West Yorkshire Combined Authority (WYCA)

Marine Aggregates Study

Final Report (Redacted Commercial Values)

Project Reference: CA1611

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https://www.royalhaskoningdhv.com

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E Executive Summary

E.1 Overview

Royal HaskoningDHV was appointed by the West Yorkshire Combined Authority (WYCA) and its strategic partners to undertake the Marine Aggregates Assessment for West Yorkshire (WY). The study examined potential sites, land requirements and note the Town Planning requirements within WY over the next 10 years.

E.2 Marine Aggregates

A relatively limited amount of aggregate is currently transported to/from and within WY by barge. The known current activity comprises a single operator transporting aggregates by barge into Leeds to the site at Knostrop Wharf. The total volume is approximately 75,000 tonnes per annum (tpa) of material, consisting of marine-dredged sand and gravel.

The main products derived from marine aggregates are fine aggregates (fine and coarse sands), coarse aggregates (gravel) and crushed rock. Of primary concern to the industry in the region is the availability of coarse sand for use in concrete (its primary use), also referred to as ‘concreting sand’.

Historic survey data indicates that WY is reliant on imports of high-quality crushed rock and sand & gravel to meet its consumption needs. While there has been a drop in growth for sand and gravel, imports for crushed rock have grown significantly. It is also noticeable that the proportion of imports has grown to near 100% demand levels. Demand for aggregates is high, the nature of the geology limited, in terms of its ability to produce certain higher specification aggregates, and the accessibility of the remaining un-worked aggregate resource constrained.

When compared to the sources of the aggregates, the overall trend is indicative of a shift in aggregate supply patterns to more distant locations. This shift to more distant quarries places even more importance upon the need to facilitate aggregate haulage modal shift by investing in rail and waterway infrastructure and safeguarding rail depots and wharfs to offload minerals in WY.

E.3 Potential Growth

There are also substantial and increasing quantities of marine aggregates both barged, railed and trucked into WY between the Humber Docks and WY wharfs and rail depots. In 2021, there were 10 production licences for both sand and gravel in the Humber marine region. The Marine Aggregates Crown Estate Licences summary of statistics 2022 indicates that within the Humber area during 2021 (two years after the impacts of Covid-19), 3.5 million tonnes of primary aggregate was dredged with a further 0.74 million tonnes for beach nourishment. The total permitted licensed tonnage of 6.88 million tonnes from the 10 production licenses. Future expansion plans would increase this to a licensed tonnage of 7.38 million tonnes with the release of an 11th production license. This represents a 7% increase (0.5 million tonnes). Feedback from The Crown Estates suggests that this could be within the next decade.

E.4 Stakeholder Consultation

Participation and consultation were central to the transport planning exercise undertaken to assist in identifying problems, setting the transport planning objectives and developing options. Early and continued consultation was undertaken with a steering group and with key stakeholders throughout the duration of the project. Adopting this practice assisted in cultivating a transparent planning process, which should in turn lead to the development of generally acceptable proposals.

The consultation process for the project has included a series of meetings with the steering group, a study specific questionnaire and workshops with key stakeholders and requests to various organisations for any information considered relevant in meeting the objectives of the project.

A series of consultations has taken place with key stakeholders including:
- A project questionnaire, issued on 23 June 2022; and
- Stakeholder Workshop on 29 June 2022 via MS Teams.

E.5 Analysis of Potential Locations

Following the stakeholder engagement feedback along with a site appraisal exercise, various potential new sites for wharfs and rail hubs were identified. Six (6) potential wharf sites and sixteen (16) potential rail sites were identified and examined.

An appraisal of the potential socio-economic benefits versus project delivery costs for each site option was undertaken. This considered the potential payback period in years for each site, using the input values described above. The appraisal does not consider other detailed planning matters. Given the current economic climate, two scenarios were tested:
- Restricted cost/benefit analysis (R-CBA); and
- Full cost/benefit analysis (F-CBA).

The F-CBA includes both the socio-economic benefits plus the business contribution and can be considered as an optimistic scenario (higher forecast). The R-CBA only includes the socio-economic benefits to allow for the risk of no private sector contributions due to the expected economic downturn over the coming few years and can be considered as a less optimistic scenario (lower forecast).

The analysis identified a number of new wharf and rail sites worth taking forward for more detailed study. Following the analysis, a programme of interventions and associated actions was identified which should allow the new strategy to be delivered over a reasonable timeframe. This included various actions over the short term (up to 3 years), medium term (up to 5 years) and long term (up to 10 years).

Various other issues were raised during this study, which could act as barriers to the further development of marine aggregates transport facilities within WY and should be addressed.

1 Introduction

1.1 Background

Royal HaskoningDHV was appointed by the West Yorkshire Combined Authority (WYCA) and its strategic partners to undertake the Marine Aggregates Assessment for West Yorkshire (WY). The study's primary purpose is to identify potential site opportunities, land requirements and note the Town Planning requirements within WY to facilitate the significant increase in the supply and delivery of marine aggregate[1] into WY for the next 10 years.

The study concentrates on sustainable means of transporting marine aggregates into the region (e.g. by waterways and rail) however, all modes of transport were given due consideration, particularly if there are means of transporting marine aggregates partially by sustainable modes and partially by traditional non-sustainable modes.

This is particularly relevant given WY's commitments to address the climate emergency. The West Yorkshire Leaders and Combined Authority declared a climate emergency and have set an ambitious, science-based emissions reduction target for the region to be net-zero carbon by 2038, with significant progress by 2030. This declaration was recognised in the region's Devolution Deal.

This report summarises the main findings of the study including the existing environment for marine aggregates in WY and potential future opportunities for expanding the options to use more sustainable modes of transport.

1.2 About this Report

Chapter 2 discusses the existing facilities and demand for aggregates in WY, where these aggregates are derived from and the volume that is transported into and within the region.

This is followed in Chapter 3 with a summary of the stakeholder engagement undertaken during the study. This outlines the feedback gathered from a range of local industry representatives and authorities.

Chapter 4 sets out an analysis of potential new sites for expanding the transport of marine aggregates by waterways and rail.

The report concludes in Chapter 5 with a description of emerging findings and recommendations to be taken forward.

1.3 Contact for this Report

Questions or clarifications about this report can be made to our study project manager as below:

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[1] In this case, marine aggregate refers to aggregates that are dredged from the sea, aggregate landed at marine wharves

2 Existing Facilities and Demand

2.1 Aggregates Transport via Barge

2.1.1 Current Facilities

A relatively limited amount of aggregate is currently transported to/from and within WY by barge. The known current activity comprises a single operator transporting aggregates by barge into Leeds to the site at Knostrop Wharf. The total volume is approximately 75,000 tonnes per annum (tpa) of material, consisting of marine-dredged sand and gravel.

Additionally, the Canal and River Trust have obtained planning permission to construct a potential aggregate wharf facility at Stourton (Leeds) and estimates that the initial capacity of this facility would be approximately 200,000 tonnes of aggregates per year. One of the purposes of this facility is to facilitate the waterborne transportation of marine won aggregates landed at the Humber into West Yorkshire, allowing increased access of marine aggregates into the regional market.

At the time of writing this report, Royal HaskoningDHV was also advised of a potential new wharf associated with the 2022 Stanley Ferry quarry permission, which was granted planning permission in March 2022 but had not commenced at the time of this study. The permitted sand and gravel working at Stanley Ferry includes provision of a wharf facility to allow Mineral to be transported to Ravensthorpe, Kirklees and/or Leeds.

Outside the above, aggregate wharf infrastructure is not available and hence the non-Leeds market is limited to sharing the site at Knostrop Wharf.

2.1.2 Known Potential Additional Sites for Barges

The Lafarge wharf at Whitwood (Wakefield) was closed in 2013 but previously received sand and gravel barged up from Besthorpe Quarry near Grantham up the River Trent and along the Aire and Calder navigation to Whitwood Wharf, near Castleford. The barges employed moved up to 200,000 tpa. Re-opening the Whitwood Wharf has the potential to significantly enhance the distribution of marine won sand and gravel outside of Leeds and is supported within Wakefield Council's emerging new Local Plan (LP2036).

In addition, a sizeable potential wharf remains adjacent to the former Ferrybridge Power Station coal stockyard. The coal stockyard is served by a rail loop and sidings, with rail sidings also running to the two operational energy facilities to the west of the stockyard. The wharf and rail loop were previously utilised to transport large quantities of coal to the Power Station and the rail loop continues to be utilised by a plasterboard manufacturer (Etex) to rail in gypsum. This remaining, under-utilised, rail and waterway infrastructure has the potential to be re-used to provide an intermodal commercial freight transportation facility (including potentially aggregates). The power station is currently under demolition and the coal stockyard is redundant, releasing over 150 hectares of potential employment development land. Safeguarding both the wharf and rail infrastructure as part of any redevelopment proposals would help to keep open the option of developing new rail/waterway connected facilities in this location.

2.2 Aggregates Transport via Rail

2.2.1 Current Facilities

The adopted Yorkshire Dales National Park Local Plan seeks a 50% (minimum) reduction in road traffic from quarries in the National Park.

Crushed rock limestone is transported by train from Buxton (Derbyshire) to Stourton (Leeds) and from Dry Rigg, Acrow, Ingleton and Swinden Quarries to Cross Green (Leeds). There are two aggregate offloading facilities at Cross Green which are operated by Tarmac and Hanson while the Stourton facility is operated by Cemex.

It is also understood that some aggregate and cement is brought by rail to the Construction Materials plant at Bretton Street in Dewsbury. All these terminals also distribute aggregate by road to other local sites; however, a large proportion of the total road haulage distance is eliminated by the railing of aggregates into WY to these locations.

2.2.2 Known Potential Additional Sites for Rail

Leeds City Council had stated that the Cemex aggregate rail depot at Stourton could have been lost due to the impact of HS2 and additional rail aggregate offloading infrastructure in Leeds would have been required to compensate for this capacity reduction. A site has been identified in Leeds to provide additional rail offloading capacity however, evidence indicates that irrespective of the loss of the eastern leg of HS2 and the allocation of this site, there will remain a shortfall in aggregate rail offloading capacity to serve WY.

Within WY, interest has recently been expressed in utilising a rail connected site off Wheldon Road (Castleford) as an aggregate rail depot. Although this site is constrained by its location within a Housing Zone where the delivery of over 4,000 new houses is proposed, the rail depot is referenced in the current land allocation and the site has already been partly prepared under planning consent. There is currently no firm information available on whether this potential new aggregate rail depot will be brought forward or not.

In light of the current lack of active rail depot capacity, it is essential, that existing rail depots are retained, and potential new sites are allocated. Currently, the import of aggregate into WY by rail is limited by the capacity and uneven geographical spread of active aggregate capable rail depots.

2.3 Local Plan Commitments to Safeguarding Aggregate Transportation Infrastructure

Leeds City Council's Natural Resources and Waste Local Plan includes policies which safeguard or allocate existing and potential rail sidings and several existing and potential wharf sites. However, challenges have been experienced in relation to the implementation of this policy due to competing pressures for housing development. This challenge has arisen because Government policy has been focussed on the delivery of housing and the subsequent rise in housing land value; with the insistence of the planning inspectorate on a policy which allows for safeguarded sites to be used for alternative development if it can be demonstrated that the site is unlikely to be used for freight purposes. This issue of safeguarded rail and waterway transportation infrastructure being threatened by alternative development proposals may be exacerbated by the national planning policy guidance set out in Section 11 of the NPPF. This revised guidance puts a strong emphasis upon the benefits of building upon previously developed and under-utilised land and advises that, where the local planning authority considers there to be no reasonable prospect of an application coming forward for the use allocated in a plan, applications for alternative uses on the land should be supported, where the proposed use would contribute to meeting an unmet need for development in the area.

Within Bradford Council's adopted Local Plan Core Strategy Policy TR6: Freight sets a commitment to encourage the protection of rail connected land for future uses that require rail freight use and seek to encourage the development of intermodal interchanges and improvements to multi-modal transfer facilities. Within Bradford Council's adopted Local Plan Core Strategy the spatial Policy TR6: Freight sets a commitment to encourage the protection of rail connected land for future uses that require rail freight use and seek to encourage the development of intermodal interchanges and improvements to multi-modal transfer facilities. The adopted Area Action for Shipley (a sub document of the Core Strategy) notes the Crossley Evans site in Shipley as a freight accessible site). The other potential site locations for freight are noted in the Bradford Replacement Unitary Development Plan (Bradford RUDP) under policy TM21, which include sites at Staithgate Lane South, Low Moor; and at Ripley Street/Bolling Road, Bowling.

The Calderdale Council Local Plan Submission Draft confirms that, given the geography and current physical infrastructure of Calderdale, alongside the nature of the local quarrying industry, it is not

intended to safeguard the transport element of the minerals supply chain. However, a general minerals infrastructure safeguarding policy for Calderdale is proposed through draft policy MS3.

The Wakefield Council Local Development Framework Core Strategy policy CS9 includes a general policy for the safeguarding of rail and waterway infrastructure through policy CS9 which states that sites which are used or suitable for inter-modal transfer facilities, rail freight facilities and the loading and unloading of water-borne freight will be protected for these uses and water and rail freight connections to existing industrial sites will be retained wherever possible and the development of new inter-modal transfer facilities, new rail sidings and rail freight facilities and new wharves will be encouraged.

The Kirklees Council Local Plan safeguards several specific minerals transportation facilities through policy LP39 including: a former coal and aggregates depot and a cement depot with rail spurs in Bretton Street, Dewsbury and a former Coal Wharf on the Calder and Hebble Navigation.

2.4 Constraints

The following constraints to the exploitable extent of marine aggregate resource have been identified:

- *Sea water depth:* the boom used to vacuum the seabed is attached to the side of the dredging vessel when in transit. The length of the boom thus limits the depth the vessel can dredge at; generally 30-50 metres depth is the operational maximum. The majority of the Humber licensing area and vessels operating in the area operate within this limit; there is a small minority coming from Teesside but movements from this area may be less able to use rail and water and therefore WY can only really exploit marine aggregates coming from the Humber area.
- *Length, draft and beam:* the length of the vessel limits the length of boom used for dredging, the draft limits both the storage capacity of the aggregate hold and landing options. A deep draft vessel will have less wharf options than a shallow draft. The beam limits the movement of the vessel through docks and waterways.
- *Vessel capacity:* marine dredging works partly because of economies of scale therefore larger vessels can become more economic. However, larger vessels (5000t and over) may have less options for berthing. Small vessels (2-3500t) are less suitable for deeper waters (see water depth above) and less able to operate in poor weather conditions but more flexible in terms of their point of landing.
- *Offshore wind energy:* wind farms are a recent addition to the list of constraints and have grown in scale considerably between each Crown Estate leasing round. The activity of dredging and location of wind farms is considered incompatible after wind turbine construction. The location of the wind farms lease areas and associated buried seabed cable connections to the shore includes large tracts lying within the Humber marine aggregates licensing area and crosses the areas of prospective new marine aggregates licensing areas. This conflict in competing demands could potentially limit the future marine aggregates licensing areas.
- *Wave and tidal power:* related to the above is the leasing of sea areas for wave and tidal power systems, which are also vested in the Crown Estate. There are no commercial tidal or wave power facilities yet operating in the UK.
- *Military areas:* the military undertakes sea training within defined military practice areas and exercise (PEXA) training areas, the military also imposes access restrictions to a number of areas.
- *Habitats:* there are a number of habitat designations within the Humber Estuary and the Humber dredging area. Such designations are taken into account in the EIA process when applying for marine dredging permissions. The designations include Special Areas of Conservation (SAC) which are strictly protected sites designated under the EC Habitats Directive; Special Protection Areas (SPA) classified for rare and vulnerable birds and migrating species; and RAMSAR sites which are wetlands of international importance.

- *Recreation areas:* recreation is a potential area of conflict, either indirectly or directly, with aggregates. Direct costs relate to displacement of recreation activity, such as diving, sea angling and sailing. Indirectly, marine aggregates extraction could damage features in local/regional ecosystems and therefore reduce attractiveness to recreational activities. However, as dredging is a transient activity the period over which areas are potentially disturbed is limited.
- *Beach replenishment:* the use of marine aggregates in beach replenishment fluctuates in relation to the programme of works undertaken on an annual basis and may be substantial. Applications for beach replenishment dredging licences are considered by the Crown Estate on the same basis as those for construction aggregates.

There are numerous constraints which have potential to limit the extraction of the identified marine aggregate resource. Some of the constraints are prima facie conflicts such as pipeline routes and constructed wind farms; others are relevant but are the subject of case specific assessment through the licensing procedure.

It is important to note the above identified constraints as it helps to explain the numbers of identified licenses granted and hence sets the future demand levels of marine aggregates that could potentially influence WY. The licence application procedure and role of the Crown Estate in granting and reviewing conditional licences is the means by which competing interests can be evaluated.

2.5 Aggregate Flows to/from West Yorkshire

2.5.1 Imports from Elsewhere

Increasing quantities of marine aggregates are being trucked and barged into WY. Facilities known to receive marine dredged aggregate include Knostrop Wharf (circa 75,000 tpa) and minerals processing facilities at Cross Green (Leeds); however, no reliable data at this site on the total quantity of marine aggregate flows into WY is currently available because it is not data that is collected in the Yorkshire and Humber Aggregate Returns, which are based on Government guidance.

The main products derived from marine aggregates are fine aggregates (fine and coarse sands), coarse aggregates (gravel) and crushed rock. Of primary concern to the industry in the region is the availability of coarse sand for use in concrete (its primary use), also referred to as 'concreting sand'.

Table 2.1 summarises the recent volumes and observed growth rates[2]. Due to the impacts of Covid-19, the analysis has used the 5-year period up to and including 2019, as 2020 and 2021 growth rates were depressed during these periods and hence cannot be relied upon to represent historic trends.

***Table 2.1** – Recent Total Annual Volumes and Observed Growth Rates*

Item	Direction and % Consumption	2014	2019	5-year Growth
Crushed Rock	Imports	1,997	2,257	13%
	Consumption	2,536	2,342	-8%
	% of Consumption met by Imports	79%	96%	–
Sand and Gravel	Imports	685	466	-32%
	Consumption	702	466	-34%
	% of Consumption met by Imports	98%	100%	–
Totals	Imports	2,682	2,723	2%
	Consumption	3,238	2,808	-13%
	% of Consumption met by Imports	83%	97%	–

Note: figures are in '000 tonnes

The 2019 consumption and imports data indicate that WY is reliant on imports of high-quality crushed rock and sand & gravel to meet its consumption needs.

[2] Data was sourced from the British Geological Survey which is informed by their National Aggregate Minerals Survey 2019 (AMS2019)

While there has been a drop in growth for sand and gravel, imports for crushed rock have grown significantly. It is also noticeable that the proportion of imports has grown to near 100% demand levels. This suggests that WY is currently a net importer of aggregates. This is because WY accommodates 42% of the population of the Yorkshire and Humber Region within 13% of the Region's total land area. Demand for aggregates is high, the nature of the geology limited, in terms of its ability to produce certain higher specification aggregates, and the accessibility of the remaining un-worked aggregate resource constrained.

Looking at the origins of the total above volumes, it is possible to see where the aggregates come from and the potential routes they could take. Table 2.2 shows the analysis based on data from the British Geological Survey[3], again based on 2019 data to match the above referenced consumption values and to avoid bias from the depressed growth rates in 2020 and 2021.

***Table 2.2** – Sources of Aggregates to West Yorkshire*

To West Yorkshire / Origin (or Source)	Sand and Gravel			Crushed Rock		
	2014	2019	Change	2014	2019	Change
North Yorkshire County Council	315,900	116,500	-199,400	380,400	128,810	-251,590
East Yorkshire	175,500	69,900	-105,600			
East Midlands (Nottinghamshire)	105,300	25,630	-79,670			
East Midlands (Derbyshire)				139,480	585,500	446,020
East Midlands (Lincolnshire)	38,610	25,630	-12,980	13,950	128,810	114,860
North-East (Durham)	38,610	163,100	124,490	139,480	128,810	-10,670
North-West (Cheshire West / Cheshire East)	38,610	25,630	-12,980			
North-West (Cumbria CC)				13,950	128,810	114,860
West Midlands (Staffordshire)	38,610	0	-38,610			
South Yorkshire (Doncaster)	3,861	25,630	21,769	634,000	128,810	-505,190
Yorkshire Dales National Park				887,600	1,288,100	400,500
Total West Yorkshire Consumption	**702,000**	**466,000**	**-236,000**	**2,536,000**	**2,342,000**	**-194,000**

Note: figures are in tonnes rounded to nearest 10 tonnes

The above provides a comparative analysis of 2014 vs 2019 data. The figures have been derived by applying the percentages to the stated total consumption figure for WY provided in the government data.

The data also indicates the level of reliance WY has upon aggregates produced in neighbouring authorities is increasing.

The main points arising from the data presented in the above tables, in terms of changes in the pattern of construction aggregate flows into WY between 2014 and 2019 are considered to be:

- An apparent significant increase in crushed rock aggregate flows into WY from the Yorkshire Dales National Park and Derbyshire;
- An apparent significant decrease in crushed rock aggregate flows into WY from Doncaster and North Yorkshire;
- An apparent significant reduction in sand and gravel flows into WY from North Yorkshire and to a lesser extent East Yorkshire; and
- An apparent increase in sand and gravel flows into WY from the North East (County Durham).

The data also indicates that smaller quantities of aggregates are supplied into WY from a number of other locations, including:

- Staffordshire;
- Lancashire;

[3] Data was sourced from the British Geological Survey which is informed by their National Aggregate Minerals Survey 2019 (AMS2019)

- Northumberland;
- Powys; and
- Rhondda Cynon Taff.

However, supplies from the above locations were identified as representing less than 1% of consumption and they should not be attributed too much significance, as the quantities could potentially be very small and could represent small consignments of aggregate procured for a specialist purpose/specific project rather than part of the general construction supply market.

The overall trend is indicative of a shift in aggregate supply patterns to more distant locations including Derbyshire and Durham. This shift to more distant quarries places even more importance upon the need to facilitate aggregate haulage modal shift by investing in rail and waterway infrastructure and safeguarding rail depots and wharfs to offload minerals in WY. Figure 2.1 shows the main sources; the thicker the arrow, the higher the volume transported.

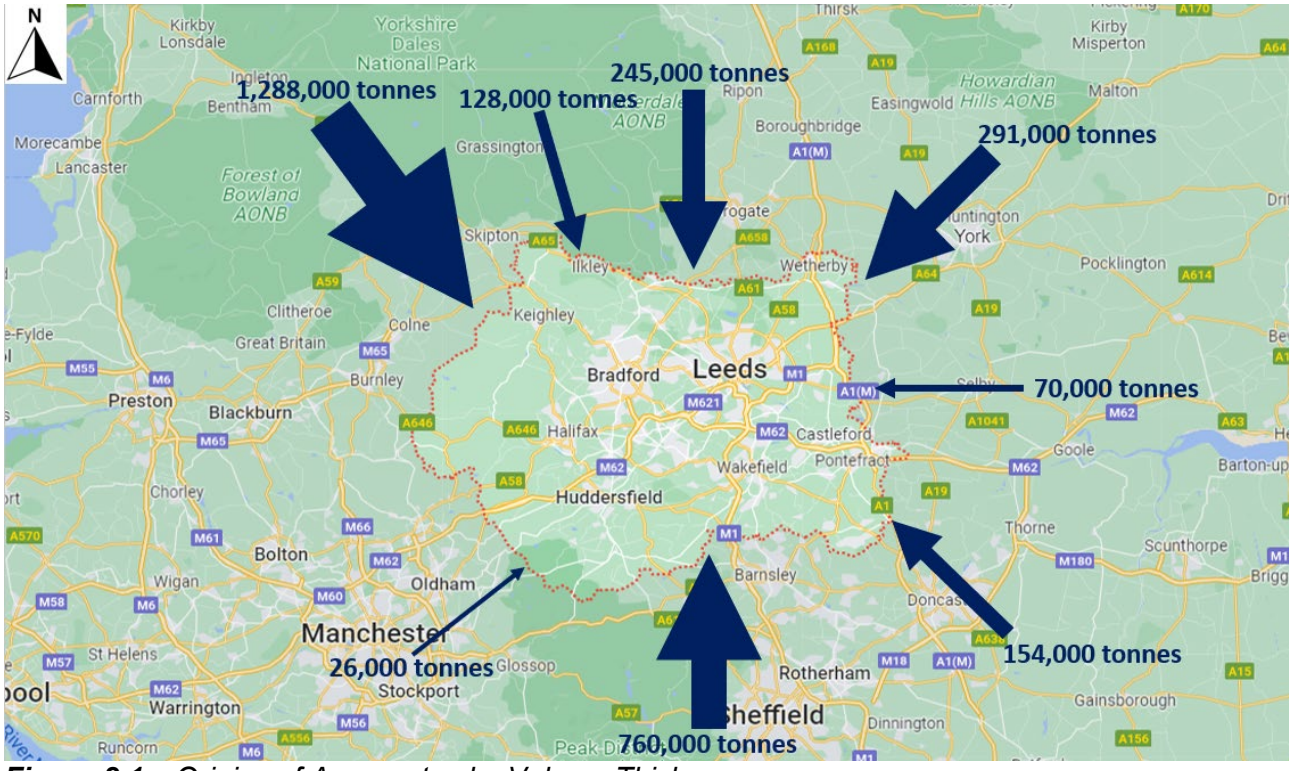


***Figure 2.1** – Origins of Aggregates by Volume Thickness*

The Yorkshire Dales National Park is the most important supplier of crushed rock aggregates into WY, with supplies from the National Park now accounting for over 50% of the crushed rock aggregates consumed within WY. Significant quantities of crushed rock aggregates are also supplied from the East Midlands (Derbyshire, The Peak District and Leicestershire), with lesser, but still significant, quantities supplied from the North-East, North Yorkshire, South Yorkshire and the North-West.

In relation to Sand and Gravel, County Durham and the North Yorkshire County Council administrative area are highlighted as the key suppliers into WY. Lesser, but still potentially significant, quantities of sand and gravel are also thought to be transported into WY from East Yorkshire, Nottinghamshire, Lincolnshire, Cheshire and Doncaster.

2.5.2 Recycled and Secondary Aggregates (RSA)

Recycled aggregate is primarily produced from construction, demolition and excavation (CD&E) waste. Most CD&E waste originating from WY is managed within WY whilst the only significant ‘exports’ were to adjacent authorities within the Yorkshire and Humberside region. Exported CD&E

waste accounted for less than 10% of estimated arisings and 92% of these exports remained within the Yorkshire and Humberside region.

2.5.3 Marine Aggregate and Potential Growth

There are also substantial and increasing quantities of marine aggregates both barged, railed and trucked into WY between the Humber Docks and WY wharfs and rail depots. In 2021, there were 10 production licences for both sand and gravel in the Humber marine region, with an estimated total lifespan of 19 years' worth of production if production is maintained at historic average levels[4].

The Marine Aggregates Crown Estate Licences summary of statistics 2022 indicates that within the Humber area during 2021 (two years after the impacts of Covid-19), 3.5 million tonnes of primary aggregate was dredged with a further 0.74 million tonnes for beach nourishment. The total permitted licensed tonnage of 6.88 million tonnes from the 10 production licenses. Future expansion plans would increase this to a licensed tonnage of 7.38 million tonnes with the release of an 11th production license. This represents a 7% increase (0.5 million tonnes). Feedback from The Crown Estates suggests that this could be within the next decade.

Furthermore, the data indicates that almost three quarters of the material dredged from the Humber area is exported to mainland Europe (70.1% or 2.45 million tonnes). A further 19.60% (0.69 million tonnes) was moved to Humber and North East and 9.60% (0.34 million tonnes) went to the Thames Estuary. The remainder (0.7% or 0.02 million tonnes) of the tonnage dredged was delivered to the East English Channel.

Of the total material transported, approximately 176,000 tonnes of extracted marine aggregate was landed at wharves on the River Humber. In addition, 267,000 were landed at wharves on the River Tees and 247,000 tonnes were landed at wharves on the Tyne.

The figures set out above indicate that marine aggregates are underexploited within the Yorkshire and Humber Region relative to the national picture.

The findings of the marine aggregate study appear to be being borne out in reality with the operator AC Marine Aggregates having their first cargo into Hull in August 2015 and in total have brought in a further 100 consignments of approximately 6,500 tonnes per consignment. Since July 2020 a weekly barge load of 1,500 tonnes per week has been received at the safeguarded Knostrop Depot, Leeds, on the Aire and Calder Navigation (around 75,000 tpa). This was temporarily halted in April 2021 due to a breach of the canal at East Cowick. Data provided by AC Marine Aggregates estimates they could bring 5,000 tonnes of marine aggregate per week into WY, with 3,000 tonnes going to Whitwood near Castleford and 2,000 tonnes going to Knostrop Depot, Leeds. This would be available for onward distribution throughout WY. The incumbent operator is only using a small area of the safeguarded wharf at Knostrop Depot with the rest of the wharf being used by non-wharf related businesses. Better rationalistion and organization of uses at the wharf could provide additional space needed to unload larger quantities of marine aggregates.

In addition to the currently operating Knostrop Wharf, an application for the development of a new aggregate wharf at Skelton Grange Road, Stourton, was approved by Leeds City Council on 2 April 2015 (known as Port of Leeds). This new wharf is expected to distribute approximately 2,000 tonnes per week of aggregate (sand and gravel) arriving from the Humber Ports. In addition, the Stanley Ferry site discussed earlier has been granted planning permission in March 2022.

2.5.4 Rail Freight Traffic and Growth Prospects

According to Network Rail data there are 30 trains operating to and from the WYCA area. Table 2.3 overleaf shows the net payload of each train based on the respective wagon type typically used, as well as the comparable number of articulated HGVs which would otherwise have moved the traffic by road.

[4] https://www.thecrownestate.co.uk/media/4243/marine-aggregates-annual-review-2022.pdf

***Table 2.3** – Daily Rail Freight Traffic to/from WYCA Area (30 Loaded Trains Operated)*

Commodity	Direction	Net Tonnes Lifted	Equivalent HGV Loads
Aggregates	Inbound	5,735	199
Cement	Inbound	1,380	48
Intermodal	Inbound	8,155	562
Sand	Inbound	1,290	45
Intermodal	Outbound	7,795	538
Waste	Outbound	1,620	56
Totals		**25,975**	**1,448**

Note: figures are in tonnes or HGVs

Rail movements to/from WY accounted for an estimated 26,000 tonnes of freight which is the equivalent of almost 1,450 articulated HGV loads and associated trips, the latter likely to have been at least 30% higher to account for empty running and/or return journeys. There is space to accommodate more freight paths within the passenger timetables and further capacity could be added by increasing some of the rail sidings to accommodate more wagons.

The Office of Rail and Road's (ORR) latest quarterly rail freight statistics suggest traffic is now exceeding pre-Covid levels, but it remains unclear the extent to which the level and rate of decline in rail freight traffic before the pandemic will be reversed over the medium to long term.

Transport for the North has published its freight strategy, noting the growth of rail freight is predicted to be 39% between 2016 and 2050[5].

2.6 Existing Sites

2.6.1 Waterways

The existing operational waterway site includes:

- *Old Mill Lane, Knostrop:* the only active wharf in the WYCA region, this is currently responsible for circa 75,000 annual tonnes. The estate is strategically located circa 1 mile from Junctions 4, 5 and 7 of the M621 Motorway and just over 1.5 miles from both Leeds City Centre and Junction 44 of the M1 Motorway. The site is accessed via Old Mill Lane, just off Low Road (A639).

Figure 2.2 shows the location of the existing wharf freight site.

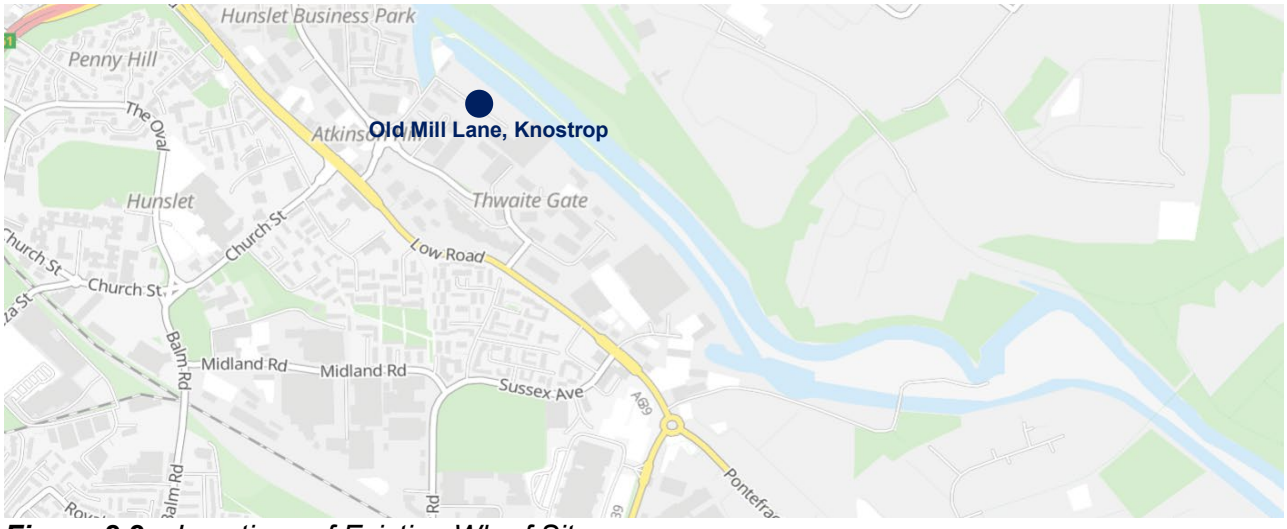


***Figure 2.2** – Locations of Existing Wharf Site*

[5] Enhanced Freight and Logistics Analysis Report, TfN January 2018, page 3

There are other wharf sites which have future potential including:

- Port of Leeds;
- Stanley Ferry;
- Bridgewater Road, Cross Green;
- Haigh Park Road, Stourton;
- Fleet Lane, Woodlesford; and
- Whitwood, Wakefield.

Of the above, the site at Skelton Grange Road, Stourton (Port of Leeds) has the capacity for 0.2m tpa. The Canal and River Trust have obtained planning permission to construct a new aggregate wharf facility at the site. One of the purposes of this facility is to facilitate the water borne transportation of marine won aggregates landed at the Humber into WY.

The site at Whitwood (Wakefield) is a former wharf which previously received sand and gravel barged up from the Trent. It was closed in 2013 following the Lafarge merger with Tarmac. It is understood that there is industry interest in utilising this wharf again to barge circa 150,000 tpa of marine won sand and gravel from the Humber.

2.6.2 Railways

Existing operational railway sites include:

- *Dewsbury, Kirklees:* a 4-acre cement distribution site operated by Breedon receiving product by rail from Hope Cement Works, surrounded by industrial land and onward access to the A644 to the north;
- *Whitehall Rail Sidings, Leeds:* the 3.8-acre site is close to the south western side of the City centre with highway access to the A58 to the north and the M621 Junction 4 to the south. The site currently moves spoil to landfill sites at Scunthorpe or Foxton in Cambridgeshire. The current Adopted Natural Resources and Waste Local Plan (ANRWLP Minerals 13) safeguards the site;
- *Hunslet East (Cross Green), Leeds:* a large 22-acre multi-product site for construction materials (stone, concrete, dry mortar and asphalt) located within the established Cross Green Industrial Estate, with Tarmac receiving stone from Arcow Quarry and cement from Oxwellmains Cement Works;
- *Stourton, Leeds:* two railheads within an established industrial estate, close to the M1 via M621 Junction 7 with the A61, home to a Freightliner intermodal terminal for containers to/from deepsea ports and a Cemex railhead for distribution of stone from Peak Forest. ANRWLP Minerals 13 policy safeguards the rail sidings at Pontefract Road;
- *Wakefield Europort:* one of the original regional “freight village” rail-linked distribution parks conceived in the 1990’s to connect to the Channel Tunnel, the intermodal terminal located alongside M62 Junction 31 is now operated by Maritime for handling containers to/from deepsea ports;
- *Ferrybridge, Wakefield:* a large industrial site close to the A1(M)/M62 intersection at Junction 32A-33/41 via the A162 and A645. The coal-fired power station ceased operations in 2016. The site retains a plasterboard factory operated by ETEX, which previously used Flue Gas Desulphurisation (FGD) gypsum direct from the power station, but now imports gypsum by rail from the port of Hull and from West Burton Power Station. The two Ferrybridge Multifuel Energy Recovery Facilities (ERF) have also been constructed on site, with an intermodal terminal for receiving containerised waste. Whilst the site currently receives all its waste fuel by road, the operator Enfinium is understood to be exploring opportunities to move waste fuel by rail to site. For the rest of the site, the owners SSE are understood to be in the process of site clearance, ahead of a planned disposal for industrial development; and

- *Shipley Scrap Yard*: a small-scale rail operation at the Shipley scrap yard that uses shunter wagons to move scrap metal to bigger rail consolidation sites elsewhere. These train units are unsuitable for moving aggregates and hence have not been considered further in this study.

Figure 2.3 shows the locations of existing rail freight sites.

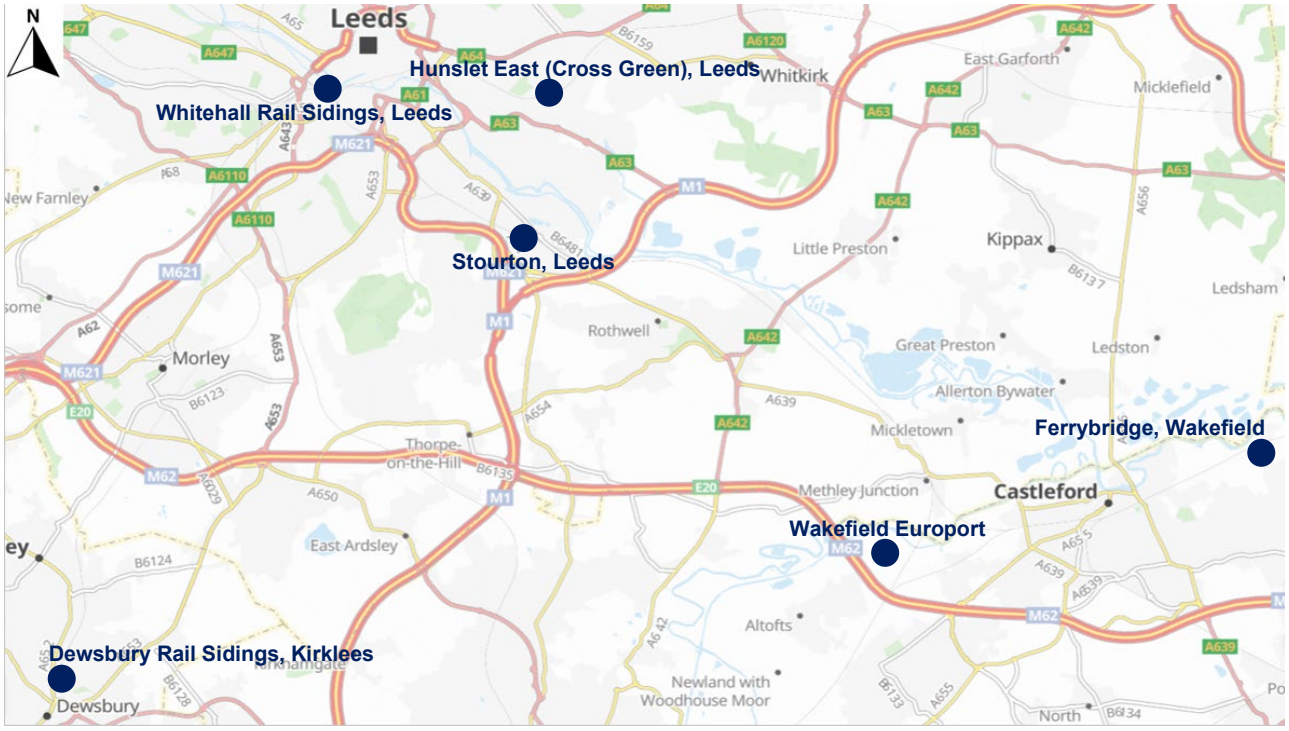


Figure 2.3 *– Locations of Existing Rail Freight Sites*

3 Stakeholder Engagement and Feedback

3.1 The Consultation Process

Participation and consultation were central to the transport planning exercise undertaken to assist in identifying problems, setting the transport planning objectives and developing options. Early and continued consultation was undertaken with a steering group and with key stakeholders throughout the duration of the project. Adopting this practice assisted in cultivating a transparent planning process, which should in turn lead to the development of generally acceptable proposals.

The consultation process for the project has included a series of meetings with the steering group, a study specific questionnaire and workshops with key stakeholders and requests to various organisations for any information considered relevant in meeting the objectives of the project.

3.2 Project Steering Group

A steering group comprising key organisations was defined for the project. The group included representatives from the following organisations:

- WYCA (Project Co-ordinator);
- Leeds City Council; and
- Bradford Metropolitan Council.

Regular meetings were held during the course of the study, usually fortnightly, to discuss issues and emerging findings. The steering group was also actively involved in the planning and implementation of the other consultation engagement procedures.

3.3 Project Stakeholders

Throughout the project, consultations have been undertaken, within the defined project programme, with a range of key stakeholders including the Crown Estate, Canal and River Trust, local authorities, local communities, local business interests, freight transport service providers and their consultants.

A list of key stakeholders identified for the project is shown below:

- The Crown Estate
- Cemex
- Mineral Products Association
- UK Govt Levelling-Up Team
- Marshalls
- Aggregate Industries
- Hanson UK and HeidelbergCement
- Capita
- Tarmac
- AC Marine – AC Aggregates Ltd
- Breedon Group
- Road Haulage Association
- Logistics UK
- Canal and River Trust
- Commercial Boat Operators Association (CBOA)
- Royal Boskalis Westminster NV
- Network Rail
- Rail Freight Group
- City of Bradford Metropolitan District Council
- Calderdale Metropolitan Borough Council
- Kirklees Metropolitan Council
- Leeds City Council
- Wakefield Metropolitan District Council
- West Yorkshire Combined Authority (WYCA)
- OCO Technology
- Consultants for Network Rai

3.4 Questionnaire and Workshops

A series of consultations has taken place with the key stakeholders during the course of the project including:

- A project questionnaire, issued on 23 June 2022; and
- Stakeholder Workshop on 29 June 2022 via MS Teams.

A study specific questionnaire was developed to assist in establishing existing conditions in the study area, identifying any issues/concerns and opportunities for improvement that may exist, and identifying the key objectives for the project. All identified stakeholders were invited to complete a questionnaire prior to the workshop to ensure that all key issues were identified for consideration as part of the study.

The main objectives of the stakeholder workshops were to involve various interested bodies, i.e. stakeholders and other organisations, in the initial stages of the study process, to listen, discuss and take into consideration other views on how the industry is perceived to operate and how it might develop in the future. The specific objectives of the first stakeholder workshop were to:

- inform all stakeholders of the purpose, extent and details of the study;
- involve stakeholders in reviewing existing/future conditions, identifying problems and opportunities, and setting objectives;
- establish the views of stakeholders on the problems, identifying what may be considered to be the most serious; and
- enable stakeholders to understand the position of others and where priorities and solutions may conflict with each other.

The specific objectives for some of the sites were discussed by some stakeholders, including:

- discuss the emerging proposals identified from the earlier study process;
- generate alternative improvement options, if applicable; and
- identify the strength of feelings for the planned proposals.

3.5 Ad Hoc Meetings

Some stakeholders specifically requested one-to-one meetings to discuss their plans or key issues. There were usually commercial in nature, so details cannot be presented here in order to safeguard their commercial interests. Nonetheless, the feedback and/or commercial data supplied by them has been considered in the project.

3.6 Consultation Feedback

3.6.1 Consensus on Safeguarding Land

Local authorities confirmed their intentions to highlight the potential importance of promoting and supporting marine aggregate transportation within relevant plans and strategies and to safeguard land and infrastructure which could be required to facilitate the enhancement of the inland waterway network and wharf facilities within Local Plans.

Further stakeholder feedback has suggested there is significant interest to increase the quantities of aggregate barged into WY utilising existing unused commercial wharf infrastructure in Leeds and Wakefield. Lack of wharf availability was specifically raised as a major barrier to this expansion occurring, highlighting the key importance of safeguarding existing wharfs from alternative uses/potentially sterilising development.

Close engagement with the Canal and River Trust and industry stakeholders is welcomed and local authorities have confirmed their commitments to pursuing a partnership-based approach in this regard.

3.6.2 Wider Infrastructure Needs

Existing navigable waterway infrastructure is thought to be sufficient to allow for a certain level of expansion of aggregate freight movements into WY. However, if waterway transportation of aggregates were to be substantially expanded, the stakeholder feedback suggests that infrastructure investment would be required. No funding source for infrastructure improvements has yet been identified.

The Canal and River Trust has looked in more detail at the constraints on marine transportation in the study area and supplied information for use in this analysis. This is summarised below.

The aim to remove bottlenecks in terms of lock capacities, etc and to consequently increase the size of ship that can access the WYCA region and the amount of aggregate freight that can be transported by this mode. The Canal and River Trust have indicated that the scope of works which would be required to *"create a new coherent, feasible, more viable and more resilient transport option between the northern cities, the Humber and Europe"* would include:

- Construction of new wharves;
- Minor channel dredging;
- Enhancements to Bulholme and Castleford Lock; and
- Improvements to air draft at a number of key bridges.

Transportation of aggregate by barge on inland waterways has a significant potential to improve the sustainability of the WY aggregate distribution system. This is particularly in terms of marine aggregate distribution connectivity between Leeds and the Humber, but also in terms of movement of minerals between quarries connected to the waterway network and construction materials manufacturing and distribution facilities. A recent example is a planning application for the development of a new sand and gravel quarry in Wakefield which proposes exclusive waterway transportation of extracted mineral and is reliant upon access to suitable wharf facilities in Kirklees and Leeds to deliver the project. Facilitating and investing in the required improvements and adjustments to the existing waterways, locks and wharfs to release the potential of waterway distribution should consequently be seen as a key priority for WY.

3.6.3 Current Limitations

Various limitations were raised by stakeholders including:

- Protection of land sites for new wharves does not guarantee that the owner will make the wharf available;
- There is a lack of data on the amounts of marine aggregate that are transported into the WYCA area. Related to this is the lack of information to make informed decisions on rail capacity along with the costs and benefits of transporting marine aggregates by different means;
- Limits to operating hours leads to potential constraints to operations;
- Aggregates traditionally have long lead times so they are perfect for slower waterborne transport. Some stakeholders pointed towards operations across Europe (Netherlands, Belgium, Germany) and London where rivers are used extensively;
- Marine aggregate wharves should be large/deep enough to accommodate large dredgers; and
- Time needed for development can be significant.

While the above constraints were highlighted, there are some positives. There is existing demand for aggregates with scope to expand further if the facilities and infrastructure were in place. In addition, there is an existing skilled workforce with relevant experience.

3.6.4 Sites or Locations Mentioned by Stakeholders

There were various opportunities and potential sites mentioned by stakeholders during the consultation process. These include:

- The former aggregates depot at Bretton Street, Dewsbury is adjacent to a rail spur so there could also be opportunities to transport marine aggregates by rail to this site;
- Re-open the Bank Dole wharf in Knottingley (former Steetley ready-mix plant and aggregates depot). Other sites raised include Knostrop (Leeds) Depot, Fleet Lane wharf and Whitwood wharf;
- Expansion at the Ferrybridge power station was raised however a rail chord might be required to provide connections to other lines that currently cannot easily be accessed from the sidings at Ferrybridge (there is poor access to/from the Sherburn in Elmet/York line to/from the north currently) but can be accessed via Castleford although there is limited capacity though the junction and station in Castleford;
- Create the inland port of Leeds at Stourton, complete with concrete batching plant on site and storage for at least 10,000 tonnes with storage area for back loads;

- The Stanley Ferry scheme in Wakefield has been granted permission, which when implemented and active would transport sand and gravel via barge from the quarry to the Newlay Concrete plant in Dewsbury (Local Plan Allocation MIS4), which would require a new wharf[6]. If this scheme was to be fully active, any new wharf could be used to receive marine aggregates. Proposed volumes could reach 1.6 million tonnes over 11 years (circa 150,000 tpa);
- Wakefield Europort was also mentioned although there may be fundamental issues with the existing container-based operations that mean aggregates cannot be accommodated. Wakefield Europort is located close to the strategic road network with rail access to/from the east coast ports (Hull, Goole and Immingham especially);
- A site close to Calder Vale Road, Wakefield was highlighted although no specifics were given;
- The Breedon site would need a wharf if it was to receive marine aggregates by barge; and
- A site at Stanley Ferry, Wakefield was mentioned and a planning application has already been granted.

One stakeholder suggested that the existing tenant at Knostrop (Lili Waste) should be relocated and the site be given priority to water freight. However, the Canal and River Trust said this was not feasible due to the existing lease agreement contract however the site would become available at the end of the lease.

3.6.5 Technological and/or Operational Improvements

There were various potential technological and/or operational improvements raised during the stakeholder engagement to support potential new proposals. These can be summarised as:

- Semi/automated unloading facilities including effective transhipment processes and modern handling equipment;
- Modern financial, administration, route/load planning systems, inventory management, communications, GPS;
- Provision for alternative fuel sources. Consideration for methanol, battery, ammonia and hydrogen. Related to this is the development of new propulsion technologies for barges such as bi-mode/hybrid diesel or diesel-electric barges. When combined with the use of electric trucks this would dramatically reduce carbon omissions for the operations; and
- Centralised control of locks and bridges to allow up to 24/7 operation.

There is strong support for decarbonisation of the freight sector through the promotion of sustainable freight. The challenge will be to decarbonise the road leg of the journey as well as addressing the lack of suitable alternative fuel sources for local deliveries within WY.

3.6.6 New Government Policy/Legislation or Support

Some stakeholders expressed frustration with the current limited guidance and requested new government policy/legislation or support. In particular, the following was raised:

- Improvements to national policy and guidance to support a strategic approach;
- Government should re-introduce the Freight Facility Grants;
- Funding to support compulsory purchase orders; and
- Funding to support the operation of commercial waterway systems.

Funding is needed to ensure the required level of investment in the infrastructure to facilitate uninterrupted use for commercial activities.

As a commercial waterway, it will never be financially self-supporting and will always need financial assistance, as private investment is not going to be able to achieve the required levels of returns given the relatively low margins associated with aggregates. However, what it can deliver in environmental gains is massive and should not be underestimated. Grant money will be required and the use of public funds is considered essential to ensure this long-term asset is able to be delivered.

[6] Planning Permission 20/01159/FUL granted on 18 March 2022. Further discharge of conditions applications pending consideration

The study was informed that a small number of business plan proposals for facilities to increase the amount of marine aggregates landed in the region and transported to inland markets have been undertaken by operators and potential operators in the last few years. Stakeholders suggested various measures to improve the viability of the marine option including operational factors e.g. guarantees from dredging companies to land single sized aggregates to minimise processing, fiscal support measures, and increased competition in port ownership to reduce port dues. Making grant funding available for transport initiatives that reduce lorry use should also be extended to include infrastructure build costs was also raised by operators and potential operators.

3.6.7 Factors Ranked by Stakeholders

Stakeholders were asked to rank the importance of various factors which influence marine aggregates freight transport and the development of potential new sites. Stakeholders were asked to score each factor from 1 (least important) to 10 (most important). The results are presented in Table 3.1 below.

***Table 3.1** – Importance of factors ranked*

Factor	Min Score	Max Score	Weighted Average
Transport cost or charges	6	10	8.56
Multimodal transfer facilities at or near production sites	2	10	8.44
Transport time or minimising transfer time	1	8	5.56
Easy access and existing road/rail connections	6	10	8.44
Govt regulation and support	2	10	6.56
Good storage and handling facilities	4	8	5.80
Avoiding road congestion delays	2	9	5.44
Environmental road impacts	1	10	6.11
Using higher capacity modes	1	10	5.33

Although there was a wide range of scores received from stakeholders, the weighted averages suggest the most important factors are minimising transport cost/charges and providing facilities at or near production sites with easy access and road connections.

3.6.8 Barriers and Constraints

Barriers to the implementation of a strategy for the increased use of marine aggregates were said by the stakeholders to include:

- the absence of a formal regional planning policy structure;
- the difficulties in safeguarding infrastructure from alternative development; and
- a lack of competition in the management of the major ports.

Constraints were acknowledged to include a lack of immediately available land adjacent to marine berths for the development of major new aggregate wharfs. The stakeholders also considered there is a limited number of sites adjacent to railways and canal or waterway wharves that could be developed for the import of marine aggregate. Many are under pressure from alternative development which the local authorities find difficult to prevent.

3.6.9 Relative Merits of Marine verses Land Won

Stakeholders generally agreed that the displacement of land won aggregate by marine aggregates would give rise to an overall net benefit (in environmental, social and economic terms) – but accepted that the evidence to prove this would be difficult to obtain.

4 Analysis of Potential Locations

4.1 Overview

Following the stakeholder engagement feedback along with a site appraisal exercise, various potential new sites for wharfs and rail hubs were identified. These are discussed in this section and a review of the site appraisal findings, to identify the best performing locations.

4.2 Locations of the Identified Potential New Locations

An additional five (5) new waterway wharves are considered to have the potential to either land the aggregate or contribute to its transport around the region by canal and waterway.

The location of existing and new wharves and barge facilities along the various branches of the waterway network are shown in Figure 4.1.

Figure 4.1 *– Locations of Existing and Identified New Wharf Freight Sites*

In addition, potential new rail sites were identified which have the potential to transport marine aggregates within the region.

Ten (10) rail depots considered to have this potential have been identified (including those already used for the transport of crushed rock aggregate).

The location of existing and new aggregate rail depots on the railway network are shown overleaf in Figure 4.2.

***Figure 4.2** – Locations of Existing and Identified New Rail Freight Sites*

The region is well served by a system of rivers, waterways and navigable ways. Ownership of these routes is vested in the Canals and River Trust on behalf of the nation. As such, the key interest for site selection has focussed on sites on the Aire and Calder and its branches. This allows integration of both rail and waterway modes.

Owners of wharves which do not have the benefit of *"permitted development rights"* would normally require planning permission to operate a marine aggregate wharf and transfer facility - which would add to the cost and delivery of any such project. There is frequently pressure for the release of infrastructure land for alternative non-compatible development especially in urban areas. The NPPF provides no guidance how a local planning authority should balance such competing interests e.g. in delivery of housing supply targets while safeguarding aggregate infrastructure. Aggregate supply policy is often seen as the 'poor relation' in relation to other forms of development e.g. housing and regeneration. Without strong safeguarding policies the available infrastructure could be lost before the need for it becomes more apparent or urgent.

4.3 Descriptions of the Identified Potential Sites

4.3.1 Wharf Sites

Various existing or potential new sites have been identified, including:

- *Knostrop Depot, Old Mill Lane, Leeds:* a 6,100 sqm site forming part of Hunslet Industrial Estate, an established and popular industrial location on the outskirts of Leeds City Centre. The estate is strategically located circa 1 mile from Junctions 4, 5 and 7 of the M621 Motorway and just over 1.5 miles from both Leeds City Centre and Junction 44 of the M1 Motorway. The site is accessed via Old Mill Lane, just off Low Road (A639).

- *Bridgewater Road, Cross Green*: located within the Aire Valley Leeds Area Action Plan, this is a riverside city-centre fringe location with up to 24 acres (9.7 ha) of land available. The site also has a railway line passing by and can be accessed using the A61 and the A63.

- *Port of Leeds*: the site proposed for an inland port is located in Stourton in Leeds, approximately 3 km to the south east of Leeds City Centre. Stourton is an industrial and warehousing area and is located between Hunslet, the M1 Motorway and Cross Green. The site is bounded by the Aire & Calder Navigation to the north-east / east, industrial units and land to the south and west, and Skelton Grange Road to the north-west. The site was previously part of a copper works which closed in the late 1990's. It is currently vacant and mostly covered by hard-standing.

- *Haigh Park Road, Stourton*: this site includes over 635,000 sq ft of industrial, warehouse and storage facilities, which includes 300,000 sq ft at The Copperworks and 250,000 sq ft at Copperworks 2, as well as 12 acres of external storage and parking land and 2x Garage/Storage units. The site location is one mile from both Junction 44 (M1) and Junction 7 (M621). There are potentially two options for locating a new wharf at this site, one to the north of Haigh Park Road and the other to the south.

- *Fleet Lane, Woodlesford*: this site is a minor waterways place on the Aire and Calder Navigation between Castleford Junction, to the east of Woodlesford, of the Aire and Calder Navigation and Leeds Dock Entrance. Access routes include the A642 and the A639.

- Whitwood Wharf: located south east of the Woodnook viaduct, just west of the Whitwood golf course, this is a small potential site. The site is capable of accommodating a 6,000 sqm facility with industrial, warehouse and storage facilities. Access is from the M62 and the Express Way.

Appendix 1 includes outline sketch plans of the existing and potential wharf sites.

4.3.2 Rail Sites

A number of disused sites exist, with most retaining main line connections. These have been identified as being preferred as they have a critical benefit in terms of access to the existing rail network. Developing a wholly new site with no existing rail connections would typically cost an additional £5 to £7 million to install plus potential signalling costs of up to £30 million. These cost figures clearly make any new sites without existing rail access prohibitively costly and uneconomically viable for consideration. As such, it is reasonable to focus on those disused sites which do not require such massive additional capital investment. These locations include:

- *Laisterdyke, Bradford:* a 6-acre recycling facility located within a large industrial area to the east of the centre of Bradford, which previously exported material by rail, the last known rail service operating in 2017. The site is accessible from the A647 and A6177, but has a very constrained highway access off Planetrees Road, which in its current form would be likely to limit use to smaller rigid or articulated vehicles. Alternative highway access might be possible via Birkshall Lane and/or Bowling Back Lane.

- *Marsh Lane, Leeds:* an 8-acre area of land with sidings previously used for bulk materials by rail. The site is well-located for the city centre but is bisected by a footpath which would otherwise impact on the ability to achieve critical mass of operations. The site is not safeguarded in the ANRWLP, and the City centre location suggests a likelihood of pressure for redevelopment for other uses. It is reported that Network Rail's proposals for the Trans-Pennine Route Upgrade project would see this strategic site disconnected, further increasing the likelihood of the site being lost.

- *Neville Hill, Leeds:* the southern half of the Neville Hill rail yard and adjacent land extends to 24 acres and latterly has been used for storage of redundant freight wagons. The site is adjacent to the established industrial estate in Richmond Hill with potential highway access onto the A63 from Newmarket Approach or Newmarket Lane. The site provides direct main line access from either end, with scope to retain some of the sidings in situ to form the basis for a rail freight interchange. In the event that such a development was considered achievable, suitable screening of the site would be required from the residential area to the east on Neville Close and Halton Moor Road.

- *Bridgewater Road South, Leeds:* land to the south and west of the Hunslet East / Cross Green site was formerly used for receiving aggregates and petrochemicals by rail. Hanson retains an asphalt batching plant on site, the remainder of the site being largely derelict but with direct signalised access to the A61 to the north west. ANRWLP Minerals 13 policy notes: The site is allocated for employment activities which will utilise movements of mineral freight by rail. Short term / temporary uses which do not utilise rail or canal freight may also be accepted providing they do not prejudice the long term use of these sites for rail or canal freight.

- *Skelton, Leeds:* part of the former Skelton Grange Power Station site which closed in 1994, the rail sidings and main line connection have since been removed, but the trackbed and structures remain in situ. The site extends to around 100 acres south of the water treatment works, with potential for highway access to M1 Junction 45 via Pontefract Lane and/or the adjacent Gateway 45 distribution development, The site has been under consideration by HS2 for a construction / maintenance depot. ANRWLP Minerals 13 policy safeguards the site of the former sidings on at Knowsthorpe Lane and the rail spur to preserve the future opportunity for rail freight.

- *Healey Mills Yard, Wakefield:* located close to the village of Healey, south west of Ossett, a marshalling yard was opened in 1963 on the site extending to 140 acres. A decline in rail freight traffic and moves towards full trainload operations on the rail network made the site redundant, with all operations ceasing around 2012. The main line connections remain in place, potentially creating an opportunity for a large rail-served employment development. The site is within 2 miles of M1 Junction 39, and is on a main line route capable of carrying bulk and containerised traffic (the route is cleared to W8 loading gauge12) but currently has no suitable highway access and is “rail locked” by the main line which passes on either side to the north and south. There does not appear to be an obvious means to achieve a suitable level of highway access capacity to link to the trunk road network, without constructing a significant length of new highway to bypass Horbury and the A642.

- *Castleford, Wakefield:* a 10-acre site forming part of the former Wheldale Colliery, which retains a main line connection and is within 2 miles of the M62 Junction 32 via the A656 and local roads. The site has been the subject of a number of abortive proposals for rail-served use in recent years, including aggregates, spoil and energy recovery. The principal challenges to developing the site for rail-served uses would appear to be achieving suitable highway access onto/via Wheldon Road, and screening of the site from residential properties facing onto Healdfield Road and Healdfield Close.

- *Kellingley, Selby:* the 149-acre former coal mining site is situated just outside the eastern boundary of the WYCA Leeds City area. Kellingley Colliery closed in 2015, but has retained part of the former on-site trackwork and a main line connection via the nearby exchange sidings to the east, with highway access via the adjacent A645 and A162 to M62 Junction 33 to the west (3.5 miles), or via the A19 to M62 Junction 34 to the east (3.5 miles). Acquired by Harworth Group, consents have since been granted for 1.5 million sq ft of commercial floorspace, and an Energy Recovery Facility. At the time of writing local media has reported that Harworth Group has conditionally exchanged contracts for the sale of the site to HPREF I Konect Investments SARL, with up to 1.1 million sq ft of floorspace expected to start construction in 2023. It is unclear at present whether the development of rail freight facilities will form part of this first phase of construction.

- *Gascoigne Wood, Selby:* the 124-acre former coal mining site is situated outside the eastern boundary of the WYCA Leeds City area, south of the established Sherburn-in-Elmet Industrial Estate, with highway access to the A1(M) Junction 42 via the B1222, A162 and A63 (6 miles). The site spans both sides of the Leeds – Hull main line with a connecting road overbridge linking the two plots. Main line connections have been retained to both the northern plot, recently reactivated by Network Rail to support the Trans-Pennine Route Upgrade programme, and the southern plot whose western main line connection has also been reactivated in recent years to

support its use for temporary stabling of redundant passenger rolling stock. Prior to this, the rail facilities on northern and southern plots have been used for handling of bulk materials. Planning permission for re-use of buildings and infrastructure was granted to Harworth Group in 2007, the site being proposed for various uses in the interim. It is understood that a further outline planning application from Harworth is expected within the coming months ahead of a start of enabling works on site. From a rail perspective, the principal advantages for freight use are the number and length of sidings on the southern plot (able to accept trains up to the maximum length of 775m) with access at either end, as well as the availability of maximum loading gauge (W12) from the site to the East Coast Main Line.

- *Eggborough, Selby:* situated outside the eastern boundary of the WYCA Leeds City area to the east of Kellingley, the former power station site closed in 2018 and demolition commenced in 2020. St Francis Group acquired 130 acres of the site in 2019 for redevelopment for warehousing. In 2020 Selby Council resolved to grant consent for the hybrid application for the demolition of existing buildings and phased redevelopment of part of the Eggborough Power Station, subject to referral to the Secretary of State, for up to 2.25 million sq ft of employment floor space. Eggborough Power Limited also plans to develop a new gas-fired power station on site, consent being granted in 2018. A mile of the rail trackwork on site has already been removed, and no reference was made to rail freight access or facilities in the hybrid application.

Appendix 2 includes outline sketch plans of the existing and potential rail sites.

4.4 Assessment of Potential Locations

4.4.1 Wharf Sites

Site Facilities

Feedback from the Canal and River Trust has provided estimates of the potential capacity of the identified options for wharf locations. These are shown overleaf in Table 4.1. There are two variations for the site at Old Mill Lane, Knostrop (Option W1). The second is a 'lower cost' variation which involves expanding the storage area within the site using an adjacent area which is currently used by an existing tenant (Lili Waste). The Canal and River Trust said the current lease agreement contract with the tenant would become available in a few years and if the tenant was to be relocated then the expanded area could be given priority to water freight and used for storage. There would therefore not be a need to build any new storage space. This 'low cost' variation is referenced as Option W1a in Table 4.1 overleaf.

The development of wharf sites exploits the fact that a large waterway is already available; some sites lack a suitable berth to handle the type of cargo that is available. The Aire and Calder Navigation canal has been dredged in some sections to allow the larger barges, capable of carrying as much as 500 tonnes of aggregate. This is known as Class I dredging. This would equate to 200,000 tonnes a year of throughput which also means the barges can come in fully laden. However, not all of the identified sites have this ability and hence the table shows some sites with lower capacity.

A basic arrangement could provide capacity to accommodate vessels with a carrying capacity of between 200,000 to 250,000 tonnes. If further upgrade of the waterway to Class II dredging was to be carried out by the Canal and River Trust, then this will allow larger barges of around 650 tonnes capacity to operate. However, discussions with the Canal and River Trust suggest that they would require funding of up to £30m which is currently unavailable. As such, this analysis has used the existing level of dredges and assumed there would not be a wholescale upgrade across the Aire and Calder Navigation canal.

Further site facilities include between 60m to 80m length of berth to provide sufficient size to accommodate vessels between 50 to 65m in length. This would be accompanied with at least 5,000 sqm of storage space and handling equipment to unload vessels and load other freight modes of transport.

The overall mix of infrastructure needs for each potential wharf site option are also shown in Table 4.1. Other facilities include site offices and road access, but these are standard for all locations and hence are not shown in the table.

***Table 4.1 –** Identified Capacity and Infrastructure Needs for Each Potential Wharf Site*

Ref	Potential Site	Capacity (tonnes/ annum)	Existing Storage Area	New Storage Area	Expand Existing Berth	New Berth	Handling Equipment
W1	Old Mill Lane, Knostrop	250,000		✓	✓		✓
W1a	Old Mill Lane, Knostrop – *Low Cost Variation*	150,000	✓		✓		✓
W2	Bridgewater Road, Cross Green	250,000		✓		✓	✓
W3	Port of Leeds	200,000	✓			✓	✓
W4	Haigh Park Road, Stourton	200,000		✓		✓	✓
W5	Fleet Lane, Woodlesford	150,000		✓		✓	✓
W6	Whitwood, Wakefield	150,000		✓	✓		✓

Capacity and Potential Demand

The maximum potential demand at each site was estimated based on the optimum operating level of 85% at each site. This gives the optimum demand as it allows for site manoeuvrability and safe working operations. This is also a conservative assumption for potential business case applications to support future government grant bids based on HM Treasury Green Book Guidance[7]. Table 4.2 shows the resultant capacity and optimum demand levels for each potential wharf site option.

***Table 4.2 –** Identified Capacity and Optimum Demand Levels for Potential Wharfs*

Ref	Potential Site	Capacity (tonnes/annum)	Optimum Demand (tonnes/annum)
W1	Old Mill Lane, Knostrop	250,000	212,500
W1a	Old Mill Lane, Knostrop – *Low Cost Variation*	150,000	127,500
W2	Bridgewater Road, Cross Green	250,000	212,500
W3	Port of Leeds	200,000	170,000
W4	Haigh Park Road, Stourton	200,000	170,000
W5	Fleet Lane, Woodlesford	150,000	127,500
W6	Whitwood, Wakefield	150,000	127,500

Assumed Project Delivery Costs

The project delivery costs for a new full wharf site have previously been estimated at circa [redacted], based on data gathered from the West Yorkshire Combined Authority. This includes full new infrastructure and handling equipment however the wharf sites at Old Mill Lane, Knostrop, (Option W1) and Whitwood, Wakefield, (Option W6) already have some existing facilities and hence only the outstanding project costs were included. This came to an estimated cost of [redacted] for each site. Furthermore, the 'lower cost' variation for the wharf site at Old Mill Lane, Knostrop, (Option W1a) was estimated to be [redacted].

[7] Green Book, Her Majesty's Treasury, November 2022 (Updated)

The project budget includes a contingency and risk allocation however since the original estimates were prepared the construction industry is experiencing significant inflationary impacts. The last 12 months has seen an average increase in inflation of over 11%. Given any construction is likely to take three (3) years to plan and build then this analysis has assumed an annual increase of 9% to average out the potential effects of inflation over the next three years. This gives an uplift of 29.5% to the estimated project costs.

Applying the above uplift to the gathered project costs gives the resultant assumed project costs used in the appraisal, which are:

- Old Mill Lane, Knostrop (Option W1a): uplifted project cost = [redacted];
- Old Mill Lane, Knostrop – Low Cost Variation (Option W1): uplifted project cost = [redacted];
- Whitwood, Wakefield (Option W6): uplifted project cost = [redacted]; and
- All other sites (Options W2 to W5): uplifted project cost = [redacted].

Network Impacts

The numbers of lorries removed from the road were estimated by dividing the average load per lorry which was obtained from the Rail Freight Study – Baseline Information undertaken for the West Yorkshire Combined Authority[8]. This gave an average load factor of 18 tonnes per lorry.

Similarly, average length of haul was calculated from the Department for Transport's National Road Traffic Statistics[9]. This showed that during 2021 marine aggregates in WY had 67% of heavy good vehicles which travelled on 66% strategic (national) trips for a mean distance of 137kms, and 33% were local (regional) trips for a mean distance of 56kms. This gives an average length of haul of approximately 110kms. It is worth noting that the distance from the Port of Humber to the existing site at Old Mill Lane, Knostrop, is 111kms. These two independent calculations provide similar values which corroborate each other. For the other sites, the extra increased or decreased distances travelled were added or removed from the average estimated above.

Multiplying the above two results gave the amount of lorry movements removed off the road, expressed in lorry-kms. This represents the network impact savings due to the mode shift brought about by each site option. The socio-economic benefits of this change can be estimated using the Department for Transport's mode shift benefit (MSB) values.

MSBs are estimates of the benefit of removing a lorry-kilometres from the road network in Great Britain, by transferring the goods to rail or water freight instead. In economics, these are known as *'externalities'* or *'external costs'*. MSB values take into account of the benefits due to:

- De-congestion (positive gain);
- Greenhouse gas reductions (positive gain);
- Air quality reductions (positive gain);
- Lower infrastructure wear-and-tear (positive gain);
- Accident savings (positive gain);
- Noise reductions (positive gain);
- Other road cost savings (positive gain);
- Road taxation loss (negative loss); and
- Net externality (negative loss).

The latest MSB technical note by the Department for Transport presents the final MSB values[10]. The average is 70.5 pence per lorry mile in 2020 prices, which is equal to £1.13 per lorry-km.

[8] Rail Freight Study – Baseline Information, Steer Davies Gleave, December 2021 (undertaken for West Yorkshire Combined Authority)

[9] National Road Traffic Statistics, Department for Transport, 2022

[10] Table 2, Mode Shift Benefit Values, Department for Transport, Updated January 2022

Business Contribution

The new wharf sites will generate revenues from the handling tonnages at the site. Data gathered from stakeholders suggests a charge of [redacted] from handling material at each site.

Furthermore, it is normal for a portion of this revenue to be hypothecated (ring-fenced) to go towards the payback of a proportion of the project costs, as well as help with maintenance costs.

From Royal HaskoningDHV's experience, it is reasonable to expect [redacted] of the revenues to be contributed towards the business plan, and hence this value has been used in this appraisal.

Outline Economic Appraisal of the Site Options

An appraisal of the potential socio-economic benefits versus project delivery costs for each site option was undertaken. This considered the potential payback period in years for each site, using the input values described above. The appraisal does not consider other detailed planning matters. Given the current economic climate, two scenarios were tested:

- Restricted cost/benefit analysis (R-CBA); and
- Full cost/benefit analysis (F-CBA).

The F-CBA includes both the socio-economic benefits plus the business contribution and can be considered as an optimistic scenario (higher forecast). The R-CBA only includes the socio-economic benefits to allow for the risk of no private sector contributions due to the expected economic downturn over the coming few years and can be considered as a less optimistic scenario (lower forecast).

Table 4.3 shows the results of the high-level economic appraisal. Appendix 3 includes the detailed calculations.

Table 4.3 – *Outline Economic Appraisal of the Site Options for Potential Wharfs*

Ref	Potential Site	Lorries Removed (annual)	Road Distance Saved (lorry-kms)	Mode Shift Benefits (£)	Full Economic Benefits (£)	Pay Back	
						R-CBA (years)	F-CBA (years)
W1	Old Mill Lane, Knostrop	11,900	1,312,213	£1,480,176	£1,543,926	3	3
W2	Bridgewater, Cross Green	11,900	1,336,013	£1,507,023	£1,570,773	7	6
W3	Port of Leeds	9,520	1,014,737	£1,144,623	£1,195,623	8	8
W4	Haigh Park R]oad, Stourton	9,520	984,273	£1,110,260	£1,161,260	9	8
W5	Fleet Lane, Woodlesford	7,140	724,496	£817,231	£855,481	12	11
W6	Whitwood, Wakefield	7,140	657,094	£741,202	£779,452	6	6

From Royal HaskoningDHV's experience, a project which is likely to pass the requirements of a business case and government funding support would be expected to achieve payback by five (5) years. From the above results, only the site at Old Mill Lane, Knostrop, (Option W1) meets the criteria, although the site at Whitwood, Wakefield, comes close.

Sensitivity Tests

The economic appraisal was repeated for the low cost variation at Old Mill Lane, Knostrop, (Option W1a) described earlier. The results are shown in Table 4.4 overleaf.

Royal HaskoningDHV are also aware that there has been previous discussions and a funding bid for the site at the Port of Leeds, Option W3. This option fell through due to significant cost increases which nearly doubled the original estimates. From the stakeholder engagement, it is possible that this site could be resurrected with a lower cost by undertaking value engineering to reduce the scheme layout and/or lower specifications for the length of berth. To identify the level of project cost which meets the economic appraisal, a sensitivity test was undertaken for a lower cost option for the site at Skelton Grange Road, Stourton (Port of Leeds), known as Option W3a. Table 4.4 shows the results of the additional economic appraisals. Appendix 3 also shows the detailed calculations.

The stakeholder engagement also identified strong interest for the site at Whitwood, Wakefield (Option W6). This option almost passed the economic appraisal. If the project cost could be reduced in a similar way as Option W3. Hence, to identify the level of project cost which meets the economic appraisal, a sensitivity test was undertaken for a lower cost option for the site at Whitwood, Wakefield, known as Option W6a. Table 4.4 shows the results of the additional economic appraisals. As before, Appendix 3 details the calculations.

Table 4.4 – *Sensitivity Tests for Some of the Potential Wharf Site Options*

Ref	Potential Site	Lorries Removed (annual)	Road Distance Saved (lorry-kms)	Mode Shift Benefits (£)	Full Economic Benefits (£)	Pay Back	
						R-CBA (years)	F-CBA (years)
W1a	Old Mill Lane, Knostrop – *Low Cost Variation*	7,140	787,328	£888,106	£926,356	2	2
W3a	Port of Leeds – *Lower Cost Variation*	9,520	1,014,737	£1,144,623	£1,195,623	5	5
W6a	Whitwood, Wakefield – *Lower Cost Variation*	7,140	657,094	£741,202	£779,452	5	5

From the sensitivity tests, the following can be concluded:

- Option W1a: the low cost variation at Old Mill Lane, Knostrop, is the best performing wharf site. This provides short-term benefits;
- Option W3a: a lower cost at the site at the Port of Leeds, can meet the economic appraisal criteria, but the project costs need to be capped at [redacted] (see Appendix 3 for details). Given the previous project costs were estimated at almost [redacted], this represents a 20% reduction in outturn costs which in the current climate of construction inflation is difficult to meet. The chances of the project costs being reduced to this level without affecting the volumes and numbers of lorries removed are unlikely to materialise. If, however, this was to be achieved then this option provides medium-term benefits;
- Option W6a: a lower cost at the site at Whitwood, Wakefield, can meet the economic appraisal criteria, but the project costs need to be capped at [redacted] (see Appendix 3 for details). This represents a 15% reduction in the original project costs which is more attainable. If, however, this was to be achieved then this option provides medium-term benefits; and
- An alternative to reducing the project costs for both Options W3a and W6a could be to seek additional funding support either from the public sector or further private sector contributions. This could be discussed with local stakeholders if either of these options were to be pursued. A feasibility study could be undertaken to ascertain more details.

4.4.2 Rail Sites

Site Facilities

Feedback from the stakeholder engagement and using data from the Rail Freight Study – Baseline Information undertaken for the West Yorkshire Combined Authority[11], estimates of the potential capacity of the identified options for rail locations were obtained. These are shown overleaf in Table 4.5 overleaf.

A basic arrangement could provide capacity to accommodate rail freight with a carrying capacity of between 125,000 to 300,000 tonnes, depending on the rail gauge of existing rail lines at and around the sites. If further upgrade of the railway was to be carried out by Network Rail, then this will allow

[11] Rail Freight Study – Baseline Information, Steer Davies Gleave, December 2021 (undertaken for West Yorkshire Combined Authority)

larger capacity to operate. However, at the time of writing this report, there are currently no details of any plans to undertake wholescale mainline rail infrastructure upgrades. As such, this analysis has assumed the existing mainline rail infrastructure in the appraisal.

Further site facilities include up to 100m length of rail sidings to accommodate the numbers of rail wagons. This would be accompanied with between 5,000 to 7,500 sqm of storage space and handling equipment to unload trains and load other freight modes of transport.

The overall mix of infrastructure needs for each potential wharf site option are also shown in Table 4.5. Other facilities include site offices and road access, but these are standard for all locations and hence are not shown in the table.

***Table 4.5** – Identified Capacity and Infrastructure Needs for Each Potential Rail Site*

Ref	Potential Site	Capacity (tonnes/ annum)	Existing Storage Area	New Storage Area	Expand Existing Siding	New Siding	Handling Equipment
R1	Dewsbury, Kirklees	200,000	✓		✓		✓
R2	Whitehall Rail Sidings, Leeds	200,000	✓		✓		✓
R3	Hunslet East (Cross Green), Leeds	250,000	✓				✓
R4	Stourton, Leeds	300,000	✓				✓
R5	Wakefield Europort	300,000	✓				✓
R6	Ferrybridge, Wakefield	200,000	✓		✓		✓
R7	Laisterdyke, Bradford	125,000		✓		✓	✓
R8	Marsh Lane, Leeds	125,000		✓		✓	✓
R9	Neville Hill, Leeds	250,000		✓		✓	✓
R10	Bridgewater Road South, Leeds	250,000		✓		✓	✓
R11	Skelton, Leeds	250,000		✓		✓	✓
R12	Healey Mills Yard, Wakefield	250,000		✓		✓	✓
R13	Castleford, Wakefield	200,000		✓		✓	✓
R14	Kellingley, Selby	200,000		✓		✓	✓
R15	Gascoigne Wood, Selby	250,000		✓		✓	✓
R16	Eggborough, Selby	250,000		✓		✓	✓

Capacity and Potential Demand

The maximum potential demand at each site was estimated based on the optimum operating level of 85% at each site. This gives the optimum demand as it allows for site manoeuvrability and safe working operations. This is also a conservative assumption for potential business case applications to support future government grant bids based on HM Treasury Green Book Guidance[12]. Table 4.6 shows the resultant capacity and optimum demand levels for each potential rail site option.

Table 4.6 – *Identified Capacity and Optimum Demand Levels for Potential Rail Sites*

Ref	Potential Site	Capacity (tonnes/annum)	Optimum Demand (tonnes/annum)	Project Costs (£)
R1	Dewsbury, Kirklees	200,000	170,000	[redacted]
R2	Whitehall Rail Sidings, Leeds	200,000	170,000	[redacted]
R3	Hunslet East (Cross Green), Leeds	250,000	212,500	[redacted]
R4	Stourton, Leeds	300,000	255,000	[redacted]
R5	Wakefield Europort	300,000	255,000	[redacted]
R6	Ferrybridge, Wakefield	200,000	170,000	[redacted]
R7	Laisterdyke, Bradford	125,000	106,250	[redacted]
R8	Marsh Lane, Leeds	125,000	106,250	[redacted]
R9	Neville Hill, Leeds	250,000	212,500	[redacted]
R10	Bridgewater Road South, Leeds	250,000	212,500	[redacted]
R11	Skelton, Leeds	250,000	212,500	[redacted]
R12	Healey Mills Yard, Wakefield	250,000	212,500	[redacted]
R13	Castleford, Wakefield	200,000	170,000	[redacted]
R14	Kellingley, Selby	200,000	170,000	[redacted]
R15	Gascoigne Wood, Selby	250,000	212,500	[redacted]
R16	Eggborough, Selby	250,000	212,500	[redacted]

Assumed Project Delivery Costs

Table 4.6 also shows the identified outline project delivery costs. The project delivery costs for a new full rail site have previously been estimated at between circa [redacted] to [redacted], based on data gathered from the stakeholder engagement. The project budget includes a contingency and risk allocation however since the original estimates were prepared the construction industry is experiencing significant inflationary impacts. The last 12 months has seen an average increase in inflation of over 11%. Given any construction is likely to take three (3) years to plan and build then this analysis has assumed an annual increase of 9% to average out the potential effects of inflation over the next three years. This gives an uplift of 29.5% to the estimated project costs.

The project delivery costs include full new infrastructure and handling equipment however some sites already have some existing facilities and hence there are lower project costs for those sites.

Applying the above uplift to the gathered project costs gives the resultant assumed project costs used in the appraisal.

Network Impacts

The numbers of lorries removed from the road were estimated by dividing the average load per lorry which was obtained from the Rail Freight Study – Baseline Information undertaken for the West Yorkshire Combined Authority[13]. This gave an average load factor of 18 tonnes per lorry.

[12] Green Book, Her Majesty's Treasury, November 2022 (Updated)

[13] Rail Freight Study – Baseline Information, Steer Davies Gleave, December 2021 (undertaken for West Yorkshire Combined Authority)

Similarly, average length of haul was calculated from the Department for Transport's National Road Traffic Statistics[14]. This showed that during 2021 marine aggregates in WY had 67% of heavy good vehicles which travelled on 66% strategic (national) trips for a mean distance of 137kms, and 33% were local (regional) trips for a mean distance of 56kms. This gives an average length of haul of approximately 110kms. For the other sites, the extra increased or decreased distances travelled were added or removed from the average estimated above.

Multiplying the above two results gave the amount of lorry movements removed off the road, expressed in lorry-kms. This represents the network impact savings due to the mode shift brought about by each site option. The socio-economic benefits of this change can be estimated using the Department for Transport's mode shift benefit (MSB) values.

MSBs are estimates of the benefit of removing a lorry-kilometres from the road network in Great Britain, by transferring the goods to rail or water freight instead. Details of the MSB benefits were described in the previous section.

The latest MSB technical note by the Department for Transport presents the final MSB values[15]. The average is 70.5 pence per lorry mile in 2020 prices, which is equal to £1.13 per lorry-km.

Business Contribution

The new rail sites will generate revenues from the handling tonnages at the site. Data gathered from stakeholders suggests a charge of [redacted] from handling material at each site.

Furthermore, it is normal for a portion of this revenue to be hypothecated (ring-fenced) to go towards the payback of a proportion of the project costs, as well as help with maintenance costs.

From Royal HaskoningDHV's experience, it is reasonable to expect [redacted] of the revenues to be contributed towards the business plan, and hence this value has been used in this appraisal.

Outline Economic Appraisal of the Site Options

An appraisal of the potential socio-economic benefits versus project delivery costs for each site option was undertaken. This considered the potential payback period in years for each site, using the input values described above. The appraisal does not consider other detailed planning matters. Given the current economic climate, two scenarios were tested:

- Restricted cost/benefit analysis (R-CBA); and
- Full cost/benefit analysis (F-CBA).

The F-CBA includes both the socio-economic benefits plus the business contribution and can be considered as an optimistic scenario (higher forecast). The R-CBA only includes the socio-economic benefits to allow for the risk of no private sector contributions due to the expected economic downturn over the coming few years and can be considered as a less optimistic scenario (lower forecast).

From Royal HaskoningDHV's experience, a project which is likely to pass the requirements of a business case and government funding support would be expected to achieve payback by five (5) years.

Table 4.7 overleaf shows the results of the high-level economic appraisal, which does not include wider detailed planning matters. Appendix 3 includes the detailed calculations.

[14] National Road Traffic Statistics, Department for Transport, 2022

[15] Table 2, Mode Shift Benefit Values, Department for Transport, Updated January 2022

Table 4.7 – *Outline Economic Appraisal of the Site Options for Potential Rail Sites*

Ref	Potential Site	Lorries Removed (annual)	Road Distance Saved (lorry-kms)	Mode Shift Benefits (£)	Full Economic Benefits (£)	Pay Back	
						R-CBA (years)	F-CBA (years)
R1	Dewsbury, Kirklees	9,520	1,228,987	£1,386,298	£1,437,298	5	5
R2	Whitehall Rail Siding, Leeds	9,520	1,115,636	£1,258,438	£1,309,438	6	5
R3	Hunslet East, Leeds	11,900	1,337,104	£1,508,254	£1,572,004	4	4
R4	Stourton, Leeds	14,280	1,542,488	£1,739,927	£1,816,427	3	3
R5	Wakefield Europort	14,280	1,337,997	£1,509,261	£1,585,761	4	4
R6	Ferrybridge, Wakefield	9,520	807,751	£911,143	£962,143	6	6
R7	Laisterdyke, Bradford	5,950	771,946	£870,756	£902,631	9	9
R8	Marsh Lane, Leeds	5,950	641,746	£723,890	£755,765	11	11
R9	Neville Hill, Leeds	11,900	1,260,516	£1,421,862	£1,485,612	5	5
R10	Bridgewater Road, Leeds	11,900	1,336,147	£1,507,174	£1,570,924	6	5
R11	Skelton, Leeds	11,900	1,241,369	£1,400,264	£1,464,014	5	5
R12	Healey Mill Yard, Wakefield	11,900	1,105,424	£1,246,919	£1,310,669	7	6
R13	Castleford, Wakefield	9,520	905,784	£1,021,725	£1,072,725	8	8
R14	Kellingley, Selby	9,520	754,139	£850,669	£901,669	10	9
R15	Gascoigne Wood, Selby	11,900	938,845	£1,059,017	£1,122,767	7	6
R16	Eggborough, Selby	11,900	906,294	£1,022,300	£1,086,050	8	8

From the above results, the following sites meet the economic appraisal criteria:

- Dewsbury, Kirklees;
- Hunslet East, Leeds;
- Stourton, Leeds;
- Wakefield Europort;
- Neville Hill, Leeds; and
- Skelton, Leeds.

However, while all of the above technically meet the economic appraisal criteria, the best performing sites are Stourton, Leeds, followed by Wakefield Europort. These two sites provide the best returns for investment and also build on the existing rail freight infrastructure. They also have the best existing road accessibility and unlike other sites they should have lower environmental impacts during the construction phase. As such, it is reasonable to conclude that these two sites should be preferred from the analysis of all rail sites. These options provide short to medium-term benefits.

Sensitivity Tests

Three site options almost passed the economic appraisal. If the project cost could be reduced in these options then these may also be worth considering. Hence, to identify the level of project cost which meets the economic appraisal, a sensitivity test was undertaken for a lower cost option for these sites. Table 4.8 shows the results of the additional economic appraisals. As before, Appendix 3 details the calculations.

Table 4.8 – *Sensitivity Tests for Some of the Potential Rail Site Options*

Ref	Potential Site	Lorries Removed (annual)	Road Distance Saved (lorry-kms)	Mode Shift Benefits (£)	Full Economic Benefits (£)	Pay Back	
						R-CBA (years)	F-CBA (years)
R2a	Whitehall Rail Siding, Leeds	9,520	1,115,636	£1,258,438	£1,309,438	5	5
R6a	Ferrybridge, Wakefield	9,520	807,751	£911,143	£962,143	5	5
R10a	Bridgewater Road, Leeds	11,900	1,336,147	£1,507,174	£1,570,924	5	5

From the sensitivity tests, the following can be concluded:

- Option R2a: a lower cost at the site at Whitehall Rail Siding, Leeds, can meet the economic appraisal criteria, but the project costs need to be reduced by 10% (see Appendix 3 for details). Given the current climate of construction inflation this seems difficult to meet;
- Option R6a: a lower cost at the site at Ferrybridge, Wakefield, can meet the economic appraisal criteria, but the project costs need to be reduced by 15% (see Appendix 3 for details). This is likely to be even harder to achieve then the above;
- Option R10a: a lower cost at the site at Bridgewater Road, Leeds, can meet the economic appraisal criteria, but the project costs need to be reduced by 10% (see Appendix 3 for details). This is also difficult to achieve;
- While all sensitivity test options may meet the economic appraisal criteria, the results are not as strong as the two previously identified rail sites, or even the recommended wharf sites discussed in the previous section; and
- An alternative to reducing the project costs could be to seek additional funding support either from the public sector or further private sector contributions. This could be discussed with local stakeholders if any of these options were to be pursued. A feasibility study could be undertaken to ascertain more details.

4.5 Commentary on Site Feasibility

The analysis presented in this chapter has identified a number of sites which suggest there are opportunities to develop wharf and rail sites to transport marine aggregates using more sustainable modes.

It is worth noting that this is a desktop study which has relied upon stakeholder engagement and historic data rather than new surveys. While the appraisal has built in conservative assumptions and follows Government analysis techniques, it is recommended that any option taken forward should undergo a full feasibility study. This should include analysis of the site engineering layout requirements and surrounding infrastructure condition. Other issues to be explored are the detailed cost estimations for recommended sites and the environmental impacts of new construction plans.

The identified sites should also be discussed with relevant stakeholders, including both the private and public sectors.

The focus of this study has been to identify the potential demand for transporting marine aggregates across WY and which sites could potentially facilitate the modal shift from road to waterways and railways. This has been collated into a strategy to take forward for further consideration. This is discussed in the following chapter.

5 Recommended Interventions and Delivery Programme

5.1 Identified Interventions Recommended for Consideration

The analysis presented in chapter 4 has identified a number of new wharf and rail sites worth taking forward for more detailed study. These include:

Wharf Sites

- Low cost variation for Old Mill Lane, Knostrop;
- Expanded layout at Old Mill Lane, Knostrop; and
- Potentially a lower cost at Whitwood, Wakefield, although the current climate of construction inflation makes this option difficult to achieve.

Rail Sites

- Stourton, Leeds; and
- Wakefield Europort.

It is recommended that the above options should undergo a full feasibility study and should also be discussed with relevant stakeholders, including both the private and public sectors.

5.2 Application of Multiple Interventions

The above sites provide positive impacts individually, although some of them could also be applied collectively as part of a long term strategy.

From the analysis of The Crown Estates data gathered in this study, the total future demand for marine aggregates across WY which could potentially transfer from road to waterways and/or railways is estimated to be up to 0.7m tpa. This is based on the 2019 aggregate minerals survey[16] that identified the proportions of movements. This is an extrapolation of all types of aggregates transported through Yorkshire and Humberside and hence to WY. This sector average (9%) has been applied to the total licensed tonnage of 7.38 million tonnes from the future expansion plans following the release of an 11th production license (see section 2.5.3).

Based on the results from chapter 4, the above full demand could be accommodated by the following sites:

- Old Mill Lane, Knostrop (0.25m tpa);
- Whitwood, Wakefield, if project costs could be reduced (0.15m tpa); and
- Stourton, Leeds, or Wakefield Europort (0.3m tpa).

The above group of interventions can be delivered in a programme over the next decade. This is outlined below.

5.3 Programme of Interventions

From the analysis results, the following programme of interventions and associated actions should allow the new strategy to be delivered over a reasonable timeframe.

5.3.1 Short Term Proposals

The cheapest new intervention is the low cost wharf option for the site at Old Mill Lane, Knostrop. This involves using the storage area within the site including an adjacent area which is currently used by an existing tenant (Lili Waste). The Canal and River Trust said the current lease agreement

[16] Collation of the results of the 2019 Aggregate Minerals Survey for England and Wales, Decarbonisation and Resource Management Programme, Open Report OR/21/024. In the OD Table 1, page 26, this shows the sector average for Yorkshire and Humberside is 9%. Discussions with local operators suggests that this is a conservative value for West Yorkshire, but for the purposes of this study it is reasonable to use this figure in the calculation to allow for a robust margin.

contract with the tenant would become available in a few years and if the tenant was to be relocated then the expanded area could be given priority to water freight and used for storage. There would therefore not be a need to build any new storage space. The capacity at this site would be circa 150,000 tpa.

The above is likely to take up to three (3) years due to the time needed for the lease agreement of the existing tenant (Lili Waste) to expire and for the company to relocate.

In parallel to the above, feasibility and environmental impact studies should be progressed to examine the other identified new sites.

5.3.2 Medium Term Proposals

Once the market at the low cost variation for Old Mill Lane, Knostrop, is established the site could be expanded to provide the additional capacity. Further site facilities include lengthening the berth to provide sufficient size to accommodate larger vessels up to 65m in length. This would be accompanied with additional storage space and larger handling equipment to unload vessels and load other freight modes of transport. The capacity at this site would increase to circa 250,000 tpa.

The above is likely to take up to five (5) years due to the time needed for the planning and environmental processes, as well as time for the new market to develop a robust baseline.

A value engineering exercise should be undertaken to examine ways to optimise the wharf site plans at Whitwood, Wakefield, and seek opportunities to lower project costs. This is also likely to take time given the current climate of construction inflation.

5.3.3 Long Term Proposals

Assuming the feasibility and environmental impact studies for the other identified new sites produce positive study findings, then the remaining site options can be progressed. Two opportunities could be pursued during the long term period.

This includes the optimised new wharf site plans at Whitwood, Wakefield, and seek opportunities to lower project costs. The capacity at this site would provide a further circa 150,000 tpa to the market.

The second site includes either the Stourton, Leeds, or Wakefield Europort site. This would be a rail site and would provide a further circa 300,000 tpa to the market.

The above are likely to take between seven (7) to ten (10) years due to the time needed for the engineering design, planning and environmental processes, as well as time for the marine aggregates market to further mature.

5.4 Other Issues Worth Considering

Various other issues were raised during this study, which could act as barriers to the further development of marine aggregates transport facilities within WY and should be addressed.

The lack of regional planning policy structure was considered by stakeholders to be a potential barrier to facilitating the cross boundary deliver of regional initiatives. There is a duty to the Corporate Group and the need for the Group to work together to form delivery.

The ABP ports have the ability to utilise “permitted development rights” under the General Permitted Development Order 1995 to develop a new aggregate wharf, but for the same reason an established aggregate wharf cannot (in practice) be safeguarded from alternative development. The same rights do not apply to independent wharves.

Existing and potential aggregate wharf and depot sites face pressure for redevelopment – particularly in urban areas where there is a high demand for uses such as housing. Mineral policy is frequently seen as the ‘poor relation’ in planning so that safeguarding potentially important aggregate infrastructure for the long term is considered less of a policy imperative than for other land uses. The

lack of secure safeguarding is recognised as a shortcoming in planning policy and plan making e.g. by giving enough weight to long-term need issues in the face of short-term competing interests.

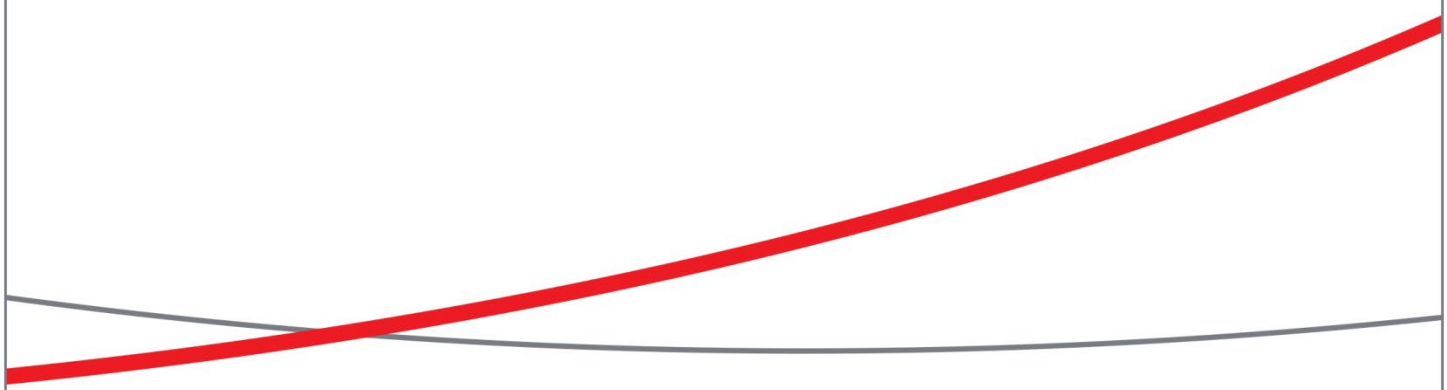
An apparent lack of appreciation for the potential to transport bulk goods on the region's canals and waterways at competitive costs was viewed as a barrier to developing the marine import strategy. This lack of appreciation was said to be manifest in several of the cost assessments carried out by the largest operators – which only appear to consider road and rail. The consultation feedback suggests that local authorities within WY are more open to considering water-based options.

APPENDICES

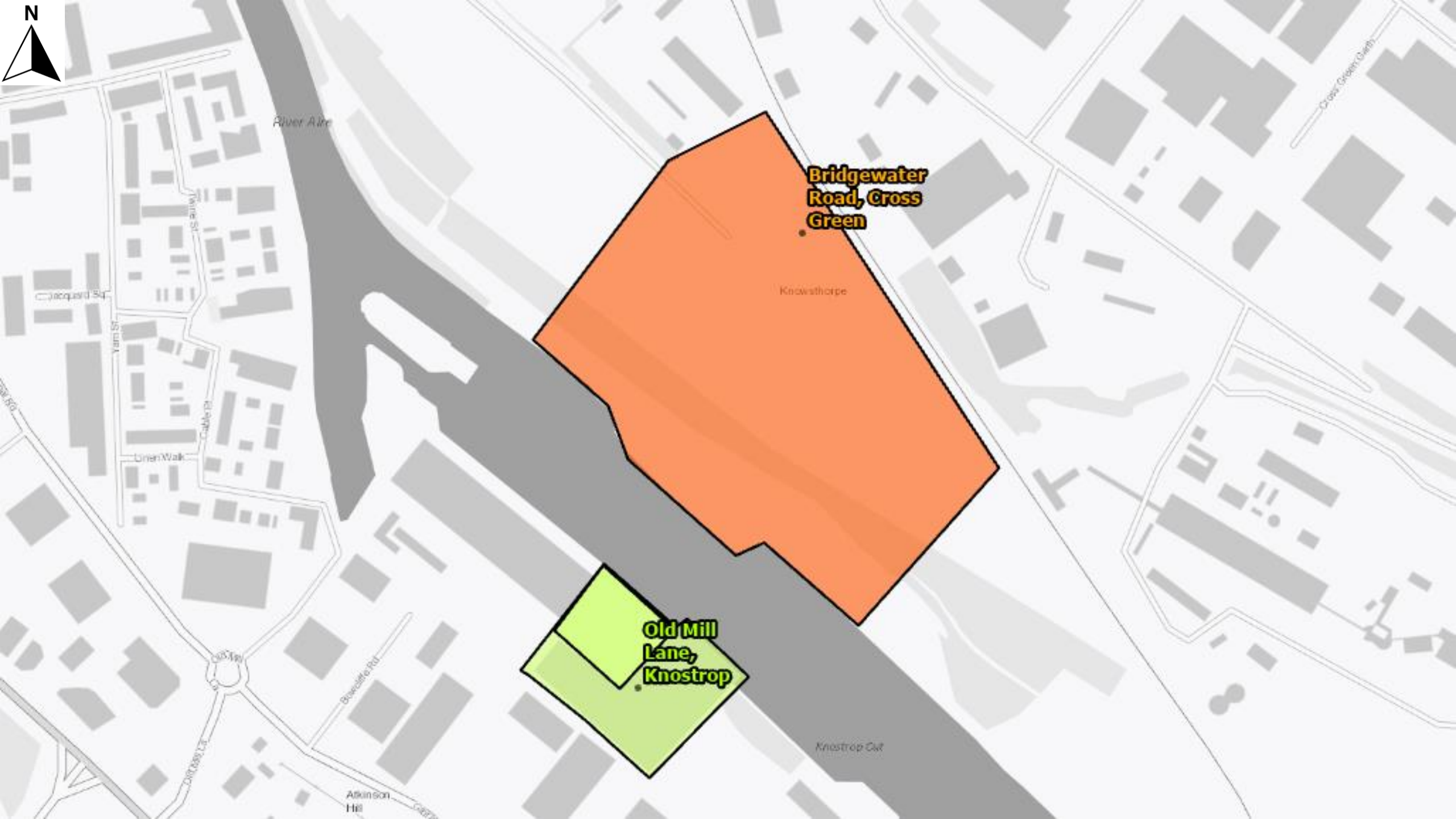
Appendix 1 – Outline Sketch Plans of Potential Wharf Sites

Appendix 2 – Outline Sketch Plans of Potential Rail Sites

Appendix 3 – Economic Appraisal of Potential Sites



Appendix 1 – Outline Sketch Plans of Potential Wharf Sites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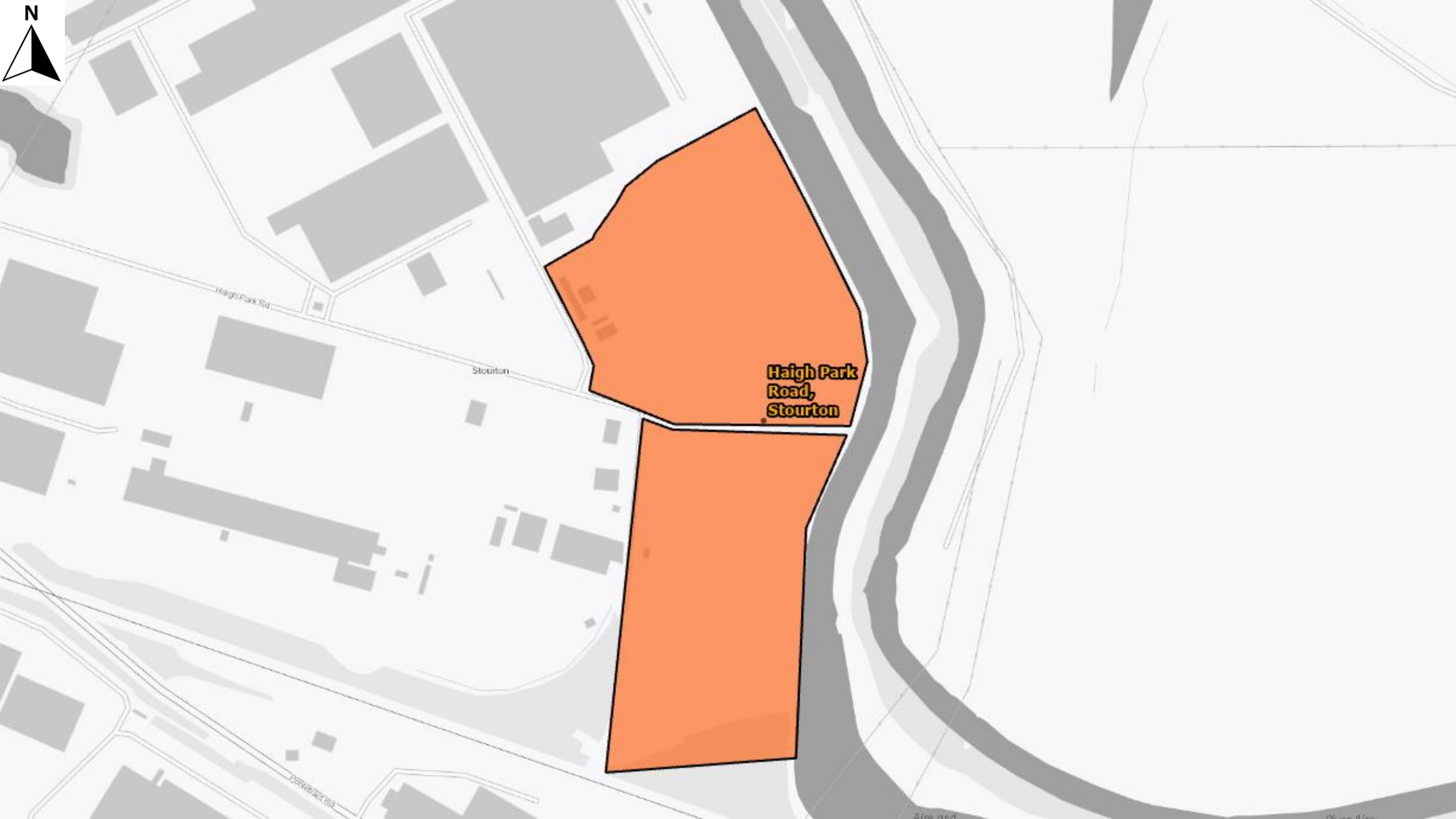
Bridgewater Road, Cross Green
Knowsthorpe
Old Mill Lane, Knostrop
Knostrop Cut
Jacquard Sq
Yarn St
Twine St
Cable St
Linen Walk
Bloxsidge Rd
Atkinson Hill


N
Skelton Grange Road, Stourton
Waterside Rd
West Rd
Central Parade
Smith Rd
Service Rd
Moore Rd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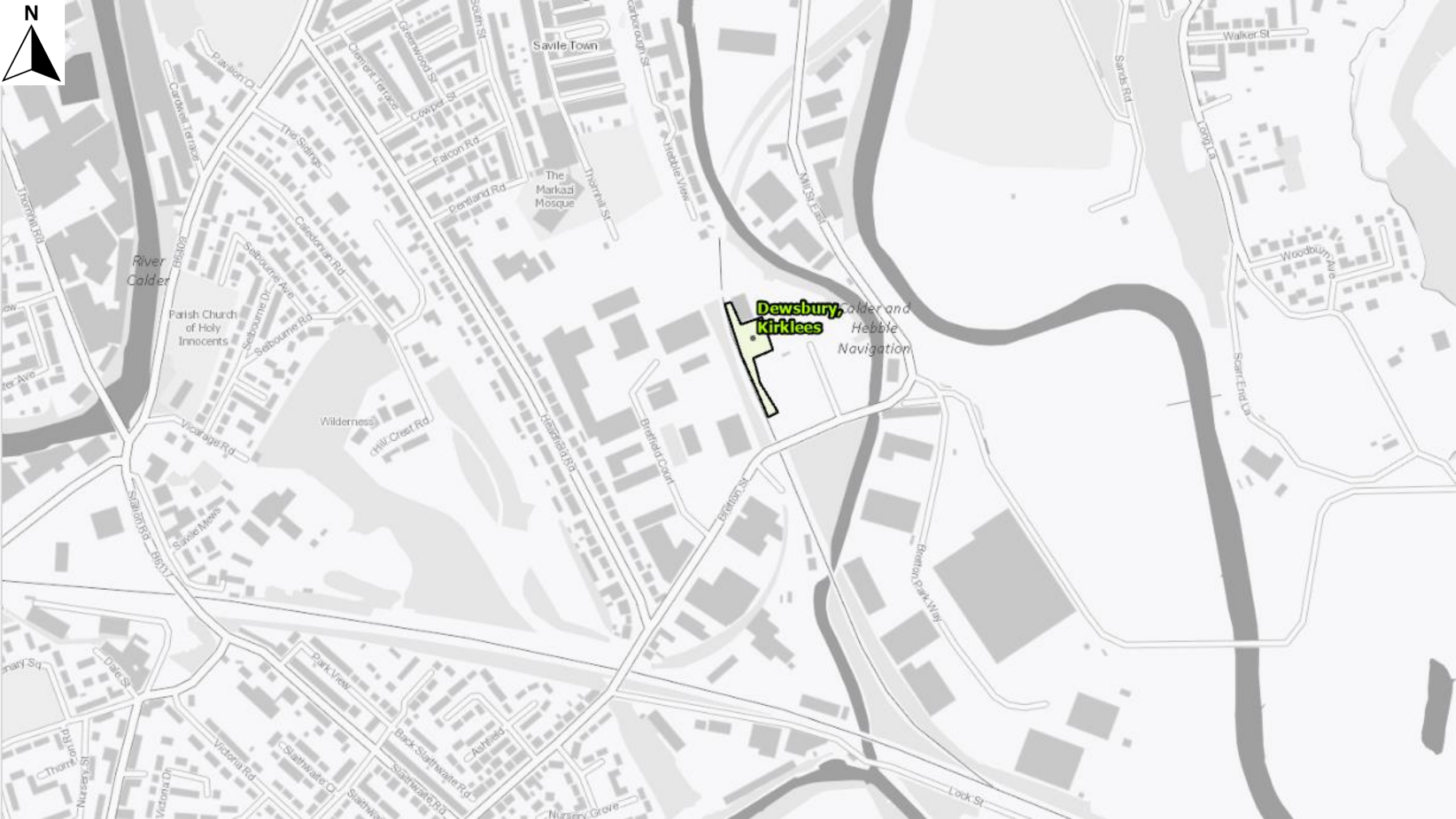
Stourton
Haigh Park Road, Stourton


N
Fleet Lane,
Woodlesford
Fleet La
Water
Haigh Farm
Lock Cottages


N
Wood Nook Lock
Aire and Calder Navigation
Whitwood, Wakefield

Appendix 2 – Outline Sketch Plans of Potential Rail Sites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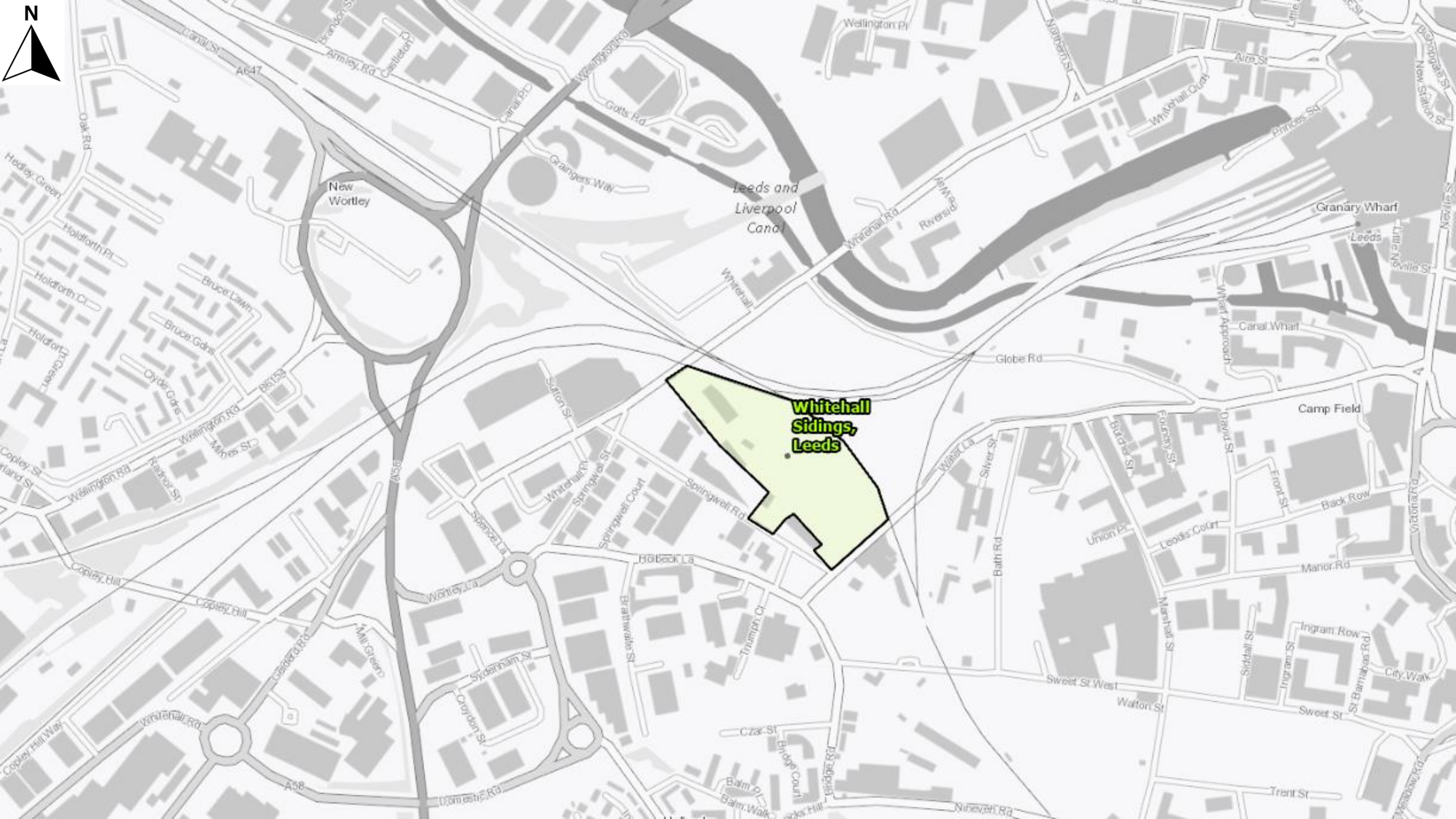
Savile Town
Dewsbury, Kirklees
River Calder
Calder and Hebble Navigation
The Markazi Mosque
Parish Church of Holy Innocents
Wilderness
Pavilion Ct
Cardwell Terrace
Clement Terrace
Glenwood St
Cowper St
Falcon Rd
Pentland Rd
Thornhill St
Hebble View
Marsh Lane
Sands Rd
Walker St
Lord Ln
Woodbourn Ave
Scarr End Ln
Thornhill Rd
B6409
Caledonian Rd
Selbourne Ave
Selbourne Dr
Selbourne Rd
Vicarage Rd
Hill Crest Rd
Headfield Rd
Brestfield Court
Bretton St
Bretton Park Way
Savile Mews
Station Rd
B6117
Park View
Victoria Rd
Slaithwaite Ct
Slaithwaite Rd
Ashfield
Nursery Grove
Lock St
Dale St
Thorn
Nursery St



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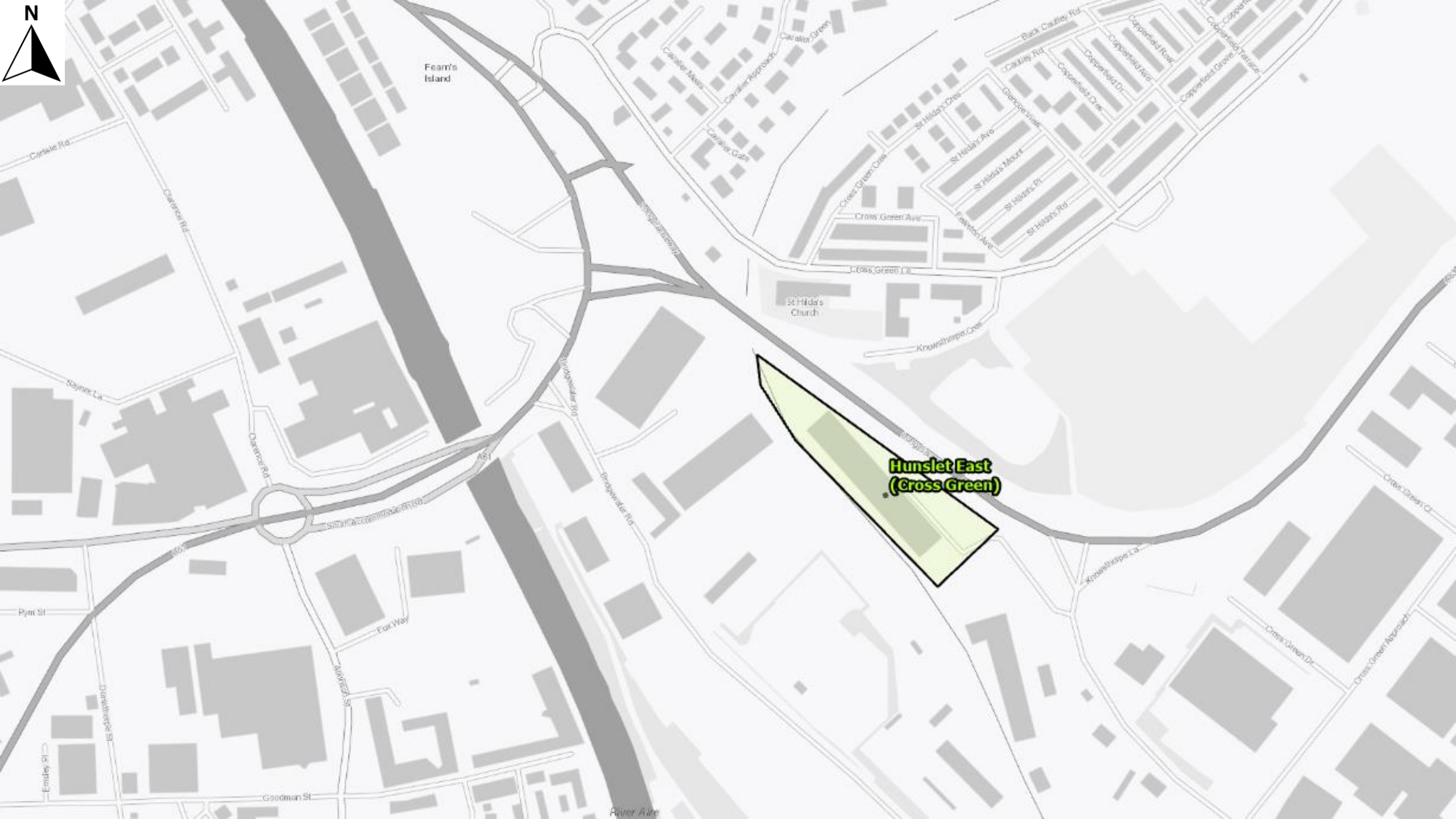
Whitehall Sidings, Leeds
Leeds and Liverpool Canal
New Wortley
Granary Wharf
Leeds
Camp Field
Globe Rd
Canal Wharf
Whitehall Rd
Wellington Rd
Springwell Rd
Holbeck La
Water La
Sweet St West
Sweet St
Manor Rd
Back Row
Copley Hill
Canal St
Armley Rd
Whitehall Quay
Princes Sq
Aire St
Wellington Pl
Northern St
Wharf Approach
David St
Marshall St
Nineveh Rd
Trent St
A58
A647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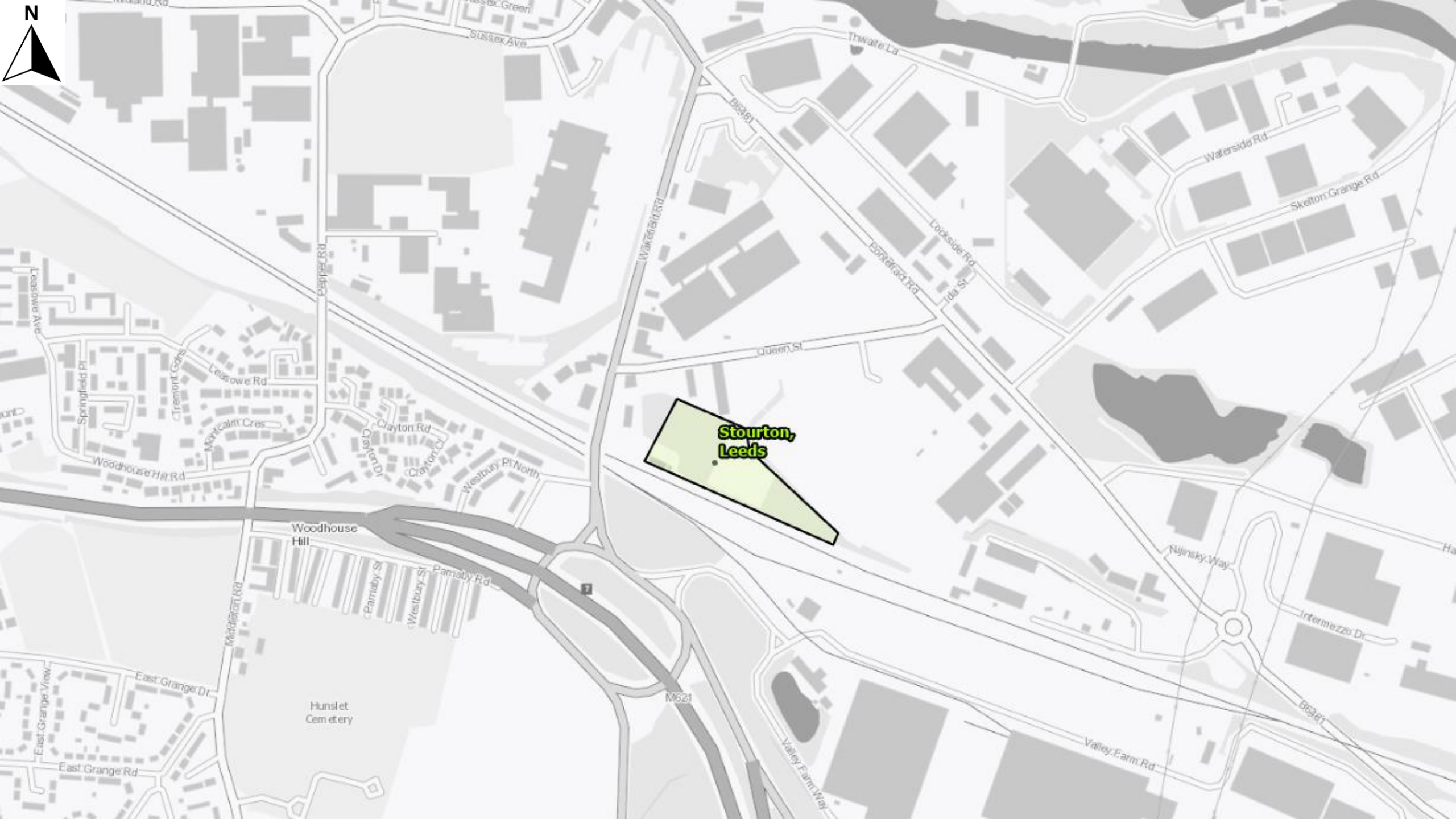
Clarence Rd
Sayers La
A61
Pym St
Fox Way
Dunelm Rise St
Emsley St
Goodman St
River Aire
Bridgewater Rd
Cavalier Green
Cavalier Mews
Cavalier Approach
Cavalier Gate
Black Carr Rd
Carr Rd
Copperfield Rise
Copperfield Ave
Copperfield Dr
Copperfield Close
Copperfield Grove
Copperfield Terrace
St Hilda's Cres
Glenbrae Mews
St Hilda's Ave
St Hilda's Mount
St Hilda's Pl
St Hilda's Rd
Cross Green Cres
Cross Green Ave
Cross Green Dr
Fewston Ave
St Hilda's Church
Knowsthorpe Cres
Knowsthorpe La
Cross Green Cl
Cross Green Approach
Hunslet East
(Cross Green)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Stourton, Leeds
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Thwaite La
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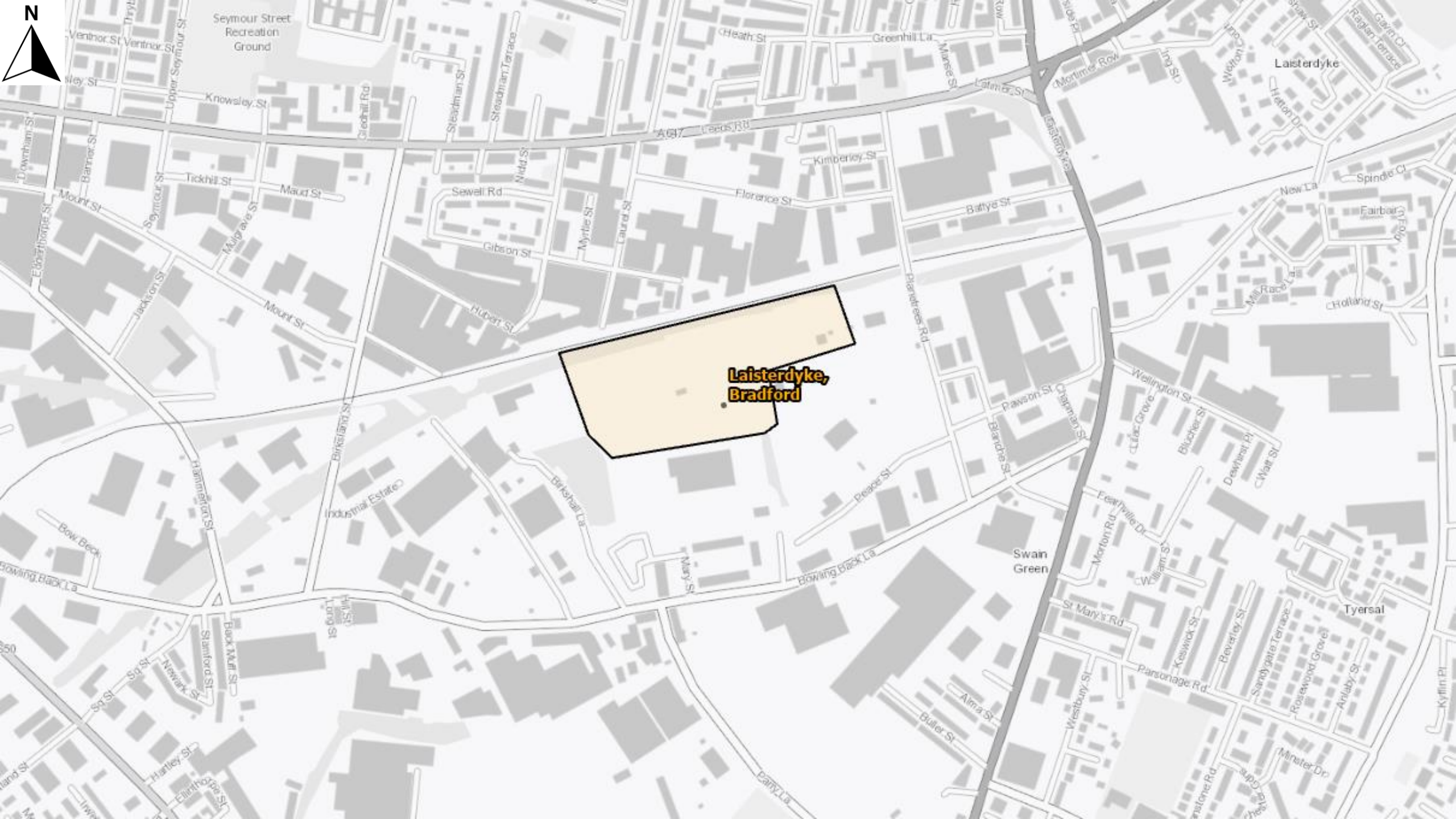
Skelton Grange Rd
Wakefield Rd
Pepper Rd
Lockside Rd
Ida St
Bonetrack Rd
Queen St
Leasowe Ave
Springfield Pl
Tremont Gdns
Leasowe Rd
Nortolcam Cres
Clayton Rd
Clayton Dr
Clayton Cl
Westbury Pl North
Woodhouse Hill Rd
Woodhouse Hill
Parnaby St
Westbury St
Parnaby Rd
Maddeson Rd
East Grange Dr
East Grange View
East Grange Rd
Hunslet Cemetery
M621
Nijinsky Way
Intermezzo Dr
Valley Farm Rd
Valley Farm Way


N
Wakefield Europort
Lower Altofts
Express Way
Pope St
Church Rd
Gilcar
Gilcar Way
M62
Ashfield Beck
A655
California Dr
Freeway Dr
Aldercroft
Aspen Ave
Buckthorne Rd


N
Ferrybridge, Wakefield
Aire and Calder Navigation
A162
B6136
Ferrybridge
Ferrybridge Hill
A1(M)
Old Great North Rd
High St
Castleford La
Pollard's Fields
Kings Mount
Richmond Ave
Windsor Dr
Hampden Cl
Kingsley Ave
Houghton Ave
Chariot Pl
Wentcliffe Rd
Crewe Ave
Wordsworth Dr
Tennyson Cl
Shelley Dr
Sandringham Ave
Balmoral Dr
Mill View
Pontefract Rd
Armcliffe Dr
St Andrews Dr
School Dr
Pinfold
Doncaster Rd
Linden Cl
Harewood Cl
Elizabeth Dr
Pinders Cres
Pinders Garth
Tenters Cl
Argyle Rd
Pottery La
Grange Cl
North View
Wilton Pl
Holes La
Lyng Court
Rockwood Cl
The Wharf
Ferrybridge Rd
Vale Cres
Vale Ave
Vale Head Grove
Vale Walk
Head Mount
Fir Tree Court
The Arcade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Bradford
Seymour Street
Recreation
Ground
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Knowsley St
Upper Seymour St
Cleehill Rd
Steadman St
Steadman Terrace
Heath St
Greenhill La
Manse St
Leeds Rd
A647
Mortimer Row
Ina St
Wilton Cl
Hatton Dr
Laisterdyke
Gavin Cl
Raglan Terrace
Downham St
Barnard St
Seymour St
Tickhill St
Maud St
Mount St
Sewell Rd
Nidd St
Myrtle St
Laurel St
Kimberley St
Florence St
Battye St
Spindle Ct
New La
Fairbairn Rd
Mill Race La
Holland St
Gibson St
Hubert St
Jackson St
Mulgrave St
Plantrees Rd
Parson St
Chapman St
Blanche St
Wellington St
Lilac Grove
Blucher St
Dewhirst Pl
Wall St
Birkshall La
Birkshall Industrial Estate
Peace St
Hammerton St
Bow Beck
Bowling Back La
Mary St
Long St
Swain
Green
Eastbourne Dr
Morton Rd
William St
St Mary's Rd
Keswick St
Beverley St
Sandygate Terrace
Rosewood Grove
Anlaby St
Tyersal
Pansonage Rd
Westbury St
Alma St
Buller St
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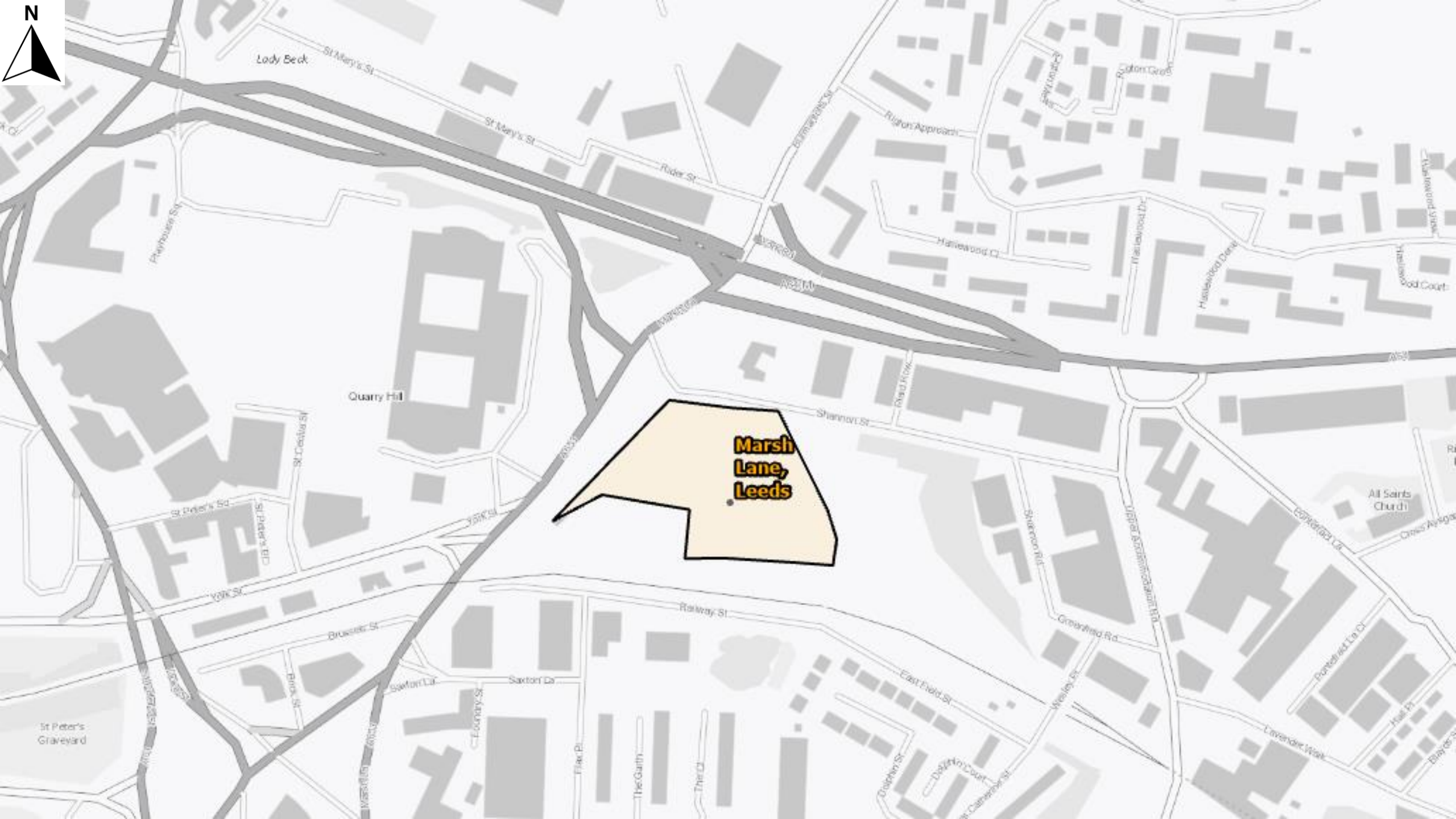
Sq St
Newark St
Stamford St
Back Muff St
Harley St
Elmhoe Dale St
Minster Dr
Kyffin Pl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Hanselwood Cl
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St Peter's Sq
St Peter's Bd
St Cecilia St
York St
Railway St
Brussels St
Saxton Ln
Saxton Dr
Boundary St
Flax Pl
The Garth
The Cl
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Greenfield Rd
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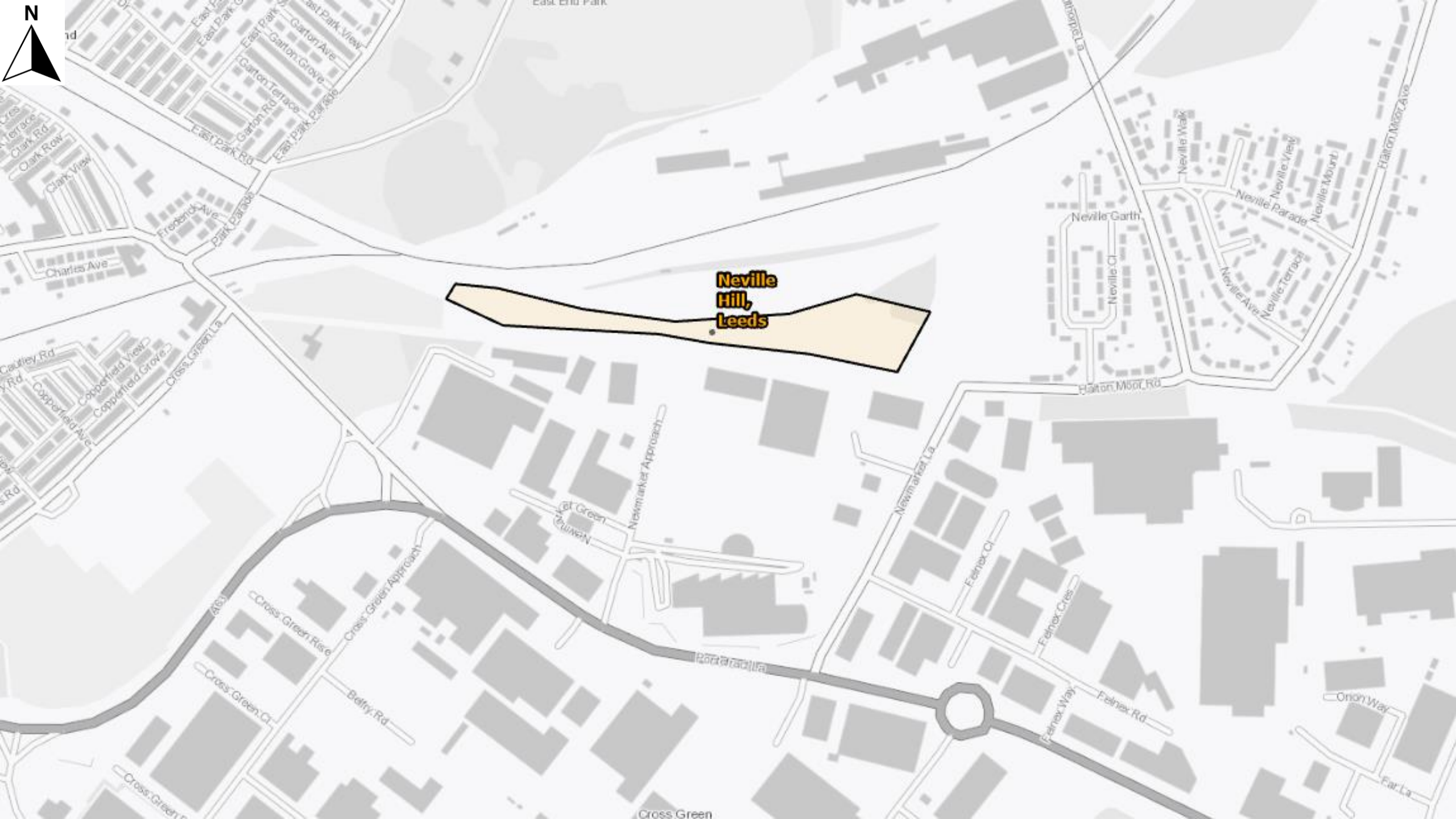
East Field St
Dolphin St
Dolphin Court
Lavender Walk
All Saints Church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Neville Hill, Leeds
East End Park
East Park Rd
East Park Parade
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Garton Ave
Garton Grove
Garton Terrace
Garton Rd
Clark Rd
Clark Row
Clark View
Frederick Ave
Park Parade
Charles Ave
Caulley Rd
Copperfield View
Copperfield Grove
Copperfield Ave
Cross Green La
Cross Green Rise
Cross Green Approach
Cross Green Ct
Belfry Rd
Cross Green
Cross Green Ln
Newmarket Approach
Newmarket La
Neville Garth
Neville Ct
Neville Way
Neville View
Neville Parade
Neville Mount
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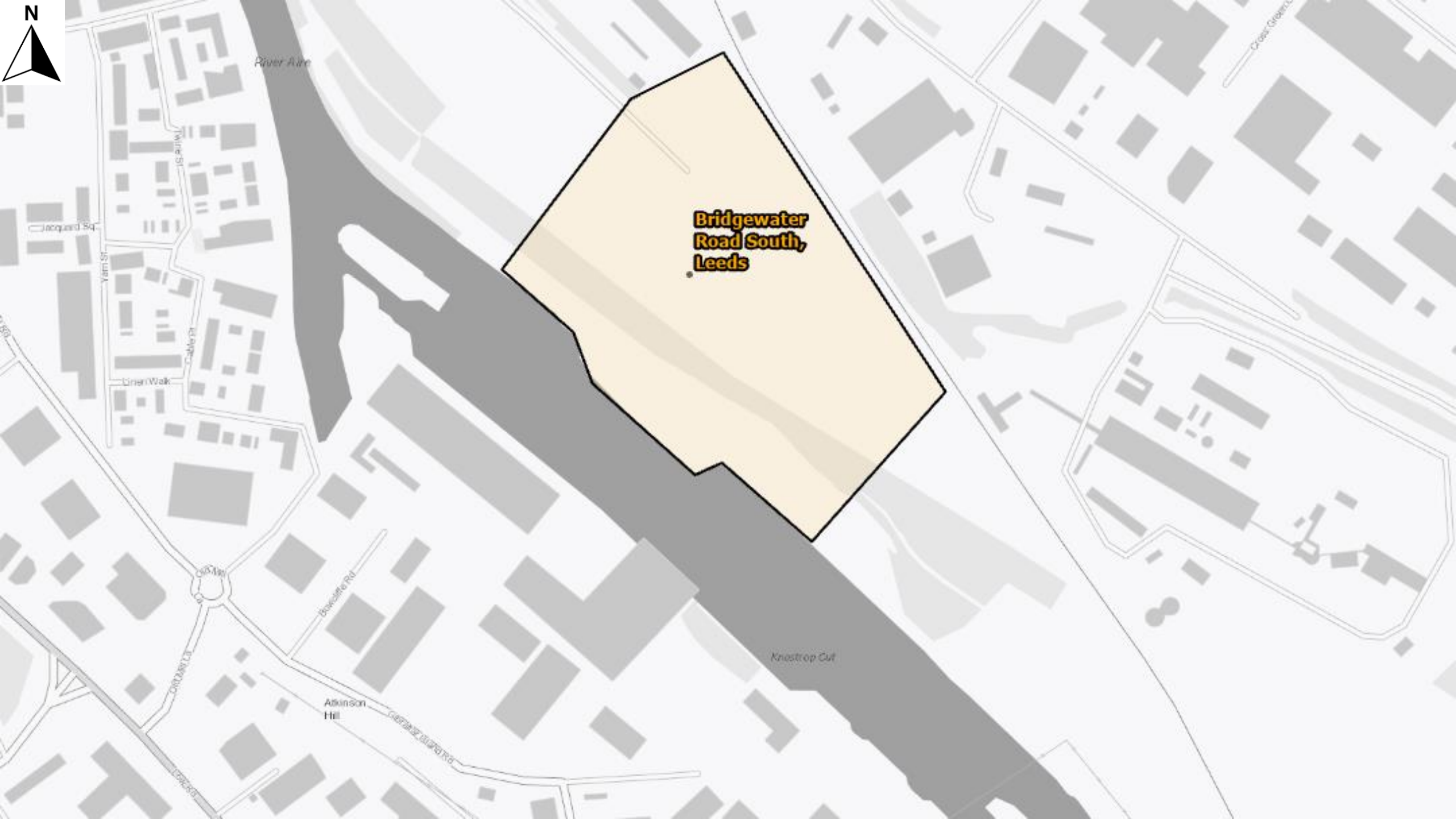
Felnex Cres
Felnex Way
Felnex Rd
Onion Way
Far La
Ring Road La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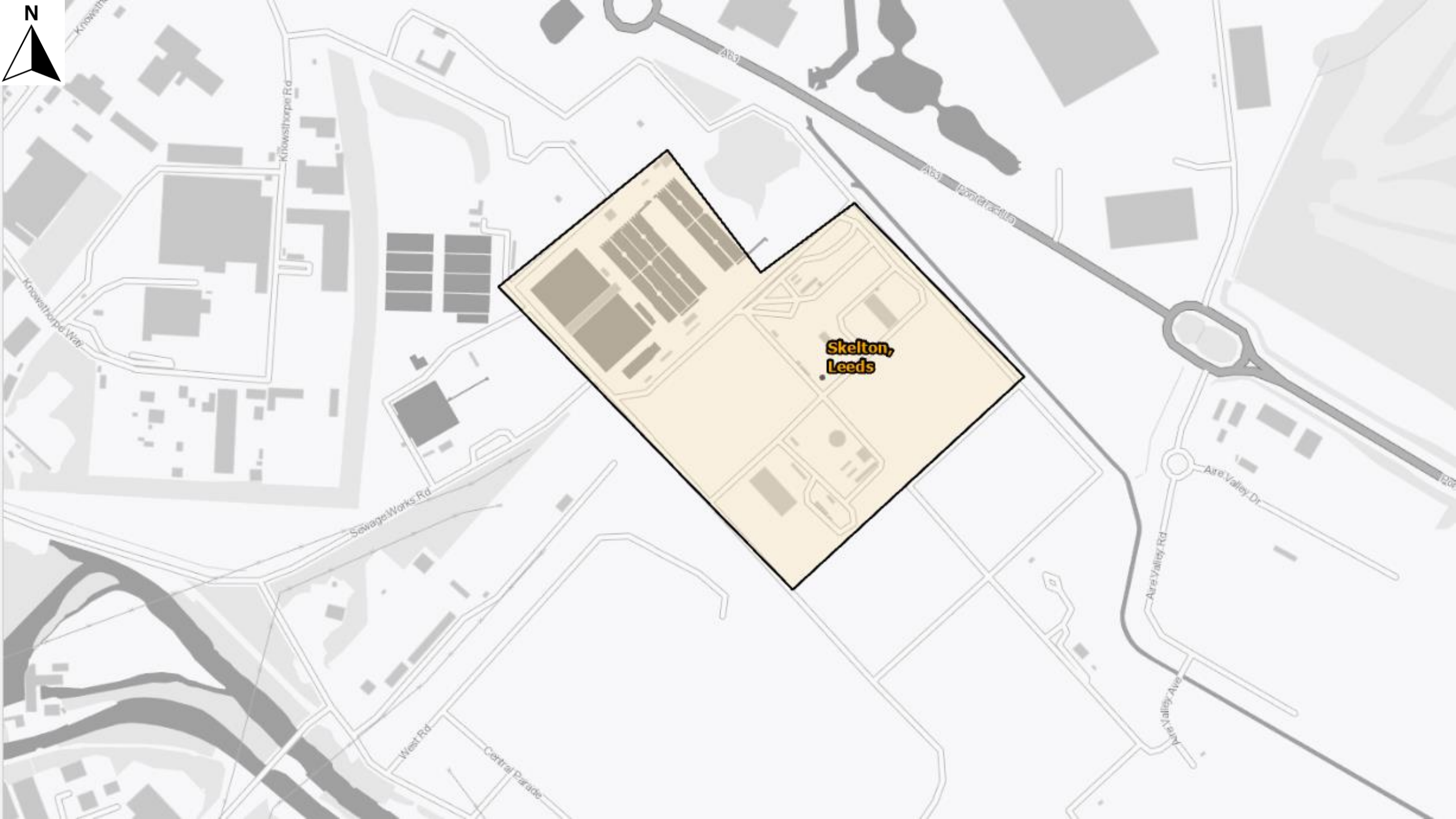
Bowcliffe Rd
Atkinson Hill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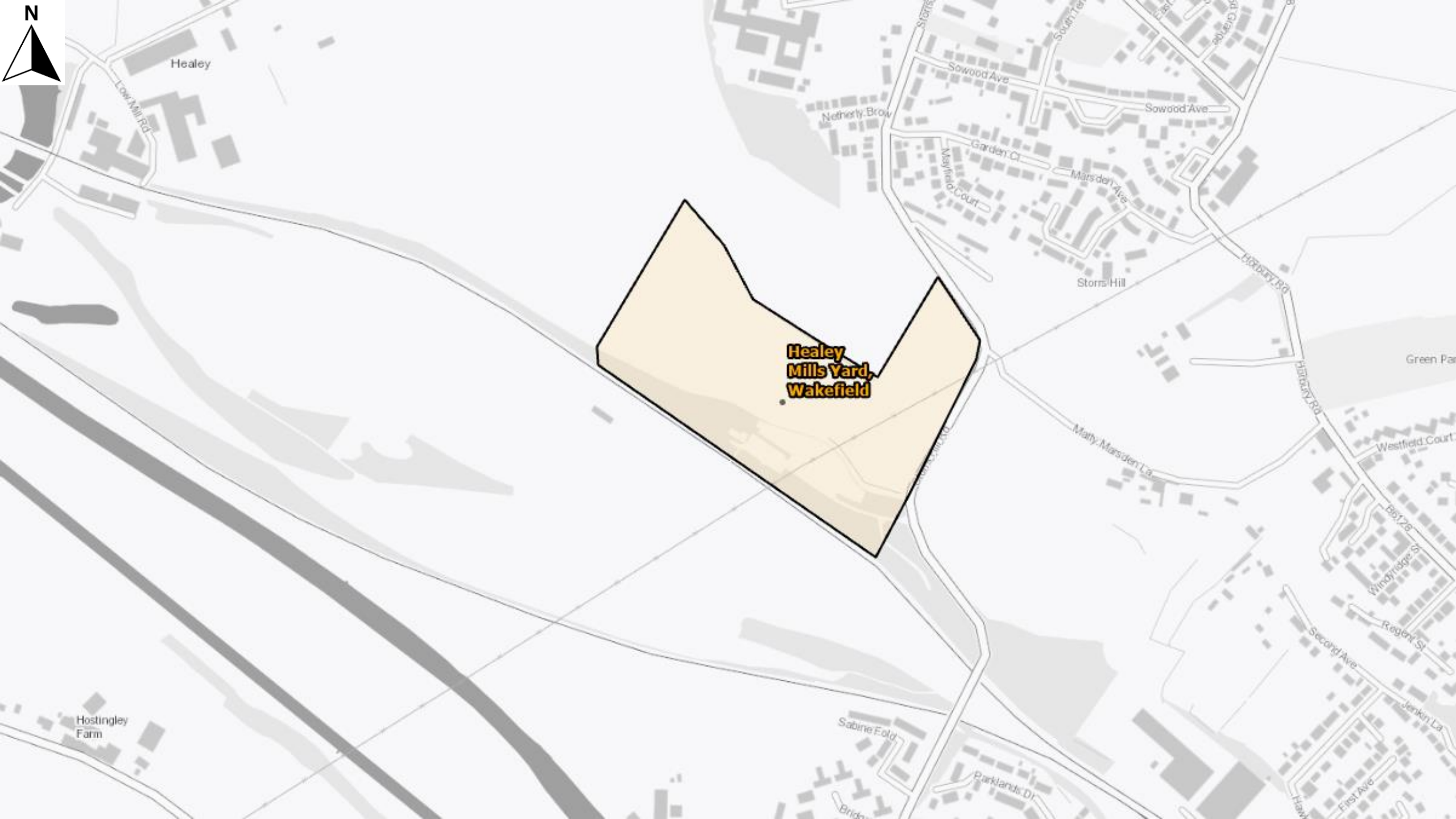
West Rd
Central Parade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Westfield Court
B6128
Windyridge St
Regent St
Second Ave
Jenkin La
Sabine Fold
Parklands Dr
First Ave
Hostingley Farm


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Hepworth St
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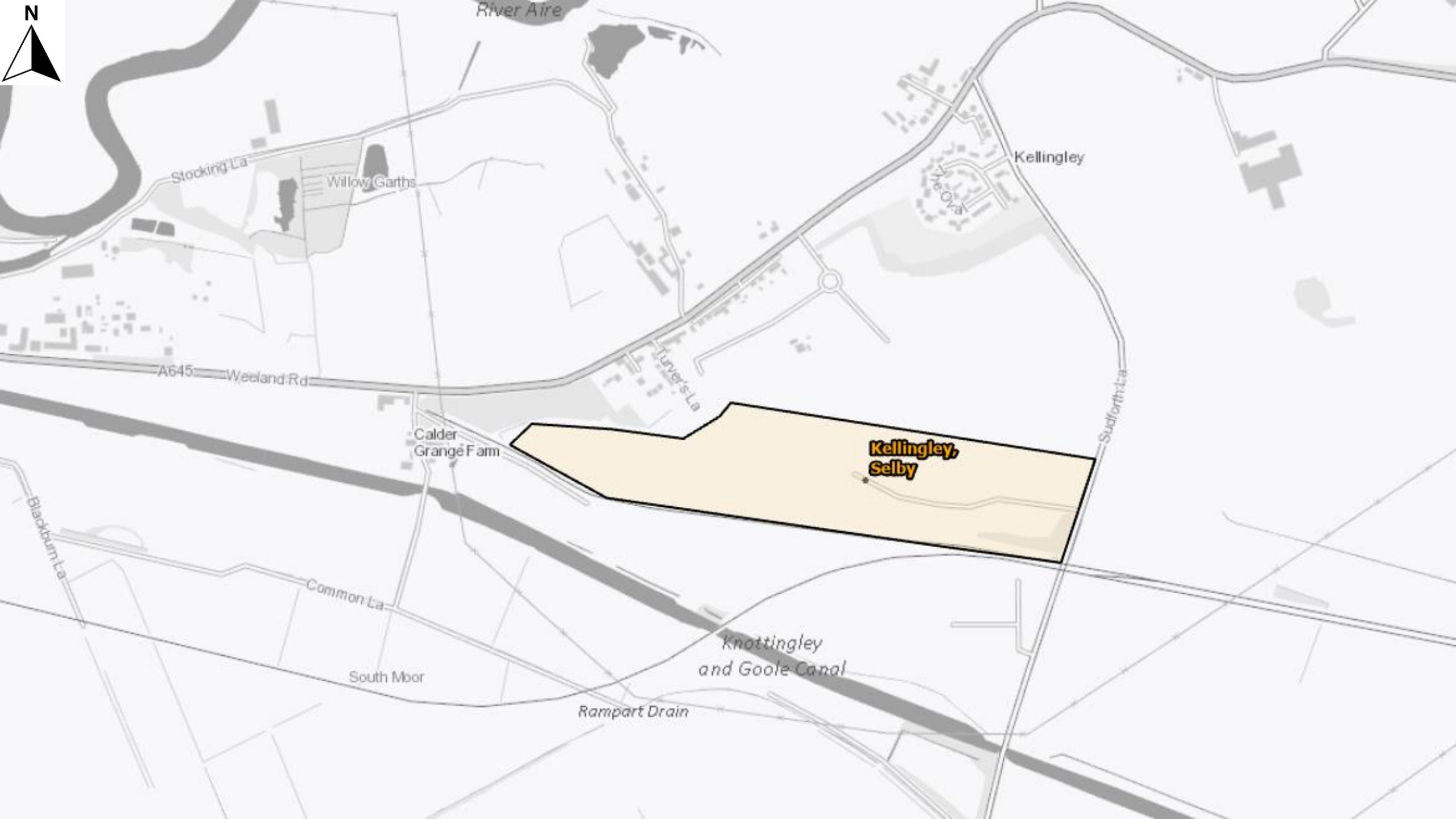
School St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Kellingley
The Ova
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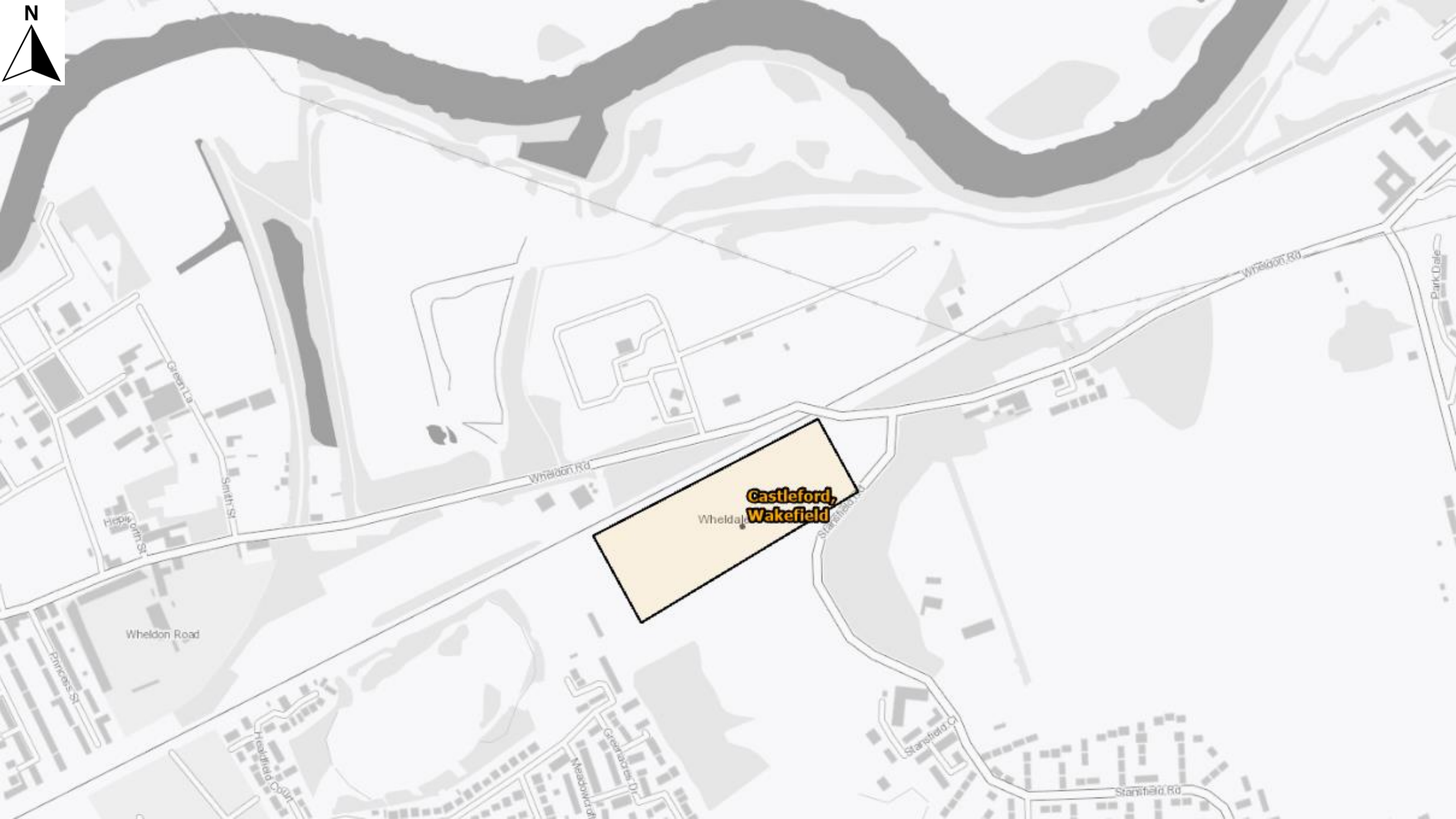
Weeland Rd
Turver's La
Sudforth La
Calder
Grange Farm
Kellingley,
Selby
Blackburn La
Common La
South Moor
Knottingley
and Goole Canal
Rampart Drain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Castleford,
Wakefield
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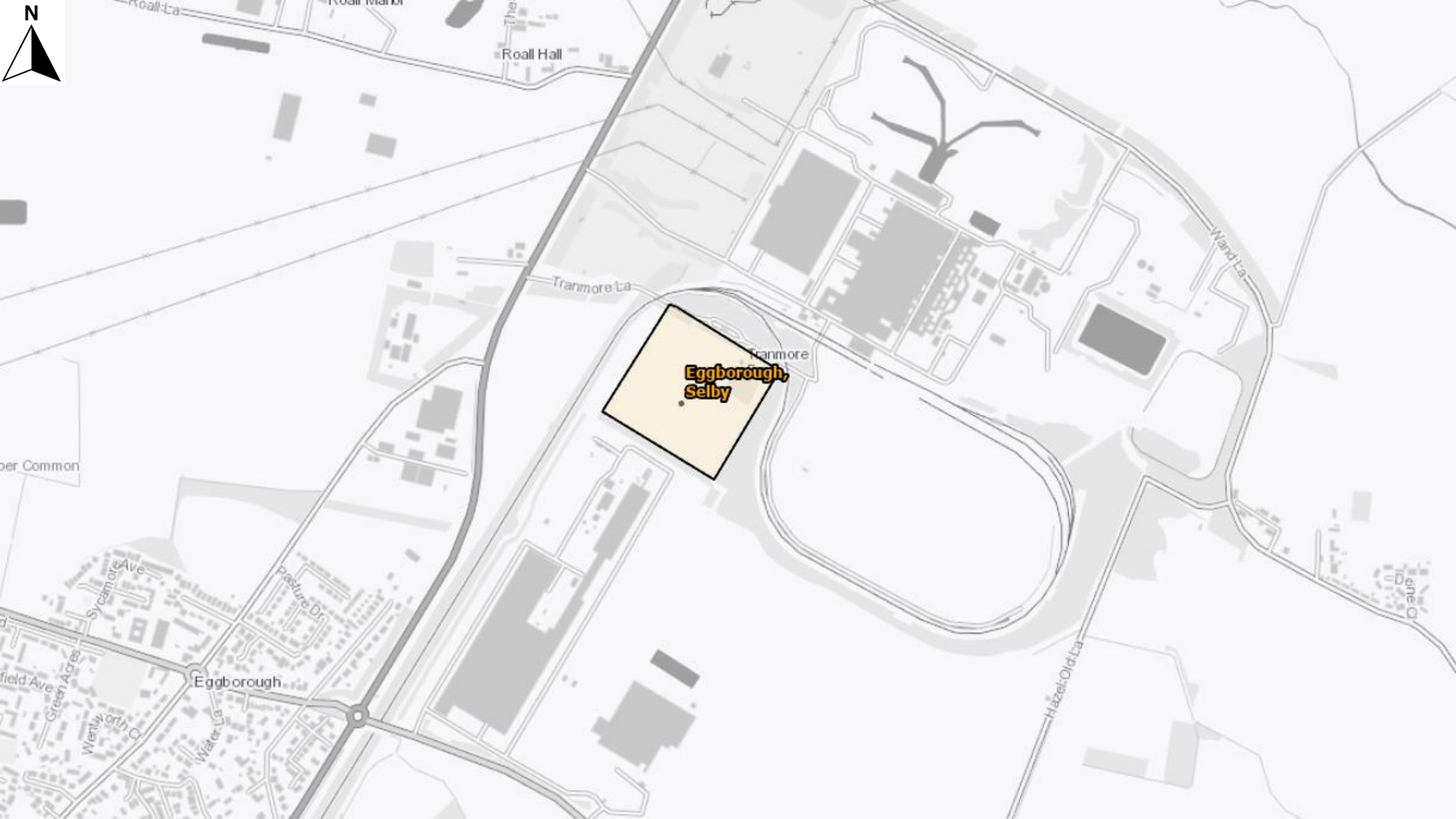
Meadowcroft
Greenacres Dr
Healdfield Court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Roall Hall
Tranmore La
Tranmore
Eggborough, Selby
Eggborough
Sycamore Ave
Pasture Dr
Green Acres
Water La
Wand La
Hazel Old La

Appendix 3 – Economic Appraisal of Potential Sites

WEST YORKSHIRE COMBINED AUTHORITY - MARINE AGGREGATES STUDY

Potential Wharf Sites Appraisals

Economic Appraisals

Wharf Site Option	*Capacity (ton/annum)*	*Demand (ton/annum)*	*Lorries Removed (per annum)*	*ALoH (kms)*	*Rd Distance Saved (lorry-kms)*	*Mode Shift Benefits (£)*	*Toll Revenues (£)*	*Business Contribution (£)*	*Full Economic Benefits (£)*	*Capital Costs (£)*	*Payback Years R-CBA (years)*	*F-CBA (years)*
Old Mill Lane, Knostrop	250,000	212,500	11,900	110	1,312,213				£1,543,926		3	3
Bridgewater Road, Cross Green	250,000	212,500	11,900	112	1,336,013				£1,570,773		7	6
Port of Leeds (Stourton)	200,000	170,000	9,520	107	1,014,737				£1,195,623		8	8
Haigh Park Road, Stourton	200,000	170,000	9,520	103	984,273				£1,161,260		9	8
Fleet Lane, Woodlesford	150,000	127,500	7,140	101	724,496				£855,481		12	11
Whitwood, Wakefield	150,000	127,500	7,140	92	657,094				£779,452		6	6

Economic Appraisals - Sensitivity Tests

Wharf Site Option	*Capacity (ton/annum)*	*Demand (ton/annum)*	*Lorries Removed (per annum)*	*ALoH (kms)*	*Rd Distance Saved (lorry-kms)*	*Mode Shift Benefits (£)*	*Toll Revenues (£)*	*Business Contribution (£)*	*Full Economic Benefits (£)*	*Capital Costs (£)*	*Payback Years R-CBA (years)*	*F-CBA (years)*
Old Mill Lane, Knostrop (*Low Cost* Option)	150,000	127,500	7,140	110	787,328				£926,356		2	2
Lower Cost Option for Port of Leeds (Stourton)	200,000	170,000	9,520	107	1,014,737				£1,195,623		5	5
Whitwood, Wakefield (*Low Cost* Option)	150,000	127,500	7,140	92	657,094				£779,452		5	5

Key:-

Capacity = the maximum estimated throughput of tonnage per annum (tonnes/annum)
Demand = the estimated optimum demand for tonnage per annum (tonnes/annum)
Lorries = the estimated numbers of lorries removed from the road (number)
ALoH = average length of haul (km)
Rd Distance Saved = the amount of lorry movements removed off the road (lorry-kms)
MS Benefits = mode shift socio-economic benefits based on DfT rates (£)
Toll Revenues = the revenue raised from handling tonnages at the site (£)
Business Contribution = the potential which could be reasonably expected to be contributed from the revenues by the site operator (£)
Full Economic Benefits = the addition of MS Benefits and Business Contribution
Capital Costs = the cost of construction and providing handling equipment at the site (£)
Payback Years = the number of years to pay back the Capital Costs (numbers of years)
R-CBA = restricted cost/benefit analysis (i.e. based only on the MS Benefits)
F-CBA = full cost/benefit analysis (i.e. based only on the Full Economic Benefits)

WEST YORKSHIRE COMBINED AUTHORITY - MARINE AGGREGATES STUDY

Potential Rail Sites Appraisals

Economic Appraisals

Rail Site Option	Capacity (ton/annum)	Demand (ton/annum)	Lorries Removed (per annum)	ALoH (kms)	Rd Distance Saved (lorry-kms)	Mode Shift Benefits (£)	Toll Revenues (£)	Business Contribution (£)	Full Economic Benefits (£)	Capital Costs (£)	Payback Years R-CBA (years)	Payback Years F-CBA (years)
Dewsbury, Kirklees	200,000	170,000	9,520	129	1,228,987	[redacted]			£1,437,298	[redacted]	5	5
Whitehall Rail Sidings, Leeds	200,000	170,000	9,520	117	1,115,636				£1,309,438		6	5
Hunslet East (Cross Green), Leeds	250,000	212,500	11,900	112	1,337,104				£1,572,004		4	4
Stourton, Leeds	300,000	255,000	14,280	108	1,542,488				£1,816,427		3	3
Wakefield Europort	300,000	255,000	14,280	94	1,337,997				£1,585,761		4	4
Ferrybridge, Wakefield	200,000	170,000	9,520	85	807,751				£962,143		6	6
Laisterdyke, Bradford	125,000	106,250	5,950	130	771,946				£902,631		9	9
Marsh Lane, Leeds	125,000	106,250	5,950	108	641,746				£755,765		11	11
Neville Hill, Leeds	250,000	212,500	11,900	106	1,260,516				£1,485,612		5	5
Bridgewater Road South, Leeds	250,000	212,500	11,900	112	1,336,147				£1,570,924		6	5
Skelton, Leeds	250,000	212,500	11,900	104	1,241,369				£1,464,014		5	5
Healey Mills Yard, Wakefield	250,000	212,500	11,900	93	1,105,424				£1,310,669		7	6
Castleford, Wakefield	200,000	170,000	9,520	95	905,784				£1,072,725		8	8
Kellingley, Selby	200,000	170,000	9,520	79	754,139				£901,669		10	9
Gascoigne Wood, Selby	250,000	212,500	11,900	79	938,845				£1,122,767		7	6
Eggborough, Selby	250,000	212,500	11,900	76	906,294				£1,086,050		8	8

Economic Appraisals - Sensitivity Tests

Rail Site Option	Capacity (ton/annum)	Demand (ton/annum)	Lorries Removed (per annum)	ALoH (kms)	Rd Distance Saved (lorry-kms)	Mode Shift Benefits (£)	Toll Revenues (£)	Business Contribution (£)	Full Economic Benefits (£)	Capital Costs (£)	Payback Years R-CBA (years)	Payback Years F-CBA (years)
Whitehall Rail Sidings, Leeds	200,000	170,000	9,520	117	1,115,636	[redacted]			£1,309,438	[redacted]	5	5
Ferrybridge, Wakefield	200,000	170,000	9,520	85	807,751				£962,143		5	5
Bridgewater Road South, Leeds	250,000	212,500	11,900	112	1,336,147				£1,570,924		5	5

Key:-
Capacity = the maximum estimated throughput of tonnage per annum (tonnes/annum)
Demand = the estimated optimum demand for tonnage per annum (tonnes/annum)
Lorries = the estimated numbers of lorries removed from the road (number)
ALoH = average length of haul (km)
Rd Distance Saved = the amount of lorry movements removed off the road (lorry-kms)
MS Benefits = mode shift socio-economic benefits based on DfT rates (£)
Toll Revenues = the revenue raised from handling tonnages at the site (£)
Business Contribution = the potential which could be reasonably expected to be contributed from the revenues by the site operator (£)
Full Economic Benefits = the addition of MS Benefits and Business Contribution
Capital Costs = the cost of construction and providing handling equipment at the site (£)
Payback Years = the number of years to pay back the Capital Costs (numbers of years)
R-CBA = restricted cost/benefit analysis (i.e. based only on the MS Benefits)
F-CBA = full cost/benefit analysis (i.e. based only on the Full Economic Benefits)