

13. Freshwater environment: groundwater

13.1 Introduction

- 13.1.1 This chapter presents an assessment of potential impacts on the groundwater environment arising from the proposed Moorside Project. Of particular relevance to the groundwater assessment is the potential for the lowering of groundwater levels due to dewatering associated with the Moorside Site construction works, and the potential for effects on groundwater quality due to various construction and operational activities on all Moorside Project Sites. However, the assessment of potential impacts on groundwater is also of relevance to other environmental receptors, which are described in other parts of the PEIR, notably the following:
- Freshwater environment: surface water (Chapter 14); and
 - Terrestrial and freshwater ecology (Chapter 18).
- 13.1.2 The assessment presented in this chapter will also be relevant to a specific Water Framework Directive (WFD) assessment that will accompany the Environmental Statement (ES) to be submitted as part of the application for a DCO for the Moorside Project in 2017.

13.2 Limitations of the PEIR

General

- 13.2.1 The scale and complexity of the Moorside Project means that it is continuing to evolve at this preliminary stage, which presents limitations in terms of programme and phasing. In addition, survey work has yet to be undertaken, or fully completed, for some Moorside Project Sites. These limitations have meant that this PEIR chapter has focussed on the Moorside Site, the Accommodation Sites, the Corkickle to Mirehouse Railway Site and the St. Bees Railway Site.
- 13.2.2 The sites for the Highway Improvements have been 'scoped out' of the assessment presented in this chapter (see Section 13.4 for more information). The improvements at these sites are limited to signal improvements, junction reconfiguration and limited road widening. Construction and operation of these sites will adopt best practice site measures. As such, the construction and operation of these Highway Improvements are considered to be of limited consequence to the groundwater environment.
- 13.2.3 Impacts of infrastructure and activities outwith the Moorside Project Sites assessed in this PEIR will be developed in the ES, including those related to any required new freshwater abstraction for the purposes of supplying the Moorside Project.

13.2.4 In addition, the assessment in this PEIR has focussed on the construction and operational phases of the above sites. Decommissioning has not been specifically assessed within the PEIR, as it remains uncertain at this point which elements would be decommissioned and when. Each of the Accommodation Sites and Additional Sites may see some element of decommissioning activity undertaken once the construction phase of the Moorside Site itself is complete (demolition or removal of certain features), and the effects of these operations are expected to be no greater than those in the construction phase assessments for these sites. The decommissioning phase of each Moorside Project Sites will be assessed in detail in the ES. As discussed at **Chapter 2, Project Description**, decommissioning of the Moorside Power Station itself will also be included within the ES, but at a high level given that these activities will take place around 60 years after operations commence, and they will be covered by a discrete EIA of the activities at that time.

Technical

- 13.2.5 The assessments of significance contained within this chapter are made in the absence of quantitative supporting analysis (e.g. numerical modelling) as this work is being progressed over the course of 2016. Instead, the assessments rely on expert judgment at this time. These judgements may be revised within the ES, following more detailed analysis and refinements in project design.
- 13.2.6 Any settlement of existing buildings due to changes in groundwater level due to the Moorside Project will be addressed in the Moorside Site Specific Safety Case. Potential health effects on construction workers and the resident population will also be considered in this Safety Case.

13.3 Policy and legislative context

- 13.3.1 The following planning policy, guidance and legislation will be used to inform this assessment.

Policy context

- 13.3.2 National Policy Statements (NPSs), National Planning Policy Framework (NPPF) and local planning policies have been discussed, in general terms, in **Chapter 1, Introduction**. The following specific planning policies have been used to inform this assessment:
- NPS EN-1 sets out the generic impacts associated with energy projects during the construction and operation phases, and the information that an ES should provide in relation to impacts on water quality and resources (including groundwater):
 - Section 5.15 covers the issue of water quality and resources in relation to new energy generation development. It explains that development can lead to increased demand for water, involve discharges to water and could cause ecological effects due to modifications to the water

environment. This could result in the environmental objectives under the WFD not being met.

- It states that decision makers will need to give “*impacts on the water environment more weight where a project would have an adverse effect on the achievement of the environmental objectives established under the Water Framework Directive*” (Paragraph 5.1.5.5).
- NPS EN-6 recognises that nuclear power projects can have adverse effects on water resources through increased demand, particularly during construction, and from the cooling water systems.
- The NPS for National Networks (Department for Transport, 2014) sets out planning policy with reference to the rail infrastructure aspects of the Project. With regard to water quality and resources, the guidance notes that network infrastructure development can lead to adverse effects on the water environment which can result in a failure to meet environmental objectives established under WFD and makes recommendations for assessment of impacts in this context (paragraph 5.219 *et seq.*).
- The Government's NPPF forms a key part of the Government's reforms to make the planning system less complex and more accessible, and to promote sustainable growth. Key elements that relate to the groundwater environment include the risk of water pollution.

Guidance

- 13.3.3 The WFD provides the framework under which water quality within the Study Areas can be assessed. Implementation of the WFD is primarily achieved through a system of river basin management planning, which is the responsibility of the Environment Agency (EA). Current water body classifications, environmental objectives and proposals for programmes of measures to achieve these objectives are brought together in a River Basin Management Plan (RBMP) for each river basin district. The River Calder, the River Ehen and the tributaries of these rivers are in the North West River Basin District. An updated RBMP for this District was released on 16 February 2016 (Reference 6. EA), and has been considered in this PEIR.
- 13.3.4 The EA's water resource duties are set out in its strategy for managing water abstraction (EA, 2013). Under this strategy, the EA assesses the availability of both surface water and groundwater resources for abstraction using its Abstraction Licensing Strategy (ALS, formerly called Catchment Abstraction Management Strategy (CAMS)) process. The Moorside Project Sites are located in the area covered by the Derwent and West Cumbria ALS (Reference 4. EA).
- 13.3.5 The EA applies its responsibilities not only in the use of its own powers, but also in seeking to influence the policies and decisions of others whose actions can affect the protection of surface water and groundwater. To this end, EA policy and general guidance relating to the groundwater environment includes Groundwater Protection: Principles and Practice (GP3) (Reference 5. EA) and Hydrogeological Impact Appraisal for Dewatering Abstractions (Reference 3. EA). The EA's Pollution Prevention Guidance Notes (PPGs) are also still of

relevance, although they were withdrawn from use in December 2015 and now reside in The National Archives (the official archive of the UK government).

- 13.3.6 Other policy and general guidance relating to the groundwater environment is available, including a series of Construction Industry Research and Information Association (CIRIA) reports and relevant British Standards.

Legislation

- 13.3.7 The legislation listed below is of particular relevance to the assessment of effects on the groundwater environment (ordered chronologically, oldest legislation first):

- Control of Pollution Act 1974 (as amended);
- Environment Protection Act 1990;
- Water Resources Act 1991;
- Land Drainage Act 1991;
- Water Act 2003;
- European Union (EU) WFD (2000/60/EC), as enacted into domestic law by the Water Environment (WFD) (England and Wales) Regulations 2003;
- Dangerous Substances Directive (codified version) (2006/11/EC);
- Priority Substances Directive (2008/105/EC), as enacted into domestic law by the 2010 Directions listed below;
- Environmental Damage (Prevention and Remediation) Regulations 2009;
- Private Water Supplies Regulations 2009;
- Water Resources Act 1991 (Amendment) (England & Wales) Regulations 2009;
- River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010; and
- The WFD (Standards and Classification) Directions (England and Wales) 2015.

13.4 Data gathering methodology

Study areas

- 13.4.1 A 3 km radius land-based Study Area around the Moorside Site (**Figure 13.1**) has been defined for use in data collection and describing baseline conditions, and also in the assessment of potential direct effects on groundwater environment receptors from the Moorside Site. A 3 km radius is considered to be sufficient for the groundwater environment, given the regional groundwater flow direction towards the coast and the likely hydrogeological

characteristics of the area's main sandstone aquifer. The impact assessment includes the entirety of any WFD water bodies that intersect the 3 km Study Area.

- 13.4.2 Precautionary 3 km radius land-based Study Areas, plus WFD water bodies, have also been defined for the Accommodation Sites (**Figure 13.1**).
- 13.4.3 1 km radius Study Areas, plus WFD water bodies, have been defined for sites other than the Moorside Site and Accommodation Sites, as identified below and on **Figure 13.1**:
- Corkickle to Mirehouse Railway Site; and
 - St. Bees Railway Site.
- 13.4.4 The smaller Railway Site Study Areas reflect the anticipated much reduced extent of impact on groundwater of these developments, due to their relatively shallow construction and the less-polluting nature of their operations.

Desk study

- 13.4.5 A desk study has collected publically available information within the Study Areas. Data has been collected from the following sources:
- The EA;
 - The Meteorological Office;
 - The Coal Authority;
 - The British Geological Survey;
 - Natural England (NE);
 - Sellafield Limited;
 - United Utilities; and
 - Previous survey work undertaken by NuGen.
- 13.4.6 The analysis of the above demonstrated that enough secondary data was available to provide a broad description of the regional baseline environment relevant to groundwater. However, the available datasets were found to be less informative at the project scale (i.e. near-field) and were considered insufficient to fully address EIA requirements. Accordingly, a programme of surveys was commissioned to address the identified data gaps. These data gaps included (amongst other things) an absence of groundwater level and quality data for the Moorside Site, including the Low Church Moss Site of Special Scientific Interest (SSSI).

Survey work

- 13.4.7 Intrusive Groundwater investigation has only so far commenced at the Moorside Site, and therefore the remaining paragraphs in this section only refer to the Moorside Site.
- 13.4.8 Surveys have been required in order to provide site-specific data regarding the hydrogeology of the Moorside Site, in addition to that accessed through desk study. Survey work to date comprises the drilling and construction of 81 observation boreholes (OBHs) across the central area of the Moorside Site. A further approximately 74 OBHs are being drilled across the Moorside Site during spring 2016.
- 13.4.9 Groundwater levels in the OBHs are manually dipped monthly, with automatic hourly readings of groundwater levels in a subset of OBHs. Geophysical logging and hydraulic testing (to establish hydrogeological parameters) have been and will be undertaken, and pumping tests that would establish hydrogeological parameters over a wider area are also planned. Sampling of groundwater for laboratory analysis commenced in January 2016, and is currently planned to be undertaken on a quarterly basis through 2016, as agreed with statutory consultees.
- 13.4.10 Additional survey work has been undertaken within the Low Church Moss SSSI to provide site-specific data to inform the understanding of the hydrological and hydrogeological functioning of the SSSI. This has comprised the installation of dipwells and piezometers to measure shallow groundwater levels at five locations, and water level monitoring on the pond and outflow ditch. A preliminary peat survey has also been undertaken. Water levels are being measured monthly, together with automatic 15 minute readings of water levels on the pond, outflow ditch and in one dipwell and piezometer pair. A spot flow gauging is also undertaken monthly. Further survey work at Low Church Moss is planned, and is likely to comprise further peat surveys, topographical surveys and geophysical surveys.
- 13.4.11 Updated monitoring results for both the Moorside Site and the Low Church Moss SSSI are held in Project Quarterly Monitoring Reports, and these data have been used to inform the Moorside Site baseline presented later in this chapter. As the past history and intended future footprint and use of the sites other than the Moorside Site are further identified, their survey needs will be addressed and planned in a similar way as has been undertaken for the Moorside Site, and results will be reported in the ES.

Consultation

- 13.4.12 Further to the details outlined in **Chapter 3, EIA methodology** regarding the consultation that has taken place to date, it should be noted that consultation received from the following organisations have been used to inform the scope of the groundwater assessment:
- The EA;
 - NE;

- Cumbria County Council (CCC);
 - Copeland Borough Council (CBC);
 - Sellafield Limited;
 - National Trust; and
 - Lake District National Park Authority (LDNPA)
- 13.4.13 The help of all organisations involved is much appreciated. The consultation has included the responses to the regular meetings and discussions held on the Survey and Monitoring Plans (SMPs), quarterly update meetings, EIA Scoping Report, and the preparation of this PEIR.
- 13.4.14 **Table 13.1** provides details of the issues which have been raised during these consultations in approximately chronological order (oldest comments first), and indicates how they are being considered in the PEIR.

Table 13.1 Consultation responses received

Issue raised	Consultees	Response
The groundwater resource may be significantly impacted by construction dewatering.	CCC (August 2015 Scoping Opinion).	This potential impact is considered in the groundwater impact assessment (Section 13.8).
Groundwater monitoring should coincide with highest and lowest groundwater levels.	CCC (August 2015 Scoping Opinion).	Groundwater surveys at the Moorside Site have taken place at various times of the year, including periods of high and low groundwater levels (Section 13.8).
It is premature to ‘scope out’ Accommodation Sites in terms of their groundwater impacts.	CCC (August 2015 Scoping Opinion).	It is agreed that it is premature to ‘scope out’ Accommodation Sites, and so they have been included in the assessment (Section 13.8).
There is no reference in environmental measures to baseline/periodic monitoring and the upkeep of a Site Condition Report.	EA (Quarter 1 2016 consultation in preparation of this PEIR).	Reference is now made to monitoring and a Site Condition Report (Section 13.6).
For groundwater dewatering, screening steps from Annex D1 (assessment of hazardous pollutants within surface water discharges) will need to be considered if there is an intention to discharge to surface water.	EA (Quarter 1 2016 consultation in preparation of this PEIR).	Agreed.

Issue raised	Consultees	Response
<p>The impacts of ground contamination on controlled waters are not identified as a potential effect, but works could cause mobilisation of pollutants to the groundwater environment and require assessment.</p>	<p>EA and CCC (Quarter 1 2016 consultation in preparation of this PEIR).</p>	<p>The potential for changes in groundwater quality due to disturbance of on-site soils is now acknowledged (Section 13.5) and incorporated in the assessment (Section 13.8).</p>
<p>Sensitivity criteria do not sufficiently acknowledge the sensitivity of non-WFD water bodies.</p>	<p>EA and CCC (Quarter 1 2016 consultation in preparation of this PEIR).</p>	<p>The sensitivity criteria are now provided (Section 13.7) and are considered appropriate with respect to non-WFD water bodies. For example, ‘<i>Moderate, Potentially Significant</i>’ effects can still be identified with respect to such receptors (Section 13.8).</p>
<p>The conclusions of the impact assessment in relation to Low Church Moss SSSI are not accepted, with more consideration required of the receptor’s sensitivity, magnitude and significance of effect, or at least premature because hydrological work is on-going.</p>	<p>EA, CBC and NE (Quarter 1 2016 consultation in preparation of this PEIR).</p>	<p>The assessment criteria are now provided (Section 13.7), and the assessment with respect to Low Church Moss Pond and associated aquifers (Section 13.8) is considered appropriate, albeit preliminary. The assessment of the impacts on the SSSI itself are addressed in Chapter 18.</p>
<p>The assessment rationales are difficult to follow and appear based on inappropriate assessment criteria, and underestimate potential ecological impacts. They could also be more informative, providing information such as site-receptor distances, aquifer being abstracted, and should differ between construction and operation.</p>	<p>EA and CCC (Quarter 1 2016 consultation in preparation of this PEIR).</p>	<p>The assessment criteria are now provided (Section 13.7), and are considered appropriate and provide the necessary support for the assessment rationales. Some additional information such as more site-receptor distances is also provided in the later assessment (Section 13.8). The assessment of impacts on conservation interests are addressed in Chapter 18.</p>
<p>Further baseline data is required to provide a detailed assessment of effect, including for the Accommodation Sites.</p>	<p>CBC (Quarter 1 2016 consultation in preparation of this PEIR).</p>	<p>Further baseline information is provided (Section 13.8), including with respect to the Accommodation Sites, and will be further expanded on in the ES.</p>
<p>Provide clear references between assessment tables and figures, to aid understanding of the PEIR.</p>	<p>CBC (Quarter 1 2016 consultation in preparation of this PEIR).</p>	<p>National Grid References (NGRs) are used extensively in the assessment tables (Section 13.8) to facilitate reference to the receptor figures (Figures 13.2 and 13.3).</p>

Issue raised	Consultees	Response
The methodology for the determination of sensitivity, magnitude and significance of impact requires further definition.	CCC and CBC (Quarter 1 2016 consultation in preparation of this PEIR).	The assessment criteria are now provided (Section 13.7), and are considered sufficiently robust for the impact assessment presented here (Section 13.8).
Potential impacts during decommissioning are not presented.	CBC (Quarter 1 2016 consultation in preparation of this PEIR).	The potential impacts of decommissioning activities associated with the Moorside Project will be addressed in the ES with a preliminary high level assessment presented in paragraph 13.8.17.
Having an assessment of pre-mitigation effect would make it easier to determine whether mitigation measures are appropriate, and more detail about mitigation will eventually be required.	CCC (Quarter 1 2016 consultation in preparation of this PEIR).	The assessment (Section 13.8) considers residual, not pre-mitigation effects. This approach is commonly used in the assessment of large development projects, the mitigation having been integrated into the Project design (Section 13.6). If any additional mitigation measures are identified, these will be added and a reassessment will be undertaken.
There will be need to review the construction design and mitigation against the creation of potential pathways.	CCC (Quarter 1 2016 consultation in preparation of this PEIR).	The assessment presented in this PEIR is preliminary, and may be revised in the ES, following more detailed analysis and refinements in engineering design (Section 13.2).
There is a need to ensure consistency of receptors and their sensitivity between chapters.	CCC (Quarter 1 2016 consultation in preparation of this PEIR).	The consistency between chapters has been addressed, and further alignments are anticipated as part of the ES. One example of this work is the reporting of impacts on conservation sites solely within Chapter 18, Terrestrial and Freshwater ecology .
Consideration should be given to receptors from potentially impacted groundwater e.g. construction workers coming into contact with polluted groundwater.	CCC (August 2015 Scoping Opinion and Quarter 1 2016 consultation in preparation of this PEIR).	Potential health effects on construction workers and the resident population will be considered in the Site Specific Safety Cases (Section 13.2).
There is no reference to a Construction Environmental Management Plan (CEMP), and other environmental measures could be identified.	EA (Quarter 1 2016 consultation in preparation of this PEIR).	A reference to the draft CEMP is now provided (Section 13.6), and further measures and more details will be provided in the ES and the finalised CEMP.
Historical mapping could be used to identify groundwater features, and abstraction	EA and CCC (Quarter 1 2016 consultation in preparation of this PEIR).	Work additional to that presented in the current baseline (Section 13.8), and including the type suggested by CCC, is anticipated in order to inform the ES.

Issue raised	Consultees	Response
surveys of private landowners should be part of the baseline.		
Effects could include changes in groundwater level from permanent groundwater abstractions used in the operation of the Moorside Site.	CCC (Quarter 1 2016 consultation in preparation of this PEIR).	The potential for changes due to operational abstraction is now acknowledged (Section 13.5) and taken into account in the assessment (Section 13.8).
The very high sensitivity category is not used.	CCC (Quarter 1 2016 consultation in preparation of this PEIR).	Although not used, the category is still retained in Section 13.7 , to facilitate its possible future use.
Only limited quantitative groundwater monitoring data is provided.	CCC (Quarter 1 2016 consultation in preparation of this PEIR).	Monitoring results for both the Moorside Site and the Low Church Moss SSSI are held in Project Quarterly Monitoring Reports. Substantive data interpretation has yet to take place, but will be undertaken to inform the ES.
Consideration should be given to the impact on the Ehen and Calder systems as a whole, especially with respect to migratory fish.	National Trust (Quarter 1 2016 consultation in preparation of this PEIR).	The water assessment (Section 13.8) includes all of the WFD surface water bodies potentially impacted by the proposed development. Effects on terrestrial and aquatic ecology are addressed in Chapter 18 .
The surface water resource availability appears not to have been considered for the Upper Calder/Worm Gill and Irt.	National Trust (Quarter 1 2016 consultation in preparation of this PEIR).	The groundwater baseline (Section 13.8) now presents a water resource availability assessment for the Upper Calder. Other surface water bodies like the Irt are not referenced because they lie outside the Project Study Areas.
It is not clear whether all of the elements are covered in order to determine the impact on groundwater flow and the consequences for Sellafield Limited e.g. changes in contaminated plume migration pattern, new receptors, off-site monitoring, subsidence, loss of abstraction, effect of ground raising and increased runoff.	Sellafield Limited (Quarter 1 2016 consultation in preparation of this PEIR).	The majority of these issues will be addressed at the time of the ES by way of the numerical modelling mentioned in Sections 13.2 and 13.7 . The Moorside Site Specific Safety Case will address the groundwater level subsidence concern.
A freshwater supply need has yet to be identified for the Moorside Project, and any	LDNPA, EA and National Trust (Quarter 1 2016 consultation in	NuGen has not included abstraction in the PEIR as it is currently assumed freshwater will be provided by a utility provider. NuGen note

Issue raised	Consultees	Response
abstraction may have significant implications.	preparation of this PEIR), CCC (August 2015 Scoping Opinion and Quarter 1 2016 consultation in preparation of this PEIR).	the point that abstraction may have significant effects.

13.5 Scope of the assessment

Potential receptors

- 13.5.1 Receptors that may be subject to groundwater effects from the Moorside Project are shown in **Figure 13.2** (for the Moorside Site and the main part of the Egremont Site Study Area) and **Figure 13.3** (for the Mirehouse Site and Corkickle Site, and also the northern part of the Egremont Site Study Area and the Corkickle to Mirehouse Railway Site and the St. Bees Railway Site). The receptors are of the following types:
- Underground aquifers and non-productive strata (both WFD and other groundwater bodies);
 - WFD surface water bodies, centred on the so-called ‘blue line network’¹ of rivers and tributaries, that could potentially interact with groundwater, either by receipt of groundwater baseflow, or through loss to groundwater via level-dependent bed leakage;
 - Small surface water features such as streams, ditches, ponds and lakes, within WFD surface water body catchments but outwith the ‘blue line network’¹, that could also potentially interact with groundwater;
 - Springs;
 - Groundwater abstractions (both licensed and unlicensed); and
 - Surface water abstractions (both licensed and unlicensed), which may be influenced by groundwater flow to, or level-dependent leakage from, rivers and other watercourses.
- 13.5.2 Whilst an assessment of effects on the groundwater environment in the vicinity of conservation (statutory and non-statutory designated) features is also undertaken, rather than being reported here these results form an input to the assessment presented in **Chapter 18, Terrestrial and Freshwater ecology**.

¹ As provided at: <http://environment.data.gov.uk/catchment-planning/RiverBasinDistrict/12>.

Spatial and temporal scope

- 13.5.3 The spatial extent of the groundwater assessment is described in **Section 13.4**. The assessment includes the construction and the operational phases of the Moorside Project.

Potentially significant effects

- 13.5.4 All the receptor groups listed above may be subject to potentially significant effects due to the Moorside Project. These effects may arise from changes in groundwater levels (changes in groundwater resources) due to the following:
- Changes in recharge patterns due to surface structures and topography changes during both construction and operation;
 - Dewatering activities during construction and potentially also operation; and
 - Disruption of groundwater flow pathways due to construction of permanent sub-water table structures.
- 13.5.5 Changes in groundwater quality could arise from the following:
- Release of contaminants due to disturbance of on-site soils during construction;
 - Leakage through spoil mounds during construction and operation;
 - Spillages or leakages during construction and operation; and
 - Migration of pre-existing contamination plumes due to changes in groundwater flow directions.

13.6 Environmental measures incorporated into the proposed development

- 13.6.1 Details of environmental measures that have been incorporated into the overall design of the Moorside Project are set out in **Chapter 2, Project Description**. Specific measures relating to this environmental topic and how these have been targeted to specific groundwater receptors are set out in **Table 13.2**. Where environmental measures are currently unknown, or uncertain, they are not included within **Table 13.2**. Further measures will be included in the ES as they are designed and confirmed.

Table 13.2 Rationale for incorporation of environmental measures

Potential receptor	Predicted changes and potential effects	Incorporated measure
Common to all sites		
All receptors	Altered recharge regime due to the proposed changes in topography and land use.	Adoption of best practice site measures e.g. deployment of sustainable drainage systems.
	Soil disturbance, spoil leakage and chemical and fuel spillages and leakages leading to groundwater pollution.	Adoption of best practice site measures e.g. CEMP, EA PPGs, upkeep of a Site Condition Report.
Moorside Site only		
All relevant receptors	Groundwater dewatering leading to a reduction in groundwater levels, flow and quality; other changes in the groundwater flow regime caused by the placement of permanent sub-water table structures. Also consequential migration of any pre-existing contamination.	Excavation/shaft/tunnel lining, cut-off wall(s) and drainage corridors; groundwater reinjection and/or surface flow augmentation, regular monitoring.

13.7 Assessment methodology

Overview

13.7.1 There is no standard assessment methodology employed for groundwater EIA in the UK. Accordingly, it is envisaged that a range of approaches will be used for the assessment of potential effects, ranging from the use of professional judgement based on evaluation of qualitative baseline information, through to detailed quantitative impact assessments based on numerical modelling. Assessment methodologies will be scoped in detail as further baseline and future climate data and scheme design information become available. Relevant consultees will be engaged to ensure confirmation and agreement on assessment methodology and scope throughout this evolving project design process.

Methodology for prediction of effects

13.7.2 **Table 13.3** provides a summary of the methodology used to classify the sensitivity or value of groundwater environment receptors that could be subject to potential effects. This is based on an assessment of a number of criteria, including the following:

- a feature’s WFD or aquifer status; and

- a feature’s use for public, industrial/agricultural or private water supply.

Table 13.3 Summary of sensitivity (or value) of groundwater receptors

Sensitivity	Criteria	Examples
Very high	Feature with a high quality and rarity at an international scale, with little potential for substitution	Not currently used in this groundwater assessment ² but left in as this allows the level to be used in the ES if required
High	Feature with a high yield and/or quality and rarity at a national scale, with a limited potential for substitution	Surface water body at WFD High Overall ³ Status; Principal Aquifer; public water supply and associated catchment
Medium	Feature with a medium yield and/or quality at a regional scale, or good quality at a local scale, with some potential for substitution	Surface water body at WFD Good Overall ³ Status; Secondary A Aquifer; industrial/agricultural water supply and associated catchment
Low	Feature with variable yield and/or quality at a local scale, with potential for substitution	Surface water body at WFD Moderate or below Overall ³ Status; Secondary B Aquifer; private water supply and associated catchment
Very low	Feature with poor yield and/or quality at a local scale, with potential for substitution	Unproductive strata; small surface water body outwith the ‘blue line network’ ¹ and not utilised for supply e.g. spring, pond/lagoon, drainage ditch

Note: as a prerequisite, all identified receptors are assumed to have some interaction with groundwater

13.7.3 The magnitude of change on groundwater environment receptors is independent of the sensitivity of the feature. The assessment of such change is anticipated to be partly qualitative, and hence reliant on professional judgement, although some elements of change will be assessed quantitatively by way of the anticipated Moorside groundwater flow and contaminant transport model. **Table 13.4** provides examples of how various magnitudes of change are determined with respect to water features.

² With reporting of the assessment of conservation sites becoming the exclusive preserve of **Chapter 18, Terrestrial and Freshwater ecology (Section 13.5)**, the ‘*Very High*’ sensitivity grade is currently not used in the groundwater assessment.

³ Whilst WFD Overall Status has an ecologically-derived component, it also takes account of both the physico-chemical elements and Specific Pollutants (UKTAG, 2008; 2012) elements of Ecological Status and the compliance or otherwise with the Environmental Quality Standard (EQS) for Priority Substances Annex II of EU Directive 2008/105/EC (http://ec.europa.eu/environment/water/water-framework/priority_substances.htm) within WFD Chemical Status. On this basis it is currently the preferred means of benchmarking both surface water quality sensitivity and magnitude of change in the groundwater chapter.

Table 13.4 Examples of groundwater magnitude of change

Magnitude	Criteria	Examples of negative change
Very High	Results in very major change to feature, of sufficient magnitude to affect its use/integrity permanently or over the long term	Very major reduction in groundwater levels, flow and/or quality, leading to surface water features outwith the 'blue line network' ¹ and/or springs becoming unsustainable; a permanent or long-term breach of surface water WFD Overall ³ Status thresholds or deterioration in surface water resource availability; a permanent or long-term reduction in groundwater WFD Quantitative/Chemical Status; or a complete loss of resource to water users
High	Results in major change to feature, of sufficient magnitude to affect its use/integrity for a sustained period	Major reduction in groundwater levels, flow and/or quality, leading to a marked deterioration in surface water features outwith the 'blue line network' ¹ and/or springs; a sustained breach of surface water WFD Overall ³ Status thresholds or deterioration in surface water resource availability; a sustained reduction in groundwater WFD Quantitative/Chemical Status; or severely reduced resource to water users
Medium	Results in noticeable change to feature, of sufficient magnitude to affect its use/integrity in some circumstances	Moderate reduction in groundwater levels, flow and/or quality, leading to a moderate deterioration in surface water features outwith the 'blue line network' ¹ and/or springs; periodic, short-term and reversible breaches of surface water WFD Overall ³ Status thresholds or deterioration in surface water resource availability; periodic, short-term and reversible reductions in groundwater WFD Quantitative/Chemical Status; or a partial loss of resource to water users
Low	Results in minor change to feature, with insufficient magnitude to affect its use/integrity in most circumstances	Measureable reduction in groundwater levels, flow and/or quality, leading to a slight deterioration in surface water features outwith the 'blue line network' ¹ and/or springs; some variation within, but no breaches of, surface water WFD Overall ³ Status thresholds or deterioration in surface water resource availability; some variation within, but no reductions in, groundwater WFD Quantitative/Chemical Status; or a slight loss of resource to water users
Very Low	Results in little or no change to feature, with insufficient magnitude to affect its use/integrity	No measureable reduction in groundwater levels, flow or quality, leading to no change in surface water features outwith the 'blue line network' ¹ and/or springs; little variation within, and no breaches of, surface water WFD Overall ³ Status thresholds or deterioration in surface water resource availability; little variation within, and no reductions in, groundwater WFD Quantitative/Chemical Status; or no loss of resource to water users

Significance evaluation methodology

13.7.4 The significance of the magnitude of change of receptors is assessed by relating the magnitude of change to the sensitivity and/or value of the receptor whilst maintaining application of professional judgement. The matrix in **Table 3.2** is used as the basis of assessing whether effects (adverse or beneficial) are significant or not.

13.8 Preliminary assessment of residual effects

Baseline conditions

- 13.8.1 The Moorside Project is located on the West Cumbria Coastal Plain. The geology broadly comprises a sedimentary sequence of sandstones (Permo-Triassic in age) overlying the Carboniferous Coal Measures (**Figure 13.4**). The upland area of the Lake District is to the east, and comprises older metamorphic and igneous rocks which also underlie the Coal Measures to the west. Quaternary deposits (drift) of variable thickness and composition overlie the solid geological sequence.
- 13.8.2 The Moorside Site, the Egremont Site and the St. Bees Railway Site are underlain by the Permo-Triassic sandstones which are a Principal Aquifer⁴, with typically High or Intermediate vulnerability⁵. One WFD groundwater body is defined for the whole of the Permo-Triassic sandstones, namely the '*West Cumbria Permo-Triassic sandstone aquifers*'. This groundwater body is currently (2015 RBMP) of WFD 'Good' Chemical and Quantitative Status. The Principal Aquifer forms the West Cumbria Groundwater Management Unit in the Derwent and West Cumbria ALS (Reference 4. EA), which has water available for licensing. A nitrate vulnerable zone (NVZ) is defined for the St. Bees Head area, which is immediately adjacent to the western boundary of the St. Bees Railway Site.
- 13.8.3 Groundwater flow in the Principal Aquifer is generally from north-east to south-west towards the coast. Recharge occurs on higher ground to the east, with groundwater discharge to lower lying rivers and springs nearer the coast and to the sea (Reference 1. Allen et al.). At the Moorside Site, surveys have taken place to date at various times of the year, including periods of high and low groundwater levels, and have shown that sandstone groundwater levels in OBHs in the central area of the site range from 6 to 24 metres Above Ordnance Datum (mAOD), up to 27 m below ground level (mBGL). The water levels vary little with time, but OBHs close to the coast show a response to the tides. Site specific groundwater levels are not currently available for most of the Accommodation Sites and also the two Railway Sites, but data from an EA OBH at the Egremont Site shows a rising trend in groundwater levels, most likely connected to the cessation of historic mining activity.
- 13.8.4 Groundwater in the Permo-Triassic sandstones is mainly of the calcium-bicarbonate type, indicative of recently recharged groundwater. The upper 200 m of the sandstone forms the effective freshwater aquifer, with a saline interface at depth (Reference 1. Allen et al.). On-site data from the Moorside Site indicate that that groundwater quality shows little variability both

⁴ Principal Aquifers are layers of rock or drift deposits that have high permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

⁵ Aquifers with High vulnerability are overlain by soils with little ability to attenuate pollutants and pollutants have the potential to move rapidly to underlying strata or to shallow groundwater. Aquifers with Intermediate vulnerability are overlain by soils with moderate ability to attenuate pollutants. Some pollutants may have the potential to move to underlying strata or to shallow groundwater. Aquifers with Low vulnerability are overlain by soils in which pollutants are unlikely to penetrate the soil layer because water movement is largely horizontal or they have the ability to attenuate diffuse pollutants.

laterally and vertically, and there is no evidence of saline groundwater. The quality of the groundwater beneath the south of the Moorside Site may have been impacted by historical activities associated with the neighbouring Sellafield Site.

- 13.8.5 The Mirehouse Site, the Corkickle Site and the Corkickle to Mirehouse Railway Site are underlain by Carboniferous Coal Measures (typically comprising mudstone, siltstones and sandstones) which is a Secondary A Aquifer⁶, with a low to high vulnerability. Coal Measures also underlie the Moorside Site, the Egremont Site and the St. Bees Railway Site beneath the Permo-Triassic sandstones at depth. Groundwater flow in the Coal Measures is likely to be predominantly within fractures in its sandstone layers and may be influenced by faulting and mining. The Coal Measures comprise part of the '*Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers*' WFD groundwater body. This groundwater body is currently of WFD '*Poor*' Chemical Status and of '*Good*' Quantitative Status. There is no Groundwater Management Unit defined in the ALS for the Coal Measures.
- 13.8.6 Ordovician strata, comprising mudstones, sandstones, andesites, and granites, underlie the Coal Measures across the entire area, and subcrop beneath the northern third of the Egremont Study Area and at the northern and eastern margins of the Moorside Site and Mirehouse Site Study Areas respectively. These strata are designated as a Secondary B aquifer with low vulnerability, and form the other component of the '*Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers*' WFD groundwater body.
- 13.8.7 The Moorside Site, the Accommodation Sites, the Corkickle to Mirehouse Railway Site and the St. Bees Railway Site are generally immediately underlain by drift deposits which are Secondary Aquifers (A, B and undifferentiated), although small areas are free from drift. The drift deposits are variable, comprising glaciofluvial deposits, alluvium, river terrace deposits and till, and have variable thickness (typically up to a few tens of metres). Particularly thick drift (up to 70 m) is found in the west of the Moorside Site, where the Ehen Buried Channel is present. No WFD groundwater body is defined for the drift deposits. Lateral groundwater flow in the permeable drift layers that are continuous across the Moorside Site broadly mirrors that in the underlying sandstone, but with water levels typically slightly higher, and therefore suggestive of the potential for an element of downward flow to the sandstone.
- 13.8.8 The main watercourses of relevance to the Study Areas are the Rivers Calder and Ehen. Data from EA river flow gauges indicates that the flow regime of both rivers is moderately responsive to rainfall, but low flows are also well supported by upstream lake storage from Ennerdale Water (in the case of the River Ehen) and groundwater baseflow, with baseflow indices of 0.41 for the River Calder and 0.43 for the River Ehen (Reference 2. CEH and BGS). The River Ehen flows through the Moorside Site and along the western boundary of

⁶ Secondary A Aquifers are permeable rock or drift layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. Secondary B Aquifers are predominantly lower permeability layers or rock or drift which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. Secondary Undifferentiated Aquifers are layers of rock or drift where it has not been possible to attribute either category A or B to a rock type due to the variable characteristics of the rock type.

the Egremont Site. The Corkickle Site, the Mirehouse Site, the Corkickle to Mirehouse Railway Site and the St. Bees Railway Site are located on two smaller watercourses, both named the Pow Beck.

13.8.9 The EA’s ALS water resource availability assessment for the watercourses in the Study Areas is presented in **Table 13.5**. The EA considers that the River Ehen, the River Calder and their tributaries have no water available for licensing and that river flows are below the indicative flow requirement to help support ‘Good’ Ecological Status (as required by the WFD). The smaller watercourses in the north west (Pow Beck (South West Lakes), Lowca Beck, Ellergill Beck, and the Thorney and Rottington Becks) have water available for abstraction.

Table 13.5 ALS Surface Water Resource Availability

	Water Resource Availability for Flow Percentiles			
	Q95	Q70	Q50	Q30
Ehen (Lower)	No water available	No water available	No water available	No water available
Ehen (Upper including Liza)	No water available	No water available	No water available	No water available
Calder (Lower)	No water available	No water available	No water available	No water available
Calder (South West Lakes)	No water available	No water available	No water available	No water available
Kirk Beck (Ehen)	No water available	No water available	No water available	No water available
Pow Beck (South West Lakes)	Water available	Water available	Water available	Water available
Keekle (Lower)	No water available	No water available	No water available	No water available
Keekle (Upper)	No water available	No water available	No water available	No water available
Dub Beck	No water available	No water available	No water available	No water available
Lowca Beck	Water available	Water available	Water available	Water available
Newmill Beck	No water available	No water available	No water available	No water available
Bleng	No water available	No water available	No water available	No water available
Ellergill Beck	Water available	Water available	Water available	Water available

	Water Resource Availability for Flow Percentiles			
	Q95	Q70	Q50	Q30
Thorney and Rottington Becks	Water available	Water available	Water available	Water available

13.8.10 The WFD status of the surface water bodies which intersect the Study Areas are given in Table 13.6.

Table 13.6 WFD Surface Water Body Status (2015 RBMP)

Water Body Name and Number	Hydromorphological Designation	Ecological Status	Chemical Status	Overall Status
Ehen (Lower) GB112074069980	None	Good	Good	Good
Ehen (Upper including Liza) GB112074070010	Heavily Modified	Moderate	Good	Moderate
Calder (Lower) GB112074069730	Heavily Modified	Moderate	Good	Moderate
Calder (South West Lakes) GB112074069750	None	Poor	Good	Poor
Kirk Beck (Ehen) GB112074069970	None	Moderate	Good	Moderate
Pow Beck (South West Lakes) GB112074069990	None	Moderate	Good	Moderate
Keekle (Lower) GB112074070000	None	Good	Good	Good
Keekle (Upper) GB112074070030	None	Moderate	Good	Moderate
Dub Beck GB112074070020	None	Good	Good	Good
Lowca Beck GB112074070040	None	Moderate	Good	Moderate
Newmill Beck GB112074069731	None	Moderate	Good	Moderate
Bleng GB112074070090	None	Moderate	Good	Moderate
Low Church Moss Pond GB31229203	Artificial	Moderate	Good	Moderate

- 13.8.11 In addition to the named WFD watercourses, the Moorside Site, the Accommodation Sites, the Corkickle to Mirehouse Railway Site and the St. Bees Railway Site have a network of minor watercourses and drainage ditches outwith the '*blue line network*'¹, some of which originate from springs. There are also several ponds within the site boundaries.
- 13.8.12 There are a range of statutory designated and non-statutory conservation habitats in the Study Areas, which may interact with the groundwater environment. The most important of the sites in terms of the groundwater EIA are considered to comprise the following (conservation sites are more comprehensively detailed in **Chapter 18, Terrestrial and Freshwater ecology**):
- River Ehen SSSI and SAC (located in the Study Areas for the Mirehouse Site and the Egremont Site);
 - Low Church Moss SSSI (located within the Moorside Site and in the Study Area for the Egremont Site);
 - Black Moss SSSI (located within the Study Areas for the Moorside Site and the Egremont Site);
 - Silver Tarn, Hollas and Harnsey Mosses SSSIs (located within the Study Areas for the Moorside Site and the Egremont Site);
 - Hailes Great Wood SSSI (located in the Study Areas for the Moorside Site and the Egremont Site);
 - Clints Quarry SSSI (in the Study Areas for the Mirehouse Site and the Egremont Site);
 - Nursery Wood scheduled ancient woodland, with associated wetland and standing water bodies (located within the Moorside Site and in the Study Area for the Egremont Site);
 - Sellafeld Tarn County Wildlife Site (located within the Moorside Site);
 - Stanley Pond County Wildlife Site (located within the Study Areas for the Mirehouse Site, the Corkickle Site, and the Corkickle to Mirehouse Railway Site); and
 - Several lowland fen and marsh habitats located in the Study Areas for the Moorside Site, the Accommodation Sites, the Corkickle to Mirehouse Railway Site and the St. Bees Railway Site.
- 13.8.13 Low Church Moss SSSI and WFD surface water body is located within the Moorside Site. Hydrogeological investigations are ongoing, but the current understanding of the site is of three deep (up to 12 m) basins of peat, separated from the deeper drift and sandstone aquifers by clay in the order of 10 m thick. Inspection of rainfall data and on-site water levels suggests that the SSSI pond and bog are most likely fed by surface water runoff and a shallow perched groundwater table in the near-surface drift. The SSSI water levels indicate shallow, topographically controlled, hydraulic gradients towards the pond from the north, east and south, and potentially away from

the pond to the west of the site. Comparison of water levels within the SSSI and water levels in the underlying drift indicates that the SSSI is hydraulically isolated from the deeper drift and sandstone aquifers by the presence of the clay and an unsaturated zone in the deeper drift.

- 13.8.14 There are a number of groundwater and surface water abstractions in the Study Areas, including licensed abstractions and also a number of deregulated⁷ and private water supply abstractions. As private water supplies are not licensed, they can be difficult to identify and accurately locate, and additional private water supplies to those identified to date may exist. These may include springs and streams used for livestock watering. None of the Moorside Site, the Accommodation Sites, the Corkickle to Mirehouse Railway Site and the St. Bees Railway Site are located within a Source Protection Zone (SPZ)⁸, although the SPZ for the new South Egremont Groundwater Scheme is yet to be defined and could potentially include the Egremont Site.

Predicted residual effects and their significance

- 13.8.15 A summary of the preliminary assessment of the predicted residual effects (i.e. the effects taking into account the incorporated measures) is provided, with respect to the types of effects that might affect each of the key receptors or receptor groups at the Project Sites, in **Tables 13.7 to 13.13**. **Table 13.7** is a summary of the residual net (all activity) effects that are common to all these sites. **Tables 13.8-13.13** cover the residual net effects on the remaining receptors at each of the Moorside Site, the Accommodation Sites, the Corkickle to Mirehouse Railway Site and the St. Bees Railway Site in turn. Receptor NGRs and WFD surface and groundwater water body reference numbers are embedded in the individual site tables, and can be matched with receptor locations shown on **Figures 13.2 and 13.3**. Rationales are provided in the last column of each table to explain each receptor's assessment.
- 13.8.16 The evaluation tables deal with the construction and operational phases of each development. They generally present a preliminary assessment of the potential adverse effects arising from the Moorside Project unless explicitly stated to be neutral or beneficial in the rationale. For the purposes of the PEIR, effects on groundwater level and quality are considered together, but with the availability of more design and environmental data, the ES will aim to assess groundwater levels and quality separately.
- 13.8.17 With respect to the decommissioning of the Moorside Project, potential effects associated with decommissioning are likely to be similar or less than to the effects arising from the construction phase. It is not anticipated that additional receptors would be affected beyond those identified for the construction phase assessment as this assessment has assumed a reasonable worst case. It is anticipated that the decommissioning works would be of shorter duration and would occupy more limited footprints than those

⁷ Deregulated abstraction licences are abstractions for less than 20 m³/day that were previously licensed, but became exempt from licensing on 1 April 2005.

⁸ SPZs are defined around groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area.

currently assumed for construction of the relevant facilities. Subject to further design and delivery details, and for the purposes of this PEIR, a worst case scenario has been applied, i.e. it has been assumed that the effects would be the same as (rather than less than) those identified for the construction phase. Decommissioning is therefore not considered further in the assessment tables below but will be covered in the ES.

Table 13.7 Moorside Site, Corkickle Site, Mirehouse Site, Egremont Site, Corkickle to Mirehouse Railway Site, and St. Bees Railway Site: Summary of predicted common residual effects

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Construction					
Non-WFD Drift Aquifers immediately beneath the Project Sites					
Effect on groundwater levels and quality from all construction activities	Likely	Medium	Medium	Moderate (Potentially Significant)	The receptors are Secondary Aquifers (A, B and undifferentiated) and therefore are at best of 'Medium' sensitivity. The aquifer water levels beneath the Moorside Site in particular would be likely to change as a result of the altered recharge regime due to the proposed changes in topography and land use, construction dewatering, and the placement of sub-water table structures. Groundwater quality would also likely be affected due to spillages and leakages resulting from site activities. However, incorporated environmental measures such as the placement of excavation/shaft lining, cut-off walls and drainage corridors (to lessen water level change) at the Moorside Site and the adoption of EA pollution prevention guidance (to lessen the risk of water quality change) at all sites help ensure that the residual change due to all the proposed development at each site would be of 'Medium' magnitude over the extent of the aquifers i.e. periodic, short-term and reversible changes in the aquifers quantitative and/or quality condition are anticipated. On this basis the 'Moderate' effects would be 'Potentially Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Springs, ponds and drainage ditches within the Project Sites					
Effect on spring, pond and ditch baseflow quantity and quality from all construction activities	Likely	Very Low	Very High	Moderate (Potentially Significant)	The receptors are outwith the 'blue line network' ¹ and therefore of 'Very Low' sensitivity. They are potentially in hydraulic continuity with the underlying shallow groundwater, and so could be influenced by groundwater conditions. As noted with respect to the non-WFD Drift aquifer receptors above, groundwater levels and quality beneath the sites would be liable to change and subject to incorporated environmental measures, but depending on the land use changes some of the features could also be built over and lost entirely, such that the residual change due to all the proposed development at each site would be of 'Very High' magnitude i.e. complete loss of some features. Given the receptors 'Very Low' sensitivity, the 'Moderate' effects would be 'Potentially Significant'.
Non-WFD Drift Aquifers in the Wider Study Areas					
Effect on groundwater levels and quality from all construction activities	Unlikely	Medium	Low	Minor (Not Significant)	The receptors are Secondary Aquifers (A, B and undifferentiated) and therefore are at best of 'Medium' sensitivity. As noted with respect to the receptors above, groundwater levels and quality beneath the sites, particularly that of the Moorside Site, would be liable to change. However, the distance between the receptors and the proposed developments at each of the sites helps ensure that the residual change due to all the proposed development at each site would be of 'Low' magnitude over the extent of the aquifers i.e. no reduction in the aquifers' quantitative and/or quality condition are anticipated. On this basis the 'Minor' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Springs, ponds and drainage ditches within the wider Study Areas					
Effect on baseflow quantity and quality from all construction activities	Unlikely	Very Low	Low	Negligible (Not Significant)	The receptors are outwith the 'blue line network' ¹ and therefore of 'Very Low' sensitivity. They are potentially in hydraulic continuity with the underlying shallow groundwater, and so could be influenced by groundwater conditions. As noted with respect to the receptors above, groundwater levels and quality beneath the sites, particularly that of the Moorside Site, would be liable to change. However, the distance between the receptors and the proposed developments at each of the sites helps ensure that the residual change due to all the proposed development at each site would be of 'Low' magnitude i.e. a slight deterioration in flow and quality is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Other deregulated and private water supply abstractions in the wider Study Areas					
Effect on groundwater levels and quality from all construction activities	Unlikely	Low	Low	Negligible (Not Significant)	The receptors' private abstraction status ensures that they are of 'Low' sensitivity. As mentioned above, groundwater levels and quality beneath the various proposed developments would be liable to change. However, the distance between the receptors and the proposed developments helps ensure that the residual change due to all the proposed development at each site would be of 'Low' magnitude i.e. a slight loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Operation					
Non-WFD Drift Aquifers immediately beneath the Project Sites					
Effect on groundwater levels and quality from all operational activities	Likely	Medium	Low	Minor (Not Significant)	The receptors are Secondary Aquifers (A, B and undifferentiated) and therefore are at best of 'Medium' sensitivity. The aquifer water levels beneath the Moorside Site in particular would be likely to change as a result of the altered recharge regime due to the proposed changes in topography and land use, and aquifer quality would change in response to operational activities. However, construction disturbance would have ceased, and changes would be subject to incorporated environmental measures, such as the adoption of EA pollution prevention guidance. The residual change due to all the proposed development at each site would be of 'Low' magnitude over the extent of the aquifers i.e. no reduction in the aquifers' quantitative and/or quality condition are anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
Springs, ponds and drainage ditches within the Project Sites					
Effect on spring, pond and ditch baseflow quantity and quality from all operational activities	Likely	Very Low	Low	Negligible (Not Significant)	The receptors remaining following construction are outwith the 'blue line network' ¹ and therefore of 'Very Low' sensitivity. They are potentially in hydraulic continuity with the underlying shallow groundwater, and so could be influenced by groundwater conditions. As noted with respect to the non-WFD Drift aquifer receptors above, groundwater levels and quality beneath the sites would be liable to change. However, construction disturbance would have ceased, and continued implementation of environmental measures would ensure that the residual change due to all the proposed development at each site

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					would be of 'Low' magnitude i.e. a slight deterioration in flow and/or quality is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Non-WFD Drift Aquifers in the Wider Study Areas					
Effect on groundwater levels and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptors are Secondary Aquifers (A, B and undifferentiated) and therefore are at best of 'Medium' sensitivity. As noted with respect to the receptors above, groundwater levels and/or quality beneath the sites would be liable to change. However, construction disturbance would have ceased, changes would be subject to incorporated environmental measures and the distance between the receptors and the proposed developments, and the residual change due to all the proposed development at each site would be of 'Very Low' magnitude over the extent of the aquifers i.e. no reduction in the aquifers quantitative and/or quality condition is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Springs, ponds and drainage ditches within the wider Study Areas					
Effect on baseflow quantity and quality from all operational activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The receptors are outwith the 'blue line network' ¹ and therefore of 'Very Low' sensitivity. They are potentially in hydraulic continuity with the underlying shallow groundwater, and so could be influenced by groundwater conditions. As noted with respect to the receptors above, groundwater levels and quality beneath the sites, particularly that of the Moorside Site, would be liable to change. However, incorporated environmental measures and the distance between the receptors and the proposed developments at each of the sites helps ensure that the

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					residual change due to all the proposed development at each site would be of 'Very Low' magnitude i.e. no change in flow and quality is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Other deregulated and private water supply abstractions within the wider Study Areas					
Effect on groundwater levels and quality from all operational activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The receptors private abstraction status ensures that they are of 'Low' sensitivity. As mentioned above, groundwater levels and quality beneath the various proposed developments would be liable to change. However, incorporated environmental measures and the distance between the receptors and the proposed developments helps ensure that the residual change due to all the proposed development at each site would be of 'Very Low' magnitude i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Table 13.8 Moorside Site: Summary of predicted residual effects

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Construction					
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000)					
Effect on regional groundwater levels and quality from all construction activities	Likely	High	Low	Moderate (Potentially Significant)	The receptor underlies the Moorside Site and almost the entirety of the Site’s Study Area. The receptor is a Principal Aquifer and therefore of ‘High’ sensitivity. The aquifer water levels beneath the Moorside Site would be likely to change as a result of the altered recharge regime due to the proposed changes in topography and land use, and groundwater quality would also likely be affected due to spillages and leakages resulting from site activities. However, incorporated environmental measures such as the placement of excavation/shaft lining, cut-off walls and drainage corridors (to lessen water level change) and the adoption of EA pollution prevention guidance (to lessen water quality change) help ensure that the residual change would be of ‘Low’ magnitude over the extent of the WFD groundwater body i.e. no reduction in WFD Quantitative/Chemical Status is anticipated. On this basis the ‘Moderate’ effects would be ‘Potentially Significant’.
Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers (WFD Groundwater Body GB41202G103700)					
Effect on regional groundwater levels and quality from all construction activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor lies at depth beneath the Moorside Site and subcrops beneath the northern edge of the Site’s Study Area. The receptor is a Secondary Aquifer (A and B) and therefore is at best of ‘Medium’ sensitivity. The changes in groundwater level and quality immediately beneath the Moorside Site itself (within the Permo-Triassic sandstone aquifer) could be transmitted into the underlying Lower

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					Palaeozoic and Carboniferous aquifer. However, incorporated environmental measures such as the adoption of EA pollution prevention guidance and the depth of the aquifer beneath the Moorside Site and distance to subcrop (at least 2.4 km) help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no reduction in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
River Ehen (Lower) (WFD Surface Water Body GB112074069980)					
Effect on river baseflow quantity and quality from all construction activities	Likely	Medium	Medium	Moderate (Potentially Significant)	The River Ehen receptor is located within the western and southern parts of the Moorside Site. The receptor is of 'Good' WFD Overall Status and is therefore of 'Medium' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As noted with respect to the aquifer receptors above, groundwater levels and quality beneath the Moorside Site in particular would be liable to change and subject to incorporated environmental measures. The residual change would be of 'Medium' magnitude over the extent of the WFD surface water body i.e. periodic, short-term and reversible breaches of surface water WFD Overall Status thresholds and/or deterioration in surface water resource availability are anticipated. On this basis the 'Moderate' effects would be 'Potentially Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
River Calder (Lower) (WFD Surface Water Body GB112074069730)					
Effect on river baseflow quantity and quality from all construction activities	Likely	Low	Low	Negligible (Not Significant)	The River Calder receptor is located to the south east of the Moorside Site. It flows along the site boundary near Calder Bridge, and is approximately 600 m from the Moorside Site at the coast. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As noted with respect to the aquifer receptors and the Lower Ehen surface water body above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated environmental measures. The residual change would be of 'Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Kirk (Black) Beck (WFD Surface Water Body GB112074069970)					
Effect on stream baseflow quantity and quality from all construction activities	Likely	Low	Low	Negligible (Not Significant)	The Kirk (Black) Beck receptor flows through the western part of the Moorside Site close to Beckermat. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As noted with respect to the aquifer receptors and the Lower Ehen and Calder surface water bodies above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated environmental

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					measures. The residual change would be of 'Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Newmill Beck (WFD Surface Water Body GB112074069731)					
Effect on stream baseflow quantity and quality from all construction activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The Newmill Beck and its catchment are located to the south of the Sellafield Complex. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Moorside Site boundary (minimum of 1 km) ensures that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
River Bleng (WFD Surface Water Body GB112074070090)					
Effect on river baseflow quantity and quality from all construction activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The River Bleng and its catchment are located on the edge of the Moorside Site's Study Area, near to Gosforth. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					surface water body boundary and the Moorside Site boundary (minimum of 2.6 km) would ensure that the residual change would be of <i>'Very Low'</i> magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the <i>'Negligible'</i> effects would be <i>'Not Significant'</i> .
Low Church Moss Pond (WFD Surface Water Body GB31229203)					
Effect on pond baseflow quantity and quality from all construction activities	Likely	Low	Medium	Minor (Not Significant)	Low Church Moss Pond is located within the Moorside Site close to Middlebank Farm (NGR NY 016 058). The receptor is of <i>'Moderate'</i> WFD Overall Status and is therefore, in water resource terms, of <i>'Low'</i> sensitivity. The surface water body is likely to be in hydraulic continuity with underlying groundwater, albeit not necessarily the WFD aquifers ⁹ , and so is influenced by groundwater conditions. As noted with respect to the aquifer receptors and the Lower Ehen and Calder and the Kirk/Black Beck surface water bodies above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated environmental measures. The residual change on this relatively small receptor would be of <i>'Medium'</i> magnitude i.e. periodic, short-term and reversible breaches of surface water WFD Overall Status thresholds and/or deterioration in surface water resource availability are anticipated. On this basis the <i>'Minor'</i> effects would be <i>'Not Significant'</i> .

⁹ WFD Aquifers - Water Framework Directive groundwater bodies in the study area are shown schematically on **Figure 13.4**, namely the West Cumbria Permo-Triassic Sandstone Aquifers and the Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Ellergill Beck (NGR NX 996 076)					
Effect on stream baseflow quantity and quality from all construction activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The receptor does not have WFD status and is therefore of 'Very Low' sensitivity. It is likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the distance between the receptor and the proposed development boundary (minimum of 0.3 km) helps ensure that the residual changes would be of 'Very Low' magnitude i.e. no change in flow and quality is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
South Egremont groundwater public water supply abstraction (NGRs NY 004 084, NX 995 089, NY 002 097 and NX 999 096)					
Effect on groundwater levels and quality from all construction activities	Likely	High	Low	Moderate (Potentially Significant)	The abstraction wells are located between 0.5 and 1.7 km to the north of the Moorside Site and abstract water from the Permo-Triassic sandstone aquifer. The receptor's public water supply abstraction status ensures that it is of 'High' sensitivity. As noted above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated environmental measures, and 'Low' residual changes would occur within the receptor's groundwater catchment i.e. a slight loss of resource is anticipated. On this basis the 'Moderate' effects would be 'Potentially Significant'.
Licensed NDA groundwater abstraction at Beckermat Mine (NGR NY 025 086)					
Effect on groundwater levels and quality from all construction activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor's industrial abstraction status ensures that it is of 'Medium' sensitivity. As mentioned above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					environmental measures. However, the distance between the receptor and the proposed development boundary (minimum of 1.1 km), and that the mine abstracts from the deep Coal Measures, helps ensure that the residual changes within the receptor's groundwater catchment would be of 'Very Low' magnitude i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Licensed NDA groundwater abstraction at Black Beck to Calder Bridge (NGRs NY 027 068, NY 027 069, NY 029 067, NY 031 066 and NY 041 059)					
Effect on groundwater levels and quality from all construction activities	Likely	Medium	Medium	Moderate (Potentially Significant)	The receptor's industrial abstraction status ensures that it is of 'Medium' sensitivity. As mentioned above, groundwater levels and quality in the Permo-Triassic sandstone aquifer beneath the Moorside Site from which these wells abstract would be liable to change and subject to incorporated environmental measures, and given its proximity (four abstraction locations adjacent to the A595 within the Moorside Site, and one outside the Site at Calder Bridge) 'Medium' residual changes would occur within the receptor's groundwater catchment i.e. a partial loss of resource is anticipated. On this basis the 'Moderate' effects would be 'Potentially Significant'.
Licensed NDA groundwater abstraction at Low Prior Scales to Calder Abby (NGR NY 053 065)					
Effect on groundwater levels and quality from all construction activities	Unlikely	Medium	Low	Minor (Not Significant)	The receptor's industrial abstraction status ensures that it is of 'Medium' sensitivity. As mentioned above, groundwater levels and quality in the Permo-Triassic sandstone aquifer beneath the Moorside Site would be liable to change and subject to incorporated environmental measures. The three wells are thought to abstract from the sandstone aquifer, however the distance between the

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					receptor and the proposed development boundary (minimum of 1.2 km) helps ensure that the residual changes within the receptor’s groundwater catchment would be of ‘Low’ magnitude i.e. a slight loss of resource is anticipated. On this basis the ‘Minor’ effects would be ‘Not Significant’.
Licensed NDA surface water abstraction from the River Ehen (NGR NY 010 061)					
Effect on river baseflow quantity and quality from all construction activities	Likely	Medium	Medium	Moderate (Potentially Significant)	The receptor’s industrial abstraction status ensures that it is of ‘Medium’ sensitivity. As mentioned above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated environmental measures, and given its proximity ‘Medium’ residual changes would occur within the receptor’s groundwater catchment i.e. a partial loss of resource is anticipated. On this basis the ‘Moderate’ effects would be ‘Potentially Significant’.
Deregulated industrial surface water abstraction at Calder Bridge (NGR NY 039 059)					
Effect on river baseflow quantity and quality from all construction activities	Likely	Low	Medium	Minor (Not Significant)	This abstraction is located just within the Moorside Site boundary at Calder Bridge. The receptor’s deregulated abstraction status ensures that it is of ‘Low’ sensitivity. As mentioned above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated environmental measures, and ‘Medium’ residual changes would occur within the receptor’s groundwater catchment i.e. a partial loss of resource is anticipated. On this basis the ‘Minor’ effects would be ‘Not Significant’.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Deregulated water supply (well source) to the east of Haile (NGR NY 046 083)					
Effect on groundwater levels and quality from all construction activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	This borehole is thought to abstract from the St Bee's Sandstone aquifer. The receptor's deregulated status ensures that it is of 'Very Low' sensitivity. As mentioned above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated environmental measures, and together with the intervening distances (1.6 km) 'Very Low' residual changes would occur i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Private water supply (mixed groundwater and surface water source) at Sellafield Visitors Centre (NGR NY 030 052)					
Effect on groundwater levels and quality from all construction activities	Likely	Low	Medium	Minor (Not Significant)	This abstraction is located within the Moorside Site boundary at Yottenfews. The receptor's private abstraction status ensures that it is of 'Low' sensitivity. As mentioned above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated environmental measures, and 'Medium' residual changes would occur within the receptor's groundwater catchment i.e. a partial loss of resource is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
Private water supply (mixed groundwater and surface water source) at the Sellafield Complex (NGR NY 027 036)					
Effect on groundwater levels and quality from all construction activities	Likely	Low	Medium	Minor (Not Significant)	This abstraction is located within the Sellafield Site, approximately 400 m to the west of the Moorside Site. The receptor's private abstraction status ensures that it is of 'Low' sensitivity. As mentioned above, groundwater levels and quality beneath the nearby Moorside Site would be

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					liable to change and subject to incorporated environmental measures, and 'Medium' residual changes would occur within the receptor's groundwater catchment i.e. a partial loss of resource is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
Operation					
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000)					
Effect on regional groundwater levels and quality from all operational activities	Likely	High	Very Low	Minor (Not Significant)	The receptor underlies the Moorside Site and almost the entirety of the Site's Study Area. The receptor is a Principal Aquifer and therefore of 'High' sensitivity. The aquifer water levels and quality beneath the Moorside Site would be liable to change as a result of the altered recharge regime due to the proposed changes in topography and land use and the possibility of permanent groundwater discharge due to the reduced elevation of parts of the Moorside Site, and groundwater quality would change in response to operational activities. However, construction disturbance would have ceased and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. This helps ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no reduction in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers (WFD Groundwater Body GB41202G103700)					
Effect on regional groundwater levels and	Unlikely	Medium	Very Low	Negligible	The receptor lies at depth beneath the Moorside Site and subcrops beneath the northern edge of the Site's Study

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
quality from all construction activities				(Not Significant)	Area. The receptor is a Secondary Aquifer (A and B) and therefore is at best of 'Medium' sensitivity. The changes in groundwater level and quality immediately beneath the Moorside Site itself (within the Permo-Triassic sandstone aquifer) could be transmitted into the underlying Lower Palaeozoic and Carboniferous aquifer. However, construction activity would have ceased, and incorporated environmental measures such as the adoption of EA pollution prevention guidance and the depth of the aquifers beneath the Moorside Site and distance to subcrop (at least 2.4 km) help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no reduction in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
River Ehen (Lower) (WFD Surface Water Body GB112074069980)					
Effect on river baseflow quantity and quality from all operational activities	Likely	Medium	Low	Minor (Not Significant)	The River Ehen receptor is located within the western and southern parts of the Moorside Site. The receptor is of 'Good' WFD Overall Status and is therefore of 'Medium' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As noted with respect to the aquifer receptors above, groundwater levels and quality beneath the Moorside Site would be liable to change, but construction disturbance would have ceased and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. The residual change would be of 'Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					availability are anticipated. On this basis the <i>'Minor'</i> effects would be <i>'Not Significant'</i> .
River Calder (Lower) (WFD Surface Water Body GB112074069730)					
Effect on river baseflow quantity and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	The River Calder receptor is located to the south east of the Moorside Site. It flows along the site boundary near Calder Bridge, and is approximately 600 m from the Moorside Site at the coast. The receptor is of <i>'Moderate'</i> WFD Overall Status and is therefore of <i>'Low'</i> sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As noted with respect to the aquifer receptors and the Lower Ehen surface water body above, groundwater levels and quality beneath the Moorside Site would be liable to change but construction disturbance would have ceased and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. The residual change would be of <i>'Very Low'</i> magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the <i>'Negligible'</i> effects would be <i>'Not Significant'</i> .
Kirk (Black) Beck (WFD Surface Water Body GB112074069970)					
Effect on stream baseflow quantity and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	The Kirk (Black) Beck receptor flows through the western part of the Moorside Site close to Beckermat. The receptor is of <i>'Moderate'</i> WFD Overall Status and is therefore of <i>'Low'</i> sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					so is influenced by groundwater conditions. As noted with respect to the aquifer receptors and the Lower Ehen and Calder surface water bodies above, groundwater levels and quality beneath the Moorside Site would be liable to change. However, construction disturbance would have ceased and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. The residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Newmill Beck (WFD Surface Water Body GB112074069731)					
Effect on stream baseflow quantity and quality from all operational activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The Newmill Beck and its catchment are located to the south of the Sellafield Complex. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Moorside Site boundary (minimum of 1 km) ensures that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
River Bleng (WFD Surface Water Body GB112074070090)					
Effect on river baseflow quantity and quality from all operational activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The River Bleng and its catchment are located on the edge of the Moorside Site's Study Area, near to Gosforth. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Moorside Site boundary (minimum of 2.6 km) ensures that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Low Church Moss Pond (WFD Surface Water Body GB31229203)					
Effect on pond baseflow quantity and quality from all operational activities	Likely	Low	Low	Negligible (Not Significant)	Low Church Moss Pond is located within the Moorside Site close to Middlebank Farm (NGR NY 016 058). The receptor is of 'Moderate' WFD Overall Status and is therefore, in water resource terms, of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with underlying groundwater, albeit not necessarily the WFD aquifers ¹ , and so is influenced by groundwater conditions. As noted with respect to the aquifer receptors and the Lower Ehen and Calder and the Kirk/Black Beck surface water bodies above, groundwater levels and quality beneath the Moorside Site in particular would be liable to change. However, construction disturbance would have ceased and changes would be subject to incorporated environmental measures such as the adoption of EA

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					pollution prevention guidance. The residual change on this relatively small receptor would be of 'Low' magnitude i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Ellergill Beck (NGR NX 996 076)					
Effect on stream baseflow quantity and quality from all operational activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The receptor does not have WFD status and is therefore of 'Very Low' sensitivity. It is likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the distance between the receptor and the proposed developments (minimum of 0.3 km) helps ensure that the residual changes would be of 'Very Low' magnitude i.e. no change in flow and quality is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
South Egremont groundwater public water supply abstraction (NGRs NY 004 084, NX 995 089, NY 002 097 and NX 999 096)					
Effect on groundwater levels and quality from all operational activities	Likely	High	Very Low	Minor (Not Significant)	The abstraction wells are located between 0.5 and 1.7 km to the north of the Moorside Site and abstract water from the Permo-Triassic sandstone aquifer. The receptor's public water supply abstraction status ensures that it is of 'High' sensitivity. As mentioned above, groundwater levels and quality beneath the Moorside Site would be liable to change. However, construction disturbance would have ceased and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. 'Very Low' residual changes would occur within the receptor's groundwater catchment

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					i.e. no loss of resource is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
Licensed NDA groundwater abstraction at Beckermet Mine (NGR NY 025 086)					
Effect on groundwater levels and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor's industrial abstraction status ensures that it is of 'Medium' sensitivity. As mentioned above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated environmental measures. However, the distance between the receptor and the proposed development boundary (minimum of 1.1 km) and the fact that the Mine abstracts from the deep Coal Measures helps ensure that the residual changes within the receptor's groundwater catchment would be of 'Very Low' magnitude i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Licensed NDA groundwater abstraction at Black Beck to Calder Bridge (NGRs NY 027 068, NY 027 069, NY 029 067, NY 031 066 and NY 041 059)					
Effect on groundwater levels and quality from all operational activities	Likely	Medium	Low	Minor (Not Significant)	The receptor's industrial abstraction status ensures that it is of 'Medium' sensitivity. As mentioned above, groundwater levels and quality in the Permo-Triassic sandstone aquifer beneath the Moorside Site from which these wells abstract would be liable to change. However, the cessation of construction disturbance, and incorporated environmental measures, help ensure that 'Low' residual changes would occur within the receptor's groundwater catchment i.e. a slight loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Licensed NDA groundwater abstraction at Low Prior Scales to Calder Abby (NGR NY 053 065)					
Effect on groundwater levels and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor's industrial abstraction status ensures that it is of 'Medium' sensitivity. As mentioned above, groundwater levels and quality in the Permo-Triassic sandstone aquifer beneath the Moorside Site would be liable to change and subject to incorporated environmental measures. The three wells are thought to abstract from the sandstone aquifer, however the distance between the receptor and the proposed development boundary (minimum of 1.2 km) helps ensure that the residual changes within the receptor's groundwater catchment would be of 'Very Low' magnitude i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Licensed NDA surface water abstraction from the River Ehen (NGR NY 010 061)					
Effect on river baseflow quantity and quality from all operational activities	Likely	Medium	Low	Minor (Not Significant)	The receptor's industrial abstraction status ensures that it is of 'Medium' sensitivity. As mentioned above, groundwater levels and quality beneath the Moorside Site would be liable to change. However, the cessation of construction disturbance, and incorporated environmental measures, help ensure that 'Low' residual changes would occur within the receptor's groundwater catchment i.e. a slight loss of resource is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
Deregulated industrial surface water abstraction at Calder Bridge (NGR NY 039 059)					
Effect on river baseflow quantity and quality from all operational activities	Likely	Low	Low	Negligible (Not Significant)	This abstraction is located just within the Moorside Site boundary at Calder Bridge. The receptor's deregulated abstraction status ensures that it is of 'Low' sensitivity. As

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					mentioned above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated environmental measures. The cessation of construction disturbance and the implementation of these measures help ensure that 'Low' residual changes would occur within the receptor's groundwater catchment i.e. a slight loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Deregulated water supply (well source) to the east of Haile (NGR NY 046 083)					
Effect on groundwater levels and quality from all construction activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	This borehole is thought to abstract from the St Bee's Sandstone aquifer. The receptor's deregulated status ensures that it is of 'Very Low' sensitivity. As mentioned above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated environmental measures, and together with the intervening distances (1.6 km) 'Very Low' residual changes would occur i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Private water supply (mixed groundwater and surface water source) at Sellafield Visitors Centre (NGR NY 030 052)					
Effect on groundwater levels and quality from all operational activities	Likely	Low	Low	Negligible (Not Significant)	This abstraction is located within the Moorside Site boundary at Yottenfews. The receptor's private abstraction status ensures that it is of 'Low' sensitivity. As mentioned above, groundwater levels and quality beneath the Moorside Site would be liable to change and subject to incorporated environmental measures. However, the cessation of construction disturbance, and incorporated environmental measures, help ensure that 'Low' residual changes would occur within the receptor's groundwater

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					catchment i.e. a slight loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Private water supply (mixed groundwater and surface water source) at the Sellafield Complex (NGR NY 027 036)					
Effect on groundwater levels and quality from all operational activities	Likely	Low	Low	Negligible (Not Significant)	This abstraction is located within the Sellafield Site, approximately 400 m to the west of the Moorside Site. The receptor's private abstraction status ensures that it is of 'Low' sensitivity. As mentioned above, groundwater levels and quality beneath the nearby Moorside Site would be liable to change and subject to incorporated environmental measures. The cessation of construction disturbance and the implementation of these measures help ensure that 'Low' residual changes would occur within the receptor's groundwater catchment i.e. a slight loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Table 13.9 Corkickle Site: Summary of predicted residual effects

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Construction					
Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers (WFD Groundwater Body GB41202G103700)					
Effect on regional groundwater levels and quality from all construction activities	Likely	Medium	Low	Minor (Not Significant)	The receptor underlies the Corkickle Site and the entirety of the Site’s Study Area, albeit below the Permo-Triassic sandstone aquifer in the south west. The receptor is a Secondary Aquifer (A and B) and therefore is at best of ‘Medium’ sensitivity. The aquifer water levels beneath the Corkickle Site would be likely to change as a result of the altered recharge regime due to the proposed changes in topography and land use, and groundwater quality would also likely be affected due to spillages and leakages resulting from site activities. However, the absence of extensive dewatering and deep structures and the adoption of EA pollution prevention guidance help ensure that the residual change would be of ‘Low’ magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical is anticipated. On this basis the ‘Minor’ effects would be ‘Not Significant’.
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000)					
Effect on regional groundwater levels and quality from all construction activities	Unlikely	High	Very Low	Minor (Not Significant)	The receptor lies in the south west of the Corkickle Site’s Study Area. The receptor is a Principal Aquifer and therefore of ‘High’ sensitivity. The changes in groundwater level and quality immediately beneath the Corkickle Site itself (within the Carboniferous Coal Measures aquifer) could be transmitted into the adjoining Permo-Triassic sandstone aquifer. However, the absence of extensive dewatering and deep structures, the adoption of EA pollution prevention guidance and the intervening 1 km

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					distance help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
Lowca Beck (WFD Surface Water Body GB112074070040)					
Effect on stream baseflow quantity and quality from all construction activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Corkickle Site boundary (minimum of 2.2 km) ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Pow Beck (Whitehaven) (NGR NX 977 167)					
Effect on stream baseflow quantity and quality from all construction activities	Likely	Low	Low	Negligible (Not Significant)	The receptor is incorporated within the Solway Outer South coastal water body which is of 'Moderate' WFD Overall Status, and is therefore of 'Low' sensitivity. The beck flows through the centre of the Corkickle Site and is likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Corkickle Site would be liable to change, but subject to incorporated environmental measures. This would help ensure that the residual change would be of 'Low' magnitude i.e. no breaches of coastal water WFD Overall

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Pow Beck (South West Lakes) (WFD Surface Water Body GB112074069990)					
Effect on stream baseflow quantity and quality from all construction activities	Likely	Low	Low	Negligible (Not Significant)	The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Corkickle Site would be liable to change, but subject to incorporated environmental measures. These measures, together with the distance between the WFD surface water body boundary and the Corkickle Site boundary (minimum of 0.75 km), ensure that the residual change (would be of 'Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
River Keekle (Lower) (WFD Surface Water Body GB112074070000)					
Effect on river baseflow quantity and quality from all construction activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor is of 'Good' WFD Overall Status and is therefore of 'Medium' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Corkickle Site boundary (minimum of 1.25 km) ensures that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.
River Keekle (Upper) (WFD Surface Water Body GB112074070030)					
Effect on river baseflow quantity and quality from all construction activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The receptor is of ' <i>Moderate</i> ' WFD Overall Status and is therefore of ' <i>Low</i> ' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Corkickle Site boundary (minimum of 1.4 km) ensures that the residual change would be of ' <i>Very Low</i> ' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.
Dub Beck (WFD Surface Water Body GB112074070020)					
Effect on stream baseflow quantity and quality from all construction activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor is of ' <i>Good</i> ' WFD Overall Status and is therefore of ' <i>Medium</i> ' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Corkickle Site boundary (minimum of 2.7 km) ensures that the residual change would be of ' <i>Very Low</i> ' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Thorney and Rottington Becks (NGR NX 970 138)					
Effect on stream baseflow quantity and quality from all construction activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The receptors do not have WFD Status and are therefore both of 'Very Low' sensitivity. They are likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the distance between the surface water body boundary and the Corkickle Site boundary (minimum of 0.3 km) ensures that the residual changes would be of 'Very Low' magnitude i.e. no change in flow and quality is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Licensed groundwater abstraction at Sandwith (Bayerstead Farm, NGR NX 967 139)					
Effect on groundwater levels and quality from all construction activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	This well is thought to abstract from the Permo-Triassic sandstone aquifer. The receptor's industrial/agricultural abstraction status ensures that it is of 'Medium' sensitivity. The changes in groundwater level and quality immediately beneath the Corkickle Site itself (within the Carboniferous Coal Measures aquifer) could be transmitted into the adjoining Permo-Triassic sandstone aquifer. However, the distance between the receptor and the proposed development boundary (minimum of 2.8 km) helps ensure that the residual changes would be of 'Very Low' magnitude i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Private water supply (spring source) at Stanley House, Sandwith (NGR NX 981 140)					
Effect on groundwater levels and quality from all construction activities	Unlikely	Low	Very Low	Negligible (Not Significant)	This spring is located to the south of the Corkickle Site, and is thought to originate from the Permo-Triassic sandstone aquifer. The receptor's private abstraction status ensures that it is of 'Low' sensitivity. As mentioned above, groundwater levels and quality beneath the Corkickle Site

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					itself (within the Carboniferous Coal Measures aquifer) could be transmitted into the adjoining Permo-Triassic sandstone aquifer. However, the distance between the receptor and the proposed development boundary (minimum of 2.6 km) helps ensure that the residual changes would be 'Very Low' i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Operation					
Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers (WFD Groundwater Body GB41202G103700)					
Effect on regional groundwater levels and quality from all operational activities	Likely	Medium	Very Low	Negligible (Not Significant)	The receptor underlies the Corkickle Site and the entirety of the Site's Study Area, albeit below the Permo-Triassic sandstone aquifer in the south west. The receptor is a Secondary Aquifer (A and B) and therefore is at best of 'Medium' sensitivity. The aquifer water levels beneath the Corkickle Site would be likely to change as a result of the altered recharge regime due to the proposed changes in topography and land use, and groundwater quality would also likely be affected due to spillages and leakages resulting from site activities. However, construction disturbance would have ceased, and the absence of deep structures and the adoption of EA pollution prevention guidance help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000)					
Effect on regional groundwater levels and quality from all operational activities	Unlikely	High	Very Low	Minor (Not Significant)	The receptor lies in the south west of the 3 km radius Corkickle Site Study Area. The receptor is a Principal Aquifer and therefore of 'High' sensitivity. The changes in groundwater level and quality immediately beneath the Corkickle Site itself (within the Carboniferous Coal Measures aquifer) could be transmitted into the adjoining Permo-Triassic sandstone aquifer. However, construction activity would have ceased, and the absence of deep structures, the adoption of EA pollution prevention guidance and the intervening 1 km distance help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body, i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
Lowca Beck (WFD Surface Water Body GB112074070040)					
Effect on stream baseflow quantity and quality from all operational activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Corkickle Site boundary (minimum of 2.2 km) ensures that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Pow Beck (Whitehaven) (NGR NX 977 167)					
Effect on stream baseflow quantity and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	The receptor is incorporated within the Solway Outer South coastal water body which is of 'Moderate' WFD Overall Status, and is therefore of 'Low' sensitivity. The beck flows through the centre of the Corkickle Site and is likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Corkickle Site would be liable to change, but construction disturbance would have ceased, and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. This would help ensure that the residual change would be of 'Very Low' magnitude i.e. no breaches of coastal water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Pow Beck (South West Lakes) (WFD Surface Water Body GB112074069990)					
Effect on stream baseflow quantity and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Corkickle Site would be liable to change, but construction disturbance would have ceased, and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. Together with the distance between the WFD surface water body boundary and the Corkickle Site boundary (minimum of 0.75 km), this ensures that the residual change would be of 'Very Low' magnitude

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.
River Keekle (Lower) (WFD Surface Water Body GB112074070000)					
Effect on river baseflow quantity and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor is of ' <i>Good</i> ' WFD Overall Status and is therefore of ' <i>Medium</i> ' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Corkickle Site boundary (minimum of 1.25 km) ensures that the residual change (would be of ' <i>Very Low</i> ' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.
River Keekle (Upper) (WFD Surface Water Body GB112074070030)					
Effect on river baseflow quantity and quality from all operational activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The receptor is of ' <i>Moderate</i> ' WFD Overall Status and is therefore of ' <i>Low</i> ' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Corkickle Site boundary (minimum of 1.4 km) ensures that the residual change would be of ' <i>Very Low</i> ' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					surface water resource availability are anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.
Dub Beck (WFD Surface Water Body GB112074070020)					
Effect on stream baseflow quantity and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor is of ' <i>Good</i> ' WFD Overall Status and is therefore of ' <i>Medium</i> ' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Corkickle Site boundary (minimum of 2.7 km) ensures that the residual change would be of ' <i>Very Low</i> ' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.
Thorney and Rottington Becks (NGR NX 970 138)					
Effect on stream baseflow quantity and quality from all operational activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The receptors do not have WFD Status and are therefore both of ' <i>Very Low</i> ' sensitivity. They are likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the distance between the surface water body boundary and the Corkickle Site boundary (minimum of 0.3 km), would help ensure that the residual changes would be of ' <i>Very Low</i> ' magnitude i.e. no change in flow and quality is anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Licensed groundwater abstraction at Sandwith (Byerstead Farm, NGR NX 967 139)					
Effect on groundwater levels and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	This well is thought to abstract from the Permo-Triassic sandstone aquifer. The receptor's industrial/agricultural abstraction status ensures that it is of 'Medium' sensitivity. However, the distance between the receptor and the proposed development boundary (minimum of 2.8 km) helps ensure that the residual changes within the receptor's groundwater catchment would be of 'Very Low' magnitude i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Private water supply (spring source) at Stanley House, Sandwith (NGR NX 981 140)					
Effect on groundwater levels and quality from all operational activities	Unlikely	Low	Very Low	Negligible (Not Significant)	This spring is located to the south of the Corkickle Site, and is thought to originate from the Permo-Triassic sandstone aquifer. The receptor's private abstraction status ensures that it is of 'Low' sensitivity. However, the distance between the receptor and the proposed development boundary (minimum of 2.6 km) helps ensure that the residual changes would be 'Very Low' i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Table 13.10 Mirehouse Site: Summary of predicted residual effects

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Construction					
Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers (WFD Groundwater Body GB41202G103700)					
Effect on regional groundwater levels and quality from all construction activities	Likely	Medium	Low	Minor (Not Significant)	The receptor underlies the Mirehouse Site and the entirety of the Site's Study Area, albeit below the Permo-Triassic sandstone aquifer in the south and west. The receptor is a Secondary Aquifer (A and B) and therefore is at best of 'Medium' sensitivity. The aquifer water levels beneath the Mirehouse Site would be likely to change as a result of the altered recharge regime due to the proposed changes in topography and land use, and groundwater quality would also likely be affected due to spillages and leakages resulting from site activities. However, the absence of extensive dewatering and deep structures and the adoption of EA pollution prevention guidance help ensure that the residual change would be of 'Low' magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000)					
Effect on regional groundwater levels and quality from all construction activities	Likely	High	Very Low	Minor (Not Significant)	The receptor underlies the south and western half of the Mirehouse Site's Study Area. The receptor is a Principal Aquifer and therefore of 'High' sensitivity. The groundwater levels beneath the Mirehouse Site itself (within the Carboniferous Coal Measures aquifer) could be transmitted into the adjoining Permo-Triassic sandstone aquifer. However, the absence of extensive dewatering and deep structures, the adoption of EA pollution

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					prevention guidance and the intervening 200 m distance help ensure that the residual change would be 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
River Ehen (Lower) (WFD Surface Water Body GB112074069980)					
Effect on river baseflow quantity and quality from all construction activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor is of 'Good' WFD Overall Status and is therefore of 'Medium' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Mirehouse Site boundary (minimum of 1.6 km) would help ensure that the residual change would be of 'Very Low' over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
River Ehen (Upper including Liza) (WFD Surface Water Body GB112074070010)					
Effect on river baseflow quantity and quality from all construction activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Mirehouse Site boundary (minimum of 2.3 km) would help ensure that the residual change would be of 'Very Low' over the extent of the WFD surface water body i.e. no breaches of surface

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Pow Beck (Whitehaven) (NGR NX 977 167)					
Effect on stream baseflow quantity and quality from all construction activities	Likely	Low	Low	Negligible (Not Significant)	The receptor is incorporated within the Solway Outer South coastal water body which is of 'Moderate' WFD Overall Status, and is therefore of 'Low' sensitivity. The Beck's catchment extends to just within the northern boundary of the Mirehouse Site. The beck is likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Mirehouse Site would be liable to change, but subject to incorporated environmental measures. This would help ensure that the residual change would be of 'Low' magnitude i.e. no breaches of coastal water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Pow Beck (South West Lakes) (WFD Surface Water Body GB112074069990)					
Effect on stream baseflow quantity and quality from all construction activities	Likely	Low	Low	Negligible (Not Significant)	The Mirehouse Site sits almost entirely within the Pow Beck catchment, with a headwater of the Pow Beck flowing through the centre of the Site. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Mirehouse Site would be liable to change, but subject to

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					incorporated environmental measures. This helps ensure that the residual change would be of 'Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
River Keekle (Lower) (WFD Surface Water Body GB112074070000)					
Effect on river baseflow quantity and quality from all construction activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor is of 'Good' WFD Overall Status and is therefore of 'Medium' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Mirehouse Site boundary (minimum of 0.6 km) would help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
River Keekle (Upper) (WFD Surface Water Body GB112074070030)					
Effect on river baseflow quantity and quality from all construction activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Mirehouse Site boundary (minimum of 2.0 km) would help ensure that the

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Dub Beck (WFD Surface Water Body GB112074070020)					
Effect on stream baseflow quantity and quality from all construction activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor is of 'Good' WFD Overall Status and is therefore of 'Medium' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Mirehouse Site boundary (minimum of 2.4 km) ensures that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Thorney and Rottington Becks (NGR NX 970 138)					
Effect on stream baseflow quantity and quality from all construction activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The receptors do not have WFD Status and are therefore both of 'Very Low' sensitivity. They are likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the distance between the receptors and the proposed development boundary (minimum of 0.6 km) would help ensure that the residual changes would be of 'Very Low' magnitude i.e. no change in flow and quality is

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.
Licensed groundwater abstraction at Sandwith (Byerstead Farm, NGR NX 967 139)					
Effect on groundwater levels and quality from all construction activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	This well is thought to abstract from the Permo-Triassic sandstone aquifer. The receptor's industrial/agricultural abstraction status ensures that it is of ' <i>Medium</i> ' sensitivity. The changes in groundwater level and quality immediately beneath the Mirehouse Site itself (within the Carboniferous Coal Measures aquifer) could be transmitted into the adjoining Permo-Triassic sandstone aquifer. However, the distance between the receptor and the proposed development boundary (minimum of 1.6 km) helps ensure that the residual changes would be of ' <i>Very Low</i> ' magnitude i.e. no loss of resource is anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.
Private water supply (spring source) at Stanley House, Sandwith (NGR NX 981 140)					
Effect on groundwater levels and quality from all construction activities	Likely	Low	Low	Negligible (Not Significant)	This spring is located approximately 400 m to the south west of the Mirehouse Site, and is thought to originate from the Permo-Triassic sandstone aquifer. The receptor's private abstraction status ensures that it is of ' <i>Low</i> ' sensitivity. The changes in groundwater level and quality immediately beneath the Mirehouse Site itself (within the Carboniferous Coal Measures aquifer) could be transmitted into the adjoining Permo-Triassic sandstone aquifer and subject to incorporated environmental measures. As a result, ' <i>Low</i> ' residual changes would occur i.e. a slight loss of resource is anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Deregulated water supplies (spring sources) at Westlakes Science Park (NGRs NX 995 150 and NX 997 147)					
Effect on groundwater levels and quality from all construction activities	Likely	Very Low	Low	Negligible (Not Significant)	The two springs are located approximately 250 and 480 m to the south east of the Mirehouse Site on an outcrop of the Permo-Triassic sandstone aquifer. The receptor's deregulated status ensures that it is of 'Very Low' sensitivity. As mentioned above, groundwater levels and quality beneath the Mirehouse Site would be liable to change and subject to incorporated environmental measures, and 'Low' residual changes would occur i.e. a slight loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Deregulated water supplies (well source) at High Walton and High House (NGRs NX 981 129 and NX 978 124 respectively)					
Effect on groundwater levels and quality from all construction activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	This well and borehole are thought to abstract from the Permo-Triassic sandstone aquifer. The receptor's deregulated status ensures that it is of 'Very Low' sensitivity. As mentioned above, groundwater levels and quality beneath the Mirehouse Site would be liable to change and subject to incorporated environmental measures. However, the distance between the receptors and the proposed development boundary (1.5 and 2.0 km respectively) helps ensure that the residual change would be of 'Very Low' magnitude i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Operation					
Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers (WFD Groundwater Body GB41202G103700)					
Effect on regional groundwater levels and quality from all operational activities	Likely	Medium	Very Low	Negligible (Not Significant)	The receptor underlies the Mirehouse Site and the entirety of the Site's Study Area, albeit below the Permo-Triassic sandstone aquifer in the south and west. It is a Secondary Aquifer (A and B) and therefore is at best of 'Medium' sensitivity. The aquifer water levels beneath the Mirehouse Site would be likely to change as a result of the altered recharge regime due to the proposed changes in topography and land use, and groundwater quality would also likely be affected due to spillages and leakages resulting from site activities. However, construction disturbance would have ceased, and the absence of deep structures and the adoption of EA pollution prevention guidance help ensure that the residual change (would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000)					
Effect on regional groundwater levels and quality from all operational activities	Likely	High	Very Low	Minor (Not Significant)	The receptor underlies the south-western half of the Mirehouse Site's Study Area. The receptor is a Principal Aquifer and therefore of 'High' sensitivity. The groundwater levels beneath the Mirehouse Site itself (within the Carboniferous Coal Measures aquifer) could be transmitted into the adjoining Permo-Triassic sandstone aquifer. However, construction disturbance would have ceased, and the absence of deep structures, the adoption of EA pollution prevention guidance and the intervening

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					200 m distance help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
River Ehen (Lower) (WFD Surface Water Body GB112074069980)					
Effect on river baseflow quantity and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor is of 'Good' WFD Overall Status and is therefore of 'Medium' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Mirehouse Site boundary (minimum of 1.6 km) would help ensure that the residual change would be of 'Very Low' over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the effects would be 'Not Significant'.
River Ehen (Upper including Liza) (WFD Surface Water Body GB112074070010)					
Effect on river baseflow quantity and quality from all construction activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Mirehouse Site boundary (minimum of 2.3 km) would help ensure that the residual change would be of 'Very Low' (over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					surface water resource availability are anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.
Pow Beck (Whitehaven) (NGR NX 977 167)					
Effect on stream baseflow quantity and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	The receptor is incorporated within the Solway Outer South coastal water body which is of ' <i>Moderate</i> ' WFD Overall Status, and is therefore of ' <i>Low</i> ' sensitivity. The Beck's catchment extends to just within the northern boundary of the Mirehouse Site. The beck is likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Mirehouse Site would be liable to change. However, construction disturbance would have ceased, and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. The residual change would be of ' <i>Very Low</i> ' magnitude i.e. no breaches of coastal water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.
Pow Beck (South West Lakes) (WFD Surface Water Body GB112074069990)					
Effect on stream baseflow quantity and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	The Mirehouse Site sits entirely within the Pow Beck catchment, with a headwater of the Pow Beck flowing through the centre of the Site. The receptor is of ' <i>Moderate</i> ' WFD Overall Status and is therefore of ' <i>Low</i> ' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					Mirehouse Site would be liable to change. However, construction disturbance would have ceased, and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. This would help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
River Keekle (Lower) (WFD Surface Water Body GB112074070000)					
Effect on river baseflow quantity and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor is of 'Good' WFD Overall Status and is therefore of 'Medium' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Mirehouse Site boundary (minimum of 0.6 km), would help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
River Keekle (Upper) (WFD Surface Water Bodies GB112074070030)					
Effect on river baseflow quantity and quality from all operational activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					conditions. However, the distance between the WFD surface water body boundary and the Mirehouse Site boundary (minimum of 2.0 km), would help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Dub Beck (WFD Surface Water Body GB112074070020)					
Effect on stream baseflow quantity and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor is of 'Good' WFD Overall Status and is therefore of 'Medium' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Mirehouse Site boundary (minimum of 2.4 km) ensures that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Thorney and Rottington Becks (NGR NX 970 138)					
Effect on stream baseflow quantity and quality from all operational activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The receptors do not have WFD Status and are therefore both of 'Very Low' sensitivity. They are likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the distance between the receptors and the proposed development boundary (minimum of 0.6 km) would help

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					ensure that the residual changes would be of 'Very Low' magnitude i.e. no change in flow and quality is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Licensed groundwater abstraction at Sandwith (Byerstead Farm NGR NX 967 139)					
Effect on groundwater levels and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	This well is thought to abstract from the Permo-Triassic sandstone aquifer. The receptor's industrial/agricultural abstraction status ensures that it is of 'Medium' sensitivity. However, the distance between the receptor and the proposed development boundary (minimum of 1.6 km) helps ensure that the residual changes within the receptor's groundwater catchment would be of 'Very Low' magnitude i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Private water supply (spring source) at Stanley House, Sandwith (NGR NX 981 140)					
Effect on groundwater levels and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	This spring is located approximately 400 m to the south west of the Mirehouse Site, and is thought to originate from the Permo-Triassic sandstone aquifer. The receptor's private abstraction status ensures that it is of 'Low' sensitivity. As mentioned above, groundwater levels and quality beneath the Mirehouse Site would be liable to change. However, construction disturbance would have ceased, and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. 'Very Low' residual changes would occur within the receptor's groundwater catchment i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Deregulated water supplies (spring sources) at Westlakes Science Park (NGRs NX 995 150 and NX 997 147)					
Effect on groundwater levels and quality from all operational activities	Likely	Very Low	Very Low	Negligible (Not Significant)	The two springs are located approximately 250 m and 480 m to the south east of the Mirehouse Site on an outcrop of Permo-Triassic sandstone aquifer. The receptor's deregulated status ensures that it is of 'Very Low' sensitivity. As mentioned above, groundwater levels and quality beneath the Mirehouse Site would be liable to change. However, construction disturbance would have ceased, and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance, and despite their proximity 'Very Low' residual changes would occur during operation i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Deregulated water supplies (well source) at High Walton and High House (NGRs NX 981 129 and NX 978 124 respectively)					
Effect on groundwater levels and quality from all operational activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	This well and borehole are thought to abstract from the Permo-Triassic sandstone aquifer. The receptor's deregulated status ensures that it is of 'Very Low' sensitivity. As mentioned above, groundwater levels and quality beneath the Mirehouse Site would be liable to change and subject to incorporated environmental measures. With the intervening distances (1.5 and 2.0 km respectively), 'Very Low' residual changes would occur i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Table 13.11 Egremont Site: Summary of predicted residual effects

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Construction					
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000)					
Effect on regional groundwater levels and quality from all construction activities	Likely	High	Low	Moderate (Potentially Significant)	The receptor underlies the Egremont Site and the southern two thirds of the Egremont Site's Study Area. The receptor is a Principal Aquifer and therefore of 'High' sensitivity. The aquifer water levels beneath the Egremont Site would be likely to change as a result of the altered recharge regime due to the proposed changes in topography and land use, and groundwater quality would also likely be affected due to spillages and leakages resulting from site activities. However, the absence of extensive dewatering and deep structures and the adoption of EA pollution prevention guidance would ensure that the residual change would be of 'Low' magnitude over the extent of the WFD groundwater body i.e. no reduction in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Moderate' effects would be 'Potentially Significant'.
Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers (WFD Groundwater Body GB41202G103700)					
Effect on regional groundwater levels and quality from all construction activities	Likely	Medium	Very Low	Negligible (Not Significant)	The receptor lies at depth beneath the Egremont Site and subcrops beneath the northern third of the Egremont Site's Study Area. The receptor is a Secondary Aquifer (A and B) and therefore is at best of 'Medium' sensitivity. The changes in groundwater level and quality immediately beneath the Egremont Site itself (within the Permo-Triassic sandstone aquifer) could be transmitted into the underlying Lower Palaeozoic and

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					Carboniferous aquifer. However, the absence of extensive dewatering and deep structures, the adoption of EA pollution prevention guidance and the depth of the aquifer beneath the Egremont Site and distance to subcrop (at least 0.7 km) help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no reduction in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
River Ehen (Lower) (WFD Surface Water Body GB112074069980)					
Effect on river baseflow quantity and quality from all construction activities	Likely	Medium	Medium	Moderate (Potentially Significant)	The River Ehen flows along the western boundary of the Egremont Site, and most of the Lower Ehen catchment falls within the Study Area of the Egremont Site. The receptor is of 'Good' WFD Overall Status and is therefore of 'Medium' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As noted with respect to the aquifer receptors above, groundwater levels and quality beneath the Egremont Site would be liable to change and subject to incorporated environmental measures. The residual change would be of 'Medium' magnitude over the extent of the WFD surface water body i.e. periodic, short-term and reversible breaches of surface water WFD Overall Status thresholds and/or deterioration in surface water resource availability are anticipated. On this basis the 'Moderate' effects would be 'Potentially Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
River Ehen (Upper including Liza) (WFD Surface Water Body GB112074070010)					
Effect on river baseflow quantity and quality from all construction activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Egremont Site boundary (minimum of 2.6 km) would help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Kirk (Black) Beck (WFD Surface Water Body GB112074069970)					
Effect on stream baseflow quantity and quality from all construction activities	Likely	Low	Low	Negligible (Not Significant)	The Kirk (Black) Beck flows approximately 1.7 km to the south east of the Egremont Site, near Haile and Beckermat. The catchment boundary is approximately 900 m to the south east of the Site. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As noted above, groundwater levels and quality beneath the Egremont Site would be liable to change and subject to incorporated environmental measures. The residual change would be of 'Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					this basis the 'Negligible' effects would be 'Not Significant'.
Low Church Moss Pond (WFD Surface Water Body GB31229203)					
Effect on pond baseflow quantity and quality from all construction activities	Likely	Low	Very Low	Negligible (Not Significant)	Low Church Moss Pond is located within the Moorside Site close to Middlebank Farm (NGR NY 016 058), approximately 2.9 km to the south of the Egremont Site. The receptor is of 'Moderate' WFD Overall Status and is therefore, in water resource terms, of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with underlying groundwater, albeit not necessarily the WFD aquifers ¹⁰ , and so is influenced by groundwater conditions. As noted above, groundwater levels and quality beneath the Egremont Site would be liable to change and subject to incorporated environmental measures. However, given the considerable distance between the Egremont Site boundary and the receptor, the residual change on this relatively small receptor would be of 'Very Low' magnitude i.e. no breaches of surface water WFD Overall Status thresholds and/or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Ellergill Beck (NGR NX 996 076)					
Effect on stream baseflow quantity and	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The receptor does not have WFD status and is therefore of 'Very Low' sensitivity. It is likely to be in hydraulic continuity with the underlying groundwater, and so

¹⁰ WFD Aquifers - Water Framework Directive groundwater bodies in the study area are shown schematically on Figure 13.4, namely the West Cumbria Permo-Triassic Sandstone Aquifers and the Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
quality from all construction activities					influenced by groundwater conditions. However, the distance between the receptor and the proposed development boundary (minimum of 0.4 km), helps ensure that the residual changes would be of <i>'Very Low'</i> magnitude i.e. no change in flow and quality is anticipated. On this basis the <i>'Negligible'</i> effects would be <i>'Not Significant'</i> .
South Egremont groundwater public water supply abstraction (NGRs NY 004 084, NX 995 089, NY 002 097 and NX 999 096)					
Effect on groundwater levels and quality from all construction activities	Likely	High	Low	Moderate (Potentially Significant)	The abstraction wells are located between 0.4 and 1.4 km to the west and south west of the Egremont Site and abstract water from the Permo-Triassic sandstone aquifer. The receptor's public water supply abstraction status ensures that it is of <i>'High'</i> sensitivity. As noted above, groundwater levels and quality beneath the Egremont Site would be liable to change and subject to incorporated environmental measures, and <i>'Low'</i> residual changes would occur within the receptor's groundwater catchment i.e. a slight loss of resource is anticipated. On this basis the <i>'Moderate'</i> effects would be <i>'Potentially Significant'</i> .
Licensed NDA groundwater abstraction at Beckermat Mine (NGR NY 025 086)					
Effect on groundwater levels and quality from all construction activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor's industrial abstraction status ensures that it is of <i>'Medium'</i> sensitivity. As noted above, groundwater levels and quality beneath the Egremont Site would be liable to change and subject to incorporated environmental measures. However, the distance between the receptor and the proposed development boundary (minimum of 1.4 km) and the fact that the Mine abstracts from the deep Coal

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					Measures, helps ensure that the residual changes within the receptor's groundwater catchment would be of 'Very Low' magnitude i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Licensed NDA groundwater abstraction at Black Beck to Calder Bridge (NGRs NY 027 068, NY 027 069, NY 029 067, NY 031 066 and NY 041 059)					
Effect on groundwater levels and quality from all construction activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor's industrial abstraction status ensures that it is of 'Medium' sensitivity. As mentioned above, groundwater levels and quality in the Permo-Triassic sandstone aquifer beneath the Egremont Site from which these wells abstract would be liable to change and subject to incorporated environmental measures. However, given the considerable distance between the Egremont Site boundary and the receptor (> 2.5 km), 'Very Low' residual changes would occur within the receptor's groundwater catchment i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Licensed NDA surface water abstraction from the River Ehen (NGR NY 010 061)					
Effect on river baseflow quantity and quality from all construction activities	Likely	Medium	Medium	Moderate (Potentially Significant)	The receptor's industrial abstraction status ensures that it is of 'Medium' sensitivity. As mentioned above, groundwater levels and quality beneath the Egremont Site would be liable to change and subject to incorporated environmental measures, and given its proximity to the River Ehen 'Medium' residual changes would occur within the receptor's groundwater catchment i.e. a partial loss of resource is anticipated. On this basis the 'Moderate' effects would be 'Potentially Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Operation					
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000)					
Effect on regional groundwater levels and quality from all operational activities	Likely	High	Very Low	Minor (Not Significant)	The receptor underlies the Egremont Site and the southern two thirds of the Egremont Site's Study Area. The receptor is a Principal Aquifer and therefore of 'High' sensitivity. The aquifer water levels beneath the Egremont Site would be likely to change as a result of the altered recharge regime due to the proposed changes in topography and land use, and groundwater quality would also likely be affected due to spillages and leakages resulting from operational activities. However, construction disturbance would have ceased and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. This helps ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no reduction in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers (WFD Groundwater Body GB41202G103700)					
Effect on regional groundwater levels and quality from all operational activities	Likely	Medium	Very Low	Negligible (Not Significant)	The receptor lies at depth beneath the Egremont Site and subcrops beneath the northern third of the Egremont Site's Study Area. The receptor is a Secondary Aquifer (A and B) and therefore is at best of 'Medium' sensitivity. The changes in groundwater level and quality immediately beneath the Egremont Site itself (within the Permo-Triassic sandstone aquifer) could be transmitted into the underlying Lower Palaeozoic and Carboniferous aquifer. However, construction activity

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					would have ceased, and incorporated environmental measures such as the adoption of EA pollution prevention guidance and the depth of the aquifer beneath the Egremont Site and distance to subcrop (at least 0.7 km) help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no reduction in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
River Ehen (Lower) (WFD Surface Water Body GB112074069980)					
Effect on river baseflow quantity and quality from all operational activities	Likely	Medium	Low	Minor (Not Significant)	The River Ehen flows along the western boundary of the Egremont Site, and most of the Lower Ehen catchment falls within the Study Area of the Egremont Site. The receptor is of 'Good' WFD Overall Status and is therefore of 'Medium' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As noted with respect to the aquifer receptors above, groundwater levels and quality beneath the Egremont Site would be liable to change, but construction disturbance would have ceased and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. The residual change would be of 'Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Minor' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
River Ehen (Upper including Liza) (WFD Surface Water Body GB112074070010)					
Effect on river baseflow quantity and quality from all construction activities	Unlikely	Low	Very Low	Negligible (Not Significant)	The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. However, the distance between the WFD surface water body boundary and the Egremont Site boundary (minimum of 2.6 km) would help ensure that the residual change would be of 'Very Low' over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Kirk (Black) Beck (WFD Surface Water Body GB112074069970)					
Effect on stream baseflow quantity and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	The Kirk (Black) Beck flows approximately 1.7 km to the south east of the Egremont Site, near Haile and Beckermet. The catchment boundary is approximately 900 m to the south east of the Egremont Site. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As noted with respect to the aquifer receptors and the River Ehen above, groundwater levels and quality beneath the Egremont Site would be liable to change. However, construction disturbance would have ceased and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. The

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Low Church Moss Pond (WFD Surface Water Body GB31229203)					
Effect on pond baseflow quantity and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	Low Church Moss Pond is located within the Moorside Site close to Middlebank Farm (NGR NY 016 058), approximately 2.9 km to the south of the Egremont Site. The receptor is of 'Moderate' WFD Overall Status and is therefore, in water resource terms, of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with underlying groundwater, albeit not necessarily the WFD aquifers ¹¹ , and so is influenced by groundwater conditions. As noted above, groundwater levels and quality beneath the Egremont Site would be liable to change. However, construction disturbance would have ceased and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. This, combined with the considerable distance between the Egremont Site boundary and the receptor, mean that the residual change on this relatively small receptor would be of 'Very Low' magnitude i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are

¹¹ WFD Aquifers - Water Framework Directive groundwater bodies in the study area are shown schematically on Figure 13.4, namely the West Cumbria Permo-Triassic Sandstone Aquifers and the Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					anticipated. On this basis the <i>'Negligible'</i> effects would be <i>'Not Significant'</i> .
Ellergill Beck (NGR NX 996 076)					
Effect on stream baseflow quantity and quality from all operational activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The receptor does not have WFD status and is therefore of <i>'Very Low'</i> sensitivity. It is likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the distance between the receptor and the proposed development boundary (minimum of 0.4 km) helps ensure that the residual changes would be of <i>'Very Low'</i> magnitude i.e. no change in flow and quality is anticipated. On this basis the <i>'Negligible'</i> effects would be <i>'Not Significant'</i> .
South Egremont groundwater public water supply abstraction (NGRs NY 004 084, NX 995 089, NY 002 097 and NX 999 096)					
Effect on groundwater levels and quality from all operational activities	Likely	High	Very Low	Minor (Not Significant)	The abstraction wells are located between 0.4 and 1.4 km to the west and south west of the Egremont Site and abstract water from the Permo-Triassic sandstone aquifer. The receptor's public water supply abstraction status ensures that it is of <i>'High'</i> sensitivity. As mentioned above, groundwater levels and quality beneath the Egremont Site would be liable to change. However, construction disturbance would have ceased and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. <i>'Very Low'</i> residual changes would occur within the receptor's groundwater catchment i.e. no loss of resource is anticipated. On this basis the <i>'Minor'</i> effects would be <i>'Not Significant'</i> .

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Licensed NDA groundwater abstraction at Beckermat Mine (NGR NY 025 086)					
Effect on groundwater levels and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor's industrial abstraction status ensures that it is of ' <i>Medium</i> ' sensitivity. As mentioned above, groundwater levels and quality beneath Egremont would be liable to change and subject to incorporated environmental measures. However, the distance between the receptor and the proposed development boundary (minimum of 1.4 km) and the fact that the Mine abstracts from the deep Coal Measures helps ensure that the residual changes within the receptor's groundwater catchment would be of ' <i>Very Low</i> ' magnitude i.e. no loss of resource is anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.
Licensed NDA groundwater abstraction at Black Beck to Calder Bridge (NGRs NY 027 068, NY 027 069, NY 029 067, NY 031 066 and NY 041 059)					
Effect on groundwater levels and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor's industrial abstraction status ensures that it is of ' <i>Medium</i> ' sensitivity. As mentioned above, groundwater levels and quality in the Permo-Traissic sandstone aquifer beneath the Egremont Site from which these wells abstract would be liable to change and subject to incorporated environmental measures. However, given the considerable distance between the Egremont Site boundary and the receptor (> 2.5 km), ' <i>Very Low</i> ' residual changes would occur within the receptor's groundwater catchment i.e. no loss of resource is anticipated. On this basis the ' <i>Negligible</i> ' effects would be ' <i>Not Significant</i> '.
Licensed NDA surface water abstraction from the River Ehen (NGR NY 010 061)					

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Effect on river baseflow quantity and quality from all operational activities	Likely	Medium	Low	Minor (Not Significant)	The receptor's industrial abstraction status ensures that it is of ' <i>Medium</i> ' sensitivity. As mentioned above, groundwater levels and quality beneath the Egremont Site would be liable to change. However, the cessation of construction disturbance, and incorporated environmental measures, help ensure that ' <i>Low</i> ' residual changes would occur within the receptor's groundwater catchment i.e. a slight loss of resource is anticipated. On this basis the ' <i>Minor</i> ' effects would be ' <i>Not Significant</i> '.

Table 13.12 Corkickle to Mirehouse Railway Site: Summary of predicted residual effects

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Construction					
Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers (WFD Groundwater Body GB41202G103700)					
Effect on regional groundwater levels and quality from all construction activities	Likely	Medium	Low	Minor (Not Significant)	The receptor underlies the Corkickle to Mirehouse Railway Site and the entirety of the Site's Study Area, albeit below the Permo-Triassic sandstone aquifer in the south west. The receptor is a Secondary Aquifer (A and B) and therefore is at best of 'Medium' sensitivity. The aquifer water levels beneath the Railway Site could change as a result of the altered recharge regime due to the proposed changes in topography and land use, and groundwater quality would also likely be affected due to spillages and leakages resulting from site activities. However, the absence of extensive dewatering and deep structures and the adoption of EA pollution prevention guidance help ensure that the residual change would be of 'Low' magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000)					
Effect on regional groundwater levels and quality from all construction activities	Unlikely	High	Very Low	Minor (Not Significant)	The receptor underlies the south western part of the Railway Site's Study Area, approximately 200 m from the site boundary. The receptor is a Principal Aquifer and therefore of 'High' sensitivity. The changes in groundwater level and quality immediately beneath the Railway Site itself (within the Carboniferous Coal Measures aquifer) could be transmitted into the adjoining Permo-Triassic sandstone aquifer. However, the absence of extensive

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					dewatering and deep structures, the adoption of EA pollution prevention guidance and the intervening 0.2 km distance help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
Pow Beck (Whitehaven) (NGR NX 977 167)					
Effect on stream baseflow quantity and quality from all construction activities	Likely	Low	Low	Negligible (Not Significant)	The receptor is incorporated within the Solway Outer South coastal water body which is of 'Moderate' WFD Overall Status, and is therefore of 'Low' sensitivity. The beck flows along the western boundary of the site, and is likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Railway Site would be liable to change, but subject to incorporated environmental measures. This would help ensure that the residual change would be of 'Low' magnitude i.e. no breaches of coastal water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Pow Beck (South West Lakes) (WFD Surface Water Body GB112074069990)					
Effect on stream baseflow quantity and quality from all construction activities	Likely	Low	Low	Negligible (Not Significant)	Approximately 1.0 km of the southern part of the site, along with the southern third of the Site's Study Area, is located within the Pow Beck catchment. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					so is influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Railway Site would be liable to change, but subject to incorporated environmental measures. Despite the Railway Site residing within the Pow Beck (South West Lakes) WFD surface water body area, the incorporated environmental measures would help ensure that the residual change would be of 'Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Thorney and Rottington Becks (NGR NX 970 138)					
Effect on stream baseflow quantity and quality from all construction activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The receptors do not have WFD Status and are therefore both of 'Very Low' sensitivity. They are likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the distance between the surface water body boundary and the Corkickle to Mirehouse Railway Site boundary (minimum of 0.7 km) ensures that the residual changes would be of 'Very Low' magnitude i.e. no change in flow and quality is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Private water supply (spring source) at Stanley House, Sandwith (NGR NX 981 140)					
Effect on groundwater levels and quality from all construction activities	Likely	Low	Low	Negligible (Not Significant)	This spring is located approximately 400 m to the south west of the Corkickle to Mirehouse Railway Site, and is thought to originate from the Permo-Triassic sandstone aquifer. The receptor's private abstraction status ensures that it is of 'Low' sensitivity. The changes in groundwater

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					level and quality immediately beneath the Site itself (within the Carboniferous Coal Measures aquifer) could be transmitted into the adjoining Permo-Triassic sandstone aquifer and subject to incorporated environmental measures. As a result, 'Low' residual changes would occur i.e. a slight loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Operation					
Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers (WFD Groundwater Body GB41202G103700)					
Effect on regional groundwater levels and quality from all operational activities	Likely	Medium	Very Low	Negligible (Not Significant)	The receptor underlies the Corkickle to Mirehouse Railway Site and the entirety of the Site's Study Area, albeit below the Permo-Triassic sandstone aquifer in the south west. The receptor is a Secondary Aquifer (A and B) and therefore is at best of 'Medium' sensitivity. The aquifer water levels beneath the Railway Site could change as a result of the altered recharge regime due to the proposed changes in topography and land use, and groundwater quality would also likely be affected due to spillages and leakages resulting from site activities. However, the construction disturbance would have ceased, the absence of deep structures and the adoption of EA pollution prevention guidance help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000)					
Effect on regional groundwater levels and quality from all operational activities	Unlikely	High	Very Low	Minor (Not Significant)	The receptor underlies the south western part of the Railway Site's Study Area, approximately 200 m from the site boundary. The receptor is a Principal Aquifer and therefore of 'High' sensitivity. The changes in groundwater level and quality immediately beneath the Railway Site itself (within the Carboniferous Coal Measures aquifer) could be transmitted into the adjoining Permo-Triassic sandstone aquifer. However, construction disturbance would have ceased, and the absence of deep structures, the adoption of EA pollution prevention guidance and the intervening 0.6 km distance help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
Pow Beck (Whitehaven) (NGR NX 977 167)					
Effect on stream baseflow quantity and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	The receptor is incorporated within the Solway Outer South coastal water body which is of 'Moderate' WFD Overall Status, and is therefore of 'Low' sensitivity. The beck flows along the western boundary of the site, and is likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Railway Site would be liable to change, but construction disturbance would have ceased, and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. This helps ensure that the residual change would be of 'Very Low' magnitude i.e. no breaches of coastal water WFD

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Pow Beck (South West Lakes) (WFD Surface Water Body GB112074069990)					
Effect on stream baseflow quantity and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	Approximately 1.0 km of the southern part of the site, along with the southern third of the Site's Study Area, is located within the Pow Beck catchment. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Railway Site would be liable to change, but construction disturbance would have ceased, and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. Despite the Railway Site residing within the Pow Beck (South West Lakes) WFD surface water body area, this helps ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Thorney and Rottington Becks (NGR NX 970 138)					
Effect on stream baseflow quantity and quality from all operational activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The receptors do not have WFD Status and are therefore both of 'Very Low' sensitivity. They are likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					distance between the surface water body boundary and the Corkickle Site boundary (minimum of 0.7 km), would help ensure that the residual changes would be of <i>'Very Low'</i> magnitude i.e. no change in flow and quality is anticipated. On this basis the <i>'Negligible'</i> effects would be <i>'Not Significant'</i> .
Private water supply (spring source) at Stanley House, Sandwith (NGR NX 981 140)					
Effect on groundwater levels and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	This spring is located approximately 400 m to the south west of the Corkickle to Mirehouse Railway Site, and is thought to originate from the Permo-Triassic sandstone aquifer. The receptor's private abstraction status ensures that it is of <i>'Low'</i> sensitivity. As mentioned above, groundwater levels and quality beneath the Corkickle to Mirehouse Railway Site would be liable to change. However, construction disturbance would have ceased, and changes would be subject to incorporated environmental measures such as the adoption of EA pollution prevention guidance. <i>'Very Low'</i> residual changes would occur within the receptor's groundwater catchment i.e. no loss of resource is anticipated. On this basis the <i>'Negligible'</i> effects would be <i>'Not Significant'</i> .

Table 13.13 St. Bees Railway Site: Summary of predicted residual effects

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Construction					
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000)					
Effect on regional groundwater levels and quality from all construction activities	Likely	High	Very Low	Minor (Not Significant)	The receptor underlies the St Bees Railway Site and the entirety of the Site's Study Area. The receptor is a Principal Aquifer and therefore of 'High' sensitivity. The groundwater water levels beneath the Railway Site would be likely to change as a result of the altered recharge regime due to the proposed changes in topography and land use, and groundwater quality would also likely be affected due to spillages and leakages resulting from site activities. However, the absence of extensive dewatering and deep structures and the adoption of EA pollution prevention guidance help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.
Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers (WFD Groundwater Body GB41202G103700)					
Effect on regional groundwater levels and quality from all construction activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor lies at depth beneath the St. Bees Railway Site and Study Area. The receptor is a Secondary Aquifer (A and B) and therefore is at best of 'Medium' sensitivity. The changes in groundwater level and quality immediately beneath the Railway Site itself (within the Permo-Triassic sandstone aquifer) could be transmitted into the underlying Lower Palaeozoic and Carboniferous aquifer. However, the absence of extensive dewatering and deep structures, the adoption of EA pollution prevention guidance and the depth

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					of the aquifer help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no reduction in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Pow Beck (South West Lakes) (WFD Surface Water Body GB112074069990)					
Effect on stream baseflow quantity and quality from all construction activities	Likely	Low	Low	Negligible (Not Significant)	The St Bees Railway Site and most of the site's Study Area are located within the Pow Beck catchment. The Pow Beck itself is culverted beneath the railway line in the north of the site and then flows approximately 10 m from the west of the site boundary. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Railway Site would be liable to change. However, the absence of extensive dewatering and deep structures and the adoption of EA pollution prevention guidance help ensure that despite the Railway Site residing within the WFD surface water body area, the residual change would be of 'Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Thorney and Rottington Becks (NGR NX 960 123)					
Effect on stream baseflow quantity and quality from all construction activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The Rottington Beck flows approximately 900 m to the west of the St Bees Railway Site. The receptors do not have WFD Status and are therefore both of 'Very Low' sensitivity. They are likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the distance between the receptors catchments and the proposed development boundary (minimum of 0.5 km), helps ensure that the residual changes would be of 'Very Low' magnitude i.e. no change in flow and quality is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Ellergill Beck (NGR NX 996 076)					
Effect on stream baseflow quantity and quality from all construction activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The Ellergill Beck flows approximately 1.8 km to the south east of the St Bees Railway Site, but its catchment extends north into the Site's Study Area. The receptor does not have WFD status and is therefore of 'Very Low' sensitivity. It is likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the distance between the receptors catchment and the proposed development boundary (minimum of 0.6 km) helps ensure that the residual changes would be of 'Very Low' magnitude i.e. no change in flow and quality is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Deregulated water supplies (well source) at High House (NGR NX 978 124)					
Effect on groundwater levels and quality from all construction activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	This borehole is thought to abstract from the St Bee's Sandstone aquifer. The receptor's deregulated status ensures that it is of 'Very Low' sensitivity. As mentioned above, groundwater levels and quality beneath the St. Bees Railway Site would be liable to change and subject to incorporated environmental measures, and together with the intervening distances (750 m) 'Very Low' residual changes would occur i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Operation					
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000)					
Effect on regional groundwater levels and quality from all operational activities	Likely	High	Very Low	Minor (Not Significant)	The receptor underlies the St Bees Railway Site and the entirety of the Site's Study Area. The receptor is a Principal Aquifer and therefore of 'High' sensitivity. The groundwater levels beneath the Railway Site would be likely to change as a result of the altered recharge regime due to the proposed changes in topography and land use. Groundwater quality would also likely be affected due to spillages and leakages resulting from site activities. However, construction disturbance would have ceased, and the absence of deep structures and the adoption of EA pollution prevention guidance would help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no change in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Minor' effects would be 'Not Significant'.

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers (WFD Groundwater Body GB41202G103700)					
Effect on regional groundwater levels and quality from all operational activities	Unlikely	Medium	Very Low	Negligible (Not Significant)	The receptor lies at depth beneath the St. Bees Railway Site. The receptor is a Secondary Aquifer (A and B) and therefore is at best of 'Medium' sensitivity. The changes in groundwater level and quality immediately beneath the Railway Site itself (within the Permo-Triassic sandstone aquifer) could be transmitted into the underlying Lower Palaeozoic and Carboniferous aquifer. However, construction disturbance would have ceased, the absence of deep structures, the adoption of EA pollution prevention guidance and the depth of the aquifer beneath the Moorside Site help ensure that the residual change would be of 'Very Low' magnitude over the extent of the WFD groundwater body i.e. no reduction in WFD Quantitative/Chemical Status is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Pow Beck (South West Lakes) (WFD Surface Water Body GB112074069990)					
Effect on stream baseflow quantity and quality from all operational activities	Likely	Low	Very Low	Negligible (Not Significant)	The St Bees Railway Site and most of the site's Study Area are located within the Pow Beck catchment. The Pow Beck itself flows beneath the railway in the north of the site, and then approximately 10 m from the west of the site boundary. The receptor is of 'Moderate' WFD Overall Status and is therefore of 'Low' sensitivity. The surface water body is likely to be in hydraulic continuity with the underlying groundwater, and so is influenced by groundwater conditions. As mentioned above, groundwater levels and quality beneath the Railway Site would be liable to change. However, construction disturbance would have ceased, the absence of deep structures, and the adoption of EA pollution prevention guidance help ensure that the residual

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					change would be of 'Very Low' magnitude over the extent of the WFD surface water body i.e. no breaches of surface water WFD Overall Status thresholds or deterioration in surface water resource availability are anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Thorney and Rottington Becks (NGR NX 960 123)					
Effect on stream baseflow quantity and quality from all operational activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The Rottington Beck flows approximately 900 m to the west of the St Bees Railway Site. The receptors do not have WFD Status and are therefore both of 'Very Low' sensitivity. They are likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the distance between the receptors catchments and the proposed development boundary (minimum of 0.5 km), helps ensure that the residual changes would be of 'Very Low' magnitude i.e. no change in flow and quality is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Ellergill Beck (NGR NX 996 076)					
Effect on stream baseflow quantity and quality from all operational activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	The Ellergill Beck flows approximately 1.8 km to the south east of the St Bees Railway Site, but its catchment extends north into the Site's Study Area. The receptor does not have WFD status and is therefore of 'Very Low' sensitivity. It is likely to be in hydraulic continuity with the underlying groundwater, and so influenced by groundwater conditions. However, the distance between the receptors catchment and the proposed development boundary (minimum of 0.6 km) helps ensure that the residual changes would be of 'Very Low' magnitude i.e. no change in flow and quality is

Receptor and summary of predicted effects	Probability	Sensitivity/value of receptor	Magnitude of change	Significance of effect	Rationale
					anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.
Deregulated water supplies (well source) at High House (NGR NX 978 124)					
Effect on groundwater levels and quality from all operational activities	Unlikely	Very Low	Very Low	Negligible (Not Significant)	This borehole is thought to abstract from the St Bee's Sandstone aquifer. The receptor's deregulated status ensures that it is of 'Very Low' sensitivity. As mentioned above, groundwater levels and quality beneath the St. Bees Railway Site would be liable to change and subject to incorporated environmental measures, and together with the intervening distances (750 m) 'Very Low' residual changes would occur i.e. no loss of resource is anticipated. On this basis the 'Negligible' effects would be 'Not Significant'.

13.9 Preliminary assessment of the Moorside Project as a whole

- 13.9.1 An assessment of the Moorside Project as a whole will be included in the ES. For the purposes of this PEIR, due to the limitations set out above, the PEIR has looked at the Moorside Site, the Accommodation Sites, the Corkickle to Mirehouse Railway Site and the St. Bees Railway Site together and assessed whether there would be any additional, "accumulated effects" on specific environmental receptors.
- 13.9.2 In terms of the spatial scope of the assessment of accumulated effects, the principles have been set out in **Section 3.4** and summarised in **Table 3.8**. With respect to the groundwater environment, the Zones of Influence (Zols) around each of the Moorside Site, the Accommodation Sites, the Corkickle to Mirehouse Railway Site and the St. Bees Railway Site vary, according to the nature and scale of the proposed development at each site (**Figure 13.5**). At this stage of the assessment, the Study Areas (**Figure 13.1** and **Section 13.4**) and Zol for the groundwater environment are the same. This is a precautionary approach and may be changed in the ES.
- 13.9.3 The following paragraphs present a preliminary high-level accumulated assessment of the effects on the groundwater environment arising from the aforementioned six Project Sites, taking into account the preliminary residual effects assessments for the individual project elements contained in **Tables 13.7 to 13.13** above.
- 13.9.4 Additional accumulated effects will only be significant during the construction phase. During the operation phase, construction disturbance would have ceased and groundwater level and quality changes would be subject to the continued implementation of incorporated environmental measures such as the adoption of EA pollution prevention guidance. As such, no significant or potentially significant effects are expected on any receptor during the operation phase (alone or in combination).
- 13.9.5 The following receptors may be subject to additional potentially significant accumulated effects during the construction phase:
- West Cumbria Permo-Triassic Sandstone Aquifers WFD Groundwater Body:
 - Potentially significant effects may occur from construction activities at the Moorside Site and the Egremont Site, alone and together with each other and more distant Moorside Project Sites (see below).
 - Potentially significant effects are not expected on regional groundwater levels and quality from construction activities at the Corkickle Site, the Mirehouse Site, and the Corkickle to Mirehouse Railway Site in isolation, but when considered together and with that at the Moorside Site and the Egremont Site, potentially significant effects on the receptor may result from activities at these sites.

- River Ehen (Lower) WFD Surface Water Body:
 - Potentially significant effects may occur from construction activities at the Moorside Site and the Egremont Site alone and together with each other and the more distant Mirehouse Site (see below).
 - Potentially significant effects are not expected on river baseflow quantity and quality from construction activities at the Mirehouse Site, but when considered together with that at the Moorside Site and the Egremont Site, potentially significant effects on the receptor may result from activities at this site.
- South Egremont groundwater public water supply:
 - Potentially significant effects may occur from construction activities at the Moorside Site and the Egremont Site both alone and together with each other.
- Licensed NDA groundwater abstraction at Black Beck to Calder Bridge:
 - Potentially significant effects may occur from construction activities at the Moorside Site both alone and together with the Egremont Site.
 - Potentially significant effects are not expected on groundwater levels and quality from construction activities at the Egremont Site in isolation, but when considered together with the Moorside Site, potentially significant effects on the receptor may result from activities at this site.
- Licensed NDA surface water abstraction from the River Ehen:
 - Potentially significant effects may occur from construction activities at the Moorside Site and the Egremont Site both alone and together with each other.

13.9.6 This analysis of accumulated effects is combined with the predictions outlined in **Table 13.7** with respect to the Non-WFD drift aquifers and springs, ponds, and drainage ditches at the relevant Moorside Project Sites, and the resulting whole project construction phase effects are summarised in **Table 13.14**.

Table 13.14 Summary of predicted residual groundwater environment effects - whole project, construction phase

Receptors	Whole Project accumulated effects/ Significance of effects*						
	Moorside Site	Corkickle Site	Mirehouse Site	Egremont Site	Corkickle to Mirehouse Railway Site	St. Bees Railway Site	Whole Moorside Project
Non-WFD Drift Aquifers immediately beneath the Project Sites: effect on local groundwater levels and quality from all construction activities	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant
Springs, ponds and drainage ditches within the Project Sites: effect on baseflow quantity and quality from all construction activities	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant	Potentially Significant
West Cumbria Permo-Triassic Sandstone Aquifers (WFD Groundwater Body GB41201G102000): effect on regional groundwater levels and quality from all construction activities	Potentially Significant	Not Significant	Not Significant	Potentially Significant	Not Significant	Not Significant	Potentially Significant
River Ehen (Lower) (WFD Surface Water Body GB112074069980):	Potentially Significant	No Effects	Not Significant	Potentially Significant	No Effects	No Effects	Potentially Significant

Receptors	Whole Project accumulated effects/ Significance of effects*						
	Moorside Site	Corkickle Site	Mirehouse Site	Egremont Site	Corkickle to Mirehouse Railway Site	St. Bees Railway Site	Whole Moorside Project
effect on river baseflow quantity and quality from all construction activities							
South Egremont groundwater public water supply abstraction (NGRs NY 004 084, NX 995 089, NY 002 097 and NX 999 096); effect on groundwater levels and quality from all construction activities	Potentially Significant	No Effects	No Effects	Potentially Significant	No Effects	No Effects	Potentially Significant
Licensed NDA groundwater abstraction at Black Beck to Calder Bridge (NGRs NY 027 068, NY 027 069, NY 029 067, NY 031 066 and NY 041 059); effect on groundwater levels and quality from all construction activities	Potentially Significant	No Effects	No Effects	Not Significant	No Effects	No Effects	Potentially Significant
Licensed NDA surface water abstraction from	Potentially Significant	No Effects	No Effects	Potentially Significant	No Effects	No Effects	Potentially Significant

Receptors	Whole Project accumulated effects/ Significance of effects*						
	Moorside Site	Corkickle Site	Mirehouse Site	Egremont Site	Corkickle to Mirehouse Railway Site	St. Bees Railway Site	Whole Moorside Project
the River Ehen (NGR NY 010 061): effect on river baseflow quantity and quality from all construction activities							

* The preliminary effects summarised under each Moorside Project Site by receptor are subject to change for individual receptors and groups of receptors as more project design information becomes available and will be reported in the ES that is to be submitted in 2017.

13.10 Preliminary assessment of cumulative effects with other developments

Scope of the assessment

- 13.10.1 As outlined in **Section 3.4**, an exercise has been undertaken to determine which other (non-Moorside) developments should be considered in the context of their ability to result in cumulative adverse environmental effects with the Moorside Project.
- 13.10.2 Of the other developments described in **Section 3.4**, listed in **Table 3.4** and considered in the context of **Table 3.9** in terms of effects on the groundwater environment, it is considered appropriate at this stage not to consider the following projects on the basis that they are located outwith the Zol of the Moorside Project Sites:
- 4. Low Level Waste Repository, Drigg (LLWR Ltd);
 - 6. Walney Extension Wind Farm (Dong Energy);
 - 7. Barrow-in-Furness Site (BAE Systems);
 - 8. Ulverston Biopharmaceutical Manufacturing Facility (GSK);
 - 9. Heysham New Nuclear Power Station (EDF Energy); and
 - 10. Tidal Lagoon West Cumbria (Tidal Lagoon Power).
- 13.10.3 However, it should be noted that the situation with respect to the above sites will be kept under review during the preparation of the EIA, pending the availability of information from the respective developers regarding their own groundwater environment Zols.
- 13.10.4 Of the remaining other developments considered in **Table 3.9**, these are briefly discussed in the context of their likely interaction with respect to groundwater environment in the sub-sections below.

Sellafield Site Decommissioning (Sellafield Ltd/Nuclear Decommissioning Authority)

- 13.10.5 The Sellafield Site Decommissioning project has the potential to interact with the Moorside Project, particularly with respect to the Moorside Site itself. The Sellafield Plan (see **Section 3.4** for more information) describes a “*Land and Groundwater Remediation Programme*”. Although there are no details of the activities that will be undertaken as part of this programme or the timing of activities, potentially significant cumulative effects could for example occur if abstraction of groundwater (for remediation purposes for example) were to take place in the Sellafield Site at the same time as construction dewatering activities at the Moorside Site.

North West Coast Connections, West Cumbria (National Grid)

- 13.10.6 The North West Coast Connections (NWCC) Project is intimately related to the Moorside Project, since it would provide the connection to the UK national electricity grid for the power generated and therefore the local works would partially take place within the boundary of the Moorside Site.
- 13.10.7 At present the publically-available information regarding the NWCC Project is not definitive as to whether any sections of the transmission circuit are to be underground. The occurrence of potentially significant cumulative effects on the groundwater environment as a result of interactions between the Moorside Project and the NWCC Project therefore cannot yet be discounted. The assumption of potentially significance cumulative effects between the two Projects will be reviewed as environmental information for the NWCC Project becomes available.

Whitehaven Coking Coal Project (West Cumbria Mining)

- 13.10.8 The Whitehaven Coking Coal Project comprises the reuse of the existing Sandwith Anhydrite mine drifts and construction of a new buried conveyor system. The project is located within the Zol for the Corkickle Site, the Mirehouse Site, and the Corkickle to Mirehouse Railway Site, and will connect to the existing railway network within the Corkickle to Mirehouse Railway Site, which is located adjacent to the Mirehouse Site (see Section 3.4 for more details).
- 13.10.9 Potentially significant cumulative effects on the groundwater environment are likely as a result of interactions between the Moorside Project and the Whitehaven Coking Coal Project. The existing Sandwith Anhydrite mine drifts are situated within the West Cumbria Permo-Triassic sandstone aquifers WFD groundwater body. It is not known if dewatering of the mine drifts is required during the operational phase of the Whitehaven Coking Coal Project, but if this is the case there may be significant cumulative effects on groundwater levels and quality in the WFD groundwater body during the construction phase of the Moorside Project. There are a number of groundwater abstractions in the area, particularly the licensed abstraction at Sandwith and the private water supply at Stanley House, which are thought to abstract from the Permo-Triassic Sandstone aquifer. There is the potential for significant cumulative effects on groundwater levels and quality at these abstractions.
- 13.10.10 The new buried conveyor system is thought to be at shallow depth and constructed by cut and cover. The phasing of the Whitehaven Coking Coal Project means that the construction of the conveyor systems should be complete before construction on the Mirehouse Site and Corkickle to Mirehouse Railway Site begins. This will limit the potential for significant cumulative effects on the Non-WFD Drift Aquifers that lie immediately beneath the Mirehouse Site and the Corkickle to Mirehouse Railway Site, and on the Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers WFD groundwater body, which is also situated beneath the Mirehouse Site and the Corkickle to Mirehouse Railway Site, and their Zols. However, potentially significant cumulative effects on groundwater levels and quality

could occur as a results of interactions between the two projects during the operational phases.

- 13.10.11 The Whitehaven Coking Coal Project is also located within the Pow Beck (South West Lakes) WFD surface water body and in the catchment of the Rottington and Thorney Becks (a non-WFD water body). Potentially significant cumulative effects on stream baseflow quantity and quality on these water bodies could occur as a result of interactions between the two projects during the construction and operational phases.

West Cumbria Water Supply Pipeline (United Utilities)

- 13.10.12 The West Cumbria Water Supply Pipeline is thought to intersect the Zol for the Corkickle Site, the Mirehouse Site, and the Corkickle to Mirehouse Railway Site. Little information is currently available on this project, but it is likely to involve underground excavation and construction for pipelines and service reservoirs. As such, potentially significant cumulative effects on the groundwater environment are likely as a result of interactions between the Moorside Project and the West Cumbria Water Supply Pipeline Project.

13.11 Consideration of additional mitigation

- 13.11.1 The Moorside Project has been designed to, where possible, prevent, reduce or offset potential adverse environmental effects and, where appropriate, to deliver environmental enhancements. This would be achieved in the context of groundwater through the implementation of a range of environmental measures (see **Section 13.6** above) all of which are part of the scheme for which consent is being sought.
- 13.11.2 At this stage, all of the mitigation measures which are anticipated will be required are incorporated into the development proposals. However, if it emerges during the preparation of the ES that additional, non-incorporated measures, need to be considered, the relevant details will be presented in the ES.

13.12 References

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