GROUNDWORK

CHANGING PLACES
CHANGING LIVES

Tyne Estuary Partnership
Feasibility Study

Environment Agency

UNIVERSITY OF HULL

IECS

July 2019

CONTENTS

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EXECUTIVE SUMMARY

Introduction
Groundwork NE & Cumbria (Groundwork) were commissioned by the Environment Agency (EA) to undertake a feasibility study to assess opportunities for environmental and economic enhancements to the Tyne Estuary. This covers the 38km tidal reach, from the mouth of the Tyne to Wylam. The study draws on findings of technical surveys carried out by the University of Hull and strategic partnership consultation carried out by Groundwork. Due to the predominantly urban nature of the Tyne Estuary the report focuses on planned development sites and opportunities for interventions to enhance water and environmental quality; with important economic, health and wellbeing benefits. The result is the formation of a new, strategic, Tyne Estuary Partnership, established to identify, shape and influence estuary enhancements.

The River Tyne is one of the most iconic and well known rivers in the UK. Over the years there has been significant investment to improve the river. Benefits can be seen by improvements in biodiversity and the Tyne Estuary becoming a focal point for economic activity that continues to develop along the river. It supports thriving businesses, £multi-million of planned developments, and is often the backdrop for large cultural and recreational events such as the Great Exhibition of the North. However, there are still significant pressures impacting the river that can be addressed.

There is now an ambition for the Tyne Estuary Partnership to champion further improvements over the next 10 years; bringing benefits to businesses, communities, and the environment. By working in partnership we will identify opportunities for sustainable environmental and economic improvements to the Tyne Estuary; unlocking investment to ensure the River Tyne continues to be an internationally significant River.

Vision and Aims
As this is a feasibility study a formal vision has not been established. The working vision is:

The Tyne Estuary Partnership: Developing a Healthy and Vibrant River Estuary

Tyne Estuary: Mouth of the Tyne to tidal limit at Wylam

Aims

Tyne Estuary Partnership aims are:

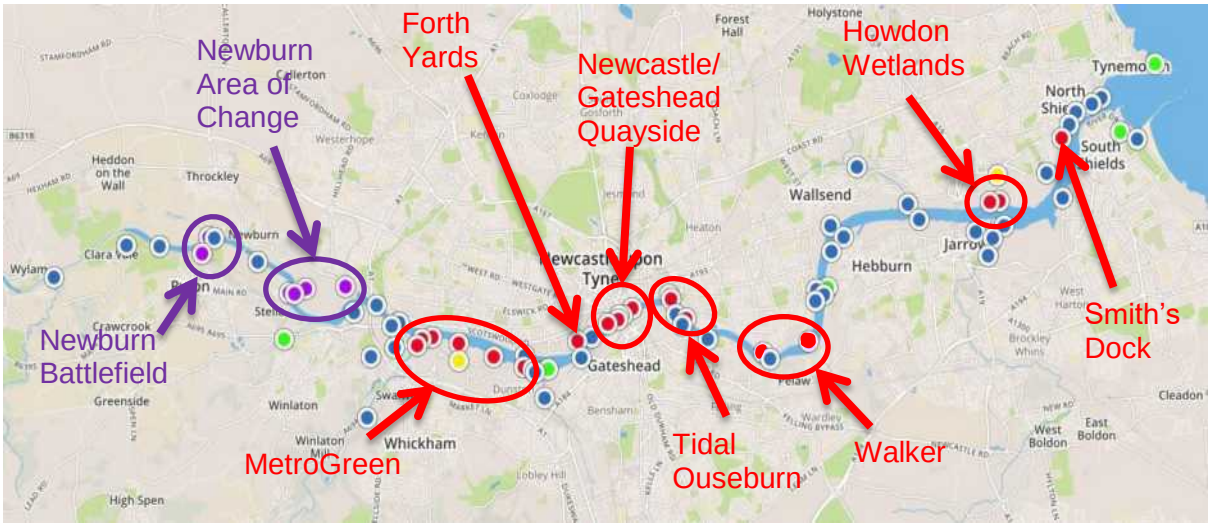
1. **Develop a Partnership**
   - A strong, strategic, influential partnership invested in long term environmental and economic enhancement of the iconic estuary.

2. **Estuary Enhancements**
   - Ecological and biodiversity improvements, meeting WFD objectives* and environmental net gain such as bank softening of estuary edges to reduce silting, pollution and improve water quality.

3. **Wider Benefits**
   - Realising the multiple wider benefits that joined up action can achieve such as natural capital gains, health and wellbeing improvements, education, social, cultural and heritage benefits.

Tyne Estuary Partnership Feasibility Study
Led by Groundwork the Tyne Estuary Partnership has identified 77 enhancement opportunities for the Tyne, with an immediate focus on what can be achieved in the next 2 years and consideration of longer term benefits. This will deliver projects to improve water and river quality moving towards 'Good Ecological Potential' (GEP) by 2027.

The map below illustrates the location of the Short Term Priority Projects; identified by red dots (1-3 years, already in development) and Medium Term Priority Projects; identified by purple dots (4+ years, improvement opportunity but not imminent).



These projects will improve the river via:

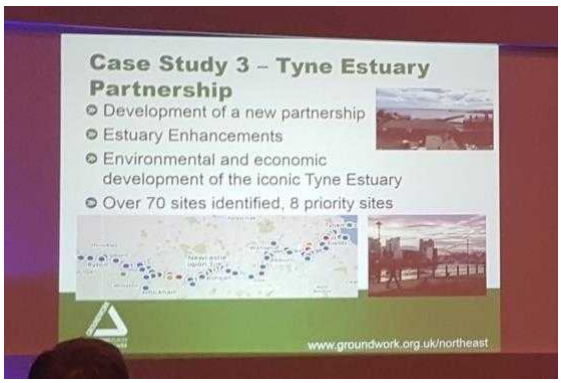
- Greening the river banks
- Managing surface water and drainage
- Alleviate flooding
- Preserving and restoring habitats
- Blue-green infrastructure development
- Improving access
- Increasing economic activity
- Attracting investment
- Hosting more tourism and events
- Monitoring the benefits.

*Water Framework Directive (WFD): a DEFRA commitment requiring all rivers to achieve good water quality status by 2027.

The Partnership

The partnership has over 60 members covering 7 sectors including:

- Statutory agencies and authorities
- Developers
- Ports, harbours and marinas
- Private sector/ business membership organisations
- Environmental, educational and community
- Culture, heritage and tourism
- University and research



Partnership Pledge

A Partnership Pledge has been developed setting out environmental and economic enhancement goals of the Tyne Estuary Partnership. It provides a simple, but effective statement to bring partners together to collectively tackle challenges that the Tyne Estuary faces. See our website for details https://www.groundwork.org.uk/Sites/northeast/news/the-tyne-estuary-partnership-pledge.

Delivering the Tyne Estuary Partnership

The EA has allocated indicative seed funding for further development and delivery of Tyne Estuary Partnership during 2019/20. This will be matched with capital and revenue funding identified and contributed by Groundwork and partners. Over time such partnership approaches to development can lead to £multi-million schemes. Specific opportunities for funding are detailed in the full report.

It is proposed that 3 or 4 different trial sites are delivered over a 2 year pilot scheme, assessing impact, effectiveness and value for money.

Key Recommendations

- Partnership development; vision, broader representation, action
- Deliver a joined up approach to environmental, economic, leisure and tourism, culture and heritage enhancements
- Consider net capital gains including societal, economic, education and health benefits.
- Real habitat improvements in new developments.
- Developing a ‘green corridor’; floating pontoons, new jetties, greening of walls and habitat creation to increase connectivity.
- Greening of roofs; in new developments and retrofitting with aesthetic and ecological benefits.

Enhancements must be developed with permissions, consents and any constraints in mind. These largely include land ownership, space, contaminated land and ongoing maintenance.

Priority Projects
Seven priority projects have been identified as illustrated below and on the previous map. Together they will enhance 38km of river and help to create 16 hectares of new habitats. When delivered in partnership they present significant opportunities for human, natural capital and economic benefits with associated matched funding possibilities.

Project	Partners	Budget	Opportunities	Outcome	Timescale
Metro Green	Gateshead Council.	£200,000	• Habitat creation • Ecology enhancement • Increased natural capital	• 3.8km river enhanced. • Flood defence	2020-2021 onwards
Forth Yards	NE1, Newcastle City Council, Local Developers.	£150,000	• Manage/ restore intertidal zone • Manage/ resort habitats • Habitat creation • Enhance ecology	• 600m river enhanced. • Flood defence • Surface water management.	2020-2021 onwards
Newcastle/ Gateshead Quayside	NE1, NE1, Newcastle City Council, Gateshead Council, NGI, HMS Calliope	£240,000	• High profile intervention • Aesthetic green corridor • Habitat creation • Ecology enhancement • Tourism/ events/ increase dwell time	• 1km of river enhanced. • Flood defence.	2019-2020 onwards
Tidal Ouseburn	Ouseburn Trust, Local Developers.	£100,000	• Habitat creation • Ecology enhancement • Aesthetic improvement • Tourism/ events/ increase dwell time	• 1km of river enhanced. • Flood defence. • Surface water management.	2019-2020 onwards
Walker Riverside Park	Newcastle City Council, Port of Tyne.	£200,000	• Habitat creation • Ecology enhancement • Increased natural capital	• 2km of river enhanced. • Flood defence.	2019-2020 onwards
Howdon Wetlands	Northumbrian Water, North Tyneside Council, Port of Tyne.	£100,000	• Habitat enhancement • Ecology enhancement • Manage/ restore intertidal zone • Bank rehabilitation	• 33,000m^2 of river enhanced. • Flood defence.	2019-2020 onwards
Smith's Doc	NorthTyneside Council, Local Developers.	£200,000	• Habitat creation • Ecology enhancement • Increased feeding/ roosting time	• 11,000m^2 of river enhanced. • Surface water management	2020-2021 onwards

Project opportunities are described in detail in Part 4: Priority Sites.

Estimated budgets are to deliver full schemes including EA and matched funding. Proposed improvements can be scaled back and positive interventions delivered for smaller budgets; especially as pilot sites to trial interventions over the next 2 years. Options include:

- £30,000 – trials at Newcastle/Gateshead Quayside and Metro Green including floating pontoons, fish refugia and otter holts. Education, engagement, natural capital gains.
- £50,000 – more extensive habitat and aesthetic improvements at the same sites.
- £70,000 – further trial sites and green edges at Tidal Ouseburn, education, heritage.
- £100,000 - extend the trials to include floating vegetated islands either at Howdon Wetlands or Smith's Dock, or consider master-planning work for Walker Park.

These priorities are flexible dependent on progress of new developments, opportunities for environmental enhancement in plans and availability of targeted matched funding.

PART 1: INTRODUCTION

Groundwork were commissioned by the Environment Agency (EA) to produce this report which details the findings of a feasibility study to identify and assess opportunities for environmental and economic enhancements to the estuary of the River Tyne. It covers the full 38km tidal reach of the Tyne from Tynemouth to the tidal limit at Wylam and has a focus on opportunities for a priority area of the MetroGreen development site. It draws on the findings of technical surveys and assessments of the full estuary including MetroGreen carried out by the University of Hull; supplemented by a detailed, strategic partnership consultation undertaken by Groundwork. Due to the predominantly urban nature of the Tyne Estuary it focuses on planned development sites and where interventions could enhance water and broader environmental quality. The report also details the formation of a new, strategic, Tyne Estuary Partnership, established to identify, shape, guide and influence the potential enhancements that could be made to the Tyne Estuary.

Tyne Estuary: Mouth of the Tyne to tidal limit at Wylam

The study took place from July 2018 to March 2019. However, this is an ongoing project with evolving priorities; the recommendations and actions are a reflection of the Tyne Estuary Partnership's priorities at the point of writing (March 2019). The priorities and recommendations could change depending on external factors such as; development opportunities, funding opportunities, land owner permission, planning restraints and so on.

Structure of the Report

- Part 1 - Introduction, background, aims, objectives and method
- Part 2 – Strategic Context
- Part 3 – Overview of Opportunities
- Part 4 – Priority Projects
- Part 5 – Recommendations and Next Steps
- Appendix – appendices of supporting information

Background

The River Tyne is one of the most iconic and well known rivers in the UK. The Tyne Estuary is a focal point for economic activity that continues to develop along the river. It supports thriving businesses, £multi-million developments, and is often the backdrop for large cultural and recreational events such as the Great Exhibition of the North.

Over the years there has been significant investment to improve the water quality and wider environment of the Tyne. The benefits can be seen by improvements to the river's biodiversity, an increase in economic development and new visitor attractions. However, there are still significant pressures impacting the quality of the river; from historic mining to sediment build-up, new developments, run-off from roads, contaminated sites and sewage.

There is now an ambition for the Tyne Estuary Partnership to champion further improvements to the river over the next 10 years, benefiting businesses, communities, and the environment. By working in partnership we will identify opportunities for sustainable environmental and economic improvements to the Tyne Estuary, unlocking investment to ensure the River Tyne continues to be an internationally significant River.

Context

The Tyne Estuary runs from rural land at its tidal reach in Wylam, through the river basin's largest urban centres of Newcastle and Gateshead. The population centred around Tyneside sustains thriving industries and cultural and recreational businesses. The estuary is home to the Port of Tyne, a 620 acre major handling facility, one of the largest in the North East.

Industry and history

Former traditional, heavy industries such as coal mining and ship building have declined dramatically in recent years, but their environmental legacy remains. In recent years there has been a shift to tackle the somewhat unique nature of historical contamination of the Tyne Estuary. Freshwater sources in the upper Tyne catchment are among some of the most polluted in the UK from abandoned metal mines.

The industry and history of the Tyne is vast. It is important here to give a brief overview of the history to better understand the challenges of this project.

The Tyne has been an important Port since the Roman times when they constructed Arbeia Roman Fort in South Shields. Over the centuries it has adapted to changing needs of society.

Originally the bulk of Port industry was export of coal and iron ore, many of the raised hills on the banks of the lower Tyne are actually discarded ballast which was used to steady ships travelling from the Thames which would return laden with coal. Such traditional heavy industry ceased in the 1990's and the Port had to adapt again. Jarrow Slake was reclaimed and Nissan opened a large operation on the site; VW followed on the North bank. Most recently the Port saw a significant investment of £180 million to build a new wood pellet facility on the Tyne Dock site. They have acquired more land and are always looking to expand their operations.

Water quality

Although the water quality in the estuary has improved greatly over the last 15 years, urban pressures, such as point source sewage inputs and diffuse source pollution from road run off, old industrial sites, mine waters and contaminated land is leading to multiple failures against the Water Framework Directive (WFD). The WFD is an EU Directive which the Department for Environment Food and Rural Affairs (DEFRA) is committed to, requiring all rivers to achieve good water quality status by 2027. This is furthered by DEFRAs new 25 Year Environment Plan which sets out further commitments to achieving a sustainable 'green' future with clean air and water where plants and animals can thrive. These goals to improve water quality and the natural environment have significant economic, health and well-being, and natural capital benefits; making the area surrounding the Tyne Estuary a better place to live, work and play and significant environmental net gains.

The Tyne Estuary is a Heavily Modified Water Body (HMWB) and is classed as Moderate water quality, rather than Good. The goal is to achieve Good Ecological Potential (GEP) by 2027. Confirmed reasons for not achieving good status (RNAG) include physical modification for Flood protection use, and Navigation and Ports. Mitigation measures to improve the water quality from moderate could include:

- Preserve or restore habitats
- Enhance ecology
- (Improve) in-channel morph diversity
- Remove or soften hard bank

- Remove obsolete structure
- Fish passes
- Retain habitats

Why now

A recent review of the Tyne Estuary has highlighted that few, if any, mitigation measures have been implemented on the Tyne. A new surface water sampling site on the Tyne indicates that water quality tests will fail at the next round of classifications. The latest analysis of monitoring data indicates that the Tyne will show a deterioration in water quality. However, the Tyne Estuary has not been closely monitored for some time and there is currently no good baseline data. This work has provided the impetus for the EA and the Urban Observatory at Newcastle University to invest in further monitoring equipment which will provide some baseline data that could help to demonstrate impacts of interventions.

Additionally one of the EA's north east area Noble Causes is 'Excellent Estuaries' reflecting a commitment to improving marine environments; due to this priority the Tyne Estuary is gaining the forefront of attention in this field.

Timing also sits perfectly with DEFRAs 25 year plan. The strategic objectives we want to set for the estuary will match those in the plan with a strong focus on Environment Net Gain and the Natural Capital Approach.

Work has taken place to improve the tributaries of the River Tyne, with the aim of improving water quality and biodiversity, especially in the upper Tyne river catchment and the site of St Anthony's Tar Works. Several partnerships have been established under the umbrella of the Tyne Catchment Partnership, a group of organisations working together on integrated catchment management across the River Tyne catchment area. Sub-partnerships have focused on tributaries including the River Don, the Ouseburn, the River Team, the Land of Oak & Iron and Revitalising Redesdale. Issue based partnerships have also been established as part of the overall Tyne Catchment Partnership, such as the Tyne Metals Working Group and initiatives including the Salmon Stocking Programme and the Clean Tyne Project to name a few (see Appendix 1- 6.1.7). However, nothing specific exists for the Tyne Estuary – the most famous section of the River Tyne.

Other river estuaries throughout the UK, including the Tees and the Thames have already brought together multi-sector partnerships to improve water and environmental quality benefiting the economy and wider communities. Interventions have included:

- Creating new habitats.
- Securing environmental designations.
- Accessing additional funding.
- Creating guidance for developers/businesses.
- Reducing waste and pollution.
- Undertaking community engagement and education activities.
- Identifying ways to create more natural estuary edges by removing/enhancing concrete edges to create natural riverbanks.

The Tyne is one of the most iconic estuaries in the world, but it is unusual in that compared to the vast majority of estuaries in the UK, there are only are small areas of designation at Mouth of Tyne, and before this project, it did not have a partnership focused on long term viability or sustainability. Limited protection and no strategic objectives can lead to mistreatment and use; ultimately deteriorating the river for all.

Now stakeholders around the Tyne Estuary want to do the same thing. To generate further funding and investment and take a joined up approach; not only to improve the water quality of the Tyne and meet WFD goals but also to take this fantastic opportunity to enhance the river to improve economic, social and cultural outcomes for all. This report takes the first strategic approach required to create an environmentally and economically vibrant Tyne Estuary for the long term.

Funding for this project was secured in July 2018. Since then, in less than a year, a working partnership of 37 organisations and 68 representatives have contributed; identifying 77 potential projects. This demonstrates the appetite, excitement and commitment for real change along the Tyne Estuary.

Vision

As this is a feasibility study a formal vision has not been established. However, the working vision being used to date to introduce the scheme is:

The Tyne Estuary Partnership: Developing a healthy and vibrant river estuary

Aims and Objectives

Aims

1. **Develop a Partnership**
   - A strong, strategic, influential partnership invested in long term environmental and economic enhancement of the iconic estuary.

2. **Estuary Enhancements**
   - Ecological and biodiversity improvements, meeting Water Framework Directive objectives and environmental net gain such as bank softening of estuary edges to reduce silting, pollution and improve water quality.

4. **Wider Benefits**
   - Realising the multiple wider benefits that joined up action can achieve such as natural capital gains, health and wellbeing improvements, education, social, cultural and heritage benefits.

This will help the Tyne Estuary to meet its ultimate aim of achieving Good Ecological Potential by 2027 by developing actions that will address mitigation measures on the Tyne.

Develop a Partnership
The Tyne Estuary crosses 5 local authority boundaries and multiple different land uses, but remains predominantly urban. No single intervention could be developed in isolation or make any meaningful impact. It is imperative that any work to improve the environment or surrounding public realm and economy along the Tyne takes place in partnership working to unified aims.

This study therefore aims to develop an effective partnership at the right level and scope of engagement to gain support for the enhancement opportunities proposed and to make a meaningful impact. It aims to develop strategy for environmental and economic improvements that has buy in and support from wider strategic partners to ensure is the Tyne remains an internationally significant river for the long term.

Estuary Enhancements
The Tyne operates as an important wildlife corridor and is one of the best Atlantic salmon rivers in England. Populations of otters and pearl mussels have also been recorded. Small

pockets of biodiversity enhancements along the Tyne that this study aims to identify and prioritise will help to create a corridor of habitats, increasing both the connectivity of biodiversity potential along the estuary and the potential for natural habitats to re-establish.

The Tyne Estuary has lost significant areas of saltmarsh over time as a result of development. Saltmarsh is a UK priority habitat, and plays a significant role in supporting a variety of birds, otters and provides valuable nursery grounds for fish. This study aims to identify areas for saltmarsh improvement that will help offset these historical habitat losses supporting water quality improvement and the overall ecology of the estuary thus supporting overall WFD aims.

There is the opportunity for 38km enhancement of estuary edges if techniques explored in this study are realised.

Wider Benefits

Both the development of a strategic partnership and estuary enhancements will not only have the direct positive impacts as described but will also aim to capitalise on the multiple wider benefits that ensue. This study aims to explore, develop and ultimately deliver, a holistic approach to improvements to the Tyne Estuary realising wider benefits including.

- Improved:
  - Health and Wellbeing
  - Access to the river
  - Education and engagement
- More:
  - Leisure, culture and tourism
  - Events and celebrations
  - Citizen science/ environmental monitoring
  - Volunteering
  - Skills and investment
- Develop new:
  - Code of Conduct
  - Protected areas

Natural Capital Gains

Health, Wellbeing & Economic Improvement

Objectives

To meet these aims the objectives are to:

1– Establishing the Working Group/ Partnership

- Identify relevant representatives from key organisations and sectors.
- Co-ordinate the working group to meet every 2 months.
- Provide feedback from the working group to report to wider strategic partnerships - Tyne Catchment and Local Nature Partnership.

2 – Evidence Gathering

- Collate existing data on the Tyne Estuary.
- Identify land ownership information from existing sources.
- Create a list of all the evidence gathered.
- Liaise with University of Hull and ensure the findings inform this report.

3 – Consultation
- Meetings to be held with key stakeholders to understand the issues and opportunities they have identified for the Tyne Estuary.

4 –Strategic Objectives
- Workshops to develop strategic objectives and priority sites for the Tyne Estuary.
- Develop a 'pledge' that partners will sign up to.
- Understand and promote wider benefits to full audience including health, community, economic, investors, developers, education institutions etc.

5 - Opportunities
- High level opportunities identified that draw upon information gathered and stakeholder engagement.
- Map and description of the opportunities.
- Next steps to be identified.

6 – Communication and Engagement
- From strategic to community
- Hard to reach communities
- Raising awareness and connecting people with environment

Combined outcomes would allow 2020/21 project proposals for the EA Medium Term Plan to see ecological enhancement opportunities realised within the estuary.

The Partnership

Groundwork, working in partnership with the EA and University of Hull are developing a strategy for the Tyne Estuary that has buy in and support from wider strategic partners. By working in partnership we have identified 77 opportunity sites for sustainable environmental and economic improvements to the Tyne Estuary. These will improve water quality, help to address WFD failures and help to ensure the Estuary remains an internationally significant river for the long term. The partnership has over 60 members covering 7 sectors including:

- Statutory agencies and authorities
- Developers
- Ports, harbours and marinas
- Private sector/ business membership organisations
- Environmental, educational and community
- Culture, heritage and tourism
- University and research

Partnership Pledge
A Partnership Pledge has been developed setting out environmental and economic enhancement goals of the Tyne Estuary Partnership. It provides a simple, but effective statement to bring partners together to collectively tackle challenges that the Tyne Estuary faces. See our website for details https://www.groundwork.org.uk/Sites/northeast/news/the-tyne-estuary-partnership-pledge.

The partnership will have working groups relevant to specific project sites. Following this feasibility study there is ambition to further formalise the partnership, develop a unified strategic vision, consider options for membership and recruit a figure head to drive it forward.

Methodology

In order to achieve the aims outlined above, Groundwork, in conjunction with the University of Hull, has undertaken a combination of qualitative and quantitative research. Groundwork, as project lead, has been responsible for the collation of data and feedback gathered throughout 2018/2019, resulting in the production of a final feasibility report detailing estuarine enhancement and/or recreation opportunities that exist along the watercourse to date. The methodological approach consisted of 8 stages as outlined below:

The study area

The study area for this work covers the full 38km tidal reach of the Tyne Estuary from its mouth at Tynemouth all the way inland to Wylam; including a focus on the MetroGreen development site. It includes a 250m buffer zone of land and development sites that significantly impact the water quality of the Tyne and the tidal reaches of its tributaries including the rivers:

- Don
- Ouseburn
- Team
- Derwent

The area crosses 5 predominantly urban local authorities but with some rural aspects:

- North Tyneside
- South Tyneside
- Newcastle
- Gateshead
- Northumberland

Initial consultation
Groundwork has led the qualitative research by undertaking 26 meetings, networking events and relationship building activities focusing on the identification of potential estuary enhancements, engagement and galvanisation of stakeholders. As a result 37 key stakeholders have come together to form a Working Group (list in Appendix 1 – 6.2); consisting of 68 contributors from various sectors: Public; Private; VCSE; Education and Research; Environment and Conservation.

Technical surveys
Groundwork commissioned the Institute of Estuarine and Coastal Studies (IECS), University of Hull, to undertake state of the art survey and drone imaging work to identify where opportunities exist for ecological enhancements along the Tyne Estuary. To achieve this IECS undertook a combination of desk and field-based studies including:

- Survey work to populate the Tyne Banks typology
    - A desk-based study investigating options for bank softening and literature reviews
    - A bank assessment undertaken by boat, (lower reaches the NIFCA survey vessel and Port of Tyne Clearwater; upper reaches the NIFCA rib), and on foot.
- Once potential pilot sites had been identified, video and oblique photographs of enhancement sites were taken by drone camera.
- Bank typology and opportunity sites mapped in GIS

Each section of bank was characterised (Bank Typology)

- The Tyne Estuary from the mouth to the tidal limit at Wylam was surveyed,
- Current bank structure and function was characterised.
- High level bank typology, sub type and detailed description of bank characteristics.
- The results were mapped in GIS which shows the general bank typology and bank characteristics
- Potential ecosystem services benefits were identified; uses an established matrix approach developed by IECS through the Valuing Nature Network (VNN) to value the habitats and the services they provide.

For full details and diagrams see:

- *Section 4, Tyne Estuary Edges Enhancement Study: MetroGreen Priority Site, 2019*
- *Section 4, Tyne Estuary Edges Enhancement Study, 2019*

Desk research
The consultation and survey work information and supplemented insight gained from the stakeholder engagement was further enhanced by Groundwork's extensive desk-based research, to help to inform the feasibility of potential opportunities identified. Key documents and websites included:

- HM Land Registry
- Local Authority Planning Portals, Core Plans, Local Plans
- Local Enterprise Partnership and North of Tyne development strategies
- DEFRA 25 year plan and Environment Agency noble causes
- Water Framework Directive
- Horizon scanning of press articles regarding relevant development plans
- Biodiversity Action Plan (And any other habitat) plans
- Natural England landscape character plans

Full details are provided in the Appendix.

Stakeholder Workshops
Four stakeholder workshops were delivered to support evidence building, identifying enhancement opportunities, prioritising opportunities and planning for the next financial year. These took into account the findings for the research conducted by the University of Hull and feedback from ecological, social and economic perspectives identified through the 26 individual strategic stakeholder meetings. Workshops included:

Date	Description	Attendance No.
July 2018	Initial exploratory sessions; gathering initial support, project ideas, land ownership information, issues, opportunities, constraints.	25
December 2018	Strategic consultation and discussion of priority sites; following an interim review of University of Hull's technical investigation and identification of priority sites and enhancement opportunities insight gained was feedback to key stakeholders.	22
February 2019	Collation and presentation of insight gained from consultation activity (meetings, attendance at other partnership events and Stickyworld online engagement). Promotion of further discussion following enhanced knowledge of priority sites.	34
April 2019	Launch event - presentation of Executive Summary report and signing of the pledge.	43

Interactive-online consultation
Wider consultation was achieved through the use of Stickyworld, a browser-based consultation platform. Different from a traditional online survey, Stickyworld allows for the development of a virtual tour of proposed enhancement sites for contributors to engage with as well as an interactive forum. Contributors were invited to provide a combination of general comments, strengths and weaknesses, opportunities, threats, planned developments, and thoughts on timescale to progress regarding political, economic, environmental, and social pressures for each of the proposed enhancement sites identified by the University of Hull's survey work and Groundwork's consultation.

Opportunity Development and Site Prioritisation
The potential enhancement opportunities for the Tyne Estuary developed over the course of the study. The identification of potential opportunities was derived from a summation of the different research, consultation and survey techniques described above. Groundwork mapped and developed a spreadsheet of all of the potential opportunities identified including commentary on landownership, opportunities, constraints and known planned developments.

The interactive site opportunity map produced built information about the sites and added new information as the project progressed. It was used to gain commentary and strategic insight from stakeholders about whether technical opportunities identified by the University of Hull would be feasible in reality and which sites and potential opportunities would most likely be possible to develop first.

Priority ideas were developed and refined through a process of:

- Consultation.
- Workshops.
- Fact checking.
- Review and consideration with experts at the EA and University of Hull.

During this process various factors to identify and ratify priority sites were considered including:

- Potential environmental and water quality benefits.
- Wider ecosystem services and natural capital benefits.
- Land ownership.
- Buy in and support from key stakeholders.
- Stage of planning and/or development.
- Cost and potential availability of match funding.

The proposed list of priority sites was then discussed at two of the stakeholder events to sense check and if relevant amend the initial proposals; as a result alterations to the priority list were made.

Reflecting on insight gained from stakeholder engagement and the opportunity for wider social and economic benefits, Groundwork also identified a series of cross cutting themes relevant to the full Tyne Estuary and revenue project ideas that could support capital projects to make a holistic, meaningful and lasting impact of enhancements to the estuary.

Finally, the opportunities have been summarised in this report which coordinates and structures all of the relevant information gained and highlights opportunities, recommendations, the emergence of themes and match funding building on the University of Hull's bank typology matrix.

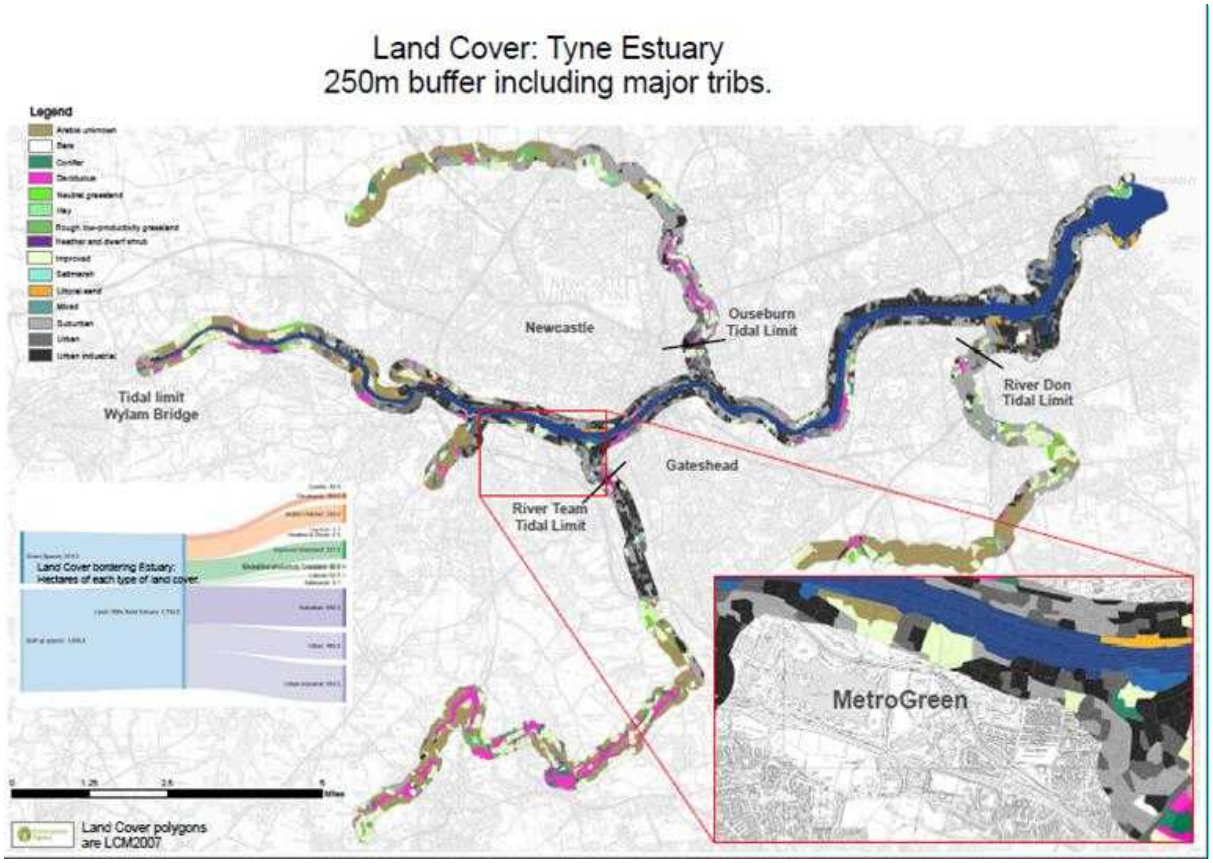
PART 2: STRATEGIC CONTEXT

Understanding the River

The River Tyne is one of the most iconic and well known rivers in the UK and is a key focal point for industry, businesses and conurbations that have developed and continue to develop along the river. With the outer and middle estuary predominantly characterised by vertically engineered banks, operational quaysides and derelict dry and wet dock areas, there are many opportunities for greening enhancements to be considered. Unlike many other heavily modified estuaries in the north east of England, the Tyne still supports some areas of extensive intertidal mudflat, particularly in the middle to upper reaches west of the Tyne Bridge, which deliver suitable habitat for a number of wildfowl and wader species, both for foraging and roosting.

The Tyne Estuary runs from Wylam in the West to the South and North piers in the East.

- Covers an area of 810 hectares
- Includes the Ouseburn, Don, Team, and Derwent tidal tributaries
- There are 5 local authority boundaries – Newcastle, Gateshead, South Tyneside, North Tyneside and Northumberland.



Landscape Character

The Tyne Estuary is sited within the Tyne and Wear Lowlands National Character Area (NCA 14). This is described as an area of gently undulating or rolling land, incised by the valleys of the major rivers and their tributaries. It is densely populated and heavily influenced by urban settlement, industry and infrastructure. Between settlements there are wide stretches of agricultural land. The River Tyne contributes a strong sense of landscape character to the area.

The Tyne Estuary provides opportunities to contribute to the Statements of Environmental Opportunity:

SEO 2: Enhance and manage the Tyne and Wear river network and Tyneside coastal area to improve water quality and reduce flood risk, and to mitigate the effects of climate change. There are various more localised Landscape Character assessments which provide more detailed outcomes for the Tyne Estuary:

Newcastle Character Assessment 2017
Following Character Areas are associated with the Tyne Estuary:

Character Area	Priorities for enhancement and improvement
Tyne Riverside and Western Villages Extends along the Tyne waterfront west from Scotswood to Newburn and the Tyne Riverside Country Park	✓ Improve and protect water quality, landscape and wildlife, river-related sports and activities. ✓ Encourage industrial uses to relocate if they have no connection with the river. ✓ Open up more public access.
West End and Riverside The area immediately west of the city centre, positioned along the north valley side of the River Tyne to Scotswood Bridge	✓ Protect and open up for public view and access ✓ Enhance river and river edge wildlife habitats ✓ Retain and refurbish bridges. ✓ Interpretation ✓ Retain and extend waterfront walkway
City Centre Covers the River Tyne historic quayside from the Queen Elizabeth Bridge to Pandon Bank	✓ Protect and improve heritage. ✓ Recognise heritage/rarity value ✓ Retain and enhance pedestrian links, 'Chares', Quayside access, and protect viewpoints of river. ✓ Retain, enhance, and link green spaces to areas on the upper bank to maximise wildlife potential
East End and Riverside The south east of Newcastle, extending along the Tyne waterfront between St Ann's and Low Walker	✓ Protect and open up for public view and access ✓ Enhance river and river edge wildlife habitats

Urban Landscape Study of the Tyne Gorge 2003
This study is focused on the area between Dunston Coal Staithes and Spiller's Mill. It divides the Tyne Gorge into distinct character types, of which 4 are relevant to this project:

Character Type	Principles of Development
Historic Waterfront; the historic core of the waterside settlements	✓ Maintaining and enhancing access ✓ Maintaining visual links to the riverside ✓ Conserving important areas of woodland and other areas of nature conservation interest. ✓ Using native planting on the Gorge sides to form a setting to new built development.

Character Type	Principles of Development
Floodplains; the floodplains of the River Tyne and Team	✓ Enhancing the transport and recreational use of the rivers ✓ Creation of any new islands or floating platforms should consider the historic context and take into account views from strategic viewpoints. ✓ Ensure that new development does not threaten the breeding populations of Kittiwake ✓ Provision of public ✓ sea level rise in planning for any new development within the floodplain.
Gorge slopes; the steep Gorge slopes that enclose the River Tyne and the flat riverside strip	✓ Encourage active woodland open space and creation of natural floodplain habitats should accompany any new built development. ✓ Maintain an open swathe alongside the river to provide wildlife habitats and recreational opportunities. ✓ Consider the effects of predicted management on the Gorge side to enhance its ecological value. ✓ Maintain pedestrian access along the waterside. ✓ Consider new native planting on the Gorge sides and in the infilled valley of Pandon Dene and encourage active management of vegetation.
Denes and Valleys; the incised tributary valleys that feed into the Tyne Gorge from the north. Many of these denes and valleys have been filled in to make room for built development	✓ Maintain public access to the Ouse Burn and public open space on the valley sides that can provide a green backdrop to the development ✓ Promote pedestrian access from the Tyne Gorge up into the Ouseburn Valley to bring people back into the valley.

South Tyneside Landscape Character Study 2012

The South Tyneside Landscape Character Study presents a detailed review of the landscapes of South Tyneside, and the means by which their distinctive characteristics can be maintained and enhanced. The study provides a greater understanding of the local character and context of the built and natural environment of South Tyneside.

The following character areas are relevant to the Tyne Estuary:

Character Area	Guidelines
Hebburn Riverside Large area of public open space along the river, providing access to the Tyne	✓ Retain riverside access, promote access and interpretation ✓ Promote access as part of a wider network
Hebburn North Extends to a small section of the riverside. The remaining links to the river, both physical and visual, are a key asset in this area.	✓ Maintain riverside access
Jarrow Riverside Long, narrow industrialised stretch of riverside. The riverside location is essential to the area's character, though access is very limited, and in places the river is all but invisible.	✓ Maintain existing riverside views, and promote the creation of new access or views ✓ Recognise the biodiversity value of vacant land incidental woodland areas
Don Valley The tidal reaches of the River Don, it continues to regenerate following realignment of the watercourse in the 1990s, and presents opportunities for improved access and biodiversity.	✓ Enhance access as part of a wider network of open spaces along the river corridor ✓ Promote opportunities to enhance habitat value that will support and benefit wildlife
Tyne Dock A modified river landscape defined by large-	✓ Continue to work with the port authority to minimise impact of dock activity on

Character Area	Guidelines
scale industrial and dockside development	character of surrounding areas ✓ Protect the remaining areas of mudflat, which are of high biodiversity value
South Shields Riverside Fragmented riverside landscape, with remaining industrial areas among redeveloped and vacant land	✓ Promote inclusion of joined-up riverside access in redevelopment proposals ✓ Allow river views to permeate through the area, in parallel with access networks

North Tyneside: A Landscape and Townscape Character Description October 2014
The River Tyne is listed as a 'Landscape of Note' in recognition of the key role it has had in the history, identity and growth of the Borough, and the important transport and economic resource it provides today.

Landscape History

The Romans were the first to develop significant settlements within the Tyne Estuary. Further expansions occurred in Norman times with the building of the castle on the north bank but the creation of a walled settlement in the Middle Ages and development of the town of Newcastle as a major seaport was the key influence in the shaping of the estuary well into the 20th Century.

The rapid development of the coal mining industry from the 17th century onwards has had the greatest influence on the Tyne Estuary and its banks. Originally large ships were required to wait outside the sand bar which restricted their entry to the river, but in the 19th century improvements were made so that ships could enter the river and the replacement of the low arched Georgian bridge by Armstrong's Swing Bridge in 1876 gave shipping access to the whole estuary. The deepening of the river and stabilisation of the banks by wooden piles and stone walling involved loss of a number of islands in the river, including King's Meadows Island, off Elswick, the neighbouring Clarence and George Islands and further inland Dent's Meadows Islands. Up until this time this area was a rural riverscape but the channel improvement works led to the loss of most of the inter-tidal area and creation of a canalised form along much of the estuary. Massive staiths were built to give the necessary height to allow coal to be tipped directly from rail wagons to waiting ships, of which Dunston remains, now a Scheduled Monument. The Tyne rapidly became the biggest coal-exporting port in the country, handling over 20 million tonnes per year by 1911. Industrialisation also led to rapid growth in population in both Newcastle and Gateshead and the sweeping away of many historic features and the culverting of tributary streams through Newcastle (the Skinner Burn, Lort Burn and Pandon Burn). Tidal tributaries, such as the Ouseburn and the River Team became busy industrial areas lined with wharves.

By the mid-20th Century, as ships became larger, the port and heavy industry moved nearer the coast into North and South Tyneside. The decline of riverbank industries started to provide opportunities for greater public access and new uses of the riverbanks. However, there remained an industrial legacy, with problems of contaminated land, industrial effluent and sewage discharge into the river. In 1971 the land-based sewage treatment works at Howdon were approved, which started a period of regeneration and redevelopment of the banks of the Tyne, with positive economic and social consequences.

Water Environment

The Tyne Estuary is classified as a Heavily Modified Water Body and is at moderate status for dissolved inorganic nitrogen but with no ecological response. It is at moderate status for invertebrates with reasons for failure of contaminated sediments and dredging. Physical modification was identified as the main reason for failure with additional impacts from urban and diffuse pollution. Physical modifications have resulted in artificially diverted, widened, deepened or straightened channels with hard, steep or vertical banks that reduce habitat diversity.

Tyne Lower and Estuary Operational Catchment WFD Status

The lower Tyne and Estuary is characterised by urbanisation, industry and business. Tributaries include the Ouseburn, Team, Don, and tidal Derwent. There are rivers, both open and culverted, flowing through agricultural areas, industrial and commercial areas, residential areas, parks and denes. Development pressures of an expanding urban fringe, large industrial estates, and runoff from large road networks alongside impermeable surfaces all lead to quantity and quality pressures on, rivers, and sewerage systems.

There are 7 water bodies in the catchment with the status (health) of the water environment in 2016 assessed as being generally moderate, with 1 water body failing for chemical status.

The main reasons for not achieving good status are:

- Pollution from waste water
- Physical modifications to the river from mining, quarrying, industry and within urban areas.
- Pollution from urban areas

Measures to improve the water environment to meet Good Status have been assessed. The measures proposed for this catchment are:

- Improve modified physical habitats
  - Removal or easement of barriers to fish migration
  - Removal or modification of engineering structure
  - Improvement to condition of channel/bed and/or banks/shoreline
  - Improvement to condition of riparian zone and /or wetland habitats
  - Changes to operation and maintenance
  - Vegetation management
- Managing pollution from waste water
  - Reduce point source pollution pathways (i.e. control entry to the water environment)
  - Mitigate/remediate point source impacts on receptor
  - Reduce point source pollution at source
- Manage pollution from towns, cities and transport
  - Reduce diffuse pollution pathways (i.e. control entry to the water environment)
  - Mitigate/remediate diffuse pollution impacts on the receptor
- Manage pollution from rural areas
  - Reduce diffuse pollution pathways (i.e. control entry to water environment)
- Manage pollution from mines
  - Mitigate/Remediate point source impacts on receptor

There is opportunity for actions taken to mitigate the effects of physical modifications to also take the opportunity to improve habitat concurrently to manage runoff. This includes sites within the Team and Don. Reversing physical modifications to restore more natural flood regimes would also bring multiple benefits, reducing flood risk whilst benefitting wildlife. New

developments also offer the opportunity to include habitat improvements in design, when planning for their interaction with the river environment.

Flood Risk

The Tyne estuary has a long history of flooding, with recorded incidents going back to at least 1339. The greatest recorded flood in 1771 caused considerable loss of life and destroyed the Tyne Bridge. Further river flooding occurred in the 1950's, 1995, 2005 and 2008. More recently recording breaking annual rainfall totals and the "Thunder Thursday" event in 2012 highlighted that the emphasis has moved from river flooding towards flash flooding. In December 2013 a tidal surge affected the Quayside at Newcastle and flooded over 25 properties. Climate change is affecting sea levels and these may impact the urban estuary area in the future.

The main sources of flooding are:

- River flooding from the River Tyne and its tributaries, particularly in Newcastle from the Ouseburn;
- Tidal flooding from the River Tyne, including from tide-locked drains and;
- Surface water flooding in the urban areas.

The risk of flooding is potentially high in this area, due to the urban nature of the land and its high regional economic importance. The combination of risk from river and tidal flooding is important to understanding and managing risk.

- There is little natural floodplain, due to the urban environment and the modified channel.
- No formal flood defence assets are present
- Flood risk could increase in the future with the threat of Climate Change.

The upstream extent of tidal flood risk is at Wylam and at locations on the lower reaches of adjoining tributaries such as the Derwent, Team, Ouseburn and Don. Tidal lag times between the river mouth at North Shields and flood risk areas upstream are very short (less than 5 minutes at Newcastle bridges, a distance of 16 km), and demonstrate the speed of tidal inflow along the River Tyne. Water levels in the Tyne Estuary and its tributaries are influenced by a combination of tide level and fluvial flow events, but occurrences of flooding are known to be predominantly tidal. The majority of the Environment Agency Flood Zones are constrained in bank along the River Tyne due to its large channel capacity. In general, the River Tyne is capable of containing water levels associated with a 0.1% design event. Along the River Tyne in Newcastle and Gateshead, there are no flood defences, as the area is dominated by tidal flooding, previous development has been raised above flooding levels. There is no Functional Floodplain within the entire reach of the tidally dominated areas of the River Tyne.

Surface water and sewer flooding also affect the catchment. Flood risk mapping studies have shown that the blockage of culverts and bridges is a potential cause of surface water flooding on numerous small streams throughout the catchment area. Including: Sugly Dene, Monkton Burn, Wallsend Dene and the Don within the Tyneside conurbation. Solutions to this source of flooding include reducing the amount of runoff entering the drainage system, the re-design of culvert screens, and frequent maintenance to reduce the potential for blockages or malfunction. The use of flood warning in the areas affected is made difficult due to the short travel times associated with this type of flooding.

A specific risk within the Estuary is from the heavily modified nature of this part of the Tyne catchment. This introduces further manmade risk in the form of channelized watercourses and loss of floodplain. Whilst predicted climate change affects are smaller along the River Tyne to those along the coast, the impact of climate change has a significant impact on flood risk.

The Northumbria River Basin District Flood Risk Management plan 2015-2021 details a number of social, economic and environmental objectives to mitigate potential impacts of flooding. Across the Tyne Catchment there are 28 measures set out to manage flood risk, 2 of which are relevant to the Tyne Estuary:

- Seek opportunities within the catchment to create habitat creation opportunities and to improve flood plain connectivity on the River Don.
- Investigate the opportunity and feasibility of providing improved flood protection to Newcastle Quayside area.

Physical and Natural Environment

Biodiversity

Estuaries are complex systems that are comprised of subtidal, intertidal and terrestrial habitats, all interconnected and interdependent and supporting a wide range of aquatic and terrestrial species. The historic influence of human activity on the Tyne Estuary has resulted in a restrained system in terms of structural changes to frontages and banks. This means that the fragments of semi-natural habitats that have remained have an even greater value.

There are 7 habitats of principal importance within the Estuary including:

- Inter-tidal Mudflats
- Coastal saltmarsh
- Lowland fens
- Lowland meadows
- Lowland dry acid grassland
- Calaminarian grassland
- Lowland mixed deciduous woodland

These habitats are conservation priorities UK wide and any activity planned within the locality of priority habitats should support conservation efforts.

Intertidal mudflats

Inter-tidal mudflats are sedimentary intertidal habitats created by deposition in low energy coastal environments, particularly estuaries and other sheltered areas. Their sediment consists mostly of silts and clays with a high organic content. They are one of the most biologically productive habitats on earth, being matched only by tropical rainforest. These areas are particularly important for wintering and migrant wading birds. As recently as the 1970s, Jarrow Slake was the most important area of inter-tidal mudflat between Teesmouth and Holy Island.

It is reported that within the tidal extent of the River Tyne (from its mouth to Wylam) mudflat and sandflats habitat totals 57ha, therefore forming significant areas for a diverse range of shorebirds. However, 100 acres have been lost to landfill at this site alone and infilling for development land such as the MetroCentre also had a huge impact. The fragments that remain continue to provide important wildlife sites and since the cessation of ship operations inland of the bridges in the 1980s, sediment has accumulated in the Dunston area and the

extent of inter-tidal mudflat has increased. Local Wildlife Sites designated for this habitat include River Tyne, Tidal Mud (Gateshead), Jarrow Slake Flats (South Tyneside) and Lemington Gut (Newcastle). The MetroGreen frontage which features an elevated mudflat of over 100m width in some locations and retains some of the most extensive mudflats within the Tyne Estuary. The area of mudflat fronting the MetroGreen site (approximately 10ha) accounts for nearly 18% of the Tyne's total mudflat and sandflat habitat.

Coastal Saltmarsh

Coastal saltmarsh comprises the upper, vegetated portions of intertidal mudflats. They occur on soft, shallow shores in sheltered coastal areas and estuaries. Saltmarsh vegetation consists of a limited number of halophytic (salt tolerant) species adapted to regular immersion by the tides. Saltmarshes are an important resource for wading birds and wildfowl. They act as high tide refuges for birds feeding on adjacent mudflats, as breeding sites for waders, gulls and terns and as a source of food for passerine birds particularly in autumn and winter. With the reduction in areas of mudflat, the majority of saltmarsh habitat has also been lost, although fragments remain at various sites along the Estuary. Local Wildlife Sites designated for this habitat include Tidal River Derwent (Gateshead), River Team Saltmarsh (Gateshead) and River Don Saltmarsh (South Tyneside).

Lowland Fens

Lowland fens are vegetated, non-woodland, habitats that are groundwater fed and either permanently, seasonally or periodically waterlogged. Grasses do not predominate as they have peat or mineral soils. They usually exist as marginal vegetation, with different types of lowland fen often merging into each other. Lowland fen by its nature is often dynamic, with vegetation fluctuating in relation to changing water levels throughout the seasons or from year to year. Within the Estuary there are instances of flood plain fen, fen that occurs in flat river valleys that flood regularly, particularly at the Tidal River Derwent Local Wildlife Site (Gateshead).

Lowland Meadows

Lowland meadows are species-rich grasslands with a near neutral pH. These grasslands are characterised by low nutrient inputs and are traditionally managed by grazing it also includes species-rich floodplain grassland which have distinct vegetation communities. Wet grassland is particularly important for breeding waders such as snipe, lapwing and curlew. Hallow Hill SSSI (Newcastle) includes examples of lowland meadows with the Tyne Estuary.

Lowland Dry Acid Grassland

Lowland Dry Acid Grassland are semi-natural grasslands generally dominated by fine-leaved grasses on nutrient-poor, free-draining soils. Some sites may be species-poor but lowland acid grassland is a scarce resource and any site is likely to be considered of high value. Ryton Willows Local Wildlife Site (Gateshead) includes examples of this habitat.

Calaminarian Grassland

Calaminarian grassland is found on alluvial shingle deposits that were contaminated by waste from historic mining for lead, silver, zinc, barium and fluorspar. Large volumes of waste were released into the rivers and deposited downstream trapped amongst the river cobbles. As rivers have cut deeper into their beds these shingle bars are left above river level and only rarely subject to flooding. They soon develop short, open grassland dominated by species and ecotypes that are tolerant of toxic metals, low nutrient levels, drought and grazing. The grassland community is structurally varied and may be species rich. The ranges and populations have declined dramatically over the last 50 years as mine sites have declined. Close House Riverside SSSI (Northumberland) contains this habitat within the Tyne Estuary.

Lowland mixed deciduous woodland

Lowland mixed deciduous woodland is characterised by trees that are more than 5m high when mature, and which form a distinct, although sometimes open, with a canopy cover of greater than 20%. It includes stands of both native and non-native broadleaved tree species, dominated by oak, ash and hazel and are typically associated with fertile moist loam and clay soils and support a rich ground flora. This habitat is found mainly within the upper reaches of the Estuary, which are more rural in nature, and includes Ryton Willows Local Nature Reserve, part of which is a SSSI, containing a mosaic of woodland, ponds, grassland and hedgerows.

Ecological Value

The River Tyne has seen dramatic improvements in ecological value and water quality over the last 50 years. A river that in the 1960's had no records of caught salmon is now said to be the best river system for salmon and sea trout in England and Wales. The demise of heavy industry along the riverside, major conservation efforts and vastly improved water quality have seen these species and many others return in abundance. The relics of heavy industry are now providing important areas of habitat. Areas of derelict and unmanaged land and urban greenspace along the estuary are important for species such as dingy skipper butterfly and for locally rare plants such as yellow wort and blue fleabane. Dunston Staiths is used as a roost and nesting site and the mudflats created by the structure altering the flow of the river provide feeding grounds for birds.

There are 943 UK species of principal importance of which 68[1] have been recorded within the Tyne Estuary. These are again of national conservation importance and consideration should be made to any impacts or identification of opportunities for enhancement when planning activity. The priority species recorded within the Tyne Estuary project area detailed in the Appendix 1 – 6.1.5 Table 1.

National and International Designations

Northumbria Coast SPA/RAMSAR

Includes the majority of the coastline between the Tees and the Tweed Estuaries; consisting mainly of rocky shore but also includes areas of estuarine intertidal mudflats and man-made structures including the south pier at the mouth of the River Tyne which are used as high tide roosts. In summer, the site supports an internationally important population of breeding little tern and Arctic tern, and 2 species of wintering waders occur in internationally important numbers, turnstone and purple sandpiper. 1.7% of the GB population of breeding little tern, 2.6% of the biogeographic population of turnstone and 1.6% biogeographic population of purple sandpiper and supported by the SPA.

Northumberland Shore SSSI

Includes most of the coastline between the Scottish border and the Tyne Estuary; providing important wintering grounds for shore birds, and it is of international, or national significance for 6 species, purple sandpiper, turnstone, sanderling, golden plover, ringed plover and redshank.

Hallow Hill SSSI

Supports remnants of flushed neutral grassland, merging into tall, fen vegetation towards the base of the slope. The pasture supports several species of butterfly, namely, small copper, wall brown, meadow brown, orange tip, green-veined white and common blue.

Ryton Willows SSSI

Includes 3 ponds; the Gut is believed to occupy part of an old meander of the River Tyne, whilst the Curling Pond and Glebe Pond occupy flooded borrow-pits which date from the construction of the Newcastle-Carlisle railway. They represent one of the few open-water sites in Tyne and Wear/eastern Durham and support associated wetland habitats of reedswamp, tall fen and alder/willow carr.

Close House Riverside SSSI

One of a series of sites in the Tyne and Allen river system where alluvial deposits, contaminated by heavy metals derived from the North Pennine Orefield upstream, support an unusual community of metal-tolerant plants. This site, on the tidal reach of the River Tyne, is the lowest point at which this metalliferous habitat is represented and furthest from the sources of metal contamination. The unusual plant community is less well developed here than at other sites further upstream, but is important as part of the sequence of sites along the river system.

Local Designations

Local Wildlife Sites are important local areas of biodiversity interest. They are recognised for their ecological value, supporting locally and nationally threatened habitats and species. Positive management and ensuring favourable condition of Local Wildlife Sites can provide a significant contribution towards delivery of biodiversity outcomes. Local Wildlife Sites also provide essential wildlife refuges, stepping stones, corridors and buffers linking and protecting sites and open spaces and make up significant contribution to local ecological

1Records from ERIC NE and Environment Agency from 2000 onwards

networks. There are 29 Local Wildlife Sites within the Tyne Estuary project area covering an area of approximately 260Ha, see Appendix 1 – 6.1.5 Table 2.

Landscape Features

Geology

The Tyne Estuary is underlain by an area of Coal Measures rocks of Upper Carboniferous age, consisting of a succession of shales and sandstones with numerous coal seams. Around 300 million years ago, the area was inundated, with large deltas accumulating sand, mud and thick vegetations, forming coal swamps as the sea receded. Sandstone rocks provide the ridge on which Newcastle and Gateshead were built. The topography of the Estuary today was then shaped by Prehistoric glaciers and ice sheets up to the early Holocene period. The River Wear originally flowed northwards to join the Tyne, but this was diverted eastwards and cut a new channel through the Magnesian Limestone Plateau to flow into the North Sea at Sunderland. The original pre-glacial course is now occupied by the River Team. The increased river flow during deglaciation also allowed the Tyne to cut a steep sided channel through the upstanding sandstone ridge; the Tyne Gorge and produced the incised valleys and denes of which tributaries of the Tyne flow. The surface geology of the Tyne Estuary is dominated by Quaternary drifts, including boulder and laminated clays, deposited by the receding glaciers some 15,000 years ago. Since this time changes to the geomorphology of the landscape have occurred as a result of human exploitation of the physical resource.

Hydrology

The River Tyne is 73 miles (118km) long and drains a large portion of North East England (2,300 km² at its tidal limit). It starts as the North Tyne, rising above the commercial forestry plantations of Kielder in the southern Cheviot Hills, and the South Tyne, rising in the remote uplands of the North Pennines near Garrigill. They join at Watersmeet and the river then flows eastwards before entering the North Sea at Tynemouth. Other major tributaries include the Rede, Allen and Derwent. The Tyne Catchment covers an area of 2,936km2 and contains 2,733 miles (4,399km) of waterways in total.

The principal fluvial flows within the Estuary are from the Rivers Tyne, Derwent, Team and Ouseburn, with minor contributions from smaller watercourses including New Burn, Blaydon Burn and Denton Burn, and possibly from culverted streams in Newcastle City centre (Skinner Burn, Lort Burn and Pandon Burn). The flow of the River Tyne is influenced by the operation of Kielder Reservoir, which has a capacity of 200 million cubic metres. It is designed principally to support abstractions from the River Tyne at Ovingham. It can also be used to support river flows in times of drought to protect fish, particularly salmon.

The Tyne Estuary is macrotidal, with a tidal range varying between 4.5m on mean spring tides and 2.4m on mean neap tides. Due to of the canalised nature of the river, significant salinity stratification occurs when the tides move the denser saline sea water in and out in a lower water layer, while the freshwater flows out to sea over the top of the salt water. Under some tidal and fluvial flow conditions, there is a net upstream movement of water in the lower layer. Stratification affects the functioning of the estuary in terms of water quality and sediment transport.

Topography

The early Holocene period has shaped the topography we now see associated with the River Tyne estuary, leaving the river draining along a wide glacial valley which narrows abruptly to a deep gorge through the centre of Newcastle and Gateshead. The shales of the coalfields form relatively low ground close to the coast. However, to the west of Newcastle and Gateshead the ground rises in response to subdued escarpments formed by thicker

sandstones. One of these sandstone ridges passes underneath Newcastle and Gateshead. De-glaciation caused the cutting of the steep sided channel of the Tyne Gorge through this upstanding sandstone ridge. As the river passes through the cities the land rises to a plateau on the Newcastle side and rises more steeply onto a rounded hill on the Gateshead side. These are split by incised valleys or denes between the hills. Further into North Tyneside and South Tyneside, the topography alters again to areas of low-lying land hugging the river bank reflecting the underlying boulder clay or land reclaimed from tidal mudflats, before on the northern bank rising again to the very steep banksides at Fish Quay and North Shields.

Climate Change
With climate change and global warming causing sea levels to rise there will be an impact on the tidal River Tyne. This impact is expected to be partially compensated by the on-going movement of the UK following the last ice age, however, sea level rise by the end of the century (when compared to 1981-2000), is likely to be in the range 0.08 m to 0.49 m to 0.30 m to 0.90m (based on UK Climate projections for Edinburgh). The risk of flooding from storm surges and high tides will increase as sea levels rise. Climate change will also affect rivers with an increased variability in river flow rates associated with either flood or drought conditions. These changes will affect the freshwater reaches of the River Tyne and its tributaries but will have limited effect on the tidal reaches of the tributaries and on peak levels in the Tyne Estuary itself. Under future climate scenarios it is expected that winter rainfall will increase, and that more intense rainfall events will occur. The UKCP18 projections indicate that in England average winter rainfall will increase by 2% drier to 33% wetter. Increased winter rainfall and more intense rainstorms will give rise to greater flood risk from surface water drainage and river sources.

The Tyne Catchment Flood Management Plan also highlights that the larger increases in flooding will be located in the lower reaches where the majority of population is located and where the combination of increased river flows and higher sea levels are most pronounced.

Newcastle and Gateshead Local Plans both recognise that flood risk is an important consideration in spatial planning. In particular with the increased threat caused by climate change and specifically reference using natural flood management measures such as river restoration, landscape management and upstream water storage to reduce or delay run-off from river catchments.

Another climate change concern for the estuary are the long-term effects of temperature rise. This may change the range of species supported by the estuary with warmer water potentially supporting invasive alien species which could out-compete indigenous flora of fauna and management action may be necessary to control such species.

Natural Environment Strategies

There are a range of national, regional and local strategies concerning the natural environment, natural capital and local biodiversity priorities which have guided the work of the Tyne Estuary study. The outcomes of the project have the capacity to contribute to each of these strategies.

A Green Future: Our 25 Year Plan to Improve the Environment (2018)
Sets out government action to help restore the condition of the natural environment and tackle the effects of climate change. It aims to deliver cleaner air and water, protect threatened species and provide richer wildlife habitats. It promotes a natural capital approach to decisions at every leve considering and creating environmental net gains. It contains a number of goals which include; improving at least 3/4 of our waters to be close to their natural state, creating or restoring 500,000 hectares of wildlife-rich habitat, making sure

that there are high quality, accessible, natural spaces close to where people live and work, particularly in urban areas and safeguarding and enhancing the beauty of our natural scenery and improving its environmental value. The use of this document should be promoted within local planning policy.

There are also a number of key policies that could influence work within the Estuary:

- Introducing new farming rules for water
- Expanding the use of natural flood management solutions
- Putting in place more sustainable drainage systems
- Promoting health and wellbeing through the natural environment
- Creating more green infrastructure

North East England Nature Partnership 20 Year Vision for Environmental Growth

North East England Nature Partnership aims to reverse biodiversity decline in North East England and become a region of Environmental Growth.
Environmental Growth recognises the link between a thriving natural environment, our health, and the economy. It promotes investment in nature, so that it is more connected, functions better and in turn provides more services. This strategy advocates creating biodiversity gain and adding value to ecosystem services through:

- Creating opportunities for partners to expand their ambitions, plans and approach to project delivery
- Encouraging businesses, communities, landowners, health professionals and individuals to work together to achieve environmental growth

It promotes putting environmental concerns at the heart of decision making. It reinforces the need to move away from the traditional focus on the protection of existing biodiversity resources towards delivering growth in ecological networks, an increase in natural capital, securing natural heritage through better management and ensuring economic activity has a positive link with our natural environment.

Tyne Catchment Management Plan 2012

This plan looks at the entire system of the River Tyne from source to estuary, understanding the issues across the entire catchment and setting out a programme of work that can begin to address these.

Goals for the Tyne Catchment:
Theme A: Conserve and restore river habitat, and adapt to / mitigate for the physical impacts of weather extremes and climate change.

Theme B: Improve people's understanding of rivers, catchments, weather extremes and climate change. Increase community participation in monitoring change and taking action to improve and protect water environments.

The key issues specifically identified for the Tyne Estuary are concerning pollution of the river. The combination of the decline of heavy industry, and regulatory limits on the amount of pollutants allowed to be discharged to rivers, have resulted in major improvements in water quality however pollution is still a major issue for the Estuary. This includes heavy metal contamination of sediments originating in former mines in the uplands and point-source pollution to the water environment from historic industrial sites in the Estuary and agriculture in the wider catchment.

Biodiversity Strategies

There are 3 Biodiversity Strategies covering the Tyne Estuary, the most relevant of these for the Tyne Estuary Project is the Newcastle and North Tyneside Biodiversity Action Plan (2012). This remains an active strategy with a monitoring report on the progress made last produced in 2018. Details of the habitat and species plans with links to the project are outlined below. The Biodiversity Action Plans for Northumberland and Durham (which includes Gateshead and South Tyneside) have both been archived. Priority Habitats and Species remain; these are still integrated into Local Plans and used as evidence for designating Local Wildlife Sites. However, there is no longer specific activity tied to these plans and there is no monitoring of progress. The relevant priority habitats and species have also been included below for reference.

Newcastle & North Tyneside Biodiversity Action Plan 2012

Buildings and Structures Habitat Action Plan
This action plan covers all buildings, their walls, roofs and associated features, and other artificial structures.

These targets remain outstanding actions relevant to the Tyne Estuary post 2018:

Target	Progress (2018)
Secure or create nesting habitat for kittiwakes along the River Tyne to enable existing colonies to expand or move.	Ongoing
Ensure existing kittiwake sites are protected	Ongoing

Estuary and Coastal Habitat Action Plan
Covers all habitats occurring within or directly adjacent to the River Tyne estuary and all natural and semi-natural habitats occurring within or directly adjacent to the tidal zone of North Tyneside's coastline.

These targets remain outstanding actions relevant to estuarine habitats post 2018:

Target	Progress (2018)
Ensure no net loss of mudflats and saltmarsh, other than by natural processes.	Ongoing
Maintain inventory of WeBS data annually	Ongoing
Investigate funding opportunities for interpretation panels along 4 locations on the River Tyne and the coast.	Not completed
Create or restore up to 0.5ha of saltmarsh habitat	Ongoing (delayed)
Minimise disturbance to wintering waders along the coast and estuary by encouraging the zoning of activities and by encouraging sensitive usage	Ongoing
Compile a mapped inventory of key coastal and estuarine sites that are used as roosting and feeding sites by coastal waders, including high tide roosts	Not completed

Potential Target Delivery Areas:

- Saltmarsh - Willington Gut, North Tyneside
- High Tide Roosts - Newburn Haugh, Newcastle
- Mudflats/Saltmarsh - Lemington Gut, Newcastle

Rivers and Watercourses Habitat Action Plan
Covers all streams and watercourses characterised by flowing freshwater, as well as their associated marginal and bankside vegetation.

These targets remain outstanding actions relevant to riverine habitats post 2018:

Target	Progress (2018)
Raise awareness of non-native invasive species along watercourses and encourage their control.	Ongoing
Map non-native invasive species along 10km of watercourse in Newcastle and North Tyneside.	Ongoing
Promote the maintenance of riparian buffer strips with a minimum width of 2 m along watercourses to improve habitat for wildlife.	Ongoing
Ensure that any developments affecting streamside habitats and associated wildlife are not permitted without appropriate and enforceable mitigation or compensation. In addition, no development should take place within 5m of any watercourse.	Ongoing
Deliver riparian improvements that will benefit wildlife along a minimum of 5km of watercourse.	Ongoing

Potential Target Delivery Areas:

- Watercourse improvements - Ouseburn, Newcastle

Otter Species Action Plan

In recent years there has been evidence of the species re-establishing itself in lowland areas of the region. In Newcastle it is present along the entire length of the Ouseburn. There is also evidence that they are utilising other small watercourses in both areas. Otters are also present on the River Tyne and occasionally along the coast.

These targets remain outstanding actions relevant to the Tyne Estuary post 2018:

Target	Progress (2018)
Maintain the current distribution of otter in Newcastle and North Tyneside.	Ongoing
Restore and improve riparian habitat along 5km of watercourse for otters.	Ongoing
Ensure all operations affecting watercourses take account of otters, retaining features such as old trees, scrub and overhanging root systems	Ongoing
Encourage public participation in submission of otter sightings and otter conservation through articles and promotional material.	Not completed
Construct and install 5 otter holts at suitable sites.	Completed but ongoing
Identify priority stretches of watercourse where habitat improvement for otters should be focused.	Completed but ongoing

Potential Target Delivery Areas:

- Habitat Creation & Management – River Tyne, Newcastle
- Habitat Creation & Management – Northumbrian Water Howdon, North Tyneside

Durham Biodiversity Action Plan 2008

- Rivers and Streams Action Plan
  Includes the Priority Habitats and Species**:** Rivers & Streams, Floodplain Grazing Marsh, Exposed Riverine Sediments, Otter
- Freshwater Fish Species Action Plan
  Priority Species: Salmon, Wild Brown Trout, Eel

Northumberland Biodiversity Action Plan 2008

- Rivers and Streams Habitat Action Plan
- Saltmarsh and Mudflats Habitat Action Plan
- Coastal Birds Species Action Plan
- Freshwater Fish Species Action Plan
- Otter Species Action Plan

Existing Biodiversity Initiatives

Tyne Kittiwakes Partnership

Kittiwakes are declining species, added to the UK Red List of Birds of Conservation Concern in 2016. During the summer the Newcastle-Gateshead quayside is home to 600 pairs of breeding Kittiwakes. Normally found on coastal cliffs, this colony is the furthest inland anywhere and makes Newcastle one of the few cities in the world to have a seabird colony in its centre. The Tyne Kittiwakes partnership works to ensure that the Kittiwake population along the Tyne is safeguarded and to improve understanding of the birds and their conservation needs. It includes the Natural History Society of Northumbria, RSPB, Northumberland and Durham Wildlife Trusts, Newcastle, Gateshead and North Tyneside Councils, Newcastle University and individual researchers and ornithologists. They are currently researching the feasibility of creating further new nesting sites for Kittiwakes, where they will not conflict with businesses and can still be enjoyed by the public.

Fish Quay Banksides Management Plan (2011-2016)

The Fish Quay banksides are located along the mouth of the Tyne estuary at North Shields. The area has been designated green space and part of the important wildlife corridor along the River Tyne. A management plan has been produced to maximise the biodiversity and conservation value of the site as well as providing a vehicle for local community activity.
General Management Aims:

- To preserve and enhance the area's wildlife and conservation value.
- To preserve and enhance the character and appearance of the conservation area.
- To provide a well-managed site containing a diverse range of habitats that can be enjoyed by the public.
- To retain and enhance strategic views across the River Tyne, which make a significant contribution to the character and appearance of the conservation area.

Environment Agency Estuary Edges

Specific design advice for schemes within estuaries has been developed by the Environment Agency through a project coordinated and steered by the Thames Estuary Partnership. Well-planned developments next to our estuaries can create better places to live and work. When reconstructing or refurbishing the banks of an estuary features should include those that support wildlife, improve public access, and educate people about the importance of protecting the environment. Replacing grey sheet piling with lush colourful plants and swards of reed stems rustling in the wind add significantly to the waterside experience. The natural habitats of our estuaries are often missing, especially in urban areas. The absence of the soft edges – where wildlife is most abundant – impacts on the ecological recovery of our rivers and estuaries. Government guidance on biodiversity now requires developers to protect and enhance biodiversity, particularly priority habitats such as mudflats and saltmarsh. Estuary and river edge design must improve the environment for fish and other wildlife, as well as meet national, regional and local Biodiversity Action Plan targets.

Land Use

In general, the River Tyne estuary is characterised by more rural and natural habitats to the west and to the southwest up the Derwent valley, with more developed land interspersed with amenity grassland and planted areas towards the urban areas. The change in character occurs around Ryton and Newburn and, as a general rule, the areas inland of these settlements are of rural character and to seaward they are urban. Through the cities and towards the coast the riverside is mostly developed, with industrial, retail, leisure and residential uses. In the western part of the estuary the dominant land uses are agricultural and recreational and this is reflected in the preponderance of farmland and golf courses, although there are areas of locally valued landscapes including the Tyne Riverside Country Park and some industrial riverside areas which support a mixture of small to medium commercial and industrial premises.

The river corridor through the urban areas, has provided one of the main focuses of development, both historically and recently within the estuary. Within the floodplain areas the predominant land-use remains industrial. However, within the urban centres the landscape is more transitional in character as the previous industrial land-use moves towards more residential and mixed-uses. The River Tyne corridor has attracted house builders with its desirable riverfront location, and new high density, high rise luxury apartments line the river and the city centre, with new mixed-use developments continuing to come forward. Out towards the mouth of the estuary, the land use remains more extensively industrial with limited access to the riverside. The riverside around Wallsend is defined by large industrial units interspersed by significant areas of concrete hardstanding. East of the Tyne Tunnel, on the northern bank, is the Port of Tyne.

River Derwent
The floodplain landscape of the River Derwent is generally masked by industrial estates, amenity grassland and new building plots on reclaimed land. The area does not function well as a gateway to the River Derwent valley which is one of the area's principal green infrastructure assets. However, development at MetroGreen, a 213 hectare brownfield site on the south bank of the River Tyne, surrounding the Metrocentre has the potential to alter this. Existing land use is dominated by retail and leisure with some industrial uses surrounding the Derwent. Forward planning is for a new sustainable urban community of 2,000 homes with a network of high-quality green and blue spaces and routes integrating it with the surrounding area.

River Team
Historically, the river and its catchment have been deeply affected by industry: coal mining, shipbuilding and steelworks created one of the first urban industrial communities, while housing produced brick quarries, subsequently used as landfill sites. Today it is a mix of urban, rural and industrial areas, with former riverside industrial land is being redeveloped with housing. The River Team is mostly hidden behind industrial buildings, although where it is revealed it is often lined by trees and vegetation.

Ouseburn
Originally agricultural land, it developed into an industrial environment followed by the development of a self-sustaining community. The heavy industry of the past has been replaced by smaller businesses, mainly related to the car industry, arts and crafts workshops, residential conversions, redundant open spaces suitable for redevelopment, and green sites.

River Don
The river emerges into the Tyne at Jarrow Slake, formerly an area of mudflats, but now reclaimed for industrial use. The majority of the wider area within the Tidal reach comprises public open space of various types and functions, with small areas of inter-war and post-war housing and other built development inset within the open space. Key features are the remains of St Paul's Monastery in Jarrow, and the associated Bede World museum. The area is crossed by transport corridors.

Strategic Policy

There are a number of regional strategies important and relevant to the development of the Tyne Estuary Partnership. These are detailed below.

North East Combined Authority Transport Manifesto December 2016
Sets out a single approach to transport across the 7 North East Local Authorities with the aim of delivering good transport that enables economic growth and sustains jobs and communities. This sets out the role of the Ports as gateways to world trade and that future work will: *"Explore better use of our main rivers as transport arteries"*

North East Local Enterprise Partnership Strategic Economic Plan January 2017
Sets out the strategic economic direction for the North East region and details key sectors for targeted investments and actions to create and support the right conditions for successful growth. The Tyne Estuary includes 3 Enterprise Zone sites. These are a part of the Government's Industrial Strategy to support businesses and enable local economic growth, by offering tax incentives and support for investment. They are seen as the driving force of local economies as they unlock key development sites, consolidate infrastructure, attract business and create jobs. North Bank of Tyne was designated in 2012, with a further extension of this site and Holborn Riverside Sites, South Shields designated in 2017. Holborn Riverside is supporting a new mixed-use development with plans to convert disused docks and surrounding brownfield land into a new riverside quarter with opportunities to preserve parts of the riversides industrial history and create a new public realm.

Green Infrastructure Strategies
The green infrastructure resource along the Tyne Estuary has been shaped by its industrial history. Whilst historically riverside industry restricted access and resulted in the degradation of bankside and intertidal habitats, after their demise they have facilitated a network of green corridors that have developed along former waggonways and disused railways, with re-development and re-use providing further opportunities to increase the resource available.

Newcastle City Council and Gateshead Council

Green Infrastructure Strategy Report 2011
There is a focus on the River Tyne as a key recreational, access and wildlife corridor of shared significance for Newcastle and Gateshead and a physical connection between many of the future growth locations. However, there is a recognised issue with maximising the benefits from and protection of the River Tyne corridor, which is both a strategic corridor and a barrier.

Priorities for Action
- Strategic Corridors
  - The integrity of the strategic network is safeguarded and enhanced.
  - Gaps within the strategic green infrastructure corridors that limit wildlife movement or access by people using sustainable non-motorised transport are addressed.

- Biodiversity
    - Address gaps and constraints along wildlife enhancement corridors and ensure that all green infrastructure links are designed to act as wildlife corridors.
- Recreation, quiet enjoyment and health benefits
    - Maximise opportunities for recreational use of green infrastructure, including the River Tyne and its banks, and realisation of associated health benefits, consistent with protection and enhancement of biodiversity.
- Sustainable water and flood risk management
    - We will seek to maximise flood alleviation using green infrastructure and protect and manage flood plains.

Wildlife Network Gaps

- 2. River Tyne urban encroachment in area where the bridges cross the river.
- 4. River Team - heavily polluted tidal section.
- 5. River Derwent - the canalised lower part of the tidal section.

Opportunity Areas

- D – Dunston Staiths - the surrounding mudflat is the most important inter-tidal area on the tidal River Tyne for birds.
    - Increase/improve access, use and cultural heritage interpretation of the staiths, while maintaining the wildlife value of the mudflats and the staiths themselves as a bird roosting site.
- F – Metro Green/Scotswood
    - Potential for green infrastructure development around the flood zone and retail area.
    - Potential for better access to the riverbank at the MetroCentre.
- G – Newburn Haugh/Riverside - within a river meander with relict tidal channel providing saline grassland and some saltmarsh habitat
    - Possible area for salt marsh extension along Lemington Gut.
    - Possible increased use of the River Tyne for recreation.
- J - Walker Riverside/Felling Shore - Extensive green linear riverbank areas.
    - Enhancement of the riverside areas to increase perceptions of safety and support accessibility along these linear parks areas, supporting regeneration objectives.
- M – Lower Derwent Valley
    - Improvement of green infrastructure access between the Derwent Walk and the River Tyne, particularly on the east bank of the River Derwent, where paths pass though poor quality industrial areas.
    - Softening of riverbanks where land is available to provide better marginal habitat.

Newcastle City Council and Gateshead Council
Green Infrastructure Study – River Tyne Report 2011

Due to the cross-cutting element of green infrastructure that the River Tyne delivers, a separate River Tyne Evidence Base was included within the evidence base for the Green Infrastructure Strategy with a specific strategy for the River Tyne corridor.

This strategy recognises the importance of the River Tyne as a key recreational, access and wildlife corridor of shared significance for Newcastle and Gateshead and a physical connection between many of the future growth locations. It takes an ecosystem approach

and considers the tidal River Tyne in Newcastle Gateshead as a single functional entity and a shared resource requiring integrated management by the 2 councils and partner organisations, such as neighbouring local authorities, the Environment Agency and the Port of Tyne Authority.

Objectives:

- Maintenance of the physical extent and chemical quality of the water environment, including floodplains, the full range of inter-tidal and tidally influenced habitats and fully aquatic habitat.
- Alleviation of deficiencies in and threats to such habitats, particularly gaps in wildlife corridors and loss of habitat due to 'tidal squeeze' between developed river banks on one hand and deepened channels and rising sea levels on the other.

Themes:

- Strategic Corridor
  - Recognise the value of the River Tyne and protect its green infrastructure functions in terms of use of the waterway and its banks by both people and wildlife.
- Development areas
  - Ensure that waterside redevelopment is set back from the river and incorporates public access to the riverside and adequate buffer zones to protect wildlife associated with the river corridor.
- Extent and quality of the aquatic environment
  - No loss of inter-tidal area as a result of development schemes, increase the inter-tidal area through planning agreements, particularly saltmarsh.
  - Gain green infrastructure and wildlife benefits through better floodplain management and re-instatement of functional floodplain.

Green Gateshead
Green Infrastructure Delivery Plan 2013-2030

This sets the context for green infrastructure work across the borough, translating the priorities identified in the strategies above into specific actions. The whole of the River Tyne strategic GI corridor is identified as an Opportunity Area.

Spatial Projects:

- S3 Felling Shore
  - Enhancement of riverside to improve quality of access
  - Opportunities for biodiversity enhancements on riverside, including enhancement of existing Felling Shore LWS
- S6 Dunston Staiths & Saltmarsh Garden
  - Managed seasonal access to part of the Staiths, saltmarsh and other habitat enhancement, community engagement combining historic and natural environment
- S7 Lower Team Valley
  - De-culverting, enhancing biodiversity and management of surface water and fluvial flood risk, improving water quality.
  - Closing the River Team Wildlife Corridor Gap
- S10 Metrogreen
  - Multi-functional GI, combining improved access, biodiversity, landscaping flood defence and surface water management using SuDS. The riverside area is particularly important for access and biodiversity.
  - Tidal and fluvial flood risk present, opportunity for swales and storage areas to manager surface water
- S11 Lower Derwent Valley

- Scope for multi-functional GI and surface water management/SuDS.
- Shibdon Meadows and the Hurrocks are functional floodplain
- Improvement to riverside access and biodiversity enhancements
- Restoration of Shibdon Meadows; multi-functional GI, enhancing wetland for wildlife, managed public access, flood storage capacity

- S15 River Tyne
  - The wintering wading bird population is regionally significant but very susceptible to disturbance. Riverside and public access needs to be screened and buffered in some areas to avoid disturbance.

Newcastle City Council
Green Infrastructure Delivery Framework 2018

This builds upon the joint green infrastructure strategy and provides a framework for implementation and monitoring of green infrastructure delivery.
Objectives:

Theme 1: Protection and Enhancement of Green Infrastructure, Strategic Network Corridors and Opportunity Areas

- Safeguard and enhance the strategic green infrastructure network.
- Address gaps within the strategic green infrastructure corridors and opportunity areas.
- Use green infrastructure to enhance landscapes, townscapes, heritage assets and contribute to the creation of distinctive and attractive green spaces.
- Maximise opportunity to seek the greening of major transport corridors.

Theme 2: Protection and Enhancement of Natural Environment and Biodiversity

- Protect and enhance biodiversity, natural assets and landscape character when planning green infrastructure.
- Ensure development does not harm areas statutorily designated for their landscape, wildlife or historic qualities.
- Seek to address gaps and constraints along Wildlife Enhancement Corridors and ensure green infrastructure links are designed to act as Wildlife Enhancement Corridors.
- Protect, monitor and promote positive management of designated sites.

Theme 4: Mitigating and adapting to climate change

- Promote mitigation of, and adaptation to, climate change through the provision and enhancement of green infrastructure.
- Maximise flood alleviation using green infrastructure and protect and manage flood plains.
- Seek to ensure that new development incorporates green spaces, green roofs and SuDs for management of surface water and heat island effects.

North Tyneside's Green Infrastructure Strategy 2015
The River Tyne is included as a Biodiversity and Blue Infrastructure Asset and as the primary green infrastructure cross-boundary assets with both Newcastle and South Tyneside.

Objectives:

- Provide a connected network of healthy, wildlife rich, natural ecosystems
  - Improve the amount and mix of protected and priority habitats and species in the urban area.
  - Improve the biodiversity value of the wildlife corridors.

- Deliver net biodiversity gains through well planned green infrastructure and beneficial design features in either new or restored buildings
- Provide more stepping stones and buffer zones for wildlife to move more easily
- Maintain and improve the Borough's air and water quality
- Enhance GI's multifunctionality through the incorporation of techniques such as SuDs, artificial habitats and increasing sustainable access, community facilities and encouraging productive green space

- Minimise the impact of, and adapt to the effects of climate change
  - Design strategic flood solutions for North Tyneside that delivers multifunctional green infrastructure benefits
  - Flood zones and sites highlighted within the SFRA should be considered for GI development/ enhancement, particularly in relation to their potential to support recreation and biodiversity

South Tyneside

SPD 3: Green Infrastructure Strategy 2013

The River Tyne is designated as a Strategic Green Infrastructure Corridor, providing an important biodiversity resource that includes a variety of different habitats and as well as important recreational facilities and access routes. It is also listed as a green infrastructure asset within the Climate Change and Water Quality objective.

River Corridor objectives:

- Manage flooding and biodiversity along the River Corridors
  - Creation of wetland areas along the river.
  - Protect remaining areas of mudflat, which are of high biodiversity value.
- Ensure accessibility to riverside areas and recreational spaces
  - Promote and retain access to riverside areas.

Climate Change and Water Quality objectives:

- Sustainable Water Management
  - Use green space to assist in flood alleviation: Identify areas that could be used to store floodwater providing alleviation to nearby developments.

Northumberland Green Infrastructure Strategy 2011

Recognises that the River Tyne is a regional Green Infrastructure Asset, connecting the settlements within the county and outside with the countryside, coast and beyond.
Highlights that river corridors are an important part of the County's green and blue infrastructure, significantly as a means of managing flood risk through the provision of space to hold, store and allow water to disperse.
The key objectives for water environments are to:

- Manage the risks and impact of flooding.
- To manage and improve opportunities for water environments to contribute to bio-diversity, and provide a recreational resource, as well as sustaining the requirements of the county's agriculture and environment.
- To provide a sustainable source of water.

The key objectives for biodiversity are to:

- Conserve, improve and enhance habitats in accordance with the County's Biodiversity Action Plan and individual Species Action Plans.
- Improve the connectivity of habitats at all levels, designations and scales.
- Develop alternative destinations for recreation and to provide new habitat sites.

Local Plans

Each of the Local Authorities covering the Tyne Estuary is at different stages of developing their Local Plans, with some still at consultation stage and others partly adopted. These documents provide a strategic framework that balance development against locally identified needs and priorities. They are the key strategic documents that set out local planning policies and identify how land is used, determining what will be built where. Along with National Planning Policy more localised studies such as Green Infrastructure Strategies and Flood Risk Management Strategies have informed and underpinned the preparation of Local Plans. Each plan has policies that support the delivery of Green Infrastructure, Biodiversity enhancements and improvements to the setting of the River Tyne, and sets out how development should contribute towards these aims. Details of the relevant policies in each Authority area are set out below.

Core Strategy and Urban Core Plan for Gateshead and Newcastle upon Tyne 2010-2030

This strategic planning framework guides development in Newcastle and Gateshead to 2030. It is the first part of both councils Local Plan, containing an overall vision and spatial strategy to deliver economic prosperity and create lifetime neighbourhoods. Relevant sub-sections include, see Appendix 1 – 6.1.6 Table 1 for full details:

- CS15 Place-Making.
- CS14 Wellbeing and Health.
- CS17 Flood Risk and Water Management.
- CS18 Green Infrastructure and the Natural Environment.
- UC3 Leisure, Culture and Tourism.
- UC15 Urban Green Infrastructure.
- Sub-Areas and Site Specific Polices: D3, QO1, QB2, QB3.

Sitting below the joint Core Strategy, Newcastle and Gateshead have both prepared more detailed planning policy documents (the Newcastle Development and Allocations Plan (submission March 2019) which provide the non-strategic detailed policies to support growth. Relevant sub-sections include, see Appendix 1 – 6.1.6 Table 2 for full details:

- DM26 – Flood Risk and Water Management.
- DM27 – Protecting and Enhancing Green Infrastructure.
- DM28 – Trees and Landscaping.
- DM29 – Protecting and Enhancing Biodiversity and Habitats.

Gateshead: Making Spaces for Growing Places (submission October 2018)

MSGP intends to: set out detailed policies to both assist applicants, and inform decisions made on planning applications; allocate land for particular types of development; designate land on the basis of its use or quality, including conservation areas, retail centres and local wildlife sites; and identify areas where there may be limitations on development. Relevant sub-sections include, see Appendix 1 – 6.1.6 Table 3 for full details:

- MSGP30 Flood Risk Management
- MSGP31 Water Quality and River Environments
- MSCP32 Green Infrastructure and Flood Management Scheme
- MSGP33 Maintaining, Protecting and Enhancing Green Infrastructure
- MSGP38 Biodiversity and Geodiversity
- MSGP 39 The River Tyne
- MSGP51 Gateshead Wharf.

North Tyneside's Local Plan (2017) sets out the policies and proposals to guide planning decisions and establishes the framework for the sustainable growth and development up to 2032. Relevant sections include, see Appendix 1 – 6.1.6 Table 4 for full details:

- S2.1 Economic Growth Strategy.

- S5.1 Strategic Green Infrastructure.
- S5.4 Biodiversity and Geodiversity.
- S5.10 Water Quality.
- DM5. 12 Development and Flood Risk.
- DM5.7 Wildlife Corridors.
- Area Specific Policies: AS2.5 and AS8.1.

South Tyneside
South Tyneside is in the process of developing a new Local Plan, but this is not yet at a stage where draft policies have been published. As such the existing Local Development Framework, Core Strategy June 2007 still contains relevant policies to support work within the Tyne Estuary. Relevant sections include, see Appendix 1 – 6.1.6 Table 5 for full details:

- ST1 Spatial Strategy for South Tyneside.
- SC6 Providing for Recreational Open Space, Sport and Leisure.
- EA3 Biodiversity and Geodiversity.
- EA5 Environmental Protection.

Development Management Policies **December 2011** (see Appendix 1 – 6.1.6 Table 6)

Northumberland Local Plan Publication Draft Plan January 2019
Northumberland draft local plan sets out strategic planning policies and the scale and distribution of new development which is required to meet Northumberland's needs to 2036. Northumberland covers only a very small area of the feasibility study. Relevant sections include, see Appendix 1 – 6.1. 6 Table 7 for full details:

- STP 6 Green Infrastructure.
- ENV 2 Biodiversity and Geodiversity.
- WAT 3 Flooding.
- POL 2 Pollution and Air, Soil and Water Quality.

Area Action Policies
Within several Local Plans, specific areas of the Tyne Estuary have been designated as development priorities and as such more detailed frameworks have been produced to guide how development proceeds in these priority areas.

Gateshead MetroGreen
A brownfield site on the south bank of the River Tyne surrounding the Metrocentre. The proposal for development includes new residential neighbourhoods with a wide choice of housing, as well as commercial, leisure and community facilities. It will feature a network of green spaces and routes for pedestrians and cyclists. Gateshead Council is currently preparing an Area Action Plan (AAP) for MetroGreen which will guide future sustainable development in the area.

Enhancing the connection to the River Tyne is seen as a key outcome:
"Create a network of safe, usable and attractive green spaces and routes, integrated with tidal and surface water mitigation measures, which protect and promote biodiversity and provide pedestrian and cycle access through the site, to the River Tyne corridor and the wider strategic Green Infrastructure and cycle Network"

South Shields 365: Riverside
South Shields Riverside is a priority regeneration area with the objective of connecting the Riverside, Foreshore and Town Centre. Key objectives linked to the River Tyne estuary include:

- Improve and encourage access to the waterfront
- Promote cross river activities

A strategic planning document was adopted in 2009 which sets out a sustainable long-term policy framework for the regeneration area. Delivering enhancement green infrastructure and increased access to the riverside are key principles within the strategy.

Strategic vision

> *"To seek a more sustainable, longer-term view towards the regeneration of the riverfront that balances the desire for an active waterfront with the ambitions of a growing residential community"*

Part of the area has been awarded Enterprise Zone status by the Local Enterprise Partnership.

River Tyne North Bank Strategic Policy Area

This includes the area around Wallsend and Willington Quay, with a specific focus on the potential opportunities associated with the River Tyne for regionally and nationally significant investment that could prove to be central to the wider regeneration of the area, contributing to the local and regional economy and benefiting local communities. The area includes almost 10 kilometres of riverfront, which has been the focus of industrial and marine development over the last 200 years, resulting in significant dock infrastructure. As a consequence large areas of the waterfront are publicly inaccessible and in private ownership and use. Delivering an enhanced network of green spaces that improve the provision of open space and linkages between key environmental assets is seen as a key outcome.

Key Objectives

"Optimising the environmental, social and economic sustainability of the redevelopment, both through the physical developments and the implementation process"

The site has also been designated as an Enterprise Zone, with the added financial support that provides.

Wider Benefits

Potential greening is not just for environmental gain. It will be situated within existing and expanding commercial, social and cultural operations along the river estuary which are central to the region's broader development.

Tyne Estuary enhancements will increase natural capital and make the area a better place to live, work and play. Improvements will have opportunity to realise a plethora of wider benefits to society and the economy including:

- Attracting tourism, skills and investment
- Producing natural capital gains
- Significant regeneration improvements; increasing dwell spaces and time therefore leading to increased interaction with commercial developments.
- Increasing rental/let income potential and equity yield for developers
- Improved knowledge of and access to the river/ river environment leading to significant health and wellbeing improvements
- Educational and engagement opportunities leading to increased ownership, care and reduced pollution
- Social, cultural and heritage enhancements
- Address climate change through clean air interventions (planting, encouraging more walking/ cycling along a more attractive river front), carbon storage.

Greening options all deliver full ecosystem services enhancements that ultimately deliver environmental and economic net gain.

- **Ecosystem Services** are the functions and products from nature that can be turned into benefits with varying degrees of human input.
- **Benefits** are the changes in human welfare (or well-being) that result from the use or consumption of goods, or from the knowledge that something exists.

Delivering environmental and green infrastructure improvements significantly contributes to the quality of the natural and built environment and is integral to the health and quality of life of communities. A healthy and biodiverse natural environment makes a positive contribution to everyone's health, throughout a person's entire life; which is a crucial wider benefit of this work.

Health and Wellbeing

The role of nature in good health and wellbeing goes beyond activity in natural assets. The greatest population health wide benefits come from daily passive exposure to nature through; street trees, woodlands, hedgerows, wildflowers, ponds, rivers, pollinators and birds. They are even more important to our health in urban areas. Creating more accessible, natural green spaces increases people's contact with the natural world.
The key health benefits of a high-quality natural environment include:

1. Improvements in mental health and wellbeing.
2. Lower rates of obesity.
3. Higher levels of physical activity.
4. Better self-rated health.
5. Increased longevity in older people.
6. Cleaner air with improved respiratory health.

The River Tyne has the potential to contribute to health and wellbeing through providing opportunities for physical recreation on the water and on the banks as well as providing the opportunity for daily exposure to a high-quality natural environment. It also provides an important link between the urban area and the more rural environment to the west.

Precedents

Many of the world's largest cities are located near to water sources, and networks of urban "blue infrastructure"; canals, harbors, rain gardens and so forth, have been constructed to capture the benefits and minimise flood risks.

Globally, cities are facing severe water uncertainties such as floods, droughts, and upstream activities on trans-boundary rivers. The increasing pressure, intensity, and speed of urbanisation has led to the disappearance of any visible form of water infrastructure in most UK cities. Urban coastal populations are growing, and many cities have seen an extensive post-industrial transformation of canals, riversides, docks, etc to leisure areas. The potential benefits of such waterside regeneration in terms of public health have only recently been scientifically investigated.

Local government, urban planners, academics and universities, business and non-profit organisations are reimagining these underutilised and neglected water features focusing on natural and semi-natural solutions as a means of combatting the pressures created by population increase and climate change. With a focus on opportunities that maximise broader ecosystem services benefits including the environmental, social and economic

benefits of water-based interventions; investment in blue-green infrastructure has seen a shift in policy. It is moving towards the animation of these spaces to improve the quality and function of the landscape in the hope of reconnecting the communities to the natural world and hidden ecosystems within the places that they live.

Blue-Green Infrastructure development has been implemented in the UK and elsewhere in the world to enhancement rivers, examples include:

- Manchester - where biodiversity and water quality were increased along the river corridor.
- Paddington Basin, London - where floating parks incorporate lawn areas, mixed raised borders and communal seating, as well as walkways on decked platforms. A separate pontoon was designed to attract ground-nesting birds.
- Lincoln – floating islands used to enhance recreational use and retail developments.
- Chicago – where existing hard steel-clad edges were softened with floating gardens promoting healthier rivers, people and cities.

Manchester

Merchant Square, Paddington, London

Lincoln

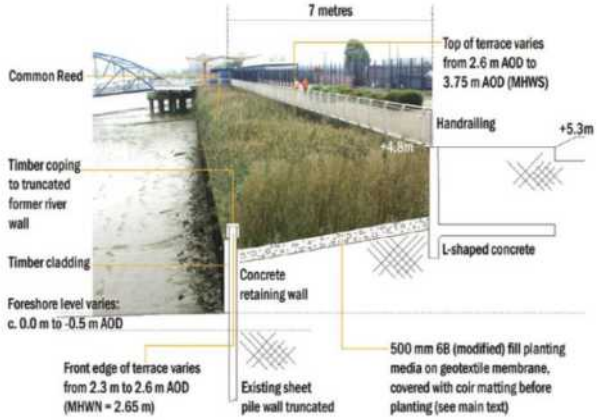

Chicago

Throughout the UK a number of River Estuary Partnerships (Thames, Tees, and Coquet) have brought together multi-sector stakeholders to improve the water and environmental quality of the estuaries. They have accessed funding to create and/or provide: new habitats; natural riverbanks and edging; secure environmental designations; guidance for developers/businesses; reduction in waste; and community engagement and education activities.

Thames Estuary Partnership (TEP)
TEP was formed in response to the challenges facing the river Thames; bringing together all the major stakeholders with an interest in the river. With a strong network of over 4,000 stakeholders, TEP is an effective membership organisation delivering best practice, knowledge sharing and key connections. TEP vision seeks to:

- Conserve and enhance the natural assets of the area and make a positive contribution to its character
- Balance the competing demands placed on the river
- Create vibrant, sustainable communities
- Create a high quality multi-functional, well-connected network of river-related spaces and places that are accessible to all, and are managed and maintained to the highest standards for people and wildlife
- Promote the use of the river as an artery for public, commercial, industrial, leisure, and recreational transport and use.

Eastern wall, Greenwich Peninsula, London: Site 2 during construction



Eastern wall, Greenwich Peninsula, London: Site 2 north end, six years after implementation (autumn)

Biomatrix Water is one of a few new ecological technology companies working primarily in the water sector, across the world providing products and services to meet the growing demand for ecological water technology that is functional, attractive and sustainable. Biomatrix Water provide excellent examples of integrating ecology and engineering to improve water quality and revitalise the natural functioning of waterways in support of biodiversity, habitat and greater resilience. They provide floating ecosystems and project management for waterway restoration and wastewater treatment.

Research Studies

NATURVATION: Led by Durham University, NATURVATION involves 14 institutions across Europe working in fields as diverse as urban development, innovation studies, geography, ecology, environmental assessment and economics; investigating nature-based solutions for sustainable development in cities. Newcastle has been selected as one of 6 case study cities across Europe; with the Newcastle Urban-Regional Innovation Partnerships selecting health, water and regeneration as key priorities for the programme.

NATURVATION works alongside communities and stakeholders to develop the knowledge and tools required to realise the potential of nature-based solutions for meeting urban sustainability goals; the Tyne Estuary Partnership has been selected as a key stakeholder to trial a new Urban Nature Index. The Index is a nature-based tool which would calculate the value of nature-based solutions; information gained from this initiative would allow the Tyne Estuary Partnerships to develop a robust narrative for nature-based solution linking benefits to scientific evidence. Key sites along the Tyne Estuary which will be used as case studies to test the tool kit include:

- Forth Yard
- Walker Riverside Park

Blue Green Path to Urban Flood Resilience:

Groundwork was delighted to work alongside signatories of the Newcastle Declaration on Blue and Green Infrastructure to produce world-class research outputs demonstrating the multiple benefits of Blue-Green strategies. Groundwork are committed to supporting the initiative as it works towards its primary goals:

- Providing local, regional and national leadership, encouraging and collaborating with others to increase the uptake of blue and green infrastructure;
- Developing a supportive policy framework;
- Encouraging alternative ways of working and funding models to realise multiple benefits;
- Continuing to build and share data, knowledge and understanding to support the implementation of these approaches; and
- Raising awareness and building capacity amongst communities to develop and maintain blue and green infrastructure, as part of wider resilience building initiatives.

Water Hub Project: The Water Hub Project seeks to harness the talent and technology of the business community to solve really challenges that affect communities and their surroundings, in areas such as water efficiency, water cleaning and flooding. In partnership Durham University, Environment Agency, Northumbrian Water and Durham County Council the Water Hub focuses on co-development of solutions to key water and environmental challenges focuses on 5 key areas:

- Data Insight;
- Water Futures;
- Catchment Management;
- Water, Energy and Waste; and
- Enabling Resilient Communities.

In order to achieve this, the partnership offers: small capital grants; challenge events; networking opportunities; live test and demonstration facilities; research collaborations; and business support and mentoring. Greening Newcastle/ Gateshead Quayside is proposed as an innovation project as part of this scheme.

PART 3 – OVERVIEW OF OPPORTUNITIES

Extensive desk research, survey work consultation and partnership engagement and development has supported the identification of 77 potential opportunity sites along the Tyne Estuary that could benefit from sustainable environmental and economic improvements. For each site, where possible, a number of opportunities and constraints have been identified that will need to be taken into consideration during the selection, development and implementation of each enhancement scheme.

The Potential Opportunities table below sets out a list of 77 Tyne Estuary enhancement points which have been broken down into: priority sites, potential sites, development sites and designated sites and parks of interest. Once all sites were identified the technical opportunities identified by the University of Hull were mapped against the potentially feasible opportunities in the short (1-3 years) to medium (4-5 years) term. Initial prioritisation was then undertaken combining expertise and knowledge from Groundwork, The University of Hull and the EA considering factors including:

- Potential ecological enhancements
- Potential water quality improvements
- Ecosystem services benefits
- Landownership contact, engagement and support for the project
- Potential constraints
- Stage of development (if it was a development site) and planning
- Potential for matched funding
- Broader partner appeal and buy in

This was consulted on at 2 of the stakeholder events to agree the current prioritised projects list. However, it must be noted that this in a live, evolving project and priorities can (and most likely will) change as and when differing opportunities arise.

Types of Enhancement

As described in Part 1: Methodology above, the University of Hull undertook a thorough survey approach to identify different types of estuary edge, or bank, enhancements that could, theoretically, be applied to the Tyne Estuary as a whole and specific detail on the MetroGreen development site.

The enhancement opportunities identified below provide a framework of natural and semi-natural solutions as the preferable approach to remediating coastal water quality problems and include either restoring natural habitats from existing degraded habitat, or newly created habitat.

Enhancements could be considered to increase the extent of the existing habitat provision of saltmarsh or mudflats, or to create new areas of estuarine fringing habitat. Not only does this provide aesthetic wins, but the greening of the banks promotes the ‘corridor effect’ and connectivity of linking areas of habitat between the terrestrial and estuary banks and along the estuary (tidal limit to the mouth). Bank softening measures can deliver foraging and roost function to a range of bird species as well as habitat to enhance fish use of the system. As such, some of the estuary enhancement measures will have a direct effect on function delivery for birds, seen through the provision of additional foraging mudflat and roost resources for wintering and passage wildfowl and waders and through increases in the utilisation of fish species in the area which form part of the diet of some important species

e.g. Terns. In addition, there is the potential for enhancement measures to deliver suitable roosting sites for some wader species as well as breeding habitat for some birds.

Enhancements appropriate for the Tyne Estuary include:

- Greening of the banks: vegetated pontoons, platforms and edges; wooden planting frameworks; floating islands and rafts
- Planting: saltmarsh enhancements; planting gabion boxes; pre-seeded coir mats and wire 'rocknet'; brushwood faggots
- Re-profiling: using existing infrastructure to created terraces and reduced slope gradients
- Fish habitat creation: fish refuge boxes; egg-laying medium
- Bird enhancements: roosting/breeding rafts; kittiwake towers/ledges; other elevated structures and ledges for nesting/roosting
- Otter enhancements: artificial otter holts

Further information about these options and their ecosystem benefits can be found in:

- *Section 3, Tyne Estuary Edges Enhancement Study: MetroGreen Priority Site, 2019*
- *Section 3, Tyne Estuary Edges Enhancement Study, 2019*

A further list of designs and case studies can be found in the *Estuary Edges: Ecological Design Advice (Environment Agency, 2008)*, see Appendix 4, with other enhancement options derived from bioengineering companies and the scientific literature.

Licences, permissions and consents
Any work other than maintenance may be subject to requiring a marine licence from the Marine Management Organisation (MMO) and will need landowner permission and likely other consents and permissions.

The MMO website states that:

The MMO is responsible for marine licensing in English inshore and offshore areas and for Welsh and Northern Ireland offshore areas.

The inshore areas include any area which is submerged at mean high water spring tide up to the territorial limit. They also include the waters of every estuary, river or channel where the tide flows at mean high water spring tide. Responsibilities extend to waters in areas which are closed permanently or intermittently by a lock or other artificial means against the regular action of the tide, where seawater flows into or out from the area either continuously or from time to time.

Some interventions may also require a Marine Wildlife Licence.

Ecosystem Services and Benefits

Ecosystems are not static but dynamic and discontinuous systems with interactions and connections evolving both spatially and temporally. They represent ecological processes and the resources they provide can be expressed in terms of goods and services. Ecosystem processes can be considered value-neutral, whilst their goods and services are considered to have a value to society; ecosystem services therefore are the benefits people obtain from ecosystems. Nature-based solutions are a possible and often preferable approach to remediating coastal water quality problems and include restoration of natural habitats from existing degraded habitat or newly created habitat.

The UK Governments 25 Year Plan for the Environment (HM Government, 2018) recognises the importance of natural capital in the marine environment, and the ecosystem services that it delivers. For the purposes of this report the following definitions are used (Natural Capital Committee, 2017):

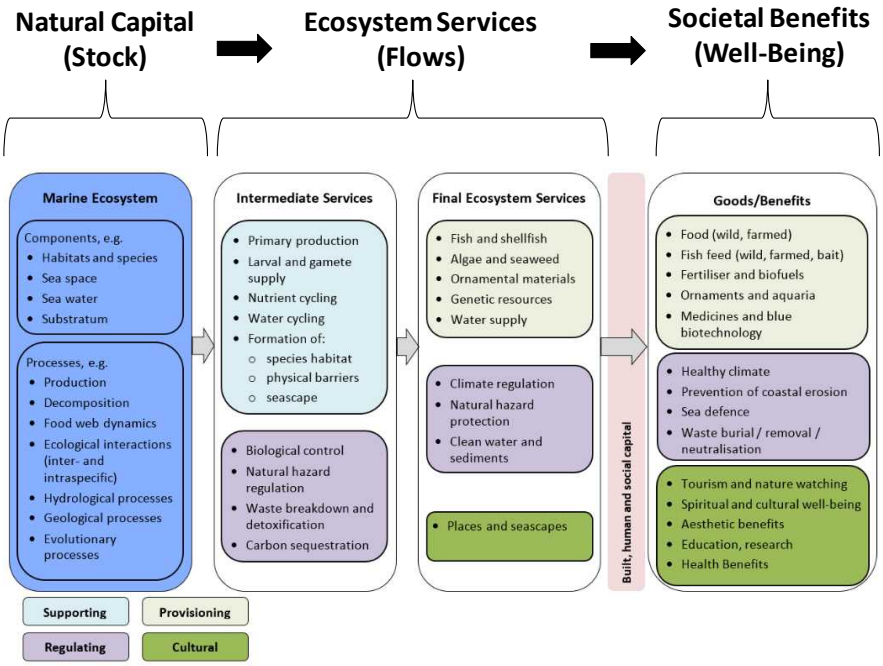
Natural Capital are the elements of nature that directly or indirectly produce value to people, including ecosystems, species, freshwater, land, minerals, the air and oceans, as well as natural processes and functions.
Ecosystem Services are the functions and products from nature that can be turned into benefits with varying degrees of human input.
Benefits are the changes in human welfare (or well-being) that result from the use or consumption of goods, or from the knowledge that something exists. This can have a positive impact on a wide range of beneficiaries from the general public, to developers, land owners and public authorities.

Multiple greening opportunities that could have ecosystem services benefits have been identified along the Estuary grouped into 4 typologies:

- Engineered vertical hard structures such as quays
- Banks with differing composition and fronting habitat
- Areas of derelict wet dock
- Natural banks

The scale of application, and therefore ecosystem service benefit, can be wide-ranging dependent on opportunity and cost; with flexibility in the form of habitat enhancement or creation implemented reflecting area requirements and sensitivities.

Many of these green actions would not only provide environmental and tourism benefits but could also make the Tyne Estuary a better place to live and work e.g. green frontage for lunch or eco-gyms, being surrounded by more nature, increasing dwell time in a green environment and the multiple, well evidence health and economic benefits this can bring. This could also encourage further investment and attract more skills to the area.



Ecosystem service classification for UK marine ecosystems (adapted from Turner et al., 2014).

Multiple ecosystem service benefit opportunities have been identified in conjunction with the estuary enhancement opportunities proposed, dependent of bank typology, these include:

- Greening of Banks: fish provision, carbon sequestration, waste breakdown, nutrient cycle, flood defence, healthy climate, aesthetic benefits.
- Fish Habitat Creation: larval and gamete supply, carbon sequestration, nutrient cycle, education and research, aesthetic benefits, tourism and nature watching, physical and mental health benefits.
- Bird Enhancement: biological control, formation of seascape and species habitat, education and research, aesthetic benefits, tourism and nature watching, mental and physical health benefits.
- Otter Habitat Creation: formation of seascape, wellbeing, tourism and nature, mental and physical health benefits, education and research, aesthetic benefits.
- Other Enhancement Options e.g. mussel ropes/blue mussel beds: biological control, waste breakdown and detoxification, carbon sequestration, formation of species habitat, healthy climate sea defence, prevention of social erosion, waste burial/removal/neutralisation.

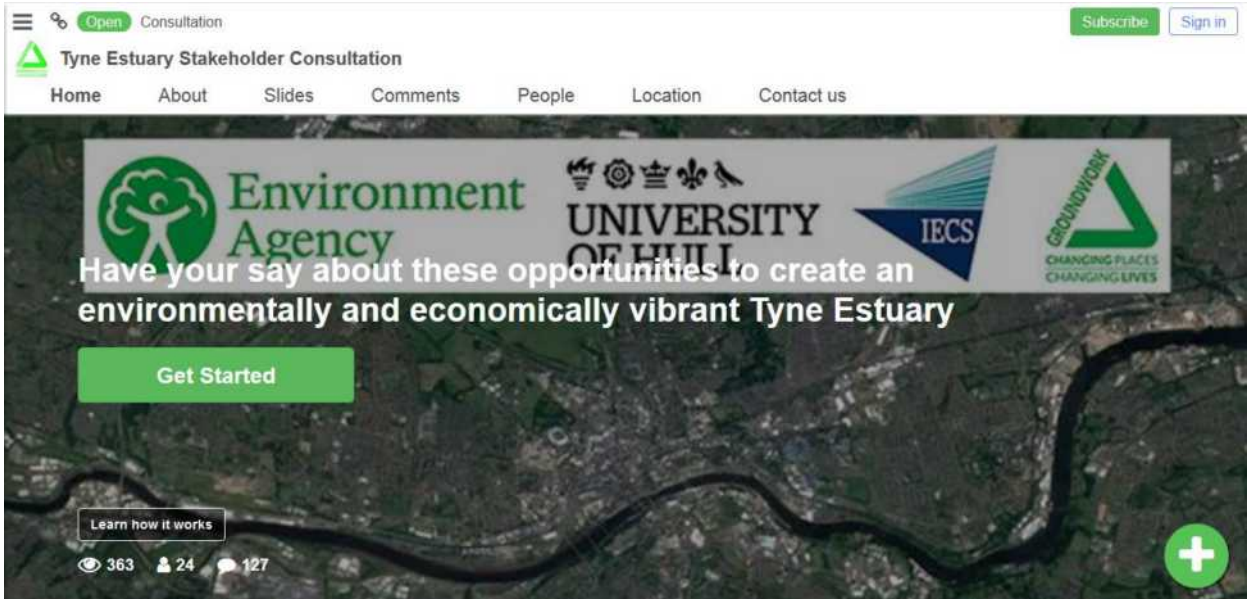
See *Section 4, Tyne Estuary Edges Enhancement Study, 2019* for further details.

All Potential Opportunities

Data regarding all potential opportunities was collected and collated from the University of Hull research and consultation with key partners and stakeholders. The information was all brought together on online interactive consultation software called Stickyworld.

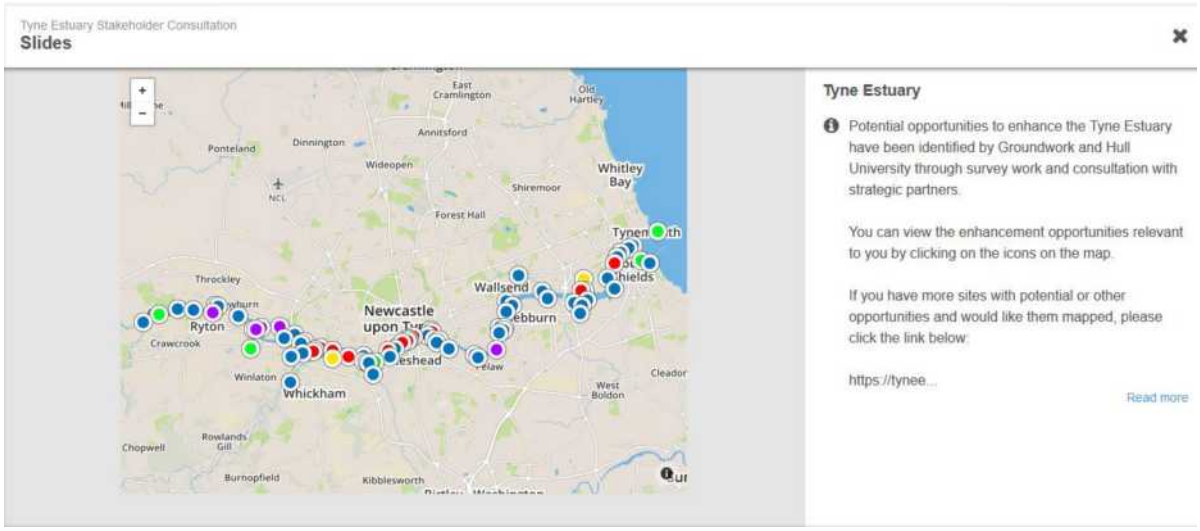
Stickyworld

Consultation activity used Stickyworld to gather a plethora of rich data about all of the potential opportunities identified by the University of Hull and from strategic partners in one place.

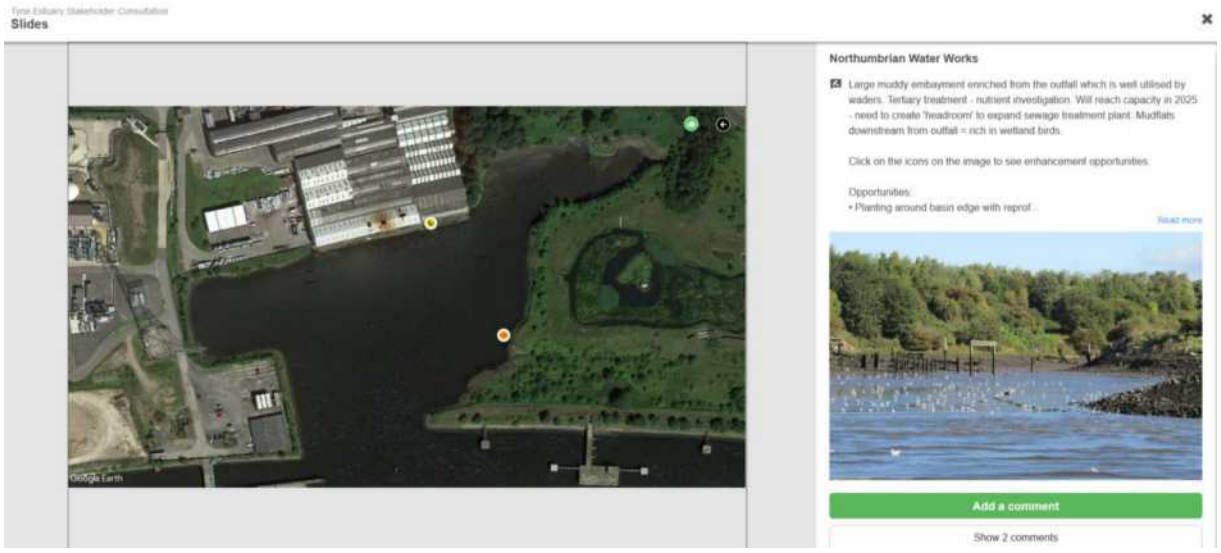


Each consultation slide depicted a potential opportunity site along the Tyne Estuary. This incorporated an aerial photograph for each site alongside a brief description, possible opportunities and constraints, and land ownership where known. The introduction slide included an interactive overview map of the Tyne with each potential opportunity sites

marked; from this point contributors could click on each site and be redirect to the appropriate slide.



Utilising Stickyworld's commenting capabilities contributors were able to 'stick' their comments to precise locations within each site; contributors were invited to provide a combination of general comments, strengths/weaknesses, opportunities, threats, planned developments, and thoughts on timescale to progress regarding political, economic, environmental, and social pressures.



To encourage engagement contributors could take part in the online forum either anonymously or as a signed up member. However, they were encouraged to register to take part, which identified their email address and name. Key stakeholders were also requested to circulate the survey to other parties they believed would provide relevant insight.

Opportunities Table

This table presents all of the theoretical opportunities identified as a result of the research and consultation conducted by the University of Hull and Groundwork.

The sites with the blue links provide links to the drone footage provided by University of Hull. There is not drone footage for each site as the technical survey work and site identification tool place concurrently with the desk research and consultation to identify sites. Many sites were identified via both routes but as different sites were identified by different means they don't all have drone footage.

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
MetroGreen – River Derwent **Gateshead Council**	Priority site (short term)	Mid channel vegetated bank Ownership: Gateshead Council	Bank enhancements, especially otter and fish	Currents and tidal range	Local Authority Developers Land Owners General Public
MetroGreen – Mouth of River Derwent **Gateshead Council**	Priority site (short term)	Gateshead Council own land west of confluence	Introduction of saltmarsh species Geotextile mattresses/membrane at mouth	Bank ownership	Local Authority Developers Land Owners General Public
MetroGreen – Metro Riverside Park (West) **Gateshead Council**	Priority site (short term)	Footpath bordered by scrub along estuary bank	Open scrub to improve river views; enhancement of vegetation heights and plant species.	Limited understanding of wider constraints and land ownership	Local Authority Developers Land Owners General Public
MetroGreen – Metro Riverside Park (East) **Gateshead Council**	Priority site (short term)	Currently limited access along this stretch of bank; though future development may change this.	Coir rolls and brushwood faggots; enhancement of high water vegetation; creation of artificial otter holts/improve breeding sites.	Future developments; floodwater issues; surrounding land prone to ground movements	Local Authority Developers Land Owners General Public
MetroGreen – East	Priority site	Area of high land with small	Preservation of large	Limited	Local Authority

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
of Costco **Gateshead Council**	(short term)	culverted creek behind the bank	creek system; wooden dolphin for tern roost/otter holt	understanding of wider constraints and land ownership; Screening to be considered to reduce wader disturbance	Developers Land Owners General Public
MetroGreen – Kingfisher Court **Gateshead Council**	Priority site (short term)	Seawall protecting Bitter Close and Glebe Close Land ownership: Gateshead Council	Re-profile midsection of boulder toe protection; horizontal terrace/saltmarsh zone creation	Limited understanding of constraints	Local Authority Developers Land Owners General Public
MetroGreen – Cormorant Drive **Gateshead Council**	Priority site (short term)	Seawall protection Cormorant Drive Land ownership: Gateshead Council/Church Commissioners	Vertical greening of seawalls; horizontal terraced edge creation	Limited understanding of constraints	Local Authority Developers Land Owners General Public
Forth Yard – Development Site **Newcastle City Council**	Priority site (short term)	North Yorkshire Developers, Newby to create 1,500 homes	Blue Green infrastructure required; water run-off solution	Very contaminated following led works. Mixed ownership Likely to be expensive and lengthy process	Local Authority Developers Land Owners General Public
Quayside - East of Queen Elizabeth Bridge **Newcastle City Council**	Priority site (short term)	Greening of Newcastle Quayside between High Level and Queen Elizabeth Bridge Land ownership: Newcastle City Council	Vertical greening of walls; floating platoons; fish refuge boxes	Walkway prone to fluvial flooding – property damage	Local Authority NE1 Developers Local Business Land Owners General Public
Quayside - Mid Channel Timber **Newcastle City**	Priority site (short term)	Greening of mid-channel timber around bridge supports Scheduled monument/Conservation	Floating vegetated edges/islands;	Limited understanding of constraints	Local Authority NE1 Developers Local Business

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
Council		Land ownership: Port of Tyne			Land Owners General Public
Quayside - Development Site Newcastle **Newcastle City Council**	Priority site (short term)	Greening the Quayside	Possible connection to planned development of Gateshead Quayside Arena	Prone to flooding and tidal surges	Local Authority NE1 Developers Local Business Land Owners General Public
Tyne Bridge **Newcastle City Council**	Priority site (short term)	Kittiwake nesting site Conservation Area Land ownership: Newcastle City Council; Crown Estates	Management of nesting; creation of alternative nesting sites	Limited understanding of constraints	Local Authority NE1 Developers Local Business Land Owners General Public
Quayside **Newcastle City Council**	Priority site (short term)	Softening of vertical concrete walls between Tyne Bridge and Millennium Bridge Conservation area Land ownership: Newcastle City Council (unregistered)	Floating platoons; vertical greening of walls; fish refuge boxes; river transit; community education/volunteering potential; landward enhancements ; educational/sustainable tourism; river-based tourism; breakdown water-land interference	Feasibility – maintenance costs and management Bank ownership Prone to flooding	Local Authority NE1 Developers Local Business Land Owners General Public
Lower Steenburgs Yard -Tidal Ouseburn **Newcastle City Council**	Priority site (short term)	Home to new riverside apartments and shops. Currently in consultation regarding planning/ mitigation measures	Mitigation enhancements	Issue around gabion design for flood alleviation and could be better for the environment.	Local Authority Developers Local Business Land Owners General Public
Ouseburn Barrage	Priority site	Left open continuously; does	Vegetated floating	Culvert may still for a	Local Authority

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
- Tidal Ouseburn **Newcastle City Council**	(short term)	not provide flood alleviation; no fish pass Land ownership: Newcastle City Council unregistered	platforms Greening estuary edges and managing surface water Compensatory habitat for Lower Steenberg development	constraint	Developers Local Business Land Owners General Public
Spillers Quay -Tidal Ouseburn **Newcastle City Council**	Priority site (short term)	The Big Wheel 'Whey Aye' development	river-based tourism; river transit; fish migration; wildlife corridor creation	Soil and ground water contamination Unstable quay wall Water management Community divide	Local Authority Developers Local Business Land Owners General Public
Northumbrian Water Works **North Tyneside Council**	Priority site (short term)	Large muddy embayment enriched from the outfall which is well utilised by waders. Tertiary treatment - nutrient investigation. Will reach capacity in 2025 - need to create 'headroom' to expand sewage treatment plant. Mudflats downstream from outfall = rich in wetland birds. Land ownership: Port of Tyne, NWL, Chemson	Planting around basin edge with re-profiling at high water. Use of the buildings for 'greening' or kittiwake ledges. Floating platoons	Landowners interest to change building use	Local Authority Land Owners Water Company
Howdon Wetlands **North Tyneside Council**	Priority site (short term)	Wetland habitat rich with bird life Land ownership: Port of Tyne; NWL	Preservation of wetland habitat	No protection status (potentially LWS)	Local Authority Land Owners General Public
Smith's Dock **North Tyneside Council**	Priority site (short term)	Wet docks with proposals for 830 new homes; will create a modern coastal community and contemporary living space.	Tern rafts, vertical greening of the dock walls, habitat site, micro tidal turbines, heritage	Development site (residential and mixed) although opportunity to	Local Authority Developers Local Business Land Owners

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
		Places for People Development Ltd, in conjunction with Urban Splash	trails, mechanisms to capture rubbish, water-based recreation,	engage with develop to make improvements during phase 3. Further information required to determine dock specifics including use and tidal range.	General Public
Ryton Willows - Newburn Battlefield **Gateshead Council**	Priority site (medium term)	Site of Special Scientific Interest (SSSI) and Local Nature Reserve (LNR). Within registered battlefield, Battle of Newburn. Land ownership: Gateshead Council	River-Haughland reconnection; remeandering the river; wetland scheme;	Safety issues – large area of open public access Site under a lot of people pressure	Local Authority Land Owners General Public
Tyne Riverside Park - Newburn Battlefield **Newcastle City Council**	Priority site (medium term)	Within registered battlefield, Battle of Newburn. Designated Sites & Parks. Farmland, woodland and grassland areas.	River-Haughland reconnection; remeandering the river; wetland scheme;	Limited understanding of wider constraints	Local Authority Land Owners General Public
Stella - Newburn area of change **Gateshead Council**	Priority site (medium term)	Natural gravels contaminated due to previous flooding events; west of stella extensive mudflats Land ownership: Port of Tyne	Vertical greening Re-profile cobble earth banks to create terraces for planting	Bank ownership	Local Authority Land Owners General Public
Newburn Haugh - Newburn area of change **Newcastle City Council**	Priority site (medium term)	Housing development to be built on North Bank – Homes Group Land ownership: Port of Tyne	Vertical planting Floating pontoons	Bank Ownership Possible development	Local Authority Land Owners General Public

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
Development Site - Newburn area of change **Newcastle City Council**	Priority site (medium term)	Land managed by Homes England; intention to build residential properties	Limited understanding of wider opportunities	Limited understanding of wider constraints	Local Authority Developers Local Business Land Owners General Public
Lemington Gut - Newburn area of change **Newcastle City Council**	Priority site (medium term)	Grassland (overgrazed) and salt marsh. Plans to put in a footbridge. Land ownership: Newcastle City Council	Preservation and enhancement of salt marsh	Limited understanding of wider constraints	Local Authority Land Owners General Public
Walker Riverside Park - Walker **Newcastle City Council**	Priority site (medium term)	St Anthony's tar work site; unsuitable for housing development. Designated Sites & Parks. Land ownership: Parks Trust	SUDs creation; riparian environment enhancement;	Anti-social behaviour	Local Authority Developers Land Owners General Public
Contained Disposal Facility - Walker **Newcastle City Council**	Priority site (medium term)	EIA scoping exercise / impact assessment submitted for comment. Catch pit to be created in centre of river bed and a rock armour bund constructed from historic sediment. Once filled the facility will form tidal mudflats. Land ownership: Church Commissioners	Limited understanding of wider opportunities	Anti-social behaviour	Local Authority All river users General Public
Wylam Bridge **Northumberland County Council**	Other potential sites	Smelt spawning ground downstream; bridge footings are a barrier to migratory fish especially eels	Fish access	Limited understanding of wider constraints and land ownership	Local Authority General Public
Clara Vale	Other	Underground burning coal	Limited understanding	Burning Coal waste	Local Authority

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
Gateshead Council	potential sites	waste heap	of wider opportunities	heap	General Public
Upstream of Ryton **Gateshead Council**	Other potential sites	Rock Armour and less development pressure Land ownership: Port of Tyne	Reigh Burn works and wetland area development	North Bank agricultural land in private ownership Low level pollution Awaiting WEG application	Local Authority Land Owner General Public
Heddon Haugh Banks **Newcastle City Council**	Other potential sites	Bank erosion, west of Newburn Registered Battlefield Land ownership: Newcastle City Council	Bio-engineered bank reinforcement	Transfer of land ownership after April to Parks Trust	Local Authority Land Owner General Public
Ryton Haugh **Gateshead Council**	Other potential sites	Within registered battlefield, Battle of Newburn.	Habitat site Water Treatment	Limited understanding of wider constraints	Local Authority Land Owner General Public
Blaydon Haugh **Gateshead Council**	Other potential sites	Industrial units on Blaydon Haughs industrial Estate. Land ownership: Port of Tyne	Greening of structure Enhance habitat site	Ownership of buildings	Local Authority Land Owner General Public
Derwent Weir **Gateshead Council**	Other potential sites	Retained intertidal muds Land ownership: Gateshead Council	Fish access work underway	Limited understanding of wider constraints	Local Authority Land Owner General Public
Shibdon Pond **Gateshead Council**	Other potential sites	High mine water levels - may impact on Shipden Pond Site Land ownership: Gateshead Council managed by Durham Wildlife Trust	SSI	Limited understanding of wider constraints	Local Authority Land Owner General Public
East Blaydon Bridge **Gateshead Council**	Other potential sites	Possible site for greening of the quayside	Vertical sheet piled walls could have floating pontoons attached Vertical greening structures.	Bank Ownership	Local Authority Land Owner General Public

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
Upstream of Scotswood Bridge **Gateshead Council**	Other potential sites	Extended area of saltmarsh Land ownership: Gateshead Council	Limited understanding of wider opportunities	Limited understanding of wider constraints	Local Authority General Public
Shibdon Meadow **Gateshead Council**	Other potential sites	Existing wetland creation scheme	Engagement and pro-active management opportunities	Limited understanding of wider constraints	Local Authority Land Owner General Public
Armstrong Works/Reece Group **Newcastle City Council**	Other potential sites	Reopened 2015 following £20m revamp	Greening of Bank	Surface water flood risk	Local Authority Land Owner General Public
Newcastle Business Park **Newcastle City Council**	Other potential sites	Sheet piled and concrete flood walls Land ownership: Newcastle City Council	Vertical planting	Limited understanding of wider constraints	Local Authority Land Owner General Public
St. Omers Haugh **Gateshead Council**	Other potential sites	Preferred flood defence option, demountable defence within a floodwall, not feasible (basis of low cost-benefit ratio/priority score) recommended that the viability was reassessed in the future (2025)	Flood alleviation scheme.	Limited understanding of wider constraints	Local Authority Land Owner General Public
Lower End of River Team **Gateshead Council**	Other potential sites	Industrial sites; inaccessible stretches; saltmarsh upstream; possible salmon spawning ground	TWBPT interested in enhancements	Fly tipping	Local Authority Land Owner
Gateshead Quayside (West)	Other potential sites	Brick wall River ownership: Church Commissioners	Floating pontoons attached Vertical greening of	Limited understanding of wider constraints	Local Authority Land Owner General Public

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
Gateshead Council		Land ownership: Gateshead Council	walls Plant boxes		
St. James Boulevard Newcastle City Council	Other potential sites	To divert surface water out of the combined system. Land ownership: Newcastle City Council	Surface water separation scheme	Development plans for Forth Yards	Local Authority Land Owner Local Businesses General Public
Gateshead Quayside (East) **Gateshead Council**	Other potential sites	Substantial estuary-side development Land ownership: Gateshead Council	Greening of Banks Floating Pontoons Softening of edges	Limited understanding of wider constraints	Local Authority Land Owner Local Businesses General Public
LaFarge **Gateshead Council**	Other potential sites	Kittiwake nesting site Private land ownership	Limited understanding of wider opportunities	Limited understanding of wider constraints	Local Authority Land Owner General Public
Kittiwake Tower - Gateshead **Gateshead Council**	Other potential sites	Kittiwake nesting site Land ownership: Gateshead Council	Limited understanding of wider opportunities	Limited understanding of wider constraints	Local Authority Land Owner General Public
Friars Goose/St. Anthony's Tar Works **Newcastle City Council**	Other potential sites	Heavily contaminated land - tar works	Restore river silt on banksides	Contaminated land	Local Authority Land Owner General Public
St. Anthony's **Newcastle City Council**	Other potential sites	Catch Pit and bund; combined disposal facility for de-silting river	Low Walker SUDs	Limited understanding of wider constraints	Local Authority Land Owner
Walkergate Technical Park **Newcastle City Council**	Other potential sites	Brick Gabions protecting the bank fronting the 'Building Futures East' building Land ownership: Newcastle City Council Managed by	Replace Brick Gabions with seeded/planted gabion boxes	Limited understanding of wider constraints	Local Authority Land Owner

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
		Shepherds			
Walkergate Technical Park/TechnipFMC **Newcastle City Council**	Other potential sites	Brick Gabions protecting the bank fronting the 'Building Futures East' building Land ownership: Newcastle City Council Managed by Shepherds	Replace Brick Gabions with seeded/planted gabion boxes	Limited understanding of wider constraints	Local Authority Land Owner Local Businesses General Public
Hebburn Riverside Park **South Tyneside Council**	Other potential sites	Series of Derelict wooden jetties and rock gabions; Intertidal zone - phragmites transplanted River ownership: Church commissioners Land ownership: South Tyneside Council	Re-profiling Planting Vertical greening of Quays	Bank ownership	Local Authority Land Owner Local Businesses General Public
North of Prince Consort Road **South Tyneside Council**	Other potential sites	Wooden shuttering at low water topped by black modified substrament. River ownership: Church commissioners Land ownership: South Tyneside Council	Re-profiling of intertidal Planting using coir mats and brushwood faggots Vertical greening of Quays.	Bank ownership Dredging likely to contain elevated contaminants	Local Authority Land Owner Local Businesses General Public
Swan Site **North Tyneside Council**	Other potential sites	Area being redeveloped into a Business Park. Half tide wall in place Land Ownership: North Tyneside Council	Softening of edges	Contaminated land Development Site	Local Authority Land Owner Local Businesses General Public
Cammel Laird South **South Tyneside Council**	Other potential sites	Former Cammel Laird site. Series of slipways River ownership - Church commissioners Land ownership - South	Habitat enhancement Saltmarsh communities	Future development plans	Local Authority Land Owner Local Businesses General Public

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
		Tyneside Council			
Wallsend Burn **North Tyneside Council**	Other potential sites	Canalised; limited biodiversity value Land Ownership: North Tyneside Council	Re-profile edges	Surface water flooding	Local Authority Land Owner General Public
Willington Gut **North Tyneside Council**	Other potential sites	Former Cammel Laird site, Hebburn yard - A&P Tyne Land Ownership: Hadrian Industrial Holdings ltd.	Re-profile edges within Gut including grasses/saltmarsh planting. Installation of floating vegetated pontoons. To the west of the marina mouth, install ropes/chains for algae colonisation or attach fish refuge boxes. Small areas of Salt Marsh to enhance.	Land Ownership and Willingness	Local Authority Land Owner
A&P Tyne, Hebburn **South Tyneside Council**	Other potential sites	Ground investigation carried out by Fairhurst River ownership - Church commissioners Land ownership - South Tyneside Council	Limited understanding of wider opportunities	Limited understanding of wider constraints	Local Authority Land Owner Local Businesses General Public
Priory Road **South Tyneside Council**	Other potential sites	Northumbrian Water pumping station on old landfill site Land Ownership: Shepherd Offshore plc; South Tyneside	Limited understanding of wider opportunities	Limited understanding of wider constraints	Local Authority Land Owner Water Authority
River Don **South Tyneside Council**	Other potential sites	Within Conservation area Land ownership - South Tyneside Council	Working alongside River Don Partnership and restoration plans Intertidal habitat creation	Possible landfill leaching into CSO	Local Authority Land Owner Local Businesses General Public

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
Slake Road **South Tyneside Council**	Other potential sites	Mudflats; important wader site. Within Conservation area. Land ownership: Port of Tyne	St Paul Monastery (English Heritage) engagement	Limited understanding of wider constraints	Local Authority Land Owner General Public
Mouth of River Don **South Tyneside Council**	Other potential sites	Mini reef; intertidal mudflats and rocky foreshore River in Conservation area. Land ownership: West bank - South Tyneside Council; East bank - Port of Tyne	Softening edges	Mink now present	Local Authority Land Owner Local Businesses General Public
Kittiwake Tower South Shields **South Tyneside Council**	Other potential sites	Kittiwake nesting site. Land ownership: Port of Tyne	Refurbishment	Limited understanding of wider constraints	Local Authority Land Owner General Public
Royal Quays Marina **South Tyneside Council**	Other potential sites	Built around the historic Albert Edward Dock Land Ownership: North Tyneside Council; Port of Tyne; Private residential properties to the South and west of Marina; other Private land owners on the East of the Peninsula.	Habitat creation and wildlife refuge Hard-wall greening Floating pontoons Tern nesting sites Educational activities	Marina use Cruise ships require unrestricted access to berth	Local Authority Land Owner Local Businesses General Public
New Quay/Shepherd's Quay **North Tyneside Council**	Other potential sites	Vertical sheet piled quayside Within Conservation area. Land Ownership: James Pepper / Duke of Northumberland; Nexus; private land owners	Floating pontoons Other greening methods	Bank Ownership Future development site	Local Authority Land Owner Local Businesses General Public
Bell Street	Other	Vertical sheet piled quayside	Floating pontoons	Bank Ownership	Local Authority

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
North Tyneside Council	potential sites	Within Conservation area. Land Ownership: Duke of Northumberland; North Tyneside Council; Port of Tyne; private ownership	Other greening methods	Future development site High levels of wave action	Land Owner Local Businesses General Public
Fish Quay **North Tyneside Council**	Other potential sites	Fish Quay/Market: Gut and surrounding fishing port Within Conservation area. Land ownership: Port of Tyne; North Tyneside Council; Duke of Northumberland	Flood prevention Colonisation Roof treatment	Active Fish Quay; opposition to roost site. New development site	Local Authority Land Owner Local Businesses General Public
Low Lights **North Tyneside Council**	Other potential sites	Good conditions for mussels Within Conservation area. Land ownership: North Tyneside Council	Install Mussel ropes/boxes/cages Jetty repair Recreational areas	Public tampering	Local Authority Land Owner Local Businesses General Public
South Shields Sea Frontage **South Tyneside Council**	Other potential sites	Seascapes project. Rocky shore survey recently conducted area.	Limited understanding of wider opportunities	Limited understanding of wider constraints	Local Authority Land Owner Local Businesses General Public
MetroGreen **Gateshead Council**	Developme nt Sites	Brownfield site – part of wider proposal area detailed above.	Limited understanding of wider opportunities	Limited understanding of wider constraints	Local Authority Land Owner Local Businesses General Public
Royal Quays Enterprise Park **North Tyneside Council**	Developme nt Sites	Proposed commercial development site Enterprise Zone and CORE status Land ownership: Port of Tyne	SUDS/ Biodiversity Wildlife corridor provision	Commercial Development Site	Local Authority Land Owner Local Businesses General Public
Close House Riverside	Designated Sites and	SSSI	Limited understanding of wider opportunities	Limited understanding of	Local Authority Land Owner

Name & Local Authority (blue links to site videos)	**Site Type**	**Description**	**Opportunities**	**Constraints**	**Beneficiaries**
Northumberland County Council	Parks			wider constraints	General Public
Blaydon Burn Nature Reserve **Gateshead Council**	Designated Sites and Parks	Managed by Gateshead Council	Limited understanding of wider opportunities	Limited understanding of wider constraints	Local Authority Land Owner General Public
Dunston Staiths **Gateshead Council**	Designated Sites and Parks	Scheduled Monument, Grade II listed; saltmarsh mudflat Ownership: Tyne and Wear Building Preservation Trust (TWBPT)	Leisure/ tourism/ promotion of the project	Restoration of low riverside deck	Local Authority Land Owner Local Businesses General Public
Hebburn Riverside Park **South Tyneside Council**	Designated Sites and Parks	Provides a combination of cycle routes, football pitches, natural trail, open space and riverside walks.	Limited understanding of wider opportunities	Limited understanding of wider constraints	Local Authority Land Owner Local Businesses General Public
North Marine Park **South Tyneside Council**	Designated Sites and Parks	HLP restoration scheme planned	Improve habitat, biodiversity, tie in with estuary ecology	Limited understanding of wider constraints	Local Authority Land Owner Local Businesses General Public
Northumbria Coast North Tyneside Council	Designated Sites and Parks	European Marine site behind pier walls. Ownerships: North Tyneside Council, Port of Tyne, Duke of Northumberland.	Preservation of existing ecology	SPA	Local Authority Land Owner Local Businesses General Public

Consultation Results

The significant consultation carried out through meetings, events, research studies, stakeholder workshops and the use of Stickyworld informed the development of the 77 estuary enhancement opportunities identified and level of data gathered on each site; as demonstrated on the online consultation (found here) and in the table above.

This consultation gained rich and varied engagement including:

- 128 separate comments on Stickyworld
- 22-34 individuals attending the stakeholder workshops and 70+ being invited to the launch event
- 26 individual meetings with key stakeholders providing targeted information about specific sites.
- High level of engagement and buy-in from strategic partners (Senior Managers/ Directors contributing)
- Good cross sectoral representation including the public sector, culture and tourism, developers, environmental and community charities, business forum engagement.

This engagement not only provided invaluable insight into the feasibility of potential opportunities identified, further knowledge about development sites and introductions to key developers; it also built the high level, strategic engagement required to make the broader partnership aims of this work a success. It has provided opportunity to open up discussion with stakeholders around lobbying to influence planning and policy, funding opportunities links into wider projects and the timing of potential interventions.

As well as providing rich qualitative data which was taken into consideration when identifying and prioritising the priority sites, feedback gained through Stickyworld has been quantitatively analysed to identify common themes to opportunities and issues facing the full Tyne Estuary. The table below summarises these issues and threats.

Comment	Frequency
Habitat improvement	32
New development	21
Flood alleviation	14
Project idea	13
Ownership	12
Heritage	10
Existing information	8
Contaminated land	5
Community engagement	5
Surface water management	4
Code of conduct	4
Grand Total	**128**

Opportunities and constraints

It is clear from the results of the consultation that habitat improvement was a key opportunity identified by stakeholders. Other opportunities included:

- Identification of and opportunities at new development sites.
- Opportunities for flood alleviation schemes.

- Broader or revenue project ideas.
- The existence and relevance of heritage and associated development ideas reading of the environment, ecology and heritage can be developed and protected hand in hand.
- Community engagement opportunities.
- Opportunities for surface water management schemes.

Constraints identified by the consultation included:

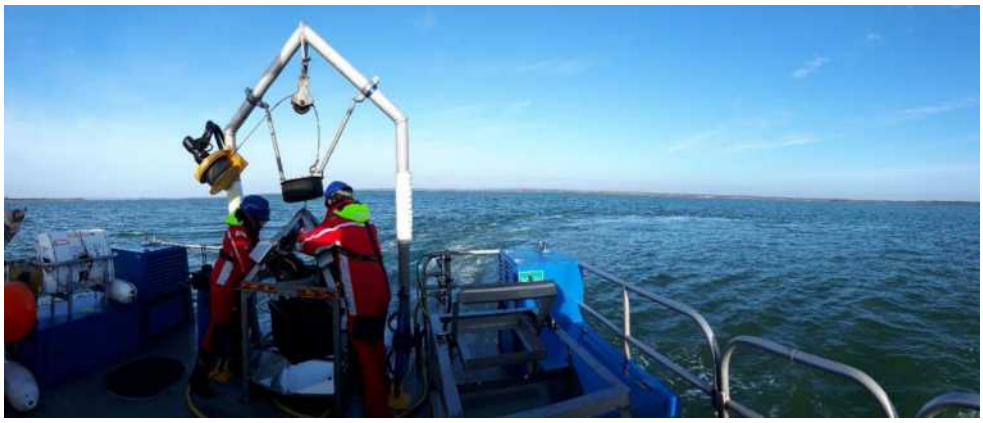
- A relatively small amount of landownership information identified.
- The existence of contaminated land.
- Commercial site/future development restrictions.
- Miss-use of the river (identifying the need for a code of conduct).
- Little information on planning/ the stage of planning process developments were in (this has since been identified through desk research).
- Where new developments and habitat protection aspirations might clash.
- The space required to implement proposed schemes.

Cross Cutting Themes

Monitoring

There has been limited WFD monitoring of the Tyne Estuary since 2009, and there is low confidence in the data that exists. However, partnership opportunities have been identified and data collection is being addressed by the EA working in conjunction with Northumbrian Water, the Urban Observatory and Newcastle University in 2019. Northumbrian Water are implementing a water quality monitoring programme, and the EA are implementing a new programme to monitor water quality and nutrients, carrying out subtidal benthic and intertidal invertebrate surveys, deploying sondes in tidal tributaries to assess inputs from the catchment. Specifically this will include:

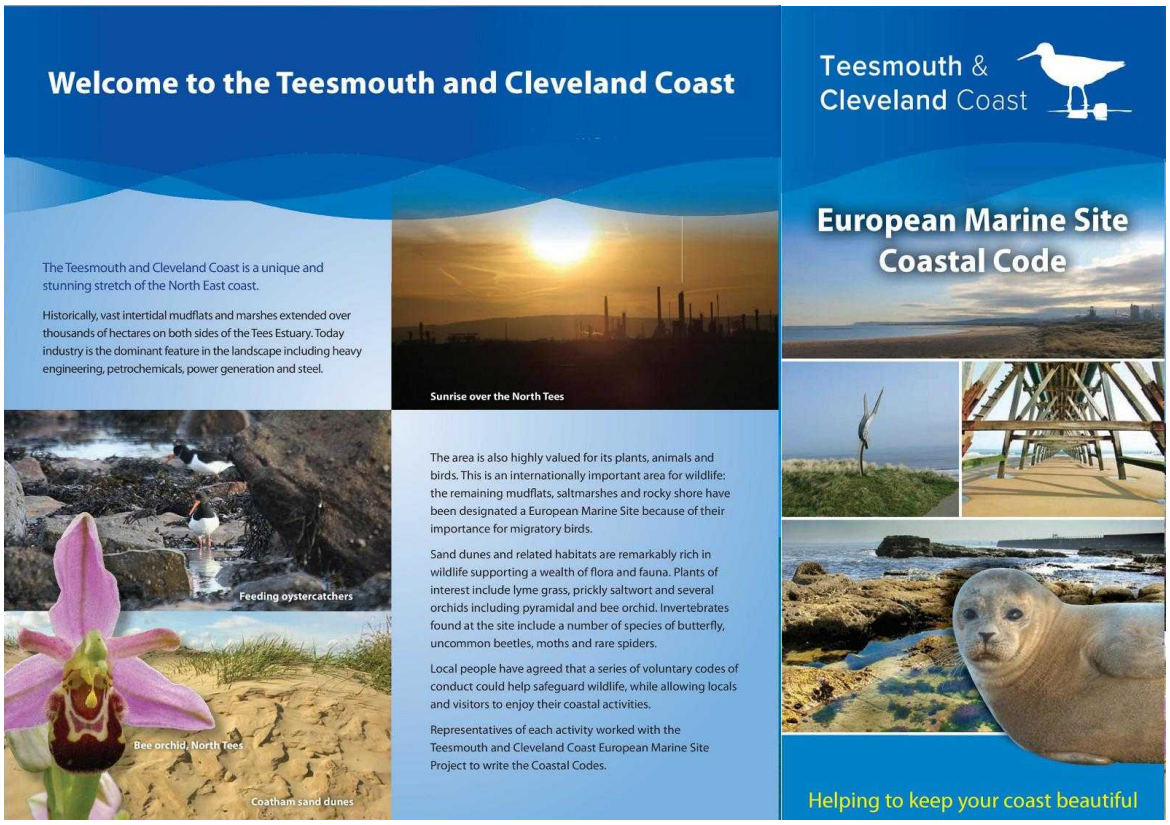
- 13 new water quality sites added 2019
- WFD benthic invertebrate monitoring 2019
- 2 continuous water quality sondes



Code of conduct

There is currently no code of conduct for the River Tyne. However the Northumberland Inshore Fisheries and Conservation Authority has developed a Voluntary Code for bait digging for the Blyth Estuary. TRT and Salmon & Trout Conservation are facilitating a working group to produce a Conservation Angling for Salmonids on the Tyne. It is hoped that this will be completed in 2019.

The Teesmouth and Cleveland Coast European Marine Site Coastal Code is a public facing leaflet to explain the special nature of the marine site and how best to enjoy it, see link here:



The river user groups range from industrial scale shipping including containers, the DFDS ferries, cruise ships, to small scale craft including the Shields Ferry, to recreational crafts – canoes, motor boats, kayaks, jet skiers, paddle boarders, training facilities, boat repairs, bait digging, bird watching, wildlife photography and so on. Some of these come into conflict such as when jet skiers try to get into narrow and shallow tributaries and disturb birds feeding and also stir up the sediments.

The opportunity here is to develop a Tyne Code of Conduct; this could be voluntary and self-policing or could have bye laws attached to it. The type of elements a code of conduct could include are:

- Litter campaigns.
- Treatment of wildlife/ birds/ habitats.
- Safe wildlife watching areas.
- Recreation use guidelines.
- Bait digging.
- How to report a pollution incident.

Revenue Projects

The Tyne Estuary could provide many more opportunities for revenue projects. Northumberland Wildlife Trust is working on a National Lottery Heritage Fund bid to fund a Wild City programme of **activities and celebrations** of the river and its adjacent sites for 2019-2023. There is an opportunity here for the Tyne Estuary to become part of this activity and events programme to raise awareness of species and the special qualities of the Estuary.

Leisure activities on the river could be improved as part of the Tyne Estuary project; the British Canoe Trust are keen to improve access points for canoeists and this could be applied to some of existing boating clubs' facilities. Quay Marinas are very keen to be involved and set a high environmental standard in terms of their marina management and habitat improvements. Surfers against Sewage are very active in the estuary and are engaged in large scale public litter collections and engagement activity on the Tyne. Nexus reported that many of their customers take the North – South Shields Ferry for recreational purposes and are very interested in being part of the Tyne Estuary project. A "What to Spot" phone app or booklet and identification boards of what it is possible to see from the Nexus ferry and/ or the DFDS ferry would enhance the identity of the Tyne Estuary as an important haven and corridor for wildlife.

Citizen Science is an international movement to engage citizens in measuring and recording data in order to provide baseline information to inform management and response decisions within their natural environments. The Lincolnshire chalk streams project now has an incredible 42 volunteers surveying at 34 key sites in and around the Lincolnshire Wolds AONB. The work achieved by volunteers has proved invaluable for reporting non-native species and for monitoring recovery following pollution events in the area. This work is led by a monitoring officer for the Lincolnshire Chalk Streams Project. There are exciting opportunities to develop this type of engagement work on the Tyne Estuary.

There are several countryside and green space **volunteering** groups for instance, Gateshead Council's Countryside Volunteers, Ouseburn Trust Volunteers in the estuary's hinterland and there are many opportunities to work with these groups to improve habitat value for wildlife, monitor water quality through chemical analysis and species presence and abundance and through events and engagement activities. The opportunity here is to identify the volunteering groups interested in taking a particular interest in the river and its tributaries and to make this information widely available so more people can get involved.

Improving access to the river itself and the river bank is crucial to getting people interested in and engaged. There is an opportunity here to work with the NEXUS, the Shields Ferry operator, and North Tyneside Council as they develop an additional or alternative landing station on the North bank. There are also other opportunities to work with boating clubs and the British Canoe Union taking into account impact on habitats and wildlife.

Access and **interpretation** could also be improved to for example, the Durham Wildlife Trust site at Shibdon Meadow, Northumberland Wildlife Trust site at their Close house SSSI site and Rabbit Banks in Gateshead. An audit of off road access to all stretches of the estuary would provide opportunities to link people and wildlife sites where appropriate. Where disturbance is an issue, remote observation points would enable the public to enjoy wildlife whilst not disrupting feeding and roosting. Pedestrian improvements along the north shore. Routes between North Marine Park and Smiths Dock and along the Walkergate riverside edge have been specifically mentioned in consultations as needing attention.

Several organisations are already working on **education and engagement** on the Tyne Estuary such as Groundwork, Tyne Rivers Trust, Durham Wildlife Trust and Northumberland Wildlife Trust and others – The EA have appointed a team of engagement officers to help communities be more resilient to flooding in the North East. Funded by the Northumbria Regional Flood and Coastal Committee (NRFCC) to help businesses, residents and children

and young people to understand their risk of flooding and become more resilient to flood events.

Northumberland and Durham Wildlife Trusts run **special education and engagement projects** related to rivers. Tyne Rivers Trust currently runs an Adopt a Stream project which can be for adults or older school children. The Ouseburn Trust won the Sandford Award for its education offer; the trust offers tours which can be combined with visits to the Seven Stories Centre for children's books, Ouseburn Farm, Stepney Bank Stables and Northern Print. There are a range of resources available on its website.

The **National Green Infrastructure Facility** based within Newcastle University's Urban Sciences Building is looking for projects and areas to test and there is an opportunity there to work with and learn from MSc and PhD students who are developing best-fit solutions to green infrastructure.

The challenge here is make these opportunities relevant and exciting for all involved to encourage stewardship of the Tyne Estuary.

Protected areas – natural and historical

The Tyne Estuary Project 2018-19 considered the area between Wylam Bridge and the Tyne Estuary, extending into tributaries and taking in a terrestrial buffer of 250m from the bankside. This was to enable riverine and terrestrial project works to be considered in the bank softening/ habitat creation project to mitigate the heavily modified nature of the estuary edges and channel geomorphology. There are both natural and historic **designated areas** along this stretch of the Tyne.

Close House

Downstream from Wylam the dredged river channel has created a very unusual configuration of land and botany at the Close House SSSI on the riverbank, where silts (contaminated with heavy metal) were dredged from the river channel to create a navigable route for barges to shuttle coal from the West Wylam coalfield to ships waiting downstream. The sediments have created a high level calaminarian grassland terrace. Managed by Northumberland Wildlife Trust (NWT) on a long lease from Close House the site would benefit from improved management it is currently in the "Unfavourable but recovering" classification from Natural England.

Battle of Newburn

Further downstream, the river flows through the Registered Battlefield: the Battle of Newburn Ford 1640 and is close to the ford used by the Scots cavalry. Here the river has been altered beyond recognition - the once-braided channel with islands of river gravels and graded riverbanks have been altered and straightened so that it is difficult to imagine how the battle took place – there is potential here to remodel the river to include meanders, islands and ox bow features.

A recent report on the battlefield provides guidance on the types of change which are likely to have beneficial or adverse impacts on the significance of the battlefield. A softer, more natural course of the river, akin to that shown on the 1st edition OS map could be beneficial to the battlefield, but this will depend on the detail of the proposals. Harder infrastructure is likely to be damaging, depending on its precise location and scale.

The battlefield site takes in areas north and south of the river and includes most of Ryton Willows which is a Local Nature Reserve, also most of the Ryton Willows SSSI. It also touches on the Clara Vale Local Nature Reserve on the south bank Changes to the river channel here would obviously involve a multi-partnership approach.

Dunston Staiths

Further downstream, Dunston Staiths which is believed to be the largest wooden structure in Europe, is a grade II scheduled monument, owned and managed by Tyne and Wear Building Preservation Trust which has helped create a wildlife haven on a large volume of inter-tidal mud captured within the tidal basin there. The combination of rich feeding and a suitable place to roost at high tide gives rise to large numbers of waders including redshank, curlew and golden plover. The area is also favoured by many species of duck and is haven for otters. The timber structure which was built in 1893 and closed as staiths in the 1970s is protected, but the inter-tidal muds are not designated. Silts from the Rivers Tyne and Team constantly recharge this tidal basin. The terrestrial area is managed by Gateshead Council and there is a bird hide on the multi user Keelman's Way a popular riverside route which links to the national cycling Coast to Coast route 14 and also links off road user groups to the Hadrian's Wall cycling route 72.

Tyne Gorge

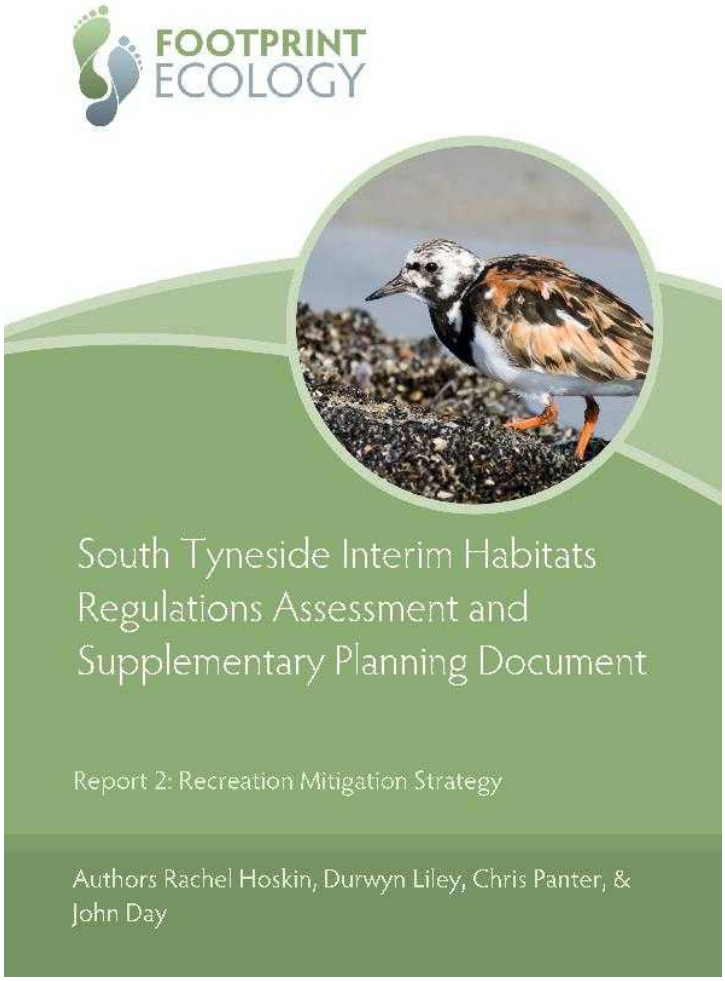
Heading further downstream, the Tyne Gorge particularly the area consisting of the group of bridges over the River Tyne has created one of the most dramatic townscapes in the region. The Millennium Bridge and the Tyne Bridge in particular, are the nationally recognised symbols of Tyneside. The rate of change along the Tyne Gorge has accelerated in recent years, not least as a result of BALTIC, Gateshead Millennium Bridge, and The Sage Gateshead but also as an area which is facing increasing development pressures. To safeguard the Gorge's special character it is important to manage future change. There could be opportunities on Rabbit Banks (designated as public open space) to better manage the steep woodland near The Hilton (Gateshead).

Reference: "Urban Landscape Assessment of the Tyne Gorge" (known as the "Tyne Gorge Study") was undertaken by Land Use Consultants (LUC) published in 2003. This character appraisal assessed architectural quality, undertook a visual analysis of the Gorge, and indicates the importance of different areas of the Gorge and indicates principles for the protection and development of the Gorge in the future.

Beyond the Gorge

From the gorge, the river meanders past the Kittiwake Tower at Gateshead where improvements to the small area of grassland and tower could be implemented. Then onwards past the industrial and business units of North and South Shields, including Port of Tyne, Shepherds Offshore, the Ouseburn Barrage and St Anthony's Tar Works (now remediated). The dramatic ruins of the historic sites of Cliffords Fort (above the Fish Quay) and Tynemouth Priory and Castle overlook the mouth of the estuary and sit atop the cliffs and intertidal rocky carrs which are part of the Special Protected Area (SPA) including Black Middens, Sandy Gait and Freestone Point near North Pier and the rocks underpinning the South Pier. South Tyneside Council's 2018 report on recreation mitigation strategy on the interim habitats linked to the Special Protected Area of the South Pier is available online and

is a useful reference document for considering how to balance public interest with species protection.



The project opportunities here are to ensure that new developments do not diminish the species using this coastal area, perhaps through developing a code of conduct and an information exercise to promote awareness and understanding of the outstanding and special nature of species using the Tyne Estuary.

Ecologists working on the Tyne Estuary are very interested in maintaining safe distances between species and observers. A project to develop and enhance **remote viewing** points at particularly rich wildlife sites along the estuary, for instance at the river mouth, possibly linked to the Low Light or the forthcoming developments on the Fish Quay, on the north shore and from the Customs House on the south shore would be welcome.

Local Political Engagement

The tidal reach of the Tyne falls into 23 council wards in 5 separate local authority areas. It runs through 9 different parliamentary constituencies and aligns with the boundary for the North of Tyne combined authority along its northern bank. It's important to engage local politicians in the opportunities and constraints identified for the Tyne Estuary and make them aware of the risk of doing nothing to improve the Tyne. In varying degrees local politicians, particularly at council level, are aware off the pollution and silting but are less likely to know

what the solutions may be. In recent months Groundwork has already engaged a number of local council cabinet members and officers in discussions about the project. This work will continue post report submission as the projects develop and prioritise evolve.
Planning policy could be an important vehicle for change and improvement. An example is Newcastle City Council issued planning regulation in recent years on public health grounds to prevent hot food takeaway's being granted permission within a 10 minute walk of a school. The Tyne Estuary Partnership could look at a similar framework for development close to the Tyne on environmental grounds. Additionally, a model motion to councils to show commitment to the cause circulated by the EA to cabinet members may be appropriate.

Impact Assessment

Under the current uncertain political times and the respective uncertain funding environment that we operate in; impact assessment of funding spent is ever more important. It is often quite difficult in the environmental sector to capture the full range of benefits that a project, intervention or environmental enhancements has. Benefits can range from intended direct environmental benefits such as improvements in water quality, habitat creation and/or connectivity or flood risk reduced; to more indirect, but nonetheless significant, impacts such as improvements to health and well-being, natural capital or the local economy. Many of these indirect benefits of environmental improvements are widely known about and accepted yet still very difficult to evidence.

Following discussion with Hull, Durham, Nottingham and Newcastle Universities (who have all been engaged with this project) as well as the EA, different potential impact assessment tool kits have been proposed; detailed below. These will be investigated in more detail when conducting subsequent work, when we will identify how to best measure the effectiveness of green infrastructure interventions resultant of this feasibility work.

Toolkits
The **CIRIA B£ST Tool** (Benefits Estimation Tool – valuing the benefits of blue-green infrastructure). This evaluates a range of environmental, social and economic benefits. It also allows for the monetisation of benefits, which are presented in charts based on Ecosystem Services (ESS) and Triple Bottom Line (TBL) criteria. It also enables benefits over different time periods to be evaluated. It can be downloaded for free.

The **Blue Green Cities** project from Nottingham University have also produced a GIS toolkit that allows the evaluation of the spatial distribution of 5 Blue Green Infrastructure (BGI) benefits including:

- Access to greenspace
- Carbon sequestration
- Air pollution reduction
- Habitat connectivity and noise reduction
- Flood damage reduction

This can downloaded from their website.

The **Urban Nature Index** being developed by NATURVATION, and led by Durham University, will allow people to assess nature based solutions to understand how they could contribute to achieving urban sustainability goals. This was trialled at the last NATURVATION Urban Regional Partnership Meeting at the end of January 2019 using Tyne Estuary Partnership sites as a case study. The tool is still under development but will be relevant to this work once complete. They have also produced a database that provides

open access to knowledge about where, when, and under which circumstances, integrated multi-functional and systemic impacts of nature-based solutions can be assessed available here.

An **ecosystem services assessment** of the different enhancement options, could be undertaken using an established matrix developed through the Valuing Nature Network (VNN), which gives values to the habitats and the services they provide and identifies the potential ecological benefits from the change in edge design.

The EA and Newcastle University are also already investing in increased monitoring of the Tyne Estuary as a result of this project; see section Cross Cutting Themes p.68The results will act as a base line and environmental improvement measurement that can be integrated into an impact assessment too.

PART 4: PRIORITY SITES

As stated in the methodology; Groundwork has worked with relevant experts and the partnership to review and prioritise site based enhancement opportunities.

Information from the University of Hull reports; *Tyne Estuary Edges Enhancement Study: MetroGreen Priority Site &Tyne Estuary Edges Enhancement Study* is summarised in the following tables and for the priority sites detailed below.

As up to £1bn of investment is planned for new developments along the Tyne Estuary; now is the time to try to influence developers to design their green space and blue-green infrastructure with the recommendations from this report in mind. As such most of the new development sites planned have been selected as short term priority projects.

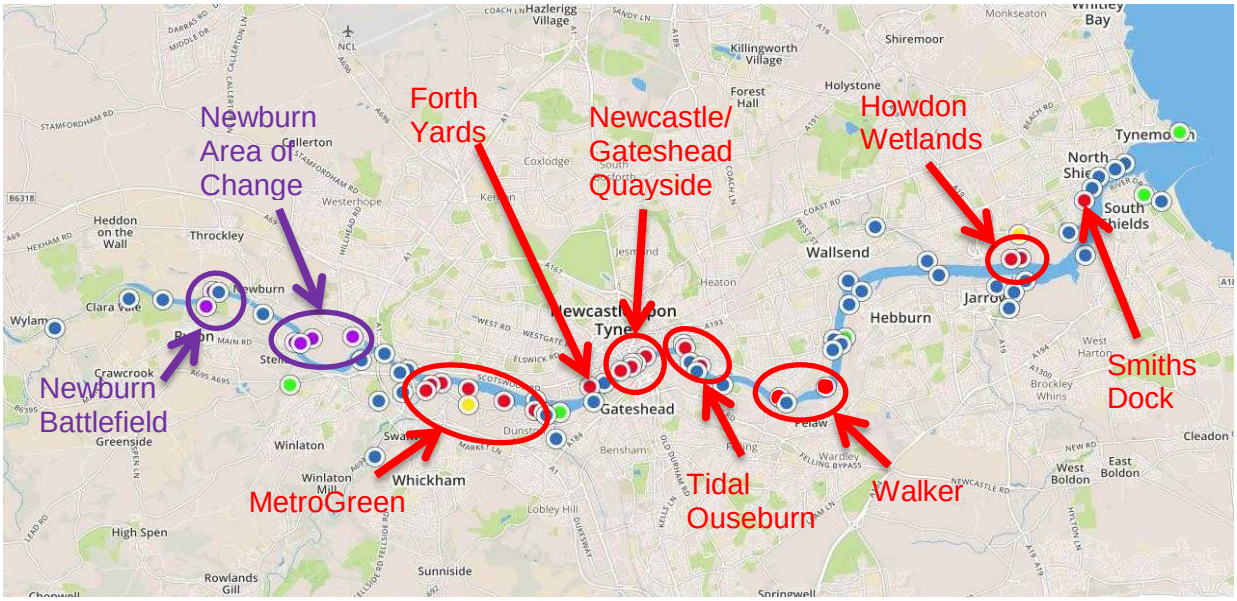
Other priority projects include those where landowners and key stakeholders already have similar plans for enhancements to the Tyne Estuary and its surrounding blue-green infrastructure and/or there are pressures on habitats which are timely to address now before any habitat or ecosystem service benefit is diminished or lost.

Short Term Priority Projects are identified by Red dots (1-3 years, already in development/planning/identified for change, listed west to east rather than order of priority)

- Metro Green – new development
- Forth Yards - new development
- Newcastle/Gateshead Quayside - potential link with NE1 and The Water hub project
- Tidal Ouseburn – new developments and Ouseburn barrage
- Walker Riverside Park – potential focus for Newcastle City Council and habitat of significant value
- Howdon Wetlands (Northumbrian Water Works and Wetlands)
- Smiths Dock – new development

Medium Term Priority Projects are identified by Purple dots (4+ years, identified/known as an improvement opportunity but not imminent)

- Newburn Battlefields
- Newburn area of change
- Holborn Docks



Summary Table: All projects could be delivered at varying scales and associated budgets. This is dependent on availability of funding, match funding, number of sites addressed and the scale of improvement works.

Table 1. Priority Sites Summary

PROJECT NAME	DESCRIPTION	WFD MITIGATION MEASURE	BAP HABITAT	WATER BODY IMPROVED	FLOOD RISK MGMT
MetroGreen	MG01 River Derwent: Highly modified watercourse with the final kilometre canalised along most of its length.	✓ Manage/restore aquatic and riparian habitats ✓ Modify or enhance structure – soften hard bank ✓ In-channel morph diversity	✓ Habitat creation ✓ Increased feeding/roosting time ✓ Create breeding/refuge areas	c.1km	N/A
	MG02 Mouth of River Derwent: High banked mudflats c.1520m in width with natural small creek systems.	✓ Manage/restore Intertidal Zone ✓ Manage/restore aquatic and riparian habitats ✓ Bank rehabilitation ✓ In-channel morph diversity	✓ Habitat creation ✓ Increased feeding/roosting time ✓ Create breeding/refuge areas	c.500m	N/A
	MG03 Metro Riverside Park (West): Mudflat fronts steep rip-rap banks; developing saltmarsh zone.	✓ Good practice vegetation management	✓ Habitat diversification	N/A	N/A
	MG04 Metro Riverside Park (East): Wide mudflat fronting, currently undisturbed.	✓ Manage/restore Intertidal Zone ✓ Manage/restore aquatic and riparian habitats ✓ Bank rehabilitation ✓ In-channel morph diversity	✓ Habitat creation ✓ Habitat enhancement ✓ Increased feeding/roosting time ✓ Create HW roosts/ breeding sites ✓ Create breeding/refuge areas	c.1.5km	Flood defence
	MG05 East of Costco: Low earth banks, with a saltmarsh zone fronted by an extensive mudflat.	✓ Manage/restore Intertidal Zone ✓ Manage/restore aquatic and riparian habitats ✓ Bank rehabilitation	✓ Habitat creation – up to 1ha ✓ Habitat enhancement ✓ Increased feeding/roosting time	c.550m	Flood defence

PROJECT NAME	DESCRIPTION	WFD MITIGATION MEASURE	BAP HABITAT	WATER BODY IMPROVED	FLOOD RISK MGMT
		✓ In-channel morph diversity	✓ Create HW roosts/ breeding sites ✓ Create breeding/refuge areas		
	MG06 Kingfisher Court: Steep concrete wall with rip-rap toe and mudflat.	✓ Manage/restore Intertidal Zone ✓ Manage/restore aquatic and riparian habitats ✓ Bank rehabilitation	✓ Habitat creation ✓ Habitat enhancement ✓ Increased feeding/roosting time ✓ Create HW roosts/ breeding sites	c.250m	Flood defence
	S06 Cormorant Drive	✓ Manage/restore Intertidal Zone ✓ Manage/restore aquatic and riparian habitats ✓ Bank rehabilitation	✓ Habitat creation ✓ Habitat enhancement ✓ Increased feeding/roosting time ✓ Create HW roosts/ breeding sites	c.250m	Flood defence
	Dunston Staiths	✓ Sediment management ✓ Preserve habitat	✓ Habitat conservation	c.4.7ha	Flood defence
Forth Yards	Located south of Scotswood Road and the line of the former Newcastle-Carlisle railway, extending area contains a large number of vacant or underused sites.	✓ Good practice vegetation management ✓ Manage/restore intertidal zone ✓ Manage/restore aquatic and riparian habitats ✓ Enhance ecology	✓ Habitat creation ✓ Habitat enhancement ✓ Increased feeding/roosting time ✓ Create HW roosts/breeding sites	c.600m	Flood defence Surface water management
Newcastle/ Gateshead Quayside	City centre location with engineered banks and public access along the quayside.	✓ Good practice vegetation management ✓ Manage/restore Intertidal Zone ✓ Manage/restore aquatic and riparian habitats ✓ Modify or enhance structure	✓ Habitat creation ✓ Increased feeding/roosting time ✓ Create HW roosts/breeding sites	c.1km	Flood defence

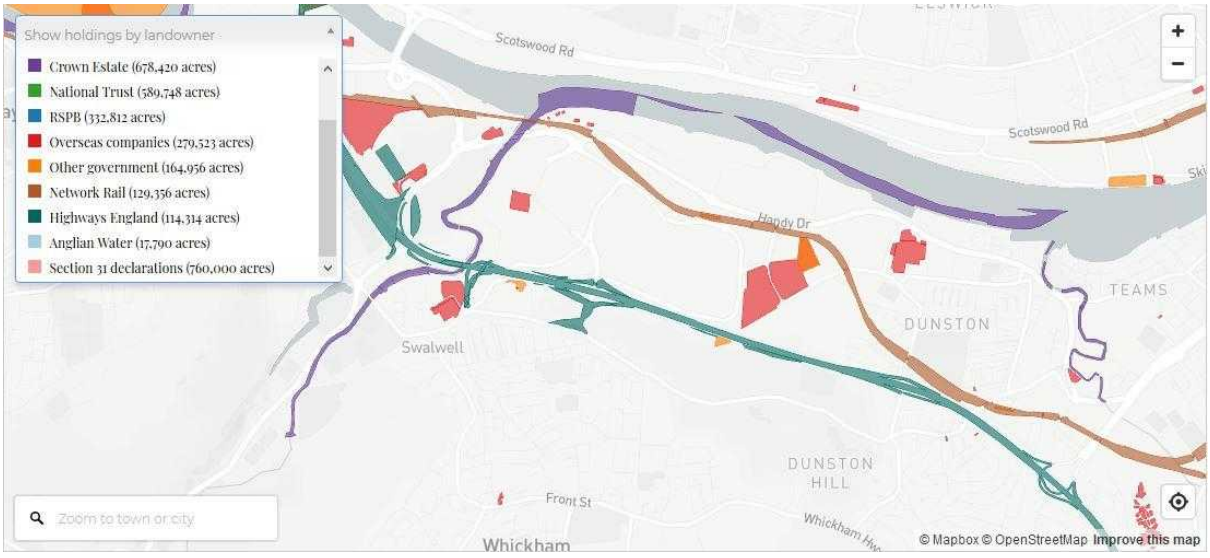
PROJECT NAME	DESCRIPTION	WFD MITIGATION MEASURE	BAP HABITAT	WATER BODY IMPROVED	FLOOD RISK MGMT
Tidal Ouseburn	Where the Ouseburn River joins the Tyne Estuary, around the Ouseburn Barrage.	✓ Good practice vegetation management ✓ Enhance ecology	✓ Habitat creation ✓ Increased feeding/ roosting time ✓ Create high water roosts/breeding sites ✓ Creating breeding/refuge areas	c.1km	Flood defence Surface water management
Walker Riverside Park	Former industrial land, now grassland, woodland and riverside.	✓ Good practice vegetation management ✓ Manage and restore intertidal Zone ✓ Manage/restore aquatic and riparian habitats ✓ Increase ecology	✓ Habitat creation ✓ Habitat enhancement ✓ Create HW roosts/breeding sites ✓ Creating breeding/refuge areas	c.2km	Flood defence
Howdon Wetlands	Consists of the intertidal area fronting the Northumbrian Water works and Howdon Wetlands.	✓ Good practice vegetation management ✓ Manage and restore intertidal zone ✓ Manage/restore aquatic and riparian habitats ✓ Enhance ecology ✓ Bank rehabilitation	✓ Habitat creation ✓ Habitat enhancement ✓ Increased feeding/roosting time ✓ Create HW roosts/breeding sites	c.33,000m^2	Flood defence
Smith's Docks	A historic site for the ship building industry, with three wet docks – a central feature of the area.	✓ Good practice vegetation Management ✓ Enhanced ecology	✓ Habitat creation ✓ Increased feeding/ roosting time ✓ Create high water roosts/breeding sites ✓ Creating breeding/ refuge areas	c.11,000m^2	Surface water management

MetroGreen

This multi-use site is now at Stage 2 of the Area Action Plan. There are a number of options with consultations going ahead over the coming months with the preferred option consulted on by end of 2019. This could be a key time to consult further with the Gateshead Council MetroGreen development team. It will take a further 18 months before the preferred option is accepted.

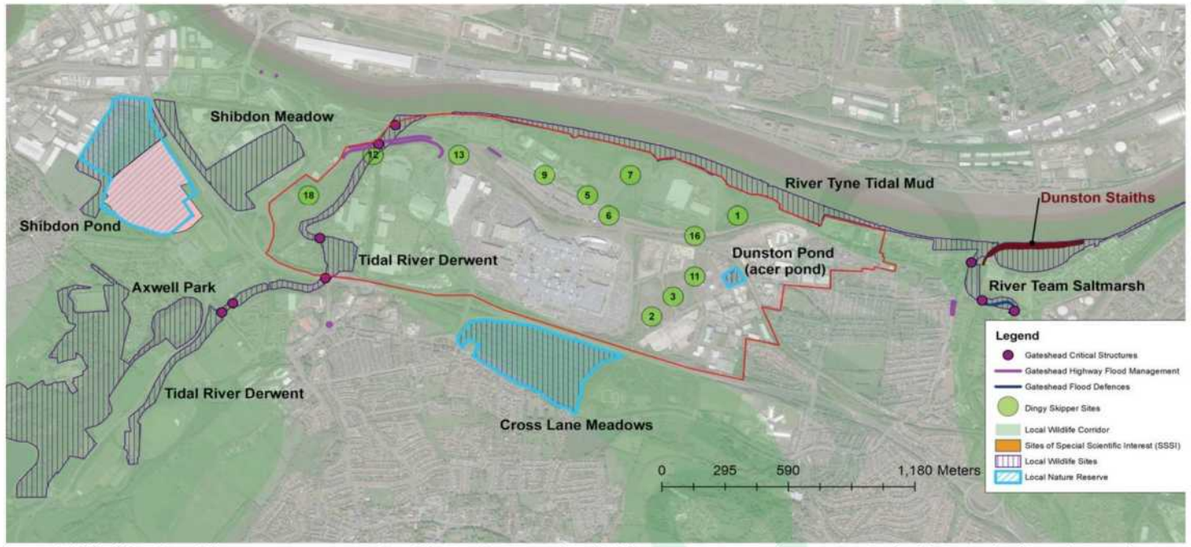
MetroGreen is a 213ha brownfield site on the south bank of the River Tyne surrounding the Metrocentre, bounded by Dunston to the east and the River Derwent and Derwenthaugh Road to the west. Development proposals for the MetroGreen site include: new residential areas, as well as commercial, leisure and community facilities. It is proposed that a network of green spaces and routes for pedestrians and cyclists will be incorporated. Of relevance to this study is the proposal within the MetroGreen Options Report of a 10 to 30 metre wide continuous recreational riverside route within a landscaped setting on the Tyne riverban. The options report also details a comprehensive, multifunctional river defence along the River Tyne and site based land raising. This will feature a landscaped bund set back from the river frontage incorporating the climate change levels to mitigate tidal flood risk over the lifetime of MetroGreen at 5.55m AOD. This flood defence would be integrated with the blue green infrastructure network and recreational routes and aim to minimise the environmental impact by ensuring a buffer between the development and the river. Hard defence components may be accepted at narrow pinch points.

Most of the MetroGreen land is in private ownership: Intu Properties own the Metrocentre, Church Commissioners and GIC Real Estate own the remainder of the land with Gateshead Council owning sections of quay walls, riverside walk and intertidal zones, and other agencies owning land as shown in the map below.

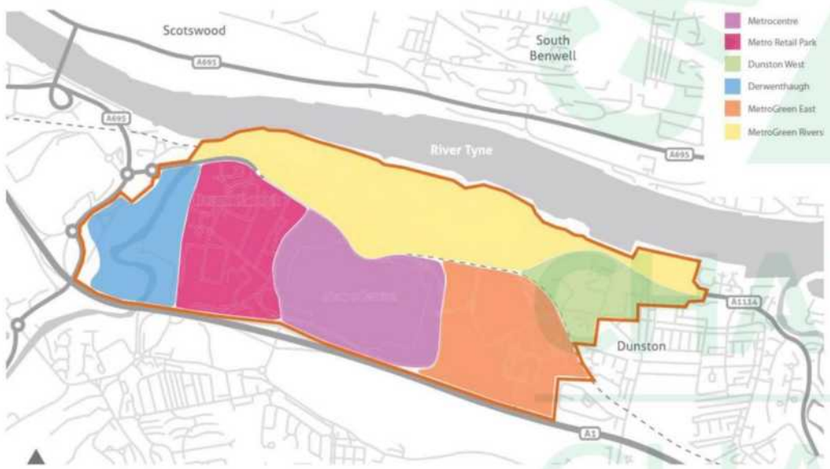


MetroGreen

The site:
MetroGreen is a 213ha brownfield site on the south bank of the River Tyne surrounding the Metrocentre, incorporating a 3km stretch of estuary bank in the Tyne Estuary, bounded by Dunston to the east and the River Derwent and Derwenthaugh Road to the west.

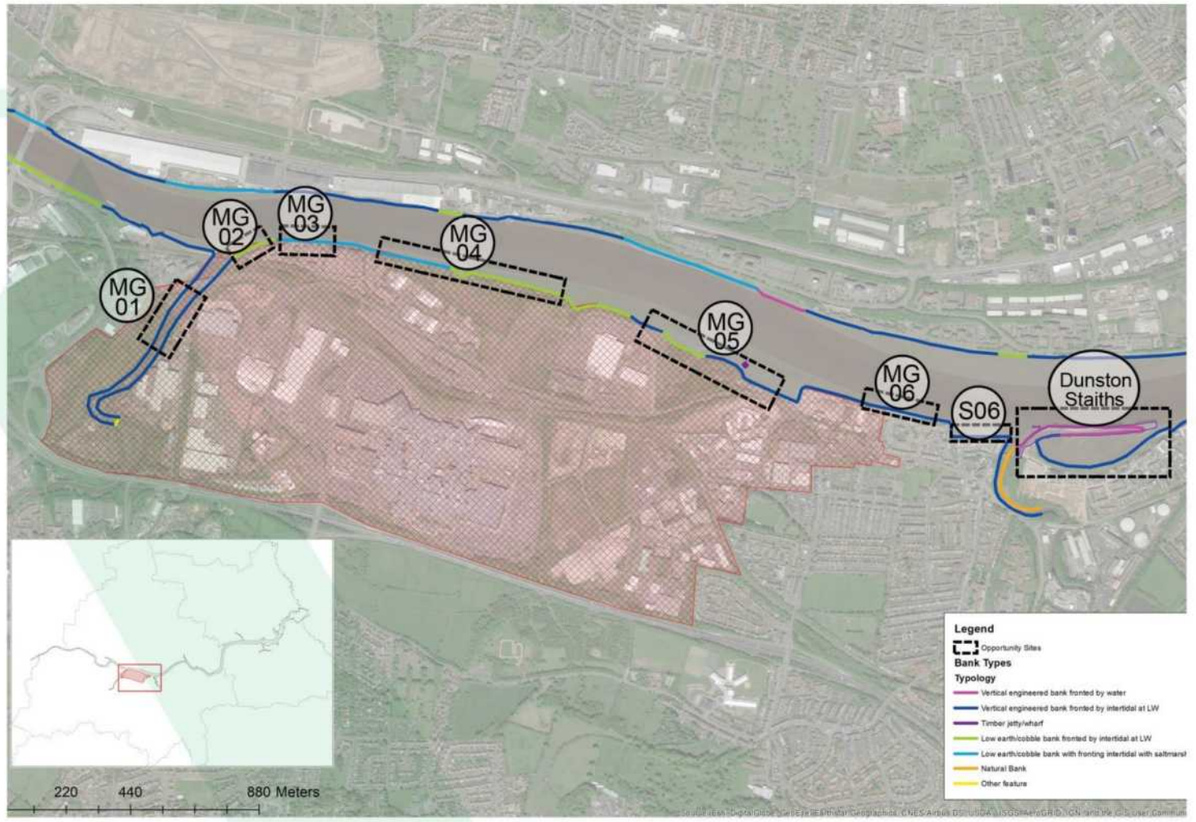


Local Wildlife Corridors run across the MetroGreen site linking numerous important designated sites: broad corridors along the Derwent and Team merge into the Tyne Estuary corridor to form an extensive network of sites important for wildlife.



MetroGreen Development: Options Report Gateshead Council 2015

Development proposals for the MetroGreen site include new residential areas, as well as commercial, leisure and community facilities. The MetroGreen Options Report proposes a 10 to 30 metre wide continuous recreational riverside route within a landscaped setting on the Tyne riverbank (Gateshead Council, 2015). The options report also details a comprehensive, multifunctional river defence along the River Tyne and site based land raising. This will feature a landscaped bund set back from the river frontage incorporating the climate change levels to mitigate tidal flood risk over the lifetime of MetroGreen.



Estuary Edges Feasibility Study (Hull University)

The aim of the MetroGreen Estuary Edges feasibility study is to identify areas along the 3km development frontage (from the tidal limit of the River Derwent to the River Team) where Estuary Edges Techniques could be applied. Even small pockets of biodiversity enhancements along this section will help to create a corridor of habitats, increasing both the connectivity of biodiversity potential along the estuary and the potential for natural habitats to re-establish. The scope of the report mainly considers enhancing existing bank infrastructure, but also includes opportunities for re-profiling or realignment if the opportunity exists.

Upstream of Newcastle centre, mudflat extent increases, particularly on the south bank e.g. in the low energy embayment formed by Dunston Staiths, and sections along the reach from Dunston to Ryton. This includes the MetroGreen frontage which features an elevated mudflat of over 100m width in some locations and retains some of the most extensive mudflats within the Tyne Estuary. The area of mudflat fronting the MetroGreen site (approximately 10ha) accounts for nearly 18% of the Tyne's total mudflat and sandflat habitat. With the loss of Jarrow Slake as a major area of intertidal mud in the 1980s, this site now constitutes the largest remaining fragments of mudflat habitat on the whole of the Tyne Estuary. These mudflats front low earth banks or steep cobble engineered walls. A culverted storm drain with storm flap runs into the estuary (MG05) with a deep creek system running down to low water.

Saltmarsh along the MetroGreen frontage is quite scarce, with the main extent limited to the River Derwent and patchy areas along the main estuary bank. Saltmarsh plants were noted on the mud and old masonry along Timber Beach adjacent to Handy Road and within and at the mouth of the River Derwent.

The presence of a large semi-contiguous intertidal mudflat habitat fronting the MetroGreen area has the potential to deliver suitable foraging and roosting function for a number of waterbird species, which may be of ecological value and sensitivity when considering the development of the MetroGreen area.

The study area also includes the mouth of the River Derwent and the River Team and Dunston Staithes to the East.

MG01 River Derwent

The site:

The tidal River Derwent is a highly modified watercourse with the final kilometre canalised along most of its length.

A steep geotextiled concrete 'honeycombed' wall on the west bank is fronted by a narrow mudflat, with ruderal vegetation growing towards the top of the bank. The east bank is characterised by vertical concrete walls fronted by a rip-rap toe, steep mudflat and developing saltmarsh vegetation.

Mature trees and shrubs provide screening to the industrial use of the bank behind. Just above the lower weir, the intertidal meander has been colonised by a stand of reed-canary grass backed by an unmanaged mosaic of wet grassland, scrub and plantation woodland.

The river is important for ecological connectivity between the River Tyne and the upper Derwent wildlife corridors. Salmon and sea trout enter the Derwent when migrating up the Tyne using the fish pass on the lower weir to continue their journey. The Derwent is also important for otters who regularly use the lower river, particularly when the migratory salmonids are present.

The intertidal mudflats within the river are of regional significance to passage and wintering birds and are utilised by teal and little grebes with a number of other wading species.

River Derwent - looking south

Canalised banks of the lower River Derwent - looking south

Enhancement Options:

With the canalised nature of the river, there is little opportunity for re-profiling the banks. However, there are opportunities for greening the current banks and providing enhanced habitat for fish and otters utilising the river channel. The creation of new vegetated habitat in the River Derwent could be considered through a combination of methods:

Floating Edges

Ideally suited for waterfront restoration projects, marine engineering materials in a modular system can to be configured in any design and be planted with native species which are going to create maximum enhancement for that ecosystem. The modular systems can be retrofitted to existing banks with steep vertical edges, to improve poor water quality, cope with floating debris, variable fast currents and changing water levels.

Examples of canalised river restoration with floating riverbanks and island modules © Biomatrix

East bank of River Derwent before and after floating edge enhancement © Biomatrix

Otter Enhancements

- Although one otter holt had been recorded by Dunkin (2015), the long stretch of canalised river has no points of shelter for otters. This could be provided by creating a new artificial holt along the bank.
- Look to install mammal ledges on bridges and culverts to allow for continued movement along the riverbanks.

Fish Enhancements

- Trial fish refuge boxes in the River Derwent by attaching to the railway or road bridge supports where the water level is present even at low water.

Summary:

Opportunities:

- New vegetated habitat through installation of floating edges
- Improved otter habitat
- New fish refuges
- Increased public awareness

Constraints:

- Channel is owned by the Crown Estates
- Attachments to bridge and road infrastructure will require highway authority approval

Costs:

- Partner engagement, permissions & project management £3000
- Floating modular system £10,000 - £15,000 for 20m2
- Artificial Otter holt £500 each
- Mammal ledges on bridges and culverts £500 - £1000 per trial ledge
- Fish refuge boxes £1000 per 4 refugia

Viability:

Although the land either side of main channel is owned by Gateshead Council the channel is owned by the Crown Estates. Interventions will require permission from both landowners.

WFD Mitigation Measures:

- Manage and Restore Aquatic and Riparian Habitats
- Modify or Enhance Structure - soften hard bank
- In-channel morph diversity

Biodiversity Action Plan:

- Habitat creation
- Increased feeding / roosting time
- Create breeding / refuge areas

Length of water body enhanced:

500m

Flood Risk Management:

N/A

MG02 Mouth of River Derwent

The site:
The mouth of the River Derwent as it meets the Tyne Estuary is characterised by high banked mudflats approximately 15-20m in width with natural small creek systems. These mudflats are backed by high cobbled seawalls with occasional saltmarsh vegetation growing within the interstitial geoweb erosion control membrane at the base.
The Keelman's Way (National Cycle Network route 14/141) is a riverside foot and cycle path which passes along the top of the flood bank with some screening by mature plants, but still providing a range of vegetation heights which maintains good views of the Tyne Estuary both up and down stream.


Saltmarsh growing in plastic geotextile membrane


Coir mattress with plug plants


Intertidal tiered Ecosystems: steel gabions filled with estuarine sediment


Intertidal tiered Ecosystems placed close to high water mark at mouth of the River Derwent © Biomatrix

Enhancement Options:
The upper shoreline is at the ideal elevation for saltmarsh plants to successfully colonise within this zone, and therefore the introduction of additional saltmarsh plants at the mouth of the River Derwent, particularly on the east bank, would provide good ecological benefits by increasing the extent of saltmarsh habitat along the banks of the Tyne.

- Saltmarsh plants naturally found along the immediate bank including the common scurvy-grass, sea aster, lesser sea-spurrey, wild celery, sea plantain, common salt-marsh grass and common orache could all be successfully planted at this location.
- Utilising the existing geotextile mattresses/membrane, new saltmarsh plug plants could be planted into the spaces of the existing membrane. Plants could be introduced on pre-seeded coir substrate e.g. coir mattresses. A wire 'rocknet' could also be placed over the mattresses to provide additional protection against the river currents giving the new plants every opportunity to establish.
- Artificial enhancements could be trialled, for example Tiered Intertidal Ecosystems (© Biomatrix, 2019): stainless steel cages, topped with biodegradable pre-planted coir geotextile mats, filled with estuarine sediment and topped with gravel. Made to any measurements (but typically 1 metre), the pods would be located close to the high water mark at both sides of the mouth of the River Derwent, at suitable elevations.

Summary:

Opportunities:
- Introduce more saltmarsh species to interstitial geotextile membrane
- Trial alternative solutions such as raised planted gabions (Tiered Intertial Ecosystems)

Constraints:
- Channel is owned by the Crown Estates

Costs:
- Partner engagement, permissions & project management £3000
- Saltmarsh plugs £500 - £1000 per 20m2
- Pre-seeded coir mattress £2000 per 100m2
- Wire rocknet protection. £6,000 per 100m2
- Intertidal Tiered Ecosystems £5000 fpr 5 units

Viability:
Although the bank is owned by Gateshead Council the channel is owned by the Crown Estates. Interventions will require permission from both landowners.

WFD Mitigation Measures:
- Manage and Restore the Intertidal Zone
- Manage and restore Aquatic and Riperian Habitats
- Bank rehabilitaion
- In-channel morph diversity

Biodiversity Action Plan:
- Habitat creation
- Increased feeding / roosting time
- Create breeding / refuge areas

Length of water body enhanced:
500m

Flood Risk Management:
N/A

MG03 Metro Riverside Park (West)

The site:
The mudflat fronting this section averages 10m in width and fronts steep rip-rap banks displaying a distinct algae to developing saltmarsh zonation.
The Keelman's Way (National Cycle Network route 14/141) is a riverside foot and cycle path which passes along the top of the flood bank along the back of the industrial units on The Watermark Road. However the planting on the flood wall and along the top of the bank in parts has been allowed to become overgrown and no longer provides clear views over the estuary.

Enhancement Options:
As the mudflat along this stretch is very narrow, with minimal bird use, there are little opportunities to enhance the river frontage. However, the screening provided by the mature plants along the bank top could be managed to allow a more open vista across the River Tyne. This could be achieved by:
- Opening up the scrub/mature vegetation to improve river views from the footpath.
- Planting different species to give a range of vegetation heights similar to the footpath near the mouth of the River Derwent.


Footpath with overgrown bank vegetation


Restricted views from footpath

Summary:

Opportunities:
- Open up mature vegetation to improve river views from footpath and provide visual connection with the estuary
- Plant different species to give a range of vegetation heights

Constraints:
- Dense vegetation provides good habitat and minimises disturbance to shoreline ecology. Care required to balance views and biodiversity
- Bank in private ownership

Costs:
- Partner engagement, permissions & project management £3000
- Vegetation removal £1500 per 100m2
- Planting alternative species £1500 per 100m2

Viability:
Permission from landowner required.

WFD Mitigation Measures:
- Good practice vegetation management

Biodiversity Action Plan:
- Habitat diversification

Length of water body enhanced:
300m

Flood Risk Management:
N/A

MG04 Metro Riverside Park (East)

The site:

The wide mudflat fronting this section is well utilised by waders at low water and is currently undisturbed with no public right of way passing along the bank. With the mudflat averaging 30m wide to the west of this section, widening to approximately 90m to the east fronting Mandela Way, it is backed by low cobble and earth banks with a fucoid zone and developing saltmarsh at high water grading to ruderal grasses and mature scrub vegetation. An outfall discharges into the river at NZ 42142 56318. The land between the flood bank and Delta Bank Road to Handy Drive is characterised by high ground with overgrown scrub vegetation and mature plants. Although no formal right of way exists, informal tracks are present with a small viewing area located opposite Costco on the bend of Mandela Way. An electricity pylon with fencing situated to the west of Costco further restricts access to the bank.

Enhancement Options:

Buffer zone

If this semi natural area of scrub land behind the river bank is redeveloped as part of the MetroGreen site, a buffer zone should be maintained between the mudflat and the developments.

- Estuarine birds are very susceptible to disturbance and developments on the river bank and therefore the proposed amenity path should be set back to its maximum distance (30m+) from this area of mudflat.
- Screening from any amenity path should be included in the development plan to ensure the mudflat use by waders is maintained. However planting should be sympathetic to ensure views across and along the Tyne are ensured. Suitable planting options which provide screening should be considered (e.g. grasses and reeds), with taller bushes and trees maintained from the existing habitat which would still allow views across and along the River Tyne.

Bank Realignment and Planting

- As the land is naturally higher behind the flood bank, the bank could be realigned to create a suitable profile for an increase in saltmarsh extent. Existing mudflat to be undisturbed.
- Use of wooden posts to create a terraced bank profile to the desired height, infilled with brushwood faggots and pre-established planted coir rolls. A terraced bank alignment together with other enhancements would provide alternative roost site for some water birds associated with the relatively important fronting intertidal mudflat.
- The surrounding land is prone to land movements, therefore, any greening enhancements should be able to adapt to and withstand any instability.

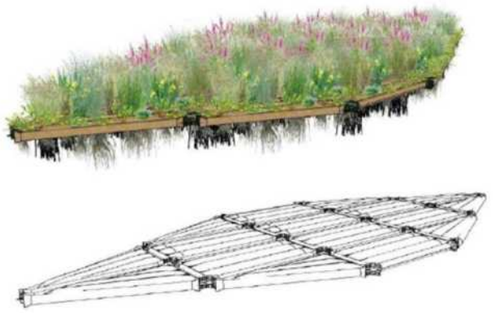
Floating Riperian Ecosystems

- Vegetated floating platforms could be positioned at suitable locations on the upper mudflat, anchored securely into the mudflat and weighted. At high water these would become suspended in the water column offering roosting pontoons for birds.

Typical bank and mudflat fronting Metro Riverside Park East

Re-profiling of intertidal banks to provide increased or new vegetated areas fronted by mudflat would improve the habitat provision of the area.

Brushwood mattress comprising fascines / faggots held by a grid of fixing posts



Floating riperian ecosystems © Biomatrix

Summary:

Opportunities:

- If access is to be improved, then screening should be considered to reduce disturbance to waders with suitable planting options
- Opportunities to use coir rolls and brushwood faggots to increase saltmarsh habitat
- This site also provides one of a limited opportunities for realignment on the Tyne
- Otter enhancements along this bank
- Floating riperian ecosystems

Constraints:

- Land behind bank is part of the MetroGreen development site to include a 10 to 30 metre wide continuous recreational riverside route within a landscaped setting on the Tyne riverbank

Costs:

- Partner engagement, permissions & project management £3000
- Brushwood faggots and coir rolls £6000 per 100m2
- Realignment and regrading of bank £15000 per 100m2
- Artificial Otter holts £500 each
- Floating riperian ecosystems £5000 per 5 units

Viability:

Bank and land behind is in private ownership.

WFD Mitigation Measures:

- Manage and Restore the Intertidal Zone
- Manage and restore Aquatic and Riperian Habitats
- Bank rehabilitation
- In-channel morph diversity

Biodiversity Action Plan:

- Habitat creation
- Habitat enhancement
- Increased feeding / roosting time
- Create HW roosts / Breeding sites
- Create breeding / refuge areas

Length of water body enhanced:

700km

Flood Risk Management:

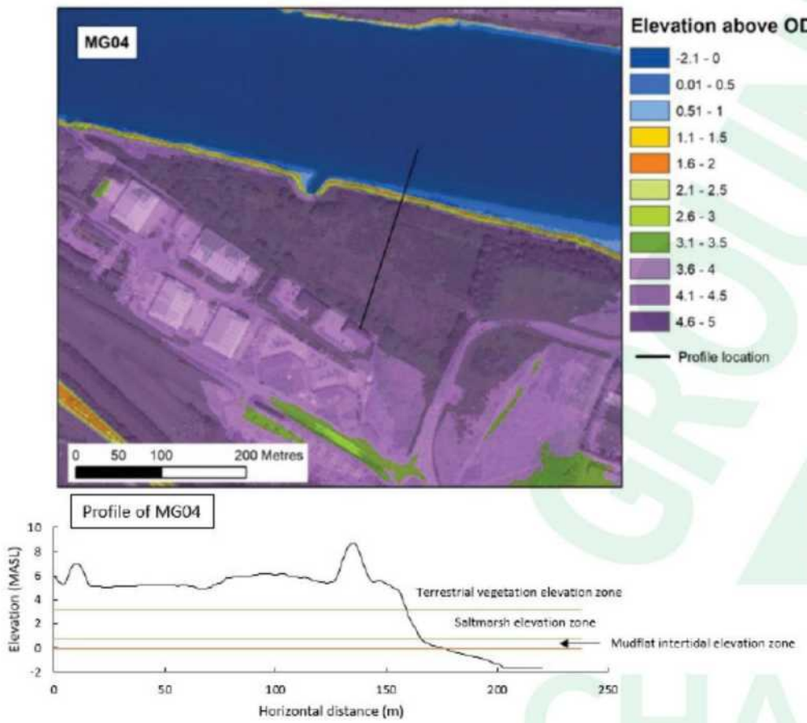
Dissipate wave energy

MG05 East of Costco

The site:

This section is characterised by low earth banks, with a saltmarsh zone fronted by an extensive mudflat (100m in width). A derelict square wooden 'dolphin' jetty is located on Timber Beach on the mid to upper mudflat. Other key features include a large tidal creek in the mudflat formed from the discharge of a storm drain. Good numbers of waders were recorded using this mudflat and within the creek during the field visits in October 2018. The drain which runs north from the A1114 to the Tyne is tidally managed with a sluice gate and protected by steel shuttering and rock gabions with saltmarsh plants at high water.

Along the upper limits of the tideline there are stretches of developing saltmarsh, with sea aster dominant. Drier upper reaches of the bank support small numbers of common-spotted orchid, cowslip, sea aster, scurvy grass and several varieties of fern. The bank protects an area of mature vegetation with the habitat supporting self-seeded Silver Birch, Willow and Apple, with a relatively open understorey, and as such, has intrinsic terrestrial ecology value.



Enhancement Options:

Bank Re-profiling and Enhancements

Due to the developed nature of the Tyne Estuary, there is limited opportunity to readily create new intertidal mudflat and associated saltmarsh habitat. However, the currently undeveloped triangle of land approximately 4ha in area between Handy Drive and Mandela Way within MG05 could be used to create such habitat. A reversal of this area to intertidal habitat would require removal of what appears to be legacy industrial material.

- As the land is higher behind the flood bank, the bank could be realigned to create a suitable profile for an increase in saltmarsh fronting the bank. Realigning the bank by 30m, would create a 1ha area of intertidal habitat. This option would require considerable groundworks to reduce ground elevations, however could be considered as part of the MetroGreen development proposals.
- Re-profiling the bank to create terraces or a natural slope would allow the correct height for saltmarsh growth and the extension of this currently fringing habitat. Wooden posts could be used to create a terraced bank profile to the desired height, infilled with brushwood faggots and pre-established planted coir rolls.
- LiDAR elevations for the area show that behind the existing flood bank, ground levels are relatively low and, following some excavation, could potentially be colonised by saltmarsh if the bank was breached to permit tidal nundation. This option would however render the area prone to silting and elevations may again exceed those suitable for saltmarsh.

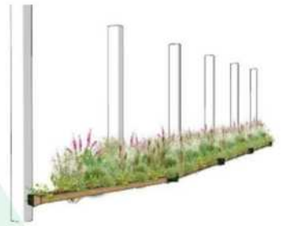
MetroGreen Development Options

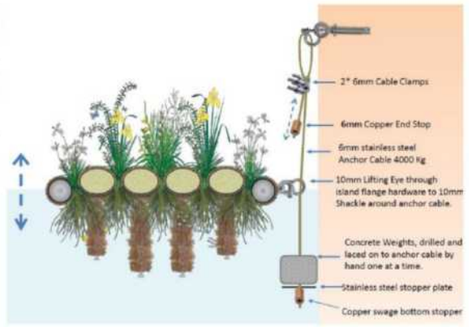
Development plans could affect this stretch of river bank, as estuarine birds are very susceptible to disturbance, therefore recommendations for this site include:

- The proposed amenity path should be set back to its maximum distance (30m+) from this area of mudflat.
- Screening from any amenity path should be included in the development plan to ensure the mudflat use by waders is maintained. However planting should be sympathetic to ensure views across and along the Tyne are maintained.
- The large mudflat creek system fronting the bank should be preserved and no development proposals should encroach onto the existing mudflats.

Derelict timber dolphin structure could support a tern nesting island

Tern roost





Floating edge ecosystem attached to top of jetty which moves up and down with the tide

Summary:

Opportunities:

- If access is to be improved, then screening should be included to reduce disturbance to waders with suitable planting options
- This site provides one of limited opportunities for realignment on the Tyne
- Re-profiling of intertidal banks to provide increased or new vegetated areas fronted by mudflat
- The timber 'dolphin' on the upper to mid mudflat could be used for a tern roost or vegetated island
- Otter enhancements should be considered along this bank

Constraints:

- Land behind bank is part of the MetroGreen development site to include a 10 to 30 metre wide continuous recreational riverside route within a landscaped setting on the Tyne riverbank

Costs:

- Partner engagement, permissions & project management £3000
- Realignment and regrading of bank £15000 per 100m2
- Artificial Otter holts £500 each
- Floating edge ecosystems £5000 per 5 units

Viability:

Bank and land behind is in private ownership.

WFD Mitigation Measures:

- Manage and Restore the Intertidal Zone
- Manage and restore Aquatic and Riperian Habitats
- Bank rehabilitation
- In-channel morph diversity

Biodiversity Action Plan:

- Habitat creation - up to 1ha
- Habitat enhancement
- Increased feeding / roosting time
- Create HW roosts / Breeding sites
- Create breeding / refuge areas

Length of water body enhanced:

550m

Flood Risk Management:

Dissipate wave energy

MG06 Kingfisher Court

The site:
The bank along this stretch is characterised by a steep concrete wall with rip-rap toe and mudflat averaging 30m in width. This provides protection to the residential properties and the A1114 behind. Mature bushes and trees present on the top of the bank provide some screening from the activity behind the bank.

Create a mid-level terrace at the strand line - indicated - and introduce vegetation through enhancements such as Biomatric Intertidal Ecosystem

Enhancement Options:

A modest habitat enhancement could be created along the frontage immediately fronting Sector 6. The current defences could benefit from being terraced/stepped such that hard standing can be available at differing tidal states for roosting waders. This would entail re-profiling the rip-rap toe to provide a terraced effect without losing the properties for flood defence and erosion.

Bank Re-profiling and Enhancements:
- Terracing of the bank profile using existing rip-rap boulders to provide increased wader roosting areas.
- Create one mid to upper level terrace (level with the existing strand line) which is planted with tall vegetation species to ensure emergence on the highest tide. This could be achieved by utilising geotextile mattresses / membrane (as seen in MG01) and planting with saltmarsh plugs.
- Alternatively, artificial enhancements could be used which employ stainless steel cages, topped with biodegradable pre-planted coir geotextile mats, filled with estuarine sediment (investigate the possibility of using dredged spoil) and topped with gravel. These would be fixed to the riprap boulders located along the strand line on the newly developed terrace.

Summary:

Opportunities:
- Re-profile @250m midsection of boulder toe protection between the fucoid zone and upper boulder zone
- Create horizontal terrace to create saltmarsh zone. Possible use of Tiered Intertidal Ecosystems © Biomatrix

Constraints:
- Extent of Crown Estates ownership of intertidal habitat to be checked

Costs:
- Partner engagement, permissions & project management £3000
- Realignment and regrading of bank £15000 per 100m3
- Tiered Intertidal Ecosystem £500 per 5 units

Viability:
Riverside walk, quay wall, bank and intertidal habitat owned by Gateshead Council. Channel owned by Crown Estates.

WFD Mitigation Measures:
- Manage and Restore the Intertidal Zone
- Manage and restore Aquatic and Riperian Habitats
- Bank rehabilitation

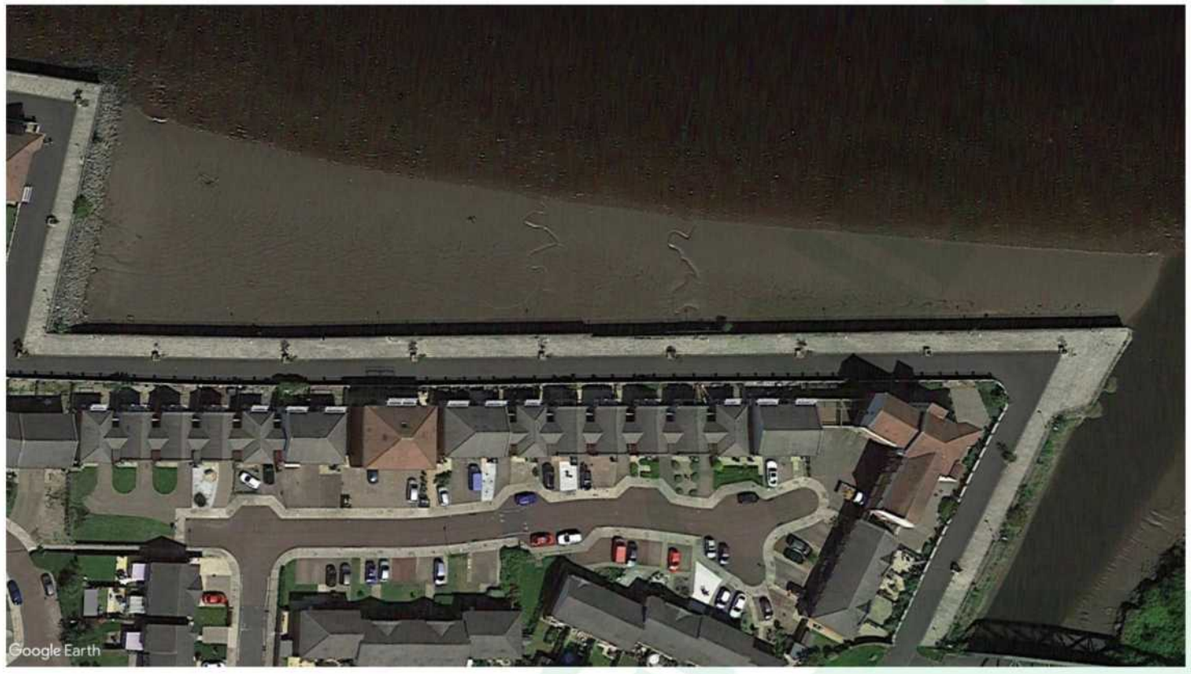
Biodiversity Action Plan:
- Habitat creation
- Habitat enhancement
- Increased feeding / roosting time
- Create HW roosts / Breeding sites

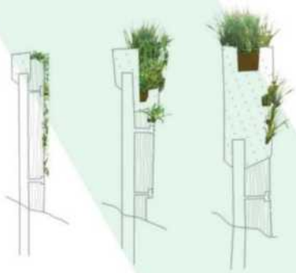
Length of water body enhanced:
250m

Flood Risk Management:
Dissipate wave energy

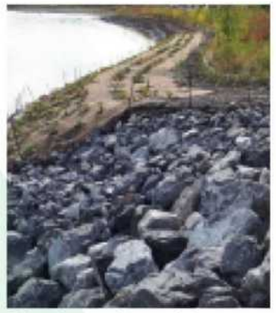
S06 Cormorant Drive

The site:
The bank along this stretch is characterised by a steep concrete wall with rip-rap toe in some sections and mudflat averaging ranging from 5 to 30m in width. This provides protection to the access road, riverside walk and residential development.





Timber cladding attached to vertical seawall. Gap backfilled with rubble and sediment to form vertical beach habitat and planted with intertidal plants



Planting saltmarsh in geotextile membrane © City of Calgary, 2019

Contained planting in gabions © Biomatrix

Rock rolls to create terraced steps to trap sediment and develop saltmarsh

Enhancement Options:
The area of bank provides an opportunity to increase the extent of saltmarsh on the estuary. The current defences could benefit from being terraced/stepped such that hard standing can be available at differing tidal states for roosting waders. This would entail re-profiling the rip-rap toe to provide a terraced effect without losing the properties for flood defence and erosion. The following enhancements could be considered at the site:

- Create a mid level terrace (level with the existing strand line) which is planted with tall vegetation species to ensure emergence on the highest tide. This could be achieved by utilising geotextile mattresses/membrane and planting with saltmarsh plugs. Saltmarsh plants naturally found within the immediate area include the common scurvy-grass, sea aster, lesser sea-spurrey, wild celery, sea plantain, common salt-marsh grass and common orache, which could all be trialled at this location.

- Alternatively, artificial enhancements could be fixed to the rip-rap boulders located along the strand line on the newly developed terrace. They could also be trialled on the upper intertidal area to create additional saltmarsh habitat. Planted cages (e.g. Biomatrix Tiered Intertidal Ecosystem) are topped with biodegradable pre-planted coir geotextile mats, filled with estuarine sediment (investigate the possibility of using dredged spoil), topped with gravel and planted.

- Additional greening could be considered for the vertical flood walls (without a rip-rap toe) by attaching floating edges to the walls.

Summary:

Opportunities:
Opportunity for the vertical greening of seawalls, re-profiling rip-rap to give terraced edge and use planting in Tiered Intertidal Ecosystems © Biomatrix.

Constraints:
N/A

Costs:
- Partner engagement, permissions & project management £3000
- Vertical greening of seawalls £2000 - £3000 per 10m2
- Mid-tier terracing at strand line using geotextile mattress £2000 - £4000 per 100m2
- Gabion features to create artifical saltmarsh £5000 per 5 units

Viability:
Riverside walk, quay wall, bank and intertidal habitat owned by Gateshead Council.

WFD Mitigation Measures:
- Manage and restore the intertidal zone
- Manage and restore aquatic and riperian habitats
- Bank rehabilitation

Biodiversity Action Plan:
Habitat creation
Habitat enhancement
Increased feeding / roosting time
Create high water roosts / breeding sites

Length of water body enhanced:
250m

Flood Risk Management:
Dissipate wave energy

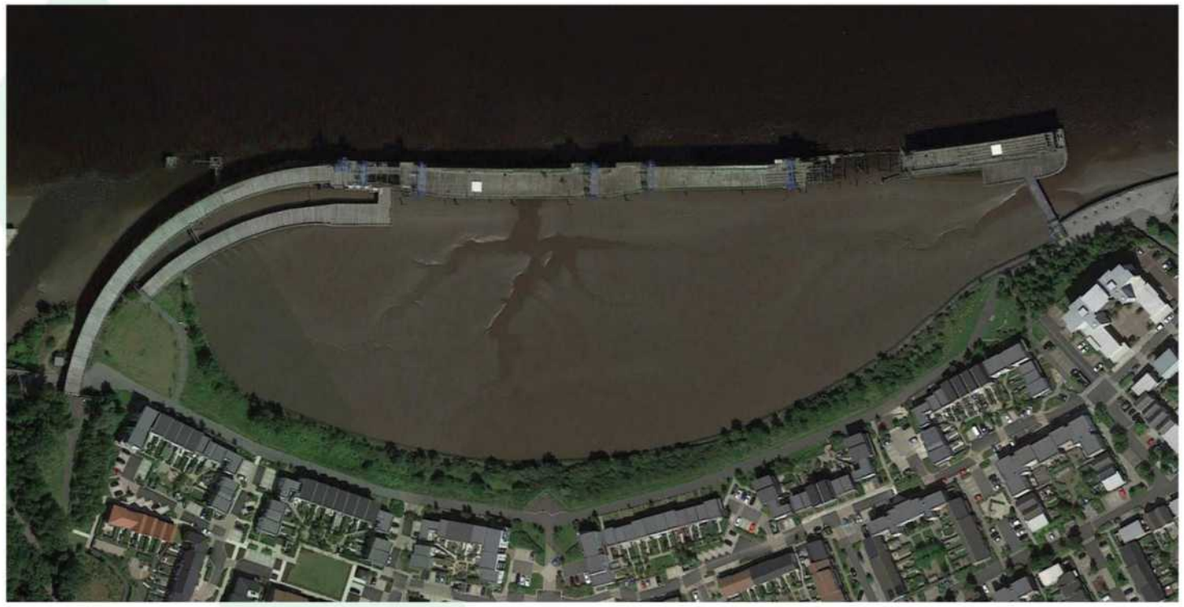
Dunston Staiths

The site:

Dunston Staiths is believed to be the largest timber structure in Europe. It is a Scheduled Monument, Grade II listed and is owned by registered charity Tyne and Wear Building Preservation Trust (TWBPT). Silted lagoon has formed an area of salt marsh mudflats, an important feeding area for wintering and migrant wading birds, as well as an undisturbed roosting area for a range of wetland birds.

The Staiths is included within two nature conservation designations: River Tyne Tidal Local Wildlife Site and River Team Saltmarsh Local Wildlife Site.

The riverbank habitat of the Tyne estuary has been radically altered by former industrial activity and the canalisation of the river causing a loss of upper shore habitats like saltmarsh. However small relict saltmarsh communities still occur on mud and old masonry at Timber Beach, Dunston and by the mouth of the River Derwent the south bank between Dunston Staiths and the mouth of the River Derwent. This reach supports the largest intertidal area on the estuary and from available WeBS data literature (Norman, 1999; E3 Ecology Ltd, 2016), a number of species are present in regionally important numbers. The Dunston Staiths embayment also supports regionally important numbers of some waterbird species - Shelduck60%, Teal 45%, Lapwing 50% Redshank 45% of the Tyne population.



Enhancement Options:

The Staiths offers the opportunity for community engagement and education regarding the importance of intertidal estuary habitats an promotion of the Tyne Estuary Vision.

Increased access and visitor numbers would need to be balanced against potential disturbance to the wildlife.

Restoration of the low riverside deck may pose a threat to the habitat.

Summary:

Opportunities:

- Protect and preserve the historic structure important to the formation of saltmarsh mudflats contained within the lagoon behind the structure
- Community engagement and education regarding estuary ecology

Constraints:

- Restoration of the structure and extended public access may disturb roosting and feeding sites

Costs:

- Revenue project to promote community engagement and education £4000

Viability:

- Tyne and Wear Building Preservation Trust
- Gateshead Council ownership restricted to Saltmarsh Garden LWS

WFD Mitigation Measures:

- Sediment management
- Preserve habitat

Biodiversity Action Plan:

- Habitat conservation

Area of water body preserved:

4.7ha

Flood Risk Management:

Dissipate wave energy

Newcastle/Gateshead Quayside

The site:
City centre location with engineered banks and public access along the quayside

Land ownership:
Newcastle Council

Planning context:
Plans are aspirational at the moment

Site Description

The vertically engineered banks of the quayside lend themselves to the possibility of greening through the attachment of floating pontoons. These could form part of the quayside attraction with vegetated pontoons people can walk on, use and interact with. Floating vegetated edges could be attached mid-channel to the existing timber framework. The University of Hull point out that 'floating edges not only make the river banks more aesthetically attractive and have ecological benefits, but they can also have educational uses, engaging the public with the history, culture and ecology of the Tyne, attracting people back to the river and increasing dwell time. The planted edges can be combined with mooring pontoons for river based recreation (e.g. kayaks) increasing the connectivity along the river. This could encourage the development of sporting and recreational facilities that make use of water based activities along the River Tyne without compromising the current ecology of the river banks. Existing pontoons along the Newcastle quayside could look to have floating vegetated islands retrofitted to the sides or in the space between the pontoon and quay wall.' Also, 'Floating edges can be strategically placed in the river channel to support wildlife and biodiversity. They are a living matrix that provides biological treatment and improves water quality and circulation. At high water, the extended root structure of the plants beneath the water provides a biological matrix, which supports good water quality and provides food for fish. These enhancements would be ideally situated where water is retained in front of the bank at low water. The pontoons can be planted with saltmarsh plants, grasses or other more terrestrial species, and at more urban sites (e.g. Newcastle quayside) could include tree modules and walkways to increase the amenity value of the edges' Tyne estuary Edges Enhancement Study, 5.1.

NE1 and the Water Hub have produced some ideas about the kind of development that may be possible in this area, which tie in well with the aspirations of greening the banks. Inclusion of the creation of more natural habitats also tie in with Newcastle/Gateshead Green Infrastructure Strategy.

Summary:

Opportunities:

- Greening the banks combined with improved public connection to the water front
- Potential strengthening of green infrastructure landwards to compliment the bank enhancements

Constraints:

- Mid channel timber quayside is a scheduled monument
- Strength of the tidal wash

Costs:

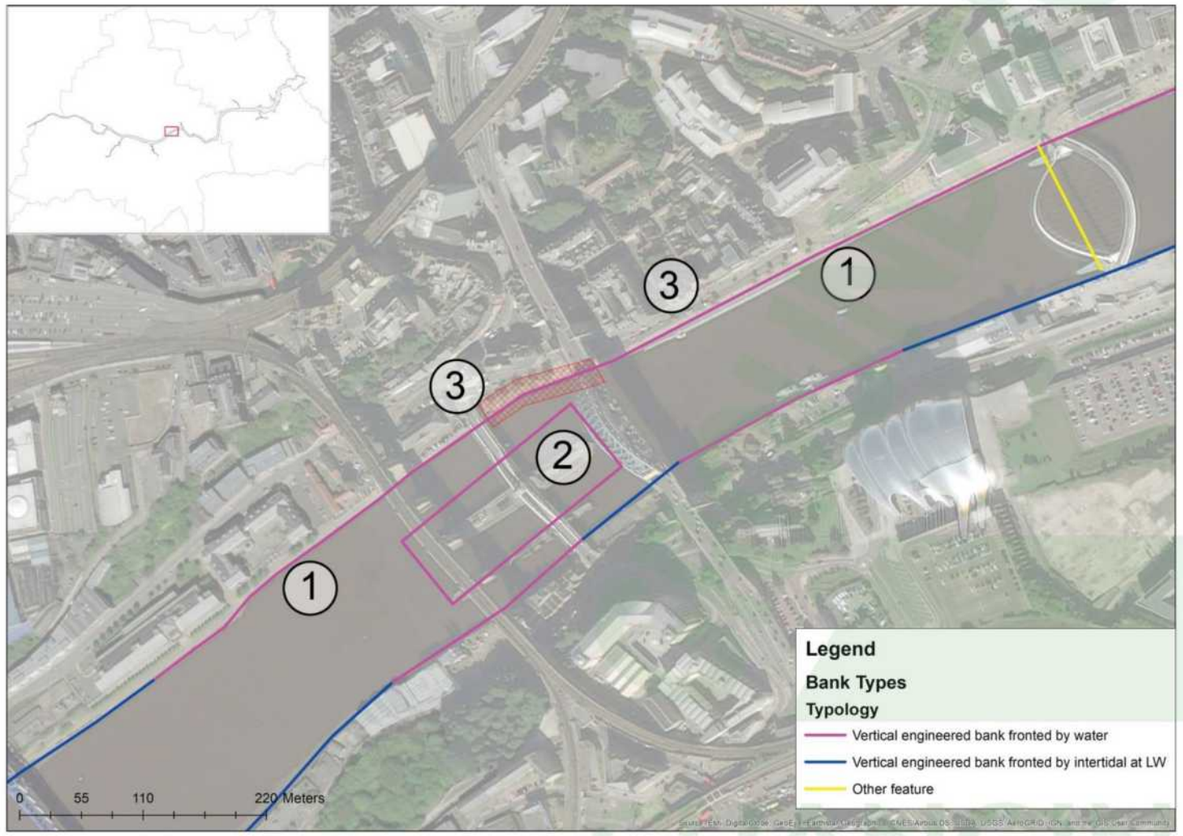
• Partner engagement, permissions & project management	£3,000
• Floating vegetated pontoons (bankside and mid-channel)	£80,000 for 100 m²

Viability:

Potential for this to be an immediate and very visible intervention - possibly a good pilot scheme for the larger project

Newcastle/Gateshead Quayside continued

Opportunity locations:
1. Floating pontoons attached to quayside, vertical greening of walls
2. Floating vegetated edges attached to existing timber framework
3. Potential for landward enhancements, greening within the built environment



Types of intervention:


a


b


c


d

a. Artist's impression of floating pontoons
b. Floating forest, Netherlands
c. Bankside, London
d. Chicago riverwalk

WFD Mitigation Measures:

- Good practice vegetation management
- Manage and restore the intertidal zone
- Manage and restore aquatic and riparian habitats
- Modify or enhance structure

Length of water body enhanced/improved:

- ≈1km

Biodiversity Action Plan:

- Habitat creation
- Increased feeding / roosting time
- Create high water roosts / breeding sites

Flood Risk Management:

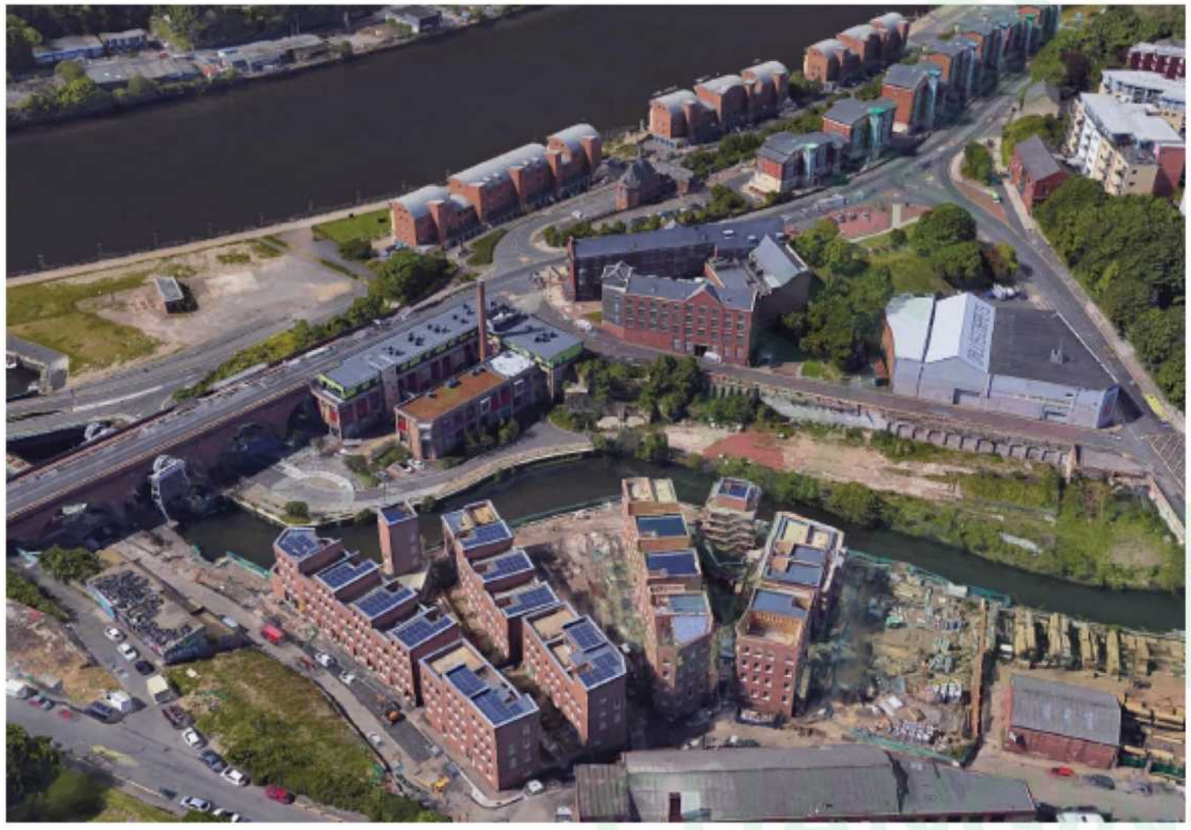
- Flood defence (dissipate wave energy)

Tidal Ouseburn

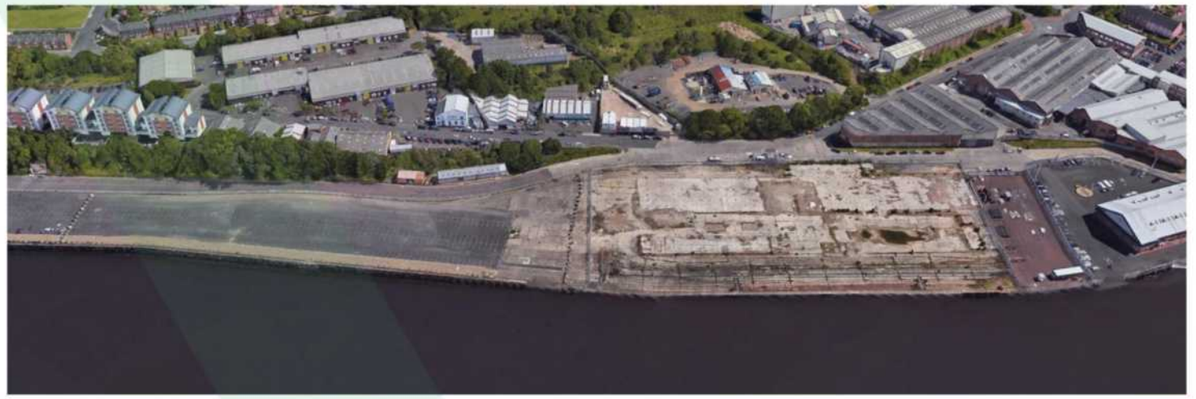
The site:
Where the Ouseburn river joins the Tyne Estuary, around the Ouseburn barrage

Land ownership:
Newcastle Council

Planning context:
Lower Steenburg's Yard and Spillers Quay are currently in the planning process



Site Description
Comments gathered from the stakeholder consultation show differing opinions on the developments and what interventions are suitable for the area, so building the partnership in this area is important. However, the development and regeneration of this area does present opportunities for positive interventions with regard to the ecology of the Tyne. Development sites are currently in the planning process at Lower Steenburgs Yard and Spillers Quay. The University of Hull have characterised the banks as Vertical Engineered fronted either by water or by intertidal at low water. This means they would be suitable for a range of vertical greening techniques such as vegetated pontoons or wooden planting frameworks. Otters are present in the Ouseburn, so the creation of artificial or natural holts should be considered. There is also the opportunity for creation of fish refugia and looking at fish migration. The Ouseburn Trust highlight the important heritage of this area on their website, there is the opportunity for education around this.



Summary:

Opportunities:
- Greening of banks
- Enhancements for fish and otters
- Surface water management within new developments
- Development of partnerships with landowners, local development trust and developers
- Education

Constraints:
- Possible clash of priorities with development

Costs:

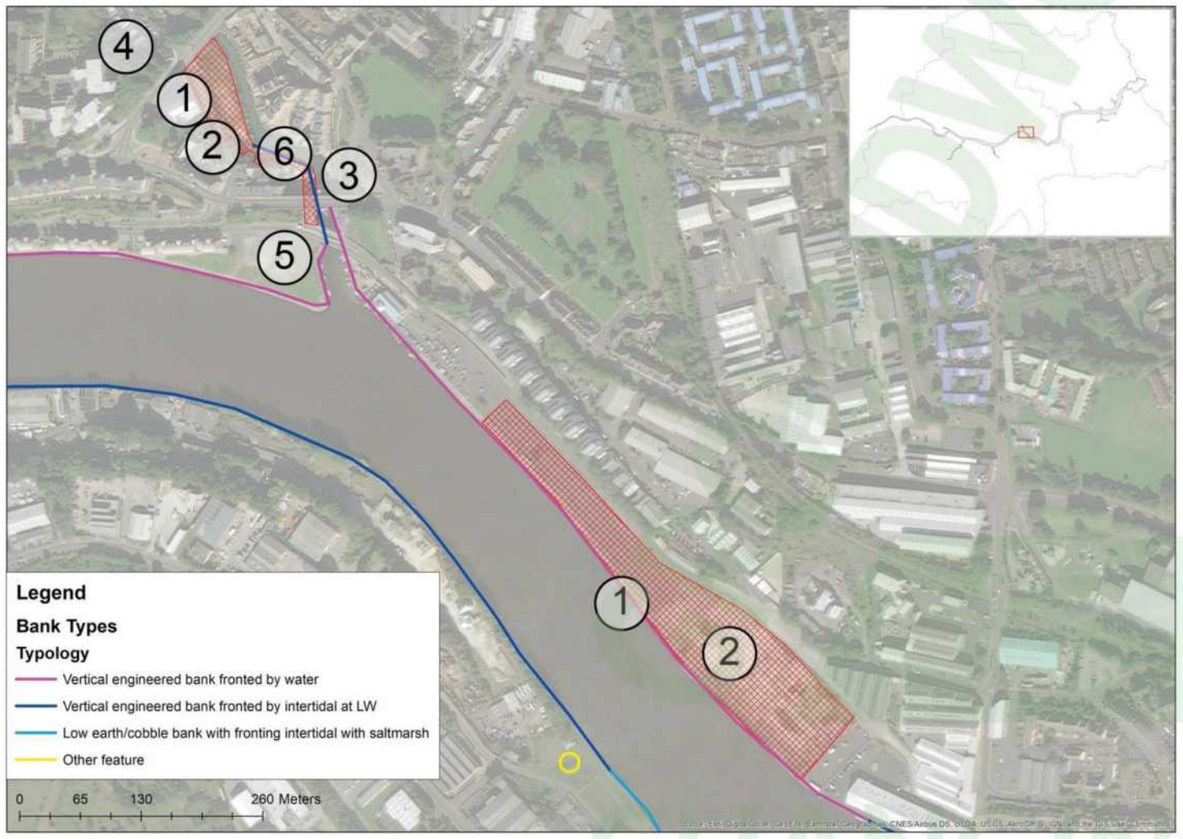
• Partner engagement, permissions & project management	£3,000
• Floating pontoon edges	£80.000 for 100 m²
• Fish refugia	£1,000 for 4 refugia
• Otter holts	£500 each
• Sea bins	£4,000 each plus £300 annual running costs
• Interpretation panels	£1,500 - £2,500 per panel

Viability:
Developments in this area provide opportunities within their ecological plans for compensatory habitat and greening estuary edges. Some interventions could be viable within the next year, with more following in the near to mid future

GROUNDWORK
CHANGING PLACES
CHANGING LIVES

Tidal Ouseburn continued

Opportunity locations:
1. Floating pontoons attached to quayside
2. Integrated SuDs in new developments
3. Installation of fish refugia
4. Otter bank enhancement
5. Education
6. Sea bins



WFD Mitigation Measures:

- Good practice vegetation management
- Enhance ecology

Length of water body enhanced/improved:

- ≈1km

Biodiversity Action Plan:

- Habitat creation
- Increased feeding / roosting time
- Create high water roosts / breeding sites
- Create breeding / refuge areas

Flood Risk Management:

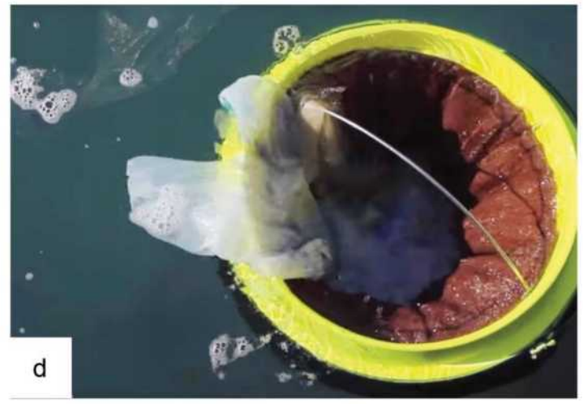
- Flood defence (dissipate wave energy)
- Surface water management

Types of intervention:


a


b


c


d

e

a. Floating pontoon edges
b. Fish refugia
c. Otter holts
d. Sea bins
e. Interpretation panels

Howdon Wetlands

The site:
Consists of the the intertidal area fronting the Northumbrian Water works and Howdon Wetlands

Land ownership:
Port of Tyne and Northumbrian Water

Planning context:
There are no development plans for the site at present

Youtube video links:
https://youtu.be/n30-lCubUYo
https://youtu.be/oIY3VUFBCpI
https://youtu.be/OXnfQJSA4gU

Site Description

Consultation with local stakeholders along with the University of Hull's survey have identified the intertidal area fronting the Northumbrian Water works and Howdon Wetlands as an ecologically rich existing habitat. It consists of a large muddy embayment enriched from the outfall. Already an important site for waders, the mudflats and surrounding wetlands have been noted as an important habitat for birds on the Tyne. Some of the birds present on the amber list for UK conservation status including redshank, turnstone and purple sandpiper which have all been recorded at the site and which are all afforded additional protection under the Wildlife and Countryside Act 1981. The surrounding wetlands are managed locally with support from the landowners. Port of Tyne and Northumbrian Water are supportive of the site management and open to suggestions of enhancing the site. With no public access to the wetlands and with additional security provided by Northumbrian Water, the ecology of the site is preserved resulting in minimal disturbance to the estuary. It may be worth considering the possibility of limited public access to the site. It is proposed that whilst protecting the existing ecological value, the following enhancements could be considered at the site:

- Opportunities for planting around the basin edge with re-profiling at high water.
- Use of timber quayside at back of site for attaching vegetated floating pontoons.
- Sheltered area behind Coaster Berth for attaching vegetated floating pontoons.
- Create a rocky foreshore to be used as a nesting ground.
- Opportunities for roof 'greening' of the Northumbrian Water buildings.
- The introduction of ledges on the buildings for kittiwake roosts. Alternatively to erect a new kittiwake tower to mitigate displacement from other areas and improve the success of kittiwake nesting along the estuary.

This site has the potential to be used as an example both of the ecological potential of sites on the Tyne and the importance of landowner support and good local management.

Summary:

Opportunities:
- Enhancement of the existing, ecologically valuable site
- Increased public access and awareness
- Development of partnership with Port of Tyne, Northumbrian Water and the local management group

Constraints:
- No Protection status
- No public access

Costs:

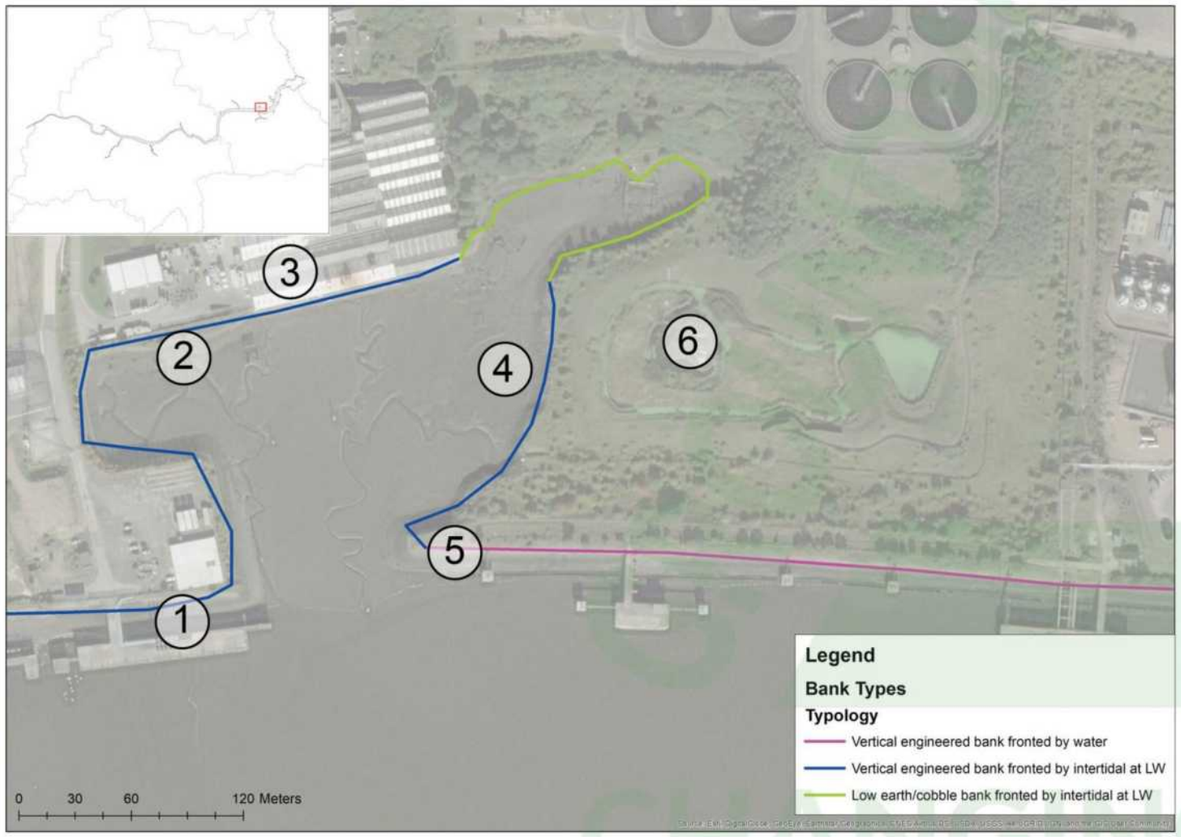
• Partner engagement, permissions & project management	£3,000
• Tiered intertidal ecosystems	£5,000 for 6 units
• Floating pontoons	£30,000 for 40 sq m island
• Rocky foreshore	£30,000 for 100m² (20 lin m.)
• Preseeded coir matting	£2,000 for 100m²
• Timber ledges	£500 - £1000 for trial ledges

Viability:
With the landowner's support, immediate nature of the interventions and no tie in with other developments, this represents a viable site for enhancements in the immediate or near future

Howdon Wetlands continued

Opportunity locations:

1. Sheltered area behind Coaster Berth for attaching vegetated floating pontoons
2. Use of timber quayside at back of site for attaching vegetated floating pontoons
3. Introduction of ledges on the buildings for kittiwake roosts
4. Opportunities for planting around the basin edge with re-profiling at high water
5. Create a rocky foreshore to be used as a nesting ground
6. Support for local management of the existing important habitat



WFD Mitigation Measures:

- Good practice vegetation management
- Manage and restore the intertidal zone
- Manage and restore aquatic and riparian habitats
- Enhance ecology

Area of water body enhanced/improved:

- ≈33,000m²

Biodiversity Action Plan:

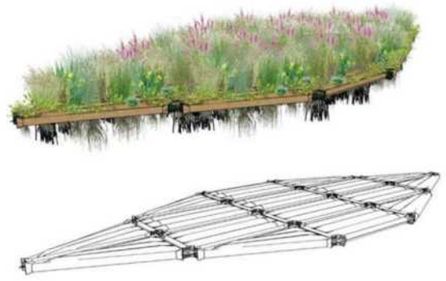
- Habitat creation
- Habitat enhancement
- Increased feeding / roosting time
- Create high water roosts / breeding sites

Flood Risk Management:

- Flood defence (dissipate wave energy)

Types of intervention:


a


b


c


d


e


f

a. Tiered intertidal ecosystems
b. Floating pontoons
c. Rocky foreshore
d. Preseeded coir matting
e. Nesting ledges
f. Bank re-profiling

Smiths Dock

The site:
A historic site for the ship building industry, with three wet docks a central feature of the area

Land ownership:
Urban Splash

Planning context:
Phased development underway: Phase 2 complete

Youtube video links:
https://youtu.be/pEWv9XWAWZs
https://youtu.be/4VsuZQ4H-X8
https://youtu.be/QQlMUxvzFF4

Site Description
Phased developments of this site over a number of years will provide 830 new homes and mixed use development along the waterside (https://www.smithsdock.co.uk/). Phase 2 is nearly complete and phase 3 is due to commence on the western side of the site. There may be opportunity to engage the developer with regard to phases of the work still to be done or to meet reserved matters for planning application to consider some of the opportunities identified by public consultation and by the University of Hull. Opportunities have been identified for the following to be considered:

- Possibility of installing vegetated pontoons in the wet dock development.
- A micro tidal turbine could be introduced into the middle dock to provide a sustainable renewable energy source for the immediate area.
- The introduction of a waste collecting facility in the open dock to capture drifting tidal rubbish.
- Integrated SuDS in the new development - green roofs, stormwater planters, attenuation tanks.
- Installation of fish refugia in open dock.
- Installation of tern rafts.

Other possibilities include vertical greening of the dock walls. Floating pontoons which incorporate walkways, seating areas and general planting could also be considered in the enclosed docks. Provision of pontoons recreational activities, such as canoeing, could be greened by floating edges.

Additional natural habitats in this area would tie in with North Tyneside's Green Infrastructure Strategy, 2015.

These historic docks have heritage value, and there could be the opportunity to provide a heritage trail, or interpretation panels which refer to the site's history. There is an educational opportunity here also.

Summary:

Opportunities:
- Greening of vertical engineered banks and floating pontoons integrated with recreational use
- Sustainable energy source through micro todal turbine
- Creation of fish habitat
- Education/ Heritage
- Integrated SuDS in the new development

Constraints:
- Possible clash of priorities with development
- Increased recreational activity

Costs:

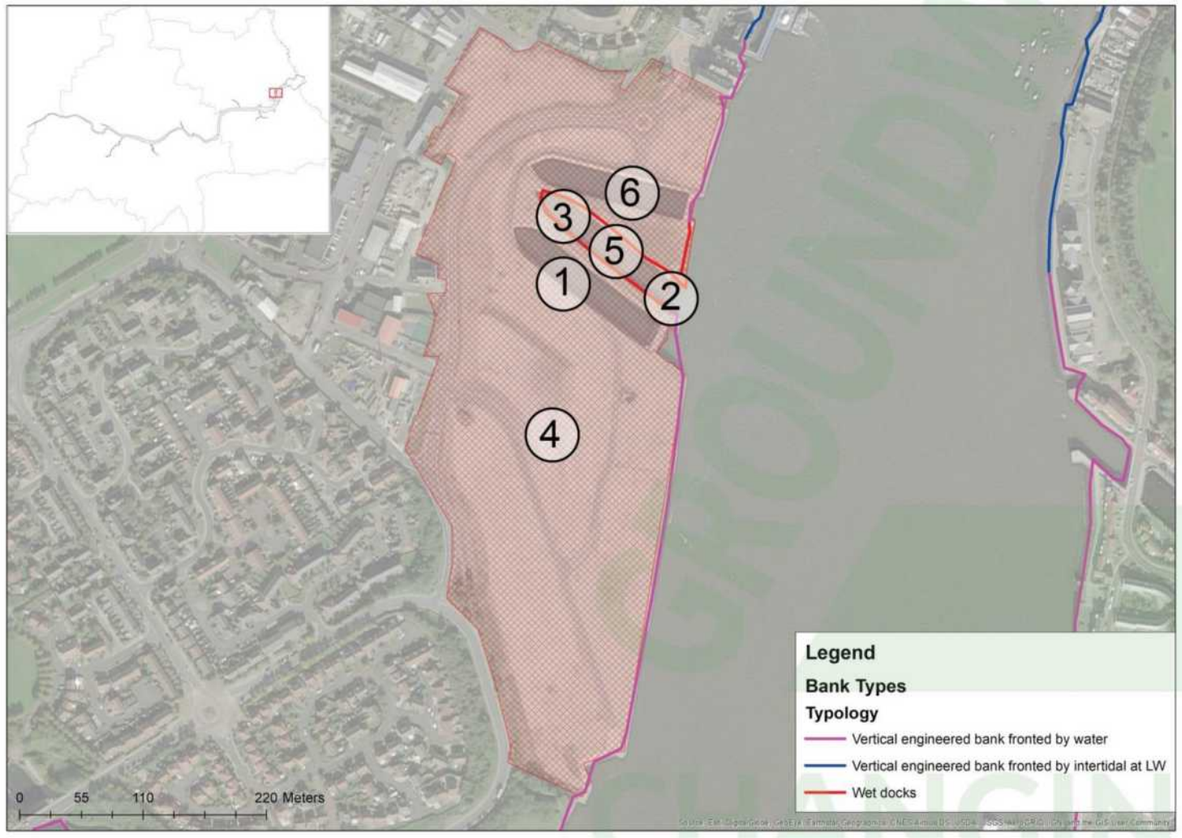
• Partner engagement, permissions & project management	£3,000
• Tiered intertidal ecosystems	£30,000 for 40 sq m island
• Floating pontoons	£5,000 for 6 units
• Micro tidal turbine	£10,000 - £15,000
• Sea bins	£4,000 each plus £300 annual running costs
• Fish refugia	£1,000 for 4 refugia
• Interpretation panels/ Heritage trail	£1,500 - £2,500 per panel
• Tern rafts	£1,000 each (1.2m x 2.4m)

Viability:
These enhancements are unlikely to be immediate as they will be dependant on developer's support, however working with the developer and the local authority some of these measures could be considered for the near future to mid term, to coincide with the rest of the development

Smiths Dock continued

Opportunity locations:

1. Possibility of installing vegetated pontoons in the wet dock development
2. A micro tidal turbine could be introduced into the middle dock to provide a sustainable renewable energy source for the immediate area
3. The introduction of a waste collecting facility in the open dock to capture drifting tidal rubbish
4. Integrated SuDS in the new development - green roofs, stormwater planters, attenuation tanks
5. Installation of fish refugia in open dock
6. Installation of tern rafts



WFD Mitigation Measures:

- Good practice vegetation management
- Enhance ecology

Area of water body enhanced/improved:

- ≈11,000m²

Biodiversity Action Plan:

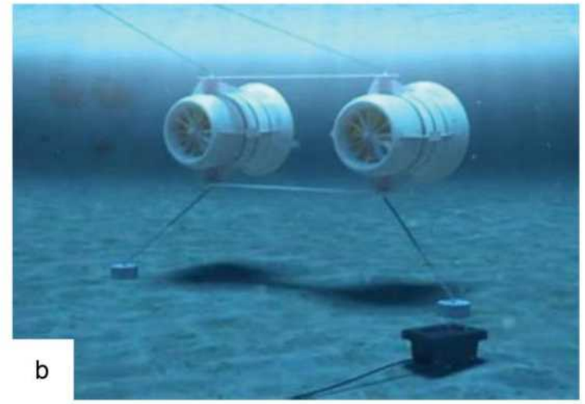
- Habitat creation
- Increased feeding/ roosting time
- Create high water roosts / breeding sites
- Create breeding / refuge areas

Flood Risk Management:

- Surface water management

Types of intervention:


a


b


c


d

e


f

a. Floating pontoons
b. Tidal turbine
c. Sea bin
d. Fish refugia
e. Interpretation panel
f. Tern raft

Walker Riverside Park

The site:
Former industrial land, now grassland, woodland and riverside

Land ownership:
Newcastle Council (going to Newcastle Parks Trust)

Planning context:
Request for Scoping Opinion for Combined Disposal Facility within Tyne

Site Description
The park was reclaimed in the 1980s from its industrial past and now consists of wildflower meadows, woodlands, amenity grassland and riverside frontage. An important habitat for a wide variety of woodland and riverside birds including curlews, redshanks, common terns and kittiwakes. Formerly St Anthony's tar works, the site is not suitable for housing and will remain green space, with the ownership going to Newcastle Parks Trust. The site is part of the development allocations plan to protect open space, wildlife corridors and green infrastructure, with the riverside also designated a Site of Local Conservation. There is opportunity here to explore the role of the park in wider SuDs planning and to enhance this riparian environment. Currently subject to anti-social behaviour, and blocked off by concrete barriers, consideration of a new masterplan to regenerate the park should be considered. There are opportunities for enhancing the river front to enhance and create habitats, vary the bank profiles, and to improve public experience of the park.

Enhancing the multi-functionality of this site through an integrated SuDS plan, improving the biodiversity value and maximising opportunities for recreational use all tie in with Newcastle City Council and Gateshead Council Green Infrastructure Strategy report, 2011.

Summary:

Opportunities:
- Enhancement of the existing planting and habitats
- Inclusion of a wider SuDS plan
- Improved visitor experience

Constraints:
- Contaminated land

Costs:

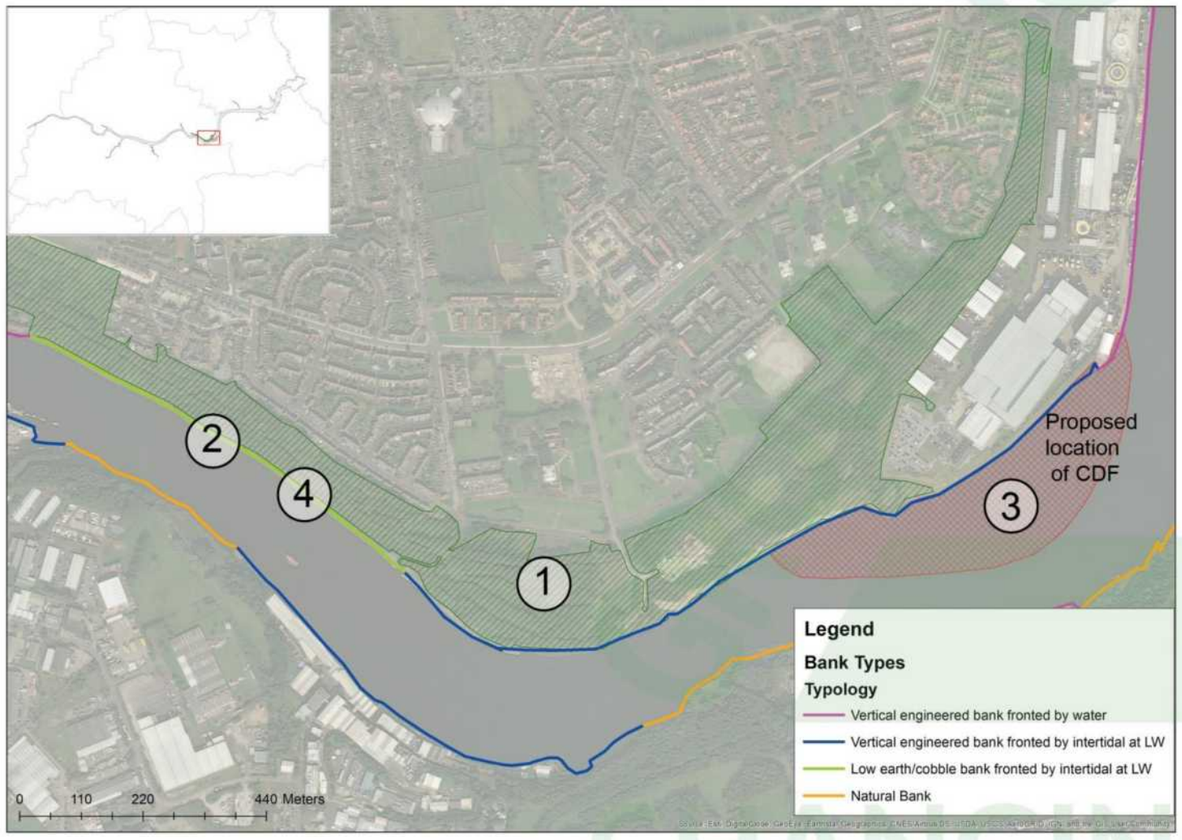
• Partner engagement, permissions & project management	£3,000
• Masterplanning and consultation	£20,000 - £30,000
• Bank re-profiling and planting	£15,000 per 100m² (20 lin m, 5m depth)
• Boulder groynes to vary bank profile	£5,000 for trial groyne
• Otter holts	£500 each

Viability:
Opportunity for masterplanning in the immediate to near future, with the possibility of some trial interventions along the banks also viable

Walker Riverside Park continued

Opportunity locations:

1. Develop as part of a large scale SuDS scheme
2. Reprofiling and planting to create new habitat
3. Possible enhancement options within the CDF
4. Otter holts



Types of intervention:

WFD Mitigation Measures:

- Good practice sediment management
- Manage and restore the intertidal zone
- Manage and restore aquatic and riparian habitats
- Increase ecology

Length of water body enhanced/improved:

- ≈2km

Biodiversity Action Plan:

- Habitat creation
- Habitat enhancement
- Increased feeding / roosting time
- Create high water roosts / breeding sites
- Create breeding / refuge areas

Flood Risk Management:

- Flood defence (dissipate wave energy)

a. Masterplanning and consultation
b. Bank re-profiling and planting
c. Boulder groynes to vary bank profile
d. Otter holts

Forth Yards

The site:
Former industrial land on the north bank of the tyne with engineered banks

Land ownership:
Mixed ownership

Planning context:
Outline application for mixed use development currently in planning

Site Description
Although this has been identified as a future development site, several obstacles were highlighted by our consultation. The site is heavily contaminated due to its former use as leadwork. It has a framework plan, but mixed ownership and division of the site may hinder a 'joined up' solution to the design. There has been discussion with regard to foul and surface water drainage and the long term aspiration of draining parts of Newcastle Centre surface water via St James Boulevard and down to a new outfall in to the Tyne stuary. Early consultation and partnership working could ensure that the site ties in with a wider vision for a suitable sustainable drainage solution. Characterisation of the banks by the University of Hull shows them to be engineered banks fronting intertidal at low water. This may mean options from vegetated pontoons through to bank re-profiling could be considered. There are trees along the riverside, enhancing this existing planting and looking to extend it could also be considered.

This area was allocated in the CSUCP (pg183-185) https://www.newcastle.gov.uk/sites/default/files/wwwfileroot/planning-and-buildings/planning-policy/planning_for_the_future_core_strategy_and_urban_core_plan_2010-2030.pdf.
The council has also produced a development framework for this area https://www.newcastle.gov.uk/planning-and-buildings/planning-and-development/planning-guidance/forth-yards-development-framework.

Summary:

Opportunities:
- Greening of the banks
- Integrated SuDS in the development
- Reprofiling to expand intertidal habitat

Constraints:
- Contaminated land
- Mixed ownership

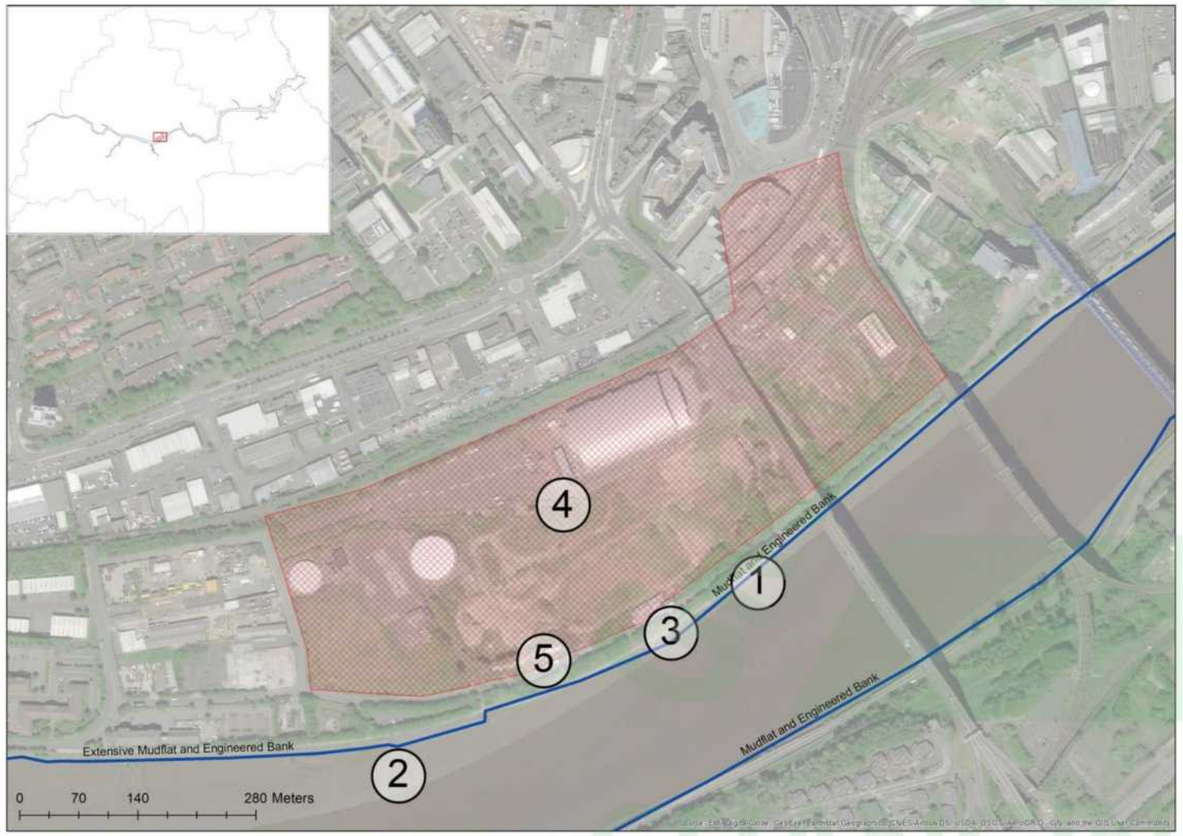
Costs:

• Partner engagement, permissions & project management	£3,000
• Floating vegetated pontoon edges	£80,000 for 100 m²
• Wooden planting frameworks	£5,000 for approx 10 lin m
• Re-profiling and planting	£15,000 per 100m² (20 lin m, 5m depth)

Viability:
This would be a site for long term consideration. Planning the SuDS element at this early stage would be beneficial though

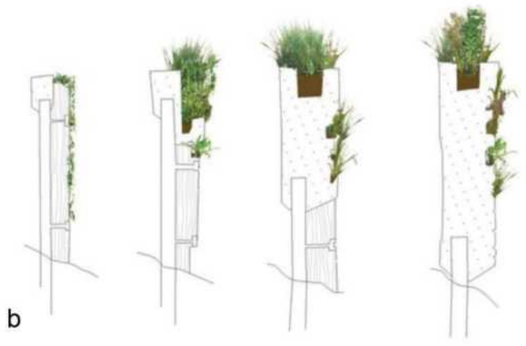
Forth Yards continued

Opportunity locations:
1. Vertical greening of walls
2. Floating vegetated pontoons attached to timber quay
3. Re-profiling the bank to create new intertidal habitat
4. Integrated SuDs in new developments
5. Enhance existing vegetation



Types of intervention:


a


b


c


d

a. Floating vegetated pontoon edges
b. Wooden planting frameworks
c. Re-profiling and planting, Mechelon
d. Floating edge, Northwich

WFD Mitigation Measures:

- Good practice vegetation management
- Manage and restore the intertidal zone
- Manage and restore aquatic and riparian habitats
- Enhance ecology

Length of water body enhanced/improved:

- ≈600m

Biodiversity Action Plan:

- Habitat creation
- Habitat enhancement
- Increased feeding / roosting time
- Create high water roosts / breeding sites

Flood Risk Management:

- Flood defence (dissipate wave energy)
- Surface water management

PART 5: RECOMMENDATIONS & ACTION PLAN

The recommendations of this feasibility study draw on the reports produced by the University of Hull on the full Tyne Estuary and focus area of Metro Green, as well as the results of the stakeholder engagement and partnership events.

In creating any estuary enhancements, it is important to weigh up the following issues:

- The benefits of creating a corridor of enhancements throughout the estuary to link biodiversity *verses* a concentration of enhancements in one area.
- The benefits of extending an existing area of saltmarsh *verses* creating new areas.

To prioritise potential enhancement opportunities and effective partnership development techniques; it is important to draw on best practice; in particular the Thames and Tees Estuary Partnerships. Such advice will be taken as this project progresses. This will include gaining an understanding of the different partnerships' drivers for change and enhancements that best relate to the Tyne; notably the anticipated speed and value of new developments.

Recommendations

Overarching opportunities and constraints exist that are applicable to, and must be considered in the development of, any estuary enhancement proposals.

The main recommendation is for a 2 year pilot scheme to test out some of the proposed ideas at a range of sites. This is also a key recommendation from the University of Hull is that a 2 year Pilot Scheme is funded to trial a selection of Estuary Edge options within the Tyne and MetroGreen sites.

Depending on budget and matched funding availability; it is proposed that 3 or 4 trial sites should be selected subject to licences, permission, consents, partnership support and suitable location. It would be prudent to select a range of trial sites in terms of bank typology and enhancement intervention to assess impact, effectiveness and value for money. Site specific proposals are detailed below.

Opportunities

- The emerging partnership; passionate about this project and its cause, is further developed with principles to effective joint working at its core.
- Partners engaged to date, and new potential partners (specifically landowners and developers) sign up to the Tyne Estuary Partnership pledge.
    - The pledge, and the design principles it promotes, become a key, enabling, feature that developers along the Tyne Estuary are proud to support.
    - This fundamentally includes **environmental net gain** and goals for increased habitat provision
- Partnership branding of interventions to raise awareness with associated signage and reference to further information available on line to track the progress that the Partnership is making.
- **Flooding and surface water drainage strategies** for new development proposals to follow best practice to avoid damaging estuary habitat and increasing flood risk.

- Integration of new business, tourism and leisure, where relevant and appropriate (such as pontoons, jetty's, events, increased public access), through improved aesthetic appeal and life qualities, enhancing the connection of the river with land.
- Consider additional societal benefits such as increasing public access, safe amenity areas, education and awareness, health and well-being and the integration of culture and heritage to development opportunities.
- Realise economic development, and natural capital benefits using enhancements as a vehicle to promote wider benefits of the partnership.

At key development sites, such as Metro Green; the following should be considered:

- Working with development plans and sites including derelict shipyards, at the earliest possible stage, utilising the Partnership Pledge to ensure integration of all partners.
- Development masterplans including water access, transport routes, wildlife corridors, and sustainable drainage systems should be considered in parallel with the estuary edge and waterside design options.
- New sites fully adopt integrated best practice and align with the principles produced from this report.
- New developments do not lead to habitat loss; soft edges are incorporated wherever possible.

Capital Enhancements

It is important that existing pockets of habitat along the Tyne Estuary amongst the significant new developed proposed are preserved and enhanced wherever possible with the core aim environmental net gains in line with the DEFRA 25 year plan and NPPF policy. This is re-enforced by the prevalence of enhancement opportunities featuring in key policy documents such as landscape character assessments, Green Infrastructure strategies, core and local plans, strategic economic plans and in some local authorities; respective planning policy.

There is a significant opportunity to further embed the recommendations and/or Partnership Pledge resultant from this work into local authority planning policy. These not only include reference to the importance of habitat protection, creation and enhancement but also the importance of the protection and enhancement of the concurrent culture, heritage, tourism, interpretation and education.

Enhancements could be achieved through:

- **Habitat improvement** in line with the bank typology matrix such as fish refuge boxes, otter halts, bird nesting etc capitalising on habitat improvement opportunities.
- A '**green corridor'** of enhancements to connect nature based solutions and have real, full habitat and ecosystem benefits.
- **Greening of banks** and/or retro-fitting soft edges; to increase habitat provision and create new areas of estuarine fringing habitat.
- Promoting the importance of **mud flats, salt marsh** and **intertidal planting**; where relevant and appropriately managed; which has the potential to deliver a wide range of habitat and additional benefits for society.
- **Greening of roofs;** in new developments and retrospectively to support bird life, aesthetic and other ecological benefits.
- **Realignment** and **re-profiling** to create additional intertidal and saltmarsh habitat.
- **Careful planning** of **new public rights of way** regarding priority habitats and bird populations; protecting the amount and diversity of waders, waterbirds and wildlife.
- Work with **National Green Infrastructure Facility** to instrument, test and report on effectiveness of the 2 year pilot projects.

Revenue Activities

Alongside the capital enhancement opportunities a range of revenue project activities exist to improve the Tyne Estuary. In our experience it is best that capital and revenue opportunities are developed concurrently to maximise impact and benefit of the project.

- Further **development of the partnership** –vision, more formal formation, broader representation
- Engagement and **influence of project beneficiaries**, lobbying and influencing of stakeholders at design stage.
- Consider **ecosystem services benefits** in all interventions – ecological, human, natural capital and tourism benefits –how this can be used to attract matched funding given the potential wide ranging health and well-being and natural capital benefits.
- Revenue projects to prioritise:
    - Increase monitoring and deliver more citizen science.
    - Increase 'whole community' education (businesses, the general public, stakeholders, schools).
    - Develop a code of conduct.
    - Further scope out heritage, culture and tourism opportunities and potential for large, £multi-million bids.

Ongoing Partnership Development

It is crucial that ongoing partnership development takes places to progress the capital and revenue opportunities identified. This includes:

- Developing a Partnership Pledge to provide a framework or ethos for members to publicly sign up to and show support for the scheme
- Develop a web presence to provide updates and advertise pledge signatories.
- Hold 3 or 4 partnership events per year around 'topics of interest' to maintain engagement and enthusiasm; for example, Health and Wellbeing opportunities, best practice workshops, design workshops, developing a code of conduct, commercial and environmental campaigns and mutual benefits.
- Host task and finish groups around the development and implementation of detailed designs at specific sites
- Engage the full partnership in questions of funding and fundraising for the scheme
- Gaining high level support and 'sponsorship' for the partnership to maintain and raise its profile including press articles
- Building the partnership and map of opportunities.

Constraints

Any enhancements must be developed with the identified key constraints at the forefront of proposals. Largely along the Tyne Estuary these include identifying and engaging land owners, space to implement proposals and contaminated land. Specific constraints to consider are:

- The riverbank habitat of the Tyne Estuary has been radically altered by former industrial activity and the canalisation of the river causing a loss of upper shore habitats like saltmarsh. Much of this alteration cannot be reversed but opportunities exist to enhance it.
- The absence of any statutory protection, either under UK regulation e.g. Site of Special Scientific Interest (SSSI) or under European Directive (e.g. as a Special Protection Area (SPA)), making it harder to engage developers to enact opportunities and meaning there is a high economic value of land that could be used for habitat creation.

- The significant amount of new developments planned, both on the banks of and within the docs of the estuary and the proposed pace of development will make it hard to engage all relevant developers and landowners within the time available.
- The amount of activity taking place and the difficulty of coordinating all partners involved to ensure to duplication of activity occurs.
- Negative impacts of increased tourism, leisure, public access and economic growth on the disturbance of wildlife that are currently inaccessible.
- Ongoing maintenance of enhancements, especially high profile ones being used as a catalyst for the project and/or enhancements containing dynamic elements such as floating pontoons.
- Land value in the area is high and ownership status hard to identify, then engage some of the owners.
- Long-term liability and maintenance costs

Site Specific Priorities and Action Plan

The action plan table below presents site specific priority recommendations in order of priority (at this point in time, March 2019) given potential budgetary constraints. Following the University of Hull's recommendations it is proposed that the first 3 or 4 sites and trialled over a 2 year period. Priority order has been allocated given current parameters including:

- Land ownership
- Partner buy-in
- Likelihood of securing permissions and consents
- Cost
- Potential availability of match funding
- Potential for high profile/ quick win schemes that could be used as a catalyst to secure further investment
- Speed of development.

Action Plan Table

No	Project	Partners	Budget (excl VAT)	Opportunities	Constraints	Outcome	Timescale
1	MetroGreen	Gateshead Council.	£200,000	Habitat creation Enhance ecology Create breeding/refuge areas Creating breeding/ refuge areas Manage/restore aquatic and riparian habitats Modify or enhance structure – soften hard bank In-channel morph diversity Bank rehabilitation Increased feeding/roosting time	Landowner/ developer engagement Currents and tidal range Bank ownership Limited understanding of wider constraints Future developments; floodwater issues; surrounding land prone to ground movements	3.8km of river enhanced. Flood Defence	2020-2021 onwards
7	Forth Yards	Newcastle City Council, NE1. Local Developers.	£150,000	Manage/restore intertidal zone Manage and restore aquatic and riparian habitats Habitat creation Enhance ecology	Landowner/ developer engagement Contaminated land Mixed ownership Likely to be expensive and lengthy development process	600m of river enhanced. Flood defence improvements. Surface water management.	2020-2021 onwards
2	Newcastle/ Gateshead Quayside	NE1, Newcastle City Council, Gateshead Council, NGI, HMS Calliope	£240,000	High profile intervention Greening of walls and green corridor Habitat creation Enhance ecology Aesthetic improvement Tourism/ events/ increase dwell time	Hard engineered walls and banks Lack of space Prone to flooding, tidal surges and property damage Limited understanding of constraints Maintenance costs Bank ownership	1km of river enhanced. Flood defence improvements.	2019-2020 onwards
3	Tidal Ouseburn	Ouseburn Trust. Local Developers. 22 Sheds	£100,000	Good practice vegetation management Habitat creation Enhance ecology Aesthetic improvement Tourism/ events/ increase dwell time	Hard engineered walls and banks Lack of space Developer engagement Current flood alleviation plans Culvert Soil and ground water contamination Unstable quay wall Water management	1km of river enhanced. Flood defence improvements. Surface water management.	2019-2020 onwards
6	Walker Riverside Park	Newcastle City Council, Port of Tyne	£200,000	Grassland, woodland and riverside to enhance Enhance ecology Create HW roosts/breeding sites Creating breeding/refuge areas	Anti-social behaviour Limited understanding of CDF	2km of river enhanced. Flood defence improvements.	2019-2020 onwards
4	Howdon Wetlands	Northumbrian Water, North Tyneside Council, Port of Tyne	£100,000	Habitat enhancement Manage and restore intertidal zone Manage and restore aquatic and riparian habitats Create HW roosts/breeding sites Enhance ecology Bank rehabilitation	Change of use No protection status (potentially LWS)	33,000 m^2 of river enhanced. Flood defence improvements.	2019-2020 onwards
5	Smith's Dock	North Tyneside Council, Places for People.	£200,000	Historic area/ heritage value Habitat creation Enhance Ecology Increased feeding/ roosting time Create high water roosts/breeding sites	Development already underway Landowner/ developer engagement Urbanised nature of area	11,000 m^2 of river enhanced. Surface water management	2020-2021 onwards

Conclusion

The following proposals are made for financial years 2019/20 and 2020/21. This includes utilising the allocated EA capital works seed funding of £33,000 and a range of capital and revenue matched funding identified and contributed by Groundwork and Partners. The significant value that matched funding can add to EA seed funding can be considerable, and over time, lead to £multi-million projects when supported by an engaged and passionate partnership.

Capital projects:

- If £30,000 is available this should focus on the installation of trial sites at Quayside and Metro Green. A trial area of floating vegetated pontoon to be installed at Quayside, and island structures, fish refugia and otter holts at Metro Green.
- If £50,000 is available this could focus on the addition of more extensive works including bank realignment and planting at Metro Green and a larger area of vegetated pontoon at Quayside.
- If £70,000 is available this could add green edges at Tidal Ouseburn as another trial site.
- If £100,000 is available this could extend the trials to include floating vegetated islands either at Howdon Wetlands or Smith's Dock, or consider master-planning work for Walker Park with some trial boulder groynes.

Revenue projects:

- If £10,000 is available this should focus on partnership development and the development of a potential £multi-million bid to deliver an Estuary wide project drawing on the recommendations of this report.
- If £20,000 is available this should also deliver citizen science, enhanced monitoring and impact assessment.
- If £30,000 is available this should add on natural history and heritage interpretation along with educational activities.
- If £50,000 is available this should be used to deliver some of the above, prioritising the bid development and establish the partnership as a formal membership organisation to include the engagement and support of more developers.

PARTNERSHIP PLEDGE

In view of aligning partners and developers behind one unified vision a 'Partnership Pledge' has been developed; in anticipation of key partners and stakeholders signing up to the pledge at the launch event in April 2019.

Draft Pledge
Tyne Estuary Partnership: the Declaration
The Tyne Estuary Partnership covers the tidal reach of the River Tyne; from Tynemouth to tidal limit at Wylam. It has a bold vision for developing a healthy and vibrant river estuary with a strong, strategic, influential partnership invested in long term environmental and economic enhancement.

This Declaration builds on the work of the existing River Catchment partnerships declaration, and as a sub-group of the full River Tyne Catchment Partnership.

It is designed to bring together stakeholders from across sectors to tackle the collective challenge of the decreasing water quality and increasing pollutants and sediments in the River Tyne; whilst seeking positive environmental and economic outcomes. It aims to respond to the Governments 25 Year Environment Plan; to create connections between existing initiatives; and real practical actions. The declaration acknowledges that change cannot be achieved by a few regulatory tweaks, nor can any single sector or agency, working in isolation, deliver this change. Solutions are multi-sector and highly interconnected.

Fundamentally, this Declaration aims to demonstrate the commitment of all parties with an interest in the Tyne Estuary to work towards effective environmental and economic management of the river, that benefits all.

This partnership is based on real cross-sector representation. We would strongly encourage any businesses, local authorities, developers, universities, tourism and culture agencies, environmental or community organisations, support groups or commercial river users to review the Tyne Estuary Partnership Feasibility Study report and Recommendations (hyper-links to documents online). If you support its ambitions please sign up (link to online form).

Funding

The EA has indicative allocated funds of £33,000 in the Medium Term Plan for the delivery of Tyne Estuary Partnership capital projects during 2019/20. However, it is anticipated that with the successful launch of this report, signatories to the pledge and as momentum and support for the project grows, it will attract more internal funding from the EA. These funds need to be matched by at least 25% by other external sources as proposed below. Proposals for EA's next financial year funding allocations will also be developed with the Partnership.

There are a number of opportunities identified for external funding to date.

Section 106 agreements – to be replaced by Community Infrastructure Levy (CIL)
Due to the amount of new development in the area there is the potential to use CIL to bring about environmental and community benefits on the actual development sites and in the wider area. The EA will continue to work with the Local Planning Authorities to identity how CIL could fund river restoration work.

The National Lottery Heritage Fund
Previously the Heritage Lottery Fund; the National Lottery Heritage Fund has a new strategic plan moving their focus away from subject area specific funds to wider, more generic funds. This includes the removal of Landscape Partnership funding which might have been an obvious initial funding avenue for the Tyne Estuary Partnership to explore. However, community, natural heritage and high profile/ impact projects (such as this) are still very relevant. Groundwork will be proposing ideas to develop a project along the full Tyne Estuary early in the 2019/20 financial year.

Groundwork has significant experience of utilising EA seed funding to develop large, schemes such as the £5m+ Land of Oak & Iron partnership and the £80,000 Ouseburn Catchment in Crisis project. This could initially include a small, £10,000 bid to scope out a much larger, potentially £multi-million, multi-year bid.

The North of Tyne Investment Fund
£600m to be invested over 30 years to build a more dynamic and inclusive local economy. Pride of place' is one of the pillars of ambition with this fund with a number of strategic objective which could be relevant to the Tyne Estuary Partnership including STEM educational activities for young people, supporting areas of high unemployment; specifically Walker, supporting North Shields Fish Quay developments, bringing together health and wellbeing issues into a wider setting.

Northumbrian Water Improving the Water Environment Scheme
Northumbrian Water Group have committed to investing £2m from 2020-2025 to working in partnership to go 'above and beyond' to improve the regions rivers, streams and wetlands amongst other things. This will include seed funding £500,000 of seed funding on 2020 which the Tyne Estuary Partnership should be primed to apply for.

Coastal Communities and Coastal Revival Fund
Currently closed; but previous rounds have funded investment the coastal economy, history and culture of our country. The government is helping coastal communities flourish and strengthen their appeal as places to live, work and visit. Groundwork has successfully secured Coastal Communities funding in the past and will support an application for the Tyne Estuary Partnership if the fund opens for another round.

Health and Wellbeing funding
Groundwork have recently featured this project alongside a talk from Newcastle's Director of Public Health regarding the positive impacts and benefits of blue-green infrastructure on physical and mental health at The Blue-Green Path to Urban Flood Resilience event in March 2019. Here is was stated in that "every 10 per cent increase in exposure to green space translated into a reduction of 5 years in ["biological"] age in terms of expected health problems ([de Vries] et al 2003" and that "residential green space in childhood is associated with lower risk of psychiatric disorders from adolescence into adulthood". With the amount of new developments planned along the Tyne Estuary properly, well planned and sustainable access to green space and nature could have a significant impact on the new residents mental and physical health, and in the long run lead to fewer health and welling issues.

Learning form this Groundwork will not only try to work with developers for environmentally enhancing plans for green space within developments but also explore options such as public health and Clinical Commissioning Groups as potential sources of funding for some of the revenue project activity.

Grant Funds
Applications of approximately £10,000 - £50,000 to LEAF, Branchout, the Asda Foundation, Tesco Bags of Help, The Community Foundations and other grant giving bodies will be made by participating community groups, stakeholder groups, schools and charities to fund projects such as volunteering, education, citizen science and local stories and audio research projects.

Private Donations
Relevant developers, local authorities, regeneration/business support groups and other organisations with a vested interested in any planned enhancement along the Tyne will be asked if they are able to financially support enhancements that are mutually beneficial to them as well as the broader project and partnership. As the Partnership develops potential options of small membership fees to generate some revenue funding for the partnership will be discussed. This would follow the best practice model set by the Thames estuary.

In-kind contributions
There are indications from several stakeholders to offer in-kind support to the further development of project proposals, the Partnership, engagement, education and monitoring work. Specifically:

- All partners signed up to the pledge to continue to develop the partnership and work towards gaining profile and momentum towards meetings its aims.
- Newcastle University with Water Quality Sondes monitoring.
- The Water Hub, Ripple Event project for innovations to green Newcastle/Gateshead Quayside.
- Groundwork in continuing to support partnership development and the development of both capital and revenue project ideas.
- Local Authority support and developers on-site.
- Key stakeholders such as NGI and Calliope Navy in providing meeting and function space along the Tyne for free.
- Tyne Estuary Catchment partners.

PART 6: APPENDIX

6.1 Reports and Background Context

6.1.1 Commissioned Reports (Appendix 2)

Three reports were commissioned as part of the Tyne Estuary Partnership Report including:

- Institute of Estuarine and Coastal Studies, University of Hull (2019) *Tyne Estuary Edges Enhancement Study: MetroGreen Priority Site*
- Institute of Estuarine and Coastal Studies, University of Hull (2019) *Tyne Estuary Edges Enhancement Study*
- Institute of Estuarine and Coastal Studies, University of Hull (2019) *Tyne Estuary Waterbird Assemblage Review*

These are available upon request from lisa.stephenson@groundwork.org.uk

6.1.2 Strategic and Historical Context (Appendix 3)

The Strategic and Historical Context provides a further comprehensive overview of the historical, environmental and political landscape of the key settlements; this report is available upon request from lisa.stephenson@groundwork.org.uk.

6.1.3 Estuary Edges: Ecological Design Advice (Appendix 4)

Estuary Edges report provides further comprehensive advice on how best to make a positive contribution to estuary enhancements; the report is available upon request from lisa.stephenson@groundwork.org.uk.

6.1.4 The Northumbria River Basin District

Flood Risk Management Plan 2015-2021: Objectives

- **Social**
  - Reduce the number of people exposed to each category of flood hazard, particularly high and extreme hazard.
  - Ensure that critical infrastructure remains operational during flood events.
  - Reduce the social impact of flooding on communities at risk, especially in areas where there is a high proportion of properties and social assets at risk.
- **Economic**
  - Reduce the direct economic damages to property and agriculture from flooding.
  - Ensure that FRM expenditure follows the level of flood risk in the catchment.
- **Environmental**
  - Maintain and where possible improve the ecological function designated sites through FRM activities.
  - Allow river channel processes to operate naturally within the catchment.
  - No adverse impact on water quality as a result of flooding.
  - Protect heritage sites from the effects of flooding and where possible use FRM activities to enhance the landscape.

6.1.5 Ecological Review

Table 1. Priority Species

SPECIES	CLASSIFICATION	SPECIES	CLASSIFICATION
Skylark	Bird	Grey dagger	Moth
Tree pipit	Bird	Brown-spot pinion	Moth
Dark-bellied brent goose	Bird	Mouse mouth	Moth
European nightjar	Bird	Dusky brocade	Moth
Lesser redpoll	Bird	Mottled rustic	Moth
Common linnet	Bird	Latticed heath	Moth
Hen harrier	Bird	Small square-spot	Moth
Corn bunting	Bird	Small phoenix	Moth
Yellowhammer	Bird	Ghost moth	Moth
Reed bunting	Bird	Rustic	Moth
Common grasshopper warbler	Bird	Dot moth	Moth
Yellow wagtail	Bird	Broom moth	Moth
Spotted flycatcher	Bird	Rosy minor	Moth
Eurasian curlew	Bird	Powdered quaker	Moth
House sparrow	Bird	Shaded broad-bar	Moth
Eurasian tree sparrow	Bird	Buff ermine	Moth
Grey partridge	Bird	Cinnabar	Moth
Willow tit	Bird	Badger	Mammal
Marsh tit	Bird	Hedgehog	Mammal
Roseate tern	Bird	Otter	Mammal
Common starling	Bird	Water vole	Mammal
Song Thrush	Bird	Common seal	Mammal
Northern lapwing	Bird	Bottle-nosed dolphin	Mammal
Atlantic salmon	Fish	Harbour porpoise	Mammal
Brown trout	Fish	Dingy Skipper	Butterfly
European eel	Fish	Grayling	Butterfly
Smelt	Fish	Small Heath	Butterfly
Atlantic Cod	Fish	Small pearl-bordered fritillary	Butterfly
Herring	Fish	Wall	Butterfly
Sea lamprey	Fish	Wood white	Butterfly
Lesser sandeel	Fish	White-letter Hairstreak	Butterfly
Plaice	Fish	Common Toad	Amphibian
River lamprey	Fish	Great Crested Newt	Amphibian
Whiting	Fish	Juniper	Plant

Table 2. Local Wildlife Sites

NAME	DESCRIPTION	LOCAL AUTHORITY
River Tyne, Tidal Mud	Linear complex of inter-tidal mud	Gateshead
Mill Wood	Ancient lowland mixed deciduous woodland	Gateshead
Eels Wood	Ancient lowland mixed deciduous woodland	Gateshead
Wylam Riverside	Lowland mixed deciduous woodland, riverbank, river sands and gravels, marsh, metal-tolerant flora	Gateshead
Clara Vale Pit Yard	Lowland mixed deciduous woodland, ponds, species-rich grassland	Gateshead
Clara Vale Pond	Lowland mixed deciduous woodland, ponds, species-rich marsh, permanent pasture and scrub	Gateshead
Ryton Willows	Lowland mixed deciduous woodland, ponds, grassland, scrub and riverbank	Gateshead
Kittiwake Tower	Artificial nest site designed to provide a place for the River Tyne's inland Kittiwake population to nest in safety	Gateshead
Westfield Pasture	Permanent pasture, semi-natural woodland and scrub	Gateshead
Stella Wood and Pathhead Woods	Ancient semi-natural and semi-natural woodland	Gateshead
Image Hill	Mesotrophic grassland.	Gateshead
Felling Shore	Riverside grassland, heathland and plantation on a formerly industrial area	Gateshead
Blaydon Burn	Lowland mixed deciduous woodland, ponds and species rich grassland	Gateshead
Bill Quay	Rough grassland, amenity planting blocks, inter-tidal river bank, riverside cliffs and dene	Gateshead
Tidal River Derwent	Inter-tidal riparian habitat, scrub, reedbed and formal park areas	Gateshead
River Team saltmarsh	Upper saltmarsh on banks of the River Team.	Gateshead
Hebburn Riverside	Area of open grassland and plantations rising steeply from the banks of the River Tyne	South Tyneside
Jarrow Slake Flats	Largest and most important area of inter-tidal mud in South Tyneside	South Tyneside
River Don Saltmarsh	Only remaining saltmarsh of significance in South Tyneside	South Tyneside
River Tyne - tidal extent	Tidal extent of the River Tyne stretching from the tidal limit in Wylam, to the river mouth in Tynemouth	Newcastle, North Tyneside, Northumberland
Howdon Wetlands		North Tyneside
Northumberland Dock	Mesotrophic grassland, scrub, bomb pools and saltmarsh.	North Tyneside
Tyne Entrance		North Tyneside
Newburn Spreading Field	Species-rich grassland within the Tyne Riverside Park	Newcastle
Paradise Jobling Purser	Naturally colonised post-industrial grassland with good species diversity	Newcastle
Shelley Road	Grassland and woodland site, designated for	Newcastle

NAME	DESCRIPTION	LOCAL AUTHORITY
	dingy skipper	
Walker Riverside	Riverside park comprising grasslands and some woodland	Newcastle
Walker Railway Station	Botanically diverse grassland located within the Tyne / Hadrians Way Wildlife Corridor	Newcastle
Lemington Gut	Saltmarsh grassland that hosts regionally rare flora	Newcastle

6.1.6 Local Plans & Planning Activity

Table 1. Gateshead and Newcastle Joint Core Strategy

STRATEGIC POLICIES
Policy CS15 Place-Making Development will contribute to good place-making through the delivery of high quality and sustainable design, and the conservation and enhancement of the historic environment. This will be achieved by: 1. Development being required to: v. Respond to the unique character and importance of the River Tyne, its tributaries and its setting
Policy CS14 Wellbeing and Health The wellbeing and health of communities will be maintained and improved by: 1. Requiring development to contribute to creating an age friendly, healthy and equitable living environment through: i. Creating an inclusive built and natural environment; iii. Preventing negative impacts on residential amenity and wider public safety from noise, ground instability, ground and water contamination, vibration and air quality; v. Promoting access for all to green spaces, sports facilities, play and recreation opportunities.
Policy CS17 Flood Risk and Water Management Development will avoid and manage flood risk from all sources, taking into account the impact of climate change over its lifetime. Development will: 1. Avoid and manage flood risk to people and property by: i. Locating new development in areas with the lowest risk where appropriate by applying the Sequential Test; ii. Managing flood risk from development to ensure that the risk is not increased on site and/or elsewhere, where appropriate by applying the Exception Test; iii. Ensuring opportunities for development to contribute to the mitigation of flooding elsewhere are taken; iv. Prioritise the use of Sustainable Drainage Systems (SuDS), given the multifunctional benefits to water quality, green space and habitat enhancement
Policy CS18 Green Infrastructure and the Natural Environment A high quality and comprehensive framework of interconnected green infrastructure that offers ease of movement and an appealing natural environment for people and wildlife will be achieved by: 6. Improving access to, along and onto the River Tyne and tributaries, without adversely impacting on the local ecology or damaging the river banks.
URBAN CORE POLICIES
Policy UC3 Leisure, Culture and Tourism Development which enhances and diversifies leisure, culture and tourism will be

achieved by: 2. Supporting proposals to improve the appearance, use and accessibility of attractions including: i. Creating a riverside leisure route along the River Tyne from the Swing Bridge to the Gateshead Millennium Bridge, ii. Relocating Keelman's Way to follow the river's edge, providing pedestrian access to Gateshead Quays between the Swing Bridge and the Millennium Bridge.
Policy UC15 Urban Green Infrastructure Development will protect and enhance the Urban Green Infrastructure Network, address gaps and improve linkages to the Strategic Green Infrastructure Network at: 1. Ouseburn, 2. Jesmond to Quays, 5. Riverside Park to Windmill Hill Park, 8. Gateshead Quays and Baltic Business Quarter, 10. Exemplar Neighbourhood to Saltmeadows Riverside (and River Tyne)
SUB-AREAS AND SITE SPECIFIC POLICIES
Policy D3 Forth Yards Development Opportunity Site Policy QO1 Quayside and Ouseburn Sub-Area Policy QB2 Gateshead Quays Key Site Policy QB3 Quays and Baltic Development Opportunity Sites

Table 2. Newcastle Development and Allocations Plan

Policy DM26 – Flood Risk and Water Management 1. Development will be required to manage and reduce flood risk by: i. avoiding the culverting of watercourses, building over culverts, and where possible, remove existing culverts; iii. contributing to reducing or delaying run-off within river catchments through river restoration, creation of upstream storage areas, and tree planting, where appropriate; and iv. minimising development on existing green space where it has the potential to reduce flood risk at catchment. 3. Development must ensure it takes the opportunity to protect and improve surface and ground water quality and quantity and enhances the river environment by: i. implementing appropriate water pollution control measures; ii. including measures to treat surface water run-off pollution within the design of the drainage system; iii. safeguarding and providing river buffers with appropriate habitat; iv. naturalising watercourse channels and creation of wetland habitat; v. improving biodiversity and ecological connectivity of watercourses and its banks; and vi. mitigating agricultural and urban diffuse pollution, including impacts of the transport network.
Policy DM27 - Protecting and Enhancing Green Infrastructure Development will be required to protect, maintain and enhance existing green infrastructure assets, and contribute towards the delivery of new green infrastructure assets by: 1. Providing on-site green infrastructure, or where it can be demonstrated that this is not possible, contribute to off-site provision. 2 Addressing gaps in the Strategic Green Infrastructure Network corridors, providing improvements within the Opportunity Areas, as identified on the Policies Map, and enhancing the function of the Green Belt as a Green Infrastructure resource. 3. Ensuring development proposals which could adversely affect green infrastructure assets demonstrate:

i. that alternative provision which maintains or creates new green infrastructure assets is accessible and of equal value to health, climate protection, and biodiversity; or
ii. the proposed development would be ancillary to the main use of the green infrastructure asset and the benefits would outweigh any harm.
4. Requiring proposals for the creation of new green infrastructure assets or enhancements of existing green infrastructure assets to:
i. maximise multi-functionality;
ii. enhance connectivity and accessibility;
iii. enhance biodiversity;
iv. contribute to the areas character and improve visual amenity;
v. take opportunities to include community involvement and education;
vi. secure long-term maintenance and management; and
vii. incorporate climate change mitigation measures.

Policy DM28 -Trees and Landscaping

Development will be required to protect, enhance and manage existing trees and landscape features.
2. Development will be required to include new trees and landscape features where appropriate which:
i. enhance the quality and character of the development and area;
ii. provide connectivity and enhancements where possible to the Strategic Green Infrastructure Network Corridors and Wildlife Enhancement Corridors;
iii. assist in providing multi-functional environmental benefits; and
iv. assist in reducing or mitigating run-off and flood risk.

Policy DM29 - Protecting and Enhancing Biodiversity and Habitats

1. Development which may affect any designated site, biodiversity or important habitat, species or geological feature must be supported by an up to date ecological assessment to ensure the likely impact of the proposal can be assessed and mitigated;
2. Development which has a direct or indirect adverse effect on a Site of Special Scientific Interest (SSSI) and/or protected species should not normally be permitted;
3. Development which directly or indirectly causes significant harm to a Local Nature Reserves (LNR), Local Wildlife Site (LWS), Site of Local Conservation Interest (SLCI), as designated on the Policies Map,
and/or protected species should be avoided. Where significant harm cannot be avoided, development will be refused unless:
i. adequate mitigation measures to offset any loss or disturbance which outweigh the harm to the biodiversity value of the site, habitat and species is secured;
ii. as a last resort where harm cannot be avoided or fully mitigated compensatory measures are secured;
4. Development which would have an adverse effect on priority habitats and priority species will not be permitted unless adequate mitigation can be provided;
5. Development which would have an adverse effect on the biodiversity value or connectivity and function of the Wildlife Enhancement Corridor as designated on the Policies Map, will only be permitted where adequate mitigation is secured;
6. Development will be required to maximise the opportunity to protect and enhance habitats and provide net gains in biodiversity by:
i. retaining natural features and habitats and protecting them during construction;
ii. maintaining and improving buffers and ecological connectivity to the wider environment;
iii. creating and restoring habitat to provide corridors and stepping stones for wildlife; and
iv. securing future management arrangements.

Table 3. Making Space for Growing Places

MSGP30 Flood Risk Management 1) The extent and impact of flooding will be reduced by: b. encouraging catchment management through the removal of existing culverts and other hard engineering structures and natural flood management measures including river restoration, appropriate tree planting, upstream flood storage and wetland habitat creation. 3) Development within the River Team catchment should where reasonably practicable accord with the Team Valley Surface Water Management Plan.
MSGP31 Water Quality And River Environments The quantity and quality of surface and groundwater bodies shall be protected and where possible enhanced in accordance with the Northumbria River Basin Management Plan. 4) Development adjacent to, over or in a watercourse should consider opportunities to improve the river environment and water quality, particularly within the Stanley Burn, Blaydon Burn, the River Don, the River Tyne, the River Team and the River Derwent catchments by: a. Naturalising watercourse channels; b. Improving the biodiversity and ecological connectivity of watercourses; c. Safeguarding and enlarging river buffers with appropriate habitat; and d. Mitigating diffuse agricultural and urban pollution; e. Ensuring that all drainage of new development is connected correctly; f. Seeking opportunities to incorporate creation of wetland habitat in designs where appropriate; g. Ensuring that development does not fragment the wildlife corridor; h. Preventing introduction of non-native species via construction or other works and managing present invasive non-native species where practical
MSGP32 Green Infrastructure And Flood Management Schemes Schemes at the following locations, which will be protected from incompatible development, will be designed to combine safeguarding land for flood management with green infrastructure enhancements benefiting biodiversity, water quality and landscape and, where appropriate, providing new public access: River Derwent Catchment MSGP32.5 Shibdon Meadow, Derwenthaugh
MSGP33 Maintaining, Protecting and Enhancing Green Infrastructure Development will be required to maintain and protect existing green infrastructure assets and where appropriate contribute towards the delivery of new and/or enhanced green infrastructure assets by: 2) Requiring proposals for the creation of new green infrastructure assets or enhancements to: a. Maximise multi-functionality where appropriate; b. Increase or enhance connectivity and accessibility; c. Increase or enhance biodiversity; d. Contribute to the areas character and improve visual amenity; e. Include community involvement and education where appropriate; f. Secure maintenance and long-term management; and g. Incorporate climate change mitigation measures where appropriate. 4) Prioritising improvements within Opportunity Areas in the Strategic Green Infrastructure Network, as identified on the Policies Map, and addressing gaps in the network.
MSGP38 Biodiversity and Geodiversity 1. Where appropriate, development proposals must demonstrate how they will: a) avoid/minimise adverse impacts on biodiversity and geodiversity in accordance with the mitigation hierarchy; and b) provide net gains in biodiversity. 2. Where development which is likely to adversely affect biodiversity and/or geodiversity is

to be approved, the Council will require planning conditions and/or obligations to secure the provision, maintenance and monitoring of appropriate mitigation and/or compensation measures. 3. Proposals for development or land use that would adversely affect a Site of Special Scientific Interest, either directly or indirectly, will only be permitted where the reasons for the development, including the lack of an alternative solution, clearly outweigh the nature conservation value of the site and the national policy to safeguard the national network of such sites. 4. Proposals for development or land use that would adversely affect a Local Wildlife Site or Local Geological Site, either directly or indirectly, will only be permitted where: a) the developer can demonstrate that there are no reasonable alternatives; and b) the case for development clearly outweighs the need to safeguard the intrinsic value of the site. 5. Proposals for development or land use that would adversely affect the ecological, recreational and/or educational value of a Local Nature Reserve will only be permitted where: a) the developer can demonstrate that there are no reasonable alternatives; and b) the case for development clearly outweighs the need to safeguard the ecological, recreational and/or educational value of the site. 6. Development proposals that would have a significant adverse impact on the value and integrity of a Wildlife Corridor will only be permitted where suitable replacement land, or other mitigation, is provided to retain, and where possible enhance, the value and integrity of the corridor.
MSGP39 The River Tyne 1. The River Tyne, its banks and tributaries will be protected from damaging development and, where appropriate, enhanced. 2. A continuous multi-user recreational riverside route will be provided, where practicable, along the south bank of the River Tyne. This will be within a landscaped setting and screened, where appropriate, from the river and associated habitats to prevent disturbance. Where new development takes place, an area of land of between 10 and 30 metres wide will be safeguarded for this purpose.
MSGP51 Gateshead Wharf Gateshead Wharf will be safeguarded as a strategic and sustainable wharf for the landing of marine aggregates and will be protected from the encroachment of incompatible land uses that would compromise its efficient operation

Table 4. North Tyneside Local Plan

STRATEGIC POLICIES
S2.1 Economic Growth Strategy Proposals that make an overall contribution towards sustainable economic growth, prosperity and employment in North Tyneside will be encouraged. This includes supporting economic growth as follows: a. Town Centres and Tourism ii. The creation, enhancement and expansion of tourist attractions, visitor accommodation and infrastructure, capitalising on the Borough's exceptional North Sea coast, River Tyne and International Ferry Terminal. b. Advanced Engineering, low carbon, renewable, marine and off-shore technology, Port related activity and manufacturing iv. Develop marine and renewable sectors of manufacturing in the River Tyne North Bank area, as shown on the Policies Map, including on the former Swan Hunter shipyard and land owned by the Port of Tyne contributing to a low carbon economy, and building upon the existing high skills base and maximising the benefits of the Enterprise Zone, and accompanying Local Development Order

S5.1 Strategic Green Infrastructure The Council will seek the protection, enhancement, extension and creation of green infrastructure in appropriate locations within, and adjoining the Borough which supports the delivery of North Tyneside's Green Infrastructure Strategy. Where deficiencies in the quality of green infrastructure and in particular types of green infrastructure are identified in relevant up-to-date evidence, improvements will be targeted to those areas accordingly.
S5.4 Biodiversity and Geodiversity The Borough's biodiversity and geodiversity resources will be protected, created, enhanced and managed having regard to their relative significance. Priority will be given to: a. The protection of both statutory and non-statutory designated sites within the Borough, as shown on the Policies Map; b. Achieving the objectives and targets set out in the UK Post-2010 Biodiversity Framework and Local Biodiversity Action Plan; c. Conserving, enhancing and managing a Borough-wide network of local sites and wildlife corridors, as shown on the Policies Map; and d. Protecting, enhancing and creating new wildlife links.
S5.10 Water Quality The Council will seek to improve the water quality in line with the requirements of the European Water Framework Directive and its associated legislation, and the Northumbria River Basin Management Plan
DEVELOPMENT MANAGEMENT POLICIES
DM5.12 Development and Flood Risk All major developments will be required to demonstrate that flood risk does not increase as a result of the development proposed, and that options have been taken to reduce overall flood risk from all sources, taking into account the impact of climate change over its lifetime. All new development should contribute positively to actively reducing flood risk in line with national policy, through avoidance, reduction, management and mitigation. In addition to the requirements of national policy, development will avoid and manage flood risk by: a. Helping to achieve the flood management goals of the North Tyneside Surface Water Management Plan and Northumbria Catchment Flood Management Plans; and b. According with the Council's Strategic Flood Risk Assessment, including meeting the requirement for a Flood Risk Assessment for sites over 0.5ha in identified Critical Drainage Areas
DM5.7 Wildlife Corridors Development proposals within a wildlife corridor, as shown on the Policies Map, must protect and enhance the quality and connectivity of the wildlife corridor. All new developments are required to take account of and incorporate existing wildlife links into their plans at the design stage. Developments should seek to create new links and habitats to reconnect isolated sites and facilitate species movement
AREA SPECIFIC POLICIES
AS2.5 River Tyne North Bank AS8.1 The Wallsend and Willington Quay Sub Area

Table 5. South Tyneside

Policy ST1 Spatial Strategy for South Tyneside The spatial strategy for South Tyneside, is to: A regenerate the River Tyne and coastal corridors including the Tyne Gateway at South Shields;
Policy SC6 Providing for Recreational Open Space, Sport and Leisure We will promote the provision of high quality recreational open space, playing fields and outdoor sporting and play facilities by:

B remedying deficiencies in open space provision and quality, including through the reuse of previously-developed 'brownfield' sites, particularly within the Tyne riverside regeneration corridor, the inner-urban areas of South Shields, and Cleadon village C supporting schemes that extend the Borough's strategic Linked Open Space System into the wider countryside or broaden the range of opportunities for recreational pursuits within the River Tyne and coastal corridors.
Policy EA3 Biodiversity and Geodiversity To optimise conditions for wildlife, implement the Durham Biodiversity Action Plan and tackle habitat fragmentation the Council will: A secure and enhance the integrity of designated sites; B maintain, enhance, restore and add to biodiversity and geological conservation interests; C ensure that new development would result in no net loss of biodiversity value of any of the following Priority Habitats: i) magnesian limestone grassland; ii) coastal sand dunes; iii) maritime cliffs and slopes; iv) mudflats; v) rivers and wetlands; vi) species rich neutral grasslands; vii) rocky shores; D reduce the fragmentation of, improve or extend existing Priority Habitats; E create new Priority Habitats, especially in the Habitat Creation Zones of: i) Cleadon Hills; ii) Downhill; iii) River Don Valley; iv) Wardley Colliery; F protect and strengthen populations of Priority or other protected species; G enhance the biodiversity value of wildlife corridors; and H where appropriate, restrict access and usage in order to conserve an area's biodiversity value.
Policy EA5 Environmental Protection To complement the regeneration of the Borough, the Council will control new development so that it: E does not permit unsustainable schemes to be located in those areas of the coast, Tyne corridor and Don Valley where flood risk is unacceptably high.

Table 6. Development Management Policies

Policy DM7 Biodiversity and Geodiversity Sites We will protect and enhance the important environmental assets of the borough, including part of the most northerly outcrops of magnesian limestone in the country. We will promote and support high quality schemes that enhance nature conservation and management, preserve and restore historic and natural environmental character, and maximise benefits for geological conservation and the enhancement of biodiversity in line with the Durham Biodiversity Action Plan targets. All proposals for development: A must ensure that any individual or cumulative detrimental impacts on sites are avoided; and B will only be permitted where they would not adversely affect the integrity, natural character or biodiversity and geodiversity value of: i) designated Sites of Special Scientific Interest; ii) designated Local Wildlife Sites; iii) designated Local Geodiversity Sites;

iv) designated Local Nature Reserves; v) the Cleadon Hills, Boldon Downhill and South Boldon areas of high landscape value and significance; vi) Wildlife Corridors; and vii) other land that forms part of the borough's strategic green infrastructure; as shown on the Proposals Map.

Table 7. Northumberland Local Plan

Policy STP 6 Green infrastructure (Strategic Policy) Development proposals should seek to protect, improve and extend Northumberland's green infrastructure; securing improved access and net-gains for biodiversity. Green infrastructure should be integrated with sustainable drainage and the management of flood risk;
Policy ENV 2 Biodiversity And Geodiversity Development proposals affecting biodiversity and geodiversity will minimise their impact and net gains for biodiversity will be secured.
Policy WAT 3 Flooding Full consideration should be given to solutions within the wider catchment area, including blue-green infrastructure based solutions and those providing ecosystem services, with wider solutions especially applied if local solutions could be harmful to biodiversity, landscape or built heritage;
Policy POL 2 Pollution And Air, Soil And Water Quality Development proposals that may cause pollution of water, are required to incorporate measures to prevent or reduce their pollution so as not to cause nuisance or unacceptable impacts on the environment, people or biodiversity. Development will be required to help improve water quality standards.

Table 8. Tidal Ouseburn Planning Activity

Lower Steenberg's Yard	
Summary	2015/0577/01/DET | Erection of 34 residential units and offices and workshop space with associated car parking, cycle parking. Highway infrastructure improvements and hard and soft landscaping as amended by plans received 03/07/15, 06/07/15, 08/07/15 and 14/07/15.
Status	Granted Conditionally (24 May 2017)
Expiry Date	N/A
Lower Steenberg's Yard	
Summary	2018/1111/01/DET | Erection of 4 storey block comprising of 28 residential duplex apartments accessed from Ouse Street and 4 commercial units (896.6 sqm) at ground floor accessed from Ouseburn riverside, associated hard and soft landscaping, car and cycle parking, refuse storage and highway infrastructure improvements.
Status	Not yet determined
Expiry Date	31 March 2019
Lower Steenberg's Yard	
Summary	2018/1337/01/DET | Installation of gabion wall baskets in front of river wall along the full length of the Lower Steenberg's Yard site.
Status	Not yet determined
Expiry Date	15 March 2019
Lower Steenberg's Yard	
Summary	2018/1473/01/DET | Erection of site compound comprising portable offices, provision of 45 car parking spaces and storage.

Status	Granted Conditionally
Expiry Date	N/A
Former Site at Spillers Quay	
Summary	2018/1639/01/DET | Erection of a 140m high steel framed observation wheel with 60 cabins, a 5 storey visitor centre/wheel terminus 6790 sqm comprising food, beverage and merchandising outlets, 3 x 2 storey buildings 2940.3 sqm comprising food and beverage units and a 3 storey family entertainment centre 10,771 sqm with associated parking, cycle parking, servicing, hard and soft landscaping and other associated works.
Status	Not yet determined
Expiry Date	08 April 2019

Table 9. Smith's Dock Planning Activity

Smith's Dock	
Summary	06/03821/REM | construction of 78 apartments, 36 houses, 402m2 retail use, 184m2 food and drink use and 126 parking spaces
Status	Granted (13 Feb 2007)
Smith's Dock Discharge Review	
Summary	19/00179/COND | Discharge of condition 32 Refuse Storage of application 15/01097/OUT
Status	Not yet determined
Expiry Date	04 April 2019
Summary	18/00388/COND | Discharge of Condition 5 Compliance Statement, 13 Surface Water Drainage, 19 Means of Enclosure and 28 Travel Plan of planning approval 15/01097/OUT
Status	Granted (12 Sept 2018)
Summary	14/01336/COND | Discharge of condition 20 of application 11/02390/OUT for plateau and dock areas as shown on drawing 79775/9001 Rev A
Status	Granted (27 Jul 2015)

Table 10. Walker Riverside Park Planning Activity

Bill Point	
Summary	17/00624/SCO | Request for Scoping Opinion for combined (or contained) facility using engineered dike structure to isolate contaminated dredged marine sediments from adjacent aquatic environment**.**
Status	Not yet determined
Expiry Date	20 Mar 2018

Table 11. Forth Yards Planning Activity

This area was allocated in the CSUCP (pg183-185) https://www.newcastle.gov.uk/sites/default/files/wwwfileroot/planning-and-buildings/planning-policy/planning_for_the_future_core_strategy_and_urban_core_plan_2010-2030.pdf. The council has also produced a development framework for this area https://www.newcastle.gov.uk/planning-and-buildings/planning-and-development/planning-guidance/forth-yards-development-framework. Jon Rippon is the case officer working on this.

Response from EA Biodiversity Specialist to a Consent to Outfall to River Tyne at Pottery Wharf

The outfall location is directly on the River Tyne – Tidal Extent Local Wildlife Site (LWS) and in close proximity to the River Tyne Extension LWS and River Tyne Tidal Mud GAT 87 LWS. These Local wildlife sites are all non-statutory protected sites, designated for otter (*Lutra lutra*) and migratory and wintering birds (further interest features me be listed, as we don't have citations for all the sites).

The outfall location directly discharges onto an area of mudflat, a Habitat of Principal Importance under Natural Environment and Rural Communities Act (2006). The discharge of water in this location at low tide will lead to erosion of the mudflats, reducing habitat extent in its own right, and also reducing forging habitat availability for migratory and wintering birds in the LWS. Erosion of the mudflats also has potential to increase turbidity in the vicinity of the outfall at low tide.

The River Tyne is an important migratory route for Atlantic salmon (*Salmo salar*), European eel (*Anguilla anguilla),* River lamprey (*Lampetra fluviatilis*), Sea lamprey (*Petromyzon marinus*) and Smelt (*Osmerus eperlanus*). There is a risk that operations during the migratory period of these species may cause adverse impacts.

It is advised that alternative locations should be considered which will not have an adverse impact on these interest features, and any ecological assessment carried out as part of the development should take these considerations into account.

Forth Yards	
Summary	2018/1210/01/OUT | Outline application for mixed use development compromising of a series of 3-19 storey blocks for up to 1,500 residential units, a hotel and up to 10,605 square metres of commercial, community and leisure floorspace with associated vehicle parking, landscaping/public realm/open space provision, feature link access to Quayside, construction of new access road between Redheugh Bridge Road and Tyneside Road and Dunn Street and installation of utilities and other infrastructure works with all matters reserved.
Status	Not yet determined
Expiry Date	30 April 2019

6.1.7 River Tyne Partnerships, Sub-Partnerships, and Issue-Based Partnerships

Tyne Catchment Partnership	In-situ minewater treatment
	Minewater and sewage treatment at Birtley
	Minewater monitoring and treatment
	Carr Shield abandoned mine
	Minewater Investigations
	Living Waterways
	Ouseburn – Great Park
	North East Lakes
	Clean Tyne
	National Park farm advice
	Silt Reduction Partnership

	Peatland Programme
	Haltwhistle Burn improvements
	Woodlands for Water (updated April 2013)
	Ouseburn Integrated Drainage Strategy
	Forestry improvements
	Forest Streams
	Border Uplands Nature Improvement Area
	River Tyne Freshwater Pearl Mussels
	Volunteer & Farmer Alliance
	Farmland Bird Advice
	Northern Uplands Chain Local Nature Partnership (updated April 2013)
	Kielder Water Voles
	Northumbrian Loughs
	Protecting designated bird sites
	Protecting designated sites
	Flood alleviation on Shibdon Meadow
	Fish passage works
	River Watch
	River Team improvements
	Tackling urban diffuse pollution from industrial estates
	Freshwater Pearl Mussel breeding programme
	Cheviot Futures
	Flood Modelling
	Community action on flooding
	Tyne Catchment Pilot
	Green Infrastructure opportunity areas
	National Park Rangers
	Local engagement on mining issues
	Salmonid and diatom research
	Water Framework Directive Investigations
	Impacts of abandoned mines on marine organisms
	Nenthead spoil stabilisation trials
	Agricultural research at Nafferton Farm
	Diffuse Urban Pollution monitoring and remediation
	Monitoring
	Wild Watch
	Monthly wetland birds surveys
	Big Sea Survey
	ERIC North East
	Bird population data
Land of Oak & Iron	Fish pass
	River restoration
	Enhancement, restoration and expansion
	Wetland enhancement
	Young people skills & training
	Volunteer skills programme
	Outdoor education
	Improved access
	Signage
	Green travel assessment
Revitalising Redesdale	River Rede restoration
	Restoring and creating wildlife habitats

	Ecological recording
Don Catchment Rivers Trust	Invasive species
	Educational activities
	Eels in the Don Catchment
	Fish passage
	The living heritage of the River Don
	Hidden Heritage Secret Streams

6.1.8 Correspondence

Image 1. North Tyneside Business Forum Letter

North Tyneside Business Forum
Business and Enterprise, North Tyneside Council,
Quadrant East, Cobalt Business Park, NE27 0BY

0191 643 6000
Business.forum@northtyneside.gov.uk

Lisa Stephenson
Business Development Manager
Groundwork NE & Cumbria
Grosvenor House, 29 Mark Place
Bishop Auckland
DL14 7NP

01/02/2019

Dear Lisa

With a membership of over 1,300 businesses in North Tyneside we would expect there to be a range of views to the Tyne Estuary Stakeholder Consultation however, given the importance of the topic that we make a formal response so that the views of the lead support organisation for the business community in North Tyneside are recorded and we would like to make the following points re the opportunities to create an environmentally and economically vibrant Tyne Estuary.

- The enhancement opportunities which are of interest to the North Tyneside Business Forum are those which lie within the North Tyneside borough boundaries.
- We recognise there are a large number of sites within the Tyne Estuary which have been identified and we do not wish to comment on all of these individually except that in general we support initiatives which promote and encourage economic growth and employment.
- We have passed the opportunity to take part in consolation to the Chambers for Wallsend and North Shields, who may make comment on specific areas identified.
- The North Tyneside Business Forum is committed to working with all appropriate organisations that help to make North Tyneside a great place to live, work and visit and we believe that your work will be an important part in helping to achieve this.

We would be grateful if you would keep us updated on this important work and when the consultation has been completed and the necessary report has been written it would be good to arrange a meeting to discuss the content and to establish how best to support this important work.

I trust that the above is in order any questions please call.

Kind Regards
David W Bavaird,
Chair of North Tyneside Business Forum

Facebook: NTBusinessForum | Twitter: @NTBusinessForum | LinkedIn: North Tyneside Business Forum
Instagram: @NTBusinessForum

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6.2 Working Group Contact List

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Statutory Agencies and Authorities	Environment Agency	Rob Carr
Statutory Agencies and Authorities	Environment Agency	Zahra Ravenscroft
Statutory Agencies and Authorities	Environment Agency	Taryn Al-mashgari
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Local Authorities	Gateshead Council	Gayle Wilson
Local Authorities	Gateshead Council	Jimmy Young
Local Authorities	Gateshead Council	Peter Burrows
Environmental Groups	Groundwork NE & Cumbria	Lisa Stephenson
Environmental Groups	Groundwork NE & Cumbria	Lesley Silvera
Environmental Groups	Groundwork NE & Cumbria	Michele MacCallam
Environmental Groups	Groundwork NE & Cumbria	Lucas Robinson
Environmental Groups	Groundwork NE & Cumbria	Matt Machouki
Statutory Agencies and Authorities	Historic England	Kate Wilson
Statutory Agencies and Authorities	Historic England	Thomas Gledhill
University and Research	Hull University	Sue Boyes
University and Research	Hull University	Nick Cutts
Statutory Agencies and Authorities	LNP	Claire Thompson
Statutory Agencies and Authorities	LNP	Helen Ryde
Statutory Agencies and Authorities	Marine Management Organisation	Kathleen Telford
Statutory Agencies and Authorities	Marine Management Organisation	Zoe MacKay
Statutory Agencies and Authorities	Natural England	Katy Barrett
Statutory Agencies and Authorities	Natural England	Elaine Young
Culture and Archaeology	Natural History Society of N'bria	Clare Freeman
Private Sector	NE1	Stephen Patterson
Local Authorities	Newcastle City Council	Darren Varley
Local Authorities	Newcastle City Council	Phil Hartley
Local Authorities	Newcastle City Council	Thomas Brown
Local Authorities	Newcastle City Council	John Robinson
Local Authorities	Newcastle City Council	Kelly Graham
Local Authorities	Newcastle City Council	Ged Bell
University and Research	Newcastle University	Paul Quinn

SECTOR	ORGANISATION	CONTACT
Private Sector	Nexus Shields Ferry	Rebecca Ditchburn
Private Sector	Nexus Shields Ferry	Beverey Clyde
Culture and Archaeology	NGI	Jonathan Gilroy
Culture and Archaeology	NGI	Sarah Stewart
Private Sector	North Shields Fish Quay	Nik Hanlon
Local Authorities	North Tyneside	Daniel Wise
Local Authorities	North Tyneside	Jackie Hunter
Local Authorities	Northumberland County Council	Nick Brodin
Statutory Agencies and Authorities	Northumberland IFCA	Alec Aitkin
Environmental Groups	Northumberland Wildlife Trust	Duncan Hutt
Environmental Groups	Northumberland Wildlife Trust	Nick Mason
Environmental Groups	Northumberland Wildlife Trust	mike pratt
Private Sector	Northumbrian Water	Clare Deasy
Private Sector	Northumbrian Water	Tony Baines
University and Research	Nottingham University	Emily O'Donnelly
Private Sector	Places for People	Nigel Brewer
Ports and Harbours	Port of Tyne	Steven Clapperton
Ports and Harbours	Port of Tyne	Stuart McLeod
Statutory Agencies and Authorities	Royal Navy	Paul Linehan
Private Sector	Royal Quays Marina	Matthew Simms
Environmental Groups	RSPB	Helen Quayle
Private Sector	Smith's Dock developers	Mark Latham
Local Authorities	South Tyneside Council	Mark Gibson
Local Authorities	South Tyneside Council	Claire Rawcliffe
Local Authorities	South Tyneside Council	Harry Alder
Environmental Groups	Surfers against Sewage	Linda Lambert
Environmental Groups	The Ouseburn Trust	Chris Barnard
Private Sector	The World Wheel Company	Philip Lynagh
Culture and Archaeology	Tyne & Wear Building Preservation Trust	Martin Hulse
Culture and Archaeology	Tyne & Wear Building Preservation Trust	Kari Vickers
Environmental Groups	Tyne Rivers Trust	Ceri Gibson
University and Research	Urban Observatory	Lindsay Bramwell
University and Research	Urban Observatory	Dr Jennine Jonczyk

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