

Great Heck Mining Subsidence Remediation Works Environmental Impact Assessment

JBA consulting

Non-Technical Summary June 2017

The Danvm Drainage Commissioners

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Contract

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Purpose

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Abbreviations

BAP	Biodiversity Action Plan
СНА	Cultural Heritage Assessment
CMS	Construction Method Statement
EIA	Environmental Impact Assessment
eDNA	Environmental DNA
EMMP	Environmental Management and Monitoring Plan
ES	Environmental Statement
FAS	Field Archaeology Specialists
IDB	Internal Drainage Board
LWS	Local Wildlife Site
NERC	Natural Environment and Rural Communities
NGR	National Grid Reference
NTS	Non-Technical Summary
RSPB	Royal Society for the Protection of Birds
PPG	Pollution Prevention Guidance
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SINC	Site of Importance for Nature Conservation
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest

1 Introduction and Background

1.1 Introduction

The area around Great Heck, south of Selby, North Yorkshire (see Figure 1-1), has been affected by mining subsidence arising from activities carried out by UK Coal Mining Ltd. Panels of coal have been extracted from the Kellingley Colliery Coalfield underneath the area of Great Heck, High Eggborough and Whitley. The subsidence from the mining has affected the existing land drainage regime and this has led to increased susceptibility to flooding and waterlogging of land. The total catchment area affected by the mining subsidence south of the canal is 495ha.

The area affected by mining is bounded by the M62 to the north, the East Coast Mainline to the east, Balne Moor Road to the South and the village of Whitley to the west.

The effects of mining in this area are evident in the drainage system where static water can be found in low lying depressions within the agricultural fields, along with disrupted gradients on the drains in the area, preventing water from flowing in its intended direction.

Under the Coal Mining Subsidence Act 1991 and Doncaster Area Drainage Act 1929, the Coal Authority (formerly UK Coal Mining Ltd prior to their collapse) has obligations to repair the drainage of the catchment area to the reasonable satisfaction of the claimant, i.e. that the flood incidence levels should be returned, as far as is reasonably practicable, to pre-mining levels.

The Danvm Drainage Commissioners, as the drainage authority for the area, has been instructed by the Coal Authority to undertake remediation works to repair the drainage of the area affected by subsidence.



Figure 1-1: Location Map

1.2 Legislative Context

The proposed works to remediate the effects of mining subsidence on the land drainage system within the Great Heck area fall under the Land Drainage Act 1991 and the Coal Mining Subsidence Act 1991.

The Danvm Drainage Commissioners will undertake the works using their powers as a drainage authority under the Land Drainage Act 1991. Under this act all IDBs have the power to undertake works to improve and maintain existing drainage systems within their district, and also construct new works (e.g. watercourses, pumping stations) required for drainage of any land.

1.3 Environmental Impact Assessment

Environmental Impact Assessment (EIA) is a process which identifies the environmental impacts (both adverse and beneficial) of a proposed development. It ensures that the importance of these impacts, and the opportunity for reducing adverse impacts are properly considered as part of the design development process and are understood by the public, statutory authorities and other interested parties. EIA helps to prevent, reduce and offset adverse environmental impacts and ensures that environmental issues can be taken into account during the design of the scheme. For drainage authorities, the requirements of EIA are applied through the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999, as amended by the Environmental Impact Assessment (Land Drainage Improvement Works) (Amendment) Regulations 2017.

Due to the environmental sensitivity of the area likely to be affected by the proposed works, it was determined that there was potential for the works to have significant effects on the environment, and therefore the Danvm Drainage Commissioners are obliged to undertake an EIA. The EIA is reported in the Environmental Statement (ES); this Non-Technical Summary (NTS) provides a review of the proposed works, and the possible environmental implications in concise lay terms.

1.3.1 Assessment Methodology

Appropriate methodologies have been used to assess the effects relating to each of the environmental topics that have been investigated as part of the EIA. These methodologies are based on recognised good practice and guidelines specific to each subject area, details of which are provided in each individual technical chapter of the ES.

In order to evaluate environmental impacts, it is important that assessment criteria are identified. Any impact is assessed by a combination of the degree of alteration from the baseline state (both positive and negative) which can be predicted (i.e. the magnitude of the effect) and the importance of the feature(s) (e.g. the rarity of a species/habitat, the quality of a view, the type of land use, etc.). Full details of how this process has been applied to each feature (e.g. hydrological, ecological, historical, etc.) are provided in the relevant chapters of the ES.

1.3.2 Study Area

The geographical area that will be covered by the EIA has been determined by considering:

- The footprint of the proposed works
- The nature of the existing baseline environment
- The manner in which impacts are likely to be propagated.

Figure 1-2 shows the proposed EIA study area.



Figure 1-2: Study Area

2 The Proposed Works and Alternatives

2.1 Proposed Scheme

The preferred option will involve pumping from Court Drain into New Fleet Drain South which would discharge via gravity to the River Don to the east (Figure 2-1). If the water level in the downstream reach of New Fleet Drain South is high the discharge chamber will divert water to storage in the upstream reach of this drain until the downstream water level has receded. The scheme will include excavating new land drains, re-grading existing drains and the construction of a new land drainage pumping station. The existing Drain No. 71 and Balne Common Drain will drain to Court Drain, and then flow to the pumping station. Drain No.71 currently discharges directly to New Fleet Drain South and will be bunded to divert to Court Drain. A weir will be placed at the junction with Balne Common Drain to restrict inflow to the pump station to high flows only, Balne Common Drain will otherwise discharge via gravity to New Fleet Drain South east of Heck Lane.



Figure 2-1: Proposed Works

2.1.1 Access

Access to the site of the pumping station will be via Lee Lane from the village of Whitley. Lee Lane will be extended through construction of a stone access track to the site of the pumping station by following existing field boundaries.

2.1.2 Pumping Station

The capacity of the pumping station will be 760l/s based upon the catchment area affected by mining subsidence south of the canal. The pumping station will include three pumps and an automatic weedscreen cleaner to ensure the trash screen is kept clear of debris. A high level gravity discharge will be included, controlled by penstock and a flap valve. The compound will be protected by a 2.4m high Paladin fence.

A telemetry system will be installed to remotely monitor and control water levels and pump activity at the site, alarms will be issued to alert the Danvm Drainage Commissioners of high water levels or pump problems.

2.1.3 New Cut Drains and Drain Re-grading

Mining subsidence has resulted in an undulating drain bed along Court Drain, restricting flow to New Fleet Drain South except during high flow conditions. Drain improvement works to enable flow to the pumping station will include re-grading of existing drains and excavation of new connecting drains.

Drain No. 71 will be connected to Court Drain by excavating new drains which will connect existing non-IDB land drains on the eastern side of Watkin's Lower Plantation (Connecting Drain 1). The existing non-IDB land drains will be re-graded to suit and a low berm will be constructed along an approximate 100m length of this connecting drain to provide an occasionally wetted platform for birds.

A connection will also be made between Balne Common Drain and Court Drain by re-grading existing non-IDB land drains and excavating a new 187m drain to connect the existing drains (Connecting Drain 2). Due to the sandy soils, and the depth to which the downstream portion of this new watercourse would need to be dug, the last 260m of Connecting Drain 2 will be culverted and not open watercourse.

Court Drain will be re-graded from where Connecting Drain 1 joins it, to the pumping station site. Berms will be constructed on two sections of this re-graded drain, over a total length of approximately 430m. The berms will be positioned 0.5m above the drain bed to allow occasional wetting to create a habitat for wildlife.

The approach drain to the pumping station will be re-graded and will include a 4.5m wide berm on the right bank for maintenance, the length of which will be approximately 300m.

No re-grading works will be undertaken on the other IDB adopted watercourses in the study area; Balne Common Drain or High Eggborough Drain.

2.1.4 Programme

Works are due to commence in Summer 2017, and last for approximately 11 months. The first phase of works will be the drain re-grading/cutting works which should last for approximately 3-4 months. This will be followed by construction of the pumping station which is scheduled to begin in August/September 2017.

2.2 Alternatives Considered

Other engineering options to meet the aims of reducing static water and disrupted gradients on the drains were considered before the above option was selected.

The alternative options considered and rejected were:

- Do nothing
- Do Minimum/Continue as present
- Raise Heck Road
- Re-grade New Fleet Drain South and pump into River Don
- Pump into New Fleet Drain South, with retention upstream and pump into River Don
- Pump into Aire and Calder Navigation
- Re-grade watercourses along existing routes including New Fleet Drain South and pump into the Canal.

These options were discounted on economic grounds, due to technical infeasibility and/or for their adverse environmental impacts.

3 Environmental Impact Assessment

3.1 Introduction

Full descriptions of all the EIA assessments undertaken for this proposed scheme are provided in Chapters 4 - 7 of the ES, with supporting information in the Appendices. A summary of these assessments and the key findings are provided in the sections below.

3.2 Ecology and Nature Conservation

3.2.1 Introduction

An assessment of the current nature conservation interest within the study area and the potential impacts of the proposed works on ecological features were undertaken. This section describes and evaluates the current nature conservation interest within the study area and assesses the potential impacts of the proposed works on ecological features. Where potentially significant effects upon habitats and species have been identified, appropriate mitigation measures are detailed which have been incorporated into the scheme design, or will be undertaken prior to and during construction and operational phases.

3.2.2 Methodology

A desk-based study was undertaken to collate information on statutory and non-statutory nature conservation sites within a 5km and 2km radius of the study area, respectively. Records of species that are afforded legal protection or are otherwise of nature conservation importance within the study area were also collected. Information has also been sought on species and habitats listed on Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, and other notable species within the study area.

This project has been in development for a considerable period of time, with it being postponed in 2013. Consequently, field surveys have been undertaken periodically throughout 2008 to 2011 and in 2016-17. Throughout the project's development the following ecological surveys have been conducted:

- Extended Phase 1 Habitat surveys
- Botanical surveys
- Bird surveys
- Water Vole surveys
- Badger surveys
- Otter surveys
- Great Crested Newt habitat suitability assessments and eDNA sampling of waterbodies
- Bat surveys including bat roost potential assessments and activity surveys
- Recording of species of conservation and/or notable interest (e.g. Brown Hare *Lepus europaeus*, reptiles and Selby LBAP species).

Full details of the survey methods employed are provided in the ES.

3.2.3 Results and Conclusions

There are no statutory designated nature conservation sites located within the study area. There are no statutory designated nature conservation sites of international importance (e.g. Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar Sites) within 5km of the study area. There are two Sites of Special Scientific Interest (SSSI) within 5km of the study area, both of which are designated for their grassland habitats; these sites will not be affected by the proposed works.

There are three non-statutory nature conservation sites within the study area (Balne Moor Ponds, the Ditch West of Balne Moor Ponds and the Dismantled Railway). These are designated by Selby District Council and the East Riding of Yorkshire Council and are known as SINCs in Selby District and Local Wildlife Sites (LWS) in the East Riding. There are a further 13 SINCs/LWS within 2km of the study area.

A range of habitats and species listed on section 41 of the NERC Act 2006, along with some included in local Biodiversity Action Plans (BAP), were found in the study area during both the desk-based and field assessments, including hedgerows, ponds, ditches, arable farmland and a number of notable bird species.

Protected species recorded in the study area included Otter and Badger; however, these were recorded in areas not to be affected by the scheme. The study area was also found to be particularly important for bird species, in particular wetland and wading bird species when the areas of standing water are present (both during the breeding season and in the winter) and non-wetland, farmland bird species at all times.

The importance of the study area for the various ecological features, the predicted impacts upon these and the proposed mitigation measures to control such impacts are summarised in Table 3-1.

The evaluation of the ecological impacts, likely to be generated by the proposed mining subsidence remediation scheme at Great Heck, determined that the construction phase would result in the ecological features in the study area generally experiencing temporary negative impacts. However, these impacts are reversible once works are complete and disturbing activities stop, and through mitigation.

The operational phase of the scheme is assessed as having significant, permanent, negative impacts on subsidence flash habitats, and the bird populations they support, as these features will be permanently lost. This will be partially compensated for by the incorporation of berms on 820m of new/re-graded drain which will provide increased geomorphological and floristic diversity within the drains and some compensatory wetland habitat for species such as Snipe and Jack Snipe, however, this will not fully mitigate the loss of these features. Other operational impacts are assessed as not being significant, or as having a positive impact through an increase in open ditch habitat and increased diversity in ditch habitat.

A range of mitigation measures have been suggested to minimise/offset impacts on other habitats and species. Prior to the construction works further surveys will be undertaken for Badger, Otter and Water Vole to ensure any new activity is detected and suitable mitigation, if required, is put in place. With the mitigation proposed, no significant adverse effects on protected species are likely and the works will be fully compliant with wildlife legislation.

No significant impacts are expected on any statutory or non-statutory nature conservation sites as a result of this scheme, either alone or in-combination with any other plans or projects

Table 3-1:	Ecological	Impacts	Summary

Ecological Features	Impact	Importance of Feature	Impact without Mitigation	Mitigation	Significance of Effects of Residual Impacts			
Construction Imp	Construction Impacts							
Ditch West of Balne Moor Ponds SINC	Contamination from sediment released and/or pollution incidents	Regional/ County	Temporary negative impact at the regional/ county scale	Measures taken to prevent significant release of sediment and chemical contamination	No significant negative effect on the extent or condition of this SINC.			
Arable farmland	Short-term, temporary disturbance	Local	Temporary negative impact at the local scale	Existing access tracks will be used where possible to limit the amount of arable land disturbed. Minimise land take.	No significant negative effect on the extent, distribution or conservation status of the habitat.			
Subsidence flashes	Short-term, temporary disturbance	Regional/ County	Temporary negative impact at the regional/ county scale	None proposed.	No significant negative effect on the extent, distribution or conservation status of the habitat.			
Grassland (improved, poor semi-improved, marshy and amenity types)	Short-term, temporary disturbance	Local	Temporary negative impact at the local scale	Existing access tracks will be used where possible to limit the amount of arable land disturbed. Areas disturbed during the construction works will be re-sown with an appropriate species- rich grass and wildflower seed mix upon completion of the works.	No significant negative effect on the extent, distribution or conservation status of the habitat.			
Drainage ditches	Short-term, temporary disturbance to flora and fauna	Local	Temporary negative impact at the local scale	The banks of affected watercourses will be sown with an appropriate species-rich grass and wildflower seed mix upon completion of the works. Channel vegetation will be allowed to re- colonise naturally, but will be monitored, with additional planting of suitable aquatic plant species undertaken if necessary.	No significant negative effect on the extent, distribution or conservation status of the habitat.			

Ecologi Feature	cal s	Impact	Importance of Feature	Impact without Mitigation	Mitigation	Significance of Effects of Residual Impacts
		Contamination from sediment released and/or pollution incidents		Temporary negative impact at the local scale	Measures taken to prevent significant release of sediment and chemical contamination	No significant negative effect on the extent, distribution or conservation status of the habitat.
		Potential spread of non-native invasive Himalayan Balsam present on some drains		Long-term negative impact at the local scale	An appropriate mitigation strategy will be implemented to prevent the spread of this species.	No significant negative effect on the extent, distribution or conservation status of the habitat.
Ponds		See assessment for Balne Moor I	Ponds SINC above	Э.		
Birds	Water -birds	Potential risk of disturbance	Regional/ County to Waterbirds (Local importance if subsidence flashes are not holding water and surrounding marginal habitat is absent)	Temporary, short- term, negative impact at the regional/ county scale	Works have been carefully programmed to avoid key breeding bird season. Prior to commencement of works between March - September inclusive a breeding bird survey will be undertaken. If ground nesting birds are found in works areas, nests will be protected with a suitable buffer. If Schedule 1 birds are found to be breeding no works will commence until the risk of disturbance is removed.	No significant negative effect on waterbird populations or their conservation status.
		Damage to or destruction of nests	2000my	Temporary, short- term, negative impact at the regional/ county scale	Any vegetation to be removed as part of the scheme during March - September inclusive will be assessed for breeding birds by a suitably qualified ecologist prior to removal.	No significant negative effect on waterbird populations or their conservation status.

Ecologi Feature	ical s	Impact	Importance of Feature	Impact without Mitigation	Mitigation	Significance of Effects of Residual Impacts
	Non- water- birds	Potential risk of disturbance	Regional/ County to non- waterbird species	Temporary, short- term, negative impact at the regional/ county scale	Works have been carefully programmed to avoid key breeding bird season. Prior to commencement of works between March - September inclusive a breeding bird survey will be undertaken. If ground nesting birds are found in works areas, nests will be protected with a suitable buffer. If Schedule 1 birds are found to be breeding no works will commence until the risk of disturbance is removed.	No significant negative effect on non-waterbird populations or their conservation status.
		Damage to or destruction of nests		Temporary, short- term, negative impact at the regional/ county scale	Any vegetation to be removed as part of the scheme between March - September inclusive will be assessed for breeding birds by a suitably qualified ecologist prior to removal.	No significant negative effect on non-waterbird populations or their conservation status.
Badger		Potential risk of disturbance	Local	Temporary negative impact at the local scale	A further survey to identify the presence of any newly active or established setts will be undertaken prior to the works. No night-time working will be permitted. To minimise the potential for Badgers being trapped in any excavations, a suitable means of escape will be provided where such works cannot be sealed off.	No significant negative effect on Badger populations or their conservation status.
Otter		Potential risk of disturbance	Local	Temporary negative impact at the local scale	No night-time working will be permitted. To minimise the potential for Otters being trapped in any excavations, a suitable means of escape will be provided where such works cannot be sealed off.	No significant negative effect on Otter populations or their conservation status.
		Damage or disturbance to an Otter resting place		Short-term negative impact at the local scale	A further survey to identify the presence of any Otter resting places/holts will be undertaken prior to the works.	No significant negative effect on Otter populations or their conservation status.
Bats		Temporary, short-term	Local	Temporary	Any trees felled will be replaced by replanting	No significant negative

Ecological Features	Impact	Importance of Feature	Impact without Mitigation	Mitigation	Significance of Effects of Residual Impacts
	disturbance		negative impact at the local scale	with native, locally sourced species appropriate to the area. No night-time working will be permitted. Any floodlighting used around site compounds must be angled downwards and fitted with a cowl to direct light to the ground.	effect on bat populations or their conservation status.
Grass Snake	Potential risk of injury/ disturbance	Local	Temporary negative impact at the local scale	A method statement will be produced to mitigate against potential impacts upon Grass Snake. This will include vegetation strimming, removal of potential refugia within work areas and careful storage of material.	No significant negative effect on Grass Snake populations or their conservation status.
Brown Hare	Disturbance	Local	Temporary negative impact at the local scale	None proposed.	Temporary negative impact at the local scale. No significant negative impact on the conservation status of Brown Hare.
Eel	Disturbance and temporary habitat loss	Local	Temporary negative impact at the local scale	None proposed.	Temporary negative impact at the local scale. No significant negative impact on the conservation status of Eel.
Predicted Operat	ional Impacts			·	·
Arable farmland	Permanent loss of approximately 12,812m ² a of arable farmland	Local	Permanent positive impact at the local scale	None proposed.	Permanent, positive impact through overall increase in area of

Ecologi Feature	cal s	Impact	Importance of Feature	Impact without Mitigation	Mitigation	Significance of Effects of Residual Impacts
		Increase in area of land able to be put into arable cultivation due to implementation of mining subsidence remediation scheme				arable farmland that will be able to be cultivated.
Subside Flashes	nce	Permanent loss of subsidence flash habitats, with both standing water and marginal habitats, as potential for them to re-form will be removed	Regional/ County	Permanent, significant negative impact at the regional/ county scale	Approximately 820m of re-graded and newly cut drain will include a berm within their cross section which will allow the development of an area of marginal vegetation and in some places shallow muddy margins.	Significant negative impact which will effect the extent, distribution and conservation status of this habitat.
Drainage ditches	9	Increase in length of watercourse in study area by 425m	Local	Permanent positive impact at the local scale	None proposed.	Permanent positive impact through increase in length of open ditch habitat present.
		Increase in geomorphological and floristic diversity through incorporation of a berm into 820m of new/re-graded drain		Permanent positive impact at the local scale	None proposed.	Permanent positive impact through increased habitat diversity in 820m of watercourse.
Ponds		See assessment for Balne Moor I	Ponds SINC above	e.	·	
Birds	Water -birds	Prevention of annual formation of subsidence flashes	Regional/ County to waterbirds (Local importance if subsidence flashes are not holding water and surrounding marginal	Permanent, significant negative impact at the regional/ county scale	Approximately 820m of re-graded and newly cut drain will include a berm within their cross section which will allow the development of an area of marginal vegetation and in some places shallow muddy margins.	Significant, permanent, negative impact on waterbird populations.
		Permanent loss of small areas of arable habitat and creation	habitat is absent)	Permanent positive impact at the regional/	None proposed.	Permanent positive impact through increase in ditch habitat, with

Ecologi Feature	cal s	Impact	Importance of Feature	Impact without Mitigation	Mitigation	Significance of Effects of Residual Impacts
		of new drain network		county scale		increased habitat diversity.
	Non- water -birds	Prevention of annual formation of subsidence flashes	Regional/ county to non- waterbird species	Permanent, negative impact at the regional/ county scale	Approximately 820m of re-graded and newly cut drain will include a berm within their cross section which will allow the development of an area of marginal vegetation and in some places shallow muddy margins.	Permanent, negative impact on non-waterbird populations.
		Permanent loss of small areas of arable habitat and creation of new drain network		Permanent positive impact at the regional/ county scale	None proposed.	Permanent positive impact through increase in ditch habitat, with increased habitat diversity.
Eel		Eel passage restricted by construction of Pumping Station	Local	Permanent negative impact at the local scale	All required measures to ensure appropriate fish and Eel passage is retained within the land drainage system, and compliance with The Eels (England and Wales) Regulations 2009, will be incorporated into the pumping station detailed design, in full consultation with the Environment Agency's Fisheries Officers	No significant negative impact on the conservation status of Eel.
		Potential for entrainment in pumps		Permanent negative impact at the local scale	The pumping station will be regularly visited and any entrainment of Eel will be reported to the Danvm Drainage Commissioners. If necessary, retrospective measures to prevent further Eel entrainment will be investigated and fitted	No significant negative impact on the conservation status of Eel.

3.3.1 Introduction and Methodology

A landscape assessment was undertaken and comprised of the following:

- Data collection and desk-based review of planning policies, landscape designations and landscape character information
- Identification of key landscape and visual receptors by desk-based study and field survey
- Assessment of impacts on landscape and visual baseline
- Identification of mitigation measures and design considerations to offset or reduce identified impacts

3.3.2 Results and Conclusions

The evaluation of the landscape impacts likely to be generated by the proposed drainage works determined that the construction and operation phases would result in a limited number of landscape receptors sustaining a low to medium magnitude of landscape change. It is concluded that overall the drainage works are acceptable in landscape terms as few landscape receptors will be adversely affected and any changes in landscape character will be short-term.

The visual assessment concludes that the proposed drainage works would be acceptable in terms of its overall visual effects upon identified receptors. The introduction of a new pumping station and the loss of a small number of trees will result in minor adverse impacts to some visual receptors, however, in the long-term, through replanting and screening of the pumping station with hedgerows, this impact will be reduced.

Table 3-2 summaries the impacts of the proposed drainage works upon the landscape and visual amenity receptors and assesses the significance of those impacts.

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Table 3-2: Landscape and Visual Amenity Impacts Summary

Receptor	Predicted Impact	Sensitivity	Magnitude of Impact	Proposed Mitigation	Impact Significance
Short-term and Construe	ction Impacts				
Existing landscape elements	Loss of a small number of mature trees (4)	Low	Medium	Tree removal kept to a minimum. Replace trees by replanting as close to their original position as possible.	Minor adverse
NCA/Local landscape character areas	Reduction in landscape character due to construction works and vehicles	Medium	Low	Construction period kept to a minimum and phased.	Minor adverse
Aire and Calder Navigation	Reduction in visual amenity value	Medium	Negligible	Construction period kept to a minimum and phased.	Negligible
Communities/Residents	Reduction in visual amenity value	Medium	Low	Construction period kept to a minimum and phased.	Minor adverse
PRoW	Reduction in visual amenity value	Medium	Low	Construction period kept to a minimum and phased.	Minor adverse
Recreational Open Space	Reduction in visual amenity value	Medium	Low	Construction period kept to a minimum and phased.	Minor adverse
Local roads	Reduction in visual amenity value	Low	Low	Construction period kept to a minimum and phased.	Minor adverse
Predicted Operational In	npacts				
Existing landscape patterns	Adverse changes to landscape patterns	Medium	Negligible	Tree removal kept to a minimum. Replace trees by replanting as close to their original position as possible.	Negligible
NCA/Local landscape character areas	Reduction in landscape character due to operation of pumping stations	Medium	Low	Green paladin fencing to be used around the pumping station and hedgerows planted to provide additional screening.	Minor adverse
Communities/Residents	Reduction in visual amenity value	Medium	Low	Tree removal kept to a minimum. Replace trees by replanting as close to their original position as possible.	Minor adverse
PRoW	Reduction in visual amenity value	Medium	Low	Tree removal kept to a minimum. Replace trees by replanting as close	Minor adverse

Receptor	Predicted Impact	Sensitivity	Magnitude of Impact	Proposed Mitigation	Impact Significance
				to their original position as possible.	
Local roads	Reduction in visual amenity value	Low	Low	Tree removal kept to a minimum. Replace trees by replanting as close to their original position as possible. Green paladin fencing to be used around the stations and hedgerows planted to provide additional screening.	Minor adverse

3.4 Hydrology, Geology and Soils

3.4.1 Introduction and Methodology

An assessment of the potential impacts of the proposed drainage remediation scheme on the hydrological, geological and soil environments was performed. It describes the baseline situation, assesses the potential impacts, and then considers options for impact mitigation and opportunities for environmental enhancement.

The assessment involved a desk-based review of existing information, and also the collection of new field data through site walkover surveys and intrusive site investigation works. Additional information was obtained through correspondence with the Environment Agency, Selby District Council (Department of Environmental Health), and consultation with Natural England, Heritage England, North Yorkshire County Council, RSPB, Yorkshire Wildlife Trust and British Waterways (now Canal and River Trust).

The fieldwork included walkover surveys, soil augering, water sampling, the drilling of seven boreholes, and the monitoring of water levels in boreholes and ditches.

The assessment involved:

- 1. Combining all the available information to form a clear understanding of the ground conditions and drainage of the area (existing, or baseline, conditions).
- 2. Assessing the likely impacts of the drainage remediation scheme on the water environment and on the ground.
- 3. Identifying measures to reduce, or mitigate, the impacts of the scheme.
- 4. Assessing the likely significance of impacts both before, and after, mitigation.

3.4.2 Results and Conclusions

Construction and re-grading of drains at Great Heck involves several phases and activities which may potentially affect the soil, hydrological and hydrogeological environments. These activities have been identified and an assessment of their potential effects made.

One of the threats is chemical/sediment contamination to the Sherwood Sandstone aquifer. However, a Hydrogeological Risk Assessment conducted as part of this EIA shows that the vulnerability of the aquifer will not be significantly changed by the works.

The only other noteworthy affect is the drying out of wetland habitat in the subsidence flash areas, as a result of the improved drainage. However, as this is the purpose of the scheme no mitigation measures have been recommended.

The following measures will be taken to mitigate potential impacts of the drainage improvement scheme on the hydrological, geological and soil environments:

- Designing ditch profiles and cross-sections in such a way as to minimise the risk of bank failure and erosion.
- Designing ditch profiles and cross-sections in such a way as to minimise the change in the connectivity of the drains with the underlying bedrock aquifer.
- Implementing a Pollution Prevention Plan following the relevant Pollution Prevention Guidelines (PPG) produced jointly by the Environment Agency, Scottish Environment Protection Agency (SEPA) and the Environment and Heritage Service of Northern Ireland. Measures will include:
 - Minimising erosion by keeping exposed areas of ground and soil stockpiles to a minimum, and by avoiding earthworks in very wet weather.
 - Employing sediment control measures such as silt traps and settlement ponds.
 - Locating any chemical, fuel and oil stores on impervious bases within a secured bund with a storage capacity 110% of the stored volume.
 - Placing drip trays underneath any standing machinery to prevent pollution by oil/fuel leaks. Where practicable, refuelling of vehicles and machinery will be carried out on an impermeable surface in one designated area well away from any watercourse or drainage.



- Not carrying out maintenance of construction plant on site, with the exception of emergency maintenance work. Emergency maintenance work should ideally be carried out on an impermeable surface away from any watercourse or drainage; however, it is recognised that broken-down vehicles may require maintenance at the point of breakdown.
- Restriction of plant and wheel washing to a designated area of hard standing with suitable drainage.
- Designing any on-site toilet facilities in such a way as to ensure appropriate disposal of sewage and to prevent pollution.
- Batching concrete within a secure bunded area on an impermeable surface at least 10 m away from any watercourse and not on areas directly underlain by Sherwood Sandstone, and taking measures to prevent the release of cement, fresh concrete and wash waters (which are alkaline and corrosive) into watercourses.
- o Suitable disposal of any waste generated during the works.
- Setting out all proposed mitigation measures within a Construction Method Statement (CMS) and Environment Management Monitoring Plan (EMMP). The CMS will describe the methods to be used in construction whilst the EMMP will detail additional management and mitigation commitments, including monitoring programmes and a site-specific Pollution Incident Response Plan.

Receptor (Sensitivity)	Potential Impact	Magnitude	Significance before mitigation	Magnitude after Mitigation	Residual Significance
Soil (Agricultural Land Classification: 2)	Compaction	Low (localised compaction of soil along vehicle access routes)	Moderate/Minor	Low (unavoidable impact)	Moderate/minor
(Medium)	Excavation	Low (limited permanent widening and deepening of ditches; localised loss of soil)	Moderate/Minor	Low (unavoidable impact)	Moderate/minor
	Erosion	Low (soil will be exposed during the works; however, its cohesive nature, along with the low topographic gradient, mean that significant erosion is unlikely)	Moderate/Minor	Negligible (measures taken on site to prevent significant erosion)	Negligible
	Contamination	Medium (slight increase in pollution risk due to the presence of vehicles/plant on site, and the use of cement)	Moderate	Low (measures taken to minimise the risk of chemical contamination)	Moderate/minor
River Don (Medium)	Sediment release	Low (sediment released into the drainage ditches could potentially find its way into the River Don, however there would be significant attenuation)	Moderate/minor	Low (measures taken to prevent significant release of sediment)	Moderate/minor
	Chemical contamination	Low (increase in pollution risk due to the presence of vehicles/plant on site, the use of cement, and the connection between the drainage ditches and the River Don however there would be significant attenuation)	Moderate/minor	Low (measures taken to minimise the risk of chemical contamination)	Moderate/minor
Agricultural drainage ditches	Sediment release	Medium (excavation works will disturb the ground and have the potential to	Moderate / minor	Low (implementation of sediment control measures; engineering design of	Minor

Table 3-3: Hydrology, Geology and Soils Impact Summary - Construction Phase

Receptor (Sensitivity)	Potential Impact	Magnitude	Significance before mitigation	Magnitude after Mitigation	Residual Significance
(Low)		release sediment; the parts of the ground profile dominated by cohesive clay, should be relatively resistant to erosion. Sand layers may be more difficult to control)		banks to minimise risk of failure)	
	Chemical contamination	Medium (slight increase in pollution risk due to the presence of vehicles/plant on site, and the use of cement)	Moderate/minor	Negligible (measures taken to minimise the risk of chemical contamination)	Negligible
Wet grassland/ subsidence flashes within the study area	Improved drainage, damaging the habitat	Medium (significant improvement of drainage where new or widened ditches intersect topographic lows)	Moderate	Medium – no mitigation measures to be taken	Moderate
(Mealum)	Sediment release and/or chemical contamination	Medium (the wet grassland/subsidence flash areas are at/close to the proposed new drains so there will be increased risk of pollution during site works)	Moderate	Low (mitigate measures to prevent significant release of sediment)	Moderate/minor
Groundwater in the Sherwood Sandstone SPZ3 (High)	Chemical contamination/ sediment release	Medium (across most of the area, the underlying aquifer is protected by between 1 and 5m of clay)	Major/Moderate	Medium (to minimise risk to the groundwater, the drains would have to be redesigned in the areas where the Sherwood Sandstone is close or at the current design bed level – this re-design has not yet taken place so the residual significance does not change)	Major/moderate
Groundwater in the drift (Low)		Medium (pollution risk to drift groundwater. The superficial geology map (IGS, 1971) shows most the areas where work will be undertaken are covered by an upper clay layer of the 25 foot drift, however SI boreholes show some central areas (BHs C and D) that have an upper sand	Moderate/minor	Low (measures taken to minimise risk of chemical contamination/sediment release)	Minor

Receptor (Sensitivity)	Potential Impact	Magnitude	Significance before mitigation	Magnitude after Mitigation	Residual Significance
		layer which would be vulnerable)			
Groundwater abstractions (High)	Chemical contamination	Medium (the clay in the upper part of the drift covering most of the study area helps to protect the groundwater from contamination originating at the surface. Some areas which only have a layer of sand drift cover over the aquifer are more vulnerable. The study area falls within SPZ3 of the Great Heck PWS groundwater abstraction so drain cuts that are proposed at depths reaching the sandstone could be a risk however there would be attenuation before contaminants could reach the abstraction)	Major/Moderate	Low (measures taken to minimise the risk to groundwater)	Moderate

Table 3-4: Hydrology, Geology and Soils Impact Summary - Operational Phase

Receptor (Sensitivity)	Potential Impact	Magnitude	Significance before mitigation	Magnitude after Mitigation	Residual Significance
Soil / subsoil (Medium)	Compaction	Low (localised compaction of soil along vehicle access routes, but only during occasional maintenance works)	Moderate/minor	Low (unavoidable impact)	Moderate/minor
	Erosion	Low (possible erosion/slumping of steep, poorly-vegetated, ditch banks; however, the upper part of the ground profile is cohesive and not very prone to erosion/slumping)	Moderate/minor	Negligible (measures taken to prevent significant erosion/failure of ditch banks)	Negligible
	Contamination	Low (slight increase in pollution risk due to the presence of vehicles/plant on site	Moderate/minor	Low (measures taken to minimise the risk of chemical contamination)	Moderate/minor

Receptor (Sensitivity)	Potential Impact	Magnitude	Significance before mitigation	Magnitude after Mitigation	Residual Significance
		during maintenance works, and possibly the storage of fuel/lubricants at the pumping stations)			
River Don (Medium)	Sediment release	Low (sediment released into the drainage ditches by erosion/slumping could potentially find its way into the River Don)	Moderate/minor	Negligible (engineering design to prevent significant erosion/failure of ditch banks)	Negligible
	Chemical contamination	Low (slight increase in pollution risk due to the presence of vehicles/plant on site during maintenance works, and possibly the storage of fuel/lubricants at the pumping station)	Moderate/minor	Low (measures taken to minimise the risk of chemical contamination)	Moderate/minor
Agricultural drainage ditches (Low)	Sediment release	Low (possible erosion/slumping of steep, poorly-vegetated, ditch banks, releasing sediment; the clay sections of the ground profile are cohesive and not very prone to erosion/slumping. Sand will be a greater risk of erosion/slumping)	Minor	Negligible (engineering design to prevent significant erosion/failure of ditch banks)	Negligible
	Chemical contamination	Low (slight increase in pollution risk due to the presence of vehicles/plant on site during maintenance works, and possibly the storage of fuel/lubricants at the pumping stations)	Minor	Low (measures taken to minimise the risk of chemical contamination)	Minor
Wet grassland/ subsidence flashes within the study area (Medium)	Sediment release and/or chemical contamination	Low (the wet grassland/subsidence flash areas are at or close to the new drain locations so if they still exist after the construction phase there will be a slight risk of sediment release or chemical contamination associated with maintenance vehicles)	Moderate/minor	Negligible (measures taken to minimise the risk of chemical/sediment contamination)	Negligible

Receptor (Sensitivity)	Potential Impact	Magnitude	Significance before mitigation	Magnitude after Mitigation	Residual Significance
	Improved drainage, damaging the habitat	Medium (improvement of drainage expected in subsidence flash/waterlogged areas due to construction of new drains and re-grading of existing drains)	Moderate	Medium No mitigation measures to be undertaken	Moderate
	Intensification of agriculture following improved land drainage	Medium (the new/improved drainage network is likely to drain wetland/subsidence flash areas, which will then, once again, be used for arable farming if conditions are suitable)	Moderate	Medium (no mitigation measure to be undertaken)	Moderate
Groundwater (Sherwood Sandstone SPZ3) (High)	Chemical /sediment contamination	Negligible (the new drains and reprofiling will not significantly change the vulnerability of the aquifer)	Negligible	Negligible (mitigation measures such a lining taken to minimise the risk to groundwater)	Negligible
Groundwater in the drift (Low)		Low (pollution risk to drift groundwater during routine maintenance of drains. The superficial geology map (IGS, 1971) shows most the areas where work will be undertaken are covered by an upper clay layer of the 25 foot drift, however SI boreholes show some central areas (BHs C and D) that have an upper sand layer which would be vulnerable)	Minor	Low (measures taken to minimise risk of chemical contamination/sediment release)	Minor
Groundwater abstractions (High)	Chemical contamination	Medium (the new drains and reprofiling will not significantly change the vulnerability of the aquifer)	Major/Moderate	Low (mitigation measures such a lining taken to minimise the risk to groundwater)	Moderate

3.5 Cultural Heritage, Archaeology and Material Assets

3.5.1 Introduction and Methodology

A Cultural Heritage Assessment (CHA) was carried out for an area of proposed mining subsidence remediation works for land between Great Heck and Whitley, North Yorkshire (centred at NGR: SE 5750 2100). The assessment was undertaken by FAS Heritage, on behalf of JBA Consulting for The Coal Authority. The report makes use of an earlier CHA undertaken for a previous scheme of proposed mining subsidence remediation works (FAS Heritage 2012). Desk-based research and report preparation were undertaken during March and April 2017.

3.5.2 Results

Heritage assets within the study area include a Scheduled Monument, three Listed Buildings and eight Protected Military Remains, in addition to non-designated assets, and range in date from prehistory to the present day. Evidence for prehistoric activity is characterised by evidence for Iron Age and Romano-British settlement and field systems recorded as cropmarks and during archaeological monitoring at Hensall Quarry. The frequency of these sites demonstrates the possibility that other hitherto undetected sites may exist within the area.

The development of the medieval rural landscape is comparatively well-attested. The village of Whitley and the hamlet of High Eggborough enter the documentary record in the Domesday survey and retain some legibility of medieval field systems and landholding. Medieval ridge and furrow cultivation is evidenced in the study area by cropmarks and to a lesser degree earthworks; evidence for ridge and furrow cultivation can be followed into the post-medieval period along with piecemeal wetland reclamation.

During the post-medieval and early modern periods the landscape of the study area experienced considerable change, beginning with piecemeal reclamation, drainage and enclosure. This period saw increased importance of waterborne and rail transport exploiting the region's natural resources. The area was linked to the canal network with the cutting of the Knottingley and Goole canal in the early 19th century and the Heck Bridge and Wentbridge Railway represents an early but failed attempt to open up the limestone resource as Kirk Smeaton to the national market. The canal was followed by a succession of railway lines in the area, the first the Wakefield, Pontefract and Goole Railway, followed quickly by the Hull Doncaster Railway and eventually by the extension to the Great Northern Railway. During the 20th century the transport infrastructure of the region also experienced development with the construction of the M62 motorway. The 20th century saw the development of the local coal industry, with the construction of the Eggborough and surrounding power stations and the development of the Kellingley colliery.

3.5.3 Conclusions

The CHA has demonstrated that any impact of the proposed mining subsidence remediation works on the heritage assets of the Great Heck and Whitley area will be minor or negligible. No remains of exceptional, considerable or local significance will be impacted. There remains the potential for the proposed works to have a more significant effect on the remains of hitherto undetected sites.

The greatest impact will be caused by the new drains, and the construction of the new pumping station. It is recommended that a continuous archaeological watching brief be maintained during these groundworks, to allow for the investigation and preservation by record of any hitherto unknown archaeological remains to be impacted by the works.

The regrading of drains is likely to have only a minor effect on below ground remains, restricted to a small area at the edge of the extant drains. It is recommended that these works be monitored intermittently by the archaeological contractor, to ensure that any archaeological features exposed within the newly graded section are preserved by record.

4 Summary and Conclusions

Table 4-1 summarises the conclusions of each of the aspects of the environment likely to be significantly affected by the proposed drainage works.

Table 4-1: Summary of Assessments

EcologyPermanent loss of small areas of habitat (arable, poor semi-improved grassland, subsidence flashes), five trees, and the potential for subsidence flash habitats to re-form.Area of habitat affected kept to a minimum and use existing access tracks.The evaluation of the ecologic impacts, likely to be generated the proposed mining subsider remediation scheme at Great determined that the construction phase would result in the ecol features in the study area gen experiencing temporary negati impacts. However, these impact are reversible once works are complete and disturbing activi stop, and through mitigation.Disturbance of protected species, in particular bird populations, but also potentially Badger, Otter, bats, Grass Snake, Brown Hare and Eel.Monitor channel vegetation recolonisation and undertake additional planting if required.The operational phase of the scheme is assessed as having significant, permanent, negati impacts on subsidence flash habitats, and the bird population	ice
populations, but also potentially Badger, Otter, bats, Grass Snake, Brown Hare and Eel.Monitor channel vegetation recolonisation and undertake additional planting if required.The operational phase of the scheme is assessed as having significant, permanent, negati impacts on subsidence flash habitats, and the bird populati they support, as these feature	gical ted by lence at Heck, iction cological enerally gative pacts are tivities n.
Internal spread of hore native, invasive Himalayan Balsam.mitigation, if required.be permanently lost. Given the rationale of the project and the requirement to fulfil the duties Coal Mining Subsidence Act 1 the project cannot avoid the IrAccidentalAccidentalAccidentalAccidental	ring ative h ations ures will the the es of the ct 1991,
Contamination of watercourses through sediment release and pollution incidents.Any flooding lighting to be angled downwards and fitted with a cowl to direct light to the ground.Interpolect cannot avoid the to these habitats and the impacts the waterbird species they sup which can only be partially compensated for by the new watercourses and inclusion of on new/re-graded drains with berms.Increase in length of drainage ditch habitat within the study area and 820m of new/re- graded drains with berms.Produce method statement for working in areas with the potential to support Grass Snake, which will detail vegetation management techniques required.Other operational impacts are assessed as not being signific as having a positive impact th an increase in open ditch hab and increased diversity in ditch	 Noss of acts upon support, Nos of berms irses. are ificant, or through abitat litch
Badger, Otter and other fauna.A range of mitigation measure have been suggested to minimise/offset impacts on oth habitats and species.Develop appropriate mitigation strategy to prevent the spread of Himalayan Balsam.A range of mitigation measure have been suggested to minimise/offset impacts on oth habitats and species.Schedule works to commence outside of the key breeding bird season.No significant impacts are exp on any statutory or non-statut nature conservation sites as a of this scheme, either alone or commencement of works and vegetation clearance between March and September.No significant impacts are exp on any statutory or non-statut nature conservation sites as a of this scheme, either alone or combination with any other play projects.Implement measures to prevent significant release of sediment and chemical contamination.Overall impact: No significat subsidence flashes and we birds which is assessed as a permanent, negative impact	ures other expected tutory s a result or in- plans or <i>icant</i> <i>icant</i> <i>in</i> <i>wetland</i> <i>as being</i> <i>pact</i>

Торіс	Key Issues	Mitigation Measures	Assessment of Significance
		Regular monitoring of pumping station and if Eel entrainment is occurring.	
Landscape and Visual Amenity	Direct impacts on the landscape fabric (e.g. arable land, trees, and watercourses). Visual impacts associated with construction traffic and plant. Visual impacts of new permanent drainage infrastructure (e.g. pumping stations).	Construction period kept to a minimum and phased. Tree removal kept to a minimum and trees felled replaced by replanting in original position. Green paladin fencing to be used around the stations and hedgerows planted to provide additional screening.	The evaluation of the landscape impacts likely to be generated by the proposed drainage works determined that the construction and operation phases would result in a limited number of landscape receptors sustaining a negligible to minor magnitude of landscape impact. It is concluded that overall the mining subsidence remediation works are acceptable in landscape terms as few landscape receptors will be adversely affected and any changes in landscape character will be short-term. The visual assessment concludes that the proposed mining subsidence remediation works would be acceptable in terms of its overall visual effects upon identified receptors. The introduction of a new pumping station and the loss of a small number of trees will result in minor adverse impacts to some visual receptors, however, in the long-term through replanting and screening of the pumping station, this will be reduced.
Hydrology, Geology and Soils	Soil erosion and compaction due to excavations, the movement of heavy plant on site and the stockpiling of materials. Release of sediment into surface watercourses, increasing their turbidity and nutrient content. Potential chemical contamination of soil, surface water and groundwater. Improved drainage of wet grassland/subsidence flash areas, including lowering of water levels, removing the habitat which was present.	Design ditch profiles and cross- sections in such a way as to minimise the risk of bank failure and erosion. Design ditch profiles and cross- sections in such a way as to minimise the change in the connectivity of the drains with the underlying bedrock aquifer. Measures to be taken to prevent significant release of sediment and chemical contamination, which will be detailed within a Construction Method Statement (CMS) and Environment Management Monitoring Plan (EMMP).	Construction and re-grading of drains at Great Heck involves several phases and activities which may potentially affect the soil, hydrological and hydrogeological environments. One of the threats is chemical/ sediment contamination to the Sherwood Sandstone aquifer. However, a hydrogeological risk assessment has demonstrated that this risk will be negligible. The only other noteworthy affect is the drying out of wetland habitat in the subsidence flash areas, as a result of the improved drainage. However, as this is the purpose of the scheme no mitigation measures have been recommended. <i>Overall impact: Moderate / Minor</i> <i>Adverse</i>

Key Issues	Mitigation Measures	Assessment of Significance
study area leading to lowered groundwater levels which could impact on wetland SINC sites (however, Balne Common Drain acts as an effective hydraulic barrier between the works and SINC sites and therefore changes in water levels will be negligible).		
Construction of pumping station within study area	Intermittent monitoring of works by an archaeological contractor during re-grading phase.	The CHA has demonstrated that any impact of the proposed mining subsidence remediation works on the heritage assets of the Great
Re-grading of existing drains within study area	Continuous archaeological watching brief maintained during the pumping station	Heck and Whitley area will be minor or negligible.
Creation of new drains within study area has the potential to uncover previously unknown archaeological remains.	groundworks phase of construction. Area of land affected kept to a minimum.	No remains of exceptional, considerable or local significance will be impacted. There remains the potential for the proposed works to have a more significant effect on the remains of hitherto undetected sites.

Topic

Cultural

Heritage, Archaeology

and Material Assets

The greatest impact will be caused by the cutting of the new drains, and the construction of the new pumping

The re-grading of drains is likely to have only a minor effect on below ground remains, restricted to a small area at the edge of the extant

Overall impact: Negligible / Minor

station.

drains.

adverse

JBA consulting



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