

FINAL

BASELINE RBMP ASSESSMENT

Kemnay Flood Study

Project no. 4021839

Prepared for:

Aberdeenshire Council

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1. Introduction

1.1 Scope of Commission

RSK / cbec Eco-Engineering have been commissioned by Aberdeenshire Council to carry out a Flood Protection Study in Kemnay. The following document outlines the baseline RBMP assessment on the local watercourses.

1.2 Study Location

Figure 1-1 shows the study location, within which the RBMP assessment has been made.

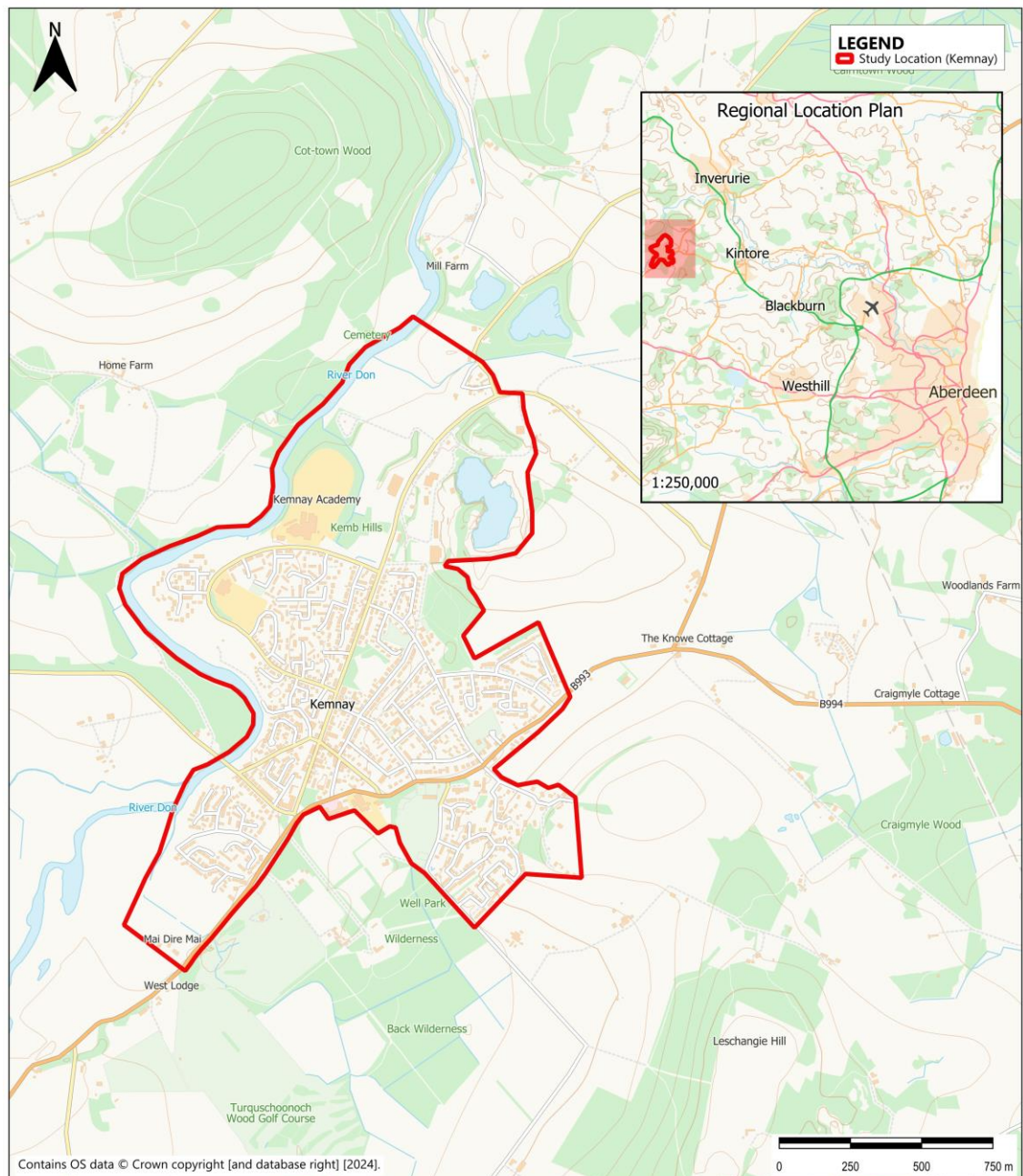


Figure 1-1 - Location Plan

1.3 Report Structure

This report outlines the steps taken to understand the River Basin Management Plan (RBMP) status of the watercourses in Kemnay. The RBMP is the implementation of the EU Water Framework Directive (WFD) into Scottish legislation. The aim of understanding the baseline RBMP status of the watercourses is to enable the identification of pressures on the water bodies which can then be used to identify options which target improvements in RBMP status – improving overall river health in the long term. Therefore, the report outlines:

- A desk-based assessment to understand where pressures exist (described in Section 2.1);
- A field-based assessment to gather further detail on pressures and consider where options could be implemented (described in Section 2.2); and
- Identification of potential options to improve RBMP status by combining the information gathered in the desk and field-based assessments (described in Section 2.3).

2. Physical condition, opportunities and constraints

2.1 Desk-Based Assessment

Existing information/data was collated and reviewed for the three study reaches to gain a contextual understanding of site conditions and current RBMP classifications, assessments and targets. The sources of information included: satellite imagery¹ and LiDAR² to understand the valley topography, channel character and land/river use; RBMP classification³ and pressures data⁴ to review the existing knowledge and RBMP objectives; and additional high-level data sets that indicate river channel recovery potential⁵, anthropogenic modification⁶, riparian planting prioritisation^{7,8}, opportunity areas for flood storage⁹ and flood risk areas¹⁰.

The River Don at Kemnay enters the study area in an unconfined valley setting, though floodplain space narrows as the river skirts the northwestern boundary of the town and flows through a more confined river corridor to the downstream extent of the study area. The River Don is approximately 20m wide in this area and follows a sinuous planform. The findings relevant to the existing pressures, opportunities for improvement and flood risk benefit and potential constraints are as follows.

- **Land use** on the floodplain and area adjacent to the channel includes the residential development to the river right and a combination of woodland, grazing and high-value agricultural land to the river left.

¹ Bing Map (2022). Satellite imagery, Aberdeenshire [Online via <https://www.bing.com/maps/>]. Accessed September 2024.

² Scottish Government et al (2012). LiDAR for Scotland Phase 1 – DTM [Online via <https://remotesensingdata.gov.scot/data#/list>]. Accessed September 2024.

³ Scottish Environmental Protection Agency (2023) Water classification Hub [Online via <https://www.sepa.org.uk/data-visualisation/water-classification-hub/>]. Accessed September 2024.

⁴ Scottish Environment Protection Agency (2016). Morphological Pressures Data.

⁵ Scottish Environment Protection Agency (2023) River Recovery Potential. [Online via <https://map.environment.gov.scot/sewebmap/?layers=riverRecoveryPotential>]. Accessed October 2024.

⁶ Scottish Environment Protection Agency (2024) River Anthropogenic Modification Index [Online via <https://map.environment.gov.scot/sewebmap/?layers=riverAnthroModIndex>]. Accessed September 2024.

⁷ Marine Directorate (2020) SRTMN - Nationally scaled tree planting prioritisation where trees are planted on both banks [Online via <https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=1901>]. After Jackson et al (2018) and Jackson et al (2021). Accessed October 2024.

⁸ Scottish Environment Protection Agency (2023) Recommended Riparian Corridor [online via <https://map.environment.gov.scot/sewebmap/?layers=recommendedRiparianCorridor>]. Accessed September 2024.]

⁹ Scottish Environmental Protection Agency. 2023. Flood Risk Management Maps. Natural Flood Management – Opportunity areas: Floodplain storage [Online via <https://map.sepa.org.uk/floodmap/map.htm>]. Accessed September 2024.

¹⁰ Scottish Environmental Protection Agency. 2023. Flood Risk Management Maps. River Depth – Medium Likelihood [Online via <https://map.sepa.org.uk/floodmap/map.htm>]. Accessed September 2024.

- **The Water Framework Directive (WFD)** classification for the River Don through Kemnay (23293 River Don - Alford to Inverurie) is 'Moderate' status. The pressures causing this Moderate classification are two fish barriers, located outwith the study area.
- **Flood hazard maps** demonstrate the existing flood risk to Kemnay, but non-built-up areas of floodplain, predominantly to the river left, show potential for opportunities to reconnect the floodplain and increase flood storage.
- **Morphological pressures data** show minimal pressures along the study area (only one bridge); however, this national dataset has variable uncertainty. More pressures are likely present along this reach as suggested by the homogeneous in-channel morphology.
- **Riparian tree coverage** is discontinuous along the study reach. The recommended riparian corridor is ~30 m wide, extending from each bank⁸.
- **Infrastructure and urban development** encroach on the river channel and corridor, including houses, Kemnay Academy and sewage works. This critical infrastructure poses constraints to remediating pressures and increasing floodplain storage. Further, the location of the sewage works indicates the potential for buried sewer pipes to be present along the river channel.
- **The Local Nature Conservation Panel (LNCS)** for the River Don, Kemnay to Bridge of Alford area falls partially within the study reach towards the upstream extent. Therefore, consultation with the (LNCS) would be essential in relation to any proposed works for this site.

The findings from the desk-based assessment inform the initial identification of opportunities for remediating pressures and reconnecting the floodplain; these have been interrogated further in the field based assessment and feed into the development of potential options.

2.2 Field-Based Assessment

A high-level walkover of the Kemnay study area was undertaken on Tuesday 15th October. River levels were normal (based on observations on site) and weather conditions were dry. Access to and visibility of the channel were good between the upstream extent of the study area to Kemnay Academy, but dense vegetation and high, steep banking meant that spot checks of the channel were only possible downstream of Kemnay Academy where access and visibility could be achieved safely.

The method for the reconnaissance-level walkover comprised walking the length of each study area and recording the general character of the river and floodplain, morphological pressures, opportunities for floodplain reconnection and improvement to physical condition, and any associated constraints. Multiple benefits were also considered in the analysis of the collected data and benefits-constraints analysis informed the development of shortlisted option reaches, which were prioritised into High, Moderate, Low or No opportunity reaches (see Section 2.3 below).

2.3 Identification of Potential Options for RBMP Status Improvement

The priority levels assigned to the reaches are based on the degree to which benefits to floodplain reconnection and/or physical condition can be achieved when balanced against the existing constraints. The criteria used for prioritising reaches are detailed in Table 2.1.

Summary maps providing an overview of results for the study area are shown on Figure 2.1, with site-specific details shown on Figure 2.2 and Figure 2.3.

Table 2-2 shows the potential options within the Kemnay study area to improve RBMP status, taking into consideration the geomorphic characteristics and pressures as well as the constraints which are prevalent.

Table 2-1 Definitions of priority levels for Option Reaches

Priority Level	Definition
High	<p>Significant benefit to geomorphology, ecology, flood risk and/or amenity value</p> <p>Proposed works highly feasible and appropriate given site conditions</p> <p>Limited effects of constraints on proposed works</p>
Moderate	<p>Notable benefit to geomorphology, ecology, flood risk and/or amenity value</p> <p>Proposed works generally feasible and appropriate given site conditions</p> <p>Constraints present but can be mitigated easily</p>
Low	<p>Limited but non-negligible benefit to geomorphology, ecology, flood risk and/or amenity value</p> <p>Feasibility of proposed works not known but options considered appropriate given site conditions</p> <p>Constraints present and could be overcome with additional work</p>
No opportunity	<p>Negligible or no benefit geomorphology, ecology, flood risk and/or amenity value</p> <p>Limited feasibility for proposed works given site conditions</p> <p>Constraints present that could not be overcome without disproportionate additional work</p>

RIVER DON, KEMNAY - NFM AND RESTORATION OPPORTUNITIES

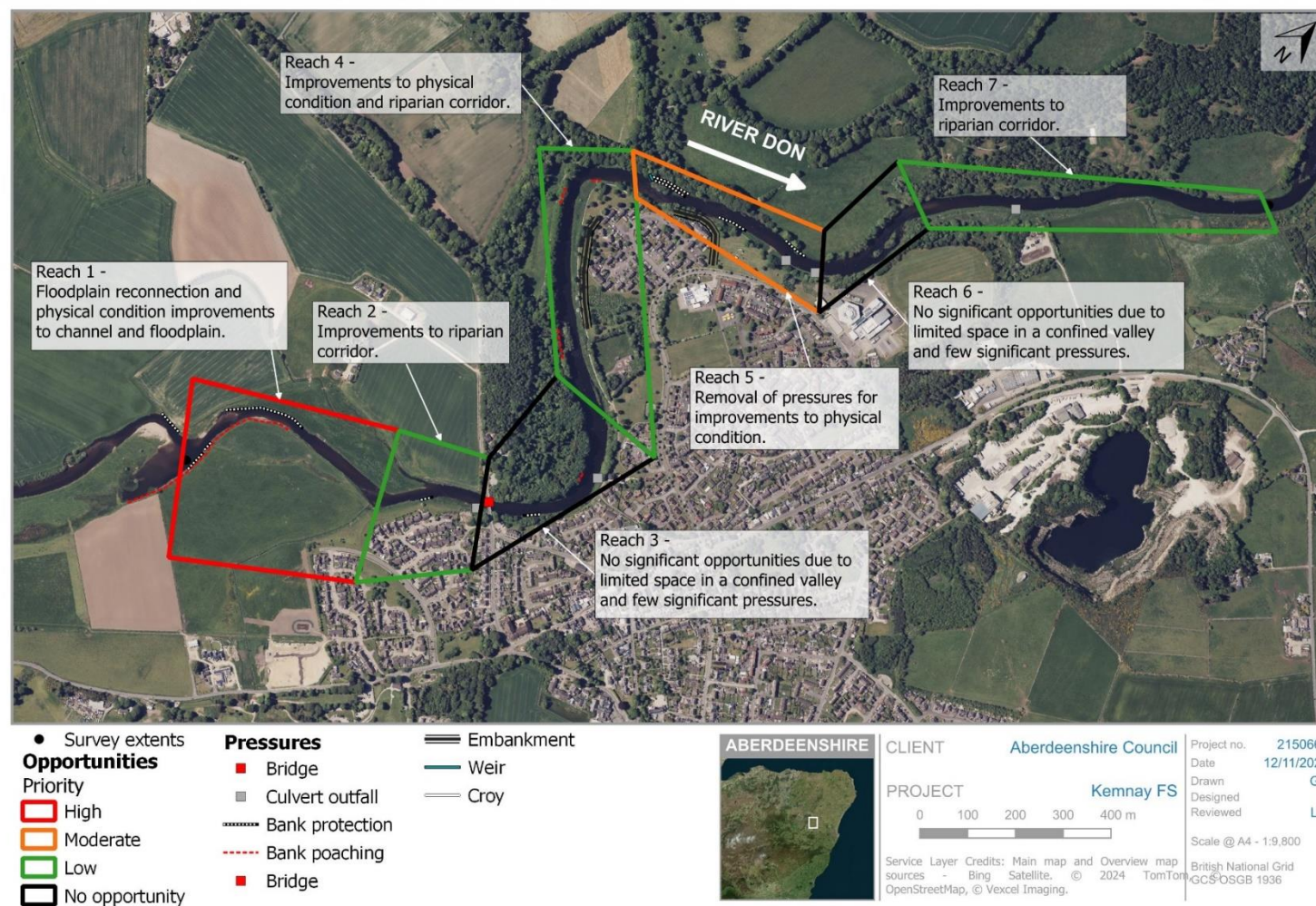


Figure 2-1 - Overview of pressures and potential options to improve RBMP status: River Don, Kemnay.

RIVER DON, KEMNAY REACH 1 & 2- NFM AND RESTORATION OPPORTUNITIES

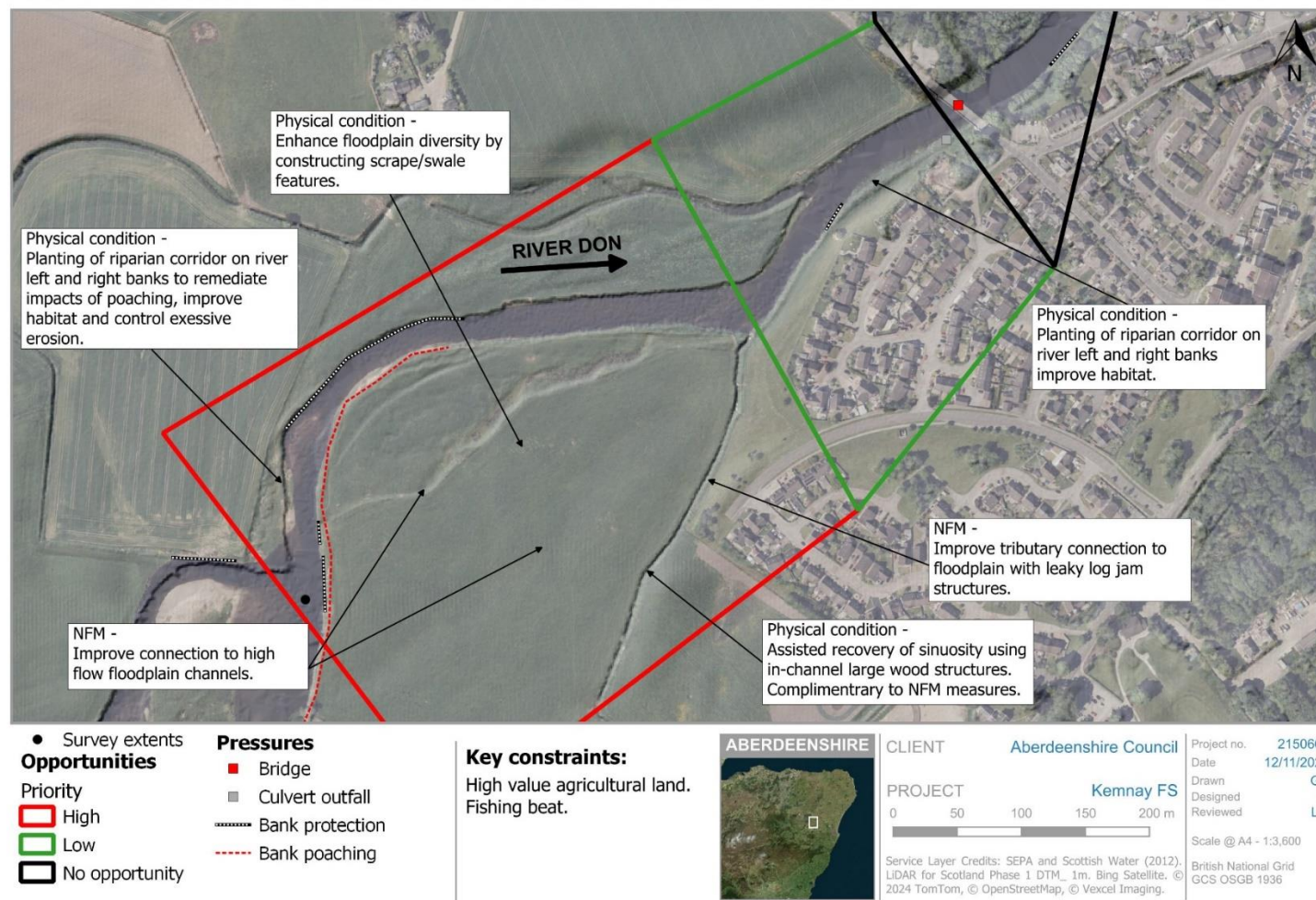


Figure 2-2 - Opportunities, pressures and constraints along reaches 1 and 2: River Don, Kemnay.

RIVER DON, KEMNAY REACH 4 & 5 - NFM AND RESTORATION OPPORTUNITIES

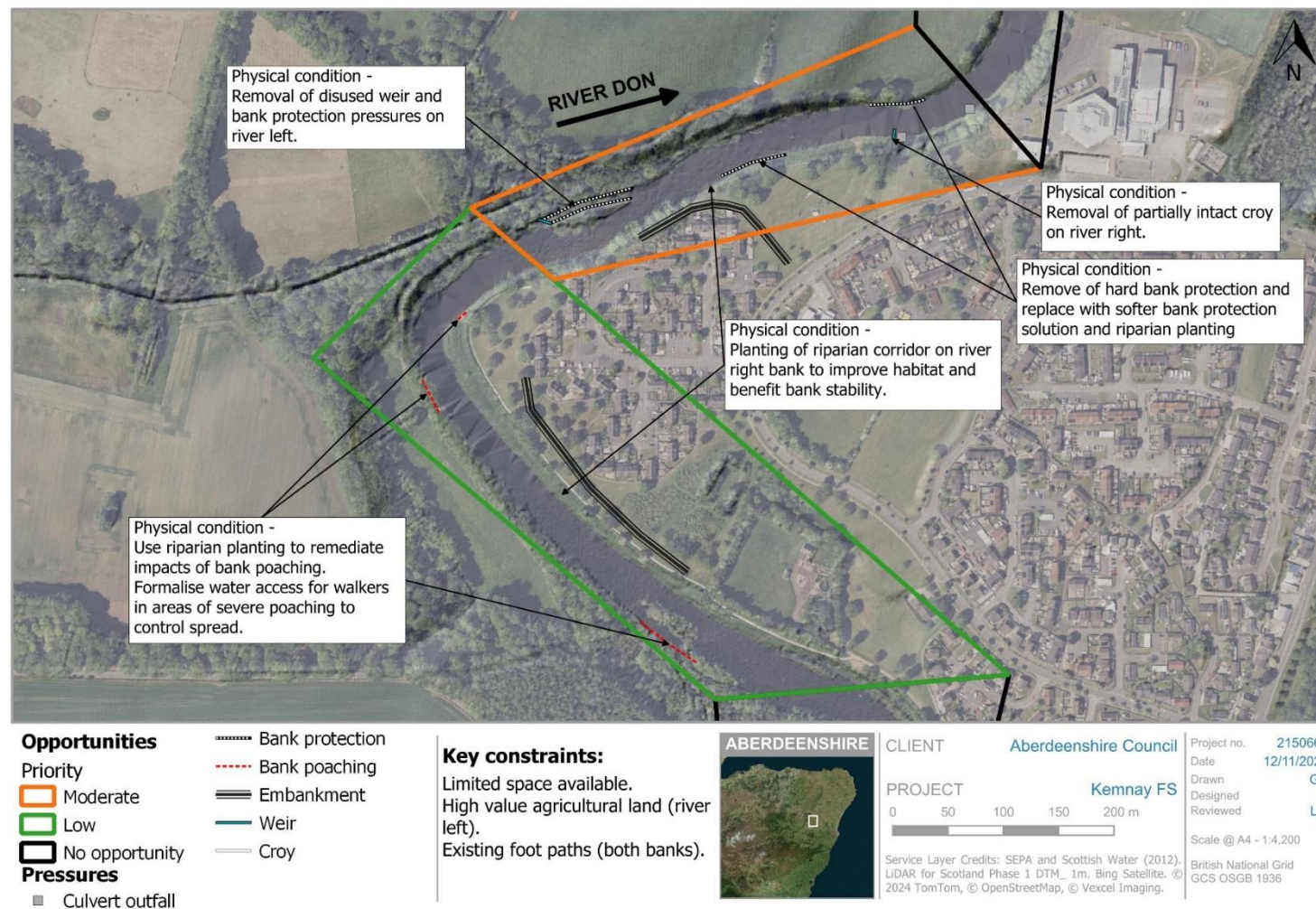


Figure 2-3 - Opportunities, pressures and constraints along reaches 4 and 5: River Don, Kemnay.

Table 2-2 - Potential options to improve RBMP status: River Don at Kemnay

Reach Number	Priority	Geomorphic characteristics and pressures	Potential Options	Constraints	Multiple benefits
1	High Opportunity for NFM and significant condition improvement. See Figure 2.2	<ul style="list-style-type: none"> Unconfined valley setting, sinuous channel with limited diversity of geomorphic features. River banks have poor resilience and subject to excessive erosion. High potential for geomorphic 'work'. Significant pressures are: hard bank protection, severe poaching from livestock and lack of riparian vegetation. An electric fence is in use to keep sheep away from the river banks to prevent future poaching. 	<ul style="list-style-type: none"> Potential to improve connection with the river right floodplain through increasing connectivity to the high-flow channels on the floodplain. Creation/ enhancement of wetlands in these topographic lows and strategic placement of large wood structures in the channel could be used to enhance floodplain connectivity. Potential to improve floodplain connectivity with the tributary that flows along the western field boundary. Options include a assisted recovery using large wood structures, a sequence of leaky log jams along the existing channel, or higher intervention channel restoration such as remeandering. Establish a riparian corridor to improve habitat and physical 	<ul style="list-style-type: none"> High-value agricultural land is present along both banks. The river right bank is part of a fishing beat. 	<ul style="list-style-type: none"> Establishing a riparian corridor will improve bank stability and reduce the need for bank protection measures. Establishing a riparian corridor benefits fish and other in-channel species by providing in-channel cover and nutrients. Roughness provided by a riparian corridor contributes to the attenuation of flood flows. Improving floodplain connectivity will contribute to sustaining floodplain wetland habitat.

Reach Number	Priority	Geomorphic characteristics and pressures	Potential Options	Constraints	Multiple benefits
			<p>condition of the river and remediate the impacts of poaching. Alternative option to establish clusters of riparian vegetation to avoid popular fishing locations could be more feasible.</p> <ul style="list-style-type: none"> Improve physical condition by enhancing floodplain wetlands with scrapes/swale features. 		
2	<p>Low</p> <p>No NFM opportunity, limited scope for mitigating pressures.</p> <p>See Figure 2.2</p>	<ul style="list-style-type: none"> Partially confined valley setting, sinuous channel with limited diversity of geomorphic features. River banks appear moderately stable and vegetated. Significant pressures are a lack of riparian vegetation, namely tree cover, along both river banks. 	<ul style="list-style-type: none"> Potential to establish a riparian corridor along the river right bank to improve the physical condition of the river environment. Alternative option to establish clusters of riparian vegetation to avoid popular fishing locations could be more feasible. 	<ul style="list-style-type: none"> The river left bank borders high-value agricultural land. Residential properties close to river right bank. A fishing beat extends along the river right bank; a continuous riparian corridor could impact fishing. 	<ul style="list-style-type: none"> Riparian vegetation benefits fish and other riverine species by providing in-channel cover and nutrients. Riparian tree cover along the banks aids bank stability, and could reduce the need for bank protection measures. Roughness provided by a riparian corridor contributes to the attenuation of flood flows.

Reach Number	Priority	Geomorphic characteristics and pressures	Potential Options	Constraints	Multiple benefits
3	No opportunity	<ul style="list-style-type: none"> Confined valley setting, sinuous channel with a homogeneous character, lacking diversity of forms and processes. Riparian vegetation is diverse and continuous along the left bank. No opportunities are highlighted along this reach because the channel is already well connected to existing floodplain, and there are few pressures which, if remediated, are unlikely to deliver significant benefits to the physical condition of the river environment. 			
4	Low No NFM opportunity, limited scope for mitigating pressures. See Figure 2.3	<ul style="list-style-type: none"> Confined valley setting, with short segments of well-connected – yet narrow – floodplain. The channel is sinuous and homogeneous in character. Significant pressures are: an embankment along the river right bank and a lack of riparian vegetation on the river right bank. Poaching of the banks is also present in discrete sections along both banks, likely due to walkers. 	<ul style="list-style-type: none"> Potential to improve physical condition by establishing a riparian corridor along the river right bank. Formalise water access at locations of severe bank poaching to control the spread of impacts. 	<ul style="list-style-type: none"> Confined channel, limited space for improvements. Close proximity to river right development limits scope for improving floodplain connection. Existing footpaths follow the river: the river right path is in close proximity to the bank. 	<ul style="list-style-type: none"> Establishing a riparian corridor aids bank stability and remediates impacts from poaching.

Reach Number	Priority	Geomorphic characteristics and pressures	Potential Options	Constraints	Multiple benefits
5	Moderate No NFM opportunities, but numerous mitigable pressures. See Figure 2.3	<ul style="list-style-type: none"> Partially confined valley setting, channel incision has reduced connectivity to the river right floodplain. The channel has low sinuosity and is mostly homogeneous in character. Significant pressures are: a river right embankment, bank protection, in-channel structures (a croy and a weir) and a lack of riparian vegetation along the river right bank. There are also two culvert outfalls located on the river right bank at the downstream extent of the reach. 	<ul style="list-style-type: none"> Potential to remove the disused weir and associated bank protection that is impacting the river left bank and island. This would aim to restore natural river processes and forms. 	<ul style="list-style-type: none"> Partially confined channel, limited space for improvements. High-value agricultural land extends along the river left bank at the downstream extent of the site. 	<ul style="list-style-type: none"> Removal of masonry wall bank protection (associated with the weir) has potential to restore more natural bank geometry, which could improve floodplain connectivity.
6	No opportunity	<ul style="list-style-type: none"> Partially confined valley setting, sinuous channel with a plane bed morphology. Lacking diversity of forms and processes, but in better condition than the wider study area. Riparian vegetation is diverse and continuous along the right bank. Evidence of rock armour bank protection that is no longer intact on the river right bank. No opportunities were highlighted along this reach that would deliver significant improvements to floodplain connectivity or physical condition. 			

Reach Number	Priority	Geomorphic characteristics and pressures	Potential Options	Constraints	Multiple benefits
7	Low No NFM opportunity, limited scope for mitigating pressures. See Figure 2.1	<ul style="list-style-type: none"> Partially confined valley setting. Low-sinuosity channel with steep banks and homogeneous character. Limited floodplain space. Significant pressures are a lack of riparian vegetation along the river right bank. There is also a culvert outfall located on the river right bank, adjacent to the waste water treatment works. 	<ul style="list-style-type: none"> Potential to improve the physical condition by establishing a riparian corridor along the river right 	<ul style="list-style-type: none"> Partially confined channel, limited space for improvements. Nearby waste water treatment works and associated culvert outfall on the river right bank. 	<ul style="list-style-type: none"> A well-developed riparian corridor aids bank stability and enhances habitat, including providing cover and nutrients to fish and other in-channel species. Roughness provided by a riparian corridor contributes to the attenuation of flood flows.

