



Review of Project Delivery Processes and Lessons Learnt

West Sussex County Council

Revision History

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Annex A - West Sussex Gateway Review Process Document 2014

Annex B - Provelio Capital Projects Process

Annex C - Infrastructure UK - Infrastructure Procurement Routemap

1.0 Purpose of Document

The purpose of this document is to set out the key findings from a review of the West Sussex County Council procedures and practices when delivering capital projects within the Highways department.

This report outlines the current state of project delivery practices and compares them to best practice in order to provide insight and Lessons in order to provide a series of recommendations on how the Council could improve project delivery, governance and certainty of outcome when delivering large, complex highway schemes.

2.0 Background

The Highways department within West Sussex County Council have historically experienced significant scope growth in a number of their projects between sign off of the Outline Business Case and signing a construction contract with the contractor. A review of processes and practices was commissioned to look at how projects are initially defined, the level of definition that exists at each stage and the control processes that exist in controlling a project as it progresses.

In order to facilitate this review Provelio were issued with the following documents:

- The Gateway Process 2014
- Examples of monthly project review meeting agenda's and minutes
- Example of monthly project highlight report
- Highways Professional Services Framework
- A29 Project Brief for Preliminary Design
- A29 WSP Design Proposal for Preliminary Design
- A2300 Project Brief for Preliminary Design
- A2300 WSP Design Proposal for Preliminary Design
- A2300 Project Manager and WS Monthly reports during design stage

It is highlighted that some of the observations made in this report are associated with the A29 and A2300 project. This is not because these projects are examples of poor practice but rather that they were the projects that data was provided for. The conclusions and recommendations made are of a general nature and not specific to any individual project.

3.0 Review of Existing Processes and Practice

3.1 Feasibility and Outline Business Case Production

The Council have formally defined their gateway process in the document "The Gateway Process 2014" that is contained in Annex A. This clearly sets out the gateway's that the council expect a capital project to pass through and outlines the status of the project at each gateway. The process follows similar stages to industry standards such as the RIBA plan of works and the HM Treasury OGC gateway stages, so is clearly appropriate and fit for purpose. From a review of current practice, it has been ascertained that the gateway process is used and WSCC project staff understand the process.

Within Annex B of "The Gateway Process, 2014" a detailed list of the issues that must be addressed at each gateway point are set out. This list is comprehensive and covers the main elements of a project when compared to other project management systems such as that developed by Provelio through 15 years of capital project delivery in various industries (see Annex B).

WSCC have a framework for the provision of Highways Professional services that sets out the duties of the consultant at each stage in line with the gateway process defined within their "Gateway Process 2014". However, when you compare the deliverables within the framework

with the deliverables in the lists set out in the process document there are gaps between what the Council require within a stage and what the framework requires the consultants to undertake. One such gap is the production of a project risk assessment. The framework only requires a consultant to provide a "designer's risk assessment" (a specific technical document required under CDM) at Detailed Design stage while the gateway process clearly defines that a costed project risk register should be produced at Preliminary design stage.

This mis-alignment of what should be produced at each stage is further highlighted when the WSP proposals for both A29 and A2300 are reviewed in detail. Each proposal is different and includes different scopes. The most notable of these is that the A29 proposal includes for a drainage strategy and design while the A2300 clearly states that this work is to be done in phase 2 (detailed design).

When there are differences between individual projects and the framework this can result in things "being missed". WSCC project leads may be running more than one project where the scope of services is different but has not been understood. This can lead to gaps appearing within technical documents that leads to omissions within scope during the tender period. This has been identified as having occurred in A2300 when an analysis of the post-tender changes is undertaken (the Compensation Events). In May 2019 a Compensation event was issued to the A2300 contractor to undertake a Drainage Strategy. While this work would have always been required, the underlying risks to embedding scope into a project in this manner are:

- The Council assumed that the drainage strategy was included at an earlier stage (as it was defined to be done within other projects) and the Outline business case did not make due allowance. This would lead to the risk allowance being used for "omitted scope" instead of project risk.
- As the work is embedded into the contract after the tender period there is not the same commercial pressure on the contractor. Although the Compensation event will be reviewed there is still the risk that the Council will pay a higher price for this work than it would if it was embedded in the tender documents.

3.2 Reporting and Governance

Historically the oversight of projects was a key gateway points only. This resulted in projects developing and changing without communication into the wider council. Gateways are often 12 to 18 months apart resulting in potential scope growth during this period without the council having clear governance around the changes.

The council have now put into place a new governance structure consisting of:

- The asset and investment hub
- The Highways hub
- Capital asset board
- This has now formalised governance arrangements outside of the sign off of gateways with monthly project boards now being held for all projects. This is a major improvement that has occurred in the last 12 months.

3.3 Approach to Risk and Contingency

The council currently uses optimism bias as the preferred method of generating a project contingency figure. While this is a recommended government approach, there are the following issues with its use:

- There are variations in project risk profile between projects. Optimism bias does not take this into account in a meaningful way.
- It is easy to apply and does not compel a team to fully assess risks on a project by producing a costed risk register.

- The result is a single monetary figure and does not reflect the degree of uncertainty, especially at the early stages of a project.

It is noted that the Council's Gateway process document stipulates that all major risks must be costed as early as Gateway 1. The current Council practice is, however, not to use costed risk registers but rather apply optimism bias.

4.0 Recommendations for Improvement

4.1 Feasibility and Outline Business Case Production

From the analysis outlined above of the early stages of project delivery it is clear that the scope and deliverables for the design consultants must be clarified and standardised. To do this it is recommended that:

- The Council produce a full definition for a standard set of design deliverables for each stage in their project delivery process.
- That all internal project managers and external consultants undertake training in these deliverables so that they are fully conversant with them.
- Produce a checklist that can be used for each gateway review so that design deliverables can be explicitly checked and signed off. This checklist can also be used to record if any defined deliverables are not present, for a known reason, at a stage in the project (e.g. if TM was not possible on a particular route to undertake surveys).
- Produce a process so that omissions and additions can only be made to the standard list of deliverables by exception.
- Embed a process so that any omissions are used to inform the risk register and ensure that adequate risk money has been allocated (e.g. if surveys were not undertaken then an adequate risk allowance has been made).

4.2 Reporting and Governance

While there has been improvement in the frequency of project boards an assessment of the reports submitted to project boards identified that improvements could be made in the content and analysis of project data. Therefore, it is recommended that:

- Further training is undertaken for the Council project Managers who produce board reports so that the content and level of analysis improves.

4.3 Approach to Risk and Contingency

There are two areas associated with contingency that could improve. The first is the use of costed risk registers instead of optimism bias and the second is whether a single contingency figure is the best method of expressing the risks associated with any individual project.

- Costed Risk Registers

The council's own gateway process states that a costed risk register should be produced at Gateway 2. This reinforces the point that the current process is comprehensive and should be followed. It is recommended that the approach to costing risk is undertaken in this way in the future and not by applying an optimism bias. This will create a more in-depth method of assessing actual risk on a project and should produce a more informed view on both the risk profile of a project and confidence level around risks materialising.

- Definition of a contingency sum

The communication of a project risk profile and the associated contingency sum is critical for the successful delivery of a project. It is recommended that the Council implement the reporting of a spread figure when reporting contingency sums in the early stages of feasibility and design. This can be easily done, when using costed risk registers in a Monte Carlo simulation, with different figures given for overall confidence levels. For

example, a high contingency figure may be given for a monetary sum to cover a 100% confidence level of not exceeding the contingency while a lesser figure would be given for a 50% confidence level. This method of definition illustrates the level of uncertainty within a project at any given point. A large spread of figures between 100% and 50% would indicate a high degree of risk while a small spread would indicate a much lower level of risk. This method of reporting is used by Infrastructure UK on major central government highway schemes as set out within their routemap (see Annex C).

Annexes

**Annex A - West Sussex Gateway Review Process
Document 2014**

Record of Practices (ROPe)

Title: **GATEWAY REVIEW PROCESS - VERSION 4**
Users: All Project Managers
Author: Peter Bradley – Service Manager
Last revision: April 2014
Next revision: April 2015

This latest version :-

- updates the process to reflect changes in organisational structure and governance,
- widens the scope to include for delivery of all schemes (not just those through the Term Contract for Highways)
- refers to schemes, though it may be appropriate to deal with programmes of similar work within a Gateway Review
- identifies all scheme 'clients' as scheme promoters,
- clearly identifies the Project Manager as being responsible for scheme delivery and all the steps associated with achieving this.

The successful delivery of projects is dependent on effective project management. The principles of this apply to projects regardless of their size or complexity. An essential part of this is the application of appropriate controls for ensuring that a project passes from one stage of development to the next only when it is ready to do so, to identify risks and to ensure that unresolved risks are taken forward in the knowledge of and understood by the project team.

The Gateway Process conforms with the principles of Project Management as defined by WSCC and is to be applied in the delivery of all types of highways projects and programmes.

The Project Manager is responsible for delivery of the project and therefore owns the Gateway Reviews and their content. As with all other aspects of the project, the Project Manager must consider the scale, sensitivity and complexity of the project in determining the content of Gateways Reviews.

Peter Bradley
April 2014

West Sussex Highways

THE GATEWAY REVIEW PROCESS

Version 4
(April 2014)

THE GATEWAY REVIEW PROCESS

1. Introduction

- 1.1 The Gateway Review process examines a programme or project at critical stages in its lifecycle to provide assurance that it can progress successfully to the next stage. It is designed to be applicable to all delivery programmes and projects, including those that procure services and construction. The process, therefore, applies to all programmes or schemes within the Integrated Works Programme (IWP).
- 1.2 It is important that the process is not viewed as an unnecessary process that does not add any value. The process is based on well-proven techniques that lead to more effective delivery of benefits together with more predictable costs and outcomes. In the context of the IWP, applied correctly it should result in greater certainty of programme delivery, more efficient budget management and, ultimately, improved customer satisfaction. The Gateway Process meets the requirements of the Gershon Report on procurement and is consistent with "Achieving Excellence in Construction"
- 1.3 This guidance note is aimed specifically at the delivery and management of the IWP and is phrased thus. However, as stated above, the review process can and should be applied to any project delivered within the Highways and Transport Service. It is consistent with the Council's Project Management Framework and should be used in conjunction with other project management tools as appropriate.
- 1.4 The Gateway Review process has been adopted by the Highways and Transport Management Team as mandatory for use on all schemes in the IWP (HTM decision November 2006).

2. What is a Gateway Review?

- 2.1 A Gateway Review is a review of a delivery programme or scheme at a key decision point carried out by a team of experienced people. If the scheme is of sufficiently high risk, it is recommended that the Review is conducted by a team independent of the project team. This is a decision for the Service Manager or Project Manager.
- 2.2 There are six possible Gateway Reviews during the lifecycle of a scheme, four before commitment to construction and two that deal with implementation and confirmation of the operational benefits respectively. Retrospective Gateway Reviews are not supported. Gateway Reviews can be combined (most commonly G2/G3, or G5/G6) this is a decision for the Project Manager and is to be based on scheme size and complexity. It may also be appropriate to consider a whole programme at a Gateway Review; this is possible

for schemes of a similar nature and complexity (such as a surface dressing programme). The process emphasises early review for maximum added value. An overview of the Gateway Process is at Appendix 1 Diagram 1, which summarises the key decision points in the progression of a planned scheme.

- 2.3 Gateway Reviews are not intended to challenge or confirm whether the scheme is the right thing to do – this is a decision that can only be made by the business in the context of its policies, strategies and other plans. They are intended to check that the scheme is likely to be successfully implemented (in terms of management of risk, achievability against planned milestones etc).
- 2.4 At each Gateway the Review enables the scheme promoter in conjunction with those involved in its delivery, including the Contractor and Consultant where appropriate and, where relevant, other stakeholders, to make a decision on whether the programme or scheme progresses through the Gateway to the next stage. Gateways are a 'one-way' process, i.e. once through there should be no return to an earlier stage. Substantial change may require the Project Manager to undertake a fundamental review with the scheme promoter. Specific decisions or outcomes arising from the Gateways are indicated in Diagram 1.
- 2.5 Of particular note is the requirement to successfully complete Gateway 3 before a scheme can be accepted for inclusion in the works programme for implementation in the following year. In other words, the intention is that schemes are to be designed in one year (or two years) for implementation in the following year. The exception to this rule will be those parts of the IWP that comprise a reactive service, or where funding windows or political pressures dictate otherwise. In such circumstances the Project Manager needs to be aware of the additional risks, such as to project planning and coordination with other highways activities, due to compressed timescales.
- 2.6 Walk-talk-build. The same principles of review should be adhered to schemes with less formal designs. In these instances the appropriate checks that apply at Gateway Reviews 1 to 3 should be carried out in order to confirm that the scheme should be included in the IWP and that the contractor is content to price and construct the scheme with the level of supporting paperwork provided. Gateway Review 3 will confirm that the procurement strategy is walk-talk-build. Gateway Reviews 4 to 6 will need completing, though they are likely to be simpler compared with more complex schemes and more suitable to be combined.
- 2.7 Reactive Programmes. For the element of our work which is planned to be reactive (ie works that respond to changes and issues which arise on the highway, such as casualty reduction schemes) the Gateway Review Process will still apply. The Reviews are likely to be

condensed in terms of their overall timescale, may well be simpler in their nature and more likely to be suited to be combined.

- 2.9 Proposals for WSCC Highways schemes can arise from a number of sources and can be funded in a variety of different ways. All of these schemes are to be delivered using the Gateway Review process and progressed using project management best practice. It is likely that the promoting group will ensure that Gateway 1 is completed, though that may not always be the case and in some cases technical assistance may be required to enable this to be achieved. Project Management is most likely to be handed over to a technical lead following Gateway 1, or a combined Gateway 1/2 for simpler projects. As schemes progress it is important that the Project Manager continues to involve the scheme promoter in the ongoing scheme development and future reviews. This is to ensure that the objectives and desired outcomes of the original proposal are not lost and that the implemented scheme results in the intended benefits.

3. What are the benefits?

- 3.1 The Gateway process provides assurance and support for Scheme Promoters, Asset Managers and senior managers in discharging their responsibilities to achieve their business aims.
- 3.2 Conducted and completed correctly, the Gateway process can assist with ensuring that:
- Schemes and programmes are not progressed too far into the lifecycle without adequate information.
 - Abortive work is not carried out on schemes that will not meet objectives.
 - Optimised solutions are developed for identified problems.
 - The best available skills and experiences are deployed on the programme or scheme.
 - There is assurance that the programme/scheme is ready to progress to the next stage of development or implementation
 - There is achievement of more realistic time and cost targets.
 - All risks are understood and are properly managed.
 - There are clear roles and responsibilities defined.
 - There is effective financial control.
 - Estimates and target prices are prepared efficiently.
 - Success criteria clearly link objectives to outcomes.
 - Key decisions with regard to progression are clearly documented.
 - The IWP is updated promptly.
 - Opportunities for scheme integration are maximised.
 - Strategic decisions affecting delivery of the overall IWP are made in a timely fashion based on sound information.

4. Accountability

- 4.1 A Gateway Review is conducted by the Project Manager on behalf of the scheme promoter to ensure that the scheme is delivered using best practice and to meet the original goals and objectives. The Reviews, and design process as a whole, are intended to develop an approach which promotes an open and honest exchange within the project review team. Ownership of the Gateway Reviews rests with the Project Manager, who is accountable for the implementation of recommended remedial action and programme/scheme progression. The Project Manager is also accountable for ensuring that the scheme promoter is advised of material changes to plans, especially changes to cost or programme, as well as ensuring that the Capital Monitor is updated monthly.
- 4.2 The review assigns a Red/Amber/Green status to the programme or scheme. 'Red' status means that remedial action must be taken before a scheme moves forward to the next stage. On occasions schemes may be cancelled by the scheme promoter.
- 4.3 The scheme promoter reviews progress reports and Gateway Review documentation and is responsible for ensuring that decisions concerning the inclusion of schemes within the IWP are commensurate with the status of the schemes. The scheme promoter and Contracts Manager will audit and assess review reports from time to time in order to confirm compliance with this guidance note and to identify and disseminate lessons learned.

5. Planning for a Gateway Review

- 5.1 In agreement with the scheme promoter, the Project Manager needs to schedule Gateway Reviews into their programme and project plans at the outset. Gateways should appear as clearly defined milestones in project plans. All parties need to ensure that sufficient time can be committed to the task. The initial project plan should include agreement with the scheme promoter as to how the Gateway Reviews are to be conducted, who should attend and any proposals to combine reviews.
- 5.2 Prior to the review, the Project Manager agrees with the scheme promoter the scope, objectives and logistics for the review and who is to be involved in the review team. The Project Manager will need to check that the programme/scheme documentation is appropriate for the agreed review and that any problems that may affect the review are identified and have the remedial actions agreed.
- 5.3 The timing of the reviews will need to take into account dependencies. For example the Gateway 3 reviews need to be completed by the end of September if the scheme is to be considered for inclusion in the following year's IWP works programme. This gives a minimum of 6-months lead-in time between completion of detailed design and implementation, allowing time for pricing and construction and road space planning.

6. Contractor and Consultant Involvement

- 6.1 Planning of schemes should take account of the requirements of all parts of the delivery chain, including contractors and consultants, and communicated so that there is a full understanding by all parties of how the IWP is to be resourced and delivered. This will be an ongoing process as schemes are identified, but will have a specific focus each year in preparing the IWP.
- 6.2 Consultant involvement will vary between schemes dependent on the requirement for design and supervision/inspection services. The extent of involvement should be identified and agreed as part of the initial project plan and reviewed and agreed at each Gateway Review.
- 6.3 Contractor involvement should not be confined only to the construction stage. The Contractor must be involved in preparing the IWP in order to agree implementation dates and plan resources. Where appropriate, the Contractor is also to be given the opportunity to comment on and inform the design process ("Early Contractor Involvement"). This should occur no later than at detailed design stage (Stage 3), but could also take place during preliminary design (Stage 2). In practice, during Stage 2 the Project Manager will discuss the outline of each scheme with the Contractor and issue an invitation to attend the Stage 2 review (though may choose not to do so).

7. The Gateway Review Process

- 7.1 The duration of each review will be dependent on the complexity and risks of the programme/scheme. The review team members, led by the Project Manager, are encouraged to openly and honestly exchange information pursuant to the scope of the review.
- 7.2 The worksheets at Appendix 2 are used as a framework for enquiries, not as a prescribed set of questions that must all be asked, concentrating on the aspects that are of particular relevance to the scheme. The review team must appreciate that even though schemes may be similar, the issues will be different and this is where the team concentrates its enquiry – the nature of the issues, how well the programme/scheme delivery and risks are being managed, and the potential for the programme or scheme to succeed.
- 7.3 At the end of their investigations the review team produces a report, using the template at Appendix 3, summarising their findings and recommendations, together with an assessment of the programme/scheme status as Red, Amber or Green.
- 7.4 'Red' status means that remedial action must be taken before the scheme can be considered to have successfully passed the Gateway.

What might give rise to such an assessment will depend on the nature of the scheme at its stage of progression and will be a matter of judgement for the Project Manager and scheme promoter to agree. By definition it comprises something that must be completed before the scheme can progress to the next stage. An example would be where land acquisition has not completed for a scheme at Gateway Review 3 and the scheme cannot therefore progress to works commitment (Stage 4).

- 7.5 'Amber' status means that recommendations have been given and that remedial action is to be taken in the next stage of development prior to the next Review. An example could be where a specific risk has been identified that can be adequately managed during the next stage, but must be resolved before the next review. An amber status will identify that the scheme has an element of risk associated with it with regard to remaining on programme or achieving the desired outcomes. Risks associated with the recommendations are to be reported and added into the project risk register. Amber status at Gateway 3 and beyond will attract a higher level of attention as changes in these stages are known to have the greatest potential for significant disruption to cost and programme during implementation.
- 7.6 'Green' status means that the review has concluded that the scheme is ready to progress to the next stage.
- 7.7 All relevant information is to be recorded and reported (see section 9).

8 Conducting a Gateway Review

- 8.1 Each review comprises three main purposes; the extent to which each of these is considered depends on the individual programme or scheme, these are:
- a) A review of value for money to ensure that:
- the scheme objectives still meet user needs;
 - contributions to other objectives, e.g. accessibility, are maximised;
 - risks have been properly identified, evaluated, allocated and are being managed effectively;
 - all options have been properly evaluated and the recommended option justified; and
 - the design takes full account of disruption, maintenance and whole life cost considerations.
- b) A financial review to ensure that:
- the latest estimate is compared with the previously approved budget and does not exceed it without justification;
 - the latest estimate includes all appropriate allowances, including risk;
 - full account has been taken of optimism bias;

- the scheme is affordable; and
 - funds are available for planned expenditure.
- c) A review of the project management and delivery systems to ensure that:
- an appropriate project management structure is in place;
 - all roles and responsibilities are defined and understood; and
 - appropriate quality, cost, time and change controls are in place.
- 8.2 It is for the Project Manager managing the review and the team involved to determine the extent of the review to satisfy the scheme sponsor. The worksheets at Appendix 2 are provided to offer guidance to what each review might consider, but this will be dependent on the scheme.
- 8.3 The process requires that a copy of the scheme risk register is included with the review report. Further guidance will be issued on how to prepare a risk register.

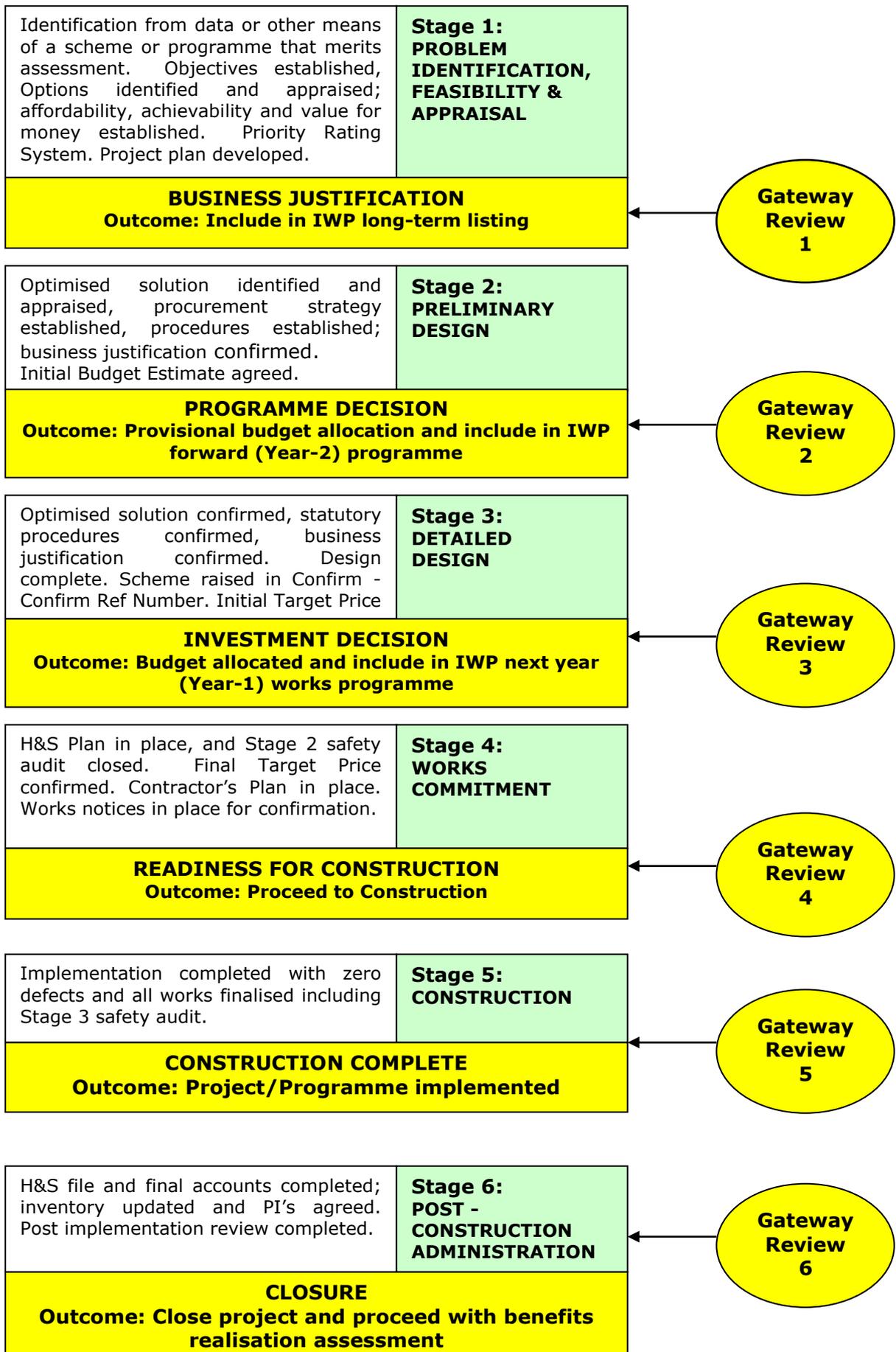
9 Reporting on a Gateway Review

- 9.1 The report at Appendix 3 is to be completed for each Gateway Review. The Review team leader, once he is satisfied that the review has been thorough, correctly conducted and the recommendations and programme/scheme status and risks are correct and recorded appropriately, is to sign and date the report and circulate it to the Review team members (and the scheme promoter if not on the team).
- 9.2 Immediately following the completion and endorsement of the review report, the Capital Programme Monitor is to be updated.
- 9.3 A copy of the report for each review remains on the scheme file. For forward programme schemes Gateway review 3 completion is a requirement by the end of the preceding September (see 5.3).

Schemes that are to be delivered in the current year should have gateway Stage 4 completion at least 12 weeks prior to the proposed construction start date. This is to ensure compliance with the Streetworks noticing requirements.

Ends

Diagram 1: Overview of the Gateway Review Process.



GATEWAY REVIEW WORKSHEETS

Gateway Review 1: Business Justification

Aim: To identify the problem or need and establish that objectives and outcomes contribute to the Transport Plan or other Council strategies. Possible solutions identified through feasibility and appraisal and establish justification for the business to take the identified problem, programme or scheme forward for preliminary design.

- (a) Value for money
- Does the programme or scheme reflect current policy and does the scope fit with the correct business strategy?
 - Does the scheme contribute to the Council's transport strategies, LAA or other Council objectives and targets?
 - Does the high-level business case meet the business need?
 - Has a wide-enough range of options been explored?
 - Have all aspects of sustainability and accessibility been considered?
 - Has the feasibility study been completed satisfactorily, with a preferred solution identified?
 - Is the preferred solution likely to achieve value for money?
 - Is there internal/external authority for the scheme?
 - Is there a clear understanding of the outcomes needed from the scheme/programme?
 - What are the success criteria and have they been agreed with stakeholders?
 - Has the scheme been through the appropriate priority rating system?
 - Are there any dependencies or dependent schemes that could affect this scheme/programme or that this scheme/programme could affect?
- (b) Financial review
- Have all costs been identified with regard to capital costs, disruption, maintenance and whole life cost considerations?
 - Have the risks for each of the options been identified and fully assessed?
 - Have risks for the preferred solution been identified and allocated and is there an outline risk management plan?
 - Have all major risks for the preferred solution been costed?
 - Is the proposed scheme/programme affordable?
 - Are the funds available to reach the next Gateway?
- (c) Project management and delivery
- Is there stakeholder support for the scheme?
 - Is there a governance framework in place, is it fit for purpose and are all roles and responsibilities understood?
 - Are the required skills and capabilities available?

APPENDIX 2

- Is there a framework for managing risk?
- Have the stakeholders been identified and are they supportive?
- Have scheme/programme controls and change management procedures been determined?
- Is the scheme/programme on track?
- Are the scope, scale, objectives and requirements realistic, clear and unambiguous?
- Have the main outcomes been identified and are they achievable?
- Is there a clearly defined and agreed project structure with key roles and responsibilities understood?
- Is there a plan for the scheme/programme regarding timescales, resources, key decisions and finance to achieve the planned outcomes?
- Is a Project Initiation Document needed and, if so, is it in place?

Gateway Review 2: Programme Decision

Aim: To establish that the business justification is sufficient for inclusion in the IWP forward (Year-2) programme for implementation and allocation of provisional budget.

- (a) Value for money
- Does the business case still meet the business need?
 - Has the Contractor contributed to the design solution?
 - Is the preferred solution likely to achieve value for money?
 - Are the outcomes clearly understood and are they achievable?
 - Have all aspects of sustainability and accessibility been considered?
 - What are the success criteria and have they been agreed with stakeholders?
 - Are there any dependencies or dependent schemes that could affect this scheme/programme or that this scheme/programme could affect?
- (b) Financial review
- Is there adequate financial controls and funding in place?
 - Have all costs been identified with regard to capital costs, disruption, maintenance and whole life cost considerations?
 - Have risks been identified and allocated and is there an outline risk management plan?
 - Have all major risks for the preferred solution been identified and costed/priced?
 - Has optimism bias been fully taken into account?
 - Where appropriate has a Budget Estimate been established based on an accepted Price List or unit rates.
 - Is the proposed scheme/programme affordable?
 - Are the funds available to reach the next Gateway?
- (c) Project management and delivery
- Has a communication strategy been agreed?
 - Has the scheme been defined sufficiently to identify procedural requirements and have these been confirmed?
 - Have all procurement options been explored?
 - Is the selected procurement strategy legal, robust, appropriate and understood by all stakeholders?
 - Is the project's plan through to completion realistic?
 - Are there adequate change controls in place?
 - Is there stakeholder support for the scheme?
 - Is there a governance framework in place, is it fit for purpose and are all roles and responsibilities understood?
 - Are the required skills and capabilities available?
 - Is the scheme/programme on track?
 - Are the scope, scale, objectives and requirements realistic, clear and unambiguous?

APPENDIX 2

- Is there a clearly defined and agreed project structure with key roles and responsibilities understood?
- Are there any specific performance measures needed?
- Is there a plan for the scheme/programme regarding timescales, resources, key decisions and finance to achieve the planned outcomes?
- Is a Project Initiation Document needed and, if so, is it in place?
- Has a CDM Co-ordinator been appointed?

Gateway Review 3: Investment Decision

Aim: To establish that the scheme has an optimised solution and confirmed business case and is sufficiently developed with regard to design, procurement and procedures for inclusion in the next-year works programme and budget allocated.

- (a) Value for money
- Has the business case been confirmed?
 - Is the preferred solution likely to achieve value for money?
 - Have all aspects of sustainability and accessibility been considered?
 - Are the outcomes clearly understood and are they achievable?
 - What are the success criteria and have they been agreed with stakeholders?
 - Are there any dependencies or dependent schemes that could affect this scheme/programme or that this scheme/programme could affect?
- (b) Financial review
- Is there adequate financial controls and funding in place?
 - Have all costs been identified with regard to capital costs, disruption, maintenance and whole life cost considerations?
 - Have risks been identified and allocated and is there a detailed risk management plan?
 - Have all major risks been identified and costed/priced?
 - Where appropriate has an Initial Target Price been established?
 - Is the proposed scheme/programme affordable?
 - Are the funds available to reach the next Gateway?
- (c) Project management and delivery
- Has the design been completed sufficient for construction?
 - Have all aspects of buildability been considered (Early Contractor Involvement)?
 - Have all statutory procedures been completed sufficient for the stage?
 - Has the procurement strategy been confirmed?
 - Is there a communications plan in place?
 - Is the project's plan through to completion realistic?
 - Are there adequate change controls in place?
 - Is there continuing stakeholder support for the project?
 - Is there a governance framework in place, is it fit for purpose and are all roles and responsibilities understood?
 - Are the required skills and capabilities available?
 - Is the scheme/programme on track?
 - Are the scope, scale, objectives and requirements realistic, clear and unambiguous?
 - Is there a clearly defined and agreed project structure with key roles and responsibilities understood?

APPENDIX 2

- Is there a plan for the scheme regarding timescales, resources, key decisions and finance to achieve the planned outcomes?
- If appropriate, has the scheme been notified to the Health & Safety Executive?
- Has a plan of the temporary traffic management layout been produced? This would be complete upon the clients request to either the design consultant or the contractor through ECI.
- Has the CDM Pre-construction information document been prepared?
- Has the scheme been input into Confirm and a Confirm Ref No assigned?

Gateway Review 4: Readiness for Construction

Aim: To establish that the scheme is ready in all respects for implementation.

- (a) Value for money
- Is the business case still valid?
 - Is the preferred solution likely to achieve value for money?
 - Have all aspects of sustainability and accessibility been considered?
 - Are the outcomes clearly understood and are they achievable?
 - What are the success criteria and have they been agreed with stakeholders?
 - Are there any dependencies or dependent schemes that could affect this scheme/programme or that this scheme/programme could affect?
- (b) Financial review
- Is there adequate financial controls and funding in place?
 - Have all costs been identified with regard to capital costs, disruption, maintenance and whole life cost considerations?
 - Have risks been identified and allocated and is there a detailed risk management plan?
 - Have all major risks been identified and costed/priced?
 - Where appropriate has a Final Target Price been established?
 - Is the proposed scheme/programme affordable?
 - Are the funds available to reach the next Gateway?
- (c) Project management and delivery
- Has the supply chain been sourced and in place?
 - Is all construction information available to the people that need it?
 - Have all statutory procedures been completed sufficient for the stage?
 - Have all notices been served?
 - Is there a communications plan in place?
 - Is the project's plan through to completion realistic?
 - Are there adequate change controls in place?
 - Is there continuing stakeholder support for the project?
 - Is there a governance framework in place, is it fit for purpose and are all roles and responsibilities understood?
 - Are the required skills and capabilities available?
 - Is the scheme/programme on track?
 - Are the scope, scale, objectives and requirements realistic, clear and unambiguous?
 - Is there a clearly defined and agreed project structure with key roles and responsibilities understood?
 - Is there a plan for the scheme/programme regarding timescales, resources, key decisions and finance to achieve the planned outcomes?
 - Has the temporary traffic plan been checked by the Contractor?

APPENDIX 2

- Has a pre-construction meeting with the Contractor/Consultant/Supply Chain been held or been arranged?
- Has the supply chain been clearly briefed on the purpose and objectives of the scheme?
- Has the supply chain been clearly briefed on the self-certification process?
- If appropriate, has the principal contractor prepared a suitable CDM Construction phase health and safety plan?

Gateway Review 5: Construction Complete

Aim: To establish that the scheme has been implemented in accordance with requirements

- (a) Value for money
 - Have lessons for future projects been identified and recorded?
 - Have the outcomes been achieved?
 - Have the success criteria been met?

- (b) Financial review
 - Have all costs been identified with regard to capital costs, disruption, maintenance and whole life cost considerations?
 - Has the risk management plan been updated to reflect materialised risks?
 - Are the funds available to reach the next Gateway?

- (c) Project management and delivery
 - Is construction complete with zero defects and has the completion certificate been agreed?
 - Has full system testing commissioning been completed?
 - Has the Stage 3 Safety Audit been completed and all necessary actions completed?
 - Is all post-construction information available to the people that need it?
 - Has the self-certification information been received from the Contractor?
 - Have all statutory procedures been completed?
 - Have all notices been served?
 - Is there continuing stakeholder support for the project?
 - Is there a clearly defined and agreed project structure with key roles and responsibilities understood?
 - Is there a plan for the scheme regarding timescales, resources, key decisions and finance to achieve the planned outcomes?

Gateway Review 6: Post-Construction Administration

Aim: To establish that the scheme has been completed in accordance with requirements and can be closed.

- (a) Value for money
 - Have lessons for future projects been identified and recorded?
 - Have the outcomes been achieved?
 - Have the success criteria been met?
 - Was the business case justification realistic?
 - Is there a plan for determining if the expected benefits actually being delivered?

- (b) Financial review
 - Have all costs been identified and the project final account settled?
 - Has the risk management plan been updated to reflect materialised risks?

- (c) Project management and delivery
 - Is all post-construction information available to the people that need it?
 - Have all statutory procedures been completed?
 - Has a post-implementation review or equivalent been carried out?
 - Have lessons for future projects been identified and recorded?
 - Has all project information and documentation been delivered?
 - Has the asset inventory been updated?
 - Have performance measures been agreed?

GATEWAY REVIEW REPORT

Programme Work/Type:						
Scheme name:					IWP Code:	
Scheme description:					WBS:	
GATEWAY REVIEW:	1	2	3	4	5	6
Review Team Members:	Name:			Organisation:		
Summary of key matters considered at review						
Value for money:						
<p>Note: To include statement of key objectives/targets.</p>						
Financial:						
<p>Note: To include breakdown of current estimated costs (including risk, design, third parties etc.)</p>						
Project Management and delivery:						
Scheme Status: (circle status)	RED	AMBER	GREEN			

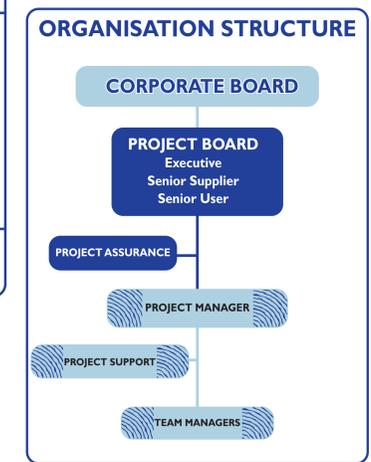
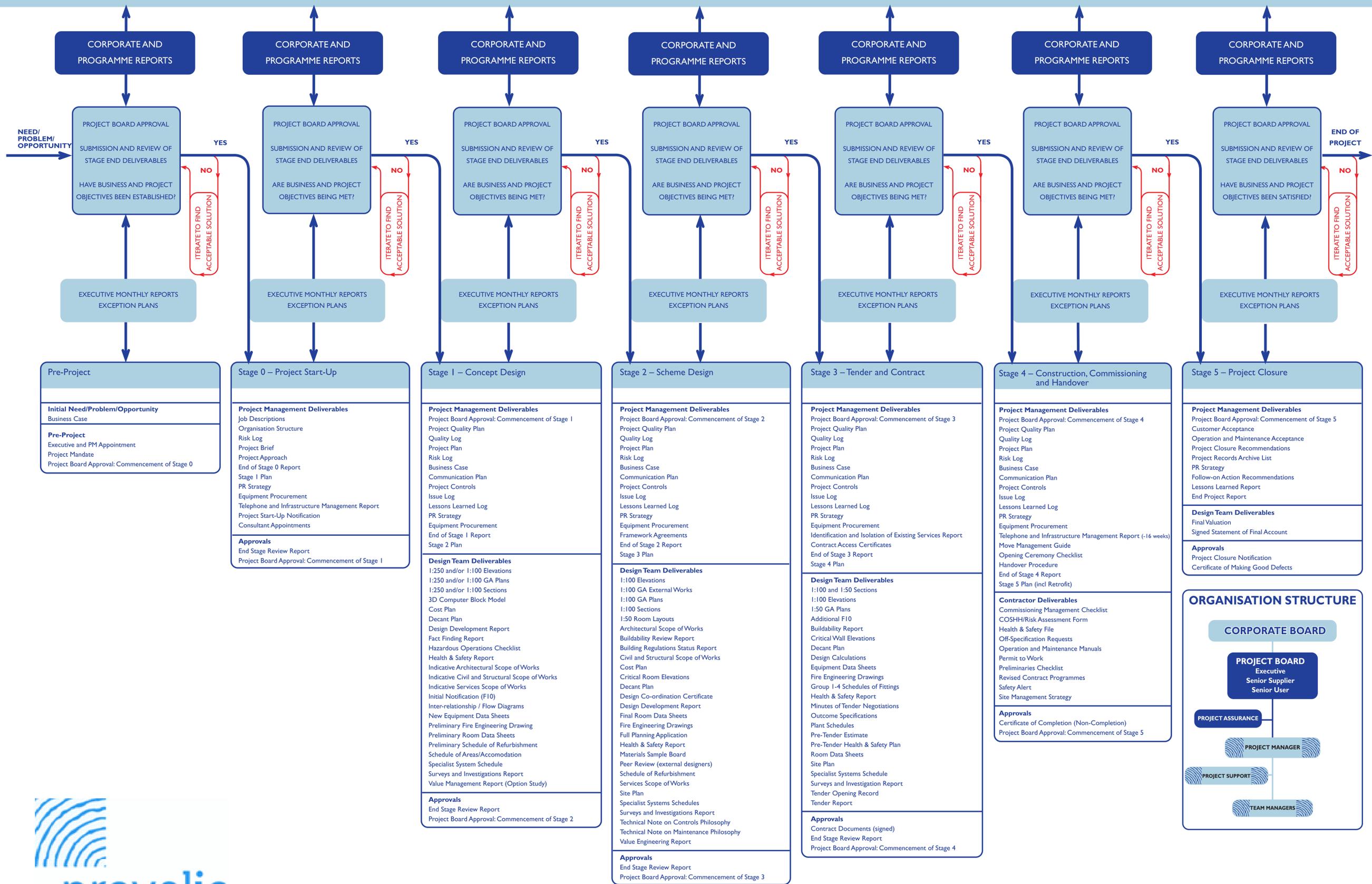
Please now complete the second page of this report.

APPENDIX 3

The Scheme has been assessed as status:		Insert 'Red', 'Amber' or 'Green'	
If Red , list below the immediate remedial action required before the scheme is to progress to next stage.			
If Amber , list below the remedial action to be incorporated into the next stage of the scheme.			
If Green , there are no outstanding remedial actions and the scheme is clear to progress to next stage.			
Risk Management:	A copy of the risk register is to be appended to this report.		
Future Critical Dates:	Date of next Gateway:		
	Date of construction:		
Certified by the Asset/Function Manager:			
	Signature	Name	Date
Certified by the Asset Sponsor:			
	Signature	Name	Date

Annex B - Provelio Capital Projects Process

CORPORATE/PROGRAMME MANAGEMENT



Annex C - Infrastructure UK - Infrastructure Procurement Routemap

Commercial Services Division Major Projects Cost Estimation Manual



AMENDMENT CONTROL SHEET

This document is subject to regular review and update with changes to the Highways England procedures. All individuals seeking to rely on, or implement, the Highways England Cost Estimation Manual have a duty to ensure they are familiar with the most recent amendments.

Version No.	Summary of Amendments	Author	Approved By	Effective Date
1.0	Initial Issue	ARM	MG	16/06/09
2.0	Draft to reflect new estimating process developed during TCM programme and the introduction of TPE	ARM	MG	-
2.1	Revision to reflect new estimating process developed during TCM programme and the introduction of TPE	MR	MG	27/08/10
3.0	Revision to reflect changes in estimating process developed by Cost Planning	MR	GH	21/02/14
3.1	Revision to reflect switch to Highways England including minor process changes	BB	MR	01/04/15

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1 INTRODUCTION

1.1 Background, Intended Audience and Purpose

Highways England requires accurate cost estimates throughout the project lifecycle for several purposes including:

- Determining the economic feasibility of a project;
- Evaluating between the project's alternatives;
- Establishing the project budget and providing a basis for project cost and schedule control;
- Benchmarking and challenging cost submissions from tenderers and the supply chain.

Commercial Services Division is responsible for ensuring that these estimates are in place for Major Projects; the purpose of this manual is to set out the process employed to achieve this.

This manual provides an introduction to the estimating process for new Commercial Services Division staff and project teams that require cost estimates for the delivery of their schemes as well as serving as a useful reference document.

1.2 Relationship with Other Manuals and Processes

The cost estimating process interacts with several other processes, for which readers should refer to the following documents:

Related Process / Guidance	Description
Project Control Framework (PCF)	Sets out the standard project lifecycle for various projects and the Products required at each Stage Gate.
Price Negotiation Processes	Detailed approach to agreement of Prices
Value Added Tax Guide	Finance Services guidance on value added tax
Lands Costs Guidance Note	Estimating Lands Costs Guidance for the production of estimates for projects' lands costs

1.3 Feedback

Commercial Services Division Head of Cost Planning is the owner of the estimating process and this manual. Feedback and suggestions for improvements are welcomed – please send your comments to commercialservicesdivision@highwaysengland.co.uk

2 PROJECT LIFECYCLE AND COST ESTIMATES

2.1 The Project Control Framework

The Highways England standard project lifecycle is based on the Project Control Framework (PCF) shown in Figure 1 which consists of the following Phases:

- Pre-Options (Strategy Shaping and Prioritisation)
- Options
- Development
- Construction

Each Phase has a number of stages with a Stage Gate Assessment Review (SGAR) through which projects must pass if they are to progress to the next stage of development. The phases and stages are summarised in Figure 1.

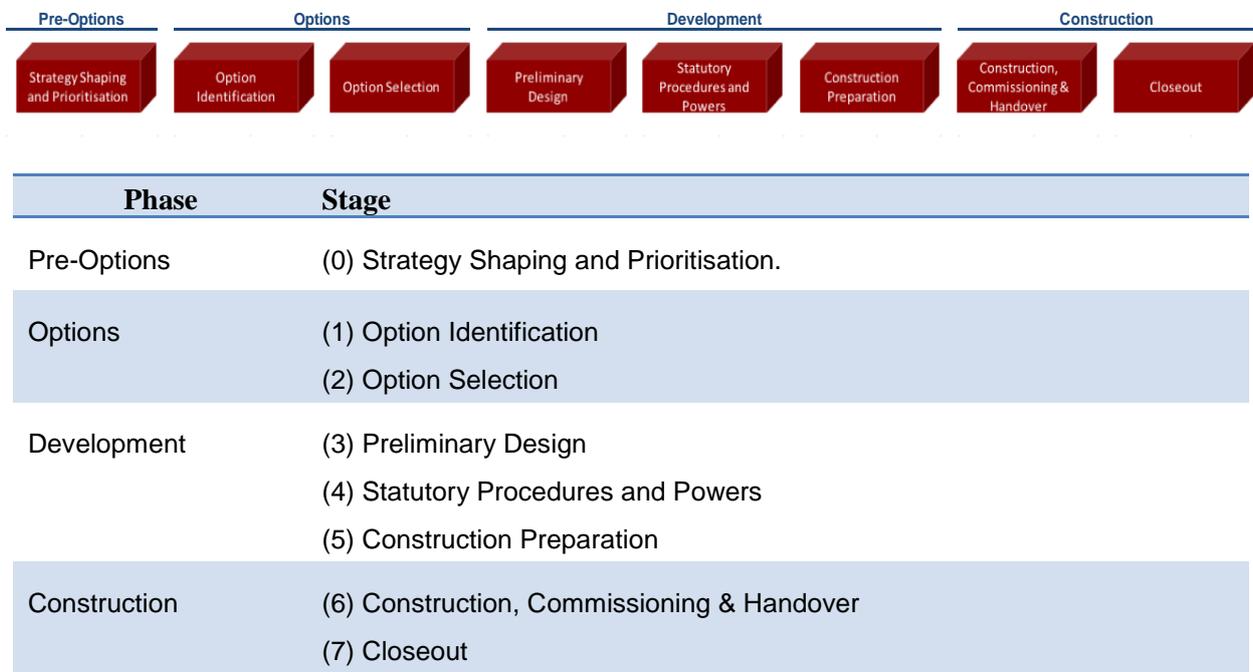


Figure 1: Project Control Framework Phases and Stages

Some programmes or forms of procurement may bypass PCF stages. For example, single option projects with no requirement for land take or an environmental statement and where the route is already fixed (i.e. an existing road is being modified) can proceed directly to PCF Stage 3 as they do not have options to investigate.

Each stage gate requires a number of defined products to be in place and approved in order for the scheme to progress to the next stage. Details of the Project Control Framework and the products required at each stage gate are available on the Major Projects *Way We Work* portal page and from the PCF Manager.

2.2 Estimates Required at Each Stage of the Project Control Framework

An approved, up to date, cost estimate is a required product for a project to pass through SGAR. The Commercial Services Division has implemented an estimate classification system recognising the different characteristics of estimates required at the various stages of the lifecycle, principally:

- degree of project definition
- purpose of the estimate
- estimating methodology/approach
- estimating accuracy

This estimate classification system consists of the following four estimate classifications:

Estimate Classification	Purpose of Estimate
Order of Magnitude Estimate	<ul style="list-style-type: none"> ▪ Assessment of proposals for entry to the forward programme of schemes and Project Lifecycle
Options Estimate	<ul style="list-style-type: none"> ▪ Identification and comparison of viable alternatives ▪ Selection of optimum alternative and decision support for Preferred Route Announcement ▪ Update of estimate with design development
Developing Estimate	<ul style="list-style-type: none"> ▪ Approval to issue Orders and Environmental Statement ▪ Approval to issue invitation to tender / appoint contractor ▪ Inception of Scheme Budget Setting Process ▪ Update of estimate with design development ▪ Inform price verification/tender validation/sustainability
Final Estimate	<ul style="list-style-type: none"> ▪ Inception of Price and /or Scheme Budget setting process ▪ Achieve formal approval of scheme budget to move into construction

Figure 2 (overleaf) shows an example of the alignment of the estimate classifications with the Project Control Framework (PCF). This example is for a Major Project procured through Early Contractor Involvement. For other forms of procurement the supplier may be engaged later in the development stage.

Details of each estimate's process, characteristics and requirements are contained in the annexes to this manual.

In addition to being required for SGAR updates to estimates are required at least every 12 months and whenever major changes in project scope or requirements materialise.

Cost Estimating and The Project Control Framework

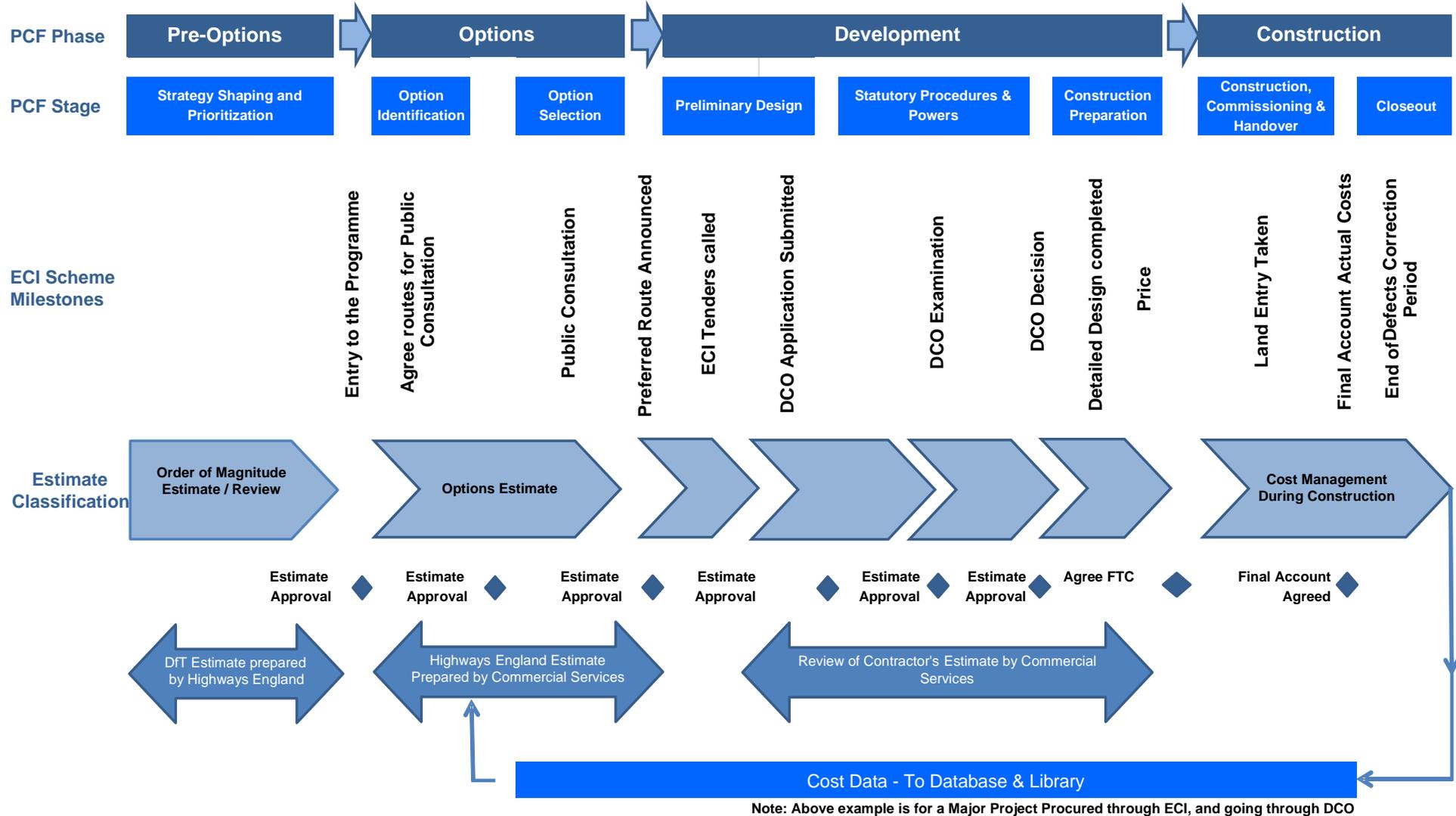


Figure 2: Correlation between Phases, Stages and Type of Estimate

2.3 Incremental Funding and Phase Cost Estimates

Under the Investment Decision Committee (IDC) process and Project Control Framework (PCF), investment funding is committed to projects incrementally, phase by phase. Therefore, only schemes in the Construction Phase will have funding committed through to their completion. Schemes in earlier Phases will have an IDC funding commitment limited to the cost of completing that Phase only.

Scheme cost estimates include ring-fenced estimates for the cost of completing the Options and Development Phases of the scheme. These estimates form the basis of budgets allocated to the project teams for the Options and Development Phases. These estimates take account of financial forecasts and other information provided by the relevant project team and should align with the financial forecasts stored on the Highways England finance system.

Project Teams make submissions in accordance with the Highways England’s IDC process to apply for funding of the appropriate Phase. For Major Projects, applications are submitted to the IDC and these are reviewed to ensure they align with approved estimates prior to submission. Further details of the IDC process are available on the *Way we Work* portal.

Figure 3 below provides an overview of Highways England approvals.

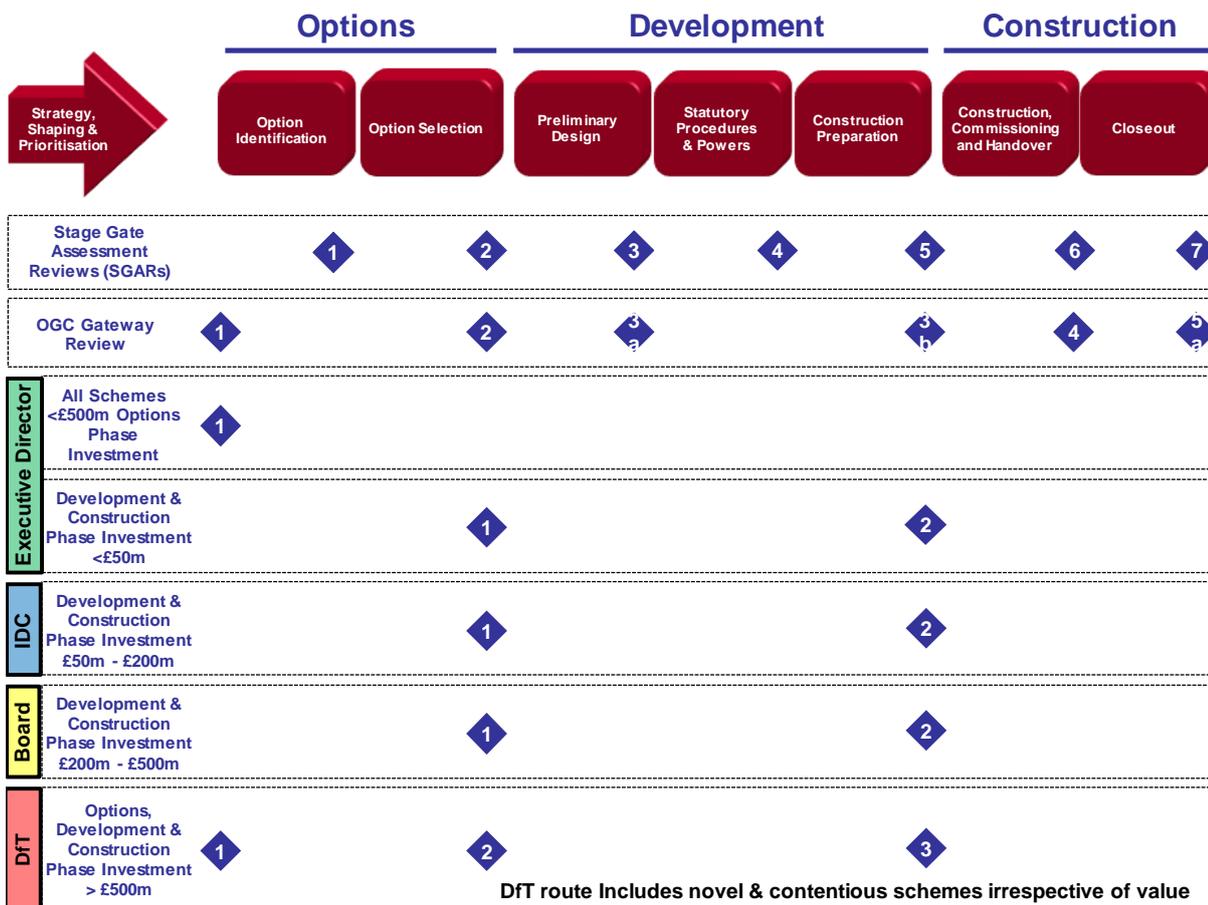


Figure 3: Investment Decision Committee Delegations

Major Projects typically have long timescales and substantial uncertainty at the early stages of development. Estimates for schemes are produced as a range with “most likely” estimates expressed between a minimum and maximum cost.

2.4 The Governance of Estimates

The outputs of estimates for proposed schemes are governed by the requirements of the following overarching framework / process:

- the Project Control Framework and PCF Product Descriptions
- the Investment Decision Committee Process

Commercial Services Division governs the production of estimates; ensuring estimates are produced to time and quality requirements. Estimates will generally be initiated by a scheme's Project Manager or stakeholder, who acts as the client for the estimate by completing an estimate request form (ref CE200) and submitting to the Commercial Services central inbox.

It is the Project Team's responsibility to ensure that estimates, and other Commercial PCF Products, are requested in time to meet the scheduled target dates for SGARs and other project milestones. It is recommended that estimates are requested 12 weeks before they are required in order to enable the Estimating Manager to plan workload, allocate appropriate resources and provide continuity of staff, e.g. where a particular Cost Engineer has produced previous estimates for the scheme.

Estimates for Major Projects' schemes are produced by the Commercial Services Division's Cost Engineers on behalf of the project teams who will be involved throughout the estimating process. Project Managers will formally review estimates to ensure understanding and commitment. All estimates are required to be reviewed and approved by the Commercial Services Division's Estimating Manager and Head of Cost Planning or Commercial Director before they are formally released to Project Teams. These approvals are documented on a standard Estimate Approval Form (*ref. CE300*).

3 ESTIMATE STRUCTURE AND OVERVIEW OF METHODS

3.1 Commercial Services Estimating Structure

Figure 3 summarises the main steps in the estimating process and the elements comprising the Division’s standard estimate structure or “cost-build” for a project.

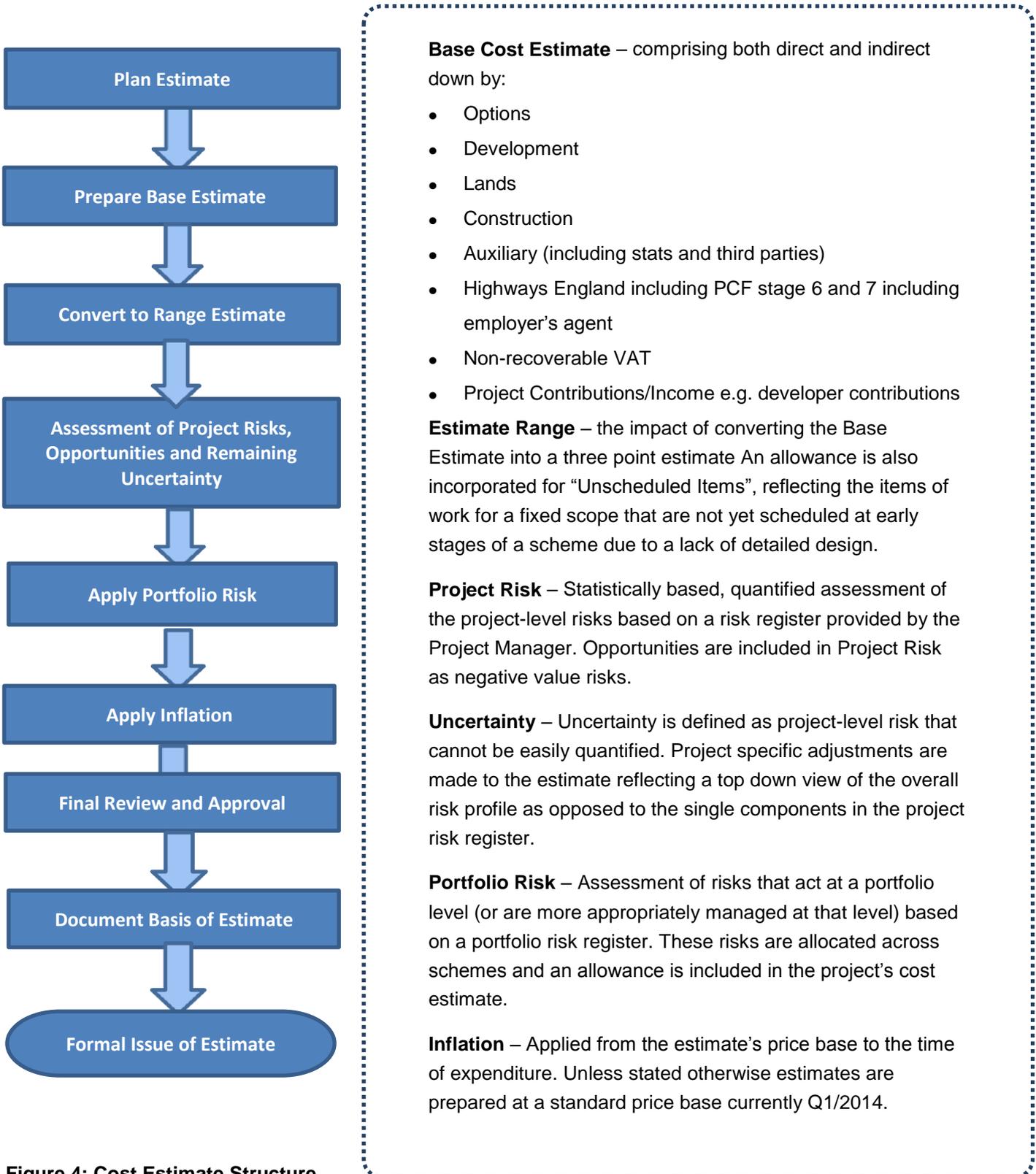


Figure 4: Cost Estimate Structure

Where estimates are prepared in the period approaching commitment to works expenditure (Development Stage 5 and for agreement of target costs / tender assessment), a Cost Estimate Summary can be generated both at the defined Base Date and also at current prices. This enables effective comparison with, and negotiation of, the Contractor’s / Delivery Partner’s price submissions.

Note that the estimate structure does not include Optimism Bias (set out in HM Treasury’s Green Book: *Appraisal and Evaluation in Central Government*) for Major Projects’ estimates. Optimism Bias is subsumed within project risk, uncertainty and portfolio risk. This approach has been reviewed and approved by HM Treasury.

3.2 Work Breakdown Structure (WBS)

Estimated costs for each component of the estimate structure are produced using the current version of the Commercial Division’s standard Work Breakdown Structure (WBS). The hierarchical structure of the WBS is based on the Manual of Contract Documents for Highway Works Volume 4, Method of Measurement for Highways Works. Figure 4 provides an illustration of the various levels of the WBS which uses a structured coding system.

WBS Code	Description	Quantity	UoM	Labour	Materials	Plant	Sub-Contracto	Other	Unit Rate
0400.	Road Restraint Systems								
0400.00.	H1 Safety Barriers - Containment Performance Class and working width class classification		m						
0400.00.10.	H1 Safety Barriers								
0400.00.10.10	H1 Safety Barriers		m						
0400.00.20.	Terminals								
0400.00.20.10	Terminals		m						
0400.00.30.	Connections to existing systems								
0400.00.30.10	Connections to existing systems		No						
0400.00.40.	Transitions - All Impact Severity Level (All ISL classes)								
0400.00.40.10	Transitions		No						
0400.05.	H2 Safety Barriers - Containment Performance Class and working width class classification		m						
0400.05.10.	H2 Safety Barriers								
0400.05.10.10	H2 Safety Barriers		m						
0400.05.20.	Terminals								
0400.05.20.10	Terminals		No						
0400.05.30.	Connections to existing systems								
0400.05.30.10	Connections to existing systems		No						
0400.05.40.	Transitions -All Impact Severity Level (All ISL classes)								
0400.05.40.10	Transitions		No						
0400.10.	H4a Safety Barriers - Containment Performance Class and working width class classification		m						
0400.10.10.	H4a Safety Barriers								
0400.10.10.10	H4a Safety Barriers		m						

Figure 5: Hierarchy and Function of the Operating Levels of the WBS

The WBS for Major Projects forms the framework for the Division’s data capture and analysis. Data is captured from agreed prices and actual costs in this format and housed within the Commercial Services Division’s Cost Intelligence System.

Contractors are required to make submissions compatible with the WBS. The Commercial Division’s estimating data libraries are reviewed/audited at 6 monthly intervals, utilising the data captured from prices and actual costs.

Note that the WBS covers all costs including direct and indirect construction costs and non-construction costs incurred during the Options and Development Phases. Cost data is captured at a set level which may be above item level when full granularity of costs will not add significant benefits. Further information about the WBS is available from the Division’s Cost Intelligence Manager.

3.3 Estimating Methods

Commercial Services Division uses a variety of estimating methods at the various stages of the project lifecycle. The estimating method used will be largely determined by the extent of design and programme information available as summarised in Figure 6.

PCF Stage						
	0	1	2	3	4	5
	Pre-Options	Options Identification	Options Selection	Preliminary Design	Statutory Process	Detailed Design
First Principles 'bottom up' estimating	○	○	◐	◐	●	●
Parametric	◐	◐	◐	◐	◐	○
Analogy	●	●	●	◐	◐	○
Legend	● Primary ◐ Applicable ○ Not Applicable					

Figure 6: Typical Application of Estimating Methods during Lifecycle Phases

The core estimating methods are:

3.3.1 Probabilistic Range Estimating

There is a range of potential outturn costs for any project and, indeed, any item of work. Estimating is effectively predicting the future and an uncertain future cannot be exactly predicted.

Prior to 2008, all Highways Agency cost estimates were single point estimates incorporating an allowance for risk, contingency or Optimism Bias and inflation. Since 2008, Major Projects' estimates have been prepared in a range estimating format.

- The most likely cost is expressed within a range of estimated project from plausible minimum to maximum outturn costs
- The probability distribution is shown across the range of costs, usually with the estimated costs for the distribution's percentile values

This provides decision makers with a clearer picture of the range of potential outturns and the probability that the project will be under or over a set budget.

3.3.2 First-principles, 'bottom-up' estimating

Preparation of estimates from the lowest level of detail, with labour, plant and materials (and any sub-contractor) resources estimated for each item of the works along with the production rate for that item. This assessment should be tailored to the quantity, schedule, project characteristics and market conditions. The Division's estimating rate database contains libraries of standard items of work with first-principles labour, plant and material build-ups for adjustment to specific projects.

3.3.3 Parametric Estimating

Parametric models correlate resources and costs with parameters describing a project. Cost Estimating Relationships (CERs) are established that can derive an assumed schedule of items based on known project parameters, e.g. Link-length, gantry spacing, road classification, lane widths, etc... Parametric estimating is primarily used at the early stages of design and to check other estimates. These models are most suitable for programmes of works with common parameters. The Commercial Services Division has established the following parametric models:

- Smart Motorways Cost Model (
- All Lane Running, Controlled Motorways and Dynamic Hard Shoulder Running)
- Roadworks Estimator – proprietary model for bypass and widening schemes
- Preliminaries Cost Template – a model producing a schedule of Method Related Costs and Project Overheads resources

3.3.4 Analogy Estimating

Using historical unit rate data at an elemental or item level to estimate the costs of future works often applying factored adjustments, this relies on a high degree of similarity between the market and project conditions of the works being estimated and the source projects for the historical rate data. The characteristics of the previous works must be clearly understood so that data can be used with confidence. The Division’s Cost Capture system contains unit rates for previous works that can be used for analogy estimating provided that the captured rates correspond to similar items of work, quantities and project environments. Analogy estimating is best used to benchmark outputs from other estimating methods and also to plug rates where there are gaps in the first-principles estimates.

3.3.5 Expert opinion

Relies on subject matter experts to give their opinion on what an element should cost. There is a large knowledge base to draw on from within the Highways England and its supply chain, but expert opinion is subjective and must be used carefully to fill non-critical gaps in a detailed estimate WBS where there is no hard source of data. Figure 7 shows the typical form of a probabilistic range estimate.

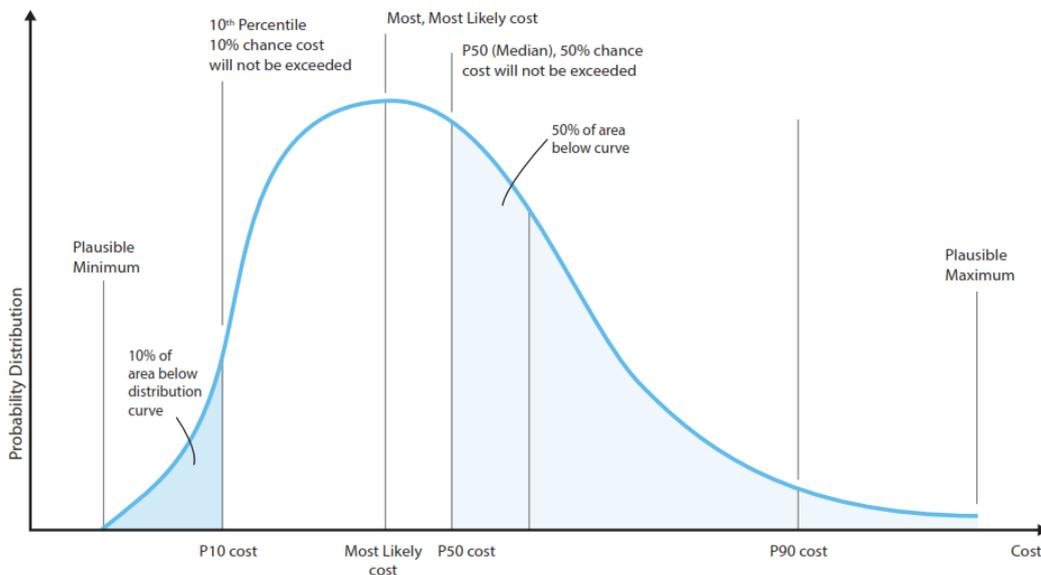


Figure 7: Example Probabilistic Range Estimate Output

4 ESTIMATING PROCESS AND SYSTEMS

4.1 Introduction

The Commercial Services Division estimating process has a number of devices, models and data to assist in the production of estimates. A summary of the estimating process is presented in Figure 8. A more detailed summary is presented in Annex E.

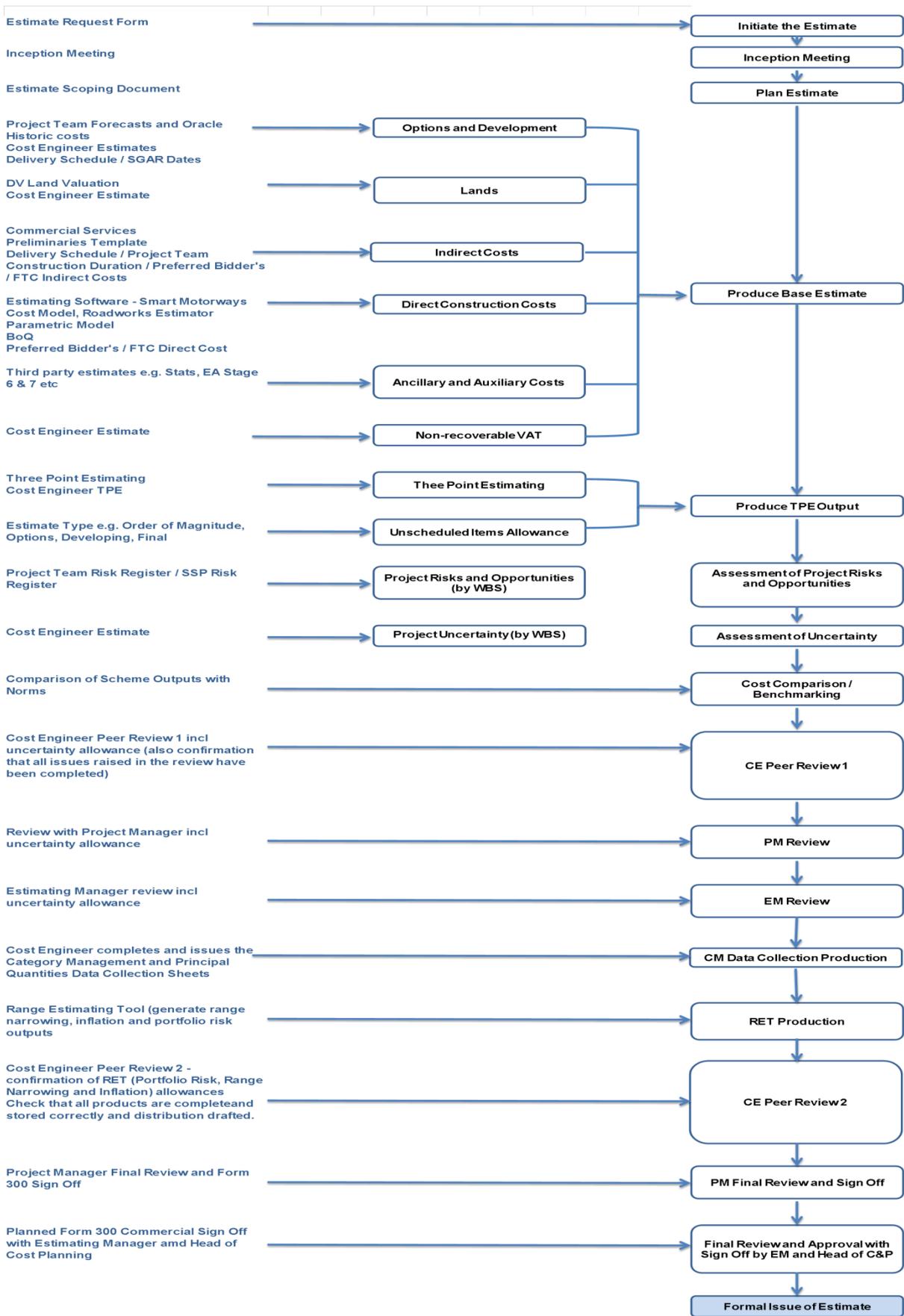


Figure 8: Inputs and devices used in estimate production

4.2 Initiating the Estimate

The stakeholders requesting estimating work from Commercial Services Division must fill out the division's Request for Estimate Form (ref. CE200), providing as much notice as practical so that the most appropriate resources can be allocated, e.g. Cost Engineering staff who are familiar with a particular project.

Ideally, this form will be completed a minimum of 12 weeks before the estimate output is required. The Estimating Manager will review requests and assign to Cost Engineers.

4.3 Planning the Estimate

The Cost Engineer produces a plan for the estimating work following an Estimate Inception Meeting with the relevant project team or stakeholders requesting the estimate. The project team and stakeholders provide a briefing to the Cost Engineer reporting on any specific requirements for the cost estimate.

The Cost Engineer will confirm the scope, purpose, scheme design information, programme and other available information on which the estimate is to be based, recording these details on the Estimate Scoping Document together with the date information is to be provided by the Project Team for and the associated delivery date for the estimate.

4.4 Production of the Base Estimate

4.4.1 Options and Development

Options and Development Phase costs are to be estimated based on the latest delivery schedule provided by the scheme's Project Manager. The Project Manager is to supply current forecasts of expenditure, and any existing consultant orders or estimates to the Cost Engineer for review. The Project Manager should also supply the current historic expenditure for the scheme. Historic costs are obtained from the finance system in order to confirm consistency.

4.4.2 Lands

The Project Manager should provide the Cost Engineer with the lands cost elements within the WBS by requesting a valuation of Lands: Blight, Acquisition, Part 1 Claims and Interest from the Lands Valuation Team.

4.4.3 Project Overheads and Method Related Costs

Project Overheads and Method Related Costs are estimated, informed by the construction schedule, using the Commercial Division's *Preliminaries Cost Model* at the earlier stages of a scheme's development.

The Price Negotiation Process concludes with an agreed Price, within a Final Estimate. The relevant section of the agreed Price shall inform this element.

4.4.4 Direct Construction Costs

A schedule of items for the Construction Phase is produced in strict WBS format for each segment. Estimating methods used will be largely determined by the level of scheme detail available.

The following systems and models are available to assist the development of the base estimate for direct costs of construction:

- *Benchmark* – The Commercial Services Division’s cost estimating software for production of first-principles estimates. *Benchmark* contains bespoke libraries of WBS Sections, Items (containing resource-based build-ups) and Resource and Production rates for the production of estimates. The software outputs Deterministic Point Estimates and Probabilistic, Three-Point Estimates in WBS format and exports to the Cost Estimate Summary Sheet within the CERT.
- The *Roadworks Estimator* – a parametric model for estimating off-line and on-line highways projects when little design information is available. The *Roadworks Estimator* generates a Schedule of Items for import into *Benchmark*. These are priced using the rate libraries and estimates output to the CERT as above.
- *Smart Motorways Cost Model* – a bespoke parametric model for estimating Smart Motorways schemes up to and including PCF Stage 4. There are two versions: based on Hard Shoulder Running to Interim Advice Notes 111 and 112/07; Managed Motorways All Lane Running based on IAN 161/13.
- Agreed Prices – The Price Negotiation Process concludes with an agreed Price for the Scheme which will inform the Direct Construction Costs for a Final Estimate.
- Cost Capture Database – The Commercial Services Division captures tender and actual item rates from Contractors and Delivery Partners in WBS format. In addition resource rates are captured using the Commodity Breakdown Structure (CBS). This cost and price capture is used for cost analysis and informs the estimating rate database as outlined in Figure 9 (overleaf).

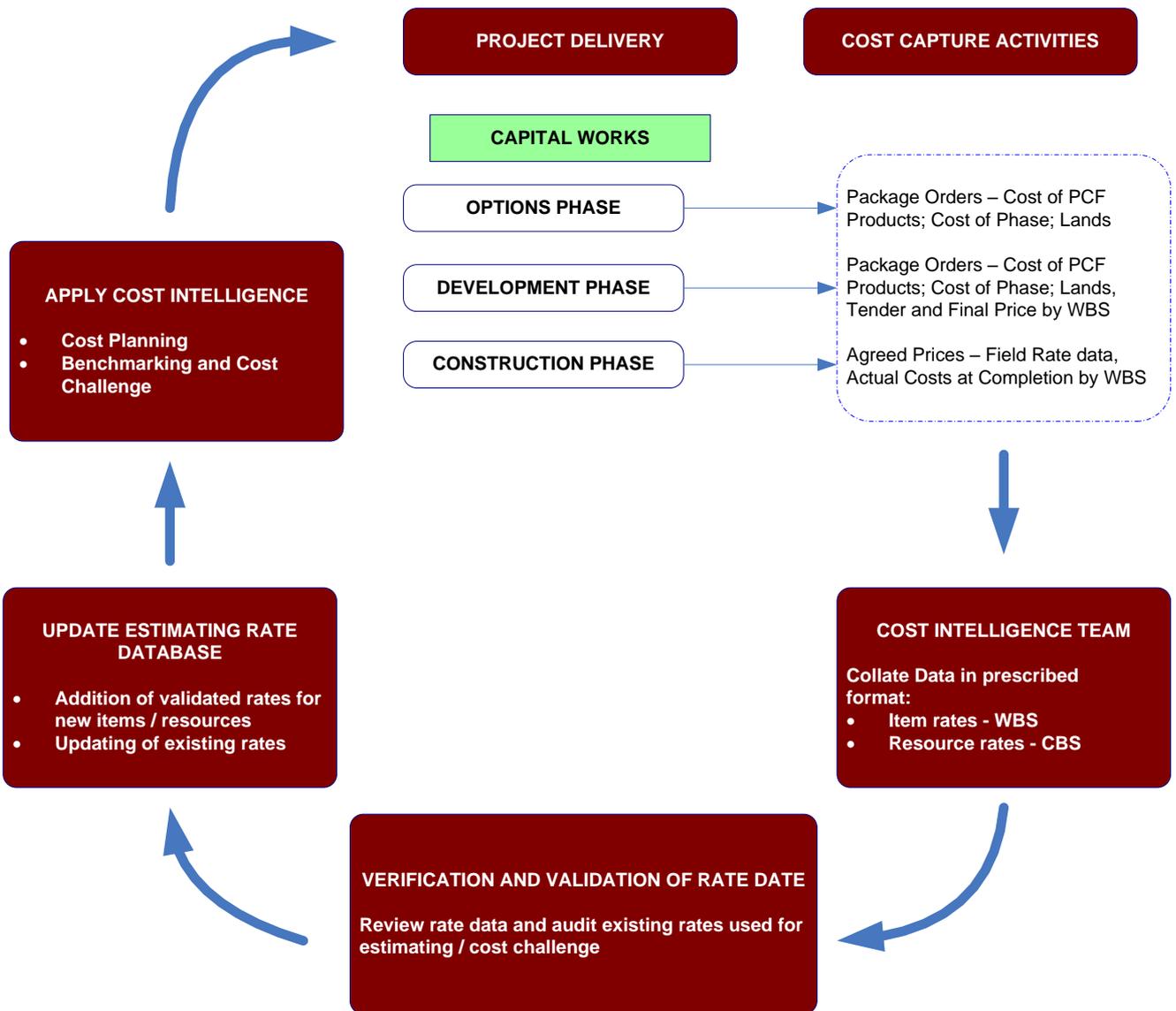


Figure 9: Estimating and Cost Capture process

Estimate costs will be automatically allocated to item codes that match with the rate database’s libraries. The Cost Engineer then prices the remaining items by allocating appropriate resources to items from the database libraries or introducing scheme specific rates in Benchmark. The Cost Engineer will adjust rates and production rates to suit the specific project characteristics.

In the Development Stage where a Contractor or Delivery Partner is appointed, the estimate will be informed by their production of a bill of quantities which is reviewed for quantum and scope by the Cost Engineer and estimated using the Division’s rate database.

Final estimates shall be informed by the agreed prices provided by the Price Negotiation Process.

Estimating Rate Database – The Commercial Services Division’s database of resource rates, production rates and resource-based items is used to produce estimates. This is in Three-Point Estimate format and currently at a price base of Q1/2014. The database is audited annually against captured Prices and actual cost data with a check of volatile rates, such as steel and oil-based materials, every 6 months to ensure that these rates reflect the latest forecasts.

In the early stages, insufficient information will be available to develop a bill of quantities from an accurate take-off. The Commercial Services Division’s parametric estimating tools, such as the *Roadworks Estimator* and the Smart Motorways Cost Models, can be used in this instance to generate an assumed Bill of Quantities that can be automatically estimated through *Benchmark* estimating software.

Where the scheme is more mature, e.g. following completion of Preliminary Design and appointment of a Contractor, including development design, the Cost Engineer will confirm the construction programme, schedule of items and quantities based on the WBS item descriptions and codes, with the project team. Any items of work outside of the WBS scope are captured with bespoke item descriptions and added to the schedule of items.

4.4.5 Contractors Fee

The Contractor’s fee level is calculated as a separate line item, based on established percentage profit and business overheads for ECI or Framework procurement. This is either informed by the contractual fee for the scheme or based upon cost intelligence if no Contractor is on board.

4.4.6 Auxiliary Costs

Statutory Undertakers costs (power, communications, water and gas) are based on the latest C2, C3 or C4 estimates received from the Statutory Undertakers.

Rail Authority, Environment Agency, Local Authority Costs shall be discussed with the Project Manager, and should be based on the latest information available from the third party impacted by the proposed works.

4.4.7 Non-recoverable VAT

Non-Recoverable VAT: This is derived from an estimate of the proportion of the works value outside the boundary to the nearest 5%, agreed with the Project Manager. This is entered directly into the Cost Estimate Summary Sheet (CESS) contained within the Cost Estimate Report Template (CERT) (see below). Once agreed this becomes fixed for the duration of the project.

4.5 Conversion to Probabilistic Range Estimate

A base estimate is produced for the scheme and then converted to a range estimates by running the three-point estimating module in *Benchmark* estimating software, using Monte Carlo simulation to produce a probability distribution for the outturn costs estimate.

Minimum and Maximum outputs are currently set at p2.5 and p97.5 respectively. These can be user defined along with the number of iterations run during simulation – a minimum of 5,000 is recommended. Outputs are exported to the CESS.

For a Final Estimate the Minimum and Maximum range is generated from the expert opinion of the Price Negotiation Team with the most likely informed by the agreed Price.

4.6 Unscheduled Items

The estimating process includes the opportunity to include an allowance for *Unscheduled Items*, to reflect the fact that the schedule of items required to deliver a project will be incomplete at the earlier stages of design development. Whilst the schedule will identify principal items of work, it is unlikely to include detailed items that are essential to support the principal items or enable them to operate successfully.

As experience has shown that this can be a major cause of cost escalation an allowance, decreasing throughout the project lifecycle, is included to cover these more detailed unscheduled items of work.

4.7 Project Risk and Opportunities

A specific Risk Register should be provided by the scheme's Project Manager for schemes at Options Stage onwards. This Risk Register, in the current PCF template, forms the basis of the Project Risk assessment included in the cost estimate. The Cost Engineer will review the identified risks and quantification and may propose amendments to the Project Team.

The Cost Engineer will review any separate savings/risk and opportunities registers in order to confirm the risk position of the scheme. Potential savings/opportunities will be recorded within the CESS as negative risks.

The estimated costs of agreed risk mitigation measures are included in the base estimate with the residual estimated exposure included in the Project Risk part of the cost build.

Project Risk will include both Employer and Contractor owned Risks.

Risk is apportioned in accordance with certain WBS headings. This allocation and ownership is based on the project manager's considerations and included within the risk register.

4.8 Uncertainty

Where risks are difficult to quantify with any precision, project specific adjustments may be included in the Uncertainty element of the CESS. These are allocated against the WBS items and accompanied with explanatory notes to record the basis for these allowances.

4.9 Portfolio Risk and Inflation

Once the Three Point Estimate Range, Project Risk and Uncertainty are complete, the estimate is reviewed and then Portfolio Risk and Inflation are generated using the Range Estimating Template (RET). For earlier estimates inflation is applied from the price base of the estimate to the time of expenditure

The *RET* takes inputs from the CESS to derive the Portfolio Risk and Inflation elements of the Cost Estimate. The RET then outputs the following information on separate worksheets:

- Spend Profile Summary – summarising the forecast expenditure for each Phase (Options Development and Construction) and other costs such as Lands costs.

- IDC Summary – a headline summary of the estimated cost, schedule and risk required for investment decisions by the Highways England Investment Decision Committee.
- Economic Outputs – cost estimate outputs discounted to a given year for use in Economic Assessment Report and similar work by WebTAG for appraisal of scheme benefits and value for money.

4.10 Documenting the Basis of the Estimate

The Cost Estimate Report Template (CERT) is a template that is completed as the estimate is prepared. It is a key document forming the basis of the estimate. It contains multiple documents which serve to provide a permanent record of the context of a scheme when the estimate was produced. Figure 10 provides a summary of the purpose of each element of the CERT template.

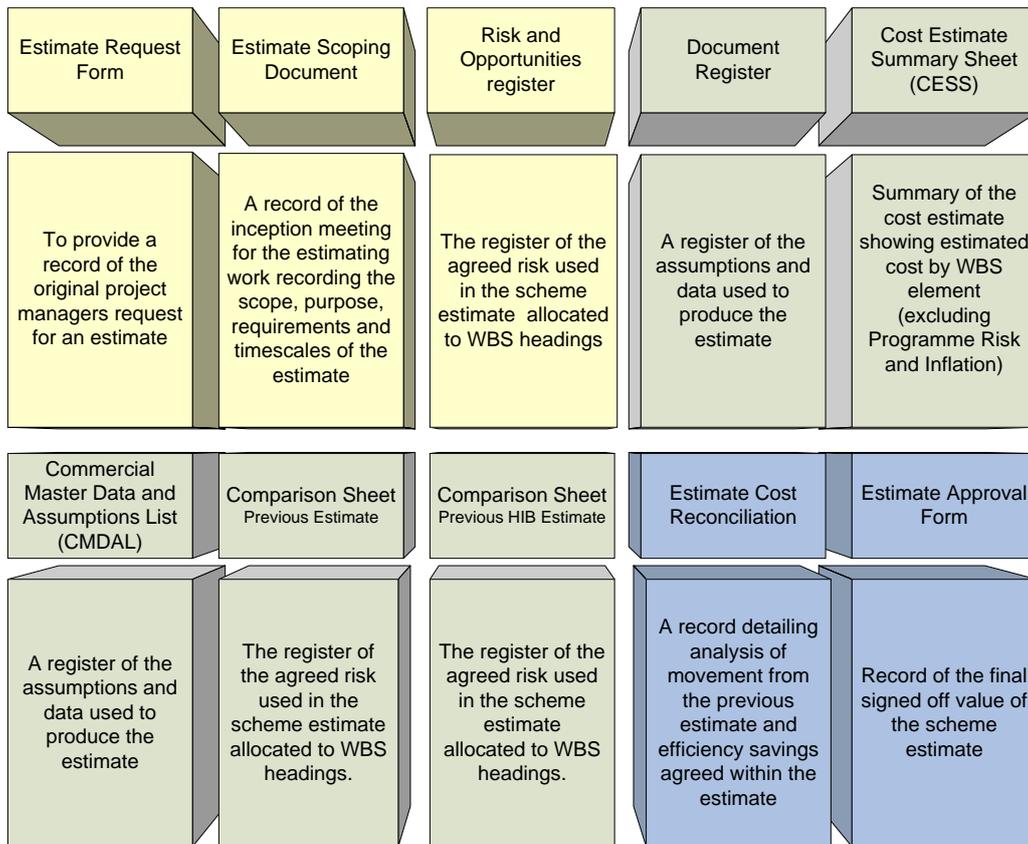


Figure 10: Cost Estimating Report Template

4.11 Estimate Reviews and Approvals

The following reviews, as shown below, are required during the production of an estimate. These are listed in the Output Assurance Checklist within the CERT file:

Review Title and Purpose	Reviewer(s)
<u>Peer Review 1.</u> A detailed check and confirmation that every element of the estimate is appropriate and correct conducted after the range estimate and evaluation of project risk are complete.	CE / Independent CE
<u>Project Manager Pre-RET Review.</u> Confirm PM understanding of the emerging estimate and discuss Uncertainty.	CE / Project Manager
<u>Estimating Manager Review.</u> Following scheme presentation, confirm EM agreement of approach and process, including general assumptions. Uncertainty proposals and agreement in advance of Inflation and Portfolio Risk allowances.	CE / Estimating Manager
<u>Peer Review 2.</u> Confirmation that inflation and portfolio risk allowances are appropriate. All products are complete and stored correctly and distribution is properly drafted.	CE / Independent CE
<u>Project Manager sign - off.</u> Formal confirmation of Project Manager agreement of understanding, support and reporting commitment.	CE and PM
<u>Final Sign off.</u> Following a general estimate review, inclusive of high level benchmarking, Estimating Manager and Head of Cost Planning or Commercial Director sign - off.	Estimating Manager / Head of Cost Planning

Reviews should include benchmarking of the estimated cost versus high-level measures such as typical costs / linear km for a given scheme type and / or benchmarking against similar schemes. Reviews should also include a reconciliation of the estimate with the last approved estimate for the scheme and / or other relevant estimates.

4.12 Formal issue of the Estimate

Once approved by the Estimating Manager and Head of Cost Planning, key estimate documents are stored on the relevant SHARE folder for the scheme. The outputs and distribution list for the estimate is captured in Annex F.

The approved, up to date, cost estimate is deemed a PCF product once submitted by the project manager in accordance with PCF. The final agreed estimate then forms the agreed Price for delivery of the works.

Annex A –Order of Magnitude Estimate Process Summary**Title:** Order of Magnitude Estimate**Aim and Purpose:**

The aim of an Order of Magnitude Estimate is to provide an assessment of proposals for entry to the forward programme of schemes and Project Lifecycle. This then leads to a decision on whether to move into the Options Phase.

The purposes of the estimate are to:

- Compare transport solutions.
- Provide a cost for taking the scheme through Options and Development Phases.
- Capital Funding.
- Entry into the Options Phase.

Inputs:

Client Scheme Requirements

Completed Form CE200 – Request for Estimate Form

Route corridor on 1:2500 OS map from Client Scheme Requirements, if available.

Completed Form 103/109 – Order of Magnitude Estimate Project Information Form - New Construction/Widening Segment, if available

Completed Form 104/105 – Roadworks Estimator Long section Input Form - New Construction/Widening Segment, if available.

Completed Form 303 for MM/ALR Projects

Outline Project Schedule

Any existing Feasibility Studies, if available.

Project Risk Register, if available.

Quality Criteria (Performance Standards):

The scope of the estimate includes:

- Preparation of a Schedule of Works, using Roadworks Estimator software to produce quantities in a Highways England WBS format
- Pricing of the Schedule of Works using Benchmark Estimating Software, which incorporates the standard Highways England WBS Items
- Generic Risk Assessment/Project Specific Risk Assessment when available

Roles and Responsibilities :

Produced By: MP Project Manager

Accountable and Signed Off By: Project Sponsor

Consulted With: Commercial Services Division Cost Estimating Manager (For Technical Approval), Integrated Project Team, Network Delivery & Development Senior User, MP Property Compensation Group, Commercial Services Risk Manager, Finance

Distributed To: Highways England Project Manager, Senior Portfolio Office Manager, Portfolio Office Business Analyst, Regional Commercial Manager, Estimating Manager, Programme Support Manager, Head of Cost Planning, Estimating Co-ordinator, Head of Commercial Intelligence

Annex B – Options Estimate Process Summary

<p>Title: Options Estimate</p>
<p>Aim and Purpose:</p> <p>The aim is to produce an estimate for each of the options that can be used as part of the selection of the Preferred Route, at the end of stage 2.</p> <p>The purposes of the estimates are:</p> <ul style="list-style-type: none"> • Identify of viable alternatives and selection of the optimum • Provide decision support for Preferred Route Announcement • Update the estimate with design development
<p>Inputs:</p> <p>Completed form CE200 - Request for Estimate Form</p> <p>Route corridor on 1:1250 OS map</p> <p>Typical cross sections for each Option</p> <p>Completed Form 103/109 – Order of Magnitude Estimate Project Information Form – New Construction/Widening Segment, if available</p> <p>Completed Form 104/105 – Roadworks Estimator Long section Input Form for a New Construction/Widening Segment, if available.</p> <p>Completed Form 303 for MM/ALR Projects</p> <p>Risk Registers for each Option.</p> <p>Statutory Costs through C3 Estimate</p> <p>Land Costs</p> <p>Historic Costs</p> <p>Current Forecasts/Consultant Package Orders</p>
<p>Quality Criteria (Performance Standards):</p> <p>Scope of the estimate includes:</p> <ul style="list-style-type: none"> • Preparation of a Schedule of Works, for each option, using Roadworks Estimator software to produce quantities in a Highways England WBS format • Pricing of the Schedules of Works using Benchmark Estimating Software, which incorporates the standard Highways England WBS Items. • Risk Assessment is to be prepared in accordance with the Highways England Risk Management Manual
<p>Roles and Responsibilities :</p> <p>Produced By: MP Project Manager</p> <p>Accountable and Signed Off By: Project Sponsor</p> <p>Consulted With: Commercial Services Division Cost Estimating Manager (For Technical Approval), Integrated Project Team, Network Delivery & Development Senior User, MP Property Compensation Group, Commercial Services Risk Manager, Finance</p> <p>Distributed To: Highways England Project Manager, Senior Portfolio Office Manager, Portfolio Office Business Analyst, Regional Commercial Manager, Estimating Manager, Programme Support Manager, Head of Cost Planning, Estimating Co-ordinator, Head of Commercial Intelligence</p>

Annex C – Developing Estimate Process Summary

<p>Title: Developing Estimate</p>
<p>Aim and Purpose:</p> <p>To aim is to have a current Estimate of the value of the Works and the cost of accepted changes, as the Detailed Design proceeds.</p> <p>The purpose of the estimate is to:</p> <ul style="list-style-type: none"> • Support approval to issue Orders and Environmental Statement • Support approval to issue invitation to tender / appoint contractor • To update the existing estimate and enable additional items to be included or removed from the estimate
<p>Inputs:</p> <p>Completed Form CE200 – Request for Estimate Form</p> <p>Preliminary design drawings at 1:500 scale from Preliminary Design</p> <p>Horizontal and longitudinal sections</p> <p>Outline Specification for Key Cost Drivers, for example Drainage, Earthworks, Structures and Traffic Management.</p> <p>Supplier Price/Estimate Submissions</p> <p>All Risk Registers and Assessments</p> <p>All Change Control Documentation</p> <p>Statutory Costs through updated C3 Estimate</p> <p>Land Costs</p> <p>Project Schedule</p> <p>Historic Costs</p> <p>Current Forecasts/Consultant Package Orders</p> <p>Completed Bill of Quantities in HA WBS format</p>
<p>Quality Criteria (Performance Standards):</p> <p>The Scope of the estimate includes:</p> <ul style="list-style-type: none"> • Preparation of a Schedule of Works measured in accordance with the Highways England WBS. • Pricing of the Schedule of Works using Benchmark Estimating Software which incorporates the standard Highways England WBS Items • Risk Assessment to be prepared in accordance with the Highways England Risk Management Manual
<p>Roles and Responsibilities :</p> <p>Produced By: MP Project Manager</p> <p>Accountable and Signed Off By: Project Sponsor</p> <p>Consulted With: Commercial Services Division Cost Estimating Manager (For Technical Approval), Integrated Project Team, Network Delivery & Development Senior User, MP Property Compensation Group, Commercial Services Risk Manager, Finance</p> <p>Distributed To: Highways England Project Manager, Senior Portfolio Office Manager, Portfolio Office Business Analyst, Regional Commercial Manager, Estimating Manager, Programme Support Manager, Head of Cost Planning, Estimating Co-ordinator, Head of Commercial Intelligence</p>

Annex D – Final Estimate Process Summary

Title: Final Estimate

Aim and Purpose:

The aim is to produce an estimate that can be used to inform commitment to construct.

The purpose of the estimate is:

- To have an estimate that reflects the current design information
- To have the ability to produce Earned Value Analysis (EVA)
- To have an estimate that supports Cost Intelligence
- To agree a Contractual figure between Highways England and the Contractor.

Inputs:

Completed Form CE200 – Request for Estimate Form

Detailed design drawings at 1:500 scale including cross sections

Full Specification

All Change Control Documentation

Supplier Price proposals and agreement in accordance with the Price Negotiations Process

All Risk Registers and Assessments

Statutory Costs through updated C4 Estimate

Lands Costs

Project Schedule

Historic and Forecast HA costs

Quality Criteria (Performance Standards):

The Scope of the estimate includes:

- Agreement of Price in accordance with Highways England Price Negotiations Process
- A Risk Assessment is to be prepared in accordance with Section 4.7 of the Cost Estimation manual and the Highways England Risk Management Manual.

Roles and Responsibilities :

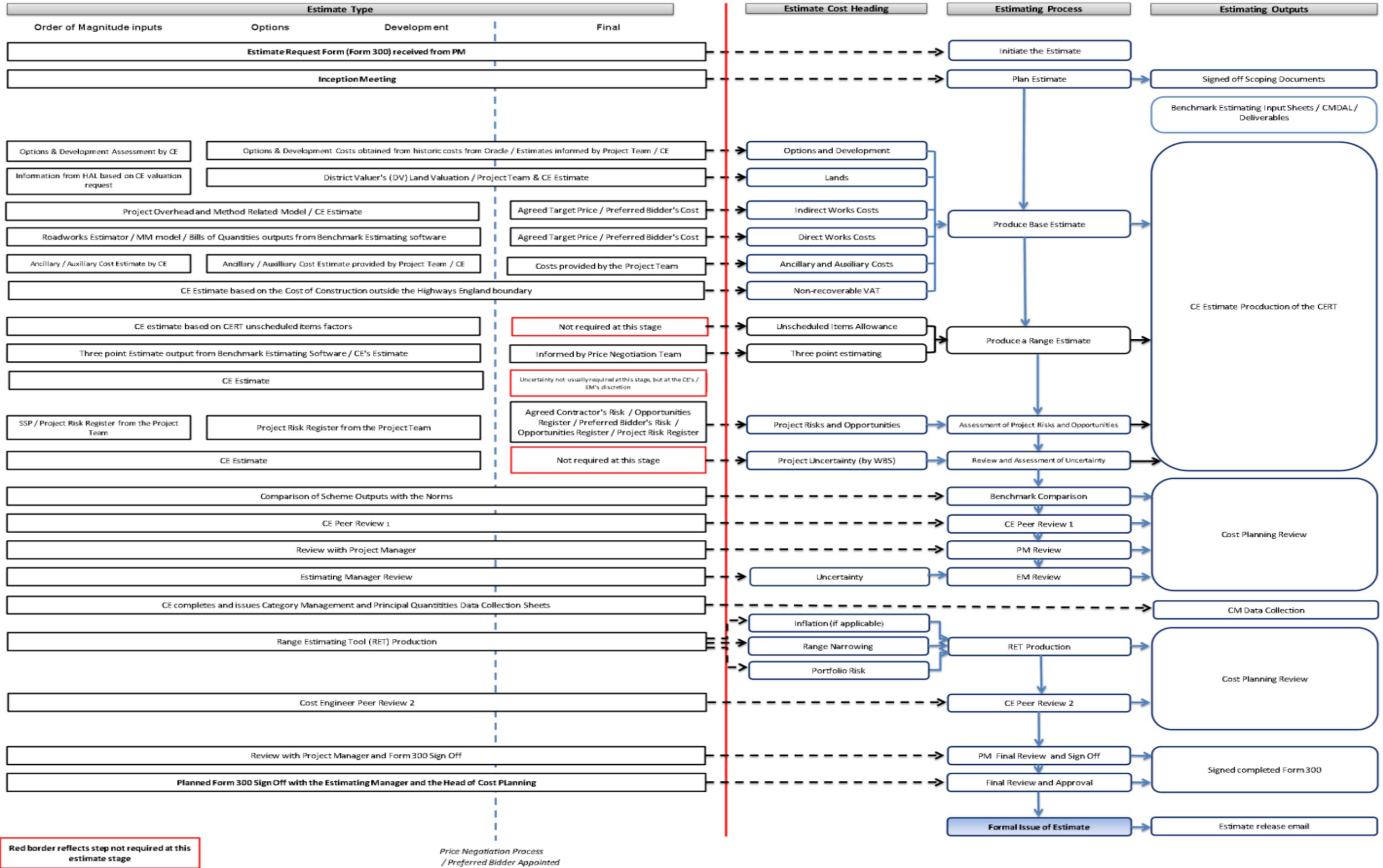
Produced By: MP Project Manager

Accountable and Signed Off By: Project Sponsor

Consulted With: Commercial Services Division Cost Estimating Manager (For Technical Approval), Integrated Project Team, Network Delivery & Development Senior User, MP Property Compensation Group, Commercial Services Risk Manager, Finance

Distributed To: Highways England Project Manager, Senior Portfolio Office Manager, Portfolio Office Business Analyst, Regional Commercial Manager, Estimating Manager, Programme Support Manager, Head of Cost Planning, Estimating Co-ordinator, Head of Commercial Intelligence

Annex E – Cost Estimating Process Summary



Annex F – Estimate Outputs and Distribution List

Managing our Highway Assets, Developing the Assets

[Road Name]

[Scheme Name]

Commercial

Cost Estimating

These documents should include:

- Estimate Approval Form CE300
- Cost Estimate Summary Sheet (CESS) providing costs by Work Breakdown Structure series
- Economic Output summary providing forecast expenditure for each phase of the project by financial year
- Commercial Factsheet providing a summary of the project, benefits, risks, schedule and cost and savings
- Outputs in the format required for investment decisions, e.g. Investment Decision Committee

Links to the key documents are then released in an estimate release email to:

- Highways England Project Manager
- Senior Portfolio Office Manager
- Portfolio Office Business Analyst
- Regional Commercial Manager
- Estimating Manager
- Programme Support Manager
- Head of Cost Planning
- Estimating Coordinator
- Head of Commercial Intelligence

Key values taken from the CESS and links to the key documents are also then captured on the Cost Planning Estimate Tracker, to enable monitoring of changes to the estimate value between stages

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