[redacted]

NEC4 professional services contract (PSC)
Scope

Project / contract information

Project name	Lower Witham Flood Resilience Project
Project SOP reference	[redacted]
Contract reference	[redacted]
Date	21 December 2021
Version number	14
[redacted]	[redacted]

Revision history

Revision date	Summary of changes	Version number
June 2020	First issue	1
August 2020	Second issue	2
26th August 2020	Third issue	3
12th October 2020	Fourth issue	4
14th October 2020	8th Version – draft changes to Hydrology and Hydraulics	8
21st October 2020	9th Version – final changes to Hydrology and Hydraulics	9
	10th Version	10
April 2021	11th Version	11
September 2021	Updated to reflect change in Business Case deliverable to produce a strategy update report.	12
December 2021	13th Version	13
16 December 2021	14th Version	14

[redacted]

This Scope should be read in conjunction with the version of the Minimum Technical Requirements current at the Contract Date. In the event of conflict, this Scope shall prevail. The *services* are to be compliant with the Minimum Technical Requirements.

Document	Document Title	Version No	Issue date
412_13_SD01	Minimum Technical Requirements	V11	4TH May 2021

1 Overview

The Lower River Witham catchment is a large area of fenland between Lincoln and Boston. With land levels ranging from only 1 to 4m above sea level, this area would naturally be marshy wetland. A historic legacy of drainage works and embanked watercourses has enabled the highly productive arable land to be farmed and communities have established in the area. The embanked channels are of significant age now (in excess of 200 years old) and increasing flood risk is testing these structures more than ever before, putting at risk the communities and economy of the area.

Whilst there have been several Lower Witham Strategies over the last few decades, for significant works to improve or sustain the current flood risk management infrastructure, few have been able to satisfy HM Treasury funding rules at the time. The Lower Witham Flood Resilience Project will be the first review since the introduction of the new Partnership Funding arrangements in 2020 and therefore a more successful outcome may be possible.

The flooding of autumn / winter 2019 has given further momentum to the need to sustain our critical assets and to develop a long-term tactical flood risk management plan for this area of low lying fenland. It is envisaged that as well as the usual engineering approach to maintaining defences, effort needs to be put into engagement and working in partnership with the local community, other risk management authorities, businesses, NGOs and infrastructure providers. This will support them in adapting to the changes that are required owing to climate change and ageing defences.

This project will be a key element in contributing to the measure set out in the National Flood & Coastal Erosion Risk Management Strategy relating to flood risk management in the Fens.

This Professional Services Contract (PSC) scope is to take the project up to Strategy Update Report and will involve the collection and collation of up-to-date data. It includes the baseline update stage and acknowledges that certain elements of the services (including delivery of the options appraisal and drafting of the Strategy Update Report) will (at the sole discretion of the *Client*) be instructed as compensation events, or under new contracts, as the project progresses.

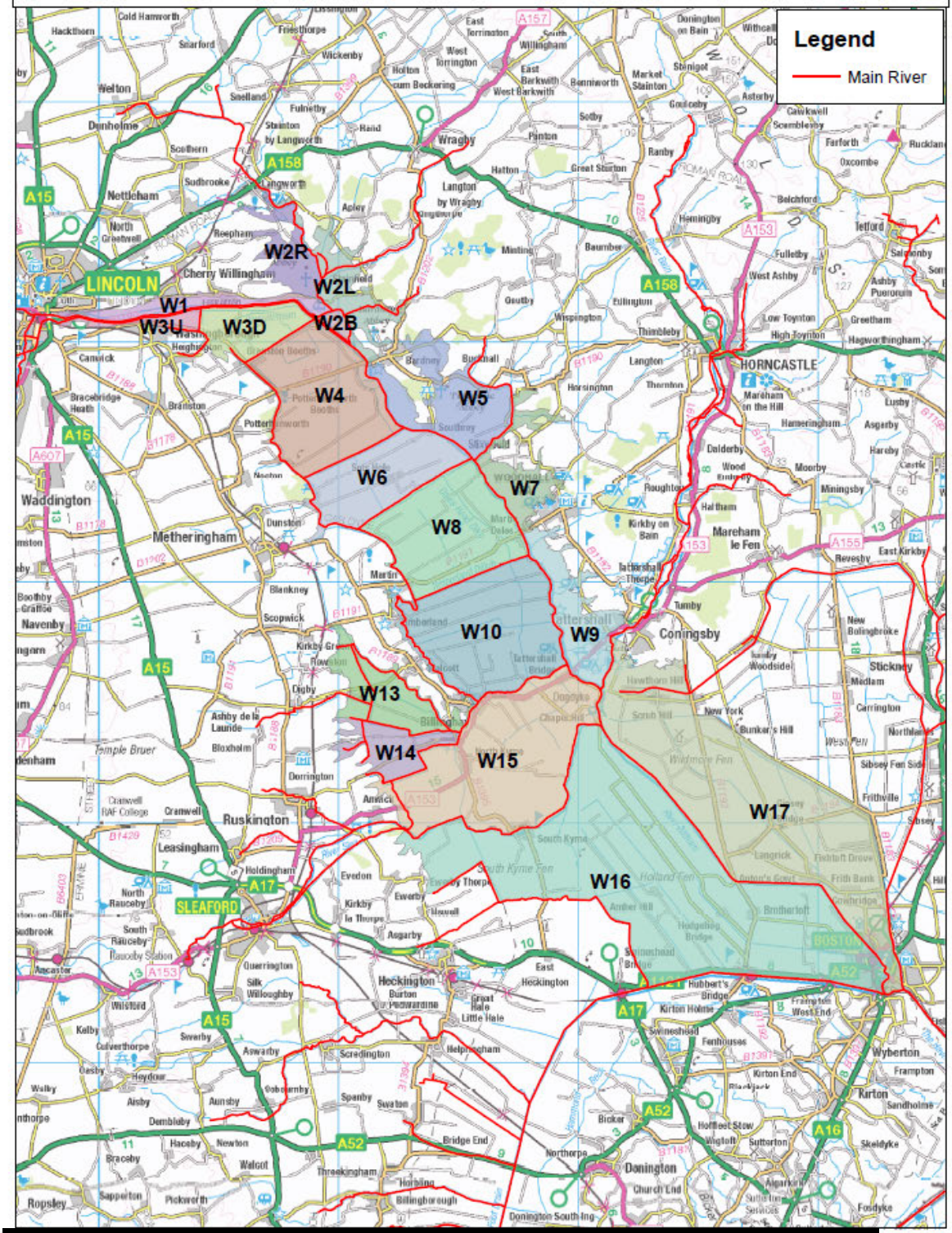
1.1 Background

The extent of the project will mirror the original Lower Witham Flood cells and pick up any additional areas of lowland fenland affected in the 2019 flood event. Amended flood cells have recently been prepared by the *Client* to extend these flood cells to the 6m AOD contour to allow for future climate change impacts. These amended cells are presented below in Figure 1 Lower Witham Flood Cells and in Appendix 2.

It is estimated that 10,518 properties and 24,000 hectares of agricultural land are within Flood Zone 2 of the Lower Witham flood cells.

[redacted]

Lower Witham Compartments V7



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1.2 Objectives

The objectives for the overarching Lower Witham Flood Resilience Project are as follows:

- Provide a resilient catchment[1], with space for flood water to flow without harm
- Increase awareness of flood risk, riparian responsibilities etc. within the community
- Improved catchment understanding on resilience during extreme floods, including interactions between highland carriers (main rivers) and lowland drainage
- Sustain/improve critical assets and remove/make safe non-critical assets
- Work with land managers and partners to achieve a sustainable long-term solution that attains net-zero whole life carbon targets and is aligned with the *Client's* ambitions for sustainability as set out in the EA 2025 Action Plan, e:Mission 2031 Strategy and the DEFRA 25 Year Environment Plan.
- Establish a clear and transparent maintenance regime that is affordable, sustainable and practical
- Improved catchment data in terms of modelling and mapping of a range of scenarios, leading to better informed decisions and improved catchment / community resilience.
- To update the baseline of environmental information (ecological, social and economic) through desk-based study and consultation and demonstrate how sustainability and environment has been integrated within options selection.

1.3 Scope

The current scope covers the baseline stage, an options appraisal stage will subsequently be required and instructed (at the sole discretion of the *Client*) via compensation events, or under new contracts, as the project progresses.

The required outcomes for the baseline stage are as follows:

- To update the baseline understanding of the current condition of flood defence assets by the *Consultant* undertaking an assessment of all existing information (including AIMS and Detailed Asset Inspections), previous studies, survey and geotechnical investigations. The *Consultant* is not required to undertake any additional Detailed Asset Inspections.
- To update the understanding of flood risk to communities, businesses and critical infrastructure through the *Consultant* production of new hydraulic modelling in line with the latest guidance on partnership funding and project appraisal.

[1] For the purposes of this commission the definition of 'resilient' is taken from the National Flood & Coastal Erosion Risk Management Strategy "Strategic objective 1.1: Between now and 2050 the nation will be resilient to future flood and coastal risks. Over the next year the [redacted] work with partners to explore and develop the concept of standards for flood and coastal resilience."

- To prepare and maintain a stakeholder communication and engagement plan. The implementation/execution of the stakeholder communication and engagement plan will (at the sole discretion of the *Client*) be instructed as a compensation event, or under a new contract, as the project progresses.
- To work collaboratively with other *Client* functions, partner organisations and land managers (who all have planned work in this area), to ensure our projects compliment and contribute to a coordinated improvement in the local environment, support economic growth and provide resilience to the wider effects of climate change
- To design a range of engagement approaches, including innovative technology to understand local opinion, communicate and engage
- To review existing environmental documentation and identify environmental constraints and opportunities that will maximize positive environmental outcomes including Biodiversity Net Gain and wider mental health, socio-economic and community benefit and update environmental baseline.
- To produce a concise Summary Report that summarises the findings of the above and sets the strategic direction for the project.

1.4 Outline Deliverables

The objective of the baseline stage is for the *Consultant* to produce and deliver the products listed below. Further details of each requirement is given in Section 3 below.

Topographic Survey

- An updated channel and defence topographic survey of the Lower Witham main rivers.

Geotechnical Investigation

- A desk based geotechnical review of four breach sites (Dorrington Dyke, Queens Dyke, Barlings Eau and Timberland Delph) which occurred in November 2019 to identify likely causes of failure
- A geotechnical stability analysis of the Timberland Delph site is required and will be costed as a Compensation Event. See 3.1.2.
- A geotechnical gap analysis for the study area. The gap analysis will be based on existing data sources as well as the outcomes of the recent *Clients* recovery programme of works. Deliverables will include a GIS database of existing information, a review of any existing bank stability information and an associated technical summary of the findings and recommendations for further assessments. See 3.1.2.

Hydrology & Hydraulics

- Conversion of the existing hydraulic model from Infoworks RS to Flood Modeller and update geometry following channel and topographic surveys to allow options to be appraised in the next stage of this project. This is to include production of hard and soft bed models. See 3.2.

- Completion of breach modelling and mapping that was started by the *Client* but paused in 2019, using the new 'Flood Modeller' model. See 3.2.
- Sensitivity runs using the new 'Flood Modeller' model as prescribed in 3.2.
- Produce required reporting deliverables. See 3.2.

Environmental

- Updated baseline environmental information which identifies and assesses social, environmental, heritage and landscaping risks and opportunities and considers statutory requirements under the Water Framework Directive and Habitats Directive. Note: the *Client's* NEAS team will provide screening to determine the appropriate level of environmental assessment required (i.e. if SEA is required) and for any early works such as GI. See 3.4.
- Collation of the baseline information required for the Landscape Vision. The baseline information supporting the Landscape Vision includes a photographic survey for descriptive purposes, and a series of strategic landscape plans for the study area illustrating relevant information, as deemed appropriate by the research undertaken by the *Consultant*, such as: published landscape character areas, landscape and heritage designations, existing blue/green infrastructure, floodplain extents, allocated development sites, access and connections, biodiversity opportunity and biodiversity value. A separate Baseline and Visual Appraisal document is not required, rather the data from this assessment will feed into the Landscape Vision document at a future stage. See 3.4. Should the *Client's* NEAS team identify any additional requirements for undertaking environment assessments then the undertaking of the additional environment assessments will (at the sole discretion of the Client) be instructed as compensation events, or under new contracts, as the project progresses.

Engagement

- A communication and engagement plan, that builds on engagement already undertaken by *the Client's* local teams and provides innovative opportunities for early stakeholder involvement. See 3.6.
- Inclusion of relevant outputs from the stakeholder analysis into the GIS database

Reporting

- A high-level baseline update report capturing the results of the above analyses. This will pull together the renewed baseline in a single place which can be used for options appraisal in the next stage of work. The format will allow the easy integration of digital data sets (such as Arc StoryMaps), the exact format is to be agreed.

This scope covers the baseline requirements, however an options appraisal stage will subsequently be required to develop the Strategy Update Report. The full requirements of the options appraisal stage are yet to be determined, and will be contracted at a later stage, but are likely to include:

- Recommendations from the gap analysis as to the appropriate level of geotechnical and bank stability assessments which will be required for the appraisal of options, taking into account geoarchaeological works as appropriate.

- Define a programme of geotechnical surveys and bank stability assessments, as prescribed by the above outcome.
- Incorporation of the Baseline Landscape and Visual Appraisal data into a Landscape Vision document to inform a high-level analysis of the areas, without the need for further baseline information. However, potential landscape and visual changes arising from suggested measures that have been developed as part of the vision, such as improved access and recreation for people, changes to vegetation, connecting habitats, natural flood management/SUDS etc, should be discussed. The requirements for the Landscape vision and associated activities are described in Appendix 3 of this scope.
- Undertaking stakeholder engagement as defined by the communication and engagement plan.
- Options appraisal to define a long list, SWOT analysis, technical viability assessment, opportunities and constraints considerations to define a short list and preferred way forward (preferred option would be defined as part of the Strategy Update Report).
- Measured and optimised scheme affordability, produced using Defra's 'Partnership Resilience Funding Calculator'.
- A Strategy Update Report, which will identify a long and short list of options and identify the preferred option for the Strategy. The principal objective of the Strategy will be to define the phasing of the projects/sites to identify which project/sites can be progressed to SOC or directly to OBC/FBC. The exact format of the Strategy is to be agreed with the *Client* prior to commencement.
- A high-level programme for the leading option showing the key funding and environmental constraints, opportunities and timescales for delivery of benefits / meeting the project objectives. This should take account of the time frame required for all approvals that are necessary for mitigation and enabling works to be carried out in advance of main construction
- Coordination with partner organisations and schemes regarding benefit apportionment and partnership working.

1.5 *Consultant* project management

In the management of the commission by the *Consultant* they shall include the following:

- Adhering to the project requirements, stages, milestones, budget constraints and timing of these stages.
- Attend relevant meetings with the *Client* and other Stakeholders. Including a project kick-off meeting, monthly risk register meetings and quarterly workshops, monthly progress meetings (face-to-face or via teleconference as required) and monthly project board meetings. The *Consultant* will be responsible for recording these meetings and the dissemination of key decisions and actions to the *Client* and project team

- Provide and co-ordinate technical support from *Consultant* 'subject matter experts' to the *Client* in its public relations and liaisons with communities, landowners, landowners agents, parish councils, local authorities, Natural England, Historic England, members of parliament, internal drainage boards, Anglian Water, local businesses, infrastructure providers, Lincolnshire Rivers Trusts, Canal and River Trust, angling groups, wildlife groups including Lincolnshire Wildlife Trust, RAF etc
- Provide input to and maintain project efficiency register
- Monthly financial and carbon updates and forecasts as required to meet *Clients* deadlines together with the production of checkpoint reports, end stage reports, exception reports (as required), end project report, and other management products in accordance with PRINCE2
- Provide all data correctly in line with Project IDP and upload information into *Client's* CDE (either ASite or Sharepoint)
- Review and update the issues log during monthly progress meetings and determine the appropriate action required to resolve
- Ensure that all the original data sent to the *Consultant* (i.e. all model and survey information provided by the *Client* in an encrypted format (using WinZip 128 bit encryption) according to the *Client's* data security policy), which is classed as commercially sensitive, is returned to the *Client* in an encrypted format using WinZip 128 bit encryption
- Ensure that project deliverables such as model files, survey data or anything of a personal nature such as questionnaires or address data is returned to the *Client* in an encrypted format using WinZip 128 bit encryption
- Deliver a copy of all models, survey data etc. undertaken and collected for the appraisal, and supporting detailed technical reports to the *Client*. The *Consultant* will be responsible for the adequacy of existing data quality and quantity and will satisfy themselves with this adequacy.
- For each data set used for preparation of the Strategy Update Report, provide an analysis of the assumptions made, to accompany the risk register.
- Ensure quarterly input into framework performance assessment/environmental Performance Measures
- Co-operate with the *Client* in the role of the BIM Information Manager

2 Previous and ongoing studies

The table below contains details of the most relevant previous studies, and a complete list of individual reports is available from the *Client*.

Report	Date	Format	Outcomes of study
Lower Witham Strategy Study - Bullen	May 1997	Digital	A phased 50 year strategic programme of works, to repair and sustain embankments and restore unconfined floodplain storage where beneficial and possible
Lower Witham Phase 1 Feasibility Report	September 1996	Digital	Works to repair and raise banks for sections of L. Witham Stamp End Lock to Nocton Delph – highest priority works
Lower Witham Phase 1 Engineers Report	October 1996	Digital	Works to repair and raise banks for sections of L. Witham Stamp End Lock to Nocton Delph – highest priority works
Lower Witham Strategy Volume 2A – Structural Assessment of Flood Defences	1997	Digital	Details and results of structural condition surveys of the Lower Witham and Tribs FD embankments.
Lower Witham Phase 2 Project Appraisal Report	November 2000	Digital	Works to repair and raise banks for sections of L. Witham Stamp End Lock to Nocton Delph – next highest priority works – not thought to have been fully implemented
Lower Witham Phase 3 Project Appraisal Report	April 2001	Digital	Nocton Delph to Grand Sluice inc Kyme Eau and Billinghay Skirth bank works – not implemented
Lower Witham Phase 4 Delphs and Car Dyke, Technical Appraisal Report	2004	Hard copy available in Ceres house (TBC)	The Delphs – not implemented
Lower Witham Phase 5 Storage Areas, Technical Appraisal Report	2004	Hard copy available in Ceres house (TBC)	Spillways – not implemented
Lower Witham Draft Strategy Review	July 2005	Digital	Never a final version, but reiterated findings of the 1997 strategy, that unconfined storage was the only way to improve the SOP and justify works in Compartment 2 (Barlings). If not implemented SOP would remain at 1 in 5 at Barlings, even with bank works implemented elsewhere.

[redacted]

River Witham Opportunities Study	July 2015	Digital	Looked at whether partnerships could be set up to deliver storage on the Witham, to provide PF to support the implementation of Phase 5.
Lower Witham Catchment Strategic Model and Flood Map Improvements	2009	Digital	InfoWorksRS model of Lower Witham and outputs in ArcGIS format
Lower Witham River Corridor Habitat Plan	2019	Digital	Scoping report to identify habitat opportunities in this area.
Lincoln River and Floodplain Restoration Options Assessment – Lincolnshire Rivers Trust	2019	Digital	
Ecosystem Services Assessment for the Lower Witham		Digital	To be provided by the *Client*

The *Consultant* should also be aware that there are a number of parallel projects and studies going on in the catchment which they will need to take account of, and may need to share outputs from and with these studies to ensure a joined up approach. The following table lists these studies/projects:

[redacted]

[redacted]

[redacted]

3 Initial assessment

Not required for this commission.

3.1 Site investigation

3.1.1 Topographic survey

The table below contains details of previous studies.

Report	Date	Format
For historical reference only: Full study area [Lower Witham (Lincoln to Boston) and all main river tributaries] has available survey of dates ranging from 1992, 1998 to mid-2000's	Various	Digital
LiDAR – complete coverage	Various	Digital

Surveys that will be carried out directly by the *Client* for use by the *Consultant*:
None

Surveys to be undertaken by the *Consultant*:

The survey shall be scoped by the *Consultant* in accordance with the *Clients* most up to date National Survey Specification at the contract date.

The survey scope, specification and contract will be agreed with the *Client*, with input from their senior user and their survey specialist, prior to commissioning.

Topographic survey deliverables
The *Consultant* shall undertake a cross sectional survey of the main river sufficient to allow for in bank and floodplain modelling and determination of depths of flooding of properties within the flood plain. Spacing of the survey shall be determined to suit the hydraulic model and should include a survey of all restrictions, bridges, culverts, structures and ideally sub dykes. Updated surveys are required as it is thought that banks have settled significantly since previous work was undertaken.

The *Consultant* shall provide the final output of the survey in the form of a survey report in digital format, together with the survey data in digital format in DWG, PDF, ASCII, DAT, and EACSD formats. EACSD shall be passed through the Environment Agency's online validator program and the validation certificate presented in the Survey Report.

The *Consultant* will commission the survey, review and agree surveyors' site risk assessment, supervise and manage the topographic survey company and review data and check all deliverables.

3.1.2 Ground investigation

The table below contains details of previous studies:

Report	Date	Format
Lower Witham Phase 4 – Delphs Ground Investigation	23-07-2001	Digital
Lower Witham Strategy Study – Borehole Maps 1& 2	01-98 and 09-98	Digital – Borehole Location maps only
Borehole records – for the entire Lower Witham (including Kyme Eau)	12-07-1963	Digital
Lower Witham/Horncastle Flood Relief Strategy 1996 – Structural Assessment	1996	Digital
Flood Recovery Works GI 2020	Commenced 2020	*Consultant* to maintain engagement with team throughout the commission to obtain latest information.

Geotechnical deliverables

- A desk based geotechnical review of four breach sites (Dorrington Dyke, Queens Dyke, Barlings Eau and Timberland Delph) is required to understand and document the causes of failure. In addition, a geotechnical stability analysis of the Timberland Delph site is also required.
- A geotechnical gap analysis for the study area including the main river embankments. The gap analysis will be based on existing data sources as well as the outcomes of the recent *Clients* recovery works. Deliverables will include a GIS database of existing information, a review of any existing bank stability information, and an associated technical summary of the findings and recommendations for further assessments.
- The *Consultant* will be required to use gaps identified above to scope, design and specify additional ground investigation required for subsequent stages of work. At this stage high-level recommendations will be made identifying areas in which GI may be advantageous and the types of GI needed based on the gap analysis. Detailed specifications and procurement of GI forms part of the deliverables for the next stage of works and will be awarded (at the sole discretion of the *Client)* as CE, or through new contracts.

3.1.3 Services search

None.

3.2 Hydrology and hydraulics

3.2.1 General

An InfoWorks-RS model for the Lower Witham was produced in 2009. A copy of the model report has been provided to the *Consultant* which provides details of the extents of the modelling, calibration and assumptions made in production of the model.

Hydrology deliverables:

The *Consultant* shall convert the existing InfoWorks-RS model to Flood Modeller Pro (FMP) format and incorporate the outputs of the new survey and updated hydrology as per 3.1.1

The *Consultant* shall provide a FMP model that is capable of stable running for the following uses:

- With defences (baseline) flood levels (in channel and on floodplain) and flood extents (mapped by depth, velocity, hazard rating and flood level) for a range of present day and climate change scenarios from 1:2 AEP to 1:1000 AEP.
- Without defences flood levels and extents for present day 1:100 and 1:1000 AEP.
- Breaching of raised defences at identified locations, with extents mapped by depth, velocity, hazard rating and flood level.
- Sensitivity testing on manning values to represent varying maintenance regimes and summer floods.
- Removal of specific defences / assets.

The *Consultant* shall provide a technical note / inception report for the updated FMP model, including:

- A review of the existing InfoWorks RS model, covering (but not limited to) extent, schematisation and any recommendations made during its production to allow its use for the full range of potential uses.
- A review, including likely benefits and risks, of how the IDB lowland systems can be incorporated into the future FMP model, together with a summary of existing / planned IDB models coverage
- A review / recommendation on available data for calibration, which should include for calibration to / replication of the November 2019 incident.
- Updated hydrological assessment

The *Consultant* shall provide to the *Client* any software licences required.

3.2.2 Hydrology

The *Consultant* shall undertake full hydrological and geohydrological analysis using appropriate methods selected by the *Consultant* and accepted by the *Client* for all sub-catchments across the study area, including pumped inflows. Hydrological analysis will establish inflows for the 1:2 to 1:1000 AEP present day and future scenarios, both with and without climate change. The *Consultant* will provide a schematic for agreement with the *Client* showing how the sub catchments and river network are connected.

The previous hydrological analysis undertaken for the 2009 InfoWorks-RS model is available.
There are multiple gauging stations across the study area, as outlined in the 2009 Model Hydrology Report.

Increases in inflow for climate change shall take account of any formal upstream storage, eg Lincoln Washlands and Horncastle Flood Storage Reservoir, as well as natural attenuation in the upper systems. The *Consultant* shall propose an approach on how these effects are to be considered which shall be agreed by the *Client*.

The Witham catchment is not heavily dominated by groundwater. However, groundwater model(s) may be useful for understanding flow through paleochannels and potential geotechnical implications. Available hydrogeological model(s) for the catchment will be provided by the *Client*. The C*onsultant* will review the available hydrogeological model(s) and make recommendations on whether any further analysis is needed. If required, further analysis will be instructed (at the sole discretion of the *Client*) via compensation events, or under new contracts, as the project progresses.

The downstream boundary is to be Mean High Water Springs (MWHS). The *Consultant* shall give consideration and make a recommendation which shall be agreed by the *Client* regarding the need for (and benefit of) a joint probability analysis of a higher tide level at the downstream boundary (taking account of Boston Barrier).

The base date for modelling work will be 2022.

Prior to commencing any hydraulic simulations, the *Consultant* shall provide a hydrology method document to the *Client* for the *Client's* acceptance. The hydrology method statement shall include the proposed catchment-wide hydrology methods/parameters/values that the *Consultant* is proposing to be used in the hydraulic method.

3.2.3 Hydraulic model

- The *Consultant* shall undertake the following preliminary sensitivity tests / breach runs using the new Flood Modeller Pro model (once it is constructed and calibrated, in advance of option selection and testing):

- Sensitivity testing – total of 15 runs
- Optimised Maintenance
- Channel With hard bed levels throughout.
- Mannings To be agreed – to reflect an optimised maintenance regime
- AEP to be modelled 1 in 5, 10, 20.

- Increased Siltation
- Channel With increased soft bed levels at specific locations (eg at confluences, exact details to be confirmed).
- Mannings To be agreed – to reflect current maintenance regime
- AEP to be modelled 1 in 5, 10, 20.

- Structure Operation Sensitivity - Grand Sluice Lock
- Inclusion of this structure for passing flood flow.
- Channel With soft bed levels plus inclusion of the lock for passing flood flow.
- Mannings To be agreed – assume winter vegetation and current maintenance regime
- AEP to be modelled 1 in 5, 10, 20.

- Structure Operation Sensitivity - Single retention level
- Channel With soft bed levels and winter retention level as initial condition.
- Mannings To be agreed – assume summer vegetation and current maintenance regime
- AEP to be modelled 1 in 5, 10, 20.

- Structure Operation Sensitivity – Branston Island
- Channel With soft bed levels, and removal of Branston Island control structure
- Mannings To be agreed – assume summer vegetation and current maintenance regime
- AEP to be modelled 1 in 5, 10, 20.

- Breaching
- Simulation of breaches at 108 breach locations across the model domain for the following scenarios:
- Present Day (2021) 1:100, 1:1000
- Climate Change (2115) 1:100, 1:1000

Model Output format

- The *Consultant* shall design the output to interface with the economic analysis, to allow for depths of flooding to be determined.

- For the areas modelled in 2d, mapped outputs are to be mapped by velocity, depth, level and hazard grids in ASCII format by the *Consultant*

- All mapping to be provided by the *Consultant* shall be suitable for use in ArcGIS 10.4

Model deliverables

- The *Consultant* shall produce a separate model report. The final report and all supplementary data (models etc.) are to be submitted in electronic format at the end of the project

- Al electronic data should be in an agreed format in line with the scheme IDP. A copy of the plan will be provided by the *Client.*

- The model report shall provide a clear technical description of the method used for hydraulic modelling, including but not limited to:

- High level description of the derivation of the run parameters (e.g. roughness, hydraulic coefficients, weir coefficients, etc) used within both the hydrological assessment and the hydraulic model

- Exception reporting (describe what non-standard things have been done to build or run or post process the model). Describe any other criteria used to improve the final results (such as the filling of islands in a flood extent map or inclusion of boundaries to flow in risk mapping or manual editing of the final results)

- Describe what, where and when the model is sensitive to as highlighted by the sensitivity analysis to give an idea of the robustness of the model

- Provide a list of the final design runs, together with where the result files can be found. Ensure that this list acknowledges where specific model runs have been combined to achieve the final products

- Provide a summary of results. Results of the sensitivity testing to be in the format of a table of peak water levels at key locations (approx. 20 – to be confirmed) for the baseline and then sensitivity test, with differences noted

- Full results to consist of the mapped extents (as specified above) and an excel spreadsheet of model results for each node location, with node labels, NGR, maximum values of stage and flow being the minimum results included. [Note: we are aware of the FMP Harvester tool. Results as extracted by this tool would be sufficient]

- Provide a summary (tabular or screen capture of relevant simulation window) to show the run-time convergence / stability / mass balance. Include a statement about why these are acceptable. State the minimum and maximum computational time-steps under which the model runs stably and with acceptable convergence for all the key simulations required for the study

3.3 Economic appraisal

The current scope covers the baseline stage however an options appraisal stage will subsequently be required, the extent of this is yet to be determined but is likely to include;

- The *Consultant* and *Client* working together to define the options to be modelled. The *Consultant* would prepare a technical note for agreement by the *Client* on the proposed scenarios for options appraisal modelling.
- Modelling of agreed options including the 'Do Nothing', 'Do Minimum' and up to three 'Do Something' scenarios.

3.4 Environmental assessment

For the overarching Lower Witham Flood Resilience Project, the C*onsultant* will work with the *Client* and project partners to:

- Explore the integration of natural processes, restoration of rivers and floodplain, and Environmental Land Management with flood risk management measures;
- Minimise negative environmental impacts, by designing out where possible, and mitigating for unavoidable adverse environmental effects aiming to achieve biodiversity net gain overall;
- Engage and involve local people, businesses and organisations in developing the preferred solution, utilising landscape visioning to support decision-making and partnership development;
- Support and contribute to outcomes that meet the objectives of the Water Framework Directive (WFD) for the relevant water bodies;
- Contribute to outcomes that support the *Client's* duty to take reasonable steps to further the conservation and enhancement of SSSIs
- Achieve innovative, sustainable solutions that support a net zero carbon ambition and the long-term sustainability goals of the CDF
- To explore the benefits of using a natural capital and ecosystem services valuation approach and make recommendations for appraisal tools to be used following the completion of the Strategy Update Report to secure funding

3.4.1 Environmental considerations

- The Lower Witham is predominantly low-lying land with characteristic habitat of fen, wet grassland, coastal and floodplain grazing marsh, scattered areas of deciduous woodland and large expanses of intensively cultivated farmland. The area encompasses numerous Local Wildlife Sites, many buffering the waterways and drains which form ecological corridors across the area. International designation include SSSI designations such as Tattershall Carr and Bardney Lime Woods. The Lower Witham forms a navigable link to the Wash SSSI/SPA/SAC/Ramsar. The area falls with the Landscape Character Area 46, "The Fens", which the *Consultant* shall refer to for its baseline information as well as its Statements of Environmental Opportunity. The *Consultant* shall also consider landscape characterisations published by local authorities, which may be relevant, providing more detailed information.

- For the overarching Lower Witham Flood Resilience Project, the *Consultant* shall give consideration to the environmental opportunities associated with:

  - Restoration of peatland, reed-beds and fenland habitat creation
  - Improving ecological connectivity and green corridors
  - Removal of in-channel obstruction, river and floodplain restoration
  - Targeted environmental land management to buffer agricultural zones and pond creation
  - Recreational and amenity potential connecting rural areas with larger populations through footpaths and cycle ways, and reinstatement of the Fens Waterway Link

- Key regulatory issues for consideration and action by the *Consultant* include:
  Assist the *Client* in consultation with Natural England with respect to development within the zone of influence of the designated sites that may require Appendix 11 CROW assessment, and in relation to any licenses required for protected species. Otters, European water vole, and Aurasian badgers are present throughout the catchment. Consultation will also be required for any derogations required for Countryside Stewardship and Environmental and Management (ELM) interest

  Support the *Client* in consultation with Historic England/Conservation officer LPA regarding archaeological/heritage risk

3.4.2 Environmental assessment deliverables

The *Consultant* shall deliver the following environmental deliverables to feed into the Baseline Summary Report stage:

- The *Consultant's* discipline leads shall carry out a site walkover with the *Client*, to gain a better understanding of the catchment. Production of product descriptions/methodologies for environmental assessment deliverables which have been developed in close consultation with the Client's environmental team (NEAS) and accepted by them.

- Review of existing environmental information including reports listed in Section 2 and environmental constraints mapping already completed by the *Client*. The *Consultant* shall prepare a technical summary of existing information and highlighting gaps and a GIS constraints map, with an ecological focus.
- Environmental support in developing the stakeholder engagement plan and the planning of the options appraisal stage.
- Collate baseline information required to inform the Landscape Vision deliverable. The final Landscape Vision deliverable will be costed and completed in the later project stage. This information will incorporate the suggested content of the *Baseline Landscape and Visual Appraisal* study based on the Minimum Technical Requirements 801_14_SD02, but will not need to consider the assessment of effects, as a preferred option will not be developed at this stage. The content of the baseline is to be determined by the *Consultants*' research, but may include a series of strategic landscape plans for the study area illustrating relevant information, such as: allocated development sites, existing blue/green infrastructure, floodplain extents, deprivation indices, existing and proposed transport routes, access and connections, data for visitor numbers, local landscape character, biodiversity opportunity and biodiversity value. This baseline will also be informed by early stakeholder engagement, as part of the Landscape Visioning process. The baseline information will serve to inform the development of the strategic landscape vision that is further detailed in Appendix 3 Lower Witham Landscape Vision.

- High level baseline historic environment and historic landscape assessment including:
    - a high-level discussion of wider heritage constraints and context and detailed historical research and discussion of the significance of the historic fenland landscape and archaeological potential;
    - supporting documentary research, site walkover survey, and mapping of designated and non-designated heritage assets identified in the National heritage List for England, local authority mapping and Historic Environment Record;
    - initial capacity to inform design and options appraisal, with a structure to allow it to be developed into a desk based assessment or heritage Statement at a later date as required for planning;
    - Consultation with key stakeholders to inform the assessment.

- Collation of existing WFD baseline data (from Catchment Data Explorer, EA data request if needed), and then establishing the WFD baseline including summarizing the status of the water body risks/opportunities of achieving good status.

3.5 Option development

The *Consultant* shall conduct an options appraisal as part of the development of the Strategy Update Report. Completion of the options appraisal and development of the Strategy Update Report will be contracted (at the sole discretion of the *Client*) via a compensation event or separate contract, as appropriate.

3.6 Engagement and consultation

- The *Client* will lead on engagement and consultation, with support from the *Consultant's* engagement specialists.

- The *Consultant* should continue to update and maintain a stakeholder communication and engagement plan in accordance with the *Client's* "Building Trust with Communities" Process including agreement of key stakeholders and political influencers, through stakeholder mapping and discussion with the *Client* and their partners (see below). For this project the *Consultant* should undertake this exercise at a very early stage to take advantage of existing partner engagement that has already started by the *Client* due to recent flooding incidents and other large strategic infrastructure projects taking place in the catchment (e.g. Water Resources East, WRE).
- It is the *Client's* expectation that early engagement activities undertaken by the *Consultant* will take place in a virtual arena (such as Citizen Space), to gather initial views from stakeholders. The *Consultant* shall determine the appropriate methodology to use to undertake virtual stakeholder engagement, and implement it with acceptance from the *Client*. The implementation/execution of the stakeholder communication and engagement plan will (at the sole discretion of the *Client*) be instructed as a compensation event, or under a new contract, as the project progresses.

[redacted]

3.7 Health and safety

The *Consultant* will provide the Principal Designer for this scheme. The Principal Designer duties will include for a review of any site based works at appraisal stage and notifying the HSE of these, as well as a review of the outline design. The *Consultant* shall supply designer's risk assessments, drawings and any other data for *Client* comment and include for any work required following review.

Principal Designer responsibilities will be contracted at the options appraisal stage via a compensation event or separate contract, as appropriate.

3.8 Business case submission

The current scope covers the baseline stage, an options appraisal stage will subsequently be required and instructed (at the sole discretion of the *Client*) via compensation events, or under new contracts, as the project progresses. The completion of the Strategy Update Report will follow the options appraisal and also be instructed by compensation events, or under new contracts, as the project progresses. The format of the Strategy Update Report will be agreed with the *Client* at this stage.

Following submission by the *Client,* the *Consultant* shall be responsible for dealing with responses to queries during the approval process and any resubmission required.

[redacted]

4 Specifications of standards to be used

4.1 Health and safety

Health and safety is the number one priority of the *Client*. The *Consultant* will promote and adopt safe working methods and shall strive to deliver solutions that provide optimum safety to all.

4.2 Guidance documents

The *Consultant* should use the following guidance.

Ref	Report Name	Where used
379_05	Computational Modelling to assess flood and coastal risk	Modelling
	Project Cost Tool	Costs
	FCERM-AG	Business Case
	Multi Coloured Manual	Business Case
183_05	Data management for Flood Risk Management projects and good data management considerations	Mapping and modelling
	Sustainability Measures Form	
	Timber Policy Documents	
120_16	Whole Life (Construction) Carbon Planning Tool User Guide	ERIC Carbon Planning Tool

5 Constraints on how the *Consultant* provides the *services*

None

6 Requirements of the programme

6.1 Programme

The *Consultant* shall provide a detailed project plan in Microsoft project format version 2016 meeting all requirements of Cl.31 of the *conditions of contract*. The programme shall also include:

-
- the following consultation periods, with adequate allowance for review and revision of documents by the project team where appropriate:
    a) *Consultant* internal review (as per your quality review procedures) and two weeks for *Client* review of all outputs before circulation to the wider project team
    b) Submission for approval and two weeks time allowance for the *Client's* approval process.

7 Services and other things provided by the *Client*

7.1 Data and information management and intellectual property rights

All of the data listed as being supplied to the *Consultant* as part of this study remains the Intellectual Property of the *Client*.

7.2 Data custodianship

The data custodian for project deliverables from this commission will be the *Client* PSO team.

7.3 Licensing information

Licences for LiDAR Data, Ordnance Survey mapping, model, survey, hydrometric and historical data will be provided to the *Consultant* upon award of this commission.

7.4 Data management and metadata

The *Client* populates a metadata database called the information asset register (IAR). It is a requirement that all information produced by modelling work is appropriately tagged with metadata. The *Client* will supply an IAR spreadsheet (and any supplementary local metadata requirements if appropriate) where all relevant metadata can be recorded and handed over on project completion.

7.5 Data security

All model and survey information will be provided to the *Consultant* in an encrypted format (using WinZip 128 bit encryption) according to *Client* data security policy. It is expected that once the commission is completed, all the original data sent to the *Consultant*, which is classed as commercially sensitive, is returned in an encrypted format using WinZip 128 bit encryption.

Project deliverables such as model files, survey data or anything of a personal nature such as questionnaires or address data must also be returned in an encrypted format using WinZip 128 bit encryption.

Further details regarding security measures will be discussed at the start-up meeting for this commission.

7.6 *Client's* Advisors

The *Client* has a number of advisory departments. Instructions from such departments should only be deemed enacted and formalised under the contract, when they are confirmed by an Instruction from the *Service Manager.* These departments include but are not limited to Area, NEAS, PSO, geotechnical, survey and modelling specialists etc.

7.7 *Client* Documents the *Consultant* contributes to;

The *Client* maintains several project documents. The *Consultant* is required to contribute to these *Client* owned documents, that include, but are not limited to:

- Project Risk Register
- Project Efficiency Register

Appendices

Appendix 1 BIM Protocol – Production and Delivery Table

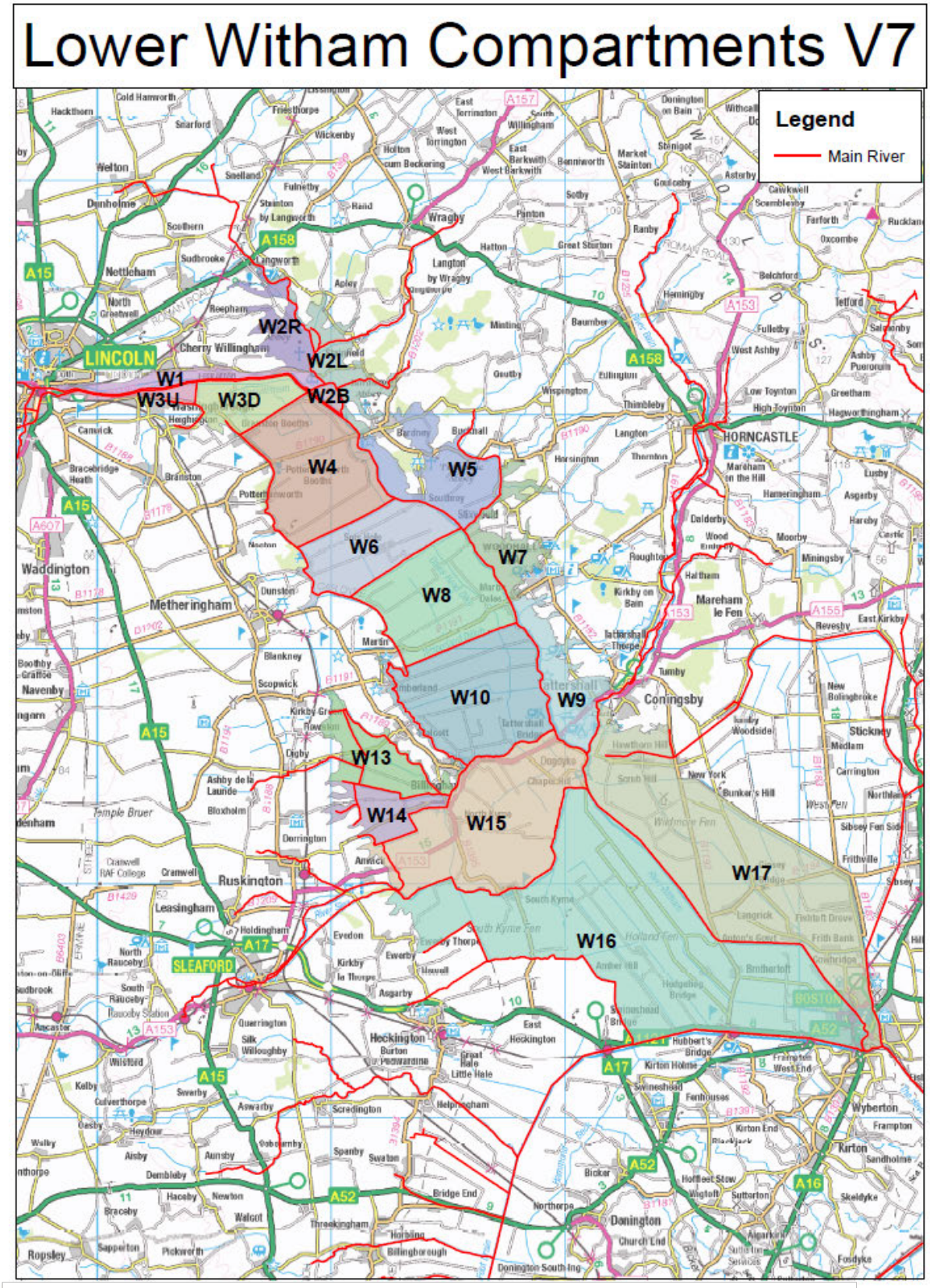
All *Client* issued information referenced within the Information Delivery Plan requires verifying by the *Consultant* unless it is referenced elsewhere within the *Scope.*

www.Pow.bim4.info

You need google chrome for this link to work. Once the table is completed it should be printed for issue in the tender document, so that the correct baseline position can be seen by suppliers.

Appendix 2 Lower Witham Compartments

– Please note this project area may be subject to some slight amendment as the *Client* is currently still confirming the extent of each flood cell.



Appendix 3 Lower Witham Landscape Vision

1. The purpose of this document is to clarify and confirm the *Client's* expectations and requirements with regard to the Lower Witham Landscape Vision document. The production of the Landscape Vision document will (at the sole discretion of the *Client*) be instructed as compensation events, or under new contracts, as the project progresses.

2. The Landscape Vision document is identified as a required deliverable in Section 3.4.2 **Environmental assessment deliverables** of the Lower Witham Flood Resilience Project Scope.

3. The 'Landscape Vision' deliverable negates the requirement for the Environmental Design Concept (EDC) Statement and Plan deliverable, as outlined in the *Client's* Minimum Technical Requirements (MTR).

4. The Landscape Vision deliverable negates the requirement for a *separate* Baseline Landscape & Visual Appraisal, but this baseline content would be included in the Landscape Vision document (see point 2 below).

5. This will be a two part process:
   a) provision of the Product Description of the work required for the Landscape Vision, a programme of work, and a fee proposal for the deliverable for review in collaboration with the *Client*, and their subsequent approval, followed by;
   b) the production of the integrated Landscape Vision.

<u>Purpose of the Landscape Vision Document</u>:

1. It tells the **story of the existing landscape** (form, land use, cultural heritage, water management, biodiversity), as well as identifying its conflicts and synergies between these aspects.

2. The Landscape Vision will encompass the same gathering of data and analysis as would be covered in a **Baseline Landscape & Visual Appraisal**, as specified in the MTR. This includes a photographic survey for descriptive purposes, and a series of strategic landscape plans for the study area illustrating relevant information, as deemed appropriate by the research undertaken by the *Consultant*, such as: published landscape character areas, landscape and heritage designations, existing blue/green infrastructure, floodplain extents, allocated development sites, access and connections, biodiversity opportunity and biodiversity value. This study will be integrated into the wider Vision document, informing the high level analysis of the study area. (NB: With reference to the MTR, there is no need to assess "potential landscape and visual effects, mitigation opportunities and constraints" at this stage, as optioneering will be carried out at a later project stage. However, potential landscape and visual changes arising from suggested measures that have been developed as part of the vision, such as improved access and recreation for people, changes to vegetation, connecting habitats, natural flood management/SUDS etc, should be discussed.)

3. It develops a **high-level conceptual brand** that may be used to maximise the wider benefits that can be delivered to the community alongside the alleviation of flood risk.

4. It provides a **promotional tool** that could be a catalyst for further investment and could help support ecological, recreational and regeneration initiatives for the rural communities between Lincoln and Boston.

5. Through stakeholder consultation, the Landscape Vision may be used to widen the scope of **potential opportunities**, which could be taken forward (by EA or partners) in subsequent funding bids.

6. It supports **EA corporate sustainability goals** including Biodiversity Net Gain, EA 2025 and Carbon Net Zero.

7. It defines recommendations spatially in a **masterplan** – such as improved access and recreation for people, changes to vegetation, connecting habitats, natural flood management/SUDS;

8. It categorises recommendations into **quick wins, medium and longer term**, and identifies (though negotiation with partners and local stakeholders) who would be best placed to deliver each of them.

Method

1. The *Consultant* may propose their methodology and innovative solutions, but these will be generally based upon:
   - a proportionate desk-based review of relevant baseline information;
   - a targeted site visit (NB: due to the geographic extents of the study area, the *Consultant* and *Client* should agree a focussed approach to the walkover), used as an opportunity for photography;
   - liaison with *Client* and key stakeholders (i.e. 2 No telecons);
   - stakeholder consultation through workshops (suggest 2 No. – potentially delivered online due to Covid-19 restrictions);
   - GIS analysis;
   - high-level masterplanning of the study area;
   - concept design of case study areas; and
   - artistic visualisations of proposals.

Note that the above list is not exhaustive and the *Consultant* is asked to review and embellish this as they think would assist in the production of the Vision.

Format:

1. All of the above will come together in **a concise promotional document**, suitable for printing at A3, or website publishing that may be used for online consultation. The document should be easily understood by the general public, aiming to be exciting, evocative and aspirational.

2. The document should **rely heavily on illustrations**, photography, plans and infographics in preference to pages of text when presenting information, ideas and concepts.

3. Please see the **example images** from the Burton FRMS Landscaping Vision: https://bv.maps.arcgis.com/apps/MapJournal/index.html?appid=b33f0009b4b34c89a354834472ba102b

4. The Consultant should also identify and agree with the Client a number of key locations or generic sites (an allowance of **15 in number), which will be illustrated** in the document. The landscape illustrations (“artist’s impressions”) and associated material should be produced to a quality suitable for being used in consultation/stakeholder engagement and for possible **award entry purposes**. The *Client* reserves the right to review samples of visual illustrations provided by the *Consultant* to assess their suitability prior to any being generated for the Vision. The quality required will be similar to those provided in the provided web link examples above. Should the *Client* be of the opinion that the illustration

samples are not of an appropriate standard, the *Consultant* will be asked to approach a professional landscape illustrator to undertake this element of the commission. Some of these illustrations may also be used to support the concept design case studies noted in item 6, below.

5. The **Landscape Visioning Masterplan should cover the whole of the study area** defined in Figure 1 of the Scope, and be presented at a scale which makes it possible to clearly understand items such as PRoWs and topography. OS 1:50,000 mapping is suggested, but this will need to be reviewed and confirmed by the *Consultant* for the approval of the *Client* when looking at layout of the document.

6. The Consultant should also identify and agree with the Client a number of key locations or generic sites (an allowance of **5 No**.), which will be worked up as **concept design case studies**. The case studies will include a landscape plan to a legible scale, including illustrative sections and sketches, showing key interventions and explaining the benefits of the proposals to water management, humans and wildlife. The *Consultant* should provide high level indicative costs for the realisation of these concept design case studies, to help understand their feasibility. **The case study areas should be those sites most likely to be taken forward in funding bids in the near future.**