enhancing both biodiversity and greenspace within the area, presenting an opportunity to address the aforementioned issues.

This report describes an up-to-date assessment of the current condition of the site to identify issues, constraints and opportunities present. This includes a geomorphic walkover to identify key features and constraints (Section 2), a topographic/bathymetric survey to capture detailed elevations across the restoration site (Section 3) and an ecological walkover to assess existing habitats and species present (Section 4). This information will be used to guide the subsequent production of detailed designs for both channel realignment and sediment management options associated with the existing wetlands. A summary of key considerations for the design development phase is provided in Section 5.

As with the original scheme, the development of this second phase of East Tullos Burn restoration designs will be underpinned by a 'nature-based' (also known as the 'process-based') approach, ensuring that the designs developed are appropriate within the geomorphic context of the wider site. The underlying concept of the approach is that addressing the processes of water and sediment supply, transport and storage at the largest possible spatial scale (i.e. catchment scale) will permit the burn to recover naturally towards a dynamically stable morphology that is self-sustaining and requires minimal post-implementation management intervention over the long term.


**Figure 1.1. Site/ Location Overview**

## 2. GEOMORPHIC WALKOVER

### 2.1 APPROACH

A geomorphic walkover was undertaken on Wednesday 6th December, covering the full extents of the previously constructed site (Figure 1.1), as well as an extended section upstream and any relevant areas of floodplain relevant to the subsequent design proposals. The assessment record all relevant characteristics of the channel, associated wetlands, and the wider floodplain, to assess the current physical condition of the watercourse, to allow a comparison to the original 'as built' design.

### 2.2 SUMMARY OF FINDINGS

Information recorded during the survey is summarised in Table 2.1 and Figure 2.1, with photographs taken during the survey presented in Table 2.2 and Table 2.3.

The survey data will be used to guide the development of designs for the section of burn realignment within the downstream section of the site, as well as informing the options for wetland management upstream.

**Table 2.1. Site conditions – key details from walkover for consideration in design**

| OS NGR Grid Reference | Description |
|---|---|
| n/a | No obvious zone of sediment supply upstream. |
| n/a | Bed of burn throughout site is sand. |
| NJ 9577 0449 | Flow into the upstream end of the site is attenuated by a pond and culverts under the railway embankment. |
| NJ 9592 0452 | Water backing up upstream from online wetland/ pond. Scottish water pipe outflow submerged (~10 m upstream of inflow to pond/ footbridge crossing). |
| NJ 9593 0453 | Clearance on the bridge now reduced to 20cm max (had been >1m) at normal flows. At high flow now, the flow overtops the banks by the bridge and flows around the concrete bridge upstream of the upstream pond, causing inundation of public footpath. |
| NJ 9593 0454 | Upstream area of the pond would need to be excavated to some extent (likely associated with some vegetation removal/ cut-back) to reduce water levels at the bridge and impounded flow upstream. |
| NJ 9597 0457 | Aeration ramp downstream of online wetland/ pond outflow now drowned out. No appreciable velocity going over that ramp now. Flow backed up from highly vegetated channel/ inset floodplain downstream. |
| NJ 9607 0466 | Water levels at mid-site footbridge also much higher than as built (from roughness effect of inset floodplain/ channel vegetation downstream backing water up). |
| NJ 9615 0476 | Offline wetland – drainage pipes under path are clogged up (especially at outflow) and not functioning as intended. Offline wetland now greater in extent |

| | |
|---|---|
| | than as designed although not necessarily a problem, and individual ponds/ swales all merged into one feature but with a significant amount of vegetation. |
| n/a (site-wide) | Inset floodplain through entire site part now operating more like a wetland (not necessarily a problem). |
| NJ 9636 0474 | Fly-tipping at downstream end of site – trees have been dropped into the channel. |

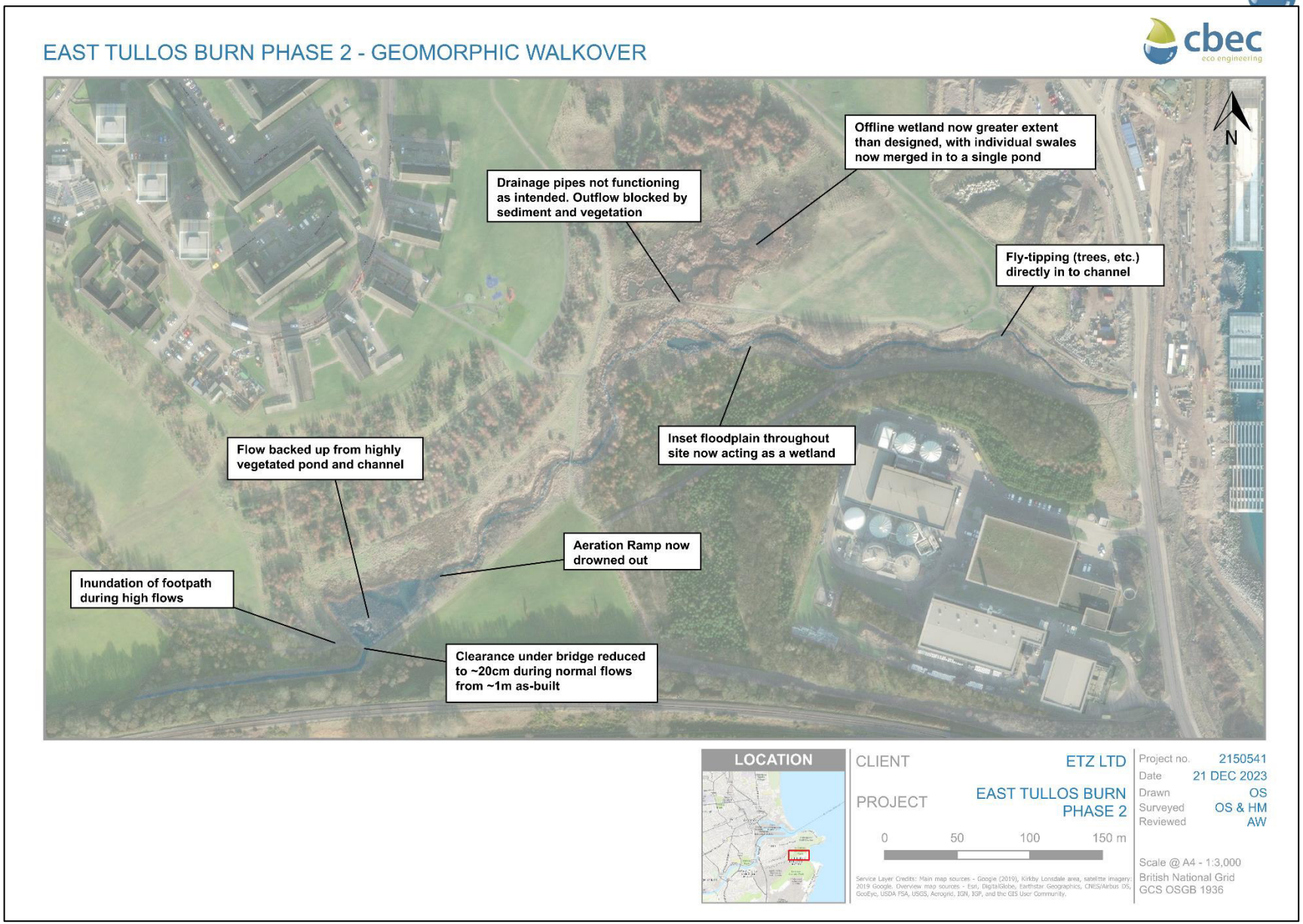


**Figure 2.1. Site conditions overview**

**Table 2.2. Site photographs (December 2023)**






**Table 2.3. Site photographs – (December 2023, continued)**






## 3. TOPOGRAPHIC ASSESSMENT

The survey of the East Tullos Burn was undertaken between the 4th and 5th December 2023. Upon arrival a site walkover was undertaken, which established that conditions were safe to work.

### 3.1 TOPOGRAPHIC SURVEY

A feature-based grid survey methodology was used within the culverted extents of the burn (NJ 95768 04487 to NJ 96453 04703), capturing topographic highs and lows, structures that might influence design or the hydraulic function of the river such as bridges, weirs and culverts. Data capture within the ponded areas was limited by access issues caused by the dense vegetation within the inset floodplain. These areas of the channel have been surveyed in close-spaced cross sections in order to better delineate any breaks in slope. The parkland areas to the east of the existing offline pond were surveyed in detail as this will be the location of any future realignment of the burn.

This survey was carried out using network RTK GNSS and a Total Station consisting of a Trimble R12i rover with VRS license and S7 total station with TSC7 controllers running Trimble Access. A control quality (auto tolerance) cut off value was set at H: 0.015m (DRMS) and V: 0.020m (1 sigma) for all points derived from GNNS measurements. Data were collected in coordinate system OSGB1936/ODN.

The total station was set up via resection with temporary control points measured using the R12i receiver. Temporary control points were observed with the pole fixed in a tripod taking 180 epochs over 3 minutes. Trimble Access software on the controller calculates the position of the total station through a least squares algorithm. One round of observations was made on each face. If any backsight observations had large residuals, they were discounted, and another observation taken. If the resulting standard errors in Easting, Northing or Height were greater than 10 mm then the resection would be abandoned and repeated. An auto-tolerance setting was active on the total station so that any knock or change in position would register on the controller. If this happened, then the total station set up would be repeated.

### 3.2 DATA PROCESSING

All survey points were checked in Trimble Business Centre (TBC). JOB files were transferred from controllers into TBC. The coverage of points is presented in Figure 3.1. PDOP, Horizontal and Vertical Precision, number of epochs and height offsets for pole observations were checked and feature codes processed. All data were then imported into AutoCAD Civil 3D for further processing and production of a 3D TIN surface of the existing conditions, pre-restoration, at the study site (Figure 3.2). This DEM will be utilised to inform the development of designs for the site, and subsequent hydraulic modelling. Additionally, information on the structures surveyed is provided in Appendix B.

### 3.3 DRONE IMAGERY

Geo-referenced aerial imagery was also captured using a DJI Mini 3 ultra-lightweight drone. An initial fly-over was done upon arrival at the site for the topographic survey to help inform the survey team of the conditions and extent of the survey area. Imagery and video footage was also captured for visualisation and modelling purposes. Key aerial views of the site are shown in Figure 3.3 - Figure 3.5. A comparison of some of these views with drone footage shot following the original construction work is also provided in Appendix A.

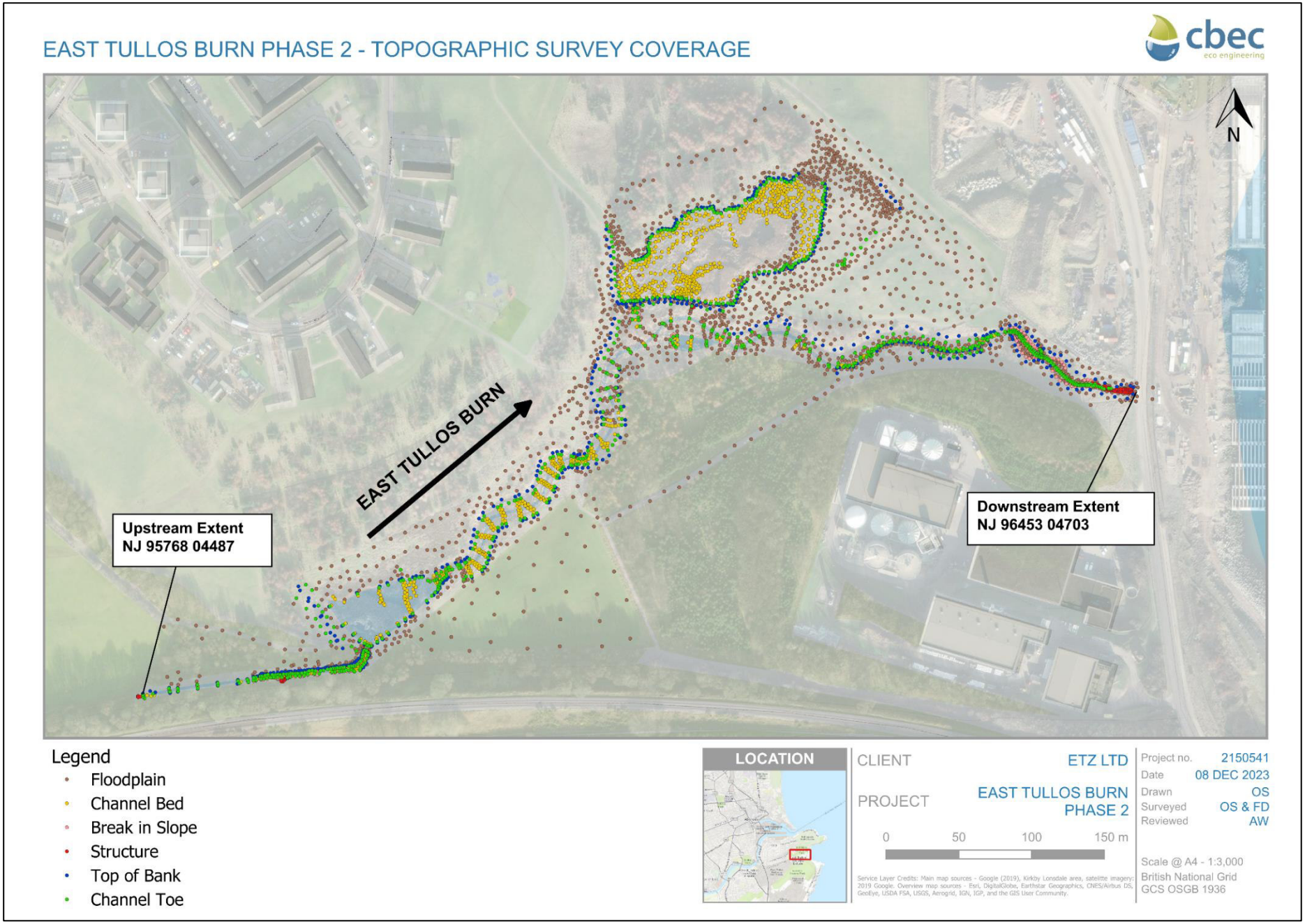


**Figure 3.1. Topographic survey coverage.**

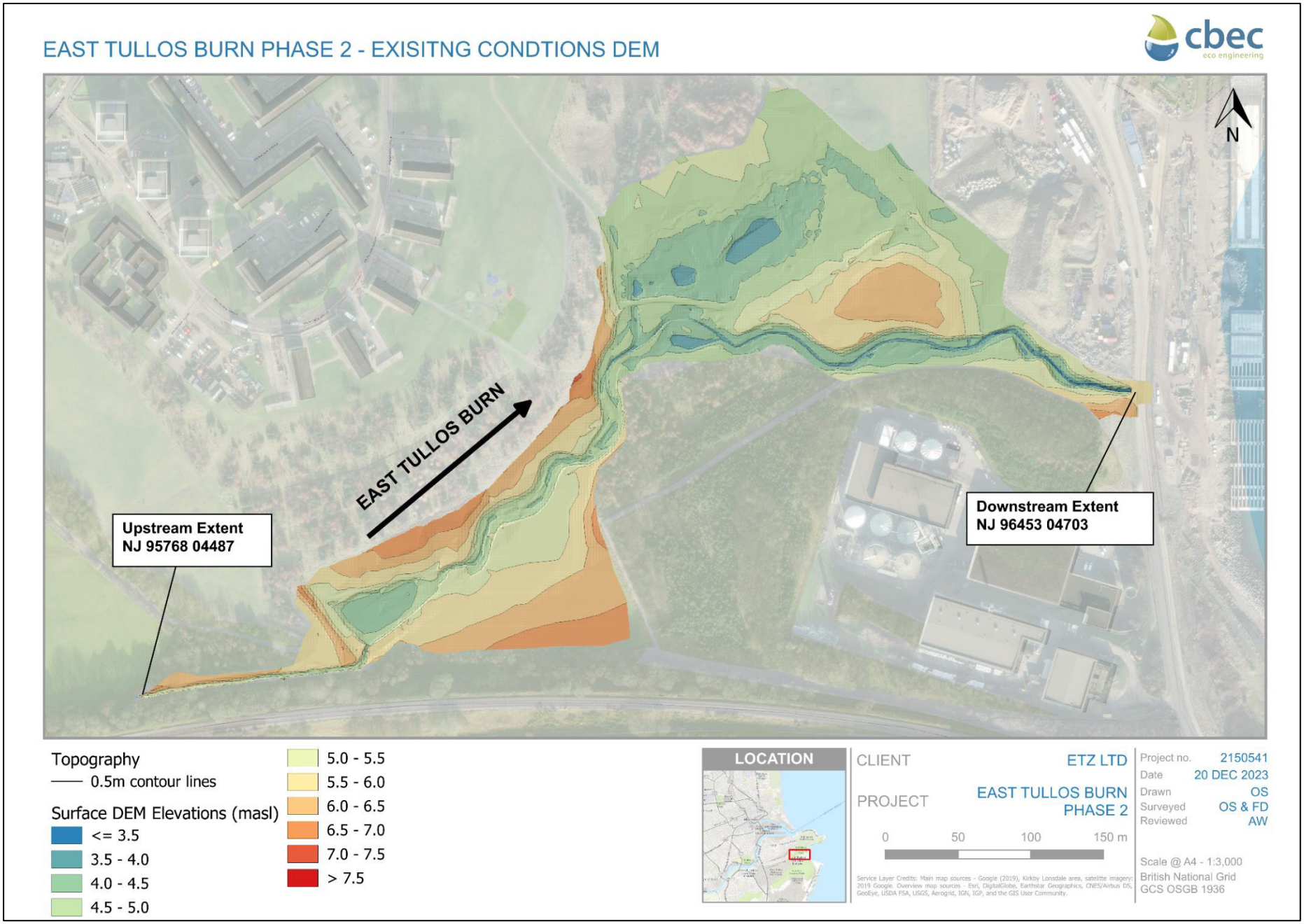


**Figure 3.2. Digital Elevation Model (DEM) of topographic survey data showing pre-restoration**


**Figure 3.3. Drone footage of upstream wetland and channel connection.**


**Figure 3.4. Drone footage of downstream 'offline' wetland.**


**Figure 3.5. Drone footage of downstream channel and potential location for burn realignment**

## 4. ECOLOGICAL ASSESSMENT

### 4.1 SUMMARY OF EXISTING ECOLOGICAL CONDITIONS

The downstream section of the East Tullos burn, which runs through St Fitticks Park in Aberdeen, was restored in 2013. This involved the creation of a sinuous channel, an inset floodplain area and some wetland / backwater and pond areas.

As part of the development of the area into an Energy Transition Zone, some modifications to the park are anticipated. To provide additional background information to support this development, an ecological walkover survey of the restored burn took place in November 2023. It should be noted that this is not an ideal time of year to undertake survey work and therefore a full species list could not be prepared. However, the survey provided enough information to establish the current condition of the site, which is summarised below.

#### 4.1.1. Existing habitats present on site

A habitat survey of the site and a wider area was undertaken by Ironside Farrar in September 2023 as part of the Biodiversity Protection and Enhancement Plan for the planning application for the site. This survey mapped the main habitats on site. The descriptions below provide further information on some of the species found within these habitat areas. It should be noted that the September 2023 survey used the UKHab classification, which is required for calculating Biodiversity Net Gain statistics, therefore these habitat classifications are included in this report to enable comparison, although the JNCC habitat classification system is easier to use in reports for non-specialists. Therefore, in this report, habitats are classified first by the JNCC Phase 1 survey habitat description and then by the UK Hab description (if it differs).

#### 4.1.2. Swamp / fen marsh and swamp

The upstream pond and the two mid site wetlands / ponds contain extensive stands of common reed (*Phragmites australis*). In the upper pond, this has spread across the majority of the pond, leaving only a relatively small area of open water. In the mid site scrapes, the reed forms stands around the edges of the open water, but there are also areas of bur-reed (*Sparganium erectum*), reedmace (*Typha latifolia*), reed sweet grass (*Glyceria maxima*) and grey club-rush (*Schoenoplectus tabernaemontani*). Several moorhen were seen using both the stands of vegetation and the open water.

#### 4.1.3. Marginal vegetation / Eutrophic standing open water & fen marsh swamp mosaic

The meandering channel contains varying densities of vegetation, although in places the vegetation almost fully blocks the channel. The most abundant species appear to be reed sweet grass, reedmace and bur-reed. A number of the flowering species which were originally planted on the site are visible, including flag iris (*Iris pseudacorus*), brooklime (*Veronica beccabunga*) and marsh marigold (*Caltha palustris*). Water starwort (*Callitriche* sp) is also visible within the areas of open water. Along the banks of the channel, there are stands of meadowsweet (*Filipendula ulmaria*) and nettle (*Urtica dioica*), interspersed with clumps of cocksfoot (*Dactylis glomerata*). Many more species are likely to be visible during the summer months.

#### 4.1.4. Unimproved neutral grassland / Holcus – Juncus neutral grassland

Away from the channel edges, the grassland sward is reasonably diverse, with tufted hair grass (*Deschampsia cespitosa*), knapweed (*Centaurea nigra*), ox eye daisy (*Leucamthemum vulgare*), yarrow

(*Achillea millefolium*) and ribwort plantain (*Plantago lanceolata*) all still visible even in December. Some of these species are likely to be present as a result of the wildlflower seed mixes which were used on the site, whilst others will have colonised over time. Clumps of soft rush (*Juncus effusus*) are present in the damper areas.

#### 4.1.5. Mixed plantation woodland

Woodland areas were planted within the areas adjacent to the burn. These included a mix of species with birch (*Betula pubescens*), alder (*Alnus glutinosa*) and willow (*Salix caprea* and *Salix cinerea*) planted in the dampest areas. Other areas in the park were also planted with a mix of broadleaves and conifers, including larch (*Larix decidua*) and Scots Pine (*Pinus sylvestris*). In some cases, these trees are quite close to the wetland areas. This is likely to speed up the process of succession within the wetlands, as trees can transfer larger quantities of water from the ground to the atmosphere. However, there are several conifer trees close to the wet areas which appear less healthy and which may not survive, probably due to the damp conditions.

#### 4.1.6. Scattered scrub

Gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*) scrub is present on the site, mainly on the lower half of the study section. Whilst gorse scrub can provide habitat for perching birds, it can also contribute to the gradual drying out of a site.

### 4.2 CHANGES OVER TIME

When the burn was restored in 2013, the list of plant species which were used within the design included mainly forb species, with only common reed planted in any significant quantity from the grass / sedge / rush group. This was partly to ensure the site was visually attractive, but also as a result of plant availability – in general it is easier to source plug plants of flowering plants than rushes and sedges. Over time, we know that a number of rush and grass species have spread onto the site. The grey club-rush, which is uncommon in north-east Scotland was first recorded at the site in 2015 (Eric Meek, pers comm) and has now spread throughout the site. The reed sweet grass was not noted during a 2015 site visit (though this took place in November, so species could have been missed) but is now also throughout the site.

The original area of open water in 2013 was significantly larger, so it is clear that the vegetation is spreading and extending within the site. This is likely to be a result of the high nutrient levels in the water within the burn, but also partly due to the natural process of succession. Over time, the extent of vegetation in a wetland can be expected to increase. As the vegetation rots down, it starts to increase the extent of soil present, resulting in the development of more vegetation. Ultimately, wet areas may dry out completely, with shrubs and then trees starting to grow. Moving water is likely to slow this process, as it continually washes out decomposing vegetation and silt. However, if the water speed slows significantly, the process of succession can begin to occur.

The timescale for a wetland area to transition from open water through swamp and marsh to wet woodland will vary between sites and can take many decades.

### 4.3 CURRENT HABITAT CONDITION

From an ecological perspective, the site has a good diversity of habitats, with areas of drier grassland, woodland, wetland and open water present. Whilst the species diversity is not entirely natural (as much of it comes from the original planting), it has matured into a site with a good mix of wetland and

grassland plants. As highlighted above, without intervention, the natural process of succession is likely to lead to the area of wet ground decreasing over time. The high nutrient levels in the burn water have also contributed to strong vegetative growth of some of the grasses and reeds, most notably the common reed within the pools. However, in the mid site ponds there is a mix of reed species, with the common reed forming distinct stands, whilst other species dominate in other areas.

The extent of vegetative growth is constricting the flow of water in the burn in some places. From an ecological perspective, this is not necessarily a bad thing, as over time the burn is likely to create new routes and meander within its own floodplain area. However, in terms of moving water off the site (and the industrial area upstream), the slowing of water may not be desirable.

There may be potential for targeting any restoration work so it involves the removal / clearance of areas which are more heavily dominated by single plant species and avoids areas with more diversity.

#### 4.3.1. Protected species

The site is clearly used by a range of bird species and therefore any restoration activities will need to take account of the bird nesting season (February – July). Ideally work should avoid the nesting season entirely. Bird nests are protected under the Wildlife and Countryside Act 1981 and it is an offence to take, damage, destroy or interfere with a nest of any bird while it is in use or being built. A breeding bird survey was undertaken as part of the preparation of the Biodiversity Protection and Enhancement Plan prepared by Ironside Farrar. However, as bird nesting locations change annually, any work undertaken during the nesting season in semi-natural habitats will still require a pre-construction nesting check to establish whether any birds are nesting in any areas which will be affected by the works.

Badger are likely to use the area of woodland to the south of the site, so any works should have a badger survey completed prior to undertaking work. A badger survey was also completed as part of the Biodiversity Protection and Enhancement Plan, in September 2023. However, badger are a dynamic species and will often create new outlier setts in areas close to existing setts. Works within 30m of a badger sett may require a licence from Nature Scot. Therefore, it would prudent to undertake a pre-construction survey of any areas to be worked, plus a 30metre buffer, to ensure new setts have not been created since the September 23 survey.

#### 4.3.2. Invasive species

No non-native invasive species were noted on the site, but there are several areas of more dominant native species. For example, creeping thistle (*Cirsium arvense*) is present on the site, as are rosebay willowherb (*Chaemerion angustifolium*) and docks (*Rumex* sp). Any areas of bare ground are at risk of being colonised by these species, which generally spread quickly across bare soil. With reasonably fertile soils, it can then take many years before a wider range of species are able to develop.

Japanese Knotweed was noted upstream of the site in the Biodiversity Protection and Enhancement Plan. Whilst this is not within the site footprint, there is a risk of it establishing on the site, particularly if plant sections are washed downstream in flood events.

## 5. SUMMARY OF SITE CONDITIONS – CONSIDERATIONS FOR DESIGN

Evidence from the field-based assessments suggests that, while the site now offers improved habitat diversity as well as greater amenity value (compared to pre-restoration conditions), there are issues to be addressed to ensure the longer-term functioning of the site.

To support this assessment, a series of photograph comparisons are presented in Appendix A. These illustrate the degree of change within key parts of the site, over time. The images presented include:

- Images taken post-construction in 2014.
- Images taken during a scoping site visit in September 2023 (showing summer vegetation cover).
- Images taken during the geomorphic walkover and topographic survey in December 2023 (following vegetation die-back).

The images in Appendix A and photos in Table 2.2 and Table 2.3, highlight both the recovery and establishment of the site over time, as well as some of the key issues currently faced. This includes:

- Siltation/sediment deposition issues throughout the site but particularly evident within the upstream online pond and at the upstream bridge crossing.
- Pipes that connect the channel to the offline wetland under the footpath in the middle section of the site are obscured and assumed to be constricted.
- The offline wetland is now larger in extent than originally designed, with the individual scrapes now merging into one large wetland (particularly noticeable in Figure 3.4).
- There is a dominance of single plant species in certain areas of the site.
- A significant volume of wood debris (not part of the restoration design) within the downstream extents of the previously realigned channel, upstream of the culvert to the harbour.
- A lack of species diversity has been noted, more evident within the upstream section of the site.
- Gorse is present within the downstream areas of the site.

In summary, the main objectives and issues to be considered as the project progresses to detailed design (and construction), are:

1. ***Design:*** any works undertaken to the upstream wetland areas should be considered when designing and modelling the downstream burn realignment, to ensure that all components of the Phase 2 designs function as intended.
2. ***Design:*** based on discussions at a stakeholder meeting held on 13th December 2023, the design is required to include a basin/pond upstream of the most upstream wetland. This should function as a sediment trap to reduce future maintenance requirements and associated disturbance to the existing wetland, and to improve water quality within the downstream areas of the original design site.
3. ***Design:*** two potential locations should be considered for the proposed treatment basin to address water quality and sediment issues within the upstream section of the site:
    - the area of woodland to the west of the upstream wetland

- the playing field to the east of the upstream wetland

4. ***Design:*** sediment and vegetation management will be required in the upstream half of the online wetland pond to reduce the backwater effect upstream.
5. ***Design:*** potential clearing out of the pipes under the footpath that connect the channel and the offline wetland will be required – this should also be considered within the final maintenance plan for the wetlands.
6. ***Design:*** vegetation management throughout the entire site with potential for targeting any restoration work so it involves the removal/clearance of areas which are more heavily dominated by single plant species and avoids areas with more diversity.
7. ***Design:*** stakeholders have highlighted the importance of retaining access through the site for the local community.
8. ***Design:*** site Biodiversity Protection and Enhancement Plan, is to be taken into account during design. A more detailed habitat survey within the wetland area could be undertaken in the spring / summer, to assess the condition of the wetlands and the exact extent of different habitat types. This could potentially then feed into any assessment of BNG which may accrue through the works. However, this would require some guidance from ACC's planning department to confirm the precise methodology to be used, as there is no current guidance in Scotland
9. ***Construction:*** Surveys to assess the presence of protected species within the site, have previously been undertaken. However, both birds and badgers are mobile species, so pre-construction re-surveys are recommended to provide an up-to-date record. These surveys should cover the localised areas of the design and be undertaken immediately prior to any works on site, allowing relevant mitigation (and, where required, licencing) to be put in place prior to construction.
10. ***Construction:*** the programme for carrying out physical works should be planned for August/September, outside the bird nesting season.

**APPENDIX A**

COMPARISON PHOTOS


Upstream bridge – 2014


Upstream bridge – Dec 2023


View from footbridge – 2014


View from footbridge – Sept 2023

**View from footbridge – Dec 2023**

**Realigned channel – 2014**

**Realigned channel – Sept 2023**

**Realigned channel – Dec 2023**


View across wetlands - 2014


View across wetlands - 2023


Aerial view of upstream wetlands - 2014
© Chris Bowles, cbec eco-engineering


Aerial view of upstream wetlands – Dec 2023
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Aerial view of offline wetland and realigned channel - 2014
©Chris Bowles, cbec eco-engineering


Aerial view of offline wetland and realigned channel - 2023
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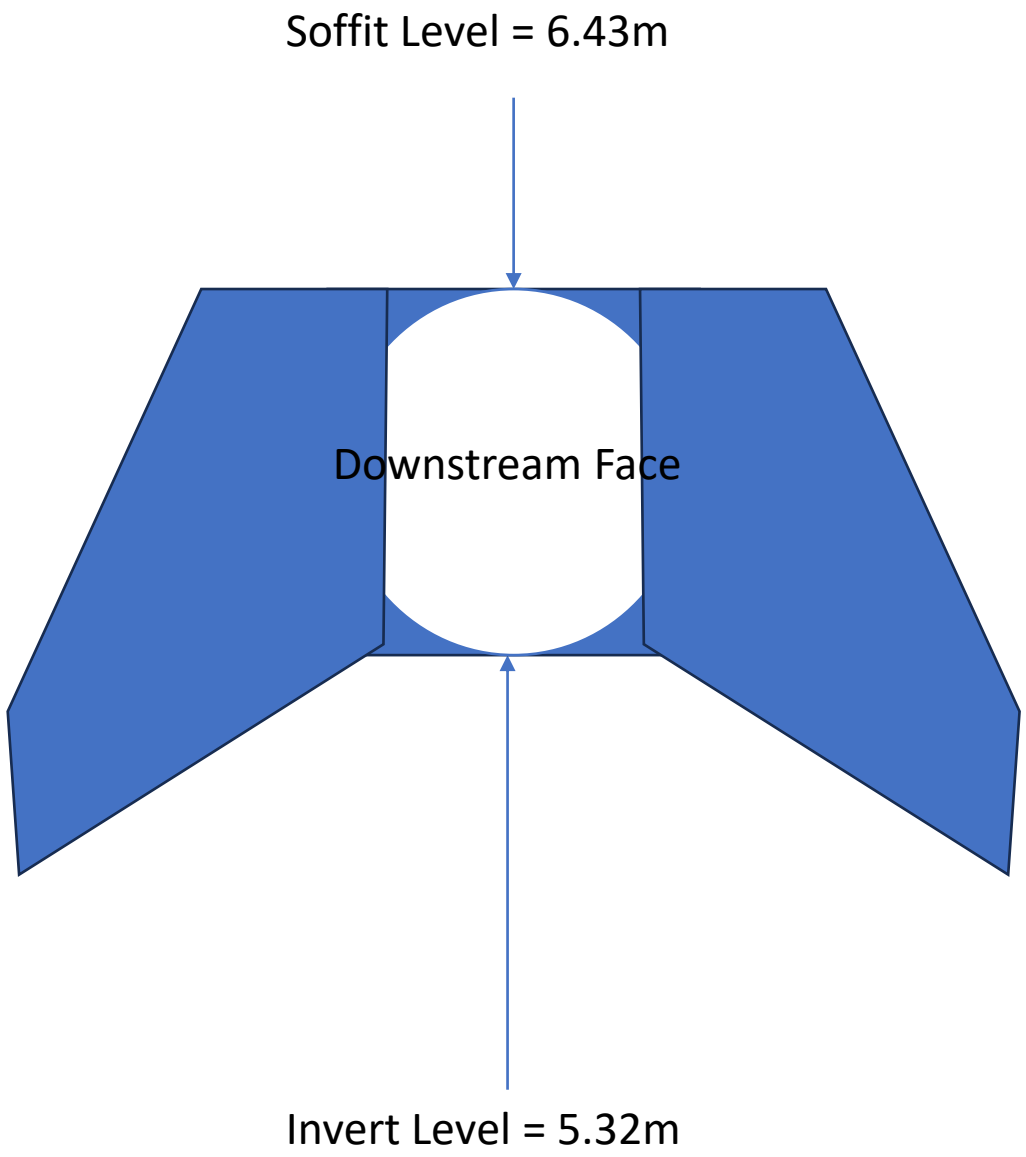
**APPENDIX B**

OVERVIEW OF SITE STRUCTURES

U/S End of Survey Culvert - 395770 , 804493

Downstream Face

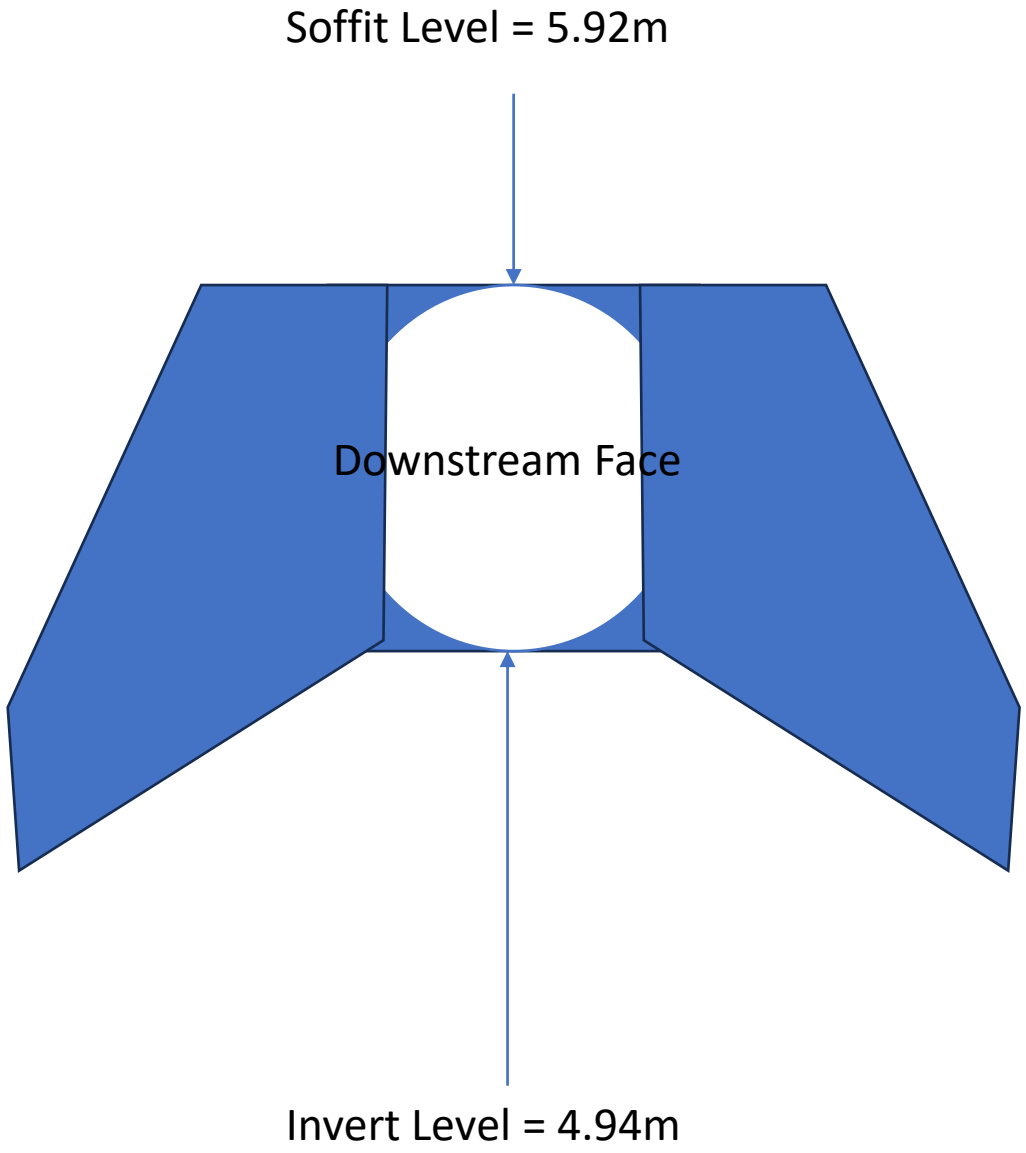
Upstream Face unable to be located.



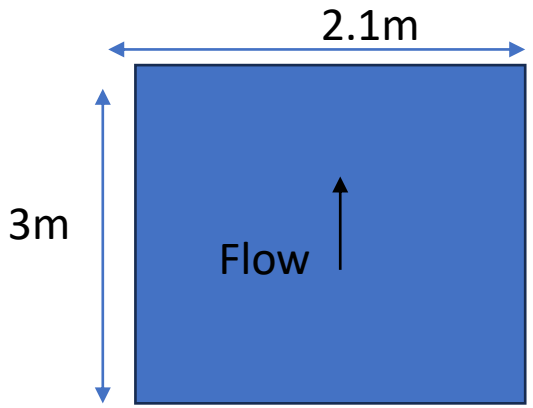
Culvert - 395869 , 804504

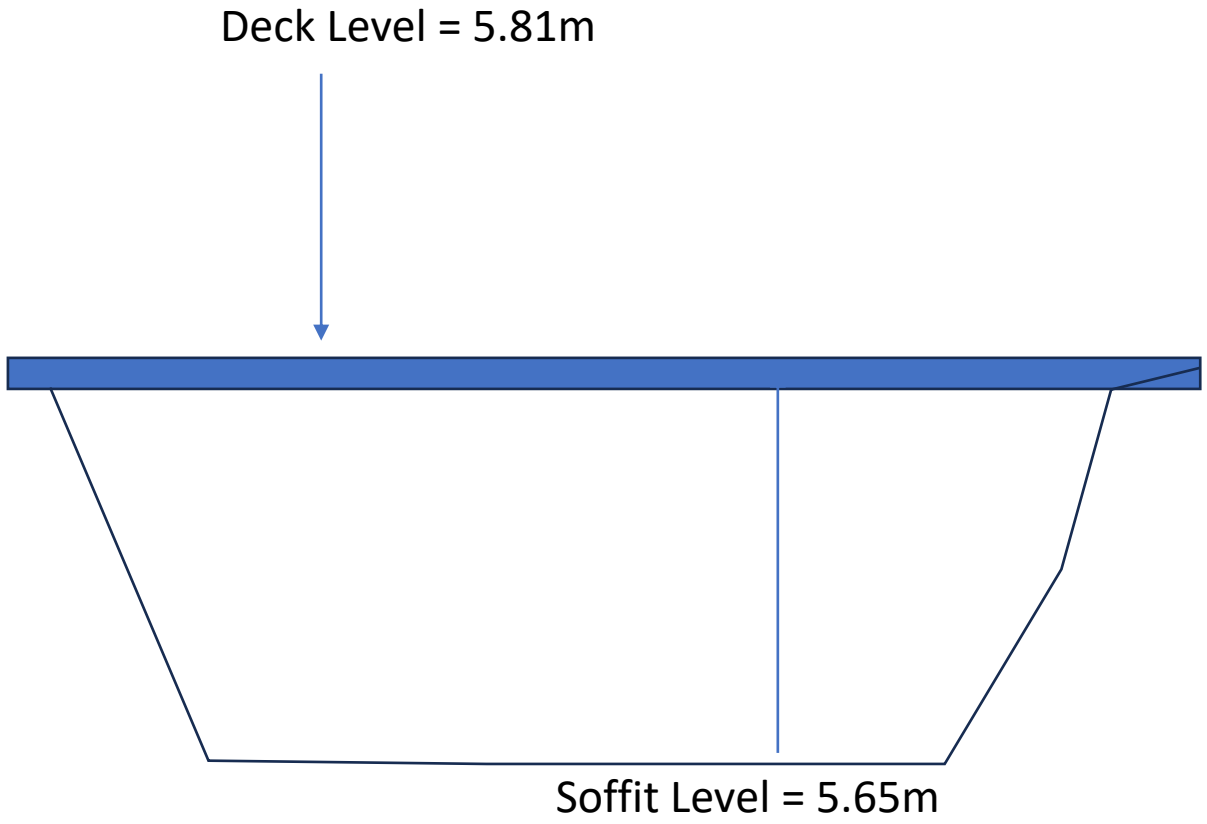
Downstream Face

Upstream Face unable to be located, potentially drainage run off frum industrial estate on other side of rail embankment

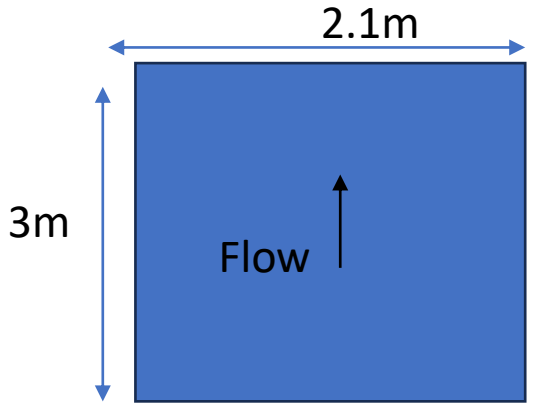


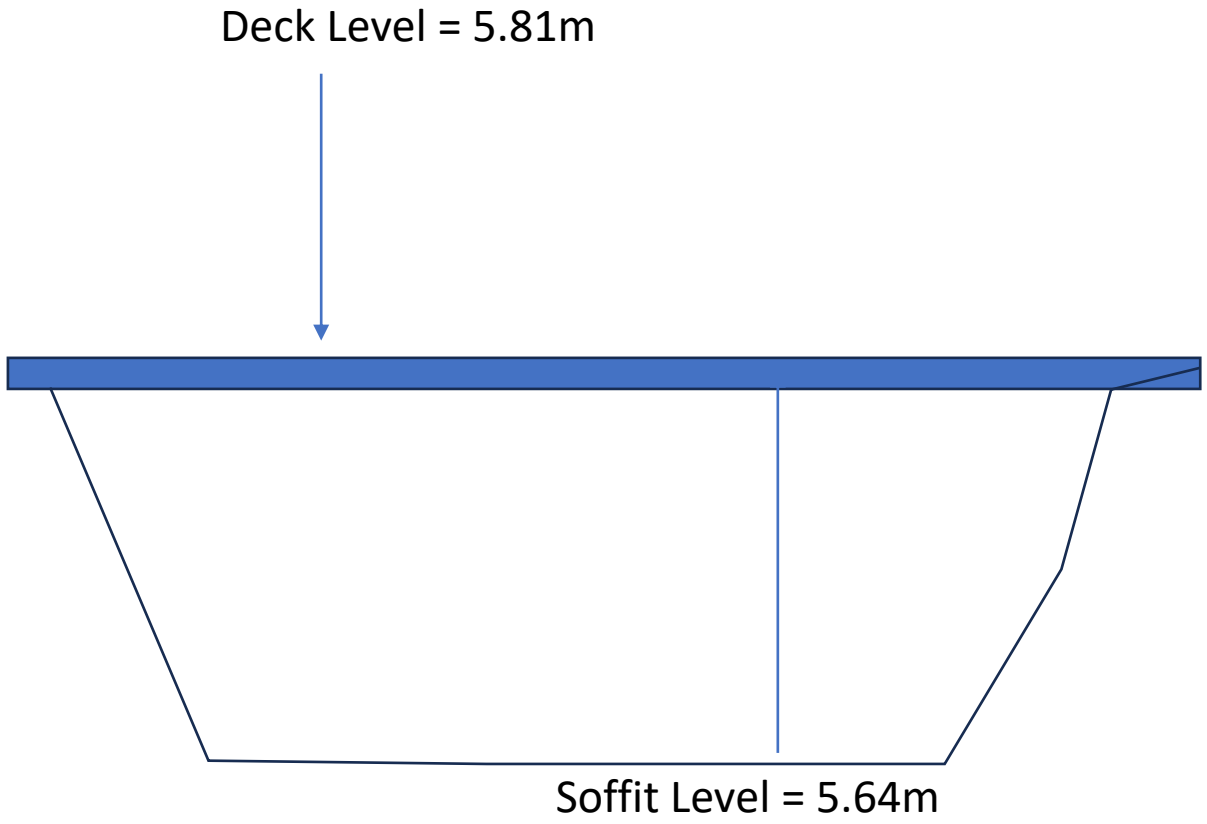
Foot Bridge Downstream Face- 395528 , 804527



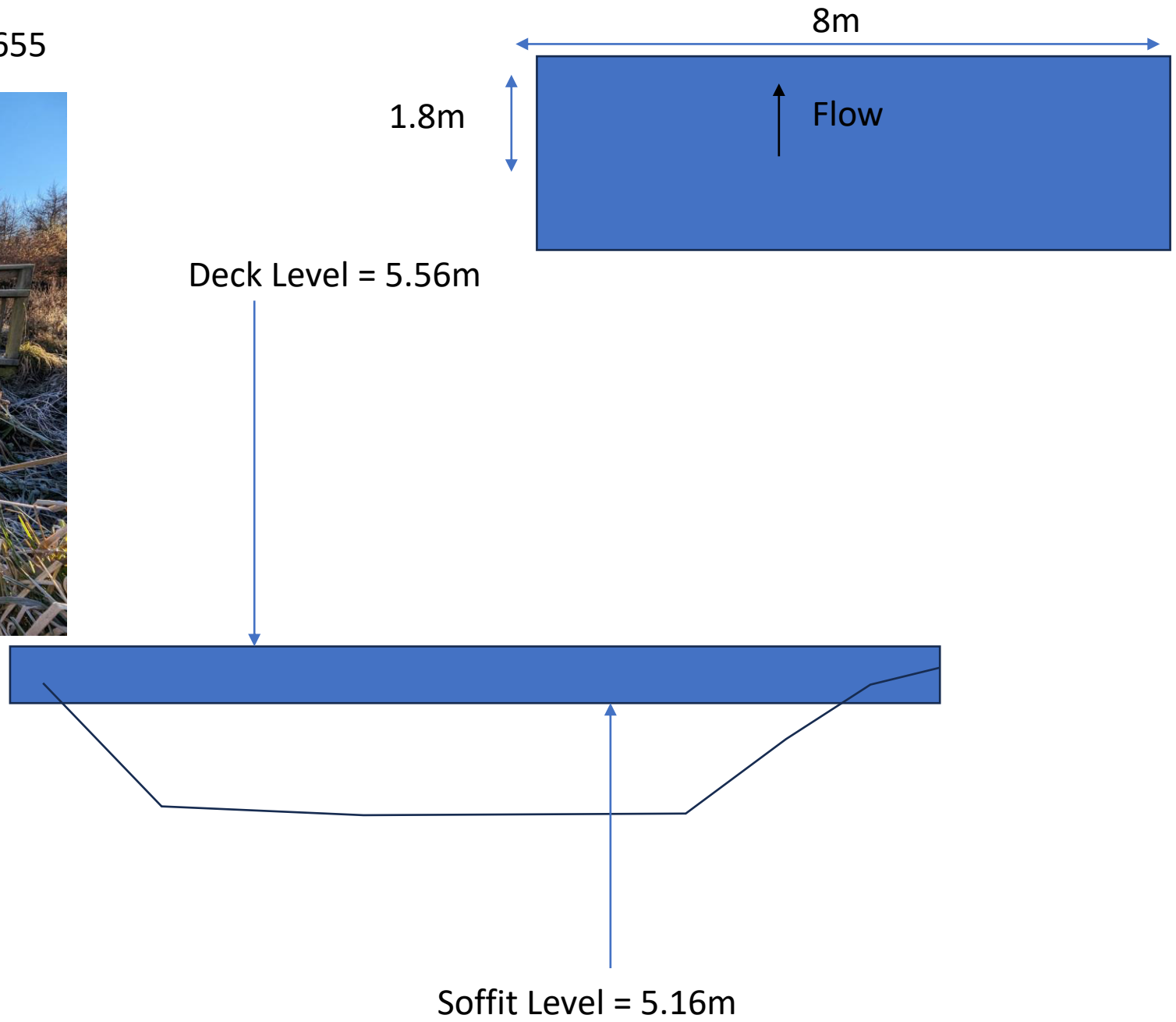



Foot Bridge Upstream Face- 395528 , 804527

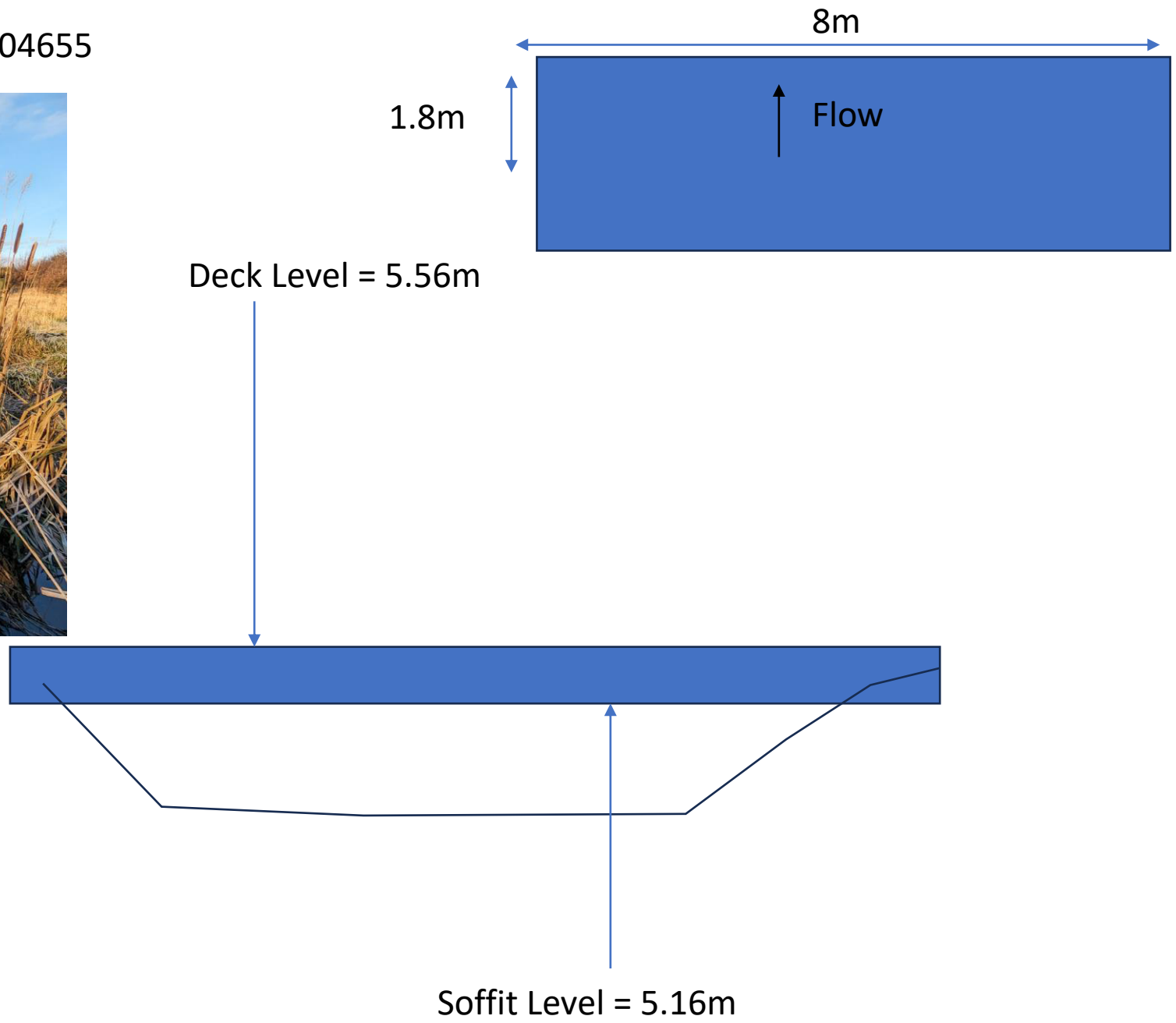


Foot Bridge Upstream Face - 396070 , 804655

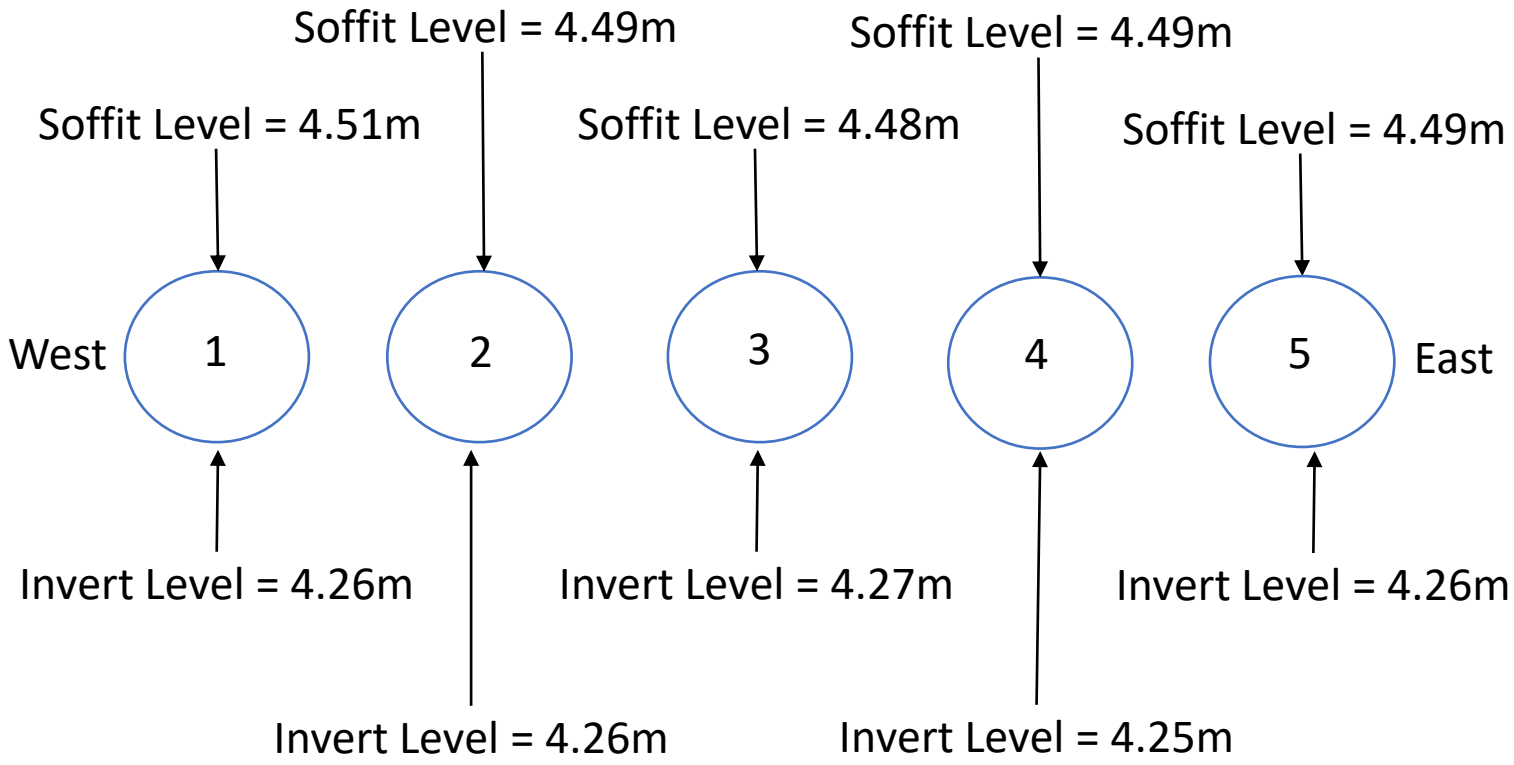


Foot Bridge Downstream Face - 396070 , 804655



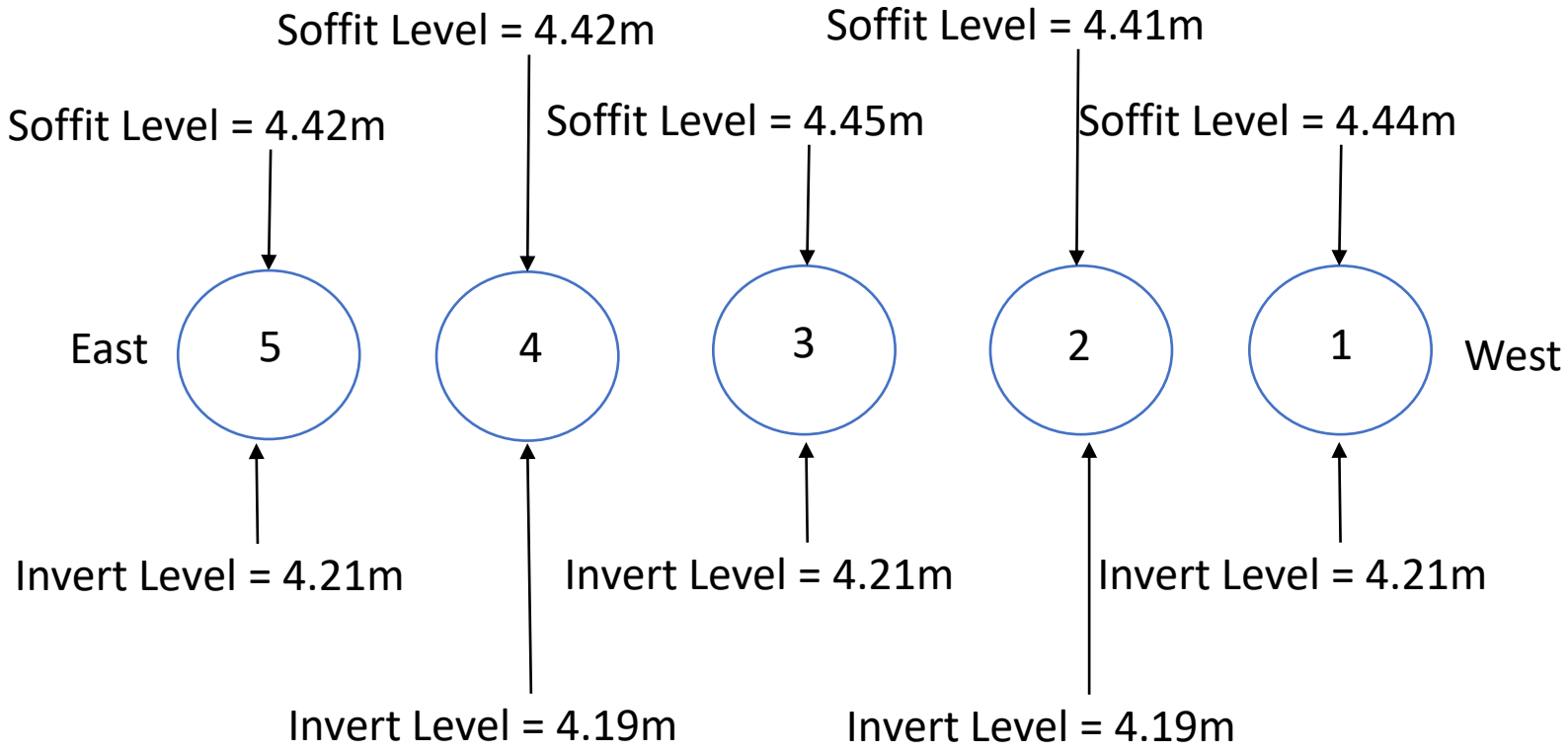
Pond Inflow Pipes Upstream - 396112 , 804761

No pictures as underwater and covered in silt



Pond Inflow Pipes Downstream - 396112 , 804765

No pictures as underwater and covered in silt



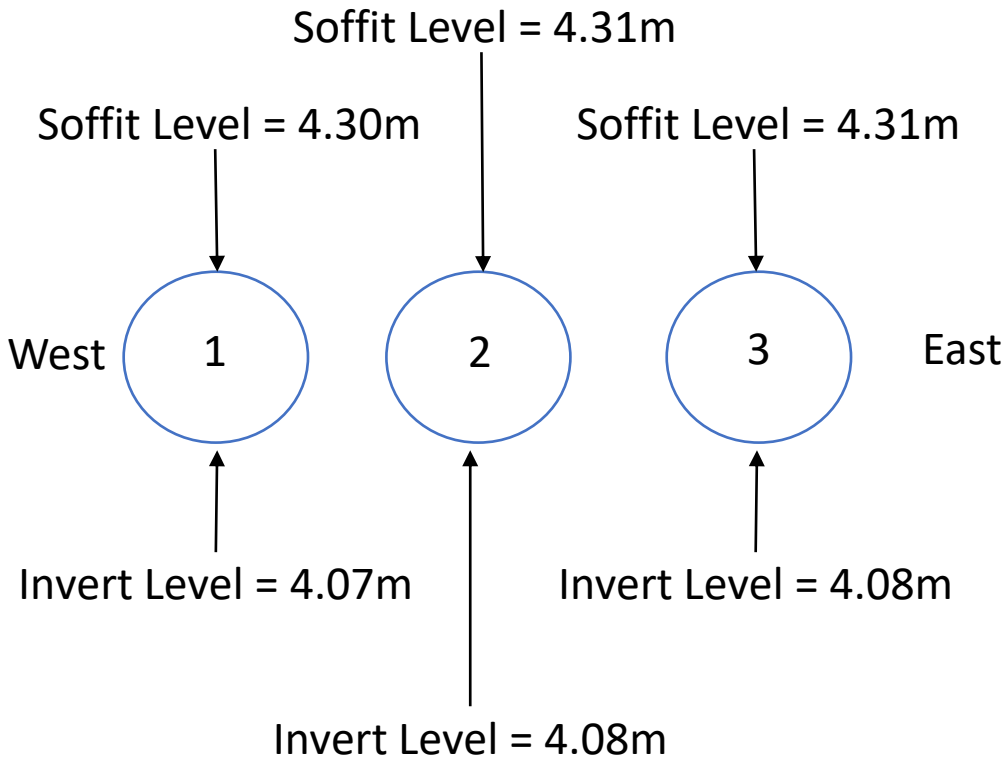
Pond Outflow Pipes Upstream - 396151 , 804766

Could not locate any outfall pipes on the upstream (pond) side. Thick vegetation and sediment buildup against the bank meant no pipes were located

Pond Outflow Pipes Downstream - 396152 , 804761

No pictures as underwater and covered in silt

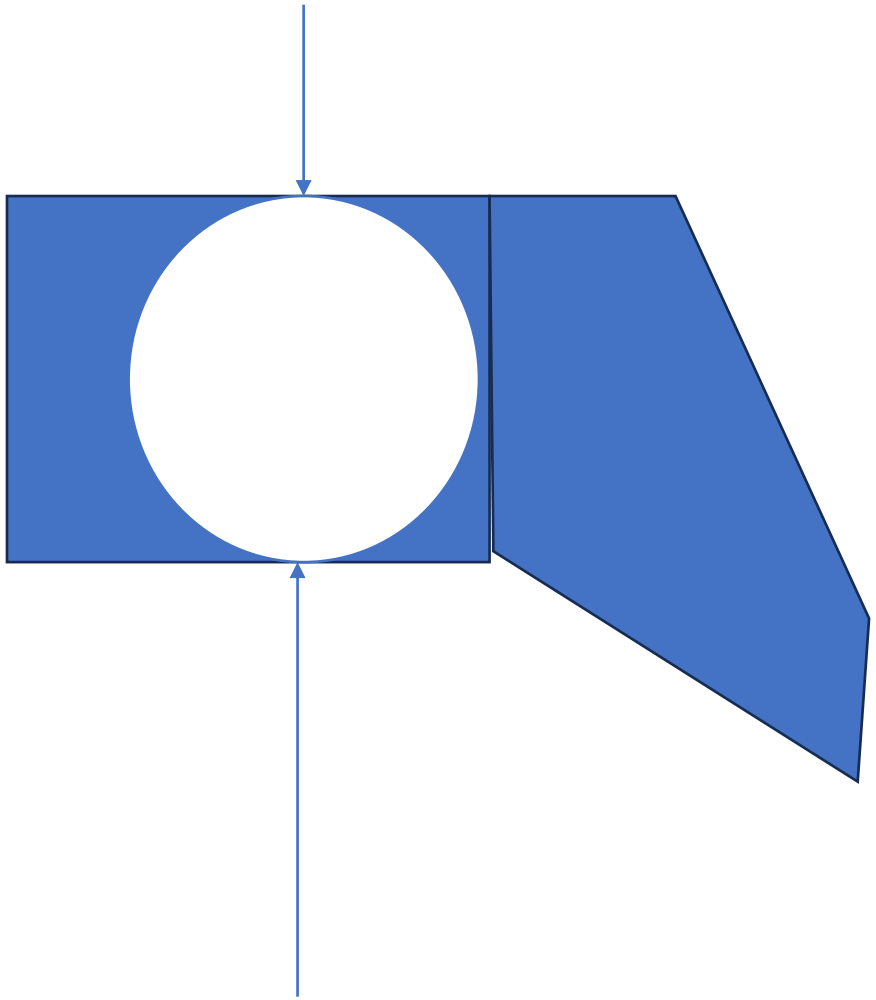
Only 3 pipes located, potential for more due to thick vegetation and silt layer



Culvert - 396390 , 804732

Downstream Face

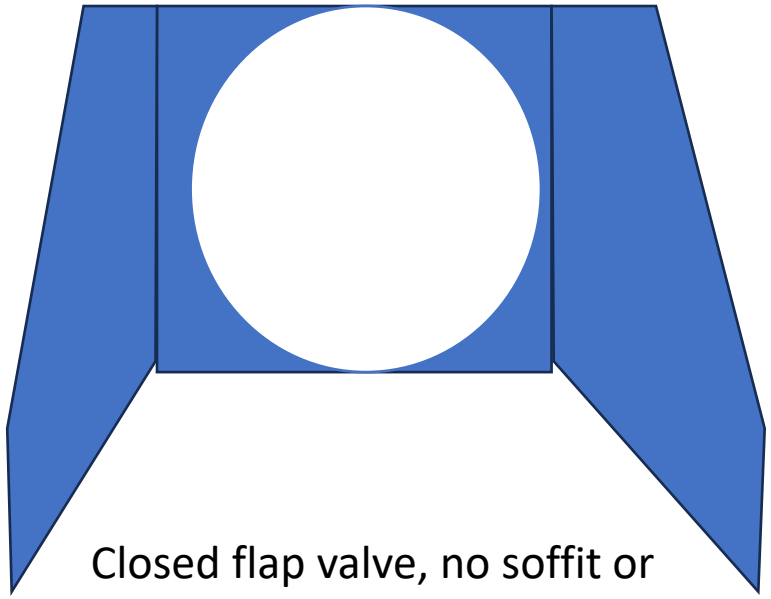
Soffit Level = 4.14m



Invert Level = 3.57m

Culvert 396390 , 804726

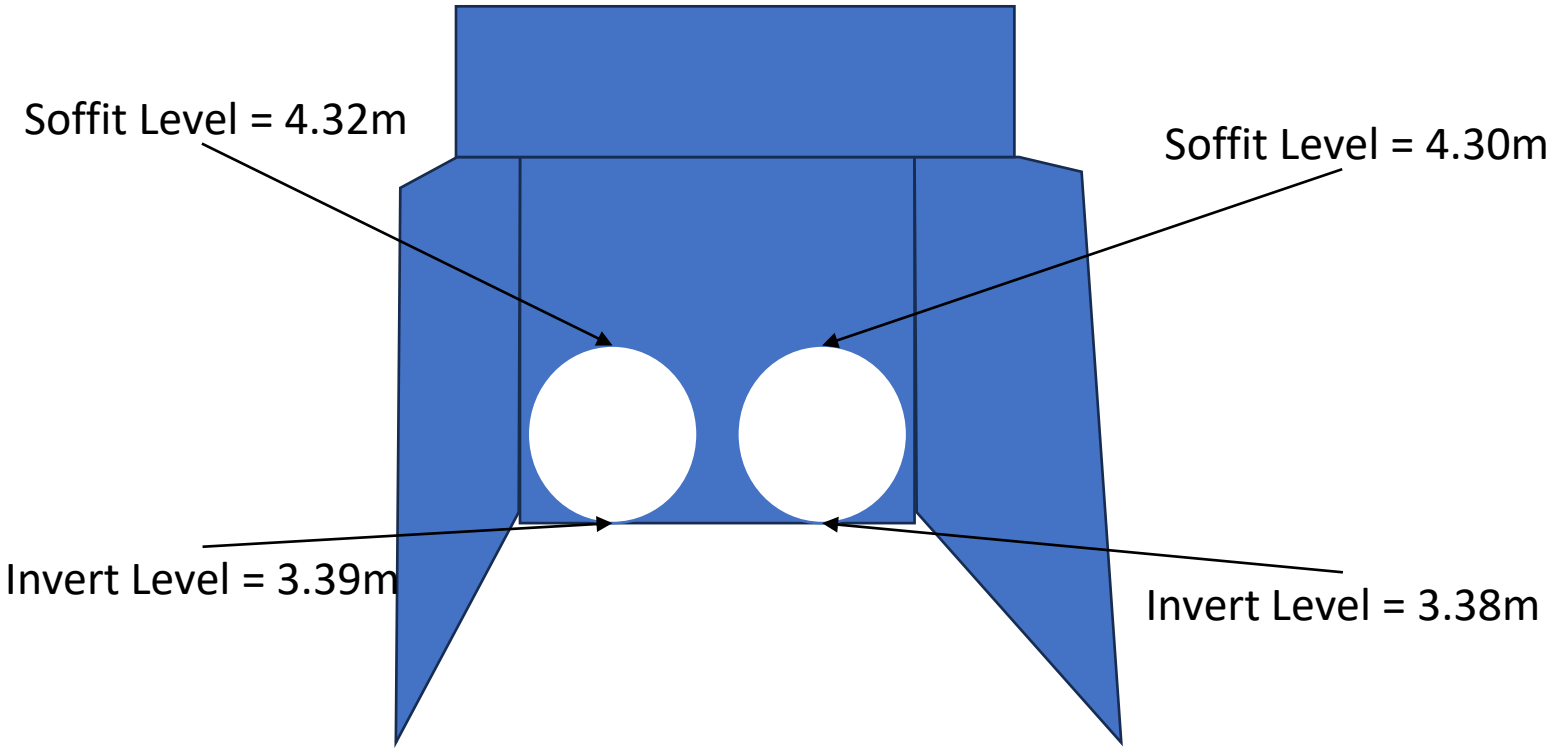
Downstream Face



Closed flap valve, no soffit or invert possible

D/S Survey Culvert 396453 , 804703

Upstream Face




No data on downstream face as it outfalls underneath the new docks. Design drawings provided by ETZ Ltd. Design also in chart datum -2.25 AOD).

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