West Cumbria Water Supplies Project - Thirlmere Transfer

United Utilities

Environmental Statement

Volume 1

Non-Technical Summary

Revision | 0

24 March 2016

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Jacobs U.K. Limited

5 First Street
Manchester M15 4GU
United Kingdom
T +44 (0)161 235 6000
F +44 (0)161 235 6001
www.jacobs.com

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1. Introduction

1.1 Background

1) United Utilities is a statutory undertaker responsible for providing water and sewerage services to around seven million people in north west England including Cumbria, Lancashire, Greater Manchester, Merseyside, most of Cheshire and a small part of Derbyshire.

2) United Utilities is seeking planning permission from Allerdale Borough Council, Copeland Borough Council and the Lake District National Park Authority for the West Cumbria Water Supplies Project – Thirlmere Transfer Scheme (*the Proposed Scheme*).

3) An alternative water supply is required to compensate for the future loss of the existing supply from Ennerdale Water, as the current abstraction licence is scheduled be revoked in 2022. New infrastructure and equipment is therefore required to maintain the piped supply of drinking water (known as potable water) to West Cumbria, in order to ensure an adequate supply/demand balance is maintained and to provide a resilient water supply for the future.

4) The main features of the Proposed Scheme are:

- A pipeline corridor, commencing with a new connection at Bridge End Water Treatment Works (Lake District National Park)
- A new underground 'Raw Water Aqueduct' which would be pipe untreated water to a Proposed Water Treatment Works north of Bridekirk near Hags Wood (Allerdale)
- Distribution of treated potable water via a network of new Network Mains or upgrades to existing pipes
- The construction of other infrastructure, specifically a Service Reservoir (Allerdale), a Pumping Station (Allerdale) and a Service Reservoir and Pumping Station (Copeland), required to pump water under pressure and to hold and store water. Other smaller scale servicing equipment, such as valves, washouts, manholes and kiosks housing equipment, would be required at various locations along the pipeline corridor.

5) The underground pipeline would be approximately 100 km in length and would cross the three local authority areas. The Proposed Scheme would also require the decommissioning of existing United Utilities water supply infrastructure, as water would no longer be abstracted at Ennerdale Water, Overwater and Crummock Water, all of which presently supply the West Cumbria area.

6) Construction of the Proposed Scheme would involve operations over an area covering approximately 374 ha. Once constructed the operational area for the Proposed Scheme would total approximately 95 ha.

7) The location of the Proposed Scheme is presented in Figure 1.

8) A short video explaining the need for the Proposed Scheme is available on the United Utilities website at http://cumbria.unitedutilities.com/west-cumbria-water-supply-project.aspx.

1.2 Environmental Impact Assessment

9) The Proposed Scheme has been subject to a formal process called Environmental Impact Assessment (EIA), in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (the EIA Regulations).

10) This Non-Technical Summary forms Volume 1 of the Environmental Statement, which reports the findings of the detailed EIA undertaken by United Utilities.

1.3 Scoping and Consultation

11) Consultation has taken place at key stages throughout the development of the Proposed Scheme to obtain views and feedback on United Utilities' proposals from the three local authorities, statutory and non-statutory consultees to the planning process and the general public.

12) The EIA Regulations allow the promoters of a proposed development to seek the opinions of relevant planning authorities on the content of the EIA through a process called scoping. United Utilities undertook

scoping studies in 2014, the outcomes of which were recorded in a Scoping Report submitted to the three local authorities in January 2015 as part of a request for a formal Scoping Opinion. United Utilities obtained formal Scoping Opinions from the three local authorities in 2015, which identified the matters to be considered and assessed in the EIA.

13) Consultation on the Proposed Scheme has been undertaken using a range of methods including public exhibitions, meetings and written correspondence to develop and refine the design of the Proposed Scheme, obtain information relating to the existing environment, and to carry out the EIA process.

1.4 Consideration of Alternatives

14) The Proposed Scheme was selected by United Utilities following a three-staged review and selection of options that could potentially address the forecast supply/demand deficit in West Cumbria.

15) The first stage involved a strategic review of three potential options:

- Use surface water from Wastwater and the use of boreholes to obtain groundwater in West Cumbria and North Cumbria
- The transfer of water from Thirlmere Reservoir
- The transfer of water from Kielder Water in Northumberland.

16) Stage 1 identified that Thirlmere Reservoir was the most appropriate supply solution for the West Cumbria area. Thirlmere has sufficient capacity to meet both current and forecasted future demands for Manchester and West Cumbria.

17) The second stage resulted in the development of outline options for the Thirlmere solution. These considered the possible construction of new pipelines and equipment such as Pumping Stations and Service Reservoirs, based on a Proposed Water Treatment Works being constructed at: Thirlmere (Option A), Cockermouth (Option B) and Bothel Moor (Option C).

18) The Stage 2 options were consulted upon, and Option C was selected by United Utilities for operational and environmental reasons.

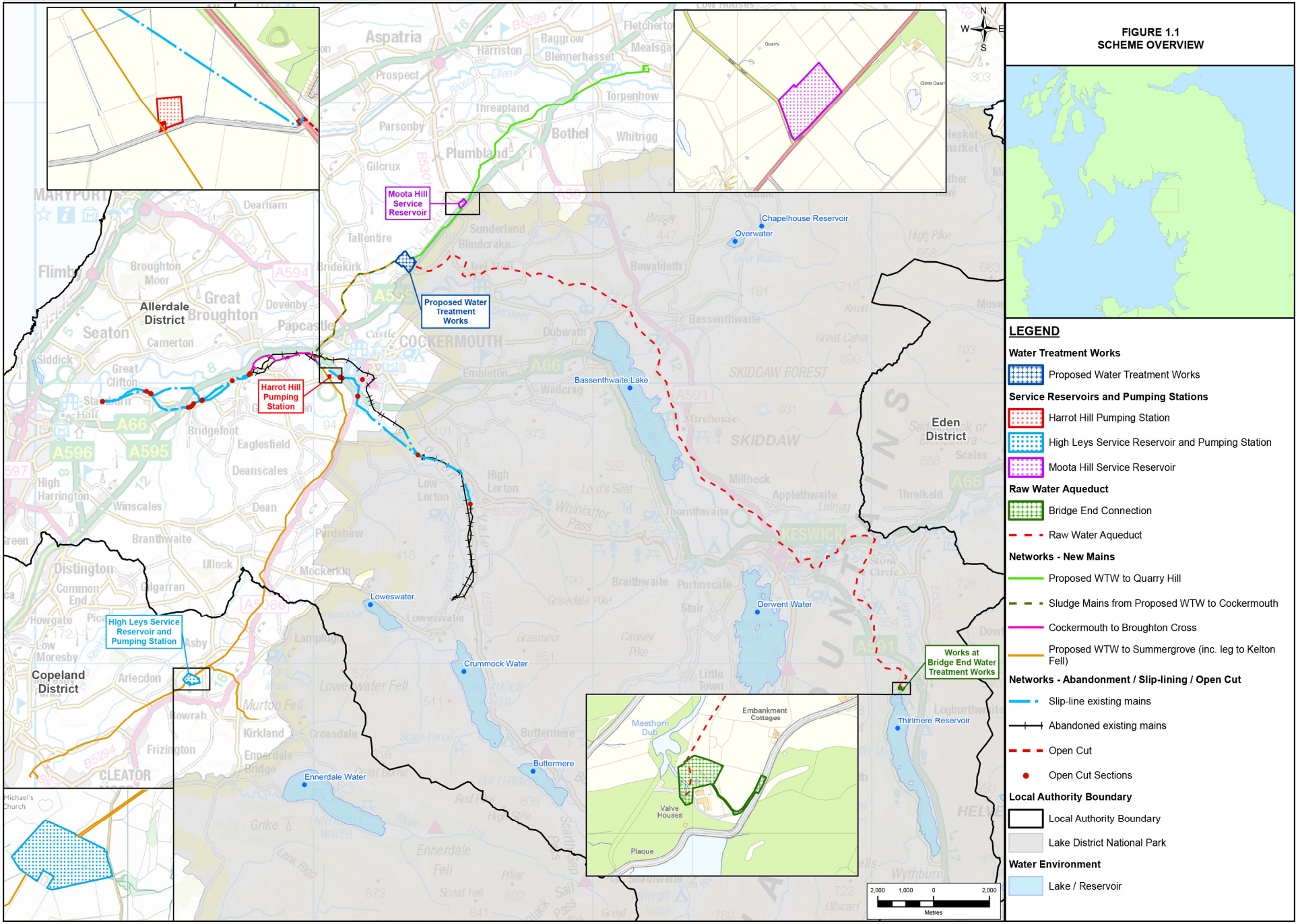
19) The third stage involved the splitting of Option C into a number of sections to help identify specific locations and corridors within which development could potentially take place. Options considered by United Utilities involved the detailed site selection and routeing of pipelines, equipment and infrastructure associated with the Proposed Scheme. The process sought to avoid environmental sites, features and areas wherever possible, and took account of factors such as existing ground levels, accessibility and landform, feedback from landowners and consultees, and the potential for environmental impacts to occur.

20) The Stage 3 options comprised a range of alternatives which were considered as part of the design development process:

- Location and alignment alternatives - in relation to the siting of the Water Treatment Works, Pumping Stations and Service Reservoirs, and potential routes for sections of pipeline connecting different pieces of infrastructure
- Design alternatives – in relation to the appearance of buildings and reservoirs
- Operational and technological alternatives – in relation to pumping solutions and the water pressures required to move water, and the decommissioning of existing infrastructure
- Construction alternatives - in relation to different methods available to build the Proposed Scheme.

21) The Proposed Scheme represents the final solutions selected from the Stage 3 alternatives considered, and includes measures identified by the EIA to avoid or address potentially significant environmental effects that might occur from its construction, operation and maintenance.

Figure 1: Scheme Overview



2. Route Description and Construction

2.1 Overview

22) The scale of the Proposed Scheme is considerable; therefore the EIA has assessed 'Scheme Sections' which relate to various elements of infrastructure which form the West Cumbria Water Supplies – Thirlmere Transfer project. The Scheme Sections are presented in Table 2.1.

23) Scheme Section 1 is the Bridge End connection in the Lake District National Park. Untreated water would be piped through the Lake District through a new Raw Water Aqueduct (Scheme Section 2 – 5) to the Proposed Water Treatment Works near Hags Wood in Allerdale (Scheme Section 6). Here, incoming raw water would be treated through a series of treatment processes to become clean drinking water.

24) The treated water would be pumped through a new Network Main northwards to connect into the existing distribution network at Quarry Hill in Allerdale (Scheme Section 7) via a new Service Reservoir at Moota Hill (Scheme Section 8).

Looking south west towards Keswick and Bassenthwaite Lake (Scheme Section 4)

25) The new Network Main would also extend southwards (Scheme Section 9) to a new Pumping Station at Harrot Hill in Allerdale (Scheme Section 10). From Harrot Hill, the Network Main would continue in a southerly direction via Ullock (Scheme Sections 11 and 12 – south through Allerdale into Copeland) to a new Service Reservoir and Pumping Station at High Leys in Copeland (Scheme Section14).

26) High Leys Service Reservoir would also be linked through a new Network Main to the existing Kelton Fell Service Reservoir (this link forming Scheme Section 13) and Summergrove Service Reservoir (Scheme Section 15).

27) The existing west to east Network Main would be upgraded by decommissioning existing pipes, using a technique called slip-lining to enable re-use of existing pipelines, and the construction of new mains where existing pipelines cannot be reused. This Network Main already extends westwards via Broughton Cross (Allerdale) to the existing Stainburn Service Reservoir, Allerdale (Scheme Sections 16 and 17), eastwards via Cockermouth to Southwaite Farm, Allerdale (Scheme Section 18) and from here carry on south eastwards into the Lake District National Park to the existing distribution network at Cornhow (Scheme Section 19). Scheme Section 20 relates to decommissioning of existing water supply infrastructure and the ending of abstraction from existing water sources such as Ennerdale.

2.2 Scheme Description

2.2.1 Construction Techniques and Timescales

28) Subject to obtaining planning permission, the phased construction of the Proposed Scheme would commence in 2017 for a period of approximately five years, becoming operational from 2022.

29) New underground pipes would be installed through a technique called open cut. This involves digging a trench, laying the pipeline, and then filling it mainly with excavated material.

30) The area immediately surrounding the pipeline is called the working width, and this would be used during construction for vehicle access and temporary soil storage. This working width would be approximately 40 m wide, and could be reduced at locations close to features such as hedgerows.

31) Following construction, future access to the pipeline would be needed for maintenance and inspection purposes. This would be achieved through a permanent easement, which would allow United Utilities access across an area extending up to 7.5 m either side of buried pipelines. Hedgerows and walls would have a lockable gate or access gate/stile fitted to enable future access along the permanent easement.

2.2.2 Enabling Works, Temporary Compounds and Laydown Areas

32) Enabling works would need to take place in advance of the main construction works commencing, and would include the cutting down of vegetation and the erection of fencing and crossing points around the working width.

33) Temporary construction compounds, access routes and areas for laying down pipes would be formed using crushed stone. Construction compounds would provide car parking, plant and machinery storage, cabins and welfare facilities and storage areas for construction materials.

34) Three compound areas are proposed for the Raw Water Aqueduct: the first would be located at the existing Bridge End Water Treatment Works, the second near Keswick, and the third near Isel. A number of mobile compounds would be located between laydown areas, depending on local construction needs.

2.2.3 Pipelines

35) New water supply infrastructure would link with existing infrastructure and the wider water supply network at Quarry Hill, Summergrove, Kelton Fell and Stainburn Service Reservoirs. A number of pipe installation techniques would be employed across the scheme:

- Open cut trenches - involving soil stripping and trench excavation. Pipe sections would be welded together prior to being placed in the trench. These would be placed on a suitable foundation such as crushed rock, and then filled with the excavated material. The top layer of soil would be replaced to return the land to its previous condition, with replacement planting restricted to protect the integrity of the underground pipeline
- Slip-lining - involving the use of pipework of a smaller size than the existing pipes which would be inserted through the existing mains. This method is less intrusive than the open cut technique, but still requires ground excavations at several locations (called launch and reception pits and fitting excavations) to undertake the slip-lining. Land associated with these pits would be reinstated following completion of the slip-lining operations
- Trenchless (for example horizontal directional drill or tunnelling) – involving subsurface construction underneath an obstacle (like a river or road) where there are technical or environmental reasons preventing a continuous trench above ground. A pit or shaft either side of the obstacle is required and the pipeline would be threaded through. Two tunnelling sections would need to be constructed in the Lake District National Park as part of the Raw Water Aqueduct in Scheme Section 3. The first is located in the vicinity of Nether Place Nursing Home and the second running under the River Greta and A5271 between the Royal Mail sorting office and Sheepdog Field. Tunnelling would also be needed under the River Derwent/A66 in Allerdale. Other trenchless crossings are required to cross: the A591 Chestnut Hill in the Lake District National Park; the A595 in three locations; the A66 and the River Ellen in Allerdale; and the River Keekle in Copeland. Land associated with the pits/shafts would be reinstated

following completion of the works, when a concrete shaft cover would be installed to allow future access.

Example of open cut trench and pipe laying on United Utilities' South Egremont Scheme

2.2.4 Other Infrastructure

Bridge End Connection (Lake District National Park)

36) Permanent structures would be needed at the existing Bridge End Water Treatment Works, which is the existing abstraction point at Thirlmere Reservoir. This would include the construction of small scale new buildings and infrastructure across 0.8 ha of land.

Water Treatment Works (Allerdale Borough)

37) A Proposed Water Treatment Works would be constructed north west of the A595, approximately 1 km north east of Bridekirk and adjacent to Hags Wood. This would treat raw water from Thirlmere for use as drinking water for onward supply into West Cumbria. The main buildings within this facility would be covered by a vegetated 'green roof' to improve its integration into the landscape. The area of land required for the Water Treatment Works would be 27 ha.

Moota Hill Service Reservoir (Allerdale Borough)

38) A new Service Reservoir with valve house and a new permanent access road would be constructed at Moota Hill, approximately 6 km north east of Cockermouth. Approximately 4.8 ha of land would be needed for the reservoir, with one third of the reservoir set into the landscape.

Harrot Hill Pumping Station (Allerdale Borough)

39) A new Pumping Station would be located at Harrot Hill approximately 0.5 km west of Cockermouth with access via the A66 and Ellerbeck Brow. This would require approximately 0.6 ha of land, and would include a main pump building and adjacent generator room, a transformer compound, kiosks and a new permanent access road. Harrot Hill Pumping Station would pump drinking water through the Network Mains to locations in West Cumbria.

High Leys Service Reservoir and Pumping Station (Copeland Borough)

40) A new Service Reservoir and Pumping Station are proposed adjacent to the existing Service Reservoir at High Leys, approximately 1 km south west of Asby. Approximately 14.8 ha of land would be needed, with approximately one third of the structure being located below ground level. Access would be provided from the A5086 and Pasture Road.

Air Valves

41) Air release valves would be fitted at high points along the length of the pipeline, with associated manhole covers to allow future maintenance and inspection.

Washouts

42) At low points on the pipeline washout facilities would be fitted to allow drainage of water during emergency events and repair situations, for example if a leak occurred which required the draining down of a particular section of pipework. Although the washouts would rarely be used, they would be routinely tested to ensure they remain in good working order.

43) The location of the washout pipes and outfalls to the receiving watercourses would need to be identified by the appointed construction contractor. United Utilities is not seeking consent for the washout pipes as part of the planning application for the Proposed Scheme, but a separate planning application will be submitted for this infrastructure in the future.

Valves

44) Valves would be fitted at intervals along the water main to allow particular sections of the main to be drained down for maintenance purposes. Some would require a control kiosk and access along the Raw Water Aqueduct.

2.2.5 Decommissioning

45) The Proposed Scheme would also involve the decommissioning of the existing Water Treatment Works at Ennerdale, Quarry Hill and Cornhow, involving the removal of selected items of plant and machinery from these locations.

Table 2.1 Scheme Sections

Scheme Section	Scheme Section Description	Local Planning Authority	Anticipated Construction[1]
1	**Bridge End Connection, Thirlmere (at Bridge End Water Treatment Works)** Development within and adjacent to the existing Water Treatment Works to enable a new connection between Thirlmere Reservoir and the proposed Raw Water Aqueduct.	Lake District National Park Authority	Spring 2017 to Summer 2020
2	**Raw Water Aqueduct from Bridge End to A66 Slip Road** The Raw Water Aqueduct comprises twin 900 mm internal diameter pipes which would follow a broadly northerly route along the St. John's Beck and Naddle valleys towards the River Greta, descending from Bridge End to approximately 150 m AOD (Above Ordnance Datum[2]) where it meets the A66.		

[1] Enabling Works would commence in advance of the main construction works.
[2] AOD is the height above mean sea level taken at Newlyn Cornwall.

Scheme Section	Scheme Section Description	Local Planning Authority	Anticipated Construction[1]
3	**Raw Water Aqueduct around Keswick and under the River Greta** This 3.8 km section of the Raw Water Aqueduct extends towards and then through Keswick from the A66 junction in the east to the Crosthwaite roundabout north west of the town. There are two sections of tunnelling in Keswick, below land to the rear of Nether Place Nursing Home and below the River Greta and the A5271 in the vicinity of the Royal Mail sorting office.		
4	**Raw Water Aqueduct – Crosthwaite Roundabout to Castle Inn** From Keswick the Scheme Section heads in a north westerly direction towards, and is then generally located along, the Bassenthwaite valley and involves the installation of approximately 10.3 km of new twin 900 mm pipeline from Keswick. The route is aligned to the east of Bassenthwaite Lake, and onwards to the B5291 Castle Inn at the northern end of the lake.		
5	**Raw Water Aqueduct – Castle Inn to Proposed Water Treatment Works** This Scheme Section runs from Castle Inn in a general westerly direction from the top of Bassenthwaite Lake, down into the River Derwent valley before gradually climbing from approximately 100 m AOD to 140 m AOD at the Proposed Water Treatment Works.		
6	**New Water Treatment Works Site (Water Treatment Works) near Hags Wood** The site of the Proposed Water Treatment Works comprises five agricultural fields. The planning application boundary encompasses approximately 27 ha of land, not all of which is proposed for permanent development.	Allerdale	
7	**Network Main – from Proposed Water Treatment Works to Quarry Hill, including the decommissioning of the existing Water Treatment Works at Quarry Hill** The pipeline heads north east from the Proposed Water Treatment Works at an elevation of approximately 140 m AOD and continues across a relatively open landscape to the west of Bothel at an elevation of some 130 m AOD. The network main generally follows the alignment of the A595 through Moota before diverging to the west and meeting the A595 again north of Bothel. Decommissioning of Quarry Hill Water Treatment Works would involve removal of plant and machinery.	Allerdale / Lake District National Park Authority[3]	Spring 2017 to end of 2018
8	**Moota Hill Service Reservoir** The proposed site comprises two agricultural fields with a total area of approximately 4.8 ha. The site is located a little over 1 km north east of Blindcrake, with access from the A595 via the B5301. The site is bounded to the south east by the A595 and all existing boundaries are defined by hedgerows.	Allerdale	Beginning 2017 to Autumn 2019

[3] Section 7 extends across the boundaries of the planning authorities.

Scheme Section	Scheme Section Description	Local Planning Authority	Anticipated Construction[1]
9	**Network Main – from the Proposed Water Treatment Works to a new Pumping Station at Harrot Hill** A combination of Network Main, twin sludge pipes and foul water pipe leaves the Water Treatment Works, at approximately 140 m AOD, and follows a south westerly route towards Cockermouth to a point just south of the A66 in the River Derwent valley. At this location the Network Water Main converges with the open cut section between Cockermouth and Broughton Cross (Scheme Section 16) and the slip-lining section between Cockermouth and Southwaite Farm (Scheme Section 18). The sludge (which originates from the water treatment process) and the foul main terminate at the existing Cockermouth Water Treatment Works.		Spring 2017 to Autumn 2019
10	**Harrot Hill New Pumping Station** The proposed Pumping Station is located at the southern end of a large field with a proposed development area of approximately 0.65 ha. The site is located some 450 m west of the edge of Cockermouth, with access via the A66 and Ellerbeck Brow, a local minor road.		Beginning 2017 to Autumn 2019
11	**Network Main – From Harrot Hill Pumping Station to Ullock** This Network Main section heads south from the site of the proposed Pumping Station at an elevation of approximately 90 m AOD, following the line of the A5086.		Spring 2017 to Autumn 2019
12	**Network Main – From Ullock to High Leys Service Reservoir** The Network Main continues south, broadly following the line of the A5086 towards the existing High Leys Service Reservoir near Asby.	Copeland	Spring 2017 to Autumn 2019
13	**Network Main – High Leys to Kelton Fell** From the site of the proposed High Leys Service Reservoir and Pumping Station, the Network Main heads north east and branches east approximately 400 m south of Asby. This section starts at an elevation of approximately 190 m AOD rising to 240 m AOD at the existing Kelton Fell Service Reservoir.		Spring 2017 to Autumn 2019
14	**High Leys Service Reservoir and Pumping Station Site** The proposed location for this section is approximately 1 km south west of Asby at an elevation between 180 m and 190 m AOD. The proposed development would comprise four agricultural fields, with a total area of approximately 14.8 ha. Access is gained from the A5086 and Pasture Road, a local lane.		Beginning 2017 to Autumn 2019
15	**Network Main – High Leys to Summergrove** Leaving High Leys Service Reservoir and Pumping Station the pipeline would head south west, through Arlecdon, returning to follow the line of the A5086. The pipe would be laid using directional drilling beneath the River Keekle with the remainder of the section using an open cut technique.		Spring 2017 to Autumn 2019

Scheme Section	Scheme Section Description	Local Planning Authority	Anticipated Construction[1]
16	**Network Main – Cockermouth to Broughton Cross** This short (just over 3 km) section of the Network Main runs from Cockermouth to Broughton Cross at an elevation of approximately 35 m AOD within the River Derwent valley. It would involve the abandonment of the two existing pipes from Cockermouth to Broughton Cross and the construction of a new section of 550 mm diameter pipeline using open cut techniques.	Allerdale	Start of construction – Summer 2020
17	**Network Main – Broughton Cross to Stainburn** The existing pipeline follows two separate routes alongside a section of the River Derwent. The use of slip-lining techniques would require temporary launch and reception pits, fitting excavations and compound/laydown areas with associated access. Small sections of the route close to Bridgefoot, Broughton Cross and Great Clifton would need to be constructed using open cut techniques, where it is not possible to slip-line the existing mains.		
18	**Network Main - Cockermouth to Southwaite Farm** This section heads south east from the A66/A595 roundabout at Cockermouth at approximately 35 m AOD and continues as two sections to Southwaite Farm at approximately 60 m AOD. Both sections follow a route through Cockermouth. Slip-lining and open cut techniques would be used in this section.		
19	**Network Main - Southwaite Farm to Cornhow, decommissioning of Cornhow Water Treatment Works** The slip-lined section continues as two sections for approximately 3.7 km south east from Southwaite Farm at approximately 60 m AOD to High Lorton (approximately 70 m AOD). Between High Lorton and Cornhow the existing mains would be abandoned. Cornhow Water Treatment Works would be decommissioned with the removal of plant and machinery.	Lake District National Park Authority	Autumn 2020 to Summer 2021.
20	**Decommissioning of the existing infrastructure.** Decommissioning of Ennerdale Water Treatment Works would involve removal of plant and machinery.	Lake District National Park Authority	2022

2.3 Working Hours

46) Construction work would occur during daylight hours with standard working hours employed. Works would not generally take place before 08:00 or after 18:00 Monday to Friday, or Saturday afternoons, all day Sunday or on Public Holidays unless agreed with the local authorities.

47) Working hours for tunnelling operations would be 24 hours a day, seven days per week for the duration of the tunnelling activity. For operational purposes, once tunnelling commences, it is desirable to undertake the activity continuously.

48) Some lighting would be required to ensure safe working. This would be positioned in such a way as to minimise light spilling onto adjacent land or properties.

2.4 Mitigation

49) The EIA has been undertaken alongside the design development process to avoid or reduce (wherever practicable) the likely significant environmental effects of the Proposed Scheme. This has resulted in a series of measures (termed mitigation) being identified and included in the overall design, examples of which are described below.

Table 2.2: Example Mitigation Measures

Type of Mitigation	Purpose	Implementation
Embedded Mitigation	To reduce potential effects by including measures into the design of the Proposed Scheme, such as avoiding environmentally sensitive sites through careful routeing of the pipeline.	Design Phase Embedded mitigation has already been incorporated into the design of the Proposed Scheme through staged option development.
Construction Code of Practice	The Construction Code of Practice comprises: • Construction Strategies detailing environmentally responsible approaches to constructing various elements of the project, including pipelaying, piling and vibratory compaction, land drainage, working in floodplains, soil management and biosecurity • A Schedule of Mitigation detailing all mitigation measures to be applied or established, such as protection of watercourses from accidental pollution. • An Environmental Masterplan comprising drawings which illustrate the principal mitigation measures presented in the Schedule of Mitigation. This would be used as a basis for the development of further mitigation within construction sites and working areas.	Construction Phase This would be implemented by United Utilities and/or their appointed Construction Contractors.
Traffic Management Plan / Travel Plan	A plan which describes a range of measures which can be employed to reduce the impact of road transportation associated with the construction of the Proposed Scheme.	Construction Phase This would be implemented by United Utilities and/or their appointed Construction Contractors.

50) Through careful design, impacts on important vegetation have been avoided wherever possible, however construction of the Proposed Scheme would result in the loss of some individual trees, groups of trees, hedgerows and woodland. To mitigate and compensate for this loss, United Utilities proposes to replace more trees than would be removed as a consequence of the Proposed Scheme. In addition, United Utilities would also set up a community fund to support planting schemes throughout the area.

51) A new area of compensatory woodland planting is also proposed at the head of the Ennerdale Valley (Figure 2.1). The land under consideration is part of the Ennerdale Valley Area, which is developed through the Wild Ennerdale Project. Subject to the Proposed Scheme being approved, discussions would take place with relevant organisations to help develop the proposal further.

Extract from the Environmental Masterplan

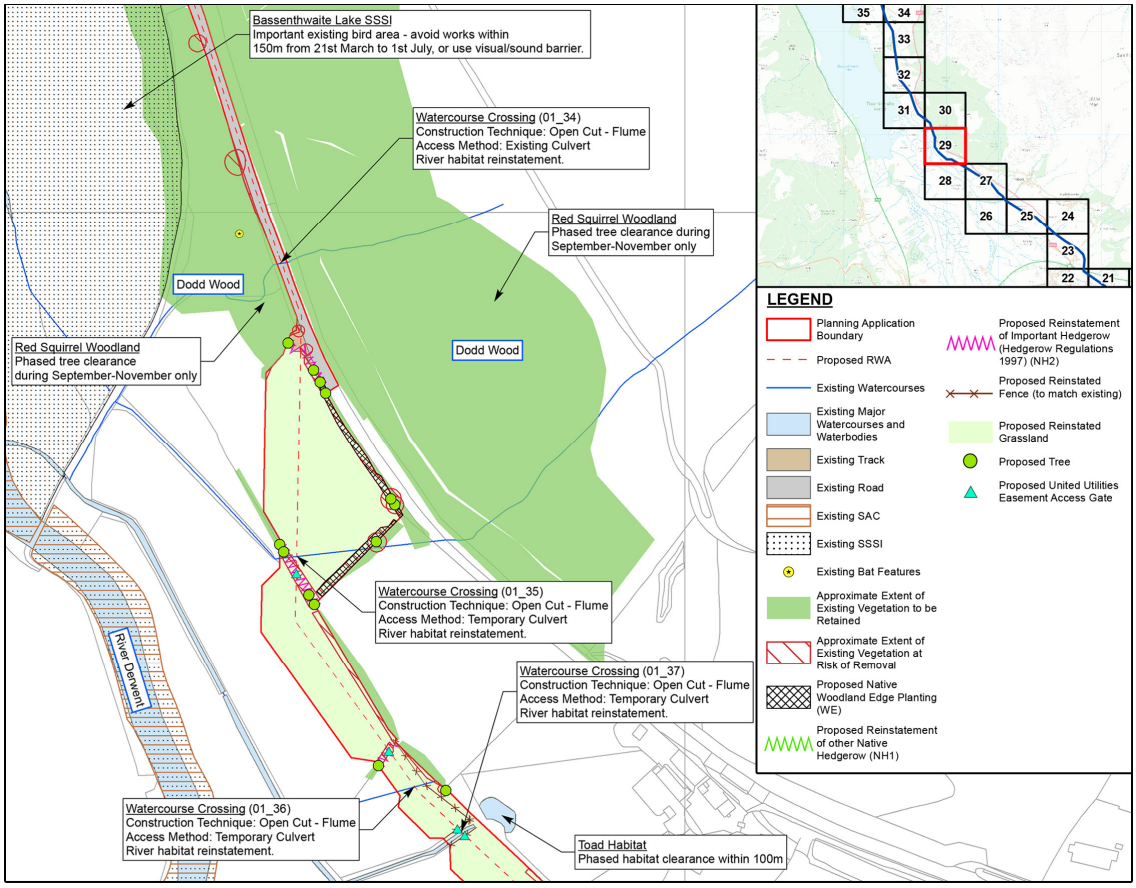
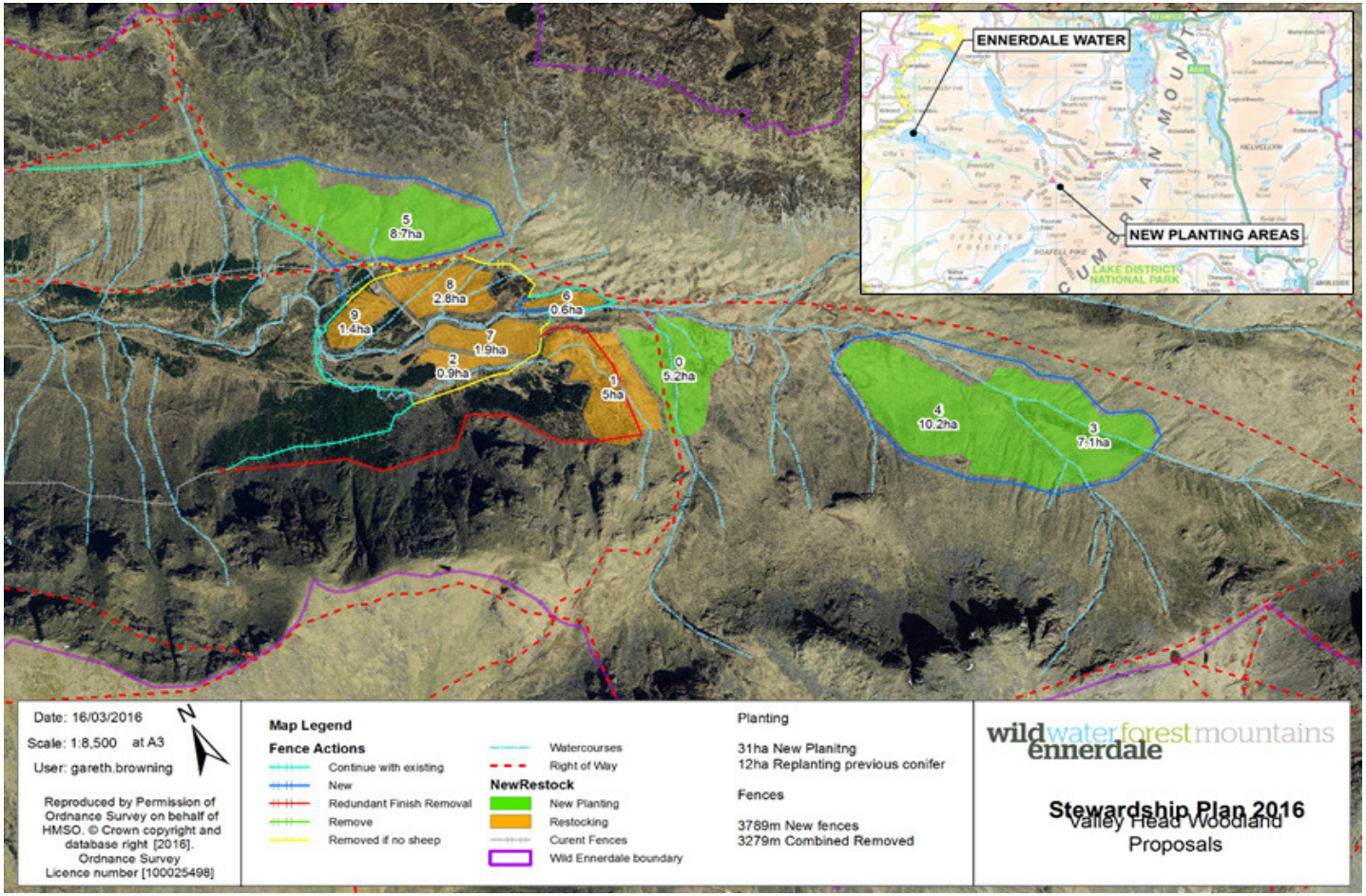


Figure 2.1: An area of compensatory tree planting is proposed at the head of the Ennerdale Valley



3. Environmental Effects

3.1 EIA Scope

52) The process of scoping identified that construction, operation and maintenance of the Proposed Scheme could result in significant effects across different environmental topics.

53) Scoping also identified the potential for impact from scheme interactions, such as landscape, visual and dust effects combining to affect a resident during construction, or for effects between the Proposed Scheme and other developments in the area to occur together and result in a larger impact.

3.2 Landscape and Visual

3.2.1 Existing Conditions

54) A Landscape and Visual Impact Assessment has been completed which considers potential changes to the landscape including views. Landscape effects are changes in the fabric, character and quality of the landscape. Visual effects relate solely to changes in available views of the landscape, and the effects of those changes on people when viewed from certain locations such as a house (referred to as a visual receptor). Landscape and visual effects do not always necessarily coincide.

55) The landscape character is covered by three National Character Areas, specifically NCA 06, Solway Basin, NCA 07: West Cumbria Coastal Plain and NCA 08: Cumbria High Fells.

56) The Lake District National Park is a nationally protected landscape and is also being put forward as a candidate World Heritage Site. The Raw Water Aqueduct passes through this landscape dropping from Bridge End, following the rivers and valleys including Naddle Beck, St. John's Beck and the River Greta to the A66, east of Keswick. The pipeline corridor passes through the built up area of Keswick following the valley floor to the east of Bassenthwaite Lake and through a transitional landscape towards Allerdale.

57) This landscape is characterised by the contrast between the pasture fields with trees and clumps of woodland in the valleys and the adjacent rugged-craggy high fells. The valley floors are tree-lined corridors with stone walls and unmanaged hedgerow field boundaries. The pipeline corridor passes through the southern edge of Blindcrake Conservation Area and towards Redmain.

58) The Lake District has also been put forward by Government as the UK's sole World Heritage Site nominee in 2016. World Heritage Sites are places of Outstanding Universal Value as set out in the 1972 United Nations Educational, Scientific and Cultural Organisation (UNESCO) Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention).

59) All of the landscape in the Lake District National Park is classed as highly sensitive to change.

60) Allerdale is also characterised by a predominantly undulating rural landform consisting of ridges and valleys. It has extensive managed pasture fields defined by hedgerows interspersed with native woodland, clusters of trees or plantations. Small streams and rivers, including the Derwent Valley, cut through the rolling topography. Hedgerows form the predominant field boundary type with some dry stone walls. The pipeline crosses through Cockermouth, including its Conservation Area and the villages of Bridekirk, Bothel, Deanscales and Ullock, Papcastle, Great Broughton and Brigham. Outside these settlements, the landscape is predominantly rural with the built environment limited to scattered farms and dispersed residential properties. Main roads are the A595, A5086 and A66.

61) Much of this landscape is sensitive to change, including the surrounding landscape around the Pumping Station proposed at Harrot Hill.

62) Copeland is also characterised by a large-scale undulating rural landscape consisting of a series of ridges and valleys that rise gently toward the limestone fringes of the Lake District National Park. Hedge bound pasture fields dominate the rural landscape interspersed with native woodland, clusters of trees and large scale conifer plantations. The pipeline passes through or by dispersed villages including Asby, Arlecdon, Rowrah and Kirkland. Most of this landscape is also highly sensitive to change.

63) Effects on landscape character and views would be most significant during the construction phases when there would be the removal of hedgerows, trees, dry stone walls and the influence of construction activities within a sensitive rural landscape. Due to the sensitivity of the landscape some of these effects are potentially high and would lead to some temporary adverse disruptive effects to the landscape form.

A typical rural landscape through which the pipeline would be constructed

64) The views of local residents and visitors to the area would be drawn to the temporary compounds, vehicle movements and other construction activity within an otherwise tranquil rural landscape. During construction, people would notice disturbance and views would be interrupted for the duration of the works. These effects would result in temporary adverse visual effects.

65) Once the pipeline is operational these temporary landscape and visual effects would begin to be removed. Land would be reinstated and construction machines and personnel no longer present. Over a short period of time, views would start to return to normal as replacement vegetation re-establishes and the landscape reassumes its normal tranquil state.

66) Within the Lake District National Park, the construction of permanent above ground structures adjacent to Bridge End are small scale and located at the existing Water Treatment Works so the change to the landscape character would be perceived only locally. Within Allerdale and Copeland, slightly more visual disturbance would be experienced when the Proposed Water Treatment Works, Pumping Stations and Service Reservoirs are under construction as they are more visible and larger in scale.

3.2.2 Operational Phase

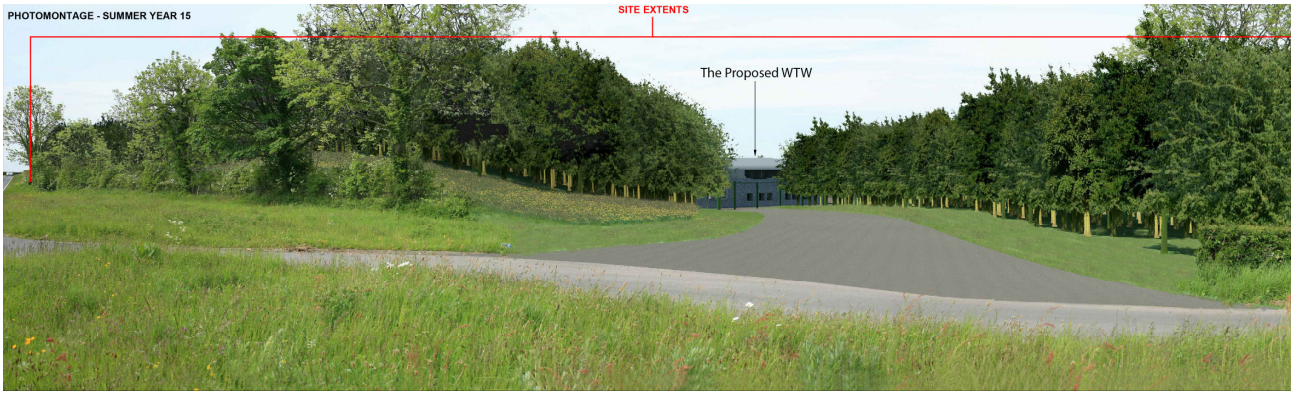
67) Once construction is completed the working width would be restored. Reinstatement planting would be undertaken following the standard practice for works adjacent to pipelines. The main ongoing impact would be that the replacement of any large hedgerows or trees would need to be offset from the pipeline corridor by at least 10 m so that the pipeline corridor can be accessed easily for maintenance and emergencies and protected from any damage from roots. Replacement vegetation over and close to the pipeline would be limited in height.

68) The Proposed Water Treatment Works, Service Reservoirs and Pumping Stations would be a notable introduction in the rural landscape. These new developments would be designed to closely match the existing contours and revegetated to reflect the appearance of the surrounding landscape.

69) The establishment of new woodland planting would provide significant screening for the Proposed Water Treatment Works and Service Reservoirs constructed in Allerdale and Copeland helping to integrate them into the rural landscape. Existing hedgerows would also be strengthened and the general sense of enclosure improved. This would significantly reduce visual effects over time particularly as people become more familiar with the change to the landscape.

70) The Water Treatment Works design incorporates many features which would significantly reduce its visual intrusion. The design integrates with the natural topography and the roof is covered entirely with managed grass. The building is gently sloped and re-profiling of surrounding land within its setting would give it an appearance as a natural part of the landform. Tree planting and landscape screening would help blend in with the natural environment and reduce visibility from the surrounding areas. Any visible parts of the structure would be finished with the local natural stone and local building finishes.

How the Water Treatment Works (Allerdale) might look fifteen years after construction is completed



71) The Water Treatment Works would incorporate significant planting proposals (see image above), reprofiling of the site, and a green roof under which some of the site's process facilities would be located.

72) The visual impact of the Service Reservoirs and Pumping Stations would also be reduced sensitive design and landscape treatment as indicated in the following visualisations.

How Moota Hill Service Reservoir (Allerdale) might look like fifteen years after construction is completed

How Harrot Hill Pumping Station (Allerdale) might look fifteen years after construction is completed

How the High Leys Service Reservoir and Pumping Station (Copeland) might look fifteen years after construction is completed

3.2.3 Overall Assessment

73) Following construction, the integration of the scheme into the landscape would reduce its impacts to such a point that they would be almost eliminated after 15 years. For the key visual receptors where people experience the most views, long term adverse impacts would be limited to slight effects at the most, with the majority of views returning to neutral which means people would no longer notice any change.

3.3 Arboriculture (Trees, Groups of Trees, Hedgerows and Woodlands)

3.3.1 Existing Conditions

74) This section describes the arboricultural interest identified within the planning application boundary and a short distance beyond to allow an appraisal of trees whose canopies or root zones are near to the proposed working width of the pipelines. The arboricultural survey identified individual trees, groups of trees, woodlands and hedgerows.

75) Trees which provide a significant amenity value to a local area may be protected under Planning Regulations. A Tree Preservation Order (TPO) enables a tree to be protected by law. Trees in a Conservation Area, if not covered by a TPO, are also afforded protection.

76) Consultation with the LPAs indicates that there are six TPOs and two Conservation Areas within or adjacent to the working width. Cockermouth is administered by Allerdale and Blindcrake by the Lake District National Park. Three TPOs are administered by the National Park Authority (two in Keswick, one in Lorton), two by Allerdale (both in Cockermouth) and one by Copeland (Summergrove).

77) 'Veteran trees' are trees which, due to their age, size or condition, are of cultural, historical, landscape or nature conservation value. Veteran trees are not afforded specific protection as a result of their designation alone but national and local land use planning policies recommend that they should only be removed if the need for, and benefits of, the development clearly outweigh the loss. The survey identified 62 veteran trees and 3 groups containing veteran trees. Of this total, 36 are in the Lake District National Park, 27 within Allerdale and 2 within Copeland.

An example of a veteran Ash tree in the Lake District National Park

78) Trees and woodland within Sites of Special Scientific Interest (SSSI) may be afforded protection as a result of the site designation. Approximately 2,769 m² are affected by the development proposals within Gill Beck SSSI and River Derwent and Tributaries, of which 2,312 m² falls within the Lake District National Park and 457 m² within Allerdale.

79) Ancient and Semi-Natural Woodland and Planted Ancient Woodland Sites would be affected by the working width at Briery Wier, Gill and Ellerswood, Messengermire Wood and Stormwood (all Lake District National Park) and Newbiggin (Allerdale).

80) The quality and value of the trees surveyed was categorised using professional judgement in accordance with relevant British Standards based on their arboricultural, landscape and cultural, including conservation, values. Category A trees are trees that have the most value in terms of their health and remaining lifespan whilst those in Category C are the least worthy of retention.

81) Table 3.1 below summarises the number of trees identified either along or adjacent to the working width. The first table is the total number of trees, tree groups, hedgerows and woodlands surveyed and the second table breaks this down for the Lake District National Park, Allerdale and Copeland.

Table 3.1: Number of Trees, Groups of Trees, Hedgerows and Woodlands Surveyed

Category	Grade				Total
	A	B	C	U	
Trees	239	950	302	39	1530
Groups	46	553	239	3	841
Hedgerows	2	468	146	0	616
Woodlands	14	74	14	1	103
Totals	**301**	**2045**	**701**	**43**	**3090**

Category	Grade				Total
	A	B	C	U	
Allerdale					
Trees	117	462	173	18	770
Groups	24	345	119	1	489
Hedgerows	2	235	87	0	324
Woodlands	3	36	5	0	44
Totals	**146**	**1078**	**384**	**19**	**1627**
Copeland					
Trees	5	58	23	6	92
Groups	0	26	16	0	42
Hedgerows	0	29	53	0	82
Woodlands	0	0	0	0	0
Totals	**5**	**113**	**92**	**6**	**216**
Lake District National Park Authority					
Trees	117	430	106	15	668
Groups	22	182	104	2	310
Hedgerows	0	204	6	0	210
Woodlands	11	38	9	1	59
Totals	**150**	**854**	**225**	**18**	**1247**

3.3.2 Construction Phase

82) This would result in the loss of trees through permanent and temporary land-take associated with the working width, temporary construction compounds and car parks, mobilisation sites, and temporary access routes.

83) The assessment indicates that of the 3,090 trees, tree groups, hedgerows and woodlands across the scheme, up to 452 trees would potentially be at risk of removal with varying impacts on 432 groups, 417 hedgerows and 59 woodlands. Twenty-one veteran trees, based on the same assessment criteria, are considered at particular risk, 16 in the Lake District National Park, four in Allerdale and one in Copeland.

84) Although the working width would pass adjacent to TPOs, none of these would be directly affected.

85) Within Conservation Areas a total of five hedgerows and one tree group in the Lake District National Park and two trees in Allerdale would be affected.

3.3.3 Operational Phase

86) There would be a requirement from time to time for operational maintenance along the pipeline easement. Access points would be available along the scheme. Normal hedge maintenance and tree pruning operations are not anticipated to have any significant or permanent effects on trees and hedges. Operational clearances for equipment, vehicles and buildings would be built into the landscape design proposals.

3.3.4 Overall Assessment

87) The design process has sought to retain existing trees wherever possible, subject to the engineering constraints associated with delivering a scheme of this size. Primary mitigation measures embedded into the project design include the reinstatement of; grass sward, hedgerows, individual and hedgerow trees including tree belt and replanting of woodland areas.

88) Tree losses have been kept to a minimum through detailed discussions regarding the working width. Where feasible, this has often resulted in the realignment of construction activities to avoid or reduce the impacts on a tree.

89) Where possible, the aim would be to re-instate lost trees within the same location to retain landscape and visual amenity, subject to land availability, agreement with third party landowners and United Utilities guidance 'Standard Conditions for Works Adjacent to Pipelines'. Tree losses associated with the working width would therefore be partially mitigated by new planting although this would be restricted along the permanent easement.

90) To provide compensation for tree losses in accordance with planning policies United Utilities would replace trees at a greater ratio than they would be lost. A location at the head of the Ennerdale Valley has been identified by United Utilities as a consolidated and aggregated replacement planting site for tree group and woodland losses. The proposed area would be a new area of woodland, designed and funded by the West Cumbria Water Supply Project. This consolidated approach is proposed in addition to replanting of suitable vegetation within the working area of the pipeline route, but which is not adequate replacement for the overall loss.

91) All the trees which would remain but which adjoin the working width would be adequately protected by stout fencing. Root Protection Zones would also be demarcated and other general tree protection measures would be in place before construction commences.

92) Hedgerows would be reinstated during the construction phase. These would progressively re-establish to the original condition and benefits experienced in the medium term, predicted as five years. Trees and hedgerow trees would be planted as standards and establishment would be long term. Within 15 years the trees would be considered to have established to a height of up to 8 m and to have become a feature in the landscape. Establishment to original size would be long term.

3.4 Water Environment

3.4.1 Existing Conditions

93) The water environment assessment considers the issues relating to the potential effects on the water environment, which includes all rivers, ditches, gills, becks, ponds, lakes and reservoirs. The assessment considers the construction and operation phases on water environment receptors, including the impacts which would result from water resources operational changes in United Utilities' wider supply system.

94) The water environment is mainly defined in terms of the Water Framework Directive (WFD); the key Directive for protecting and enhancing the water environment in Europe, plus other criteria relating to the designation of receptors for nature conservation and drinking water protection. Under the WFD, the water environment is divided into discrete units called waterbodies; these are the basic units in which WFD status is assessed as high, good, moderate, poor or bad.

95) The Environmental Statement has identified that the baseline water environment for construction and operation is predominantly high value, based on a large number water bodies with at least Good Status, numerous high importance areas including internationally designated areas for nature conservation

(including the River Derwent & Bassenthwaite Lake, and the River Ehen SAC and SSSI), the Lake District National Park, plus various Drinking Water Protected Area Safeguard Zones (DrWPAs).

3.4.2 Construction Phase

96) The assessment has identified that, without mitigation, the construction phase for linear features (including a large number of watercourse and road crossings) would lead to likely significant impacts on the water environment. These impacts would relate to erosion of the river bank (plus further lateral migration in active rivers), direct pollution to the river by fine sediment (from bank erosion) or construction vehicles and local scouring of the river bed, creation of pollution pathways to local watercourses, the increased risk of pollution from construction and the mobilisation of fine and/or contaminated sediment.

97) The assessment has identified that, without mitigation, the construction phase for permanent installations would lead to likely significant effects on the water environment. These impacts would relate to effects on water quality and sediment quality in runoff from site compounds, destabilisation of riparian areas/channel banks due to vegetation removal, increased risk of soil erosion and delivery of fine sediment towards river channels, construction/presence of the outfall structures, plus water quality impacts from discharging commissioning flows from the Proposed Water Treatment Works.

98) Following implementation of proposed mitigation measures, including adoption of the relevant construction strategies highlighted in the Environmental Statement, the likely significant effects could be reduced to minor or no residual effects.

3.4.3 Operational Phase

99) With regards to source closures in the West Cumbria Resource Zone, major benefits have been identified at Overwater. Moderate benefits have been identified at Ennerdale Water and in the River Ellen catchment. Minor water environment benefits have been identified for Ennerdale Water, the River Cocker and Dash Beck. Minor impacts have been identified at Chapel House Reservoir. The impacts of the Proposed Scheme were assessed as negligible at the River Ehen. With regards to changes in the Integrated Resource Zone, minor water environment benefits have been identified at Haweswater Reservoir.

3.4.4 Overall Assessment

100) With respect to the construction and operational phase of permanent installations, following incorporation of all mitigation measures, there would be no likely residual effects on the water environment. With respect to the construction and operational phase of the pipelines, following incorporation of all mitigation measures, there would be no likely residual effects on the water environment with the exception of residual effects of Major significance at two watercourse crossings locations along the pipeline route.

101) The assessment has identified some adverse and numerous beneficial effects relating to the impacts of water resources operation changes resulting from the Proposed Scheme. Where adverse impacts have been identified, following incorporation of all mitigation measures there would be no likely residual effects on the water environment. This is with the exception of the impacts on Thirlmere Reservoir, for which no mitigation is proposed, noting that the amended level regime from the baseline conditions remains a significant impact to the water environment with the Proposed Scheme

3.5 Flood Risk

3.5.1 Existing Conditions

102) Severe flooding has been experienced by many parts of the Lake District and West Cumbria in recent years most recently in December 2015; including the communities of Keswick and Cockermouth. This caused disruption to local infrastructure such as roads and severance between communities when bridges were destroyed, impacts on businesses through ruining stock and machinery and ruined homes. The personal impacts on people's homes and possessions, fear of future flooding and difficulty in obtaining insurance are just a few of the issues associated with living with flood risk.

103) It is therefore important that the creation of new infrastructure does not add to the existing flood risk through creating more surface water run off or displacing existing flows of water therefore increasing the

potential for flooding during heavy rainfall. Flood Risk Assessments and Flood Investigation Reports (collectively referred to as 'FRA') have been undertaken to examine the potential risks posed during the construction and operational phases of the pipeline.

3.5.2 Construction Phase

104) The FRA has identified that there is a high risk of flooding to the proposed connection works at Bridge End during the construction phase due to the potential for wind-generated waves from Thirlmere Reservoir to overtop the weir crest and flow towards the working area. An event similar to this scenario occurred during the severe storms experienced in December 2015. As the works cannot be moved to another part of the site this risk cannot be directly mitigated other than to continually monitor the weather and evacuate the site during storms.

105) The Raw Water Aqueduct and Network Main would pass through the floodplain of several Main Rivers including St John's Beck and the Greta. As the pipeline and its easement cannot be practically located elsewhere and it would be located below ground, it is classified by National Planning Policy on Flood Risk as essential infrastructure which is an acceptable form of development which can go ahead even though it is in a floodplain.

106) There is the potential for construction activity to divert the flows of existing surface water through blocking existing paths increasing the risk of flooding during periods of heavy rainfall. To reduce this potential, excavated materials would be stored in locations which do impede existing surface water flowpaths. Where this is not possible, topsoil bunds would be constructed with regular spaces between stockpiles to prevent surface water backing up behind the structure.

3.5.3 Operational Phase

107) Through embedded design to make the Water Treatment Works, Service Reservoirs and Pumping Stations resilient to flooding, potential risks from flooding would have been reduced once the Proposed Scheme is operational. Nevertheless, this embedded design does not entirely eliminate residual risk, as there is a very low risk of potential failure of individual assets and infrastructure. This is why maintenance and inspection regimes are strictly controlled through relevant legislation so that any faults or issues are detected, monitored or rectified before they become an issue. The probability of outright failure of the infrastructure causing flooding is therefore extremely low. Furthermore, a major benefit of the scheme is that it would implement new pipelines built to modern standards and many older aspects of the current distribution network would be decommissioned.

3.5.4 Overall Assessment

108) Once the application of flood risk tests required by land use described above are successfully implemented, the risk of flooding during the Proposed Scheme's construction and operational phases would be very low.

3.6 Ecology

3.6.1 Existing Conditions

109) The Proposed Scheme passes through a variety of valuable wildlife habitats that are capable of supporting a range of associated notable species.

110) Some of the areas of habitat have been formally designated under statute as sites of international and national importance such as Special Areas of Conservation (SAC), Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR) either for their habitat interest or because of the species they support. Other, non-statutory locally-designated areas known as County Wildlife Sites (CWS) are also present.

111) A desk-based study of available records of protected and notable habitats and species was undertaken in 2014, and updated in 2015. In addition, an overall habitat survey and mapping exercise (Phase 1 Survey), followed by specific habitat surveys of ancient woodland, hedgerows and aquatic habitats, and a series of protected species surveys including: bat, otter, red squirrel, badger, great crested newt, reptiles and

breeding birds provided detailed information to assess the likely impact of the Proposed Scheme on ecological receptors.

3.6.2 Construction Phase

112) Both habitats and species are vulnerable to a wide range of potential impacts arising from construction activities. Impacts considered included: habitat loss; habitat damage (including habitat fragmentation); species disturbance; changes in water levels/flow, and river sediment transport; changes in water or air quality; species mortality, and introduction of disease or non-native species.

113) Nature Conservation Sites are classified according to a hierarchy of their importance; Regional (County Wildlife Sites – 'CWS'); National (Sites of Scientific Interest - SSSI) or European Importance (Special Areas of Conservation - SAC).

114) The Ecological receptors where the construction of the scheme is likely to have a significant effect at least at a local level, prior to mitigation, include: River Derwent and Bassenthwaite Lake SAC, including River Derwent and Tributaries SSSI, Bassenthwaite Lake SSSI, Bassenthwaite Lake NNR; River Ehen SAC, including River Ehen (Ennerdale Water to Keekle Confluence) SSSI; Thirlmere Woods SSSI; Little How Road Side Verge (RSV) CWS; Adams Cross RSV CWS; Broadstones CWS; Dale Bottom Marshy Grassland CWS; River Greta Wood CWS; Shoulthwaite Moss CWS; Briery Wood and Meadow CWS; Blumer Cottage Wood CWS; Ellers Wood (Blindcrake) CWS; Gill Wood (Blindcrake) CWS; Roadside Verge (Bridekirk) CWS; Randle Cross RSW CWS; Dub Beck CWS; Rheda South Park CWS; hedgerows; ponds; wet grassland; species-rich grassland; peat habitats; deciduous woodland (including ancient woodland); river habitats, lakes, bat species, reptile species, breeding and wintering bird assemblages; and populations of otter, red squirrel, great crested newt, common toad, fish, aquatic macroinvertebrates and aquatic macrophytes.

3.6.3 Operational Phase

115) The assessment undertaken of the likely impacts arising from the routine maintenance and operation of infrastructure indicated that the magnitude of likely impact was determined to be so low that for all receptors it was considered insignificant. As a result, no further assessments or identification of mitigation measures were undertaken.

116) Operational changes to the abstraction regime from different water bodies has been found to have potential impacts on some of the same ecological receptors already listed above. Primarily this involves changes in abstraction regime at Thirlmere Reservoir which has the potential to result in changes to the flow regime of St John's Beck (part of the River Derwent and Bassenthwaite Lake SAC). Additional changes to water bodies and watercourses as a result of operation include: a reduction in the drawdown regime in Thirlmere; higher lake levels in Ennerdale Water during dry periods; higher lake levels and a reduction in drawdowns below weir crest in Crummock Water; a more naturalised low-flow regime and in the River Cocker, Dash Beck and Halls Beck; less frequent and lower magnitude changes in water level in Overwater; a reduction in circulation and water quality in Chapel House Reservoir; a more naturalised flow regime in the River Ellen; and temporarily higher reservoir levels in Haweswater Reservoir.

3.6.4 Overall Assessment

117) Potential significant (pre-mitigation) effects during construction have been identified for 17 designated sites, 15 habitat types, 12 terrestrial species assemblages or species, eight fish species and multiple macroinvertebrate and macrophtye species. These impacts have the potential to occur in 17 of the 20 scheme sections, with only the site of the new Service Reservoir at Moota Hill (Scheme Section 8), the site of the new Pumping Station at Harrot Hill (Scheme Section 10) and the existing Ennerdale Water Treatment Works (section 20) unlikely to impact any ecological receptor at a local level or above. Though no effect on the conservation status of badger and great crested newt is considered likely, construction activities could result in a legal offence being committed.

118) The routine maintenance and operation of infrastructure was considered not likely to significantly impact ecological receptors and no further assessments or identification of mitigation measures was undertaken. However, operational changes to the abstraction regime from different water bodies was found to impact (both positively and negatively) certain ecological receptors.

119) Positive effects as a result of operational changes to the water resources regime are considered likely (for all or some features) at the River Ehen SAC; River Ehen (Ennerdale to Keekle Confluence) SSSI and Ennerdale SSSI; Overwater SSSI, Holme Fen CWS, High Park Mires CWS, and Tarn Dale and Stanger Spa CWS. Adverse impacts are considered likely without mitigation (for all or some features) within the River Derwent and Bassenthwaite Lake SAC (which includes the River Derwent and Tributaries SSSI) at St John's Beck.

120) Following construction all notable habitats affected by temporary habitat loss would be restored to the condition they were in before construction, or would be left in a condition which would allow their recovery over time, by replanting the existing species and habitats or reinstating substrate and flow conditions, levels of shading and retaining or creating woody debris in aquatic environments.

121) Additional habitat features for specific species such as bats (roost boxes), breeding birds (nest boxes) and reptiles (refuges and hibernacula) would be provided within or adjacent to the Proposed Scheme area where possible to minimise any impacts from the temporary and permanent habitat loss as a direct result of the Proposed Scheme.

122) Where required, species specific mitigation measures would be undertaken if there is a risk notable species may remain within the working width after other techniques have been used. Measures would include, where necessary: phased vegetation clearance; trapping and localised relocation (under licence where required); exclusion fencing; creation of artificial roosts; covering trenches at night; and the exclusion of badgers from setts under licence.

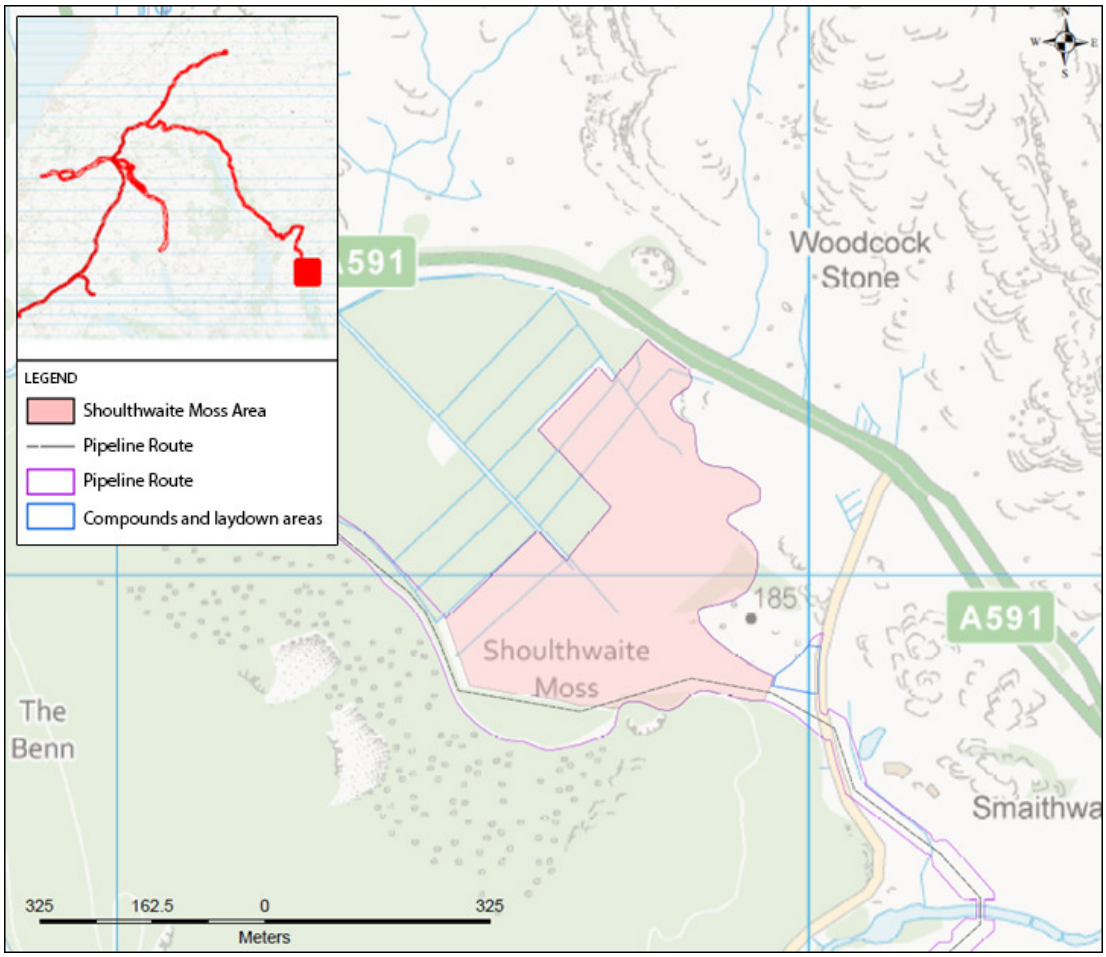
123) An Outline Land Drainage Plan has been produced to provide further details on how drainage systems would be reinstated to ensure that existing hydrological regimes are maintained and a Biosecurity Management Plan has been developed and which details measures to ensure that invasive non-native species are not introduced or spread.

124) For the predicted operational effects on the River Derwent and Bassenthwaite Lake SAC (and associated SSSI) and some of its qualifying species and habitats in St John's Beck, it is anticipated that specific mitigation measures would include: a programme of research and monitoring to provide an updated understanding of fish habitat and populations; and to understand the required range of flows to fully mitigate any impacts. This work would then make recommendations for changes to the operation of the Thirlmere Reservoir releases to overcome potential significant adverse effects.

125) Though impacts would be mitigated as far as is reasonably practicable there would remain some residual impacts that arise as a result of construction and operation of the Proposed Scheme. These residual impacts include a residual local level effect due to loss of two short sections of open river habitat to permanent stream culverts in the two pipe bridges proposed in the River Derwent catchment. Residual effects also include permanent loss of ancient woodland habitat which is significant up to the regional level and loss and/or damage to some valley mire habitat at Shoulthwaite Moss CWS which is a significant effect at the county level.

126) As on-site mitigation is not possible, specific compensation measures have been developed for the residual county and regional level effects. For the loss of ancient woodland it is proposed that a large woodland planting scheme is undertaken at an off-site location at the head of Ennerdale Valley, including a 15-year habitat management plan. For the likely loss and/or damage to valley mire habitats at Shoulthwaite, habitat enhancement works would be undertaken on adjacent land comprised of the same habitat type but of currently poor condition (see Figure 3.1).

Figure 3.1 Area of Shoulthwaite Moss to be enhanced



3.7 Cultural Heritage

3.7.1 Existing Conditions

127) A desk based study of heritage assets has identified a total of 691 cultural heritage assets which the scheme could potentially impact on. A total of 415 assets are 'archaeological remains', 222 are 'built heritage or historic urban landscape', 41 are 'historic landscape' and 12 in the category 'intangible cultural heritage or associations'.

128) Archaeological remains are usually underground and require archaeological methods (e.g. careful digging) to identify their existence. Built Heritage or historic urban landscape comprises all buildings and structures which form 'architectural heritage' for example Listed Buildings and the wider historic landscape encompass the wider setting of these areas for example historic gardens and field patterns. Intangible cultural heritage covers historic culture for example an annual event or certain local practices.

129) There are two Conservation Areas at Blindcrake (Lake District) and Cockermouth (Allerdale) and the Lake District National Park is a candidate World Heritage Site.

The Grade I Listed Church of St Bridget, Brigham, has a sensitive setting

3.7.2 Construction Phase

130) Within the Lake District National Park, the construction of the Raw Water Aqueduct would impact on known buried archaeological remains and the setting of known archaeology assets including ridge and furrow and field systems (this is an archaeological pattern of ridges and troughs created by a system of ploughing used in Europe during the Middle Ages, typical of the open field system) in Redmain, Blindcrake and Isel and the possible line of the Roman road from Keswick to Caermote although preliminary investigations (called 'trial trenching') have shown there is unlikely to be any significant remains.

131) The working width would impact on the broad ridge and furrow south of Blindcrake and east of the village and the field-system near Redmain, including broad ridge and furrow. The impact would be physical through the removal of surviving ridge and furrow, and associated field boundaries, within the working width. As this is part of the designation of the Blindcrake Conservation Area and due to contribution to the Outstanding Universal Value of the nominated World Heritage Site, the working width has been realigned and narrowed so it is restricted to only one or two fields.

132) As stated in the arboriculture section, construction requires the removal of Ancient Woodland. There are potential impacts on built heritage through the temporary removal of features which to the distinctive agricultural nature of the Lake District. This includes the historic gardens of Mirehouse, Chestnut Hill House, Shelley Cottage and 19 undesignated cultural heritage assets. Temporary adverse impacts on the setting of Scheduled Monuments could also occur at Castle How Hillfort, Castlerigg stone circle and two bowl barrows.

133) The construction of the Network Water Main would also require the temporary removal of a Grade II listed milestone east of Broughton Cross within Allerdale. The removal of this would also require Listed Building Consent. The milestone would be carefully removed prior to construction and would be stored in a secure and weatherproof location for the duration of the construction works and reinstated to its original location on completion of the construction works.

134) The setting of Scheduled Monuments Roman forts at Papcastle and part of the vicus the Romano-British farmstead in Fitz Woods and the Settlement 25 m south-east of Gatra (within Allerdale) would experience

some temporary disturbance to their setting but it would not have long-term effects or direct impacts on the monuments.

135) Within Allerdale and Copeland, the construction of the Network Water Mains would potentially impact on the Roman Road which connected Papcastle with Lamplugh Woodmoor although no remains of the road were found during trial trenching.

136) The setting of a number of historic buildings would be affected during the construction of the Network Main. These include the setting of the Church of St Brides, St Bridget's Church and Outbuildings at Kirkland Gate. This would only be temporary and would not have long-term effects on the monuments.

137) During construction, the Proposed Scheme is also predicted to have a temporary impact on 117 hedgerows identified as archaeologically or historically important as a result of the removal of hedgerows along the working width. These hedgerows would be reinstated once the construction phase has been completed.

3.7.3 Operational Phase

138) Any impacts on cultural heritage would be mainly temporary and limited to the construction phase, although the setting of a limited number of heritage assets would be altered.

139) The pipeline corridor would have some adverse impacts on the historic landscape due to the permanent removal of Ancient Woodland. Unfortunately, it is not possible to mitigate this effect other than routeing the pipeline around the woodland which has not always been possible.

3.7.4 Overall Assessment

140) Measures to reduce potential impacts on the historic environment have been incorporated into the design throughout (referred to as 'embedded mitigation) so as to avoid and preserve heritage assets. The area around Blindcrake Conservation Area is an example of this where the design has been changed through narrowing of the working width.

141) Most of the impacts on heritage assets would be temporary and would comprise physical effects on undesignated archaeological remains and temporary effects on the setting of historic buildings and historic landscape types. Measures to reduce potential impacts on the historic environment have been incorporated into the design in consultation with heritage stakeholders. Other than the removal of Ancient Woodland and the stated direct impact on a small part of the Blindcrake Conservation Area through the removal of medieval field patterns, mitigation would reduce any adverse impacts on cultural heritage to slight.

3.8 Soils, Geology and Hydrogeology

3.8.1 Existing Conditions

142) The majority of the working width is located in previously undeveloped open countryside and agricultural land. Only three discrete land parcels have been identified as potentially contaminated all within Allerdale. This includes a former petrol station at Stainburn, a former landfill site south of Cockermouth and a former quarry at Arlecdon. In addition, ground which is derived from human activity (referred to as 'made ground') is mostly absent except in discrete locations such as the Raw Water Aqueduct through Keswick (Section 3 - Lake District) and the upgrade to the Network Main through Cockermouth and Great Clifton (Scheme Sections 17 and 18 Allerdale).

143) Aquifers are permeable rocks capable of holding and moving water (a bit like an underground river). They are classified according to British Geological Survey (BGS) and Environment Agency mapping depending on how permeable they are and how much water they can h old. The majority of the working width is classified as Secondary A or Secondary B Aquifer, with smaller areas through Copeland in Scheme Sections 12, 14 and 15 classified as a Principal Aquifer. Due to the structure of the underlying rock, Principal Aquifers store more water and often act as a source of water for rivers.

144) There are four groundwater abstraction licenses used for agricultural purposes, household use, brewery operations and acid mine groundwater treatment. In addition, there are 27 groundwater and 25 surface water private water supplies.

145) Eighteen sites are identified for their geological importance including Geological Sites of Special Scientific Interest (SSSI), Regionally Important Geological Sites (RIGS) and Geological Conservation Review (GCR) sites. Within the Lake District National Park, the Raw Water Aqueduct crosses the northern extent of the Gill Beck SSSI.

The proposed Raw Water Aqueduct crossing point at Gill Beck

3.8.2 Construction Phase

146) There is the potential for a degradation of peaty soils at Shoulthwaite Moss and south east of Bassenthwaite Lake as a result of potential pollution or interference to groundwater flows (Lake District National Park).

147) Adverse effects on groundwater quality within bedrock aquifers would occur only if they were contaminated as a result of construction work activities, which is considered unlikely.

148) The scheme is located in proximity to 10 geologically designated sites including three nationally important geological SSSIs. Although highly sensitive to change, no significant changes to the geology of these sites would occur. For example, the Raw Water Aqueduct crosses the northern part of Gill Beck SSSI, Blindcrake (Lake District National Park - Section 5) but this area is approximately 100 m north of the protected geological exposures within the Beck.

149) Based on available information, the likelihood of encountering land contamination is very low and restricted to three distinct sites. No long term impacts are therefore expected to occur.

150) Long term surface water impacts, for example river flows, could occur if reductions in levels and flows were altered as a result of changes to groundwater drainage caused by the pipelines but once again with mitigation in place this is unlikely to occur.

151) Without mitigation, there is potential for long term impacts on Shoulthwaite Moss.

152) Parts of the area are also safeguarded by Planning Policy from development that could sterilise future opportunities for mineral extraction. This is known as a Minerals Safeguarding Area ('MSA'). The pipeline crosses the MSA in several places.

3.8.3 Overall Assessment

153) With appropriate mitigation measures and construction strategies in place the Proposed Scheme would not give rise to significant effects on soils, geology or groundwater resources.

3.9 Materials and Waste

3.9.1 Existing Conditions

154) The Materials and Waste Management chapter of the Environmental Statement describes the use of materials and manufactured products, the predicted volumes of waste to be generated and the capacity of local waste management facilities to recycle and dispose of any waste materials which cannot be used within construction. It is strongly linked to sustainability in terms of reducing the impact on the environment through minimising resources.

155) The choice of route alignment sought to reduce the resource impact of the scheme such as avoiding waterlogged and soft ground, potential sources of ground contamination, seeking pipe alignments near roads to reduce the amount of materials required for access tracks, optimising the length of gravity fed pipeline to reduce the need for pumps and associated materials and where possible upgrading existing pipes.

3.9.2 Construction Phase

156) The waste materials generated during construction would primarily consist of surplus excavated material which, due to technical or logistical reasons, cannot be reinstated or serve the materials demands required to meet construction standards. The majority of excavated material would be widely classed as inert (i.e. chemically neutral) uncontaminated materials suitable for reuse or recycling subject to testing.

157) Although materials would be stored along the working width, Lillyhall Landfill, (Copeland) and Moota Quarry (Allerdale) have been identified to store or process surplus materials excavated from the scheme ready for subsequent backfilling (this means refilling the trench with soils that have previously been excavated) or using the surplus excavated material to restore the landfill or quarry. Capacity to receive the predicted estimated volume of surplus material generated during construction has been confirmed.

158) The site preparation and enabling works would involve stripping the top layer of soil ('topsoil') across the entire working width including haul roads and construction compound areas. This topsoil would be stockpiled within the working width and all of this material would be reused for reinstatement following construction.

159) Trees and vegetation removed to facilitate construction would be classified as waste. The construction contractors would discuss the options with the landowners but it is anticipated that the majority would be removed directly from the working width for further meaningful use.

3.9.3 Operational Phase

160) The largest materials and waste impact during the operational phase would be from the disposal of sludge outputs. The design includes an underground sludge pipeline to discharge sludge to Cockermouth Wastewater Treatment Works. This would eliminate the current need for sludge road transportation from Cornhow, Ennerdale and Quarry Hill to zero.

3.9.4 Overall Assessment

161) Initial calculations predict that approximately 82.5 % (1,893,501 cubic metres) of excavated material would be directly reused within construction sites over the five year construction period. The remaining 17.5 % (397,036 m^3) of the excavated material would be transported locally for recycling processes or used in deposit for restoration activities. It is anticipated that use of best practice waste management techniques would lead to an increase in the re-use of material and facilitate an overall 95 % level of diversion from landfill meaning only 5 % is disposed in landfill.

162) The approach to waste management and very high rate of diversion from landfill is considered to be in accordance with the waste hierarchy. The waste hierarchy is a pyramid where waste prevention is at the top as the most sustainable solution to waste management and disposal at landfill is at the bottom as the least sustainable solution.

3.10 Public Access and Recreation

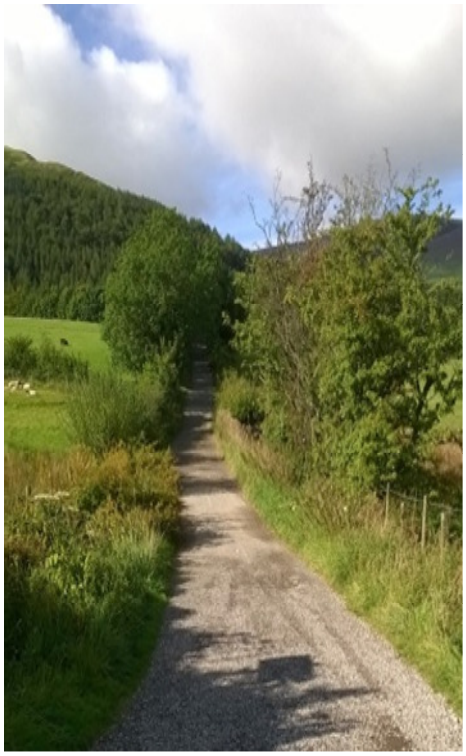
3.10.1 Existing Conditions

163) There is an extensive network of approximately 7,450 km of Public Rights of Way (PRoWs) across Cumbria including the Lake District National Park. The Lake District National Park is a key tourist destination for walkers, with a total of 16.4 million tourist visits per year. Additionally, there are a number of bridleways suitable for horse-riding.

164) High Rigg (near Keswick) is the only open access area and a small number of PRoWs access it across the planning application boundary from the western side.

165) The majority of recreational facilities are centred on Keswick, Bassenthwaite and Cockermouth areas. Important recreational facilities that are also important for tourism include (but not limited to) the Lake District Wildlife Park, Calvert Trust Activity Centre, Calvert Trust Stables, Dodd Wood Visitor Centre (including osprey viewing platforms) and Mirehouse. Additionally, a number of campsite and caravan parks are located in the general area. There are also other informal recreational activities not based at specific locations such as paragliding.

The scheme intersects with the Cumbria Way, an important long distance footpath through the National Park



3.10.2 Construction Phase

166) A total of 73 Public Rights of Way (some of which are crossed multiple times) would be affected during the construction period; including public footpaths, bridleways, permissive routes, railway paths and cycle routes.

167) Within the Lake District National Park the long distance Cumbria Way, Keswick Railway Path, NCN71 (Coast 2 Coast), NCN 10 (L and D Loop) and High Rigg Open Access Area would be affected. Where it is technically possible and safe to do so, PRoW gates would be installed in the temporary working area demarcation fence line to allow the public continued access across the working width. For the safety of the general public 28 PRoWs would need to be closed for a short duration at the time of the pipe laying in the

vicinity of the PRoW. Diversion routes to link PRoWs and maintain connection would also be maintained where possible including formal diversions for NCN71 and NCN10.

168) Access to twenty-seven recreational facilities would be affected including Dodd Wood Visitor Centre and Calvert Trust Adventure Centre which are considered regionally important. A traffic management system would be implemented, meaning that access would be maintained at all times.

169) Twenty-nine PRoWs within Allerdale, including NCN71 (Coast 2 Coast), would be directly or indirectly affected. Where it is technically possible and safe to do so, PRoW gates would be installed in the temporary working area demarcation fence line to allow the public continued access across the working width. For the safety of the general public 17 PRoWs would need to be closed for a short duration at the time of the pipe laying in the vicinity of the PRoW. A formal diversion would be provided for NCN71.

170) Access to High Dyke Equestrian Centre, Great Clifton Village Hall and Great Clifton Rugby League Pitch would be disrupted during construction. A traffic management system would be implemented, meaning that access would be maintained.

171) Five PRoWs within Copeland would be crossed by the Proposed Scheme. Where it is technically possible and safe to do so, PRoW gates would be installed in the temporary working area demarcation fence line to allow the public continued access across the working width. For the safety of the general public three PRoWs would need to be closed for a short duration at the time of the pipe laying in the vicinity of the PRoW. In addition, access to Cumbria Kart Racing and Summergrove Hall (Woodland) would be directly affected so a traffic management system would be implemented to maintain access.

3.10.3 Operational Phase

172) All PRoWs would be reinstated following construction so the potential impacts would only be temporary.

3.10.4 Overall Assessment

173) The majority of impacts on public access and recreation occur as a result of temporary closures of existing routes during construction however with the use of PRoW gates to maintain access this would be limited. Detailed discussions would be held with Public Rights of Way Officers, local cycling groups, ramblers groups and the managers/owners of the facilities that are affected, in order to discuss and agree the temporary closures and diversions in advance of construction.

174) All temporary Public Right of Way closures would be in accordance with Cumbria County Council and Lake District National Park Authority Rights of Way guidance and agreed with the relevant local authorities in advance of their implementation. In addition, during the construction period a number of measures to reduce nuisances (including dust and noise) experienced by users of the PRoWs would be put in place and set out within the Construction Code of Practice.

3.11 Socio-Economics

3.11.1 Existing Conditions

175) The Socio-Economics chapter assesses the potential effects on community, business and tourism interests as well as the potential positive effects on the local economy in terms of income and job creation.

176) Cumbria is one of the largest counties in the UK (the 3rd largest in terms of area in the UK) and is also one of the least populated with a population density of only 74 people per square kilometre; compared to the rest of England with a population density of 413 people per square kilometre.

177) The unemployment rate in Allerdale is consistent with the national average but is higher than the average for Cumbria. Copeland has low rates of unemployment in comparison to both the county and UK as a whole.

178) West Cumbria and the Lake District National Park are particularly reliant on tourism as this makes a major contribution to the local economy and peoples livelihoods depend upon it. The scheme passes through places, such as Keswick, which are tourist hot spots and many small businesses in West Cumbria rely on passing tourism. Whilst tourism peaks in certain months, the beauty of the Lake District in particular means that the tourism market is all year round.

179) As well as tourism, farming, agriculture and food production is also a key part of the economy. The impact on Agriculture is considered separately.

180) During consultation, many businesses and local people raised the potential for severance during the construction period as a major concern.

3.11.2 Construction Phase

181) During construction, there would be positive localised effects, such as the creation of local jobs and additional expenditure. Preliminary estimates are that on average approximately 220 people would be directly employed over the entire construction period but this would peak at 385 during the busiest construction year. On average, a further 45 additional indirect jobs would be supported although this would peak at 90. It is estimated the scheme would cost £280 million with £52 million additional expenditure captured within Cumbria.

182) The everyday negative effect during construction is a result of severance caused by the working width or haulage routes blocking normal access routes, such as roads or footpaths. It is therefore important that the tourism and agricultural industries, which are the foundations of the local economy, do not suffer as a result.

183) Across the Lake District National Park, commercial, tourism or community properties or facilities affected by restricted access from construction works would generally experience short-term temporary severance of about 10 weeks' duration. These impacts are primarily as a result of constructing the Raw Water Aqueduct and because tourism related businesses are most concentrated in the Lake District. During this period some disruption to everyday routines may occur in the communities of Bassenthwaite, Underskiddaw and Blindcrake.

184) In Allerdale, commercial or community properties or facilities would experience short term severance for up to approximately 10 weeks with some minor disruption experienced in the communities of Bridekirk and Deanscales, for example. This would include the primary school in Bridekirk.

3.11.3 Operational Phase

185) As the severance impacts would be associated with the working width for the pipeline only rather than the associated above ground infrastructure, no permanent impacts would be experienced.

3.11.4 Overall Assessment

186) As outlined above some temporary severance impacts on community, residential or commercial property would occur; however, these would all be short term effects that only occur during the construction period.

187) Mitigation would reduce or prevent isolation impacts as a result of severance. This mitigation includes a commitment by United Utilities not to close multiple roads used by a single community at the same time. At Bridekirk, mitigation would be in the form of a commitment not to undertake the road closure during school term time. Other measures, such as where temporary bus route diversions are necessary, would be agreed with relevant operators.

3.12 Agriculture

3.12.1 Existing Conditions

188) Agriculture is the predominant land use along the working width and makes a significant contribution to the wider Cumbrian economy. The local climate and topography means agriculture is predominantly based on livestock rather than horticulture or arable production.

189) Of the 374 ha within the planning application boundary, some 345 ha is agricultural land. It is conservatively estimated, that the proposed scheme could affect up to 69.1 ha of the best and most versatile land and this would be located within land graded as Grade 3.

190) A total of 154 farming interests are potentially impacted by the pipeline and associated infrastructure. Most of the land is owner occupied, although some is rented on both a seasonal and farm business tenancy

basis. The principal activity is sheep and cattle farming, with some arable farming. Arable crops are predominantly cereals including winter wheat, winter barley and spring malting barley.

191) The land also supports diversified business interests such as agricultural contracting, horse livery, tourism and small renewable energy projects particularly wind turbines. It also supports some sporting activities such as rough shooting, stalking and driven shooting managed on a let basis by syndicates. Other wider sporting interests include deer stalking and salmon fishing.

3.12.2 Construction Phase

192) Construction of the pipes would require access for plant, vehicles and operatives in a temporary working corridor of up to 40 m in width. Within this corridor a smaller area would be subject to direct soil stripping and excavation works necessary to lay the pipe work and associated fittings. The planning application boundary has been developed in consultation with land owners and agricultural and sporting interests. This has resulted in an application boundary that, as far as is practicably possible, minimises effects on agricultural soils, and agricultural and sporting activities. However, agricultural land interests would still be affected across the Proposed Scheme. Temporary agricultural land-take of 303 ha would be required for construction.

193) Whilst mitigation significantly reduces impacts, 49 agricultural and sporting interests would still experience some adverse impacts during the construction phase. 22 are located within the Lake District National Park, 23 within Allerdale and four within Copeland.

3.12.3 Operational Phase

194) Construction of the Proposed Water Treatment Works, Service Reservoirs, Pumping Stations and pipes would result in permanent agricultural land-take of approximately 46 ha of agricultural land.

195) During operation, seven agricultural and sporting land interests have been assessed as experiencing significant effects. The majority of the permanent effects would arise from the Proposed Water Treatment Works and the Service Reservoirs and Pumping Stations). Within the Network Main Scheme Sections one further land interest is significantly affected during operation.

3.12.4 Overall Assessment

196) Temporary land-take of 298 ha would be required for construction works on agricultural land. Due to the significant amount of reinstatement which would take place, permanent land-take is 48 ha and represents approximately 14 % of the total land required to construct the scheme.

197) The effects on soils and protection of their agricultural land capability is closely related to the procedures for stripping, storing and reinstatement of soils in all areas where the works are temporary and land is being returned to agriculture. A Soil Management Strategy and Drainage Strategy would enable good practice measures to be employed and the sustainability of soils to be promoted to assist their return to agricultural land capability.

198) Mitigation has been developed to avoid or reduce construction and operational effects on agricultural and sporting activity. A Code of Practice for Pipe Laying would be followed and specific mitigation measures would include provision of alternative access, reinstatement of boundary features and reinstatement of land drainage systems.

3.13 Traffic and Transport

3.13.1 Existing Conditions

199) The local and strategic highway network is predominantly rural, characterised by the two main access routes to the west Cumbrian coast from the M6 motorway; namely the A595 / A689 from the north-east towards Carlisle (Junction 44) and the A66 towards Penrith (Junction 40) to the east.

200) The delineation between the local and strategic networks is clear, with the A66 / A595 corridor providing a high standard route between the M6 and the ports of Workington and Whitehaven on the west Cumbrian coast, and operated by Highways England as custodians of the Strategic Highways Network. The A66 corridor predominantly comprises single lanes, with short sections of dual carriageway and crawler lanes in

areas that have been improved to take account of the local topography. The population alongside the route is largely dispersed, with the key towns of Keswick and Cockermouth both by-passed by higher standard sections of route, removing traffic from constrained sections of highway within the respective town centres.

201) The A591, A595 and the A5086 provide access through the area, albeit to a lesser standard than the A66 corridor. Aside from the A595, which links northwards to Carlisle (M6 J.44) from Cockermouth, the majority of routes were not considered to be of a standard that would be suitable for the strategic movement of materials to the construction works, aside from local access to specific sites.

3.13.2 Construction Phase

202) A review of daily flows across the highway network demonstrated that increases in total two-way traffic flows as a consequence of construction activities would exceed 10 % in four locations, and 30 % in one location (31.5 %). With respect to changes in Heavy Goods Vehicles (HGVs), it was noted that a further 19 highway links would experience daily increases in excess of 30 %, and were therefore considered for further assessment.

203) There a number of locations considered 'sensitive' to traffic impacts, namely areas where there are frontage properties including retail units and a school, where the presence of HGV activity may not be suitable at specific peak periods of the day due to on-street parking and inherent width constraints in the highway. In Allerdale this specifically includes Bothel and in Copeland the settlements of Rowrah Frizington and Cleator Moor.

204) To minimise wider possible impacts on the road network and reduce overall haulage impacts, the actual pipelines would be imported by sea to the Port of Barrow, Heysham, or Workington. From the port, the pipes would be delivered to the temporary compound locations closest to the working area. Cumbria County Council, Highways England and the local constabulary would be involved in discussions with the contractors, and that the favoured routeing for pipe movements from the identified ports would be via the A590 / M6 / A66 to the southern/western Scheme Sections and A590 / M6 / A595 to the northern Scheme Sections. Where the existing road network is not suitable for HGV's, the delivery would take place at the nearest laydown area on route to the working area where the pipes would be stored and then distributed along the pipeline spread via suitable means, such as tractor and trailer.

3.13.3 Operational Phase

205) Traffic during the operational phase would be associated only with direct employment at the Water Treatment Works. Small numbers of staff would be employed and these would be supplemented by occasional service and maintenance vehicles trips. Some maintenance vehicles would also visit the pipeline easement, Service Reservoirs and Pumping Stations. It is considered however that operational phase traffic levels would be insignificant.

3.13.4 Overall Assessment

206) During construction a number of locations would experience some temporary traffic impacts. These are generally areas where the existing level of background traffic is low, and features in the locality (such as schools, shops, residential) can be considered to be sensitive.

207) It is acknowledged that whilst the duration of construction activities would be generally short-term and returned to its normal state on completion, there would still be some impacts requiring mitigation. To this end, a Traffic Management Plan is proposed that would serve to limit the impacts of HGV activity within sensitive areas. This would be delivered through a routeing strategy to be agreed between the construction contractors, Cumbria County Council and Highways England.

208) Further to this, on sections of highway where traffic impacts are considered to be unavoidable (e.g. on an access route to a laydown area) the Traffic Management Plan would be used to identify which periods are considered to be most sensitive and appropriate measures put in place so that HGV activity, where possible, does not coincide. It is likely that this measure would be required specifically in Allerdale at Bothel and in Copeland at Rowrah, Cleator Moor and Frizington. On the Raw Water Aqueduct St Herberts School may also require construction traffic controls. HGV movements would be managed so they do not

coincide with periods where their presence would be most apparent and potentially problematic; for example at school opening and closing times.

209) Mitigation would be implemented during the construction phase to limit the potential effects of additional employee and construction traffic. A Traffic Management Plan is necessary to minimise the likely effects of HGV traffic during construction.

210) A Construction Travel Plan would be developed to mitigate against the potential effects of vehicle access to the construction sites on the surrounding highway network. It is acknowledged that limited options exist to promote sustainable travel alternatives (such as public transport, walking and cycling) due to the rural nature of the Proposed Scheme and the transient nature of the works. The emphasis is therefore placed upon the consolidation of movements within multi-occupancy vehicles from shared accommodation sites such as bed and breakfast, and the management of vehicles within the site compounds to ensure that they do not have a wider impact upon the surrounding highway network, especially within residential areas and close to schools / community facilities.

3.14 Noise and Vibration

3.14.1 Existing Conditions

211) The Proposed Scheme would be located in a generally tranquil rural setting with the majority of construction occurring outside built up areas. As background noise levels are generally low, noise from construction activities have the potential to cause temporary disturbance.

212) Surveys to measure baseline background ambient noise levels have been conducted at 58 locations considered to be representative of the prevailing acoustic climate within each Scheme Section. These were agreed with Environmental Health Officers. Noise is measured in decibels (dB) although this scale can be misleading as it is not a proportionate scale, for example 40 dB is not twice as loud as 20 dB. For comparison, standing within 25 m of a plane taking off is 150 dB and the majority of people would feel discomfort at 110 dB.

213) In rural areas, away from towns and main roads, ambient sound levels typically measured between 40 dB and 50 dB during the daytime and 35 dB and 45 dB during the night-time. In the more urban areas, including Keswick and Cockermouth, ambient sound levels typically varied between 50 dB and 60 dB during the daytime and 40 dB and 50 dB at night. As a typical value for a quiet residential suburb is 50 dB (but this is one quarter the noise level of 70 dB) and 30 dB for a very quiet rural area the measurements are comparable to what would be expected.

3.14.2 Construction Phase

214) Given the typical background noise levels, plant and equipment operating near to noise and vibration-sensitive receptors has the potential to cause adverse impacts. Noise and vibration predictions using currently available information on the likely plant and equipment to be used were undertaken for various construction activities. The activities considered in the assessment included scheme-wide enabling works, pipe-laying (open cut and slip-lining) and reinstatement activities, directional drilling, tunnelling, establishing site compounds, rock breaking and excavation, ground compaction, piling activities and construction of the various permanent operational installations.

215) Without mitigation, significant noise effects would be experienced at many locations close to the working width including residential properties in Keswick (Lake District National Park) and Cockermouth (Allerdale). However, in many cases the construction works are transient in nature and would be of short duration as the construction activities move along the route. Where significant noise impacts are predicted, consideration would need to be given to appropriate mitigation measures to reduce noise levels where feasible.

216) For the Water Treatment Works, Service Reservoirs and Pumping Station, noise impacts during construction are not predicted to give rise to significant effects at the nearby sensitive receptors and no specific mitigation measures, other than use of best practice, have been proposed.

217) Consideration has also been given to the effect of additional construction vehicles on road traffic noise levels during the construction phase. Five roads would potentially experience a perceptible increase (this

is an increase in noise of 1 dB or more) in noise levels as a result of construction traffic. For four of the roads, the increases in noise level would be just about perceptible to residents (with noise increases ranging from 1.4 dB and 1.7 dB). For the worst case affected road (un-named road, linking Bothel and Torpenhow in Allerdale), a 3 dB increase in noise level was predicted. These increases in noise are considered to be temporary adverse construction noise impacts.

218) There is the potential for adverse ground-borne vibration impacts at those properties located in closest proximity to the working width during pipeline enabling, pipe laying and re-instatement works. No significant vibration effects are anticipated during vibration compaction activities at the proposed site compounds and the likelihood of significant vibration impacts resulting from activities at the laydown areas was considered low. For directional drilling, there is considered to be a risk of complaints and possible significant effects at the nearest receptors to the Chestnut Hill Road crossing point, should directional drilling be adopted for that location.

219) Significant adverse ground-borne vibration impacts were not predicted during construction of the Water Treatment Works, Service Reservoirs and Pumping Stations.

220) For piling operations (this is to provide foundations to support buildings), significant vibration impacts have been predicted at the nearest properties. Consideration would need to be given to mitigation measures, including the use of low vibratory piling techniques. Percussive piling should, where possible, be avoided for the tunnel launch and reception shafts for the River Greta and Nether Place tunnels in Keswick and for the Chestnut Hill Road crossing point in Keswick, within the Lake District National Park.

221) There is potential for significant vibration from the various rock breaking techniques proposed. At this stage, it has not been possible to quantify the likely impacts, but mitigation measures are considered likely where rock breaking is required in close proximity to properties. Any blasting undertaking to aid the extraction of high-strength rock would take place during daytime working hours only, with appropriate blast design to minimise noise and vibration (ground borne and air borne) impacts and advance warning provided to local residents and other sensitive receptors.

222) For the proposed tunnelling works, although significant ground-borne noise and vibration effects are considered likely for the tunnels on land to the rear of Nether Place Nursing Home and at the River Greta crossing (both within the Lake District National Park), the impacts would be of relatively short duration and transient in nature.

3.14.3 Operational Phase

223) Very limited operational noise would be associated with the Water Treatment Works, Service Reservoirs and Pumping Stations. With the mitigation measures already embedded into the facility designs, significant noise impacts were not anticipated during either the daytime or night-time periods.

3.14.4 Overall Assessment

224) Appropriate mitigation measures would be agreed in advance of the commencement of works with the relevant authorities and implementation secured through a Construction Code of Practice. Mitigation measures could include suitable noise barriers and consideration of low-noise and low-vibration emitting plant and equipment.

225) Whilst elevated construction noise levels are predicted, construction activities along the working width would generally pass quickly and would therefore be temporary and short-lived. Good practice guidance would be followed, but there may be some locations, particularly where rock is encountered, that would require further noise mitigation to reduce noise impacts at nearby sensitive receptors.

226) No significant noise and vibration effects are anticipated during operation.

3.15 Air Quality and Odour

3.15.1 Existing Conditions

227) Existing air quality in the study area is good in the context of national air quality objectives for pollutants such as nitrogen dioxide (NO2) and particulate matter (PM10) (these are particles which affect human health and are so small they are capable of penetrating the respiratory system).

3.15.2 Construction Phase

228) Exhaust emissions from construction vehicles are likely to be the main source of pollutants. A screening assessment indicated that annual mean concentrations of nitrogen dioxide and particulate matter would be below the relevant air quality standards at locations which are sensitive to changes in air quality. The overall effect from construction vehicles on local air quality is therefore considered to be negligible.

229) Three nature conservation sites are designated within 200 m of roads which would be used during construction (Clints Quarry, River Derwent and Bassenthwaite Lake, and Braithwaite Moss). Predicted nitrogen oxide concentrations are below the 'Critical Level' (set by the World Health Organisation), at Clints Quarry and Braithwaite Moss, therefore there are no predicted significant air quality impacts at these locations. Nitrogen deposition rates at River Derwent and Bassenthwaite Lake are predicted to exceed the normal standard but this would only be for a short period of time during construction and is not considered to be a significant issue.

230) The risk of dust emissions from earthworks and construction activities varies depending upon the scale of anticipated works and the sensitivity of the surrounding area. However, standard good practice measures to mitigate dust emissions from the construction phase of the Proposed Scheme would be included within a Construction Code of Practice to prevent or minimise the release of dust entering the atmosphere and/or being deposited on nearby receptors. With these mitigation measures in place, all residual effects on receptors would not be significant.

3.15.3 Operational Phase

231) Increases in nitrogen dioxide (NO2) and particulate matter (PM10) associated with emissions from vehicles during the operational phase are negligible due to the small number of vehicle movements predicted compared to existing vehicle flows on the road network.

3.15.4 Overall Assessment

232) The main potential effects on local air quality associated with construction are dust and vehicle exhaust emissions.

233) The main roads affected by construction vehicles are the A66 between Keswick and Bridgefoot (between the Lake District and Allerdale) and the A595 around Moota (Allerdale). The overall impact of construction traffic on local air quality at properties in close proximity to these roads is negligible and therefore not significant.

234) The incorporation of the Construction Code of Practice and incorporation of mitigation measures should reduce all construction dust, human health and ecological effects across the scheme to 'not significant'.

3.16 Cumulative Effects

235) Potential exists for the effects identified above to combine with those from the other development projects - termed cumulative effects. Table 3.2 summarises where such effects are likely to occur.

Table 3.2: Cumulative Effects

ES Chapter	Potential Cumulative Effects
Landscape and Visual Assessment	Significant cumulative visual effects would be restricted to a small number of visual receptors at specific locations along the route of the Proposed Scheme. These receptors would have sequential or combined views of the Proposed Scheme and some of the developments in question. The level of significance of these cumulative effects varies, largely dependent on the location of the visual receptors in relation to the Proposed Scheme and the proposed developments. Cumulative effects would be most pronounced during the construction phase of the Proposed Scheme and would be reduced once its associated mitigation planting and reinstatement of vegetation becomes established. Cumulative landscape effects would be largely limited and, on the whole, would not alter the conclusions drawn from the landscape and visual effects of the Proposed Scheme in isolation. Although the combined developments would result in changes to the landscapes in which they are located, their cumulative effects would be mostly temporary, being largely limited to the construction phase of the Proposed Scheme. Cumulative effects in the long-term (residual) would remain unchanged.

ES Chapter	Potential Cumulative Effects
Arboriculture	At the current time there is limited publicly available information to make a full assessment about the amount of potential tree loss for the other proposed developments. It is acknowledged that a number of the proposed developments particularly the larger developments such as the North West Coastal Connections Project could potentially result in an inevitable loss of trees and hedgerows. As this information is not available it is not possible to determine the full cumulative effect.
Water Environment	There is potential for cumulative effects with other proposed developments unrelated to the West Cumbria Water Supplies project. However, it has been assumed that all other schemes would have to adhere to good practice or provide specific mitigation measures to reduce the impacts they may have on the water environment. Using this assumption it is considered unlikely that the Proposed Scheme would have anything more than extremely limited cumulative effects with other schemes and where it does occur it would not alter the conclusions drawn from the effects of the Proposed Scheme in isolation.
Flood Risk	There is potential for cumulative effects with other proposed schemes however, it has been assumed that all other schemes would have to adhere to good practice or provide specific mitigation measures to reduce the impacts they may have on flood risk as part of the FRA process if it is a larger scheme. Using this assumption it is considered unlikely that the Proposed Scheme would have anything more than extremely limited cumulative effects with other schemes and the likelihood of it happening is considered low.
Ecology	The number and type of developments considered indicates that there is potential for cumulative effects from the Proposed Scheme and other proposed developments. However, it has also been assumed that all other schemes would have to adhere to similar levels of good construction practice or provide specific mitigation measures to reduce the impacts they may have on designated sites, protected species and other biodiversity resources. Using this assumption it is considered unlikely that the Proposed Scheme would give rise to anything more than very limited cumulative effects with other schemes and where cumulative effects might occur it would not alter the conclusions drawn in the Ecology chapter of the ES.
Cultural Heritage	It is unlikely that there would be cumulative effects on cultural heritage assets from the Proposed Scheme and the majority of other proposed developments considered. There is potential however for cumulative impacts with Cockermouth WwTW Extension due to the increased visibility of infrastructure in close proximity to known archaeology within an area of archaeological sensitivity, and due to excavation of a new network of pipes at the Wastewater Transfer Papcastle and Brigham WwTWs to Cockermouth WwTWs.
Soils, Geology and Hydrogeology	There are potential cumulative effects associated with groundwater relating to dewatering and changes to groundwater levels and flows. Provided that long-term stable groundwater conditions have developed before any future developments are constructed, the Proposed Scheme would not affect future developments through groundwater effects. Residual changes to groundwater levels and flows associated with the scheme are expected to be small. The Proposed Scheme's contribution to any cumulative effects on groundwater levels and flows would be correspondingly small. The Proposed Scheme could be affected by dewatering related subsidence effects associated with future developments. Any proposed dewatering should be assessed for potential effects on the scheme.
Materials and Waste	The potentially significant cumulative effects of other proposed developments would present only a temporary risk if their construction programmes were to coincide with construction of the Proposed Scheme. Assuming that some of the other projects coincide with the Proposed Scheme, there could be cumulative effects in connection with the requirement for construction materials and products, and demand for receptor sites for waste outputs. Materials supply is not considered to generate significant cumulative effects because pipeline of the type required for the Proposed Scheme would not be in large demand from the other proposed developments; the stone and pipe bedding materials are in plentiful supply within Cumbria. The schemes with potential to result in the greatest cumulative effects associated with surplus excavated material are the NuGen developments, Sellafield site, North West Coastal Connection and West Cumbria Mining.
Public Access and Recreation	The majority of proposed developments would not act cumulatively with the Proposed Scheme. A number of PRoWs may experience temporary nuisances (i.e. noise and dust emissions) generated from the Proposed Scheme as well as other developments. It is anticipated that recreational facilities and activities would be accessible but there could be

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	increased construction traffic from the Proposed Scheme and other proposed developments. All of these effects would be minimal and would not change the conclusions that have already been drawn in connection with the Proposed Scheme.
Socio-Economics	The cumulative effects of the Proposed Scheme with other proposed developments on the schedule would likely reduce the predicted additional employment as presented in the employment assessment. This is due to increased competition for construction workers during a short period of approximately five years from 2016 when several large and medium-sized developments would occur. However, as the benefit was not assessed to be significant, this would not result in a change in the assessed level, and so it has not been investigated further in the ES. The cumulative effects of these schemes would likely increase pressure on the availability of tourism accommodation during the construction of this scheme. As the details of the accommodation provisions being made by some of these projects are not fully known, it cannot be fully appraised. It is known however that the Moorside project's *associated development* proposals under consideration include provision of accommodation for up to 4,000 workers in Corkickle and South Whitehaven, whilst Cleator Moor and Egremont could accommodate up to 1,000 workers. However, it can be broadly stated that the cumulative effects result in a more frequent occurrence of significant impacts on tourism accommodation, particularly during peak months and August 2017 and 2018 especially. These impacts could have knock-on effects, such as those included in the NuGen scoping report (e.g. 'change in prosperity of the visitor economy') describing the potential impact that major, lengthy construction projects can have due to incoming workers, disruption to existing visitors and changes in the willingness of the tourism sector to invest in its facilities.
Agriculture and Sporting Land Use	A couple of schemes have been identified as having potential cumulative effects in combination with the West Cumbria Water Supplies project, namely the Lake District National Park Allocation of Land – KE03H Sheep Dog Field which could require approximately 1.51ha of land from Threlkeld Hall (Land Plot 61 and 63) in addition to the proposed scheme. The North West Coastal Connections Project would also potentially require temporary and permanent land take from a number of land plots which are affected by the Proposed Scheme. The additional effects on the above land plots are however not considered to be significant against the total land interests
Traffic and Transport	As part of the mitigation identified within Section 18 of the ES, it is proposed that a Steering Group be set up to manage the potentially negative effects of concurrent construction operations across the Strategic Road Network (SRN) resulting from identified schemes within West Cumbria. Of particular interest is the A66 / A591 / A595 corridor between the M6 at Junction 40 and the west Cumbrian coast where cumulative effects are foreseeable.
Noise and Vibration	Significant cumulative noise and vibration effects would be restricted to a small number of sensitive receptors in the village of Goose Butts. These receptors may experience adverse cumulative impacts during construction, and in some locations operation.
Air Quality and Odour	There is potential for cumulative effects on local air quality associated with construction phase dust and vehicle exhaust emissions from developments within proximity to the Proposed Scheme. It is anticipated that if appropriate mitigation strategies similar to those proposed for the West Cumbria scheme are adopted for the other developments, the risk of combined air quality effects would be negligible and not significant.

3.17 Interaction of Effects

236) Potential exists for effects identified for the Proposed Scheme to interact with each other. Potential interactions can occur at the scheme-wide level and section level, during both construction and operational phases, as described below.

3.17.1 Construction Phase

Bridge End Connection

237) During construction at Bridge End, a combination of temporary land take along with construction access, visual intrusion and noise impacts would affect residential property and temporarily disrupt local farming operations. At Thirlmere Reservoir, nearby construction could temporarily influence the amenity of the area. Table 3.3 examines potential interactions of effects in the Bridge End area.

Table 3.3: Interaction of Effects at Bridge End

Receptor	Interacting Effects	Potential Outcome
Farmland and residential property – human environment	• Visual intrusion (LVIA[4]) • Temporary land take (Agriculture) • Site access by construction vehicles (Traffic and Transport)	A combination of effects on agriculture, land interests and residential property
Thirlmere Reservoir and environs	• Visual intrusion (LVIA) • Residential and recreational amenity (LVIA / Socio-economics / Access and Recreation)	Interaction of effects arising from a temporary reduction in amenity value, with some visual intrusion to the north of Thirlmere

Raw Water Aqueduct

238) During construction on the RWA there would be many significant effects. Key receptors are identified in Table 3.4 to illustrate how the interactions may arise at, for example, the communities of Keswick, Underskiddaw and Bassenthwaite.

Table 3.4: Interaction of Effects – Keswick to WTW

Receptor	Interacting Effects	Potential Outcome
The community of Keswick; including local residents, farmers, providers of tourism services and tourists	• Significant noise experienced at several locations in the Keswick area (Noise) • Visual intrusion to the front or rear of residential properties (LVIA) • Temporary land take (Agriculture) • Intersection of PRoW and road closures interrupting access and connectivity (Access and Recreation) • Construction compounds and limited road closures (Traffic and Transport)	The combination of effects occurring within Keswick is likely to reduce the amenity of living, working and visiting the community for the duration of construction both within the town and surrounding areas. Agricultural land interests, also part of the Keswick community, would be affected through temporary land take and severance.
Crosthwaite Roundabout to Dodd Wood, including the community of Underskiddaw	• Visual intrusion for walkers and those travelling by road (LVIA) • Temporary land take (Agriculture) • Intersection of PRoW and cycle paths (Access and Recreation) • Road closures (Traffic and Transport) • Impacts on heritage assets such as roman road and undesignated sites (Cultural Heritage)	The combination of effects occurring in the environs of Underskiddaw is likely to reduce amenity for those living, working in and visiting the community for the duration of construction contract. There would also be interaction of effects on cultural heritage resources.

[4] Landscape and Visual Impact Assessment

Receptor	Interacting Effects	Potential Outcome
Dodd Wood to Castle Inn, including the community of Bassenthwaite	• Visual intrusion for walkers those travelling by road (LVIA) • Temporary land take (Agriculture) • Intersection of PRoW and road closures interfering with access to sites (Access and Recreation) • Traffic management on local roads (Traffic and Transport) • Impacts on heritage assets such as Mirehouse and St Bega's Church and their recreational amenity (Cultural Heritage / Access and Recreation)	The combination of effects occurring in the environment around Dodd Wood and Bassenthwaite is likely to reduce visual, residential and recreational amenity.
Dodd Wood area visitor attractions	• Visual intrusion around Dodd Wood (LVIA) • Intersection of PRoW and road closures interfering with access to sites (Access and Recreation) • Road closures (Traffic and Transport)	The combination of effects in the Dodd Wood area is likely to reduce local visual and residential amenity at visitor attractions.
Castle Inn to the Proposed WTW and visitor attractions in the area	• Visual intrusion around Castle Inn (LVIA) • Intersection of PRoW and road works interfering with access to sites (Access and Recreation) • Temporary land take (Agriculture) • Tree losses (Arboricultural) • Impacts on heritage assets such as the ridge and furrow field systems, parkland and listed buildings (Cultural Heritage)	The combination of effects at Castle Inn is likely to reduce local visual and residential amenity, as well as influence cultural heritage assets.
Blindcrake Conservation Area	• Intrusion into the Conservation Area • Habitat loss (Ecology) • Impacts on heritage assets such as the ridge and furrow field systems (Cultural Heritage) • Visual intrusion of the Gill Beck crossing (LVIA) • Tree and hedgerow losses (Arboriculture, Ecology) • Construction noise and construction traffic flows	The interaction of effects at this sensitive and designated location encompasses both natural resources, the human environment and cultural heritage assets.

Proposed Water Treatment Works

239) During construction of the Proposed Water Treatment Works, construction activities would result in movements of heavy goods and light duty commercial vehicle movements, visual intrusion, task lighting installations and noise generation. Together these effects would serve to reduce the amenity of local properties, as well as influencing local tourism accommodation. The reduction in tranquillity and natural beauty may serve to interfere with the attraction of these businesses. Table 3.5 presents examples of the types of interacting effects which might be expected at the Proposed Water Treatment Works site.

Table 3.5: Interaction of Effects in the Environs of the Proposed Water Treatment Works

Receptor	Interacting Effects	Potential Outcome
Local residences at Redmain and Williamsgate	• Visual intrusion (LVIA) • Noise from construction (Noise) • Site access by construction vehicles (Traffic and Transport) • Tree and hedgerow losses (Arboriculture, Ecology) • Temporary land take (Agriculture)	The interaction of effects may serve to reduce the quality of life and residential amenity during the construction period.
Tourist accommodation at Redmain	• Visual intrusion (LVIA) • Noise from construction (Noise) • Traffic management on local roads (Traffic and Transport)	The interaction of effects may serve to reduce the amenity of the accommodation.

Network Main – Proposed Water Treatment Works to Quarry Hill

240) During construction of the Network Main between the Proposed Water Treatment Works and Quarry Hill, construction activities would result in visual intrusion and disruption of the local landscape while simultaneously giving rise to noise emissions. Together these would serve to reduce the amenity of local residences in areas such as Mealsgate, Boltongate, Bothel and Blindcrake. In addition, there are several facilities offering tourism accommodation in Mealsgate, such as Larches Caravan Park. The reduction in tranquillity and local amenity may serve to interfere with the attraction of these businesses. Table 3.6 presents examples of the types of interacting effects which might be expected along this Scheme Section.

Table 3.6: Interaction of Effects Water Treatment Works to Quarry Hill

Receptor	Interacting Effects	Potential Outcome
Local residences in settlements such as Mealsgate, Boltongate, Bothel and Blindcrake	• Visual intrusion (LVIA) • Noise from construction (Noise) • Traffic and construction vehicle movements (Traffic and Transport) • Temporary land take (Agriculture)	The combination may serve to reduce quality of life and amenity during the construction period.
Tourist accommodation at Mealsgate, such as the Larches Caravan Park	• Visual intrusion (LVIA) • Noise from construction (Noise) • Traffic management on local roads (Traffic and Transport)	The combination of effects may serve to increase disturbance and reduce local amenity during the construction period.

Network Main – Proposed Water Treatment Works to Summergrove

241) During construction of the new mains south towards Summergrove, construction would result in visual intrusion and disruption of the local landscape while simultaneously producing noise during construction periods. Together these would serve to reduce the amenity of local communities at Papcastle, Deanscales and Arlecdon for instance, as well as visitors to and users of the tourism facilities at these locations. Additionally, there are significant ecological and archaeological resources in the area which could be affected during the construction phase. Table 3.7 presents examples of the types of interacting effects which might be expected along these Scheme Sections.

Table 3.7: Interaction of Effects Proposed Water Treatment Works to Summergrove

Receptor	Interacting Effects	Potential Outcome
Local residents and visitors to Papcastle and Cockermouth	• Noise from construction (Noise) • Visual impact from loss of vegetation (LVIA) • Tree and hedgerow loss (Arboriculture, Ecology) • Construction vehicle movements (Traffic and Transport)	This interaction of effects may serve to reduce local amenity during the construction period, while the effects of tree and hedgerow losses would extend into the operational phase.
Cultural heritage assets e.g. Papcastle area	• Noise from construction (Noise) • Visual impact from loss of vegetation (LVIA) • Construction vehicle movements (Traffic and Transport)	This combination of effects may serve to impact on cultural heritage assets.
Local residents and tourists at Deanscales	• Noise from construction (Noise) • Visual impact from loss of vegetation (LVIA) • Tree and hedgerow loss (Arboriculture, Ecology) • Construction vehicle movements (Traffic and Transport) • Temporary land take (Agriculture)	This combination of effects may serve to reduce local amenity during the construction period, while the effects of tree and hedgerow losses would extend into the operational phase.
Local residents and tourists at Arlecdon	• Noise from construction (Noise) • Visual impact from loss of vegetation (LVIA) • Tree and hedgerow loss (Arboriculture, Ecology) • Construction vehicle movements (Traffic and Transport) • Temporary land take (Agriculture)	This combination of effects may serve to reduce local amenity during the construction period, while the effects of tree and hedgerow losses would extend into the operational phase.

Networks Main – Cockermouth to Broughton Cross and Stainburn, and from Cockermouth to Southwaite Farm and Cornhow

242) During construction of the new mains between Cockermouth and Stainburn in a westerly direction, and Cockermouth to Cornhow in an easterly direction, the geographical extent of interacting effects would be less than those reported for other sections of pipeline. This is because slip-lining would comprise the main construction technique. Nevertheless slip-lining operations would require intrusive groundworks at locations along the pipeline's alignment, and in addition small sections of open cut along the Cockermouth to Broughton Cross and other small areas would generate interacting effects.

243) Table 3.8 presents examples of the types of interacting effects which might be expected along these Scheme Sections.

Table 3.8: Interaction of Effects along Slip-ling Sections

Receptor	Interacting Effects	Potential Outcome
Local residents and tourists at Cockermouth	• Noise from construction (Noise) • Construction vehicle movements and road closures (Traffic and Transport) • Impacts on heritage assets such as the scheduled monument nearby (Cultural Heritage)	The interacting effects may serve to reduce local amenity in the Cockermouth area during the construction period.

Receptor	Interacting Effects	Potential Outcome
Local residents and tourists at Broughton Cross	• Noise from construction (Noise) • Visual impact from loss of vegetation (LVIA) • Construction vehicle movements and road closures (Traffic and Transport) • Impacts on heritage assets (Cultural Heritage)	The interacting effects may serve to reduce local amenity in the Broughton Cross area during the construction period.
Local residents and tourists at Brigham	• Noise from construction (Noise) • Visual impact from loss of vegetation (LVIA) • Construction vehicle movements and road closures (Traffic and Transport) • Temporary land take (Agriculture)	The combination may serve to reduce local amenity in the Brigham area during the construction period.
Local residents and tourists at Bridgefoot	• Noise from construction (Noise) • Visual impact from loss of vegetation and loss of stone walls (LVIA) • Construction vehicle movements and road closures (Traffic and Transport)	The combination may serve to reduce local amenity in the Bridgefoot area during the construction period.
Local residents and tourists at Great Clifton	• Noise from construction (Noise) • Visual impact from loss of vegetation and loss of stone walls (LVIA) • Construction vehicle movements (Traffic and Transport)	The combination may serve to reduce local amenity in the Great Clifton area during the construction period.

Harrot Hill Pumping Station

244) During construction at Harrot Hill Pumping Station, it is not anticipated that there would be any significant interaction of effects. The site is located in a comparatively isolated position over 0.5 km from the nearest residential properties on the west side of Cockermouth. While the Pumping Station would give rise during the construction phase to visual and landscape effects, noise emissions and increased construction vehicle movements, there are no nearby receptors at which these effects would interact significantly.

Moota Hill and High Leys Service Reservoirs

245) During construction at Moota Hill Service Reservoir and High Leys Service Reservoir and Pumping Station, the EIA has identified agricultural land take, vegetation and field boundary clearance, emissions of noise, visual intrusion and increased construction vehicle movement on local roads. Table 3.9 provides a qualitative assessment of how these effects may interact with the human environment.

Table 3.9: Interaction of Effects Service Reservoirs

Receptor	Interacting Effects	Potential Outcome
Local residential properties	• Visual intrusion (LVIA) • Field boundary removal (LVIA) • Noise emissions (Noise and Vibration) • Construction vehicle movements on the local road network (Traffic and Transport)	The interacting effects may serve to reduce residential amenity during the construction phase at local properties.
Tourist accommodation in the surrounding area	• Visual intrusion (LVIA) • Construction vehicles on the local road network (Traffic and Transport)	The interacting effects may serve to reduce residential amenity during the construction phase at local tourism accommodation.

Receptor	Interacting Effects	Potential Outcome
Local farmland at Moota Hill and High Leys	• Visual intrusion (LVIA) • Temporary land take (Agriculture)	The combination may both disrupt the agricultural use of this land while reducing its amenity value for the duration of construction.

3.17.2 Operational Phase

246) The nature and scope of environmental effects during the operational phase of the Proposed Scheme would be considerably less than during the construction phase. Effects considered in the ES include the visual aspects of the permanent installations such as the Proposed Water Treatment Works, Harrot Hill Pumping Station and Service Reservoirs, agricultural land take and noise emissions. However, there would be no interaction of effects which might be considered significant in the context of the Regulations.

4. Obtaining Further Information

247) Planning applications have been submitted by United Utilities for the Proposed Scheme to the three Local Planning Authorities, copies of which can be viewed at the following locations during normal office hours:

Development Management
Lake District National Park Authority
Murley Moss
Oxenholme Road
Kendal LA9 7 RL

Allerdale Borough Council
Allerdale House
Workington
Cumbria
CA14 3YJ

Copeland Borough Council
Development Services
The Copeland Centre
Catherine Street
Whitehaven
CA28 7SJ

248) Electronic (CD) copies of the Environmental Statement can be purchased at a cost of £10 including postage and packaging from:

United Utilities plc
West Cumbria Team
Thirlmere House
Lingley Mere
Great Sankey
Warrington
WA5 3LP

Email: myview@uuplc.co.uk

249) Paper copies of the Non-Technical Summary are available from United Utilities at the above address.

250) Expressions of support, representations, or opinions should be sent to the relevant Local Planning Authority at the above addresses.