3 Geology

3.1 Solid Geology

According to the British Geological Survey 1:50,000 scale Solid and Drift Sheet 77 (Huddesfield), Queensbury Tunnel passes through the Lower Coal Measures (Westphalian A Group). This formation comprises of a sequence of interbedded strata of the Elland Flags and various coal seems. The Holmfield cutting is hewn from Rough Rock Flags (Milstone Grit Series).

3.2 Mining and Quarrying

The area of Queensbury has been subject to extensive near surface and deep mining activity in the past. Moreover, the Mining Report supplied by The Coal Authority states that for the Queensbury Portal section of the tunnel, "...the property (tunnel) is within the likely zone of influence on the surface from workings in 2 seams of coal at 40m to 100m depth, the last date of working being 1903." It is also noted that other seams have been worked in this area at some time in the past. There are several mine entries, shafts and adits, at the Queensbury Portal area.

Within the mid section of the tunnel, directly beneath the town of Queensbury itself, the Mining Report states that the tunnel is within the likely zone of influence from 2 seams from 100m to 150m. The last date of working being 1931.

The Holmfiled Portal section is within the likely zone of influence of 1 seam of coal from shallow to 50m depth, last worked in 1941. There are several shafts and adits within close proximity to the tunnel at this loacation.

There is a strong likelihood that coal seams, shafts and adits are located within a close proximity to the tunnel. Further information has been obtained from Mining Engineers Report to the Chief Engineer, Great Northern Railway. It reports to "...the Halifax Soft seam which lies at a depth of only 20yds. from rail level." and "...the Halifax Hard seam which is worked adjacent to the tunnel."
It also refers to the fireclay seams "...the headings which have been put over and above the tunnel have not yet been filled up."

No reference has been obtained as to the final condition of these workings, however, being at a level below the ground water level it can be considered that those at tunnel level may be flooded.

3.3 Industrial Processes

At the Holmfield Portal, 1 seam of fireclay at shallow depth was worked until 1946. The works for this activity were situated adjacent to Holmfiled cutting and now site a Pre-cast concrete factory. (see figure 4.1).

4 Surface Water Hydrological

4.1 Introduction

A site visit and a desk study have been undertaken to investigate reasons for the collection of water at the Holmfield portal and detail further investigations required.

4.2 Site Observations

A site visit was made by a Hydrologist and Geotechnical Engineer to the southern and northern tunnel portals on Wednesday 22nd February 2005. During the visit the weather was cold with occasional snow, with approximately 30mm of snow lying on the ground at the site.

4.3 Northern Portal

A number of springs were seen above the level of the Queensbury (northern) portal which are in the main picked up by two watercourses which pass the portal entrance and enter a brick culvert. On the day of the site visit there were significant flows in both these watercourses (Refer to Figure 4.1, Appendix A). It appears that the brick culvert flows to the north east, against the topographic slope, across the site of the old station area, to discharge to Hole Bottom Beck (Refer to Figure 4.1). As the topographic fall, between the old station site and the portal, is generally towards the tunnel portal this brick culvert has an important role to play in preventing significant quantities of water entering the tunnel.

During the site visit it was observed that water was entering the tunnel by virtue of a significant flow down the north west abutment slope adjacent to the portal. This water is thought to emanate from the ground surface above from either the watercourse above or a spring. The water was ponding at the tunnel entrance to a depth of approximately 150mm and flowing into the tunnel (Refer to Photograph no.10).

It was evident, from the sound of falling water from within the tunnel, that there was groundwater ingress to the tunnel.

4.4 Southern Portal

The Holmfield (southern) portal was flooded to a depth of approximately 4 metres (Refer to Photograpgh no. 5). At this location the tunnel opens into a rock cutting approximately 8 metres deep. The invert level of this cutting appears to continue to fall away from the portal. Approximately 150m downstream of the tunnel portal a brick lined aqueduct conveys a watercourse, from north to south, over the cutting, (Refer to Photograph no. 4 and Figure 4.1). A small amount of leakage from the aqueduct to the cutting was observed on its western abutment. The water ingress visible on the western rock cutting immediately outside the tunnel portal suggested that the adjacent groundwater levels were approximately 2 metres higher than the retained water level (Refer to Photographs 6, 7 and 8).

The void under the aqueduct had been filled, as had the cutting to the south west of this location (Refer to Photographs 2 and 3). This filling has the effect of restricting the flow of water downstream and results in the water below a certain level ponding

in the disused rail cutting up to the tunnel portal and into the tunnel itself. As the water table condition observed was higher than the ponded water level it seems likely that water is flowing away to ground beyond the informal dam, although no such discharge was observed.

Further local investigations highlighted two discharges from the adjacent pre-cast concrete works. The first was a significant white coloured flow which flows down the slope directly into the cutting. Closer inspection showed that this arose from an informal overflow from a sludge tank located at the top of the slope inside the pre-cast yard. This appeared to arise as a result of some fault in the operation of the sludge tank, possibly as a result of a pump failure or a blockage. The second was a small discharge of foul sewage via a dilapidated sewage treatment facility located just above and to the east of the tunnel portal. Any flows from this latter source appear to run down the slope and collect at the top of the tunnel portal.

4.5 Desk Study

The 1:25,000 scale Ordnance Survey Explorer Map of the area (Sheet 288) has been examined to provide information of the area. The levels on the map, together with the observations made during the site visit, suggest that the tunnel falls from the northern portal, at an invert level of approximately 240m AOD, to the southern portal which has an invert level of approximately 230m AOD.

The hill under which the tunnel passes forms part of the catchment divide between the River Aire to the north and the River Calder to the south. Thus in the natural condition, without the tunnel, the area occupied by the northern portal would drain north east towards the River Aire and that occupied by the southern portal south to the River Calder. However, with the tunnel present the northern portal drains through the tunnel to the southern portal and hence onwards to the River Calder.

Annual average rainfall in the area is approximately 1100 mm and open water evaporation is estimated to be approximately 650 mm/yr.

There are a number of springs indicated on the map which suggest that the groundwater level above the tunnel could be significantly higher than the tunnel roof. However, the complex nature of the geology at the site may cause perched water tables in the area.

Each of the two tunnel portals has a natural drainage catchment area that could contribute runoff to the tunnel portal. The northern portals catchment area is approximately 17ha. That of the southern portal is approximately 34ha, although a significant proportion of the runoff from this is probably intercepted by the drainage system associated with the pre-cast concrete works adjacent.

The watercourse conveyed over the southern portal approach cutting serves a catchment area of approximately 3 km^2. Flows in this watercourse could therefore be significant.

4.6 Source of Water

Table 1 below provides a summary of the sources of water that may contribute to the tunnel flooding.

*Source	Location	Details	Discharge Type	Magnitude
A	Northern Portal	Groundwater inflow	Continuous	Small
B	Northern Portal	Overflow from watercourse/spring	Continuous	Significant
C	Northern Portal	Direct rainfall	Intermittent	Small
D	Northern Portal	Rainfall runoff	Intermittent	Small
E	Southern Portal	Aqueduct Leakage	Continuous	Small
F	Southern Portal	Sludge tank overflow	Continuous	Significant
G	Southern Portal	Sewage	Continuous	Small
H	Southern Portal	Direct rainfall	Intermittent	Small
I	Southern Portal	Rainfall runoff	Intermittent	Small
J	Tunnel	Leakage	Continuous	Unknown
K	Air Shafts	Leakage	Continuous	Unknown

*Source locations as noted on figure 4.1, Appendix A

Note: Flood sources A to I are external to the property owned by BRB (Residuary) Ltd.

Table 1 – Summary of known Water Sources Discharging to Tunnel and Portals.

5 Conclusions & Recommendations

5.1 Stage 1 Determination of Cause of Tunnel Flooding

Water is collecting at the southern end of the tunnel due to infilling of the original approach cutting under the aqueduct crossing and further to the south. The water emanates from various sources, from both portals and the tunnel itself, as detailed in Table 1. Some of these water sources could be removed or diverted. However, some cannot and as a consequence water will continue to collect at this location in the future. There is a need to find a long-term solution to the problem by providing a discharge from the cutting.

The brick lined culvert between the northern portal and the Hole Bottom Beck serves an important function in diverting flows away from the existing tunnel portal presently. This alignment, connectivity and condition of the culvert needs to be better understood and measures taken to safeguard it's continued future operation.

5.2 Recommendations

Following the site visit and desk study to examine the reasons for the flooding to the southern portal we make the following recommendations to alleviate the flood water from the tunnel:

1. That the connection and condition of the brick lined culvert from the northern portal to the Hole Bottom Beck is examined by CCTV survey.
2. That contact be made with the pre-cast concrete works owner adjacent to the southern portal with a view to preventing their sludge tank overflow discharge contribution to the flooding.

That a further study is commissioned to:

1. examine options to discharge water from the cutting at the southern end of the tunnel on a permanent basis. This may take the form of a new ditch, horizontal directional drilling through the cutting fill to create a drain, or pumping up into the existing Strines Beck either a short or long term pumping operation. This will require topographic survey to be commissioned to establish the relative levels of the watercourse and the cutting. It would also require a condition survey of the existing Strines Beck structure, as advised by the Environment Agency. The course of Strines Beck south of Holmfield cutting has been identified in Figure 5.2.1.
2. examine methods to eliminate the watercourse overflow/spring discharge at the northern portal that contributes a significantly to the flooding.
3. examine the possibility of installing cut off ditches to intercept discharges above both tunnel portals. Installation of cut off ditches above both tunnel portals could divert some of the discharges to adjacent watercourses and thus significantly reduce the quantity of water reaching the tunnel. Items 5 and 6 will require discussions with land owners prior to undertaking any work.
4. examine the possibility of creating a storage retention system within Holmfield cutting.

5.3 Proposals for future Stage 2 Report – Tunnel Inspection

The works remit (see BRB Residuary letter of 31st August) required an inspection of the tunnel to be carried out to determine the effects of the flooding on the lining. As stated previously, this would be assessed under a Stage 2 Report

An inspection may be made to observe the lining where it has been subjected to rise and fall of water level. An inspection at this stage would involve health and safety issue working in the flooded tunnel, in which methane has been reported met. Due to the proximity of coal measures in the area, there is a significant methane level risk.

It is considered that inspection of the visible areas of the tunnel lining would not give a representative indication of the deterioration due to the flooding and therefore such an inspection is not warranted given the associated risks.

It is therefore recommended that all efforts be made to remove the flood water (subject to issues noted below) prior to internal examination of the tunnel.

Any future removal of the flood water should consider the effects of draw down rate on the tunnel lining. The draw down rate should be such that the pore water pressures behind the lining have time to dissipate without causing damage to the lining.

Prior to any works to be carried out it is recommended that an Eco survey of Holmfield cutting is carried out. This shall include water testing to determine levels of contaminants in the water, so that authorisation to discharge the water from the cutting can be sought from the EA.

5.3.1 Summary of Stage 2 Proposals

- Pump out water from Holmfield cutting – discharge into Strines Beck
- Create a dam and pump out water from cutting within the portal area only to reduce the pumped volume of water - discharge into Strines Beck
- Engage 3rd parties, i.e. Environment Agency, landowners.

Appendix A - Drawings and Figures

Figure 1.1 Queensbury Tunnel Site Location Plan
Figure 1.2 Queensbury Tunnel Site Location Plan
Figure 5.2.1 Course of Strines Beck south of Holmfield Cutting
Drawing no. J24110/FJ/HQU-3D/0001. Plan of Queensbury tunnel and surface Mapping

HQU/3D – Queensbury Tunnel

Figure 1.1

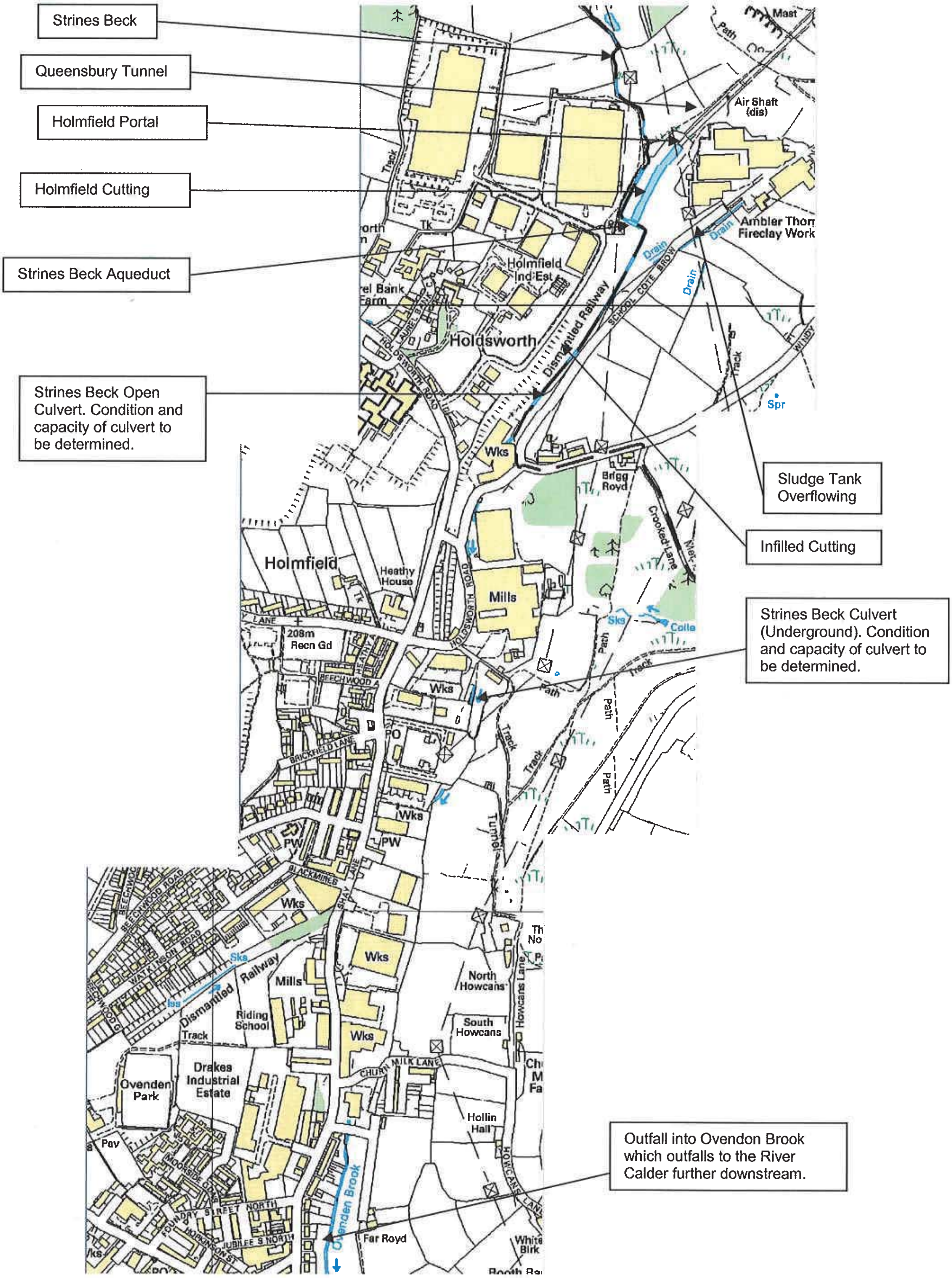

Strines Beck
Queensbury Tunnel
Holmfield Portal
Holmfield Cutting
Strines Beck Aqueduct
Strines Beck Open Culvert. Condition and capacity of culvert to be determined.
Sludge Tank Overflowing
Infilled Cutting
Strines Beck Culvert (Underground). Condition and capacity of culvert to be determined.
Outfall into Ovendon Brook which outfalls to the River Calder further downstream.
Air Shaft (dis)
Ambler Thorn Fireclay Work
Holmfield Ind Est
Holdsworth
Dismantled Railway
Holmfield
Heathy House
Mills
Brigg Royd
Crooked Lane
Recn Gd
Wks
PO
PW
Tunnel
Riding School
Drakes Industrial Estate
Ovenden Park
North Howcans
South Howcans
Hollin Hall
Ovenden Brook
Far Royd

Figure 5.2.1

Appendix B - Photographs

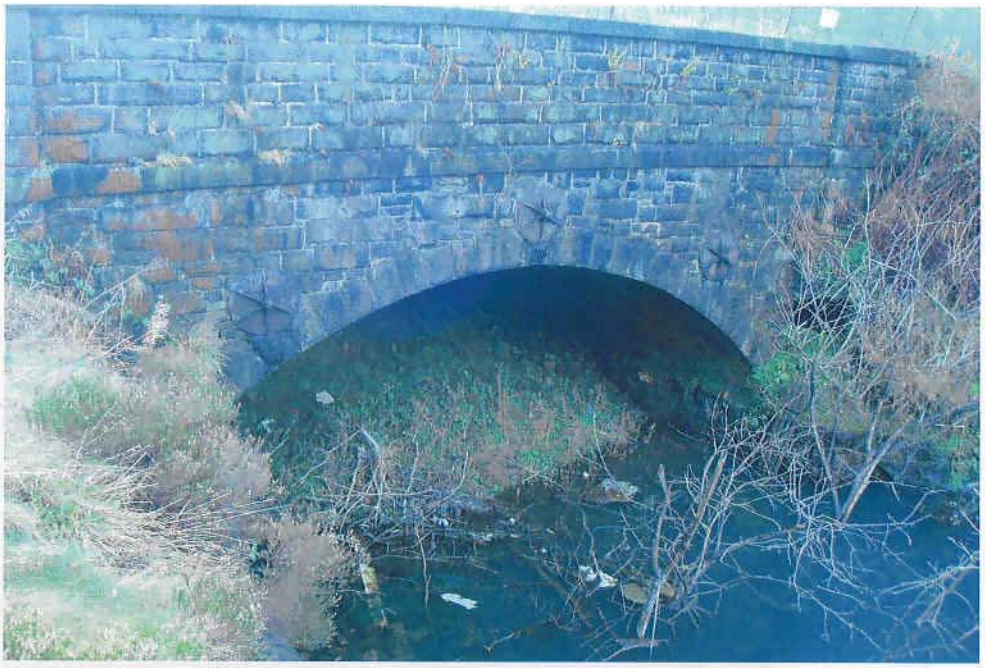
Photograph 1 **Holmfield (south) Portal**

Photograph 2

Photograph 3 Holmfield (south) Portal showing extent of Holmfield cutting. Picture taken from Strines Beck Aqueduct.

Photograph 4 Holmfield Cutting. View towards Strines Beck Aqueduct. Level of groundwater seepage through rock cutting evident 1 m (approx) above water level.

Photograph 5 Strines Beck Aqueduct – Infill material beneath.



Photograph 6 **Strines Beck Aqueduct – Infill material beneath**

Photograph 7 **Watercourse on Strines Beck Aqueduct. South Portal to left of picture.**

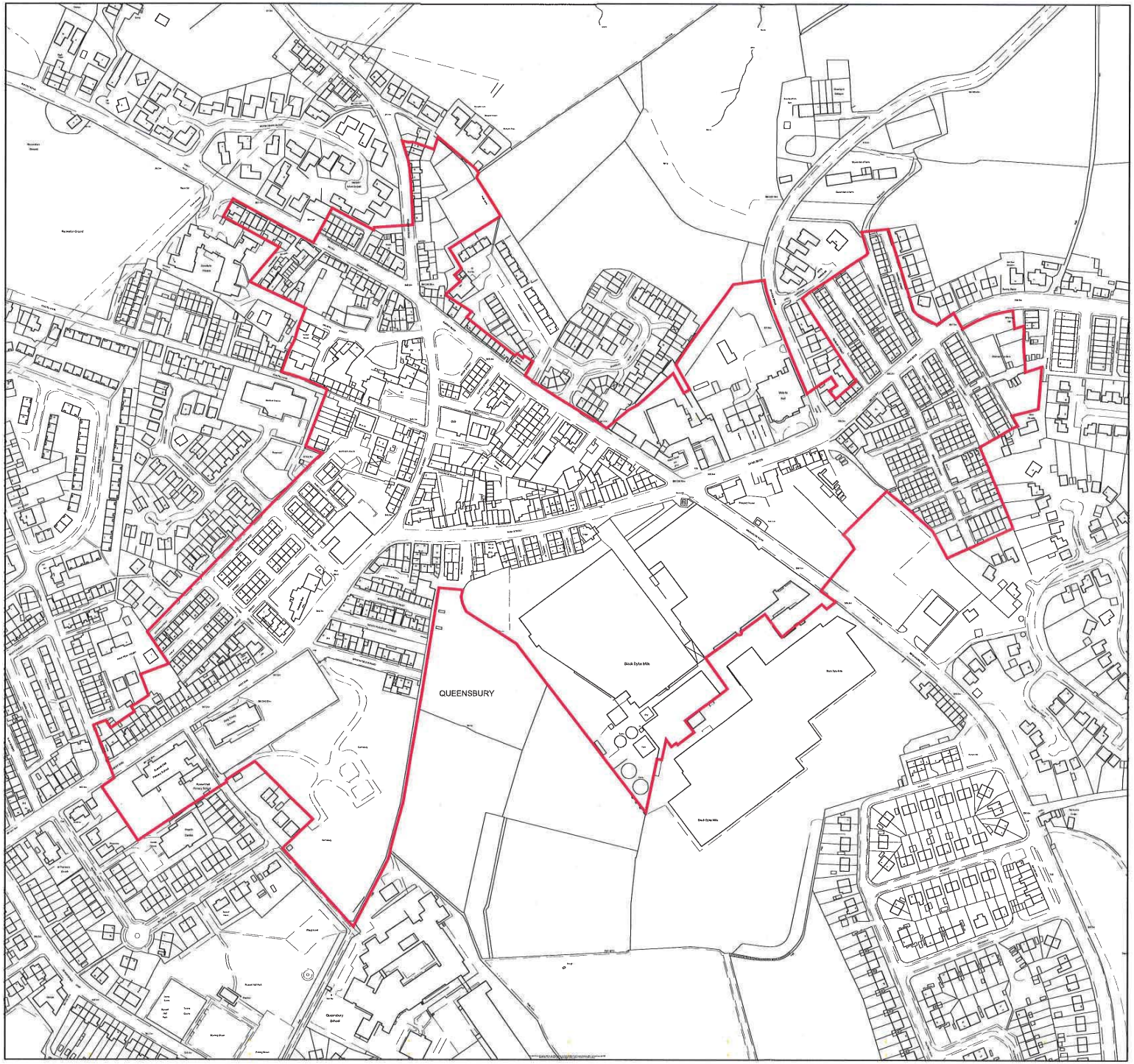
Photograph 8 View looking south of infilled cutting south of Strines Beck Aqueduct. Course of Strines Beck running south along left of picture

Photograph 9 View of Queensbury (north) Portal. Course of culvert running along right hand side cutting (mid height of slope)

Photograph 10 View of Queensbury (north) Portal. Course of stream can be seen running from top right of picture.

JACOBS

Appendix E Queensbury Conservation Area Plan



QUEENSBURY CONSERVATION AREA

Conservation Area boundary.

FEBRUARY 2004

NORTH

Scale 1:3,000

Highways England
Procurement
Lateral
8 City Walk
Leeds
LS11 9AT

Direct Line: 0300 470 2702

29th August 2018

http://highwaysengland.co.uk

Our ref: HQU/3D
Your ref:

AMCO Rail
Amalgamated Construction Ltd
Head Office
Whalley Rd
Barugh Green
Barnsley
South Yorkshire
S75 1HT

For the attention of: Dave Fisher

CLOSED BRANCH LINES MAJOR WORKS – HQU/3D QUEENSBURY TUNNEL, PARTIAL INFILLING.

Dear Sir,

I refer to your recent tender exercise for the above contract, carried out by Highways England - Historical Railways Estate Team. I am pleased to advise you that you are appointed as Principal Contractor to carry out these works. This letter may be considered as formal notice of the award of contract in the sum of £3,565,744.23 as per your Tender submission received on 31st July 2018.

You should note that we will not pay for any works unless it has been specifically authorised in writing within the terms of the agreement.

Jacobs will be the CDM Principal Designer and the Engineer under the Contract and henceforth all instructions in connection with the project will be issued by them. The construction phase Health and Safety Plan supplied with your revised Tender is under review and no work is to commence on site until this has been prepared to the satisfaction of the CDM Principal Designer and a written notice from Highways England Historical Railways Estate team has been received.

Enclosed is the Tender Agreement for you to sign and return.

Invoices should be sent to FS Payments at Highways Agency, The Cube, 199 Wharfside Street Birmingham B1 1RN, quoting the Blanket Purchase Agreement number, Release number and Receipt number. These details will be provided by the Historical Railways Estate team as works are certified.

I trust the above is acceptable. The agreed Start Date is 17th September 2018. The Completion Date is 31st October 2019. Should you wish to discuss the matter further

please contact Fiona Smith the Project Manager for Historical Railways Estate on 01904 621924.

Please acknowledge receipt of this letter by return

I wish you well in undertaking the works.

Yours sincerely

[redacted]

Suzanne Moran
Procurement Lead for Historical Railways Estate
[redacted]

Compensation Event Form CE0001

Structure Reference:	HQU/3D
Structure Name:	Queensbury Tunnel – Abandonment Works
Early Warning No. (if applicable)	N/A

Description of Change: (inc. reason for necessity of change)

RAM Arch Mesh installation.

Advanced safety works (Phase 1 works) are to be undertaken to support vulnerable sections of the lining inside the tunnel. These advanced works shall comprise the installation of RAM Arch Mesh at the proposed working areas beneath each shaft eye and at discrete locations towards the south portal which are noted to be in particularly poor condition.

These works have been instructed due to delays in obtaining the necessary consents (Planning Permission) to undertake the whole of the abandonment works.

Where this was discussed: • ~~Meeting~~ • Email • Other	**Details:** (Which meeting? Who was it discussed between?) Discussed through e-mails between Fiona Smith (HRE), Dave Thomas & Duncan Bellis (AMCO) and James Wilson (Jacobs).	
Date this was discussed:	04/09/2018 – 06/09/2018	**Was the Client Present?** Yes/~~No~~

Project Impact:

1) Value £ 545,372.50.
2) This has not caused a delay to the Project Completion.

Clause in Scope:	**61.1**

Programme (inc. start date and end date of work in addition to any key dates in between. Event must be split into a series of small tasks with their own set of dates, for start and completion):

The programme duration of the Phase 1 works is 6 weeks and will reduce the remaining, Phase 2 works programme by 4 weeks.

Signed: P. [redacted]

Project Manager

Compensation Event Form CE0002

Structure Reference:	HQU/3D		
Structure Name:	Queensbury Tunnel – Abandonment Works		
Early Warning No. (if applicable)	EW1		
Description of Change: (inc. reason for necessity of change) Investigation works to unblock buried drainage channel. An instruction was given from HRE and Jacobs during a site visit on 24/10/2018 to AMCO to provide suitable plant that would be capable for excavating deeper into the tunnel formation. AMCO proposed the use of a 17t excavator to find and unblock the buried drainage channel.			
Where this was discussed: • Meeting • Email • ~~Other~~	**Details:** (Which meeting? Who was it discussed between?) Discussed between Fiona Smith (HRE), James Wilson & Despoina Katsouli (Jacobs) and Richard Purcell (AMCO). Costs were agreed by e-mail between Dave Thomas, Tom Judge & David Martin (AMCO), HRE & Jacobs.		
Date this was discussed:	24 & 25/10/2018	**Was the Client Present at the meeting?**	Yes/~~No~~
Project Impact: 1) Value £ 5403.04. 2) This has not caused a delay to the Project Completion.			
Clause in Scope:	**61.1**		
Programme (inc. start date and end date of work in addition to any key dates in between. Event must be split into a series of small tasks with their own set of dates, for start and completion): The original programme will not be affected.			
Signed: P.P. **Project Manager** [redacted]			

Compensation Event Form CE0003

Structure Reference:	HQU/3D
Structure Name:	Queensbury Tunnel – Abandonment Works
Early Warning No. (if applicable)	EW2

Description of Change: (inc. reason for necessity of change)

Investigation works to unblock buried drainage channel.

Following the investigations carried out as per EW1 the drain/culvert to the north end of the tunnel has been located and identified; following discussions with AMCO, Despoina Katsouli and James Wilson, during a site visit on 30/10/2018, it has been requested that a new manhole chamber is constructed above the drain to form safe access in order to undertake jetting works (EW3). The chamber will be formed of precast concrete rings, concrete slab and manhole cover.

Where this was discussed: • Meeting • Email • Other	**Details:** (Which meeting? Who was it discussed between?) 30/10: Discussed between James Wilson & Despoina Katsouli (Jacobs) and David Thomas & Richard Purcell (AMCO). 02/11: Costs were provided by e-mail from Dave Thomas, Tom Judge & David Martin (AMCO) to James Wilson & Despoina Katsouli (Jacobs). 06/11: Costs were agreed by phone between Jacobs & HRE.	
Date this was discussed:	30/10 - 06/11/18	**Was the Client Present at the meeting?** ~~Yes~~/No

Project Impact:

1) Value £7,432.71.
2) This has not caused a delay to the Project Completion.

Clause in Scope:	**61.1**

Programme (inc. start date and end date of work in addition to any key dates in between. Event must be split into a series of small tasks with their own set of dates, for start and completion):

The original programme will not be affected.

Signed: P. P[redacted]

Project Manager

Compensation Event Form CE0004

Structure Reference:	HQU/3D
Structure Name:	Queensbury Tunnel – Abandonment Works
Early Warning No. (if applicable)	EW3

Description of Change: (inc. reason for necessity of change)

Investigation works to unblock buried drainage channel.

It has been identified that the drain is significantly blocked/backed up and at this stage we can't determine as to the extent of the blockage. AMCO recommend High Pressure water jetting the drain to attempt to clear built up debris/silt accompanied by regular CCTV surveys throughout the course of jetting works in order to assess the condition of the drain and feasibility of continued jetting, and to identify the outfall should the jetting be successful. At this stage AMCO propose that all debris/silt deposits be jetted into the tunnel itself. This price does not include for any muck away and this will be issued once all parties are aware of the extent of waste, and if it is required to be disposed off site.

AMCO provided a price for 3 days jetting/surveying with daily feedback of their progress back to Jacobs.

AMCO assume no consents are required for the works as the drain is part of the tunnel infrastructure and the initial jetting is unlikely to impact on any watercourses/ponds.

Where this was discussed: • Meeting • Email • Other	**Details:** (Which meeting? Who was it discussed between?) 30/10: Discussed between James Wilson & Despoina Katsouli (Jacobs) and David Thomas & Richard Purcell (AMCO). 02/11: Costs were provided by e-mail from Dave Thomas, Tom Judge & David Martin (AMCO) to James Wilson & Despoina Katsouli (Jacobs). 06/11: Costs were agreed by phone between Jacobs & HRE.	
Date this was discussed:	30/10 - 06/11/18	**Was the Client Present at the meeting?** ~~Yes~~/No

Project Impact:

1) Value £12,510.39.
2) This has not caused a delay to the Project Completion.

Clause in Scope:	**61.1**

Programme (inc. start date and end date of work in addition to any key dates in between. Event must be split into a series of small tasks with their own set of dates, for start and completion):

The original programme will not be affected.

Signed: P. P. [redacted]

Project Manager

Compensation Event Form CE0005

Structure Reference:	HQU/3D		
Structure Name:	Queensbury Tunnel – Abandonment Works		
Early Warning No. (if applicable)	EW4		
Description of Change: (inc. reason for necessity of change) Confined space safe system of work. Following the submission of AMCO's application 1No for Phase 1 of the works at Queensbury, AMCO have identified that they have inadvertently excluded their charges for confined space safe system of works as per items A3591 & A3592. Based on these rates the cost of £35,289.10 was omitted from our price build up for CE001. This is for 6 weeks at rate A3592 and £29,740 for confined space training and safety equipment of rate A3591.			
Where this was discussed: • Meeting • Email • Other	**Details:** (Which meeting? Who was it discussed between?) 09/11: EW was provided by e-mail from Tom Judge & David Martin (AMCO) to Despoina Katsouli & James Wilson (Jacobs). 13/11: Costs were agreed during a meeting between Jacobs & HRE.		
Date this was discussed:	09/11-13/11/2018	**Was the Client Present at the meeting?**	~~Yes~~/No
Project Impact: 1) Value £35,289.10. 2) This has not caused a delay to the Project Completion.			
Clause in Scope:	**61.1**		
Programme (inc. start date and end date of work in addition to any key dates in between. Event must be split into a series of small tasks with their own set of dates, for start and completion): The original programme will not be affected.			
Signed: P. P. [redacted] **Project Manager**			

Compensation Event Form CE0006

Structure Reference:	HQU/3D
Structure Name:	Queensbury Tunnel – Abandonment Works
Early Warning No. (if applicable)	EW5

Description of Change: (inc. reason for necessity of change)

Investigation works to unblock buried drainage channel.

An additional one days jetting and CCTV surveying were required over and above the allowance in CE0004.

Where this was discussed: • ~~Meeting~~ • Email • Other	**Details:** (Which meeting? Who was it discussed between?) 20/11: EW was provided by e-mail from Tom Judge & David Martin (AMCO) to Despoina Katsouli & James Wilson (Jacobs). 23/11: Costs were agreed during a call phone between Jacobs & HRE.	
Date this was discussed:	20/11/2018	**Was the Client Present at the meeting?** Yes/~~No~~

Project Impact:

1) Value £4,170.10.
2) This has not caused a delay to the Project Completion.

Clause in Scope:	**61.1**

Programme (inc. start date and end date of work in addition to any key dates in between. Event must be split into a series of small tasks with their own set of dates, for start and completion):

The original programme will not be affected.

Signed: P. P. [redacted]

Project Manager

Compensation Event Form CE0007

Structure Reference:	HQU/3D
Structure Name:	Queensbury Tunnel – Abandonment Works
Early Warning No. (if applicable)	N/A

Description of Change: (inc. reason for necessity of change)

Work through the collapses to install temporary protection arches & install the pumping system. Additional time for completion of the remaining Phase 1 RAM Arches. The extended programme includes a total of 14 weeks (including 2 week holiday period) to inspect and make safe the tunnel lining between 82ch and the first collapse at 90ch, clear the debris and install temporary colliery arches beneath the collapse areas. A further 3 weeks are included for the installation of the RAM Arch to shafts 1, 2 & 3. As this work is all being undertaken in advance of the main works, this extended programme will not cause a delay to the project completion.

Where this was discussed: • ~~Meeting~~ • Email • Other	**Details:** (Which meeting? Who was it discussed between?) 21/11: E-mail provided from Tom Judge & David Martin (AMCO) to Despoina Katsouli & James Wilson (Jacobs). 22/11: Costs were agreed during a call phone between Jacobs & HRE.	
Date this was discussed:	21/11/2018	**Was the Client Present at the meeting?** Yes/~~No~~

Project Impact:

1) Value £498,861.92.
2) This has not caused a delay to the Project Completion.

Clause in Scope:	**61.1**

Programme (inc. start date and end date of work in addition to any key dates in between. Event must be split into a series of small tasks with their own set of dates, for start and completion):

The original programme will not be affected.

Signed: P. P. [redacted]

Project Manager

Compensation Event Form CE0008

Structure Reference:	HQU/3D
Structure Name:	Queensbury Tunnel – Abandonment Works
Early Warning No. (if applicable)	EW7

Description of Change: (inc. reason for necessity of change)

Tunnel Ventilation.

The original plan was to ventilate from both ends and place the fans outside the tunnel. Due to the access restrictions at the South portal and the flooding, blocking the passage of air, AMCO provided an alternative solution using methods which will force air all the way through from one end of the tunnel to the furthest work location, rather than just halfway. Increasing the capacity of the fans and the ducting to ensure the delivery of the clean air requires more powerful generators (from 65KVA to 100KVA) and therefore the requirement for more diesel. In order to accommodate the fans in the tunnel AMCO need to house them in parallel on a steel frame and connect the outlet sides together via a Y shaped steel ducting, which will then lead into the 1200mm layflat mine ducting. As the fans have been transferred in the tunnel AMCO need to prevent any recirculation of the air. This will happen by using steel tubing on the inlet side and extending this from the fan location to the outside of the portal. The steel tubing will be suspended from the tunnel and exit the portal via a 90 degree bend fixed to the spandrel face.

Where this was discussed: • ~~Meeting~~ • Email • Other	**Details:** (Which meeting? Who was it discussed between?) 12/12: E-mail provided from Tom Judge & David Martin (AMCO) to Despoina Katsouli & James Wilson (Jacobs). 13/12: Costs were agreed via email between Jacobs & HRE.	
Date this was discussed:	12 & 13/12/2018	**Was the Client Present at the meeting?** Yes/~~No~~

Project Impact:

1) Value £115,762.57.
2) This has not caused a delay to the Project Completion.

Clause in Scope:	**61.1**

Programme (inc. start date and end date of work in addition to any key dates in between. Event must be split into a series of small tasks with their own set of dates, for start and completion):

The original programme will not be affected.

Signed: P.P. [redacted]

Project Manager

Compensation Event Form CE0009

Structure Reference:	HQU/3D
Structure Name:	Queensbury Tunnel – Abandonment Works
Early Warning No. (if applicable)	EW8

Description of Change: (inc. reason for necessity of change)

Flood water pumping

During the Christmas holiday period, work has been carried out at Strines Cutting, at the south end of the tunnel to divert water from Strines Beck into the cutting and therefore the tunnel. This had significantly increased flooding levels in the tunnel which has caused progress of the works to slow considerably. AMCO had been instructed and installed a pumping system at approx. ch.85 with a 6" pipe. The water, before their management, was up to the ch.75.

Where this was discussed: • ~~Meeting~~ • Email • Other	**Details:** (Which meeting? Who was it discussed between?) 18/01: E-mail provided from Dave Thomas & Tom Judge (AMCO) to Despoina Katsouli & James Wilson (Jacobs). 18/01: Costs were agreed during a call phone between Jacobs & HRE.	
Date this was discussed:	18/01/2019	**Was the Client Present at the meeting?** ~~Yes~~/No

Project Impact:

1) Value £144,622.67.
2) The overall programme has been affected causing a delay of 1.6weeks (to date) to the Project Completion.

Clause in Scope:	**61.1**

Programme (inc. start date and end date of work in addition to any key dates in between. Event must be split into a series of small tasks with their own set of dates, for start and completion):

Flood management at recommencement of the works prevented other works being undertaken between 02/01/2019 – 11/01/2019 inclusive.

Signed: P. P. [redacted]

Project Manager

Compensation Event Form CE0010

Structure Reference:	HQU/3D		
Structure Name:	Queensbury Tunnel – Abandonment Works		
Early Warning No. (if applicable)	EW9		
Description of Change: (inc. reason for necessity of change) Damaged tracked boom During the Christmas holiday period, work has been carried out at Strines Cutting, at the south end of the tunnel to divert water from Strines Beck into the cutting and therefore the tunnel. This had significantly increased flooding levels in the tunnel which has damaged the tracked boom that had been placed in the formation had been submerged in water over this period.			
Where this was discussed: • ~~Meeting~~ • Email • Other	**Details:** (Which meeting? Who was it discussed between?) 19/03: E-mail provided from Dave Thomas & Tom Judge (AMCO) to Despoina Katsouli & James Wilson (Jacobs). 22/03: Costs were agreed during a phone call between Jacobs & HRE.		
Date this was discussed:	19-22/03/2019	**Was the Client Present at the meeting?**	Yes/~~No~~
Project Impact: 1) Value £3,654.00. 2) This has not caused a delay to the Project Completion.			
Clause in Scope:	**61.1**		
Programme (inc. start date and end date of work in addition to any key dates in between. Event must be split into a series of small tasks with their own set of dates, for start and completion): The original programme will not be affected.			
Signed: [redacted] **Project Manager**			