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Belfast Tidal Flood Alleviation Scheme

Environmental Screening Report

Marine Works (Environmental Impact Assessment) (Amendment) Regulations 2017

May 2019

Notice

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This document has 55 pages including the cover.

Document history

Revision	Purpose description	Origin-ated	Checked	Reviewed	Author-ised	Date
Rev 1.0	For Review	MML / NC	LMN	MML	JT	March 2019
Rev 2.0	For Issue	MML / NC	LMN	MML	JT	May 2019

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1. Introduction

1.1. Purpose of the Screening Report

Environmental Impact Assessment (EIA) screening has been conducted pursuant to Regulation 11 of The Marine Works (Environmental Impact Assessment) (Amended) Regulations 2017 in respect of the Belfast Flood Alleviation Scheme.

1.1.1. Legislative Context

Within the Regulations, consideration is required as to whether the proposed drainage scheme will have significant effects on the environment. The regulations state the following:

11.(1)— An applicant may request a screening opinion from the appropriate authority at any time before he applies for a regulatory approval in relation to a regulated activity.

(2) If the request is made and the applicant does not defer making his application until the screening opinion is given, the regulator must not deal with the application until after the appropriate authority has given its screening opinion.

(3) If an applicant makes an application for a regulatory approval in relation to a regulated activity without having requested a screening opinion and the regulator considers that the regulated activity is or may be one in relation to which an environmental impact assessment is required under regulation 7 or 8, the regulator—

> *(a) must direct the applicant to request a screening opinion from the appropriate authority; and,*
>
> *(b) must not deal with the application until after the appropriate authority has given its screening opinion.*

(4) The procedures for requesting and giving screening opinions are set out in Schedule 2.

(5) If the screening opinion is that an environmental impact assessment is not required for the project in the course of which the regulated activity would be carried out, the application may (subject to regulation 10(3) or (4), if either applies) proceed in accordance with the relevant legislation.

(6) If the screening opinion is that an environmental impact assessment is required for the regulated activity, the regulator must reject the application unless it is one which is capable of being dealt with in accordance with Part 3 without changes being made to the application.

(7) Where paragraph (2), (3), (5) or (6) applies in relation to an application under relevant legislation that provides that an applicant may proceed to carry out a regulated activity without further consent unless the regulator takes some step within a specified period—

> *(a) any time prior to the giving of the screening opinion by the appropriate authority does not count in the calculation of that period; and,*
>
> *(b) where the appropriate authority gives a screening opinion to the effect that an environmental impact assessment is required for the regulated activity, the regulator is to be treated for the purposes of the relevant legislation as having taken, within the specified period, a step of such a kind as precludes the applicant from proceeding to carry out the regulated activity without further consent.*

(8) Paragraphs (2), (3) (5), (6) and (7) apply notwithstanding any provision to the contrary in the relevant legislation.

The components of the projects subject to this screening are only the works that take place below the tidal level of the Mean High-Water Springs (MHWS).

2. Description of the Scheme

2.1. Scheme Background

Belfast is at risk of flooding from a number of sources, notably tidal, fluvial and surface water. In economic terms the 200-year Annual Exceedance Probability (AEP) predicted extreme tidal event is of most concern; potentially affecting up to 560 residential and 460 non-residential properties. There would also be serious disruption to commerce, the transportation network, and the social fabric of the city.

The highest tidal surges recorded within Belfast Harbour have occurred within the past 20 years, most recently on the 4th and 7th January 2014. Without the close coordination and intervention of all the statutory and voluntary agencies and the city's emergency plan, more serious damage to property and key infrastructure would have occurred.

The above "near miss" flooding event, concerns over the numbers of "near misses" within a relatively short time period (the 5 highest tidal surges have been recorded since 1994), and the opportunity to build in a "flood risk element" into the York Street Interchange project are reasons why the tidal flood risk study, and subsequent flood alleviation scheme were commissioned by DfI Rivers.

The flooding envelope in a 200-year AEP tidal flood scenario encompasses 2 sq. km of the Belfast City Centre, and areas at Lower Ravenhill Road, Ormeau Embankment and Stranmillis.

Hydraulic modelling of flood return periods and design events for the scheme has been carried out in line with Rivers' Technical Flood Risk Guidance in relation to allowances for Climate Change in NI. Climate Change is allowed for using medium emission scenario at the 95% probability level.

2.2. Scheme Extent

An initial review of the hydraulic model extents for the 2080 epoch for a 200-year tidal event indicates that the design max tide level required is 3.55mAOD. There will be an additional minimum 300mm of freeboard on top of this. On this basis, of a reference height of 3.85mAOD have been derived (scheme details in Table 2.1) across the entire 8km of the scheme. The scheme will involve a variety of flood defence options such as flood walls, demountable barriers, glass walls and property level protection along an 8km stretch from the Belfast Harbour area to Stranmillis Weir at the upstream end of the Impounded Lagan. The majority of these defences will follow the existing river bank with defences moving inland in the harbour area and following the line of existing footpaths.

This scheme includes a 215m stretch of existing quay wall beside the Ravenhill Reach area which will also require in-river works and fall under the Marine Works (EIA) Regulations pertinent to this screening report.

Note: refer to drawings in Appendix A for additional detail.

Table 2-1 - Summary of Scheme Details

Zone	Location	Length of Defence (m)*	Average existing bank levels (mOD)	Average height of defence (m) above g.l	Proposed Defence Type	Comments
Belfast Harbour / City Centre	Northern Road	1077	2.73	0.97	Mixture of defence options: • Solid flood walls (with/without security fencing) • Use of existing walls • Flood gates • Demountable defences	Harbour Estates operation area. All construction would take place on footpaths of existing roads.
	Clarendon Road, Corry Road, Pollock Road	997			Mixture of defence options: • Solid flood walls (with/without security fencing) • Use of existing walls • Rebuilding existing walls • Flood Gates • Demountable defences	Harbour Estates operation area. All construction would take place on footpaths of existing roads.
	Clarendon Basin to Clarendon Road	270			Mixture of defence options: • Glass flood wall • Bridge Replacement • Use existing walls • Demountable defences	Mixture of defences reflects consideration given to maintaining the integrity of the existing streetscape and to maintain open spaces for access
	Lagan Bridge to Clarendon Basin (City Quays)	402			Mixture of defence options: • Use of existing building walls • Solid flood walls (with security fencing) • Demountable defences • Flood gates	Mixture of defences reflects consideration given to maintaining the integrity of the existing streetscape and to maintain open spaces for access
	Middle path Street Bridge to Lagan Bridge	278			Mixture of defence options: • Solid flood walls	Mixture of defences reflects consideration given to maintaining the integrity of the existing streetscape

Zone	Location	Length of Defence (m)*	Average existing bank levels (mOD)	Average height of defence (m) above g.l	Proposed Defence Type	Comments
					• Flood gates • Demountable defences • Glass flood wall	and to maintain open spaces for access
	Rail Bridge to Bridge End (Waterfront Hall)	180			Mixture of defence options: • Rebuild of existing walls (with/ without security fencing) • Demountable defences • Flood gates • Solid flood walls	Mixture of defences reflects consideration given to maintaining the integrity of the existing streetscape and to maintain open spaces for access
	Laganbank Road Apartments to Rail Bridge	205			Mixture of defence options: • Rebuild of existing walls • Demountable defences	Mixture of defences reflects consideration given to maintaining the integrity of the existing streetscape and to maintain open spaces for access
	Laganbank Road Apartments	125			Glass flood wall located on top of Quay stones. Replace existing railings	Minimise visual impact on access to river and access along path from the apartments.
	Allstate site to East Bridge Street	190			Solid flood wall with and flood gates at access points. Located at rear of path.	Wall at rear of path maintains visual and physical connection to river. Consideration given to the use of precast sections to reduce construction time and risk of pollution incident with concrete.
	Allstate Site	198			Use of demountable barriers around the basin and of existing walls.	Maintain visual and physical connection to the river.
	Gasworks Underpass to Allstate site	404			Solid flood wall (new and existing) with flood gates at access points. Located at rear of path along existing fence line.	Wall at rear of path maintains visual and physical connection to river. Consideration given to the use of precast sections to reduce construction time and risk of pollution incident with concrete.
Ormeau (4.0m AOD defence)	Ormeau Bridge to Gasworks Underpass	917	2.86	1.13	Solid flood wall (with/ without security fencing) with flood gates at access points. Located at rear of path along existing fence	Wall at rear of path maintains visual and physical connection to river. Consideration given to the use of precast sections to reduce construction time

Zone	Location	Length of Defence (m)*	Average existing bank levels (mOD)	Average height of defence (m) above g.l	Proposed Defence Type	Comments
					line. Demountable defences at access point to underpass.	and risk of pollution incident with concrete.
Lockview (3.85m AOD defence)	Rowing Club Buildings	686	2.74	1.11	Property Level Protection	Permanent flood defence would restrict access to river. PLP preferred option
	Cutters Wharf Carpark				Solid flood wall and flood gates at access points.	Wall located along existing hedge boundary.
	Cutters Wharf				Rebuild existing wall at front of property.	Rebuild of wall along front access of property on Lockview Road.
	Cutters Wharf to Queen's University Boat Club				Solid flood wall (with/ without security fencing), demountable barriers and flood gates at access points.	Consideration of use of precast sections to reduce construction time and risk of pollution incident with concrete.
	Towpath at Stranmillis Wharf Apartments				Solid flood wall with, topped with security fencing at points and flood gates at access points. Located at rear of path. Demountable barrier at access point to bridge underpass.	Wall at rear of path maintains visual and physical connection to river. Consideration given to the use of precast sections to reduce construction time and risk of pollution incident with concrete.
	Stranmillis Embankment at Governor's Bridge				Solid flood wall with demountable barriers at access points to bridge underpass. Locate along existing fence line at top of bank.	Consideration of use of precast sections to reduce construction time and risk of pollution incident with concrete.
	Southview Cottages on Stranmillis Embankment				Demountable defences at boundary of properties.	Use of demountable defences proposed as permanent structure would obscure property windows.
Ravenhill (3.85m AOD defence)	Ormeau Embankment (Right Bank)	1048	2.9	0.92	Solid flood wall at rear of path with flood gates at access points. Replaces existing fence.	Wall at rear of path maintains visual and physical connection to river. Consideration given to the use of precast sections to reduce construction time and risk of pollution incident with concrete.
	Ravenhill Reach				Solid flood wall at rear of path with flood gates at access points. Replaces existing boundary wall.	Wall at rear of path maintains visual and physical connection to river. Consideration given to the use of precast sections to reduce construction time

Zone	Location	Length of Defence (m)*	Average existing bank levels (mOD)	Average height of defence (m) above g.l	Proposed Defence Type	Comments
						and risk of pollution incident with concrete.
	Ravenhill Reach pathway to end of Car Auction Showroom				Stepping out from the existing quay wall by 5-10m using a sheetpile wall and infilling behind this.	Existing quay wall in very poor condition, with bank showing evidence of failure. Stepping out will provide future capacity to build towpath along this section of river. Note: This will involve in river works
	River Fronting Properties				Property level protection and demountable barriers along the front of these properties on Ravenhill Road	Property walls are directly onto river.
Sydenham / East Belfast (4.0mAOD)	Short Strand Apartments	1431	3.0	1.00	Demountable barriers, Rebuilding of existing walls (with security fencing) with flood gates at access points.	Wall at rear of path maintains visual and physical connection to river. Consideration given to the use of precast sections to reduce construction time and risk of pollution incident with concrete.
	Sirocco Wall				Use existing red brick wall.	No new construction required.
	Gregg's Quay & Laganview Court Apartments				Rebuilding of existing wall (with/ without security fencing) with flood gates at access points. Provision of new solid flood wall along front of the apartment buildings.	Wall at rear of path maintains visual and physical connection to river. Consideration given to the use of precast sections to reduce construction time and risk of pollution incident with concrete.
	Lagan Weir to Odyssey				Solid flood wall with flood gates. Follows fence line at footpath with coach park.	Wall at rear of path maintains visual and physical connection to river. Consideration given to the use of precast sections to reduce construction time and risk of pollution incident with concrete.

2.3. Examples of Defence Types

The following figures display examples of defence types that may be similar to those proposed for the final design of the scheme. The final design of flood protection measures will be chosen to integrate into the existing landscape as seamlessly as possible.

Figure 2-1 - Example of Glass Flood Walls

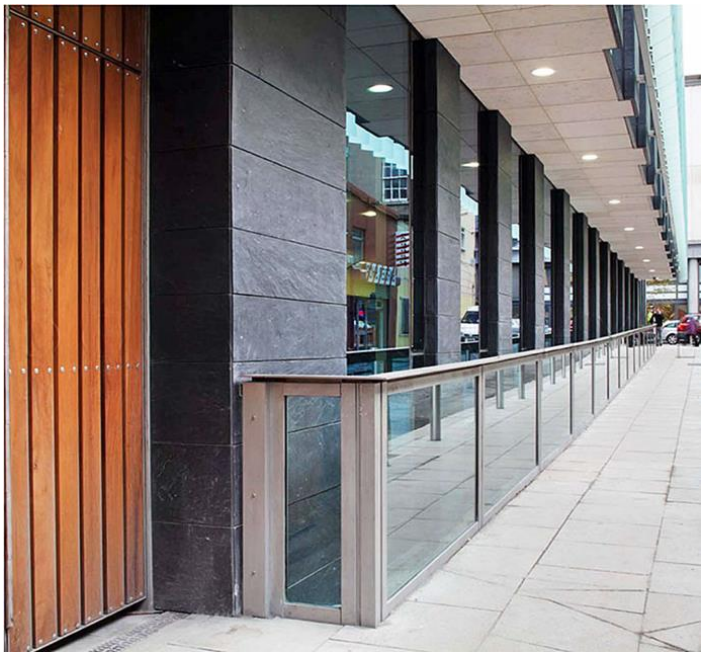


Figure 2-2 - Flood Gates

Figure 2-3 - Property Level Defences

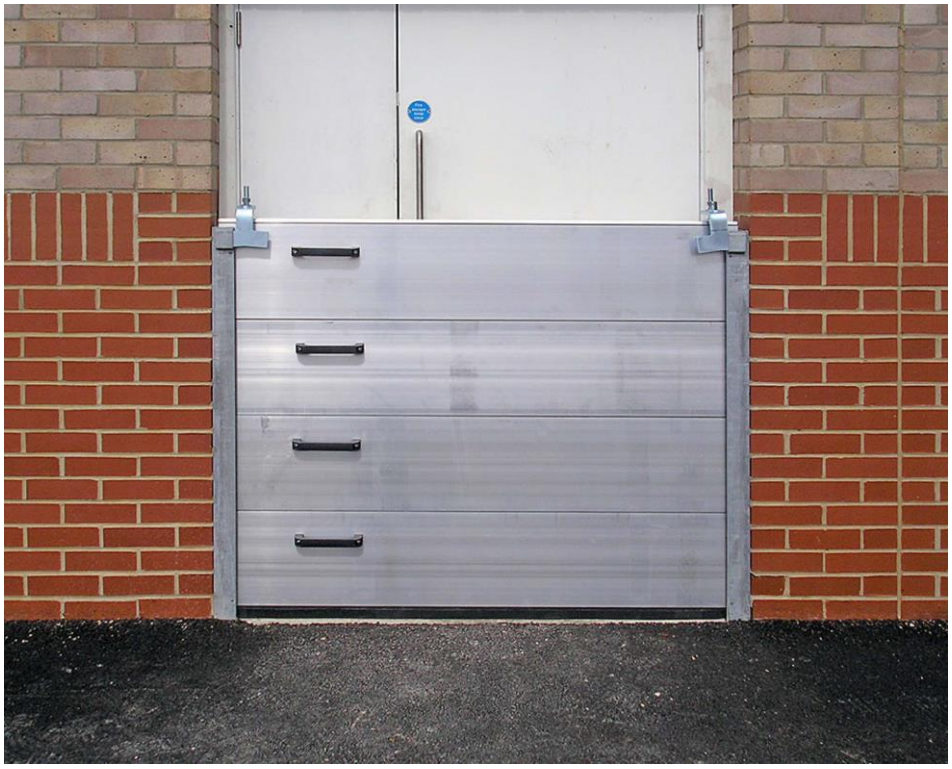


Figure 2-4 - Concrete wall with stone cladding

Figure 2-5 - Brick Wall with Railing

Figure 2-6 - Demountable Barrier

2.4. In-river works

This screening report considers the wider flood alleviation scheme but will focus more specifically on the in-river works which are proposed for one stretch along the Impounded River Lagan.

This is the proposed 215m stretch along the Ravenhill extent of the River Lagan between the end of the Ravenhill Reach pathway and the corner of no.17 Ravenhill Road. This stretch of existing quay wall has visible structural impairments (evidenced in the photos in Appendix B) and is considered structurally unsafe. As a result, it has been proposed that a new concrete flood wall will be built in place of the existing wall. This wall will step out into the river by 5-10m and will include the strategic placement of steel/concrete piles with infilling behind these. The location of the proposed scheme can be seen in Appendix A2.

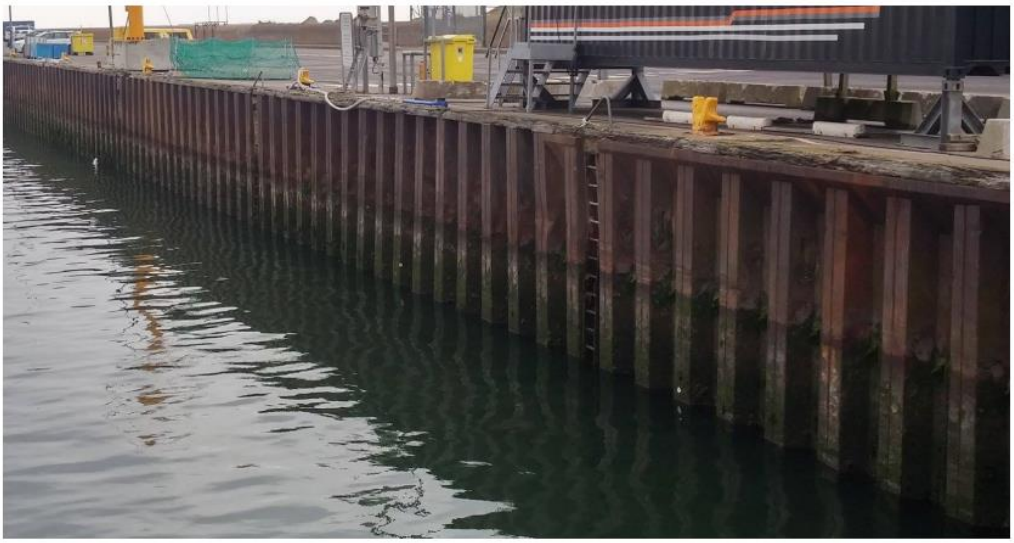
However, it is important to acknowledge that this will be a Design and Build project. A Construction Method Statement (CMS), as evidenced in Appendix C, has been developed for the scheme but the appointed contractor will be able to make amendments to the design and methods used which may result in changes to this CMS. Whilst this is the case, the most intrusive solution along the Ravenhill Quay Wall section is considered to be the permanent piling described previously. Any other methods, e.g. temporary piles, construction of a walled embankment will have a lesser impact. Therefore, this report has considered the worst-case scenario in regard to in-river works for the scheme.

The following figures display examples of sheet pile wall installation and backfilling for similar in-river projects.

Figure 2-7 - Sheet Pile wall stepped out from Quay Wall

Figure 2-8 - Backfill behind a sheet pile wall

Figure 2-9 - Sheet Pile Quay Wall



3. Environmental Characteristics of Study Area

Relevant environmental characteristics noted in the following sections are shown in Figure 3.1 - Environmental Constraints Map in Appendix D.

3.1. Population and human health

When considering the environmental characteristics of the study area in the context of EIA, Population and Human Health is directly linked to the size of the population in proximity to the scheme and those who are likely to be exposed to its effects - whether these are beneficial or adverse.

The scheme location is in an area where the population lives, works and visits recreationally. To indicatively quantify the potential number of people likely to be affected by the scheme a count of properties within 200m of the proposed flood walls has been undertaken. It is noted that this will not be wholly accurate as buildings may be multiple occupancy and recreational events will attract unknown numbers of people to the locality, however it is an indication of the population density in the area.

Distance	Property Count
0 – 50m	1,365
50 – 100m	1,674
100 – 150m	2,228
150 – 200m	2,651
Total	7,918

3.2. Biodiversity

Downstream of Stranmillis Weir, the Impounded River Lagan hosts little in the way of natural riverbank, but the narrow riparian corridor is an extremely valuable biodiversity and recreational resource within Belfast. The importance of the scheme location in terms of biodiversity is highlighted by the number of ecological designations that are located in close proximity to the proposed scheme and these must be considered in relation to the in river works due to a hydrological connection between them. These are detailed as follows:

3.2.1. Natura 2000 sites

The European Union (EU) has identified a number of habitat types that are most important across Europe. These habitat types are listed in Annex I of the EU Habitats Directive (92/43/EEC and as amended). The Habitats Directive also requires member states to identify sites that contain representative examples of these habitat types, these are known as Special Areas of Conservation (SACs). The study area is hydrologically connected with the following SAC's:

- The Maidens (SAC) (approx. 33 km distance) qualifies due to the presence of Annex I habitat types, Sandbanks which are slightly covered by sea water all the time and Reefs. The site is also home to the Grey Seal which is listed as an Annex II species.

- The North Channel (SAC) (approx. 22 km distance) qualifies due to the presence of an Annex II species at the site – the Harbour Porpoise.

Similarly, the EU, under the EU Birds Directive (79/409/EEC, as amended and codified in 2009/147/EC) also requires that member states identify sites to protect birds at their breeding, feeding, roosting and wintering areas. These sites are known as Special Protection Areas (SPAs).

The study area is hydrologically connected with the following SPA's:

- Belfast Lough Special Protection Area (SPA) (approx. 5km distance) qualifies under Article 4.2 of EC Directive 79/409 on the Conservation of Wild Birds by regularly supporting internationally important numbers of redshank in winter. The site also regularly supports nationally important numbers of shelduck, oystercatcher, purple sandpiper, dunlin, black-tailed godwit, bar- tailed godwit, curlew and turnstone. Belfast Lough as a whole is also used by several other waterfowl species including great crested grebe, scaup, eider, goldeneye and red-breasted merganser.
- Belfast Lough Open Water Special Protection Area (SPA), (5km distance). qualifies under Article 4.2 of the Directive (79/409/EEC) as it supports an internationally important wintering population of great crested grebe.

Natura 2000 sites, (SAC's & SPA's), are protected by the requirements of the above Directives, which were transposed into Northern Ireland legislation through The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 section 43) and later amendments. These are known as the Habitats Regulations. They build on previous existing domestic law and implement the various requirements of the Habitats and Birds Directives in Northern Ireland. The Regulations place a statutory duty on all competent authorities to act in accordance with the Directives.

3.2.2. RAMSAR sites

A Ramsar site is a wetland site of international importance designated under the terms of the Ramsar Convention. This is an intergovernmental treaty which provides the Framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

Although there are no Ramsar sites located within the study area it is hydrologically connected to the Belfast Lough Ramsar Site approximately 5km upstream. The site qualifies under criterion 3c by regularly supporting internationally important numbers of Redshank Tringa tetanus in winter.

3.2.3. Areas of Special Scientific Interest (ASSI)

Areas of Special Scientific Interest (ASSI) are areas of land that have been identified by scientific survey as being of the highest degree of conservation value. The law relating to ASSIs is contained in the Environment Order (Northern Ireland) 2002 because of the flora or fauna that is found on it, or because of geological features.

Notice must be given of any operations likely to damage any of the flora, fauna or geological, physiographical or other features by reason of which an ASSI is of special scientific interest before carrying out or permitting any such operation, even if the operations would not take place on land included in an ASSI. In practice, this means applying to the Northern Ireland Environment Agency (NIEA) for Assent to undertake the works.

Although not being undertaken directly within any ASSI's Construction work within the study area has the potential to impact on the following ASSIs due to their hydrological connection:

- Inner Belfast Lough ASSI is of Special Scientific Interest primarily because of its fauna and lies approximately 5km away from the study area. It includes areas of intertidal foreshore, comprising of mudflats and lagoons, and land, both reclaimed and being reclaimed which form important feeding/roosting sites for significant numbers of wintering waders and wildfowl. Of particular note are redshank and oystercatcher. Of similar proportional significance are the on-shore feeding populations of goldeneye and scaup which feed in the area at high water. Several other species of wildfowl - including wigeon, mallard and teal and waders, including dunlin, ringed plover and bar-tailed godwit are also found in large numbers throughout much of the ASSI. In addition, Victoria Park Lake, although artificial in origin, is a good example of a brackish lagoon with some associated characteristic plant and animal species. Inner Belfast Lough ASSI also contains a number of Earth Science Conservation Review (ESCR) sites exhibiting a range of Ordovician, Carboniferous and Permian features of national geological interest.

- Outer Belfast Lough ASSI located 6.4km from the study area, is important for the Ordovician series of spilitic lavas, black shales and greywackes. The Carboniferous series of the Holywood group are also of significance and the Permian rocks are the best exposed series of rocks of this age in Ireland. The habitat range includes open mud flats, boulder and rock shore, extensive mussel beds and a narrow shoreline strip of semi-natural vegetation including small, isolated pockets of beach-head saltmarsh. Associated terrestrial habitats are represented in a few places. Notable plants include spring squill and Ray's knotgrass. Birds

from Inner Belfast Lough ASSI regularly use Outer Belfast Lough for feeding, and the populations of the two areas are closely linked. However, in its own right, the area supports important numbers of great crested grebe and nationally important wintering populations of oystercatcher, ringed plover, redshank and turnstone.

3.2.4. Other Designations

There is one Site of Local Nature Conservation Importance (SNCLI) and Area of Constraint on Mineral Developments located immediately adjacent to the proposed scheme, Belvoir SLNCI. This SLNCI includes reedbed, semi-natural woodland and unimproved inundation grassland habitats along the eastern bank downstream of Stranmillis Weir. The wider SLNCI includes coniferous plantations intermixed with stands of estate woodland, wet areas and semi-natural grassland. Large bitter-cress occurs in wetter areas and three-nerved sandwort along path sides, in addition to a diverse bird population and red squirrels.

The River Lagan, the tidal River Lagan (Impoundment) and Inner Belfast Lough, immediately downstream of Lagan Weir are designated as nutrient sensitive under the Urban Waste Water Treatment Directive (91/271/EEC) and the Nitrates Directive (91/676/EEC). The Lagan is a designated salmonid river under the Freshwater Fish Directive (78/659/EEC) and is also considered as a salmon river under the North Atlantic Salmon Conservation Organisation (NASCO) definition.

Belfast Lough is designated as a Shellfish Water under the Shellfish Waters Directive (79/923/EC). Regular water quality monitoring of the designated shellfish area within the Lough is undertaken. (Belfast City Council, 2004).

3.2.5. Phase 1 Habitat Survey and Biodiversity Enhancement Strategy

Atkins, on behalf of the Depart for Communities (DfC) (formally DSD), undertook a Phase 1 habitat survey of the Impounded River Lagan in 2013 which formed part of a wide Biodiversity Enhancement Strategy. The following summarises the findings and a full copy of the study report is provided in Appendix E.

The majority of the Impoundment upstream of Albert Bridge comprises mostly narrow riparian strips of neutral, semi-natural grassland, backed by planted trees and scrub along the top of the embankments. The lower reaches of the Impoundment, on the eastern bank immediately downstream of Stranmillis Weir, supports the best developed habitat of semi-natural broad-leaved woodland and inundated semi-natural grassland. The remaining habitats within the study area include ephemeral / short perennial vegetation, amenity grassland and ornamental planting. Downstream of Albert Bridge the embankments become increasingly hard engineered and of little or no ecological importance.

As a result of improvements in water quality in the Impoundment, and other measures, it now supports salmon, trout and a small population of eel (DEFRA, March 2010) which migrate upstream to spawning areas and feeding grounds, in addition to coarse fish, common seal, water birds and other wildlife. The bridges crossing the Impoundment also offer habitat for wildlife. Albert Bridge supports a very large population of starlings and black guillemot nest on Queens Bridge.

Invasive plant species are becoming increasingly common along the River Lagan, and along the Impoundment. They provide very poor habitat for insects and birds, grow extremely densely and shade out native species and increase the rise of riverbank erosion when they die back in the autumn. Japanese knotweed, Himalayan balsam and giant hogweed were recorded along the Impoundment, and records indicate floating pennywort is present upstream of Stranmillis Weir.

3.2.6. Habitats Regulation Assessment

Atkin's on behalf of Department for Infrastructure (DfI) Rivers undertook a Habitat's Regulation Assessment (HRA) in March 2019 to assess the impact that the proposed in river works could have on the nearby designated sites. The following summarises the findings and a full copy of the report is provided in Appendix F.

This HRA highlighted the designated sites that were hydrologically connected and could be impacted by the Ravenhill area in-river works. These were:

- Belfast Lough Open Water SPA, (within 5km of the scheme);
- Belfast Lough SPA, (within 5km of the scheme);
- Belfast Lough Ramsar, (within 5km of the scheme);
- The Maidens SAC, (within 33km of the scheme);

- The North Channel SAC (within 22km of the scheme); and
- East Coast Marine pSPA, (within 5km of the scheme).

Also considered was the potential impact on the Belfast Harbour Seal Colony.

The HRA Stage 1 Assessment concluded that given the requirement for embedded mitigation through a CEMP it can be stated that there is the potential for impacts relating to the construction of the proposed scheme in reducing water quality or the introduction and spread of invasive species in these sites. Therefore, a Stage 2 Appropriate Assessment was undertaken.

The Appropriate Assessment concluded that with the inclusion of the mitigation measures in the CEMP it can be considered that the proposed scheme, including the in-river areas of work, will not adversely affect any of the hydrologically connected designated sites. Therefore, a conclusion of 'No AESI' (Adverse Effect on Site Integrity) was given but this was dependent on the mitigation measure outlined in the CEMP.

One of the key elements of this HRA was the potential impacts of piling activities on the Harbour Seal Colony along Musgrave Channel and East Twin Island. This took into consideration a report by the Joint Nature Conservation Committee (JNCC) regarding the risks of piling activities during the installation of offshore windfarms. This report outlines a number of best practice protocol measures to reduce to negligible levels the potential risk of injury or death for marine mammals that can be adapted to the piling activities that will be employed along the Ravenhill Quay Wall.

Considering the location of the seal colony approx. 2km from the closest site requiring piling activities, the low probability of seals entering the impounded section of the River Lagan, the schedule of works taking place in the autumn months and the adoption of appropriate mitigation measures outlined within the JNCC report to be included in the CEMP, it was considered there would be no impact of piling activities on marine mammals (in particular Harbour Seals).

3.3. Land and Soil

3.3.1. Land Use and Recreational River Activities

The main land uses in the area are residential, transport, recreational, industrial and commercial.

The River Lagan, Belfast Lough and adjacent lands form an important recreational hub within Belfast, providing facilities that cater for on-water recreational activities; tourism, community centres, tennis clubs, walking and children's playgrounds.

3.3.2. Land

A review of NIEAs Land Quality database has shown that there are numerous historical and current land quality uses of potential concern within the study area. This includes:

- Railway land;
- Chemical Works;
- Engineering works;
- Dockyards & Docklands;
- Sewage works;
- Airports;
- Fuel Storage;

- Petrol filling stations;
- Gas Works;
- Power Stations.

3.3.3. Geology and Soil

The principal underlying bedrock of the reaches downstream of Governor's Bridge is formed by the sedimentary Sherwood Sandstone Group (sandstone, siltstone and mudstone), formed in the Triassic/Permian (229-271 mya) and typically found in areas which had been dominated by rivers. The Stranmillis area is underlain by the Permian (251-271 mya) Belfast Group -Sandstone with interbedded Limestone. The bedrock is overlain for the most part by Quaternary marine deposit of sand silt and clay.

The 1:50,000 soils maps (Sheets 15 & 20) classify the Impoundment as 'Urban', where landcover in some cases has been heavily modified. Much of the Impoundment is made ground, including the hard-engineered revetments. Downstream of Albert Bridge, the embankment generally is formed by vertical stone and concrete revetments and walls. Where soil occurs at the top of the revetments, downstream of Governor's Bridge, it is thin and well drained, comprising sand and clays. Upstream of Governor's Bridge, some sections of more naturalised banks remain, and soils here are predominantly mixtures of clays/muds, silts and fine sands.

3.4. Water

The Water Framework Directive requires countries to protect the status of water bodies from deterioration and, where necessary and practical, to restore waterbodies to good status. The Impounded River Lagan has been designated as a Heavily Modified Water Body (HMWB) because of the Weir and its transitional water environment. Transitional waters are recognised across Europe as being difficult to classify as each one is unique. Transitional environments are naturally stressed systems with high spatial and temporal variability.

The WFD therefore requires 'Good Ecological Potential' (GEP) in HMWB's, as opposed to 'Good Ecological Status' (GES). The ecological potential of a water body represents the degree to which the quality of the water body's aquatic ecosystem approaches the maximum it could achieve, given the heavily modified and artificial characteristics of the water body that are necessary for the use or for the protection of the wider environment.

The study area lies within the remit of the North-Eastern River Basin District and waterbodies within it are referenced in the North Eastern River Basin Management Plan (RBMP) carried out under the requirements of the Water Framework Directive. The River Lagan is noted as a Transitional Water Body and is currently classified as being of overall 'Poor' Ecological Potential status. It has an objective of meeting 'Moderate Ecological Potential' by 2021 and 'Good Ecological Potential' by 2027 The Connswater River is currently classified as being of overall 'Poor' Ecological Potential status. It has an objective of meeting 'Moderate Ecological Potential' by 2021 and 'Good Ecological Potential' by 2027. The Blackstaff River is currently classified as being of overall 'Moderate' Ecological Potential status. It has an objective of meeting 'Moderate Ecological Potential' by 2021 and 'Good Ecological Potential' by 2027. Belfast Harbour is classified as a Coastal Water Body and is currently classified as being of overall 'Moderate' Ecological Potential status. It has an objective of meeting 'Good Ecological Potential' Status by 2021 and maintain 'Good Ecological Potential Status by 2027.

Intense urbanisation and industry have resulted in historically poor water quality in the study area. The large extent of impermeable surface areas, such as roads, pavements and car parks, results in frequently contaminated surface water run-off.

There are numerous other smaller watercourses within the study area and the potential for construction related pollution incidents affecting all rivers should be determined. There are a range of guidelines which detail measures which are to be taken to ensure that the potential for water pollution incidents and impacts are minimised. However, with any construction project there is the potential for water quality incidents to occur.

As previously discussed, the HRA considered the potential impacts that the in-river works, along the four stretches of the Impounded Lagan, would have on water quality and subsequently any designated sites hydrologically connected to this area. This concluded that there was no risk anticipated as a result of these

works on the water quality including from the spread of invasive species provided a detailed CEMP outlining appropriate mitigation measures was adhered to throughout the construction stage.

3.5. Air

A Strategic Planning Policy Statement (SPPS) for Northern Ireland – Planning for Sustainable Development sets out the Department of the Environment's (DOE) regional planning policies for securing the orderly and consistent development of land under the reformed two-tier local planning system. The SPPS provides a new set of overarching core planning principles to underpin delivery of the planning reforms set out in the Planning Act (Northern Ireland) 2011 ('the Planning Act').

One of the core planning principles of the reformed, two-tier planning system is 'Improving Health and Well-Being' including the requirement to improve air quality. The SPSS sets out how the planning system can positively contribute to the improvement of air quality and in minimising the harmful impacts on health and well-being.

The SPPS, under Part 2 of the Planning Act (Northern Ireland) 2011, requires each Council to prepare a Local Development Plan (LDP) for the district which will (when adopted) replace the current separate development plans previously produced by the DOE.

The proposed scheme lies within the Belfast City Council administrative area which has an adopted local plan (Belfast Metropolitan Area Plan 2015). The plan seeks to 'enhance quality of life' and the development of healthier lifestyles is encouraged through increased provision for walking and cycling facilities together with policies which seek to provide an alternative to car travel which in turn offers the potential for improvement in air quality on major routes.

There are 2 Air Quality Management Areas (AQMA's) in the vicinity of the proposed scheme:

- Cromac St AQMA
- Ormeau Rd AQMA

Both AQMA's have been designated due to Nitrogen Dioxide (NO^2) levels above Air Quality Standards.

In the context of EIA air quality also relates to the creation of dust during construction. The approximate population exposed to any potential air quality issues as a result of the proposed scheme is shown above in section 3.1.

3.6. Climate

A growing population and a changing climate will place increasing pressures on the water environment with sea level rise projected to increase above 1990 levels by between about 0.11 m and 0.19 m (UK Climate Projections 2009).

The Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) published the findings of a study on the potential impacts of climate change on Northern Ireland's environment, economy and natural resources in 2002. This independent technical report concluded that there was a generally low state of awareness and concern about climate change and its impacts across all sectors in the Region. In the construction, infrastructure and transport sectors it advised that this was reflected in a reactive approach to climatic variation, such as flooding, rather than a planned long-term strategy.

The SNIFFER Report represented a first step towards the development of a regional strategy to address the impacts of climate change in Northern Ireland. Together with the report of the UK Climate Impacts Programme, the Government's Foresight Report and climate change publications prepared by DAERA (formerly Department's Environment and Heritage Service), it assisted the formulation of the policies to deal with flood risk for example within PPS 15: 'Planning and Flood Risk'.

PPS15 was revised in September 2014. Annex A of the PPS specifically deals with impacts of climate change with regard flooding and the need for adaptation to deal sustainably with the consequences of a changing climate.

In addition, the Strategic Planning Policy Statement for Northern Ireland (SPPS) 'Planning for Sustainable Development' has been published (September 2015). A key pledge of the Executive within the SPPS is 'to continue to work towards a reduction in greenhouse gas emissions by at least 35% on 1990 levels by 2020.'

The most recent assessment of the potential local impacts of climate change is the Northern Ireland Climate Change Risk Assessment (CCRA). This identifies, for different sectors such as agriculture, health, transport, business and the natural environment, the risks and opportunities likely to ensue through climate change. The report informed the Northern Ireland climate Change Adaption Programme (NICCAP), published in January 2014, which identifies priorities for action and appropriate sustainable adaptation measures that will be required to minimise risks to the economy, environment and society.

The development and publication of the SPPS fulfils a DfI (formerly DOE) commitment in the Adaptation Programme to identify and implement opportunities to build resilience into the built and natural environment and to develop and implement sustainable strategies to explore, address and manage significant flood risk.

3.7. Material Assets

Material Assets is a broad term that encompasses a wide range of features and which could cover almost all physical or non-physical sectors of the environment that could be said to have material value. It should be noted that there is no commonly accepted meaning of the term. In the context of this proposed scheme and the potential environmental impacts of this, the term ‘Material Assets’ is taken to refer to the following:

- Utility Infrastructure;
    - Electricity
    - Gas
    - Water (including private installations)
- Rights of Way; and
- Minerals (e.g. sand & gravel).

3.7.1. Utility Infrastructure

Electricity & Gas: Given the urban nature of the study area there are features of the electricity and gas networks that may be impacted by the proposed scheme. Location plans have been received from the relevant statutory undertaker and consultation to mitigate the impact is ongoing.

Water: NI Water (NIW) are responsible for both the water supplies and sewers within this study area. Water mains and existing NIW infrastructure are located in the roads throughout the extents of the scheme.

3.7.2. Rights of way

There are no public rights of way in proximity to the proposed scheme, however the area alongside the proposed scheme comprises mainly public footpaths adjacent to the River Lagan.

3.7.3. Minerals

There are no extractive quarries in the vicinity of the proposed scheme.

3.8. Cultural Heritage

Northern Ireland has a rich cultural heritage. Evidence of circa 9000 years of human activity has been found scattered across the region, with a Mesolithic site at Mount Sandel in Coleraine being the earliest known site of human occupation in Ireland. The known evidence presents itself across Northern Ireland as archaeological and historic features such as tombs, forts and castles, churches, townhouses and farmhouses, industrial features and planned parklands. There have also been numerous finds of artefacts which provide evidence of the day to day activity of people's lives, as well as more high-status items. There are also, of course, likely to be many unknown artefacts still to be identified.

It is well documented that the River Lagan and its hinterland have been hugely influential in the development of Belfast since the first settlements were established at the Beal Feirste, which is from the old Irish and which means literally 'The Mouth of the Farset', the River Farset being a minor tributary of the River Lagan. The Normans built a castle there and in 1613, with the granting of a Charter of Incorporation by King James I, Belfast became a town.

The river facilitated the spectacular growth of Belfast, and more so when the Lagan Navigation was fully operational and by 1794 linked Belfast with Lisburn and Lough Neagh. Rich agricultural land along the river provided fresh produce for trading, numerous industries, including the famous linen and ship building industries, were associated with the River, it provided a safe, secure and comparatively rapid means of allowing the import and export of goods. As the Industrial Revolution increased the rate of development, the usefulness of the River Lagan for navigation propelled Belfast into a leading port and increased industrialisation of its hinterland.

Protection of sites and features of cultural heritage significance is principally afforded through the Historic Monuments and Archaeological Objects (NI) Order 1985 and the Planning (NI) Order 1991. Planning Policies for protection of archaeological features are detailed in Planning Policy Statement (PPS) 6.

3.8.1. Sites of Archaeological Potential

A significant Area of Archaeological Potential, as identified in the Belfast Metropolitan Area Plan 2015, is located north of the gasworks site and extends along the towpath to Clarendon Dock. This area also extends across a large section of the river between Railway Bridge and the Lagan Weir.

It is however, prudent to note that the potential exists for an unknown feature of heritage potential to be uncovered at any location and under the terms of The Historic Monuments and Archaeological Objects (NI) Order 1995 the discovery of any unknown archaeological object must be reported.

3.8.2. Industrial Heritage Features

There are numerous Industrial heritage features which are protected under Policy BH 2 of PPS 6 within the study area, as seen in Appendix D.

3.8.3. Sites and Monuments Record

There are a number of records noted on NIEA's Sites and Monument Register within the Study area. Of these, there are 2 scheduled monuments sites that are directly affected by the proposed scheme.

- Lagan Navigation Reach 1
- McConnell's Lock

When a monument is scheduled, written consent is required for works that would alter or break the ground surface or disturb the historic fabric of the monument within its statutory protected area.

Under Article 4 of the Historic Monuments and Archaeological Objects (NI) Order 1995, it is an offence to carry out or to permit the carrying out the above scheme works without scheduled monument consent.

3.8.4. Listed Buildings

Due to its urban nature, there are a large number of listed buildings within the study area. A map of the identified listed buildings has been prepared and presented in Appendix D. Although King's Bridge, Albert Bridge and Queens Bridge are listed features it is not anticipated that any will be adversely affected by the proposed scheme.

Note: Albert Bridge is located c.150m downstream of the Ravenhill in-river works area.

3.8.5. Historic Parks and Gardens

Two sites designated as Historic Parks and Gardens are located adjacent to the proposed scheme though neither are directly affected. These are:

- Ormeau Park
- Botanic Gardens

3.9. Landscape

Overall, the general area is contained with the Belfast/Lisburn Landscape Character Area, characterised by steep ridges and escarpments that enclose the Lagan Valley at the head of Belfast Lough and by the concentration of industry along the banks of the River Lagan as it flows through Belfast.

3.9.1. Townscape Character

The area around Stranmillis falls under Designation BT 054 Stranmillis Riverside Area of Townscape Character (Belfast Metropolitan Area Plan 2015). Key features identified within this designation are 'the river to the east' and Queens University Boat Club along the river. Proposals for developments within Townscape Character areas are subject to assessment against key design criteria as set out in the Metropolitan Area Plan 2015. Belfast city centre is covered by a Conservation Area designation due to the quality of architecture and scale of the city centre streets.

Note: The wider Stranmillis area is covered under Designation BT 055 Stranmillis Village Area of Townscape Character. The closest point of this designation, the Lyric Theatre, lies within 40m of the scheme.

3.9.2. Local Landscape Policy Areas

There are 3 Local Landscape Policy Areas (LLPA's) that coincide with the proposed scheme:

3.9.2.1. River Lagan / Botanic LLPA

The LLPA includes Botanic Gardens, which were established in 1828 by the Belfast Botanic and Horticultural Society and continued as a private park for many years, only opening to members of the public on Sundays. It became a public park in 1895 when the Belfast Corporation bought the gardens. The gardens form a focal point and valuable amenity open space within south Belfast, used extensively by members of the public and students, visited by many tourists and regularly used as a venue for public events.

The most notable feature within the gardens is the Palm House, designed by Charles Lanyon and completed in 1840. It is one of the earliest examples of a curvilinear, cast iron, glasshouse in the world and is listed in recognition of its architectural and historic importance. The gardens also contain the Tropical Ravine House, built by head gardener Charles McKimm in 1889 which features a unique design of a sunken ravine running the length of the building, with a balcony at each side for viewing. The gardens are formally laid out with paths, seats, grass areas and flower beds. They feature long herbaceous borders, a rose garden created in 1932, a rockery, alpine garden and children's play area. There are many mature trees, shrubs and bedding plants. A statue of Lord Kelvin, the imminent physicist stands at the Stranmillis Road entrance and there is a gate lodge at the northern entrance which is listed along with the gate pillars. Located within Botanic Gardens is Queen's University Physical Education Centre, with a bowling green to the north and an expansive grass area to the south.

The Ulster Museum also lies within Botanic Gardens. The original building was completed in 1929, with a subsequent extension built in 1971, and after an extensive refurbishment reopened in October 2009. The building is another focal point and landmark within the park. The museum is listed as are the gates, piers, railings and walls along Stranmillis Road for their architectural merit and historic interest. It is a building much used by school children and other members of the public. To the south of the museum is the listed Friar's Bush Graveyard which is enclosed by a high stone rubble wall and entered via. an archway through the listed gate lodge, built in 1829.

The LLPA extends to include a number of listed buildings associated with Queen's University and its grounds, including Queen's University Main Building (the Lanyon Building), designed by Charles Lanyon, circa 1847/49, QUB South Wing, the Old Library, also by Lanyon, circa 1886/68, the Department of Music building and the Whitla Hall, built circa 1949. The War Memorial which stands as a focal point at the University Road entrance is also listed. The setting of the buildings is enhanced by many mature trees around the perimeter of the campus, extensive lawns to the front of the main building and the quadrangle in the centre. Across the road is the main campus of Methodist College, originally known as Wesleyan College, the largest grammar school in Belfast. The college was founded in 1865, originally as a college to train Methodist Ministers and partly as a school for boys. It opened on 18th August 1868 and shortly thereafter became co-educational. Both the main building and the McAuthur Hall, circa 1887/91, are listed for their architectural merit. Mature trees and large areas of lawn enhance the setting of the school buildings and contribute to the landscape and amenity value of the College grounds. College Gardens which runs along the north eastern boundary of the College and the listed gates and piers at the Lisburn Road end are included in the LLPA.

Included within the LLPA is part of the River Lagan corridor including Stranmillis and Annadale Embankments, the listed King's Bridge and the allotments at Annadale Embankment. The river and associated vegetation form an area of high landscape value and recreational amenity importance. The LLPA opens onto Malone Road, University Road, Stranmillis Road, Stranmillis Embankment and Annadale Embankment. It is an important green open space and amenity area, with many fine buildings of landscape and visual merit and historic and archaeological importance within a densely populated area. It is viewed by many passing motorists and extensively used by local people for both passive and active recreation.

The LLPA adds to the townscape character of the area and contributes to and enhances the setting of Queen's Conservation Area, Stranmillis Village Area of Townscape Character (ATC) to the west, Holyland ATC and Rugby ATC to the north east, Ormeau ATC to the east and Wellesley Avenue / Kier ATC to the north-west.

3.9.2.2. Ormeau Park LLPA

The LLPA is centred on Ormeau Park which comprises the remains of the planned landscape demesne at Ormeau. It is Belfast's oldest municipal park and one of the largest and busiest parks in the city. The park was designed by Timothy Hevey and opened to the public in 1871. The opening was marked with a parade from Carlisle Circus through Belfast which attracted a large crowd and finished with speeches in the park. The present-day park still roughly follows his design but with several alterations, for example, in the 1920's, the embankment road cut off the river frontage from the park.

The importance of the park is underpinned by its inclusion in the register of Historic Parks, Gardens and Demesnes of Special Historic Interest in Northern Ireland. The park opens on to Ormeau Road, Ormeau Embankment, Park Road, and Ravenhill Road. It is an important green open space and amenity area, of landscape and visual importance within a densely populated area. It is viewed by many passing motorists and extensively used for both passive and active recreation. The park features ornamental gates at its entrances and is enclosed with railings around its perimeter, all of which are listed. It contains a successful mix of planned landscape and recreation facilities, including open grass areas with mature specimen trees, shrubs and bedding plants, together with areas of woodland, pedestrian walkways, two formal children's playgrounds and a listed Victorian band stand and its setting. It includes the Ormeau Park Recreation Centre and the Ozone Complex as well as an indoor tennis facility, outdoor tennis courts, basketball, netball, and football pitches, a cycle track, eco-trails and orienteering course. The old walled garden associated with the original Ormeau House now contains the service yard, bowling greens and pavilion. It also contains an extensive area of long-established woodland, which underpins the historic importance of the planting within the park.

The LLPA also includes Ormeau Golf Course, which abuts the park to the south-east. Ormeau Golf Club was formed in 1893 and is one of the oldest in Ireland. It includes a club house and a nine-hole golf course set within the remnants of the planned parkland which was once part of the Marquis of Donegall's Ormeau Demesne and includes open grass areas, many fine mature specimen trees and a pond with a fountain. The golf course contributes to the green open space and amenity value of this part of the city. The park adds to the townscape character of the area and contributes to and enhances the setting of the adjacent Areas of Townscape Character along Ormeau Road, Park Road and Ravenhill Road.

3.9.2.3. Victoria / King George LLPA

The LLPA comprises Victoria Park, a formal Victorian park of high landscape and visual amenity value, a section of the Conn's Water and associated pedestrian walkway and the adjacent King George V Playing Fields. Victoria Park is a planned landscape of historical interest created on reclaimed land. It includes a man-

made island surrounded by a former boating lake, playing fields, bowling greens, tennis courts, significant groups of mature trees and shrubs and formal flower beds.

The park makes a major contribution to the landscape character of the area, forming an important large green open space adjacent to areas of dense housing, the George Best Belfast City Airport, the Belfast Harbour Estate and the Sydenham By-Pass, a major route into the city. The general open aspect of the south-eastern boundary of the park which abuts the Sydenham Bypass affords views into the park from passing vehicles and also from the adjacent railway line

3.9.3. Areas of Outstanding Natural Beauty (AONB)

For its small area, Northern Ireland has a great variety of scenic countryside and although there are no National Parks, large areas of landscape of distinctive character and special scenic value have been designated Areas of Outstanding Natural Beauty (AONBs). This designation is designed to protect and enhance the qualities of each area and to promote their enjoyment by the public. The southern extent of the proposed scheme (approx. 350m) is located within the following AONB adjacent to Stranmillis Weir:

- Lagan Valley AONB

The riverbank scenery, meadows, woods and the pleasant pastoral land of the Lagan Valley make this AONB a peaceful haven. The area has a rich heritage, not only through its impressive monuments such as the Giant's Ring, its Early Christian raths and the remnants of fine estates, but also its important industrial archaeology related to linen production and the old Lagan Canal and its towpath.

3.9.4. Tree Preservation Orders

Tree Preservation Orders (TPOs) are statutory protection afforded to trees under the Planning (Northern Ireland) Order 1991. TPOs are designations that aim to protect trees which provide high amenity value and make an important contribution to the environment, creating a varied, interesting and attractive landscape. Trees within conservation areas will not have individual TPO designations but must be treated as if a TPO is in place. Belfast City Council were consulted in relation to any TPOs within 250m of the proposed scheme boundary. The reply stated that there were no TPOs within that zone. However, as discussed previously the southern extent of the proposed scheme is located within the Lagan Valley AONB.

4. EIA Screening

Schedule 2 of The Marine Works Regulations presents the selection criteria that should be used to determine whether an Annex II project is likely to require an EIA. These criteria relate to the:

- Characteristics of the project;
- Location of the project; and
- Type and characteristics of the potential impact.

4.1. Characteristics of drainage scheme

Schedule 2 of the Regulations sets out the specific characteristics of an Annex II project that should be considered when determining whether an EIA is required. In response Table 4.1 provides a summary of the characteristics of the development against the screening selection criteria in Schedule 2.

A method statement relative to the proposed in-river works is included as Appendix C .

Table 4-1 - Screening criteria for characteristics of the project

Screening Criteria (Schedule 2, Paragraph 1)	
(a) The size and design of the whole project	Total Scheme Length = 7,961.82m Total Scheme Operational Area = 3980.5m2 / 0.39 hectares (assuming standard width of 0.5m) Total Length of in river Works is approximately 215m along Ravenhill Reach area.
(b) cumulation with other existing or approved projects	Works undertaken are stand-alone and no other works required to assist/achieve ultimate objective i.e. flood protection However, major dredging works of the Impounded Lagan is to occur at the same time as the flood alleviation scheme. The dredging works are to begin the 1st October 2019 and expected to last 8 months. Throughout the dredging, navigation within the river will be restricted and only by arrangement with the dredging contractor. Note: dredging will not be taking place within 10-15m of the existing quay wall due to fears of its potential failure.
(c) the use of natural resources, in particular land, soil, water and biodiversity	The use of natural resources would be kept to a minimum. Areas of construction will mainly be limited to lands already developed i.e. on existing footpaths, roads and quay walls. Aggregates and soil would be re-used on site, where possible. Vegetation clearance required for the proposed scheme would be limited to areas of riverbank where no other alternative exists. The in-river works along the Ravenhill section of the scheme will require stepping out from the current quay wall by 5-10m (i.e. installing sheet piles and infilling behind these). This will result in a reduction in the width of the river in this area. However, this is considered to be a small reduction given the overall

	size of the River Lagan, therefore it will have negligible effect on natural resources. During operation, the use of resources would be limited to cleaning/maintenance.
(d) The production of waste	Construction waste would be kept to a minimum with only excess materials removed to accommodate foundations. Excavated material will be re-used where possible and any excess waste will be disposed of in the appropriate manner. Operation waste would be minimal connected with the maintenance of the proposed structures.
(e) Pollution and nuisances	Construction traffic emissions and dust from material delivery and removal, and earthworks would be kept to a minimum. No construction liquid discharges are anticipated. There is opportunity for offsite manufacture of pre-cast units to reduce the likelihood of a pollution incident. Concrete and mortar required will be batched off-site. Construction activities would be programmed to minimise potential noise impacts to these receptors. On site construction activities will be managed via a Construction Environmental Management Plan (CEMP) – Procedures for monitoring and auditing will be included. The defence type chosen, will reflect the local environment and in agreement with local stakeholders. In relation to the in-river works, the carrying out of sheet piling will result in an increase in noise pollution for the duration of the project. A CEMP will be adopted to mitigate against these issues. This CEMP will also address the measures to be adopted to prevent any pollution events which could impact water quality within the river for all in-river works being carried out.
(f) the risk of major accidents or disasters which are relevant to the project concerned, including those caused by climate change, in accordance with scientific knowledge,	The proposed works are intended to prevent the impacts of flooding in Belfast. Climate change scenarios have been included in the modelled flood extent from which design levels have been obtained. Note: these levels will be refined prior to detailed design. Modelling will be carried out to inform understanding of a fluvial event with defence in place. The in-river works along Ravenhill Quay wall are being carried out to prevent the failure of the existing wall. Should the failure of the quay wall occur it would be considered a major incident due to the location of commercial and industrial business along this extent of the river.
(g) the risks to human health (for example due to water contamination or air pollution)	Construction would be undertaken in accordance with the commitments to be set out in a CEMP which would provide adequate mitigation for any potential environmental issues that may arise during the works. The CEMP designed specifically for the in-river works will address all mitigation measures to prevent

	pollution impacts and potential impacts on other river users. Operationally the barriers will prevent adverse impacts in the form of flood protection.

4.2. Location of the project

Schedule 2 of the Regulations sets out the locational factors that should be considered when assessing whether a proposed development is likely to be EIA development. In response, Table 4.2 provides details of the location of the development against the screening selection criteria in Schedule 2.

Table 4-2 - Screening criteria for location of the project

Screening Criteria (Schedule 2, Paragraph 2)	
(a) the existing and approved land use	The wider scheme is a linear site and is located within an urban area. Current land use includes footpaths with existing barriers/railings, footpaths, quay walls, roadways and river embankment/ bed, e.g.  In-river works will take place along the existing quay wall in the Ravenhill stretch of the river. Photos of this section of the river are evidenced in Appendix B.
(b) the relative abundance, availability, quality and regenerative capacity of natural resources (including soil, land, water and biodiversity) in the area and below ground in that area	The vast majority of the area under consideration is on top of land that has already been developed i.e. footpaths, roadways and quay walls. Localised works in areas of river embankment may be required.

	Some smaller sections of in-river works will be carried out adjacent to an existing quay wall but there will be minimal impact on the natural resources in these areas. The works along the Ravenhill area will result in a reduction in river width due to a new sheetpile wall and infilling behind this. However, this is viewed as a small portion of the overall River Lagan area.
(c) the absorption capacity of the natural environment, paying particular attention to then following areas— (i) wetlands, riparian areas, river mouths; (ii) coastal zones and the marine environment; (iii) mountain and forest areas; (iv) nature reserves and parks; (v) areas classified or protected under national legislation, Natura 2000 areas designated or classified by member States pursuant to the Habitats Directive or the Wild Birds Directive (vi) areas in which there has already been a failure to meet the environmental quality standards laid down in EU legislation and relevant to the project, or in which it is considered that there is such a failure; (vii) densely populated areas; and (viii) landscapes and sites of historical, cultural or archaeological significance.	The absorption capacity of the natural environment is characterised as follows: i. The impounded River Lagan and a section of Belfast Lough lie adjacent to the proposed scheme. The in-river works will occur within the impounded River Lagan along an existing quay wall; ii. The northern section of the proposed scheme lies adjacent to the channels within Belfast Lough i.e. Herdman and Victoria. iii. There are no mountain or forested areas in proximity to the proposed scheme. iv. There are no nature reserves or parks within 500m of the site, however, there are a number of Sites of Local Conservation Importance (SLNCI's) located in close proximity to the proposed scheme. v. The proposed scheme is not within any Natura 2000 areas. The River Lagan is however hydrologically connected to Belfast Lough SPA, Belfast Lough Open Water SPA, The Maidens SAC and The North Channel SAC. The proposed scheme is not within a RAMSAR site. The River Lagan, however, is hydrologically connected to Belfast Lough RAMSAR site. vi. The River Lagan (under the WFD) is a Transitional Water Body and is currently classified as having 'poor ecological status'. It has an objective of meeting 'moderate ecological potential' in 2027 vii. The area surrounding the proposed scheme is densely populated. There are approximately 7,918 properties within 200m of the proposed scheme. viii. The southern section (approximately 350m) of the proposed scheme (near Stranmillis) is within the Lagan Valley AONB. However, it is anticipated that only property level protection will take place within this area of the scheme, and no hard-engineered flood defences will be incorporated. The proposed scheme is also within the zones of 2 scheduled monuments. This includes the chimney stack at the sirocco site, where the existing wall is to be used as flood defence, therefore no changes will occur. The second is an old dock situated on Lockview Road, the only part of the scheme in contact with this dock will utilise an existing solid flood wall with security fencing. The area

	surrounding this dock is designated as being of a scheduled monument zone, and a new flood wall is to be built on the western edge of this zone.

4.3. Type and characteristics of the potential impact

Schedule 2 of the Regulations sets out the screening criteria that should be considered in relation to the types and characteristics of the potential impact of the proposed development. Table 4.3 provides an assessment of the potential impacts of the Belfast Tidal Flood Scheme against the criteria given in Schedule 2.

Table 4-3 - Screening criteria for type and characteristic of the potential impact

Screening Criteria (Schedule 2, Paragraph 3)	
(a) the magnitude and spatial extent of the impact (for example the geographical area and size of the population likely to be affected);	Direct impacts associated with the overall proposed scheme is likely to be located within the immediate environs of the site, chiefly associated with impacts on pedestrians or river users (for in-river works). There are currently high pedestrian flows in the immediate environs of the site and the river is used frequently for recreational purposes such as rowing. In-river works are to be carried out adjacent to an existing quay wall, with no public access/footpath. There is unlikely to be a significant impact on river users in this area as this is a wide section of the river and the area in which works will take place is avoided due to high sedimentation resulting in shallow waters. Due to the localised nature of the proposed scheme it is unlikely that the resident population would be significantly affected by the development.
(b) the nature of the impact	It is anticipated that potential impacts would be restricted to the construction phase. There could be potential adverse construction impacts arising from temporary disruption or disturbance associated with construction activities i.e. hedgerow removal. This has potential to result in noise, water and air quality impacts but with the implementation of the control measures which would be incorporated in a CEMP. (CEMP) it is unlikely that impacts would give rise to significant environmental effects. Potential adverse operational impacts of the scheme would be limited to maintenance which should also be controlled by appropriate environmental procedures. Although works are planned within the zones of two scheduled monuments, they are unlikely to directly impact or affect the setting of these monuments. Scheduled monument consent would be sought for works in the relevant areas. With incorporated control measures and design principles the residual environmental impacts would be minor to negligible at the local scale. The in river works have the potential to result in noise, water and air quality impacts due to

	construction procedures but these would be limited to the construction phase only. In addition, with the incorporation of mitigation laid out in a CEMP it is unlikely that these impacts would be significant. Any in-river works will be accompanied by a Marine Licence the conditions within this will be incorporated into the CEMP.
(c) the transboundary nature of the impact	Given the location of the site no transboundary impacts would occur.
(d) the intensity and complexity of the impact	The project is not considered intense or complex in environmental terms. The proposed scheme will be similar to fencing/boundary works. Potential environmental impacts are mainly limited to the construction phase and standard control measure which would be incorporated to the CEMP would ensure no significant adverse environmental impacts. The in-river phase, along the 215m stretch of existing Ravenhill Quay Wall, may require piling activities and the constraints of the site. However, this is only a small section of the overall scheme and mitigation measures incorporated into the CEMP will reduce the potential environmental impacts to appropriate levels.
(e) the probability of the impact	The probability of any environmental impact is considered very low. Any potential impact will be managed by appropriate procedures e.g. contained within the CEMP. This is also relevant to the in-river section of the works. Added to this, any Marine Licence condition will also be adhered to for in-river works.
(f) the expected onset, duration, frequency and reversibility of the impact	No significant impacts are anticipated. The in-river works will prevent the quay wall collapsing into the river which would be a much larger impact.
(g) the accumulation of the impact with the impact of other existing and/or approved projects	The proposed scheme will be carried out with liaison with stakeholders. In particular the Department for Communities (DfC) have responsibility for the management of the Impounded River Lagan and its environs. We will work with DfC to ensure the detailed design is in accordance with any initiatives being carried out by DfC e.g. Biodiversity Strategy. The major dredging works that are to begin on 1st October 2019 will coincide with the Belfast Flood Alleviation Scheme works. The majority of works will be outside of the river, therefore not conflicting with in-river dredging with the exception of the small area of in-river works. Throughout the dredging works, navigation within the river will be restricted and only by arrangement with the dredging contractor. However, considering that the in-river works is only a small section of the river and that dredging will not be taking place within 10-15m of the existing quay wall due to fears of it failing it is unlikely there will be any conflict in this area. Therefore, potential for any large impacts from the accumulation of both schemes is unlikely.
(h) The possibility of effectively reducing the impact	The design of the scheme will be developed to

reduce both construction and operational impacts. During construction the impact of the proposed scheme would be further reduced through the implementation of the CEMP.

During operation, potential impacts would be reduced by the inclusion of design measures, such as self-cleaning glass (in appropriate areas).

In river structures and other structures would require minor maintenance works.

5. Conclusions and Recommendations

From an assessment of the types and characteristics of the potential impacts likely to arise from the proposed scheme, with particular attention to the in-river works, it is considered that they would not constitute EIA development. With the implementation of the control measures included in a CEMP and Marine Licence (for in-river works) during construction few impacts would be likely to arise. Those that do, would be restricted to the site and a limited area in proximity to the site and would not be significant. Apart from pedestrians that utilise the paths in the immediate vicinity of the construction works the local population and other sensitive receptors are unlikely to be affected by construction activities. In regard to the in-river works, there is no pedestrian access along the Ravenhill Quay Wall stretch of the river, however, access for recreational boats using the river will be required at all times. It is not expected there will be any impacts resulting from the cumulative effect of this project occurring at the same time as the major dredging works due to works being carried out in separate areas and the implementation of mitigation measures within the CEMP. At the operational stage, no significant impacts are anticipated with the only potential issues relating to maintenance.

The Habitats Regulations require a Habitat Regulation Assessment (HRA) to be carried out on any proposed plan or project that has potential to cause impacts on a Natura 2000 (N2K) site. This assessment was carried out for the in-river section of the works concluding that the proposed construction operations along the quay wall would not adversely affect the integrity of any designated sites through reduced water quality or spread of invasive species and would also not result in any impacts on the harbour seal colony located within Musgrave Channel. However, this conclusion was dependent on the implementation of all appropriate mitigation through a CEMP.

Therefore, it is recommended that the following measures are undertaken:

- Production of an Outline CEMP (referencing both the overall scheme and the in-river works) as part of contractor tender documentation which will identify the issues to be addressed, including (but not limited to):
    - Staff responsibilities;
    - Site management procedures including working hours and pedestrian management;
    - Water protection measures;
    - Biodiversity protection including interaction with DfC's Biodiversity Strategy and following measures to ensure the protection of trees;
    - Identification and management of Invasive Species;
    - Waste; and
    - Noise management procedures.
- Liaison with Department for Communities (DfC) Historic Environment Division (HED) regarding permitting requirements relating to scheduled monuments, features of industrial heritage and other features of heritage importance;
- Preparation of Marine Licence Application- Please note a licence can only be granted once a contractor is known; and
- Ecological and arboricultural surveys will also be carried out where appropriate.

In addition to the above, the scheme design and construction will be carried out under the Civil Engineering Environmental Quality Assessment Scheme (CEEQUAL). The project is to be registered for a CEEQUAL Whole Project.

CEEQUAL is the evidence-based sustainability assessment, rating and awards scheme for civil engineering, infrastructure, landscaping and public realm projects. It promotes the achievement of high environmental and social performance.

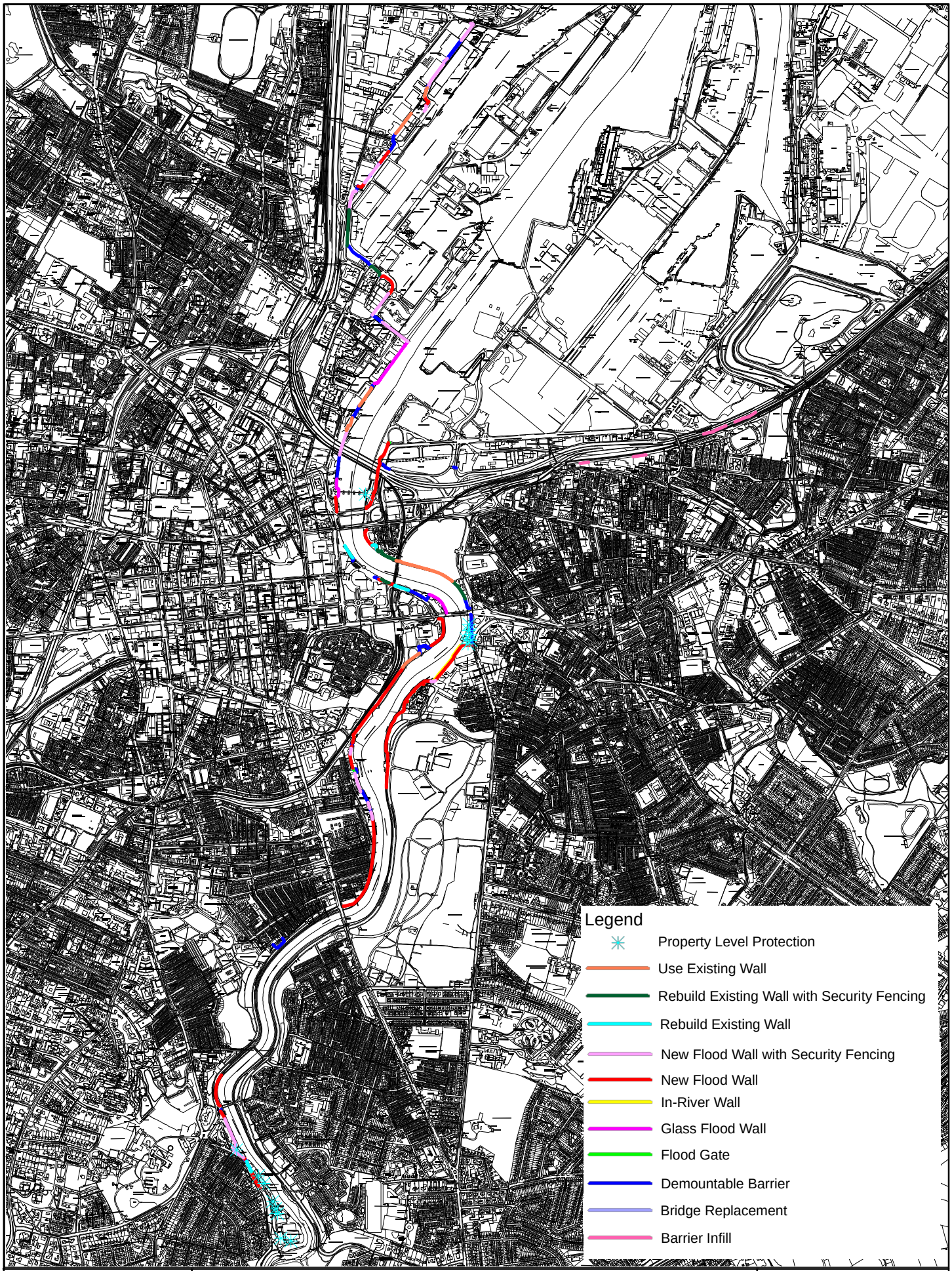
CEEQUAL aims to deliver improved project specification, design and construction of civil engineering works. CEEQUAL rewards project and contract teams in which clients, designers and contractors go beyond the legal and environmental and social minima to achieve distinctive environmental and social performance in their work. In addition to its use as a rating system to assess performance, it also provides significant influence on the project or contract teams as they develop, design and construct their work, because it encourages them to consider the issues in the question set at the most appropriate time.

It should be noted that the specimen design produced for the proposed scheme will be adapted by the design and build contractor. The detailed design will be informed by further environmental work including Statutory Liaison and CEEQUAL. As such opportunities will be identified to optimise the design solution in terms of environmental receptors.

Appendices

Appendix A. Drawings

A.1. Scheme Overview



Client

Scheme Overview- Draft (Scheme boundary subject to change)

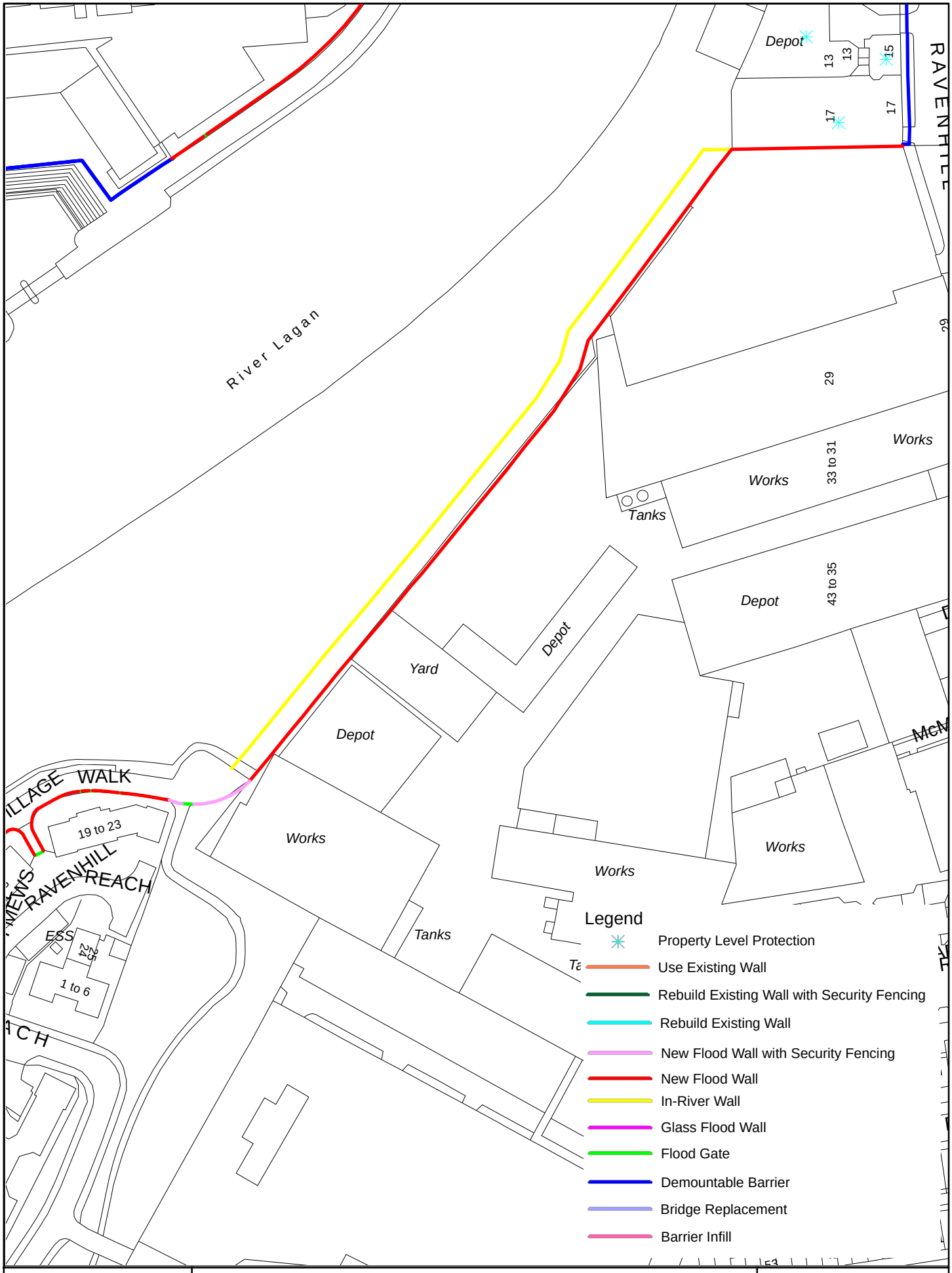
71 Old Channel Road
Belfast
BT3 9DE
Tel. (028) 90788600
Fax (028) 90788688

Project Name

Belfast Tidal Flood Alleviation Scheme

Drawn	Reviewed	Checked
NC		
Date May 19	Date	Date

A.2. Ravenhill Quay Wall



Client

Ravenhill Quay Wall Overview- Draft (Scheme boundary subject to change)

71 Old Channel Road
Belfast
BT3 9DE
Tel. (028) 90788600
Fax (028) 90788688

Project Name

Belfast Tidal Flood Alleviation Scheme

Drawn	Reviewed	Checked
NC		
Date May 19	Date	Date

Appendix B. Photos

B.1. Ravenhill Quay Wall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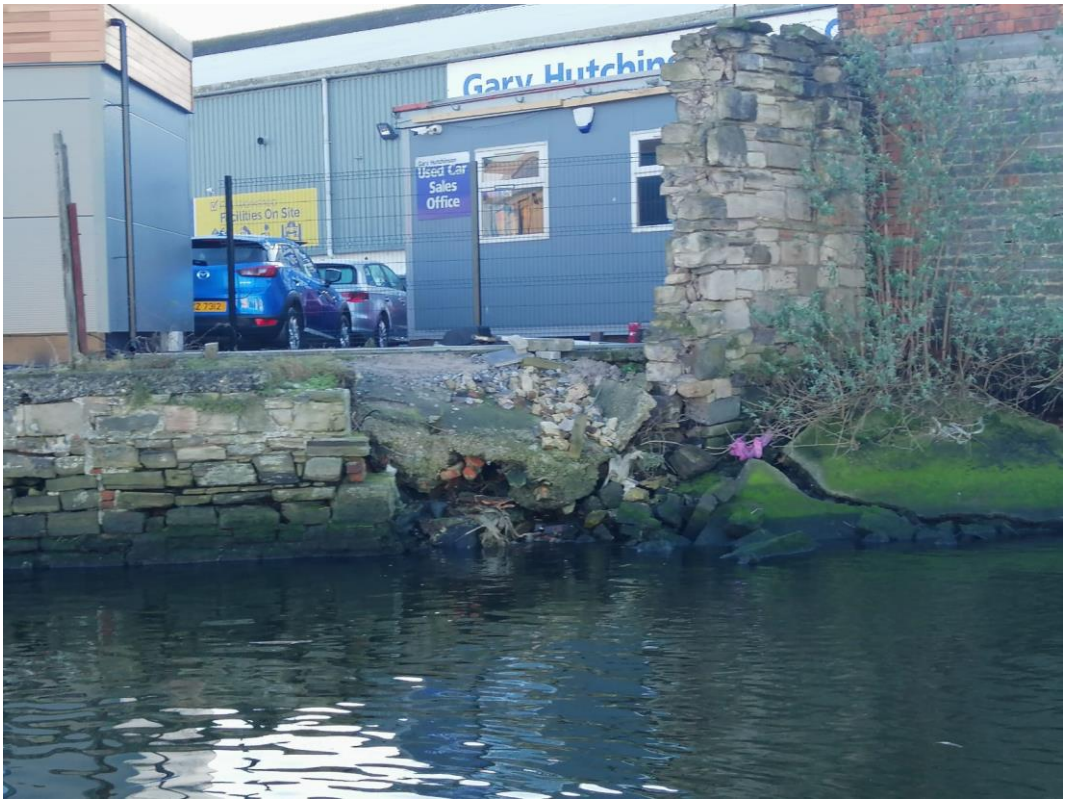
Close Motor Finance


Used Car
Sales
Office


CAUTION
RAZOR WIRE

Appendix C. Construction Method Statement

Memo

To:	Rachel Murray		
From:	J.Canham	Email:	jonathan.canham@atkinsglobal.com
Date:	30 April 2019	Phone:	n/a
Ref:	5163476-MS-001 Rev 01	cc:	
Subject:	Outline Sheet Piling and Tow Path Construction Methodology		

1. Background

1.1. Scope of this Document

This document describes a high-level construction methodology to construct the RH 36 sheet pile and tow path, as described in the below reference documents.

Reference documents;

- Technical Note "Belfast Tidal – Tennant's Sheet Pile Wall", dated 18th April 2019
- Drawing series 5163476-ATK-ZZ-ZZ-DR-C-00XX Rev P01
  - Proposed Sheet Pile Photo Locations' Rev P01
  - Proposed Sheet Pile Wall Location Rev P01
  - Proposed Sheet Pile Wall Sections - Sheet 1 of 2 Rev P01
  - Proposed Sheet Pile Wall Sections - Sheet 2 of 2 Rev P01

1.2. Design Construction Sequence

The design assumes the following construction sequence is adopted;

1. Sheet piles installed with river in dredged condition.
2. Tow path is backfilled in two layers by "light plant" over any silt/soft material and sheet pile capping beam installed.

1.3. Assumptions

- There are no foreseen significant obstructions on-site that require specific mitigation.
- Existing river wall is to remain in-situ (including minor collapsed sections).
- Capping beam can be cast with tow path back fill up to 80% installed to mitigate the need to temporary scaffolding.
- Outfall will be required for either extensions of existing outfalls or drain trapped water behind the sheet pile wall.
- Structural monitoring is required on the existing river wall.

2. Health and Safety Provision

Work on site is only permitted to proceed upon satisfactory compliance with this section.

2.1. Inductions and Tool Box Talks

All personnel onsite shall be a site induction providing key information of site rule, key personnel and emergency procedures.

Tool Box Talks shall be undertaken prior undertaking site activities and shall be valid to the completion of the site activity or end the working shift (whichever occurs first). All personnel relevant to or within the work site/area vicinity shall attend or review the Tool Box Talk (including relevant risk assessments).

2.2. Risk assessment

All activities onsite shall be risk assessed and any mitigation action implemented prior to undertaking work on-site.

Risk assessments shall be undertaken in consultation with, as a minimum, the Site Manager, HSE Repetitive and Operator.

All risks shall be reduced to as low as practically possible.

2.3. Permit to Work

Work will be undertaken using a permit to work system controlled by the site manager, or authorised delegate, to ensure the safe co-ordination of activities on the worksite. Permits shall be raised each shift, which cover activities only for that shift. For clarity a new permit shall be raised each shift.

Specific permits shall be raised for activities associated with elevated risk levels, and may include;

- Ground Disturbance (i.e. excavation, piling, fill, etc)
- Hot Works
- Isolations / Interventions (i.e. utilities/services, pressurised systems, etc)
- Working at Height
- Confined/Restricted Spaces

2.4. Equipment and Operators

All equipment and operators shall hold the correct and in-date certificates/qualifications. All documentation shall be available for review on request.

Typical documentation to be available shall include, but would not be limited to;

- Equipment test certificates
- Load / Pressure tests
- Calibration certificate
- Hose registers
- Rigging certificates
- Operator certificates/qualifications

All material, rigging, plant or equipment that does not have a valid in-date certificate shall be quarantined and not used.

Any material, rigging, plant or equipment that appears in poor condition or damaged shall be quarantined and not used until it has been confirmed fit for purpose by a qualified individual.

2.5. Personal Protective Equipment (PPE)

PPE is considered the last line of protection that cannot be mitigated by any other means. This section captures PPE requirements for a selection of activities and is not exhaustive. PPE requirements shall be determined through risk assessments and detailed on Permits to Work.

The below list indicates the minimum PPE required for any specific activity. Each activity should be considered a building block to establish PPE requirements onsite.

- Mandatory basic minimum
  - Protective Boots
  - Reflective Jacket
  - Eye Protection
  - Hard Hat
  - Gloves (suitable for activity)
- Working near/over water
  - Life Jacket
- Piling / Heavy Equipment
  - Hearing Protection

3. Construction Logic

Mobilise Site

- Site Security
- Establish Compound
- Inductions
- Setup Structural Monitoring, if required
- Mobilise Floating Plant
- General Site Clearance

Piling

- Installation of sheet Piling

Tow Path Formation

- Two Layer Infill behind sheet piles
- Install outfalls through sheet pile wall as required

Capping Beam and Tow Path Finishing

- Level Sheet Piles
- Cast Capping Beam
- Make Good / Finish Tow Path

River Works

- Dredge River, to maintain navigable channel where required.

Demobilise Site

4. Method Statement

4.1. Mobilise Site

1. Onshore compound (including offices, welfare facilities, moorings, etc) and site storage setup with suitable riverside access to provision construction site as and when required.
2. Project and safety signage to be erected in all relevant locations.
3. All personnel on site shall have undertaken appropriate inductions and attended/reviewed the daily/shift Tool Box Talk.
4. Onshore compound and open riverside areas (with land owners' permission) shall be fenced off from the landward side to prevent unauthorised access during construction.
5. Undertake a pre-construction survey of all adjacent structures including production of a photographic report.
6. Establish site survey / setting out system including level datum.
7. Utilising suitable riverside vessel (to facilitate or provide safety support) structural monitoring points shall be installed on the existing riverside walls. These will be monitored at the start and end of each working shift to establish what movement that may occur during construction.
8. Work Platform (i.e. Spud barge / Jack-up platform) including construction plant will be mobilised to the site to provide suitable working platform.

   Vessel shall manoeuvre, setup and operate, as required, in accordance with its own Standard Operating Procedures.
9. Site will be cleared in preparation for the main works. This will include the removal of excessive vegetation, clearance of unstable structure and ground.

   Any excavation works will be controlled with a Permit for Ground Disturbance.

   Any significant clearance and temporary works are not foreseen.

4.2. Piling

Sheet piles shall be lifted from the stock pile and installed in a single operation. It may be possible to install pairs of sheet piles at a time, although this is subject to a driveability assessment and any observed movement of the river wall. During pile installation monitoring points shall be routinely checked for any movement.

1. Foreman to become familiar with the required pile alignment setting out.
2. Rigging and equipment to be checked for damage prior to use.
3. Sheet pile hammer to up-end sheet pile from stockpile and positioned onto river bed ready for driving under the foreman's direction.
4. Foreman to confirm sheet pile position and verticality.

   Foreman to instruct SPH operator to drive pile in accordance with Standard Operating Procedures.
5. Sheet pile to be driven to required level or refusal, while being continuously checked by foreman for alignment and verticality.
6. Above sequence is repeated until sheet pile wall is completed.

   Work Platform to be repositioned as work progresses and materials restocked as required.
7. During piling should significant movement be observed on the existing river wall operations shall stop and situation reviewed with site management team and designers.

4.3. Tow Path Formation

The sheet pile returns will close the tow path infill area from the main river. It should be noted this work maybe subject to tidal restrictions to satisfy practical operations or safety concerns.

1. If required suction pumps dewater behind sheet pile wall and discharge via sediment interceptor into the river.

   As far as practically possible the minimum target dewatering capability will be 150%.

2. Any unacceptable material present behind the sheet pile wall to be removed and disposed of off-site.

3. Suitable fill material will be placed in uniform layers behind the full length of the sheet pile wall. Layers shall not exceed 300-500mm to the design engineer's discretion.

4. Upon reaching the top of the first compaction layer light plant (not exceeding 10kN/m^2) to suit the design requirements shall be used to compact the fill material.

   Suitable tidal windows and/or dewatering will be used to allow safe plant operations behind the sheet pile wall.

5. Tidal working will be undertaken to install any outfalls including any local strengthening works on the river side.

   All outfalls would have non-return style flap valves to facilitate draining hydrostatic surcharges on the landward side and isolate the river from adversely impacting any upstream drainage systems.

6. If required, suction pumps to be located in designated sumps will continue to dewater the worksite should plant be operating behind the sheet pile wall.

7. Second layer of suitable fill material to be placed behind sheet pile wall and compacted using light plant not exceeding 10kN/m^2

8. Final tow path surfacing not to be installed at this point.

4.4. Capping Beam and Tow Path Finishing

1. Capping beam shall be cut down to the required level as required.
2. Formwork to be constructed over the pile head to allow “hit and miss” concrete casting.
   Maximum length of capping beam runs shall be the smaller of either; run length equal to a single concrete pour or maximum distance between movement joints.
3. Reinforcing cages to be constructed either in-situ or offsite and craned into position.
4. Concrete to be poured in alternate casting bays and left to cure
5. Once poured concrete has reached its initial strength, remaining capping beam bays shall be cast.
6. Tow path to be releveled if required and final surfacing to be installed.
7. Formwork to be removed from new concrete capping beam

4.5. River works

1. Any safety equipment to be installed at agreed locations, if required.
   For example life rings or rescue lines/ropes.
2. Working platform in conjunction with barge to locally dredge navigable river channel.
3. Dredge arisings to be disposed approved offsite location.

4.6. Demobilisation

1. Work Platform and construction equipment to be removed from site.
2. Monitoring points to be removed and readings included in as built dossier.
3. Site fencing and signage to be removed.
4. Onshore compound to be demobilised

5. Environmental Management

5.1. Construction Environmental Management Plan (CEMP)

A Construction Environmental Management Plan (CEMP) will be prepared in advance of any piling or construction activities. This will address the following water protection measures to prevent any pollution incidents:

1. Pollution Prevention Guidelines (PPGs) / Guidance for Pollution Prevention (GPPs) and consents;
2. Suspended Solids;
3. Heavy Metals and Hydrocarbons;
4. Use of Cement;
5. Stored materials;
6. Poor Working Practices; and
7. Spread of invasive species.

The appointed contractor will assess the site-specific construction processes and any associated supporting service facilities that will take place on-site and adopt an appropriate pollution prevention strategy accordingly. The contractor will then identify the best working practices that will minimise the potential impacts on the local aquatic environment. Adopting these construction practices that are sympathetic to the natural aquatic environment will greatly reduce the risk of water pollution.

In addition to this, procedures will be outlined within the CEMP to mitigate against the impacts of piling activities on marine mammals, particularly harbour seals. This will follow advice laid out in the Joint Nature Conservation Committee (JNCC) Report and will include:

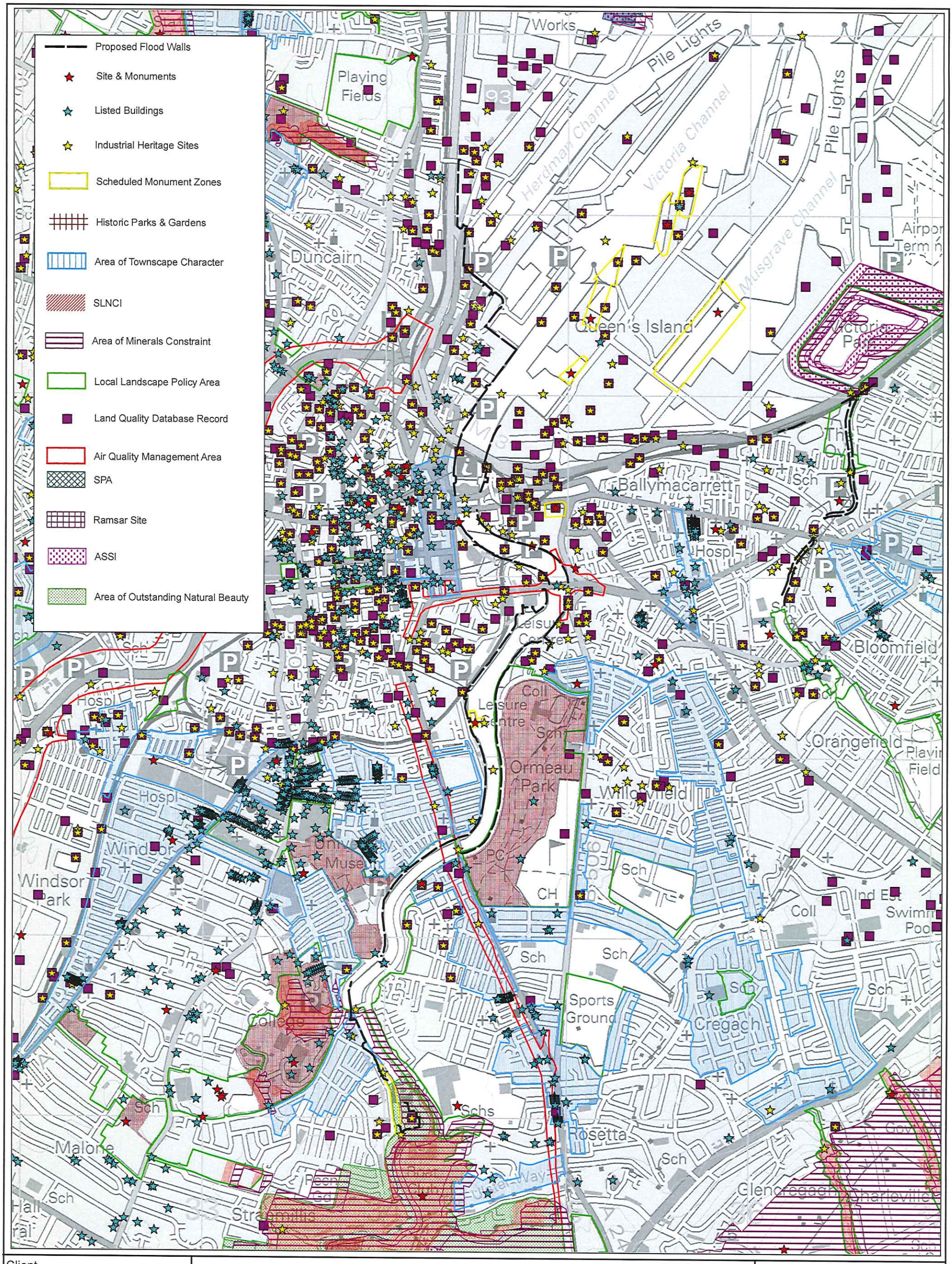
1. Use of Best Available Technique (BAT);
2. Seasonal restrictions for activities;
3. Employment of appropriately trained Marine Mammal Observer (MMO) and / or Passive Acoustic Monitoring (PAM);
4. Establishment of a mitigation zone (recommended to be 500m circumference or larger);
5. Piling should not occur at night;
6. A pre-piling search should be carried out for a minimum of 30 minutes;
7. A delay in commencement of piling activities by 20 minutes from the last sighting of a marine mammal;
8. Gradual ramping up of piling power during a soft-start over a period of 20 minutes or greater should be considered where possible;
9. For breaks in activities greater than 10 minutes the pre-piling search should begin again; and,
10. Consideration should be given to the use of Acoustic Deterrent Devices (ADDs) but only in conjunction with visual and / or acoustic monitoring.

5.2. Works Information

As part of the tendered contract the following information will be provided and must be adhered to by the appointed contractor:

1. The River Lagan is a salmonid river and as such works can only be carried out between 01st September and 31st March to avoid salmon and smolt migration;
2. Monitoring of Dissolved Oxygen (DO) will be required for the duration of the contract. DO shall be monitored at the surface and the bottom of the water column. If DO levels fall below 4mg/l operations will cease;
3. The contractor shall as a minimum be expected to buoy off his working area and create a 15m wide lane along each bank for the exclusive use of rowing clubs;
4. The contractor will not be allowed to work on those days when a rowing race is planned in the river;
5. At the end of each working day the contractor must leave all plant securely moored, adequately lighted and buoyed off to the satisfaction of the Project Manager and River Manager;
6. The contractor must ensure that all river users are kept informed as to where plant is moored;
7. All floating vessels and plant must be fitted with a VHF radio, a horn and be suitably lit in accordance with the rules of the river; and
8. All dredging and disposal operations will be in strict accordance with relevant Marine Licences. The contractor will be expected to undertake the role of the licensee and be responsible for meeting all requirements and aspects of the licence.

Appendix D. Environmental Constraints Map



Client

Department for Infrastructure
www.infrastructure-ni.gov.uk

ATKINS

71 Old Channel Road
Belfast
BT3 9DE
Tel. (028) 90788600
Fax (028) 90788688

Figure 3.1 Environmental Constraints

Project Name

Belfast Flood Alleviation

Drawn	Reviewed	Checked
JW	AJ	MML
Date 03/18	Date 03/18	Date 03/18

Appendix E. River Lagan Phase 1 Habitat Survey and Biodiversity Enhancement Strategy

Phase 1 Habitat Survey and Biodiversity Enhancement Strategy

Impounded River Lagan

Department for Social Development, NI

October 2013

Plan Design Enable

Phase 1 Habitat Survey and Biodiversity Enhancement Strategy Plan

Impounded River Lagan

October 2013

Notice

Document History

JOB NUMBER: 5098875			DOCUMENT REF: 5098875/31/DG/014			
0	Draft for Comment	DB/ED	POD/DB	POD/MML	JN	30-10-2013
Revision	Purpose Description	Originated	Checked	Reviewed	Authorised	Date

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Appendices

Citation

Byrne, D., Jess, A., Macklin, R., Delaney, E., Kelleghan, D. & O'Donoghue, P.D. (2013). *Phase 1 Habitat Survey and Biodiversity Enhancement Plan: Impounded River Lagan.* Report prepared for the Department for Social Development. Atkins, Belfast.

Cover Photograph: View along the upper reaches of the Impounded River Lagan (R. Macklin).

Photo Credits: All R. Macklin & D. Byrne, Atkins; except DOE NI Plate 4.8; Lagan Canal Trust Plate 5.1.

Acknowledgements

Atkins would like to thank the Department of Social Development (DSD) for their support during the undertaking of this work in particular Mr. Peter Gallagher, Mr Ronald Surgenor and DSD staff based at the Lagan Lookout.

We are particularly grateful to those individuals and organisations that provided information on habitats and species for this project; including NIEA (Natural Heritage; Earth Heritage & Ornithological Department; Water Management Divisions), Department of the Environment (Marine Division), Northern Ireland Water, British Trust for Ornithology (BTO), Royal Society for the Protection of Birds (RSPB), CEDaR, Lagan Valley Regional Park and Belfast City Council. The attendees at the Lagan Workshop meeting on 20th August were extremely generous with their thoughts and ideas and warm thanks are extended to them for their input and enthusiasm.

1. Introduction

1.1 Project Scope, Key Aims and Objectives

1.1.1 Scope of the Project

The impounded River Lagan serves a multitude of functions; a primary recreation feature within Belfast, flood regulation, a focus for city centre regeneration and an important wildlife corridor within an urbanised setting.

Atkins were engaged by the Department of Social Development (DSD) to undertake a Phase 1 habitat survey of a 4.8km impounded river stretch (referred to as the Impoundment), with the aims of delivering a coordinated approach to biodiversity conservation and promotion of the tidal section as a biodiversity resource. Development of a Biodiversity Enhancement Strategy Plan, with targeted outcomes and actions will provide a framework for reaching biodiversity goals along the Impoundment.

The project study area for the impounded River Lagan was agreed with DSD and is shown on Figure 1.1.

Plate 1.1 – Lagan Weir, which regulates water level within the impounded River Lagan.

1.1.2 Aims and Objectives

The main objectives of this project are to: -

- Undertake a Phase 1 habitat survey and map the riparian habitat along the impounded section of the River Lagan, from Stranmillis Weir to Lagan Weir;
- Collect information on resident flora and fauna, invasive species and other notable ecological features as relevant;
- Provide a policy review to analyse links to interacting plans, policies, programmes and environmental objectives which may influence the development of a Biodiversity Enhancement Strategy, primarily aimed at the riparian margins;
- Facilitate discussions on future management of the Impoundment through a consultation exercise with identified stakeholders;
- Identify realistic and achievable goals as part of the Biodiversity Enhancement Strategy to facilitate the conservation management of identified habitats and species along the Impoundment and to enhance the recreational value of the Impoundment whilst still protecting its inherent biodiversity value;

- Identify areas of constraint or concern which may influence the achievement of the identified management goals, particularly the presence of invasive species;
- Summarise management goals and deliverables into short, medium and long-term objectives;
- Act as a catalyst for exploration of future conservation objectives, including establishing links with relevant community stakeholders, educational organisations and other interested parties.

This report has been prepared following completion of field survey work, desktop research and an extensive consultation exercise, including a stakeholder workshop, and builds on a previous ecological survey and enhancement report carried out for the Impoundment (Marenco, 2002). The report comprises habitat classifications and descriptions and key findings along the impoundment, along with the provision of recommendations on future priorities for conservation management and a management strategy for the DSD in the short, medium and long term. The Biodiversity Enhancement Strategy should be viewed as a working document which can be revisited and revised as considered necessary.

In addition to reporting, a finalised GIS dataset containing information on plants species, habitat classification, habitat evaluation, threats and management recommendations will be presented to the DSD for potential use as an interactive informative dataset. Where present, details of invasive species are also recorded.

1.1.3 Report Structure

The report is divided into three main sections:

Section 1: Introduction and Background Information – sets out the objectives and aims of the project; baseline information on the Impounded River Lagan and principal agencies and organisations with management responsibilities or links to the Impoundment.

Section 2: Baseline Ecological Information - comprising the results of the Phase 1 habitat survey in addition to compilation of information from other available sources to set out a comprehensive baseline for development of the Biodiversity Enhancement Strategy. Detailed Target Notes for ecological features of note along and adjacent to the Impoundment are located in Appendix F.

Section 3: Biodiversity Enhancement Strategy - sets out the rationale for the strategy; eight key biodiversity enhancement objectives; actions to achieve the key objectives; and potential partnerships to develop future measures to achieve biodiversity gain.

Additionally, the report provides detailed biodiversity management proposals for DSD primarily aimed at the riparian corridor within their management (see Appendix A).

1.2 The River Lagan

1.2.1 Overview of the River Lagan

The River Lagan rises from a spring in Slieve Croob, just north of the Mourne Mountains, from which it flows for approximately 60km in a northerly direction, joined by five small tributaries, before reaching Stranmillis Weir, encompassing a catchment area of 570km^2. The impounded section stretches for 4.8km, extending from Stranmillis Weir to the Lagan Weir at Donegall Quay. Along the majority of its length through Armagh and the reaches upstream of Stranmillis Weir, the River Lagan is characterised by a number of woodland and semi-natural grassland habitats located adjacent to the riparian margin, whilst also draining the urban area of Lisburn. Downstream of Stranmillis Weir, the canalised river hosts little in the way of natural riverbank, but the narrow riparian corridor is an extremely valuable biodiversity and recreational resource within Belfast.

1.2.2 Designated Sites

The European Union (EU) has identified a number of habitat types that are most important across Europe. These habitat types are listed in Annex I of the EU Habitats Directive (92/43/EEC and as amended). The Habitats Directive also requires member states to identify sites that contain representative examples of these habitat types, these are known as Special Areas of Conservation (SACs). There are no SACs along or adjacent to the Impoundment.

Similarly, the EU, under the EU Birds Directive (79/409/EEC, as amended and codified in 2009/147/EC) also requires that member states identify sites to protect birds at their breeding, feeding, roosting and wintering areas. These sites are known as Special Protection Areas (SPAs).

The large intertidal area of Belfast Lough SPA, which at its closest is located approximately 500m from Lagan Weir, regularly supports internationally important numbers of redshank in winter. The site also supports nationally important numbers of shelduck, oystercatcher, purple sandpiper, dunlin, black-tailed godwit, bar-tailed godwit, curlew and turnstone. The boundary of the SPA is entirely coincident with Belfast Lough Ramsar site. Belfast Lough as a whole is also used by several other waterfowl species including great crested grebe, scaup, eider, goldeneye and red-breasted merganser. Due to the general absence of mudflats along the Impoundment, wading birds are generally absent or very occasional visitors. According to AFBI[1], Belfast Inner Lough is hypernutrified and is subject to eutrophication, with industrial discharges and surface water treatment plant discharges being the main contributors of dissolved inorganic nitrogen. Belfast Lough SPA is currently assessed as being in unfavourable condition due to a range of issues including water quality, possible natural fluctuations in migration and bird numbers as well as disturbance to roosting birds.

Areas of Special Scientific Interest (ASSI) are areas of land that have been identified by scientific survey as being of the highest degree of national conservation value; the appropriate legal instrument is the Environment (Northern Ireland) Order 2002. Such sites can be declared due to their inherent value for flora and fauna or due to features of geological interest. There are no such sites designated for nature conservation within the impounded River Lagan study area. Belfast Lough hosts two ASSI designations. The Inner Belfast Lough ASSI was originally declared in 1987, but subsequently had boundary revisions to take account of permitted port related

[1] http://www.afbini.gov.uk/index/services/services-specialist-advice/coastal-science/coastal-monitoring/monitored-sites/belfast-lough.htm

development, and marine areas below mean low water are not included in the designation. The outer section of Belfast Lough is designated as Outer Belfast Lough ASSI.

Designated sites adjacent to the Impoundment are shown on Fig 1.2.

1.2.3 Other Designations

There is one Site of Local Nature Conservation Importance (SNCLI)[2] and Area of Constraint on Mineral Developments located immediately adjacent to the Impoundment – Belvoir SLNCI (CR9 - Map. No. 4/106, Belfast City Council) – Appendix J. This SLNCI include the reedbed, semi-natural woodland and unimproved inundation grassland habitats along the eastern bank downstream of Stranmillis Weir. The wider SLNCI includes coniferous plantations intermixed with stands of estate woodland, wet areas and semi-natural grassland. Large bitter-cress occurs in wetter areas and three-nerved sandwort along path sides, in addition to a diverse bird population and red squirrels (Belfast City Council, 2004).

Upstream of Stranmillis Weir, Lagan Meadows SLNCI and Area of Constraint on Mineral Developments commences along the western river bank (B9 - Map No. 4/094). The meadows consist of extensively grazed, species-rich grasslands. Grounds at Stranmillis and Riddel Hall SLNCI and Area of Constraint on Mineral Developments (B10 - Map No. 4/091) is located within Stranmillis College and Riddel Hall and is not directly connected to the Impoundment. The SLNCI contains a number of ponds which are of ornithological interest.

The River Lagan, the tidal River Lagan (Impoundment) and Inner Belfast Lough, immediately downstream of Lagan Weir are designated as nutrient sensitive under the Urban Waste Water Treatment Directive (91/271/EEC) and the Nitrates Directive (91/676/EEC). The Lagan is a designated salmonid river under the Freshwater Fish Directive (78/659/EEC) and is also considered as a salmon river under the North Atlantic Salmon Conservation Organisation (NASCO)[3] definition.

Belfast Lough is designated as a Shellfish Water under the Shellfish Waters Directive (79/923/EC). Regular water quality monitoring of the designated shellfish area within the Lough is undertaken.

The entirety of the Lagan Navigation, including the Belfast to Lisburn section of the Lagan Canal, is a scheduled archaeological site, as is the Lagan towpath and the remains of McConnell's Weir (called McConnell's Lock in the designation).

Lagan Valley Regional Park boundary includes the section of Impoundment upstream of Governor's Bridge, although the Park extends primarily downstream of Stranmillis Weir along both sides of the river.

Overall, the general area is contained with the Belfast/Lisburn Landscape Character Area, characterised by steep ridges and escarpments that enclose the Lagan Valley at the head of Belfast Lough and by the concentration of industry along the banks of the River Lagan as it flows through Belfast[4]. The area around Stranmillis falls under Designation BT 071 Area of Townscape Character Stranmillis Riverside (Belfast Metropolitan Area Plan 2015). Key features identified

[2] For a list of SLNCI within Belfast see:-
http://www.planningni.gov.uk/index/policy/dev_plans/devplans_az/bmap_2015/bmap_district_proposals/bmap_belfast/bmap_belfast_library/bmap_belfast_library_city/bmap_belfast_library_slnci.htm
[3] http://www.nasco.int/pdf/far_habitat/HabitatFAR_NIreland.pdf
[4] http://www.doeni.gov.uk/niea/print/land-home/landscape_home/country_landscape/97/97-land.htm

within this designation are 'the river to the east' and Queens University Boat Club along the river. Proposals for developments within Townscape Character areas are subject to assessment against key design criteria as set out in the Metropolitan Area Plan 2015. Belfast city centre is covered by a Conservation Area designation due to the quality of architecture and scale of the city centre streets.

1.2.4 Land Use and Recreational River Activities

Along the Impoundment, the main land uses are residential, transport, recreational and commercial. Between Stranmillis Weir and Lagan Weir, the Impoundment is crossed by six road bridges:- Governor's Bridge, Kings Bridge, Ormeau Bridge, Albert Bridge, Queens Bridge and Queen Elizabeth Bridge, in addition to Lagan Railway Bridge.

The Impoundment and adjacent lands form an important recreational hub within Belfast, providing facilities that cater for on-water recreational activities; community centres, tennis clubs, walking and children's playgrounds.

A number of rowing clubs are located along the banks of the impounded river, mainly on the west bank upstream of Governor's Bridge, and this was the most commonly observed activity on the Impoundment. Five main rowing clubs are accessed from Lockview Road, all of which have their own privately owned single or combined slipways. Few boats use the Impoundment as there are limited berthing places.

Between Lagan Weir and Albert Bridge, a well-used riverside walkway and cycleway borders both sides of the Impoundment, with the footpath / cycleway continuing along the western bank until Ormeau Bridge. Along this walkway are areas of semi-natural vegetation on the Lagan embankments and amenity grassland and ornamental shrub planting.

Plate 1.2 – Walkway and cycleway along the impounded River Lagan, showing hard engineered edge along the embankment.

Upstream of Ormeau Bridge, the riparian edge is bordered for much of its length by road infrastructure and associated pedestrian footpaths. Fishing stands are located along Annadale Embankment.

1.2.5 Geology and Soil

The principal underlying bedrock[5] of the reaches downstream of Governor's Bridge is formed by the sedimentary Sherwood Sandstone Group (sandstone, siltstone and mudstone), formed in the Triassic/Permian (229-271 mya) and typically found in areas which had been dominated by rivers. The Stranmillis area is underlain by the Permian (251-271 mya) Belfast Group - Sandstone with interbedded Limestone. The bedrock is overlain for the most part by Quaternary marine deposits of sand silt and clay.

The 1:50,000 soils maps (Sheets 15 & 20)[6] classify the Impoundment as 'Urban', where land cover in some cases has been heavily modified. Much of the impoundment is made ground,

[5] Geological Survey of Northern Ireland - http://www.bgs.ac.uk/gsni/
[6] Geological Survey of Northern Ireland - http://maps.bgs.ac.uk/gsni_geoindex/

including the hard engineered revetments. Downstream of Albert Bridge, the embankment generally is formed by vertical stone and concrete revetments and walls. Where soil occurs at the top of the revetments, downstream of Governor's Bridge, it is thin and well drained, comprising sand and clays. Upstream of Governor's Bridge, some sections of more naturalised banks remain, and soils here are predominantly mixtures of clays/muds, silts and fine sands.

1.2.6 Historical and Cultural Context

It is well documented that the River Lagan and its hinterland have been hugely influential in the development of Belfast since the first settlements were established at the Beal Feirste, which is from the old Irish and which means literally 'The Mouth of the Farset', the River Farset being a minor tributary of the River Lagan[7]. The Normans built a castle there and in 1613, with the granting of a Charter of Incorporation by King James I, Belfast became a town.

The river facilitated the spectacular growth of Belfast, and more so when the Lagan Navigation was fully operational and by 1794 linked Belfast with Lisburn and Lough Neagh[8]. Rich agricultural land along the river provided fresh produce for trading, numerous industries, including the famous linen and ship building industries, were associated with the River, It provided a safe, secure and comparatively rapid means of allowing the import and export of goods. As the Industrial Revolution increased the rate of development, the usefulness of the River Lagan for navigation propelled Belfast into a leading port and increased industrialisation of its hinterland. McConnell Weir (or lock) was constructed in the 1930's to However, water supply issues, in addition to changes in economic fortunes of the major associated industries and the rise of railway and road transport led to sharp declines in trade along the Lagan Navigation, and the final section was from Belfast to Lisburn was closed in 1958.

Belfast continued to expand and become urbanised along the tidal section of the River Lagan, supporting residences, commercial enterprises and recreation, although from the early 20th century to the early 1990's the problems with unsightly mudflats and poor river water quality led to underinvestment along the Impoundment.

1.2.7 Regeneration of the River Lagan

By the 1970's and 1980's it was clear that the section of the River Lagan flowing through Belfast was severely polluted, and neglected with many derelict areas and devoid of fish and other aquatic species. Laganside Corporation was formed by the Laganside Development (Northern Ireland) Order 1989 to stimulate regeneration of the River Lagan and associated lands, including areas within the city centre, to make it a focal point for an ever growing city. When it was dissolved in July 2007, Laganside Corporation had invested £1 billion in projects and regeneration and achieved many successes, the most notable of which in terms the impoundment is the Lagan Weir, completed in 1994. The weir is a series of massive steel barriers which are raised as the tide retreats so as to keep the river at an artificially constant level; hence no intertidal flats are exposed during periods of low tide within the Lough, and the weir has acted as a catalyst for other key developments along the Impoundment, including Waterfront Hall, Lagan Lookout, and developments at Clarendon Quay. Additional measures were also taken to improve the water quality, with a programme of river dredging and the installation of an aeration system.

[7] The River Lagan itself translates from the Irish *Abhainn an Lagáin*, meaning "river of the low-lying district" and from the Ulster Scots *Lagan Wattèr* - http://en.wikipedia.org/wiki/River_Lagan

[8] For more information on the history of the Lagan Navigation see:
http://www.laganvalleylearning.co.uk/archive/Lagan_Navigation/teachers/History%20of%20the%20Canal.pdf
http://lagan.iwai.ie/history.html

Improvements within the impoundment have been assisted through ongoing partnership with a range of government agencies such as the Northern Ireland Environment Agency (NIEA) and the Agri-Foods and Biosciences Institute Northern Ireland (AFBI), together with non-governmental organisations such as Queens University Belfast. After dissolution of the Laganside Corporation in 2007, responsibilities for management of the tidal River Lagan up to Stramillis Weir, and its associated infrastructure, including Lagan Weir, were transferred to the DSD.

Plate 1.3 – Information signage near Lagan Lookout, erected by DSD to enhance public knowledge of the Impoundment.

The DSD, in cooperation with Belfast City Council and other relevant stakeholders, are committed to continuing the transformation of the Impoundment and continue to identify opportunities and projects to improve and enhance the Impoundment. Among the aims of the DSD, is to continue regeneration along the impoundment for commercial, recreational and residential activities. As part of DSD's commitment to improving the quality of features within and surrounding the impoundment, they have commissioned this terrestrial Phase 1 habitat survey and Biodiversity Enhancement Strategy Plan to augment and conserve the biodiversity within the terrestrial environment along the impoundment that is within their control.

Future projects which are being considered include the Lagan Corridor Project which aims to rejuvenate the Lagan Canal within the Belfast boundary, eventually in the long term looking at the possibility of opening up the Lagan corridor from Lough Neagh through to Belfast. As part of the initial stages there are proposals to construct a new cascade weir and lock at the existing Stranmillis Weir and formalising public access through the provision of a footbridge over the weir and development of commercial facilities (Lagan Canal Trust, February 2012).

2. Key Stakeholders and Management

2.1 Key Stakeholders

A number of stakeholders are in play along the Impoundment, either directly involved in management or with responsibility for land parcels/structures/projects which impact on the Impoundment.

Table 2.1 – Summary of key stakeholders – Impounded River Lagan

Stakeholder	Responsibilities / Interests
Department for Social Development (DSD)	Manages the riparian bank along the Impoundment up to 1.5m from high water mark (HWM); manage and operate Lagan Weir; enforce the River Lagan Tidal Navigation and General Bye-Laws (Northern Ireland) 2007 for the tidal river stretch.
Belfast City Council (BCC)	Owns and manages most of the Impoundment corridor above the 1.5m HWM.
Department of Agriculture and Rural Development (DARD) - Rivers Agency	Owns and operates the pen weir at Stranmillis; responsible for river flow management.
Department for Regional Development (Transport NI) - Roads Service	Responsible for public roads and road bridges along the Impoundment.
Department of Culture, Arts and Leisure (DCAL)	Owner and manager of Lagan Canal and towpath.
DCAL – Inland Waterways and Fisheries	Statutory responsibility for conservation and protection of inland fisheries.
Department of the Environment (DOE) - Northern Ireland Environment Agency (NIEA)	Statutory remit in relation to prevention of pollution and enforcement. The Natural Heritage section has responsibility for biodiversity protection and provision of advice. The Water Management Unit is responsible for River Basin Management Planning, including for the marine environment.
DOE – Marine Division	Responsible for monitoring of the marine/transitional environment; policy planning, reporting etc in line with the WFD, BWD and other marine policies.
NI Water	No direct responsibilities, but lead on projects such as Belfast Sewers which impact positively on the Impoundment.
South Belfast Partnership Board	Strategic partnership between communities, private sector and the NI Assembly to promote development and regeneration of the south of the city.
Lagan Navigation Trust	Promoter of Lagan Canal regeneration project which aims to restore navigation along the River Lagan in full from Belfast to Lough Neagh
Lagan Canal Trust	Aims to reopen navigation from Belfast Harbour to Lough Neagh.
Lagan Valley Regional Park	Responsible for management of the Regional Park
Agri-food and Biosciences Institute (AFBI)	Initiated fish stocking programme in the River Lagan; continue to periodically monitor fish stocks and water quality.

Rowing Clubs	Based along Lockview Road, the clubs maintain riparian margins associated with their clubs, also have direct access to the Impoundment.
Belfast Lough and Lagan Stakeholders Group	A catchment stakeholder group covering Belfast Lough and the River Lagan; including the impounded tidal section.

2.2 Management and Responsible Bodies

The Impoundment is almost entirely man-made and has been heavily engineered through stabilising banks using extensive stretches of stone revetments, provision of walkways and footpaths along the edge and through the commercial and residential interests which line the banks. The structures along the Impounded River Lagan come under the management responsibilities of a number of different agencies.

2.2.1 DSD

DSD owns and is the navigation authority for the stretch of River Lagan between Stranmillis Weir and the Harbour Commissioners limit on the downstream side of the Lagan Weir, and are responsible for operation of Lagan Weir. The Department is responsible for enforcing the River Lagan Tidal Navigation and General Bye-Laws (Northern Ireland) 2007 for this tidal stretch of the river. DSD monitor river user's compliance with the navigation and safety procedures, operate aeration equipment, undertake regular water quality analysis and have responsibility for pollution control procedures along the Impoundment.

Plate 2.1 – Reedbed on east river bank, upstream of Annadale Fishing Stands which receives a yearly cut to facilitate litter picks.

DSD also manage the revetments along the Impoundment, up to 1.5m from HWM, and is responsible for maintaining them in good repair. Ongoing revetment maintenance is undertaken as required, generally comprising cleaning, replacement of damaged sections and repointing of brickwork. Above the HWM, DSD manage a narrow strip of the terrestrial habitats along the revetments. Along the banks, DSD undertake cuts of reedbed and other vegetation to facilitate litter picks, limited bankside management and in more well-used public areas, for aesthetics. DSD are also responsible for the footbridge attached to Lagan Railway Bridge.

2.2.2 DARD Rivers Agency

Rivers Agency owns and operates the pen weir at Stranmillis and control the flow of water upstream into the Impoundment. The organisation has statutory responsibility for flood management and flood defences and works closely with relevant partners to integrate flood alleviation measures in the wider area e.g. as part of the Connswater Greenway Community Project.

2.2.3 Belfast City Council

Belfast City Council manages the land above the 1.5m zone managed by DSD. The areas of land within their management include the wildflower grassland at the Klondyke, Annadale Fishing Stands above HWM, areas of ornamental planting within the public realm mainly downstream of Ormeau Bridge, land within Lagan Lands East and much of the tree/shrub planting so often found at the top of the revetments. The Council is also responsible for Maysfield Inlet.

2.2.4 Other Management

Various land and other items are owned and/or managed by a number of different organisations. DARD Roads is responsible for the public roads and footpaths which border the Impoundment and for maintenance of bridge structures. The Lagan Railway Bridge is owned and maintained by Translink. Ornamental planting areas associated with residential developments are managed by private management companies. Walls along the east bank, downstream of Ormeau Bridge are in a number of different ownerships. Rowing and sporting clubs along Lockview Road maintain land around the clubs and up to the edge of the Impoundment.

2.3 Water Quality

2.3.1 Background

Intense urbanisation and industry have resulted in historic poor water quality in the Impoundment. The large extent of impermeable surface areas such as roads, pavements and car parks results in frequently contaminated surface water run-off. Regeneration of the Lagan has sought not only to address development, industrial and cultural parameters, but to place regeneration of the river itself at the core. Since the Lagan Weir was built in 1994, a continuous programme of water quality monitoring has been set in place. Water quality within the Impoundment is directly linked to issues such as fish migration and amenity value and it is therefore essential that the quality of the Impoundment water is maintained at a consistent level. By understanding the water quality issues within the Impoundment, this allows for relevant management measures to be implemented when required.

Since October 2009, the water quality status of the Impounded Lagan has been assessed against the European Union Water Framework Directive (WFD). The WFD requires countries to protect the status of water bodies from deterioration and, where necessary and practical, to restore water bodies to good status. The Impounded River Lagan has been designated as a Heavily Modified Water Body (HMWB) because of the Weir and its transitional water environment. Transitional waters are recognised across Europe as being difficult to classify as each one is unique. Transitional environments are naturally stressed systems with high spatial and temporal variability.

The WFD therefore requires ‘Good Ecological Potential’ (GEP) in HMWB’s by 2015, as opposed to ‘Good Ecological Status’ (GES). The ecological potential of a water body represents the degree to which the quality of the water body’s aquatic ecosystem approaches the maximum it could achieve, given the heavily modified and artificial characteristics of the water body that are necessary for the use or for the protection of the wider environment.

The River Lagan Local Management Area (LMA) includes all of the River Lagan as well as Belfast Harbour, including the Impoundment, and sits within the North Eastern River Basin District. The LMA indicates a target of GEP for HMWB in 4% of surface waters by 2021.

2.3.2 Water Quality Management Strategy

The WFD requires that the general physicochemical quality elements comply with standards established to protect the functioning of the ecosystem. The physicochemical quality elements that describe water quality include Dissolved Oxygen (DO), Salinity, and Temperature; these are described as the supporting elements to the ecological status.

The DSD (via Atkins), as well as other statutory bodies, currently monitor and report on the water environment within the impoundment. The Lagan is therefore currently the most monitored water body in Northern Ireland. Atkins, under commission from DSD, contributes to a water quality management strategy for the Impoundment. This includes weekly water quality monitoring, reporting and advice on environmental issues concerning the management of the Impoundment.

Plate 2.2 – Aeration tube covered with Chironomid larvae.

Dissolved Oxygen (DO) describes oxygen molecules which have actually dissolved in water. DO is one of the most important parameters in aquatic systems and is therefore a good indicator to assess water quality within a water body. It is required in metabolism for aerobic organisms and also influences inorganic chemical reactions. A summary of Impoundment DO readings from April 2010 to June 2013, shown in Table 2.2, indicates that the percentage of failing readings has decreased, indicating an improvement in water quality and a positive impact on water quality status. Only 7.9% failed to meet the required 4mg/l in 2013 compared to 2011 that saw over 1/5th of readings fail (see Appendix I).

Table 2.2 - Dissolved Oxygen WFD pass / fail summary table

Year	Pass (%)	Fail (%)
April – June 2010	81.0%	19.0%
April – June 2011	79.4%	20.6%
April – June 2012	87.2%	12.8%
April – June 2013	92.1%	7.9%

DSD can employ many short term and long term remedial actions depending on the reporting including gate operations (tidal barrages and flushes), selective withdrawals of anoxic water through penstocks, aeration and dredging.

2.3.3 Other Water Quality Monitoring

Agri-Food and Biosciences Institute (AFBI) have a permanent monitoring station located downstream of the Ormeau Bridge. The monitoring station takes dissolved oxygen, fluorescence,

salinity and temperature readings periodically (every hour) over a 24hr period throughout the year. The NIEA Water Management Unit undertakes various monitoring programmes within the impoundment at different times of the year. This sampling assesses biological (chlorophyll, fish, benthic invertebrates), micro biological (faecal coliforms and faecal streptococci), chemical (Annex 8 and 10 pollutants) and physic-chemical (dissolved oxygen and nutrients) parameters in line with the WFD.

2.3.4 Dredging

While the weir was being constructed in 1994, dredging of the impoundment took place to obtain sufficient navigation depth throughout the impoundment to facilitate small boat activities and to remove significant quantities of organic muds. DSD have a statutory obligation to maintain a minimum navigable depth of 1.5m throughout the impoundment. To this end, dredging is carried out periodically within the Impoundment main channel. Previous dredging operations were undertaken in 1994, 2001/2002, with the most recent completed in 2011 to remove sediment accumulations.

During the comprehensive 1994 dredge, an incised channel was established in addition to removal of silt. The 2010/2011 dredging provided maintenance dredging of the Impoundment, and reinstatement of the 10m wide incised channel. Silts arising were subject to contamination testing and a FEPA licence was granted for disposal of the arisings, whilst 250 tonnes of manmade rubbish was taken to licence landfill sites[9]. Works were timed so as to be complete by end of March 2011, before the salmon migration season. The date of next comprehensive dredging is not currently known, but is anticipated in a 10-15 year period.

A dredged depth of 1.5m below the minimum impoundment control level of 0.3m OD was provided. The incised channel along a section of the river bed was regarded to remove some high areas which in the past had trapped anoxic saline water in the bed hollows and prevented free flowing drainage conditions seawards. The latest substantial dredging programme in the Impoundment took place between September 2010 and April 2011 and saw the removal of some 60,000m^3 of silt from the 4.5km stretch of impoundment.

The timing of the dredge coincided with the Belfast Sewer Project which saw the removal/closure of several of the combined sewer overflows (CSO's) that spill into the impoundment, decreasing pollutant load by 85% and the combination of these projects, along with other river management actions, is leading to improved water quality.

2.3.5 Water Quality and Other Plans/Projects

Among the aims of the DSD, is to continue regeneration along the impoundment for commercial, recreational and residential activities. Salmon and seals are now regular occurrences within the impoundment and more and more recreational events are being held on the water; dragon boat races, rowing races, zap cats and zorbing, further promoting the transformation of the impoundment over the last two decades.

A number of other proposed sewerage schemes in the Greater Belfast area should contribute to further improvements in water quality within the impoundment e.g. Glenmachan Street Scheme; which would collect sewerage discharges currently entering the Blackstaff, a major pollutant hotspot in the impoundment. Works are also scheduled to rectify blocked sewers in the Cromac

[9]Contractor for the 2010/2011 dredging operation was Graham - http://www.graham.co.uk/whatwedodetail/15/141/river-dredging.aspx?expanddiv=slide_15,slide_11

Street area of Belfast which should also alleviate spills to the Blackstaff Culvert and the Blackstaff Relief Culvert.

Due to the management of the impoundment, operation of the weir, improvements to the sewerage system (e.g. Belfast Sewers Project which was completed 2011) and extensive dredging of the impoundment (last undertaken between September 2010 - April 2011), there has been a marked improvement in water quality within the Impoundment. To further improve water quality within the impoundment, a riverbed aeration system was installed to mix and oxygenate the mixture of freshwater and saline water. Salmon and seals now swim in the river due to improvements made regarding water quality within the impoundment.

2.4 Fisheries Management

Fisheries Management in the River Lagan, including the Impounded section, is the responsibility of the Department of Culture, Arts and Leisure (DCAL), Inland Waterways and Fisheries section. Under the Fisheries Act (NI) 1966, DCAL (Waterways and Fisheries) are responsible for salmon and inland fisheries of Northern Ireland and required to provide advice and guidance on matters relating to the conservation, protection, development and improvement of salmon and inland fisheries to angling clubs, fishery owners, and a range of other water users and interested parties.

Salmonids were absent or rare in the lower sections of the River Lagan from 1744 onwards until relatively recently (Rossell, undated). Estuarine water quality was identified as a primary issue, in addition to limited spawning gravels and passage issues upstream. Salmon stock was reintroduced from 1991 onwards to upper sections of the Lagan by AFBI as part of the River Lagan Salmon Reintroduction Programme. These stocks then smoltified, went to sea and returned via the Impoundment to spawn in upper reaches. Counters are installed at Stranmillis Weir, in addition to CCTV monitoring of fish to monitor migratory fish.

The River Lagan is designated as a year round coarse fishery by DCAL. Stands offer coarse fishing. The local club is East Belfast Coarse Angling Club with the main fishing upstream of Stranmillis weir, for gudgeon, perch, pike, roach, rudd and some bream.

As of 2010, monitoring had noted up to 4 seal individuals fishing within and upstream of the Impoundment, and they have been recorded as far upstream as Ballyskeagh[10]. There is some concern as to their impact on fish stocks in the Impoundment, but to date, targeted research has not been carried out.

On a wider scale, as part of the Lagan Targeted Catchment Action Plan, the NIEA are working with the Ulster Angling Federation and Iveagh Angling Club to identify stretches of the River Lagan and its tributaries which are problematic for fish stocks and a combined, targeted approach is being undertaken to resolve these issues.

[10] http://www.lagancanaltrust.org/wildlife-belfast-lisburn.html

3. Survey Methodology

3.1 Sources of Information

3.1.1 Consultation

Information about habitats and species for the Impoundment was obtained from various individuals and bodies. Detailed discussion was held with the DSD as to previous studies commissioned and sources of local data, such as published material, tree surveys or other targeted ecological surveys which may contain data on habitats within the study area.

Key groups consulted included: -

- Northern Ireland Environment Agency;
- Centre for Environmental Data and Recording (CeDAR);
- Royal Society for the Protection of Birds;
- Northern Ireland Bat Group;
- British Trust for Ornithology;
- Ulster Wildlife Trust;
- Lagan Canal Trust;
- Botanical Society of the British Isles.

Plate 3.1 – Stranmillis Weir viewed from the banks of the River Lagan adjacent to Belfast Boat Club and Tennis Club.

A summary of responses is provided in Appendix B.

3.1.2 Desktop Research

A desktop review was carried out focusing on collection of all available data on the identity, abundance, location, quality, connectedness and other attributes of habitats present, particularly those of high international, national or local importance or that have the potential to support species of importance according to: -

- EU Habitats Directive (92/43/EEC);
- EU Birds Directive (79/409/EEC; as recently codified 2009/147/EC);
- Relevant legislation (e.g. Northern Ireland Wildlife Order 1985, Wildlife and Natural Environment Act, 2011), and;

- Red Data books and lists (e.g. Northern Ireland Priority Species, Northern Ireland Species of Conservation Concern).

There are no designated sites for nature conservation within the survey area; Belfast Lough SPA and Ramsar site is shown on Figure 1.2.

A review of published and unpublished literature was undertaken in order to collate data on habitats and species of note in the study area, in addition to information received from consultees – see 3.1.1 above. The study area is enclosed within two 10km grid squares, namely J33 and J34. Relevant databases were trawled to search for any protected flora or fauna species present in either of these grid squares and where possible the search was narrowed to a 1km grid along the Impoundment.

The following key sources of information were consulted:

- National Biodiversity Network website[11];
- Butterfly Conservation website;[12]
- Northern Ireland Flora website[13];
- Invasive Species Ireland website;[14]
- Northern Ireland's Mammals, Amphibians and Reptiles (NIMARS) website;[15]
- British Geological Society;[16]
- Belfast City Council website and published documents, particularly Draft Belfast Metropolitan Area Plan (BMAP) 2011;
- Northern Ireland Priority Species[17];
- Northern Ireland Priority Habitats:[18]
- Northern Ireland Biodiversity Strategy;

Documents or data sources reviewed are listed in Chapter 7 – References, or as footnotes through the text.

[11] http://www.nbn.org.uk/
[12] http://www.bcni.org.uk/
[13] http://www.habitas.org.uk/flora/
[14] http://invasivespeciesireland.com/
[15] http://www.habitas.org.uk/nimars/
[16] http://www.bgs.ac.uk/
[17] http://www.habitas.org.uk/priority/
[18] http://www.doeni.gov.uk/niea/biodiversity/habitats-2/northern_ireland_habitat_action_plans.htm

3.2 Phase 1 Habitat Survey Methodology

3.2.1 Defining the Survey Boundary

The survey was planned in conjunction with the Department for Social Development. The area covered by the survey is contained within the boundary indicated in Figure 1.1.

The boundary was determined as the riparian edge along the Impoundment from Lagan Weir to Stranmillis Weir, generally encompassing the habitats from water level up to the nearest walkway or road feature. However, note was made of habitats and features outside of this line where potential exists to provide biodiversity enhancement or where ecologically notable features were identified.

3.2.2 Phase 1 Habitat Survey Methodology

The Joint Nature Conservation Committee's Handbook for Phase I habitat survey (JNCC, 2010) provides advice on how to plan, carry out and use the results of a habitat survey project. The recently published *Best Practice Guidance for Habitat Survey and Mapping* (Smith *et. al.*, 2011) and *Guidelines for Preliminary Ecological Appraisal* (CIEEM, 2013) were also consulted.

Habitats are defined by the living things that are found there, mainly plants, and also by environmental conditions, such as geology, water, topography and human management. *The Joint Nature Conservation Committee's Handbook for Phase I Habitat Survey* (JNCC, 2010) classifies habitats in a number of types in a hierarchy under broad categories, such as woodland and scrub, grasslands, Tall herb and fern, heathland, mire, swamp, marginal and inundation, open water, coastland, rock exposure and waste and miscellaneous.

Information on the type, location and extent of habitats is collected during a habitat survey. This can be used to prepare a habitat map for the Impoundment which can clearly and simply outline the spatial characteristics of habitats in an area, particularly any linkages amongst them. Depending on the reasons why a survey is being carried out additional information on habitats was collected; such as a habitat's main plant species or its conservation status. Information collected on habitats along the impounded River Lagan included: conservation value, threats, abundant and characteristic plant and animal species, presence of invasive exotic species (see Box 1), connectivity with other habitats, and notes on current and past management.

As with many habitat surveys, the habitat survey data have been stored and manipulated in a Geographical Information System (GIS), a computer-based information system tailored to store, process and manipulate spatial data. Use of GIS allows easy production of habitat maps and the ability to interrogate geographical datasets to answer particular questions.

One piece of information on habitats that is frequently collected during surveys is the ecological value of a particular habitat. Habitats are evaluated on a number of criteria, including their rarity, the abundance and diversity of species they support, how natural or modified by humans they are, their fragility, and their size. Habitats of greater nature conservation importance should be offered greater protection than those of lesser value.

3.2.3 Field Survey

A Health and Safety Risk Assessment was completed prior to undertaking the field survey; specific risks identified included working near water, on step banks and potential for contact with giant hogweed, a known health hazard.

Field surveys were carried along the Impoundment on the 24th and 25th June 2013. Weather conditions were sunny to overcast, with temperatures ranging from approximately 18 to 20ºC. The objective of the Phase 1 habitat survey was to record the main habitats present. Habitats present were classified according to the Joint Nature Conservation Committee's classification system (JNCC, 2010) and marked their extent on the preliminary habitat maps.

Other notable ecological features such as the presence of mammals and the use of the site by birds, amphibians and invertebrates was recorded. In addition, information gathered in conjunction with desk-based research, was used to evaluate the conservation importance of habitats along the Impoundment.

Initially, surveys were conducted along the River Lagan using a rib boat with the assistance of Mr Ronald Surgenor and Mr Andy Franklin, Department for Social Development. This allowed familiarisation with the riparian edge, and facilitated survey of areas to which access may otherwise have been difficult. e.g. the fringing reedbed near Annadale Fishing Stands. The river survey was complemented by a survey of the embankment and adjacent habitats conducted along walkways and footpaths, where available. All areas within the survey area were accessed.

The objectives of the field survey were to: -

- Gather detailed information on ecological features of habitats, including species composition, conservation value and condition of habitats on the ground;
- Collect data on protected or rare species of outstanding interest;
- Record alien invasive plant species;
- Take photographs of representative habitats;
- Evaluate conservation value and identify threats to natural heritage;
- Consider threats and impacts to the conservation and future protection of the site; to include management and restoration recommendations and priorities in order to maintain and enhance biodiversity.

Plate 3.2 – Hard engineered riparian edge upstream of Governor's Bridge, showing revetment, narrow grassland strip and tree/shrub at the top.

Field data collected has been merged with existing habitat information into a GIS database which has been used to prepare habitat maps and maps outlining potential management areas and will be provided to DSD who may in turn wish to provide to CEDaR.

3.2.4 Ecological Evaluation

Prior to field survey, a customised field survey datasheet was prepared to facilitate error free data collection and assist the GIS specialist at a later stage with data entry (Appendix E). Data on habitats were collected using the field survey datasheets in conjunction with preliminary habitat maps. The later were annotated in the field as required. Additional information was collected on

conservation value and threats on prepared data sheets. This information included whether the habitat corresponded with a habitat of European conservation importance as listed on Annex I of the EU Habitats Directive, if the habitat supported any notable species, threats to the habitat, and the presence of non-native invasive species.

The nature conservation value of habitats present was according to a hierarchical classification system reproduced in Table 3.1 below. The below evaluation system has been developed by Atkins as a method of evaluation of a range of terrestrial, freshwater and coastal habitat types and closely follows the assessment criteria as set out in CIEEM (2006) *Guidelines for Ecological Impact Assessment*. Reference has also been made to the Northern Ireland Priority Species List[19] and to the Local Biodiversity Action Plan for Belfast (Belfast City Council, undated). The criteria below have also been used for evaluating the nature conservation significance of important flora and fauna.

Table 3.1 – Ecological evaluation scale

Value	Criteria	Examples
International	High importance and rarity, international scale and limited potential for substitution.	Internationally designated sites.
National	High importance and rarity, national scale, or regional scale with limited potential for substitution.	Nationally designated sites. Regionally important sites with limited potential for substitution.
Regional	High or medium importance and rarity, local or regional scale, and limited potential for substitution.	Regionally important sites with potential for substitution. Locally designated sites. Sites which support habitats listed Northern Ireland priority habitats.
High Local Importance	High importance on a local scale.	Undesignated sites of some local biodiversity and earth heritage interest. Sites which hold semi-natural habitats and/or species likely to be of rare occurrence within the local area. Sites which hold the best examples of a semi-natural habitat type within the local area; i.e. with a high degree of naturalness.
Moderate Local	Medium importance on a local scale.	Sites which hold good quality semi-natural habitats.
Low Local	Low ecological importance and rarity, local scale.	Small areas of semi-natural habitat that are not of local conservation value.
Negligible	Very low importance and rarity, local scale.	Other sites with little or no local biodiversity and earth heritage interest.

[19] http://www.doeni.gov.uk/niea/northern_ireland_priority_species_list.pdf

3.2.5 Zoning of the Study Area

In order to describe the habitats and species along the Impoundment, and to provide targeted information on habitats, species and management options, the study area has been divided into four zones (see Figure 4.1):

- Zone A – Stranmillis Weir to Governor's Bridge;
- Zone B – Governor's Bridge to Ormeau Bridge;
- Zone C – Ormeau Bridge to Albert Bridge;
- Zone D – Albert Bridge to Lagan Weir.

The results of the Phase 1 habitat survey, desk-based research and evaluation are presented for the four zones in Chapter 4. Detailed target notes for habitats and features of note are presented in Appendix F. Whilst the audit of biological diversity presented is as comprehensive as possible, the main aim is to identify key features for protection and enhancement within the four identified zones, in addition to areas of concern or constraint to inform the Biodiversity Enhancement Strategy.

4. Ecology of the Impounded River Lagan

4.1 General Overview

The impounded River Lagan commences at Stranmillis Weir and from this point onwards untill it enters Belfast Lough, the river is heavily modified by alterations in channel and length, running through industrial, leisure and residential areas along the river banks. It enters Belfast Lough Special Protection Area (SPA) north of Lagan Weir, a large sea lough with mudflats and lagoons, surrounded by industrial docklands.

The survey area studied covers the impounded section of the River Lagan which reaches from Stranmillis Weir to Lagan Weir. Along the Impoundment, the river is spanned by six road bridges and the Lagan Railway Bridge; is bordered by residential and commercial developments, roads and footpaths; and forms a very significant recreational resource within the city centre.

The width of the Impoundment varies considerably; the narrowest sections occur upstream of Governor's Bridge where the average width of the channel is approximately 30m; the widest section occurs near the remains of McConnell's Weir where the channel is approximately 100m wide; but on average the channel is between 60-80m wide. Water depth is generally 1.5-2.5m.

The majority of the Impoundment upstream of Albert Bridge comprises mostly narrow riparian strips of neutral, semi-natural grassland, backed by planted trees and scrub along the top of the embankments. The lower reaches of the Impoundment, on the eastern bank immediately downstream of Stranmillis Weir, supports the best developed habitat of semi-natural broad-leaved woodland and inundated semi-natural grassland. The remaining habitats within the study area include ephemeral / short perennial vegetation, amenity grassland and ornamental planting. Downstream of Albert Bridge the embankments become increasingly hard engineered and of little or no ecological importance.

Plate 4.1 – Lagan Railway Bridge crossing the downstream section of the Impoundment.

As a result of improvements in water quality in the Impoundment, and other measures, it now supports salmon, trout and a small population of eel (DEFRA, March 2010) which migrate upstream to spawning areas and feeding grounds, in addition to coarse fish, common seal, waterbirds and other wildlife. The bridges crossing the Impoundment also offer habitat for wildlife. Albert Bridge supports a very large population of starlings and black guillemot nest on Queens Bridge.

Invasive plant species are becoming increasingly common along the River Lagan, and along the Impoundment. They provide very poor habitat for insects and birds, grow extremely densely and shade out native species and increase the rise of riverbank erosion when they die back in the autumn. Japanese knotweed, Himalayan balsam and giant hogweed were recorded along the Impoundment, and records indicate floating pennywort is present upstream of Stranmillis Weir.

Box 1: Invasive Species

Exotic or alien species are plants or animals that are not native to Northern Ireland – in other words, species that did not colonise naturally at the end of the last Ice Age, approximately 10,000 years ago, but have been introduced by humans. Most alien species that have become naturalised in Ireland do not have significant negative impacts on our biodiversity. These include species such as ivy-leaved toadflax, a common plant of old stone walls, crack willow, a tree of riversides and wetlands, and bank vole, an introduced rodent in the southwest of Ireland now thought to have been accidentally imported from Germany with machinery for the Shannon Scheme in the 1920s.

Unfortunately, a minority of exotic species become invasive, spreading rampantly throughout native habitats and threatening biodiversity by competition, overgrazing, predation, habitat alteration, disease or dilution of native gene pools through hybridisation. Invasive species can have serious economic impacts through costs of control, decreases in or damage to economically beneficial species, damage to infrastructure, and reductions in water quality.

Legislation governing invasive species in Northern Ireland is dealt with under Article 15 of the Wildlife (Northern Ireland) Order 1985 as amended by the Wildlife and Natural Environment (Northern Ireland) Act 2011. Article 15 of the Wildlife Order (Northern Ireland) states that it is an offence to "plant or otherwise cause to grow in the wild" any plant listed on Part II of Schedule 9. Schedule 9 lists those species of plants and animals that have established in Northern Ireland but do not occur naturally within Northern Ireland.

Plate 4.2 – Giant hogweed leaves along east bank of the Impoundment, near Stranmillis Weir.

Further information about invasive exotic species is available from Invasive Species Ireland (http://www.invasivespeciesireland.com/) and http://www.habitas.org.uk/invasive/species

Japanese knotweed is a garden escape that forms dense stands in nearly any open habitat. It shades out native species and can even damage nearby walls and roads with its tough underground rhizomes. Japanese knotweed was identified within semi-natural woodland along the old Annadale Rubbish Dump.

Giant hogweed is another plant which was originally imported for use in gardens. However this plant is health and risk hazard, as contact with the plant sap causes phytophotodermatitis. It is especially prevalent along river banks, where it forms dense patches which displace native riparian vegetation can contribute to unstable soils. It is present downstream of Kings Bridge, on both sides of the Impoundment. Given the potential health implications of this plant, immediate control strategies are required along the Impoundment for its eradication.

Himalayan balsam is typically found along river and lake margins. It produces copious quantities of seeds and stands of this plant can be pervasive where they occur, outcompeting native vegetation. This plant is present in abundance upstream of Stranmillis Weir.

Floating pennywort is a highly invasive aquatic plant species, first brought to the UK and Ireland as plant feature for tropical aquariums and ponds, but which has now escaped into the wild at a number of locations within Northern Ireland, and recorded upstream of Stranmillis Weir. Its ability to grow rapidly, upwards of 20cm a day, enables it to outcompete native aquatic flora very quickly and to establish thick floating mats which reduce suitability for other wildlife.

Other invasive species known from the general area include rhododendron, cherry laurel and grey squirrel.

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4.2 Zone A - Stranmillis Weir Downstream to Governor's Bridge

4.2.1 Overview

This section of the river comprises some of the more natural and less disturbed areas within the study area (see Figures 4.1 and 4.2). The main feature is the pen weir at Stranmillis which controls rate and flow of water from the upstream River Lagan into the Impoundment. However, it is clear that the operation of the weir is resulting in erosion along the west bank at the Belfast Boat Club, and scouring of the bank here is noticeable. According to Scott Wilson (2008), the operation of the weir has also resulted in '*the formation of a significant sandbar approximately 140 metres downstream. This would appear to be caused by the high velocities which occur under the sluice gates when they are raised during flood conditions. Laganside Corporation, now Department for Social Development, have also expressed concern that the large hole formed on the downstream side of the weir is as a result of the high velocities'.* The new weir and lock proposed as part of the Lagan Corridor project may alleviate the erosion issue in the future. Semi-natural woodland borders the east bank, upstream of Annadale Fishing Stands, fringed in part by reedbed offers connected, good quality habitat for wildlife although the occurrence of invasive species will be detrimental to biodiversity if not controlled.

Plate 4.3 – Semi-natural woodland located on the eastern bank of the impounded River Lagan, near Stranmillis Weir.

4.2.2 Semi-natural Woodland (A1.1.1)

The semi-natural broadleaved woodland habitat along the east bank occurs on steep sloping ground (45 degree slope in places). It is densest and best developed on the steeper bank sections from Stranmillis Weir northwards to where it meets Annadale Embankment (TN 50) where it supports semi-mature ash, alder, sessile oak, sycamore and elder, scrubby hawthorn, blackthorn, osier willow and rarely hazel. The trees are of varying ages, with the ash trees measuring between 12- 15 metres height with tree girths not surpassing 1.0 to 1.2 metres. The ground flora is well developed in terms of cover, but not in terms of diversity and includes frequent water horsetail towards the river, ivy, common nettles, bramble and common hogweed, which indicate mesotrophic conditions. Within this section of woodland are stands of Japanese knotweed and along the edge of the river stands of giant hogweed are present. There is little fringing vegetation along the edge, but hemlock water-dropwort, common reed, water horsetail and fool's-watercress are occasionally present. Due to the abundance of ash in the canopy, in addition to the frequent occurrence of hawthorn throughout the shrub layer, this woodland is considered a semi-natural habitat.

There is no indication that management of the knotweed patches in the woodland near Stranmillis Weir has been undertaken to date.

Towards Annadale Fishing Stands, the woodland becomes less dense, and grades into a treeline/scrub over a narrow strip of semi-improved grassland.

The woodland does not appear to have consistent affinities with EU Annex old sessile oak woodland with Ilex and Blechnum [91A0], due to the general impoverishment of the ground flora and fragmentary nature of the woodland, but is nonetheless of local conservation value.

Evaluation

Extensive areas of woodland are not found elsewhere along the Impoundment, and this woodland connects to planted, but maturing woodland along the reclaimed Annadale Landfill and further southwards towards Lagan Regional Park. The woodlands along the eastern river bank accentuate the watercourse and its margins as a viable commuting route for mammals and birds alike. The woodland habitat itself with its constituent mature trees (and their associated cover) provides viable nesting / roosting habitat for mammals and birds, including passerine birds and bats. As a result these woodland areas are considered to be of **High Local** importance for nature conservation. The presence of giant hogweed along the margins and Japanese knotweed within the woodland needs to be monitored and controlled to reduce potential for spread.

Plate 4.4 – Parkland and scattered tree vegetation along the edge of Belfast Boat Club.

4.2.3 Marginal Reedbed (F2.1)

The best developed section of reedbed occurs on the east bank of the impounded River Lagan, upstream of Annadale Fishing Stands. This section is not consistently 5m wide, and is therefore considered as marginal vegetation and not swamp. Common reed is dominant, with very occasional reed canary grass. In the drier sections towards Annadale Fishing Stands, common hogweed appears, and at the rear of the reedbed, blackthorn is starting to encroach from the adjacent planting along the Fishing Stands. The reedbed is cut once a year approximately to facilitate litter picks.

Evaluation

As the largest and best developed section of reedbed along the Impoundment, this is considered to be of **Moderate Local** importance.

4.2.4 Mixed Parkland and Scattered Trees (A3.3)

Along the east of the Belfast Boat Club/Tennis Court is an area planted with a mixture of trees and shrubs over generally short mown amenity grassland (TN47).

The area of trees/shrubs covers more than 30%, but it is best described as scattered trees and parkland and it is therefore assigned the Phase 1 code A3. Trees present include mature, forked

small-leaved lime trees (to 20m), occasional mature horse chestnut and beech less mature sycamore and alder, and occasional small ash, hawthorn and ornamental shrubs such as variegated laurel, ornamental roses, rhododendron, cotoneaster and willow and elder scrub. Evidence of decay on the horse chestnut trees was noted. The amenity grassland is generally short mown under the trees along the edge of the tennis court, but allowed to grow longer at the margins of the opposite side, closer to the river, where bluebell, hedge woundwort, common nettles, bush vetch, nipplewort and creeping thistle are present. The riparian edge along this habitat has a number of stands of the invasive giant hogweed. The natural, small but steep slope along the river margin supports a fringe of reed canary-grass, hemlock water-dropwort, meadowsweet and occasional common scurvy-grass.

Evaluation

Although this planted area supports non-native species and is regularly maintained, it provides good habitat for birds, small mammals and invertebrates and facilitates continuity of movement along the western river bank, and is therefore considered of **Low to Moderate Local** value.

4.2.5 Unimproved Neutral Grassland - Inundation Grassland (B2.1)

A linear stretch of inundation grassland (TN51) is located to the east of Stranmillis Weir at the base of steep woodland and alongside the brackish channel described below. Although this grassland is periodically inundated, under the Phase 1 habitat survey criteria it is categorised as unimproved neutral grassland (B2.1). Small ponded areas of water occur throughout. Soils appear to be fine mud, and possibly anoxic in parts. The grassland slopes relatively steeply towards the backwater channel. Fringing the edge of the grassland along the channel is a discontinuous line of Himalayan balsam and common reed with occasional bindweed. At the north-east tip of the grassland the invasive giant hogweed was noted. The grassland itself is characterised by abundant floating sweet-grass, with other grasses indicative of drier ground at lower cover including Yorkshire fog, common bent-grass, rough meadow-grass and false-oat grass. The grassland has a patchy distribution of herbs, including frequent creeping buttercup, occasional brooklime and hemlock water-dropwort; less frequent herbs recorded included celery-leaved buttercup, hairy willowherb, water forget-me-not and angelica. Infrequent patches of hard rush and soft rush were noted. A moss, *Calliergonella cuspidata*, was occasional at the base of the grassland.

Evaluation

Unimproved grassland is not found elsewhere along the Impoundment and although small in size, this grassland is considered of **Low to Moderate Local** value, particularly as it forms a mosaic with other semi-natural habitat in this section.

4.2.6 Brackish Channel (G2.6)

A brackish side channel, approximately 60m in length and 6m wide (TN53) is located to the east of Stranmillis Weir. At the time of survey the channel held between 0.3-0.7m water. The base is formed by cobbles with fine muds and sands. The algae *Cladophora* sp. covers the rocks. Common duckweed is occasional along the margins of the channel.

Evaluation

The brackish channel itself is of **Moderate Local** value, as there are no other similar natural features along the Impoundment. It may also have value for juvenile fish, otter and other wildlife.

4.2.7 Habitats within Restored Annadale Landfill

Running alongside the steep woodland and inundation grassland along the eastern impoundment bank near Stranmillis Weir is the restored Annadale Landfill, now part of Lagan Lands East and which fall within Belvoir SLNCI. This area supports a mixture of mixed plantation woodland (A1.3.2); semi-natural broad-leaved woodland on steeper slopes (A1.1.1) and semi-improved grassland (B2.2).

The grassland areas may have been seeded in the past as part of the landfill's rehabilitation; however, they are classified as semi-natural on the basis of the current plant composition. Grasses dominate:- red fescue, Yorkshire fog, rough meadow-grass, cock's-foot, crested dog's-tail, common bent-grass and rare perennial rye-grass. Carnation sedge is occasional to frequent throughout. Herb cover is good and species noted include common knapweed, ragwort, white clover, red clover, cat's-ear, common vetch, ribwort plantain, creeping buttercup, meadow buttercup, creeping thistle, dandelion, germander speedwell, and hogweed. Approximately 5 individual plants of meadow crane's-bill, a Northern Ireland priority species, were noted in the grassland at TN56 (Fig 4.5). A mature apple tree is located to the north-east corner of the main section of grassland.

Evaluation

The mosaic of different habitats, combined with potential to support a wider range of wildlife and connectivity with Lagan Valley Regional Park makes this area of **Moderate Local** value.

4.2.8 Fauna

This area provides habitat for a number of bird species. Grey heron were noted feeding along the embankment. Other bird species recorded included chaffinch, robin, magpie, goldfinch, rook, chaffinch and lesser black-backed gull. CEDaR records indicate records of dunnock, a Northern Ireland priority species, from this area in the past. Kingfisher[20], a Schedule 1 species in the Birds Directive, has been recorded feeding on sicklebacks at Stranmillis Weir in 2011 and are occasionally seen flying along this section of the Impoundment. The reedbed provides habitat for small birds and could be used on by reed bunting which is known from Lagan Valley Regional Park, although there are no confirmed records of this species along the Impoundment. The RSPB have indicated that there are breeding swift colonies near Cutters Wharf and across the Stranmillis area, but confirmed breeding sites for 2013 are confidential at present (Lynne Peoples, *pers comm.).*

The mosaic of habitats along the eastern bank in particular have good potential for small mammals and invertebrates. During the survey small tortoiseshell, small white and red admiral butterfly species were noted, in addition to buff-tailed bumblebee, white-tailed bumblebee and common darter. Records from CEDaR indicate a variety of invertebrates from the general area such as peacock, painted lady, large white, speckled wood butterfly and common carder bee which will be attracted to the flowering herbs in grassland along the Impoundment. Records from NBN and NBDC indicate that there are a number of records for glass and whorl snails from the 1km gridJ3371, including English chrysalis snail which is a Northern Ireland priority species, Red Listed as Vulnerable, but is not legally protected. This species prefers mature broadleaved and hazel woodland.

No evidence of otter was noted in the woodland along the eastern bank, but it is possible that the steep terrain coupled with relative privacy could make it of occasional use to otter as they move

[20] http://www.flickr.com/photos/ronaldsurgenor/6076874214/

further upstream along the Lagan. Red squirrel are known from Lagan Valley Regional Park, but were not observed within woodland. No evidence of badger was recorded. The mature trees within woodland along the eastern bank are potentially suitable for bat roosts and the riparian corridor provides a relatively continuous, and good quality, foraging area.

Evaluation

The semi-natural habitats which connect to the Lagan Regional Park upstream and to the Impoundment downstream offer good quality and consistent habitat for fauna. The habitats present have potential to support a range of common bird, small mammal and invertebrate species, and possibly protected species such as bats, otter and kingfisher, and will facilitate movement through to other areas along the impoundment. This section is considered of **Moderate to High Local** importance for fauna as part of the wider network along the impoundment and could be of greater value if more detailed surveys indicate the presence of protected species.

4.2.9 Summary

The habitats in Zone A are amongst the most valuable for nature conservation within the survey area due to their semi-natural nature and their interconnectedness. The semi-natural woodland accentuates the River Lagan as a viable commuting route for mammals, birds and invertebrates, in addition to providing nesting / roosting habitats. In addition, these woodland habitats also represent a semi-natural habitat within a relatively built-up environment.

Table 4.1 – Summary of habitats / species in Zone A – Stranmillis Weir to Governor's Bridge

Habitat/feature	Location	Evaluation	Existing management
Semi-natural woodland	Located on the east bank along the River, between Stranmillis Weir and Annadale Fishery stands	High local importance	None apparent
Semi-natural grassland/ associated trees and scrub along margins	Associated with Annadale Fishing Stands on the east bank and fronting Stranmillis Wharf apartments on the west bank	Moderate local importance	Cut in rotation once every two years approximately
Planted broad-leaved woodland	Along the Belfast Tennis Club	Low to moderate importance	Regularly maintained
Marginal reedbed	Fringing semi-natural woodland and parts of Annadale Fishing Stands	Moderate local importance	Cut once a year to facilitate litter pick
Ornamental planting	Mainly associated with the sports clubs and residences along the western bank	Negligible to low local importance	Regularly maintained
Amenity grassland	Primarily along the western bank, associated with residences and sports clubs	Negligible importance	Mown regularly
Brackish channel	Small channel, located off the main Lagan channel, immediately to the east of Stranmillis Weir	Moderate local importance	None apparent

Habitat/feature	Location	Evaluation	Existing management
Unimproved inundation vegetation	To east of Stranmillis Weir, along brackish channel	Low / Moderate local importance	Evidence of low level cattle grazing
Meadow crane's-bill	On grassland within Annadale Landfill and on inundation grassland	NI Priority species – but highly unlikely that this population is native	Grassland appears to receive a cut and may be open to grazing
Giant hogweed	Along both banks, particularly near Belfast Boat Club/Tennis Club and along base of steep woodland to the east of Stranmillis Weir	Public health threat	Queen's University had been injecting plants in recent past in order to control but DSD unsure if this is continuing Some strimming noted along east bank where giant hogweed is present
Japanese knotweed	Small sections in semi-natural woodland on east bank	Main knotweed patch approximately 2m x 4m in size at time of survey, smaller areas present. Has potential to impact on biodiversity of the semi-natural woodland if left uncontrolled.	None apparent
Birds (general)	Good habitat for passerine and other birds along both sides of the river, kingfisher and dunnock have been noted in the recent past; heronry in trees along semi-natural woodland section	Moderate local importance	N/a
Other fauna	Good habitat for small mammals, otter, bats and invertebrates along both sides of the impoundment	Moderate local importance	N/a

4.3 Zone B – Governor's Bridge Downstream to Ormeau Bridge

4.3.1 Overview

This section of the Impoundment incorporates the river between Governor's Bridge to immediately upstream of Ormeau Bridge and includes Kings Bridge (see Figure 4.3). From Ormeau Bridge upstream to Governor's Bridge, the riverbank curves in an elongated 'S' shape. Stranmillis Embankment road and pedestrian footpath forms the western boundary; Annadale Embankment and pedestrian footpaths forms the eastern boundary. Land use on both sides is predominantly residential, with a supermarket (Dunnes Stores) and car park located at the top of Annadale Embankment. A cycleway runs alongside Stranmillis Embankment.

4.3.2 Semi-improved Neutral Grassland (B2.2); Scattered Scrub (A2.2) and Broad-leaved Scattered Trees (A3)

The principal habitat along both embankments is a narrow (3-4m generally) strip of semi-improved neutral grassland on a sloping river bank (45 degrees). The neutral, semi-natural grassland is well -developed, though slightly rank and forms a continuous corridor along the banks of this river section.

The grassland is slightly more open on the western (TN24) than eastern embankment (TN25) due to somewhat lower cover of trees and shrubs and within this grassland, grass species dominate, primarily Yorkshire fog, red fescue, false oat-grass, cock's-foot, creeping and common bent-grass. Common nettles, common hogweed, creeping buttercup, common cleavers, and ribwort plantain are occasional to frequent throughout and form inherent mosaic patches of tall ruderal vegetation (C3.1) on occasion. Other herbaceous species noted include ox-eye daisy, wood avens, common knapweed, prickly sowthistle, common hogweed, yarrow, angelica, cow parsley, greater plantain and common vetch all at rare to occasional cover. Along the western bank, the top margin is planted with intermittent trees, mainly Italian alder (to 10-15m and girths between 0.7 to 1.5m), smaller ornamental cherries and small areas of scrub (elder, ornamental roses, privet, whitebeam and hawthorn). A small population (4-6 individuals) of broad-leaved helleborine was recorded on the western bank in semi-improved grassland, immediately south of Kings Bridge.

The tree and shrubs cover along the west bank is scattered, but often dense when it occurs. Upstream of Ormeau Bridge, a dense area of tall hybrid black poplar trees (10-14m) with Italian and scrubby grey willow, cherry, elder and occasional dog-rose dominates the upper part of the revetment. Other scattered trees (generally 6-10m height) and scrub include common whitebeam, ornamental cherry, sycamore, alder and hawthorn. Ground flora under the dense tree/scrub vegetation tends to be rank, dominated by common hogweed, broad-leaved dock and common nettles, but grades quickly into rank grassland along the top of the revetment. Some of the cherries are moribund, which was also noted in the Marenco (2002) report.

Plate 4.5 – Semi-improved neutral grassland along the margin of the Impoundment.

Along the eastern embankment the grassland is similar in composition to the opposite bank. However, tree / shrub cover is better developed, including tall Italian alder (10-12m) poplar, occasional lime, ornamental cherry trees, occasional ash and alder and one crab apple. Towards Ormeau Bridge large aspen trees (14-16m height) are present in addition to young hazel, elder and willow saplings, and where the grassland flora becomes almost tall ruderal in nature with frequent spear thistle. There is slightly better development of tall ruderal vegetation along this embankment, but overall this area can be classified as semi-improved neutral grassland with scattered trees and shrub. Bramble is occasional. In damper areas occasional field horsetail and meadowsweet occur. One feverfew plant was noted on the embankment near Dunnes Stores, and although not a rare plant, it was not recorded elsewhere during the survey.

Plate 4.6 – View downstream along east bank of the Impoundment, from Kings Bridge showing hard engineered revetment at the base with a semi-natural grassland/tree & shrub mosaic along the top.

The base of the embankment is hard engineered stone and supports occasional common scurvy grass, sea aster and *Enteromorpha* sp.

Evaluation

The semi-improved grassland along the embankments provides an essential wildlife corridor along the Impoundment. The grasslands themselves are generally not species diverse, but due to their length, connectivity and value for invertebrates in an otherwise highly urbanised setting, they are considered of **Moderate to High Local** ecological value. They are likely to provide cover and temporary refuge for small birds and mammals and may well provide feeding habitats for butterfly species and other invertebrates.

The small patches of tall ruderal vegetation are considered of **Low Local** ecological value, but add to the overall mix of species present and provide additional habitat for invertebrates and other small wildlife.

4.3.3 Amenity Grassland (J1.2) and Ornamental Planting (J1.4)

Immediately downstream of Kings Bridge is an area of closely mown amenity grassland, the edges of which appear to have been treated recently with herbicide. At the margins is an ornamental treeline with lime, beech, sycamore and whitebeam and understorey is frequently coppiced (TN 33).

Evaluation

This section of amenity grassland/ornamental planting is considered to be of **Negligible** ecological value, nonetheless they are of considerable enhancement potential given the general lack of semi-natural habitat. Planted trees offer shelter for birds, and opportunities for insects.

4.3.4 Fauna

No evidence of bird nesting was noted along this section, although dense foliage obstructed views. Birds noted included robin, magpie, feral pigeon, chaffinch, blue tit, blackbird and hooded crow. Not many insects were flying at the time of survey; those recorded included large white, common darter, small tortoiseshell, orange tip and white-tailed bumblebee.

Both Kings Bridge and Ormeau Bridge are rendered and offer little in the way of opportunities for roosting birds or bats.

Otter, fish and occasionally common seal pass along this section. Brown rat droppings were noted and tunnels through the grassed revetments were evident.

Evaluation

The semi-improved grassland corridors have potential to support a range of common bird, small mammal and invertebrate species and will facilitate movement through to other areas along the impoundment. This section is considered of **Moderate Local** importance for fauna as part of the wider network along the impoundment.

4.3.5 Summary

Table 4.2 – Summary of habitats / species in Zone B –Governor's Bridge to Ormeau Bridge

Habitat/feature	Location	Evaluation	Existing management
Semi-improved neutral grassland / associated trees / shrub along top of grassland margins	Both sides of embankment	Moderate to high local	Grassland cut approximately once a year to maintain aesthetics and facilitate litter picks
Amenity grassland/ornamental planting	Small area north of Governor's Bridge on eastern bank	Negligible	Regularly cut and ornamental plants maintained
Broad-leaved helleborine	Small population (4-6 individuals) on western embankment	Low local	Within grassland which is periodically cut
Fauna (general)	Potential along both embankments for common species	Moderate local	Bird box on tree along western embankment

4.4 Zone C - Ormeau Bridge Downstream to Albert Bridge

4.4.1 Overview

This long stretch of the impounded River Lagan flows between Ormeau Bridge and Albert Bridge, with no other river crossings along the section (see Figures 4.4 and 4.5). It supports more varied embankment habitats than the zone downstream of Albert Bridge. Strips of semi-improved neutral grassland line the margins of much of the river, with small sections of fringing reedbed, trees and shrubs and embankment walls and amenity grassland / ornamental planting.

Whilst the adjoining land is generally urbanised, Ormeau Park is located along the east of much of the Impoundment, separated from it by Ormeau Embankment road. Ormeau Park, the oldest municipal park in Belfast, is well used for recreation and forms a 'green lung' within the city.

Plate 4.7 – Semi-improved grassland along the west bank, immediately downstream of Ormeau Bridge.

4.4.2 Semi-improved Neutral Grassland (B2.2); Scattered Scrub (A2.2) and Scattered Broad-leaved Trees (A3)

Downstream of Ormeau Bridge to McConnell's Weir, both steeply sloping embankments along the river are lined by species diverse semi-improved neutral grassland strips topped occasionally by scattered scrub and broad-leaved trees. On the eastern embankment, the top margins of the grassland strips have planted or naturally occurring trees and shrubs to varying degrees of density and cover (TN19 and TN20), whilst the strip long the western embankment is generally open and has little in the way of tree / shrub cover (TN21 and TN22). The grassland strips are typically 3-5m in width, and form a narrow but vital wildlife corridor along the impoundment.

The grasslands are formed over well-drained sand/clay material. The revetments have been planted with creeping fescue species in the past as cover and for ease of maintenance (Marenco, 2002). Generally, rank grasses are dominant, with cock's-foot, creeping bent, meadow foxtail, false oat grass, Yorkshire fog, crested dog's tail and common couch. However, herbaceous plants are well represented and can account for between 10 to 50% cover in sections. Typical forb species include common nettle, creeping buttercup, cleavers, lesser stitchwort and broadleaved dock. The grassland along the western embankment appears to be slightly more species diverse towards the Ormeau Bridge section where the grassland strip is slightly wider.

Localised patches of tall ruderal vegetation (C3.1) occur as a mosaic within the grassland, and sometimes at the base of trees/shrubs along the eastern grassland strip, but are too small to map individually. Common nettles, rosebay willowherb, common hogweed and abundant common cleavers predominant in this habitat type, which can have value for foraging invertebrates.

It must be noted that management of these grassland strips is constrained due to the steep slope of the revetments. The grassland strips are cut periodically and on a rotational basis to maintain landscape aesthetics and to assist in litter picking. Cuttings are removed usually by the tide, which

reduces enrichment of the grassland strips and is beneficial in grassland management. Lifting the cuttings does not appear to be viable due to health and safety concerns. The steepness of the slopes also influences the type of mowing equipment used.

Of note is the semi-neutral grassland near the 'Klondyke' (TN18), on a flat embankment which then slopes to meet the river. The grassland is species diverse and has developed over a well-drained sand/light clay soil. Grass species are similar to those recorded in semi-natural grassland elsewhere along the embankment, but the herbaceous diversity is greater than the general grassed strips. Herbaceous species account for up to 40 to 50% ground cover, and include species not recorded commonly elsewhere including autumn hawkbit, meadow vetchling, perforate St. John's-wort, kidney vetch, hairy tare and common knapweed. A wildflower seed mixture has been sown here in the recent past (date of sowing unknown), and species such as cornflower, corncockle, Welsh poppy, ox-eye daisy and frequent yellow-rattle appear to have originated from this seed mixture. Yellow-rattle, a hay meadow species which is parasitic on the roots of grasses, may be acting to reduce the vigour of grasses within this grassland and could be advantageous in maintaining a species diverse grassland community. Isolated patches of the non-native Japanese rose and butterfly bush are present, in addition to a poplar sapling.

Plate 4.8 – Locations of Japanese knotweed identified near Shaftesbury Community Centre (courtesy DOENI).

Whilst the wildflower mixture has introduced non-native herbs to this grassland, nonetheless this grassland is one of the most species diverse grasslands along the embankment, and has potential to be enhanced further. According to the DOENI, three small patches of Japanese knotweed were noted near Shaftesbury Community Centre (Plate 4.8). The patch at the Klondyke grassland was stem injected in 2009[21] but no Japanese knotweed was apparent in this area during the Phase 1 habitat survey. There was no evidence of the other patches at the time of survey, however, these areas should be checked regularly for occurrence of this pervasive and long-lasting invasive species.

A 1m strip of this grassland closest to the walkway was cut by Belfast City Council in early September 2013 using an arm mounted on a tractor to reach over the railings. The grass cuttings on this flatter section were left in situ and at the time of preparation of this report had not been removed and appear unsightly along this well-used public section. This illustrates the complexity of managing grassland habitat along narrow steep slopes where ease of access for machinery and personnel is difficult. In the past, the grassland along this section was subject to anti-social behaviour such as burning and littering, the latter still being evident along this stretch of revetment.

Immediately south-east of Albert Bridge is an elevated and inaccessible area of land, bordered by the embankment wall to the west, by a masonry wall and walkway along Ravenhill Road to the

[21] Email from John Early, DOENI 05 June 2013

east and by buildings at Potter's Quay to the south (TN8). Measuring approximately 10m x 20m, the principal habitat present appears to be rank semi-improved neutral grassland dominated by Yorkshire fog, cock's-foot, false oat-grass and red fescue. Herbs noted include red clover, bush vetch, ribwort plantain, cat's-ear and creeping and meadow buttercup. Bramble scrub is frequent. At the north-east corner, an area of elder and silver birch scrub is present. This habitat mosaic would be of value for nesting birds, small mammals and other wildlife.

Noxious weeds such as spear thistle, ragwort, curled dock and creeping thistle occur occasionally to locally frequently along the revetments.

Evaluation

The semi-improved grassland along the embankments provides an essential wildlife corridor along the Impoundment. The grasslands themselves are generally not species diverse, but due to their length, connectivity and value for invertebrates in an otherwise highly urbanised setting, they are considered of **Moderate to High Local** ecological value. They are likely to provide cover and temporary refuge for small birds and mammals and may well provide feeding habitats for butterfly species and other invertebrates.

The small patches of tall ruderal vegetation are considered of **Low Local** ecological value, but add to the overall mix of species present and provide additional habitat for invertebrates and other small wildlife.

4.4.3 Mosaic Embankment Vegetation

Two narrow strips of mosaic vegetation are located on the western bank, running parallel to the railway line in this area (TN13 and TN14) – known locally as 'the wildlife banks'. At the general flat margins of the embankments a regularly mown grassland strip forms the boundary with the riverside walkway (J1.2). Thereafter the bank slopes relatively gently to the river, and comprises species poor semi-improved neutral grassland (B2.2), with occasional areas of tall ruderals (C3.1), scattered scrub including common gorse, alder, crack willow, butterfly bush, and ornamental scrub (including Japanese rose), and a very thin line of fringing common reed (F1.2) at the base. The grassland is dominated by grasses such as red fescue, false oat-grass, Yorkshire fog and common bent-grass. Herb species are generally present at low cover, including creeping buttercup, common cleavers, common nettles, occasional nipplewort, daisy, dandelion, bush vetch and colt's-foot. A single giant hogweed plant was noted here by Marenco (2002), but there was no evidence of this species during the current Phase 1 survey. Winter waders occasionally reed along the base at times of low tide.

Evaluation

This area is currently of **Moderate Local** ecological value, due to the mosaic of habitats present and the semi-natural gradation of habitats along the river edge which is absent elsewhere along this zone. The habitats present provide opportunities for small birds, winter waders and invertebrates primarily.

4.4.4 Disturbed ground (J4)

At the southern end of the grassland described in TN21 (approximately 4m x 0.7m) is a triangular area of disturbed ground. It was previously part of the adjacent grassland area but fencing was moved to facilitate works and it now lies unprotected between the riverside walkway and the fencing along the embankment. Bare soil patches are visible, with a sparse covering of annual meadow-grass, meadow foxtail and creeping buttercup. The underlying soil appears to be a well-

draining mixture of sand/clay which could be used as the basis for establishment of hay meadow type grassland similar to that occurring on the Klondyke grassland further downstream (TN18).

Evaluation

This area is currently of **Negligible** ecological value, but has potential to support species diverse hay meadow type grassland. Realignment of the metal fence in this section to exclude it from public access would be required.

4.4.5 McConnell Weir

McConnell Weir and barge lock was constructed as part of the Belfast City Council's project to narrow the River Lagan, which commenced in 1924. When operational the weir had a 40ft long sluice gate and it was completed in 1937 (Cox and Gould, 1998). With the opening of Lagan Weir, McConnell Weir became unnecessary and today two sections remain as features on the river.

Plate 4.9 – The top of McConnell Weir showing development of semi-improved neutral grassland to the foreground and tall ruderal to the background.

The large gantry section comprising two abutments, known as the 'Welly Boots' is located close to the centre of the Lagan, and supports no vegetation, however the railings at the top provide perches for seagulls. The second rectangular section, known as McConnell Weir (or sometimes Cromac Lock) runs north south and is approximately 30m long (TN17). It has high brick walls approximately 6-8m from the water and a flat top. On the top of the weir, tall ruderal vegetation (C3.1) and what can be best described as semi-improved grassland (B2.2) with occasional low and sparse scrub has developed over a thin stony and well-drained soil. The grassland area supports frequent cock's-foot, Yorkshire fog, common bent-grass and red fescue, with occasional herbs such as ribwort plantain, mouse-ear hawkweed, white clover, red clover and creeping buttercup. The ruderal vegetation is dominated by rosebay willowherb, common nettles, common cleavers and occasional small rowan saplings. A mallard was noted nesting in this section of grassland, near a small willow sapling, and the Marenco report (2002) indicates it may be used as a roost site by waders during winter. Oystercatcher have been recently been recorded roosting on the structure[22]. The grassland on the top receives infrequent cuts.

Evaluation

The small areas of grassland and tall ruderal vegetation on McConnell Weir are themselves of **Low Local** ecological value, but offer safe nesting opportunities for mallard and possibly waders in winter, and has potential to offer nesting sites for common tern. The 'Welly Boots' section may have **Low Local** value for roosting birds.

[22] http://www.flickr.com/photos/ronaldsurgenor/4232595075/in/set-72157605800406173

4.4.6 Wall (J2.5)

From Ravenhill northwards to Albert Bridge, the eastern bank is lined by a vertical concrete block seawall at the base, topped by stone wall and the sidewalls of brick and corrugated iron buildings (TN9) and by security fencing. This section of wall has many crevices and cracks, particularly on the stone wall and side building walls where the mortar has started to decay.

The walls support a limited flora, including ragwort, dandelion, ivy-leaved toadflax, short-fruited willowherb, red fescue, common scurvy-grass, sea aster, maidenhair spleenwort, hart's-tongue fern, ribwort plantain and rosebay willowherb, with *Enteromorpha* sp. along the tidal zone. Mosses such as *Grimmia pulvinata*, and at the top of the stone wall, grasses including cock's-foot, Yorkshire fog and red fescue have established a sometimes dense strip of vegetation, with occasional common nettles and butterfly bush also present. At TN 9a, a pile of rubble and concrete forms a mound along the river edge, and is topped with abundant bramble, charlock and grasses.

Of importance is the use of some of the larger crevices for breeding and roosting birds. Black guillemot was noted nesting in holes south of Albert Bridge. Nesting lesser black-backed gull was recorded on top of the brick wall north of Ravenhill Reach, and two chicks were visible on the nest. The adjacent buildings may also of value for birds, but were not accessed for survey.

The vertical wall on the opposite bank supports only the algae *Enteromorpha* sp. along the base.

Plate 4.10 – Nesting black guillemot noted in wall between Ormeau Bridge and Albert Bridge, north of Ravenhill Reach.

Evaluation

The walls along the eastern bank are of **Negligible** intrinsic ecological value, but offer nesting and roosting opportunities for birds, and so could be considered of **Low to Moderate local** value for birds. Any management to these walls will need to take account of the value of crevices for birds.

The hard engineered walls along the western bank offers very limited opportunities for wildlife and is of **Negligible** ecological value.

4.4.7 Amenity Grassland (J1.2) and Tree Planting

Extensive areas of regularly mown, species poor amenity grassland is found in the grounds around Ravenhill Reach (TN16), south of Maysfield Leisure Centre carpark (TN11) and on the western river bank between Dromara Street / Kinallen Court and the riverside walkway just north of Ormeau Bridge (TN23). These amenity grassland habitats are intensively managed through regular mowing and possibly fertilisation. Amenity grassland is species poor, being dominated by grasses such as perennial ryegrass, Yorkshire fog and red fescue and support only a limited range of broadleaved species, such as dandelions, white clover and daisy. Planted trees, where they occur, include poplar, maple and sycamore. They are generally 6-12m in height and maintained for aesthetics. Common birds use the trees, but there was no evidence of nesting.

Evaluation

The habitats comprising the amenity grassland habitat category are considered to be of **Negligible** ecological value, nonetheless they are of considerable enhancement potential given the general lack of semi-natural habitat. Planted trees offer shelter for birds, and opportunities for insects.

4.4.8 Mixed Plantation Woodland (A1.3.2)

To the north and south of Ravenhill Reach, fingers of mixed plantation woodland extend alongside closely mown amenity grassland. The trees are generally uniform in age and height, being mainly 10-12m in height (TN16). Species planted include ash, mountain ash, pine, hazel, sycamore and poplar. In the understory where light permits elder, field maple, rose and laurel had been planted. The understory is heavily shaded with ground elder and ivy occasional. Laurel is also present in understory. It is managed by a private management company.

Evaluation

The woodland is not mature and lacks canopy stratification and ground flora. However, given the urbanised settling along much of this section and the connectivity to Ormeau Park, this woodland is considered of **Low Local** value. The woodland itself will offer some opportunities for bird roots and small mammals and invertebrates to a lesser degree.

4.4.9 Ornamental Shrub (J1.4)

Small areas of ornamental planting occur adjacent to the walkway along the east river bank, primarily associated with the residences at Ravenhill Reach and scattered patches along the walkway where it runs near Balfour Avenue. The planting is dense and comprises non-natives such as Japanese rose and other ornamental roses, berberis, privet, cotoneaster, box, and laurel. The planting is managed regularly to maintain condition and aesthetics.

Evaluation

The habitats comprising the ornamental shrub habitat category are generally considered to be of **Negligible** ecological value, although given the urbanised environment, this habitat could be considered to be of **Low Local** value for small birds and common invertebrates.

4.4.10 Species Rich Hedge with Trees (J2.3.1)

A tall hedge borders the railway line (TN12) on the western river bank and is separated from the adjacent walkway by a high metal fence. Willow species (white, grey, osier) and alder form the main portion of the hedge, being up to 10-12m in height, with a dense understorey of hawthorn, blackthorn, elder and ornamental roses. This hedge is categorised as species rich as over its length it supports at least five woody species, although some of these are non-native species. The lower 2-3m of the hedge are strimmed along the walkway and the upper part of the hedge is starting to become top heavy and may need to be cut.

Evaluation

Whilst this hedge is outside of the management of the DSD, it provides a valuable block of tree / shrub vegetation along the western river bank, and enhances the value of the adjacent embankment grassland/scrub vegetation for small birds and other small wildlife. Therefore, it is considered to be of **Low Local** value.

4.4.11 Fauna

Black guillemot nest in crevices along the walls on the eastern river bank from Ravenhill northwards to Albert Bridge, whilst lesser black-backed gull were recorded nesting on top of the brick walls in this area. The two sections of the old McConnell Weir offer opportunities for roosting birds, and a pair of mallard nest on the rectangular section. There was no evidence of nesting birds along the eastern embankment which is within an area well used by the public. Other birds noted in the section at the time of survey were pied wagtail, pigeon and grey heron feeding at the base of the sloping masonry wall along Ormeau Embankment road. A sparrowhawk was noted flying over the nearby Ormeau Park. The small areas of fringing reedbed are unlikely to be of high value for specialist birds such as sedge warbler, but add to overall habitat diversity. Common invertebrates such as peacock, cabbage white and red admiral butterfly and buff–tailed bumblebee were noted. Otter pass through this area to reach more significant cover upstream. Common seals are regularly spotted in this section as they move up and downstream. Winter waders, including oystercatcher, have been recorded feeding along the 'wildlife banks' (R. Surgenor, pers comm.) when small areas of mud are exposed at low tide.

Evaluation

Although this zone lacks significant areas of semi-natural vegetation, nonetheless it is of some value for birds and possibly invertebrates, and habitats here form a connective corridor through to the upstream Impoundment sections. Therefore, it is considered to be of **Moderate Local** value for fauna.

4.4.12 Summary

Table 4.3 – Summary of habitats / species in Zone C – Ormeau Bridge to Albert Bridge

Habitat/feature	Location	Evaluation	Existing management
Semi-improved neutral grassland/ associated trees/shrub along top of grassland margins	Both sides of embankment, notable grassland habitat near the 'Klondyke'	Moderate local	Cut approximately once a year to maintain aesthetics. Wildflower seed mixture sown at the 'Klondyke' grassland
Fringing reedbed	Small linear strips at the base of mosaic grassland/shrub habitat on sloping embankment near Cromac Place	Low/moderate local	Cut yearly (approx.) to facilitate litter pick
Buildings, hardstanding, walls	Along the embankment	Negligible/low local	General maintenance as required
Amenity grassland, planted trees, ornamental shrubs	Sections adjacent to the embankments	Negligible/low local	Regular maintenance such as mowing and cutting
Species rich hedge with trees	Along railway line, separated from adjacent walkway by high metal fence	Low local	Maintained by railway authorities
Black guillemot and lesser black-backed gull	Recorded on the eastern bank, nesting in holes and crevices along impoundment wall and old masonry from Ravenhill Reach to Albert Bridge	Moderate local	One artificial nest tube installed by DSD on Queens Bridge which has been used by the guillemots
Mallard	Recorded nesting on the rectangular remains of McConnell Weir	Moderate local	No grassland cuts or management undertaken during nesting season on top of the Weir
Grey heron	Feeding at base of embankment along Ormeau Embankment road	Low local	N/a
Fauna (general)	Along the Impoundment, includes invertebrates, common bird species, transitory otter and common seal, wading birds may roost on McConnell Weir and occasionally feed within the Impoundment	Low / moderate local	N/a

4.5 Zone D - Albert Bridge Downstream to Lagan Weir

4.5.1 Overview

This section of the River Lagan is highly urbanised and the embankments are artificial, supporting little in the way of plant life or habitats (see Figures 4.5 and 4.6). Lagan Weir, Queen Elizabeth Bridge, Queen's Bridge, Albert Bridge and the Lagan Railway Bridge cross the Impoundment. Along both the east and west banks, the Impoundment is lined by paved civic areas and walkways, concrete steps leading to the river at both sides of the Lagan Weir and areas of amenity grassland and ornamental planting.

4.5.2 Buildings and Bridges (J3.6)

This habitat type includes the footpaths, trackways and bridge structures along this Impoundment. All road bridges along this section have concrete bridge decks, and are generally rendered smooth making them unsuitable for bats. The bridges do provide habitat for a number of bird species; e.g. black guillemot were noted nesting on Queens Bridge (see Section 4.5.7).

Evaluation

The habitats comprising this habitat category are considered to be of **Negligible** intrinsic ecological value. However, they are of **High Local** value for roosting birds and Lagan Weir may be of value for breeding common seal – see section 4.5.7 below.

Plate 4.11 – Guillemot nesting tube installed by DSD staff on Queens Bridge.

4.5.3 Wall (J2.5)

From Albert Bridge downstream to Lagan Weir, both embankments along the river are formed by predominantly vertical or concrete or brick walls, which provide very little opportunity for plants or wildlife. The algae *Enteromorpha* sp. is frequent at the base of the wall, very occasional plants noted include sea aster, scentless mayweed and common scurvy-grass which occur in gaps on the walls.

Evaluation

The walls are considered to be of **Negligible** intrinsic ecological value.

4.5.4 Ornamental shrub (J1.4)

Small areas of ornamental planting occur on the east river bank, primarily within the curtilage of the apartment block and residences which line the walkway along this river bank, but also to the south-east of Queens Bridge and north-east of Albert Bridge. Low maintenance garden planting includes evergreen shrubs such as cotoneasters, berberis, viburnum, shrubby cinquefoil and escallonia.

On the east bank, between Queens Bridge and Queen Elizabeth Bridge, is a small wharf which is largely covered with concrete paving, holding four small concrete planters with untended ivy and cordaline planting (TN 3). This has good potential for biodiversity enhancement.

Evaluation

The habitats comprising the ornamental shrub habitat category are generally considered to be of **Negligible** ecological value, although given the urbanised environment, this habitat could be considered to be of **Very Local** value for small birds and common invertebrates.

4.5.5 Amenity grassland (J1.2) and Tree Planting

Small areas of amenity grassland and tree planting occur adjacent to the embankments (TN1, TN2 and TN6). These amenity grassland habitats are intensively managed through regular mowing and possibly fertilisation. Amenity grassland is species poor, being dominated by grasses such as perennial ryegrass, Yorkshire fog and red fescue and support only a limited range of broadleaved species, such as dandelions, white clover and daisy. Planted trees include poplar, maple and sycamore. They are generally 6-12m in height and maintained for aesthetics. Common birds use the trees, but there was no evidence of nesting.

Evaluation

The habitats comprising the amenity grassland habitat category are considered to be of **Negligible** ecological value, nonetheless they are of potential enhancement value given the general lack of semi-natural habitat within this zone. The planted trees offer shelter for birds, and opportunities for insects.

4.5.6 Invasive Species

There is a past record (2009) for Japanese knotweed near Shaftesbury Community Centre, but it was not recorded during the survey.

4.5.7 Fauna

Although a highly urbanised zone, this area of the river is of note for the bird species it supports.

Black guillemot is associated with Queens Bridge, and up to 13 pairs may nest in suitable crevices in the bridge, regionally notable numbers. DSD River Management Team has increased nesting opportunities for black guillemot by securing a section of pipe to Queens Bridge to act as a nesting tube.

A very large starling roost is present on Albert Bridge and there are links to videos of starling flocks in this area on social media sites, including sparrowhawk hunting starlings in this area[23][24], and it was recently featured on Nature on One (RTE, Radio 1, June 23rd 2013)[25]. The girders underneath the bridge make a very suitable roosting site for upwards of 30,000 to 70,000 individuals and the starling murmuration here is one of the most spectacular, and noisy, natural

[23] Wildlife Spectacle – Starlings at Albert Bridge in Belfast. http://www.youtube.com/watch?v=JNfZ0BeNjdA. Accessed 8th August 2013.
[24] Starling Murmuration – Albert Bridge, Belfast, 07 Dec 2011. http://www.youtube.com/watch?v=geIuUPFGjxE. Accessed 8th August 2013.
[25] RTE Radio 1 (23rd June 2013). Nature on One. The Wild Site of Belfast. http://www.rte.ie/radio1/nature-on-one/programmes/2013/0623/456103-nature-on-one-sunday-23rd-june-2013/?clipid=1238881. Accessed 8th August 2013.

wildlife sights in Belfast. Within the immediate area, peregrines (Annex 1species) are known to nest occasionally at Waterfront Hall, and are likely to predate upon starlings and other small birds attracted to the bridges.

Common terns are regularly recorded foraging along the Impoundment and have been noted prospecting the area for nesting sites. An artificial nest raft was constructed near the Lagan Lookout in 2008, but has not been used by breeding terms, but has been successfully used by breeding ducks and as a seal haul out (R. Surgenor, pers comm). Potentially, common tern may have breed at Donegall Quay, downstream of Lagan Lookout, in 2013 (I. Enlander, pers comm).

Cormorants are regularly seen feeding within the Impoundment. Also noted in the past from this section of the river are pochard[26], black-headed gull, mute swan, sandwich tern, long-tailed duck, Iceland gull (R. Surgenor, pers comm.) and CEDaR hold records for visiting razorbill from the area around Queen Elizabeth Bridge.

Common seal, an Annex II species, can be seen regularly from Lagan Weir upstream to Stranmillis Weir, and feed on the fish which now inhabit the much improved waters of the river. Seal pubs have been born at Lagan weir in the past couple of years, seemingly oblivious to their urban surroundings (Ronald Surgenor, *pers comm.*).

Evaluation

A number of bird species noted along this section of the river are Northern Ireland priority species – starling, pochard, and black-headed gull. Common tern, a regular visitor, is listed on Annex I of the Birds Directive, as are sandwich tern, which are occasional visitors. Black guillemot are Amber listed on the Birds of Conservation Concern. Common seal are a European protected species. The planted trees offer shelter for birds, and opportunities for insects. The impoundment itself is of value for fish migrating upstream from Belfast Lough, including salmonids. Overall this section is considered to be of **High Local** value for fauna.

[26] http://www.flickr.com/photos/ronaldsurgenor/5319442561/in/set-72157605800406173. Accessed 22nd October 2013.

4.5.8 Summary

Table 4.4 – Summary of habitats / species in Zone D – Albert Bridge to Lagan Weir

Habitat/feature	Location	Evaluation	Existing management
Buildings, hardstanding, walls	Along the embankment	Negligible	General maintenance as required
Amenity grassland, planted trees, ornamental shrubs	Isolated sections adjacent to the embankments	Negligible/low local	Regular maintenance such as mowing and cutting
Black guillemot	Roosting and nesting on Queens Bridge	Moderate local importance – Amber listed (Lynas *et al.* 2007)	Nesting opportunity created on Queens Bridge; monitoring by DSD staff
Starling	Albert Bridge	Regional importance as this is a Northern Ireland Priority species and the bridge hosts one of the largest populations in Northern Ireland	N/a
Common tern	Forage along the Impoundment	High local at present as breeding terns have not been confirmed – common tern is listed on Annex I of the Birds Directive	Artificial nest raft constructed for common tern in 2008 but successful nesting recorded – used by duck for breeding and as a haul out area for common seal
Birds (general)	Other species known from the downstream reaches include pochard and black-headed gull, Northern Ireland priority species; and other birds are attracted to feed and roost within the area; tidal sections	High local	Common mallard has bred on the artificial tern nest
Common seal	Migratory, past record of breeding at Lagan Weir	High local – seal listed on Annex II of the Habitats Directive	Use the artificial tern nests as a haul out site
Fish	Migratory	High local	Water quality improvements
Fauna (general)	Very limited potential for other fauna along the riparian corridor	Negligible	N/a
Japanese knotweed	Small patches near Shaftesbury Community Centre	-	Treatment in the past, not present now

4.6 Overall Evaluation

4.6.1 Summary of Habitats and Plant Species

The most ecologically intact habitats present are the semi-natural woodlands and grasslands in Zone A, between Stranmillis Weir and Governor's Bridge. These habitats link to other semi-natural areas within the locality, mainly southwards from Stranmillis Weir towards Lagan Valley Park, providing continuity of wildlife corridors and habitat. Although the habitats fringing the embankments are narrow, nonetheless, the semi-natural grasslands, trees and scrub provide a mosaic of vegetation which is of value for a range of fauna. Towards the Lagan Weir, replacement of more natural river banks with vertical walls which support very little vegetation reduces the value of terrestrial habitats considerably. None of the habitats fringing the Impoundment are of Annex quality, although semi-natural woodland on the east bank near Stranmillis Weir is of considerable value along the Impoundment linking through to Lagan Lands East and further upstream to Lagan Valley Regional Park. Reedbed and mudflats are Northern Ireland BAP habitats. The small intertidal mudflats in the lower reaches of the Impoundment provide occasional feeding grounds for winter waders. Areas of reedbed present are best considered as fringing, but nonetheless are of value for birds and possibly other wildlife.

One notable plant was recorded, meadow crane's-bill, but this plant is not thought to be native to the locality and may be a garden escape, or planted with wildflower mixtures during rehabilitation of Annadale Dump. There are no other records of protected or rare species from the Impoundment. However, broad-leaved helleborine, an attractive member of the orchid family, was recorded along the grassed revetments and this plant appears to be relatively widespread within shady habitats in the Belfast area (P. Cush, pers comm.).

Problematic invasive species listed in the Wildlife (Northern Ireland) Order 1985 as amended by the Wildlife and Natural Environment Act (Northern Ireland) 2011 – Japanese knotweed, Himalayan balsam and giant hogweed - are present along the Impoundment, primarily upstream of Governor's Bridge; floating pennywort has been recorded upstream of Stranmillis Weir, but not within the Impoundment. Noxious weeds as listed on the Noxious Weeds (NI) Order 1997 are present along much of the vegetated sections of revetments.

4.6.2 Summary of Fauna

A number of passerine and birds common throughout peri-urban and urban environments were confirmed during the site walkover. These included robin, chaffinch, blue tit, goldfinch, pied wagtail, wood pigeon, swallow, rook and grey heron. Black guillemot and lesser black-backed gull were recorded nesting along the impoundment. Kingfisher has been recorded upstream along the Stranmillis section, and cormorant regularly feed within the Impoundment. The downstream bridges hold importance for birds; Albert Bridge hosts a very large population of starlings and approximately thirteen pairs of black guillemot nest at Queens Bridge.

Otter was not confirmed along the Impoundment; i.e. spraints, holts, scrapings etc., but they are known to occasionally use the Impoundment for commuting or feeding purposes particularly as prey items such as salmon and trout are using the Impoundment. A common seal was noted during the survey and other individuals are known in the Impoundment. Common seal breeding has occurred near Lagan Weir.

Badger was not confirmed along the Impoundment. The study area is bounded on all sides by housing estates. This makes the habitual commuting and foraging, commonly associated with badger activity almost impossible and hence they would not be expected to occur. Urban fox and other small mammals such as rabbits and mice may use the habitats along the Impoundment.

The Impoundment may be used to some extent by bats as a feeding and commuting route. Marenco (2002) indicated that Leisler's, pipistrelle and brown long-eared bat were present in the general area (information received from Northern Ireland Bat Group). The general lack of mature trees with suitable crevices for roosting, together with the rendered nature of the bridges lessens the potential for roosting bats. Greater potential for bat roosts exists in Zone A between Stranmillis Weir and Governor's Bridge where more mature trees and semi-natural woodland is found.

The mosaic of habitats present along the Impoundment provide opportunities for wildlife in general, particularly small mammals and invertebrates. Detailed invertebrate surveys have not been undertaken along the impoundment and there are no specific current records of rare invertebrate species from the Impoundment.

The Impoundment supports migratory salmonids, river lamprey and coarse fish[27], and fish stocks are reported to have increased since water quality improvement measures and the reintroduction programme were put in place. Remaining issues within the Impoundment for fish include water quality, physical barrier to movement, predation by seals and stratification in the water column.

4.6.3 Overall Evaluation of the Impounded River Lagan

The overall evaluation of the Impounded River Lagan considers all of its component habitats and their combined value in the localised landscape. The Impoundment is bordered throughout by urban and peri-urban setting which increases the value of its semi-natural habitats and its role as a wildlife corridor through the site. The habitats along the Impoundment provide a considerable resource of habitat for a range of flora and fauna within a highly urbanised environment. River corridors are a Belfast BAP habitat. As a result the Impoundment and the narrow vegetated corridors it supports are considered to be of **High local** ecological value due to the restriction of such habitats and opportunities for flora and fauna within the nearby locality.

Table 4.5 – Overall summary of habitats / species along the Impounded River Lagan

Habitat/Species	Location	Description
Trees and scrub	Found downstream of Albert Bridge, on both banks, associated with grassland habitat	A variety of native and non-native species are planted or have arisen naturally along the embankments. Of **High Local** value for birds, invertebrates and small mammals when taken as a connective wildlife corridor along the Impoundment.
Semi-natural, broad-leaved woodland	Along the east bank, near Stranmillis Weir	Mixed age and species woodland with some mature trees, which merges with restored habitats at Annadale Landfill site. Poorly developed ground flora and infestations of giant hogweed and Japanese knotweed currently limit the potential value if the woodland, nonetheless it is considered of **High Local** value and is a Belfast BAP habitat.
Semi-improved neutral grassland	Found downstream of Albert Bridge, on both banks	Of **Moderate to High Local** value due to the general lack of this unimproved, sometimes herb-diverse grassland in the locality; also of value for invertebrate foraging and hunting

[27] Marenco (2002) report indicated that in addition to salmon and trout, migratory populations of eel, summer visiting thick-lipped mullet in addition to flounder, three-spined sickleback and bream. Other coarse fish known to be present in the Impoundment are pike, roach and gudgeon - http://www.nidirect.gov.uk/angling-at-river-lagan-stranmills-stretch.

Habitat/Species	Location	Description
		combined with potential for nesting.
Marginal reedbed	Scattered pockets along the River, best developed section is on the left bank at Annadale Embankment	Reedbed generally supports a low number of plant species, but can provide important habitat for passerine birds, small mammals, otter and other wildlife and is of **Moderate Local** value. Reedbed is a UK and Northern Ireland Biodiversity Action Plan habitat[28].
Brackish channel	Adjacent to Stranmillis weir	A small tidal backchannel, showing some signs of eutrophication through the abundance of the green algae *Enteromorpha* sp. Potentially an area which could act as a fish nursery, of **Moderate local** value.
Unimproved Inundation grassland	Small area of grassland located on the east river bank adjacent to Stranmillis Weir	Relatively species diverse grassland which supports unimproved grassland not found elsewhere in the study area, considered of **Low to Moderate** local value.
Other habitats	This includes amenity grasslands, ornamental planting, mixed and broad-leaved plantation woodland, revetment wall vegetation	Offer opportunities for wildlife and act as wildlife corridors along the Impoundment – generally of **Negligible to Low Local** value, but set within their urban context they are of more considerable value and have potential for enhancement.
Broad-leaved helleborine	Found in semi-natural grassland on left bank, immediately south of Kings Bridge and south and north of Governor's Bridge and along Annadale fishing stands on the right bank	Whilst not a common species, this orchid is not protected or listed as a priority species. Nonetheless, it is a notable species along the Impoundment. The Impoundment is of **Low Local** value for this species.
Meadow crane's-bill	Located on inundation grassland immediately adjacent to Lagan Weir, and in grassland on the nearby Lagan Lands East	A Northern Ireland priority species. However, the only native location for this species is thought to be Country Antrim, possible that it is a garden escape or has been planted as part of reclamation of the Annadale Landfill and a nature conservation value is not assigned.
Black guillemot	Downstream reaches of the Impoundment, nesting at Queens Bridge	Queens Bridge is an important nesting area for this species; Amber listed bird species (Lynas *et al.* 2007). The Impoundment is of **High Local** value for this species.
Starling	Very large roost at Albert Bridge	One of the largest starling roosts in Northern Ireland is located along the impoundment and is of considerable public interest; starling is a NI priority species, a Belfast BAP species and the Impoundment could be considered of **Regional** value for this species.
Kingfisher	Commutes along the upper reaches of the Impoundment near Stranmillis Weir	Listed on Schedule 1 of the EU Birds Directive and is afforded special protection. The Impoundment offers feeding grounds and

[28] http://jncc.defra.gov.uk/pdf/UKBAP_BAPHabitats-44-Reedbeds.pdf

Habitat/Species	Location	Description
		perching opportunities, particularly near Stranmillis; nesting opportunities may be limited. Overall the Impoundment is of **Moderate to High Local** value for this eye-catching bird.
Common tern	Forages along the Impoundment	Listed on Schedule 1 of the EU Birds Directive and is afforded special protection. Regularly noted along the Impoundment, but has not used the artificial tern rafts at Lagan Lookout for breeding. At present, the Impoundment is of **Moderate to High Local** value for terns.
Birds (general)	Found throughout the Impoundment and adjacent habitats	A wide range of passerine bird species and seagulls are using the impoundment; the narrow tree / shrub strips along the revetments provide foraging and breeding opportunities. Mallard nest on McConnell Weir. Small areas of exposed mudflats offer occasional feeding for winter waders in the lower reaches of the Impoundment. The Impoundment is of **High Local** value for birds.
Fish	Migrate along the Impoundment	Salmon (listed on Annex II of the Habitats Directive, and a Belfast BAP species) and eel (Critically endangered, IUCN Red List) migrate along the river; coarse fish present. The Impoundment is of **High Local** value for fish.
Otter	Possibly commutes along the Impoundment	Most of the Impoundment offers very limited opportunities for otter resting areas, the best being the woodland along the eastern embankment near Stranmillis Weir and is considered of **Moderate Local** value for otter. Otter are listed on Annex II and V of the Habitats Directive.
Common seal	Recorded along the Impoundment up to and past Stranmillis Weir	Seals are listed in Annex II and V of the EU Habitats Directive. Up to four seals have been recorded in the Impoundment, with birthing having occurred on the steps of Lagan Weir. The Impoundment could be considered of **High Local** value for seal.
Bats	No specific information on bats, but	The riparian corridor, particularly downstream of Ormeau Bridge offers opportunities for bat foraging and possibly bat roosts (in semi-natural woodland on the east bank, primarily). The Impoundment at present, could be considered of **Moderate Local** value for foraging bats, targeted surveys may find evidence of bat roosts in which case those areas would be of **High Local** value for bats.
Fauna (general)	Small mammals and invertebrates	Potential for small mammals and invertebrates throughout most of the length of the impoundment, although hard engineered walls from Albert Bridge downstream to Lagan Weir present limited opportunities. Currently assessed as having an overall **Moderate Local**

Habitat/Species	Location	Description
		value for fauna.
Invasive Species		
Giant hogweed	Notable stands along the left and right banks between Stranmillis Weir and Governor's Bridge	This large herbaceous plant can grow to 6-8m tall and is a public health hazard as contact with the plant can cause photosensitive reactions on skin. Giant Hogweed is listed on Schedule 9 of the Wildlife (Northern Ireland) Order 1985 (as amended) and it is therefore an offence to plant or cause it to grow in the wild.
Japanese knotweed	Small stands noted in woodland along Annadale Embankment	Japanese knotweed is considered one of the main threats to native vegetation (Invasive Species Ireland). It is listed on Schedule 9 of the Wildlife (Northern Ireland) Order 1985 (as amended) and it is therefore an offence to plant or cause it to grow in the wild.
Himalayan balsam	Noted in woodland on the left river bank between Stranmillis Weir and Annadale Fishery Stands, likely to be elsewhere, but does not appear to be well established at the moment	Due to the potential for impacts on sensitive and valuable riparian habitats, Himalayan balsam is considered a major threat to biodiversity. Under the Wildlife and Natural Environment (Northern Ireland) Act 2011, it is an offence to plant or cause Himalayan balsam to grow in the wild.
Floating pennywort	Recorded in 2010 upstream of Stranmillis weir (NIEA) and is known from other parts of the River Lagan (DOE, 2012).	Not noted within the Impoundment during the Phase 1 habitat survey, but regular monitoring required.

5. Setting the Context for the Biodiversity Enhancement Strategy Plan

To assist in the delivery of the Biodiversity Management Strategy for the Impoundment, it is important to set the context within which management and future aspirations may occur. A range of legislative and strategic planning mechanisms influence biodiversity and natural resource management along the Impoundment.

5.1 Legislation

5.1.1 European Legislation

The Impoundment is not subject to any statutory or non-statutory nature conservation designations. It does support and provide migratory corridors for legally protected species.

Table 5.1 – Summary of key European legislation

Directive	Main Provisions
EU Habitats Directive 92/43/EEC	Sets out the framework for designation and protection of sites for nature conservation for species and habitats listed in Annex II, IV and V. Protection for species Transposed into national legislation principally by The Conservation (Natural Habitats, etc) (Amendment) Regulations (NI) 2012 and The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995. Under Regulation 3(3) all competent authorities (including Planning Authorities), in the exercise of functions generally, to have regard to the requirements of the Habitats and Birds Directives
EU Birds Directive EC/79/409	Sets out the criteria for Special Protection Areas; list of species requiring protection on Annex 1 of the Directive and mechanisms for protecting wild birds naturally occurring in Europe. Transposed into national legislation principally by The Conservation (Natural Habitats, etc) (Amendment) Regulations (NI) 2012.
EU Freshwater Fish Directive 78/659/EC	Directive to protect those fresh water bodies identified by Member States as waters suitable for sustaining fish populations. For those waters it sets physical and chemical water quality objectives for salmonid waters.
EU Water Framework Directive	The WFD was transposed into Northern Ireland through the Water Environment (WFD) Regulations (Northern Ireland) 2003. Sets out framework to reach target to have all waters in 'good' condition and to avoid deterioration in the status of waters. The Impoundment falls into the North Eastern River Basin District.
Environmental Liability Directive 2004/35/EC	Transposed as the Environmental Liability (Prevention & Remediation) Regulations (NI) 2009; establish environmental liability with respect to prevention and remedying of environmental damage.

The Impoundment supports a number of protected species under the Habitats and Birds Directives. Common seal, salmon and otter are afforded protection under Annex II of the Habitats Directive. Kingfisher and common tern and are listed on Annex I of the Birds Directive. Therefore, there are obligations to undertake management in such a manner that maintains the favourable conservation status of these species.

The River Lagan falls within the North Eastern River Basin District. The North Eastern River Basin Management Plan (DOE, 2009) sets out plans to improve the water quality of all waterbodies (groundwater, wetlands, rivers, lakes, transitional waters, coastal waters) the Belfast Lough and Lagan Catchment River Basin District in line with the Water Framework Directive.

5.1.2 National Legislation

The principal national legislation governing protection of wildlife and natural resources in Northern Ireland is:

- The Wildlife and Natural Environment Act (Northern Ireland) 2011 (see Box 2);
- The Wildlife (NI) Order 1985 (S.I. 1985/171 (N.I. 2)), as amended by the Wildlife (Amendment) (NI) Order 1995 (S.I. 1995/761 (N.I. 6)); - prohibits the intentional and reckless killing, taking, injuring or disturbance of all wild birds and of certain animals and any person who knowingly causes or permits this to be done shall be guilty of an offence. It also prohibits the intentional and reckless destruction, uprooting or picking of certain wild plants;
- Environment (Northern Ireland) Order 2002 (as amended) – gives legal protection to Areas of Special Scientific Interest;
- The Conservation (Natural Habitats etc.) Regulations (NI) 1995 [S.R. 1995 No. 380] as amended (see Table 5.1 above) – transpose the Habitats and Birds Directives into national law;
- Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2003 – transposes the Water Framework Directive into national law;
- Noxious Weeds (NI) Order 1977- identifies certain noxious weed species for which special control measures should be implemented.

Box 2: Biodiversity Duty

The **Wildlife and Natural Environment Act** (2011) imposes a general Biodiversity Duty on public bodies which states that:

(1) It is the duty of every public body, in exercising any functions, to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions.

(2) In complying with subsection (1), a public body must in particular have regard to any strategy designated under section 2(1).

(3) Conserving biodiversity includes—

(a) in relation to any species of flora or fauna, restoring or enhancing a population of that species;

(b) in relation to any type of habitat, restoring or enhancing the habitat.

(4) The Department must issue guidance containing recommendations, advice and information for the assistance of public bodies in complying with the duty under subsection (1).

A comprehensive review of other interacting legislation is presented in Appendix H.

5.2 Policy Drivers

5.2.1 Planning Policy Statements

Planning Policy Statements (PPS) set out the policies of the DOENI on aspects of land-use planning and they are taken into account during the preparation of development plans and within the planning process.

PPS2 Natural Heritage, published in July 2013, supersedes PPS2 'Planning and Nature Conservation, setting out the DOENI's planning policies for conservation, protection and enhancement of Northern Ireland's natural heritage resource. PPS2 strengthens '"*the Northern Ireland Executive's commitment in its Programme for Government to preserve and improve the built and natural environment and halt the loss of biodiversity*".

Box 3: PPS2 Natural Heritage

"Planning Policy Statements set out the policies of the Department on particular aspects of land-use planning and apply to the whole of Northern Ireland. Their contents will be taken into account in preparing development plans and are also material to decisions on individual planning applications and appeals." (PPS1 General Principles)

The objectives of this PPS2 are:

- to seek to further the conservation, enhancement and restoration of the abundance, quality, diversity and distinctiveness of the region's natural heritage;
- to further sustainable development by ensuring that biological and geological diversity are conserved and enhanced as an integral part of social, economic and environmental development;
- to assist in meeting international (including European), national and local responsibilities and obligations in the protection and enhancement of the natural heritage;
- to contribute to rural renewal and urban regeneration by ensuring developments take

account of the role and value of biodiversity in supporting economic diversification and contributing to a high quality environment;

- to protect and enhance biodiversity, geodiversity and the environment; and
- to take actions to reduce our carbon footprint and facilitate adaptation to climate change.

PPS2 sets out six policies to meet the above objectives through the planning process:

Policy NH1 – European and Ramsar Sites – International

Policy NH2 – Species Protected by Law

Policy NH3 – Sites of Nature Conservation Importance – National

Policy NH4 - Sites of Nature Conservation Importance – Local

Policy NH5 – Habitats, Species or Features of Natural Heritage Importance

This includes natural heritage features such as trees and woodland which do not fall under priority habitat classification and other features which make a 'significant contribution to biodiversity'.

Policy NH6 – Areas of Outstanding Natural Beauty.

5.2.2 Other National Policies and Guidance

National level thematic strategies and guidance uniformly advocate the need to protect and enhance biodiversity within Northern Ireland and ultimately halt biodiversity loss and to use natural resources sustainably. These strategies include the Sustainable Development Strategy for Northern Ireland; Northern Ireland Water Resource Management Plan 2012; and Urban Regeneration and Community Development Policy Framework (DSD).

The **NIEA Strategic Priorities 2012-2022** (NIEA, 2012) identifies four main strategic priorities: Healthy Natural Environment, People and Places, Sustainable Economic Growth and Using our Resources Well. Relevant specific goals include sustainable, diverse landscapes with rich biodiversity that are resilient to change; extensive opportunity for everyone to appreciate and enjoy the natural and built environment; and common understanding of the role the environment plays in our health and well-being.

Whilst not a policy or strategy, information contain on environmental indicators measured as part of the annual **Northern Ireland Environmental Statistics** report (DOE, January 2013a) is considered important to understanding the value of strategies developed to enhance biodiversity along the Impoundment. Indicators include Water, which looks at compliance with the WFD and Freshwater Fish Directive; and Biodiversity which exams the trends for protected habitats and species (mainly unchanged), bird populations (underlying bird population is not increasing, wetland birds are decreasing), and population of seals at Strangford Lough.

5.2.3 Regional Guidance

Within regional guidance and strategy documents, there is consistent reference to the integration of biodiversity enhancement and protection measures into planning and development. The most relevant strategies to the Impoundment are summarised below.

Regional Development Strategy 2025 is the overarching regional strategy for Northern Ireland which sets strategic guidance on a range of social, economic and environmental issues. An update was published in 2008 after the first five year review of the strategy.

The **Belfast Metropolitan Area Plan 2015** (DOE, 2004 and subsequent updates) sets out policy framework and land use proposals to guide development in the area. It contains the Belfast Metropolitan Area Natural Environment Strategy which states protection of designated areas; protection of priority habitats as identified in the Northern Ireland Biodiversity Strategy; designation of Sites of Local Nature Conservation Interest; and protection of biodiversity resources.

DSD Corporate Plan 2011-2015 sets outs five priorities for the Department's work:

Box 4: Summary of DSD Corporate Plan 2011-2015

DSD's five priorities are:

1.Growing a sustainable economy and investing in the future;

2. Creating opportunities, tackling disadvantage and improving health and well- being;

3. Protecting our people, the environment and creating safer communities;

4. Building a strong and shared community; and

5. Delivering high quality and efficient public services.

Over the period of the plan, one of three objectives is to "*bring divided communities together by creating urban centres which are sustainable, welcoming and accessible to live, work and relax in peace*."

Belfast Tourism: Gateway to the Future. An Integrated Strategic Framework for Belfast Tourism 2010-2014 (Belfast City Council, 2009). sets out measures to improve and enhance tourism within Belfast. The Lagan River-Maritime Corridor area is identified as requiring animation, events and interpretation and actions specifically set forth for the River Lagan are:

- Analyse existing and proposed land uses and spaces and produce a comprehensive plan that shows how the waterfront can be developed, linked and promoted as a key area for visitors;
- Pursue initiatives to increase activity on the river (e.g. more access points and moorings);
- Develop the Lagan Canal locks and linkages;
- Provide a marina on the sea side of the weir.

5.2.4 Biodiversity Strategies and Action Plans

In October 2010, the UK and over 190 other countries signed the Nagoya agreement committing to undertake action to halt global decline in biodiversity by 2020. Consequently, in June 2011, EU Member States endorsed the European Commission's **EU Biodiversity Strategy**[29] which is to be

[29] The EU Commission published, in 2011, a communication on the new EU Biodiversity Strategy, entitled "*Our life insurance, our natural capital*: *an EU biodiversity strategy to 2020*". This Communication identifies 6 Target Areas for action of which five are relevant: -

- Full implementation of the nature directives
- Maintain and restore ecosystems and their services
- Ensure the sustainable use of fisheries resources
- Combat invasive alien species
- Help avert global biodiversity loss.

used as a framework by Member States, along with the global Nagoya agreement, to inform and develop their revised biodiversity action plans.

The **UK Biodiversity Action Plan** (1994, regularly updated) describes the natural heritage resources of the UK and provides detailed action plans for the conservation of these resources. These action plans, including ones for rivers and otter, have been supplemented by the Northern Ireland BAP and has led to the development of regional BAP's. The Northern Ireland Biodiversity Strategy is currently being revised to align with the EU Biodiversity Strategy.

The development of the **Belfast LBAP** (Belfast City Council, 2005) strengthens the city's commitment to biodiversity protection. The contained target timescales are now surpassed and it is in the process of being updated in line with the EU Biodiversity Strategy. The ecological importance of the River Lagan is highlighted in the LBAP, and it the river valley through Belfast city is described as supporting '*semi-natural habitats such as wet meadow, marsh and woodland that largely originates from 18th and 19th century estate landscaping'*.

Table 5.2 – Habitats and species listed in the Belfast BAP

River corridors	Open water	Leisler's bat
Lowland meadows	Built environment	Starling
Semi-natural, broad-leaved woodland	Upland heathland	House sparrow
Gardens	Estuaries and mudflats	Salmon
Species-rich hedgerows	Moschatel	Red squirrel

Although highly modified, the Impoundment is a river corridor with open water, which supports migratory salmon and hosts one of the largest populations of starling on Albert Bridge. Semi-natural broad-leaved woodland borders the Impoundment. The built environment adjacent to the Impoundment offers limited potential for biodiversity.

Relevant **Northern Ireland Priority Species List**[30] species for which Biodiversity Action Plans (BAPs) have been prepared include otter, salmon, brown/sea trout, common seal, starling, common swift, house sparrow and song thrush. Meadow crane's-bill is listed as a Priority Species. However, the origin of this species in its locations near Stranmillis Weir is uncertain but is thought unlikely to be of natural occurrence. Detailed invertebrate, fungal and bryophyte surveys have not been carried out to date, and so other priority species could potentially occur. Habitats which are the subject of Northern Ireland Bi BAP's include muflats[31](although only small areas are exposed in the Impoundment) and reedbeds[32].

Prioritised **Action Framework for Natura 2000** (DOENI, January 2013b) sets out key measures at the national level to maintain and enhance the Annex habitats and species occurring in Northern Ireland, including in the case of common seal, consultation with interested parties in relation to for example the effectiveness of voluntary agreements in place to prevent seal shootings; and monitoring / surveying of populations.

[30] http://www.doeni.gov.uk/niea/northern_ireland_priority_species_list.pdf
[31] http://www.doeni.gov.uk/niea/mudflats_web_version_april_03-3.pdf
[32] http://www.doeni.gov.uk/niea/reedbeds_pdf-2.pdf

Published in June 2011 (DEFRA), the **UK National Ecosystem Assessment** (NEA) is the first national study of ecosystem services in the UK, this document provides an evidence base for the services which the natural environment provides which are critical for the maintenance of human wellbeing and economic prosperity. However, the NEA also showed that nature is consistently undervalued in decision-making and that many of the services we get from nature are in decline. The analysis for Northern Ireland (DEFRA, 2011b) indicates that there is an overall trend towards decline in semi-natural ecosystems of high biodiversity and an increase in less diverse areas due to land use intensification and that the value of ecosystem services has yet to be widely recognised.

An **Invasive Alien Species Strategy for Northern Ireland** (DOE, 2013) contains strategic measures to control and tackle the impacts of invasive alien species in Northern Ireland, including Japanese knotweed and giant hogweed.

5.3 Plans and Projects

5.3.1 Interacting Projects – General

Plate 5.1 – Graphic showing proposals for new weir, lock and footbridge at Stranmillis Weir (source Lagan Canal Trust).

Belfast city centre is party to ongoing regeneration creating a better environment for people to live, work and visit. Future plans and projects will be brought forward as economic conditions and other factors allow. Major players in regeneration include Belfast City Council, DSD and private and commercial developers. DSD Urban Regeneration (Belfast Regeneration Office) provide support and access to funding opportunities and recently have unveiled plans[33] for redevelopment of Queens Quay although timescales are as yet, uncertain. Redevelopment at Sirocco Quay also remains uncertain as the site's owner is currently in administration.

The Lagan Navigation Re-opening project, spearheaded by the Lagan Canal Trust, is in pre-planning application stages, with a number of surveys and assessments, including SEA (URS, 2013) have been undertaken to date. The project aims to restore navigation along the River Lagan from Belfast Lough through to Lough Neagh. Implementation of the project would likely result in increased boat traffic along the Impoundment, but also offers opportunities for biodiversity gains and formation of linkages to the river upstream of the Impoundment.

5.3.2 Interacting Biodiversity Led Projects

The recently commenced Connswater Greenway Project has been developed by the East Belfast Partnership and funded by the Big Lottery Fund, Belfast City Council and the DSD. This project aims to restore the Connswater, Knock and Loop Rivers, creating linear parks, walkway / cycleways, heritage trails, new and improved bridges and an improved wildlife corridor from Belfast Lough to Castlereagh Hills. The Connswater River has been indicated as having an adverse impact on water quality in the Impoundment (participants at Lagan Workshop, pers comm), therefore any improvements in water quality may have consequential benefit for the Impoundment.

[33] http://www.dsdni.gov.uk/queens-quay-masterplan.pdf

The Controlling Priority Invasive Non-native Riparian Plants and Restoring Native Species[34] is a cross-border and Scottish based initiative aimed at controlling Japanese knotweed, giant hogweed, Himalayan balsam and rhododendron in trial tidal river catchments. The pilot area in Northern Ireland is the Newry / Clanrye catchment. This project commenced in February 2011 and is due to run until December 2014 and it may be rolled out to other catchments after this date.

5.4 Stakeholder Workshop Consultation

5.4.1 Stakeholder Workshop

Key Stakeholders were invited to attend a one-day workshop on 20th August 2013 to identify issues and concerns of relevance to the development of the Biodiversity Enhancement Strategy. A list of attendees is appended as Appendix G.

The aim of the workshop was to stimulate discussion and interest in the continued regeneration of the Impoundment and to advance development of key objectives which could be matched to specific actions. Stakeholders were presented with a summary of works which have led to substantive improvements in water quality and ongoing monitoring, in addition to a summary of habitats and species identified through the Phase 1 habitat survey. Subsequently, stakeholders were split into four 'break-out' groups to discuss in more detail proposals and issues related to the Impoundment, the emphasis being consideration of measures which could be implemented to enhance biodiversity.

5.4.2 Outcomes

The four 'break-out' groups had lively and thought provoking discussions. Stakeholder consultation identified six main themes which were felt should guide the development of the Biodiversity Enhancement Strategy.

[34] http://www.qub.ac.uk/research-centres/cirb/

Table 5.3 Summary of main themes which emerged from Impounded River Lagan Stakeholder consultation, 20th August 2013.

Box 5: Workshop Outcomes – Exploration of Main Emergent Themes

Public benefit to be at the heart of the Biodiversity Enhancement Strategy:

- Match resources available for biodiversity enhancement to areas where they will be visible and accessible to the public;
- Priority areas for biodiversity enhancement are downstream of Ormeau Bridge, where greatest concentration of public and tourists are located;
- However, identified the need to target specific biodiversity enhancement strategies towards habitats or species of specific importance or value;
- Bring an ecosystem service approach to the Strategy.

Realistic and achievable goals:

- Examine the 'Do-Nothing' scenario for habitats and species;
- Set achievable actions which meet identified objectives.

Continued improvements in baseline conditions:

- Continued investment and improvement in water quality is key as other biodiversity gains will follow from this;
- Maintain diversity of habitats and species along the impoundment.

Increased public awareness:

- Need for interpretation of current biodiversity and value of the Impoundment to stimulate public interest;
- Engage local communities with the Impoundment;

- Market the Impoundment to a wider audience.

Building partnerships:

- Essential that the Strategy identifies need to build partnerships between key stakeholders;
- Belfast City Council identified as a key partner;
- Stakeholders to be involved and able to contribute to progress on identified actions.

Clear management responsibilities:

- The Strategy should clearly identify who is responsible for management of key habitats and sections;
- Identify what existing management is being undertaken and by whom;
- Identify key management issues;
- How are management and future aspirations to be funded?

6. Biodiversity Enhancement Strategy

6.1 Introduction

6.1.1 Introduction

In their natural state, rivers are dynamic systems, with considerable value for nature as supporting habitats and as wildlife corridors. Although the impounded River Lagan exhibits an altered state from its original natural form, subject to intense riparian management and supporting a variety of uses, nonetheless it represents an essential wildlife corridor link between fragmented habitats in both urbanised and rural areas upstream of Stranmillis Weir.

As noted in Chapter 1, the Impoundment has suffered historic declines in water quality and hence loss of ecological function and structure, which are now being addressed by the various policies, plans and projects in place. Ultimately, protection of the Impoundment as an integrated ecological entity, building recognition of its role and function as a wildlife corridor and understanding how it functions in the context of surrounding environment will be centremost in achieving long-term and permanent biodiversity gains, securing a functioning ecologically enhanced and connected river.

Plate 6.1 – Wildflower meadow type grassland at the 'Klondyke', near McConnell Weir.

6.1.2 Scope

The habitat survey and Biodiversity Enhancement Strategy have been commissioned by the DSD, which is responsible for management of the water-based Impoundment and the revetments up to 1.5m from the HWM. However, restricting the enhancement strategy to areas under direct DSD management would limit potential for achieving more significant biodiversity gains. Moreover, a more co-ordinated approach to management of the revetments would be highly beneficial, as would exploration of possible linkages between the Impoundment and other green areas within Belfast. Therefore, this strategy identifies areas where the DSD can maintain or alter management practices for maximum biodiversity gain, in addition to identifying projects for which implementation will be best achieved through partnership and effective co-operation. Key partners may include Belfast City Council (BCC), NIEA Waters and Natural Heritage, RSPB, Ulster Wildlife Trust and other relevant and interested groups which can be identified as specific projects come forward.

Physically, there is limited scope for altering the Impoundment, therefore biodiversity enhancement has focused on improving existing management for habitats and species; development of partnerships; and more positive public engagement with the Impoundment. Actions are presented for the short (1-2 years), medium (3-5 years) or long term (5-7 years) and should deliver on a greater level of protection, enhancement, access to and public knowledge of biodiversity along the Impoundment. Successful implementation of the Biodiversity Enhancement

Strategy will aid the DSD in meeting their Biodiversity Duty under the Wildlife and Natural Environment Act (2011).

The role of the Strategy is to:

Inform	Guide	Drive	Engage
To inform the DSD and other partners of the existing biodiversity value along and within the Impoundment.	To guide DSD and other partners on management and initiatives to enhance biodiversity.	To drive a range of objectives and associated actions which can deliver the Biodiversity Enhancement Vision and support DSD's continuing commitment to biodiversity, bringing on board other partners to realise these actions.	To engage with and strengthen relationships with key stakeholders along the Impoundment; building partnerships which will be essential to bringing the Strategy to fruition.

6.2 Implementation

6.2.1 Partnerships

Partnership engagement will be needed to generate the support and resources to ensure key strategies and actions are implemented and the vision achieved. Objective 1 Building Partnerships, discussed in detail below, develops this theme further.

6.2.2 Funding

It is not possible at this stage to identify clearly the resources required, in terms of staff, financial or other resources, for the majority of the identified projects. Hence, it is clear that the strategy document will change over time as specific actions are identified, prioritised, resourced and completed and the Strategy should be regarded as a working document to be added to and revised as necessary.

It is important that the **whole-life** cost of the actions and projects arising are considered. For instance, even small-scale projects such as installing nest boxes have costs other than primary installation costs, and invasive species control measures are usually required over the medium to long-term to be effective. Therefore, maintenance and replacement costs in the medium to long term should be considered. A whole-life assessment of an action/project may influence decisions on whether it is practical or would provide acceptable cost benefit returns.

6.2.3 Constraints

Funding and long-term management resourcing have been identified above as possible constraints to implementing the Biodiversity Enhancement Strategy.

It is important to note that the Biodiversity Enhancement Strategy has been developed in the absence of concrete proposals or known delivery timescales for the Lagan Navigation re-opening, redevelopment of Queens Quay, provision of mooring and access points along the river and proposals to provide a marina on the sea side of the Lagan Weir. Other projects may arise in the future which impact on the spatial use of the Impoundment. Therefore, delivery of certain actions identified in the Biodiversity Enhancement Strategy e.g. floating island vegetation, interpretation,

and placement of bird/bat boxes will need to consider interacting plans and projects before final proposals are implemented.

Management along the Impoundment is subject to natural restrictions, for instance cutting grass is difficult and expensive due to the sloping revetments. Existing management constraints, where known, are highlighted below under each objective, or in Appendix A which lays out management specifications for the DSD. Where other constraints arise they should be noted and actions adjusted accordingly.

6.2.4 Monitoring and Review

The main body of the Strategy should remain robust in the short to medium term but the Actions should be reviewed and amended on a two to three year basis, including an update on completed actions together with an Action List reflecting initiatives proposed to be undertaken in the near future. DSD, together with partners where involved, will co-ordinate this process and there will be opportunities for all partners to input into the process.

6.3 DSD Management Recommendations

The Biodiversity Enhancement Strategy objectives and actions as set out below establish the need for partnership working. However, the DSD manage a significant resource along the Impoundment and part of the remit of this project is to provide biodiversity management specifications for this resource. Small tweaks to existing DSD management can provide biodiversity benefit, and will add to the overall Biodiversity Enhancement Strategy when underway. The DSD is fortunate that its Lagan River Management Team are highly motivated and passionate about maintaining and improving the Impoundment for biodiversity and their on the ground knowledge should be integrated at every step.

DSD Biodiversity Management Plans for the Impoundment are located in Appendix A and set out recommendations for management and biodiversity enhancement within DSD managed areas.

DSD requested that recommendations be practical and identify measures in the short, medium and long term. One of the key considerations in terms of management is the ability to undertake grass cutting along the sloping revetments. It is important to note that enhancing biodiversity does not always require management intervention, or even continuous or high levels of intervention; ensuring the maintenance of wildlife corridors and management levels appropriate to ecological features of interest is sufficient in many cases to conserve and protect biodiversity. This is especially valid along extensive habitats where management recommendations need to be mindful of resources and staffing.

6.4 Developing the Biodiversity Enhancement Strategy

6.4.1 Biodiversity Workshop

The biodiversity objectives have been selected based on an analysis of relevant policies and plans, and on the results of the consultations with stakeholders, held on 20th August 2013. As a result of that consultation, this strategy and the resulting actions identified have adopted a twin approach of placing public requirements and biodiversity at the heart of the strategy. The Strategy identifies key biodiversity issues or habitats/species, and sets out specific actions to achieve biodiversity gain, along with an indication of the lead organisations, potential partners, priorities being addressed, benefits of the proposed actions and timescales.

6.4.2 SWOT Analysis

Based on a review of relevant information, Phase 1 habitat survey and consultation and feedback, a SWOT (strengths, weaknesses, opportunities, threats) analysis has been compiled to assist with developing the Biodiversity Enhancement Strategy, particularly identification of key strategic priorities.

The priorities respond to key issues raised and are listed under the appropriate topic headings, they are designed to act as a catalyst for action. This list will form the basis for the development of specific projects and actions on the ground. In some cases, a project may relate to just one priority, others may involve tackling a number of related priorities.

Table 6.1 – SWOT analysis undertaken to inform development of the Biodiversity Enhancement Strategy for the Impounded River Lagan

Strengths	Opportunities	Weaknesses	Threats
		• Narrow terrestrial habitats along majority of Impoundment • Lack of signage along much of the Impoundment • Lack of consistent management along revetments • Responsibilities for management to be clarified • Lack of public awareness of biodiversity value of Impoundment	• Routine maintenance, e.g. revetment repointing • Health and safety concerns which limits management actions, e.g. working on steep slopes or near water • Maintenance costs • Invasive species • Anti-social behaviour, e.g. littering • Balance between usage and biodiversity requirements

6.5 Biodiversity Enhancement Strategy - Vision

6.5.1 Overall Vision

The development of a biodiversity enhancement vision for the Impoundment is based on a number of interconnecting and complementary ideas.

Based on the key habitats and species identified above, in conjunction with potential partner and other aspirations for the Impoundment, the Biodiversity Enhancement Strategy vision can be summarised as follows: -

Table 6.2 – Biodiversity Enhancement Strategy - Vision

Better	**E**nhancement	**L**ocal	**F**acilitating corridors	**A**spirational	**S**pecies	**T**ogether
Increase cover of wildlife habitat	Enhance the value of existing habitats	Connect communities with the wildlife and habitats along the Impoundment	Target action on ecological corridors and stepping stones	Radical or alternative approaches to enhancement	Maintain and enhance the value of the Impoundment for key species and habitats	Develop and enable partnerships to achieve biodiversity gains

Over the short to medium term, the biodiversity resource along the Impoundment should be protected and enhanced where possible. In the long term, the aim should be to establish a 'net gain' in biodiversity in terms of extent and quality of habitats and species. Whilst the Vision establishes the importance of protecting and managing key biodiversity assets, the focus is towards integrated biodiversity conservation which places emphasis on partnership.

6.5.2 Biodiversity Enhancement Strategy - Objectives

Building on the SWOT Analysis, main themes emerging from the Workshop, and the Biodiversity Enhancement Strategy Vision, eight strategic objectives can be identified.

Table 6.3 – Summary of Biodiversity Enhancement Strategy key objectives, desired outcomes and inter-relationships with relevant plans and policies

Impounded River Lagan – Biodiversity Enhancement Strategy Overall Objectives		
Objectives	**Desired outcomes**	**Inter-relationships**
Objective 1: **Building partnerships**	Establish a multi-stakeholder Lagan Biodiversity Working Group to: • Ensure integrated implementation of the Biodiversity Enhancement Strategy; • Oversee prioritisation and implementation of actions/projects; • Establish mechanisms for seeking funding opportunities; • Review plan progress and outcomes; • Facilitate key stakeholders working together to develop integrated forward planning proposals for the Impoundment.	EU and Belfast Biodiversity Action Plans; DSD Corporate Plan 2011-2015 Vision - BELFAS**T**
Objective 2: **Maintain and improve water quality**	Current water quality to remain at current values or improve. Ecosystem service approach is implemented where links between the sea and the rivers are co-ordinated.	Water Framework Directive; Freshwater Fish Directive; Habitats and Bird Directive; PPS2; Belfast Local Biodiversity Action Plan

		Vision - **B**ELFAST
Objective 3: **Conserve and enhance habitats and species**	Wildlife corridor linkages are protected and enhanced. Key habitats and species are incorporated into management plans and decisions. Opportunities for habitat creation are explored. Build a knowledge base.	Habitats Directive; Belfast Local Biodiversity Action Plan; NIEA Strategic Priorities 2012-2022; The Wildlife and Natural Environment Act (2011); Freshwater Fish Directive; PPS2; Northern Ireland Habitat Plan (reedbeds) Vision - BEL**F**A**S**T
Objective 4: **Maintain and enhance bird diversity**	Diversity of bird species is maintained and enhanced.	Birds Directive; EU & Belfast BAP; NIEA Strategic Priorities 2012-2022; The Wildlife and Natural Environment Act (2011); PPS2 Vision - BELFA**S**T
Objective 5: **Building positive public perception**	Increased visibility of the Impoundment as a biodiversity and amenity resource.	NIEA Strategic Priorities 2012-2022; DSD Corporate Plan 2011-2015 Vision - B**EL**FAST
Objective 6: **Controlling the threat of invasive species**	Using partnership working to facilitate effective control of invasive species.	NI Invasive Species Action Plan; The Wildlife and Natural Environment Act (2011) Vision - BEL**F**AST
Objective 7: **Bringing about wider community benefit**	Development of a range of projects over the short to long term which, allied with biodiversity enhancement, will lead to increased engagement and community benefit.	Belfast LBAP; Belfast Tourism Framework 2010-2014; DSD Corporate Plan 2011-2015 Vision - BELF**A**ST
Objective 8: **Research**	Targeted research to provide knowledge on increased biodiversity and ecosystem service functioning and resilience of the Impoundment and at a wider landscape scale.	UK and NI National Ecosystem Assessment; EU and Belfast BAP; The Wildlife and Natural Environment Act (2011) Vision - BEL**FA**ST

Making the objectives and related actions achievable and possible is vital to ensuring these objectives will be delivered. Actions are set out below which provide the framework for achieving the objectives. Potential lead partners are highlighted in bold, and supporting partners are also identified.

[**Note:** - The tables summarising potential partners for identified actions in its current format is presented for discussion purposes; potential support agencies are identified with respect to the delivery of certain tasks. This should not be read as a commitment by these agencies; rather the circulation of the document to consult with such bodies would determine whether such support is feasible].

6.6 Objective 1: Building Partnerships

Achieving long-term, significant biodiversity enhancements along the Impounded River Lagan will require partnership and effective co-operation.

Bringing together interested organisations to deliver significant improvements to the natural environment along the Impoundment will propel forward practical and aspirational options for management. An Impounded River Lagan Working Group should aim to have representation from all stakeholders along and connected to the Impoundment.

To achieve maximum biodiversity benefit the DSD, and where identified, external partners, may consider developing detailed, joint delivery plan(s) to take forward the identified actions based on the actions as set out in this report. Resource implications, in both staff and financial terms, should be identified as well as potential sources of funding in addition to any issues which may influence the delivery of actions and projects.

The partnership may wish to explore the development of Delivery Themes, which will prioritise the types of projects to be undertaken and ensure that developed projects form part of larger and linked actions which are being rolled-out across the Belfast Metropolitan area. Resources are therefore being invested in securing community benefit and in maximising nature improvement gain, engaging with as wide a public group as possible.

A Steering Group could be appointed from the partnership to monitor and report on progress in delivering identified actions or projects. Six monthly Steering Group meetings can provide timely opportunities to forward plan, monitor process and agree projects. A mechanism to provide all partners with updates on progress should be agreed, and could potentially take the form of a six-monthly newsletter or mail-out, supplemented by a yearly or biennial Partnership Forum to facilitate a wider gathering of all partners. This will ensure that the strategic, joined-up approach which has informed the initial stages of the Biodiversity Enhancement Strategy will continue to inform its development and evolution.

Community and educational engagement with the River Lagan will also be an evolving process. There is ample opportunity for community groups, individuals, non-governmental organisations and educational facilities to become involved in monitoring and development of a knowledge base.

Building a co-ordinated and flexible response to the development of the Impounded River Lagan will be a vital step moving forward in the medium to long term. Biodiversity is only one aspect which should be considered along the Impoundment, and moving forward, a coordinated and focused approach to the sustainable use and development of the Impoundment, encompassing all variables, such as landscape, public use and future development proposals, is required.

In the medium to long term, it is worth considering the Nature Improvement Area (NIA) approach[35] being piloted across twelve areas in England, which aims to provide a network of landscape scale initiatives to deliver biodiversity gain. Central to the approach is biodiversity linkage and connectivity at a landscape scale, promoting ecosystem service gain and uniting communities, landowners and businesses. Taking the concept of this project, and applying to Belfast and possibly other centres within Northern Ireland, could be a discussion point for the partnership to bring forward in the future.

[35] For more details on the NIA approach and the twelve pilot AIA's see: http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/funding/nia/default.aspx

Objective 1: Building Partnerships		
Actions	**Responsible Agencies**	**Timeframe**
Establish a cross-organisational Impounded River Lagan Biodiversity Working Group.	**DSD, BCC, Rivers Authority,** other interested parties	Short term
Establish Delivery Themes, priorities for action and opportunities for funding of the Biodiversity Enhancement Strategy.	**DSD, BCC, NIEA, Rivers Authority,** other interested parties	Short to long term
Identify mechanisms for delivery of selected projects, including lead partners, staffing and financial resources, timescales, opportunities or constraints and targeted outcomes.	**DSD, BCC, Rivers Authority,** other interested parties	Short to long term
Establish effective communication between partners.	**DSD, BCC, Rivers Authority,** other interested parties	Short to long term
Regular monitoring of progress on strategic actions, establishing reporting and feedback mechanisms.	**DSD, BCC, Rivers Authority, other interested parties**	Short to long term
Provide a project report (annually or every two years) summarising works and achievements	**DSD, BCC, Rivers Authority,**	Short to long term
Develop an overall management strategy for the Impoundment.	**DSD, BCC, Rivers Authority, other interested parties**	Medium term

6.7 Objective 2: Maintain and Enhance Water Quality

Ensuring water quality in the River Lagan Impoundment meets the needs of its biodiversity resources

Any reduction in water quality could have adverse consequences for wildlife which has recolonized the Impoundment since the 1980's. Maintaining the current water quality management is essential to retaining current aquatic ecology. Future aspirations would be to achieve further improvements in water quality which would have beneficial impact on aquatic species.

Since 1994, measures implemented to improve Impoundment water quality have been employed. A comprehensive review of the effectiveness of these measures would be of enormous benefit to inform water quality control plans in the medium to long term. Regular dredging of the Impoundment is considered necessary to maintain navigation and flood control, but can also exert influences on water quality, both positive and negative. Understanding where sediment within the impoundment arises, and mechanisms or projects through which sediment input can be minimised, would be beneficial.

Workshop participants identified the River Connswater as being of particular issue in relation to water quality in the Impoundment. The Connswater Community Greenway project[36], currently underway, will address water quality issues within the Connswater, Knock and Loop Rivers and may result in subsequent water quality improvements in the Impoundment.

Objective 2: Maintain and Enhance Water Quality		
Actions	**Responsible Agencies**	**Target Date**
Continued monitoring of water quality of impoundment.	**DSD, DOE Marine Division, AFBI**	Ongoing
Place gravel at the exit points of wastewater discharges into the Impoundment.	**DSD, Rivers Agency**	Short to long term
Comprehensive review of effectiveness of existing measures such as aeration and dredging on water quality targets.	**DSD, BCC**, other interested parties	Short/medium
Preparation of sediment control plan for the Impounded and localised catchment area.	**DSD, BCC, Rivers Agency, NIEA,** other relevant parties	Medium to long term
Regular monitoring of aquatic invertebrates in the Impoundment to guide water quality management and complement existing water sampling.	**DSD**	Short to medium term
Liaison with Connswater Greenway Partnership to establish links and best practice.	**DSD, BCC, Rivers Agency**	Medium to long term

[36] For more information on the Connswater Community Greenway project, see http://www.communitygreenway.co.uk/project/about-connswater-community-greenway

6.8 Objective 3: Conserve and Protect Habitats and Species

Habitats and species will be conserved and enhanced

Based on desktop research information and results of the Phase 1 habitat survey, flagship habitats and species along the Impoundment have been identified and are summarised in Table 4.5.

Specific measures for these habitats and species within the remit of DSD are developed in the Biodiversity Management Plan for each of the identified zones along the Impoundment (Appendix A) and general measures are discussed below. The need to be practical, to take account of resources and future management has been balanced with the need to also provide aspirational ideas which could be brought forward in the medium to long term. The Impounded River Lagan Biodiversity Group will be better positioned to assess the potential to implement the actions below if and when circumstances become favourable. At all stages the practical implications of each project should be assessed by the partners involved and long-term targets and outputs agreed.

The Belfast conurbation is intensively urbanised and therefore green (terrestrial) habitat corridors are often key to species movement, site colonisation and population expansion are important for enhancement. The network of habitats along the Impoundment is important and should be retained and enhanced where possible.

Along most of its length downstream of Kings Bridge, the Impoundment exhibits homogeneity of structure, with vertical or steeply sloping revetments and featureless sediments. A programme of habitat diversification could provide additional habitat and interest along the Impoundment and provide visual amenity, particularly in more visited areas downstream of Ormeau Bridge. Options which could be considered for habitat creation include; provision of small floating island rafts; and creation of new areas of reedbed, a Northern Ireland priority habitat. Reedbed could be created at the base of the grassed slope at TN19 (immediately upstream of the Klondyke grassland), possibly by using willow fencing to form an enclosed area into which common reed could be planted. The exact placement of floating rafts and / or new reedbed, anchorage, and vegetation composition, would need to be finalised through consultation with relevant stakeholders and through assessment by targeted survey. Interacting issues such as securing appropriate long-term management, health and safety concerns and potential conflicts with existing or planned river activities should also be considered at that stage. Detailed management specifications for existing reedbed habitat is located in Appendix A.

Semi-natural grassland has developed along the revetments and forms an extensive corridor along the Impoundment, from Stranmillis Weir through to McConnell Weir. Periodic cuts of grassland are undertaken, primarily to facilitate litter picks, particularly in the higher footfall areas downstream of Ormeau Bridge. Further upstream of Ormeau Bridge, grassland merges into areas of tall ruderals and bramble dominated scrub, but these habitats are not extensive at present. Along many sections of the Impoundment, regular cutting is not feasible due to difficulty of access for personnel and machinery, health and safety reasons and cost implications. ‘Non-intervention’ is a term used to describe leaving habitats to natural processes and removing management intervention. For the majority of the grassland upstream of Ormeau Bridge, this is a feasible management option. Non-intervention does not always mean that management cannot occur, just that management may be relaxed or may not occur for some time, if at all. Grassland along the Impoundment which is not regularly cut may tend towards succession to tall ruderal vegetation, followed by scrub and trees. However, given the very steep nature of some revetments, it is likely that some areas will remain grassland like in character as shrubs and trees fail to flourish. All three habitats – grassland, tall ruderal and trees/scrub – have value for wildlife. Whatever management occurs, the primary issue is to retain the function of riparian habitats as wildlife

corridors and to limit fragmentation. Certain areas of grassland will still require cutting – those downstream of Ormeau Bridge, within the well-used public realm, and areas upstream of Ormeau Bridge to facilitate litter picking and for aesthetics. Bringing together DSD and Belfast City Council to agree on aspects of grassland management in order to maximise potential for biodiversity enhancement is envisaged as an action in the short term.

Non-intervention grassland located along the Impoundment could potentially be construed as 'messy' or 'untidy' areas of grassland that need to be cleaned. Signs could be erected alongside the grassland areas to inform locals and other interested parties of the nature and purposes of the management options.

Small scale coppicing should be undertaken on a rotational basis, outside of bird breeding season, in order to maintain structural diversity in scrub areas, but much of the scrub habitat can be left undisturbed.Selective tree pruning may be required to reduce shading of grassland and to maintain open areas. Pruning of trees in public areas should be completed by qualified or experienced personnel. Proper tree pruning can enhance the aesthetic qualities of trees and increase life span. Standing dead trees should be allowed to stand wherever possible, as this provides a habitat for a different range of fauna, for example feeding and nesting opportunities for birds, and where they are not considered a health and safety hazard. Larger items of cut wood should be placed in suitable locations to provide dead wood habitat and staked down if necessary to prevent it being rolled into the river. Existing dead or fallen trees should be left *in situ* to provide dead wood habitat wherever safety considerations allow.

Aquatic species are faring well but also need enhancement measures. DEFRA (March 2010) indicated that there could be merit in fitting permanent structure or traps for counting glass eel and elver where tidal head sluices with a fall exist such as at the Lagan for use in annual monitoring. The lack of cover for migrating fish along the Impoundment is evident and may cause pressure on fish stocks. Installing floating island vegetation mats[37] would provide in-channel fish refuges as well as offering additional habitat for birds, aquatic invertebrates and plants, and providing more interesting aesthetics along parts of the Impoundment. However, the long-term maintenance, location, interaction with other river users and costs of such a project should be evaluated before implementation.

The Impoundment offers habitat for two aquatic mammals, common seal and otter, both of which are listed on Annex II of the Habitats Directive. Both travel along the Impoundment in search of fish prey. Whilst otter are secretive, seals are a common sight along the Impoundment. Public perception of seals could be improved, particularly amongst anglers. Level of salmonid predation by common seal has been suggested as one of a number of difficulties facing progress to a self-sustaining salmon population, however, other factors will also be influential, e,g, water quality and migratory impediments. Primary research is required to determine levels of predation, seal behaviour, and to identify mitigation measures, and this could be carried out in conjunction with third level organisations.

Noxious weeds are present throughout the Impoundment and adjacent habitats, at low cover values, although abundant spear thistle is present in Lagan Lands East in grassland near Annadale Embankment Road. Under The Noxious Weeds Order 1977 there is a legal obligation for landowners to destroy noxious weeds, generally to prevent adverse impacts on livestock and agricultural land in rural areas, or areas where horses may pass. To date, it appears that control of noxious weeds has not occurred along the Impoundment. A noxious weed control strategy could be developed for the Impoundment and adjacent lands which would examine the requirement for control and set out management and control strategies, if considered necessary.

[37] For more details on floating vegetation rafts see http://www.aquascience.co.uk/fishery.html and

In the longer term, potential impacts of climate change may contribute to changes in the biology of individual species as they adapt to new conditions, and changes in the resilience of habitats. Building resilience into existing habitats and species to climate change will assist in ameliorating some projected impacts, as will ensuring good baseline habitat.

Objective 3: Conserve and Protect Habitats and Species		
Actions	**Responsible Agencies**	**Timeframe**
General Actions		
Develop a strategy to improve and buffer existing habitats through enhancement of adjacent habitats along the Impoundment.	**DSD, BCC** in conjunction with landowners	Short to long term
Specialist invertebrate, bat and small mammal surveys could be undertaken to provide information on the other wildlife potentially using the habitats along the Impoundment.	**DSD, Rivers Authority, BCC**	Short to medium term
Examine potential need for preparation of a noxious weed control strategy.	**DSD, BCC**	Short to medium term
Potential to place bat boxes in the semi-natural woodland downstream of Stranmillis Weir and on semi-mature trees downstream of Ormeau Bridge.	**DSD, BCC**	Short to medium term
Investigate potential to attach bat boxes to the underside of Governor's, Kings and Ormeau Bridges to attract in Daubenton bats. Currently these are rendered and offer no opportunities for roosting bats.	**DSD, DRD Roads Service**	Short to medium term
Plants		
Investigate origin of meadow crane's-bill upstream of Stranmillis Weir and in Lagan Lands East; identify management strategy if one is required.	**BCC**	Short term
Maintain short grassland in areas where broad-leaved helleborine is found, where practical. This orchid prefers shady woodland environments, therefore retention and expansion of tree/shrubs will maintain habitat for this species. Perhaps consider making this a 'characteristic' plant of the Impoundment and raising the profile of this plant through inclusion on information signage.	**BCC. DSD**	Short to long term
Semi-natural Grassland		
DSD and BCC to explore avenues to identify the most appropriate management and staffing response for management of the revetment grasslands.	**DSD, BCC**	Short to long term
Maintain existing management of grassland along revetments, where possible, particularly downstream of Ormeau Bridge.	**DSD, BCC**	Short to long term

'No-intervention' or limited intervention scenario is a viable management option for revetment grassland upstream of Ormeau Bridge – to be agreed with partners and regularly monitored.	**BCC, DSD**	Short to long-term
Enhance and extend grassland habitat at the 'Klondyke' - Consider removal of non-native wildflower species (pull by hand during growing season); - Install gate in fencing along grassland to allow easier access for maintenance; - Maintain biannual cut to maintain low nutrient levels; - Removal of cuttings; - Extend this grassland type to area upstream of the Klondyke grassland (TN19, Fig 4.1) through green hay cut, realignment of fence to enclose grassland, installation of gate in realigned fence to facilitate access for management.	**BCC, DSD**	Short/medium
Regular monitoring of grassland structure, species diversity and review of management on a three to five year basis – monitoring could be undertaken via community involvement, DSD/BCC staff and by expert ecologists, as required.	**DSD, BCC**	Short to long term
Emergent/riparian Habitat		
Maintain existing extent and management of reedbeds – annual cutting to facilitate litter picks.	**DSD**	Short to long term
Cyclic (3-5 years) raking of reedbed after cutting to prevent build-up of organic material.	**DSD**	Short to medium term
Investigate potential for extension of fringing reedbed habitat along the impoundment – location(s) and methodology to be agreed.	**DSD,** other interested parties	Medium to long term
Investigate potential to increase aquatic habitat through provision of floating vegetation rafts – location(s) and methodology to be agreed.	**DSD, Rivers Agency,** other interested parties	Medium to long term
Trees/Scrub/Woodland		
Inventory of tree resources along the Impoundment, including tree condition survey.	**DSD, BCC**	Short term
Implement actions of tree condition survey – pruning, pollarding thinning etc.	**DSD, BCC**	Short/medium term
Replace trees and shrubs, as required / necessary, with native species in the semi-rural sections downstream of Ormeau Bridge; ornamental species could be used in the more urban areas for aesthetics.	**DSD, BCC**	Medium/long

Retain standing dead trees where possible – subject to tree survey recommendations.	**BCC, DSD**	Short to long term
Discuss potential to replace Leyland cypress hedge between Lagan Scullers Club and Belfast Rowing Club with native species.	**DSD, private owners**	Long term
Aquatic Fauna		
Investigate feasibility of fitting structures or traps for counting glass eel and elver to Stranmillis Weir – dependent on plans to replace the weir as part of the Lagan Corridor project	**AFBI, DEFRA, DSD, Rivers Agency**	Medium to long term
Investigate obstacles to movement of salmonids and other fish from Belfast Lough, through the Impoundment and upstream to the River Lagan.	**AFBI, DSD, Rivers Agency**	Short to medium term
Raise positive profile of seals using the Impoundment through media articles and social media.	**DSD, Rivers Agency**	Short to medium term
Initiate research to investigate seal behaviour; linked to this could be a project to investigate success of salmonid migration through the Impoundment and level of impact potentially caused by seal predation.	**Rivers Agency, AFBI, DSD**	Short to medium term

6.9 Objective 4: Maintain and Enhance Bird Diversity

The Impounded River Lagan will provide enhanced opportunities for birds

One of the most notable and interesting faunal groups along the Impoundment are birds. From the impressive starling murmuration at Albert Bridge, to the eye-catching black guillemots nesting at Queens Bridge and the occasional sighting of kingfishers along the upper reaches of the Impoundment, the variety of birdlife in this urban setting is both welcome and perhaps surprising to the public. Maintaining and improving water quality will have positive impacts on herons and kingfishers and measures to maintain and enhance habitats along the Impoundment will also have value for birdlife, encouraging species diversity and abundance.

There is scope for erecting small bird boxes on suitable semi-mature trees along the embankments – areas where boxes could be erected include Annadale Fishing Stands; on suitable trees between Governor's Bridge and Ormeau Bridge; and on trees along the embankment opposite Lockview Road apartments . The potential for interference with the boxes should be considered before erecting boxes, as should ease of access for monitoring and maintenance.

Kingfishers have been recorded along the upper reaches of the Impoundment, but no evidence of nesting was recorded, possibly due to lack of suitable sites. Artificial kingfisher nests[38] can be used to provide nesting opportunities and have been successful in attracting breeding kingfisher. Possibly an artificial nest could be located along the base of the semi-natural woodland upstream of Annadale Fishing Stands. The RSPB should be contacted for advice on the placement and construction of an artificial nest.

The flat surface of McConnell Weir currently supports nesting mallard and roosting winter waders. However, it has potential to offer safe and secure nesting habitat for common tern, an Annex 1 species under the Birds Directive. The grassed area on the top of the structure could be cleared and a thick polyurethane liner put in place, topped by layers of gravel, and recycled tyres filled part way with gravel to provide nesting opportunities. Given the location of McConnell Weir within a well-used section of the Impoundment, this could be a high profile project, and one which could be used to promote the theme of biodiversity enhancement along the Impoundment.

Around the main structure of McConnell Weir, nest boxes or pipes could be bolted to the structure to provide additional habitat for black guillemot, encouraging them to move upstream along the Impoundment. Similar projects to enhance nesting opportunities have been undertaken elsewhere in Northern Ireland, e.g. the Roads Service in conjunction with a range of partners has provided nest boxes for this species along sea walls in Carlingford Lough and these groups could be contacted for advice and best practice.

[38]For example of a project see http://back2naturewinnall.wordpress.com/tag/kingfisher/

Objective 4: Maintain and Enhance Bird Diversity		
Actions	**Responsible Agencies**	**Timeframe**
Hold regular walks and talks with bird themes specifically related to the Impoundment and adjacent areas.	**DSD, RSPB, other parties such as UWT**	Short to long term
Maintain value of Queens Bridge for starlings – possibly requires primary research.	**DSD, Belfast City Council,** RSPB, UWT	Short to long term
Maintain value of the Impoundment for black guillemots - examine potential measures to increase nesting opportunities at Albert Bridge through installation of pipes on the bridge. - examine potential to bolt on nest boxes to McConnell Weir to provide additional nesting opportunities. - along with broad-leaved helleborine, black guillemot could be promoted as an 'emblem' of the Impoundment through literature, social media and other publications.	**DSD,** RSPB	Short to long term
Work with RSPB to identify areas along Impoundment which can integrate into the 'Swift City' project. Potentially, nesting boxes suitable for swifts can be affixed to the 'Welly Boots' section of McConnell Weir, where swifts have been recorded.	**DSD, RSPB**	Short to medium term
Examine potential to install special kingfisher nest boxes in semi-natural woodland downstream of Governor's Bridge; floating nest boxes upstream of Ormeau Bridge where they can be viewed by the public	**DSD, BCC,** RSPB	Short to medium term
Erect small bird boxes on trees along revetments and at the Lagan Lookout. Public participation could be used to monitor use of the bird boxes.	**DSD, BCC**	Short to medium term
Promote public participation in general bird recording along the Impoundment, e.g. through annual bird counts,		
Produce a leaflet – *Birds of the Impounded River Lagan* - which identifies which species can be spotted and where, general information on particular bird species and pictures.	**DSD,** RSPB	Short to medium term
Engage with adjacent landowners along the Impoundment to erect bird boxes and encourage feeding during winter.	**DSD, BCC,** landowners along Impoundment	Short to medium term

6.10 Objective 5: Building Positive Public Perception

Biodiversity enhancements will facilitate renewed public engagement with the Impoundment

In the past, the lack of natural riverbank features and poor water quality have resulted in low perception of the biodiversity value of the Impoundment. With improvements in both water quality and the civic areas along the Impoundment, cementing public knowledge of the value of this resource is critical to securing support for biodiversity enhancement. Many people use the Impoundment on a daily basis, walking, cycling, running and rowing and acknowledgement of the value of the site is important. Of benefit would be primary research into attitudes and attitudes of user groups along the Impoundment to biodiversity and wider elements, including litter control and potential for establishment of a 'Friends of the Impounded River Lagan Group', which could then feed into and inform the delivery of actions.

Community groups, businesses and sports clubs could have a strong role to play in managing Conservation Management in public areas along the Impoundment. They should be consulted at an early stage and integrated fully into the planning and management processes. They have the advantage of being on the ground, close to the action, which facilitates monitoring progress and identifying problems at an early stage. Funding opportunities such as the Challenge Fund[39], could potentially be accessed by groups for environmental improvement projects within the locality and including the Impoundment. Statutory participation with community led initiatives is encouraged under the Challenge Fund and would offer a means of engagement between the DSD and relevant groups.

One of the other major steps to achieve the actions of Objective 5 is to raise the profile of the Impoundment within Belfast and nationally. What has worked well in other parts of the UK is the appointment of a Biodiversity Champion, who can champion the Impoundment and biodiversity enhancement efforts. Ideally, the Biodiversity Champion will be a local elected representative who is in a position to provide political buy-in to the Biodiversity Enhancement Strategy and aspirations for the Impoundment.

An outcome of the Workshop was the suggestion to appoint a Lagan Interpretative Officer who could invigorate interest in the Impoundment and the wider area connected to the River Lagan. An Interpretative Officer could help facilitate heritage sustainability education along the lower Lagan, Belfast Lough and other geographical areas, as agreed; provide environmental advice to partners undertaking actions of the Biodiversity Enhancement Strategy and seek funding for projects and continuation of the Interpretative Officer's post. Funding sources and remit of the Interpretative Officer would be the subject of future discussion, but could have a hugely beneficial effect on public attitude and engagement with the Impoundment and wider area. Securing the post for at least an initial two to three year period would allow sufficient time to develop initiatives which have the chance to result in real biodiversity gains.

Certain elements of impoundment management are directly related to litter issues, e.g. reedbed cutting to facilitate litter removal. Litter within and along the Impoundment is an eyesore and potentially reduces water quality and may be an issue for wildlife. Measures to highlight the cost of litter, not only in monetary terms, but also to wildlife, could reap results in increased sense of community ownership of the Impoundment. A litter awareness campaign could be co-ordinated with businesses along the Impoundment.

[39] http://www.nienvironmentlink.org/news/12m-for-Challenge-Fund-2014

Information signage commissioned by the Minister for the Environment has been erected at four locations along the river at Lagan Weir, Hauler's Way, McConnell Weir and Governor's Bridge. However, there is a lack of signage towards the center and upstream reaches of the Impoundment where good quality semi-natural vegetation is present and which is also well used by the public. A Biodiversity/Heritage Path could complement other walking trails in Belfast, and highlight areas of significant vegetation, habitat areas, heritage hotspots and provide an educational resource to encourage the protection and conservation of local heritage. Lagan Valley Regional Park recently launched a Heritage Audio Trail[40], using QR code interpretation points, which could serve as a basis for developing interpretation along the Biodiversity/Heritage Path.

Using the Impoundment to engage with community biodiversity education should be explored. Biodiversity education is popular and enthusiastic in Belfast, e.g. the Saturday Club is run by Ulster Wildlife Trust and aims to engage younger children with their local environment; the RSPB hold regular walks and talks within Belfast, and events such as Biodiversity Day deliver environmental education to a variety of audiences. Fostering links between these groups/events and the Impoundment, providing avenues for interpretation and means to raise consciousness of the importance of biodiversity, will raise the profile of the Impoundment in a positive manner.

Objective 5: Building Positive Public Perception		
Actions	**Responsible Agencies**	**Timeframe**
Identify and appoint a Biodiversity Champion for the Impoundment.	**Local Politicians, DSD, BCC**	Short to medium term
Commission user survey of the Impoundment to inform knowledge of public awareness and perception.	**DSD, BCC, Rivers Agency**	Short to medium term
Examine the feasibility of creating a 'Lagan Interpretative Officer' role. The remit and focus of the role would be agreed with relevant partners.	**DSD, BCC, Rivers Agency,** other interested parties	Medium to long term
Engage with community groups along the Lagan to determine interest in establishing a volunteer 'Friends of the Impoundment' group.	**BCC, DSD, other interested parties**	Short term to establish Maintain in the long term
Consider organising a Biodiversity open day or fair along the Impoundment. The open day could be held in conjunction with other bodies, e.g. NIEA, Ulster Wildlife Trust, RSPB, Lagan Valley Regional Park and could include wildlife talks, stands, mural painting and competitions.	**DSD, BCC**, other interested parties	Short to medium
Every year, choose a species, group of species, habitat or theme to promote conservation action along the Impoundment. This could be tied into other conservation action across Belfast - RSPB Swift City project; Belfast Zoo Native Species week. Opportunities also arise to	**DSD**, **BCC**, NIEA Rivers, UWT, RSPB	Short/medium/long

[40] For more information go to http://www.laganvalley.co.uk/audiotrails.html. Accessed 6th September 2013.

integrate into national biodiversity themes e.g. the RSPB run a series of surveys throughout the UK such as Dragonflies in Focus, Moth Count and UK Ladybird Survey, which could be used to generate interest in natural history recording along the Impoundment and in the wider locality.		
In conjunction with relevant partners, develop information leaflet on the Impoundment to include history, culture and biodiversity.	**DSD, BCC**	Short / medium
Consider entering the Impoundment and adjacent areas, e.g. Lagan Valley Meadows as a future site for BioBlitz.	**DSD, BCC**	Short/medium
Explore the potential for local biodiversity groups/interested parties to use the Impoundment for biodiversity awareness raising, talks/walks and meetings.	**DSD, BCC**, Ulster Wildlife Trust	Short to long term
Explore the possibility of setting up a social media avenue (Twitter, Facebook) whereby users of the Impoundment can send on biodiversity records[41] and receive updates and seasonal information on species to be seen along the Impoundment.	**DSD**, BCC, NIEA Rivers	Short to long term
Prepare articles and information on the value of Impoundment for publishing in local and regional media, e.g. Belfast City Matters.	**DSD, Rivers Agency, BCC**	Short to long term
Encourage use of the Impoundment as a biodiversity education resource.	**DSD**	Medium to long term
Initiate a litter awareness campaign specifically for the impoundment and to complement ongoing litter campaigns.	**BCC, DSD, Rivers Agency**	Short to medium term
Provide signage along the centre and upstream sections of the Impoundment.	**DSD, BCC**	Short to long term
Investigate innovative multimedia tools to assist in educating the community and other stakeholders, possibly as part of interpretation along a Biodiversity/Heritage Path.	**DSD, BCC**, other interested parties	Short/medium

[41] Translink ran a similar successful project, launched in 2013 - http://www.translink.co.uk/Latest-News/Translink-asks-passengers-to-discover-biodiversity-by-bus-or-train/

6.11 Objective 6: Controlling the Threat of Invasive Species

Overall Aim: Invasive species will be controlled effectively

Northern Ireland takes the threat of invasive species very seriously due to their potential ecological, financial and social implications. The DOE publication, *An Invasive Alien Species Strategy for Northern Ireland* (May 2013) sets out a framework for the control of invasive species. Records for invasive species are maintained by CEDaR and by the National Biodiversity Data Centre as part of the all island National Invasive Species Database. Invasive species are topical and increasingly gaining in public and political consciousness, e.g. a recent question (answered on 1st June 2013) was made to Minister Alex Attwood, Minister for the Environment querying what alien invasive species have been identified in river courses[42]. The answer provided indicated that the main channel of the River Lagan has a number of invasive plant species; Japanese knotweed, giant hogweed, floating pennywort, Himalayan balsam, fringed waterlily, hybrid knotweed, Nuttall's pondweed and Canadian pondweed, in addition to yellow bellied slider turtle.

Three invasive plant species were recorded along the Impoundment during the Phase 1 habitat survey, all upstream of Kings Bridge:- Japanese knotweed, giant hogweed and Himalayan balsam.

Japanese knotweed is present in semi-natural woodland at the foot of Annadale Embankment. It has also been noted growing in three locations near the Shaftesbury Community Centre, along River Terrace road but was not recorded there during the current Phase 1 habitat survey. Giant hogweed was recorded south of Kings Bridge, on both sides of the Impoundment. Queen's University have undertaken limited control of small areas of hogweed along Annadale Embankment by injecting the stem. However, given that much of the impoundment is open to public access, priority should be given to eradicating giant knotweed due to the potential health and safety implications of this plant. Himalayan Balsam was noted along the brackish channel and at the edge of woodland near Stranmillis Weir. As it does not yet appear to be well established, control in the very near future could be efficient and very effective rather than in the future when it has become more established.

In 2010, Dromore Angling Club found the highly invasive plant floating pennywort within the River Lagan[43]. While floating pennywort was not recorded in the Impoundment, a record for this species upstream of Stranmillis weir indicates that the site should be closely monitored.

Detailed information and best practice guidance (where available) for invasive terrestrial, freshwater and marine species in Northern Ireland can be found on the Invasive Species Ireland website at: - *http://www.invasivespeciesireland.com/mostunwanted/*.

One of the key issues with the control of invasive species is to ensure that the treatment is cost effective and worthwhile. Treating an infestation of Japanese knotweed or any invasive species, on an individual site, whilst leaving adjacent untreated areas provides a ready way for re-infestation to occur. Therefore it is essential that a holistic and integrated approach is taken to developing a control strategy. As part of the process, a site specific invasive species control plan should be drawn up for the Impoundment. This should include reference to control methodologies that best practice and health and safety such as those outlined below.

[42] http://www.niassembly.gov.uk/Documents/RaISe/Deposited-Papers/2013/dp1149.pdf

[43] Rapid control action was taken following the discovery of floating pennywort in the River Lagan, and the NIEA, AFBI and Dromore Angling Club removed an estimated five to six tonnes of floating pennywort by November 2010. http://www.northernireland.gov.uk/index/media-centre/news-departments/news-doe/news-releases-doe-november-2010/news-doe-041110-experts-on-high.htm.

The locations of giant hogweed and Japanese knotweed along the margins of the Impoundment indicate that there is a risk of these species spreading to other areas. At present the extent, cover and abundance of these species is not considered to be problematic in terms of habitat diversity. Nonetheless, initiatives should be put into place to effect control as soon as possible to limit spread. For health and safety reasons, all identified areas of giant hogweed should be treated as a matter of priority. There is also a duty of care to prevent the spread of these species to adjacent land.

Developing a site-specific invasive species Code of Practice for the Impoundment, which can be used by both managers (DSD, Rivers Agency and BCC) and users is important to ensure a co-ordinated approach to implementing best practice. For instance, the code should identify which work actions could potentially lead to introductions or spread of invasive species and measures to be implemented to minimise or avoid such risks.

Objective 6: Controlling the Threat of Invasive Species		
Actions	**Responsible Agencies**	**Target Dates**
Liaison with relevant parties and authorities to identify and agree on a comprehensive control strategy for invasive species along agreed stretches of the lower River Lagan.	**DSD, BCC, Rivers Agency, Belfast Lough** NIEA,	Short to long term
Consider preparation of a priority control plan for giant hogweed along the Impoundment, as this plant can be a public health hazard.	**DSD, BCC**	Short to medium term
Regular monitoring and surveys for invasive species along the riparian margins and for invasive aquatic species within the Impoundment.	**DSD, Rivers Agency, BCC**	Medium to long term
Investigate development of a lower River Lagan GIS mapping database for mapping locations of invasive species and control measures.	**DSD, BCC, NIEA**	Short to medium term
Develop site-specific Code of Practice to integrate best practice to prevent introduction and spread of invasive species to the Impoundment.	**DSD, Rivers Agency, BCC**	Short term

6.12 Objective 7: Bringing About Wider Community Benefit

Biodiversity enhancement will act as a catalyst for wider community benefit

Redevelopment along the Impoundment offers additional avenues for biodiversity gain in the wider area. For instance, proposed future plans for Queens Quay[44]. Sirocco Quay and City Quay redevelopments could look at the possibility of incorporating biodiversity features such as inclusion of nesting spaces within new buildings; landscape planting which functions as wildlife corridors; interpretation signage; possibly enhancements along the riparian edge (e.g. habitat creation) and other innovative methods to encourage and enhance biodiversity.

The Impoundment is bordered by different landuse and businesses. Upstream of Governor's Bridge the west bank is lined by boat and tennis clubs which are directly connected to the Impoundment. Belfast Boat Club in particular has well-maintained grounds with mature trees, grassland and ornamental shrub planting. Establishing links with these businesses, and bringing a co-operative response to identifying biodiversity enhancement measures could lead to net gain. Establishment of a 'Business for Biodiversity' scheme could be a good avenue to move forward biodiversity enhancement on adjacent lands. The scheme could provide surveys and advice for businesses along the Impoundment to improve their premises and grounds for biodiversity, offer practical advice and avenues for funding. This could form part remit of the Lagan Interpretative Officer, should such a post be funded in future (see Objective 5: Building Positive Public Perception).

The expanse of railings downstream of Ormeau Bridge combines with hard engineered revetments to provide extremely limited wildlife potential. The tops of the railings could be fitted with planters, planted with a variety of annuals and perennials, providing visual amenity and potential linkages to Ulster in Bloom competition, as well as providing seasonal nectar source for insects.

During the survey, it was noted that the most public area of the Impoundment, downstream of Ormeau Bridge, has extensive paved areas which would be highly suitable for installation of a biodiversity and cultural heritage themed walk. Parts of the paved area could be replaced with tiles or stones bearing engravings of wildlife present along the Impoundment, with local poems and other art work to bring the Impoundment further into the public realm. Other heritage elements could be included to enhance the visual and learning experience.

The Impoundment margin fronting the Methodist College Rowing Club comprises unattractive, stone filled gabion baskets. There is scope to provide a more attractive edge to this section of riverbank, e.g. the gabion baskets could be fronted by coir fibre rolls and planted with marginal plants. However, it must be restated that any improvement works here should be undertaken only when financial and personnel resources are in place to ensure long-term management and only if

Outdoor classrooms provide an opportunity to bring students to the outdoor environment to stimulate learning and discovery. Typically they can consist of a circular seating area linked to habitats where students are able to explore and learn about biodiversity and their natural environment. Potentially, the large amenity grassland immediately upstream of Maysfield Inlet could be suitable for an outdoor classroom. The existing planting along the grassland could be

[44] The draft for Queens Quay (DSD, August 2013) identified '*poor quality environment and image'* as a weakness for the proposed development. One of the design principles is '*Riverscape, creating a special place'* which is to be achieved by maximising views from the development and provision of gaps and vistas to the river edge.

enhanced through wildflower planting and other landscaping such as a willow dome[45] (subject to discussion on potential for vandalism) and fruit tree planting which can provide a stimulating and education experience as well as retaining value for the general public. Erection of information signage suitable for primary and secondary levels at this location would be highly advantageous to the learning process.

Objective 7: Bringing About Wider Community Benefit		
Actions	**Responsible Agencies**	**Timeframe**
Promote integration of biodiversity enhancement opportunities into future development proposals along the Impoundment.	**DSD, BCC**	Short to long term
Set up a 'Business for Biodiversity' scheme to assist with enhancement of adjacent lands; the scheme can provide advice, and practical methods to increase biodiversity; consideration could be given to a pilot scheme along the Impoundment, potentially followed by rolling the scheme out to the wider Belfast area.	**BCC,** Chamber of Commerce, DSD, other interested parties and businesses	Medium term
Fit flower planters to railings downstream of Ormeau Bridge.	**BCC**	Short to medium term
Consider introducing seating between Kings Bridge and Governors Bridge, to draw the public to this section of the Impoundment. Enhance the experience through provision of signage.	**Belfast City Council,** DSD	Medium to long term
Investigate potential to create a footpath Biodiversity and Heritage trail downstream of Ormeau Bridge.	**BCC, DSD,** Rivers Agency	Medium to long term
Examine feasibility of softening the gabion basket edge along the Methodist College Boat Club e.g. through new floating reedbed, or coir fibre rolls planted with marginals.	**DSD, Rivers Agency, private owners**	Medium to long term
Examine potential to create an outdoor classroom on the large amenity grassland area near Shaftesbury Community Centre (immediately upstream of Maysfield Inlet).	**BCC, DSD,** other interested parties	Short to medium term

[45] For example of willow dome see - http://www.companyofartisans.co.uk/page12.html

6.13 Objective 8: Research

The Impounded River Lagan will become a focus for research

The Impounded River Lagan is a wildlife and cultural corridor through Belfast, linking the open sea with parkland and agriculture, urban and rural areas, semi-natural vegetation and highlights the tremendous efforts towards regeneration and renewal of functioning ecosystems and communities. The Biodiversity and Ecosystem Service and Sustainability (BESS)[46] programme runs from 2011 to 2017 which has been set up to examine fundamental questions on the role of biodiversity in the delivery of ecosystem processes. As of 2013, BESS has not sponsored research in Northern Ireland and ample opportunity exists for a cross-organisational research submission. Details of the submission could be the focus of targeted discussions between the Lagan Working Group and potential research partners. Potential research could examine the cultural and economic aspects of ecosystem services of waterways within the Belfast Metropolitan area, functional relationship of waterway based communities to identified ecosystem services and evaluation of methods to build resilience of within these ecosystem services to environmental and social change.

The European Territorial Co-Operation 2014-2020 programme[47] provides funding schedule for the new EU Programme for Cross Border Co-operation (INTERREG V) and the new EU Programme for Peace and Reconciliation (Peace IV). One of the themes under INTERREG V will be 'Protecting the Environment and Promoting Energy Efficiency'. These programmes both offer potential for identifying cross-cutting themes along the Impoundment and in the wider locality and catchment which could aid biodiversity protection and enhancement. It is likely that the first call for INTERREG V projects will be the second half of 2014.

Promoting the Impoundment as a 'Living Laboratory' to all educational levels has the potential to integrate into schools curriculua and higher level research, providing a facility for identifying, evaluating and assessing processes which influence biodiversity and the wider environment along the Impoundment. Working together with interested educational bodies, a list of topics could be developed for potential student projects, and can also play a role in collating primary research information on the Impoundment which could assist in future management.

Other on-line, urban/peri-urban impoundments exist in the UK and Ireland, e.g. Tralee Ship Canal, River Tawe, Swansea, Cardiff Bay, Tees Barage, Teeside and River Irwell, Manchester. Each impoundment has a suite of both similar and differing management issues. Hosting a conference or workshop where best practice information could be shared between managers and staff of the impoundments could assist in facilitating dissemination of information and identifying opportunities for co-operative projects.

[46] For more details on the BESS programme see - http://www.nerc-bess.net/index.php/theme-overview
[47] http://www.seupb.eu/Libraries/2014-2020_Programmes/ConsultationInformationDocument_Final.sflb.ashx

Objective 8: Research Opportunities		
Actions	**Responsible Agencies**	**Timeframe**
Examine potential for formation of partnership to submit research proposal to BESS programme.	**DSD, Belfast Lough Partnership, BCC, Rivers Agency, interested higher education institutions**	Short to medium term
Establish partnerships with higher education institutions and research agencies to enhance baseline knowledge and monitoring.	**DSD, BC, Rivers Agency, NIEA, interested higher education institutions**	Short to long term
Explore potential to secure funding for a target of one PhD and one Masters research projects specifically related to the Impoundment; research themes to be agreed with the Working Group.	**BCC, DSD, Rivers Agency, NIEA, AFBI**	Medium to long term
Investigate submitting proposals under the new EU INTERREG V and Peace IV programmes.	**BCC, DSD, Rivers Agency,** other interested bodies	Short to medium term
Establish the Impoundment as a 'Living Laboratory'.	**DSD, BCC, Rivers Agency, AFBI,** other interested parties	Medium to long term
Investigate hosting a workshop / conference which focuses on UK / Irish impoundments to share best practice and explore potential for developing collaborative projects and strategies.	**DSD, Rivers Agency,** AFBI, BCC, other interested parties	Medium to long term

6.14 Forward Planning

The Biodiversity Enhancement Strategy Plan offers the potential to engage a wide cross section of interests and to provide real biodiversity gain within the Belfast area. The next step will be to start the process of invite potential members of the Lagan Biodiversity Action Group to form a Steering Committee and to start the process of bringing forward actions and projects, identifying sources of funding and setting timescales and targeted outcomes. Thereafter the plan will be developed with the partners and can form the basis for prioritising themes, deliverables and actions on the ground. In the medium to long term, it is hoped that the Biodiversity Enhancement Strategy will sit within a more comprehensive and coordinated strategy for the Impoundment.

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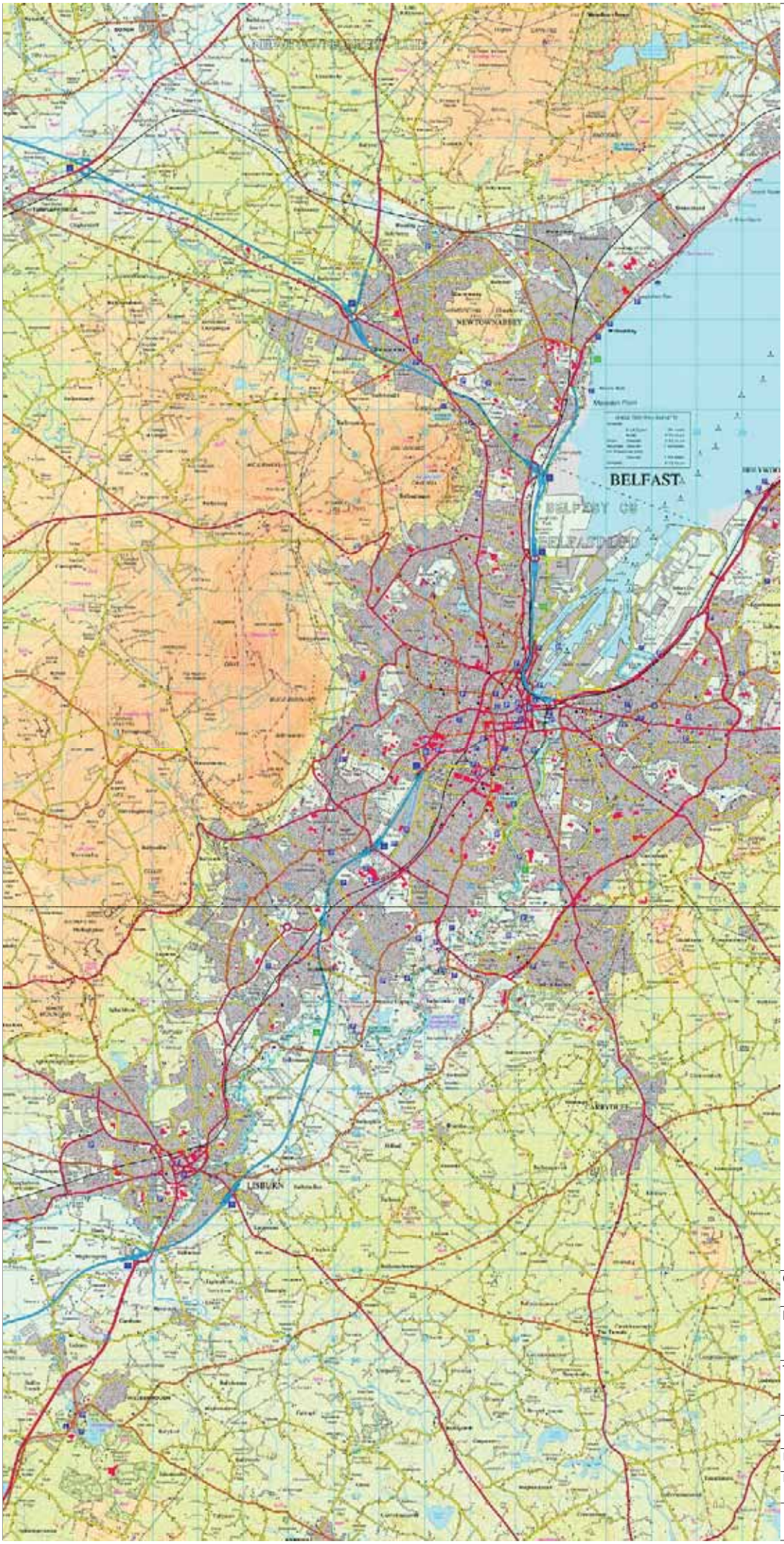
Figures



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Legend

Study Area

Client: Department for Social Development		
Project: Phase 1 Habitat Survey and Biodiversity Management Plan		
Title: Location of Study Area		
Designed / Drawn: DK	Checked: DB	Authorised: POD
Date: Oct 2013	Date: Oct 2013	Date: Oct 2013
Drawing No: FIGURE 1.1		Rev: 0

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Dublin - Tel: 353 - 1 - 890 9000
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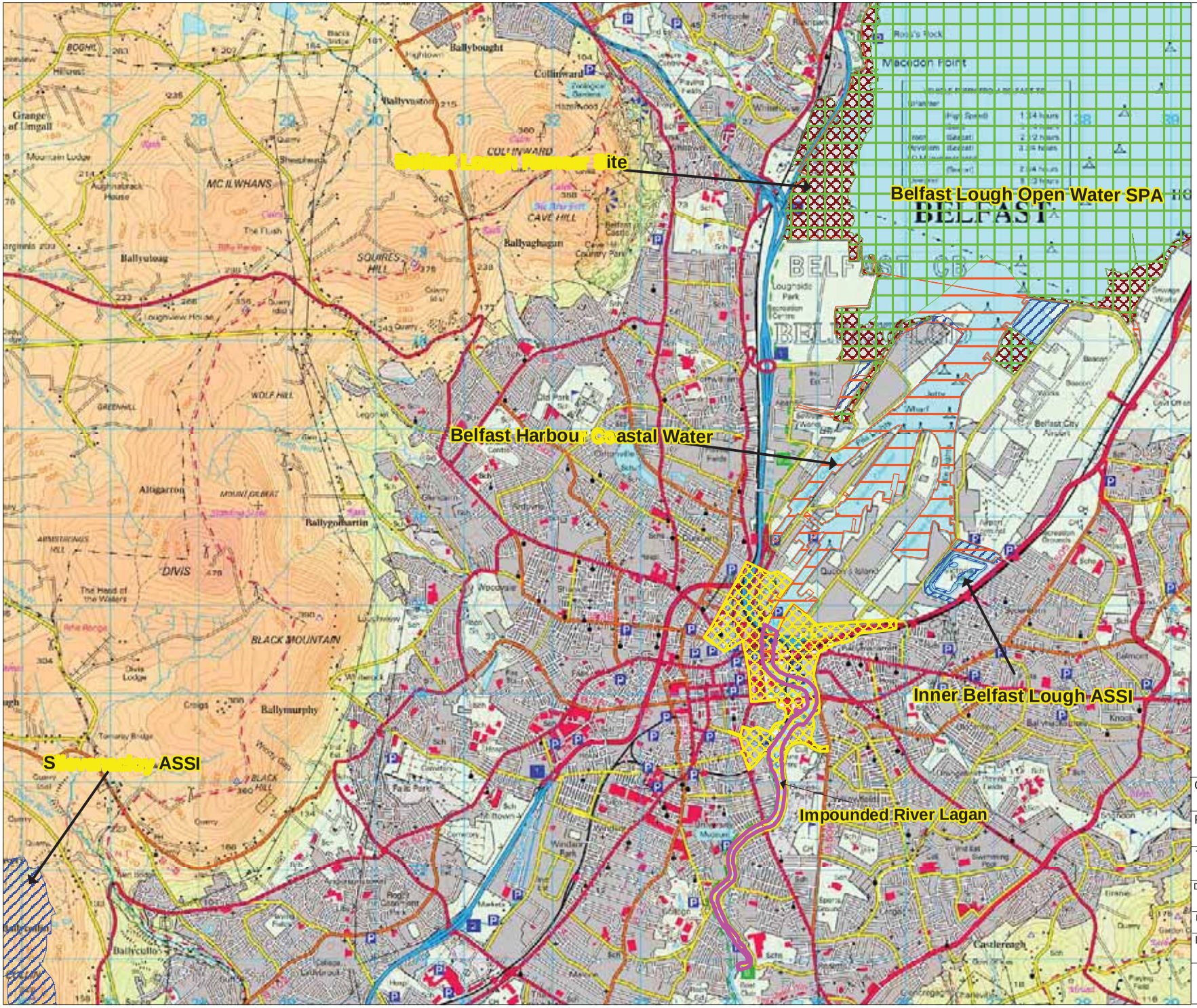

Client: Department for Social Development (DSD)		
Project: Phase 1 Habitat Survey and Biodiversity Strategy Plan		
Title: Designated Sites		
Designed/Drawn: ED	Checked: PO'D	Authorised: PO'D
Date: October 2013	Date: October 2013	Date: October 2013
Drawing No: Figure 1.2		Rev: 0

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N

Legend

Zone A

Stranmillis Weir Dowstream to Governor's Bridge

Zone B

Governor's Bridge Downstream to Ormeau Bridge

Zone C

Ormeau Bridge Downstream to Albert Bridge

Zone D

Albert Bridge Downstream to Lagan Weir

Client: Department for Social Development		
Project: Phase 1 Habitat Survey and Biodiversity Management Plan		
Title: Impounded River Lagan - Phase 1 Habitat Survey Zones		
Designed / Drawn: DK	Checked: DB	Authorised: POD
Date: Sep 2013	Date: Sep 2013	Date: Sep 2013
Drawing No: FIGURE 4.1		Rev: 0

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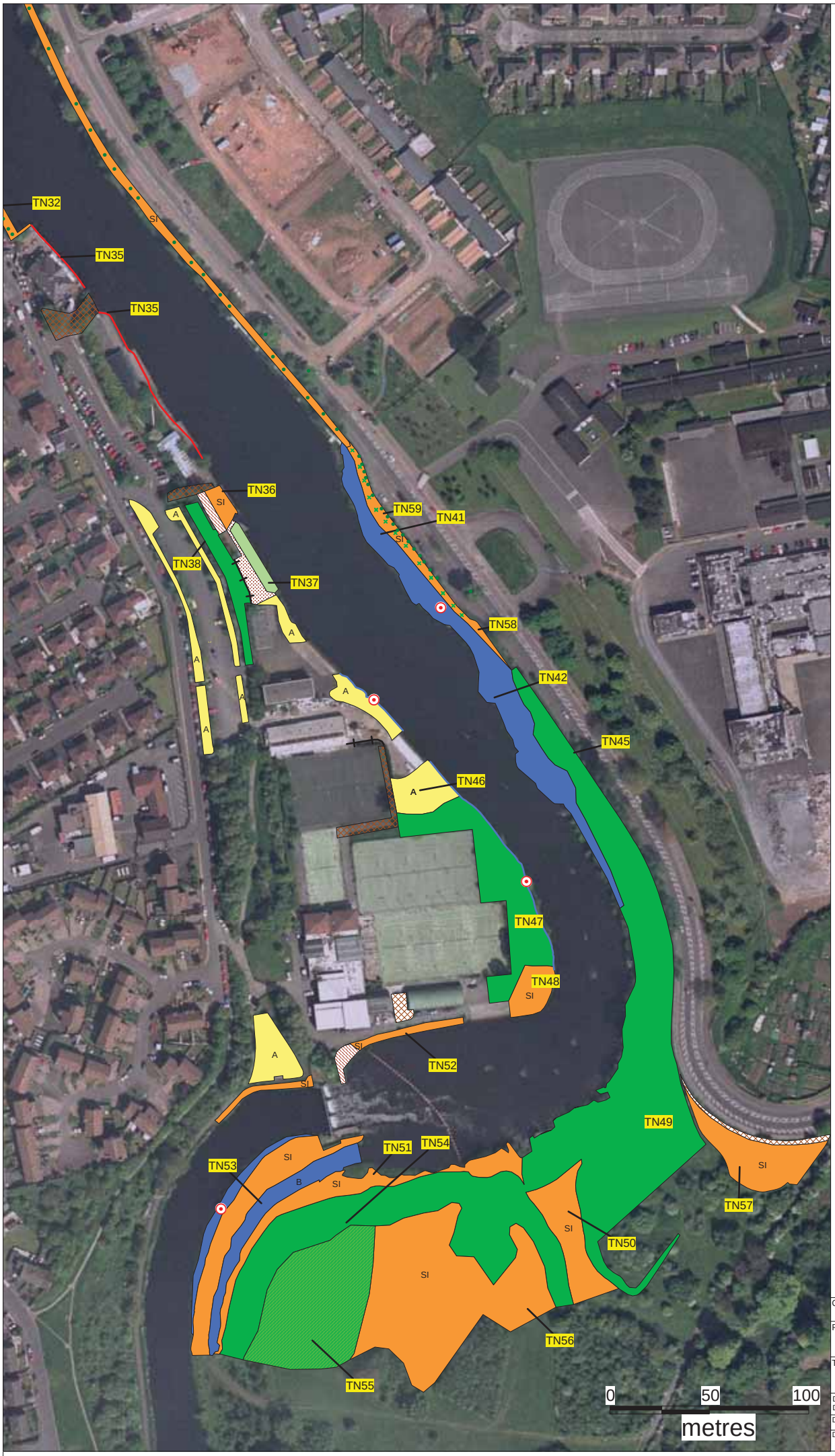

N

Habitats Legend

Polygons (NNC Code)

	A1.1.1
	A1.3.2
SI	B2.2
	C3.1
	C3.2
	F2.1
B	G2.6
A	1.2
	1.4
	2.1.2
	4

Point Features (NCC Code)

- A2.2
- A3

Polylines (NNC Code)

- F2.1
- 2.4
- 2.5

Client: Department for Social Development

Project: Phase 1 Habitat Survey and Biodiversity Strategy Plan

Title: Impounded River Lagan Habitat Map one A

Designed / Drawn:	Checked:	Authorised:
D	DB	POD
Date: Sep 2013	Date: Sep 2013	Date: Sep 2013

Drawing No: FIG RE 4.2 Rev: 0

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N

Habitats Legend

Polygons (NNC Code)

- A1.1.1
- A1.3.2
- SI B2.2
- C3.1
- C3.2
- F2.1
- B G2.6
- A 1.2
- 1.4
- 2.1.2
- 4

Point Features (NCC Code)

- A2.2
- A3

Polylines (NNC Code)

- F2.1
- 2.4
- 2.5

Client: Department for Social Development

Project: Phase 1 Habitat Survey and Biodiversity Strategy Plan

Title: Impounded River Lagan Habitat Map one A and one B

Designed / Drawn:	Checked:	Authorised:
D	DB	POD
Date: Sep 2013	Date: Sep 2013	Date: Sep 2013

Drawing No: FIG RE 4.3

Rev: 0

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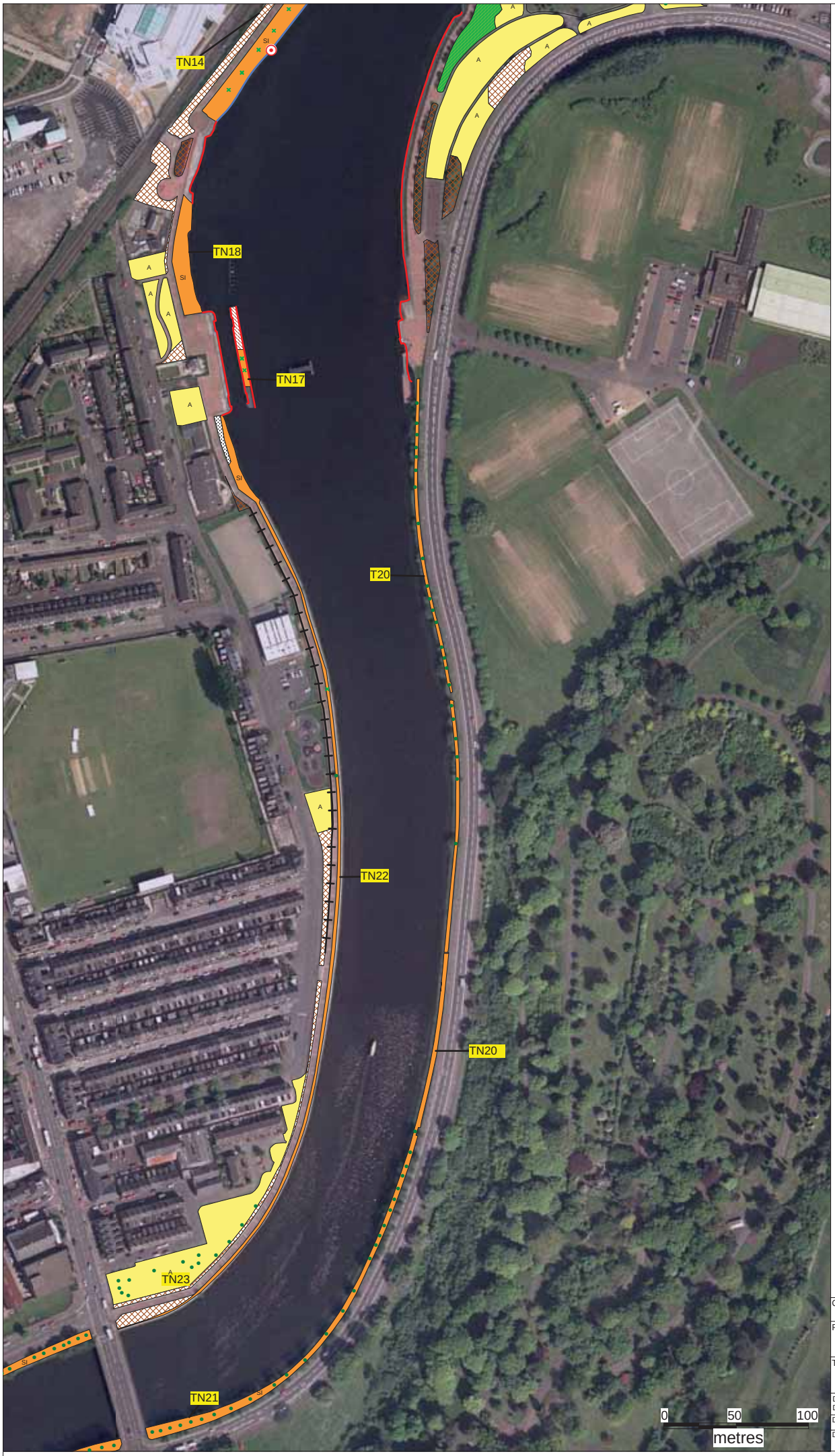

N

Habitats Legend
Polygons (NNC Code)

- A1.1.1
- A1.3.2
- SI B2.2
- C3.1
- C3.2
- F2.1
- B G2.6
- A 1.2
- 1.4
- 2.1.2
- 4

Point Features (NCC Code)

- A2.2
- A3

Polylines (NNC Code)

- F2.1
- 2.4
- 2.5

Client: Department for Social Development

Project: Phase 1 Habitat Survey and Biodiversity Strategy Plan

Title: Impounded River Lagan Habitat Map one C

Designed / Drawn:	Checked:	Authorised:
D	DB	POD
Date: Sep 2013	Date: Sep 2013	Date: Sep 2013
Drawing No: FIG RE 4.4		Rev: 0

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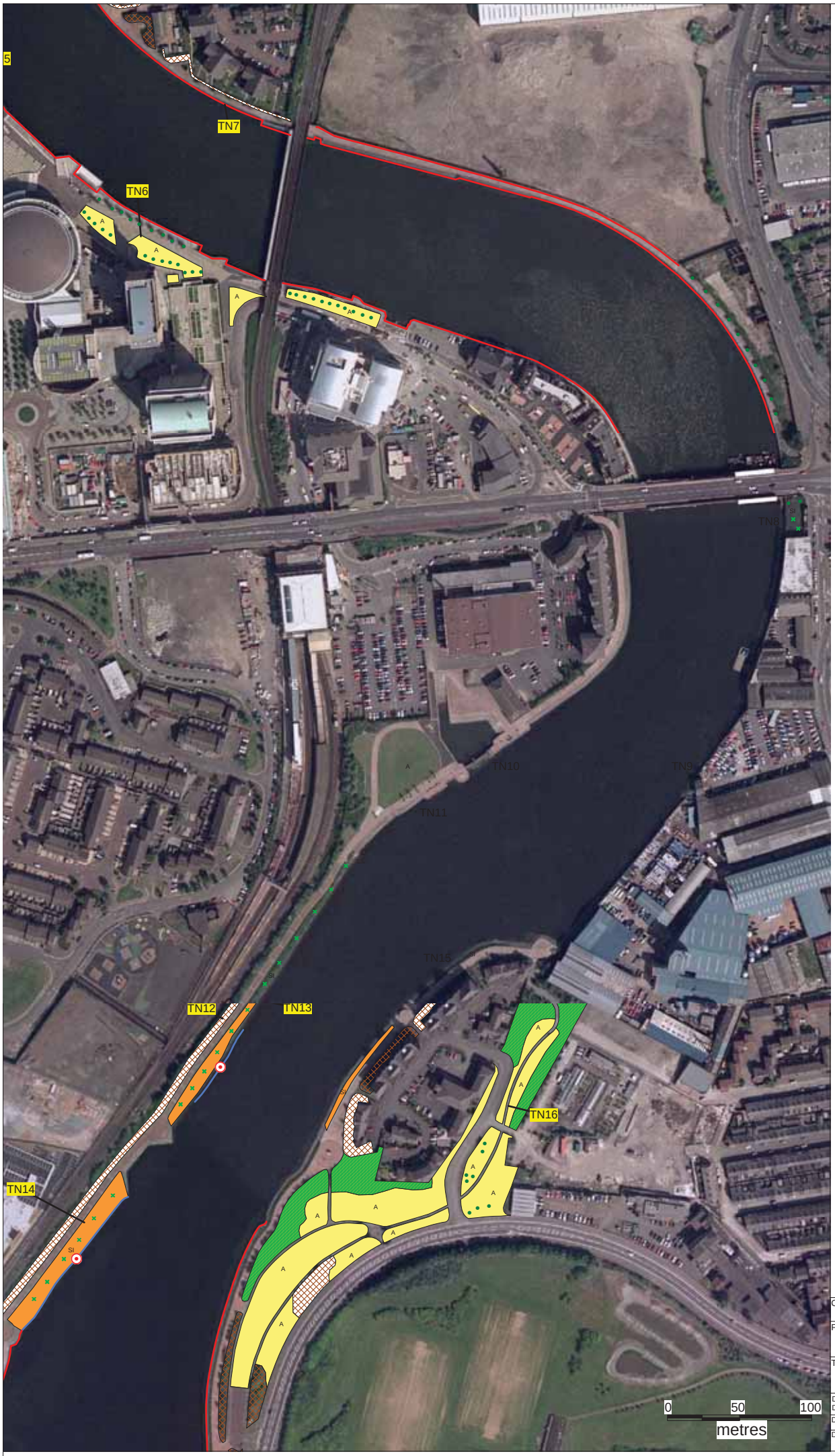

N

Habitats Legend

Polygons (NNC Code)

- A1.1.1
- A1.3.2
- SI B2.2
- C3.1
- C3.2
- F2.1
- B G2.6
- A 1.2
- 1.4
- 2.1.2
- 4

Point Features (NCC Code)

- A2.2
- A3

Polylines (NNC Code)

- F2.1
- 2.4
- 2.5

Client: Department for Social Development

Project: Phase 1 Habitat Survey and Biodiversity Strategy Plan

Title: Impounded River Lagan Habitat Map one C and one D

Designed / Drawn:	Checked:	Authorised:
D	DB	POD
Date: Sep 2013	Date: Sep 2013	Date: Sep 2013

Drawing No: FIG RE 4.5

Rev: 0

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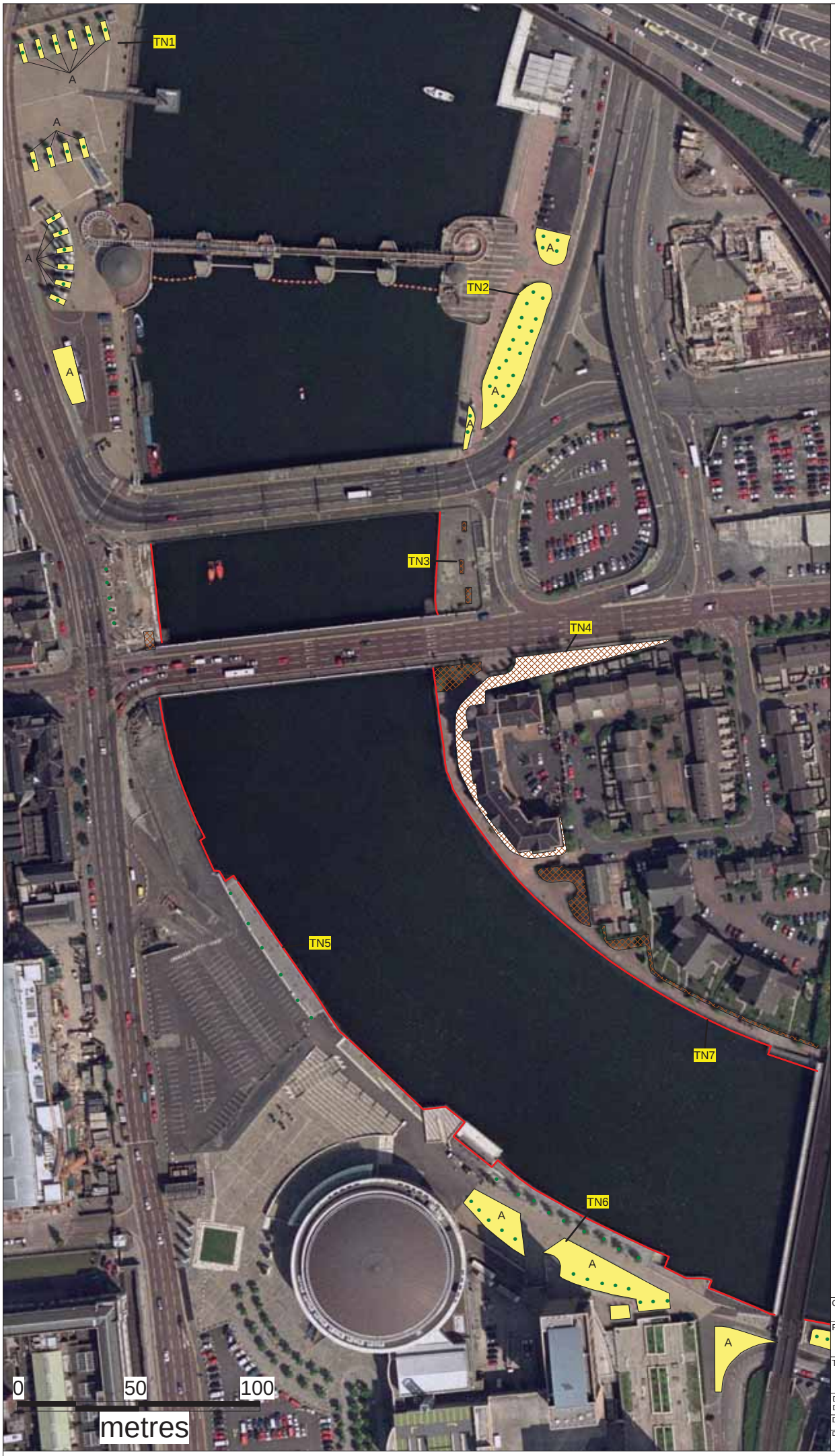

N

Habitats Legend

Polygons (NNC Code)

- A1.1.1
- A1.3.2
- SI B2.2
- C3.1
- C3.2
- F2.1
- B G2.6
- A 1.2
- 1.4
- 2.1.2
- 4

Point Features (NCC Code)

- A2.2
- A3

Polylines (NNC Code)

- F2.1
- 2.4
- 2.5

Client: Department for Social Development		
Project: Phase 1 Habitat Survey and Biodiversity Strategy Plan		
Title: Impounded River Lagan Habitat Map one D		
Designed / Drawn: D	Checked: DB	Authorised: POD
Date: Sep 2013	Date: Sep 2013	Date: Sep 2013
Drawing No: FIG RE 4.6		Rev: 0

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Legend

- Himalayan Balsam
- apanese knotweed
- Giant hogweed
- Area where Giant hogweed control measures have been implemented

Client: Department for Social Development		
Project: Phase 1 Habitat Survey and Biodiversity Strategy Plan		
Title: Impounded River Lagan - Location of Invasive Species		
Designed / Drawn: D	Checked: DB	Authorised: POD
Date: Sep 2013	Date: Sep 2013	Date: Sep 2013
Drawing No: FIG RE 4.7		Rev: 0

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Appendices

Appendix A – Management Plan for DSD

DSD Biodiversity Management Specifications – Zone A Stranmillis Weir to Governor's Bridge

These management specifications relate specifically to DSD managed riparian edge along the Impoundment (1.5m above HWM) and to the Impoundment waterbody itself. This zone has a semi-rural character, natural edge to the Impoundment and banksides that support semi-natural woodland and extensive lengths of grassed revetments with tree and shrubs. Banks along Belfast Boat Club show indications of erosion. The objective of management here is to maintain and enhance semi-natural vegetation, with resultant benefits for species. The 'Non-intervention' management option is a legitimate management tool for grasslands here, as steep slopes mean they are difficult to cut safely and effectively. The woodland between Stranmillis Weir and Annadale Fishing Stands is outside of DSD management, therefore only measures for control of invasive species along the edge of the river bank in this section are included. Measures for this section to be revisited if the Lagan Gateway Project Lock 1 comes forward.

Key Action/issue	Location	Existing management & frequency	Recommendations	Targeted outcomes	Issues/constraints
Management of grass margins along revetments	Along Annadale Fishing Stands and along revetment fronting Stranmillis Wharf apartments	Grass cut irregularly in this zone to facilitate litter picks and for aesthetics. Cuttings taken away by the tide	Undertake a yearly cut along the base of the Annadale Fishing stands to maintain habitat suitability for broad-leaved helleborine. Cut to be undertaken after July, when most flowers have set seed. Cuttings can be removed with the tide. 'Non-intervention' management may be the best management option along the remaining grassed revetments due to difficulty of cutting and removal of cuttings. This may lead to rank grass growth and spread of brambles/scrub but these habitats will be of wildlife value. A cut could be undertaken every 5-7 years to prevent rank bramble and scrub from becoming established and would increase habitat mosaics. Inform public of value of benefits of this management option through information signage Medium to long term - Should bramble/scrub become extensive and views along the	Habitat diversity is maintained Wildlife corridor function is maintained	Health and Safety considerations – working near water and steep slopes with machinery. Information signage required to inform public of chosen management, i.e. uncut grassy verges along revetments are not 'neglected'. Localised change in landscape character of the grassed revetments as parts become scrub dominated.

			Impoundment be obscured, consideration could be given to cutting bays into the scrub, managed by cutting once a year, which would provide habitat mosaics.		
Cutting reedbed for litter pick **Maintaining reedbed habitat**	Along Annadale Fishing Stands upstream along woodland edge	Cut once a year to facilitate removal of litter, Cuttings taken away by the tide	Cutting period ideally should be in the non-growing season. Cutting in the growing season may lead to reduced competiveness of the reedbed and ultimately put it under strain. All cuttings to be removed. In medium to long term, drier areas of reedbed closer to the river margins may need removal of scrub to halt/slow natural succession to scrub. Removal of scrub to be undertaken using hand-held tools to minimise disturbance to reedbed. Scrub removal to be undertaken between September and February, outside of bird breeding season. As water levels in the Impoundment remain generally constant, accumulation of organic material not removed by cutting may need to be raked and material removed from site on a 5 to 7 year cycle. This prevents the reedbed from becoming nutrient rich maintains reedbed habitat. Consider increasing area of fringing reedbed along the west bank, near Belfast Boat and Tennis Club, which may provide erosion protection to the bank. Specialised matting can be laid down as the basis for planting, and plants of local provenance used to seed the mats. Consider using coir rolls planted with suitable marginal plants or planting reedbed on mats along the base of the gabion baskets at the Methodist Boat Club.	Existing area of reedbed is maintained in good condition Extent of reedbed habitat is increased	Maintenance of annual cut is essential to slow natural succession to scrub. Consultation with Belfast Boat Club and Rivers Agency regarding potential for new reedbed planting along bank. Consultation with owners of the Methodist Boat Club and Rivers Agency regarding potential to soften gabion basket edging. Planting of reedbed along the margins of Belfast Boat Club will need to take account of the Lagan Canal project proposals and also usage of the river. Feasibility of planting and success in the long term should be factored into the decision making process, as should the need to securing personnel and funding for adequate long-term maintenance and management.
Trees/scrub	Along both banks	Limited	In short to medium term, a tree survey is recommended to establish a tree inventory and health of existing tree stock. Implement recommendations of the tree survey.	Tree/shrub habitat remains at similar or increased cover Trees to be	Consultation with Belfast City Council with regard to trees and woodland above 1.5m HWM to ensure co-

			Medium to long term some pruning or pollarding may be required of the trees to maintain vistas along the Impoundment and maintain trees in good condition. Dense scrub along Annadale Fishing Stands may need to be coppiced down to the ground on a regular basis – 3 to 5 year cycle (in conjunction with BCC). Removal of dense dogwood in this section should be considered in the medium to long term, and be replaced by native willow, hazel and blackthorn. Coppicing to be undertaken outside of bird breeding season. In the long term, replace aging and senescent trees with native species such as ash, downy and silver bird and native alder. The very mature poplar (see Fig 4.5) should be protected and a full condition survey undertaken. DSD manage the base (1.5m from HWM) of the semi-natural woodland along the east bank. Often, the best management for woodland is to leave it to natural processes.	maintained in good condition	ordinated approach to management and objectives. Investigate potential for Friends of the Lagan group to assist in tree and scrub maintenance.
Control of giant hogweed	Along both banks	Hogweed along top of revetment has been stem injected in the past. No control measures along the base of the revetment.	All patches of giant hogweed to be treated as soon as possible. Chemical control using appropriate herbicides is recommended to achieve effective control. ***Chemical giant hogweed control:-*** • Spray between March and May/June using a glyphosate based herbicide licenced for use near water; • Apply herbicide as spot treatment to individual plants;	Eradication of giant hogweed	***Due to health and safety implications of this plant, control should be a priority project.*** Particular care needed when working with giant hogweed. All operatives must wear full protective clothing. Refer to Invasive Species Ireland[48] for more details. Consultation with BCC

[48] http://invasivespeciesireland.com/toolkit/invasive-plant-management/terrestrial-plants/giant-hogweed/

			• Repeat application as necessary over several growing seasons; • Use native grass mixture (Yorkshire fog, red fescue, false oat-grass) to quickly establish vegetation on treated soils as this reduces seed germination; • Monthly checks during growing season to control late germinating plants before they can set seed.		required to ensure control of giant hogweed on other parts of the Impoundment within their remit. Consultation with NIEA to determine upstream locations of giant hogweed and to co-ordinate control efforts.
Control of Japanese knotweed	In woodland - outside of DSD control but may extend down to edge of river if left untreated in the short to medium term	None	The current area of Japanese knotweed appears to be outside of DSD management. However this species can spread quickly and should control measures not be implemented in the short to medium term, it may spread onto DSD controlled areas. Regular monitoring of the cover of this species is recommended, including photographic records. Ideally, control measures should be implemented by BCC in the short to medium term to prevent spread.	Eradication of Japanese knotweed	Liaise with BCC regarding Japanese knotweed control measures and strategy.
Control of Himalayan balsam	In woodland and along base of woodland	None	At present cover of this invasive is relatively low and could be removed by hand using staff or volunteers. The best time for removal is between May and June, when the plant is visible and has not yet produced seeds. All cut material to be taken off site and composted thoroughly. The areas treated should be monitored monthly to check for late germinating plants, over several growing seasons. Reseeding of areas is unlikely to be required if plants are controlled in the short term. Should control not occur within the near future, the extent of cover is likely to increase and chemical control methods may be required using a glyphosate based herbicide licenced for use near watercourses. It may also be necessary at that stage to use a native grassland mix to establish dense sward to discourage seed germination.	Eradication of Himalayan balsam	Health and Safety - working near water and on steep slopes. Consultation with NIEA to determine upstream locations of Himalayan balsam and to co-ordinate control efforts – important as Himalayan balsam occurs frequently on banksides upstream of Stranmillis Weir. Investigate potential use of Friends of the Lagan group to assist in hand removal of Himalayan balsam e.g. balsam bashing.

Management for wildlife	Kingfisher, birds heron, otter, salmonids	No specific management	Limited management required in the short to medium term other than to maintain habitats in good condition and water quality to remain at current levels or improve. Kingfisher nest boxes could be provided on the west bank, along the base of the woodland[49]. Bird and bat boxes could be erected in the woodland, along Annadale Fishing Stands and on trees fronting the revetment at Stranmillis Apartments. Liaise with anglers using Annadale Fishing Groups to promote awareness of the impoundment, particularly of the legally protected common seal.	Maintain diversity of wildlife	All measures to be in compliance with Habitats Directive and Birds Directive Location of kingfisher nest to be agreed with BCC. Advice to be sought from RSPB / Northern Ireland Bat Group. Be aware of potential for interference with bird boxes as there is greater public access along this area than upstream of Governor's Bridge. Care to be taken when undertaking maintenance of bird boxes – health and safety considerations to be put in place.

[49] For specifications see http://www.nhbs.com/schwegler_kingfisher_and_sand_martin_nest_tunnel_tefno_173235.html

DSD Biodiversity Management Specifications – Zone B Governor's Bridge to Ormeau Bridge

These management specifications relate specifically to DSD managed riparian edge along the Impoundment (1.5m above HWM) and to the Impoundment waterbody itself. This zone is more urban in character than Zone A and the river edge is generally hard engineered. The main habitat present is semi-natural grassland fringing the top of the generally steeply sloping revetments. The objectives of management in this zone are to maintain the diversity of existing habitats and species and to retain value of the river banks as wildlife corridors. The 'Non-intervention' scenario is a legitimate management tool for the grasslands here, as steep slopes mean they are difficult to cut safely and effectively.

Key Action/issue	Location	Existing management & frequency	Recommendations	Targeted outcomes	Issues/constraints
Management of grass margins along revetments		Grass cut irregularly in this zone. Cuttings taken away by the tide	'Non-intervention' management option may be appropriate along majority of revetment grassland due to difficulty of cutting and removal of cuttings. This may lead to rank grass growth and spread of brambles/scrub but these habitats will be of wildlife value. A cut could be undertaken every 5-7 years to prevent rank bramble and scrub from becoming established and would increase habitat mosaics. Inform public of value of benefits of this management option through information signage. Occasional grass cutting (after July when seeds have been set) to facilitate litter picking can continue as required and will help maintain some open grassland sections. Cuttings can continue to be removed with the tide as at present. Yearly cuts should occur along on the west bank, immediately upstream of Kings Bridge to maintain habitat suitability for broad-leaved helleborine – cut after July and cuttings to be	Habitat diversity is maintained	Health and Safety considerations – working near water and steep slopes with machinery. Information signage required to inform public of chosen management, i.e. revetments are not 'neglected'. Localised change in landscape character of the grassed revetments as parts become scrub dominated.

			removed with the tide. Medium to long term - Should brambles and scrub start to become extensive along both banks, consideration could be given to instigating cutting and clearance along selected sections, or cutting bays into the bramble/scrub, to maintain habitat mosaics. All works to bramble/scrub to be undertaken after bird breeding season.		
Trees/scrub	Scattered or in clumps along both margins of Impoundment	Limited	In short to medium term, a tree survey is recommended to establish a tree inventory and condition of existing tree stock. Implement recommendations of the tree survey. In the medium to long term some pruning or pollarding may be required of the trees to maintain vistas along the Impoundment and maintain trees in good condition. In the long term, replace aging and senescent trees with native species such as ash (depending on ash dieback disease spread), downy and silver bird and native alder. Removal of dense laurel scrub between Governor's Bridge and Kings Bridge in the medium to long term and replacement by native willow, hazel and blackthorn.	Tree/shrub habitat remains at similar or increased cover Trees to be maintained in good condition	Maintenance and works affecting trees/scrub to be undertaken outside of bird breeding season. Investigate potential for Friends of the Lagan group to assist in tree and scrub maintenance.
Giant hogweed	Located on west bank, between Governors Bridge and Kings Bridge	No apparent management	All patches of giant hogweed to be treated as soon as possible. At the level of current infestation, chemical control using appropriate herbicides is recommended (see Appendix xx Controlling Invasive Species). ***Chemical giant hogweed control:-*** • Spray between March and May/June using a glyphosate based herbicide licenced for use near water; • Apply herbicide as spot treatment to	Eradication of giant hogweed	***Due to health and safety implications of this plant, control should be a priority project.*** Particular care needed when working with giant hogweed. All operatives must wear full protective clothing. Refer to Invasive Species Ireland for more details. Consultation with BCC to ensure control of giant

			individual plants; • Repeat application as necessary over several growing seasons; • Use native grass mixture (Yorkshire fog, red fescue, false oat-grass) to quickly establish vegetation on treated soils as this reduces seed germination; • Monthly checks during growing season to control late germinating plants before they can set seed.		hogweed on other parts of the Impoundment within their remit. Consultation with NIEA to determine upstream locations of giant hogweed and to co-ordinate control efforts.
Bird and bat boxes	-	-	Install small bird boxes in suitable trees along both revetments, e.g. east bank, on tall aspen trees upstream of Ormeau Bridge, where interference is likely to be minimal. Old nests and unhatched eggs can be removed from the boxes between August and January, when birds are not present. If necessary, use warm water to clean out the nest box, never use insecticide or flea powder. Consideration could be given to bolting on nest boxes suitable for Daubenton bats to the undersides of the bridge structures, as there is currently no potential for bats to roost on these bridges.	Increase bird nesting sites	Liaise with RSPB for the bird boxes and DRD Roads Service and Northern Ireland Bat Group for bat box project. Be aware of potential for interference with bird boxes as there is greater public access along this area than upstream of Governor's Bridge. Care to be taken when undertaking maintenance of bird boxes – health and safety considerations to be put in place.

DSD Biodiversity Management Specifications – Zone C Ormeau Bridge to Albert Bridge

These management specifications relate specifically to DSD managed riparian edge along the Impoundment (1.5m above HWM) and to the Impoundment waterbody itself. Management specifications are given for the 'Klondyke' grassland, which although within the remit of Belfast City Council, has in the past been managed in the recent past on an *ad hoc* basis by DSD.

Landuse along both sides of the Impoundment in this zone is a mixture of residential and commercial. Ormeau Park borders much of the east, separated by Ormeau Embankment road. Upstream of McConnell's Weir, both revetments are steeply sloping and support semi-natural grassland topped by trees/shrubs. Downstream of McConnell Weir, the east bank is generally hard engineered. A more naturalised river bank has been formed along part of the west bank. This zone is within the well-used public realm, and a combined cycleway/footpath borders the western bank Ornamental planting is associated with the public spaces and residential properties facing the Impoundment. The objectives of management here are to maintain the diversity of existing habitats and species; maintain the value of the river banks as wildlife corridors; and maintain aesthetics.

Key Action/issue	Location	Existing management & frequency	Recommendations for management	Targeted outcomes	Issues/constraints
Management of grass margins along revetments	Along both river margins, from Ormeau Bridge to just past McConnell Weir	Grass cut regularly in this zone to facilitate litter picks and for aesthetics. Cuttings removed by the tide.	Maintain regular cuts of grassland along both Impoundment banks. Grassland to be cut once a year at least, after July when flowers and grasses have set seed. Cuttings can be removed with the tide.	Grassland is visually attractive and species diverse	Health and Safety considerations – working near water and steep slopes with machinery. Information signage required to inform public of chosen management, i.e. revetments are not 'neglected'. Liaison with BCC to discuss grassland management within their remit to ensure a co-ordinated and cost effective approach to grass verge cutting is prioritised.

Klondyke grassland		The flat top of grassland is cut yearly for aesthetics and for litter picking by BCC. Cuttings are either left in place or placed into the channel for removal by tides. Wildflower seed mixture has been added in the past, and includes non-native species	Consider removal of non-native wildflower species (pull by hand during growing season). Should the Biodiversity Working Group feel wildflower seeds would be beneficial in future, source seeds locally or use a local green hay crop – take out non-native wildflowers first Install gate in fencing along grassland to allow easier access for maintenance. Grassland to be cut once yearly in July when flowers and grasses have set seed. All cuttings to be raked and either removed for composting. The opportunity exists to extend this grassland type to currently unenclosed area at TN19 (Fig 4.2) through green hay cut from the main Klondyke grassland for seeding from a locally sourced wildflower mix. Realignment of fence to enclose grassland will be required. Recommendation to install gate in realigned fence to facilitate access for management.		DSD and Belfast City Council to discuss appropriate management of the 'Klondyke' grassland. Getting access for cutting machinery appears to be a problem. Installation of gate in the existing railings should help.
Trees/scrub	Scattered along the eastern bank, very limited cover along most of the west bank apart from semi-natural bank east of the railway line	Occasional pruning or replanting	In short to medium term, a tree survey is recommended to establish a tree inventory and health of existing tree stock. Implement recommendations of the tree survey. Medium to long term some pruning or pollarding may be required of the trees on the east bank to maintain 'vista along the Impoundment and maintain trees in good condition. In the long term, replace aging and senescent trees with native species such as ash, downy and silver bird and native alder.	Tree/shrub habitat remains at similar or increased cover Trees to be maintained in good condition	Maintenance and works affecting trees/scrub to be undertaken outside of bird breeding season. Investigate potential for Friends of the Lagan group to assist in tree and scrub maintenance.
Impoundment wall	Wall along east bank from Ravenhill	Repointing and clearance as necessary	If at all possible, try to preserve some plant cover along this section of wall during any repairs or repointing.	Value for nesting black guillemot is recognised	Works near holes with nesting birds to be undertaken outside of bird

	apartments to Albert Bridge		Liaise with owners/responsible persons or agencies regarding repairs to fabric of wall to ensure that due attention is paid to nesting black guillemot.		breeding seasons.
Semi-natural vegetation (TN13 & TN14)	Immediately downstream of McConnell Weir, on the west bank	Amenity grassland strip along the towpath is cut regularly. Litter picks require yearly cut of reedbed along the river's edge.	Leaving a narrow strip of unmown grass along the edge of the trees and shrubs would create a less formal edge along the footpath. The mosaic of habitats and natural gradation should be maintained. Areas of open grassland and trees/shrubs are valuable for birds, small mammals and invertebrates. Marenco (2002) survey noted one clump of giant hogweed along this section. However, no invasive species were recorded during the Phase 1 survey. Recommend regular monitoring for invasive species. Maintain regular reedbed cutting. Cutting period ideally should be carried out in the non-growing season. All cuttings to be removed by the tide.	Maintain habitat mosaics Maintain reedbed habitat	Liaise with BCC regarding management.
Cromac Lock		Occasional cut of grassland on flat top of McConnell Weir	Leave small saplings in place to provide cover for birds. Prune as necessary to retain bushy growth. If the habitats on the top of McConnell Weir are to be maintained, cut grassland every 2 years approximately, in late August/September, to maintain plant diversity and avoid disturbance to ground nesting mallard. Grass cuttings can be disposed of into the Impoundment. In the medium to long term, and subject to structural assessment and possibly archaeological approval, nest boxes could be bolted to the sides of the structure to provide additional nesting opportunities for black guillemot. To create a safe and secure tern nesting area, the grassed area at the top of the weir	Maintain value for breeding mallard Provide opportunities for nesting black guillemot	Liaise with managers of other similar projects in Northern Ireland for advice and best practice guidance, and with the RSPB.

			could be stripped, lined with heavy duty liner, covered with gravel and recycled tyres filled with gravel used to provide nesting sites for common tern. Nest boxes could be sited elsewhere along the Impoundment to provide replacement nesting sites for mallard which would be displaced from McConnell Weir.		
'Welly Boots' – McConnell Weir	East of Cromac Lock	None (in biodiversity terms)	Install swift boxes on the 'Welly Boot' structures in association with the RSPB and possibly subject to archaeological assessment. Swift boxes to be located at least 5m above the high water mark on the structure. Triple cavity Schwegler boxes, or similar, are recommended. The number of boxes and orientation should be discussed with the RSPB, but boxes should not face directly south. Old nests and unhatched eggs can be removed from the boxes between August and January, when birds are not present. If necessary, use warm water to clean out the nest box, never use insecticide or flea powder. The most ideal time to erect boxes is before the nesting season, ie between October to February/March. After installation, regular monitoring of the boxes should be undertaken in the first 2-3 years to determine use.	Increase nesting habitat for swift	Liaise with RSPB regarding Belfast 'Swift City' project. Health and safety protocol to be drawn up for monitoring and maintenance of nest boxes.
Installing floating vegetation rafts/ reedbed / floating nestboxes	Possible locations include alongside McConnell Weir; reedbed could be created at the base of grassland at TN19		Floating island vegetation mats can be used to increase area of aquatic habitat[50], but subject to commitment of sufficient funding and resources to properly maintain these islands. Small floating nest boxes could be sited within the Impoundment to provide additional	Increase area of aquatic habitat and habitat for nesting birds	Exact locations and type of floating mats to be agreed between DSD, river users and other relevant parties.

[50] For examples of floating see http://www.aquascience.co.uk/floatingreedbeds.html

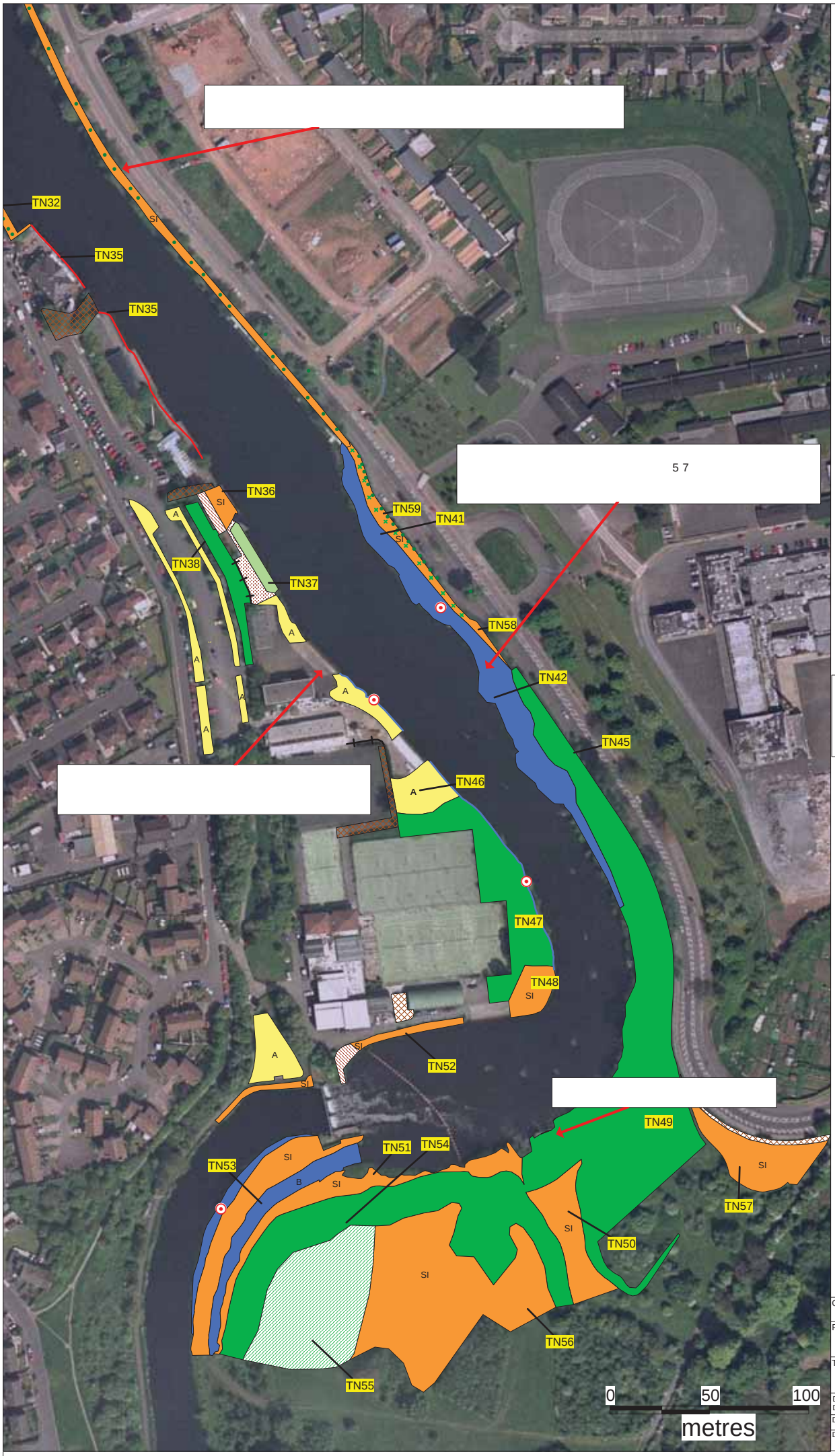
	(immediately upstream of McConnell Weir	habitat for nesting birds, e.g. mallard Maintenance requirements will be determined by size, planting and use by wildlife which may place seasonal restrictions on management. Only to be implemented if sufficient funding and resources are available to maintain in the long term.

DSD Biodiversity Management Specifications – Zone D Albert Bridge to Lagan Weir

These management specifications relate specifically to DSD managed riparian edge along the Impoundment (1.5m above HWM) and to the Impoundment waterbody itself. Between Albert Bridge and Lagan Weir, the footpath along the Impoundment is very well used. Landuse along both sides of the Impoundment in this zone is a mixture of residential and commercial. The river banks are uniformly hard engineered and lack natural vegetation, apart from occasional marine tolerant plants exploiting gaps in the cement pointing. Ornamental planting is associated with the public spaces and residential properties facing the Impoundment. Measures to enhance biodiversity in this zone would be very beneficial.

Key action/issue	Location	Existing management & frequency	Recommendations for management	Targeted outcomes	Issues/constraints
Impoundment walls	Along both river margins	Repointing and clearance as necessary	Investigate potential to attach planters to revetments to build a 'living wall'. Locations to be agreed, but may be beneficial on the vertical wall sections near Waterfront Hall and along Laganside Walkway. Planters to be placed near top of wall to avoid inundation. Planting to include herbs and small shrubs which can tolerate the tidal environment such as lavender, olearias, santolina and sea hollys. Only to be considered if funding is secured for long-term maintenance.	Small increase in habitat available for invertebrates Create interest along the walls	Liaise with BCC
Black guillemot	Queens Bridge	Pipe installed to increase nesting opportunities	Maintain informal monitoring of black guillemot numbers at Albert Bridge. Provide additional artificial nest tubes if considered necessary, attached to the bridge structure.	Maintain present numbers of black guillemots at this bridge	Liaise with DRD Roads Service
Lagan Lookout	-	-	Install bird boxes (suitable for swift, house martin) on the exterior of the building Old nests and unhatched eggs to be removed from the boxes between August and January, when birds are not present. If necessary, use	Increase nesting opportunities for birds	Orientate boxes to the east or west; seek advice of RSPB. Health and safety protocol to be drawn up for

	warm water to clean out the nest box, never use insecticide or flea powder. Consider installing a nest box camera (before start of breeding season); consider means to have public access to nest box camera photos e.g. live stream from camera to link on DSD website	monitoring and maintenance of nest boxes



Habitats Legend

Polygons (NNC Code)

- A1.1.1
- A1.2
- A1.3.2
- SI B2.2
- C3.1
- C3.2
- F2.1
- B G2.6
- A 1.2
- 1.4
- 2.1.2
- 4

Point Features (NCC Code)

- A2.2
- A3

Polylines (NNC Code)

- F2.1
- 2.4
- 2.5

Client: Department for Social Development		
Project: Phase 1 Habitat Survey and Biodiversity Strategy Plan		
Title: Summary of DSD Management Specifications one A Stranmillis Weir to Governor's Bridge		
Designed / Drawn: D	Checked: DB	Authorised: POD
Date: Oct 2013	Date: Oct 2013	Date: Oct 2013
Drawing No: APPENDI A.1		Rev: 0

ATKINS
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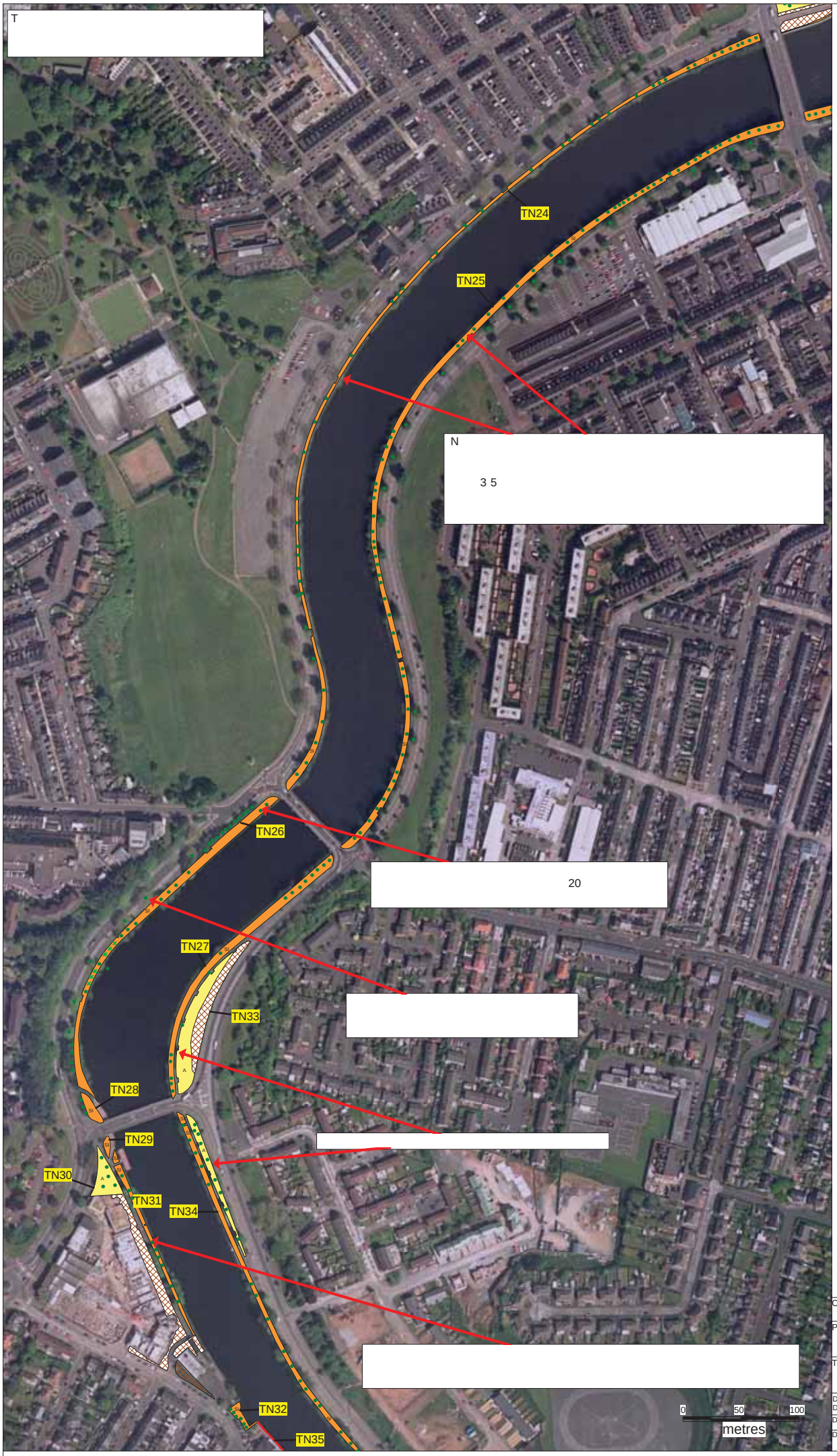

Habitats Legend

Polygons (NNC Code)

- A1.1.1
- A1.2
- A1.3.2
- SI B2.2
- C3.1
- C3.2
- F2.1
- B G2.6
- A 1.2
- 1.4
- 2.1.2
- 4

Point Features (NCC Code)

- A2.2
- A3

Polylines (NNC Code)

- F2.1
- 2.4
- 2.5

Client: Department for Social Development

Project: Phase 1 Habitat Survey and Biodiversity Strategy Plan

Title: Summary of DSD Management Specifications one B Governor's Bridge to Ormeau Bridge

Designed / Drawn	Checked:	Authorised:
D	DB	POD
Date: Oct 2013	Date: Oct 2013	Date: Oct 2013

Drawing No: APPENDI A.2 Rev: 0

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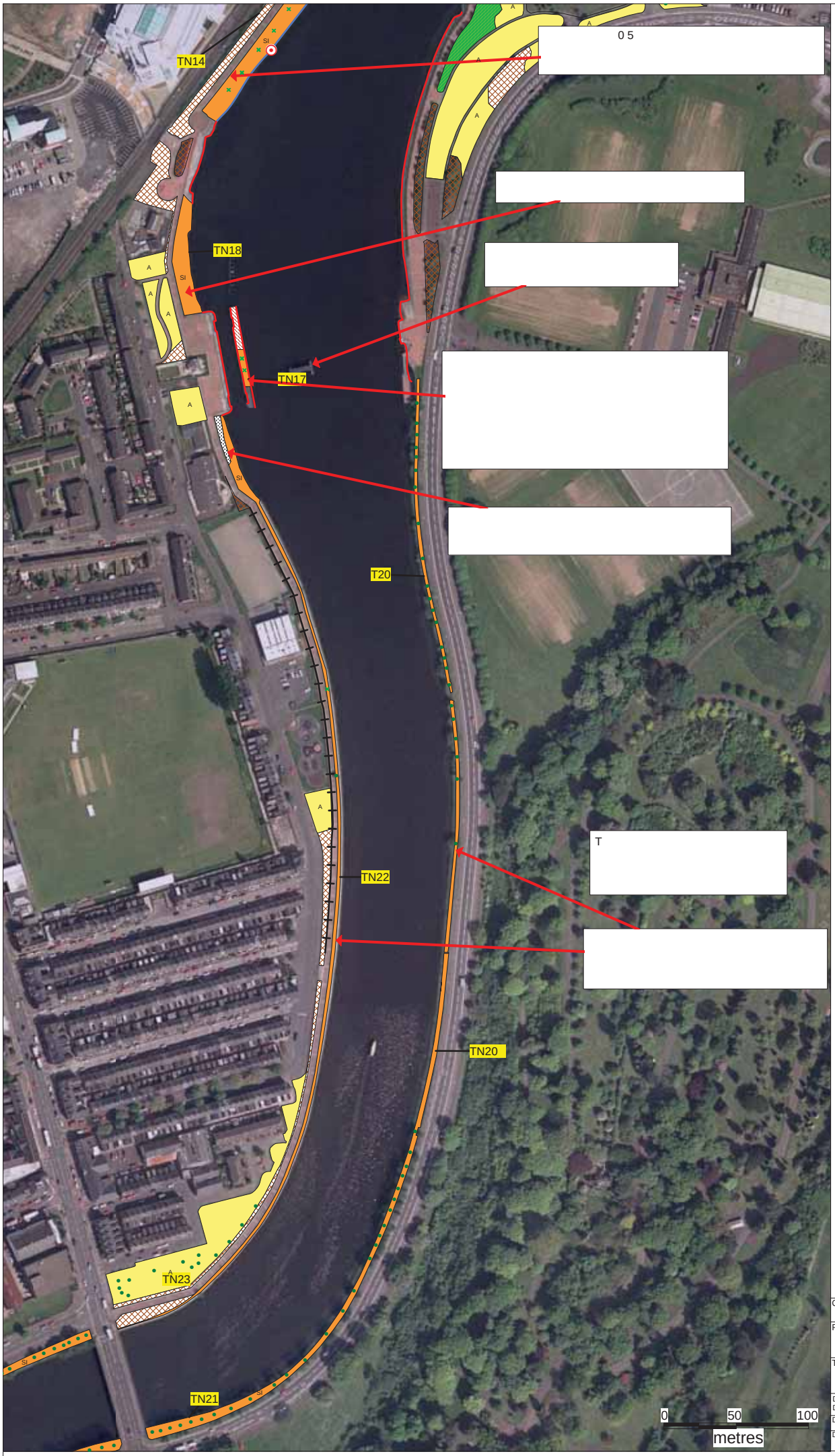

N

Habitats Legend

Polygons (NNC Code)

- A1.1.1
- A1.2
- A1.3.2
- SI B2.2
- C3.1
- C3.2
- F2.1
- B G2.6
- A 1.2
- 1.4
- 2.1.2
- 4

Point Features (NCC Code)

- A2.2
- A3

Polylines (NNC Code)

- F2.1
- 2.4
- 2.5

Client: Department for Social Development		
Project: Phase 1 Habitat Survey and Biodiversity Strategy Plan		
Title: Summary of DSD Managemetn Specifications one C Ormeau bridge to Albert Bridge (See also Drawing No: APPENDI A.4)		
Designed / Drawn: D	Checked: DB	Authorised: POD
Date: Oct 2013	Date: Oct 2013	Date: Oct 2013
Drawing No: APPENDI A.3		Rev: 0

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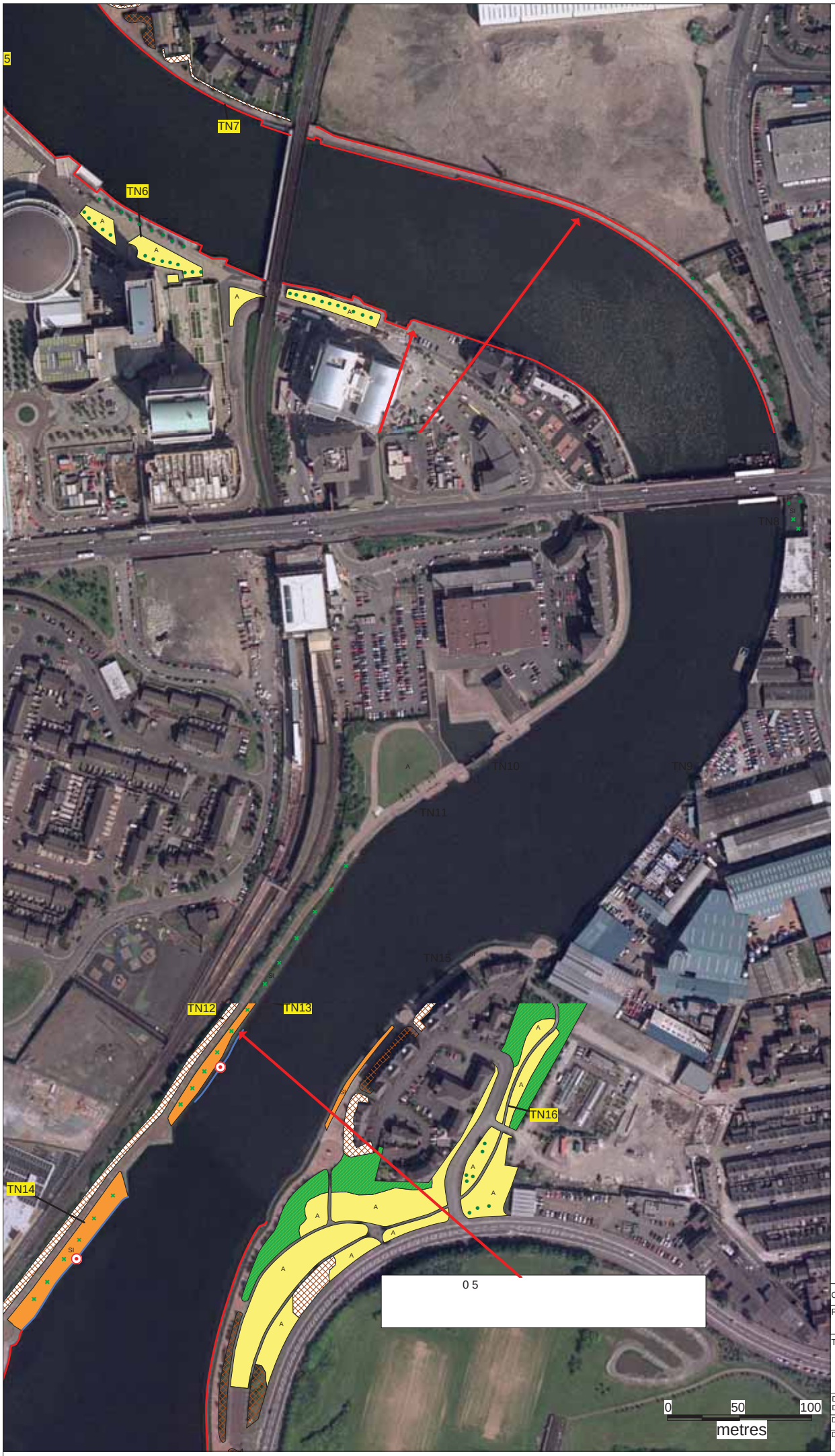

Habitats Legend

Polygons (NNC Code)

- A1.1.1
- A1.2
- A1.3.2
- SI B2.2
- C3.1
- C3.2
- F2.1
- B G2.6
- A 1.2
- 1.4
- 2.1.2
- 4

Point Features (NCC Code)

- A2.2
- A3

Polylines (NNC Code)

- F2.1
- 2.4
- 2.5

Client: Department for Social Development

Project: Phase 1 Habitat Survey and Biodiversity Strategy Plan

Title: Summary of DSD Management Specifications
one C Ormeau Bridge to Albert Bridge
(See also Drawing No: APPENDI A.3)
part of one D Albert Bridge to Lagan Weir
(See Also Drawing No. APPENDI A.5)

Designed / Drawn: D	Checked: DB	Authorised: POD
Date: Oct 2013	Date: Oct 2013	Date: Oct 2013
Drawing No: APPENDI A.4		Rev: 0

ATKINS
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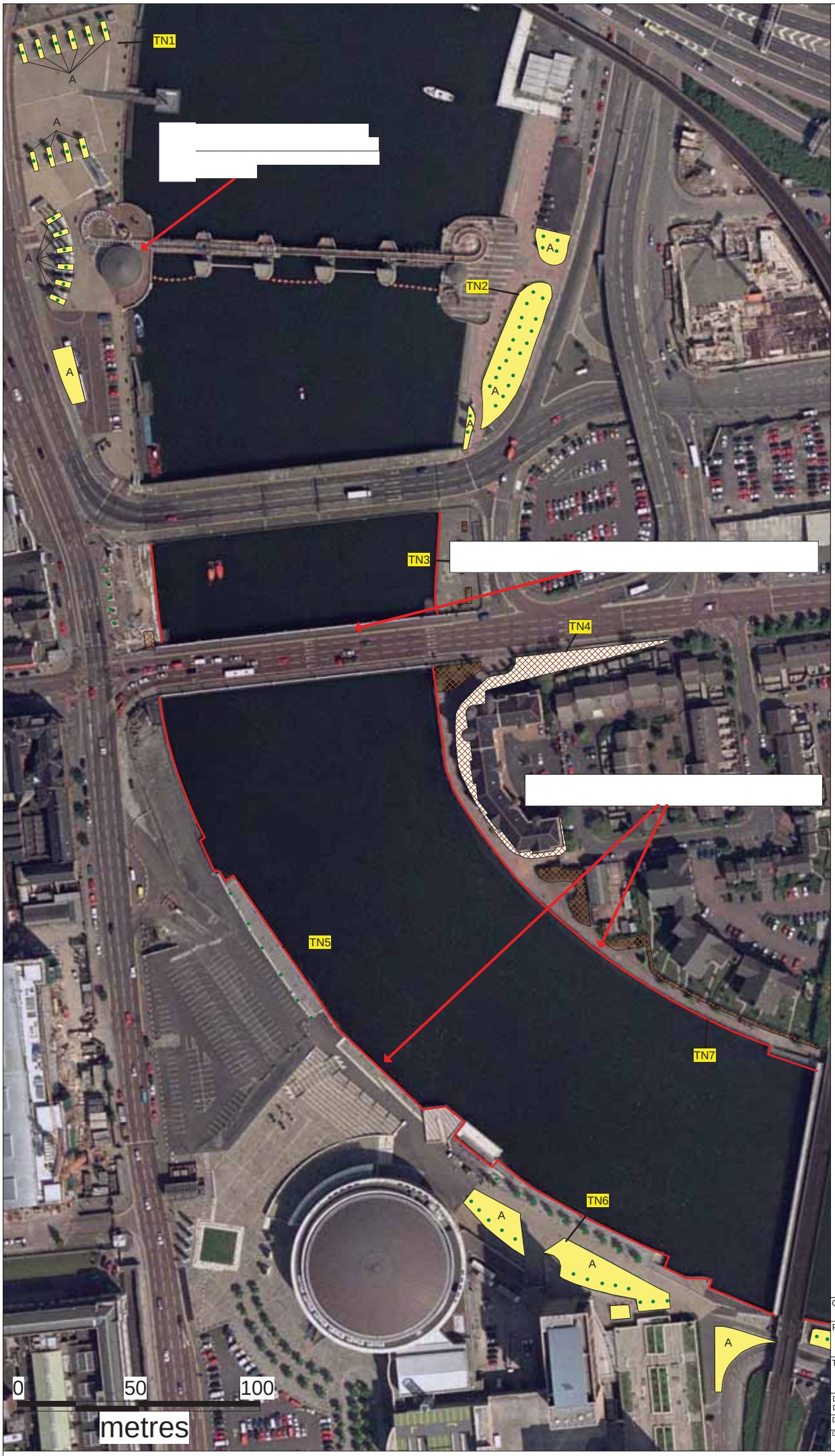
Cork - Tel: 353 - 21 - 429 0300
Galway - Tel: 353 - 91 786050



N

Habitats Legend

Polygons (NNC Code)

- A1.1.1
- A1.2
- A1.3.2
- SI B2.2
- C3.1
- C3.2
- F2.1
- B G2.6
- A 1.2
- 1.4
- 2.1.2
- 4

Point Features (NCC Code)

- A2.2
- A3

Polylines (NNC Code)

- F2.1
- 2.4
- 2.5

Client: Department for Social Development

Project: Phase 1 Habitat Survey and Biodiversity Strategy Plan

Title: Summary of DSD Management Specifications Part of one D Albert Bridge to Lagan Weir (See also Drawing No. APPENDI A.4)

Designed / Drawn	Checked:	Authorised:
D	DB	POD
Date: Oct 2013	Date: Oct 2013	Date: Oct 2013

Drawing No: APPENDI A.5 Rev: 0

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Appendix B – Information from Consultations

Consultee	Information/response
DOENI (NIEA) – Michael Meharg	Recommends Contact CEDaR for species records and send new records recorded during the Phase 1 habitat survey to CEDaR. Recommended contacting Water Management Unit at NIEA Lisburn which undertakes regular biological and chemical monitoring of the area.
DOENI (NIEA) – Peter Cush	Will provide information on birds, biodiversity management issues, community engagement and other issues via workshop consultation. Particularly interested in the grassland at the back of the 'Klondyke' which is considered to be a valuable ecological site in a highly urbanised setting. May have information available on species composition and invertebrates at this grassland. Photographs and description of management works undertaken at the 'Klondyke' grassland in September 2013.
DOENI (Marine Monitoring and Assessment Team) – Hugh Edwards	Has not carried out survey work along the impounded section of the River Lagan. However, has knowledge that there is an intertidal area on the north bank, between Central Station and the Gasworks, which at low tide is used by wading birds for feeding. This section has a more natural river bank and intertidal area that is used by wildlife.
DOENI – John Early	Aware of three small areas of Japanese knotweed near the Shaftesbury community centre, one of which was recently controlled - . There other came up after works to a drain. Indicated that giant hogweed may be present near Stranmillis, and has noted this species growing at Annadale embankment opposite Cutters Warf. Not aware of Himalayan balsam on the river bank in the impounded stretch of the River Lagan, but it occurs upstream and along the fenceline of the Ormeau Park along Ormeau Embankment road, so potential for it to occur.
DOENI (NIEA) – Ian Enlander,	Mr Enlander has overall responsibility for NIEA (Natural Heritage) ornithological programme. NIEA hold not survey information for the impoundment, but Mr Enlander has made some personal observations of birds and other features. a) Area is probably of most significance for breeding Black Guillemot. Breeding sites are mainly associated with bridge structures but also perhaps gaps in riverside walls could also be used. The largest breeding colonies for this species in Northern Ireland are associated with man-made structures so it is important that maintenance programmes recognise their presence and no not needlessly block up actual or potential nest holes. It is relatively easy to provide additional nest boxes for Black Guillemot either provided as 'bolt-ons' to existing riverside structures or incorporated into new building developments. b) The area is also 'prospected' by Common Tern. Breeding may have taken place in the impoundment area, on tern friendly rafts around the Lagan Lookout. There appears to be a lot of activity in 2013 suggesting breeding further downstream around Donegall Quay. Site prospecting has also occurred at McConnell Locks near River Terrace. It is clear that certainly Common Tern use the river for foraging (possibly birds from any breeding activity on the river + birds from RSPB reserve in Belfast Harbour) – consistent provision of nesting rafts and/or management of existing structures to facilitate nesting would be a significant development for the Lagan area. All Tern species are Annex I species on the Birds Directive so anything that meets their needs is a biodiversity gain. c) The requirements of common bird should be factored into management and planning of the impoundment area seeking to maximise provision of breeding and foraging habitat e.g. retention/planting of scrub, retention/inclusion of nest boxes/nest holes in structures, appropriate management of semi-natural grasslands for insect and seed eating species and management of alien invasive species. Wider issues are retention/provision of appropriate semi-natural or amenity habitat providing foraging and shelter opportunities for wintering birds. d) The tidal sections of the river hold small numbers of wintering waders which feed on the inter-tidal muds – management needs linked to water quality issues.

Consultee	Information/response
RSPB – Lynne Peoples	a) There may be potential for nesting moorhens, coots and mallards; feeding herons, swallows and swifts; jays and kingfishers* (European level protected species i.e. Annex 1*) as all are present upstream. b) Reedbed vegetation and inundations along the river banks will provide preferred habitat for birds as they can both roost and adults leave their young in safety and shelter. c) RSPB Belfast Swift City Event was launched in June 2013; there could be potential to connect with the ethos of this project as it is a long term conservation project across Belfast to make it one of the UK's most swift-friendly cities. d) Non-natives – Himalayan balsam and giant hogweed both occur upstream. e) Key species of conservation concern could be the focus of subsequent management decisions/plans and determining these species as the features of your biodiversity project could thus indicate likely partners and necessary resources etc. f) Recommended contacting Northern Ireland Bat Group. g) Potential for community involvement to be explored.
Lagan Canal Trust – Brenda Turnbull, Chief Officer	As part of the proposal to reopen the 27 mile Lagan Navigation from Belfast Harbour to Lough Neagh, the Lagan Canal Trust commissioned a Scoping Study resulting in the commission of an SEA Environmental Report completed in January 2013. The proposal to reopen the canal affects the Stranmillis Weir and involves the introduction of a sea lock at the Lagan Weir.
AFBNI – Robert Rosell	The AFBNI has annual data on the numbers of salmon coming into the River Lagan at Stranmillis Weir. Eels, salmon and a few sea trout use it as a migration route in and out of freshwater. However, given the nature of the impoundment – hard engineered banks, dredged substrate, variable salinity and stratification ranging from fast freshwater floods to a freshwater layer over saline wedge, more or less no in-stream structure and variable and sometimes low oxygen, it is anticipated that the impoundment will hold only a transient/migratory fish population. Recommend contacting NIEA for data on estuarine fish from WFD surveys.
CEDaR	Information received on species of note within 5km of the Impounded River Lagan – included throughout the main report.
BTO	Records of heronries along the Stranmillis area. Within the grid square IJ3371 records of commonly occurring birds including wren, coal, blue and great tit, chiffchaff, bullfinch, hooded crow, greenfinch, feral pigeon, carrion crow, rook, jackdaw, magpie, blackcap, blackbird, woodpigeon, collared dove, goldcrest and chaffinch. Four greylag geese were recorded in 2012, very small numbers of black-headed gull (3 individuals in total), small numbers of herring gull (up to 15 individuals) and one jay have also been recorded since 2005. House martin and swift have also been recorded, as has sparrowhawk.
Belfast City Council	Sabine Kalke (Property and Projects Section) attended the Workshop on 20th August 2013 and provided background information to Lagan corridor and other potential projects in the locality.

Appendix C - Scientific Names of Species

Species identified during the habitat survey (unless otherwise noted) and named in this report are listed in the table below.

Table C.1 – Common and scientific names of species identified during the Impounded River Lagan survey

Common Name	Species Name
Vascular Plants	
Alder	*Alnus glutinosa*
Angelica	*Angelica sylvestris*
Annual meadow grass	*Poa annua*
Annual sea-blite	*Suaeda maritima*
Ash	*Fraxinus excelsior*
Aspen	*Populus tremula*
Autumn hawkbit	*Leontodon autumnalis*
Barberry species	*Berberis* spp.
Beech	*Fagus syvatica*
Blackthorn	*Prunus spinosa*
Bird's-foot trefoil	*Lotus corniculatus*
Biting stonecrop	*Sedum acre*
Box species	*Boxus* spp.
Bramble	*Rubus fruticosus agg.*
Bridewort species	*Spiraea* sp.
Broad-leaved dock	*Rumex obtusifolius*
Brooklime	*Veronica beccabunga*
Broom	*Cystisus scoparius*
Burdock	*Arctium minus sens. lat.*
Bush vetch	*Vicia sepium*
Butterbur	*Petasites hybridus*
Butterfly bush	*Buddleja* sp.
Carnation sedge	*Carex panicea*
Cat's-ear	*Hypocaheris radicata*
Charlock	*Sinapsis arvensis*
Cherry laurel	*Prunus laurocerasus*
Cherry species	*Prunus* spp
Cock's foot	*Dactylis glomerata*

Common Name	Species Name
Common cleavers	*Galium aparine*
Common couch	*Elytrigia repens*
Common hogweed	*Heracleum sphondylium*
Common knapweed	*Centaurea nigra*
Common mouse-ear	*Cerastium fontanum*
Common nettle	*Urtica dioica*
Common reed	*Phragmites australis*
Common scurvy-grass	*Cochlerla officinalis*
Common sorrel	*Rumex acetosa*
Common vetch	*Vicia sativa*
Colt's-foot	*Tussilago farfara*
Cornflower	*Centaurea cyanus*
Corncockle	*Agrostemma githago*
Corn poppy	*Papaver rhoeas*
Cotoneaster species	*Cotoneaster* spp.
Cow parsley	*Anthriscus sylvestris*
Crab apple	*Malus sylvestris*
Crack willow	*Salix fragilis*
Creeping bent	*Agrostis stolonifera*
Creeping buttercup	*Ranunculus repens*
Creeping cinquefoil	*Potentilla reptans*
Creeping thistle	*Cirsium arvense*
Crested dog's-tail	*Cynosurus cristatus*
Crested dog's tail	*Cynosurus cristatus*
Curled dock	*Rumex crispus*
Daisy	*Bellis perennis*
Daisy bush	*Olearia heastil*
Dandelion	*Taraxacum officinale agg.*
Dissected crane's-bill	*Geranium dissectum*
Dog rose	*Rosa canina*

Common Name	Species Name
Dogwood species	*Cornus* sp.
Downy birch	*Betula pubescens*
Eared willow	*Salix aurita*
Elder	*Sambucus nigra*
Enchanter's nightshade	*Circaea lutetiana*
English elm	*Ulmus procera*
Escallonia species	*Escallonia* sp.
Euonymus species	*Euonymus* sp.
False brome	*Brachypodium sylvaticum*
False oat-grass	*Arrhenatherum elatius*
Field horsetail	*Equisetum arvense*
Field maple	*Acer campestre*
Firethorn species	*Pyrancantha* spp.
Floating sweet-grass	*Glyceria fluitans*
Floating sweet-grass species	*Glyceria* sp.
Fool's-watercress	*Apium nodiflorum*
Fushia species	*Fushia* spp.
Germander speedwell	*Veronica chamaedrys*
Giant hogweed	*Heracleum mantegazzianum*
Goat willow	*Salix caprea*
Great willowherb	*Epilobium hirsutum*
Greater plantain	*Plantago major*
Grey alder	*Alnus incana*
Grey willow	*Salix cinerea*
Ground elder	*Aegopodium podagraria*
Ground ivy	*Glechoma hederacea*
Griselinia species	*Griselinia sp.*
Groundsel	*Senecio vulgaris*
Guelder rose	*Viburnum opulus*
Hairy tare	*Vicia hirsuta*
Hard rush	*Juncus inflexus*
Hawthorn	*Crataegus monogyna*
Hazel	*Corylus avellana*
Hebe species	*Hebe* sp.
Hedge bindweed	*Calystegia sepium*
Hedge woundwort	*Stachys sylvatica*
Hemlock water-dropwort	*Oenanthe crocata*

Common Name	Species Name
Herb Robert	*Geranium robertianum*
Himalayan balsam	*Impatiens glandulifera*
Hogweed	*Heracleum sphondylium*
Holly	*Ilex aquifolium*
Hop trefoil	*Trifolium dubium*
Horse chestnut	*Aesculus hippocastanum*
Horse chestnut (ornamental)	*Aesculus hippocastanumvar. baumannii*
Hybrid black poplar	*Populus deltoides x P. nigra*
Italian alder	*Alnus cordata*
Ivy	*Hedera helix*
Japanese knotweed	*Fallopia japonica*
Japanese rose	*Rosa rugosa*
Kidney vetch	*Anthyllis vulneraria*
Lady's bedstraw	*Galium verum*
Lesser spearwort	*Ranunculus flammula*
Lesser stitchwort	*Stellaria graminea*
Lesser trefoil	*Trifolium dubium*
Leyandii	*Cupressocyparis leylandii 'Castlewellan'*
Lime	*Tilia cordata x T. platyphyllos*
London plane	*Platanus x acerifolia*
Lord's and ladies	*Arum maculatum*
Mahonia species	*Mahonia* sp.
Maiden hair speleenwort	*Asplenium trichomanes*
Maple species	*Acer* sp.
Manna ash	*Fraxinus omus*
Marsh horsetail	*Equisetum fluviatiale*
Meadow buttercup	*Ranunculus acris*
Meadow crane's-bill	*Geranium pratense*
Meadow foxtail	*Alopecurus pratensis*
Meadow grass	*Poa* spp.
Meadowsweet	*Filipendula ulmaria*
Meadow vetchling	*Lathyrus pratensis*
Moss	*Calliergonella cuspidata*
Moss	*Rhytiadelphus squarrosus*
New Zealand flax	*Phormium tenex*
Nipplewort	*Lapsana communis*

Common Name	Species Name
Oilseed rape	*Brassica napus*
Oleasater species	*Elaeagnus sp.*
Osier willow	*Salix viminalis*
Oxeye daisy	*Leucanthemum vulgare*
Oxford ragwort	*Senecio squalidus*
Pedunculate oak	*Quercus robur*
Perennial rye grass	*Lolium perenne*
Pheasant bush	*Leycesteria formosa*
Pineappleweed	*Matricaria discoidea*
Poplar species	*Populus* spp.
Prickly sow- thistle	*Sonchus asper*
Purple willow	*Salix purpurea*
Red fescue	*Festuca rubra*
Reed canary grass	*Phalaris arundinaceae*
Remote sedge	*Carx remota*
Ribwort plantain	*Plantago lanceolata*
Rose species	*Rosa* sp.
Rosebay willowherb	*Chamerion angustifolium*
Rough meadow-grass	*Poa trivalis*
Rowan	*Sorbus aucuparia*
Salad burnet	*Sanguisorba minor*
Sea aster	*Aster tripolium*
Sea mayweed	*Tripleurospermum maritimum*
Sea plantain	*Plantago maritima*
Selfheal	*Prunella vulgaris*
Short-fruited willowherb	*Epilobium obscurum*
Silver birch	*Betula pendula*
Silverweed	*Potentilla anserina*
Soft rush	*Juncus effusus*
Soft shield fern	*Polystichum setiferum*
Small-leaved lime	*Tilia cordata*
Smooth meadow-grass	*Poa pratensis*
Smooth sow-thistle	*Sonchus oleraceus*
Sneezewort	*Achillea ptarmica*
Southern lady's mantle	*Alchemilla mollis*
Spear thistle	*Cirsium vulgare*
Sweet vernal grass	*Anthoxanthum ordoratum*

Common Name	Species Name
Sycamore	*Acer pseudoplatanus*
Teasel	*Dipsacus fullonum*
Timothy	*Phleum pratense*
Tutsan	*Hypericum androsaemum*
Upright hedge parsley	*Torilis japonica*
Viburnum species	*Viburnum* sp.
Water forget-me-not	*Myosotis scorpioides*
Water mint	*Mentha aquatica*
Wavy bittercress	*Cardamine flexuosa*
Weld	*Reseda luteola*
Welsh poppy	*Meconopsis cambrica*
Whitebeam	*Sorbus aria agg.*
White clover	*Trifolium repens*
White poplar	*Populus alba*
White willow	*Salix alba*
Wild cherry	*Prunus avium*
Wild privet	*Ligustrum vulgare*
Willow species	*Salix* sp.
Winter heliotrope	*Petasites fragrans*
Wood avens	*Geum urbanum*
Wood speedwell	*Veronica montana*
Wych elm	*Ulmus glabra*
Yarrow	*Achillea millefolium*
Yellow iris	*Iris pseudacorus*
Yellowrattle	*Rhinanthus minor*
Yorkshire fog	*Holcus lanatus*
Fauna	
Blackcap	*Slyvia atricapilla*
Black guillemot	*Cepphus grylle*
Blue tit	*Cyanistes caeruleus*
Brown rat	*Rattus norvegicus*
Buff-tailed bumblebee	*Bombus terrestris*
Chaffinch	*Fringilla coelebs*
Coal tit	*Parus ater*
Common carder bee	*Bombus pascuorum*
Common darter	*Sympetrum striolatum*
Common tern	*Sterna hirundo*

Common Name	Species Name
Coot	*Fulica atra*
Cormorant	*Phalacrocorax carbo*
Dunnock	*Prunella modularis*
Goldfinch	*Carduelis carduelis*
Greenfinch	*Carduelis chloris*
Grey heron	*Ardea cinerea*
Grey squirrel	*Sciurus carolinensis*
Hooded crow	*Corvus corone cornix*
House martin	*Delichon urbicum*
Lesser black-backed gull	*Larus fuscus*
Magpie	*Pica pica*
Mallard	*Anas platyrhynchos*
Moorhen	*Gallinula chloropus*
Pied wagtail	*Motacilla alba*
Red admiral	*Vanessa atalanta*
Robin	*Erithacus rubecula*
Rook	*Corvus frugilegus*
Small tortoiseshell	*Aglais urticae*
Song thrush	*Turdus philomelos*
Sparrowhawk	*Accipiter nisus*
Swallow	*Hirundo rustica*
Swift	*Apus apus*
Starling	*Sturnus vulgaris*
White-tailed bumblebee	*Bombus lucorum*
Wood pigeon	*Columba palumbus*

Table C.2 – Common and scientific name of other species mentioned in this report

Common Name	Species Name
Atlantic salmon	*Salmo salmo*
Badger	*Meles meles*
Bittern	*Botaurus stellaris*
Blackbirds	*Turdus merula*
Black-tailed godwit	*Limosa limosa*
Bluebell	*Hyacinthoides non-scripta*
Blue tit	*Cyanistes caeruleus*
Bream	*Abramis brama*
Canadian pondweed	*Elodea canadensis*
Coal tit	*Periparus ater*
Common dog violet	*Viola riviniana*
Common frog	*Rana temporaria*
Curlew	*Numenius arquata*
Daffodil	*Narcissus* sp.
Daubeton's bat	*Myotis daubentonii*
Dunlin	*Calidris alpina*
Eel	*Anguilla anguilla*
Eider	*Somateria mollissima*
English chrysalis snail	*Lauria cylindracea*
Floating pennywort	*Hydrocotyle ranunculoides*
Flounder	*Platicthys flesus*
Goldeneye	*Bucephala clangula*
Great crested grebe	*Podiceps cristatus*
Great tit	*Parus major*
Greater stitchwort	*Stellaria holostea*
Greenfinch	*Carduelis chloris*
Grey squirrel	*Sciurus carolinensis*
Gudgeon	*Gobio gobio*
House sparrow	*Passer domesticus*
Jay	*Garrulus glandarius*
Kingfisher	*Alcedo atthis*
Large bitter-cress	*Cardamine amara*
Large white	*Pieris brassicae*
Leisler's bat	*Nyctalus leisleri*
Mistle thrush	*Turdus viscivorus*
Meadow brown	*Maniola jurtina*
Natterer's bat	*Myotis nattererii*
Nuttall's pondweed	*Elodea nuttallii*
Otter	*Lutra lutra*
Oystercatcher	*Haematopus ostralegus*
Painted lady	*Vanessa cardui*
Peacock	*Inachis io*
Perch	*Perca fluviatilis*
Peregrine	*Falco peregrinus*
Pike	*Esox Lucius*
Pipistrelle	*Pipistrellus sp*
Primrose	*Primula vulgaris*
Purple sandpiper	*Calidris maritimia*
Razorbill	*Alca torda*
Red-breasted merganser	*Mergus serrator*
Redshank	*Tringa totanus*
Red squirrel	*Sciurus vulgaris*
Reed bunting	*Emberiza schoeniclus*
Rhododendron	*Rhododendron ponticum*
Ringlet	*Aphantopus hyperantus*
Roach	*Rutilus rutilus*
Scaup	*Aythya marila*
Shelduck	*Tadorna tadorna*
Small tortoiseshell	*Aglais urticae*
Smooth newt	*Lissotriton vulgaris*
Speckled wood	*Parargae aegeria*
Starling	*Sturnus vulgaris*
Thick-lipped mullet	*Chelon labrosus*
Three-nerved sandwort	*Moehringia trinervia*
Three-spined stickleback	*Gasterosteus aculeatus*
Tree sparrow	*Passer montanus*
Trout (brown and sea)	*Salmo trutta*
Turnstone	*Arenaria interpres*
Wren	*Troglodytes troglodytes*
Yellow bellied slider	*Trachenys scripta scripta*

Appendix D – Habitat Classification According to the JNCC Handbook for Phase I Habitat Survey

The table below outlines the classification of terrestrial and freshwater habitats according to the JNCC Handbook for Phase I habitat survey (JNCC, 2010).

Table D.1 – JNCC habitat classification system (JNCC, 2010).

Habitat Category	Alphanumeric Code	Lettered Code
A WOODLAND AND SCRUB		
1 Woodland		
-Broadleaved – semi-natural	A1.1.1	BW
-Broadleaved - plantation	A1.1.2	PBW
-Coniferous – semi-natural	A1.2.1	CW
-Coniferous – plantation	A1.2.2	PCW
-Mixed – semi-natural	A1.3.1	MW
-Mixed - plantation	A1.3.2	PMW
2 Scrub		
-Dense/ continuous	A2.1	DS
-Scattered	A2.2	SS
3 Parkland/ scattered trees		
-Broadleaved	A3.1	SBW
-Coniferous	A3.2	SCW
-Mixed	A3.3	SMW
4 Recently-felled woodland		
-Broad-leaved	A4.1	FB
-Coniferous	A4.2	FC
-Mixed	A4.3	FM
B GRASSLAND AND MARSH		
1 Acid grassland		
- Unimproved	B1.1	AG
- Semi-improved	B1.2	SAG
2 Neutral grassland		
- Unimproved	B2.1	NG
- Semi-improved	B2.2	SNG
3 Calcareous grassland		
- Unimproved	B3.1	CG
- Semi-improved	B3.2	SCG
4 Improved grassland	B4	I
5 Marsh / marshy grassland	B5	MG

6 Poor semi-improved	B6	SI
C TALL HERB AND FERN		
1 Bracken		
-Continuous	C1.1	CB
-Scattered	C1.2	SB
2 Upland species-rich ledges	C2	Target note
3 Other		
-Tall ruderal	C3.1	TR
-Non-ruderal	C3.2	NR
D HEATHLAND		
1 Dry dwarf shrub heath		
-Acid	D1.1	ADH
-Basic	D1.2	BDH
2 Wet dwarf shrub heath	D2	WH
3 Lichen/ bryophyte heath	D3	LH
4 Montane heath/ dwarf herb	D4	MH
5 Dry heath / acid grassland mosaic	D5	DGM
6 Wet heath / acid grassland mosaic	D6	WGM
E MIRE		
1 Bog		
-Blanket bog	E1.6.1	BB
-Raised bog	E1.6.2	RB
-Wet modified	E1.7	WB
-Dry modified	E1.8	DB
2 Flush / Spring		
-Acid-neutral	E2.1	AF
-Basic	E2.2	BF
-Bryophyte	E2.3	Target note
3 Fen		
-Valley mire	E3.1	VM
-Basin mire	E3.2	BM
-Flood-plain	E3.3	FPM
4 Bare peat	E4	P
F SWAMP, MARGINAL AND INUNDATION		
1 Swamp	F1	SP
2 Marginal / Inundation		
-Marginal	F2.1	MV
-Inundation	F2.2	IV
G OPEN WATER		
1 Standing water		

-Eutrophic	G1.1	SWE
-Mesotrophic	G1.2	SWM
-Oligotrophic	G1.3	SWO
-Dystrophic	G1.4	SWD
-Marl	G1.5	SWC
-Brackish	G1.6	SWB
2 Running water		
-Eutrophic	G2.1	RWE
-Mesotrophic	G2.2	RWM
-Oligotrophic	G2.3	RWO
-Dystrophic	G2.4	RWD
-Marl	G2.5	RWC
-Brackish	G2.6	RWB
H COASTLAND		
1 Intertidal		
-Mud/sand	H1.1	O.S symbol
-Shingle/ cobbles	H1.2	O.S symbol
-Boulders/ rocks	H1.3	O.S symbol
-Zostera beds	H1. (1-2).1	Zo
-Green algal beds	H1.(1-3).2	Ga
-Brown algal beds	H1.(1-3).3	Ba
2 Saltmarsh		
-Saltmarsh/ dune interface	H2.3	Target note
-Scattered plants	H2.4	SSM
-Dense/ continuous	H2.6	DSM
3 Shingle above high tide mark	H3	O.S symbol
4 Boulders / rocks above high tide mark	H4	O.S symbol
5 Strandline vegetation	H5	Target notes
6 Sand-dune		
-Dune slack	H6.4	DW
-Dune grassland	H6.5	DG
-Dune heath	H6.6	DH
-Dune scrub	H6.7	DX
-Open dune	H6.8	OD
8 Maritime cliff and scope		
-Hard cliff	H8.1	HC
-Soft cliff	H8.2	SC
-Crevice/ ledge vegetation	H8.3	Target note
-Coastal grassland	H8.4	SG + target note
-Coastal heathland	H8.5	SH + target note
I ROCK EXPOSURE AND WASTE		

1 Natural		
-Inland cliff – acid neutral	I1.1.1	AC
-Inland cliff - basic	I1.1.2	BC
-Scree – acid/ neutral	I1.2.1	AS
-Scree - basic	I1.2.2	BS
-Limestone pavement	I1.3	LP
-Other exposure – acid/ neutral	I1.4.1	AR
-Other exposure - basic	I1.4.2	BR
-Cave	I1.5	CA
2 Artificial		
- Quarry	I2.1	Q
-Spoil	I2.2	S
-Mine	I2.3	MI
-Refuse-tip	I2.4	R
J MISCELLANEOUS		
1 Cultivated/ disturbed land		
- Arable	J1.1	A
-Amenity grassland	J1.2	AM
-Ephemeral/ short perennial	J1.3	ESP
- Introduced shrub	J1.4	IS
2 Boundaries		
-Hedges – intact – species rich	J2.1.1	RH
-Hedges – intact – species poor	J2.1.2	PH
-Hedges – defunct – species rich	J2.2.1	RH-
-Hedges – defunct – species poor	J2.2.2	PH-
-Hedges – with trees – species rich	J2.3.1	RHT
-Hedges – with trees – species poor	J2.3.2	PHT
-Fence	J2.4	F
-Wall	J2.5	W
-Dry ditch	J2.6	DD
-Boundary removed	J2.7	X
-Earth bank	J2.8	EB
3 Built-up areas		
- Caravan site	J3.4	CS
- Sea wall	J3.5	SWALL
- Buildings	J3.6	Shade black
4 Bare ground	J4	BG
5 Other habitat	J5	Target note

Appendix E – Field Survey Datasheets

Impounded River Lagan Field Data Sheet

				Surveyor:				**Date:**	
Map Number:				**Survey Conditions:**					
Hab No	**Data Quality**	**JNCC Code**	**Evaluation**	**Annex I Code / Priority habitat**	**Notable species (0 or 1)**	**Threats**	**Photo_ID**	**Invas Exotic (0 or 1)**	**GPS Point (IG)**

Data Quality: V = simple validation in field (+/- remotely) **S** = survey- walkover
Annex I Code: code as per interpretation manual; **Priority Habitat**: NI Priority Habitat
Notable Spp?: Protected species at global, European or national level, NI priority species list. **0 =** No or **1 =** Yes and name under species column on underside
Evaluation: I = International **N** = National **R** = Regional **HL** = High Local **ML** = Moderate Local **LL** = Low Local **N** = Negligible
Threats: codes as per Natura 2000 codes

Appendix F – Target Notes and Summary of Enhancement Options

The table below provides more detailed information on habitats and features of interest along the Impounded River Lagan (refer to Figures 4.2 to 4.6)

Table F.1 – Target Notes and enhancement options to accompany the Phase 1 Habitat Survey

TN No.	Photo	Description	Managers and Potential for Enhancement
Zone A – Albert Bridge downstream to Lagan Weir			
TN1	 	Small geometric rectangles of amenity grassland strips with planted trees (poplar and horse chestnut (*Aesculus hippocastanum* var. *baumannii*)) on the western bank close to the Lagan Lookout. Otherwise the surrounding area is extensively paved. The river has steep walls along this section with little to no vegetation. Attractive and informative interpretative signage in place around Lagan Lookout.	Manager(s): Belfast City Council Limited enhancement potential as in public realm and will be primarily managed for aesthetics and landscape value

TN2		Short-mown amenity grassland with planted small-leaved lime trees to 6-8m in height. Steep walls and flights of steps lead to the river. Bulb planting has been undertaken in parts of this area as part of the Marie Curie 'Fields of Hope',	Manager(s): Belfast City Council. Limited as within the public realm. Installation of bird boxes not advised due to potential for interference.
TN3		Paved area with concrete planters now supporting ruderal vegetation and occasional euonymus. Located on an old wharf which may need repair in future. This area is likely to be redeveloped at some stage in the future. The location offers views along the Impoundment where seals and birds can be regularly seen.	Management: Belfast City Council Discussions to identify future uses of this site would be advantageous. Potential to enhance any future development by either new planting, installation of public telescopes for bird watching and interpretative signage.
TN4		Ornamental planting, including a mixture of non-native shrubs and small trees. Species include euonymus, hebe, ash, escallonia,	Management: Belfast City Council, private bodies Limited as in public realm and will be primarily managed for aesthetics and landscape value.

TN5		Extensive paved area, with occasional specimen horse chestnut trees. The quay walls here are stone faced and vertical, offering inhospitable habitat for plants.	Management: Belfast City Council Limited as in public realm and will be primarily managed for aesthetics and landscape value.
TN6		Extensive paved area. Formal planted areas of specimen willow and cypress trees underlain by closely mown amenity grassland. This type of planting is also present in a rectangular area upstream of the Railway Bridge.	Manager(s): Belfast City Council Limited as within public realm and will be primarily managed for aesthetics and landscape value.
TN7		A view along footpath/cycleway on the east bank, looking upstream from the Railway Bridge to Albert Bridge which runs along this section. There is very limited ecological interest along the riparian edge. The revetments are in good repair and either vertical or steeply sloping. A palisade fence lines the top of the revetment and a high brick wall forms the landward boundary of the walkway upstream of the Railway Bridge. Towards Albert Bridge, a row of specimen lime trees lines the landward side of the walkway. Extensive areas of	Manager(s): Revetments – DSD up to 1.5m above HWM Footpath & palisade fencing, ornamental planting – Belfast City Council Potential to place planters along railings to increase aesthetics and foraging

		ornamental planting are associated with Lagan View Apartments downstream of the Lagan Railway Bridge. Planting includes dense evergreen shrubs such as barberry, cotoneaster, New Zealand broadleaf, euonymus and Japanese rose. A row of manna ash has been planted in front of the apartments. Towards Gregg's Quay Apartments, raised beds have been planted with similar dense ornamentals, and flowering shrubs such as spiraea, astilbe and cherry laurel.	resource for insects.
Zone C – Ormeau Bridge downstream to Albert Bridge			
TN8		Neglected, rectangular area of grassland located on high flat section immediately south of Albert Bridge. The area could not be assessed for survey. The grassland is bordered by disused buildings to the east and south, Albert Bridge to the north and masonry wall to the west. The grassland appears to be semi-natural and rank in nature. Grasses appear to dominate, including Yorkshire fog, cock's-foot, false oat-grass and red fescue. Herbs noted include red clover, bush vetch, ribwort plantain, cat's-ear and creeping and meadow buttercup. Bramble scrub is frequent. At the north-east corner, an area of elder and silver birch is present.	Manager(s): unknown At present, the rank nature of the grassland and mosaic with scrub and trees provides habitat for small mammals, birds and invertebrates. Future development may remove these habitats, and compensatory habitat could be created through use of green roofs or sensitive planting.

TN 9		Long stretch of vertical quay wall which is bordered by active and disused commercial buildings and is topped by security fencing. The quay wall is with plants growing in crevices. Species included maiden hair spleenwort, common scurvy grass, sea mayweed, plantain and occasional buddleia bushes, with *Enteromorpha* sp. at the base. Holes in the wall towards Albert Bridge created nesting opportunities for black guillemot and the top of the wall is used by other nesting birds, e.g. seagulls.	Manager(s): Revetment – DSD up to 1.5m from HWM Railings - private The wall at present offers welcome habitat for plants and insects within an area which lacks semi-natural vegetation. Any repairs to the quay wall should aim to retain some plant growth. Future development could aspire to naturalise the river edge in this location. Any works to the wall would need to be aware of the potential for nesting birds.
TN9a		Collapsed section of old quay wall, which forms a mound along the river edge, and is topped with abundant bramble, charlock and grasses. Small holes visible in the rubble which could offer potential for small mammals and other wildlife.	Manager(s): private No management recommendations.

TN10		Small enclosed impoundment basin (Maysfield Inlet) adjacent to Maysfield Community Centre car park. It has vertical sides and steps, and supports no vegetation apart from a covering of *Enteromorpha* sp. at the base of the basin. It was originally built to facilitate water sports, and connected to the Impoundment via a span bridge. It appears that the basin has not been used for sporting activities and is idle at present.	Manager(s): Belfast City Council Future development or improvements in this area should consider the potential for biodiversity enhancement, including creation of wetland habitat, reprofiling and naturalisation of the banks and new and improved civic space. The URS (2013) SEA carried out for the Lagan Canal Trust identified potential for possible new moorings near Maysfield Leisure Centre.
TN11		Large area of amenity grassland adjacent to the south of Maysfield Community Centre carpark, circled by a footpath and with young tree planting and shrub planting at the northern and western peripheries. Species planted include non-native butterfly-bush, Japanese rose, firethorn, daisy bush, cotoneaster species and bridewort. Trees notes include downy birch, hawthorn and poplar. The trees and shrubs provide some habitat for wildlife.	Manager(s): Belfast City Council. Depending on future development aspirations, there is potential to improve this area through establishing wildflower areas, planting pockets of native trees and through interpretative signage. It could also be used as an outdoor classroom.
TN12		Tall and dense treeline which screens the adjacent railway line. Crack willow, grey willow, osier, white willow, ash, alder, sycamore and downy birch form the main portion of the treeline, being up to 10-12m in height, with a dense understorey of hawthorn, blackthorn, elder and ornamental roses.	Manager(s): Belfast City Council, Translink Tree thinning may be required in the medium term to reduce over-crowding and promote good tree growth.

TN 13 & TN 14	  	One of the most natural areas, albeit man-made, in the lower reaches of the Impoundment which comprises two linear areas of mosaic habitats which grade down to the river. At the top of the bank, a regularly mown grassland strip forms the boundary with the riverside walkway. Thereafter the bank slopes relatively gently to the river, and comprises species poor semi-improved neutral grassland, with occasional areas of tall ruderals, scattered scrub including common gorse, alder, crack willow, butterfly bush, and ornamental scrub (including Japanese rose and dogwood). Much of the tree/scrub cover was planted in spring1996 (Marenco, 2002). The grassland is dominated by grasses such as red fescue, false oat-grass, meadow foxtail, Yorkshire fog and common bent-grass. Herb species are generally present at low cover, including creeping buttercup, common cleavers, common nettles, occasional nipplewort, daisy, dandelion, bush vetch and colt's-foot. Tall ruderals noted include rosebay willowherb, common hogweed, spear thistle, colt's-foot, ragwort and common nettles, Scattered marsh woundwort and hemlock water-dropwort are also present. Some of the pioneer species of waste ground noted in the Marenco (2002) survey are much reduced in cover, indicating this habitat is starting to mature and develop. A very thin line of fringing common reed and reed canary-grass is present at the base of the grassland/shrubs, above the high tide mark. The	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to the footpath This area known as 'the wildlife banks' is already being managed sympathetically, albeit minimally, and the habitats present are in good condition. Leaving a narrow strip of unmown grass along the edge of the trees and shrubs would create a less formal edge along the footpath. The mosaic of habitats and natural gradation should be maintained. Areas of open grassland and trees/shrubs are valuable for birds, small mammals and invertebrates. No invasive species were recorded – Marenco (2002) survey noted one clump of giant hogweed along this section. Recommend monitoring for invasive species. The sloping revetment wall supports a nice assemblage of salt tolerant species. Should repointing or repairs be necessary in future, these should be undertaken sensitively and aim to retain some vegetation.

		reed canary-grass was introduced in September 1996 and July 1997 from a source upstream (Marenco, 2002) to facilitate a more naturalised riverbank. Where open muds and gravels are present along the tidal area, salt tolerant species such as common scruvygrass, sea plantain, sea mayweed, sea aster and annual sea-blite occur. Wading birds occasionally use this area for feeding when there is a low tide and muds are exposed. The sloping revetment wall to the north of TN13 supports a relatively diverse assemblage of herbaceous species in eroded cracks including red clover, hop trefoil, biting stonecrop, autumn hawkbit, charlock, creeping thistle, broad-leaved dock, ribwort plantain, short-fruited willowherb, ragwort, common cleavers and small alder and butterfly bush seedlings above the high water mark.	
TN15		View northwards with the frontage of Ravenhill Reach apartment blocks and ornamental planting to the right, riverside walkway in the centre and narrow strip of semi-improved neutral grassland along the revetment to the left separated from the walkway by a metal rail fence. Ornamental shrub species include box, privet, escallonia, cotoneaster, fuschia and cherry laurel. The grassland strip along the revetment supports similar grassland vegetation to that described in TN18. One southern lady's mantle plant was recorded, possibly a garden escape. The grass is cut every two years approximately with brush cutters to remove rubbish and cuttings removed with the tide.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings Mowing here is difficult due to the slope. Maintain the mowing regime if possible to retain grassland habitat. Cuttings can be left in place and removed with outgoing tide. Consideration could be given to replacing the grassland with low growing native shrubs, which could minimise management requirements and still maintain open vistas.

TN16		Extensive areas of closely mown amenity grassland with mixed planted woodland blocks to 10-12m in height at Ravenhill Reach apartments. A mixture of native and non-native tree and shrub species are planted in the woodland blocks, including ash, mountain ash, Scots pine, Italian alder, common alder, hazel, wild cherry, downy birch, sycamore & poplar. In the understory where light permits elder, field maple, Japanese rose and laurel had been planted as understorey. Ground flora is not well developed due to heavy shading from the tree and shrub canopy and ground elder and ivy are occasional. Cherry laurel also present in understory. Ravenhill Reach park is well used for recreation and dog walking. Marenco (2002) survey indicated that an attempt had been made to establish a wildflower meadow in this area but it was unsuccessful (cause not given).	Manager(s): private This area is well-used and management here is primarily aimed at maintain aesthetics and recreational area
TN17		The flat top surface of the rectangular section of McConnell Weir now supports rank grasses such as creeping bent and perennial rye-grass. Bush vetch, cat's-ear, mouse-ear chickweed, shepard's purse and dandelion are all occasional. Tall ruderal vegetation dominated by rosebay willow herb is common to south. A pair of mallard nest on the top. The 'Welly Boot' structure to the east, also part of the old weir, supports no vegetation but the railings at the top are used as roosts by seagulls and other birds.	Manager(s): DSD If habitats are to be maintained as at present, continue strimming every 2nd year at McConnell's Weir – avoiding nesting season for mallard. There is potential to enhance the area for black guillemot and common tern. Vegetation on the top of McConnell Weir could be stripped, the area lined with heavy duty plastic and covered with shingle to form a large tern island which would be generally free from predators. Tern decoys could be used to attract terns to McConnell Weir.

			Black guillemot nest tubes could be attached to the side of the structure to encourage this species to nest further upstream along the Impoundment. There is potential to install swift nest boxes on the 'Welly Boots' section in association with the RSPB 'Swift City' project.
TN18	 	A larger area of relatively flat grassland at the top of the embankment, which then slopes to meet the river, known locally as the 'Klondyke' grassland. The grassland shares many of the species recorded along TN19, but is less rank in character. Grasses comprise over 60% of cover and species noted include Yorkshire fog, crested dog's-tail, common bent-grass, sweet vernal-grass, false-oat grass. Herbs are diverse and constitute up to 40% of cover in places, including occasional to frequent hop trefoil, common mouse-ear, dandelion, ribwort plantain, creeping thistle, hairy tare, white and red clover, meadow and creeping buttercup, common cleavers and less frequent perforate St. John's-wort, short-fruited willowherb, tormentil, autumn hawkbit, meadow vetchling, common knapweed, kidney vetch, colt's-foot, cat's-ear, teasel, red bartsia and ragwort. A wildflower seed mix has been sown into the grassland and has grown well on the thin, sandy and slightly gravelly soil. Species which appear to have arisen from the wildflower mixture include abundant yellowrattle, a parasite which feeds on the root of grasses, cornflower, corncockle, Welsh poppy, ox-eye daisy and corn poppy. Small cover of Japanese rose is	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings The key management aspect of this grassland is to maintain an annual cut of the entire grassland area, and to remove arising cuttings to reduce soil fertility levels which will favour a diverse grassland community. Currently, only part of the grassland appears to be cut (via a tractor arm reaching over the railings), and grass cuttings are not being removed. Consensus on an approach to management of the grassland along here and at TN 19 will need to be the subject of discussions between responsible bodies. In the short term, a gate could be installed in the fencing to facilitate easier access of personnel and equipment for mowing and removal of

	With thanks to Peter Cush, NIEA (Biodiversity Unit) for the picture of cut grassland (below) on the 6th September 2013 	present in the grassland, butterfly bush and a poplar sapling. Cut annually to facilitate litter picks and for aesthetics.	cuttings. This would allow the majority of the grassland to be cut annually, (in late July/August, when plants have set seed). Cuttings should be removed as soon as possible after the grassland is mown. In the short-term, remove shrubs present in the grassland. Should it be required, a green hay crop could be sourced locally to introduce wildflowers to this grassland. Removal of the non-native wildflowers could be considered, e.g. corn poppy and Welsh poppy. On the other hand, the consensus may be that non-native wildflowers add colour and variety to the grassland and should be left i*n situ*. An invertebrate survey of the grassland could be undertaken, possibly in conjunction with local community groups. Interpretative signage could be very beneficial in this area, to inform the public of the value of semi-natural grasslands, the importance of urban habitats and of partnership working to achieve maximum biodiversity gains.

TN19	 	Fence moved in recent past to facilitate maintenance works. Bare soil patches are visible, with a sparse covering of annual meadow-grass, meadow foxtail and creeping buttercup. The underlying soil appears to be a well-draining mixture of sand/clay. On the river side of the fencing is a narrow line (1m approx width) of grassland with abundant grasses such as common bent-grass, Yorkshire fog, false-oat grass and also abundant herbaceous species including white clover, creeping buttercup, broad-leaved dock, mouse-ear chickweed, occasional germander speedwell, ox-eye daisy, bird's-foot trefoil, dandelion and cat's-ear. A wildflower seed mixture appears to have been added to the grassland and non-native herbaceous species such as cornflower, poppy, occasional kidney vetch. The revetment along this section has been repointed recently.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings and also the area of bare ground Move railings to enclose open ground and install gate in new railings to facilitate ease of machinery and personnel. Use green hay crop from elsewhere along the Impoundment, preferably from the 'Klondyke' grassland to seed this area – the ground would need to be scarified first before the green hay is added to allow seeds to establish. Employ the same management regime as for the 'Klondyke' grassland. Explore the potential to create reedbed at the base of this area.

TN20		Disjunct mature treeline of hornbeam, hazel, birch, crack willow that becomes denser moving north towards McConnell Weir. At the base, the well-developed semi-improved neutral grassland is dominated Yorkshire fog, cock's-foot, false-oat grass and red fescue, with creeping buttercup, cow parsley and charlock common with occasional common knapweed. Yarrow locally frequent with creeping thistle, nettle, ribwort plantain, broad-leaved dock and ragwort also present. Grassland cut once a year using a brush cutter to facilitate litter removal. Cuttings left in place and removed by tide.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings Maintain yearly cut and removal of cuttings, if feasible as this will keep grassland habitat open and species diverse. In the long-term, scrub and trees may encroach on the top of the bank, but this is not undesirable in terms of biodiversity.
TN20a		Open area of grassland which continues from TN20 along Ormeau Embankment road. The grassland has similar species composition to that described in TN20. One crab apple tree, one sliver birch and two hawthorn trees, scattered young hazel and 2 small hornbeam trees noted along this section, in addition to non-native pheasant bush. At the base of the sloping masonry wall sea aster, common scurvy-grass and *Enteropmorh*a sp. are present. A heron was noted along this section.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings Maintain yearly cut and removal of cuttings, if feasible as this will keep grassland habitat open and species diverse. In the long-term, scrub and trees may encroach along parts of this grassland, but this is not undesirable in terms of biodiversity. However, some open areas should be retained to provide habitat mosaics which will be of value for small birds, invertebrates and small mammals.

TN21		This section of the eastern river bank downstream from Ormeau Bridge supports semi-improved neutral grassland and small patches of tall ruderal vegetation under trees, with planted poplars (some to 15m height) occasional birch and crack willow (to 10-12m). The grassland is dominated by rank grasses, such as false-oat grass, Yorkshire fog and red fescue. Herbaceous plants are occasional to locally common, and include creeping thistle, common hogweed, cow parsley, charlock, common cleavers, broad-leaved dock and creeping buttercup. Hemlock water-dropwort is occasional at the base of the slope.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings No significant management required in short to medium term. In long term may require tree thinning.
TN22		Variously sloping embankment to river, quite open along its length with a walkway running alongside, bordered by a low palisade fence. The grassland is dominated by grasses such as Yorkshire fog, common bent-grass, false-oat grass, red fescue and occasional meadow foxtail. Scattered small trees (ash, willow) and shrubs occur infrequently. Towards the base of the slope the masonry wall supports sparse sea mayweed, common scurvy-grass and sea aster. Very occasional fringing reed canary grass occurs at the base. In places, the grassland may start to resemble tall ruderal vegetation, but this is not consistent and therefore this grassland is more akin to B2.2, semi-improved neutral grassland. Low metal railings mark the upper part of the embankment, separating it from a riverside footpath and cycleway, which has lighting along its length. To the west of the walkway, there are sections of dense ornamental planting, low cut amenity grassland, buildings, hardstanding and a playground. Grassland cut once a year using a brush cutter to facilitate litter removal. Cuttings removed by tide.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings No significant management changes required in short to medium term; maintain regular grass cut and removal of cuttings. Potentially could be a location where reedbed might be possible to establish along the margins.

TN23		Short mown grassland with planted Italian alder	Manager(s): Belfast City Council Limited opportunities as within the public realm and well used. Explore potential for bird boxes, but potential for interference could be a constraint
Zone B – Governor's Bridge downstream to Ormeau Bridge			
TN24		The sloping embankment supports well developed, though slightly rank semi-natural, neutral grassland, with various areas of taller planted trees at the top (mainly Italian alder, bird cherry) and small areas of scrub (elder, ornamental roses, privet, whitebeam, hawthorn). The grassland varies slightly in cover of herbs over this section, but is primarily dominated by grasses, including Yorkshire fog, red fescue, false oat-grass, cock's-foot, creeping and common bent-grasses. Common nettles, common hogweed, creeping buttercup, common cleavers, and ribwort plantain are occasional to frequent throughout. Rare to occasional occurrences of ox-eye daisy, wood avens, common knapweed, prickly sowthistle, broad-leaved dock, bush vetch, spear thistle, yarrow, angelica, cow parsley, greater plantain, common vetch, meadow vetchling and short-fruited willowherb also occur, A small area of calcareous underlying substrate supports ladies bedstraw and salad burnet. Small cover of the non-native colt's-foot in this section. At the base of the embankment, the sloping masonry wall supports sparse common scurvy-grass, sea aster	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings Maintain occasional cut and removal of cuttings which will help retain grassland diversity. In the long-term tree thinning may be required.

		and *Enteromorpha* species. Very occasional hemlock water-dropwort and reed sweet-grass occur along the base. The grassland appears more diverse in the southern section. The grassland is cut when required to facilitate litter pick.	
TN25	 	Along the eastern embankment, the grassland is similar to that described in TN 24 above, although due to the greater cover of trees / shrubs there is slightly better development of tall ruderal vegetation, but overall this area can be classified as semi-improved neutral grassland with scattered trees and shrub. Trees and shrubs noted include tall Italian alder (10-12m) poplar, occasional small-leaved lime, ornamental cherry trees, occasional ash and alder and one crab apple. Towards Ormeau Bridge large aspen trees (14-16m height) are present in addition to young hazel, elder and willow saplings, and where the grassland flora becomes almost tall ruderal in nature with frequent spear thistle. Bramble is occasional. In damper areas occasional field horsetail and meadowsweet occur. One feverfew plant was noted on the embankment near Dunnes Stores and a number of broad-leaved helleborine plants were noted in the grassland. The grassland is cut as necessary to facilitate litter picks and cuttings left to be removed on the tide.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings Maintain occasional cut and removal of cuttings which will help retain grassland diversity. In the long-term tree thinning may be required, although this section of embankment could be left to establish semi-natural woodland strips. Install bird boxes on taller trees. Potential to install bat boxes.

TN26		Sloped embankment running along Stranmillis Embankment. The slope is approximately 40 degrees. The base of the slope has been reinforced by a masonry wall which is inundated regularly and supports a sparse flora of common scurvy-grass, sea aster and curled dock. Much of this section of the embankment has well-developed, slightly rank semi-improved, neutral grassland. The grassland is dominated by grasses:- Yorkshire fog, cock's-foot, common bent-grass, red fescue and false-oat grass. Herb cover varies, but is generally occasional to sometimes frequent in parts. The main herb species present are creeping buttercup, common cleavers, common hogweed, common nettles, ragwort, creeping thistle, occasional ground elder, cow parsley and tutsan in shadier areas and hemlock water-dropwort, meadowsweet and rarely yellow flag iris in damper areas. A patch of the invasive giant hogweed is present. A small population (6-8 individual plants) of broad-leaved helleborine is present. Along the upper edge of the embankment are groupings of trees, predominantly tall (10-15m) poplar, occasional sycamore and alder. A bird box was noted on one of the trees. Scattered native and ornamental scrub species are spread along the embankment. Dense patches of cherry laurel and bramble occur in sections, with common gorse, privet and willow. Immediately downstream of Governor's Bridge is a section where the planted trees (aspen, poplar) along the bank are grouped closely together and the ground flora is characterised by tall ruderal such as common nettles, bramble, cow parsley, creeping thistle and occasional reed canary grass along the river margin. Some of the trees in this	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings Maintain occasional cut and removal of cuttings which will help retain grassland diversity or 'Non-Intervention' option is equally feasible. Control of giant hogweed required (as part of an overall invasive species strategy). In the long-term tree thinning may be required, although this section of embankment could be left to establish semi-natural woodland strips. Bird boxes could be installed along this section, as could bat boxes.

		section are multi-stemmed and of value for birds.	
TN27	 	Infrequently cut embankment with semi-improved neutral grassland on the eastern embankment, similar to that described in TN 26a above. Occasional patches of cherry laurel in the centre of this section. Towards the north, upstream of Kings Bridge a treeline of Italian alder and hybrid poplar (12-14m height) becomes established on the top margin of the embankment.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings Maintain occasional cut and removal of cuttings which will help retain grassland diversity. Consider removing non-native laurel scrub in the medium term. In the long-term tree thinning may be required, although this section of embankment could be left to establish semi-natural woodland strips. Bird boxes could be installed.
TN28		Sections of elevated semi-natural, neutral grasslands with planted poplar, and occasional hawthorn and hazel and ornamental shrubs to the rear of the two sections closest to the walkways. Grasses are dominant: - cock's-foot, red fescue, false oat-grass, Yorkshire fog and common bent-grass, with a diversity of herbs including white clover, ribwort plantain, bush vetch, creeping buttercup, tormentil, meadow vetchling (all occasional), less frequent ragwort, cow parsley and red clover. One broad-leaved helleborine plant noted in the grassland to south of the bridge.	Manager(s): Belfast City Council Maintain yearly cut here and remove cuttings to retain species diversity. In the long-term, ensure scrub and trees do not encroach onto grassland. Limit informal access tracks through the grassland and place anti-dog fouling signs in the area to help reduce nutrient enrichment of the grassland.

TN33		Managed amenity grassland. Herbicide appears to have been recently applied. At the margins is an ornamental treeline with lime, beech, sycamore and whitebeam and the understorey is frequently coppiced.	Manager(s): Belfast City Council With the addition of seating and interpretative displays, this could act as a viewing point along the Impoundment. Maintain an open vista along the Impoundment bordering this area through regular cut of grassland along the revetment. Planting native shrub species along the edge of the amenity grassland could be considered.
Zone A – Stranmillis Weir downstream to Governor's Bridge			
TN29		The section to the north of Governor's Bridge is slightly more herb diverse and has more abundant meadow vetchling and lesser stitchwort and occasional common knapweed. Dog fouling noted on this section of grassland and an informal pathway through the grassland is present.	Manager(s): Belfast City Council Maintain yearly cut here and remove cuttings to retain species diversity. In the short-term, put up anti dog-fouling notices and block pathway through grassland. In the long-term, ensure scrub and trees do not encroach onto grassland.

TN30		Triangular area of short mown amenity grassland with tall (to 10-12m) maples and sycamores.	Manager(s): Belfast City Council Limited potential for enhancement. Placement of bird boxes on the trees could be beneficial. Spring bulb planting would increase aesthetics and provide an early season nectar source.
TN31		Section of open embankment with what is best described as semi-improved, neutral grassland which is slightly rank in nature. The grassland is dominated by tall cock's-foot, false oat-grass, Yorkshire fog, with tall herbs including rosebay willowherb, cow parsley, smooth sow-thistle, hogweed, common cleavers, ground elder, and less frequent white clover, tormentil, ribwort plantain, dandelion, field bindweed and germander speedwell. Further northwards, the grassland becomes less species diverse, with mature and multi-stemmed sycamores along the fenceline. Along the base of the embankment the river margin is reinforced by sloping masonry, with sparse common scurvy-grass, sea aster and *Enteromorpha* species. One moribund alder along this section.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings No significant management required. In the long-term, grassland may be encroached by bramble or scrub, but this will provide good habitat for birds and invertebrates. Bird boxes could be installed on the trees. Local residents in the adjacent apartments could be encouraged to monitor the success of the bird boxes.

TN32		A small area of immature but tall (to 8m) planted trees and ornamental shrubs along the sloping river margin near the Cutters Wharf public house. Rowan, poplar species and downy birch are present, with one immature horse chestnut tree. Climbing old man's-beard is frequent over the trees and fencing. At the base of the planting, a grass dominated ground flora comprises false-oat grass, red fescue, common bent-grass with occasional creeping buttercup, common nettles, red clover, yarrow, bush vetch, spear thistle and hemlock water-dropwort in wetter areas. The base of the slope is formed by exposed rocks, covered with *Enteromorpha* species. Gabion baskets line the river margin of the Cutters Wharf. No visible signs of management.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings No significant management required. In the long-term, trees may require thinning.
TN34		Section of eastern river embankment located upstream of Governor's Bridge. The revetment slopes steeply to the river. The flatter top is lined by a mixture of trees, including sycamore, alder, silver birch (all between 8-10m) and willow, hazel and hawthorn scrub. Where trees are grouped together, brambles and common nettles dominate the ground flora. The narrow strip of grassland is rank in nature, dominated by false oat-grass, Yorkshire fog, cock's-foot. Herbs are occasional, including meadow vetchling, hedge woundwort, ribwort plantain, spear thistle, herb Robert and rarely angelica. One very mature black poplar tree (18-.20m) is located in this section. The bole is approximately 2m in width, and the tree is multi-stemmed 1.5m from the base. Broad-leaved helleborine was noted at the base.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings Maintain cut as required for litter picks. In the medium to long term, the large poplar tree should be inspected by a qualified tree surgeon to check its condition. Retain if possible. In medium to long term, the dense area of dogwood could be replaced by a mixture of willows, hazel and hawthorn.

		Upstream of Governor's bridge is a dense area of dogwood. To the road side is a linear area of amenity grassland with standard lime trees (to 6-8m) and occasional rowan. Currently cut as required to facilitate litter picks.	
TN35		Hard engineered edge along Methodist Boat Club comprising gabion baskets	Manager(s): Methodist Boat Club / DSD to 1.5m above HWM It would be worthwhile exploring potential options to soften the appearance of the gabion baskets margins. The level of boating activity (row boats mainly) in the area may constrict options, however, as may the need to maintain the gabion baskets. Possible options include floating vegetation mats in front of gabion baskets or placement of coir matting along the gabion baskets and plant with marginal. However, the practicalities of such measures and future management would need to be considered.

TN36		Old slipway with triangular area of semi-natural, neutral grassland, fringed by tall ruderals. The grassland has formed over free straining substrate and supports a diversity of species, including;- red fescue, Yorkshire fog, creeping bent-grass, false oat-grass and rough meadow-grass (all occasional to frequent); white clover, dandelion, creeping buttercup, ribwort plantain (all occasional to frequent), meadow buttercup, nipplewort, broad-leaved dock, water horsetail, greater plantain, bush vetch and red clover. Tall ruderals along the margins include rosebay willowherb, ragwort, common nettles, broad-leaved dock, curled dock and hemlock water-dropwort towards the river margin. This area could be occasionally used by otter, but there was no evidence at the time of survey.	Manager(s): Methodist Boat Club Retaining this area in its current state provides habitat for invertebrates and birds. Future plans for the site could include biodiversity enhancement measures.
TN37		Line of mature and densely planted Leyland cypress, bordered by scrubby elder along the river margin. Behind is a flat area of land, which is dominated by ground elder and with occasional winter heliotrope at the margins. A tunnel like effect is evident from the overlapping canopies of the Leyland hedge to the north and the semi-natural woodland to the south (TN 38), creating shady ground conditions which favour abundant ground elder. A disused boat shed is located in the south-west of this polygon. It is formed of corrugated metal and plastic, and does not appear suitable for bats.	Manager(s): Methodist Boat Club The planted Leyland cypress form effective cover. In the long-term, when/if replacement of this hedge is being considered, native species could be replanted. Future plans for the site could include biodiversity enhancement measures.

			
TN38		This woodland has probably arisen from a combination of planting and self-seeding of trees, and now resembles species poor semi-natural woodland. The dominant tree present is mature sycamore, and some of these trees are multi-stemmed and are up to 16m in height. The understorey is relatively open, and comprises privet, immature sycamores, occasional elder and rose species and rare hawthorn. Ground elder is frequent in the ground flora, with frequent ivy and occasional bramble. A fence forms the boundary between this woodland and the line of Leyland cypress along the river margin. Grass clippings were noted along the edge of the woodland, otherwise no current management appears to be in place.	Manager(s): Belfast City Council Remove grass clippings from woodland and seek new method of grass clipping disposal. In the longer term, there is potential to improve this woodland through targeted clearance of sycamore and replanting of native species and coppicing of existing trees to encourage the field layer.

TN39	 	Margin along Belfast Boat Club. Some giant hogweed present on the bank, with infrequent hemlock water-dropwort. Occasional fringing reedbed (very narrow). The channel is not heavily engineered in this section and retains a natural edge although this shows signs of scour.	Manager(s): DSD up to 1.5m from the HWM; Belfast Boat Club manage above this point Control of giant hogweed required (as part of an overall invasive species strategy). Potential to increase area of reedbed along this margin or create new edge habitats. This may be best achieved in conjunction with the Lagan Corridor project which may replace Stranmillis Weir, the operation of which may be causing scour along this bank. Once the scour issues are assessed and/or eliminated, options to enhance biodiversity include potential to plant new areas of reedbed along the margins; installing willow fencing 1m from the riparian edge, planting and creating a new wetland feature; or installing floating vegetation rafts.

TN40	 	Annadale Fishing Stands. The habitats can be divided into three main sections. Between the footpath along Annadale Embankment and the walkway leading to the fishing stands is a narrow (1.5-2m width) slope planted with a variety of trees and shrubs. Mature poplars, ash and occasional small-leaved lime are present, with denser eared willow, hawthorn and occasionally blackthorn. Common laurel occurs occasionally. Underlying this is uncut rank grassland, dominated by false-oat grass, Yorkshire fog and red fescue, with occasional common cleavers, nipplewort, yarrow, spear thistle and common nettles. Broad-leaved helleborine occurs regularly in this area. The walkway and fishing stands are concrete and bordered by low metal fence on the riverside. Below the walkway is a thin line of grassland and more salt tolerant plants, occasionally with willow or hawthorn scrub. A range of plants are present at differing covers along this strip. Yorkshire fog and false oat-grass dominate. Plants with wetland affinities such as reed canary-grass, hemlock water-dropwort, meadowsweet and angelica occur, in association with hedge woundwort, smooth sowthistle, colt's-foot, field horsetail, spear thistle, remote sedge and broad-leaved dock. The base of the revetment is hard engineered stone and is covered by a layer of *Enteromorpha* sp.	Manager(s):DSD up to 1.5m from the HWM; Belfast City Council manage above this point to the top of the fishing stands along Annadale Embankment Road Grassland at top of fishing stands to be cut when possible to maintain species diversity and suitable habitat for broad-leaved helleborine. Maintain regular checks for giant hogweed and other invasive species. In the medium to long term, tree thinning may be required, and laurel scrub could be removed in the short to medium term.

TN41		Area which has been sprayed to control giant hogweed.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings Monitor to ensure giant hogweed has been eradicated. In the short to medium term, this area could be replanted with a mixture of native tree and shrub species.
TN42	 	The most significant area of fringing reedbed. Common reed is dominant with occasional reed canary grass and marsh horsetail. Towards Annadale fishing grounds, the reedbed becomes thinner and the top margins of this section have been sprayed with herbicide to facilitate giant hogweed control. Reebed is cut once a year to facilitate litter clearance. Cuttings are removed with the tide.	Managers(s): DSD Reedbed within Belvoir SLNCI Maintain regular cut and removal of cuttings. In the medium to long term, drier areas towards the back of the reedbed may require some scrub removal to halt succession. Targeted bird surveys could be undertaken to build up a more comprehensive picture of the ecological value of this reedbed habitat.

TN43		Semi-natural grassland riparian edge on the west bank upstream of Stranmillis Weir, with occasional Himalayan balsam along the edge. This is a well-used recreational area, and the grassland shows signs of trampling damage along the edges.	Managers(s): Belfast City Council Control strategy for Himalayan balsam required Eastern bank is within Belvoir SLNCI
TN44		Area of amenity grassland with grove of tall trees. Many of the trees have good cover of ivy and could be suitable as occasional bat roosts. Himalayan balsam occurs.	Managers(s): Belfast City Council Control strategy for Himalayan balsam required Lies within the small area identified as Lagan Valley Regional Park Opportunity Node (map No. 6/015), Belfast Metropolitan Area Plan 2015).

TN45		The fringing reedbed narrows at this point, before the start of Annadale Fishing Stands. Lining the back of the reedbed is an area of dense blackthorn dominated scrub with occasional guelder rose, small ash saplings and bramble. Planted dogwood is occasional along the fenceline.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings Reedbed within Belvoir SLNCI Maintain regular checks for invasive species In medium to long term, scrub may need to be removed from reedbed to halt succession. Possibly consider removing dogwood and replacing with native species Rotational coppicing of scrub to maintain density and form.
TN46		Short mown amenity grassland fringed by a narrow line of reed canary grass, occasional hemlock water-dropwort, bittersweet, common nettles and broad-leaved dock on small but relatively steep slope to the river.	Managers(s): Belfast Boat Club Maintain a wider uncut margin along the riverbank to act as a wildlife corridor.

TN47	 	This area along the east of the Belfast Boat Club/Tennis Court is planted with a mixture of trees and shrubs over generally short mown amenity grassland. The area of trees/shrubs covers more than 30%, but it is best described as scattered trees and parkland and it is therefore assigned the code A3. Trees present include mature, forked small-leaved lime trees (to 20m), occasional mature horse chestnut and beech less mature sycamore and alder, and occasional small ash, hawthorn and ornamental shrubs such as variegated laurel, ornamental roses, rhododendron, cotoneaster and willow and elder scrub. There is some evidence of decay on the horse chestnut trees. The amenity grassland is generally short mown under the trees along the edge of the tennis court, but allowed to grow longer at the margins of the opposite side, closer to the river, where bluebell, hedge woundwort, common nettles, bush vetch, nipplewort and creeping thistle are present. The riparian edge along this habitat has a number of stands of the invasive giant hogweed, both within the woodland and along the margin with the Impoundment. The natural, small but steep slope along the river margin supports a fringe of reed canary-grass, hemlock water-dropwort, meadowsweet and occasional common scurvy-grass.	Manager(s): Belfast Boat Club Control measures for the invasive giant hogweed should be considered, particularly as there is an informal pathway through this area. Liaison with the Boat Club to discuss measures which could be used to enhance the ‘buffer’ along the Impoundment – measures could include new native tree planting, wildflower meadow planting and management, extending reedbed along river margins.

TN48		Small area of grassland which has more diversity than amenity grassland and is therefore described as species-poor, semi-improved neutral grassland. The grassland is short mown and has developed over a free draining, thin soil. Some signs of disturbance at the edges. Yorkshire fog, common bent-grass, red fescue and false-oat grass dominate, with rare soft brome at edges; herbs are represented by frequent white clover, yarrow, ribwort plantain, mouse-ear chickweed, creeping buttercup; occasional creeping cinquefoil, ragwort, dissected crane's-bill, hop trefoil, germander speedwell, with bush vetch and smooth-sow thistle and broad-leaved dock at the edges. The moss species *Rhytiadelphus squarrosus* is occasional to frequent. This grassland type continues as a smaller strip along the south of the tennis courts, where it is fringed by occasional hemlock water-dropwort, common scurvy-grass and oilseed rape along a low, but steeply sloping drop to the river edge. Immature ash and hawthorn saplings are well spaced along the embankment.	Manager(s): Belfast Boat Club Sections of the grassland could be let grow longer between May and July, and cut thereafter to let plants flower and seed. Also potential to add a wildflower mixture of local provenance to create an attractive and botanically more diverse grassland.
TN49		The woodland strip becomes narrower along this section and is less steep than the woodland described in TN50. Along the top of the embankment are tall multi-stemmed hybrid poplars with occasional ash and small-leaved lime trees to 20m. The understorey is formed by hawthorn and bramble, and is dense in parts. Some weed killer has been applied at the top of the slope. Along the fenceline which separates the woodland from the footpath is occasional burdock and frequent field horsetail.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings Maintain regular checks for giant hogweed and other invasive species. Potential to plant trees /shrub at the top of this section near the fenceline.

TN50	 	Continuation of woodland at TN54 below, along steep bank to River Lagan. This section of woodland is denser than 101w, and comprises a mixture of tree ages, with semi-mature ash, alder, sessile oak, sycamore and elder, scrubby hawthorn, blackthorn, osier willow and rarely hazel. The ground flora is well developed in terms of cover, and includes frequent water horsetail towards the river, ivy, common nettles, bramble and common hogweed. Within this section of woodland are stands of Japanese knotweed and along the edge of the river stands of giant hogweed are present. There is little fringing vegetation along the edge, but hemlock water-dropwort, common reed, water horsetail and fool's-watercress are occasionally present.	Manager(s): Belfast City Council Woodland within Belvoir SLNCI Control strategy for Japanese knotweed and giant hogweed required before these species become too established in the woodland. More detailed surveys required for bats, birds and spring flora.

TN51	 	A relatively species diverse area of inundated grassland along a small backchannel of the River Lagan, located to the south of Lagan weir. Small ponded areas of water occur. Soils appear to be fine mud, and possibly anoxic in parts. The grassland slopes relatively steeply towards the backwater channel. Fringing the edge of the grassland along the channel is a discontinuous line of Himalayan balsam and common reed with occasional bindweed. At the north-east tip of the grassland the invasive giant hogweed was noted. The grassland itself is characterised by abundant floating sweet-grass, with other grasses indicative of drier ground at lower cover including Yorkshire fog, common bent-grass, rough meadow-grass and false-oat grass. The grassland has a patchy distribution of herbs, including frequent creeping buttercup, occasional brooklime and hemlock water-dropwort; less frequent herbs recorded included celery-leaved buttercup, hairy willowherb, water forget-me-not and angelica. Infrequent patches of hard rush and soft rush were noted. A moss, *Calliergonella cuspidata*, was occasional at the base of the grassland. The grassland appears to be grazed periodically by cattle and small amount of poaching was evident.	Manager(s): Unknown, possibly Belfast City Council Habitats within Belvoir SLNCI In good condition at present. In future, if poaching of ground by livestock becomes a concern, consideration could be given to fencing to minimise access. Control of Himalayan balsam as part of an integrated invasive species control strategy upstream and downstream. Requires a more detailed botanical survey and assessment.

TN52		Footpath, ornamental planting and closely mown amenity grassland along the edge of the Belfast Boat Club.	Manager(s): Belfast City Boat Club Explore potential to erect bat and bird boxes, and allow some sections of grassland to grow long to facilitate flowering and seed set.
TN53	 	Brackish channel to the east of Stranmillis Weir, fringed by Himalayan Balsam and occasional reed canary grass. The channel is formed by a mixture of cobbles, gravel and fines. Within the channel small cover of duckweed was noted.	Manager(s): Rivers Agency /Belfast City Council Channel within Belvior SLNCI Control of Himalayan balsam as part of an integrated invasive species control strategy. Targeted surveys to determine value for fish, birds and invertebrates.

TN54		Steep semi-natural woodland which slopes down to inundation grassland. The trees are generally semi-mature and well-spaced out, and include sycamore, ash and occasional sessile oak. Some of the trees have good ivy cover and there is potential for bats. The ground flora consists primarily of scrambling ivy, occasional bramble with common hogweed and ground elder.	Manager(s): Belfast City Council Woodland within Belvoir SLNCI Forms part of Lagan Lands East. Valuable as a connecting habitat.
TN55		At the top of the slope is a plateau which supports a number of habitats. Adjacent to the steep sycamore dominated woodland is an area dominated by young, apparently self-sown common alders with occasional hawthorn. Bramble and common nettles are frequent at the base, indicating some enrichment of the soil, with occasional common hogweed and common cleavers.	Manager(s): Belfast City Council Woodland within Belvior SLNCI Forms part of Lagan Lands East. Valuable as a connecting habitat.
TN56		This grassland is located on a plateau at the top of woodland described in TN50. It is apparently a reclaimed landfill, and the grassland may have been seeded. However, it is classified as semi-natural on the basis of the plant composition. Grasses dominate:- red fescue, Yorkshire fog, rough meadow-grass, cock's-foot, crested dog's-tail, common bent-grass and rare perennial rye-grass. Carnation sedge is occasional to frequent throughout. Herb cover is good and species noted include common knapweed, ragwort, white clover,	Manager(s): Belfast City Council Habitats within Belvoir SLNCI Forms part of Lagan Lands East. Valuable as a connecting habitat. Determine origin of meadow crane's-bill; possibly manage grassland to

		red clover, cat's-ear, common vetch, ribwort plantain, creeping buttercup, meadow buttercup, creeping thistle, dandelion, germander speedwell, and hogweed. Approximately 5 plants of meadow crane's-bill were noted in this grassland. A mature apple tree is located to the north-east corner of the main section of grassland.	conserve this plant species. A species specific plan could be developed for this species, with the agreement and input of NIEA, should this be considered appropriate.
TN57		Area of semi-improved grassland adjacent to Annadale embankment, with style from the road allowing access through the grassland to woodland. The grassland slopes south-eastwards and whilst not rank, no management was apparent at time of visit. Grasses dominate: - Yorkshire fog, common bent-grass, crested dog's-tail, meadow foxtail, sweet vernal-grass, cock's-foot. Herb cover is occasional to frequent, and includes common knapweed, creeping and meadow buttercup, lesser stitchwort, creeping thistle, dandelion, cat's-ear and common hogweed.	Manager(s): Belfast City Council Grassland within Belvoir SLNCI Forms part of Lagan Lands East. Valuable as a connecting habitat. Spear thistle is a noxious weed and may require control.

TN58		Area of tall ruderals at the top of the steep woodland. Brambles are abundant, with hogweed, field horsetail, common cleavers, creeping cinquefoil, spear thistle and common bindweed. This area may have been sprayed in the past to control weeds.	Manager(s): DSD up to 1.5m from the HWM; Belfast City Council manage above this point to railings Maintain regular checks for invasive species. Potential to plant trees/shrubs in this area to improve aesthetics and form connectivity between woodland sections.

Appendix G – List of Attendees, Lagan Workshop, 20th August 2013

Gemma Alexander	DSD
Judith Bankhead	Rivers Agency
Dolores Byrne	Atkins
Daniel Clarke	Lagan Valley Regional Park
Peter Cush	NIEA Biodiversity Unit
Bob Davidson	NIEA Biodiversity Unit
Eamonn Delaney	Atkins
Ian Enlander	NIEA Earth Heritage & Ornithological Department
Peter Gallagher	DSD River Manager
Angela Halpenny	NIW Environmental Regulation
Trevor Harrison	NIEA Estuarine Fish Monitoring & Assessment
Anna Jess	Atkins
Sabine Kalke	Belfast City Council
Michael McAliskey	NIEA Marine Conservation & Reporting Group
Mike Meharg	NIEA Biodiversity Unit
Renny McKeown	NIEA Biodiversity Unit
Michael McLarnon	Atkins
Lynne Peoples	RSPB
Melina Quinn	NIEA Biodiversity Unit
Orla Ruddel	NIEA Marine Licensing
Joseph Shearer	South Belfast Partnership Board
Ronald Surgenor	DSD
Brenda Turnbull	Lagan Canal Trust

Appendix H – Summary of Interacting Legislation

Legislation	Description	Interaction with the Impounded River Lagan
Marine Licensing, Marine and Coastal Access Act 2009	Provides for the licensing of marine activities, such as Burial at sea, Cables, Construction (including renewables), Deposit and use of explosives, Dredging (including aggregate dredging), Disposal of dredged material, Disposal of fish and shellfish waste, Divers, Pipelines etc	Likely positive impacts to water quality within the Lagan. Limiting disposal of dredged material, fish and shellfish waste in the marine environment.
Marine and Coastal Access Act (2009)	Northern Ireland is included in the UK Act for the provisions relating to the Marine Policy Statement, marine planning in Northern Ireland's offshore area (from the 12 nautical mile limit to the boundary of the Northern Ireland zone) and the reform of marine licensing insofar as it relates to the Food and Environment Protection Act 1985 and marine aggregates extraction.	Likely positive impacts to fish populations within the Lagan from new licensing system within the marine environment.
Contaminated Land (NI) Order 1997	Sets out regime for waste management and also covers waste carrier registration and identification and remedying of contaminated land	Likely positive impacts through the reduction of accidental contamination of the river and neighbouring habitats.
Waste and Contaminated Land (Amendment) Act (Northern Ireland) 2011	Gives the DOE and district councils' power to investigate, enforce and clean up illegally dumped waste.	Likely positive impacts through the reduction and / or the removal of illegally dumped waste.
Environmental Protection Act 1990	Protects certain birds, plants, animals, marine life and their habitats, including Natura 2000 sites, through creating criminal offences and changing planning requirements	Likely positive impacts through the increased repercussions to wildlife disturbance.
Environment (Northern Ireland) Order 2002 SI 3153 (NI 7) (including amendments up to 2004)	Covers several environmental issues, including pollution prevention control, assessment and management of air quality, and designation of areas of special scientific interest (ASSIs)	Likely positive impacts through increased control of pollution.
The EIA Directive Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 1999 SR 73	Requires that planning application decisions consider the potential environmental impact of the project. Sets out which developments require an Environmental Impact Assessment (EIA) and the rules and procedures relating to EIAs.	Likely positive impacts on species and habitats using / in the environs of the Lagan. Reducing impacts from developments.
Controlled Waste Regulations	Creates a duty of care for controlled waste that requires all producers, carriers and managers of	Likely positive impacts through the reduction of accidental contamination of

(Northern Ireland) 2002 SR 248	waste to keep records and use waste transfer notes.	the river.
Controlled Waste (Duty of Care) Regulations (Northern Ireland) 2002 SR 271	Covers the disposal of PCBs and similar dangerous substances, and outlines measures for identification, registration and disposal.	Likely positive impacts through the reduction of accidental contamination of the river.
Environmental Protection (Disposal of Polychlorinated Biphenyls and other Dangerous Substances) (Northern Ireland) Regulations 2000 SR 232	Details the regime for controlling and tracking the movement of hazardous waste.	Likely positive impacts through the reduction of accidental contamination of the river.
Hazardous Waste Regulations (Northern Ireland) 2005 SR 300	Regulates waste on land, abandoned vehicles, noise nuisance, noise abatement zones, sulphur content of oil fuel used in furnaces and engines, cable burning, and pollution of the atmosphere and water. Other aspects have been revoked.	Likely positive impacts through the improvement of water quality and habitats along the banks of the river.
Pollution Control and Local Government (Northern Ireland) Order 1978 SR 1049 (NI 19)	Amends Water Resources (Environmental Impact Assessment) Regulations (Northern Ireland) 2005. Outlines measures for public participation in creating plans or programmes relating to the environment.	Likely positive impacts through the improvement of water quality.
Water Resources (Environmental Impact Assessment) Regulations (Northern Ireland) 2005 SR 32	Requires an EIA to be carried out for water management projects for agriculture (including irrigation projects) which would be likely to have significant effects on the environment.	Likely positive impacts through the improvement of water quality.
Shellfish Waters Directive (2006/113/EC)	Established regime to protect and manage designated shellfish waters.	Likely positive impacts through requirement for good quality waters to support shellfish production.
The SEA Directive (2001/42/EC)	Strategic level environmental assessment of plans and programmes which are likely to have significant impacts on the environment	Likely positive impacts through the integration of environmental considerations into strategic level policies and plans.
Urban Wastewater Directive 91/271/EEC (Amended under Directive 98/15/EEC)	The Directive sets out requirements for sewage systems and waste water collection systems and set deadlines for provision of sewage treatment; requires monitoring of discharges from treatment systems.	Likely positive impacts on biodiversity as the Directive is in place to prevent and reduce pollution from waste water
The Floods Directive (2007/60/EC)	Sets a framework undertaking preliminary flood risk assessment to identify areas of significant flood risk, preparation of flood hazard and risk maps and preparation of flood risk management plans (by 2015) setting out prioritised actions	DARD Rivers Agency is the competent authority for the Floods Directive. Catchment Flood Risk Assessment and Management (CFRAM). Positive impacts from tendency for 'soft defences' such as wetlands to provide biodiversity gain.

The Integrated Pollution Prevention Control Directive (96/61/EC)	The objectives of the Directive are to prevent or reduce emissions to air, water and land, reduce waste and use energy and resources efficiently.	Likely positive impacts on biodiversity as the Directive is in place to prevent and reduce pollution.
Sewage Sludge Directive (86/278/EEC)	The Directive provides for protection of the environment, and in particular of soil, and sets controls on the use of sewage sludge in agriculture.	Likely positive impacts on biodiversity as the Directive is in place to prevent and reduce pollution from sewage sludge.
International Conventions		
Berne Convention (1982)	Aims to conserve wild flora and fauna and their natural habitats, to promote international cooperation, to give added attention to endangered and vulnerable species including migratory species.	Positive impacts on any endangered or vulnerable species using the Lagan.
Bonn Convention	International agreement on the conservation of migratory species of wild animals.	Positive impacts on any migratory species using Belfast Lough SPA/Ramsar and on occasion, the Impoundment.
UN Convention on Biological Diversity (1992)	A legally binding agreement which sets out three main goals for the protection of biodiversity: a) conservation of biological diversity; b) sustainable use of biodiversity components; and c) fair and equitable sharing of benefits arising from genetic resources. Signatories are required to report towards progress in accordance with Article 26.	Positive impacts through delivery of actions associated with Biodiversity Action Plans.
The Ramsar Convention (1971)	Under the terms of this commitment, signatories must maintain the ecological character of their wetlands of international importance and to plan for the "wise use", or sustainable use, of all of the wetlands in their territories.	Belfast Lough Ramsar site is largely coincident with Belfast Lough SPA. Positive impact on conservation of wetlands and wetland species due to commitments to improve water quality, raise awareness, integrate wetlands into policy and strategic decisions and designate Ramsar sites.

Appendix I – Summary of Dissolved Oxygen Monitoring April 2010 to June 2013

Table J.1 - Dissolved Oxygen WFD Classification Mean (Quarterly 5%ile) April – June 2010

Mean DO	5%ile DO (mg/l)	Status	Data (Quarterly Period)	No. of samples	Data coverage (%)
Queen's	6.68	High	Apr 2011 - Jun 2011	49	100
Albert	5.40	Good	Apr 2011 - Jun 2011	49	100
B'Staff	2.87	Moderate	Apr 2011 - Jun 2011	48	98
Weir	3.26	Moderate	Apr 2011 - Jun 2011	49	100
Ormeau	3.11	Moderate	Apr 2011 - Jun 2011	48	98
Dunnes	3.12	Moderate	Apr 2011 - Jun 2011	48	98
Culvert	2.37	Poor	Apr 2011 - Jun 2011	48	98
King's	1.67	Poor	Apr 2011 - Jun 2011	47	96
Cutter's	2.53	Moderate	Apr 2011 - Jun 2011	45	92
Stranmillis	2.43	Moderate	Apr 2011 - Jun 2011	45	92

Table J1.2 - Dissolved Oxygen WFD Water Quality Summary April – June 2010

WFD Status	Number of readings	Percentage (%)	Pass/Fail Readings	Pass/Fail %
'High'	572	72.6%	638	81.0%
'Good'	66	8.4%		
'Moderate'	72	9.1%	150	19.0%
'Poor'	13	1.6%		
'Bad'	65	8.2%		

788 samples: 150 **failed** to meet required WFD standard (**19%**)

Table J.3 - Dissolved Oxygen WFD Classification Mean (Quarterly 5%ile) April – June 2011

Mean DO	5%ile DO (mg/l)	Status	Data (Quarterly Period)	No. of samples	Data coverage (%)
Queen's	5.38	Good	Apr 2011 - Jun 2011	47	100
Albert	5.00	Good	Apr 2011 - Jun 2011	47	100
B'Staff	4.91	Good	Apr 2011 - Jun 2011	47	100
Weir	4.42	Good	Apr 2011 - Jun 2011	47	100
Ormeau	3.35	Moderate	Apr 2011 - Jun 2011	47	100
Dunnes	3.06	Moderate	Apr 2011 - Jun 2011	47	100
Culvert	1.90	Poor	Apr 2011 - Jun 2011	47	100
King's	1.36	Bad	Apr 2011 - Jun 2011	47	100
Cutter's	1.69	Poor	Apr 2011 - Jun 2011	44	94
Stranmillis	0.69	Bad	Apr 2011 - Jun 2011	43	91

Table J.4 - Dissolved Oxygen WFD Water Quality Summary April – June 2011

WFD Status	Number of readings	Percentage (%)	Pass/Fail Readings	Pass/Fail %
'High'	363	62.5%	461	79.4%
'Good'	98	16.9%		
'Moderate'	46	7.9%	120	20.6%
'Poor'	29	5.0%		
'Bad'	45	7.7%		

581 samples: 120 **failed** to meet required WFD standard (**20.7%)**

Table J.5 - Dissolved Oxygen WFD Classification Mean (Quarterly 5%ile) April – June 2012

Mean DO	5%ile DO (mg/l)	Status	Data (Quarterly Period)	No. of samples	Data coverage (%)
Queen's	6.42	High	Apr 2012 - Jun 2012	18	100
Albert	5.00	Good	Apr 2012 - Jun 2012	18	100
B'Staff	3.20	Moderate	Apr 2012 - Jun 2012	18	100
Weir	4.34	Good	Apr 2012 - Jun 2012	18	100
Ormeau	2.25	Poor	Apr 2012 - Jun 2012	18	100
Dunnes	3.92	Moderate	Apr 2012 - Jun 2012	18	100
Culvert	2.62	Moderate	Apr 2012 - Jun 2012	17	94
King's	3.42	Moderate	Apr 2012 - Jun 2012	17	94
Cutter's	2.56	Moderate	Apr 2012 - Jun 2012	17	94
Stranmillis	1.83	Poor	Apr 2012 - Jun 2012	17	94

Table J.6 - Dissolved Oxygen WFD Water Quality Summary April – June 2012

WFD Status	Number of readings	Percentage (%)	Pass/Fail Readings	Pass/Fail %
'High'	812	77.63%	912	87.2%
'Good'	100	9.56%		
'Moderate'	71	6.79%	134	12.8%
'Poor'	18	1.72%		
'Bad'	45	4.3%		

1046 samples: 134 **failed** to meet required WFD standard (**12.8%**)

Table J.7 - Dissolved Oxygen WFD Classification Mean (Quarterly 5%ile) April – June 2013

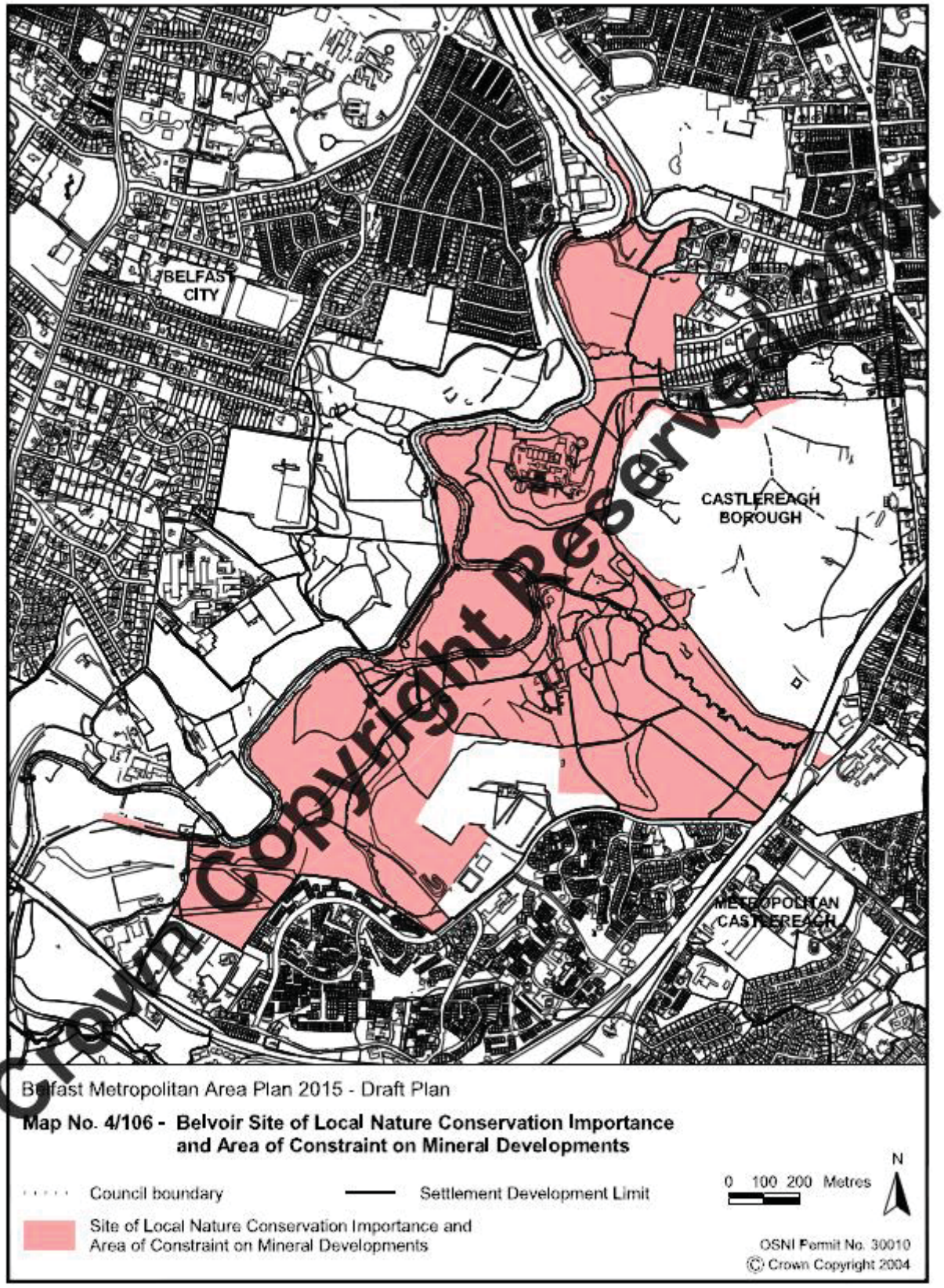
Mean DO	5%ile DO (mg/l)	Status	Data (Quarterly Period)	No. of samples	Data coverage (%)
Queen's	8.12	High	Apr 2013 - Jun 2013	24	100
Albert	6.61	High	Apr 2013 - Jun 2013	24	100
B'Staff	5.44	Good	Apr 2013 - Jun 2013	24	100
Weir	4.79	Good	Apr 2013 - Jun 2013	24	100
Ormeau	5.39	Good	Apr 2013 - Jun 2013	24	100
Dunnes	3.95	Moderate	Apr 2013 - Jun 2013	24	100
Culvert	4.05	Good	Apr 2013 - Jun 2013	24	100
King's	3.12	Moderate	Apr 2013 - Jun 2013	24	100
Cutter's	3.00	Moderate	Apr 2013 - Jun 2013	24	100
Stranmillis	3.16	Moderate	Apr 2013 - Jun 2013	24	100

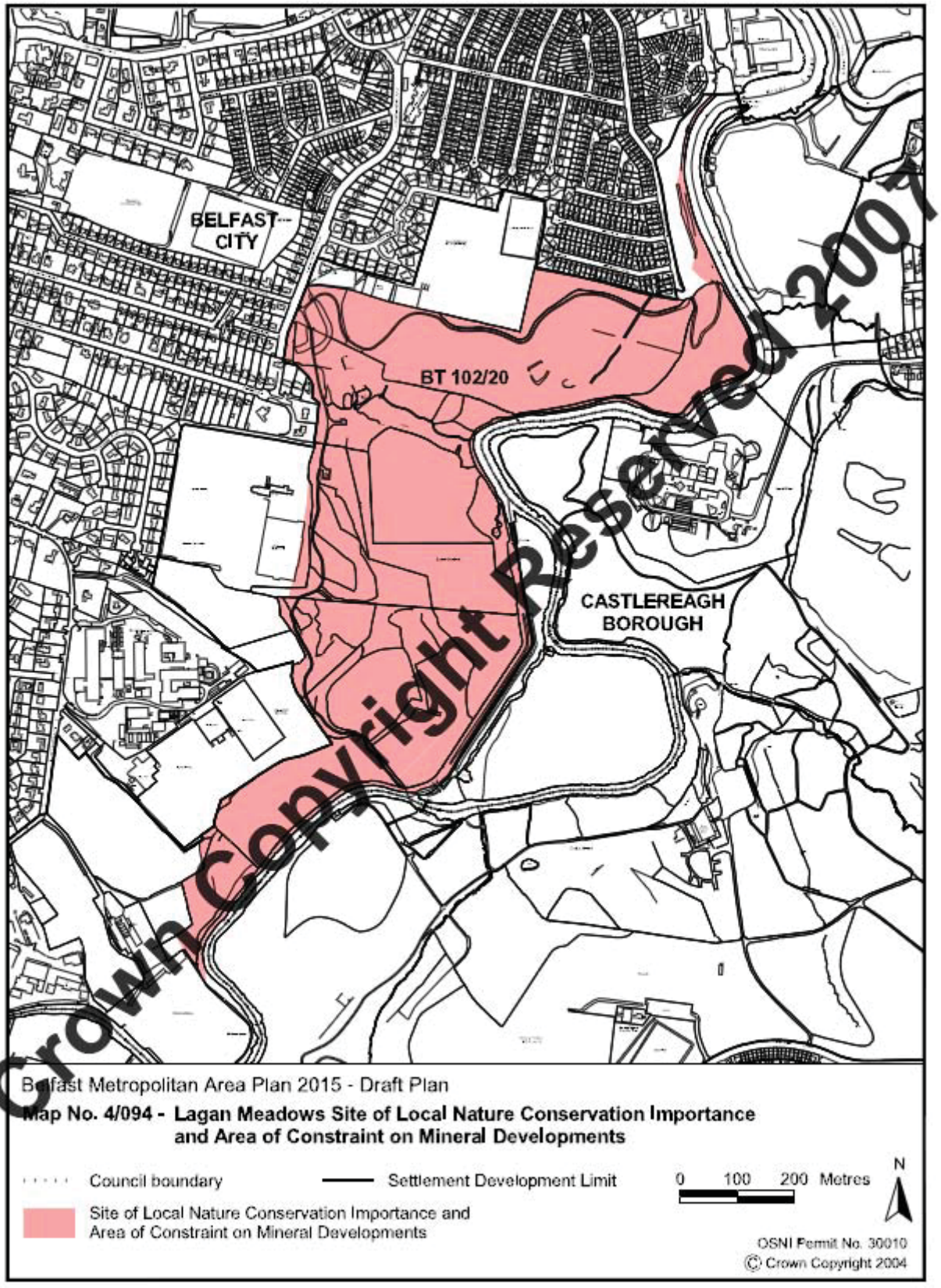
Table J.8 - Dissolved Oxygen WFD Water Quality Summary April – June 2013

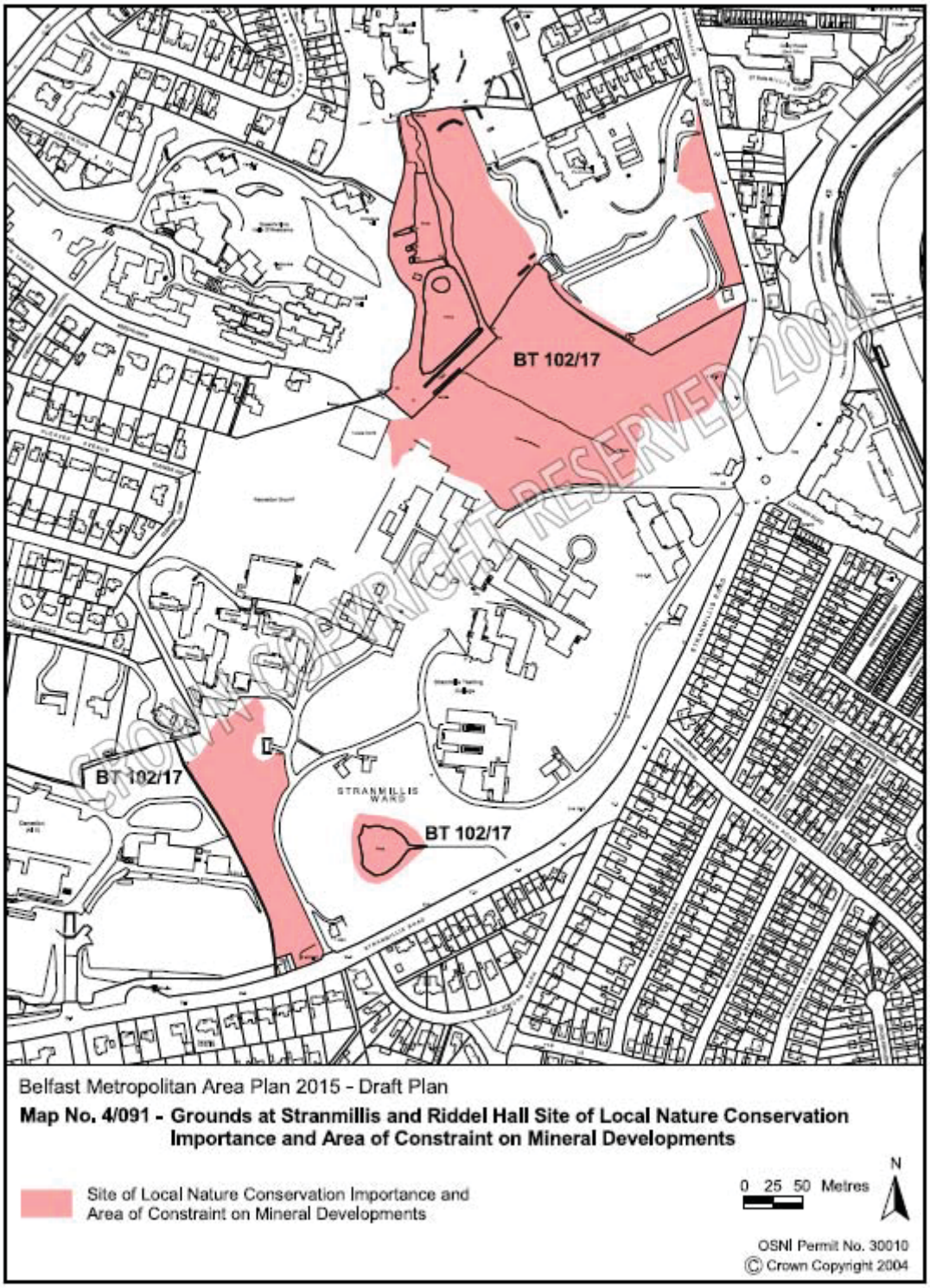
WFD Status	Number of readings	Percentage (%)	Pass/Fail Readings	Pass/Fail %
'High'	973	86.11%	1041	92.1%
'Good'	68	6.02%		
'Moderate'	44	3.89%	89	7.9%
'Poor'	13	1.15%		
'Bad'	32	2.83%		

1030 samples: 89 **failed** to meet required WFD standard (**7.9%**)

Appendix J – Sites of Local Nature Conservation Importance






BT 102/17
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STRANMILLIS WARD
CROWN COPYRIGHT RESERVED 2004
Belfast Metropolitan Area Plan 2015 - Draft Plan
Map No. 4/091 - Grounds at Stranmillis and Riddel Hall Site of Local Nature Conservation Importance and Area of Constraint on Mineral Developments
Site of Local Nature Conservation Importance and Area of Constraint on Mineral Developments
0 25 50 Metres
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Swords Co Dublin
e e one
Fa 353 1 810 8001

Unit 2B
2200 Cork Airport Business Park
Cork
e e one
Fa 353 21 429 0360

2nd Floor
Technology House
Parkmore Technology Park
Galway
e e one
Fa 353 91 779 830

www.atkinsireland.ie
email: info.ie atkinsglobal.com

Appendix F. Belfast Flood Alleviation Habitats Regulation Assessment (HRA).

Niamh Cassidy
Atkins Limited
71 Old Channel Road
Belfast
BT3 9DE

Tel: +44 (0)28 90 788600
Fax: +44 (0)28 90 788688
Fax: +44 (0)28 90 788688