Oath to Burrowbridge Dredging and Associated Activities

Volume 2: Environmental Statement

DOCUMENT CONTROL

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Parrett Internal Drainage Board

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1 INTRODUCTION

1.1.1 This Environmental Statement (ES) has been prepared in support of a proposal by the Parrett Internal Drainage Board (PIDB) to undertake dredging works and associated activities (improvement works) on the River Parrett (the 'Proposed Improvement Works') at specific locations between Stathe Bridge and the downstream confluence with the River Tone at Burrowbridge (the 'Site').

1.2 Overview of the Improvement works

1.2.1 During the winter of 2013/14 the Somerset Levels and Moors experienced a severe and prolonged flood. There have also been recent notable flood events in spring/summer 2012 and winter 2012/13. As part of the response to these floods the Somerset Rivers Authority (SRA) was formed. The SRA's purpose is to deliver higher standards of flood protection than would be funded nationally, and to create better flood protection and resilience against further flooding by joint planning and delivery from SRA members. The SRA produced a Flood Action Plan (FAP) covering the next 20 years, of which 'Workstream 1' includes dredging and river management.

1.2.2 The SRA, and or partner organisations, have delivered a number of schemes within the wider Parrett catchment that have successfully reduced the risk of flooding. These include improvements to pumping and localised flood defence improvements. These works have ensured that if a flood of a similar magnitude to 2013/14 were to occur again then the degree of flooding would be much reduced from that experienced during that event. However, significant flooding would still occur in some locations. In addition, all smaller events would reduce in frequency, duration and extent.

1.2.3 In 2014, the Environment Agency carried out dredging along 8km of the River Parrett and River Tone to increase the conveyance capacity of the river following the 2013/2014 winter flooding to reduce the likelihood and severity of future flooding to surrounding communities. The SRA carries out the ongoing maintenance dredging of the 2014 river profiles and also identifies further dredging locations for improved flow conveyance and flood management under Workstream 1. Hydraulic studies carried out by CH2M, HR Wallingford and AW Water Engineering investigated and proposed additional dredging locations and compared these locations in terms of flood risk conveyance benefits, constraints and costs. The River Parrett between Northmoor Pumping Station and the M5 and the River Parrett from Oath Lock downstream to its confluence with the River Tone were identified and assessed as the next most beneficial dredging locations. The M5 dredging location was assessed and various constraints were identified. The Oath to Burrowbridge location has been assessed and a viable dredging proposal developed.

1.2.4 Focused assessment of the Oath to Burrowbridge site and dredging proposal has demonstrated that the maximum flood risk benefits can be achieved with the minimum environmental impact by reducing the extent of river dredged and focusing operations on the downstream reach. Consequently, the proposed dredge includes the banks immediately downstream of Stathe Bridge (downstream of Beazleys spillway) to the

confluence with the River Tone at Burrowbridge (approximately 2.2km and half the length of the original proposal). The Environmental Impact Assessment (EIA) baseline assessment includes the entire site from Oath Lock to Burrowbridge and a much more extensive area of the adjacent floodplain.

1.2.5 As a member of the SRA, the Parrett Internal Drainage Board (PIDB) is proposing to undertake the dredging operations in the last part of 2019. The project aims to increase the conveyance of the channel within the dredged reach by 3-4 cumecs at low tide. The project will therefore contribute to:

- relieving existing flood extents, durations and frequencies on several upstream moors including those on the River Sowy and Kings Sedgemoor Drain;
- reducing the duration of flooding to the surrounding road network; and
- reducing the flooding impacts on the wider community and local businesses.

1.2.6 In addition to these direct benefits, this scheme, (alongside the other improvement works undertaken within the FAP), will confer further benefits which are less readily quantified. By increasing the capacity of the channel, the overall flexibility in the system will also increase. This can be especially important when flood events are localised more in one catchment than another, or if emergency works need to be undertaken. Also, by increasing the flow passing Burrowbridge, there will be an increase in channel velocities during low tides. This will increase the natural erosion of sediment that occurs in the downstream channel, thereby reducing the need for maintenance dredging.

1.2.7 The location of the proposed dredging and the extent of the working areas are shown in Figures 1.1 and 1.2 (in Chapter 1).

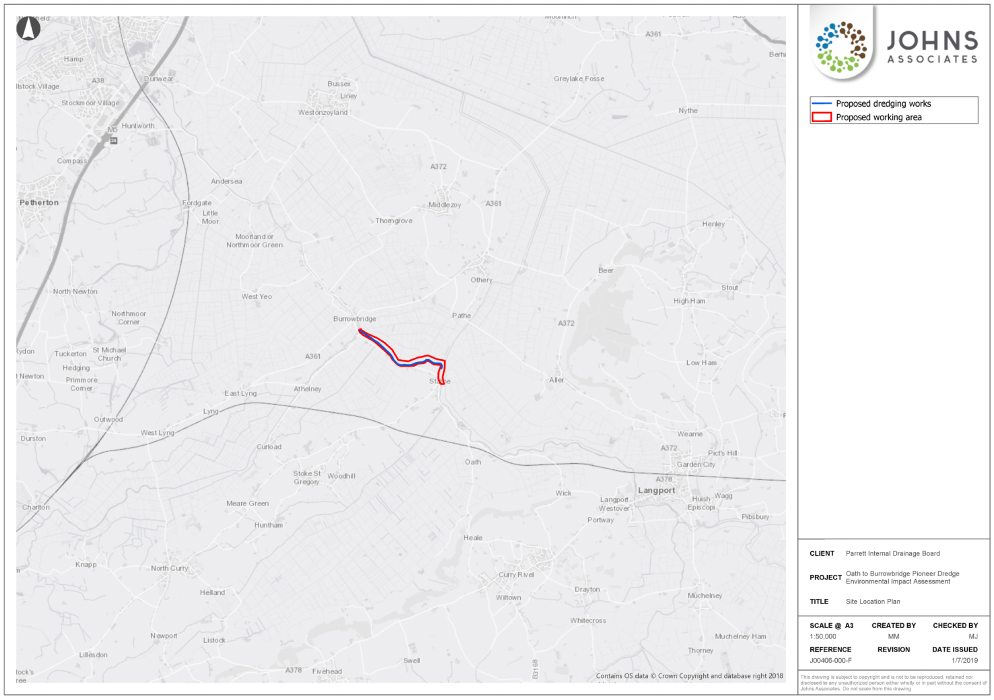

Figure 1.1. Plan showing location of Proposed Improvement Works

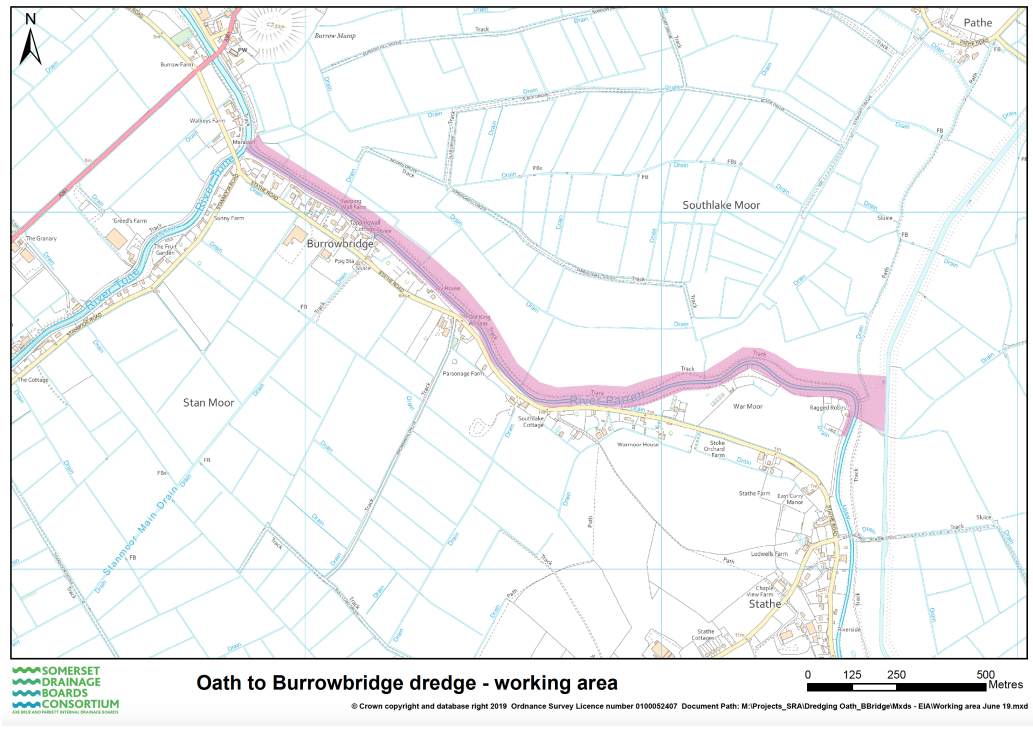

Figure 1.2. Plan showing extent of Proposed Working Area

1.3 Consenting Regime

1.3.1 **Planning Acts:** The proposal to dredge the watercourse is considered to be improvement works that are a development activity. All proposed works (dredging and deposition of dredged arisings) will take place on the banks of the River Parrett, defined as a main river and under the statutory authority of the Environment Agency. The works will be carried out by the PIDB using powers delegated by the Environment Agency through a Public Sector Cooperation Agreement (PSCA). As such, the works fall within the Environment Agency's permitted development rights under Class D of Part 13 (water and sewerage) of Schedule 2 to the Town and Country Planning (General Permitted Development) (England) Order 2015 (as amended):

> *Class D – development by the Environment Agency (**58**)*
>
> "Development in, on or under any watercourse or land drainage works and required in connection with the improvement, maintenance or repair of that watercourse or those works."

1.3.2 **Environmental Impact Assessment:** 'Improvement works', as defined under Regulation 2(1) of the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations (SI 1999 No. 1783) (as amended in 2005[1], 2006[2], and 2017[3]) (the 'Land Drainage EIA Regulations'), are defined as works which are:

- the subject of a project **to deepen, widen, straighten, or otherwise improve or alter, any existing watercourse** or remove or alter mill dams, weirs, or other obstructions to watercourses, or raise, widen, or otherwise improve or alter, any existing drainage work; and
- permitted development by virtue of Class C or Class D of Part 13 (water and sewerage) of Schedule 2 to the Town and Country Planning (General Permitted Development) (England) Order 2015.

1.3.3 The proposal to dredge the watercourse and return it to its baseline condition is considered to be improvement works as per the bold highlighted definition above; and are further considered to be permitted development. Therefore, the Land Drainage EIA Regulations apply.

1.3.4 It is the 'Drainage Body' who is responsible for implementing the Land Drainage EIA Regulations. The 'Drainage Body' as defined by the Land Drainage EIA Regulations comprises a public authority initiating improvement works, which can include an internal drainage board. As it is PIDB initiating the works, it is therefore PIDB who are responsible for implementing the Land Drainage EIA Regulations and assessing whether any likely significant environmental effects are likely to arise due to the works. In the event that

1 The Environmental Impact Assessment (Land Drainage Improvement Works) (Amendment) Regulations 2005 (SI 2005 No 1399).

2 The Environmental Impact Assessment (Land Drainage Improvement Works) (Amendment) Regulations 2006 (SI 2006 No 618)

3 The Environmental Impact Assessment (Land Drainage Improvement Works) (Amendment) Regulations 2017 (SI 2017 No 585).

formal EIA is required (screening), it is PIDB[4] who will decide whether the improvement works should proceed, taking into account the necessary mitigation measures (or conditions) that the works should be subject to.

1.3.5 However, it should be noted that the PIDB has indicated that it does not intend to make a formal request under Regulation 8 to the Appropriate Authority (the Secretary of State) for its formal opinion as to the information that should be included within an ES.

1.3.6 Environmental Permits: Placement of dredging arisings on the rear of the flood bank will be undertaken in accordance with the Environmental Permitting Regulations 2010 (as amended). The deposition of dredging waste will be covered by a D1 exemption to deposit dredged waste from inland waters and is therefore exempt from the requirement for an Environmental Permit. Sediment sampling has been carried out and confirms the waste code of the dredged arisings and the suitability for use under a D1 exemption.

1.3.7 The D1 exemption requires that 'the waste must be deposited as close as possible to where it was dredged from' and allows 'over any 12-month period', you can deposit or treat up to 50 cubic metres of dredgings for each metre length of land on which waste is deposited.

1.3.8 A U1 waste exemption has also been registered allowing 5,000 tonnes of dredged material (waste code 170506 -Dredging spoil not containing hazardous substances) to be stored for up to 12 months before use in construction (i.e. river bank structural support to build up the temporary spillways).

1.3.9 SSSI Assent: The improvement works are partly located within the boundary of Southlake Moor Site of Special Scientific Interest (SSSI). In addition, the works have the potential to damage the condition or special features of other SSSIs, including Curry and Hay Moors SSSI and West Sedgemoor SSSI.

1.3.10 As such, these works would require advice and approval (known as assent) from Natural England before being carried out. However, where works are carried out under statutory permission (Environment Agency powers) they do not require a formal application for SSSI assent but instead require consultation with Natural England prior to works commencing. Consultation has been initiated with Natural England for this purpose.

1.3.11 Habitats Regulations: The SSSIs referred to above are also internationally designated as part of a network of 'Natura 2000' sites: the Somerset Levels and Moors Special Protection Area (SPA) and Ramsar Site. Additional constituent SSSIs are Catcott Edington and Chilton Moors, Curry and Hay Moors, King's Sedgemoor, Moorlinch, Shapwick Heath, Southlake

4 Under Regulation 12A of the Environmental Impact Assessment (Land Drainage Improvement Works) (Amendment) Regulations 2017 (SI 2017 No 585), PIDB may only progress the determination of whether the improvement works should proceed if there is no extant objection in relation to the likely significant environmental effects of the works.

Moor, Tealham and Tadham Moors, West Moor, West Sedge Moor, Westhay Heath, Westhay Moor, and Wet Moor.

1.3.12 As the improvement works, in the absence of mitigation, could result in impacts to the SPA and Ramsar site, a Habitats Regulations Assessment (HRA) will be required under the Conservation of Habitats and Species Regulations (2017). It will be necessary to demonstrate that the improvement works will not adversely affect the integrity of the SPA and Ramsar site, known as Appropriate Assessment.

1.3.13 PIDB are a 'Competent Authority' under the Habitats Regulations and will therefore undertake a Habitats Regulations Assessment, consulting with Natural England as required by Regulation 63. Coordination with Natural England in accordance with Regulation 67 will also be required, as Natural England are also a Competent Authority with regards to these improvement works.

1.3.14 This document has been prepared to jointly inform the proposed scope of the HRA in accordance with 3c of the EIA Regulations.

1.3.15 **Water Framework Directive:** Public bodies, including PIDB, must, in exercising their functions insofar as affecting a river basin district, have regard to the river basin management plan prepared under The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (as amended).

1.3.16 As such, PIDB will be required to undertake a Water Framework Directive (WFD) Compliance Assessment to demonstrate that the improvement works support the objectives of the South West River Basin Management Plan (RBMP).

1.4 Environmental Impact Assessment

1.4.1 Environmental Impact Assessment (EIA) is a process required by European and UK law, which brings together information about any likely significant environmental effects of the Proposed Improvement Works. It provides decision-makers, stakeholders and the public with the environmental information needed for decision making.

1.4.2 The legal basis for EIA is European Community (EC) Directive 85/337/EEC5 (as amended by Directives 97/11/EC6, 2003/35/EC7, 2011/92/EU8, and 2014/52/EU9) which is transposed into UK legislation.

1.4.3 The Proposed Improvement Works could result in likely significant environmental effects in the absence of suitable scheme design to avoid such effects or through appropriate mitigation. Consequently, the proposed works are considered to fall under the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations (SI 1999 No. 1783) (the 'Land Drainage EIA Regulations'), which have been subject to significant revisions in 2005, 2006 and in 2017. The 1999 Regulations, and subsequent amendments, are referred to as the 'Land Drainage EIA Regulations' within this report.

1.4.4 Environmental Impact Assessment (EIA) is a process that ensures that the environmental effects of the proposed improvements are fully considered and taken into account before

it proceeds. The EIA process is impartial and systematic and draws on a detailed understanding of current environmental conditions (the baseline), information gathered during consultation, and from a detailed understanding of potential effects from the development. This understanding allows effects to be 'designed' out (e.g. avoiding dredging adjacent to residential properties) and where this is not possible, allows suitable mitigation (e.g. providing alternative habitats for animals or improving water level management) to be identified and included in the development proposal. Once these have been agreed and the final design has been 'frozen,' an assessment of likely effects is carried out. This focuses on those effects that are considered to be significant. The findings of an EIA are then reported in an Environmental Statement (ES), which is specifically to meet certain legal standards, that guide the main headings, topics that need to be taken into account, key organisations that need to be consulted, the different stages of the project, relevant timescales and types of effects and mitigation that will be taken into account.

1.4.5 For the applicant (the PIDB), the EIA process follows three key stages: screening; scoping; and the preparation of the ES. These stages are described in turn, setting out the context of the EIA of the Proposed Improvement Works.

Screening

1.4.6 Under the Land Drainage EIA Regulations, the Drainage Body (in this case, PIDB) is required, taking into consideration the selection criteria in Schedule 2, to determine whether the proposed works are likely to have significant effects on the environment (Reg. 4); and therefore, whether formal Environmental Impact Assessment is required for this project.

1.4.7 The Proposed Improvement Works have been considered against the criteria set out in Schedule 2 and 2A of the EIA Regulations. The applicable thresholds associated with the Proposed Development, as set out in these Schedules, are reproduced in Table 1.1.

Table 1.1: Schedule 2 and 2A thresholds and criteria

Location of improvement works

2. The environmental sensitivity of geographical areas likely to be affected by improvement works must be considered, with particular regard to—

(a)the existing and approved land use;

(b)the relative abundance, availability, quality and regenerative capacity of natural resources (including soil, land, water and biodiversity) in the area and its underground;

(c)the absorption capacity of the natural environment, paying particular attention to the following areas—

(i)wetlands, riparian areas, river mouths;

(ii)coastal zones and the marine environment;

(iii)mountain and forest areas;

(iv)nature reserves and parks;

(v)areas classified or protected under national legislation and Natura 2000 areas designated by member States pursuant to the Habitats Directive and the Wild Birds Directive;

(vi)areas in which there has already been a failure to meet the environmental quality standards, laid down in EU legislation and relevant to the improvement works, or in which it is considered that there is such a failure;

(vii)densely populated areas;

(viii)landscapes and sites of historical, cultural or archaeological significance.

Type and characteristics of the potential impact

3. The likely significant effects of improvement works on the environment must be considered in relation to criteria set out in paragraphs 1 and 2 of this Schedule, with regard to the impact of the improvement works on the factors specified in regulation 12(2), taking into account—

(a)the magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected);

(b)the nature of the impact;

(c)the transboundary nature of the impact;

(d)the intensity and complexity of the impact;

(e)the probability of the impact;

(f)the expected onset, duration, frequency and reversibility of the impact;

(g)the cumulation of the impact with the impact of other existing or approved projects;

(h)the possibility of effectively reducing the impact.

1.4.8 The PIDB have made a determination as required by Regulation 4, taking into account the criteria set out in Schedules 2 and 2A of the Regulations, that the Proposed Improvement Works are likely to have significant effects on the environment due to their location (Schedule 2, 2. (c) (i) and (v)) and potential impact (Schedule 2, 3. (a), (f), (g), and (h)) in the absence of changes to the design and/or mitigation. In consequence, PIDB has determined to undertake an EIA in support of the dredging and associated works.

1.4.9 By following the full EIA process, PIDB will ensure that any potentially significant effects on the environment resulting from the dredging and associated works are considered, and, where appropriate, mitigated.

Scoping

1.4.10 In accordance with Regulation 8 and good practice, a Scoping Report (Appendix 1A) was prepared to identify the potential likely significant environmental effects of the Proposed Improvement Works. Of these effects, those that were identified as likely to be significant were proposed for further assessment in the ES. This reflects the requirement of the EIA Regulations for the ES to only evaluate in depth those effects that are likely to be significant in the absence of mitigation.

1.4.11 A Scoping Report was approved by the Board of the PIDB in April 2019. Further consideration of potential significant environmental effects has been completed throughout May 2019 and June with consultation and engagement on the Scoping Report with both other relevant consultation bodies and the general public, together with informal public consultation on the Proposed Improvement Works (see Volume 3: Appendix 1B). Collectively, responses on these processes form the Extended Scope of Assessment prepared by Johns Associates (Volume 3: Appendix 1C) and representing a 'scoping opinion' from the PIDB (Volume 3: Appendix 1C) and meeting the requirements of the Regulation 8 of the EIA Regulations and best practice; this formed the second stage of the EIA process.

1.4.12 Further information relating to the scoping stage is presented in Chapter 4: Approach to Preparing the Environmental Statement.

Preparation of the Environmental Statement

1.4.13 The final stage of the EIA process is focused on producing the ES. The ES provides information relating to the likely significant environmental effects of the Proposed Improvement Works; it is prepared for the PIDB and others, to support the process of determining whether the improvement works should proceed.

1.5 Purpose of the Environmental Statement

1.5.1 This ES has been prepared to meet the requirements of the EIA Regulations (relating to the preparation of an ES). Taking into account the scoping opinion (Appendix 1C) and associated consultation and assessment work, this ES sets out an assessment of the likely significant environmental effects of the Proposed Improvement Works, leading to a conclusion as to which effects are assessed as being significant. Methods to define significance, as well as further information about the approach to preparing the ES, including the scoping stage, are set out in Chapter 4: Approach to Preparing the Environmental Statement.

1.5.2 As set out in Schedule 7 of the EIA Regulations, the following information should be included in an ES:

"Preparation of an environmental statement

7.(1) A drainage body must ensure that in any case to which regulation 6 applies a written statement (an "environmental statement") in respect of the improvement works is prepared by a competent person which—

(a) includes the information specified in paragraph (2);

(b) is based on the opinion given under regulation 8;

(c) takes into account the results of any relevant EU environmental assessment which are reasonably available to the drainage body; and

(d) states the relevant expertise and qualifications of the competent person.

(2) The specified information is:

(a) a description of the improvement works comprising information on the site, design, size and other relevant features of the improvement works;

(b) a description of the likely significant effects of the improvement works on the environment;

(c) a description of any features of the improvement works or measures to avoid, prevent, reduce or offset any likely significant adverse effects of the improvement works on the environment;

(d) a description of the reasonable alternatives studied by the drainage body, which are relevant to the improvement works and their specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the improvement works on the environment;

(e) a non-technical summary of the information referred to in sub-paragraphs (a) to (d); and

(f) any additional information specified in Schedule 1 relevant to the specific characteristics of particular improvement works or type of improvement works and to the environmental features likely to be affected.".

1.5.3 Schedule 1 of the EIA Regulations require the following

1. A description of the improvement works, including in particular:

(a) a description of the location of the improvement works;

(b) a description of the physical characteristics of the whole of the improvement works, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;

(c) a description of the main characteristics of the operational phase of the improvement works (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used;

(d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction and operation phases.

2. A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the drainage body, which are relevant to the Proposed Improvement Works and their specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

3. A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the improvement works as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.

4. A description of the factors specified in regulation 12(2) likely to be significantly affected by the improvement works: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.

5. A description of the likely significant effects of the improvement works on the environment resulting from, among other things—

(a) the construction and existence of the improvement works, including, where relevant, demolition works;

(b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;

(c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;

(d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);

(e) the cumulation of effects with other existing or approved improvement works or projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;

(f) the impact of the improvement works on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the improvement works to climate change;

(g) the technologies and the substances used.

6. The description referred to in paragraph 4 of the likely significant effects on the factors specified in regulation 12(2) must cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the improvement works. That description must take into account the environmental protection objectives established at EU or member State level which are relevant to the improvement works.

7. A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered in compiling the required information and the main uncertainties involved.

8. A description of the measures envisaged to avoid, prevent, reduce or offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example, the preparation of a post-works analysis). That description must explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and must cover both the construction and operational phases.

9. A description of the expected significant adverse effects of the improvement works on the environment deriving from the vulnerability of the improvement works to risks of major accidents or disasters which are relevant to the improvement works. Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC(23) or Council Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations(24) or UK environmental assessments may be used for this purpose provided that the requirements of the EIA Directive are met. Where appropriate, the description must include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.

10. A non-technical summary of the information provided under paragraphs 1 to 9.

11. A reference list detailing the sources used for the descriptions and assessments included in the statement."

1.5.4 The Regulations require that the environmental topics listed in column 1 of Table 1.2 need to be considered when preparing an ES. Column 2 identifies where these topics are included in this ES, with reference to the relevant chapter titles (and numbers).

Table 1.2: Environmental topics addressed in the ES and chapter references

Topics that need to be assessed under the EIA Regulations	ES Chapter
Population	Population (Chapter 8) – see also Water (Chapter 7)
Human Health	Scoped out of the assessment
Biodiversity	Biodiversity (Chapter 6)
Land	Scoped out of the assessment
Soil	Scoped out of the assessment
Water	Water Environment (Chapter 7)
Air	Scoped out of the assessment
Climate	Considered within the scheme design and relevant technical chapters
Material assets and waste	Description of the Proposed Development (Chapter 2) and Construction Environmental Management Plan (Volume 3: Appendix 2C)
Cultural Heritage	Scoped out of the assessment
Landscape	Scoped out of the assessment
The inter-relationship between the above factors	These are discussed with each chapter as relevant
Vulnerability to major accidents or disasters	Scoped out of the assessment

1.6 The applicant and the project team

1.6.1 The ES has been prepared on behalf of the Drainage Body, Parrett Internal Drainage Board, by Johns Associates Ltd (hereafter referred to as 'Johns Associates'), with support from a wider team of specialists. The details of the EIA project team are provided in Table 1.3.

Table 1.3: EIA Project Team

Role	Project Team
Drainage Body	Parrett Internal Drainage Board
EIA Consultant Team	Johns Associates (lead and all disciplines not listed below) AW Water Engineering Ltd (Water Environment)

Role	Project Team
	Other specialist sub-consultants that have contributed to the environmental baseline (see Volume 3: Appendices).

1.6.2 Johns Associates is an experienced environmental consultancy and a Corporate Member of the Institute of Environmental Management and Assessment (IEMA) and Member of the River Restoration Centre. It employs and sub-contracts a strong body of suitably experienced and qualified technical consultants and specialists (that in turn are individual members of relevant professional bodies, including the Chartered Institute of Water and Environmental Management, Institute of Civil Engineers, Chartered Institute of Ecology and Environmental Management, Landscape Institute and Society for the Environment) to prepare Environmental Statements.

1.6.3 A statement outlining the relevant experience and qualifications of the competent experts who have prepared this ES is provided in Volume 3: Appendix 1D. A statement from the Drainage Body that confirms that it considers the experts to be competent is included in Volume 3: Appendix 1D.

1.7 Structure of this Environmental Statement

1.7.1 The ES comprises four volumes:

- Volume 1 is a Non-Technical Summary (NTS), which is also available as a standalone document;
- Volume 2 (i.e. this volume) is sub-divided into the following chapters;
    - Chapter 2 provides a detailed description of the Proposed Improvement Works;
    - Chapter 3 explains the need for the Proposed Improvement Works, it outlines the main alternatives considered for meeting this need and indicates the main reasons for the selection of the improvement works as proposed;
    - Chapter 4 details the approach that has been adopted in preparing the ES;
    - Chapter 5 provides an overview of the legislation and policies that are relevant to the Proposed Improvement Works and ES;
    - Chapters 6, 7 and 8 set out the technical assessments for the environmental topics that need to be considered in the ES including relevant mitigation and conclusions on significance;
    - Chapter 9 deals with the cumulative effects associated with the Proposed Improvement Works, considering the improvement works on their own and in-combination with other related works;
- Volume 3 contains the appendices referred to in the ES; and
- Volume 4 contains the figures referred to in Volume 2.

1.7.2 A glossary of technical terms is provided as Appendix 1E and a list of abbreviations is provided in Appendix 1F of the ES in Volume 3.

1.8 Other documents

1.8.1 The request for the PIDB to approve the Proposed Improvement Works is supported by this ES alongside a number of other documents, at least some of which have contents relevant to the findings presented in this document. The additional supporting documents are appended to this ES and include:

- Improvement Works Drawings (See Volume 3: Appendix 2A of this ES);
- Appropriate Assessment and its appendix (See Volume 3: Appendix 6I of this ES);
- Water Framework Directive Regulatory Compliance Assessment (See Volume 3: Appendix 7C of this ES);
- Johns Associates. 2019. Oath to Burrowbridge Dredging: Analysis of Responses to Initial Consultation and Reg. 6 Notification (See Volume 3: Appendix 1C of this ES);
- Johns Associates. 2019. Oath to Burrowbridge Improvement Works: Construction Environmental Management Plan (See Volume 3: Appendix 2C of this ES);
- Johns Associates. 2019. Oath to Burrowbridge Dredging: Landscape and Ecology Management Plan (See Volume 3: Appendix 2D of this ES); and
- AW Water Engineering Ltd (2019) – Oath to Burrowbridge Hydraulic Assessment doc (See Volume 3: Appendix 7B).

1.9 Access to this Environmental Statement

1.9.1 The ES is available via the Somerset Drainage Boards Consortium website. Hard copies can be requested, for a fee, via admin@somersetdbc.co.uk. CD's will also be made available free of charge.

1.9.2 A hard copy of all application documents will be available to view, upon request, at the Somerset Drainage Boards Consortium offices in Highbridge, and at Langport Town Library.

2 DESCRIPTION OF THE PROPOSED IMPROVEMENT WORKS

2.1 Introduction

2.1.1 In 2014, the Environment Agency carried out dredging along 8km of the River Parrett and River Tone to increase the conveyance capacity of the river following the 2013/2014 winter flooding to reduce the likelihood and severity of future flooding to surrounding communities. The SRA carries out the ongoing maintenance dredging of the 2014 river profiles and also identifies further dredging locations for improved flow conveyance and flood management under Workstream 1. Hydraulic studies carried out by CH2M, HR Wallingford and AW Water Engineering investigated and proposed additional dredging locations and compared these locations in terms of flood risk conveyance benefits, constraints and costs. The River Parrett between Northmoor Pumping Station and the M5 and the River Parrett from Oath Lock downstream to its confluence with the River Tone were identified and assessed as the next most beneficial dredging locations. The M5 dredging location was assessed and various constraints were identified. The Oath to Burrowbridge location has been assessed and a viable dredging proposal developed.

2.1.2 Focused assessment of the Oath to Burrowbridge site and dredging proposal has demonstrated that the maximum flood risk benefits can be achieved with the minimum environmental impact by reducing the extent of river dredged and focusing operations on the downstream reach. Consequently, the proposed dredge includes the banks immediately downstream of Stathe Bridge (downstream of Beazleys spillway) to the confluence with the River Tone at Burrowbridge (approximately 2.2km and half the length of the original proposal). The benefits associated with these improvement works will be sustained through a limited extent of ongoing maintenance to retain the restored bank profile supported by monitoring and associated ecological management.

2.1.3 This part of the ES describes the location of the proposed dredging and associated works, recent dredging history and ongoing associated works before describing the Proposed Improvement Works itself. The description of the Proposed Improvement Works considers the requirements of Schedule 1 of the EIA Regulations in which paragraph 1 states that a description of the improvement works should include:

i. "a description of the location of the improvement works;

ii. a description of the physical characteristics of the whole improvement works, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;

iii. a description of the main characteristics of the improvement works (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; and

iv. an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases."

2.1.4 These requirements are addressed in the sub-sections below.

2.2 Overview of recent improvement work history

2.2.1 A number of works aimed at alleviating flooding have recently been completed in the immediate area (since 2014) delivering considerable benefits to residents, landowners and tenants and to infrastructure through the overall reduction in flood risk achieved. The past projects completed along the Parrett and Tone since the flooding of 2013/2014 include those listed below. The extent of dredging works on the Parrett and Tone since 2014 is shown in Figure 2.1.

- Completion of the dredging of an 8km reach between Hook Bridge on the River Tone and Northmoor Pumping Station on the River Parrett by the Environment Agency.
- Dredging of a 750m reach of the River Parrett downstream of Northmoor Pumping Station by the Environment Agency.
- SRA maintenance dredging of the EA profiles in 2015 using excavators and in 2016, 2017, and 2018 using hydro-dynamic dredging techniques (water injection dredging or WID).
- The Asset Recovery Programme (ARP) improvement works to the flood banks.
- Improvement works to several pumping stations, including the works associated with bringing in temporary pumps.
- The revised operating rules for the pumping stations following the 'Trigger point' project.
- Works at Beer Wall (A372) to increase the capacity of the culverts under the road.
- Changes to the operation of the River Sowy and Kings Sedgemoor Drain during flood events.

2.2.2 The EA are currently delivering improvements to the River Sowy and Kings Sedgemoor Drain on behalf of the SRA. This project is being delivered in phases with the aim of increasing the amount of flow that can be conveyed through this system from the River Parrett prior to the formal spillways (Allermoor and Beazleys) being overtopped. Upstream of Langport this project will deliver similar impacts to the dredging being considered by this report.

2.2.3 Awareness of the SRA Flood Action Plan and ongoing programme for flood alleviation since 2014 is an important part of the cumulative impact assessment within the EIA process and covers both past and present cumulative impacts.

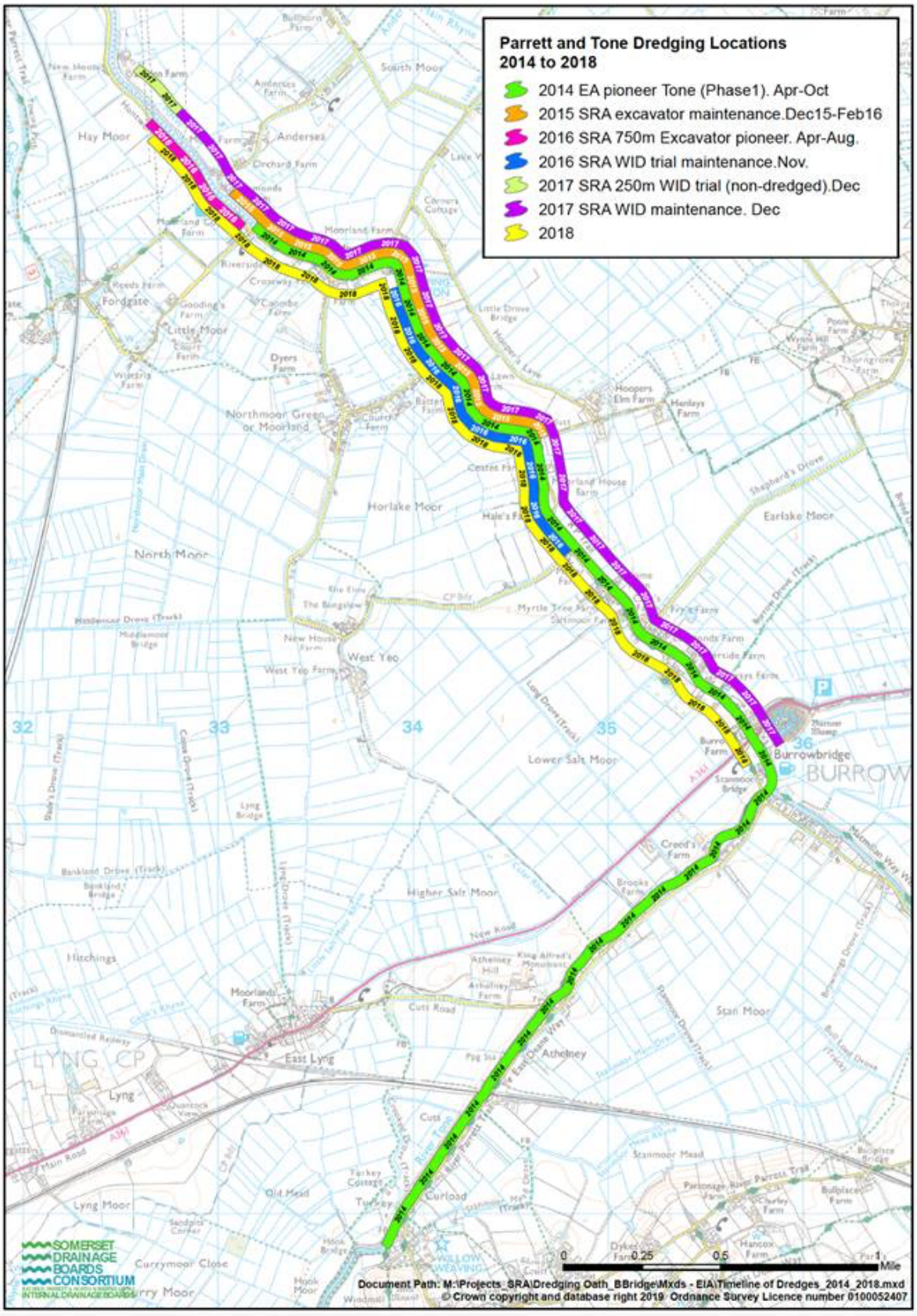

Figure 2.1. Extent of dredging works on the Rivers Parrett and Tone 2014 – present day

2.3 The Study Area

2.3.1 In general terms, the study area for the EIA will include the maximum potential extent of dredged river, locations where dredged material will be placed, access routes, compounds and the areas which could have resultant changes in water levels. The general study area is shown in Figure 2.2 (Chapter 2) and includes:

- The River Parrett between Oath Lock and its confluence with the River Tone, immediately to the south of Burrowbridge;
- 1km radius around this stretch of the river;
- For receptors where there are additional potential environmental pathways comprising changes to water levels within different moors (e.g. a potential change in splash conditions required by wintering water birds or flood depth and/or duration), the Study Area has been expanded (please refer to individual topic Chapters 6, 7 and 8 for further details and Volume 4: Figure 2.1).

2.3.2 The Study Area is predominantly rural in nature with a mixture of mainly livestock grazing with some arable land, populated with small villages, hamlets and farms. The River Sowy flood relief channel runs parallel to the River Parrett in the vicinity of the southern extent of the proposed dredging works. The A361 crosses the Parrett to the north of the proposed dredging works at Burrowbridge. A main railway line runs adjacent to the River Parrett immediately to the south of the proposed dredging works. The River Parrett Trail and Macmillan Way long-distance footpaths run along the right-hand bank of the River Parrett throughout the extent of the proposed dredging works.

2.3.3 The Study Area encompasses land of international importance for wildlife, designated as part of the Somerset Levels and Moors Special Protection Area and Ramsar Site (including component Sites of Special Scientific Interest Southlake Moor and West Sedge Moor, which lie immediately adjacent to the proposed dredging works). In addition, the non-statutorily-designated local wildlife site Aller Moor Local Wildlife Site (rhyne and wet meadow habitat with an important wintering bird population) lies adjacent to the right-hand bank in the southern stretch of river to be dredged.

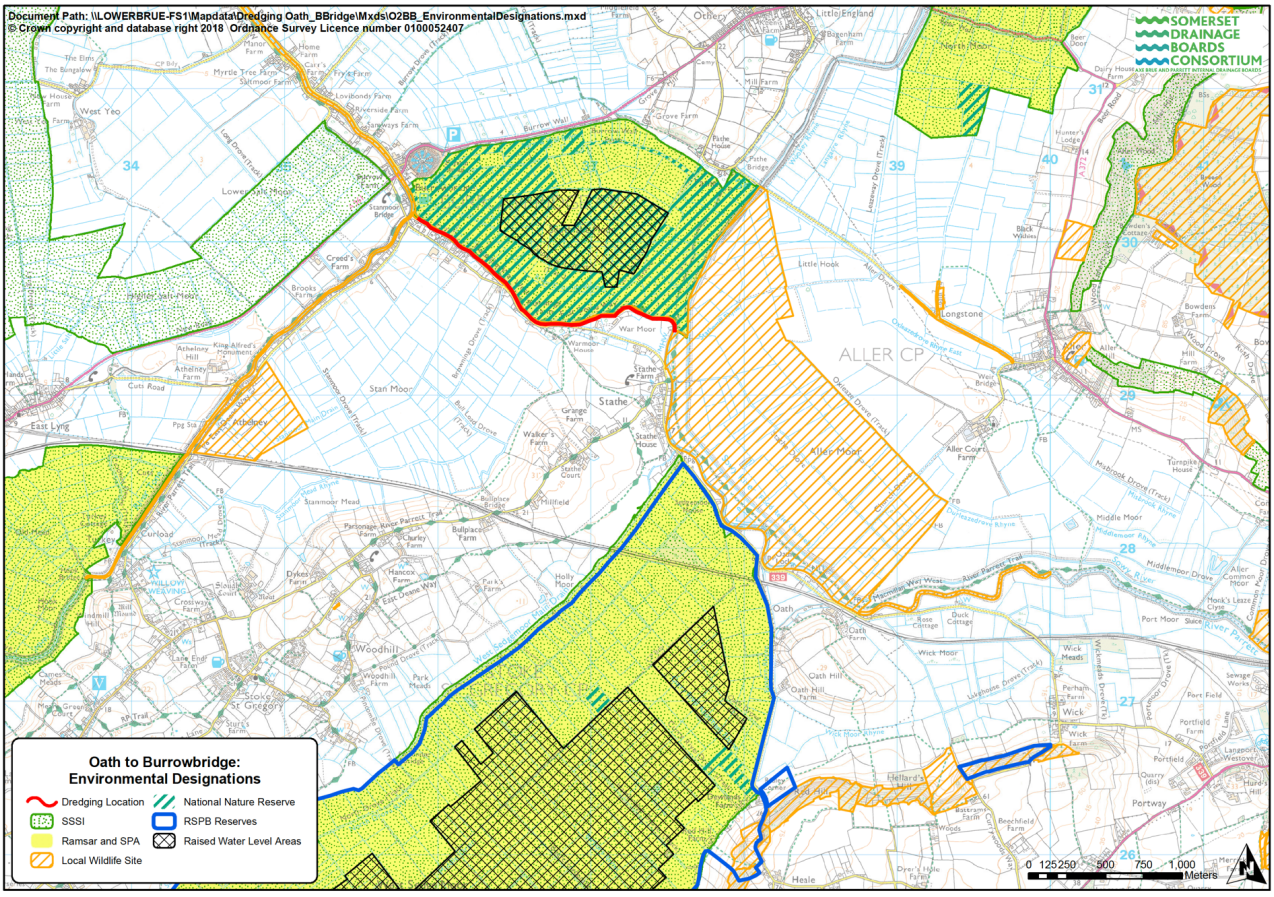

Figure 2.2 Plan showing extent of dredging, surrounding area, and key environmental designations

2.4 The Proposed Improvement Works

2.4.1 The site under consideration comprises approximately 2.2km of the banks of the River Parrett between Beazley's spillway and its confluence with the River Tone (see Figure 1.1 and 1.2 in Chapter 1). This represents a shortened section of the overall Site from Oath Lock to Burrowbridge and is based on the outcome of environmental surveys, environmental, engineering and safety assessments, and the detailed hydraulic modelling indicating the areas with the maximum potential for improvement to flood conveyance. No dredging is proposed between Oath Lock and Beazleys spillway within this programme of works. Over part of the length of these works, the right bank acts as both a flood bank to contain flows within the river, and a reservoir bank to contain floodwater within Southlake Moor. The possible works to this length of bank are limited due to these functions.

2.4.2 The works will comprise excavation to increase the flow capacity in the Parrett by approximately 3-4 cumecs at low tide within the dredged reach by excavating accumulated silt back to the design gradient of the bank, to form a two-stage channel. 22,000m^3 of silt will be removed in total from the banks within the 2.2km section of river to be dredged. All arisings from the excavation are proposed to be deposited on the landward side of the right flood bank crest (facing downstream) under conditions of D1 and U1 waste exemptions. The level of the bank crest is not

to be raised above existing levels. A sample cross-section showing the proposed excavation and placement of arisings is shown as Figure 2.3 (Chapter 2).

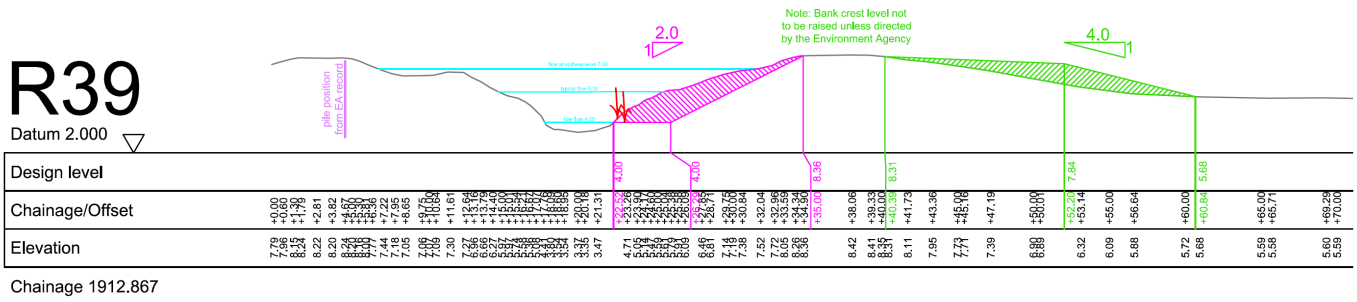

Figure 2.3. Sample cross section illustrating the works

2.4.3 Excavation will remove recent accumulations of silt on the upper banks only. No dredging of the lower flow channel is proposed. A 'reed fringe', 1-2m in width and comprising marginal vegetation (typically dominated by reed canary grass *Phalaris arundinacea*) will be retained along 1600m of the left-hand bank and up to 300m of the right-hand bank, where present, to ensure critical habitat for aquatic fauna is retained at all times. A strip and recover/replanting of reed turf and rhizomes for a further 900m on the right bank to enhance the reedy fringe will also be undertaken wherever feasible. Re-establishment of vegetation beyond this will be achieved using a suitable seedmix and natural recolonization from the local seedbank.

2.4.4 Bank re-profiling will be managed sensitively in order to reduce environmental impacts, mitigate impacts on the working bank and aid ecological recovery.

2.4.5 Long-reach excavators using biodegradable oils working from, or near, the bank crest will be used for the cut and fill earthworks. Topsoil will be stripped from the landward bank where excavated material is to be deposited to form a raised bund along the proposed toe line for fill material. Machines will then excavate to the design profile, swinging round to place arisings in the 'fill' location to the rear of the flood bank.

2.4.6 Material will be removed whenever possible in dry conditions, but should dredging occur when water levels are elevated, specific measures will be put in place to provide suitable safeguards for fish (and other aquatic fauna) that may be present at the time of dredging.

2.4.7 The fill material will be allowed to dry out as necessary before it is graded and consolidated to the design profile. The stripped topsoil will then be dressed back over the fill material. Light harrowing will then be undertaken before seeding of the fill area.

2.4.8 It should be noted that the two-stage channel excavation will create marginal berms and areas of shallow water, which have the potential to substantially increase habitat diversity, particularly for fish populations when water levels rise above the retained

lower bank edge. In addition, morphological diversity will be retained on the river bank wherever possible. The bank surface will not be finished to a smooth compacted surface with the back of an excavator bucket but left with an open textured surface to assist vegetation in becoming established on the bank which will then assist with bank stability.

2.4.9 Vegetation recovery behind the retained and enhanced reed fringe will be protected by a temporary stockproof fence provided at the outer toe of the regraded bank to support appropriate and timely access of grazing livestock to the banks. Additional habitat features will be provided by restoration/replacement at a rate of 2:1 compensation of poor quality rhynes implemented near to the dredging works to mitigate for short sections of rhyne headwaters that are filled with dredged material and provision will be made through the works contract to facilitate re-establishment of ancient orchard with enclosing hedgerow in the works locality.

2.4.10 Dredging plant will access the right banks within the Working Area via the flood embankment of the River Sowy, but small plant and 4x4 vehicles could also gain access from the King Alfred Pub in Burrowbridge. It is proposed that the long reach excavators will predominately work from the crest of the right bank to remove sediment from both the right and left of the channel (reaching across the channel) and deposit silt on the rear downslope of the right bank, although use of an excavator on the left bank to pass material across the river is not precluded.

2.4.11 A site compound will be provided adjacent to the working area and will include a welfare unit for staff, staff parking for vehicles, a storage container and fuel bowser. It is anticipated that the mobile fuel bowser will be transported to the excavators along the banks as necessary. The mobile fuel bowser will be deployed in accordance with good practice EA guidance, with necessary spillage procedures and kits in place.

2.4.12 The enabling works will commence in August 2019, with dredging commencing in September 2019. It is anticipated that all works will be completed within twelve weeks. Further activity to finalise bank profiles, vegetation restoration/management, deliver wider ecological enhancement and commence post works monitoring will occur in 2020. Monitoring will continue post-completion to ensure the success of the ecological mitigation measures and to trigger any dynamic management that may be required to deliver the required restoration/mitigation.

2.4.13 Ongoing maintenance of the restored channel profile delivered by the Proposed Improvement Works will be implemented, informed by ongoing monitoring and on a minimal level of intervention (e.g. localised removal of silt using a small excavator or by the use of a small Water Injection Dredger). The monitoring will inform the requirement and support the implementation of appropriate mitigation to ensure negligible environmental effects and legal compliance. Such future dredging would also be supported by a separate environmental appraisal.

2.5 Climate change resilience

2.5.1 The impacts of climate change have been considered throughout the ongoing design and operation of the River Parrett and the associated moors and levels by the PIDB.

2.5.2 During the operational phase of the Proposed Improvement Works, resilience has been addressed through the following measures:

- The proposed scheme design and mitigation strategy is part of the wider SRA 20-year Flood Action Plan that provides further climate change resilience; and
- The design of ecological mitigation measures takes into account climate change through the restoration of more climate change resilient habitats.

2.5.3 Consideration of climate change has been included within Chapter 2: Description, Chapter 3: Scheme Need and Alternatives, and in the topic specific assessments: Chapter 6: Biodiversity, Chapter 7: Water Environment and Chapter 8: Population.

2.6 Embedded environmental measures

Introduction

2.6.1 The EIA Regulations require an assessment to be undertaken of the 'Proposed Improvement Works' – not of the Proposed Improvement Works with and without mitigation. This is a proportionate approach and meets the approach advocated by the Institute of Environmental Management and Assessment (IEMA). Consequently, the Proposed Improvement Works are presented as a single scheme being inclusive of the 'environmental measures' that have been highlighted as being required and adopted during the design process. This therefore is suitable "…to avoid, prevent, reduce or offset any identified significant adverse effects on the environment". The Proposed Improvement Works, where appropriate, incorporates good practice and enhancement measures.

2.6.2 The term 'environmental measures' describes those features which are incorporated into the Proposed Improvement Works. These are subtly different from additional 'mitigation measures, which are identified as being over and above what constitutes the Proposed Improvement Works. As a result, the approach taken here is to undertake a single assessment that embeds all measures approved by the PIDB into the Proposed Improvement Works.

Implementation of environmental measures

2.6.3 Each environmental topic (Chapters 6, 7 and 8) identifies a number of embedded environmental measures that have been incorporated into the design of the Proposed Improvement Works in order to mitigate any likely significant effects. It also sets out where the responsibility for implementing these measures lie (in the case of the Proposed Improvement Works implementation responsibilities lie with both the PIDB and the Environment Agency.

Monitoring

2.6.4 If permission is granted for the Proposed Improvement Works, there is a need to impose monitoring requirements to ensure the effectiveness of the proposed mitigation and to deliver any required reactive management. These will be secured through the consenting and permitting requirements to deliver the Proposed Improvement Works (e.g. as a requirement of any SSSI Assents).

2.6.5 Monitoring, where it is required, is explained further in the relevant technical chapters (Chapters 6, 7 and 8).

2.6.6 In addition, a range of construction phase environmental safeguarding, management and monitoring measures are proposed as part of the Contract for the Works that will, in due course, form the basis for a Construction Environmental Management Plan (see Volume 3: Appendix 2C); also see below.

Management Plans

2.6.7 A number of management plans and strategies will be produced and/or updated as part of the Proposed Improvement Works. These will describe further how the embedded environmental measures will be delivered and will be produced and finalised prior to the commencement and completion of all site works (as appropriate).

Construction Environmental Management Plan (CEMP)

2.6.8 The Draft CEMP Template (Volume 3: Appendix 2C) provides an overview of the standard construction management measures that would be implemented as part of the Proposed Improvement Works. As such, it aims to ensure that construction activities for the Proposed Improvement Works are carried out in accordance with legislation and best practice for minimising the effects of activities on the environment and local communities.

2.6.9 The key objectives of a CEMP are to:

- Provide a mechanism for delivering many of the embedded environmental measures described in the ES;
- Ensure compliance with legislation by identifying the need for consultation with consultation bodies (as defined in Regulation 2 of the EIA Regulations) and by obtaining all necessary consents and licences from relevant bodies;
- Provide a framework for monitoring and compliance auditing and inspection to ensure the environmental measures included in the Proposed Improvement Works are being implemented successfully;
- Ensure environmental best practice is adopted throughout the construction/ dredging stage;
- Provide a framework for dealing with adverse effects should they occur; and

- Ensure a prompt response should unacceptable adverse levels be identified during the works.

Landscape and Ecological Management Plan

2.6.10 The Draft LEMP Template (Volume 3: Appendix 2D) provides an overview of the protocols to ensure the long-term management and monitoring of all retained and restored landscape/ habitat types and ecological features within the Oath to Burrowbridge Dredging site downstream of Stathe Bridge and the confluence with the River Tone. When completed and agreed, the LEMP will set out the method for restoring/maintaining and successfully managing these during the long term operational period of the project as guided and supported by monitoring. As such it will serve as a handbook for landscape and ecological management and maintenance of the restored proposed dredging site.

3 SCHEME NEED AND ALTERNATIVES

3.1 Introduction

3.1.1 This chapter of the ES considers the alternatives in the context of the wider need and drivers for the Proposed Improvement Works.

3.2 Need for the Proposed Improvement Works

3.2.1 There is a clear and identifiable need for the scheme in the context of the SRA's purpose to deliver higher standards of flood protection than would be funded nationally, and to create better flood protection and resilience against further flooding by joint planning and delivery from SRA members. The SRA produced a flood action plan (FAP) covering a 20-year period, of which Workstream 1 includes dredging and river management. The Oath to Burrowbridge location has been assessed and a viable dredging proposal developed.

3.3 Consideration of Alternatives

Overview

3.3.1 Schedule 1 and Regulation 7(2)(d) of the Environmental Impact Assessment Regulations requires an Environmental Statement (ES) to provide a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the drainage body, which are relevant to the proposed improvement works and their specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

3.3.2 This section details the reasonable alternatives identified and considered by the PIDB in developing its proposals for the Proposed Improvement Works, providing the rationale for the selection of preferred options.

3.3.3 In identifying reasonable alternatives, the following option types have been considered:

- 'Do Nothing' alternative, where the Proposed Improvement Works are not progressed, which would result in a 'Do Minimum Scenario' as currently occurs being continued;
- Strategic alternatives; and
- Alternative designs/solutions in the context of the design evolution.

'Do Nothing' alternative

3.3.4 Under a 'Do Nothing' (Do Minimum) the current level of flooding experienced upstream of the Site will occur with the potential to impact on the frequency and duration of flooding in those areas affected. The current level of river maintenance would continue, however. This is set out below:

- Vegetation cutting on the top of the left bank to maintain a grass sward on the

top of the flood embankment and to enable inspection of the flood defence asset.

- Installation and maintenance of piling along the left bank, although no new piles have been installed recently.
- Maintenance of the integrity of the formal spillways including vegetation cutting and repairs to spillway crest level.
- Maintenance of the integrity of the left bank, as a reservoir asset. This mostly involves sandbagging low spots to control overtopping. A project is being developed to repair low spot and relevel the bank crest.
- Tree clearance from the channel (recently done immediately downstream of the proposed working reach).
- Maintenance dredging of the Parrett channel downstream of the Proposed Improvement Works and the confluence with the River Tone (done every year for the past 5 years).
- No vegetation cutting within the channel of both bank faces (not completed for at least 10 years).
- No silt removal, or silt agitation in the channel (not completed for the last 10 years).

3.3.5 In consequence, the 'Do Nothing' alternative has not been considered further.

Strategic alternatives

3.3.6 When considering 'reasonable alternatives' to the Proposed Improvement Works, it is necessary to explore whether there are alternative solutions to meeting the objectives of the SRA's 20 year FAP. The strategic level alternatives identified by the SRA in this regard relate to:

- Dredging and River Management;
- Land Management;
- Urban Water Management;
- Resilient Infrastructure;
- Resilient Communities.

Consideration of on-site alternatives

3.3.7 In the preparation of the project, various modelling scenarios were developed in order to assess the potential conveyance of the scheme along the river Parrett. This modelling, along with aspects such as budget, environmental and physical constraints, helped define the promoted scheme.

3.3.8 The maximum possible dredged sections were assessed and discounted due to physical, environmental and financial constraints that meant that the scheme was unlikely to obtain approvals and permits. Similarly, a small dredge project was developed and this time discounted due to the limited hydraulic benefit provided post works.

3.3.9 Works upstream of Stathe bridge to Oath Lock were discounted due to the lack of effectiveness of any dredging in this area based on budgets and increase in conveyance in that stretch of the Parrett.

3.3.10 The promoted project is a balance between the larger and smaller schemes. The sections chosen allow increased conveyance along with flood reduction benefit, it does not impact on physical constraints identified during project development and is within budget.

Selection of method of dredging

3.3.11 There are three forms of dredge method that can be applied to remove material in channel along a river such as the Parrett, these being:

- Tracked Excavators on the riverbank moving material from within the channel (as is commonly used on the Somerset Rivers). This work can take place with low water flows in the river and can be used to place material on the rear of the banks which meet the requirements of the scheme.
- Water Injection Dredging (WID) This form of dredging requires high water level and flows to provide access for the small boat (in this case) and to mobilise the disturbed sediment. WID equipment that would be used on this scale also requires the material to be relatively unconsolidated. By using this method, it would be hard to achieve the reed fringe feature to be retained in the river. The reliance on high water levels to undertake this operation bring a risk to programme given the tight window for the scheme works. This form of works does not allow the material to be placed on the rear banks, so do not meet the need for the scheme.
- Cutter Section Dredging. As with WID dredging, this form of dredging requires high water levels and flows to provide access for the small boat/machine attachments and to mobilise the disturbed sediment. The reliance on high water levels to undertake this operation brings a risk to the programme given the tight window for the works. By using this method, it would be hard to achieve the reedy fringe feature to be retained in the river. As with WID, this form of works does not allow the material to be placed on the rear banks, so does not meet the need for the scheme.

Choice of method

3.3.12 Given the access limitations, the potential for low water flows in the river, both WID dredging and cutter section dredging were, in this instance, not considered as a suitable option. Another consideration was that for this project the dredging is not in the low water channel where WID dredging would be most beneficial.

3.3.13 Therefore, the use of excavators on the bank was selected as the most suitable method of dredging. This form of excavation allows the reed fringe to be delivered, allows for material to be moved directly onto the rear bank and can work with very low water flow so gives assurance on programme.

3.4 Summary

3.4.1 Schedule 1 and Regulation 7(2)(d) of the EIA Regulations requires an ES to consider the reasonable alternatives to the proposed development which 'may include development design, technology, location, size and scale'. This chapter of the ES has considered such alternatives in the context of the wider need and drivers for the Proposed Improvement Works. It has concluded that the Proposed Improvement Works associated with this ES are the best solution for increasing conveyance of flood water through this part of the River Parrett and realising the additional benefits this brings, with the least environmental effect on sensitive receptors.

4 APPROACH TO PREPARING THE ENVIRONMENTAL STATEMENT

4.1 The Environmental Impact Assessment Process

4.1.1 Preparing the ES is the key stage in the EIA process, as it brings together information about any significant environmental effects, which PIDB will use to inform its decision about whether the Proposed Improvement Works should be consented.

4.1.2 This ES has been prepared using best practice guidance and industry standards, drawn on a considerable body of work from the project team, involved partnership working, in particular between the SRA, PIDB, EA and NE, and also drawn on robust professional judgement.

4.2 EIA Terminology

Impacts vs effects

4.2.1 This ES only refers to the term 'impacts' in terms of 'Environmental Impact Assessment', which is the regulatory process completed starting at scoping and working through ES preparation and finishing at subsequent monitoring and other work. This ES adopts the word 'effects' when describing the environmental consequences of the Proposed Improvement Works. For example, such effects may come about as a result of the following:

- Physical activities that would take place if the Proposed Improvement Works were to proceed (e.g. vehicle movements during construction operations); or
- Environmental changes that are predicted to occur as a result of these physical activities (e.g. loss of vegetation prior to the start of construction work or an increase in noise levels). In some cases, one change causes another change, which in turn results in an environmental effect.

4.2.2 The predicted environmental effects are the consequences of the environmental changes for specific environmental receptors. For example, with respect to water vole, the loss of burrowing sites or foraging areas could affect the water voles' population size; with regard to people, an increase in noise levels could affect people's amenity.

4.2.3 This ES focuses on assessing the significance of the environmental effects of the Proposed Improvement Works, rather than the activities or changes that cause them. However, this requires these activities to be understood and the resultant changes identified and quantified, often based on predictive assessment work.

Spatial and temporal scope

4.2.4 Spatial scope is the area over which changes to the environment are predicted to occur as a consequence of the Proposed Development. In practice, an EIA should focus on those areas where these effects are likely to be significant.

4.2.5 For the purposes of this ES, the spatial scope varies between environmental topics and is therefore described in each of the topic chapters (Chapters 6, 7 and 8).

4.2.6 The temporal scope covers the time period over which changes to the environment and the resultant effects are predicted to occur; they are typically defined as either being temporary or permanent.

4.3 EIA Scoping

4.3.1 Scoping involves identifying the following:

- The people and environmental resources (collectively known as 'receptors') that could be significantly affected by the Proposed Improvement Works;
- Those aspects of the Proposed Improvement Works those receptors might be affected by; and
- The work required to take forward the assessment of these potential likely significant effects.

4.3.2 Scoping was initiated at the outset of the work on the EIA, with initial conclusions about potentially significant effects of the development being set out in the Scoping Report (Appendix 1A). This was informed by the legislative and policy context relevant to the Proposed Improvement Works and the key principal that, to be significant, an effect must be of sufficient importance to influence the process of decision-making about whether or not consent should be granted for the Proposed Improvement Works or part of it. This is often referred to as the 'significance test'.

4.3.3 At the scoping stage, conclusions drawn by using the significance test are based upon professional judgement, with reference to the Proposed Improvement Works description and drawing upon, as appropriate, available information about:

- The magnitude and other characteristics of the potential changes that are expected to be caused by the Proposed Improvement Works;
- The sensitivity of receptors to these changes;
- The value of receptors; and
- The effects of these changes on relevant receptors.

4.3.4 If the information that is available during scoping does not enable a robust conclusion to be reached that a potential effect is not likely to be significant, the effect is taken forward for further assessment.

4.3.5 The Scoping Report (Appendix 1A) sets out what has been identified to be the potentially significant environmental effects for consideration in the ES and the approach to undertaking the assessments. It recommended that the following topics were ‘scoped-in’ to the assessment: Biodiversity; Water Environment; and Population (largely dealt with in the Water Environment.

4.3.6 The Scoping Report (Volume 3: Appendix 1A) was submitted for comment to the Drainage Authority, PIDB, and statutory consultees (refer to Section 4.4) in April 2019. This was followed by a month of consultation in May 2019. The PIDB were provided with the results from these and wider consultations (see Volume 3:

Appendix 1B) as an Extended Scope of Assessment (included as Volume 3: Appendix 1C) for a further consideration of a final 'scoping opinion' (also see Volume 3: Appendix 1C). This ES has been based on the final opinion as adopted by the PIDB, as per the requirement in Regulation 18(4)(a) of the EIA Regulations.

4.3.7 Subsequent to the issue of the Scoping Report (Volume 3: Appendix 1A), the scope of the assessment has been progressively refined in response to comments from the Drainage Authority and from consultees (refer to Section 4.4), together with environmental information that has been obtained from survey or assessment work carried out as part of the EIA, and the evolution of the improvement work proposals. Consultation, through meetings, correspondence and discussions with statutory and non-statutory consultees has taken place throughout the preparation of this ES duing May and June 2019 as well as a period of initial public consultation in May 2019.

4.3.8 It was identified that the Proposed Improvement Works was unlikely to cause significant changes to the risks associated with major accidents and disasters and as such recommended that this was scoped out of the EIA (refer to Volume 3: Appendix 1A, 1B and 1C for further information on what was proposed to be scoped in and out).

4.3.9 The environmental topic chapters (Chapters 6 and 7 and 8) set out the final scope of the assessment in relation to effects assessed as potentially significant, which therefore require an in-depth detailed assessment. In some cases, effects that could be scoped-out (because they are considered not likely to be significant) have been scoped-in because further information is required to justify and explain this. All other effects (i.e. that are not referred to in the environmental topic chapters) are not likely to be significant.

4.4 Consultation

4.4.1 The purpose of consultations (via meetings, telephones and correspondence) was to agree the assessment methodologies for technical studies and identify any sensitivities or concerns associated with the Proposed Improvement Works as well as relevant environmental measures included in the proposals. Such sensitivities and solutions have been considered and incorporated into the design process and assessment of the EIA.

4.4.2 The scope of the detailed assessment is based on the approved Extended Scope of Assessment and the final 'scoping opinion' of the PIDB (Volume 3: Appendix 1C). Engagement with the following parties has contributed to the evolution of the scope:

- Relevant environmental officers from PIDB and Somerset Drainage Boards Consortium;
- Somerset Rivers Authority;
- Environment Agency (EA);
- Natural England (NE);

- Somerset County Council (SCC);
- Historic England (HE);
- Sedgemoor District Council;
- All Parish Councils in the Parrett IDB district;
- Somerset Wildlife Trust;
- Royal Society for the Protection of Birds.

4.4.3 Numerous other bodies and members of the public have additionally responded in writing as part of the non-statutory and statutory consultation completed so far. Comments from these bodies is provided within the Consultation Report that accompanies the Environmental Statement (Volume 3: Appendix 1B). Where comments are relevant to the EIA, this is identified in the applicable technical chapters (Chapters 6, 7 and 8) of this ES.

4.5 Overview of assessment methodology

Introduction

4.5.1 All the topic assessments presented in the ES have been undertaken on the basis of the description of the Proposed Improvement Works, as set out in Chapter 2: Description of the Proposed Development.

4.5.2 For each topic, the assessment of likely significant effects has been undertaken by competent experts with relevant specialist skills (refer to Volume 3: Appendix 1D), drawing on their experience of working on other relevant projects, good practice in EIA and on relevant published information. For some topics, use has been made of modelling or other methodologies, as appropriate.

4.5.3 Each topic chapter follows a common format, as outlined below:

- Introduction
- Limitations of this assessment
- Relevant legislation, planning policy, technical guidance
- Data gathering methodology
- Overall baseline (where appropriate), with the detailed baseline being set out under Sub section 10 below (or as an Appendix)
- Consultation
- Scope of the assessment
- Environmental measures embedded into the development proposals
- Assessment methodology
- Assessment of effects - this sub-section excludes cumulative effects and deals separately with each receptor or category of receptors that could be significantly affected. The assessment is made against the predicted future baseline. Where this approach is deviated from it is explained within the relevant topic chapter (refer to Section 4.6)
- Consideration of optional additional mitigation

- Conclusions of significance evaluation
- Implementation of environmental measures and monitoring
- References.

4.6 Identification of baseline conditions

4.6.1 To determine the baseline conditions that should be used for the assessment of the likely significant effects of the Proposed Improvement Works, it is necessary to define the current baseline conditions and subsequently decide whether these conditions are likely to change by the 'assessment years' that are selected for the construction and operation of the Proposed Development. If this future baseline is more likely to occur than the current baseline, the future baseline is used for the assessment of likely significant effects. However, in many cases it will be concluded that the current baseline is just as likely, or even more likely, to occur in the assessment years than would be the case with any future baseline conditions.

4.6.2 The current baseline is determined for the 'Study Area' for each environmental topic by a combination of desk-based research, including consultation with the relevant statutory and non-statutory authorities, together with field survey work (where required).

4.6.3 At a basic level, the Study Area comprises the site of the Proposed Improvement Works. However, the adopted Study Area associated with this EIA includes land outside the site, especially where the effects of the Proposed Development are likely to extend beyond such geographical limits to reflect 'Zones of Influence' (ZoIs), where the Proposed Development could affect off-site areas (e.g. changes in water depth and extent during flood events).

4.6.4 Details of the relevant ZoIs are discussed in the baseline section of each environmental topic chapter (Chapters 6-8). These chapters also explain the basis for defining the future baseline conditions, where appropriate. This is based on the following:

- Information gathered about the existing environmental conditions;
- Changes that can be predicted based on reasonable assumptions and modelling calculations;
- Information relating to other likely and predictable changes, e.g. climate change, which could affect current prevailing environmental conditions; and
- Information about other relevant improvement works, including the nature of the proposals, their likely timing and their location relative to the Proposed Improvement Works.

4.7 Overview to approach to significance evaluation methodology

Introduction

4.7.1 A requirement of an ES is to outline conclusions that have been reached about the likely significant environmental effects that it is predicted will result from the

Proposed Improvement Works. Reaching a conclusion about which effects, if any, are likely to be significant is the culmination of an iterative process that involves the following stages:

- Identifying those effects that could be likely to be significant (refer to Section 4.3);

4.7.2 Assessing the effects of the Proposed Improvement Works against the baseline (current or future, as appropriate); and

- Concluding whether these resultant effects are likely to be significant

4.7.3 Chapters 6, 7 and 8 describe the approaches that have been used, in relation to the stages outlined in paragraph 4.7.1, for each environmental topic within this ES.

Identification of likely significant effects

4.7.4 To inform the identification of likely significant effects during the early stages of the assessment process, information pertaining to current and intended future management/maintenance for the River Parrett in the area associated with the Proposed Improvement Works.

4.7.5 As proposals evolved, further detail concerning construction and operational activities became available. This enabled the assessment of potential environmental changes caused by the Proposed Improvement Works to be avoided and refined, including their spatial extent and other characteristics (e.g. their magnitude, frequency etc.).

4.7.6 The identification of receptors under consideration within the assessments draws upon available information on environmental changes. In some cases, this can be translated into ZoIs outside of which the environmental changes are predicted to be sufficiently small that receptors are not likely to be significantly affected. In addition, for some environmental topics (e.g. biodiversity and water environment), a valuation is undertaken to define those receptors that are of sufficient importance or value that they could be significantly affected. Only those receptors that are of sufficient importance or value and that are located within the defined ZoIs where effects could be significant, are taken forward for further assessment.

4.7.7 The technical assessments, undertaken in Chapters 6-8, describe how environmental changes and resulting effects are assessed, together with the topic specific approaches that have been used to identify the receptors affected by the Proposed Development.

Types of effects

4.7.8 Paragraph 6 of Schedule 1 of the EIA Regulations states:

"The description referred to in paragraph 4 of the likely significant effects on the factors specified in regulation 12(2) must cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the improvement works. That description must take into account the environmental protection objectives

established at EU or member State level which are relevant to the improvement works.

4.7.9 This ES considers these types of effects, where appropriate and deemed relevant to the environmental topic chapter. Cumulative effects are discussed in Section 4.8.

Direct effects

4.7.10 Direct effects are those that result directly from the Proposed Improvement Works. For example, where a machine disturbs an area of habitat; the associated physical activity could result in a change to the receptor (i.e. the habitat).

Indirect and secondary effects

4.7.11 Indirect and secondary effects are those that result from consequential change caused by the Proposed Improvement Works. As such they would normally occur later in time or at locations farther away than where direct effects may occur. An example would be where a flow control structure is damaged as a result of the development, and the consequences of that damage is flood risk to receptors.

Transboundary effects

4.7.12 Transboundary effects are those that would affect the environment in another state within the European Economic Area (EEA). Unless these effects are considered significant, they are not reported within the topic chapters (Chapters 6, 7 and 8) of this ES.

Temporal effects

4.7.13 As discussed in Section 4.3, temporal effects are typically defined as being permanent or temporary as follows:

- Permanent - these are effects that will remain even when the Proposed Development is complete, although these effects may be caused by environmental changes that are permanent or temporary. For example, an excavator that is temporarily driven over an area of valuable habitat could cause so much damage that the effect on this vegetation would be permanent; and
- Temporary – these are effects that are related to environmental changes associated with a particular activity and the effects will cease when that activity finishes.

Significance evaluation

Overview

4.7.14 Receptors that could be significantly affected as a result of the Proposed Improvement Works are identified in the topic chapters (Chapters 6, 7 and 8). The adopted approach to determine whether effects on receptors is significant is to apply a combination of professional judgement and a topic-specific significance evaluation methodology that draws upon the results of the assessment.

4.7.15 In applying this approach to significance evaluation, it is necessary to ensure that there is consistency between each environmental topic in the level at which effects are considered to be significant. Therefore, it is inappropriate for the assessment of one topic to conclude that minor effects are significant, when, for another topic, only comparatively major effects are significant.

4.7.16 Conclusions about significance are arrived at using the following: professional judgement; available information on the magnitude and other characteristics of potential changes expected to be caused by the Proposed Improvement Works; receptors' sensitivity to these changes; the value of the receptor; and the effects of these changes on relevant receptors.

4.7.17 For some environmental topics, published guidance is available with regard to significance evaluation. Where such guidance exists, even if in draft, it has been utilised to inform the development of the significance evaluation methodologies contained within this ES. This is applicable to the following environmental topics:

- Chapter 6: Biodiversity, which uses Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal.

4.7.18 Where guidance is not available, methodologies have been developed by technical specialists drawing upon previous experience of significance evaluation in EIA.

Evaluation matrices

4.7.19 Significance evaluation involves combining information about the sensitivity, importance or value of a receptor, and the magnitude and other characteristics of the changes that affect the receptor. The approach to using this information for significance evaluation is outlined below.

Receptor sensitivity, importance or value

4.7.20 The sensitivity or value of a receptor is largely a product of the importance of an asset, as informed by legislation and policy and as qualified by professional judgement. For example, receptors for landscape, biodiversity or the historic environment may be defined as being of international or national importance. However, lower value resources may still be defined as sensitive or important at a county or district level. For each environmental topic, it is necessary to provide a detailed rationale that explains how the assessment of sensitivity, importance or value has been derived.

4.7.21 The use of a location or physical element that may be representative of receptors, e.g. human beings, would also play a part in its classification in terms of sensitivity, importance, or value. For example, when considering effects on the amenity of a human population, a location used for recreational purposes may be more valued and therefore more sensitive to change than a place of work.

Magnitude of change

4.7.22 The magnitude of change affecting a receptor is identified on a scale from very low to very high. As with receptor sensitivity and value, a rationale is provided in each topic chapter (Chapters 6-8) that explains how the categories of environmental change are defined. For certain topics, the magnitude of change is assessed in accordance with guidance on what levels of change are considered to be acceptable and based on numerical parameters. For other changes, professional judgement is used to determine the magnitude of change, using descriptive terms.

Determination of significance

4.7.23 The significance of effects is determined with reference to the nature of the development, the receptors that could be significantly affected and their sensitivity, importance or value, together with the magnitudes of environmental change that are likely to occur.

4.7.24 Other than for environmental topics where significance evaluation does not involve the use of matrices, sensitivity/value and the characteristics of environmental changes can be combined using a matrix (refer to Table 4.1). In addition, professional judgement is applied since, for certain environmental topics, the distinction between the sensitivities or magnitudes of change may not be clearly defined. Consequently, the resulting assessment conclusions explain how professional judgement has been applied to arrive at the level of effect.

4.7.25 Variations to this approach, which may be applicable to specific environmental topics, are detailed in the relevant 'Significance evaluation methodology' sub-section contained in each environmental topic chapter (Chapters 6, 7 and 8).

4.7.26 Definitions of how matrix categories are derived for each topic are also outlined in the relevant environmental topic chapter (Chapters 6-8), along with an explanation of receptor sensitivity, magnitude of change and levels of effect that are considered significant under the EIA Regulations.

4.7.27 Within the matrix that is used in most significance evaluation exercises, reference is made to:

- Major effects, which will always be determined as being significant in EIA terms;
- Moderate effects which could be significant, although there may be circumstances where such effects are considered not significant on the basis of professional judgement; and
- Minor or negligible effects, which will always be determined as not significant.

Table 4.1: Significance evaluation matrix

		Magnitude (of change)					
		Very high	High	Medium	Low	Very Low	Will not occur
Importance/ value / sensitivity (of receptor)	Very high	Major (significant)	Major (significant)	Major (significant)	Major (significant)	Moderate (could be significant)	Minor (not significant)
	High	Major (significant)	Major (significant)	Major (significant)	Moderate (could be significant)	Minor (not significant)	Minor (not significant)
	Medium	Major (significant)	Major (significant)	Moderate (could be significant)	Minor (not significant)	Negligible (not significant)	Negligible (Not significant)
	Low	Major (significant)	Moderate (could be significant)	Minor (not significant)	Negligible (not significant)	Negligible (not significant)	Negligible (not significant)
	Very low	Moderate (could be significant)	Minor (not significant)	Negligible (not significant)	Negligible (not significant)	Negligible (not significant)	Negligible (not significant)
	Negligible	Minor (not significant)	Minor (not significant)	Negligible (not significant)	Negligible (not significant)	Negligible (not significant)	Negligible (not significant)

Note: Significant effects are those shown as 'Major'. 'Moderate' effects could be significant. Notwithstanding this, this is not always the case, although this very much depends on the environmental topic and the appropriate application of professional judgement.

4.8 Assessment of cumulative effects

Introduction

4.8.1 Two types of cumulative effects assessment (CEA) are considered within this ES, these are inter-project and inter-related effects.

4.8.2 Further details regarding the methodology undertaken for the CEA is provided in Chapter 9: Cumulative Effects Assessment.

Inter-project effects

4.8.3 For each of the environmental topics within this ES, an assessment has been completed of how the environmental effects resulting from the Proposed Improvement Works, could combine with the same topic-related effects generated by other works to affect a common receptor. To do this, it is important to first identify which other works need to be included in the CEA under each environmental topic assessment.

4.8.4 The starting point for this is to determine the ZoIs from the Proposed Improvement Works for each receptor that could be significantly affected under each environmental topic. In this ES, consideration of Inter-project Works has been guided by earlier consultation with the Environment Agency (and other consultees) and review of the draft Water Framework Regulatory Compliance Assessment required to support the scheme. This confirmed the suite of other works being considered.

4.8.5 In the context of the Proposed Improvement Works, other schemes that have been included for the cumulative assessment in this ES are:

- Stathe to Burrowbridge Capital Dredge and Parrett Annual Maintenance Dredging; and
- Environment Agency Sowy /Kings Sedgemoor Project.

Inter-related effects

4.8.6 Inter-related effects assessments involve assessing whether any of the individual environmental topic effects resulting from the Proposed Improvement Works, which are not significant in their own right, could combine to create effects that are significant.

4.8.7 There are two types of inter-related effects, these being:

- Combined effects: consideration as to whether any of the individual effects of the Proposed Improvement Works would combine to create a cumulative effect (i.e. within a single topic); and
- Interactive effects: consideration of the effects of different activities from the Proposed Improvement Works on a specific receptor (i.e. different topics).

4.8.8 The first step is to identify the environmental topics that have common receptors, and then to consider whether the topic effects on any common receptors are likely to combine. One type of receptors that could fall into this category are those pertaining to the amenity of the relevant human population. For example, the occupants of a residential property in close proximity to the Proposed Improvement Works might be subject to adverse effects in terms of noise, vibration, air quality, traffic, as well as with regard to visual amenity, or any combination thereof, each of which, when assessed individually, is not significant in EIA terms, but when assessed cumulatively, the effects are judged to be significant.

4.8.9 This cumulative assessment involves different environmental topic assessments that cannot be combined, the outcome of this CEA will be reliant on the application of professional judgement from, potentially, several different technical specialists. Further details on the specific approach are given in Chapter 9: Cumulative Effects Assessment.

4.9 Limitations and assumptions

4.9.1 The key assumptions and limitations associated with conducting this EIA are outlined below. Assumptions and limitations specific to each environmental topic are identified in the appropriate chapter (Chapters 6, 7 and 8).

4.9.2 Baseline conditions have been established from a variety of sources, including historical data, but due to the dynamic nature of certain aspects of the environment, conditions will change during the construction and operation of the Proposed Improvement Works.

4.9.3 The key limitations and assumptions are as follows:

4.9.4 Information received from third parties is complete and up to date;

4.9.5 The design, implementation and operational stages of the Proposed Improvement Works will satisfy minimum environmental standards, consistent with contemporary legislation, practice and knowledge; and

4.9.6 Controls will be imposed on the decision made by the Drainage Body that would secure appropriate measures to control construction methods for the site preparation dredging and restoration.

4.9.7 Likely significant environmental effects have been assessed on the basis of the defined description of the Proposed Improvement Works, set out in Chapter 2: Description of the Proposed Improvement Works.

5 LEGISLATIVE AND POLICY OVERVIEW

5.1.1 A range of legislation and policy applies to the Proposed Improvement Works and is set out in Chapters 1, 6, 7 and 8 of this ES. In summary, the following legislation (as a minimum) are relevant to the proposed improvement works.

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003
- European Community (EC) Directive 85/337/EEC5 (as amended by Directives 97/11/EC6, 2003/35/EC7, 2011/92/EU8, and 2014/52/EU9)
- Environmental Impact Assessment (Land Drainage Improvement Works) Regulations (SI 1999 No. 1783)
- Conservation of Habitats and Species Regulations 2017
- The Wildlife and Countryside Act (WCA) 1981 (as amended)
- Protection of Badgers Act 1992
- The Natural Environment and Rural Communities Act (NERC) 2006
- The Hedgerow Regulations 1997
- Environmental Permitting (England and Wales) Regulations 2016 (Statutory Instrument (SI) 2016 No. 1154), as amended
- The Water Resources Act 1991
- Water Act 2003
- The Land Drainage Act 1991 and 1994
- The Flood Risk Regulations 2009
- The Bathing Water Regulations 2013

5.1.2 Please refer to Chapters 6, 7 and 8 for further details and guidance on relevant policy.

6 BIODIVERSITY

6.1 Introduction

6.1.1 This chapter of the Environmental Statement (ES) assesses the likely significant effects of the Proposed Improvement Works with reference to Biodiversity, including designated sites and different habitats and species. The chapter should be read in conjunction with Chapter 2: Description of the Proposed Improvement Works and with reference to relevant parts of Chapter 7: Water Environment, where common receptors have been considered (e.g. WFD Designated Sites) and where there is an overlap or relationship between the assessment of effects.

6.2 Limitations of this assessment

6.2.1 There are no notable limitations relating to Biodiversity that affect the robustness of the assessment of the likely significant effects of the Proposed Improvement Works.

6.3 Relevant legislation and technical guidance

Legislative context

6.3.1 The following legislation is relevant to the assessment of effects on Biodiversity receptors:

- Conservation of Habitats and Species Regulations 2017: Protection of internationally designated sites, including Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). It also confers protection to animals listed in Schedule 2 (including disturbance) and plants listed in Schedule 5 ('European Protected Species');
- The Wildlife and Countryside Act (WCA) 1981 (as amended): Statutory protection to Sites of Special Scientific Interest (SSSIs) and protection to Schedule 1 wild bird species (nests and eggs, from disturbance while breeding). Protection is granted for species listed in Schedule 5 and Schedule 8;
- Protection of Badgers Act 1992: Protection from killing, injury or disturbance; protection of setts from damage or destruction;
- The Natural Environment and Rural Communities Act (NERC) 2006: Section 41 lists flora, fauna and habitats of principal importance. Section 40 requires public bodies and local planning authorities to have regard to the conservation of biodiversity in England when carrying out their normal functions; and
- The Hedgerow Regulations 1997.

Technical Guidance

6.3.2 There are a number of technical guidance documents that have been used to define the adopted approach to undertaking the Biodiversity aspects of the Environmental Impact Assessment (EIA). These include methods for characterising the Biodiversity

baseline and the appropriate interpretation of data, as well as the specific approach to be adopted for Ecological Impact Assessment (EcIA). Technical guidance directly applicable to this technical specialism is listed in Table 6.1.

Table 6.1: Technical guidance adopted for assessing the impacts on Biodiversity

Guidance reference	Usage
British Standards Institute (BSI): BS 42020:2013 Biodiversity – Code of practice for planning and development	Provides recommendations on topics such as professional practice, proportionality, pre-application discussions, ecological surveys, adequacy of ecological information, reporting and monitoring.
Chartered Institute of Ecology and Environmental Management (CIEEM): Guidelines for Ecological Impact Assessment in the UK and Ireland – Terrestrial, Freshwater, Coastal and Marine	Provides technical guidance for assessing the potential ecological impacts of a development. EcIA is a process of identifying, quantifying and evaluating potential effects of development-related or other proposed actions on habitats, species and ecosystems. EcIA can be used for the appraisal of projects of any scale including the ecological component of EIA. When undertaken as part of an EIA, EcIA is subject to the relevant EIA Regulations. Includes guidance on scoping; establishing the baseline; identifying important ecological features; assessing potential impacts; incorporating measures to avoid, reduce and compensate ecological impacts and the provision of ecological enhancements. Guidance on the consideration of the legal and policy framework throughout the EcIA process is also included.
UK Government	Provides standing advice on assessing impacts on a range of protected species, including bats, great crested newts (GCN), badgers, otters, water voles, dormouse, reptiles, wild birds, protected plants, invertebrates and ancient woodland. Includes guidance on survey effort, methods, assessing impacts and mitigation. Incorporates current Natural England (NE) guidance.
Bird Monitoring Methods	Guidance on undertaking breeding bird surveys, including methodology.
River Habitat Survey in Britain and Ireland: Field Survey Guidance Manual – 2003 Version	Guidance on the fieldwork survey element of the core RHS method.

6.4 Data Gathering Methodology

Study area

6.4.1 The study area includes the entire spatial extent of the Site (the Working Area) as well as consideration of areas beyond this boundary to enable consideration of certain effects that potentially could occur outside of the river channel. This area can be seen in Figures 1.1 and 1.2 in Chapter 1 and in Figure 6.1 (located in Volume 4: Figures).

Designated sites

6.4.2 Consideration has been given to potential effects on designated sites and their features of interest, with an examination of statutorily designated sites extending 2km from the Site and non-statutorily designated sites also within 2km, unless coinciding with areas further away where changes in hydrology are predicted. This allows consideration of potential effects to Biodiversity receptors associated primarily with water level management beyond the Site boundary. Please refer to Volume 3: Appendix 6A.

Habitats

6.4.3 All habitats associated with the Site and immediately adjacent land have been surveyed to establish a baseline and to inform this ES Chapter. Both Phase 1 Habitat Survey and River Habitat Survey methods were used to ensure comprehensive information was recorded. An assessment of available fish, bird, amphibian, mammal, reptile and invertebrate habitat was also undertaken. Use of Google Earth and other aerial images and mapping have also been used to place the habitats into context within the wider landscape and to support the site based Phase 1 habitat mapping. Please refer to Volume 3: Appendices 6B-H.

Kingfisher and Nesting Birds

6.4.4 A survey to identify potential nesting habitat for kingfisher (*Alcedo atthis*) and the presence of nesting birds along approximately 4km of the River Parrett upstream of its confluence with the River Tone was undertaken to identify key areas of likely bird nesting activity. Please refer to Volume 3: Appendix 6D.

Invertebrates

6.4.5 Benthic macroinvertebrate samples were taken from four locations between Oath Lock (the tidal limit of the River Parrett), and the confluence with the River Tone to establish the value of the benthic macroinvertebrate assemblage present and to enable the potential impacts on this assemblage to be considered.

6.4.6 In addition, a desk-based review was carried out by a specialist entomologist of the habitat requirements of a number of Ramsar invertebrates which are known to be present within local designated sites and to assess the likely presence of these species within the proposed stretch of the River Parrett to be dredged.

6.4.7 A specialist survey for the endangered hairy click beetle (*Limonius griseus*) was also carried out in July 2018 to establish the status of the species at seven locations where historic records exist.

6.4.8 Please refer to Volume 3: Appendix 6F.

Otter

6.4.9 The Site was surveyed for signs of otter (*Lutra lutra)* to enable an assessment of the potential impacts on this European protected species to be completed as part of this Biodiversity chapter. Please refer to Volume 3: Appendix 6E.

Water Vole

6.4.10 The Site was also surveyed for signs of water vole (A*rvicola amphibius*) to enable an assessment of the potential impacts on this protected species to be completed as part of this Biodiversity chapter. Please refer to Volume 3: Appendix 6E.

Badger

6.4.11 The Site and immediately adjacent areas of suitable habitat were surveyed for signs of badger to enable an assessment of the potential impacts on this protected species to be completed as part of this Biodiversity chapter. Please refer to Volume 3: Appendix 6H.

Great Crested Newt

6.4.12 A detailed desk-based study of the presence/ likely absence of amphibains – focusing on great crested newt (*Triturus cristatus*) within the Site and an associated 500m buffer from each bank top was undertaken, in combination with a field based evaluation of potential habitat suitability and physical barriers to migration, to enable consideration of potential impacts as part of this chapter. Please refer to Volume 3: Appendix 6C.

<u>Desk study</u>

6.4.13 A desk-based assessment was undertaken by Somerset Ecology Services in April 2018 (Appendix 6A). The desk study collated existing ecological records for priority habitats and species, controlled and legally protected species and data on statutory and non-statutory designated sites within the floodplain associated with the Site. In line with current CIEEM guidance, these are sites, habitats and species that are of sufficient importance that effects upon them could be significant (Further information is provided in Box 6.1 and 6.2). Please refer to Volume 3: Appendix 6A.

Box 6.1: Designated biodiversity sites, priority habitats and species

Statutory biodiversity sites

Internationally important sites (collectively referred to in this Chapter as European sites – whilst recognising that Ramsar sites are designated at a global level):

- SACs;
- Candidate SACs;
- SPAs;
- Listed or proposed Ramsar sites, potential SPAs, possible/ proposed SACs; and
- Sites identified or required as compensatory measures for adverse effects on other European sites.

Nationally important sites:

- SSSIs; and
- National Nature Reserves (NNRs).

Locally important sites:

Local Nature Reserves (LNR): Statutory sites that are of importance for recreation and education as well as biodiversity. Their level of importance is defined by their other statutory or any non-statutory designations (e.g. if an LNR is also an SSSI but is not a European site, it will be of national importance). If an LNR has no other statutory or non-statutory designation it should be treated as being of borough/district-level importance for biodiversity (although it may be of greater socio-economic value).

Non-statutory nature conservation sites

Sites of county importance: Non-statutory nature conservation sites are called Local Wildlife Sites (LWS).

Priority Habitats and Species

In this Chapter (and following the CIEEM guidance), the geographic level at which a species/habitat has been identified as a priority for biodiversity conservation is referred to as its level of 'species/habitat importance'. For example, habitats and species of principal importance for the conservation of biological diversity in England are identified as of national species or habitat importance reflecting the fact that the importance of these species or habitats has been defined at a national level. The level of importance pertains to the species or habitat as a whole rather than to individual areas of habitat or species populations, which cannot be objectively valued (other than for waterfowl, for which thresholds have been defined for national or international 'population' importance).

- International importance: populations of species or areas of habitat for which European sites are designated;
- International importance: populations of birds meeting the threshold for European importance (1% of the relevant international population);
- National importance: priority habitats and species of principal importance (HPI and SPI) for the conservation of biological diversity in England.

- National importance: species listed as being of conservation concern in the relevant UK Red Data Book (RDB) or the Birds of Conservation Concern (BoCC) Red List;
- National importance: Nationally Rare and Nationally Scarce species, which are species recorded from, 1-15 and 16-100 hectads (10x10km squares of the national grid) respectively;
- National importance: populations of birds comprising at least 1% of the relevant British breeding/wintering population (where data are available); and
- Borough/district importance: habitats and species listed in the Borough or District Biodiversity Action Plan (BAP).

Box 6.2: Legally protected and controlled species

Legal Protection

Many species of animal and plant receive some degree of legal protection. For the purposes of this document, legal protection refers to:

- Species included in Schedules 1, 5 and 8 of the WCA (as amended), excluding:
  - Species that are only protected in relation to their sale (see Section 9(5) and 13(2) of the WCA 1981), given that the Proposed Development does not include any proposals relating to the sale of species; and
  - Species that are listed in Schedule 1 of the WCA 1981 that are likely to breed on or near the site (given that this schedule is only applicable whilst birds are breeding).
- Species included in Schedules 2 and 5 of the Habitats Regulations 2017;
- Badgers, which are protected under the Protection of Badgers Act 1992; and
- Hedgerows, some of which are protected under The Hedgerows Regulations 1997.

Legal Control

Schedule 9 of the WCA 1981 lists species of animal that it is an offence to release or allow to escape into the wild and species of plant that it is an offence to plant or otherwise cause to grow in the wild.

6.4.14 Organisations that have supplied data and information on the data and associated search area are contained within Table 6.2.

Table 6.2: Information sources and data sought

Source	Data
Department for Environment, Food and Rural Affairs (Defra) Multi-Agency Geographic Information for the Countryside (MAGIC) website	Existing statutorily designated sites of nature conservation interest located within 2km of the application site.
Somerset Environmental Records Centre (SERC)	Existing non-statutory designated sites of nature conservation interest, Priority habitats, veteran

Source	Data
	trees and ponds, notable and legally protected species within 2km of the application site.
Somerset Special Alert Mapping	Somerset County Council GIS resource which maps where protected species are likely to be present based on past records and the scientific literature concerning home ranges.
Somerset IDB Biodiversity Action Plan 2010	Habitats and species identified as priorities within the boundaries of the five drainage board districts.
Google Earth	Review of satellite imagery for identification of biodiversity interest features (e.g. water bodies, connectivity feature) and wider context.

Survey Work

6.4.15 The following surveys were conducted in 2018 and updated (where necessary) in 2019:

- A Preliminary Ecological Assessment and Desk Study was completed in April 2018 (details contained in Appendix 6A);
- An Extended Phase 1 Habitat Survey and Invasive Plants Assessment was completed in March-May 2018 updated in June 2019 (details contained within Appendix 6B).
- A detailed great crested newt desk top study was undertaken for the 4km length of the River Parrett and a buffer of 500m from each bank top (details contained within Appendix 6C).
- Kingfisher and nesting bird habitat surveys were completed in May 2018 updated in June 2019 (further details contained in Appendix 6D).
- Otter and water vole surveys were carried out in May 2018 (updated in June 2019), with a further inspection for water vole undertaken in June 2018 (details contained within Appendix 6E).
- Invertebrate surveys were undertaken in June 2018, with a specialist review of the habitat requirements of a range of Ramsar invertebrates and a specialist hairy click beetle survey of seven locations within the Site also completed (Appendix 6F).
- Fish Habitat Surveys were undertaken in May 2018 (details contained within Appendix 6G).

6.5 Overall Baseline

Current Baseline

6.5.1 The Site is situated adjacent to residential housing and agricultural land of the Somerset Levels. The surrounding landscape is predominantly coastal and floodplain grazing marsh with areas of lowland meadows and semi-improved and improved neutral grassland. Numerous ditches and drains are present within the immediate local area, with permanently wet and ephemeral ponds and other standing waterbodies.

6.5.2 The following section contains summary baseline information gained through the contemporary (2018) surveys. Further details, including raw data and information relating to historic surveys and reports, are contained within the suite of Appendices to this Chapter. Further detailed assessment of likely impacts to those features present within the relevant ZoI from the site is undertaken in Sections 6.10 to 6.22.

Statutory Sites

6.5.3 Please refer to the Tables and Figures presented in Volume 3: Appendix 6A and in the Appropriate Assessment contained in Volume 3: Appendix 6I.

6.5.4 There are two statutory sites of international importance within 2km of the Site: the Somerset Levels and Moors Special Protection Area (SPA) and Ramsar Site, located adjacent to the right-hand bank of the River Parrett along the entire stretch to be dredged. The SPA is designated for its internationally important assemblage of birds, including Bewick's swan (*Cygnus columbianus bewickii*), golden plover (*Pluvialis apricaria*), lapwing (*Vanellus vanellus*), teal (*Anas crecca*) and its waterbird assemblage. The Ramsar site is designated as the largest area of lowland wet grassland and associated wetland habitat remaining in Britain. It is an important site for wildfowl in winter and for aquatic invertebrates.

6.5.5 There are five statutory sites of national importance within 2km of the Site: one National Nature Reserve (NNR) and four Sites of Special Scientific Interest (SSSI):

- Somerset Levels National Nature Reserve (NNR): Primary habitats include open water and lowland grassland.
- Southlake Moor SSSI: An extensive system of grazing marsh and ditches.
- West Sedgemoor SSSI: Comprises numerous small, low-lying fields and meadows separated by water-filled rhynes and ditches.
- Kings Sedgemoor SSSI: An extensive system of grazing marsh and ditches, supporting a wide variety of neutral grasslands.
- North Moor SSSI: Comprises grazing marsh and ditch systems.

6.5.6 The Site is located within the SSSI Impact Risk Zones for each of the SSSIs listed in 6.5.5.

Non-Statutory Sites

6.5.7 Please refer to the Tables and Figures presented in Appendix 6A.

6.5.8 There are eight non-statutory Local Wildlife Sites (LWS) within 2km of the Site:

- River Parrett, Middle Moor to Scree LWS: Stretch of the River Parrett supporting legally protected species and rare invertebrate species.
- River Tone and Tributaries LWS: Biologically rich river and tributaries with a variety of associated habitats and legally protected species.
- Aller Moor LWS: Rhyne and wet meadow site, important wintering bird population.
- Athelney Fields LWS: Fields with rhynes and a Somerset notable species.
- Hellards Copse LWS: Ancient semi-natural broadleaved woodland.
- Wick Hill Wood LWS: Ancient semi-natural broadleaved woodland, scrub and unimproved calcareous grassland.
- Aller Drove Rhynes LWS: Watercourse with indicators of high biological quality.
- Cox's Wood LWS: Ancient semi-natural broadleaved woodland.

Priority Habitats and Habitats of Principal Importance

6.5.9 Ten Priority Habitats or Habitats of Principal Importance are present within 2km of the Site. These include: rivers; hedgerows; coastal and floodplain grazing marsh; traditional orchard; lowland fen; lowland meadows; deciduous woodland; lowland calcareous grassland; purple moor grass and rush pasture.

Phase 1 Habitat Types

6.5.10 Please refer to the Tables and Figures presented in Appendix 6B and Figure 6.2a – 6.2d in Volume 4: Figures.

6.5.11 The Phase 1 Habitat types habitats recorded within the Site are listed in Table 6.3. Those directly associated with the proposals are highlighted together with their location.

Table 6.3: Phase 1 habitats recorded within the Site

Phase 1 Habitat Type	Within application site?	Location/ areas
Running water	Yes	Within entire Site
Marginal vegetation	Yes	Within entire Site
Tall ruderal	Yes	Within entire Site, predominantly LHB
Neutral semi-improved grassland	Yes	Predominantly RHB
Poor semi-improved grassland	Yes	Predominantly RHB

Phase 1 Habitat Type	Within application site?	Location/ areas
Standing trees	Yes	Occasional trees/mature hedgerow shrubs on the RHB set back from channel
Hedgerow	Yes	Small sections, predominantly RHB
Standing open water	Yes	Small sections, predominantly RHB
Scattered scrub	No	
Bare ground	Yes	Exposed tidal sediment throughout Site and localized cattle-poached soil predominantly on RHB

6.5.12 Table 6.4 lists those habitat types present within the Site that will be modified or lost through the proposed dredging works and provides a summary description of what this is and where it is located.

Table 6.4: Habitats recorded within the working area

Phase 1 Habitat Type	Location	Summary Description
Running water	Throughout the Site	River Parrett (tidal) with works occurring to the upper banks
Marginal Vegetation	Throughout the majority of the site	Associated with the interface between the lower and upper inner banks of the River Parrett (influenced by normal tidal range)
Tall ruderal	Throughout the site	Associated with predominantly drier upper inner bank face where less normal tidal influences and lower grazing pressures are present
Neutral semi-improved grassland	Throughout the majority of the site	Associated with the upper inner bank and outer bank
Poor semi-improved grassland	Throughout the majority of the site	Associated with the upper inner bank and outer bank
Hedgerow/ Trees	Right hand bank	Small sections of hedgerow (57m) associated with the working area, typically included existing gaps/gateway. Three small trees associated with works area.
Standing open water	Right hand bank	Limited extent (81m) of shallow filled ditch associated with area of works and outer bank

Phase 1 Habitat Type	Location	Summary Description
Bare ground	Bank top and occasionally bank face	Bare ground associated with pedestrian pathway, cattle poaching and tidally exposed sediment.

Notable Plants

6.5.13 Stands of the Invasive Non-Native Species (INNS) Himalayan balsam (*Impatiens glandulifera*) are present along the River Parrett throughout the Site.

Fish

6.5.14 Previous surveys carried out by Loughborough University recorded a total of 13 fish species at the Site (see Volume 3: Appendix 6G for further details).

6.5.15 An assessment of suitable promoting and limiting habitat features present in the survey area was subsequently carried out by Johns Associates in 2018 (See Volume 3: 6G). This involved a review of habitat requirements of certain fish species identified as previously being present in this part of the River Parrett (using www.fishbase.org) and a boat-based visual inspection survey along the entire Site. This field survey enabled the identification and characterisation of certain in-channel habitat features influencing the distribution, behaviour and presence/absence of fish species. A structured approach to recording channel and bank physical habitat features that will influence the type of fish habitat present was employed using the standard River Habitat Survey method. Aerial imagery was also used to identify riparian and channel features of interest.

6.5.16 The study concluded that the artificial, re-aligned and re-sectioned River Parrett channel presents many consistent attributes in terms of good quality and diverse fish habitat along its length (e.g. flow controls, tidal influence and varying exposed extent of bare bank face during lower flow conditions, storm flow and submerging of the upper river banks during elevated flow conditions; virtual absence of any in-channel features associated with trees; and the presence of extensive stands of submerged aquatic macrophytes). However, additional fish habitat diversity has been introduced as a result of bank failure causing localised (but limited) backwaters, overhangs and submerged overhangs, and influences on cross-sectional velocity profiles associated with the lower flow channel area, caused by macrophyte stands and narrower channel cross sections.

6.5.17 Habitat conditions are considered likely to continue to support the range of species previously identified by Loughborough University.

6.5.18 River and sea lamprey ammocoetes could use softer marginal sediments, (for example those associated with the limited backwaters/ embayments), as juvenile habitat but generally the upper banks are too steep and compact for this purpose. These species could navigate upstream unimpeded, although no suitable spawning

habitat is present within the survey reach. The river is not designated for lamprey species and as such their habitat is not legally protected within this section of the River Parrett.

Great Crested Newt

6.5.19 A review of available records and OS mapping was carried out by Johns Associates in 2018 (See Volume 3: 6C). This study identified a large number of waterbodies within 500m (plus a 250m buffer) of the Site, including ponds and ditches.

6.5.20 No records of great crested newt were identified for an area extending up to 5km from the Site. It is known, however, that this species is present in the wider area and therefore a precautionary approach has been adopted with potential foraging habitat being present within 250m of the Site.

6.5.21 Some barriers to newt migration were identified during the course of the desk study and site visits, (for example, the main A361), waterbodies to the west and east of the Site (i.e. those present close to the right-hand bank of the River Parrett) had no such barriers to migration and therefore, where suitable terrestrial habitat exists, this could support great crested newt.

6.5.22 Seasonal flow conditions and limited optimal breeding habitats are present, making it less likely for great crested newt to be present, suitable terrestrial habitat is present. Optimal overwintering and refuge habitats are largely absent from the engineered river banks.

6.5.23 Further details are contained in Volume 3: Appendix 6C.

Kingfisher and Nesting Bird Habitat

6.5.24 Suitable but limited extents of potential kingfisher nesting habitat and two Cetti's warbler (*Cettia cetti*) territories were identified within the Site during a survey undertaken in 2018 by ecologists from Johns Associates.

6.5.25 This included a single area of vertical shallow river bank, although poached by cattle, and an area of riparian scrub and long vegetation within a maximum 450m range including area extending away from the left-hand river bank (see Volume 3: Appendix 6D).

Otter and Water Vole

6.5.26 Data supplied by SERC includes record/s of otter from an area to the north of the River Parrett. No records are shown from within the area surveyed by Johns Associates in 2018/2019 and no IDB records for this species are shown. This would seem to suggest that otters were previously absent from this area of the Somerset Levels, or else under-recorded.

6.5.27 Results from a desk study completed in 2018 identified records of water vole for the complex of ditches to the north of the River Parrett and for the lower reaches of the River Parrett within the Site itself (see Figure 2 in Volume 3: Appendix 6E).

6.5.28 Field surveys for otter and water vole were undertaken by Johns Associates in 2018 and updated in 2019 (see Volume 3: Appendix 6E). These confirmed the presence of both otter and water vole from within the stretch of the River Parrett surveyed, as summarised below:

- Water vole:
    - Habitat along the main River Parrett channel within the stretch surveyed was considered suitable for this species;
    - The banks are of suitable gradient for burrow excavation, with a plentiful supply of food plants nearby (particularly on the left-hand bank).
    - Positive signs of water vole were identified along the entire stretch of the left-hand bank between the confluence with the River Tone and Stathe Bridge, comprising an extensive network of burrows.
    - Additional evidence including feeding signs and characteristic water vole droppings were also noted and mapped.
- Otter:
    - Habitat along the main River Parrett channel within the stretch surveyed was considered suitable for otter, with side ditches providing a well-connected wider area of available habitat for this species. There was suitable habitat available for the establishment of holts within the system, and areas of low disturbance. The fluctuating water levels would not constitute a significant constraint to otters.
    - Positive signs of otter were identified during the course of the survey, particularly close to Stathe Bridge.
    - Feeding remains (fish) were identified in an area of vegetation on the lower part of the left-hand bank face. Characteristic footprints and claw marks were identified from an area of soft mud close to the edge of the water whilst old and recent spraints were noted on an exposed area of mud, suggesting resident rather than transient otters along this stretch of the River Parrett.

Aquatic benthic macro-invertebrates

Survey

6.5.29 There were no notable or rare species found in any of the samples collected in 2019 and all were characteristic of lowland waterbody habitat at or around the tidal limit with low diversity. However, relatively high numbers of the brackish shrimp *Gammarus zaddachi* were recorded from all samples, with a maximum count of 429 individuals.

6.5.30 BMWP scores were generally low, although sample S1 contained some higher-scoring taxa (including blackfly larvae, water beetles, alderfly larvae and the cased

caddisfly larva *Anabolia nervosa*), which explains the higher score of 81. All samples had a very similar ASPT, indicating a similar assemblage across the four sites.

Ramsar Invertebrates

6.5.31 The Somerset Moors and Levels Ramsar Site supports 17 nationally important species of British Red Data Book invertebrates. The review of habitat requirements for these species concluded that as confirmed/unconfirmed reports of the Ramsar invertebrate species are predominantly from ditches outside the proposed working area, they are unlikely to be affected by the proposed dredging works, assuming mitigation proposals will prevent sediment/ run-off from entering the ditches in which the species have been recorded.

6.5.32 One exception is the sea club-rush hover fly (*Lejops vittata*), which require stands of sea-club rush as adults. Locally-occasional stands of sea club-rush were identified on the River Parrett during the Phase 1 Habitat Survey undertaken by Johns Associates Ltd in 2018 and updated in 2019. These will be retained in situ and as such, no change in habitat extent is predicted.

Hairy Click Beetle

6.5.33 Surveys were completed on behalf of the PIDB in 2018 (See Volume 3: Appendix 6F). These recorded 26 adults from 21 locations along the River Parrett between 500m downstream of Oath Lock and 250 m downstream of Burrowbridge. The species was found to be associated with shallowly sloping tidal terraces, where dense stands of reed canary-grass are subject to flooding on the highest tides. Of an overall seven locations in which the species has historically occurred, it was recorded at three in 2018.

6.5.34 Further details of all invertebrate assessments are contained in Volume 3: Appendix 6F.

Future Baseline

6.5.35 The future baseline being assessed is 2019 as this represents the period associated with the construction phase.

6.5.36 The operational phase assessment commences from 2020-21 and incorporates a limited and localised maintenance dredging as required, but not more frequently than a 5-year cycle, to maintain the improved flow conveyance achieved in 2019-2020 from the Proposed Improvement Works.

6.5.37 At the time of writing, there is no indication that the role of the SRA or the PIDB (or equivalent) would change or that there is any indication that the operational regime including current future maintenance as described in this ES would cease. As a consequence, it has been concluded that the operational conditions would continue in the long term and there is no decommissioning stage associated with the Proposed Improvement Works or an assessment of this as part of the ES.

6.6 Consultation

6.6.1 On-going dialogue and meetings with consultees have informed and influenced this Chapter, the dredging proposals (in relation to Biodiversity) and conclusions drawn. Please refer to Volume 3: Appendices 1B and 1C for further details on consultation completed and responses received.

6.7 Scope of the assessment

6.7.1 The scope of the assessment was established and agreed by the Scoping Report (Appendix 1A) the Scoping Opinion (Appendix 1B); the results of the baseline survey work detailed in Section 6.5 and Appendices 6A to 6H; and the dredging proposals (refer to Chapter 2: Description of the Proposed Development).

Approach to Identifying Receptors

6.7.2 The identification of receptors is based on relevant guidance and the professional judgement of qualified technical specialists who have undertaken a desk study and a range of ecological field surveys at the Site.

6.7.3 In some cases, even without quantified information, it is reasonable to conclude that some potential receptors will not experience significant effects. This is sometimes the result of mitigation measures that have been incorporated into the proposals, which might reasonably be expected to be effective (refer to Section 6.8).

6.7.4 The following considerations have been taken into account in identifying potential receptors:

- The importance (or value) of the receptor at a local, regional, national or international level;
- The extent to which important ecological receptors will be affected by changes that are expected to result from the proposed dredging works;
- The sensitivity of the important ecological receptors to the changes that are likely to occur;
- The likely magnitude, duration and other characteristics of the effects; and
- Relevant best practice and guidance where specialist methodologies have been developed as detailed below.

Potential Receptors

6.7.5 A key consideration in assessing the effects of the proposed dredging works on flora and fauna is to define the habitats and species that need to be included in the assessment. In identifying these receptors, it is important to recognise that the proposals can affect flora and fauna both within the Site (e.g. placing dredged sediment on adjacent areas of grassland) as well as beyond the Site (e.g. effects of the dredging on areas of functionally linked land, for example, through changes in water levels). The approach that has been taken in preparing this Chapter is to identify important Biodiversity resources (the sites, habitats and species of sufficient

importance that effects upon them could be significant), as well as considering legally protected species.

6.7.6 Assessment of the effects of the Proposed Development on Biodiversity was undertaken with reference to CIEEM's EcIA Guidelines. The assessment has focused on legally protected and otherwise important Biodiversity resources (refer to Boxes 6.1 and 6.2).

6.7.7 The starting point for the assessment was to undertake an exercise, using the baseline data that were collected through the desk study and knowledge of the local area, to subdivide the recorded Biodiversity receptors (i.e. designated sites, together with species populations and habitats) into:

- Those that could be significantly affected by the dredging proposals or for which the proposals could result in the contravention of relevant legislation, and that therefore required more detailed assessment; and
- Those that were assessed as not being likely either to be significantly affected or whose presence was not likely to result in any relevant legislation being contravened, and that did not therefore require further assessment (i.e. that were 'scoped out' of the assessment).

6.7.8 For sites/habitats/species that meet the criteria in Box 6.1 and/or 6.2, the next stage of the scoping assessment is to determine whether the identified receptors are likely to be of sufficient 'biodiversity conservation value' that an effect upon them could be significant in EIA terms. In this context:

- Biodiversity conservation value relates to the quality and/or size of sites or habitats, or the size of species populations (see Box 6.3); and
- Potential significance means that the effect could be of sufficient concern, or for positive effects, of such substantial benefit that it could influence the decision about whether or not development consent or a specified other consent should be granted.

Box 6.3: Value and importance for biodiversity conservation

The distinction between importance and value can be illustrated by common species such as the house sparrow. This species is important at a national level because it is a priority species (Section 41, NERC Act 2006). However, a small population that could be affected by a development would often be assessed as being of insufficient value for an effect (whether adverse or beneficial) to be of potential significance, due to the small size of the population. On this basis, it would not need to be assessed further (i.e. it would be 'scoped out' of the assessment).

Spatial Scope

6.7.9 The spatial scope of the assessment of each potential significant effect reflects:

- The area occupied by the receptor that is being assessed; and

- The ZoI associated with the environmental changes that will result from the Proposed Development that are likely to affect the receptor.

6.7.10 Therefore, if part of a designated biodiversity site is located within the ecological ZoI relating to a particular environmental change, an assessment is made of the effects on the biodiversity site as a whole. A similar approach has been taken for areas of notable habitat. For species that occur within an ecological ZoI that relates to a change that could significantly affect the species, an assessment has been carried out on the total area that is used by the affected individuals or population of the species (e.g. for feeding or migrating).

6.7.11 Receptors that are of sufficient value that an effect upon them would have the potential to be significant, together with all relevant legally protected species, are taken through to the assessment stage. This involves identifying, for each receptor:

- Any environmental changes that are likely to be caused by the proposed dredging works which have the potential to lead to a significant effect and/or to contravene relevant legislation;
- For these environmental changes, determining the area within which each change could cause a likely significant effect or could contravene relevant legislation (i.e. an 'ecological ZoI' - see Box 6.4 and Figure 6.1 in Volume 4: Figures);
- Comparing the area where the receptor occurs with the ecological ZoI; and
- If the receptor occurs or is likely to occur within the ZoI, concluding that either the receptor could be subject to a significant effect and/or the relevant legislation could be contravened, in which case the effects upon the receptor are scoped in, or no significant effect is likely to occur and it is scoped out.

Box 6.4: Defining Ecological ZoI

The ecological ZoI that is the most straightforward to define is the area affected by land- take and direct land-cover changes associated with the development. This zone is the same for all affected receptors. By contrast, for each environmental change that can extend beyond the area affected by land-take and land-cover change (e.g. changes in noise associated with development activities within the land-take area), the ZoI may vary between receptors, dependent upon the receptors' sensitivity to the change and the precise nature of the change. For example, dormouse might be unaffected by noise associated with a development unless the noise is generated very close to where the dormouse nests, while another mammalian species might be disturbed at much greater distances; other species (e.g. of invertebrate) may be unaffected by changes in noise. A further complication is that the response of a receptor to a change associated with one development may differ to the response of the same receptor to a similar change on another development. This can occur as a result of the wide range of variables that influences the precise nature of any change (e.g. for noise this can include: differing baseline noise conditions; specific magnitude, timing or other characteristics of the noise; and the effects of screening and topography). In view of these complexities, the definition of the zones of influence that extend beyond the land-take area will be based upon professional judgement, informed by discussions with the technical specialists who are working on other chapters of the ES. These specialists will provide information about the environmental changes that they assess within their ES chapters. This information will be combined

with available ecological information about receptors' sensitivities to different environmental changes in order to define the extent of each ecological ZoI.

6.7.12 The key issues relating to Biodiversity receptors and the proposed dredging works are as follows:

- The effects of temporary and permanent habitat loss caused by the dredging and placement of sediment;
- The effects of pollution (mobilization of quantities of silt which impact downstream habitats or accidental spillages of hydrocarbons from machinery); and
- Disturbance (from noise, visual and light) to surrounding habitats and associated species.

6.7.13 There are a range of Biodiversity receptors at the Site and there is also a variation in the spatial influence of the proposed dredging works. For example, the majority of changes in habitat are localised (e.g. loss of neutral semi-improved grassland through placement of dredged material), whilst the potential effects from changes in water levels in the hydrologically connected levels and moors works may be evident for some considerable distance.

6.7.14 Consequentially, the spatial scope of the assessment varies between different receptors and the ZoI associated with each of the different components of the construction and operational phases of the Proposed Improvement Works.

6.7.15 The effects of temporary and permanent habitat loss were initially considered across the whole Site, but then refined on the basis of the presence/absence of specific habitats within the development footprint (e.g. extensive water vole habitat within or adjacent to an area of change), the affinity of particular species for these habitats (e.g. hairy click beetle records and areas of suitable habitat across the Site and in immediately adjacent areas), in combination with the function of the on-site habitat to species that use key habitats located off-site (e.g. badgers foraging in adjacent fields in the floodplain).

6.7.16 Table 6.5 summarises information about the receptors that have been identified through the scoping process as having the potential to be significantly affected by the proposed dredging works and/or for which legislation could be contravened. Table 6.5 also identifies the potential effects that need to be assessed. The Information to Support Appropriate Assessment (Appendix 6I) relates to the assessment of those receptors (European sites) covered by the Habitats Regulations and those sites (such as Ramsar sites), which according to national policy (NPPF), are given the same consideration as European sites.

Table 6.5: Potential Receptors

Potential Receptor	Important/ valued and/or legally protected?	Relevant criteria (from Box 6.1) and legislation (from Box 6.2)	Potentially significant effects/ legal contravention and causal changes
Statutorily Designated Sites of Nature Conservation Interest (SPA, Ramsar, SSSI, NNR, LNR) and Functionally Linked Land	Important and legally protected	Internationally and nationally important. Habitats Regulations WCA 1981 NERC Act 2006	Potential for indirect impacts from disturbance (wintering water birds); temporary short-term changes in water quality affecting mobile species (particularly fish); temporary medium-term changes to river habitat used by mobile species (fish); and, changes to water levels on moors (resulting in changes in habitat quality for wintering water birds and Ramsar invertebrates, with a subsequent effect on populations). The scheme introduces appropriate mitigation measures in combination with the Environment Agency's Sowy project that are likely to maintain current conditions but have the potential to introduce some flexibility in water level management control.
Non-statutorily Designated Sites of Nature Conservation Interest	Important	County importance. NERC Act 2006 section 41 Habitats of Principal Importance Local BAP Priority Habitats	Potential for indirect impacts from disturbance (wintering water birds); temporary short-term changes in water quality affecting mobile species (particularly fish); temporary medium-term changes to river habitat used by mobile species (fish); and, changes to water levels on moors (resulting in changes in habitat quality for wintering water birds and Ramsar invertebrates, with a subsequent effect on populations). The scheme introduces appropriate mitigation measures in combination with the Environment Agency's Sowy project that are likely to maintain current conditions but have the potential to introduce some flexibility in water level management control.
Priority Habitats	See below		

Potential Receptor	Important/ valued and/or legally protected?	Relevant criteria (from Box 6.1) and legislation (from Box 6.2)	Potentially significant effects/ legal contravention and causal changes
Running Water	Important and legally protected	WFD County importance. NERC Act 2006 section 41 Habitats of Principal Importance Local BAP Priority Habitats	The improvement works will result in an increase in downstream flow conveyance during certain elevated flow conditions under a lower tidal state than currently occur. This is likely to positively increase the natural erosional potential of the downstream channel, which may reduce the amount of tidal siltation over time and contribute to reducing the extent/frequency of maintenance dredging. The operation of the works may cause certain changes in water extent and duration in the wider moors and levels including within designated sites associated with a matter of a few tens of centimetres over a few hours or days. The construction of the Proposed Improvement Works may lead to unintentional release of pollutants or contaminants into the River Parrett during the construction phase and during longer terms low intensity maintenance during the operational phase. For WFD waterbodies, in an unmitigated scenario, this may lead to them either not achieving 'good' status or potential in the short term, although in this spatially limited scenario, it is considered that this would not result in a downgrade of their status. Once the bank vegetation has recovered the new bank face will contribute minimal inputs to the running water. Lower flow conditions (below the retained fringe) are likely to remain the same and current, with some new flow characteristics introduced at the interface with the re-profiled bank, with the aim of

Potential Receptor	Important/ valued and/or legally protected?	Relevant criteria (from Box 6.1) and legislation (from Box 6.2)	Potentially significant effects/ legal contravention and causal changes
			increasing physical habitat diversity for a range of species.
Marginal-Innundation Vegetation	Important and legally protected	WFD County importance. NERC Act 2006 section 41 Habitats of Principal Importance Local BAP Priority Habitats	The dredging will retain the majority of left hand bank habitat and associated marginal habitat (86%) and modify the majority of the right-hand bank habitat. Where present a 1-2m fringe of marginal habitat will be retained in dredging areas. Further marginal habitat retention will be maintained through stripping and replacing the rhizome mass of the vegetation. The operational conditions arising from the change in upper channel cross section may result in conditions that limit the recovery of any residual areas of this habitat unless further management/mitigation is introduced.
Standing Water	Important	County importance. NERC Act 2006 section 41 Habitats of Principal Importance Local BAP Priority Habitats	The works have the potential to result in accidental spillages of pollution (e.g. hydrocarbons, sediment) that may result in local deterioration in water quality. The works will result in the removal of short lengths (81m) of existing ditches that are typically, sediment in-filled, poached and shaded.
Hedgerow/Trees	Important	County importance. NERC Act 2006 section 41 Habitats of Principal Importance Local BAP Priority Habitats	The works will result in the removal of short lengths of 57m of species poor hedgerow where these are present within the working area. Three trees require felling where these are located within the working area.
Birds	Important and legally protected	WCA 1981 NERC Act 2006 section 41 Species of Principal Importance	Land take/ land cover change (habitat removal); management changes resulting in a temporary reduction in breeding/nesting habitat during construction works.

Potential Receptor	Important/ valued and/or legally protected?	Relevant criteria (from Box 6.1) and legislation (from Box 6.2)	Potentially significant effects/ legal contravention and causal changes
		Local BAP Priority Species	Potential direct effects on birds, young and/or eggs due to damage or destruction of active nests will be avoided because the works are timed for autumn/winter and outside of nesting periods.
Badgers	Legally protected	Protection of Badgers Act 1992	Potential risk of disturbance/sett damage as a result of localized areas of the dredging works.
Otter	Important and legally protected	Habitat Regulations WCA 1981 NERC Act 2006 section 41 Species of Principal Importance Local BAP Priority Species	Potential risk of disturbance of otter (generally) from the dredging activity as they are present in the local area although no holts were reported during the 2018 and 2019 surveys.
Water Vole	Important and legally protected	WCA 1981 NERC Act 2006 section 41 Species of Principal Importance Local BAP Priority Species	Potential risk of injury/killing of voles and collapse of burrows from dredging works, noting that water vole are almost exclusively using the left hand bank due to typically unsuitable habitat on the right hand bank.
Fish	Important and legally protected	WFD Salmon and Freshwater Fisheries Act	The works have the potential to result in accidental spillages of pollution (e.g. hydrocarbons, sediment) that may result in local deterioration in water quality. Once the bank vegetation has recovered the new bank face will contribute minimal inputs to the running water. Lower flow conditions (below the retained fringe) are likely to remain the same and current, with some new flow characteristics introduced at the interface with the re-profiled bank, with the aim of increasing physical habitat diversity for a range of species.

Potential Receptor	Important/ valued and/or legally protected?	Relevant criteria (from Box 6.1) and legislation (from Box 6.2)	Potentially significant effects/ legal contravention and causal changes
Ramsar Invertebrates	Important	NERC Act 2006 section 41 Species of Principal Importance Local BAP Priority Species	One species the sea club-rush hover fly (*Lejops vittata*) is likely to be present, which require stands of sea-club rush as adults. Locally-occasional stands of sea club-rush were identified on the River Parrett during the Phase 1 Habitat Survey. These stands will be retained in situ and as such, no change in habitat extent is predicted.
Hairy Click Beetle	Important	NERC Act 2006 section 41 Species of Principal Importance	The works will impact on the habitat known to support hairy click beetle (marginal-inundation vegetation dominated by reed canary grass). The majority of this habitat is present on the left-hand bank where 82% is being retained. Throughout the works, where dredging coincides with reed fringe, 1-2m buffers will be retained intact with further habitat being restored through a process of stripping and replacing further reed canary grass rhizomes that fall within the dredged area. The works will also create more extensive shallow sloping and tidally inundated cross sections that are considered to be of benefit to this species.
Amphibians and Reptiles	Important and legally protected	Habitat Regulations WCA 1981 NERC Act 2006 section 41 Species of Principal Importance Local BAP Priority Species	No evidence of the presence of amphibians and reptiles has been identified from walkover surveys or through consultation and the working area is subject to seasonal increases in water level, does not contain potential overwintering or notable areas of refuge habitat. The timing of the works is largely when amphibians and reptiles are overwintering in more optimal locations. Notwithstanding this, a precautionary basis to the works is required to ensure minimal risk of injury/killing of these animals.

Potential Receptor	Important/ valued and/or legally protected?	Relevant criteria (from Box 6.1) and legislation (from Box 6.2)	Potentially significant effects/ legal contravention and causal changes
			Potential habitat will be reinstated following completion of the dredging.

Climate Change

6.7.17 Climate change is likely to affect the frequency of future flood events as well as flood levels. This could, in turn, affect the designated features of European, national and local sites, habitats and species considered in this Chapter. For example: increased water levels associated with flood events together with an increased frequency of these events could impact water vole populations as areas traditionally used for burrow excavation become too vulnerable.

6.7.18 The Natural England Climate Change Adaptation Manual supports practical and pragmatic decision making and guides reasonable judgement on the potential effects of climate change on the key habitats associated with the Site. The habitats that characterise the Site: for example, running water and marginal vegetation are vulnerable to climate change.

6.7.19 Climate change and its implications for Biodiversity has been incorporated into the design of embedded ecological mitigation and enhancement measures to reduce the risk of impact on legally protected and other species. These embedded measures are listed in Table 6.6 and strategic measures associated with managing water levels in the hydrologically connected moors and levels are set out in Volume 3: Appendix 6J.

6.7.20 This has largely been achieved through low level of sensitivity of the replacement habitats (notably grassland) to climate change (subject to appropriate management). These measures are associated with the provision of trees, hedgerow, the creation of additional areas of ditches, and improvement in grassland species diversity. A Landscape and Ecological Management Plan will be produced to guide appropriate long-term care of these and existing habitats.

6.7.21 As a result, no further Biodiversity mitigation for climate change as part of the proposed dredging works is required beyond that included in the embedded mitigation and enhancements set out in this Chapter (Table 6.6 and in Volume 3: Appendix 6J), including management and monitoring beyond that highlighted in Table 6.19).

Temporal Scope

6.7.22 The temporal scope of the assessment of Biodiversity is consistent with the period over which the proposed dredging works would be carried out and therefore covers

the dredging and long term post-dredging periods including low level and infrequent, localised maintenance dredging (e.g. every five years) and informed by monitoring. Dredging works along the right-hand bank of the Site will be undertaken during the autumn/early winter of 2019 with further restoration of habitat occurring in 2020. This approach will ensure minimal disruption to legally protected species such as water vole or conservation notable species such as hairy click beetle that are present along parts of the section of the River Parrett to be dredged, typically using habitat that is being retained or stripped and replaced.

6.7.23 Effects of the proposed dredging on Biodiversity receptors have the potential to arise for part of, or the entirety of the works. For Biodiversity receptors, effects on their favourable conservation status or the site integrity have to be considered. Consequently, the impacts from all dredging activities have been considered across the programme of works and the assessment has identified which phases and activities are likely to cause effects on each specific Biodiversity receptor. Specifically, construction / dredging phase impacts within the working area, downstream effects on the River Parrett and the long term operational phase effects associated with water levels in the hydrologically connected parts of the Somerset Moors and Levels SPA/Ramsar and constituent SSSIs, together with low level maintenance, are the key focus of this part of the assessment.

6.7.24 The 'completion year' for the proposed dredging works is 2020 with infrequent low-level maintenance dredging likely to occur every five years to maintain the restored channel profile.

Likely Significant Effects

6.7.25 Based on the assessment methodology set out in Section 6.7, Table 6.5 summarises information about the receptors that have been identified (through the scoping process) as having the potential to be significantly affected by the proposed dredging works (due to their biodiversity conservation value and/or for which legislation could be contravened). Table 6.5 also identifies the potential effects that need to be assessed. The identified receptors are taken forward in Section 6.10 for further, post-scoping assessment.

6.7.26 The environmental changes that are likely to be caused by the proposed dredging works where a valued receptor is considered sensitive to these and which therefore have the potential to cause significant effects and/or contravention of wildlife legislation, have been identified as:

- Direct risk of injury/killing/disturbance
- Damage /destruction/reinstatement of habitat
- Change in riverine physical habitat and localised fluvial hydrological conditions
- Change in water depth/duration in areas hydrologically connected in the wider Somerset moors and Levels

- Change in water chemistry from dredging works (e.g. sediment mobilisation or accidental spillages)

Inter-Related Effects

6.7.27 There are two types of inter-related effect:

- Combined effects: when individual effects of the proposed dredging proposals combine to create a cumulative effect; and
- Interactive effects: consideration of interactions between different effects in relation to a specific receptor.

6.7.28 Combined effects normally occur when different activities associated with an activity act upon the same environmental receptor (e.g. the additive effect of physical disturbance from dredging activities upon nesting birds may occur at the same time as machinery or transport related noise and lighting that may act upon the same receptor(s) during the works). In determining such effects, consideration would be given to the sensitivity of the receptor and the magnitude of environmental change. This is considered directly within the assessments included in this Chapter and, as such, is not reported separately.

6.7.29 Interactive effects are assessed in relation to a specific receptor where the effect could be caused by the interactions of different types of effect from activities even if individually these are insignificant (e.g. the interaction of noise disturbance and lighting changes on water voles). Changes in relation to the Water Environment, as a result of the proposed dredging works, have been considered and inter-related effects on Biodiversity receptors are assessed within this Chapter.

6.7.30 Where appropriate, interactive cumulative effects across topic areas are assessed, where the nature of the effect allows professional judgment to be applied. Interactive inter-related effects are located at the end of each assessment section.

6.7.31 The assessment of effects on Biodiversity receptors has the potential to be exacerbated by climate change, and this has been incorporated into the approach to integrated and embedded mitigation as set out in this Chapter.

Receptors scoped out of further assessment

6.7.32 The following receptors have been scoped out from being subject to further assessment because the potential effects are not considered likely to be significant:

- Temporary and permanent damage/loss of habitats other than running water, standing water, marginal-inundation, hedgerow/trees.

6.8 Environmental Measures Integrated and Embedded into the Dredging Proposals

6.8.1 A range of environmental measures have been integrated and embedded into the proposals as outlined in Section 2.5. Table 6.6 outlines how these embedded measures will influence the Biodiversity assessment. A long-term Landscape and Ecological Management Plan (LEMP) will be produced and agreed prior to the

implementation of the improvement works, that will set out all appropriate measures for the delivery/ aftercare/ monitoring and long-term management for these measures.

6.8.2 Please also refer to the Strategic Ecological Mitigation Measures document which is based on agreed measures between the PIDB, EA and NE and relate to ensuring no change in water levels and duration in the hydrologically linked components of the Somerset Moors and Levels SPA and Ramsar site and functionally linked land. (Volume 3: Appendix 6J and also forming part of the Appropriate Assessment Volume 3: Appendix 6I). These are considered to be additional mitigation and are further assessed in Section 6.23.

Table 6.6: Summary of the integrated and embedded environmental measures

Receptor	Changes and Effects	Integrated/ embedded measures and influence on assessment
Statutorily Designated Sites of Nature Conservation Interest (SPA, Ramsar, SSSI, NNR, LNR) and Functionally Linked Land	Indirect disturbance on wintering birds, short term change on water quality, changes to physical riverine habitats, changes in water levels and duration in the floodplain.	Reduced length of scheme and working area, completion of works over a single period, timing to minimise works in the core wintering period, location is separated from wider SPA/SSSI/Ramsar habitats by a network of hedgerows. Creation of varied environmental features in the finished channel profile where possible resulting in a rough finish and introduction of features such as backwaters, hollows, bays to maximize physical habitat diversity above the interface between lower and upper banks (where the retained margin is present). Refer to Volume 3: Appendix 2A) Inclusion of extensive construction/dredging best practice measures, tool box talk, use of Environmental Clerk of Works, monitoring (water quality, environmental performance, habitat, protected species) and a CEMP to avoid/minimise risk of disturbance and pollution (Refer to Volume 3: Appendix 2A and Appendix 2C)) Inclusion of agreed strategic mitigation measures to ensure no change in water level and duration

Receptor	Changes and Effects	Integrated/ embedded measures and influence on assessment
		wihtin designated sites/habitats (agreed between PIDB, NE and EA). Refer to Volume 3: Appendix 6I and 6J.
Non-statutorily Designated Sites of Nature Conservation Interest	Indirect disturbance on wintering birds, short term change on water quality, changes to physical riverine habitats, changes in water levels and duration in the floodplain.	As above.
Running Water	Increased downstream conveyance of sediment. Changes to physical riverine habitats, changes in water levels and duration in the floodplain. Potential risk for short term increase in contaminants.	Reduced length of scheme and working area, completion of works over a single period, timing to complete works in the winter where flow dilution is greater to minimise water quality changes, location is separated from wider SPA/SSSI/Ramsar habitats by a network of hedgerows. Creation of varied environmental features in the finished profile where possible resulting in a rough finish and introduction of features such as backwaters, hollows, bays to maximize physical habitat diversity above the interface between lower and upper banks (where the retained margin is present). Refer to Volume 3: Appendix 2A) Inclusion of extensive construction/dredging best practice measures, tool box talk, use of Environmental Clerk of Works, monitoring (water quality, environmental performance, habitat, protected species) and a CEMP to avoid/minimise risk of disturbance and pollution (Refer to Volume 3: Appendix 2A and Appendix 2C))
Marginal-Inundation Vegetation	Increased downstream conveyance of sediment. Changes to physical riverine habitats, changes in water levels and duration in the floodplain.	Reduced length of scheme and working area, completion of works over a single period. Retention of 86% of the left-hand bank habitat where this habitat is dominant. Retention of a 1-2m buffer of reed

Receptor	Changes and Effects	Integrated/ embedded measures and influence on assessment
	Potential risk for short term increase in contaminants.	canary grass/other marginal vegetation where present and use of strip and replace techniques to provide further restoration of reed rhizome mass (or equivalent) behind the retained buffer or in alternative suitable locations where it is currently absent.
Standing Water	Loss of 81m of existing ditch habitat.	Creation of 162m of new ditch / rhynes with a varied cross section to maximize biodiversity value. Funds to be provided to NE to implement the works.
Hedgerow/Trees	Loss of 57m of species poor hedge and three trees.	Planting of 114m of new species rich hedgerow. Replacement of trees on a 2 for 1 basis. Funds to be provided to NE to implement the works.
Birds	Temporary change/reduction in availability of nesting habitats. Likely temporary increase in feeding habitat (from bare ground exposes from dredged material.	Reduced length of scheme and working area, completion of works over a single period, timing to minimise works in the core wintering period, location is separated from wider SPA/SSSI/Ramsar habitats by a network of hedgerows. Avoidance of works in the breeding season. Retention of 82% of left hand bank habitat and 18% of right hand bank habitat including a 1-2m reed fringe. Restoration of grassland and other bankside habitats through seeding and natural recolonisation. Planting of 114m of new species rich hedgerow and replacement trees on a 2 for 1 basis.
Badgers	Potential risk of disturbance/sett damage as a result of localised areas of the dredging works.	Provision of suitable fenced exclusion zones around any existing setts is active for the duration of works. Provision of ecological tool box talks and Clerk of Works. Closure of setts under licence if required.

Receptor	Changes and Effects	Integrated/ embedded measures and influence on assessment
Otter	Potential risk of disturbance of otter (generally) from the dredging activity as they are present in the local area although no holts were reported during the 2018 and 2019 surveys.	Reduced length of scheme and working area, completion of works over a single period. Retention of 82% of the left-hand bank habitat where this habitat is dominant. Retention of a 1-2m buffer of reed canary grass/other marginal vegetation where present and use of strip and replace techniques to provide further restoration of reed rhizome mass (or equivalent) behind the retained buffer or in alternative suitable locations where it is currently absent. Provision of ecological tool box talks and Clerk of Works.
Water Vole	Potential risk of injury/killing of voles and collapse of burrows from dredging works, noting that water vole are almost exclusively using the left hand bank due to typically unsuitable habitat on the right hand bank.	Reduced length of scheme and working area, completion of works over a single period. Retention of 82% of the left-hand bank habitat where this habitat is dominant. Provision of ecological tool box talks and Clerk of Works. Displacement of water vole into retained high quality adjacent habitat under Natural England licence with vegetation reduction/removal occurring from mid-September 2019 followed by endoscope examination and destructive search (hand and/or machine) prior to dredging in that location. Retention of a 1-2m buffer of reed canary grass/other marginal vegetation where present and use of strip and replace techniques to provide further restoration of reed rhizome mass (or equivalent) behind the retained buffer or in alternative suitable locations where it is currently absent.

Receptor	Changes and Effects	Integrated/ embedded measures and influence on assessment
		Restoration of habitat through natural recolonization and seeding.
Hairy Click Beetle	Potential risk of killing and loss of habitat (typically reed canary grass marginal habitats)	Reduced length of scheme and working area, completion of works over a single period. Retention of 82% of the left-hand bank habitat where this habitat is dominant. Provision of ecological tool box talks and Clerk of Works. Translocation of specifically confirmed hairy click beetle habitat within site and similar position on the bank face to ensure environmental conditions remain the same. Retention of a 1-2m buffer of reed canary grass/other marginal vegetation where present and use of strip and replace techniques to provide further restoration of reed rhizome mass (or equivalent) behind the retained buffer or in alternative suitable locations where it is currently absent. Restoration of habitat through natural recolonization and seeding. Monitoring of the presence of hairy click beetle and condition/extent of suitable habitat post works.
Fish	Potential risk in reduced water quality from accidental spillages during construction. Change in physical habitat conditions at the interface with the upper bank from the re-profiling works.	Reduced length of scheme and working area, completion of works over a single period, timing to complete works in the winter where flow dilution is greater to minimise water quality changes and avoiding sensitive breeding periods, location is separated from wider SPA/SSSI/Ramsar habitats by a network of hedgerows. Creation of varied environmental features in the finished profile where possible resulting in a rough finish

Receptor	Changes and Effects	Integrated/ embedded measures and influence on assessment
		and introduction of features such as backwaters, hollows, bays to maximize physical habitat diversity above the interface between lower and upper banks (where ther retained margin is present). Refer to Volume 3: Appendix 2A) Inclusion of extensive construction/dredging best practice measures, tool box talk, use of Environmental Clerk of Works, monitoring (water quality, environmental performance, habitat, protected species) and a CEMP to avoid/minimise risk of disturbance and pollution (Refer to Volume 3: Appendix 2A and Appendix 2C)) Priority dredging in the dry. In the event of elevated flows, provision of suitably experienced Ecological Clerk of Works and supervision of dredging placement to recover any fish present, with provision of aerated clean water to allow fish to recover before being returned downstream. Monitoring of physical and fish habitat post works through repeat River Habitat Survey.
Amphibians and reptiles	Risk of disturbance/injury/killing if present	Avoidance of likely places of rest/shelter/hibernacula. Provision of tool box talks. Ecological Clerk of Works. Sequential removal of vegetation to promote dispersion (on a precautionary basis if present) and inspection as material is being removed.

6.8.3 Table 6.7 provides a summary comparison of areas of habitat lost through the proposed works (including both the dredging and placing of sediment) and delivered through the integrated/ embedded ecological mitigation and enhancement proposals. These areas are represented on Figures 6.3a to 6.3d location in Volume 4: Figures.

Table 6.7: Comparison of areas/ lengths of receptor habitat loss/ replacement through the development and the integrated and embedded environmental measures

Receptor	Habitat loss through improvement works	Area of associated habitat delivered through the improvement works
Statutorily Designated Sites of Nature Conservation Interest (SPA, Ramsar, SSSI, NNR, LNR) and Functionally Linked Land	No habitat loss but potential for variation in water depth and duration in hydrologically linked areas	No change in habitat affected by potential for variation in water depth and duration in hydrologically linked areas due to implementation of agreed (PIDB, NE and EA) strategic mitigation (See Volume 3: Appendix 6I and J).
Non-statutorily Designated Sites of Nature Conservation Interest	No habitat loss but potential for variation in water depth and duration in hydrologically linked areas. No impact on typical tidal channel and submerged/marginal features	No change in habitat affected by potential for variation in water depth and duration in hydrologically linked areas due to implementation of agreed (PIDB, NE and EA) strategic mitigation (See Volume 3: Appendix 6I and 6J).
Running Water	No direct impact/loss on typical tidal channel and submerged/marginal features	Increased diversity of habitats in higher flow conditions above the interface between the lower-upper bank on 18% of the left-hand bank with all other areas retained and along the majority of the right-hand bank. Use of retained fringe and retention of features in the low flow channel to preserve lower flow conditions and diversity to maintain current submerged habitats for fish and invertebrates. Monitoring of conditions and evolution of the restored cross section.
Marginal-Inundation Vegetation	870m2 on the left-hand bank (15% of existing habitat) and 1937m2 on the right-hand bank (40% of existing habitat) although this does not always comprise reed canary grass	Additional reed canary grass rhizome mass will be translocated to adjacent nearby areas where hairy click beetle is present and in areas where other features require this, subject to conditions encountered. This will be achieved though strip and replacement/anchored on a suitable position on the lower bank face, using an excavator with natural plant regeneration supported by cattle exclusion for 12 months and monitoring and management expected to result in further re-

Receptor	Habitat loss through improvement works	Area of associated habitat delivered through the improvement works
		establishment of this habitat along the toe of the dredged bank face within 5 years.
Standing Water	81 m of ditch habitat	81m of ditch habitat with an enhanced profile to maximize biodiversity benefit
Hedgerow/Trees	57m of hedge and 3 trees	57m of hedge and >6 trees
Birds	57m of hedge and 3 trees	57m of hedge and >6 trees
Badgers	0 setts	0 setts – all other riparian foraging habitat to be reinstated
Otter	0 holts, no loss of river corridor	0 holts – all other riparian habitat to be reinstated
Water Vole	Circa 300m of habitat supporting water vole burrows	Circa 300m bank restored/created to provide conditions for water vole burrows to be re-established.
Hairy Click Beetle	Retention of the 1-2m reed fringe where Hairy Click beetle have been found. See Marginal Habitats above	Translocation of all habitat known to currently support hairy click beetle through strip and replace techniques within local parts of the Site. Monitoring and management intervention to ensure successful recovery and hairy click beetle presence. See Marginal Habitats above.
Fish	No impact on typical tidal channel and submerged/marginal features	Increased diversity of habitats in higher flow conditions above the interface between the lower-upper bank on 18% of the left-hand bank with all other areas retained and along the majority of the right-hand bank. See running water above.

6.9 Assessment Methodology

6.9.1 The approach to the assessment methodology is set out in Chapter 4: Approach to preparing the Environmental Statement, and specifically in Sections 4.5 to 4.7. However, whilst this has informed the approach that has been used in this Biodiversity assessment, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of this Biodiversity assessment.

6.9.2 Information for the assessment derives from the results of the desk study, baseline surveys, flood modelling, supplemented by published information (e.g. on potential Biodiversity receptors' status, distribution, sensitivity to environmental changes and ecology) and professional knowledge of ecological processes and functions.

6.9.3 For each scoped-in receptor, effects have been assessed against the predicted future baseline conditions for that receptor (assumed to be no notable difference to the current baseline as noted in Section 6.5) during and after the works. This future baseline has been defined using information as defined in Section 6.7 about the likely future use and management of the Site in the absence of the proposed dredging works, known population trends (for species) and any other proposed developments (consented or otherwise) that may act cumulatively with the proposed dredging works to affect Biodiversity receptors. Assessment of hydrological / hydraulic changes (please refer to Chapter 7: Water Environment) has been based upon a worst-case scenario. A precautionary basis has also been taken where appropriate, in this Chapter.

6.9.4 Throughout the assessment process, findings about potential for significant effects were used to inform the definition of requirements for additional baseline data collection and the identification of environmental measures to be incorporated into the extent and methodology for the proposed dredging works (in order to avoid or reduce adverse effects or to deliver enhancements). Measures to comply with relevant legislation have also been included. The results of the assessment reflect the final design (i.e. incorporating the environmental measures).

6.9.5 For each receptor, the assessment deals with the effects of dredging, and the effects post-dredging/operation (including limited infrequent maintenance). As more information has become available about the proposed dredging works and about the habitats and populations of important and legally protected species, the scope of the assessment has been refined to focus on those receptors that have the potential to be significantly affected. Each scoped-in receptor has then been subject to further assessment of how it was likely to be affected by the works, allowing for environmental changes that could affect the receptor both during and after completion of the dredging.

6.9.6 A worst-case scenario has been used for the assessment, based upon the existing baseline and expert opinion, to ensure that the predicted impacts are not underestimated. The environmental measures have been identified based on the worst-case scenario to ensure that any effects upon valued receptors are avoided where possible and minimised where this is not possible so that residual effects are not significant.

6.9.7 The results from additional monitoring will confirm whether the worst-case scenario is present, or whether the effects are actually less severe. If the effects are less severe than the worst-case mitigation, compensation and habitat provision (which has been designed based on worst-case assessment) can be refined and targeted at the actual effects.

Methodology for prediction of effects

6.9.8 The method for the prediction of effects is based on Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines; these guidelines are widely regarded by the ecology profession as the 'industry standard'.

6.9.9 The assessment is based upon not only the results of the desk study and field surveys, but also relevant published information (on potential Biodiversity receptors' status, distribution, sensitivity to environmental changes and ecology), and professional knowledge of ecological processes and functions.

6.9.10 The effects on each scoped-in receptor have been assessed against the predicted future baseline conditions for that receptor. The future baseline has been defined using information about the likely future use and management of the Site in the absence of the proposed dredging, known population trends (for species where available) and any other proposed activities that may act cumulatively with the proposed dredging works to affect Biodiversity receptors.

6.9.11 Throughout the assessment process, findings about potential likely significant effects were used to inform the definition of requirements for additional baseline data collection and the identification of embedded environmental measures that are incorporated into the proposals (in order to avoid or reduce adverse effects or to deliver required enhancements as necessary for receptors where legislation has been derogated). The results of the assessment, as set out later in this Chapter, reflect the final proposed dredging works (i.e. incorporating the embedded environmental measures, which include methodologies for the proposed works) as well as the locations of specific embedded environmental measures.

6.9.12 The spatial extent of the assessment of each potential likely significant effect reflects the area occupied by the receptor that is being assessed and the ZoI associated with the environmental changes that are likely to affect the receptor (refer to Box 6.4). Thus, if part of a designated Biodiversity site is located within the ecological ZoI relating to a particular environmental change, an assessment was made of the effects on the site as a whole. A similar approach was taken for areas of notable habitat. For species that occur within an ecological ZoI that relates to a change that could significantly affect that species, an assessment was carried out on the total area that is used by the affected individuals or population of the species (e.g. for foraging).

6.9.13 Where appropriate for each receptor, the assessment deals in an integrated way, with the effects of all phases of the proposed works. Effects within each of the phases have been detailed, where there are distinct differences between those phases. The level of magnitude of change is subsequently concluded. It is a consequence of the levels of change within each phase, taking into account transitions between those changes, and the length of time over which those changes persist.

Significance evaluation methodology

6.9.14 The assessment has been informed by the specific details of all works associated with the proposed dredging and embedded environmental mitigation. The evaluation of

effects on receptors are considered following the methodology presented below, and in the context of the programme set out in Chapter 2, which describes the delivery of the dredging works. Integrated and embedded environmental measures consist of those described in Section 6.8.

6.9.15 For some environmental topics, published guidance is available with regard to significance evaluation. Where such guidance exists, even if in draft, it has been utilised to inform the development of the significance evaluation methodologies contained within this ES. This is applicable to Chapter 6: Biodiversity which uses Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (CIEEM, September 2018).

6.9.16 Using information about the way in which sites/habitats/species are likely to be affected by the proposed dredging works, each change (from the baseline situation) that is assessed has been assigned a level of 'magnitude', based on the definitions set out in Table 6.8.

Table 6.8: Guidelines for the assessment of change of magnitude

Magnitude of Change	Criteria and Resultant Effect
High	The change permanently (or over the long-term) negatively affects the conservation status of a habitat/species, reducing the ability to sustain the habitat or the population level of the species within a given geographic area. Relative to the wider habitat resource/species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised. There may be a decrease in the level of biodiversity conservation value of the receptor.
Medium	The change permanently (or over the long-term) negatively affects the conservation status of a habitat/species reducing the ability to sustain the habitat or the population level of the species within a given geographic area. Relative to the wider habitat resource/species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be a decrease in the level of biodiversity conservation value of the receptor. Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations would experience little or no reduction. Any changes are likely to be within the range of natural variability and there would be no short-term or long-term change to the conservation status of habitat/species receptors or the integrity of designated sites.
Low	The quality or extent of designated sites or habitats or the sizes of species' populations, experience some small-scale reduction. These changes are likely to be within the range of natural variability and there is not expected to be any permanent change in the conservation status of the species/habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the receptor in terms of its biodiversity conservation value

Very Low/ Neutral	A change to the level of which is so low, it is not discernible on designated sites or habitats or the sizes of species' populations, or changes that balance each other out over the lifespan of a project.
Will not occur	The effect will not occur due to an absence of an environmental pathway to the sensitive receptor.

6.9.17 The criteria in Table 6.8 refer to the terms 'integrity' and 'conservation status'. For habitat areas and species, an effect is assessed as being significant if the favourable conservation status of a receptor would be changed by the proposed dredging. Conservation status is defined by the CIEEM guidelines as follows:

- For habitats - the sum of the influences acting on the habitat and its typical species, that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species within a given geographical area; and
- For species - the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area.

Negative Effects

6.9.18 A negative effect is considered to be significant if the favourable conservation status of a receptor is compromised by the proposed dredging works.

6.9.19 A similar procedure has been used for designated sites that are affected by the development, except that the focus is on the effects on the integrity of each site, defined by the CIEEM guidelines as:

"…the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified."

The assessment of effects on integrity draws upon the assessment of effects on the conservation status of the features for which the site has been designated.

6.9.20 The decision as to whether the favourable conservation status has been compromised is made using informed judgement based on the findings of the assessment of how the resource would be affected.

Positive Effects

6.9.21 A positive effect is assessed as being significant if development activities are predicted to cause:

- An improvement in the condition of a habitat/species population from unfavourable to unfavourable recovering or favourable (noting that condition data are only available for SSSIs but that professional judgement has been used to apply the same principle to habitats/species elsewhere); or

- Partial or total restoration of a site's favourable condition.

6.9.22 If a species population, habitat or site is already in favourable condition, it is still possible for there to be a significant positive effect. There is, however, no simple formula for determining when such effects are significant and decisions about significance therefore have to be made on a case by case basis using professional judgement.

6.10 Assessment of Effects: Somerset Levels and Moors SPA, Ramsar and Constituent SSSIs/NNR/LNR

Predicted Effects and their Significance

6.10.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the Favourable Conservation Status of the SPA/Ramsar/SSSI and NNR/LNR sites is set out below, separated into construction and operational effects. Please refer to Volume 3: Appendix 6I for the Appropriate Assessment which provide a robust evaluation of these potential effects and is summarised here.

6.10.2 The sensitivity of these receptors has been set at very high due to their notable importance, designated and legally protected status.

Construction

6.10.3 Potential construction phase impacts are associated with indirect impacts from disturbance (wintering water birds); temporary short-term changes in water quality affecting mobile species (particularly fish). The magnitude of the change is considered to be very low resulting in a Very Low (probably significant) effect, although this has been reduced to **Minor (not significant)** due to the application for the embedded mitigation measures set out in Table 6.6 and professional judgement.

Operation/ Post-Construction

6.10.4 Potential operational changes are associated with temporary medium-term changes to river habitat used by mobile species (fish); and, changes to water levels on moors (resulting in changes in habitat quality for wintering water birds and Ramsar invertebrates, with a subsequent effect on populations. The magnitude of the change is considered to be low resulting in a Significant (Major) effect, although this has been reduced to **Minor (not significant)** due to the application of the embedded mitigation measures set out in Table 6.6, the additional and agreed mitigation measures set out in **Section 6.23** and professional judgement.

6.10.5 A summary of the results of the assessment of statutorily designated sites is provided in Table 6.9.

Table 6.9: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Somerset Levels and Moors SPA, Ramsar and Constituent SSSIs/ and associated NNR/LNR	Very High	Very Low	Moderate (could be significant) but reduced to Minor (not significant) through the application of professional judgement	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to the designated sites from the construction phase can be minimised to an acceptable Non-Significant level.
Operation	Very High	Low	Major (significant) but reduced to Minor (not significant) though the application professional judgement and additional mitigation	The works will result in changes to water depths and duration in certain locations which although relatively minor in variation, could result in subtle modifications to conditions associated with the designated Features of Interest. Taking into account the embedded mitigation listed in Table 6.6 and the additional mitigation listed in Section 6.23 it is reasonable to conclude that the risk to the designated sites from the operational phase can be minimised to an acceptable Non-Significant level.

6.11 Assessment of Effects: Non-Statutorily Designated Sites

Predicted Effects and their Significance

6.11.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the status of the hydrologically connected non-statutory sites is set out below, separated into construction and operational effects. Please refer to Volume 3: Appendix 6I for the Appropriate Assessment which provide a robust evaluation of these potential effects which is used as a model for the effects on these sites.

6.11.2 The sensitivity of these receptors has been set at high due to their notable importance, presence of Priority Habitats and Species.

Construction

6.11.3 Potential construction phase impacts are associated with indirect impacts from disturbance and temporary short-term changes in water quality affecting mobile species. The magnitude of the change is considered to be low resulting in a Moderate (probably significant) effect, although this has been reduced to **Minor (not significant)** due to the application of the embedded mitigation measures set out in Table 6.6 and professional judgement.

Operation/ Post-Construction

6.11.4 Potential operational changes are associated with temporary medium-term changes to river habitat used by mobile species and, changes to water levels on moors (resulting in changes in habitat quality for wintering water birds and Ramsar invertebrates, with a subsequent effect on populations. The magnitude of the change is considered to be low resulting in a Probably Significant (Moderate) effect, although this has been reduced to **Minor (not significant)** due to the application of the embedded mitigation measures set out in Table 6.6, the additional and agreed mitigation measures set out in Section 6.23 and professional judgement.

6.11.5 A summary of the results of the assessment of non-statutorily designated sites is provided in Table 6.10.

Table 6.10: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Hydrologically connected non-statutorily designated site	High	Low	Moderate (could be significant) but reduced to Minor (not significant) though the application of professional judgement	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to the designated sites from the construction phase can be minimised to an acceptable Non-Significant level.
Operation	High	Low	Moderate (could be significant) but reduced to Minor (not significant) though the application of professional judgement	The works will result in changes to water depths and duration in certain locations which although relatively minor in variation, could result in subtle modifications to conditions associated with the designated Features of Interest. Taking into account the embedded mitigation listed in Table 6.6 and the additional mitigation listed in Section 6.23 it is

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				reasonable to conclude that the risk to the designated sites from the operational phase can be minimised to an acceptable Non-Significant level.

6.12 Assessment of Effects: Running Water

Predicted Effects and their Significance

6.12.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the status of the running water (the River Parrett) is set out below, separated into construction and operational effects.

6.12.2 The sensitivity of this receptors has been set at high due to their notable importance as a Priority Habitats also supporting legally protected and Priority Species

Construction

6.12.3 Construction phase impacts are considered to be associated with short-term changes in water quality leading to increased stress on aquatic ecological receptors and potentially chronic or acute responses. Taking into account the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Minor (not significant)** effect.

Operation/ Post-Construction

6.12.4 Operational changes are associated with increased downstream conveyance of sediment, changes to physical riverine habitats, changes in water levels and duration in the floodplain. These are potential risks for short term increase in contaminants and disturbance/displacement of certain riverine species during limited ongoing maintenance. Taking into account the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Minor (not significant)** effect.

6.12.5 A summary of the results of the assessment of non-statutorily designated sites is provided in Table 6.11.

Table 6.11: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Running Water	High	Very Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to the running water from the construction phase can be minimised to an acceptable Non-Significant level.
Operation	High	Very Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to the running water from the operation phase can be minimised to an acceptable Non-Significant level.

6.13 Assessment of Effects: Marginal Inundation Vegetation

Predicted Effects and their Significance

6.13.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the status of the running water (the River Parrett) is set out below, separated into construction and operational effects.

6.13.2 The sensitivity of this receptors has been set at medium due to their importance as a Priority Habitats also supporting legally protected and Priority Species, but also relative large extent in the local area and ability to recolonize adjacent habitat areas.

Construction

6.13.3 Construction phase impacts are considered to be associated with short-term changes in extent of this habitat and its successful re-establishment in the first 12 months post dredging. Taking into account the extent of the retained habitat on the left-hand bank and the retention/strip and replacement of habitat on the right-hand bank where possible, and the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Low. This results in a **Minor (not significant)** effect.

Operation/ Post-Construction

6.13.4 Operational changes are associated with increased downstream conveyance of sediment, changes to physical riverine habitats, changes in water levels and duration in the floodplain. These may cause periods of stress on the marginal habitat under a new channel/habitat equilibrium is reached. It is considered however, that the habitat will continue to establish where conditions are optimal which will be informed by ongoing monitoring. Any maintenance will seek to avoid further removal of this habitat. Taking into account the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Low. This results in a **Minor (not significant)** effect.

6.13.5 A summary of the results of the assessment of non-statutorily designated sites is provided in Table 6.12.

Table 6.12: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Marginal Habitat	Medium	Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to the marginal habitat from the construction phase can be minimised to an acceptable Non-Significant level.
Operation	Medium	Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to the marginal habitat from the operation phase can be minimised to an acceptable Non-Significant level.

6.14 Assessment of Effects: Standing Water

6.14.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the status of the standing water (the short length of ditches 82m affected by the works) is set out below, separated into construction and operational effects.

6.14.2 The sensitivity of this receptors has been set at medium due to their importance as a Priority Habitats, but also current poor condition and large extent in the local area and ability to be colonized once new ditches are created through the scheme.

Construction

6.14.3 Construction phase impacts are considered to be associated with short-term small reduction in extent of this habitat (82m) and the creation of circa 160m replacement ditch (rhyne) and its successful re-establishment in the first 12 months post dredging. Taking into account the extent of this habitat in the local area, its current poor condition, and the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Low. This results in a **Minor (not significant)** effect.

Operation/ Post-Construction

6.14.4 Operational changes are not predicted as a result of the operation of the scheme. Any maintenance will avoid further removal of this habitat. Taking into account the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Negligible (not significant)** effect.

6.14.5 A summary of the results of the assessment of non-statutorily designated sites is provided in Table 6.13.

Table 6.13: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Standing Water	Medium	Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to the standing water from the construction phase can be minimised to an acceptable Non-Significant level.
Operation	Medium	Very Low	Negligible (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to the standing water from the operational phase can be minimised to an acceptable Non-Significant level.

6.15 Assessment of Effects: Hedgerows and Trees

6.15.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the status of hedgerows and trees circa 50m of species poor hedgerow and 3 trees is set out below, separated into construction and operational effects.

6.15.2 The sensitivity of this receptors has been set at Low due to their limited ecological diversity, recognising Priority Habitat status in general, and relatively extensive presence in the local area and ability to plant and maintain these features through the scheme.

Construction

6.15.3 Construction phase impacts are considered to be associated with short-term small reduction in extent of this habitat (50m for hedgerow and 3 trees) and the creation of circa 100m replacement species rich hedge and more than 6 trees and its successful re-establishment in the first 12 months post dredging. Taking into account the extent of this habitat in the local area, its current poor condition, and the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Low. This results in a **Negligible (not significant)** effect.

Operation/ Post-Construction

6.15.4 Operational changes are not predicted as a result of the operation of the scheme. Any maintenance will avoid further removal of this habitat. Taking into account the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Negligible (not significant)** effect.

6.15.5 A summary of the results of the assessment on hedgerow and trees is provided in Table 6.9.

Table 6.14: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Hedgerow	Low	Low	Negligible (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to the hedgerow and trees from the construction phase can be minimised to an acceptable Non-Significant level.

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Operation	Medium	Very Low	Negligible (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to the hedgerow and trees from the operational phase can be minimised to an acceptable Non-Significant level.

6.16 Assessment of Effects: Kingfisher and Breeding Bird Habitat

6.16.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the status of Kingfisher and nesting birds, is separated into construction and operational effects.

6.16.2 The sensitivity of these receptors has been set at high due to their ecological importance, recognising Priority Habitat and legally protected status, mobile ability to use alternative habitats and relatively extensive presence in the local area.

Construction

6.16.3 Construction phase impacts are considered to be associated with short-term reduction in the extent of potential nesting habitat for all birds but also the potential to create more suitable extents of bank nesting habitat for kingfisher. These habitats will be modified outside of the nesting period with its successful re-establishment in the first 12-24 months post dredging. Taking into account the extent of this habitat in the local area, its current poor condition on the right-hand bank where most of the dredging is to occur, the magnitude of the change is considered to be Low. This results in a Moderate (could be significant) effect, but through the application of the embedded mitigation identified in Table 6.6 and professional judgement, this results in a **Negligible (not significant)** effect.

Operation/ Post-Construction

6.16.4 Operational changes are not predicted as a result of the operation of the scheme. Any maintenance will avoid further removal of this habitat. Taking into account the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Minor (not significant)** effect.

6.16.5 A summary of the results of the assessment on birds is provided in Table

Table 6.15: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Nesting birds including kingfisher	High	Low	Moderate (could be significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to the birds from the construction phase can be minimised to an acceptable Non-Significant level.
Operation	High	Very Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to birds from the operational phase can be minimised to an acceptable Non-Significant level.

6.17 Assessment of Effects: Badger

6.17.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the status of badger, is separated into construction and operational effects.

6.17.2 The sensitivity of these receptors has been set at Medium due to conservation and legally protected status, mobile ability to use alternative habitats and relatively extensive presence in the local area.

Construction

6.17.3 Construction phase impacts are considered to be associated with short-term risk of disturbance or damage of a small number of setts in the general vicinity of the working area. Taking into account the extent of this habitat in the local area, and through the application of the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Low. This results in a **Minor (not significant)** effect.

Operation/ Post-Construction

6.17.4 Operational changes are not predicted as a result of the operation of the scheme. Any maintenance will avoid further works in the vicinity of any badger setts of this habitat. Taking into account the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Minor (not significant)** effect.

6.17.5 A summary of the results of the assessment on badger is provided in Table 6.16.

Table 6.16: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Badger	Medium	Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to badger from the construction phase can be minimised to an acceptable Non-Significant level.
Operation	High	Very Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to badger from the operational phase can be minimised to an acceptable Non-Significant level.

6.18 Assessment of Effects: Water Vole

6.18.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the status of water vole, is separated into construction and operational effects.

6.18.2 The sensitivity of these receptors has been set at Medium due to conservation and legally protected status, mobile ability to use alternative habitats and relatively extensive presence in the local area.

Construction

6.18.3 Construction phase impacts are considered to be associated with short-term risk of injury/killing and/or disturbance or damage of water vole burrows largely where these animals are present on the left-hand bank (circa 350m of bank). Further details can be seen in Figure 6.4a to 6.4d (see Volume 4: Figures). Taking into account the extent of this habitat in the local area, and through the application of the embedded mitigation identified in Table 6.6, including the implementation of an appropriate Method Statement forming part of a Natural England Water Vole licence, the magnitude of the change is considered to be Low. This results in a **Minor (not significant)** effect.

Operation/ Post-Construction

6.18.4 Operational changes are not predicted as a result of the operation of the scheme. Any maintenance will avoid further works in the vicinity of any water vole burrow. Taking into account the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Minor (not significant)** effect.

6.18.5 A summary of the results of the assessment on water vole is provided in Table 6.17.

Table 6.17: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Water vole	Medium	Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to water vole from the construction phase can be minimised to an acceptable Non-Significant level.
Operation	High	Very Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to water vole from the operational phase can be minimised to an acceptable Non-Significant level.

6.19 Assessment of Effects: Otter

6.19.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the status of otter, is separated into construction and operational effects.

6.19.2 The sensitivity of these receptors has been set at High due to conservation and legally protected status, mobile ability to use alternative habitats and relatively wider presence in the local area.

Construction

6.19.3 Construction phase impacts are considered to be associated with short-term risk of disturbance in the general vicinity of the working area. Taking into account the extent of suitable habitat in the local area, and through the application of the

embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Minor (not significant)** effect.

Operation/ Post-Construction

6.19.4 Operational changes are not predicted as a result of the operation of the scheme. Any maintenance will be localised and of short duration and infrequent (e.g. every 5 years). Taking into account the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Minor (not significant)** effect.

6.19.5 A summary of the results of the assessment on otter is provided in Table 6.18.

Table 6.18: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Otter	High	Very Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to badger from the construction phase can be minimised to an acceptable Non-Significant level.
Operation	High	Very Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to badger from the operational phase can be minimised to an acceptable Non-Significant level.

6.20 Assessment of Effects: Ramsar Invertebrates

6.20.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the status of Ramsar invertebrates, is separated into construction and operational effects.

6.20.2 Only one species of these invertebrates is likely to be associated with the working area. This is the sea club-rush hover fly (*Lejops vittata*), which require stands of sea-club rush as adults. The sensitivity of this receptor has been set at High due to conservation and legally protected status.

Construction

6.20.3 Construction phase impacts are considered to be associated with short-term risk of disturbance or damage to stands of sea club rush in the general vicinity of the working area. These habitats will be retained in situ avoiding potential effects to this species. As such, through this measure and the application of the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Minor (not significant)** effect.

Operation/ Post-Construction

6.20.4 Operational changes are not predicted as a result of the operation of the scheme. Any maintenance will avoid further works will avoid stands of sea club rush habitat. Taking into account this and the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Minor (not significant)** effect.

6.20.5 A summary of the results of the assessment on Ramsar Invertebrates is provided in Table 6.19.

Table 6.19: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Ramsar Invertebrates	High	Very Low	Minor (not significant)	Suitable habitat will be retained in situ. Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to badger from the construction phase can be minimised to an acceptable Non-Significant level.
Operation	High	Very Low	Minor (not significant)	Suitable habitat will be retained in situ. Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to badger from the operational phase can be minimised to an acceptable Non-Significant level.

6.21 Assessment of Effects: Hairy Click Beetle

6.21.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the status of Hairy Click Beetle, is separated into construction and operational effects.

6.21.2 The sensitivity of these receptors has been set at High due to conservation and legally protected status.

Construction

6.21.3 Construction phase impacts are considered to be associated with risk of disturbance or damage to marginal habitat dominated by reed canary grass that is used by this species. Taking into account the extent of the retained habitat in the local area, the retention of the majority of this habitat on the left-hand bank, the natural recovery of this habitat and through the application of the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Low. This results in a Moderate (could be significant) effect although through the use of further strip and replacement of this habitat type where possible, monitoring measures and reactive management and the application of professional judgement, it is considered reasonable to have an overall conclusion of **Minor (not significant) effects**.

Operation/ Post-Construction

6.21.4 Operational changes are not predicted as a result of the operation of the scheme. Any maintenance will avoid further works associated with the key reed canary grass/ marginal habitat associated with the species and will implement ongoing monitoring and management for this species. Taking into account this and the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Minor (not significant)** effect.

6.21.5 A summary of the results of the assessment on badger is provided in Table 6.20.

Table 6.20: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Hairy Click Beetle	High	Low	Moderate (could be significant)	Taking into account the embedded mitigation listed in Table 6.6 and professional judgement it is reasonable to conclude that the risk to Hairy Click Beetle from the construction phase can be minimised to an acceptable Non-Significant level.

Operation	High	Very Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to Hairy Click Beetle from the operational phase can be minimised to an acceptable Non-Significant level.

6.22 Assessment of Effects: Amphibians and Reptiles

6.22.1 Consideration of how the Proposed Improvement Works could affect environmental conditions and therefore cause a negative effect on the status of amphibians and reptiles, is separated into construction and operational effects.

6.22.2 The sensitivity of these receptors has been set at Medium due to conservation and legally protected status, mobile ability to use alternative habitats and relatively extensive presence in the local area.

Construction

6.22.3 Construction phase impacts are considered to be associated with short-term risk of disturbance or damage of potential terrestrial habitat in the general vicinity of the working area. Taking into account the extent of this habitat in the local area, and through the application of the embedded mitigation identified in Table 6.6, including the use of a Precautionary Method Statement for the Works, tool box talk and Clerk of Works, to minimise the risk of encountering/ affecting amphibians/reptiles, the timing of some of the works to when these animals are expected to be in suitable overwintering habitats not present within the Site and the restoration of this habitat post works, the magnitude of the change is considered to be Low. This results in a **Minor (not significant)** effect.

Operation/ Post-Construction

6.22.4 Operational changes are not predicted as a result of the operation of the scheme. Any maintenance will avoid any resting/overwintering habitats should they be established in the future. Taking into account the embedded mitigation identified in Table 6.6, the magnitude of the change is considered to be Very Low. This results in a **Minor (not significant)** effect.

6.22.5 A summary of the results of the assessment on amphibians and reptiles is provided in Table 6.21.

Table 6.21: Summary of Significance of Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction				
Amphibians and reptiles	Medium	Low	Minor (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to amphibians and reptiles from the construction phase can be minimised to an acceptable Non-Significant and legally compliant level.
Operation	Medium	Very Low	Negligible (not significant)	Taking into account the embedded mitigation listed in Table 6.6 it is reasonable to conclude that the risk to amphibians and reptiles from the operational phase can be minimised to an acceptable Non-Significant level.

6.23 Consideration of optional additional mitigation or compensation

6.23.1 Additional biodiversity mitigation will be implemented through the delivery of this scheme.

6.23.2 This relates to strategic mitigation agreed and implemented by the PIDB, Environment Agency and Natural England, to ensure that no change to the current water depth/duration within the Somerset Levels Moors and Levels SPA/Ramsar/SSSI and functionally linked land will occur, arising from the increase in downstream conveyance below Stathe Bridge from the proposed dredging. This is set out in Volume 3: Appendix 6J, and incorporated into the Appropriate Assessment (Volume 3: Appendix 6i) and reproduced below in Table 6.22.

Table 6.22 Additional Strategic Mitigation Associated with the Somerset Levels SPA, Ramsar, SSSIS and Functionally Linked Land

Area	Description	Type	Responsible Body	When	Comments
Aller Moor	Remedial Work at Beer Wall	Structures	EA	Autumn 2019	Not part of Sowy scheme mitigation but as completion of Beer Wall project.
	WLMP change – winter penning levels for Aller Moor	Operational protocols WLMP – at least 300mm of water in ditches at winter pen	EA/IDB	Winter 2020/21	Use EA structures Church Drove, Oxleaze Drove and IDB structure Stathe Drove to pen winter level. Operate IDB weirs Lucas Rhyne, Black Withies and Leazeway to hold water in winter. Maintain a 30 cm ditch water level.
	Operation of Langacre and Beer Wall	Operational Protocols	EA	Completion of beer wall 2019/20	Operate to effect 'no change' in winter months. ('no change' baseline - before the culverts were put under the road).
	Monitoring & WLMP update	Monitoring & WLMP update	IDB	2020 – 2022	Ecological and Monitoring plan.
King Sedgemoor (Non SSSI) Butleigh and Walton Moor, 18 ft rhyne	Telemetry to be installed at Nythe structure	Telemetry	IDB	Autumn 2019	Telemetry installed at Greylake.
	Monitor using telemetry at greylake and nythe structure	Monitoring	IDB	2020 – 2022	If effect seen then investigate operate Greylake sluice differently (environmental trigger). Or alternative option: purchase a piece of land and create new RWLA.
	Consider Operation of Greylake sluice Consider Nythe structure or other alternative.	Operating Protocols (Monitoring & Mitigation)	IDB	2022	If required and feasible, as informed by monitoring.
West Sedgemoor (SSSI)	Monitoring compliance of existing WLMPS	Operating Protocols (Monitoring & Mitigation)	EA	2020/21	Monitoring to trigger operational protocol of pumping stations.
Long Load (King's Moor and Witcombe Bottom)	Monitoring	Overwintering bird survey and existing data review	IDB	2019/20	
Long Load (King's Moor and Witcombe Bottom)	Operation of Long Load pumping station and syphon	Environmental Trigger points	2 year approach to affect.		Only if effect seen through monitoring? Operate to effect 'no change' in winter months. Retention of ecologically beneficial water.
Wet Moor (non SSSI)		Monitor		Effect after two years	Water levels, telemetry, levels and duration
Wet Moor (non SSSI)	Operate North barrier bank and sluice. Operate HEPs for the West	Environmental Trigger Points			Operate to effect 'no change' in winter months. Retention of ecologically beneficial water. Only if effect seen through monitoring?
West Moor (SSSI)	Replace RWLA structures	Structure	EA to install, IDB to operate	2020/21	Replace 4 stock structures, modification of 2 tilting weirs) approx. £100k Alternative Option: Possibility to extend the RWLA, re resilient wet grassland project.
West Moor (SSSI)	WLMP	WLMP review			

Area	Description	Type	Responsible Body	When	Comments
Huish Level	Assess potential WLM options.	Study	IDB/EA	2021	
Moorlinch RWLA	Refurbish the existing RWLA, Consider minor extension to the east	Construction/Appraisal	EA – Construction IDB – Future operation	2021 -2023	
King Sedgemoor SSSI	Monitor site conditions	Monitoring	IDB / EA	2020 ONWARDS	
Curry Moor SSSI	Monitor site conditions	Monitoring	IDB /EA	Continuation of existing	Monitoring already in place for Curry moor,

6.24 Conclusions of Significance Evaluation

6.24.1 Taking into account the:

- Detailed ecological baseline;
- Consultee feedback;
- The integrated and embedded ecological mitigation and enhancement measures (including the additional strategic mitigation); and
- The assessment of likely significant effects as set out in Tables 6.10 to 6.21 (and other Chapters of this ES).

6.24.2 It is considered reasonable to conclude that no significant likely effects will occur to important Biodiversity receptors, including legally protected species and designated sites, from either the construction or operational stages of the proposed dredging works.

6.25 Implementation of Environmental Measures

6.25.1 Table 6.23 describes the environmental measures embedded within the proposals and the means by which they will be implemented.

Table 6.23: Summary of environmental measures to be implemented – relating to Biodiversity

Environmental Measure	Responsibility for Implementation	Compliance Mechanism
Improvement works has been designed to minimise working area, duration of works and low sensitive timings.	PIDB	Inherent to the scheme design. SSSI Assent. Waste Exemption.
Creation of multi-stage channel with varied features/finish to maximize habitat diversity	PIDB and Principal Contractor	Contract of Work and CEMP

Environmental Measure	Responsibility for Implementation	Compliance Mechanism
Use of best dredging practice measures, including us of GPS and automated water quality monitoring, site management and equipment/ works monitoring	PIDB and Principal Contractor	Contract of Work and CEMP. SSSI Assent
Environmental/Ecological Clerk of Works to oversee environmental mitigation, monitoring, audits, corrective actions, reporting	PIDB and Environmental Consultants	CEMP
Strategic Water Level Management Mitigation	PIDB and EA	Agreed Schedule of Water Level Management dated 28th June 2019
Retention of the majority of the priority/important reed canary grass bank habitat on the left-hand bank and part of the right-hand bank.	PIDB and Principal Contractor	Scheme design and Contract of Work
Strip and replace of additional reed canary grass habitat where possible but including all areas where hairy click beetles have been recorded in 2018.	PIDB and Principal Contractor	Scheme design and Contract of Work
Planting of 114m of new species rich hedgerow, replacement of trees on a 2 for 1 basis.	PIDB and Natural England	SSSI Assent
Creation of 162m of new ditch	PIDB, Principal Contractor and Natural England	Contract of Works. SSSI Assent
Retention of majority of key water vole habitat. Displacement into this habitat under water vole licence and associated Method Statement. Tool Box Talks, Ecological Clerk of Works and monitoring. Restoration of suitable habitat through re-profiling and strip and replacement of reed canary grass.	PIDB and Principal Contractor	Contract of Works. Natural England Water Vole Licence.
Retention of the majority of suitable habitat. Translocation of all habitat where hairy click beetle was recorded within site in 2018. Restoration of suitable habitat where possible through re-profiling and strip and replacement of reed canary grass.	PIDB, Principal Contractor and Environmental Consultant.	Scheme design and CEMP.
Priority dredging in the dry. In the event of elevated flows, provision of suitably experienced Ecological Clerk of Works and	Principal Contractor and Environmental Consultant	Scheme design and Contract of Works and CEMP.

Environmental Measure	Responsibility for Implementation	Compliance Mechanism
supervision of dredging placement to recover any fish present, with provision of aerated clean water to allow fish to recover before being returned downstream.		
Avoidance of likely places of reptile/amphibian rest/shelter/hibernacula. Provision of tool box talks. Ecological Clerk of Works. Sequential removal of vegetation to promote dispersion (on a precautionary basis if present) and inspection as material is being removed.	Principal Contractor and Environmental Consultant	Scheme design and Contract of Works and CEMP.
Monitoring and reporting on works, including mechanisms to stop works, vary method to overcome any concerns	Principal Contractor and Environmental Consultant	Scheme design and Contract of Works and CEMP.
Implementation of habitat restoration and monitoring works, including identification of future need for maintenance dredging and further mitigation/supervision/monitoring/mitigation during any future maintenance	PIDB and Environmental Consultant	LEMP – to be agreed with partners prior to start of operational period.

6.26 References

Please refer to Chapter 11.

7 SURFACE WATER AND FLOOD RISK

7.1 Introduction

7.1.1 This chapter of the Environmental Statement (ES) assesses the likely significant effects of the Proposed Improvement Works with reference to the Water Environment. For the purposes of this ES, taking into account the EIA scoping process (see Volume 3: Appendices 1A, 1B and 1C) , the Water Environment focuses on surface water and flood risk drawing on a range of modelling work (see Volume 3: Appendix 7A and Appendix 7B) as well as elements associated with the aquatic environment associated with the Water Framework Directive (WFD), which includes associated WFD protected areas (including relevant aspects of water quality), hydro-morphology and aquatic ecology. The chapter should be read in conjunction with Chapter 2: Description of the Proposed Development and with reference to relevant parts of Chapter 6: Biodiversity, and Chapter 8: Population where common receptors have been considered and where there is an overlap or relationship between the assessment of effects. Consideration of water resources and groundwater (hydrogeology) have been scoped out of further assessment (see Section 7.7).

7.1.2 This chapter is supported by a separate Further Dredging Assessment (contained in Volume 3: Appendix 7A) and Oath to Burrowbridge Dredging Hydraulic Assessment Technical Note (contained in Volume 3: Appendix 7B) that provides all relevant information and/or cross-referring to existing supporting hydrological and flood risk technical work. It is also supported by a separate Water Framework Directive Regulatory Compliance Assessment of the Proposed Improvement Works (contained in Volume 3: Appendix 7C) and the Appropriate Assessment (and its supporting documents) of the proposals (see Volume 3: Appendix 6I).

7.2 Limitations of this assessment

7.2.1 The key limitations of this assessment are linked to the hydraulic modelling used to inform the analysis. There are several necessary uncertainties in the hydraulic modelling due to the approximations that are required to estimate flows over this wide a catchment, and in simulating the hydraulic flow mechanisms of the system under a variety of conditions.

7.2.2 To reduce this uncertainty observed flood event data is used to produce inflows to the model. These are based on the winter 2013/14 flood event, and the Spring 2012 flood event. The 2013/14 flood event is used to represent a major flood event, whereas the Spring 2012 event represents a more regular flood event.

7.2.3 No attempt is made to quote what the annual probability of these events would be, as this will vary greatly depending on the location and variable (e.g. flow, peak level or flood duration) that is being considered. Instead impacts are quoted in terms of their relative difference during these events.

7.2.4 During the more significant flooding, when large areas are inundated, the model can be considered to be or high accuracy, as this is what it was intended to simulate, and

what it has been calibrated against. During more regular flooding, the model will be less accurate in certain areas. This is due to elements of the local drainage system within the moors not being fully represented.

7.2.5 When assessing the impacts at more regular flooding the results from the modelling are used alongside more detailed local knowledge to produce final conclusions.

7.2.6 The model is based on the topographical survey data that was available at the time of the assessment. The system is highly mobile and therefore the results represent those that would have occurred at a set moment in time. This further supports the need to quote results as relative changes rather than absolute values.

7.2.7 The WFD Assessment that has been consulted upon and completed to inform this Chapter of the ES has adopted existing and published River Basin Management Plan data and as such the WFD Assessment has inherited any limitations in this monitoring data set.

7.2.8 When considering the in-combination effects of the Environment Agency's Sowy/King's Sedgemoor Drain (KSD)scheme this has assumed the scheme involves the following (confirmed by the Environment Agency by email on 25/06/19).

7.2.9 The scheme aims to increase the flood protection in Somerset through increasing the conveyance of the River Sowy/KSD. The scheme will be delivered through a number of work packages. These are: Culverts beneath the A392 at Beer Wall (completed), Smoothing over an existing lump of masonry from underneath the old A38 road bridge at Dunball (partly complete, more planned in 2020), Dredging at Parchey bridge and Dunball (completed autumn 2018), Bank restoration/raising and ecological enhancements along the Sowy/King's Sedgemoor Drain (Parchey Bridge to KSD/Sowy confluence to Monks Leaze clyse). Material for the bank improvements will be sourced from the channel.

7.2.10 To ensure compliance with environmental legislation there will be refurbishment/repair of a number of control structures, located at Westmoor Raised Water Level Area (RWLA), Moorlinch RWLA and Egypt's clyse. Modelling of the Sowy/KSD enhanced capacity scheme has identified certain areas that will require changes to current pumping operations to maintain a 'no change' status to existing water levels. Proposed changes to the current pumping operational levels will be implemented through 'operational protocols' that have been agreed with the key statutory bodies before implementation (see Volume 3: Appendix 6J). The agreed pumping operational protocols will include, environmental trigger points to define revised pump operational timing, duration and levels. These operation protocols will supersede the levels currently stated within the existing WLMP for the area. Any agreed deviations from the existing WLMPs will subsequently be captured in future WLMP updates post Sowy/KSD scheme implementation.

7.3 Relevant legislation, policy and technical guidance

Legislative context

7.3.1 The following legislation is relevant to the assessment of the effects on Surface Water and Flood Risk receptors:

- The European Union (EU) Water Framework Directive (WFD): focuses on delivering an integrated approach to the protection and sustainable use of the water environment on a river basin scale;
- Environmental Permitting (England and Wales) Regulations 2016 (Statutory Instrument (SI) 2016 No. 1154), as amended: of relevance to surface water and drainage design due to infiltration to ground. The regulations include requirements for the prevention of hazardous substances entering groundwater and the control of non-hazardous pollutants to avoid pollution of groundwater;
- The Water Resources Act 1991: states that it is an offence to cause or knowingly permit polluting, noxious, poisonous or any solid waste matter to enter controlled waters. The Act was revised by the Water Act (2003)4, which sets out regulatory controls for water abstraction, discharge to water bodies, water impoundment and protection of water resources;
- The Land Drainage Act 1991 and 1994: places responsibility for maintaining flows in watercourses on landowners and gives Local Authorities powers to serve a notice on landowners to ensure works are carried out to maintain flow of watercourses;
- The Flood Risk Regulations: published in December 2009, these Regulations transpose the EU Floods Directive into UK law;
- The Flood and Water Management Act, 2018: sets out the Government's proposals to improve flood risk management (building on the 2009 regulations), and also covers approaches to water quality and to ensure water supplies are more secure. The act also provided for the formation of Lead Local Flood Authorities (LLFAs) and aims to create a simpler and more effective means of managing the risk of flood and coastal erosion; and
- The Bathing Water Regulations 2013: implements updated European legislation[5] on bathing water and simplifies its management and surveillance methods. It also provides a more proactive approach to informing the public about water quality using four quality categories for bathing waters — 'poor', 'sufficient', 'good' and 'excellent'.

Technical Guidance

7.3.2 A summary of technical guidance relevant to the Water Environment assessment is given in Table 7.1.

[5] Directive 2006/7/EC concerning the management of bathing water quality and repealing Directive 76/160/EEC.

Table 7.1: Technical guidance relevant to this Water Environment Assessment

Technical guidance	Relevance to this assessment
CIRIA (2001) C532: Control of water pollution from construction sites	The guidance provides practical help for consultants and contractors on how to plan and manage construction projects to control water pollution.
CIRIA (2015) C741: Environmental good practice on site[6]	A training aid used to provide practical advice about managing construction on site to minimise environmental impacts.
Environment Agency. Clearing the Waters for All. November 2017.	Guidance on how to assess the impact of your activity in estuarine (transitional) and coastal waters for the Water Framework Directive (WFD). Enviroin

7.4 Data gathering methodology

Study area

7.4.1 The study area for this assessment of surface water and flood risk is considered as the hydrological 'Zone of Influence' (ZoI) which is shown in Figure 2.1 in Volume 4: Figures. Figure 7.1 and 7.2 (in Volume 4: Figures) illustrate the potential changes in flood extent and duration as a result of the dredging proposals.

7.4.2 The ZoI incorporates the WFD water body unit in which the Proposed Improvement Works are located and hydrologically interact with through direct pathways and linkages with potential receptors (a screening of WFD units has been completed in the WFD Regulatory Compliance Assessment which can be found in Volume 3: Appendix 7C).

7.4.3 The WFD water body unit is the Parrett Transitional Water Body (Parrett TraC) which is over 40km long and has water body ID GB40805210900. The hydrological connectivity associated with the ZoI includes all of the lowland reaches of the Rivers Parrett, Isle, Yeo, Tone, Sowy and Cary and the Kings Sedgemoor Drain, along with the lowland moor areas that are connected to these moor areas as shown in Figure 2.1 and Figure 7.1 and 7.2 (contained in Volume 4: Appendix 7). It also extends to consider downstream bathing waters e.g. at Burnham on Sea as part of the WFD Assessment.

7.4.4 The upstream extents of the assessment are approximately the A303 on the Rivers Parrett, Yeo and Isle, Somerton on the River Cary and Taunton on the River Tone. The study area also extends downstream to the mouth of the River Parrett at Steart to enable consideration of Bathing Water Directive waters.

[6] CIRIA (2015) C741: Environmental good practice on site, [Online]. Available at: https://www.ciria.org/ItemDetail?iProductCode=C741D [Checked 28/08/18].

Desk study

7.4.5 The assessment has utilised the existing hydraulic model that was developed by the Environment Agency following the 2014 Somerset Levels flood event. This has been modified, where necessary, to represent the proposed changes as part of this scheme and those included in the in-combination effects.

7.4.6 Existing data published on the transitional water body WFD classification status for each WFD element was reviewed and used. This data was drawn from the Environment Agency's RBMP2 2015 catchment data explorer resource[7]. Additional data/information from various reports, monitoring and studies has also been identified, reviewed and discussed for each classification element (to help characterise the baseline condition of these elements using all available information). Full details can be found in the Water Framework Directive Regulatory Compliance Assessment (located in Volume 3: Appendix 7C).

Survey work

7.4.7 Cross sectional survey data has been regularly collected on the River Parrett and Tone following the 2014 flooding and subsequent channel improvement works. This has been used to update the Environment Agency model. Details on the model and the survey data is contained in River Parrett – Further Dredging Assessment[8], which is located in Volume 3: Appendix 7A).

7.4.8 The latest LiDAR data[9] has been used to assess the impacts of flooding to the moor areas.

7.4.9 A wide range of baseline surveys were completed in 2018 and written up as separate technical notes (please refer to Volume 3 of this ES) to inform the design and assessment of the proposed Improvement Works and their findings have been incorporated into the WFD Regulatory Compliance Assessment and this Chapter of the ES, as well as Chapters 6 and 8.

7.4.10 These are listed below:

- Phase 1 Habitat Survey (SDBC, Johns Associates 2018)
- Fish Habitat Survey (SDBC, Johns Associates 2018).
- Fixed Point Photography Report (Johns Associates, June 2018). Phase 1 Habitat Survey (SDBC, Johns Associates 2018).
- Oath to Burrowbridge Benthic Macroinvertebrate Study (Johns Associates, June 2018).
- Oath to Burrowbridge Ramsar Invertebrate Study (Johns Associates, June 2018).
- Results of a Survey for Hairy Click-Beetle Synaptus Filiformis on the River Parrett, Somerset. AEcol, July 2018.
- Loughborough University, Dr A Pledger, Dr Dapeng Yu, Prof. Paul Wood, Dr

7 https://environment.data.gov.uk/catchment-planning/

8 AW Water Engineering (2018) River Parrett – Further Dredging Assessment, Somerset Drainage Boards Consortium

9 Sourced online from https://environment.data.gov.uk/dataset/2e8d0733-4f43-48b4-9e51-631c25d1b0a9

David Ryves. Interim report: Ecological Impacts of Water Injection Dredging, Somerset Levels.

- Loughborough University, Dr Andrew Pledger. Technical note: 2018 pre-dredge River Parrett fish surveys.
- River Parrett Oath to Burrowbridge Dredge. Soils Screening Report. On Behalf of Somerset Drainage Boards Consortium (Hydrogeo, July 2018).
- Particle Size Distribution Results: Sediment Samples Oath to Burrowbridge. June 2018.
- Parrett Dredging Trials Monitoring Report Ambios vFinal. 2017.

7.5 Overall baseline

Current baseline

Location, topography and land-use

7.5.1 The Rivers Parrett, Cary and Tone and associated tributaries flow from their sources in the Quantock and Brendon Hills, Blackdown Hills and Dorset Heights to the southwest, south and east of the catchment and flow in a north and westerly direction into an extensive lowland floodplain, before flowing out into the Bristol Channel through the Parrett Estuary.

7.5.2 The watercourses in this catchment are typically steep, narrow and unconstrained in the uplands; while further downstream they are slower moving and heavily constrained by flood embankments, particularly through the low-lying, flat floodplain characteristic of the Somerset Levels and Moors, where the lowland rivers are known as 'high-level carriers'.

7.5.3 These are watercourses that are embanked on both sides, fully or partially straightened and counter-drained on either side. Their normal water levels are set above the level of the surrounding floodplain. The whole lowland area of the catchment is heavily dependent on a controlled system of drainage and water level management, which has been in place for hundreds of years.

Geology – solid and drift geology

7.5.4 The area is underlain by the Tone and Somerset Streams groundwater body. The bedrock is Mercia Mudstone which is not an aquifer. At the Curry Moor pumping station a borehole indicates that the depth to bedrock is about 15m. Soft alluvial clays and silts overlie a well-defined peat layer. Below this there is firm alluvial clay above the Mudstone. None of these materials are considered to be aquifers. Immediately south of the River Tone there are pockets of terrace gravels which are above the level of the alluvial floodplain. There is also a small outcrop of Sherwood Sandstone in this area. This can be an aquifer. However, there is a good aquiclude of clay between the river and the sandstone. As a result, there are no predicted effects from the proposed works and hydrogeology has not been considered further.

7.5.5 The underlying rock types influence the catchment's response to rainfall, with relatively fast run-off from the impermeable uplands in the east and water-logged

conditions dominating conditions in the lowlands. The area does not have any major aquifers so groundwater flooding is not a major risk; however, flooding in lowland areas, can take a long time to drain away.

Hydrology

7.5.6 The runoff from the upstream catchments and lowland moor areas is heavily influenced by the wetness of the ground. Following sustained periods of heavy rainfall, the runoff gradually increases until reaching almost 100% once the soils become saturated.

7.5.7 The lower reaches of the River Parrett and Tone are tidally influenced for about 30-40km inland depending on the height of the tide. Spring flood tides bring in sediment up the watercourse from the Severn Estuary. These tidal sections are generally depositional in nature and their sediment dynamics and modified physical can influence channel capacities. During periods of high fluvial flow following rainfall, the river will erode some of this sediment and convey it towards the Severn Estuary. Generally, this only occurs within the lower parts of the channel, but will also often lead to slumping of the deposited sediment above this level.

Water Framework Directive (including water quality)

7.5.8 The Proposed Improvement Works are associated with approximately 2.1km of the Parrett Transitional Water Body (Parrett TraC) which is over 40km long and has water body ID GB40805210900 under the Water Framework Directive. It is located within the South West TraC and is a Transitional Water water body type. The overall water body status (in 2015) was Moderate. The Ecological status was Moderate. The chemical status was Good and there is a Target water body status and deadline of Good by 2027. The water body Supports Good hydromorphology.

7.5.9 The site of the Proposed Improvement Works is a Heavily Modified Water Body. The watercourse has been modified over centuries to benefit land drainage and flood protection.

7.5.10 No highly sensitive habitats associated with the Water Framework Directive are associated with the area of the Proposed Improvement Works.

7.5.11 Please refer to Volume 3: Appendix 7C, the Water Framework Directive Regulatory Compliance Assessment, for full details of the character and classification of the site under the WFD.

Flood risk

7.5.12 During fluvial flooding, there is wide scale inundation of the moor areas in the Parrett catchment. Depending on the moor, this flooding can either drain back to the river by gravity when river levels recede, or has to be pumped back into the river. Flooding happens to a large area of moors upstream of Langport, which acts to restrict the flow passing this point in a flood. Pumping out of these moors is restricted partially based on when the spillways are overtopping on the rivers downstream of Langport.

7.5.13 The flood water that does continue downstream of Langport either passes into the River Sowy via Monks Leaze Clyse sluice or the spillways, or continues down the River Parrett. Flood water in the River Sowy is discharged into the Kings Sedgemoor Drain, which then discharges into the River Parrett at low tides at Dunball Sluice. The River Parrett is joined by the River Tone at Burrowbridge. During flood conditions, flow passes over spillways and banks from the River Tone into Curry and Hay Moors. The amount of overtopping will be partially influenced by the flows within the River Parrett.

7.5.14 During very extreme flood events (as happened in 2013/14), flood water can then pass from Curry Moor into Salt and North Moors via Athelney spillway and Lyng Cutting. This can lead to flooding to the communities of Moorland and Fordgate.

7.5.15 The capacity of the main river, tributaries and drainage channels in the lower reaches can be significantly reduced by high tidal water levels backing up flow in the tidal River Parrett and Tone. This can further exacerbate the flooding in these areas.

7.5.16 The works that have been undertaken by the SRA and partner organisations following the 2013/14 flood have significantly reduced the risk of flooding. The greatest reductions in flood risk have been to Curry, Hay, North and Salt Moors. The impact is most pronounced on North Moor, where, if the 2013/14 flooding was to be repeated, the scale of flooding would be dramatically reduced.

Drainage

7.5.17 The moors within the study area are managed by a series of different, and sometimes connected, drainage systems. During normal conditions water levels are controlled by a system of different water level control structures, consisting of weirs, sluice gates, flapped outfalls and pump stations.

7.5.18 Various Water Level Management Plans (WLMPs) are in place to define how these systems are operated during different times within the year. The operation of the structures is influenced by the time of year and current and predicted water levels within the moors and main watercourses.

7.5.19 Further details on the WLMPs and their use on the designated sites is discussed within Chapter 6: Biodiversity.

WFD Protected and Nature Conservation Sites

7.5.20 The Water Framework Directive Assessment (see Appendix xx) identifies the presence of 6 WFD protected areas. These are listed below:

- Somerset Levels and Moors SPA UK UK9010031 Conservation of Wild Birds Directive;
- Severn Estuary SPA UK9015022 UK0013030 Conservation of Wild Birds Directive;
- Severn Estuary SAC UK9015022 Habitats and Species Directive;
- Berrow North of Unity Farm UK35500 Bathing Water Directive;
- Burnham Jetty North UK35300 Bathing Water Directive; and

- Brean UK35600 Bathing Water Directive.

7.5.21 Key sites that have been statutorily designated for their nature conservation interest and associated with the Proposed Improvement Works (also considered as part of the WFD Compliance Assessment) are the Somerset Levels and Moors SPA and constituent SSSIs, the Severn Estuary SPA and constituent SSSIs and the Severn Estuary SAC and constituent SSSIs.

7.5.22 In addition, North Moor SSSI is located some 300m from the downstream extent of the dredging location. Designated for grassland and rhyne system and inhabited by an array of flora and fauna. It is utilised by wintering bird populations, similar to the SLM SPA.

7.5.23 Southlake Moor NNR is a National Nature Reserve that also comprises small parts of Sedgemoor SSSI.

7.5.24 The River Parrett, Middle Moor to Screech Owl Site of Nature Conservation Importance (SNCI) covers the entire works area. Designated as a LWS as it is a catchment seen to be in regular use by otter, and supports Red Data Book invertebrate species and other notable species. The river and its habitat also support water vole *Arvicola amphibius*, and is one of only three recent localities in the UK for the hairy click beetle *Synaptus filiformis*, whose larvae live in waterlogged soil and whose adults live in emergent vegetation, particularly reed canary-grass *Phalaris arundinacea*. In addition, the river supports a large number of coarse fish species as well as supporting a run of eel *Anguilla Anguilla*, Atlantic salmon *Salmo salar*, and sea trout *Salmo trutta*.

7.5.25 The River Tone and Tributaries SNCI is located immediately to the west of Burrowbridge. This site has been designated as it is considered to be the best example in the county of a whole river from source to saline limit of each river type; comprise a section of river with a minimum of modification to bed and water level and a high proportion of semi-natural habitats on both banks; have high biological quality; and show regular recent use by otter, including all bankside wetland, scrub and woodland.

7.5.26 Please refer to Volume 3: Appendix 7C, the Water Framework Directive Regulatory Compliance Assessment, for full details of the character and classification of the site under the WFD.

Population (people, property, land and infrastructure)

7.5.27 The immediate Study Area associated with the Proposed Improvement Works encompasses a number of small villages and hamlets as well as numerous farms. The hamlet of Stathe is located on the left-hand bank approximately half way along the dredged stretch. There are a number of properties (40-50) that are located adjacent to the river on the dredged stretch. The village of Burrowbridge is located at the downstream (northern) end of the works.

7.5.28 The wider area affected by changes to fluvial flooding and water levels as a result of the proposed works includes properties, businesses, infrastructure (e.g. road network) and agricultural land within or adjacent to the Parrett catchment moors upstream of the proposed works, and on the Sowy and Kings Sedgemoor Drain moors.

7.5.29 The Study Area is spatially dominated by aspects of the rural economy, such as fields of grazing livestock and arable land. Much of the land is floodplain which is grazed typically by cattle and sheep. Much of the land within the Study Area is covered by the Environmental Stewardship and Countryside Stewardship agri-environment schemes that provide funding to farmers to deliver effective environmental management. Much of the land within the Study Area is covered by Entry Level and Higher Level schemes as part of the overall Environmental Stewardship Scheme. The Environmental Stewardship scheme is now closed to new applicants, although the existing schemes below will run until the end of the agreement (10 years for most Higher Level schemes and 4 years for Entry Level). The new Countryside Stewardship (CS) scheme was introduced during late 2016; and several farms within the Study Area are now covered by Mid and Higher Tier CS schemes.

7.5.30 However, it should be noted that the most recent Census data for the area shows a spread of economic activity in which the local population are engaged. The most dominant industry in terms of numbers employed in the area, and in Somerset as a whole, is the wholesale and retail trade. Human health and social work and education are also notably high employment areas. Agriculture, forestry and fishing account for a relatively small proportion of employment (Somerset County Council Partnership Intelligemce Unit, 2011)

7.5.31 The main fisheries use of the Parrett and Tone is the glass eel fishery. This operates from the 14th February to the 25th May annually. Licences are issued by the Environment Agency on an unlimited basis (i.e. there is no limit to the number issued). In 2013, 169 licences were issued, which resulted in the capture of 4,000kg of glass eels. This comprises 90% of the Environment Agency south-west region, and 40% of the total UK glass eel catch. The economic value of the fishery fluctuates annually, depending on the prevailing market price of glass eels, which is in turn a reflection of supply (i.e. natural abundance and catches). Thus, in 2013 the value was £100/kg, which, given the capture of 4,000kg would have given the fishery a value of £400,000. In May 2018, the Environment Agency reported the current legal market value of glass eels as £150/kg. However, in other years the market value has risen as high as £250-£300/kg.

7.5.32 Please refer to Chapter 8: Population for more information on this aspect of the baseline.

Recreation

7.5.33 Long Distance Paths are recreational trails which can, to varying degrees, be used for a range of non-motorised travelling options (including walking, cycling and horse riding). Typically, they will be at least 31 miles (50km) long and will take the user more than a day to walk, but many are much longer than this. The Long-Distance Paths in the Study Area are comprised of a mix of Public Rights of Way (PRoWs) and permitted paths.

7.5.34 There are three Long Distance Paths within the Study Area – these are the River Parrett Trail, East Deane Way and Macmillan Way West (as shown on Figure 2). These paths are all in close proximity to the proposed dredging locations along the River Parrett; and run along the right-hand bank of the channel for the entire dredging stretch. The Parrett Trail section immediately adjacent to the dredging works is majority permitted path (2105m). This section of path is permitted by Natural England as the landowner. A small section of path adjacent to planned dredging works (immediate downstream of Beasleys spillway and Stathe Bridge) is a PRoW footpath (approx. 50m).

Tourism

7.5.35 Burnham-on-Sea is a designated beach for bathing and is tested by the Environment Agency regularly under the EU Bathing Water Directive (2006/7/EC). Burnham-on-Sea is located approximately 3km downstream of the confluence of the River Parrett with the Severn Estuary. The confluence is approximately 30km from the downstream extent of the dredging area.

7.5.36 Many tourism-related businesses in Burnham-on Sea are reliant on the quality of the beach and bathing water and could suffer if the bathing water quality does not satisfy the requirements of the new Directive in 2015.

7.5.37 A water quality warning is currently in place for Burnham Jetty North and bathing is therefore not advised at this area due to poor water quality (based on monitoring results from 2014 to 2017). This bathing water is subject to short term pollution. Short term pollution is caused when heavy rainfall washes faecal material into the sea from livestock, sewage and urban drainage via rivers and streams. At this site, the risk of encountering reduced water quality increases after rainfall and typically returns to normal after 1-3 days. The Environment Agency makes daily pollution risk forecasts based on rainfall patterns and will issue a pollution risk warning if heavy rainfall occurs to enable bathers to avoid periods of increased risk. 63 warnings advising against swimming due to an increase risk of short term pollution were issued in 2017 for Burnham Jetty North bathing water (Environment Agency, n.d.).

7.5.38 The Somerset Levels are a popular destination for walkers, cyclists, ornithologists, photographers, for arts and crafts and broader tourism.

7.5.39 Please refer to Chapter 8: Population for more information on this aspect of the baseline.

Traffic and transport

7.5.40 The local road network incorporates one main road (the A361) which runs through Burrowbridge immediately to the north of the proposed dredging works. Through its connections with the A372 and A38, this road provides connectivity for local communities within the Study Area to nearby towns such as Taunton, Bridgwater and Glastonbury; as well as providing an important access route for emergency services. The A361 crosses the River Parrett at Burrowbridge immediately to the north of the proposed dredging works.

7.5.41 There are also a large number of interconnected secondary local roads within the Study Area. Many of the secondary roads are below 4m in width and serve to connect small communities and farms with the rest of the road network and surrounding villages. In places, the secondary roads also form part of Long Distance Paths.

7.5.42 Of these secondary local roads, Stathe Road runs alongside the left-hand bank of the River Parrett for the entire dredging stretch, before it crosses the River Tone close to its confluence with the Parrett at Burrowbridge (Stanmoor Bridge). There are no other road bridges associated with this stretch of the River Parrett.

7.5.43 Much of the local road network (including the A361) was flooded during the recent flooding events, in particular the winter flooding of 2013/14. Flood risk to this road has been significantly improved as a result of the flood risk benefits achieved by the 2014/15 capital dredges and the further SRA improvement works. However, the road remains at risk of future flooding in extreme events.

7.5.44 A major railway line runs through the Study Area east-west, connecting London to Devon and Cornwall (through Taunton). A second line runs through North Moor connecting Bristol to towns in Devon and Cornwall. This line was closed during the 2013/14 flood event, but significant improvement works have been undertaken to the line since this time to increase its resilience to flooding.

7.5.45 Please refer to Chapter 8: Population for more information on this aspect of the baseline.

Future baseline

Factors influencing the baseline

7.5.46 There are several factors that could influence the Water Environment baseline in the future.

7.5.47 It is accepted that winters will become generally wetter and summers will typically drier (e.g. UK Climate Protections 2009[10](UKCP0) or general Met Office projections)). Peak rainfall intensities could increase, with a consequent effect on the frequency and magnitude of elevated river flows and associated flooding.

[10] Met Office, UK Climate change projections (2009), [online]. Available at: http://ukclimateprojections.metoffice.gov.uk/media.jsp?mediaid=87894&filetype=pdf

7.5.48 The surface water environment and flood risk within the ZoI could be affected by future modification in land use (e.g. agricultural practices, and or urban developments), which in turn could affect sources and magnitude of sediment inputs, changes in water body morphology, rates and patterns of rainfall infiltration and flow pathways.

7.5.49 However, these factors will generally all influence absolute values and not the relative values that are considered within this assessment. They will therefore not change the conclusions made in this assessment on the impacts of the scheme.

7.5.50 The WFD requires the achievement of good status/potential by 2027 and therefore it is expected that the status of lower quality WFD water bodies will improve over time.

7.6 Consultation

7.6.1 Please refer to Volume 3: Appendices 1B and 1C for further details on consultation completed and responses received.

7.7 Scope of the assessment

Spatial scope

7.7.1 The spatial scope covers the area associated with the Proposed Improvement Works and the ZoI which, together, form the basis of the study area.

7.7.2 The Source-Pathway-Receptor approach has been used to inform the spatial scope of the assessment including e.g. potential sources of flood risk and pollution, and pathways which these sources could be used to reach receptors.

7.7.3 The ZoI has been defined through consideration of the WFD waterbody associated with the Proposed Improvement Works and downslope of these (the Parrett TRac) as this is the fundamental unit used nationally for reporting on the water environment. It also takes into account modelling work completed for the Somerset Levels and Moors by the Somerset Drainage Boards Consortium[11]. As such the ZoI represents a maximum potential spatial extent of effects.

Temporal scope

7.7.4 The construction phase assessment (and any residual/remedial works in the following 12 months) has been assumed to run from 2019-2020 inclusive. Please refer to Chapter 2: Description of the Proposed Improvement Works for full definitions of the different elements of the proposed works.

7.7.5 The operational phase assessment commences from 2021 and incorporates maintenance dredging as required, but not more frequently than a 5-year cycle, to maintain the improved flow conveyance achieved in 2019-2020 from the Proposed Improvement Works.

[11] AW Water Engineering (2018) River Parrett – Further Dredging Assessment, Somerset Drainage Boards Consortium

7.7.6 At the time of writing, there is no indication that the role of the SRA or the PIDB (or equivalent) would change or that there is any indication that the operational regime including current future maintenance as described in this ES would cease. As a consequence, it has been concluded that the operational conditions would continue in the long term and there is no decommissioning stage associated with the Proposed Improvement Works or an assessment of this as part of the ES.

7.7.7 From a WFD Waterbody status, it has been assumed that the Parrett TRac will achieve good ecological potential by 2027. This assessment considers potential effects on the basis that this waterbody is currently at 'good ecological potential' status.

7.7.8 Cumulative Development is assessed separately within Chapter 9: Cumulative Effects Assessment of the ES.

Climate change

7.7.9 Climate change has not been explicitly included within the assessment of flood risk. This is because the assessment has been a relative one based on changes to set flood events, that are based on historic data. No attempt has been made to classify the flood risk in terms of annual probabilities. The main reason for this is that it is not possible to apply a single annual probability to a flood event, as it will depend on the location and the variable that is being considered (e.g. peak flow, flood level or duration of flooding).

7.7.10 With the impacts of climate change the frequency of these events will become more regular, however the relative impact of the proposed works on these events will stay the same. Over time climate change is going to result in increased frequency of flooding to the study area, and potentially an increase in the severity of events. Therefore, if no works are undertaken other than the existing maintenance activities in this area, the flood risk will increase over time.

Potential receptors

Identification of receptors that could be subject to likely significant effects

7.7.11 Receptors have been identified by applying the source-pathway-receptor principals for the surface water environment associated with the ZoI and downslope/stream from the Proposed Improvement Works (See Figure 2.1 and Figure 6.1 in Volume 4: Figures).

7.7.12 The baseline assessment (incorporating all detailed technical studies referred to and included within the appendices of this ES), the following class of receptors have been included:

- Aquatic ecology (including WFD elements)
- Water quality and hydro-morphology (Including WFD elements);
- Flood risk receptors on site and off site (people, property, infrastructure and land).

Likely significant effects

7.7.13 The assessment considers the likely significant effects of the Proposed Improvement Works on the receptors identified above. These are considered to be:

- Contamination of surface water bodies downslope of the area of works during the construction period (e.g. fuels/oils/lubricants from construction plant, silty runoff from exposed soils and increased turbidity/sediment load/change in other water quality parameters in channel from dredging);
- Construction effects of the proposed improvement works and the operational effects of the increased channel capacity. It considers the effects on surface water and flood risk from these activities within the ZoI and the impacts on water quality and morphology to the water body.
- Increases in the channel conveyance and flow associated with the River Parrett downstream of the area of works and associated flow paths within the wider Somerset levels and moors within the ZoI, and associated changes in water levels and duration of standing water in protected sites associated with the WFD;
- Changes in water quantity or quality, the reduction in status/potential of the WFD waterbodies, or the deterioration of these elements of surface water dependent features or designated sites.

Receptors taken forward for assessment

7.7.14 The water environment receptors that have been taken forward for assessment are listed below:

- Water within the Parrett TRac WFD water body
- Aquatic environment receptors - designated sites and specific habitats
- Flood risk (predominantly surface water) receptors – people, property, land and infrastructure. It can be seen that there is an overlap between the receptors associated with the WFD and the aquatic environment.

7.7.15 Table 7.2 sets out the specific receptors identified for all three receptor classes identified that are to be taken forward for assessment. Figures 2.1 and 6.1 (se Volume 4: Appendix 7) shows the locations of the identified receptors within the ZoI.

Table 7.2: Surface Water and Flood Risk receptors scoped in for further assessment

Receptors	Relevant assessment criteria	Likely significant effects
River Parrett TRac catchment including the following protected areas:	The EU WFD states that all waterbodies must achieve 'good' ecological and chemical potential. Where this is not possible due to a waterbody being so affected by human activity or its	The improvement works will result in an increase in downstream flow conveyance during certain elevated flow conditions under a lower tidal state than currently occur. This is likely to positively increase the natural erosional potential of the downstream

Receptors	Relevant assessment criteria	Likely significant effects
Somerset Levels and Moors SPA Severn Estuary SPA Severn Estuary SAC Berrow North of Unity Farm Bathing Water Burnham Jetty North Bathing Water Brean Bathing Water	natural condition being such that achieving 'good' status would be infeasible or disproportionately expensive then waterbodies should aim to achieve 'good' potential.	channel, which may reduce the amount of tidal siltation over time and contribute to reducing the extent/frequency of maintenance dredging. The operation of the works may cause certain changes in water extent and duration in the wider moors and levels including within designated sites associated with a matter of a few tens of centimetres over a few hours or days. The construction of the Proposed Improvement Works may lead to unintentional release of pollutants or contaminants into the River Parrett during the construction phase and during longer terms low intensity maintenance during the operational phase. For WFD waterbodies, in an unmitigated scenario, this may lead to them either not achieving 'good' status or potential in the short term, although in this spatially limited scenario, it is considered that this would result in a downgrade of their status.
Somerset Levels and Moors Ramsar Site. Southlake Moor, West Sedgemoor, North Moor, Curry and Hay Moors SSSIs. Aller Moor SNCI. River Parrett, Middle Moor to Screech Owl SNCI	Reduction or increase in status of designated site	Potential for indirect impacts from disturbance (wintering water birds); temporary short-term changes in water quality affecting mobile species (particularly fish); temporary medium-term changes to river habitat used by mobile species (fish); and, changes to water levels on moors (resulting in changes in habitat quality for wintering water birds and Ramsar invertebrates, with a subsequent effect on populations). The scheme introduces appropriate mitigation measures in combination

Receptors	Relevant assessment criteria	Likely significant effects
		with the Environment Agency's Sowy project that are likely to maintain current conditions but have the potential to introduce some flexibility in water level management control.
People, land, property and infrastructure and off-site flood risk in the moor areas within the ZoI	The Somerset 20 Year Flood Action Plan (SRA, 2014)	The need for the proposals are to reduce flood risk. Without mitigation, the proposals have the potential to increase off-site flood risk within Curry, Hay, Salt and North Moors. In all moors, this could affect flooding to land. Within Curry Moor this could also affect people, property and infrastructure, including certain roads and public rights of way.

7.7.16 A number of potential receptors set out in the Scoping Report were scoped out from further assessment because the potential effects to those receptors are not considered likely to be significant. The consultation conducted to inform this ES did not contradict with this approach. These receptors are:

- Groundwater – not affected by the improvement proposals
- Water resources – abstractions and discharges (other than those associated with strategic water level management on the Somerset Moors and Levels)

7.8 Environmental measures embedded into the development proposals

7.8.1 A range of environmental measures have been embedded into the development proposals as outlined in Section 2.5. Table 7.3 outlines those embedded measures with a direct influence on the Water Environment assessment. Existing mitigation measures are controlled via appropriate permits, consents and agreements, and future operations will also be subject to the same controls.

Table 7.3: Summary of the embedded environmental measures

Receptor type	Changes and effects	Embedded measures
Aquatic Environment	Potential for dredging to result in temporary increased sediment load and release of contaminants (over and above those experienced in the baseline conditions). The indirect result of this could be changes to turbidity, dissolved oxygen levels and damage to eels/elvers and other fish in the commercial or ecological fishery.	Construction Environmental Management Plan to avoid/minimise and manage any potential construction phase effects (e.g. pollution, sediment mobilisation, reduced oxygen quality, deliver ecological mitigation, monitoring and

Receptor type	Changes and effects	Embedded measures
	Potential 'deterioration' in WFD status of the biological quality elements (BQEs). As well as the direct effects of damage/removal on BQEs, potential changes in hydromorphological and physico-chemical (water quality) conditions during and after dredging may have indirect effects on the BQEs. Dredging may affect the implementation of WFD 'mitigation measures' for heavily modified water bodies as stated in the River Basin Management Plan. Dredging may affect bathing water quality. Dredging and material disposal will take place within Southlake and potentially West Sedgemoor (part of the Somerset Levels and Moors SPA and Ramsar site). Direct habitat loss will be limited to loss of species-poor improved grassland on the flood embankment and a small area to the rear of the bund. This will quickly regenerate, and no significant impact due to direct habitat loss is predicted. Potential for eutrophication of ditches due to high phosphate content in runoff from dredging arisings. Extensive consultation, liaison and development of positive mitigation measures with the Environment Agency, Natural England and others has been completed. Potential for indirect impacts from disturbance (wintering water birds); temporary short-term changes in water quality affecting mobile species (particularly fish); temporary medium-term changes to river habitat used by mobile species (fish); and, changes to water levels on moors (resulting in decreased habitat quality for wintering water birds and	construction phase management). Reduction in spatial extent of dredging footprint and volume of sediment being removed/increase in conveyance. Avoidance of any works in the lower flow channel – 'the Thalweg' which provides the most valuable critical habitat and morphological features. Retention of the majority of the left-hand bank habitat and a good proportion of the right-hand bank lower reedy fringe. Strip and replacement of remaining lower reedy fringe habitat and reseeding of reinstated bank. Stock exclusion during construction and for 12 months after to maximize bank reinstatement and revegetation and mimimise the short-term risk of increased faecal indicators to Bathing Waters. Use of a silt fence and other related measures to avoid/minimise runoff into adjacent land. Provision of temporary spillways during dredging to minimise risk of soil erosion to be reinstated. Incorporation of physical habitat features into restored bank cross-section to maintain morphological value in the channel under higher flows.

Receptor type	Changes and effects	Embedded measures
	Ramsar invertebrates, with a subsequent impact on populations). Potential for direct impacts such as habitat loss or degradation (riparian areas and hydromorphology); or, indirect impacts such as changes to habitats as a result of altered water or sediment regimes. Direct loss of invertebrates (including the locally resident and nationally notable Hairy Click Beetle) as a result of removal with the dredged sediment and/ or removal of emergent and marginal vegetation. Although there are many species of notable/rare invertebrates within the nearby protected areas, a detailed habitat review by an entomological expert has concluded that the designated invertebrate assemblages are associated with the small rhynes and ditches in the moors, not the main river channels. Direct impact of habitat loss on the invertebrate assemblage associated with rhynes and ditches is very limited but will be been scoped in for further assessment. There is potential for eutrophication of ditches due to high phosphate content in runoff from dredging arisings. Changes in vegetation community within the rhynes may also result in changes to the invertebrate community, so this has been scoped into the assessment.	Landscape and Ecological Management Plan to implement post works monitoring, management and reactive change to management if required to ensure no deterioration in the aquatic environment. Implementation of agreed updated hydro-ecological protocols to ensure no change in water levels and duration of specific standing water conditions within designated sites (see Volume 3: Appendix 6J).
Flood Risk	Changes in hydraulic benefits to people, land and property. The proposed dredge has the potential to reduce flooding to an area of around 65km^2. Within, or in close proximity to this area there are approximately 200 homes that will receive some additional hydraulic benefit as a result. The proposed dredge has the potential to reduce the hydraulic benefit	Reduction in spatial extent of dredging footprint and volume of sediment being removed/increase in conveyance. Avoidance of works in areas where further impingement in flows may occur.

Receptor type	Changes and effects	Embedded measures
	already delivered to a small area associated with Curry Moor. Changed flood risk to businesses and landowners benefitting the local economy including the agricultural community. Reduced flood risk to agricultural land and associated agricultural infrastructure, will enable more continual grazing and reduce risk of death/loss of livestock. Reduced risk of road flooding will result in reduced road traffic delays with improved communications/logistics for business. Reduced risk of uncontrolled overtopping of flood embankments upstream. Uncontrolled overtopping increases the risk of breaches and failure of embankments which would lead to more widespread, and uncontrolled, flooding. Increased capacity of the channel during in channel high flows will result in increased in channel velocities downstream during low tides. This will increase the natural erosional capacity of the downstream channel, and reduce the amount of tidal siltation. Over the longer term this will reduce any negative impacts from increased siltation and reduce the required frequency of maintenance dredging. An increased channel capacity in this reach will provide additional flexibility in the overall system during flood events. This may provide greater options on the operation of structures during a flood event. These works will also potentially increase the effectiveness of future interventions.	Avoidance of works on left hand bank where there is the potential for increased seepage into adjacent properties could occur. Repair of limited areas of reservoir dam wall as a result of these proposals accelerating the timing of these planned works. Implementation of agreed updated hydro-ecological protocols to ensure no change in water levels and duration of specific standing water conditions within designated sites. (see Volume 3: Appendix 6J). Additional operation of Environment Agency pumps to ensure no increase in water levels/duration on Curry Moor.

7.9 Assessment methodology

7.9.1 The general assessment methodology is set out in **Chapter 4: Approach to Preparing the Environmental Statement**. While the general approach has been used to structure and inform this water environment assessment, further information is provided on how this methodology has been applied, and adapted as appropriate.

Determination of significance

7.9.2 The EIA Regulations require detailed assessment only of resources that are "likely to be *significantly affected* by the development" and the Regulations recognise that improvement works will affect different environmental elements to differing degrees, and that not all of these are of sufficient concern to warrant detailed investigation or assessment through the EIA process.

7.9.3 The EIA Regulations themselves do not define significance and it is therefore necessary to state how this will be established for the EIA. The significance of an effect resulting from a development (during construction or operation) is most commonly assessed with reference to the sensitivity (or value) of a given surface water receptor and the magnitude of the change as a result of the development. This approach provides a mechanism for identifying areas where mitigation measures may be required and to identify the most appropriate measures to alleviate the risk presented by the improvement works. This approach has been adopted for this Chapter of the ES and the effects of the Proposed Improvement Works on the water environment will be evaluated assuming that the embedded environmental measures identified in **Table 12.9** are implemented.

7.9.4 In terms of the surface water environment, the EIA will be largely based on professional judgement, based on experience and the use of best practice guidance, such as that published by CIRIA, Defra and the West of England Authority. The key assessment criteria of sensitivity and magnitude will relate to the aquatic environment and flood risk receptors.

7.9.5 The basis for assessing receptor sensitivity is set out in Table 7.4.

Table 7.4. Receptor Sensitivity

Sensitivity	Criteria	Receptor type	Examples
Very High	Feature with a high quality and rarity at an international scale, with little potential for substitution	Aquatic environment	Conditions supporting sites with international conservation designations (Special areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar sites), where the designation is based specifically on aquatic features or where these are essential in supporting the designated features.

Sensitivity	Criteria	Receptor type	Examples
		Flood risk	Land use types defined as 'Essential Infrastructure' (i.e. critical national infrastructure) in the NPPF flood risk vulnerability classification. For the purposes of this assessment this is considered to include all mainline railways and strategic roads (the M5 in this case), managed by Highways England.
High	Feature with a high yield and/or quality and rarity at a national scale, with a limited potential for substitution	Aquatic environment	Conditions supporting sites with national conservation designations (i.e. SSSI, National Nature Reserves (NNR)) where the designation is based specifically on aquatic features or where these are essential in supporting the designated features. Receptor water body: all relevant WFD supporting elements (All biological quality elements e.g. fish, invertebrates etc.; All physico-chemical quality elements e.g. dissolved oxygen, phosphate etc.; and Hydromorphological supporting elements) at least good status/potential.
		Flood risk	Land use types defined as 'Highly Vulnerable' in the NPPF flood risk vulnerability classification. This is considered to police, ambulance and fire stations.
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	Aquatic environment	Sites with local conservation designations where the designation is based specifically on aquatic features or where these are essential in supporting the designated features. Receptor water body: all relevant WFD elements* at moderate or less status/potential.

Sensitivity	Criteria	Receptor type	Examples
		Flood risk	Land use types defined as 'More Vulnerable' in the NPPF flood risk vulnerability classification. For the purposes of this assessment this is considered to include residential housing, schools, hospitals and all minor roads maintained by Somerset County Council
Low	Feature with a low yield and/or quality at a local scale, with some potential for substitution	Aquatic environment	Small watercourses not classified as a WFD river water body.
		Flood risk	Land use types defined as 'Less Vulnerable' in the NPPF flood risk vulnerability classification. For the purposes of this assessment this is considered to include commercial/retail buildings and any agricultural land or buildings.
Very Low	Feature with minimal yield and/or very low quality at a local scale, with a high potential for substitution	Aquatic environment	Minor water features such as ditches, not classified as a WFD river water body.
		Flood risk	Land use types defined as 'Water-compatible development' in the NPPF flood risk vulnerability classification and undeveloped land.
Negligible	Feature with no yield / no identified quality at the site level, readily substituted	Aquatic environment	Small temporary features, not classified as a WFD river water body.
		Flood risk	Land use types defined as 'Water-compatible development' in the NPPF flood risk vulnerability classification and undeveloped land.

7.9.6 The next step is to assess the magnitude of change on a sensitive receptor arising from the Proposed Improvement Works as defined in Table 7.5.

Table 7.5 Magnitude of Change

Magnitude	Criteria	Receptor type	Examples of negative change
Very High	Results in major change to feature, of sufficient magnitude to affect its use/integrity	Aquatic environment	Deterioration in river flow regime, morphology or water quality, leading to sustained, permanent or long-term breach of relevant conservation objectives (COs) or downgrading of WFD status (including downgrading of individual WFD supporting elements).
		Flood risk	Change in flood risk resulting in potential loss of life or major damage to property and infrastructure.
High	Results in noticeable change to feature, of sufficient magnitude to affect its use/integrity in some circumstances	Aquatic environment	Deterioration in river flow regime, morphology or water quality, leading to periodic, short-term and reversible breaches of relevant COs, or downgrading of WFD status (including downgrading of individual WFD supporting elements or ability to achieve future WFD objectives).
		Flood risk	Change in flood risk resulting in potential for moderate damage to property and infrastructure.
Medium	Results in minor change to feature, with insufficient magnitude to affect its use/integrity in most circumstances	Aquatic environment	Measurable deterioration in river flow regime, morphology or water quality, but remaining generally within COs, and with no change to WFD status (of overall status or supporting element status).
			Minor reduction in resource availability and/or quality, but unlikely to affect the

Magnitude	Criteria	Receptor type	Examples of negative change
			ability of water users to exercise licensed rights.
		Flood risk	Change in flood risk resulting in potential for minor damage to property and infrastructure.
Low	Results in little change to feature, with insufficient magnitude to affect its use/integrity	Aquatic environment	Limited measurable deterioration in river flow regime, morphology or water quality and limited probability of consequences in terms of COs or WFD designations.
		Flood risk	Increased frequency of flood flows, but which does not pose an increased risk to people, property and infrastructure.
Very Low	Results in minimal change to feature, with insufficient magnitude to affect its use/integrity	Aquatic environment	Barely measurable deterioration in river flow regime, morphology or water quality and no consequences in terms of COs or WFD designations.
		Flood risk	No increase in frequency of flood flows, and no increase in risk to people, property and infrastructure.
Will not occur	Results in no change to feature, no substantive environmental pathway	Aquatic environment	No measurable deterioration in river flow regime, morphology or water quality and no consequences in terms of COs or WFD designations.
		Flood risk	No increase in frequency of flood flows, and no increase in risk to people, property and infrastructure.

7.9.7 Through combining the interaction between the sensitivity of a receptor and the magnitude of change predicted, the level of effect can be categorized. In terms of

the EIA Regulations, the critical outcome is whether the effect is significant or not (positive or negative) and as such a threshold level effect of Moderate/Major or greater has been applied to define 'Significant'. Where the effect is Minor or below, these are typically viewed as being 'Not Significant'. Table 4.1 sets out the matrix adapted for the Water Environment to support the determination of the level of significance for the water environment in this ES.

7.10 Assessment of Water Environment Effects

Predicted effects and their significance

7.10.1 This section sets out the receptor sensitivity (for each receptor being assessed), the predicted magnitude of change as a result of the Proposed Improvement Works and the rationale for the final assessment of effect significance.

Receptor sensitivity

7.10.2 Consideration of the receptors included in this stage of EIA has resulted in a value of sensitivity being assed adopting a precautionary approach to ensure compliance with EU environmental law.

7.10.3 The sensitivity of the River Parrett TRac water body has been set by consideration of Table 7.5 and has been assigned a 'high' sensitivity reflecting that many elements are at good status/potential at the current time.

7.10.4 The sensitivity of the bathing waters listed as being associated with the Parrett TRac are set as medium, due to current quality levels and a key objective being to avoid any potential exceedances of water quality standards.

7.10.5 The sensitivity of all associated designated aquatic environment sites (SPA, SAC, Ramsar, SSSI, LNR, etc. have been set as very high due to their nature conservation importance including being listed (on the whole) within the WFD waterbody description.

7.10.6 The sensitivity of 'on site' flood risk receptors in the immediate vicinity of the proposed works has been set as medium due to the proximity of some residential properties.

7.10.7 The sensitivity of 'off-site' people and property flood risk receptors within the ZoI has been defined as medium due to the residential housing within the area.

7.10.8 The sensitivity of 'off-site' land and associated agricultural buildings flood risk receptors within the ZoI has been defined as low due to being classified as Less Vulnerable.

7.10.9 The sensitivity of 'off-site' infrastructure (including roads) flood risk receptors within the ZoI has been defined as very high, but only if there are effects to the M5 or mainline railway. The majority of infrastructure will have a medium sensitivity.

Construction phase – potential effects

7.10.10 Please refer to Table 7.2 and 7.3 for a description of potential changes and effects and a description of embedded mitigation.

Construction phase – significance assessment rationale

7.10.11 A draft Construction Environmental Management Plan (Volume 3: Appendix 2C) has been included as part of this ES, this will finalised and approved by the project partners following the appointment of the principal contractor prior to any works commencing, in line with best practice, to manage and minimise the potential environmental effects of construction activities. Amongst other things, this covers measures to reduce/avoid the generation of pollution and maintain the environmental conditions during the construction period, as well as measures to safeguard, retain and recreate key hydromorphological and riparian features. This builds on similar measures employed elsewhere by the PIDB, SRA and the EA. This provides confidence in their effectiveness, and hence future application as part of the Proposed Improvement Works. Receptor specific assessments are provided below. The construction phase of the works will not modify the characteristics of any hydrological pathways between the channel and the floodplain and any designated sites or features.

Construction phase – aquatic environment (reduction in surface water quantity or quality)

7.10.12 Potential effects on the aquatic environment receptors are set out in Table 7.2 and 7.3, with the embedded environmental measures to manage and limit the risk of these effects occurring also being detailed in Table 7.3. They are also considered in detail in the Water Framework Directive Regulatory Compliance Assessment, which is set out in Volume 3: Appendix 7C and in the Appropriate Assessment which is set out in Volume 3: Appendix 6I and the Strategic Ecological Mitigation (Volume 3: Appendix 6J).

7.10.13 A range of key measures are embedded in the scheme design and construction protocols to ensure these receptors are protected. Management of runoff within the dredging / bank reinstatement area is addressed through the CEMP, combined with sediment management measures. Water quality/pollution prevention measures incorporated in construction works will manage the risk of pollution entering the River Parrett and associated rhynes and surface runoff pathways and therefore preventing effects on hydrologically connected receptors. The dredging works will occur within a short duration (estimated 10-12 weeks) with reinstatement of the banks occurring during this period and seeding following during and/or shortly after (the following spring). This minimises the potential for significant effects caused by alternatives e.g. phased initial dredging (e.g. over two years).

7.10.14 As a result of these embedded measures (Table 7.3 and in the CEMP (Volume 3: Appendix 2C), the magnitude of change identified for these receptors is: very low for the designated sites and for the Parrett TRac. The rationale being that these measures reflect current best practice, and have been effective in other similar works

carried out elsewhere by the PIDB and the EA. These measures will manage the quality and quantity of water within the area of the Proposed Improvements and downstream until the restored channel cross section has been reinstated, preventing significant effects to local water quantity and quality. Once the dredging and channel reinstatement is completed it will function as detailed for the operational phase to ensure that significant effects on water quality and quantity are prevented.

7.10.15 For the identified aquatic environment receptors (Table 7.2) sensitivities of very high, high and medium are identified (Table 4.1), therefore with the expected magnitude of change of very low and with though the application of professional judgement due to the embedded mitigation measures, conclusions of **Minor (not significant)** have been reached for the designated sites and not significant (minor) have been reached for the Parrett TRac and **Negligible (not significant)** for the Bathing Waters.

Construction phase – flood risk

7.10.16 During construction, there will be no additional effects on flood risk beyond those that the scheme is delivering (as described in the Operational phase below). Therefore, the expected magnitude of change can be considered as very low and a conclusion of **Negligible (not significant)** is reached.

Construction phase – conclusions

7.10.17 A summary of the results of the assessment of the surface water and flood risk is provided in **Table 7.7**.

Operational phase – significance assessment rationale

7.10.18 A draft Landscape Environmental Management Plan (Volume 3: Appendix 2D) will be prepared and agreed with the project partners prior to works being completed and will be implemented alongside the agreed Strategic Ecological Measures (Volume 3: Appendix 6J). This will detail all embedded and additional measures included as part of this ES, prepared as a result of consultation and partnership working, in line with best practice to manage and minimise the potential environmental effects of operational activities, including any limited and infrequent maintenance works. Amongst other things, these cover measures to reduce/avoid the generation of pollution and maintain the environmental conditions during the operational period, as well as measures to safeguard and maintain key hydromorphological and riparian features. This builds on similar measures employed elsewhere by the PIDB, SRA, NE and the EA. This provides confidence in their proposed effectiveness, and hence future application as part of the Proposed Improvement Works. Receptor specific assessments are provided below.

Operational phase – aquatic environment (change in water volume and levels in the floodplain)

7.10.19 Only limited changes in water depth, extent and duration are predicted in the floodplain (a few 10s of centimeters and hours or a small number of days) in the absence of the strategic mitigation described in Volume 3: Appendix 6J). The

sensitivity of the aquatic environment has been set as very high for the designated sites, high for the Parrett TRac, and High for future Bathing Waters.

7.10.20 Taking into account the incorporated mitigation, enhancement, monitoring and management measures to be set out in the LEMP and those associated with the Strategic Ecological Mitigation (Volume 3: Appendices 2D and 6J) allows the use of professional judgement to ensure that the magnitude of change for designated sites and features is considered to be very low.

7.10.21 Taking into account the integrated mitigation, and measures to be set out and agreed by the LEMP and low intensively, infrequent ongoing maintenance of the channel, informed by monitoring and mitigation, the predicted magnitude of change for the Parrett TRac is considered to be very low.

7.10.22 The future condition of the channel in terms of land use and restored habitat cover for the river is considered to be very low.

7.10.23 By applying these criteria to Table 4.1 (including professional judgement), the conclusions of the assessment of effects predicted from the operational phase are concluded as being: **Minor (not Significant)** in all cases.

Operational phase – flood risk

7.10.24 Taking into account the embedded mitigation, for people and property flood risk impacts there are both positive and negative effects. Within the wider area the works have the potential to reduce the flood risk to 200 properties, mainly in reduction in risk to land or outbuildings surrounding the property, or access routes to the property. In some locations, there is also a reduction in risk from internal flooding to properties. The scale of benefit is relatively small and therefore the expected magnitude of change is considered as Medium. Therefore, conclusions of **positive Moderate (could be significant)** are reached. For a small number of properties within Curry Moor there is the potential for a small increase in flood risk (<100mm increase in flood depth and 3-day increase in flood duration). The expected magnitude of change is considered as Medium. Therefore, conclusions of negative Moderate (could be significant) are reached for these properties. Additional Mitigation (additional Environment Agency pumping) is therefore required. Taking into account this additional mitigation a conclusion of **Minor (not significant)** is reached.

7.10.25 For land and associated agricultural buildings flood risk impacts there are similar positive and negative effects. Within the wider area the works have the potential to reduce the flood risk to 65 km^2 of land. The amount of change will vary by location but can be considered to have a Medium magnitude. Within Curry, Hay, Salt and North Moors there will be a small increase in risk which will also have a Medium magnitude. Therefore, conclusions of **Minor (not significant)** is reached.

7.10.26 For infrastructure flood risk impacts, there are similar positive and negative effects. Within the wider area the works have the potential to reduce the flood risk to sections of the A361, A372 and A378. There are also a number of local roads that

will benefit from a reduction in risk. There is a potential for a small increase in risk to the A361 in Salt/North Moor, but during events significantly in excess of the 2013/14 event. There is also a potential small increase in risk to minor roads in Curry Moor and North Moor. There will be a negligible impact on the railway lines within the study area, and no impact on the M5, therefore the impacts are only considered on the receptors with a Medium sensitivity. Where there is a reduction in risk the amount of change can be considered to have a Medium magnitude, but where there is an increase in risk, this will be for limited lengths of road and generally in extreme flood events therefore the amount of change can be considered to have a Low magnitude. Therefore, conclusions of **Minor (could be significant - positive)** and **Minor (not significant)** are reached.

Table 7.7. Summary of Predicted Effects

Receptor and summary of predicted effects		Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
Construction Phase					
Aquatic Environment (reduction in surface water quality, river flow regime and morphology)	**River Parrett TRac**	High	Low	Minor (not significant)	Embedded mitigation, management and monitoring will prevent notable effects Limited measurable deterioration in river flow regime, morphology or water quality and limited probability of consequences in terms of condition or WFD designations.
	Designated sites and Important Features	Very High	Very Low	Minor (not significant)	Restricted environmental pathway to designated sites from Site. Embedded mitigation, management and monitoring

Table 7.7. Summary of Predicted Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				will prevent notable effects. Limited measurable deterioration in river flow regime, morphology or water quality and limited probability of consequences in terms of condition or WFD designations.
Bathing Waters	Medium	Very Low	Minor (not significant)	Dredging is focused on the upper bank and will relocate soil/sediment to the outer bank, away from potential high flows, removing the potential for notable downstream transport. It is predicted that only limited

Table 7.7. Summary of Predicted Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				resuspension of sediment will occur during the dredging and that the processes of dilution, deposition and the influence of tidal movement will not result in concentrations entering Bathing Waters creating a potential exceedance of the standards.
Flood Risk: **Off-site receptors**	Very High	Very Low	Negligible (not significant)	During construction, there will be no additional effects on flood risk beyond those that the scheme is delivering (as described in the Operational

Table 7.7. Summary of Predicted Effects

Receptor and summary of predicted effects		Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
					phase below). Therefore, the expected magnitude of change can be considered as very low and a conclusion of Not significant (negligible) is reached.
<u>Operational Phase</u>					
Aquatic Environment (reduction in surface water quality, river flow regime and morphology)	**River Parrett TRac**	High	Low	Minor (not significant)	Embedded mitigation, management and monitoring will prevent notable effects including during and low intensity infrequent maintenance. Limited measurable deterioration in river flow regime,

Table 7.7. Summary of Predicted Effects

Receptor and summary of predicted effects		Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
					morphology or water quality and limited probability of consequences in terms of condition or WFD designations.
<u>Flood Risk</u>	**Designated sites and Important Features**	Very High	Very Low	Minor (not significant)	Restricted environmental pathway to designated sites from Site. Embedded mitigation, management and monitoring will prevent notable effects. No measurable deterioration in river flow regime, morphology or water quality and limited probability of consequences in terms of

Table 7.7. Summary of Predicted Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				condition or WFD designations after restoration is complete. This includes compliance with the agreed operating protocol that overrides the levels set in the WLMP for these designated sites and including during any localised maintenance.
Bathing Waters	Medium	Very Low	Minor (not significant)	No direct contribution of Bathing Water quality threats from the proposed operational phase, noting that grazing will return to the Site after approximately 12 months. It

Table 7.7. Summary of Predicted Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				is considered that due to the processes of dilution, deposition and the influence of tidal movement will not result in concentrations of bacteria entering Bathing Waters from the Site creating a potential exceedance of the standards.
People and Property	Medium	Medium	Moderate (could be significant – positive) and Minor (not significant)	For majority of people and property the impact will be positive (i.e. a reduction in flood risk). For a small number of people and property the impact will be negative requiring additional

Table 7.7. Summary of Predicted Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				Mitigation (Environment Agency pumping). Conclusion of 'Medium' magnitude of change based on the flood risk mitigation measures set out in Table 7.4, and in Volume 3: Appendix 7B.
Land and associated agricultural buildings	Low	Medium	Minor (not significant)	For the majority of the land effected the impact will be positive (i.e. a reduction in flood risk). For some land, the impact will be negative. Conclusion of 'Medium' magnitude of change based on the flood risk mitigation measures set out in Table 7.4, and in

Table 7.7. Summary of Predicted Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				Volume 3: Appendix 7B. An overall significance of 'Minor' is based on the relatively low sensitivity of the receptor based on Table 7.4 and Volume 3: Appendix 7B.
Infrastructure	Very High	Medium	Moderate (could be significant – positive)	For the receptors with Very High sensitivity, the change in flood risk is negligible. Conclusion of 'Medium' or 'Low' magnitude of change based on the flood risk measures set out in Table 7.4 and Volume 3: Appendix 7B. Where the impacts are positive (i.e. a
	Medium	Low	Minor (not significant)	

Table 7.7. Summary of Predicted Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor	Magnitude of change	Significance	Summary rationale
				reduction in flood risk), the magnitude is considered 'Medium', but where the impacts are negative, the magnitude is considered 'Low' as detailed in 'Operational Phase – Infrastructure flood risk impacts'. Overall professional judgement has been applied to assign a 'Moderate' significance where there are positive effects, and a 'Minor' significance where there are negative effects.

7.11 Consideration of optional additional mitigation or compensation

7.11.1 Strategic mitigation has been agreed and implemented by the PIDB, Environment Agency and Natural England, to ensure that no change to the current water depth/duration within the Somerset Levels Moors and Levels SPA/Ramsar/SSSI and functionally linked land will occur, arising from the increase in downstream conveyance below Stathe Bridge from the proposed dredging. This is set out in Volume 3: Appendix 6J, and incorporated into the Appropriate Assessment (Volume 3: Appendix 6i)

7.11.2 The SRA are also promoting a scheme to increase the capacity of the River Sowy. This river works to provide additional capacity to the River Parrett during fluvial flooding. Flood water is diverted into the River Sowy at Monks Leaze Clyce, which is upstream of these proposed works. This reduces the amount of water flowing into the moors upstream of Langport, and also enables them to be evacuated quicker after a flood event.

7.11.3 The River Sowy scheme principally provides flood risk benefits to the moors upstream of Langport. However, by increasing the flow passing into the River Sowy there is also a small reduction in flow continuing downstream. This results in a small benefit to the Curry/Hay/Salt/North Moors area. By considering the two schemes together the negative effects from the proposed works is reduced.

7.11.4 To fully mitigate against the negative effects from the proposed works the capacity of the pump station at Curry Moor is proposed to be increased and implemented by the Environment Agency. The amount of increase will depend on the operational protocols associated with the Sowy scheme at the time of requirement and is detailed in Volume 3: Appendix 7B.

7.11.5 With the River Sowy scheme and additional pumping included there are no remaining negative significant flood risk effects.

7.12 Conclusions of significance evaluation

7.12.1 This assessment has concluded that there are no significant effects on the water environment from the Proposed Improvement Works after taking into account the embedded and additional mitigation measures and the conclusions of Chapters 6 and 8 of this ES, the Water Framework Directive Regulatory Compliance Assessment (Volume 3: Appendix 7C) and the Appropriate Assessment (Volume 3: Appendix 6I).

7.13 Implementation of environmental measures

7.13.1 The environmental measures embedded in the Proposed Improvement Works and the means by which they would be implemented are set out in Table 7.8.

7.13.2 Table 7.8 describes the environmental measures embedded within the proposals and the means by which they will be implemented

Table 7.8: Summary of environmental measures to be implemented – relating to Water Environment

Environmental Measure	Responsibility for Implementation	Compliance Mechanism
Construction Environmental Management Plan to avoid/minimise and manage any potential construction phase effects (e.g pollution, sediment mobilisation, reduced oxygen quality, deliver ecological mitigation, monitoring and construction phase management).	PIDB, Principal Contractor and Environmental Consultants	Contract of Works, Waste Exemption and SSSI Assent
Reduction in spatial extent of dredging footprint and volume of sediment being removed/increase in conveyance and timing to a less sensitive period in terms of water quality.	PIDB, Principal Contractor	Inherent in scheme design. Contract of Works, Waste Exemption and SSSI Assent
Avoidance of any works in the lower flow channel – 'the Thalweg' which provides the most valuable critical habitat and morphological features and creation of new habitat features in multi-stage channel. Retention of the majority of the left-hand bank habitat and a good proportion of the right-hand bank lower reedy fringe. Strip and replacement of remaining lower reedy fringe habitat and reseeding of reinstated bank.	PIDB, Principal Contractor	Inherent in scheme design. Contract of Works, Waste Exemption and SSSI Assent
Prioritising dry works unless Environmental Clerk of Works and fish rescue protocols are in place.	PIDB, Principal Contractor and Environmental Consultant.	CEMP and Contract of Works.

Environmental Measure	Responsibility for Implementation	Compliance Mechanism
Stock exclusion during construction and for 12 months after to maximize bank reinstatement and revegetation and mimimise the short-term risk of increased faecal indicators to Bathing Waters. Use of a silt fence and other related measures to avoid/minimise runoff into adjacent land.	PIDB, Principal Contractor	CEMP and Contract of Works. SSSI Assent and Waste Exemptions.
Landscape and Ecological Management Plan to implement post works monitoring, management and reactive change to management if required to ensure no deterioration in the aquatic environment.	PIDC and Environmental Consultant	LEMP
Implementation of agreed updated hydro-ecological protocols to ensure no change in water levels and duration of specific standing water conditions within designated sites (see Volume 3: Appendix 6J).	PIDB, Environment Agency and Natural England.	Strategic Water Level Management Mitigation Agreed 28th June 2019. (see Volume 3: Appendix 6J).
Reduction in spatial extent of dredging footprint and volume of sediment being removed/increase in conveyance. Avoidance of works in areas where further impingement in flows may occur. Avoidance of works on left hand bank where there is the potential for increased seepage into adjacent properties could occur.	PIDB and Principal Contractor	Inherent in scheme design. Contract of Works.

Environmental Measure	Responsibility for Implementation	Compliance Mechanism
Repair of limited areas of reservoir dam wall as a result of these proposals accelerating the timing of these planned works.	PIDB and Principal Contractor	Inherent in scheme design. Contract of Works.
Additional operation of Environment Agency pumps to ensure no increase in water levels/duration on Curry Moor.	PIDB and Environment Agency	PIDB funding for additional EA operation of pumps.

7.14 References

Please refer to Chapter 11.

8 POPULATION

8.1 Introduction

8.1.1 This chapter of the Environmental Statement (ES) assesses the likely significant effects of the Proposed Development with reference to Population. For the purposes of this ES, taking into account the EIA scoping process, Population focuses on people, property and land and infrastructure that could be affected by the Proposed Improvement Works. The chapter provides the population baseline only and confirms the scope of the assessment. It must be read in conjunction with Chapter 2: Description of the Proposed Development and, critically, with reference to relevant parts of Chapter 7: Water Environment where assessment of effects on Population from likely significant effects has been completed and concluded.

8.2 Limitations of this assessment

8.2.1 Please refer to Chapter 7 for limitations associated with the assessment of any likely changes in flood risk on population.

8.2.2 The population baseline set out in this Chapter relies on Census data that has been retrieved from Nomis to inform the current baseline as it relates to Population (people, property, land and infrastructure), Recreation, and Traffic and transport. The most up-to-date and geographically suitable datasets were selected to inform the current baseline and relate to either the following 8 Medium Super Output Areas:

- Sedgemoor 012, 014; South Somerset 003, 004, 007, 009, 010; Taunton Deane 005
- Or the following 25 Built-Up-Areas:
- Ash (South Somerset) BUA, Ashcott BUA, Chedzoy BUA, Compton Dundon BUA, Creech St Michael BUA, Curry Rivel BUA, Drayton (South Somerset) BUA, Dundon BUA, Fivehead BUA, Hambridge BUA, High Ham BUA, Kingsbury Episcopi BUA, Langport BUA, Long Load BUA, Long Sutton (South Somerset) BUA, Martock BUA, Meare Green/Stoke St Gregory BUA, Middlezoy BUA, North Curry BUA, North Newton BUA, North Petherton BUA, Northmoor Green BUA, Othery BUA, Somerton (South Somerset) BUA, Westonzoyland BUA

8.2.3 Some data may be aggregated or rounded for statistical purposes by the Office for National Statistics, while this does adversely affect the precision of the data it is still the most accurate and up-to-date information available and as such is suitable for the purpose of informing the current baseline.

8.3 Relevant legislation, policy and technical guidance

Legislative and Policy context

8.3.1 The following legislation is relevant to the assessment of the effects on Population receptors:

- Environmental Impact Assessment (Land Drainage Improvement Works) Regulations (SI 1999 No. 1783) sets out the formal requirement to consider impacts on population.

- The Land Drainage Act 1991 and 1994: places responsibility for maintaining flows in watercourses on landowners and gives Local Authorities powers to serve a notice on landowners to ensure works are carried out to maintain flow of watercourses;
- The Flood Risk Regulations: published in December 2009, these transpose the EU Floods Directive into UK law;
- The Flood and Water Management Act, 2018: sets out the Government's proposals to improve flood risk management (building on the 2009 regulations), and also covers approaches to water quality and to ensure water supplies are more secure. The act also provided for the formation of Lead Local Flood Authorities (LLFAs) and aims to create a simpler and more effective means of managing the risk of flood and coastal erosion; and
- The Bathing Water Regulations 2013: implements updated European legislation[12] on bathing water and simplifies its management and surveillance methods. It also provides a more proactive approach to informing the public about water quality using four quality categories for bathing waters — 'poor', 'sufficient', 'good' and 'excellent'.

Technical Guidance

8.3.2 A summary of technical guidance relevant to the Population assessment is given in Table 8.1.

Table 8.1: Technical guidance relevant to this Population Assessment

Technical guidance	Relevance to this assessment
Somerset River Authority 20 Year Flood Action Plan	Sets out the need for and confirmation on actions that together form part of a solution to reduce the frequency, duration and impact of flood on population.
Please refer to Chapter 7 for Water Environment guidance	

8.4 Data gathering methodology

Study area

8.4.1 The study area for this assessment is based on that associated with the assessment of the Water Environment i.e. hydrological 'Zone of Influence' (ZoI) adopted in Chapter 7 of this ES (see Figure 2.1 in Volume 4: Figures)

8.4.2 The ZoI incorporates the proposed Working Area (see Chapter 2: Description of the Proposed Development) and the WFD water body unit in which the Proposed Improvement Works are

[12] Directive 2006/7/EC concerning the management of bathing water quality and repealing Directive 76/160/EEC.

located and where hydrological interactions are predicted between direct pathways and linkages with potential receptors. Figure 2.1 (Volume 4: Figures) shows the ZoI.

8.4.3 The census area refers to the combined extent of the 8 MSOAs identified in section 8.2 above.

Desk study

8.4.4 Please refer to Chapter 7: Water Environment for methods associated with the flood risk desk study.

Survey work

8.4.5 Please refer to Chapter 7: Water Environment for methods associated with the flood risk survey work.

8.5 Overall baseline

Current baseline

Location, topography and land-use

8.5.1 The Rivers Parrett, Cary and Tone and associated tributaries flow from their sources in the Quantock and Brendon Hills, Blackdown Hills and Dorset Heights to the southwest, south and east of the catchment and flow in a north and westerly direction into an extensive lowland floodplain, before flowing out into the Bristol Channel through the Parrett Estuary.

8.5.2 The watercourses in this catchment are typically steep, narrow and unconstrained in the uplands; while further downstream they are slower moving and heavily constrained by flood embankments, particularly through the low-lying, flat floodplain characteristic of the Somerset Levels and Moors, where the lowland rivers are known as 'high-level carriers'.

8.5.3 These are watercourses that are embanked on both sides, fully or partially straightened and counter-drained on either side. Their normal water levels are set above the level of the surrounding floodplain. The whole lowland area of the catchment is heavily dependent on a controlled system of drainage and water level management, which has been in place for hundreds of years.

Flood risk

8.5.4 During fluvial flooding, there is wide scale inundation of the moor areas in the Parrett catchment. Depending on the moor, this flooding can either drain back to the river by gravity when river levels recede, or has to be pumped back into the river. Flooding happens to a large area of moors upstream of Langport, which acts to restrict the flow passing this point in a flood. Pumping out of these moors is restricted partially based on when the spillways are overtopping on the rivers downstream of Langport.

8.5.5 The flood water that does continue downstream of Langport either passes into the River Sowy via Monks Leaze Clyse sluice or the spillways, or continues down the River Parrett. Flood water

in the River Sowy is discharged into the Kings Sedgemoor Drain, which then discharges into the River Parrett at low tides at Dunball Sluice. The River Parrett is joined by the River Tone at Burrowbridge. During flood conditions, flow passes over spillways and banks from the River Tone into Curry and Hay Moors. The amount of overtopping will be partially influenced by the flows within the River Parrett.

8.5.6 During very extreme flood events (as happened in 2013/14), flood water can then pass from Curry Moor into Salt and North Moors via Athelney spillway and Lyng Cutting. This can lead to flooding to the communities of Moorland and Fordgate.

8.5.7 The capacity of the main river, tributaries and drainage channels in the lower reaches can be significantly reduced by high tidal water levels backing up flow in the tidal River Parrett and Tone. This can further exacerbate the flooding in these areas.

8.5.8 The works that have been undertaken by the SRA and partner organisations following the 2013/14 flood have significantly reduced the risk of flooding. The greatest reductions in flood risk have been to Curry, Hay, North and Salt Moors. The impact is most pronounced on North Moor, where, if the 2013/14 flooding was to be repeated, the scale of flooding would be dramatically reduced.

Drainage

8.5.9 The moors within the study area are managed by a series of different, and sometimes connected, drainage systems. During normal conditions water levels are controlled by a system of different water level control structures, consisting of weirs, sluice gates, flapped outfalls and pump stations.

8.5.10 Various Water Level Management Plans (WLMPs) are in place to define how these systems are operated during different times within the year. The operation of the structures is influenced by the time of year and current and predicted water levels within the moors and main watercourses.

8.5.11 Further details on the WLMPs and their use on the designated sites is discussed within Chapter 6: Biodiversity.

Population (people, property, land and infrastructure)

8.5.12 The immediate Study Area associated with the Proposed Improvement Works encompasses a number of small villages and hamlets as well as numerous farms. The hamlet of Stathe is located on the left-hand bank approximately half way along the dredged stretch. There are a number of properties (40-50) that are located adjacent to the river on the dredged stretch. The village of Burrowbridge is located at the downstream (northern) end of the works.

8.5.13 The 2011 Census (Office for National Statistics, 2019a) indicated a population of 53,943 across 23,080 households. 29,589 are resident within one of the 25 built-up areas wholly contained within the census area; with 20,365 in the 7 largest of these areas: Martock, Somerton, North Pendleton, Langport, Curry Rivel, Creech St Michael, and Westonzoyland.

Population projections derived from the Census for these Output Areas indicate that the resident population increased to 57,881 in 2017 and was older than both the regional and national average with 27% of residents aged over 65 years of age, and only 17% under 15 years of age. The wider area affected by changes to fluvial flooding and water levels as a result of the proposed works includes properties, businesses, infrastructure (e.g. road network) and agricultural land within or adjacent to the Parrett catchment moors upstream of the proposed works, and on the Sowy and Kings Sedgemoor Drain moors.

8.5.14 The Study Area is spatially dominated by aspects of the rural economy, such as fields of grazing livestock and arable land. Much of the land is floodplain which is grazed typically by cattle and sheep. Much of the land within the Study Area is covered by the Environmental Stewardship and Countryside Stewardship agri-environment schemes that provide funding to farmers to deliver effective environmental management. Much of the land within the Study Area is covered by Entry Level and Higher Level schemes as part of the overall Environmental Stewardship Scheme. The Environmental Stewardship scheme is now closed to new applicants, although the existing schemes below will run until the end of the agreement (10 years for most Higher Level schemes and 4 years for Entry Level). The new Countryside Stewardship (CS) scheme was introduced during late 2016; and several farms within the Study Area are now covered by Mid and Higher Tier CS schemes.

8.5.15 However, it should be noted that the most recent Census data for the area shows a spread of economic activity in which the local population are engaged. The most dominant industry in terms of numbers employed in Somerset as a whole is the wholesale and retail trade. Human health and social work and education are also notably high employment areas. Agriculture, forestry and fishing account for a relatively small proportion of employment (Somerset County Council Partnership Intelligemce Unit, 2011)

8.5.16 In 2017 there were approximately 2,960 businesses (Office for National Statistics, 2019b) within the census area employing approximately 15,500 people (Office for National Statistics, 2019c) across a range of industries with the most dominant of these being manufacturing (15%), human health and social work (11%), transport & storage (10%), accommodation (9%) and education (8%). Micro (employing 0-9) or small (employing 10-49) enterprises account for 99% (approximately 2,920) of all businesses within the census area.

8.5.17 The main fisheries use of the Parrett and Tone is the glass eel fishery. This operates from the 14th February to the 25th May annually. Licences are issued by the Environment Agency on an unlimited basis (i.e. there is no limit to the number issued). In 2013, 169 licences were issued, which resulted in the capture of 4,000kg of glass eels. This comprises 90% of the Environment Agency south-west region, and 40% of the total UK glass eel catch. The economic value of the fishery fluctuates annually, depending on the prevailing market price of glass eels, which is in turn a reflection of supply (i.e. natural abundance and catches). Thus, in 2013 the value was £100/kg, which, given the capture of 4,000kg would have given the fishery a value of £400,000. In May 2018, the Environment Agency reported the current legal

market value of glass eels as £150/kg. However, in other years the market value has risen as high as £250-£300/kg.

Recreation

8.5.18 Long Distance Paths are recreational trails which can, to varying degrees, be used for a range of non-motorised travelling options (including walking, cycling and horse riding). Typically, they will be at least 31 miles (50km) long and will take the user more than a day to walk, but many are much longer than this. The Long-Distance Paths in the Study Area are comprised of a mix of Public Rights of Way (PRoWs) and permitted paths.

8.5.19 There are three Long Distance Paths within the Study Area – these are the River Parrett Trail, East Deane Way and Macmillan Way West). These paths are all in close proximity to the proposed dredging locations along the River Parrett; and run along the right-hand bank of the channel for the entire dredging stretch. The Parrett Trail section immediately adjacent to the dredging works is majority permitted path (2105m). This section of path is permitted by Natural England as the landowner. A small section of path adjacent to planned dredging works (immediate downstream of Beasleys spillway and Stathe Bridge) is a PRoW footpath (approx. 50m).

Tourism

8.5.20 Burnham-on-Sea is a designated beach for bathing and is tested by the Environment Agency regularly under the EU Bathing Water Directive (2006/7/EC). Burnham-on-Sea is located approximately 3km downstream of the confluence of the River Parrett with the Severn Estuary. The confluence is approximately 30km from the downstream extent of the dredging area.

8.5.21 Many tourism-related businesses in Burnham-on Sea are reliant on the quality of the beach and bathing water and could suffer if the bathing water quality does not satisfy the requirements of the new Directive in 2015.

8.5.22 A water quality warning is currently in place for Burnham Jetty North and bathing is therefore not advised at this area due to poor water quality (based on monitoring results from 2014 to 2017). This bathing water is subject to short term pollution. Short term pollution is caused when heavy rainfall washes faecal material into the sea from livestock, sewage and urban drainage via rivers and streams. At this site, the risk of encountering reduced water quality increases after rainfall and typically returns to normal after 1-3 days. The Environment Agency makes daily pollution risk forecasts based on rainfall patterns and will issue a pollution risk warning if heavy rainfall occurs to enable bathers to avoid periods of increased risk. 63 warnings advising against swimming due to an increase risk of short term pollution were issued in 2017 for Burnham Jetty North bathing water (Environment Agency, n.d.).

8.5.23 The Somerset Levels are a popular destination for walkers, cyclists, ornithologists, photographers, for arts and crafts and broader tourism with accommodation accounting for 9% of employment within the census area. The area is well served by the public rights of way network and the numerous long-distance paths described in the Recreation section above.

This adds a further element for consideration when assessing the significance of any impacts upon transport or recreational networks as both of these will impact the viability of the study area as a tourist destination.

8.5.24 Boating and canoeing are popular in the region, and it is understood that these activities do take place on the River Parrett.

Traffic and transport

8.5.25 The local road network incorporates one main road (the A361) which runs through Burrowbridge immediately to the north of the proposed dredging works. Through its connections with the A372 and A38, this road provides connectivity for local communities within the Study Area to nearby towns such as Taunton, Bridgwater and Glastonbury; as well as providing an important access route for emergency services. The A361 crosses the River Parrett at Burrowbridge immediately to the north of the proposed dredging works.

8.5.26 There are also a large number of interconnected secondary local roads within the Study Area. Many of the secondary roads are below 4m in width and serve to connect small communities and farms with the rest of the road network and surrounding villages. In places, the secondary roads also form part of Long Distance Paths.

8.5.27 Of these secondary local roads, Stathe Road runs alongside the left-hand bank of the River Parrett for the entire dredging stretch, before it crosses the River Tone close to its confluence with the Parrett at Burrowbridge (Stanmoor Bridge). There are no other road bridges associated with this stretch of the River Parrett.

8.5.28 Much of the local road network (including the A361) was flooded during the recent flooding events, in particular the winter flooding of 2013/14. Flood risk to this road has been significantly improved as a result of the flood risk benefits achieved by the 2014/15 capital dredges and the further SRA improvement works. However, the road remains at risk of future flooding in extreme events.

8.5.29 A major railway line runs through the Study Area east-west, connecting London to Devon and Cornwall (through Taunton). A second line runs through North Moor connecting Bristol to towns in Devon and Cornwall. This line was closed during the 2013/14 flood event, but significant improvement works have been undertaken to the line since this time to increase its resilience to flooding.

8.5.30 Origin-destination data (Office for National Statistics, 2019d) indicates that residents within the census area predominantly make use of private motor cars or vans for commuting to work (77% as either a driver or passenger) with the next most common form method of travel being on foot (7%) or bicycle (2%). There is a high level of out-commuting (Office for National Statistics, 2019e) with 42% of usual residents travelling beyond the study area for work with 19% working within the census area and a further 19% working mainly at or from home. This highlights the significance of the local road network in facilitating economic activity for the

residents of the census area as well as for those in the region who commute to work within or through it.

Future baseline

8.5.31 The future baseline is defined in Chapter 7: Water Environment.

Factors influencing the baseline

8.5.32 No additional factors beyond those identified in Chapter 7: Water Environment are believed to be of influence to the baseline.

8.6 Consultation

8.6.1 Please refer to Volume 3: Appendices 1B and 1C for further details on consultation completed and responses received.

8.7 Scope of the assessment

Spatial scope

8.7.1 The spatial scope covers the area associated with the Proposed Improvement Works and the ZoI which, together, form the basis of the study area. Please refer to Figure 2.1 in Volume 4: Figures.

Temporal scope

8.7.2 The construction phase assessment (and any residual/remedial works in the following 12 months) has been assumed to run from 2019-2020 inclusive. Please refer to Chapter 2: Description of the Proposed Improvement Works for full definitions of the different elements of the proposed works.

8.7.3 The operational phase assessment commences from 2021 and incorporates limited maintenance dredging as required, but not more frequently than a 5-year cycle, to maintain the improved flow conveyance achieved in 2019-2020 from the Proposed Improvement Works.

8.7.4 Due to the regulatory requirements to continue managing and maintaining the River Parrett, there is no Decommissioning Stage.

8.7.5 Cumulative Development is assessed separately within Chapter 9: Cumulative Effects Assessment of the ES.

Climate change

8.7.6 The Proposed Improvement Works form part of the wider 20 Year Flood Action Plan for the Somerset Levels and whilst individual components such as this scheme are unlikely to delivery significant climate change resilience, the overall delivery of the Flood Action Plan will do. As such, this scheme contributes to local climate change resilience to flooding in this manner.

Potential receptors

8.7.7 Identification of receptors that could be subject to likely significant effects

8.7.8 Receptors have been identified by applying the source-pathway-receptor principals for the surface water environment associated with the ZoI and downslope/stream from the Proposed Improvement Works.

8.7.9 The baseline assessment (incorporating all detailed technical studies referred to and included within the appendices of this ES), the following class of receptors have been included:

- People, Property, Land and Infrastructure

Likely significant effects

8.7.10 The assessment considers the likely significant effects of the Proposed Improvement Works on the receptors identified above. These are considered to be:

8.7.11 Construction effects of the proposed improvement works and the operational effects of the increased channel capacity. It considers the effects on surface water and flood risk from these activities within the ZoI.

Receptors taken forward for assessment

8.7.12 The population (and water environment receptors) that have been taken forward for assessment in Chapter 7: Water Environment are listed below:

8.7.13 Flood risk (predominantly surface water) receptors – people, property, land and infrastructure. It can be seen that there is an overlap between the receptors associated with the WFD and the aquatic environment.

8.7.14 Table 8.2 sets out the specific receptors identified that are to be taken forward for assessment.

Table 8.2: Surface Water and Flood Risk receptors scoped in for further assessment

Receptors	Relevant assessment criteria	Likely significant effects
People, land, property and infrastructure and off-site flood risk in the moor areas within the ZoI	The Somerset 20 Year Flood Action Plan (SRA, 2014)	The need for the proposals are to reduce flood risk. Without mitigation, the proposals have the potential to increase off-site flood risk within Curry, Hay, Salt and North Moors. In all moors this could affect flooding to land. Within Curry Moor this could also affect people, property and infrastructure, including certain roads and public rights of way.

8.7.15 A number of potential population (or associated) receptors were scoped out from further assessment because the potential effects to those receptors are not considered likely to be significant. The consultation conducted to inform this ES did not contradict with this approach.

8.7.16 These receptors are summarised in Table 8.3 below:

Table 8.3: Population receptors scoped out of further assessment

Resource/ Environmental Receptor	Description of potential effect	Scoping justification
Local residents/ businesses	Machinery/vehicle movements associated with the works, as well as the location of the site compound/s could result in temporarily increased levels of noise and vibration.	Construction traffic movements on the highways network will be minimal and will be limited to initial delivery of plant to the dredging area (as all dredging arisings will be managed *in-situ* by placing on the rear of the flood embankment). Excavators and dump trucks will be operating at any one time over a short period of time. These machines would be distributed over the entire 2.2km site; and therefore, there will be no risk of multiple machines working alongside each other at the same location. The works will be undertaken during normal considerate construction working hours using best construction practice. The works are typical of frequent routine operations in the same location for annual maintenance dredging of rhynes and weed control.
Local community	Health and safety risks to public.	Previous high river flows and flood conditions will already have presented a health & safety risk to the public. Risks to the public during the works can be managed by good site practice e.g. use of banksmen and warning notices on site to restrict public access to site for the duration of the works. Risk to bank stability through previous flooding and proposed dredging will be assessed and mitigated as part of detailed design.

Resource/ Environmental Receptor	Description of potential effect	Scoping justification
Local economy	Deposit and spreading of dredged arisings on neighbouring agricultural land may affect its suitability as grazing land depending on the type/level of contamination and salinity.	All dredging arisings will be placed on the rear of the flood embankment and will not be spread on adjacent agricultural land Sediments have been tested prior to dredging which has demonstrated that they are non-hazardous and suitable for agricultural use prior to depositing on river banks. Therefore, potential for contamination to affect agricultural land has been scoped out.
Recreational users	Restricted access to the River Parrett Trail, East Deane Way and Macmillan Way West Long Distance Paths and other PRoWs whilst dredging is undertaken.	It is anticipated that the works will affect access to the path along the righthand banks (the River Parrett Trail, East Deane Way and Macmillan Way West Long Distance Paths) where dredging is being undertaken. Machinery/vehicle movements may also affect other PRoWs where these intersect with site access routes.
AIR QUALITY		
Local air quality	Emissions to air from machinery and vehicles required for the dredging activity	Excavators and dump trucks will be operating over a short period of time (these machines would be distributed over the entire 2.2km site; and therefore, there will be no risk of multiple machines working alongside each other at the same location); and the resulting emissions (including NOx and PM10) are considered to be small-scale and temporary, resulting in negligible change to local air quality
Local air quality	Generation of dust during or immediately after placement of dry sediment, particularly in windy conditions.	Sediments have been tested prior to dredging and have been confirmed as non-hazardous. As such, any dust generated will not contain pollutants harmful to human health. The potential nuisance impacts from generation of dust will be managed through good construction practice and are therefore scoped out.

Resource/ Environmental Receptor	Description of potential effect	Scoping justification
CLIMATE CHANGE AND SUSTAINABILITY		
Climatic factors	Generation of gases (such as carbon dioxide) that have potential to increase the effects of global warming	No significant generation of climate gases is predicted due to the works. As such, the works themselves are not considered likely to have a significant effect on climate change and this element is scoped-out of further assessment.
TRAFFIC AND TRANSPORT		
Local traffic	Possible temporary disruption to local traffic flow and tracking of debris onto roads.	Construction traffic movements on the highways network will be minimal and will be limited to initial delivery of plant to the dredging area (as all dredging arisings will be managed *in-situ* by placing on the rear of the flood embankment). No significant difference to existing use of road network predicted.
Railway line	Potential effects on the railway line from dredging activity or movement of plant and vehicles.	It is not anticipated that the dredging works (including vehicle movements) will affect the railway line in any way.
Visual intrusion	Potential visual intrusion to residential receptors associated with the left bank; and users of the long-distance path running along the right flood embankment. Visual intrusion arising due to dredging works, placement of dredged materials and siting of compounds	Visual intrusion will be temporary and slight. The works are typical of frequent routine operations in the same general location for annual maintenance dredging of rhynes and weed control. The works are mobile and will not stay in the same general location for more than temporary periods. Vegetation restoration will be implement following the works to restore the character of the views from properties and rights of way.

8.8 Environmental measures embedded into the development proposals

8.8.1 A range of relevant environmental measures have been embedded into the development proposals. For those relating to flood risk and people, property, land and infrastructure, please refer to Chapter 7: Water Environment.

8.8.2 Volume 3: Appendix 2A Description of Development Plans includes a range of measures by which the dredging works construction phase is being managed to avoid and minimise non-significant effects on the local population. These are controlled through a robust specification, tool box talks and use of Clerk of Works.

8.8.3 Disturbance to residential properties from the dredging activity will be minimised through the use of an efficient programme of works lasting 8 to 12 weeks.

8.8.4 The works shall be programmed and executed in a manner that causes the least possible interference or disruption to the local community.

8.8.5 The Contractor shall be responsible for notifying local residents and The Local Authority's Environmental Health Officer of any unavoidable disruptive operations, particularly when these are to take place outside the normal working hours, and for fostering good public relations generally in respect of the works, copies shall be notified and available to the Client.

8.8.6 A contact name within the Contractor's organisation shall be provided to residents who would be available to deal with complaints or queries in relation to the works.

8.8.7 The Contractor is expected to work to the principles of the Considerate Constructor Scheme (www.ccscheme.org.uk) for the site and dealings with the public.

8.8.8 All activities are to be carried out so to minimise any disruption and nuisance to the local population, ensure that adequate notice of any temporary closures or traffic restrictions necessary to carry out works is given and good liaison with landowners and the public is maintained.

8.8.9 The permissive footpath along the right bank between sections R1 and R42 known variously as *'The Macmillan Way (West)'*, *'The Parrett Trail'* and *'East Deane Way'* will be closed from September to November 2019 inclusive. The *contractor* maintains the closure during the works phase and assists walkers who may arrive unaware of the closure.

8.8.10 Public footpath L1/8, also on the right bank, is affected by works at sections R40 to R41 but will not be closed. Instead the *Contractor* will fence the affected length of footpath and deploy a 'banksman' whenever plant is working on or near those sections.

8.8.11 Boats, canoes or other vessels do not typically navigate along this stretch of river. However, it is conceivable that such river traffic may arise. The Contractor will make suitable arrangements to warn river traffic that it is approaching the *works* area and assists its passage safely through the *works*.

8.9 Assessment methodology

8.9.1 The general assessment methodology is set out in Chapter 4: Approach to Preparing the Environmental Statement. While the general approach has been used to structure and inform this water environment assessment, further information is provided in Chapter 7: Water

Environment on how this methodology has been applied to Population receptors, and adapted as appropriate.

Determination of significance

8.9.2 Please refer to Chapter 7: Water Environment.

Construction phase – potential effects

8.9.3 Please refer to Chapter 7: Water Environment.

Operational phase – potential effects

8.9.4 Please refer to Chapter 7: Water Environment.

8.10 Consideration of optional additional mitigation or compensation

8.10.1 Please refer to Chapter 7: Water Environment.

8.11 Conclusions of significance evaluation

8.11.1 This assessment has concluded that there are no significant effects on population receptors from the Proposed Improvement Works after taking into account the embedded mitigation measures and the conclusions of this ES (notably Chapter 7: Water Environment).

8.12 Implementation of environmental measures

8.12.1 The environmental measures embedded in the Proposed Improvement Works and the means by which they would be implemented (apart from those associated with Chapter 7: Water Environment) fall within the responsibility of the appointed contractor, and monitored by the PIDB and its Agents.

8.13 References

Please refer to Chapter 11.

9 CUMULATIVE EFFECTS

9.1 Introduction

9.1.1 This ES adopts the general approach to CEA of evaluating inter-project effects separately from intra-related effects associated with the project itself (the Proposed Improvement Works). Definitions for these have been adopted from the Institute of Environmental Assessment and Management (IEMA).

9.1.2 Inter-project effects – These effects occur as a result of a number of past, present or reasonably foreseeable proposed developments, which individually might not be significant, but when considered together could create a significant cumulative effect on a shared receptor, and could include developments separate from and related to the Project.

9.1.3 Intra-project effects – These occur where a single receptor is affected by more than one source of effect arising from different aspects of the Project. An example of an intra-project effect would be where a local resident is affected by dust, noise and traffic disruption during the construction of a scheme, with the result being a greater nuisance than each individual effect alone. Determine of whether this constitutes a significant is then required.

9.1.4 The EIA Regulations require a description of the likely significant effects of the Project on the environment, which should cover cumulative effects e.g.:

"5. A description of the likely significant effects of the improvement works on the environment resulting from, among other things—

(e) the cumulation of effects with other existing or approved improvement works or projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources";

9.2 Limitations of the Assessment

9.2.1 Because of the nature of the proposals, at an early stage of the assessment work, a draft version of the Water Framework Directive Regulatory Compliance Assessment was completed (see Volume 3: Appendix 7C). WFD Step 5 is the In-combination / Cumulative Assessment element. This was completed in draft and consulted on with the Environment Agency in 2018. The conclusion of this consultation was that two relevant projects should be incorporated into the assessment of cumulative effects on the Parrett channel and Somerset Levels and Moors SPA/Ramsar site.

9.2.2 These were: the in-combination effects of the Proposed Improvement Works and the Environment Agency's Sowy/KSD Project and the 'Proposed Improvement Works' and Annual Maintenance Dredge of the River Parrett Downstream' of these works. This led to a series of detailed consultation events between the PIDB, EA, NE. consideration of in-combination effects and appropriate embedded and additional mitigation was identified. No other projects to be considered as part of the assessment of cumulative effects were identified

during this process leading to an in-combination assessment of the Environment Agency's Sowy/KSD scheme in the Appropriate Assessment (See Volume 3: Appendix 6I).

9.2.3 No other projects were identified as being relevant to this cumulative assessment, being scoped out at the initial stages (Steps) of the draft WFD Assessment that was consulted upon.

9.2.4 The assessment was based on information relating to these other schemes that was provided by third parties.

9.3 Assessment Methodology: inter-project effects

9.3.1 The assessment of inter-project effects was based on the Environment Agency's Clearing the Waters for All guidance, but also general good practice in EIA and Appropriate Assessment.

9.3.2 Detailed and regular engagement and consultation with the Environment Agency and Natural England informed the approach to considering cumulative effects.

9.3.3 The cumulative effects assessment for the Project follows the guidelines as set by the Institute of Environmental Management and Assessment (IEMA)

9.4 Assessment of inter-project effects

9.4.1 Consideration of potential inter-project cumulative effects arising from the 'Proposed Improvement Works' and Annual Maintenance Dredge of the River Parrett Downstream' of these works (as concluded by the assessment set out in Volume 3: Appendix 7C) has been given. This has concluded that any effects will not be significant at the water body scale. In addition, no negative cumulative effects are predicted on the WFD Supporting Conditions for:

- hydro-morphology, (depth variation, quantity, structure and substrate of bed, structure of the intertidal zone or tidal regime – freshwater flow);
- physico-chemical (transparency, thermal conditions, oxygenation conditions, salinity, nutrient conditions or specific pollutants); and
- biological quality elements (aquatic flora, aquatic benthic invertebrates, invertebrate fauna - terrestrial margins, fish or invasive species).

9.4.2 This evaluation has concluded that this will result in a **Not Significant (minor adverse)** in-combination effect.

9.4.3 Consideration of potential inter-project cumulative effects arising from the 'Environment Agency's Increased Sowy River/KSD' scheme (as concluded by the assessment set out in Volume 3: Appendix 7C) has been given.

9.4.4 In conclusion, the in-combination assessment of effects arising from the Environment Agency's Sowy scheme and the Oath to Burrowbridge Dredging confirms **Not Significant (negligible)** will occur.

9.5 Assessment Methodology: intra-related effects

9.5.1 The assessment of intra-project effects was based on general good practice in EIA and Appropriate Assessment (e.g. as set by the IEMA).

9.6 Assessment of intra-project related effects

9.6.1 It is considered very unlikely that there would be any intra-project effects during the operational lifetime of the improvement works, recognising that any proposed maintenance will be localised, small scale and be managed through tried and tested environmental mitigation, management and monitoring effects. As such, this assessment only considers construction/dredging stage effects.

9.6.2 The construction phase of the work has the potential to result in population receptors, particularly associated with the left-hand bank of the works area, to encounter levels of noise, dust, altered views, air pollutants at a level they would not have encountered for over 10 years. This may have an effect on local communities and residential dwellings. As embedded and additional mitigation is proposed within the individual topic chapters (e.g. the contractor's specification in Volume 3: Appendix 2A and the implementation of the draft template CEMP in Volume 3: 2C), this will result in a **Not Significant (minor adverse)** in-combination effect.

9.6.3 The construction phase of the work has the potential to result in changes in water quality, arising from both the dredging activity and accidental spillages of contaminants into the river This may have an effect on the local aquatic ecosystem in the River Parrett effect. As embedded and additional mitigation is proposed within the individual topic chapters (e.g. the contractor's specification in Volume 3: Appendix 2A and the implementation of the draft template CEMP in Volume 3: 2C), this will result in a **Not Significant (minor adverse)** in-combination effect.

9.7 Conclusion

9.7.1 **No significant inter-project effects are predicted** from the Proposed Improvement Works and the two other projects identified through consultation as being relevant and incorporated into the WFD Regulatory Compliance Assessment and the Appropriate Assessment.

9.7.2 There are no significant inter-related effects predicted.

10 SUMMARY OF SIGNIFICANT EFFECTS AND MITIGATION

10.1 Introduction

10.1.1 This ES has been produced on behalf of the PIDB in support of permission to undertake Proposed Improvement Works on 2.2km of the River Parrett between Stathe Bridge and Burrowbridge. This will result in the dredging of 22,000 m3 of upper bank sediment from 18% of the left-hand bank and 86% of the right-hand bank, with the sediment placed and graded on the outer right-hand bank before being re-vegetated. This is seen as the optimal solution to provide improved flow conveyance in the channel at this point whilst minimise environmental effects.

10.1.2 Chapter 2 sets out a detailed description of the works.

10.1.3 The scoped of the Environmental Assessment has been agreed by the PIDB in consultation with the consultation bodies and also incorporating a period of informal public consultation.

10.1.4 Chapter 1 of this ES sets out the requirements of the EIA and the technical topic requirements, which are detailed in Chapter 6: Biodiversity, Chapter 7: Water Environment, Chapter 8 Population and Chapter 9: Cumulative Effects.

10.2 Overall Summary of Significant Effects

10.2.1 Taking into account:

- the robust scheme design;
- the reduced spatial and temporal extent of the proposals;
- the embedded and additional mitigation that is based on robust and tried and tested measures; and
- the implementation of both construction and operational phase monitoring and reactive management;

10.2.2 There are **no significant effects** identified for biodiversity, the water environment or the population associated with the Proposed Improvement Works and this ES.

10.3 Cumulative Effects Assessment

10.3.1 **No significant** inter-project effects are predicted from the Proposed Improvement Works and the two other projects identified through consultation as being relevant and incorporated into the WFD Regulatory Compliance Assessment and the Appropriate Assessment.

10.3.2 There are **no significant** inter-related effects predicted.

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