highways england

A303 Amesbury to Berwick Down (Stonehenge)

Invitation to Participate in Dialogue

Quality Submission Template B

(Pre-appointment) BIM Execution Plan

TEMPLATE B - (Pre-Appointment) BIM Execution Plan	
Participant allocated name	BADGER
Submission version	Final
Submission date	30/07/2021

Abbreviations

Abbreviation	Definition
ADMM	Asset Data Management Manual
APIM	Assistant Project Information Manager
BEP	BIM Execution Plan
BIM	Building Information Modelling
BC	Business Collaborator
BS	British Standard
CDE	Common Data Environment
CDM	Construction, Design and Management
CIC	Construction Industry Council
CJV	Construction Joint Venture
DJV	Design Joint Venture
DMRB	Design Manual for Roads and Bridges
D-CDE	Design CDE – Part of the Project CDE
E-CDE	Employer's CDE
EIR	Employer's Information Requirements
H&S	Health and Safety
IDC	Interdisciplinary Design Check
ISO	International Organisation for Standardisation
MIDP	Master Information Delivery Plan
P-CDE	Project CDE & Document Management System
PIM	Project Information Model
QA/QC	Quality Assurance / Quality Check
TBC	To be confirmed
TBD	To be defined
TIDP	Task Information Delivery Plan

Purpose of the BEP

The BIM Execution Plan (BEP) will encompass the full digital requirements for the Scheme. This will include BIM, GIS, Asset Management and Information Management across the design, construction and operational phases. The purpose of the pre-appointment BEP is to define the methods and procedures to deliver the Digital Construction Requirements as per ITPD Volume 2 – Scope, document reference A303-Proc-PD-012-V2-P5, and associated Employer's Information Requirements 3.0 (EIR) contained within Data Room reference

MW_OI_7_1_13. The requirements outlined in the EIR section 2.10 provide the structure to develop the pre-appointment BEP.

1. Named Individuals

Table below lists roles names as requested in ITPD Volume 2-Scope Digital Constructions Requirements, document reference A303-Proc-PD-012-V2-P5.

Table 1-1 Contractor individual names

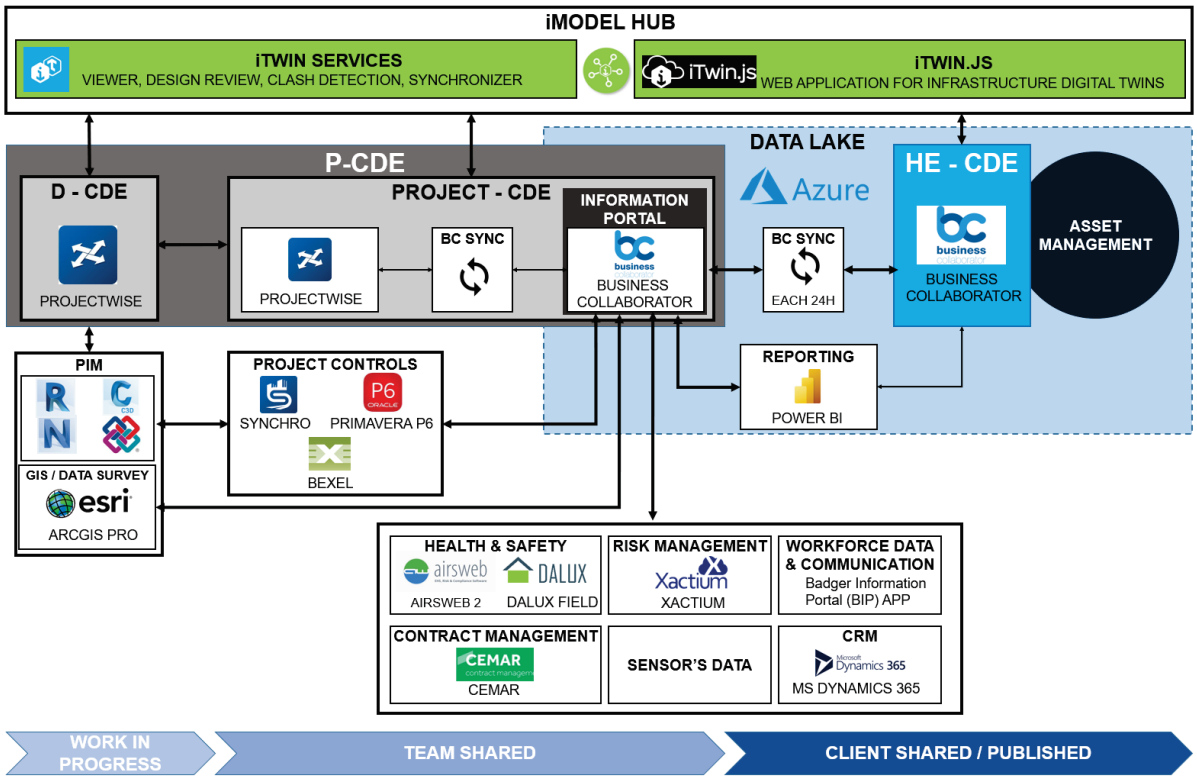
Name	Company	Responsibility
Juan Ramon Mena	Badger CJV	Digital Lead
TBC	Badger CJV	Project Information Manager
TBC	Badger CJV	Data Engineer
TBC	Badger CJV	Data Analyst
TBC	Badger CJV	Information Services Lead
TBC	Badger CJV	Security Lead

2. Information Delivery Strategy

2.1. Approach to meeting the Appointing Party's Exchange Information Requirements.

The organisation and digitisation of information throughout project delivery shall be configured to comply with the information management and collaborative principles as defined inside the BS EN ISO19650 suite of standards and also as per the requirements identified inside the Appointing Party's Exchange Information Requirements section 1.2 detailed in the ITPD Volume 2 – Scope Digital Construction Requirements, document reference A303-Proc-PD-012-V2-P5. Also, the methods for managing the production, distribution and quality of design and construction information through a disciplined process shall be further defined through the application of the GG184 DMRB standard.

Figure 2-1-1: Flow of information between Stakeholder systems



BADGER will set up an Information Portal that will provide the Project Team and HE with access to the relevant project information. All design will be produced in the D-CDE (Design Common Data Environment), where the lifecycle of deliverables shall be managed as per BS EN 19650 suite of standards. Data will be pushed to the Project CDE (Project Common Data Environment), which will also embed the metadata from the D-CDE, thus serving as the document management system of the project. Information will be exchanged automatically from Teams Shared status in P-CDE to Client Shared status/Published in E-CDE, taking advantages of sharing both systems the same BC technology (BC Sync). BADGER's Information Portal, based in Business Collaborator (BC) will also provide a central point for the Project Team, HE and supply chain to access relevant project information. Further details of the portal can be found in **QS-14C**.

The Project BIM goals and objectives outlined in Table 2-1-1 shall be undertaken in accordance with the programme timelines as agreed in the delivery programme and MIDP.

Table 2-1-1: BIM Goals Objectives and uses

BIM Goal / Objectives	Potential BIM Uses
Multi-disciplinary fully co-ordinated design	Fully integrated design models across disciplines to meet Appointing Party's scope of works. Comprehensive clash avoidance and detection process to reduce design and site risks and costs. Temporary works integrated when they add value to the design.
Development of an accurate data-rich model	Facilitation of means to link non-graphical asset data and augment it through the project whole life cycle from design, spatial, cost, as-built and asset information.
Eliminate waste	By normalising the data, enter information once and reuse it many times – turning data into an asset.

Site Utilization Planning	Using models to graphically represent both permanent and temporary facilities on site during multiple phases of the construction process. Output from models to directly interface with machine control.
Controlled information management protocols in accordance with BS EN ISO 19650 suite of standards	Shared model development in a controlled environment incorporating managed change control and validation processes.
H&S management on site improvement and communications	Using Project Information Models for hazard and risk identification and mitigation. Through use of a virtual scheme model to incorporate H&S, CDM requirements. Model to be used for toolbox talks, start of shift briefings, site induction, work methodologies (e.g., for non-native English speakers).
Project control including time dependant construction, sequencing and optimizations.	Primavera P6 will be the software solution for project planning and control. 4D models will be a result of pairing PIM and planning by using Synchro tools, allowing a bidirectional connection with P6 and enhancing the solution with all the benefits of 4D Planning.
Cost Planning	Quantity and materials extractions from PIM to support cost estimation and procurement activities.
Digital legacy	Hand over a digital legacy for the scheme to be used for the operation and maintenance by Highways England area team
BIM collaboration / education	Engage with the supply chain to obtain their views, ideas and develop their BIM capability.
Integral asset data solution	Workflow for the association of asset data within the federated model (Project Information Model PIM), including site information, input/output with Contractor
Reduce carbon footprint	By eliminating the production of hard copies during construction and using the Project Information model (3D federated model) in devices
Operation, maintenance services and activities	Incorporate or link additional parameters required for the operational phase of an asset. Allow for future updates of record model to show current building asset information after upgrades, replacements, or maintenance by tracking changes and importing new information into model.
Contribute to optimising the customer experience	Utilise BIM models to help clarify intentions about the project programme & design, to increase project awareness & acceptance with both technical & non-technical stakeholders.
Inform business analytical decision-making, at the strategic, regional and scheme levels;	Allow all parties involved to access interactive visualizations and walkthroughs in order to support sound decision making without the need for specialized software

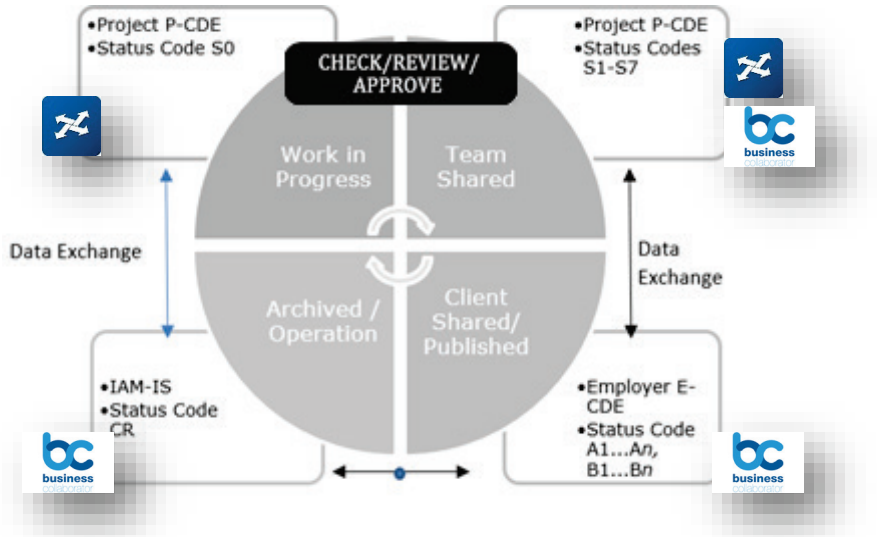
Asset information shall be delivered at stages agreed through the project programme and at each Design Fix during the scheme lifecycle, with alignment to key decision points identified in Employer's Information Requirements (Ref. **3.1.3**) and the latest version of the Highways England Project Control Framework. All asset information shall be associated to model components using the Autodesk Model Development Management Tool (MDM) and structured to meet the requirements of the latest version of the Highways England Asset Data Management Manual (ADMM v12), GG184 DMRB standard and asset specific data standards as identified in the Exchange Information Requirements and section 1.2 in the ITPD Volume 2 – Scope and Digital Construction Requirements.

Project information shall be linked to the PIM models at a Level of Information Need which shall be appropriate to the project stage with alignment to the Exchange Information Requirements and GG184 standard. The level of information need strategy and proposed data drops shall be agreed with Highways England through submission of the Task Information Delivery Plans and Master Information Delivery Plan. The level of information need of each deliverable shall adhere to the "no-waste" premises of BS EN ISO 19650-1:2018. Graphical detail, metadata and documental information shall be restricted to the minimum amount of information needed to answer particular requirements of each relevant party/stakeholder when required.

2.2. Process for the collaborative production of information, including design review process.

The Project Information Model (PIM) shall be the focal point of design and construction development, planning, safety and maintenance activities throughout delivery. The PIM model shall be hosted on the P-CDE and the information management function shall be supported by the P-CDE and in-built workflows. The flow of information with associated status and state is captured inside Figure 2-2-1.

Figure 2-2-1: BS EN ISO 19650-1 Location and status flow of Information



The P-CDE "Work in Progress" state shall correspond to the file status inside the D-CDE (Design Common Data environment) identified in Figure 2-1-1 as per 'Flow of information between Stakeholder systems.' The P-CDE processes shall be managed in compliance with BS EN ISO 19650-1:2018 through the mandatory software solutions detailed by Highways England inside the tender scheme requirements and through the additional solutions proposed in Table 2-2-1.

Table 2-2-1: Proposed Systems for Collaboration and Information Modelling

Company	Solution	Comments
Appointing Party– Highways England	Business Collaborator	E-CDE (Employer's Common Data environment) which will lodge Shared information issued from P-CDE for authorization and/or Published information (once the information has been validated by the Employer).

Lead Appointed Party	Business Collaborator	Lead Appointed Party authoring & reviewing section of the P-CDE (Project Common Data environment) which will lodge Shared information issued from the Lead Appointed Party for further issuing for authorization and/or Published information to the Appointing Party E-CDE
Appointed Party	ProjectWise	Appointed party authoring section of the P-CDE (categorised as Project Common Data environment system as per Figure 2-2-1 and further defined as D-CDE inside Figure 2-1-1) that will host all design files lifecycle since they are produced at Work in Progress to Shared states. Before files go to Shared state, they will go through an assurance process by means of Check, Review, Approve and Verification procedure, then they will be ready to be shared with the Project CDE, keeping all metadata as part of the document management system flow described in Figure 2-1-1. Finally, files will be issued to the Appointing Party E-CDE from the P-CDE.
Lead Appointed Party	iTwin Services	Bentley's iTwin Service is a cloud-based program for managing Infrastructure Digital Twins and includes services for visualizing, managing and securing a single digital twin, including its reality data and iModels, along with federated project and/or asset data. ITwin Services include tools for granting (and revoking) role-based authorization to access digital twins and services.
Lead Appointed Party	Information Portal (Business Collaborator)	A web-based project 'Home Page' will be implemented to help provide a collaborative working environment between all disciplines and other parties involved with the scheme. It will be the first port of call for all individuals identified to be working on the scheme. Users will be required to undertake a digital induction, hosted on the portal. Upon completion, user will have access to a wide range of links to key systems, documentation and information that is pertinent to the scheme.
Appointed Party	GIS -based mapping tool (ArcGIS)	Online GIS based mapping solution which enables multiple projects and users to upload, share and access project designs in a single place. The single consistent view of all the design options can be overlaid with constraint information, alongside any other available information, giving nominated stakeholders the ability to make faster and smarter decisions. The ease of use and the speed of which you can display different design options, makes it the perfect tool to facilitate co-ordination and collaboration meetings, removing the need to produce and print numerous drawings every time there is a design update.
Lead Appointed Party	Health and Safety Management platform (Dalux)	H&S management software designates as entry point for hazard information and management of health and safety at work information

Lead Appointed Party	Live collaboration platform (ITwin – MS Teams integration)	Drive lean delivery through using collaborative platform to give all parties transparency and confidence in the project programme enabling a more proactive and efficient planning and monitoring process.
Appointed Party	Issue tracking software	Real-time issue tracking software for Architecture, Engineering and Construction with a focus on collaboration and BIM project coordination. BIM intelligent platform to open up design issues and make them immediately accessible and actionable for the entire project team, to identify and manage model-based issues in the 3D space and on 2D sheets, including addressing clash resolution.
Lead Appointed party	Synchro	Cloud-based portfolio of integrated software and services for digital construction management which includes: - Synchro 4D: 4D scheduling and simulation application for construction projects able to integrate directly with Primavera P6 - Synchro Control: Web-based construction management service to access, manage, collaborate, and analyze construction data - Synchro Field: Mobile Construction Management Environment for capturing real-time data and managing project from construction site.
Lead Appointed party	QA/QC Platform (Dalux Field)	Cloud-based Quality Management System that documents processes, procedures, and responsibilities for achieving quality policies and objectives.
Lead Appointed Party	Cost Planning (Bexel)	Models will be developed using Autodesk's design authoring software stack. These models will provide a basis for quantity take-off, which will be performed with Bexel software. This tool shall read IFC format models and utilise the ADMM and Uniclass classification data to allow the identification of each element and enable the extraction of quantities, arrangement of data to mirror the Work Breakdown Structure and association of costs.

**Note: Please refer to QS-14C for further reference about solutions and data exchange*

Design Assurance Procedures

Discipline clash reviews shall be undertaken by the Task Teams as an inherent part of their design process. The Assistant PIM will lead multi discipline clash reviews prior to Interdisciplinary Design Check (IDC) meetings to identify any unresolved clashes. These clashes will be reviewed, and an agreed resolution will be documented during the IDC meetings. Where agreement to resolution cannot be reached, a separate action will be taken by the discipline leads and further discussion will take place outside of the IDC meetings. This action will be tracked, and an update will be brought to the following IDC meeting.

All clashes identified by the Project Information Manager will be made available to the project team via shared viewpoints in the relevant software prior to IDC meetings. A clash test strategy shall be put in place and the tests will be updated as the design develops. A collaborative approach will be used on this project as a tool to support the IDC meetings and internal change processes. This tool shall be deployed to all Task Team Managers and Interface Managers and be used primarily to manage and track design interface issues

Construction process activity-based clash detection

Recognizing constructability issues early in the design and construction phases will help contractors to avoid problems that hinder construction operations and increase construction costs, and a 4D model shall be developed to represent the various activities of a construction project constrained to a project schedule. Information obtained from a 4D simulation will be assessed for clashes between objects and resulting data will be used to reduce rework, save time and a significant amount of cost, through rectifying errors prior to the start of field installation.

The clash detection process will be based on Synchro Pro, directly connected with activities' schedule from Primavera P6. The frequency of clash detection will be performed as needed and before the commencement of each sequence of work that is recognized as a change in site condition. The proposed collaborative working practices and design review meeting procedures are detailed inside Table 2-2-2.

Table 2-2-2: Design Review Workshops and other collaborative practices

Meeting type	Description	Frequency	Participants
Digital Delivery Strategy	BIM Strategy Meeting to establish the project aims	Project Inception	All Digital Delivery project team and also the Appointing Party
CIP Information Services workshop	Information Services Lead to facilitate knowledge sharing and coordinate innovations between CIP projects	At least every six months	All CIP Information Services (IS) Leads and also the Information Services Lead
Project Information Services Steering Group (ISG)	Information Services Lead (IS) will provide update of IS activities and deliverables, overview of IS strategy, reports on how the IS Strategy is aligned with wider A303 and CIP strategies and priorities, submissions of IS deliverables at project stage gates for review and acceptance and assistance with resolving issues and risks	Every month	Information Services Lead and Digital Lead and all Information Services Leads
Digital Delivery Kick-off	Meeting to confirm the content of the Post Contract BIM execution Plan and the implementation/Management of the BIM processes	Once, post BIM Strategy Meeting	All Digital Delivery project team
Digital Delivery Audit	To monitor and report on the on the compliance with the BIM Standards	Fortnightly	Project Information Manager

Design Co-ordination Meetings	3D and/or data co-ordination meetings using visual software where required. Review of issue log and resolutions	Weekly	Design Team, Project Manager/Engineering Manager, Project Information Manager
Information Exchange Meetings	To align information exchange dates, ensuring successful handover of information	All key milestones	All Digital Delivery project team
Asset Information Model Handover	To discuss and formalize the final Asset Information Model handover requirements	One at mobilization, another prior to project completion and additional meetings aligned with information exchange dates as agreed in programme.	All Digital Delivery project team and Highways England
Any Additional meetings	Meetings to discuss issues as required	When required	Key project Members associated with the issue

The full process which the team shall be following for the collaborative production of information is detailed in section **5.6.6** within BS EN ISO19650-2:2018.

2.3. Overview of the delivery team's organisational structure and commercial relationships.

The proposed organisational structure of the delivery team and commercial responsibility is defined in Table 2-3-1.

Table 2-3-1: Team Organisational Structure and commercial relationship

Commercial Relationship	Organization/Team
Appointing Party	Client/Employer
Lead Appointed Party	Construction Joint Venture
Appointed Party	Design Joint Venture

2.4. Overview of the delivery team's composition, in the form of one or more task teams.

The Delivery team task team and discipline composition are detailed in Table 2-4-1.

Table 2-4-1: Delivery Task Team Composition

Task Teams	Roles
Highways, Structures, Tunneling, Drainage, Technology, Lighting, Environment	Project Director Project Manager Assistant Project Manager Technical Manager Task Team Manager Design Lead Designers Graduate Designers Technicians – Drawings/Design
Design Management, Construction, Project Controls, Digital H&S, Survey Team, ITS Team	Digital Construction Lead Assistant Digital Construction Task Specialists Technicians / Operators IS Lead Data Analyst Data Engineer

3. Proposed Federation Strategy

The Federation Strategy to be adopted throughout delivery will consist of defining a standardised layout for the different components (volumes) of the design that will avoid clashes and promote an inherent clash-free design. This Federation Strategy will take the form of several typical cross-sections showing the relative layout of the features to be accommodated in the central reserve and in verges.

As per the nature of the linear assets being developed, volumes will be separated by design discipline (Task Teams) as outlined in Table 2-4-1 and will adhere to the Volume codes as provided by the Highways England GG184 standard and in accordance with Figure A.2 in BS EN ISO 19650-1:2018. The scheme will also be broken down into separate locations appropriate to the scheme geometry, in a manner which promotes optimum working conditions for each Task Team. Additionally, each point asset also has a required volume that is neighboured by other design elements. Point assets such as structures, chambers, signs and lighting columns all have a volume in space that will be considered throughout the design development.

Table 3-1: Illustration of spatial federation strategy by discipline and volume

Discipline	Volume Code	Scope content
Highways	**HAW**	Accommodation Works
	HEL	Power/Electrical
	HSN	Traffic Signs
	HSL	Traffic Signals
	HSR	Side Roads
	HPV	Road Pavements
	HFE	Fencing
	HML	Mainline Geometric Layout. Alignment & Geometry Design
	HSR	Side Roads Geometric Layout

	HSN	Traffic Signs & Traffic Signals
	HMK	Road markings
	HRR	Road Restraint System (Vehicle and Pedestrian). Safety Barrier
	HSC	Site Clearance
	HKF	Kerbs, Footways and Paved Areas. Off network access path
Structures	**SBR**	Bridges and Major Culverts
	SGN	General
	SGT	Geotechnical
	SGY	Gantries
	SMA	Masts
	SMN	Minor Structures and Culverts
	SRW	Retaining Walls
	SSP	Special Structures
Tunnels	**STU**	Tunnels
Drainage	**HDG**	Drainage Network Design
Technology	**HMC**	Motorway Communications. Technology (Ducts & Cabinets)
Lighting	**HLG**	Road Lighting
Landscape	**ELS**	Environment Landscape
	EGT	Geology and Soils
Environmental	**EGN**	Environment General
	EAQ	Geology and Soils Air Quality
	EBD	Biodiversity
	EHR	Heritage/Historic resources
	ENM	Non-Motorised Users
	ENV	Noise & Vibration
	EWE	Water Environment
Survey	**VAB**	Asbestos survey
	VAS	Accident Statistics
	VDS	Drainage Survey
	VES	Environmental survey
	VGT	Geotechnical Investigation
	VNR	National Road Telecommunications Services
	VPS	Pavement Systems
	VSM	Structures management
	VSS	Stakeholder Surveys
	VTO	Topographical
	VTR	Traffic Survey
	VUT	Utilities Data
General	**GHS**	Health and Safety
Temporary	**TTM**	Traffic Management
	TTW	Temporary Works

Each model content shall correspondent to the specified volume code content listed in Table 3-1. This volume code will be part of the file name of the model. The Project Information

Model (PIM) will federate all of the single models that have been produced for each of the disciplines. An example of PIM content and federation strategy can be found in Appendix B. The non-graphical information associated with the models shall be structured as per the latest version of the Highways England Asset Data Management Manual (ADMM v12) and the asset specific data standards identified in the Employer's Information Requirements (section 1.2 in ITPD Volume 2 – Scope, Digital Construction Requirements).

4. Delivery Team's Responsibility Matrix

KEY ID
R : Responsible for undertaking activity *A : Accountable for activity completion*
C : Consulted during activities *I : Informed following activity completion*

Task	Appointing Party	Lead Appointed Party	Appointed Party
5.1.1 Appoint individuals to undertake the information management function			R
5.1.2 Establish the project's information requirements	R		
5.1.3 Establish the project's information delivery milestones	R		
5.1.4 Establish the project's information standard	R		
5.1.5 Establish the project's information production methods and procedures	C	R	A
5.1.6 Establish the project's reference information and shared resources	C	R	A
5.1.7 Establish the project's common data environment	C	R	I
5.1.8 Establish the project's information protocol	R		
5.2.1 Establish the Appointing Party's exchange information requirements	R		
5.2.2 Assemble reference information and shared resources	C	R	
5.2.3 Establish tender response requirements and evaluation criteria	R		
5.2.4 Compile invitation to tender information	R		
5.3.1 Nominate individuals to undertake the information management function	I	R	R
5.3.2 Establish the delivery team's (pre-appointment) BIM execution plan		A	R
5.3.3 Assess each task team capability and capacity	I	R	A
5.3.4 Establish the delivery team's capability and capacity	I	A	R
5.3.5 Establish the delivery team's mobilization plan	I	R	R
5.3.6 Establish the delivery team's risk register		R	R

5.3.7 Compile the delivery team's tender response		A	R
5.4.1 Confirm the delivery team's BIM execution plan		A	R
5.4.2 Establish the delivery team's detailed responsibility		R	R
5.4.3 Establish the lead appointed party's exchange information requirements		A	R
5.4.4 Establish the task information delivery plan(s)		A	R
5.4.5 Establish the master information delivery plan		R	
5.4.6 Complete lead appointed party's appointment documents		R	
5.4.7 Complete appointed party's appointment documents			R
5.5.1 Mobilize resources	R	R	R
5.5.2 Mobilize information technology	R	R	R
5.5.3 Test the project's information production methods and procedures		A	R
5.6.1 Check availability of reference information and shared resources		R	R
5.6.2 Generate information		R	R
5.6.3 Undertake quality assurance check		A	R
5.6.4 Review information and approve for sharing		R	R
5.6.5 Information model review	I	A	R
5.7.1 Submit information model for lead appointed party authorization			R
5.7.2 Review and authorize the information model	R	R	R
5.7.3 Submit information model for Appointing Party acceptance		R	
5.7.4 Review and accept the information model	R	R	R
5.8.1 Archive the project information model	R		
5.8.2 Capture lessons learned for future projects	R	R	R

5. Additions or Amendments to the Project's Information Production Methods and Procedures

5.1. Capture of existing asset information.

The design teams will carry out a review of the existing infrastructure data to identify interfaces or clashes through collection of data such as Topographic surveys, LIDAR, static laser surveys and utilities information which shall be sourced from third parties. Where existing infrastructure could conceivably have impact on the overall feasibility of a design option or approach, the existing infrastructure information in that area will be subject to a

confirmatory / complementary survey to reduce the impact. Any impact on the feasibility of a design option or approach that third-party data might produce will be flagged as changes.

A significant amount of survey data to be used on the scheme, including AGS data from ground investigations, will be legacy data created/obtained by Highways England or data produced in previous stages of the project. This should include obtaining approved survey reports and certificates. Targeted surveys shall also be undertaken through delivery to support design assurance which will include, but not limited to; topographical surveys drainage, pavement, geotechnical, cross carriageway duct surveys, archaeological surveys, structures condition surveys and lighting surveys.

Digital surveys will also comprise a visual record of the works and a 3D mesh digital model of the working area with full colour data surface imaginary. BIM Models will be updated each time the site is surveyed utilizing Reality Capture technology and the digital survey will be an automated process. This process, intended to be performed cyclically during the execution of the project fulfilling the ITPD Volume 2 – Scope, Digital Construction Requirements, document reference A303-Proc-PD-012-V2-P5, will be undertaken within one week of the access date of the works up to the completion of section 3A. Digital survey shall be used to monitor construction progress, support site safety planning and support the monitoring, planning and operation of earthworks.

A gap analysis shall then be undertaken to identify additional survey requirements in line with the EIR and tender requirements. Any additional survey requirements will then be reviewed to identify the appropriate point in the Scheme Schedule for the surveys to be undertaken.

5.2. Production, review, approval and authorisation of information.

There are five states defined within the CDE workflows (Work in Progress, Team Shared, Client Shared, Published and Archived) and information will pass from one state to another in the corresponding party CDE by means of formal sign-off procedures in line with the procedures defined in BS EN ISO 19650-1:2018 section 12 and GG 102 Quality management systems for highways works.

The WIP and Team Shared states will occur in the Appointed Party D-CDE, whereas Client Shared will reside in the Lead Appointed Party Project CDE and E-CDE upon issue. The Published state will be displayed following final client acceptance of the file in all party CDE systems and Information shall be Archived upon completion of the project. It will be the responsibility of the Appointed Party, Lead Appointed Party and Appointing Party to update the Published and Archive status in their corresponding CDE systems. See further details in Table 5-2-1 below.

Table 5-2-1 Responsibility of Information Between States

Commercial Relationship	Information State From	Information State To	Responsibility
Appointed Party Designer (D-CDE)	Work in Progress	In check	Information Author / Appointed Party
Appointed Party Designer (D-CDE)	In check	In review	Task Information Manager / Appointed Party
Appointed Party Designer (D-CDE)	In review	In approval	Discipline Lead / Technical Manager Appointed Party
Appointed Party Designer (D-CDE)	In Approval	Ready for Sharing	Project Manager / Project Director Appointed Party
Appointed Party Designer (D-CDE)	Ready for Sharing	Team Shared	Document Controller Appointed party
Lead Appointed Party P-CDE	Team Shared	Client Shared	Document Controller Lead Appointed party
Appointing Party Highways England E-CDE	Client Shared	Published	Highways England Representative

For further detail refer to the Information model delivery process described in section 5.6.6 In BS EN ISO 19650-2:2018.

5.3. Security and distribution of information.

The proposed P-CDE shall be hosted within corporate IT infrastructure which shall be configured to comply with BS EN ISO19650-5:2020 and meet the security requirements identified ITPD Volume 2 – Scope, Digital Construction Requirements section 2. Exchanges of internal project data will take place between the D-CDE and the P-CDE platform. Due to Security protocols implemented by the standards, each discipline folder within P-CDE shall be restricted to use by that discipline only. Only information held at 'Team Shared' or 'Shared at WIP' stage will be visible to all disciplines on the project.

An Information Security Management Plan will be defined in order to prevent unauthorized and malicious access to data sources and systems. This plan shall comply with the requirements of BS ISO/IEC 27001 'Information Technology - Security Techniques - Information Security Management Systems – Requirements' and BS EN ISO/IEC 27002 'Information Technology - Security techniques - Code of practice for information security controls. An Information Services (IS) Lead will be appointed to manage and assume responsibility for IS&T (Information System & Technology). The IS&T plan will be design in accordance with the guidance and recommendations contained in BS EN ISO 19650-5:2020 and will be agreed with the Project Manager.

In order to ensure compliance of security policy and determine the minimum set of controls required to reduce the risks to an acceptable level, security audits (internal and external) will be conducted periodically.

5.4. Delivery of information to the Appointing Party.

Delivery of information to the Appointing Party will meet requirements as outlined in ITPD Volume 2 – Scope, Digital Construction Requirements, section 1.4. All documents issued

externally shall follow the checking process outlined in section 5.2 within this document, using quality procedures built into the D-CDE and P-CDE.

Alongside the required deliverables, Task information Delivery Plans and a Master Information Delivery Plan will be submitted on a frequent basis. The MIDP will be a 'live' document and will continue to develop in content as the project progresses. The Project Information Manager will be responsible for the MIDP and the data transfer protocols.

Once the project is approaching close out, an Asset Information exchange package from the Project Information Model will be delivered to the Appointing Party.

6. Additions or Amendments to the Project's Information Standard

6.1. Development and structuring of data.

Each file created on the scheme shall be issued a relevant status code defined by the originator as per BS EN ISO 19650-2:2018 table NA.1 'Status codes for information containers within a common data environment'.

The Government standard and guidance documents that are to be used to define the BIM processes, protocols and structure of data on the project are as listed in the Exchange Information Requirements 3.0 Revision 4.1 (EIR) section 3.2.1.

6.2. Exchange of information between task teams.

All documents to be issued internally and externally shall follow the checking process outlined in section **5.2**, using the BADGER quality procedures built into the P-CDE. During this process, the disciplines will progress their documents through the states up to the 'Ready for Sharing' state, prior to the completion of the Transmittal request e-mail being sent to the Document Control team. Once the Document Control team issue the file, the document will change to the 'Team Shared' state, meaning it has officially been issued to the Lead Appointed Party and it will then be available to the task teams. The file will then be issued to the Appointing Party upon formal acceptance of the by the Lead Appointed Party.

6.3. Distribution of information to external parties.

The process for external parties shall be the same as that followed in section **6.2** but once a file is held in a 'Team Shared' state, it will then be the responsibility of the Lead Appointed Party to share information with external parties through a Shared area of the P-CDE, following approval by the client. The involved parties will be notified automatically when the published file is written to the Shared Area, overriding the previously existing copy of the file and updating all interdisciplinary links. The external parties will download the files from the P-CDE and use them as needed. A Supply Chain area will be integrated into the web-based Information Portal with supply chain guidance and templates available to assist suppliers deliver Highways England's objectives.

6.4. Delivery of information to the Appointing Party.

Refer to 5.4.

7. Schedule of Software

The table below lists all Information Systems that will be used by the Appointed Party, Lead Appointed Party and Client, as requested in ITPD Volume 2 – Scope, Digital Construction Requirements, section 3.1.2. Software versions will not be older than two years since the project award as per GG184.

Table 6-1: Information systems

Software	Version	Native format	Exchange format
Autodesk Civil 3D (DJV)	2021	.dwg	IFC
Autodesk Revit (DJV)	2021	.rvt	IFC
Autodesk Navisworks (DJV)	2021	.nwc	IFC
Autodesk MDM (DJV)	TBD	TBD	TBD
Primavera P6 (CJV)	19.12	.xer	TBD
Synchro 4D (CJV)	Connect	.sp	TBD
Bexel (CJV)	20.6.1	.bx3	IFC
Dalux (CJV)	Cloud		IFC
ARCGIS (DJV)	TBD	Geodatabase	Geodatabase
CEMAR (HE)	TBD		
XACTIUM (HE)	TBD		
Microsoft Dynamics 365 (HE)	Microsoft Office Enterprise E5	Includes Word, Excel, PowerPoint, Outlook, OneNote, SharePoint, OneDrive and Microsoft Teams.	
AirsWeb 2 (HE)	TBD		
ProjectWise (DJV)	TBD		
Business Collaborator (CJV)	TBD		
Business Collaborator (HE)	TBD		
MS Azure Data Hub (HE)	TBD		

8. Upskilling Plan

Each task team shall undertake an assessment of their capability and capacity to deliver information in accordance with BS EN ISO 19650-2:2018 section 5.3.4, the Appointing Party Exchange Information Requirements (EIR) section 3.3.5 and BEP, by completing the BIM questionnaire before commencement of works on the project. The questionnaire will allow BADGER to understand the task teams' current level of experience and knowledge in areas associated with the application of relevant digital delivery standards, processes and requirements meets project requirements.

Once an understanding of task teams' level of skill has been achieved, the BADGER team shall utilise this knowledge to plan and deliver focussed training sessions to equip staff with the knowledge required to utilise systems, undertake efficient working practices and deliver the project to the client requirements. In addition, periodical assessment of knowledge capabilities in relation with norms and context evolution will be carried out during project development.

BADGER's Upskilling Plan ensures the workforce are set targets to improve their knowledge and skills levels. This in turn ensures the A303 Scheme leaves a genuine skills and knowledge legacy. Our workforce is set performance management targets to be reviewed, in line with the SSPMs and the CPF, with evidence gathered from our inspection and monitoring schedule.

As part of the Upskilling Plan, the following methodologies shall be adopted:

- HR management software which will allow employees to grow with training and certification tracking. Also, it will empower managers with team performance data, helping optimise team skills development paths and address any immediate concerns.
- Self-service workspace to help keep employees proactive and enrich their skills, generating a personalised portal that aligns their competencies with career goals and opportunities.
- Access to on-demand leaning academies and in-person technical support for new software and hardware training.
- Digital training to the supply chain, apprentices and community, as part of our employment skills development, with Digital team support in upskilling the suppliers and community involved.
- Supply chain innovation days shall be implemented as an opportunity for our supply chain to demonstrate best practice, market intelligence and new technology to enhance productivity.
- Refresher sessions held via toolbox talks at the start of each new phase of the scheme.
- BADGER Information Portal (BIP) App messages held as a key agenda item on all meetings, to remind and reinforce digital strategy and content.

APPENDIX A

CV of proposed Digital Lead

Refer to **QS-18A** for the proposed Digital Lead CV.

APPENDIX B

Federation Strategy

Example as per figures below: