Appendix B

Detailed Risk Assessments and Assumptions: Chelmsford HIF Programme.

Project Name: Beaulieu Station and North East Bypass: Chelmsford

Date: 8 March 2021

Appendix B to accompany Cabinet Report entitled: Housing Infrastructure Fund – Contract for Beaulieu Park Station and Chelmsford North East Bypass.

Contents:

Introduction

This document contains:

- Details to specially cover the risk in the HIF contract on the operational expenditure clause. This document shows the working assumptions that have been made when considering the operational cost modelling.
- Risk assessment documents that have been worked up by both the Beaulieu Park Station and Chelmsford North East Bypass project teams.
- Separate risk assessments that were drawn up by finance to separately record financial risks.

Finances List of Assumptions associated with the Jacobs modelling which currently forecasts the operational cost risk for ECC.					61%	
Reference	**Area/Tab**	**Assumption**	**Evidence base**	**Controllable/Uncontrollable**	**Rag Rating**	**Further Detail**
1	Cost Component of the Model : This includes Staff Costs, Maintenance and service cost, utility costs .	These costs have been quoted by associates (Winder Philips) and 1. are based on comparing Beaulieu Park Station to Cambridge north station 2019 prices 2. assumed to only include Staff Costs, Utilities, Maintenance and services, no other costs are accounted for. 3. assumes 15 station staff, but we do not know at what FTE and at what Salary per FTE 4. utilities at a total fixed cost, we do not know the activity or unit cost used 5. maintenance/ services at a total cost of £76,544. how this cost has been calculated is unknown. 6. inflation has been applied by Jacobs using RPI. 7. modelling assumes station opens in 2024/25 Note: Cambridge North Station opened in 2017 so the costs are based on a station that had been operating for approximately 2 years. Specific detail on the drivers behind these costs, including activity levels and cost base has not been detailed in the Wilder and Philips report and is therefore unknown.	Winder and Philips report which is based on Cambridge North Station. This is based on Actual costs as at 2 years of operation, so there is an evidence base supporting these calculations. **We don't actually have the detail on how the individual calculations have been worked up i.e.. what is the salary for each FTE, what is the energy unit cost and quantity of energy assumed to be utilised ect.**	**Uncontrollable** ECC have no say on how GA staff the station and maintain the station once its in operation. Its arguable that ECC could influence utility costs as we have influence on how its built, but this is not something we have challenged or influenced to date. ECC don't want to be responsible for these cost or influencing them though due to health and safety and risk transfer, if we were to be involved in non track side of service. There are also rail regulations on number of staff required at a station which also make the staffing element of this non controllable. The only controllable ability ECC has is to remove as many costs from this cost methodology as possible. Once they are factored in and agreed we have no influence or control over them . Dft have agreed that they will only charge against BP staff not other staff hanged to BP station included senior individuals	High (8) Probability Almost certain (4) Impact: Moderate (2) Probability of costs changing and assumptions differing is likely and cannot be controlled by ECC but the impact is thought to be minor in terms of materiality in the grand scheme of the calculations	There has been no analysis to identify how these costs could differ from Cambridge Station. This figure has come from winder Philips, we don't know how they have done this calculation. We don't know whether its based on activity and cost or activity and current cost. They don't think activities will be too different no's of staff, maintenance frequency should be the same. But this analysis hasn't been done and how this translates across to Beaulieu

2	Cost Component of the Model: Fleet Costs	The Fleet costs included in the cost methodology are based on Winder Philips report and are estimated at £23,400. 1. They include costs associated with the assumed additional mileage that trains would have to do for 3am peak services that could be extended back to start from Beaulieu Station. The mileage assumed here and the number of trips is unknown and not stipulated anywhere. 2. They do not assume any additional mileage based fleet cost for this service. The reason for this or evidence base supporting this assumption is not stipulated or known. 3. The key components of this calculations are Number of Trains and cost per mile which is driven by some degree to the cost train itself. The additional mileage is thought to require additional staff time. They've applied a simplistic £6 per train mile to cover all costs associated with this including staff, energy, mileage, but there is not information on what constitutes this £6m and how many miles have been used. 4. Its based on 2019/20 prices, with RPI applied	Wilder Philips Report. The Calculation within the report is based on 2019 prices. **We do not have the detail on how the £23,400 has been calculated, only that a cost per mile of £6 has been used, but there is no evidence base or information behind this.**	**Uncontrollable** If GA changed the frequency of timetable then this cost would changed. This doesn't affect the mileage, it just affects the frequency. Fundamental change to timetable would need to happen but everyone has settled on 4 trains and GA have come to agree this.	Medium (4) Well researched , low RAG rating as the probability of this assumption in terms of trips is unlikely to change as its been agreed it would require a fundamental timetable change to occur which isn't probable and the impact is seen to be low due to materiality.	calculation based on train proposed. Number of trains sent back based on peak services, other element is cost per mile, which s driven by cost of train itself (which is fixed by lease so shouldn't change) the energy cost is inflation linked energy cost. The frequency cant increase and mileage distance from Chelmsford cant change either so this is a fixed cost. It cant go unless there is a fundamental change to the timetable like a train changes location.
3	Cost Component: Managing and Maintaining the Car Park Controlled by the Train Operator	The current modelling assumes that there are no costs associated with the management and maintenance of the Car Park which will controlled by the train operator. ECC has accepted to cover costs should there be any relating to the carpark. These will be minimal and are not factored into current forecasts.	**No clear evidence base**	**Uncontrollable**	High (8) Probability: Almost Certain (4) Impact: Moderate (2)	This cost is expected to form part of the methodology and side agreement, however have not been captured or included in any analysis to date. Officer believe the cost to be minimal but there is no evidence base to support this assumption.

4	Cost Component of the Model: Additional Driver diagrams/ Train Crew Costs (Rows 19-23)	Note: These are currently assumed to be non existent in the baseline modelling, but are included in other scenario modelling which a maximum exposure of £488,000. IT is unknown how the £488,000 has been calculated and whether formal agreement has yet been sought to confirm this is the maximum cost exposure It is assumed that the driver costs are based on : 1. Winder Philips report, WP were clear this calculation was based on second hand information, no detailed research was completed. 2. Additional Journey time of 3 minutes, its unknown what this is based on 3. 3am peak starters are included, at 8 minutes (16 minutes each service). It is not know what this is based on 4. an assumption that the driver diagram scenarios that there are not additional peak services and would form part of the 4 tph am peak service. 5. The proposed December 2021 timetable has been used for calculations. IT is not known what December 2021 timetable this is using? 6. an estimated increase is used for Traincrew costs by considering the percentage increase in train mile, and apply it to the overall cost base for drivers (c£60m). The % estimated increase is unknown and the evidence base for how they came to the total driver cost is not stipulated in the report and therefore unknown. Therefore, there is no evidence base supporting this calculation and how reflective it may be of additional driver costs. 7. An uplift is then applied to the traincrew cost to represent the operational costs associated with serving the new station. But what these are based on is unknown. 8. It is assumed that all services stopping at Beaulieu park Station will be Driver Only operational and there is no uplift in conductor costs associated with services calling at the station. The detail behind the drivers supporting 3 minutes and 3am peak services (for example) what is the cost per minute, what is this based on , how many trips are in 3am peak services is not known. 9. RPI Inflation has been applied to WP numbers to input in Jacobs model. 10. Modelling of these costs assumes opening in year 2024/25 Different scenarios to cost based on 4 differing timetable options. What the timetable options are based on is unknown and how they have taken the additional minutes and calculated a total cost is also unknown. a- Scenario 1: Additional time of 2 minutes b- Scenario 2: Additional time of 2 minutes and 3am peak starters included. The figure used for 3am peak starters is not known? c- Scenario 3: Additional time of 3 minutes d- Scenario 4: Additional time of 3 minutes and 3 am peak starters included For all of these scenarios the evidence base supporting the additional minutes is unknown, as is the evidence base supporting the 3am peak starters. Jacobs It was originally assumed that there are no driver diagrams which refers to there being no additional drivers required as a result of placing additional stops on the line and prior calculations of risk assumed zero cost. But, it was confirmed on the 02.03.2021 that this will be part of the agreement, maximum exposure is £488,000. Jacobs still consider it unlikely that BP will be exposed to these costs, but if they are we have to pay for them up to a max as per above per annum. Jacobs have put these into the worse-worse case scenario that was circulated on 01.03.2021.	**Evidence base is unknown, information is included in the Wilder Philips report but details behind the cost drivers and assumptions supporting this report is limited.** There is thought to be an agreed maximum fixed exposure of £485,000 which is currently factored into worst case scenario issued by the service on 01.03.2021 which indicates a loss in year one of station operation. However, this will not be formally agreed until the side agreement between dft & ECC is signed.	**Uncontrollable.** The costs associated here will be controlled by the train operators in terms of timetables and routes. **Quote from Wilder Philips report "Without knowing the timetable that will be in operation prior to Beaulieu's opening, it is not possible to accurately model the additional driver cost. "**	Medium (6) Probability is seen to be possible but impact is Major as it is in the region of £500k which could be assumed as material to ECC in terms of risk exposure Without knowing the timetable that will be in operation prior to Beaulieu's opening, it is not possible to accurately model the additional driver cost.	Driver diagrams are placing additional stops on the line there are some thought there may need to be additional drivers. It was felt that with additional time on time there may need to be additional drivers. When GA did original piece of work they put in a huge variations anything from 0 to 7 figure sum, wider Philips put a very small figure in for driver diagrams and there strong professional opinion was that there would be no additional driver requirements. GA agreed no need for additional drivers or over time. were not b

5	Revenue Component of the Model: Fare Revenue generated from Beaulieu Park Station, including an abstraction element.	Complex area with assumptions within assumptions around a number of drivers, timetable, abstraction ect. The Fare revenue generated from Beaulieu park Station calculation is based; 1. on the Direct Demand Model which was created by Jacobs back in 2017 for the SELEP business case. This is otherwise referred to as a parkway access model and is developed bespoke for this situation which forecasts demand and abstraction at Beaulieu Park and other stations to London. This model relies upon complex sets of input data and assumptions. There is no guarantee that this assumptions will be correct or accurate. The Direct Demand Model includes a number of assumptions within it including 2. Journey numbers stipulated in MOIRA1 for 2017/18. The MORIA is an industry standard software to forecast the impact of timetable change, excluding the impact of flows. IT contains data on 17/28 volume for each origin destination in UK rail network 3.The DDM used average generalised cost for a journey starting at the MSOA centroid to the destination station. The generalised cost include the access costs weighted by access mode, car parking charge and rail generalised cost. 4. Timetable specification, base on May 2018 timetable, additional journey times of 2.5 minutes in peak and 2 minutes in peak assuming the current line speed is 100mph in both directions, 5. Station specification of three platforms based on GRIP 2 stage, with all platforms planned to be designed to accommodate 12 cars of 20m 6. The MOIRA1 data then has an applied average fare/mile from ORR (2017/18) which estimates revenue 7.The DDM assumes demand from local stations including (Braintree, Braintree Freeport, Crossing , White Notley, Witham, Kelvedon, Hatfield Peverel, Chelmsford, Ingatestone, Billericay , Brentwood and Shenfield.) 8. population age group assumed to be relevant is 20-64 based on ONS 2011, 2018 population data 9. growth is forecast within this model using Dft DDG data for GDP, employment, population, participation etc. 10. Housing growth is based on local plan data 11. An average price per fare is used to calculate revenue, calculated from ORR data 12. Trip Rate analysis is assumed to be based on Witham (as a comparator station) for non-London demand compared to London demand. 13. The DDM include Notes: There are a number of scenarios that can be used here and this has a very significant variance from top potential revenue and lowest. Jacobs confirmed you cant put a finger on easy. Forecasting revenue on a station is very difficult, and this is before considering items in risk and uncertainties item such as housing build out, covid 19 etc. Risk: Please note that this does not take account of covid and any macro economic impacts. The current assumptions is that ECC will be protected under the Dft side agreement for any force majeure events and the impact that may have on items feeding into the methodology for calculating operational costs under the side agreement, but this does not take account of the economic impacts of covid.	The evidence base supporting the figure in the methodology is based on the Direct Demand Model and evidence bases within it . But the evidence within the Direct Demand Model is limited and based on a number of assumptions that are based on expertise rather than facts. Jacobs confirmed that there is no generic demand model that you can access to forecast level of revenue at new stations, so you must define and develop from scratch which is what Jacobs have was done, and then you use that to forecast. Its using industry standard tools and guidance but is very bespoke to the situation and Jacobs confirm there are lots of limitations to this. **This demand model is by no means perfect but its the best guess on what passenger numbers would look like . Link within revenge sheet that details direct demand model. It is noted that the Demand Model includes outdated results which do not reflect the latest assumptions on timetabling and car parking.**	**Uncontrollable** Whilst ECC have control over negotiations and what elements are factored into this revenue line, once the service is operational this is completely outside of ECC's control or any organisations control. ECC have sought to ensure that as much fare revenue is included in this revenue line as possible to mitigate risk.	Very High (12) The Probability of this assumption changing is almost certain (4) and the impact Major (3). There are very significant variances from top potential revenue to bottom potential revenue, forecasting revenue at a station is very difficult and there are a number of uncertainties within it such as considering the risk of housing build out, covid 19 etc all of which are factors that could changes and influence the position more than is currently being shown. There is also no certainty based on this that the actual revenue will fall within the parameters of what is being forecast in this model. A quick benchmark exercise has been done to compare expected revenue to other actual stations which gives the service some confidence. But given the probability of this changing is high and the impact	The demand model is used to forecast the expected fare income. The Model development includes industry standard tools and guidance but is very bespoke for each situation and includes a number of limitations, "this is by no means perfect" but it is the best guess .The Model is designed to look at demand based on a study area based on destination areas and to and from London and Stratford and then you can calibrate it to a position based on Moria Data (see reference to Moria above). When you use the model to turn on BP station it will forecast impact . It will forecast additional demand at BP that is created from nearby area. In this model Jacobs have included nearby station abstraction (Chelmsford, HP, Witham etc) This is completely separate from no 8 abstraction. The model itself looks at wider group of stations and looks at abstraction and total generation to calculate total annual revenue in various timetable scenarios. This modelling approach is inherently uncertain and includes educated guess work trying to forecast what it will lookalike (based on Location of BP and other stations and costs and access from origin house to nearest stations nearby through a journey time). The outputs in the calculation don't isolate out the abstraction calculations, we don't say 80% of x revenue is abstracted and 20% is core revenue. ITs agnostic of existing station usage. Its demand based on location of beau lieu and calibrating total level of demand. if 34 million trips at Chelmsford there might be an extra million when you include beau lieu but your

					could be major I would flag this as a RED FINANCE RISK.	patterns might be changing. Industry style lag factors have been applied to passenger numbers to ensure that we aren't assuming that from day one this is a success, it therefore creates a growth model for passengers that feeds into your revenue calculations. 9m passengers at Chelmsford per annum....were assuming 2m for beau lieu.

6	Car park Revenue Generated by Greater Anglia at Beaulieu park Station	The model includes 3 different assumptions in terms of the methods that can be used to calculate car park revenue. 1. 1st method is very optimistic, its a high ball estimate just based on: - an unlimited no of passengers assumed to be driving to the station - no of passengers assumed to be driven is a % of total projected passenger demand (with the assumptions in above cells relating to forecasting demand) . - Car park fare of £8 a day , Based on Shenfield Car Park Prices. - Indexation- RPI has been used to uplift revenue expected over the life of the project. - a number of different timetable scenarios can be assumed here (Timetable, A,B,C,D,E,F,G). 2. The 2nd method is a more Constrained Car Park estimate and assumes: - 750 car park spaces are available for passenger usages. - Car park space turnaround/churn of 22%, which is based on analysis from car park data turnaround in Chelmsford and compared to entry and exits at Chelmsford station which concluded that the turnaround is about 22% . This equates to an overall 915 spaces to be filled a fay at full price - the extra 22% of spaces made available due to the above still pay the full £8 per day - 240 days a year for parking. 3. Final method assumes is based on he Greater Anglia Model for forecasting car park income and assumes : - £1000 of income is achieve per car park space per annum. It is unclear why GA use this method and what evidence it is based on. - The number of spaces used to multiply up the £1000 income is unknown but can be altered to any required number of spaces. They put the 2nd method for calculating this revenue is included in current scenario analysis. To note the difference between the 2nd method and the final method is £50,000.	**There is a combination of evidence bases used for the assumptions and modelling.** £8 figure is based on Stratford Train Station. - £1000 per annum income was provided by Greater Anglia but it is not known what this is based on. - 750 spaces is based on current Station plans	**Uncontrollable** Whilst the fare charged is controllable to a degree, the uptake in the car park is not and therefore this is assumed Non Controllable	Medium Risk (6) Probability is likely and impact is moderate. The number of spaces filled could significantly change due to a number of factors such as local demand, covid impact, accessibility to cars ect. The impact that this income has on the overall position is not as high as fare income and therefore this is flagged as Amber	This is revenue associated with the car park that will be operated and run by Greater Anglia which is separate to the car park which is intended to be owned and ran by Chelmsford City Council, revenue associated with CCC car park is not factored into this methodology at all.
7	Car Park Revenue generated from CCC Car Park at Beulieu Park Station	No income is assumed to be received from CCC in association with this model to offset the operational costs to ECC.	None.	**Uncontrollable** this will be managed and controlled by Chelmsford City Council	Low risk as no real exposure	no further detail

8	Fare revenue lost or abstracted from stations up the line (e.g., Colchester)	**The current assumption is that there will be no fare revenue lost or abstraction from other stations feeding into the methodology and side agreement with DfT.** Old assumption: 1st element of abstraction is longer journey times is additional 3 mins using Moira. This is still uncertain as to whether this will be included. But methodology takes timetable without BP and then compares with more calls at BP. When fewer stops at BP revenue lost is less then when BP has more stops. Uses a fare per mile assumption. This is an element where ideally you would agree timetable now as it could change and change these numbers.... we know its going to change between now and 2025... you would need to isolate change to just beau lieu and not wider timetable changed. This is using the Moria model which has current levels of demand / passengers and current journey time . by putting beau lieu in you slow down the time and then you get less passengers.	Moria Model from Government We apply fare per mile to the output of the model… its in the report…cant remember how calculated.	**Uncontrollable** due to timetable changes and Moria model is set by gov.	Low risk as no real exposure	no further detail
9	Fare Revenue Lost due to abstraction from Chelmsford to Beaulieu. This is essentially Passengers moving from Chelmsford to Beaulieu Park Station.	The current methodology and calculations assumed: - the direct demand model to calculate the impact of introducing Beaulieu Park Station on overall Chelmsford Demand to calculate a rate of abstraction. (See assumptions above on Direct Demand Model) - The calculation uses Hatfield Peveral split of passengers to and from London and to and from areas that are not London. (It is not know what year of Hatfield Peveral Data was used?) - The % used of Non London passengers was 11.9% as per Hatfield Peveral assumption above. - The rate of abstraction of x is then applied to the proportion of Chelmsford base revenue (From when/what year?) not to and from London upon the Hatfield Peveral proportion of non- London revenue to represent that Beaulieu Park revenue would likely be more similar to Hatfield Peveral. - passenger data split from Hatfield Peveral is based on season ticket data. It is not know what year this season ticket data was taken from and over what period of time (i.e. Annual, Monthly, Quarterly??) - This does not include passengers that are living at BP. The assumption around the number of passengers living at BP that previously used Chelmsford is not known. - They are various different rates of abstraction that can be used in the model ranging from 4-25% which is dependent on the timetabling. Timetable scenarios range from A-G and assume different levels of growth. But , it is unknown what these timetable options are based on. - a lag factor is applied to represent that demand would not switch on instantaneously. What the lag factor is in terms of a % and what it is based on is unknown. It is worth noting that the level of abstraction here can never be as high as BP revenue figures due to methodology and this is the case should this every go live. 50% of abstraction could be maximum risk.	Hatfield Peveral Passenger Data Direct Demand Model Growth Demand Model	**Uncontrollable** . Depends on timetable and stopping pattern and housing demand.	Very High (12) The Probability of this assumption changing is almost certain (4) and the impact Major (3).	no further detail

10	Fare Revenue Lost due to abstraction too and from London	The current methodology and calculations assumed: - the direct demand model to calculate the impact of introducing Beaulieu Park Station on overall Chelmsford Demand to calculate a rate of abstraction. (See assumptions above on Direct Demand Model) - The calculation uses Hatfield Peveral split of passengers to and from London and to and from areas that are not London. (It is not know what year of Hatfield Peveral Data was used?) - The rate of abstraction of x is then applied to the proportion of Chelmsford base revenue (From when/what year?) to and from London upon the Hatfield Peveral proportion of London revenue to represent that Beaulieu Park revenue would likely be more similar to Hatfield Peveral. - passenger data split from Hatfield Peveral is based on season ticket data. It is not know what year this season ticket data was taken from and over what period of time (i.e. Annual, Monthly, Quarterly??) - Demand relating to the new Beaulieu Park Housing has not been removed from this methodology. - They are various different rates of abstraction that can be used in the model ranging from 4-25% which is dependent on the timetabling. Timetable scenarios range from A-E and assume different levels of growth. But , it is unknown what these timetable options are based on. - a lag factor is applied to represent that demand would not switch on instantaneously. What the lag factor is in terms of a % and what it is based on is unknown. It is worth noting that due to the methodology used, the loss or abstraction from Chelmsford can be higher than the total Beaulieu Park Revenue.	Hatfield Peveral Passenger Data 2019-20 and Growth Demand Model	**Uncontrollable**	Very High (12) The Probability of this assumption changing is almost certain (4) and the impact Major (3).	no further detail
11	Fare Revenue increased due to Crowding and Overcrowding at Chelmsford Station. People who have been crowded off of Chelmsford should be added from BP revenue	This is very difficult to forecast and will be difficult to assess once the station is live. There is a separate model "Station Crowding delay Model" For this calculation which was produced for the SELEP Business case which calculates the impact of BP Station on crowding delays experienced at Chelmsford Station in given timetable scenarios. Assumptions include; - total number of access and egress passengers during peak period based on average delays experienced at Chelmsford Station at Peak Services during a week in April 2018. - assuming an average delay per access and egress passenger in minutes of between 0.11-1.27 without scheme at Chelmsford. - assuming an average delay per access and egress passenger in minus of between 0.04-1.20 with scheme. - both of the above average delays feed into the model to calculate the benefits associated with crowding, it is unknown how the Jacobs model takes the minutes delay and creates a monetary benefit value - delay calculations above for boarding passengers are assumed to arrive at the platform over the 5 mins preceding the service arrival. - station crowding model (not seen but referenced to in the Jacobs tab) which forecasts station usage projections with data on the capacity and current usage patterns of the station (Chelmsford Station), to forecast the delays experienced by passengers accessing and egressing the stations platforms during he AM and PM Peak Period's. - Chelmsford Station gateline count data was used to inform the model here. This data was provided by greater angles for the two gate lines with data disaggregated by 15 mins period for each day between 21st-27th April 2018. - Service counts included the time (6.30-9.30) AM and (4.30-7.30 PM). These are the periods at which overcrowding at Chelmsford was analysed and therefore part of the evidence base for the average delay above. - Demand and Train frequency information to inform this calculation were provided in the	1. Moria Data, it will be forecasted with growth indices applied on top. This might change as things happen in wider economy (e.g. covid) . 2. Passenger delay data from GA was provided for just one week in 2018 for Chelmsford Station. This is very limited data to create a forecast which creates the Station Delay model. 3. NR Stations Capacity Planning Guidance to calculate stair capacity	**Uncontrollable**	Low Risk in terms of impact and probability	no further detail

		form of Moira projection data. This is Dft data, but the output of this specifically has not been seen. - it assumes no change in the number of calls at Chelmsford station. One scenario assumes that Hatfield Peveral Peak hour calls are reduced by 1 and replaced by BP station. It is unknown as to what this assumption is based on and whether it will reflect the number of calls when the service opens. - Boards and alighters for each service at Chelmsford were extracted and forecast for the year 2025 and 2038. - Flow rates to calculate stair capacity which is used to calculate crowding were taken from NR's Station Capacity planning guidance. Assuming 35 passengers per meter per minute for one way stair case and 28 for two-way staircase. Stairs are assumed to work in a 1-way direction, this was to not underestimate the capacity. assumes journey times and delays of passenger data with and without BP using the Moria Model (which is a dft model), this has a positive impact. This is a good thing for us as it increases revenue and this has been accepted. Methodology on how this exactly would be modelled when station opened, it might just have to use our calculation Henry has calculated which is £150K				
12	Moira Database	Moira Database feeds into a number of assumptions and calculations identified above. The Moria Model is a model provided by Dft.	Moria Model from Government	**Uncontrollable**	Medium Risk (6) The result of the Moira Model may not be reflective of what could come to fruition when the station opens therefore risk rating is deemed to be Likely (3) Moderate Impact (2)	no further detail

Winder Philips Report Log of Assumptions (WIP)

Area of Assumption	Description of Assumption in Winder Philips report	Risk Flagged By Winder Philips in the report?
Costs (Staff, Utilities, maintenance and services)	The annual operating costs for the station, including staff costs, will be similar to those of Cambridge North Station, which opened in 2017 and is 3 platform station like Beaulieu is proposed to be . The costs for Cambridge North Station for the year 2019/20 have been used in the Winder Philips report and therefore in the Jacob modelling.	n/a
Costs (Staff, Utilities, maintenance and services)	The majority of operational costs are associated with Payroll and assume 15 station staff, with other costs including maintenance, utilities and services	n/a
Costs- Car Park Costs	The annual operational costs of the 1,000 space car park at Beulieu is assumed to be covered by an extension to the car park contract which is currently operated by NCP. It is assumed that the cost of contract extension will be covered by predicted revenue income form the car park spaces.	n/a
Timetable assumptions	That GA will call 2 trains per hour (tph) in each direction, in the off-peak hours and 4tph in the peak hours at Beulieu	n/a
Train Crew Costs	It is assumed that a train would have to run an additional 2-3 minutes to enable a Beulieu stop, therefore the increase in train minutes has been used to calculate an estimated increase in traincrew costs . These costs will differ depending on what timetable option is implemented. 4 Scenarios were included in the WP report (2mins, 2mins with 3am starter, 3 mins and 3 mins with 3am started . Additional Train Crew operating costs	Without knowing the timetable that is going to be in operation at Beaulieu it is not possible to accurately model the additional driver costs. Instead they have estimated the increase by considering the % increase in train miles and applying that to the overall cost base for drivers (c£60m)

Infrastructure Projects

IP Enterprise Risk and Value Management

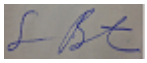
Beaulieu New Station GRIP 3 QSRA Report

Project Name: Beaulieu New Station
OP Reference: 150796
LOC: 2
Project Manager: Mark Chettle
Sponsor: Paul McAleer
Version: 1.0

Authored by: Nigel Tang, Risk and Value Analyst

Signed:	Date:

Approved by: Simon Burton, Principal Risk and Value Manager

Signed: 	Date:

Accepted by: Mark Chettle, Project Development Manager

Signed:	Date:

2. Background

The provision of a new station at Beaulieu is a long-standing aspiration of stakeholders, politicians and local authorities, and has a strong consensus in favour of the scheme. The new mixed use housing and business development at Beaulieu has planning permission and construction has already begun. The station also has outline planning permission, and is a key required output for the development, as housing construction would be curtailed without it.

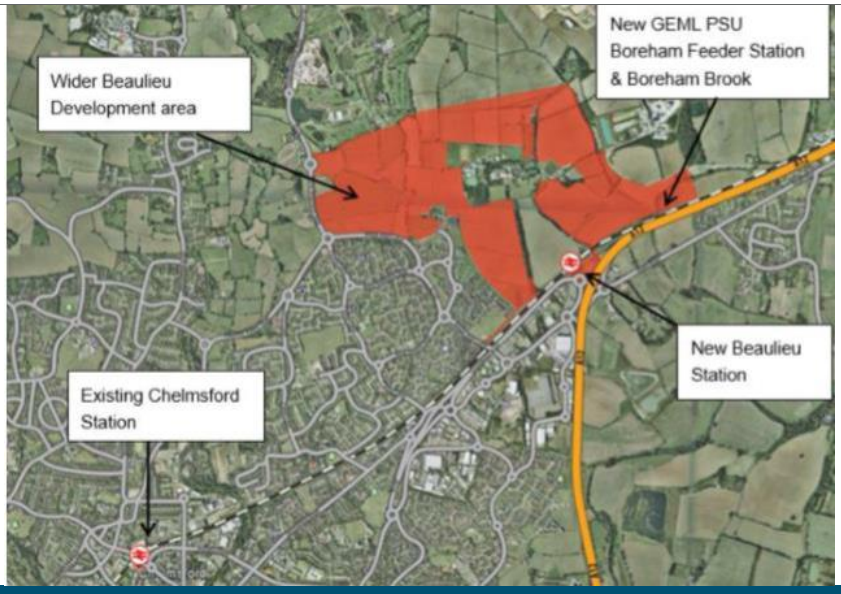


Figure 2.1 Site Overview

The new railway station will be developed on the Great Eastern Main Line (GEML), on a site 2.72 miles to the north-east of Chelmsford station. The scope of works includes:

- Full bi-directional rail loop with a 3-platform station arrangement (an island and single faced platforms);
- Two footbridges between the platforms (Access for All (AFA) and Second Means of Escape (SMoE));
- Lifts to serve the AFA footbridge;
- Platform coverage with waiting shelters;
- Retail units within the station building and on the platforms;
- Staff and passenger welfare and toilet facilities, within the station building and on the platforms;
- Approximately 1,400 station car parking spaces at the station including;
    - 5% disabled parking spaces;
    - Approximately 300 premium parking spaces;
    - Approximately 1,100 spaces in a multi-storey carpark;
    - Cycle parking and storage facilities for 500 bicycles; and
    - Provision for an interchange with local bus services.

3. Assumptions Analysis

3.1 Assumptions that were modelled

A number of assumptions were identified and an assumption analysis exercise was undertaken, details are shown in the table below. It should be noted that these assumptions are modelled as discrete risk events or duration uncertainties and actions should be taken to reduce their likelihood of occurrence or impact.

Note: The following assumptions were captured based on their impact on the project's programme (i.e. schedule assumptions). The cost assumptions are captured separately in the QCRA report.

Table 3.1 Assumptions Analysis Key

Confidence	Impact
A – Very Confident	A – Minor Impact
B – Fairly Confident	B – Manageable Impact
C – Uncomfortable	C – Significant Impact
D – Very Uncomfortable	D – Critical Impact
How confident are we that the assumption will be correct?	What is the impact would the assumption is wrong?

No	Assumption	Confidence	Confidence Justification	Impact	Impact Justification
1	WSP will have completed the design before the Chelmsford North East Bypass (CNEB) bridge designs progress.	A	Currently, the CNEB bypass project is on pause and Essex County Council is not progressing with the design.	C	Currently, WSP is designing without considering the bridge interface with the bypass. An acceleration of the CNEB programme will require the project to incur delays due to interface. **Modelled in QSRA Risk ID 415441**
2	The proposed access strategy will be approved by TOCs and FOCs	B	There has been ongoing liaison with the TOCs and FOCs to ensure that they are aware of the planned access strategy	B	If this is not the case, then the access strategy will need to be revisited and updated. **Modelled in QSRA Risk ID 486819**

No	Assumption	Confidence	Confidence Justification	Impact	Impact Justification
3	Timely accreditation will be achieved in regards to Construction Safety Method (CSM) and Technical Specifications for Interoperability (TSI) compliance.	B	There has been ongoing liaison with the National Certification Body (NCB) and positive feedback has been given so far.	C	Past projects (e.g. WAML and Ipswich to Felixstowe) struggled in achieving compliance. **Modelled as duration uncertainty in A23940**
4	Countryside Properties will have completed the foul water drainage system by December 2022.	B	A housing development is currently being built and is well progressed. This is needed for the development and must be in place, so the project is confident that this will be completed in line with the project's needs.	C	If the assumption is incorrect, there will be an extension of time associated to interface and also work around the drainage design issue. **Modelled in QSRA Risk ID 469983**
5	Archaeological review will not find anything that needs to be removed from the site	C	Currently, there have been studies completed or evidence that could confirm the site's archaeological conditions.	C	The impact is unknown, but it would result in a delay to the start of site works. **Modelled in QSRA Risk ID 469977**
6	It is assumed that the S&C units will be accepted by the RAM.	A	The project team will be managing this with the RAM and Track Team.	C	The impact would be that additional re-design is required and if the components are long lead items; this would result in a significant delay to the programme. **Modelled in the QSRA Risk ID 408230**
7	There will be no major delays with the delivery and procurement of S&C components	B	The team are aware of the importance of procurement and manufacture of S&C, currently there is sufficient time between the completion of design and the relevant blockade. Procurement strategy is to be monitored and updated accordingly.	C	If S&C is not procured or delivered on time then major blockades may be cancelled, therefore impacting the construction methodology. **Modelled in QSRA Risk ID 408251**

No	Assumption	Confidence	Confidence Justification	Impact	Impact Justification
8	Network Change will be approved and proceed as per programme with no changes required.	C	Currently, there is uncertainty around Network change, however there are ongoing liaisons with the TOCs and FOCs to ensure they are regularly updated on the progress of the project	C	If Network Change is not approved in-time, it will delay the signalling design in GRIP 4 or a potential re-work in detailed design could be required which would result in a significant delay depending on the severity. **Modelled in QSRA Risk ID 408254**
9	The project will gain TWAO with only minor objections received and that the Secretary of State will approve the TWAO in accordance with timeframe given in Ministry Guidance.	B	The project has already received outline planning approval and there is widespread support for the project from local authorities, consequently it is not expected that significant objections are received against the scheme. The local planning authority are a key member of the project steering group.	C	If there is protracted delay in granting Secretary of State approval, then the project will not be able to commence the detail design phase. This could be due to comment(s) or objection(s) submitted to the SoS or the need for a local public enquiry (conducted by an independent inspector) into the proposal. This could be a potential showstopper depending on the extent of delay incurred. **Captured as Duration Uncertainty for A1700320 - Stage 2 - Application Stage (TWAO)** **Showstopping impact is excluded (refer Table 3.2)**
10	It is assumed that the Essex TWAO for the existing Public Rights of Way (PROW) across the railway at Paynes bridleway crossing and Noakes footpath crossing will be approved in a timely manner.	C	The existing PROW will be stopped by another project and this will be implemented before the end of the first year in CP6 via a TWAO. However, currently the Essex TWAO is experiencing some delays.	C	If the assumption is incorrect, this will lead to a delay to the programme as the project may have to expand the TWAO to include the Public Right of Way for Paynes and Noakes. **Modelled in QSRA Risk ID 473533**

No	Assumption	Confidence	Confidence Justification	Impact	Impact Justification
11	Access to surveys would be granted and the project will not miss the survey period.	B	Surveys are ongoing in GRIP 3 and disruptive surveys have already been undertaken and no new ones identified as being required to be completed.	C	If the assumption is incorrect, the project would miss the survey timescale to access the operational railway and private land therefore, resulting in a significant delay to the detail design in GRIP5. **Modelled in QSRA Risk ID 408229** **Showstopping impact excluded (Refer Table 3.2)**
12	It is assumed that the project will not have to alter the proposed signalling design to obtain approval from the Major / Minor Signalling Review Panel (MSRP).	B	The project has engaged with MSRP in GRIP 3 to seek their views on the proposed designs. This should help avoid the need for alterations in GRIP 4.	B	If the assumption is incorrect, the signalling design will need to be re-visited which may result in a delay to the programme. **Modelled in QSRA Risk ID 489943**
13	The revalidation of the Environmental Impact Assessment (EIA) will not suggest any design modifications to ensure project is compliant.	B	The latest environmental statement (ES) was submitted in 2013 in which outline planning permission was granted. However, the specification for the proposed station has changed which potentially includes additional land required outside application boundary and changes to design including amendments to the height of the access footbridge.	B	If the assumption is incorrect and the output of the assessment implicate that the changes are considered likely to result in significant effects to the environment; the project may need to implement additional measures which may cause a delay to programme. **Modelled in QSRA Risk ID 473531**

No	Assumption	Confidence	Confidence Justification	Impact	Impact Justification
14	There project assumes that there will be no interface required with nearby project(s) on signalling source records.	B	No nearby schemes requiring access to the signalling source records have been identified.	B	If the assumption is incorrect, the project may have to parallel design with other project(s) – in which a potential Overlapping Design Agreement (ODA) may be required. Depending on the severity, there may be a slight delay to the programme. **Modelled in QSRA Risk ID 470040**
15	All mitigations will be identified and sought out for any protected species found.	B	Ecological surveys have already been carried out and a number of protected species within the vicinity have been identified. However, the project will only finish construction by 2025, hence circumstances might change.	B	If the assumption is incorrect, the project will have to implement any unforeseen mitigation(s) that are required. **Modelled in QSRA Risk ID 408402** **Showstopping impact excluded (Refer Table 3.2)**

3.2 Showstoppers and Exclusions

The Beaulieu New Station project has defined showstoppers as:

- An event that would have a significant change in design or construction philosophy.
- An event that would have a significant change to the project cost or programme.

The following items have therefore been identified as showstopping exclusions and have not been modelled as part of the risk analysis as the impact would significantly alter the project:

- The project will not obtain Transport and Work Act Order (TWAO) due to rejection from the Secretary of State (SoS).
- The implementation of any unforeseen Covid-19 measures (potentially due to another spike) that may lead to significant delay to the delivery works.
- The project will not gain access in a timely manner to conduct any unforeseen mitigations or survey(s) for any protected species found on site.
- The funding that Essex County Council will receive from the Housing Infrastructure Fund (HIF) grant is insufficient to support the continuity of the project.
- Homes England does not grant an extension until March 2025 to allow for the HIF money to be spent.

Table 3.2 Assumptions excluded from the analysis

No	Assumption	Reason for exclusion	Owner
1	The project will gain TWAO and that the Secretary of State (SoS) will approve the TWAO in accordance with timeframe given in Ministry Guidance.	If there is protracted delay in granting Secretary of State approval, then the project will not be able to commence the detail design phase. The project has excluded the showstopping impact of the SoS rejecting the scheme and modelled a tolerable delay (up to 3 months) as duration uncertainty. In addition, there is a risk (**473533)** modelled regarding the expansion of the TWAO to include PROW for Paynes and Noakes. **Showstopping Exclusion** **Stress-tested in Scenario 1 (Refer to Section 6.1)**	Essex County Council (Project Funders)
2	There will be no implementation of any unforeseen Covid-19 measures (potentially due to another spike) that may lead to significant delay to the delivery works.	The project has not envisaged at the moment that any key resources are compromised (i.e. fallen ill, self-isolating, etc.) and are unable to support the project. In addition, procurement of critical materials will not occur until late July 2022 and first construction works will only start in April 2023 – where circumstances may have changed already. **Showstopping Exclusion** **Stress-tested in Scenario 2 (Refer to Section 6.2)**	NR Project Team
3	The project will gain access in a timely manner to conduct any unforeseen mitigations or survey(s) for any protected species found on site.	The project has excluded the possibility of conducting ecological surveys or mitigations on any unidentified species outside the permitted calendar period. This meant the project would have to set up on next calendar period due to seasonal constraints which would result in a significant delay to the programme. Risks **408253** and **408402** were modelled that accounted for the risk of conducting these additional surveys or additional mitigations with a tolerable delay and does not include the prolongation of up to 6-months. **Showstopping Exclusion**	NR Project Team
4	The funding that Essex County Council will receive from the Housing Infrastructure Fund (HIF) grant is insufficient to support the continuity of the project.	This is not something the project can manage or has control over. If the funding is insufficient, the project may be paused for a significant period of time. **Showstopping Exclusion**	Essex County Council

No	Assumption	Reason for exclusion	Owner
5	Homes England will grant an extension by 1 year until March 2025 to allow for the HIF moneys to be spent.	This is not something the project can manage or has control over. If the extension is not granted, then it may not be possible for the awarded HIF moneys to be spent by the agreed deadline. **Showstopping Exclusion**	Essex County Council
6	The installation of the new RDR bridge will not cause unanticipated changes to the existing rail infrastructure.	There are on-going discussions about the road project being completed by 2021 – which is a few years in advance of the Beaulieu Station work. Communication so far has not indicated any unanticipated changes to proposed infrastructure. However, if incorrect, this will impact the design of signal sighting and Overhead Line Equipment (OLE) clearances. Currently, the project is confident on this assumption being correct.	Essex County Council
7	The installation of a new Radial Distributor Road (RDR) Bridge and associated road scheme will be completed in-time to allow the project to move in as haul roads.	Majority of the new road network is already in place. The RDR bridge will not be demolished until the construction of the new road is complete. Sufficient diversion route will be in place.	Essex County Council
8	Third party land beyond the defined development boundary will be made available to facilitate the construction of vehicle access.	There is an agreement in place with the Council and Countryside Properties that the project will be given the land it needs when it needs it.	Chelmsford City Council
9	It is assumed that the project will be prepared and ready for all key possessions and blockade(s).	Any possession-related risks (e.g. availability of plant and materials; frustrated access, etc.) will be managed as part of the DWWP process. Hence the model assumes that there will be no cancelled possessions that may delay the programme.	NR Project Team

4. Modelled Risks

The following risks, from the risk register in Active Risk Manager (ARM), were incorporated within the analysis.

The duration uncertainties incorporated within the analysis are shown in Appendix B, page 30.

Table 4.1 Design development risks (Pre-GRIP 6) that were modelled

Risk ID	Risk Title	Risk Description	Impact Description	Activities Impacted	Prob.	Impact (days)			Mitigation(s)
						Min	ML**	Max	
408253	Access to Survey Premises	There is a risk that access may not be granted in a timely manner to conduct surveys on the operational railway and private land during AiP or GRIP 5 stage.	Delay to programme as project will have to seek and negotiate for the next available access.	A22770 - Produce Form 003 / Form B / SDS	10%	20		40	Design consultant (WSP) to advise on survey strategy and early identification of survey needed and the survey opportunities. On-going action – Plan for access as per developed survey strategy.
408254	Network Change approval (additional modifications)	There is a risk that Network Change may not be approved, and negotiations may introduce design modifications.	As Network Change approval is required for the project to progress to GRIP 5, any significant design modifications will cause a delay to the programme.	A22880 - External Network & Station Lease Documents Approval	35%	10		40	On-going liaison with TOCs/FOCs to provide advice on the scheme.

Risk ID	Risk Title	Risk Description	Impact Description	Activities Impacted	Prob.	Impact (days)			Mitigation(s)
						Min	ML**	Max	
415441	Installation of the Chelmsford North East Bypass (CNEB) may cause changes to the infrastructure	There may be a threat where re-design of signal sighting and OLE system may be required.	As WSP's design do not take into consideration any of the bridge interface with the bypass. If there is an acceleration of the CNEB programme, this will see the project incur a delay due to re-design.	A22390 - Produce Form 002	5%	20		60	NR to review the design parameters of CNEB programme and ensure to regular follow-up of the project's progress.
470040	Overlapping design with nearby projects to update Signalling Records	There is a risk that the project would need to dedicate resource to integrate design with other projects in order to update the source records.	If the risk is realised, dedicated resource is required to complete the work within a month.	A1700550 - Produce Signalling GRIP 4 AIP Design	20%	0	20	20	Put in an early request for the source records. If other projects have acquired it, ensure to liaise with project team to establish parallel designing procedures.
486819	Access strategy not approved by TOCs/FOCs	There is a risk that TOC/FOC will have disagreements about the access to the railway to complete the work.	The planning application will go in stipulating how the project plans to construct the station. However, if there are disagreements from TOC/FOC's about access to the railway to complete the work, this may see that the project must modify how it constructs and this will change the application.	A22840 - Disruptive Possession Planning / Negotiations	10%	5	10	15	Early engagement with TOC and FOC.

Risk ID	Risk Title	Risk Description	Impact Description	Activities Impacted	Prob.	Impact (days)			Mitigation(s)
						Min	ML**	Max	
469983	Incomplete drainage design of Countryside Properties	There is a risk that the project will incur some delay if the drainage design which is developed by Countryside is not complete in a timely manner.	Delay to programme due to re-design of the drainage outfall.	A22770 - Produce Form 003 / Form B / SDS	10%	10		20	On-going liaison with Countryside to ensure the drainage design is complete.
473533	Expansion of TWAO application (due to Essex TWAO delays)	There is a risk that the project may incur additional costs and delays as a result of delays with Essex TWAO which would require the projects TWAO to include the public right of way for Paynes and Noakes.	Potential delay to programme to include the PRoW for Paynes and Noakes into the TWAO application	A1700330 - Stage 3 - Post Application Stage / SoS Decision Stage (TWAO)	50%	0		40	Await updates on progress of TWAO.
489943	Delays in obtaining MSRP approval	There is a risk that project may have to alter the proposed design and construction of the signalling discipline due to modifications imposed by the MSRP.	- Additional design team costs due to re-design - Potential knock-on delay impact to construction programme'	A1700640 - Signalling - MSRP Approval	10%	20		40	Ensure to communicate with MSRP if any significant changes to signalling design were done prior to panel review.
473531	Revalidation of Environmental Impact Assessment (EIA)	There is a risk that the project will incur additional costs if revalidation of EIA suggests that modifications to the design will be required to ensure project is compliant.	Depending on the output of the assessment, the project may need to implement additional measures to be compliant.	A22770 - Produce Form 003 / Form B / SDS	10%	20		40	Assess what additional intervention may be required following outcome of EIA revalidation in GRIP 4.

Table 4.2 Delivery risks (GRIP 6) that were modelled

Risk ID	Risk Title	Risk Description	Impact Description	Activities Impacted	Prob.	Impact (days)			Mitigation
						Min	ML**	Max	
408251	Delays in manufacturing long lead items (S&C)	There is a risk that the S&C components cannot be manufactured on-time. This could be due to the capacity of the manufacturer, late design and compressed programme.	If S&C is not procured or delivered on time then major blockades may be cancelled, therefore impacting the construction methodology and result in a delay to the programme.	A22050 - Site Works	10%	5		20	Determine which long lead components are required and place order with manufacturer in a timely manner. Freeze design in accordance with lead time
489946	Unexploded ordnance (UXO) disposal	There is a risk that the project may encounter UXO during the enabling works stage.	Delay to the construction programme as project will have to instruct an UXO disposal team to mitigate risk.	A22050 - Site Works	5%	2		5	Further assessment of UXO presence and site supervision Consider providing explosive ordnance disposal expert supervision during enabling works if risk is deemed high.
408226	Contaminated land / Unforeseen ground conditions	There is a residual risk that the ground conditions may be worse than anticipated during construction.	Depending on the severity of the ground conditions; project may incur additional costs in: - Re-designing works (e.g. piles), affecting construction works as well - Treatment costs or contaminated waste removal costs.	A22050 - Site Works	5%	10		20	Ensure all GI works are carried out before starting AIP design and on-going monitoring once construction work starts.

Risk ID	Risk Title	Risk Description	Impact Description	Activities Impacted	Prob.	Impact (days)			Mitigation
						Min	ML**	Max	
408403	Invasive species found on site	There is a threat that the project may come into contact with invasive species (e.g. Japanese Knotweed) during site works.	- Additional costs incur to the project due to clearance. - Potential delay to site works depending on severity of the species.	A22050 - Site Works	5%	2		5	Complete a detailed ecological survey and verify the presence of invasive species by a qualified ecologist prior to start of construction.
469977	Archaeological Sightings	There is a risk that the project will incur delays due to any archaeological finds during construction	There is no evidence of archaeological remains on site. However, no studies were conducted to prove this. If there were any findings, it will incur a month delay.	A22050 - Site Works	10%	0		20	Monitor works and review survey results
408402	Unforeseen mitigations required for protected species	There is a threat that any unidentified protected species would require the project to set up mitigations to protect or move the species.	If the project has missed the survey calendar to carry out the appropriate mitigations, it would result in a significant delay to the programme.	A22040 - Mobilisation	35%	20		40	Understand the results of the initial survey to identify if any protected species are found in order to set up the appropriate mitigations.

5. Results

The results of the analysis identified that the project team can only be 90% confident of completing Entry into Service (EIS) by 9th March 2026. This is 4 months later than the deterministic date of 13th November 2025 therefore, the project may not be able to achieve the December 2025 timetable change.

Table 5.1 Summary of results table

Milestone	Likelihood of achieving the milestone			
	Deterministic (planned)	50%	80%	90%
A21840 - End Stage 4 (Scheme Development)	23% by 21/03/2022	14/04/2022 (+24 days)	17/05/2022 (+57 days)	03/06/2022 (+74 days)
A21860 - End Stage 5 (Detailed Design)	12% by 26/04/2023	13/06/2023 (+48 days)	25/07/2023 (+90 days)	11/08/2023 (+107 days)
A24300 – EIS December 2025 (Timetable)	2% by 16/12/2025	25/02/2026 (+71 days)	07/04/2026 (+112 days)	28/04/2026 (+133 days)

The following section contains the detail analysis for each key milestone.

5.2 GRIP 4 Completion

The analysis revealed that there is only a 23% confidence of completing GRIP 4 by 21st March 2022, with a 90% confidence of completing the milestone by no later than 3rd June 2022, roughly 3 months later than planned.

The graph below shows the range of simulated completion dates and times:-

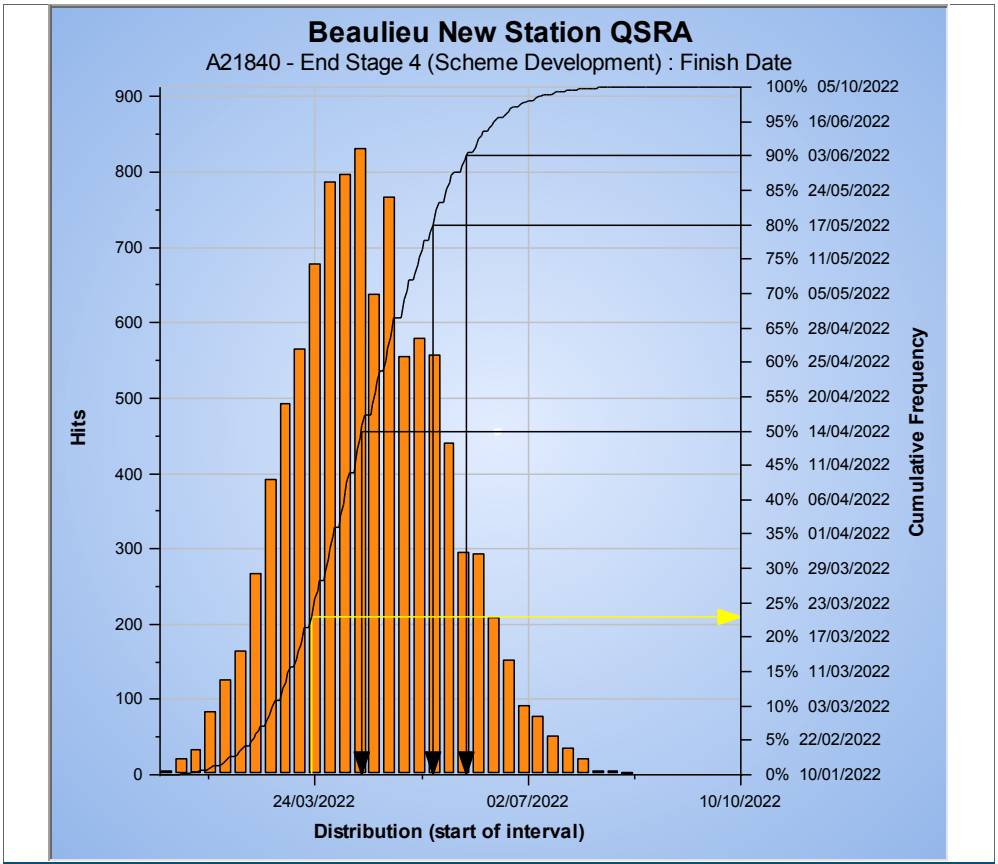


Figure 5.2 Distribution Graph – Completion of GRIP 4 Stage

The distribution seen in Figure 5.2 has a slight positive skew to the left. It can be observed that there is a small peak on the right due to the discrete risks associated were modelled with a medium likelihood of realising. The yellow line represents the confidence level for the finish time as per the programme (planned date).

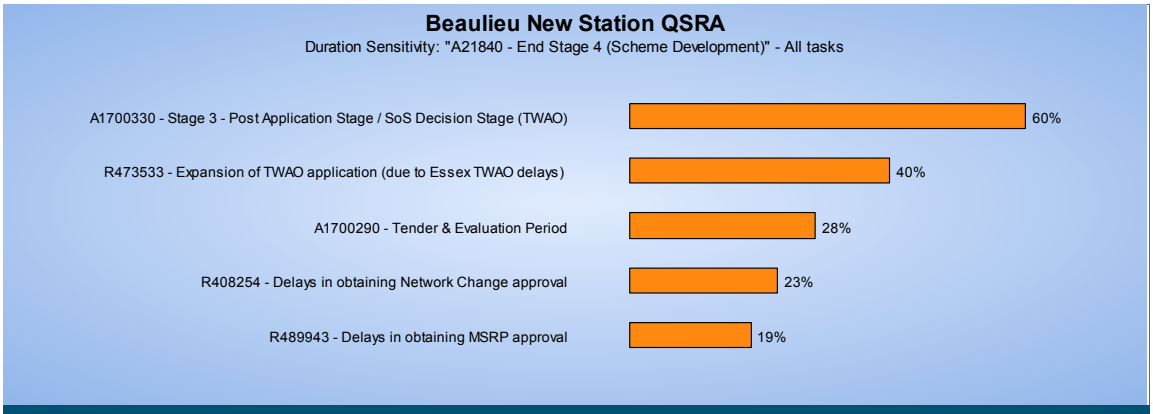


Figure 5.3 Duration sensitivity analysis for Completion of GRIP 4 Stage

The tornado graph shown in Figure 5.3 highlights the discrete *Risk 473533* and the uncertainty of *Activity – A1700330* have the largest impact on the completion of GRIP 4 stage. This is due to *Risk 473533* (Expansion of TWAO application) and the potential challenges and the uncertainty surrounding the TWAO application – which was modelled with a large range of duration in the programme.

5.3 GRIP 5 Completion

The analysis revealed that there is only a 12% confidence of completing GRIP 5 by the planned date (26th April 2023) and a 90% confidence by no later than 11th August 2023, roughly 4 months later than planned.

The graph below shows the range of simulated completion dates and times: -

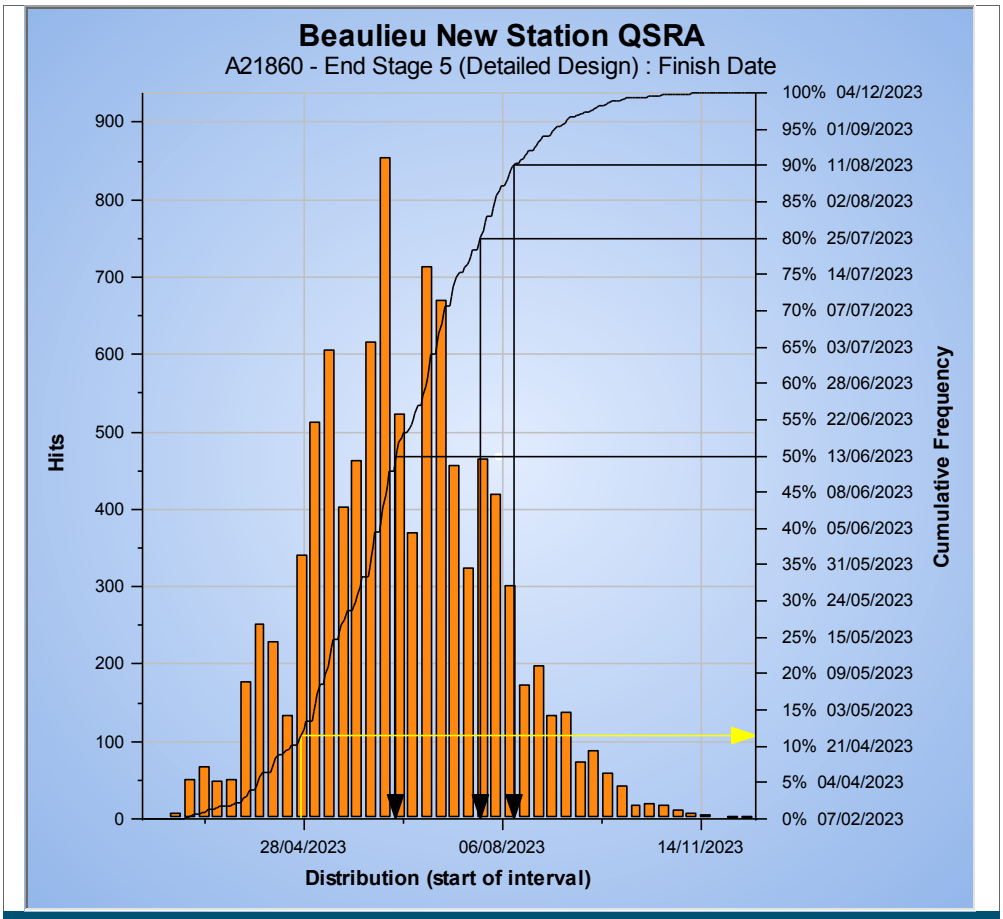


Figure 5.4 Distribution Graph – Completion of GRIP 5 Stage

The distribution shows several small peaks. This is due to the cumulative effect of uncertainties and risks with large range along with the bespoke calendars applied to several investment authority milestones in GRIP 5. These are the following milestones: *A22500 - GRIP 5-8 - Anglia Submission*; *A22510 - GRIP 5-8 Authority- Anglia Meeting*; *A22520 - GRIP 5-8 - IP Submission* and *A22490 - GRIP 5-8 Authority- IP Meeting*. Furthermore, the analysis also indicates that in majority of the iterations, the project would miss its scheduled investment authority; causing a periodic (4-week) delay.

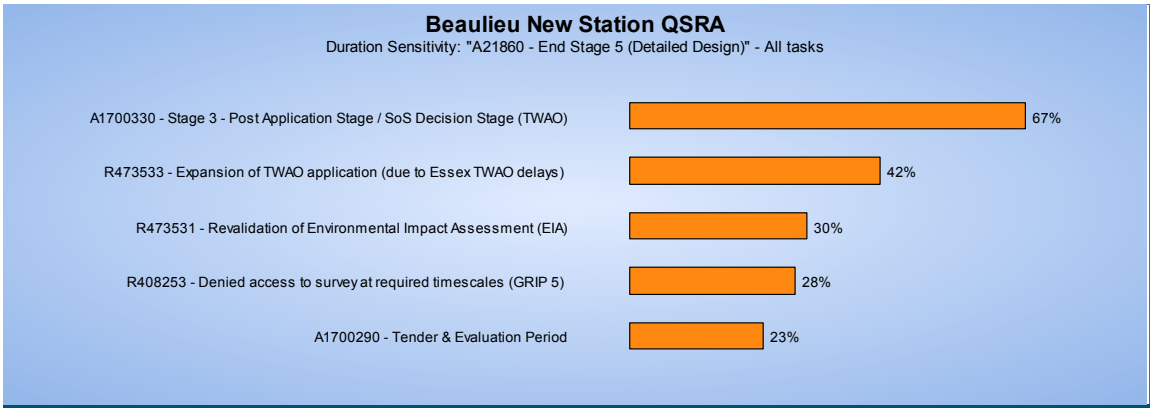


Figure 5.5 Duration sensitivity analysis for Completion of GRIP 5 Stage

It can be seen in Figure 5.5 that the “knock-on effect” of TWAO process contributes significantly in driving the completion of GRIP 5 as well. This indicates a large focus and attention is required by the project to effectively manage the TWAO process. Due to this, the TWAO process is examined further through stress/scenario testing (refer to Section 6.1) to evaluate the impact of the TWAO activities finishing according as planned and investigate the delay impact of the showstopping exclusion (SoS rejection).

5.1 Entry into Service

The analysis identified that the project team can be 90% confident of completing Entry into Service (EIS) and achieve Timetable Change by 28th April 2026. This is roughly 5 months later than the deterministic date of 16th December 2025. The graph in Figure 5.6 below shows the range of simulated completion dates and times: -

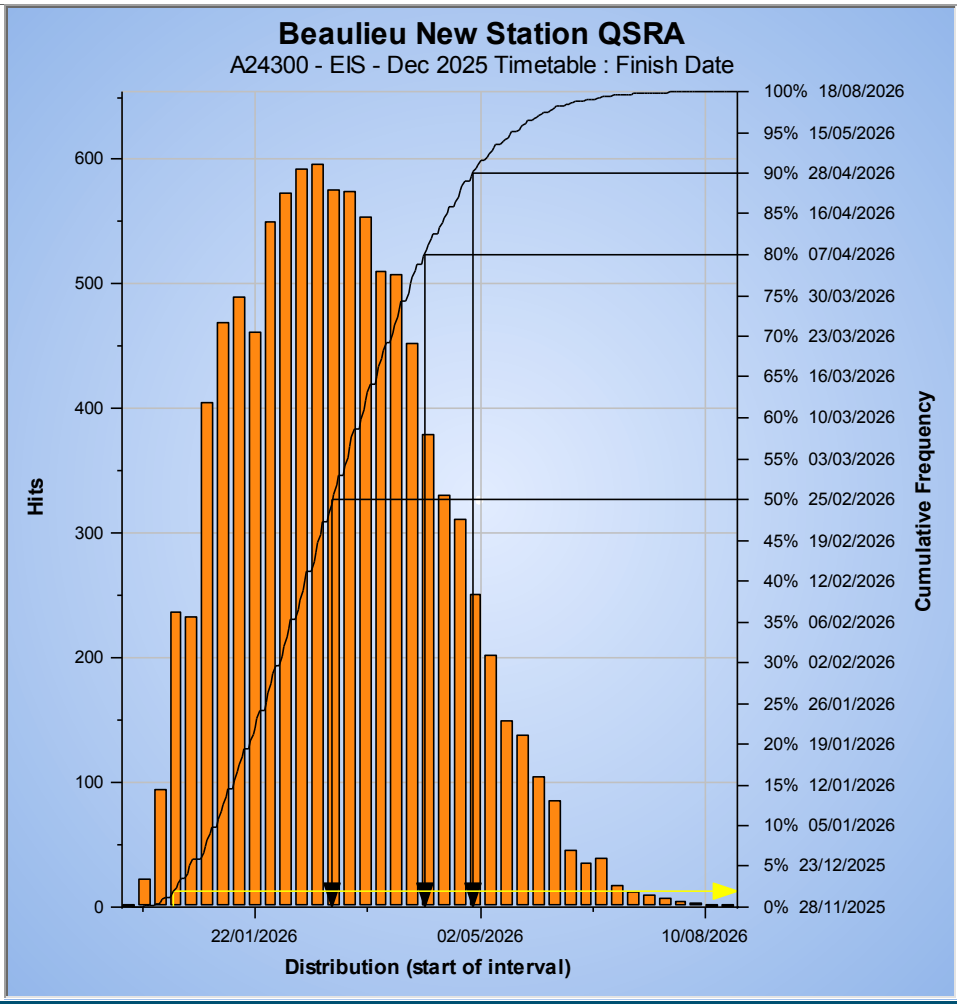


Figure 5.6 Distribution Graph – EIS – Dec 2025 Timetable

Based on Figure 5.6, the distribution does not have an unusual shape and the majority of the iterations in achieving the EiS (Timetable change) milestone will only be completed by 2026. This means the project may not be able to meet the station timetable change in December 2025.

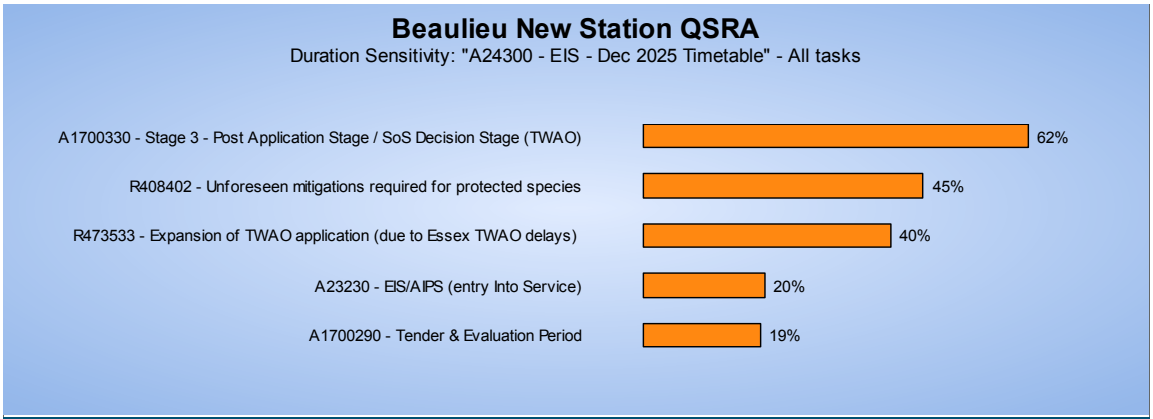


Figure 5.7 Duration sensitivity analysis for Completion of GRIP 5 Stage

Based on the tornado graph in Figure 5.7, the key drivers in determining the completion of the EiS / APiS are still the risks and uncertainties surrounding the TWAO process and Risk 408402 (Protected species).

Aside from this, the activity itself (A23230) contributes noticeably to the overall duration sensitivity. This can be seen as an opportunity as the project could reduce or eliminate the time taken through pro-actively documenting and collating evidence and information for the National Certification Body (NCB) to establish early conformance.

6. Stress and Scenario testing

Once the model of the programme has been completed, it is necessary to 'stress test' the overall model. This is outside an individual run of the model and the confidence of achieving hand back of the key milestones.

6.1 Scenario 1 – TWAO Approval

Scenario 1 examines the impact of challenges and objections that will delay TWAO application process; including the possibility of application being rejected by the SoS. The project will most likely be put on-hold if this scenario is realised. It was decided that the original result would consist of the maximum duration the project team can tolerate and a separate discrete risk (refer table below) was modelled to stress-test the additional prolongation which will put the project on-hold. This was done by simulating an additional risk (see table below) and comparing it at a 15% likelihood and at 100% likelihood.

In addition, the project investigated the scenario in which all the TWAO-related activities were to happen as according as planned with the related-risks mitigated.

Risk Title	Risk Description	Activities Impacted	Prob.	Impact (days)		
				Min	ML**	Max
Delays in obtaining SoS approval on TWAO application	The risk is that the SoS may appoint an independent inspector to a conduct local public inquiry into the proposal whereby the timescales are not defined. The risk also accounts for re-submission of the proposal.	A1700330 - Stage 3 - Post Application Stage / SoS Decision Stage (TWAO)	15%	60	130	390
			100%	60	130	390

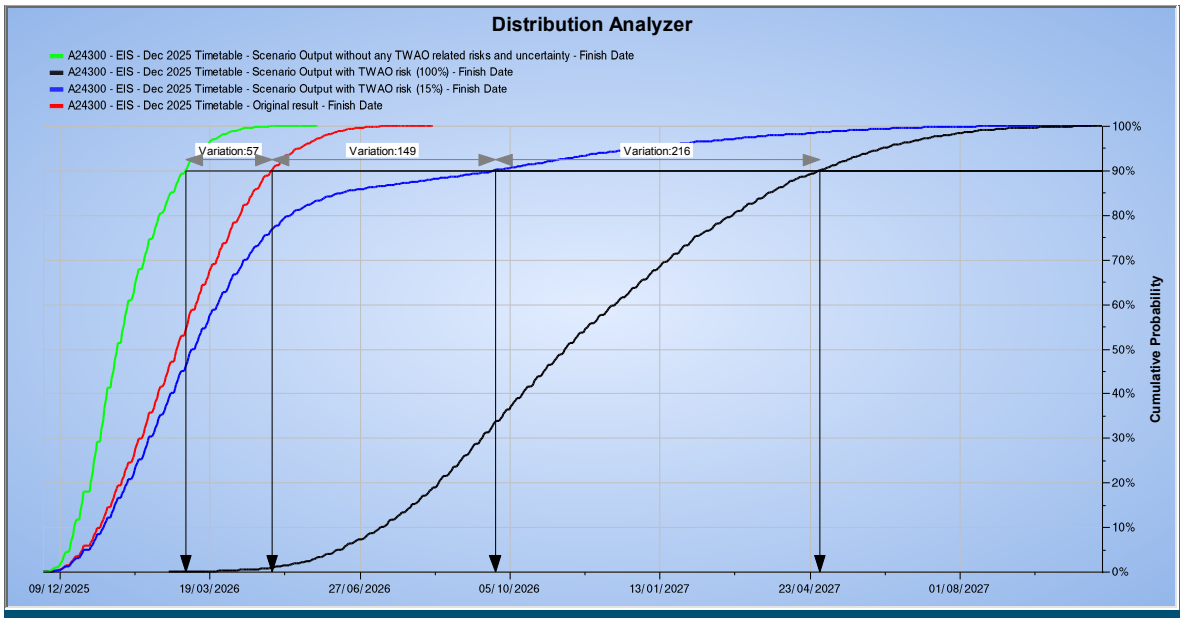


Figure 6.1 Distribution Analyser output from PRA for Scenario 1

The results from this scenario is shown in Table 6.1 below.

Table 6.1 Simulated results from Scenario 1

Scenario Description	Deterministic (planned) at 16/12/2025	P90 Confidence
Original result – Red curve	2%	28/04/2026
Scenario result **without** any duration uncertainty and risks associated with TWAO – Green curve	7%	03/03/2026
Scenario result with TWAO risk of 15% likelihood – Blue curve	2%	25/09/2026
Scenario result with TWAO risk of 100% likelihood – Black curve	<1%	29/04/2027

From the results in Scenario 1, it can be observed that there is not a significant difference in the completion date at P90 between the original result (Red curve) and the Scenario result without the any duration uncertainty and risks associated with TWAO (Green curve). All the four scenarios indicate the project has a very low confidence in meeting December 2025 Timetable change. Hence, the figure below was generated to outline the activities and risks with the most effect in driving the programme provided that all TWAO risks and uncertainties are mitigated.

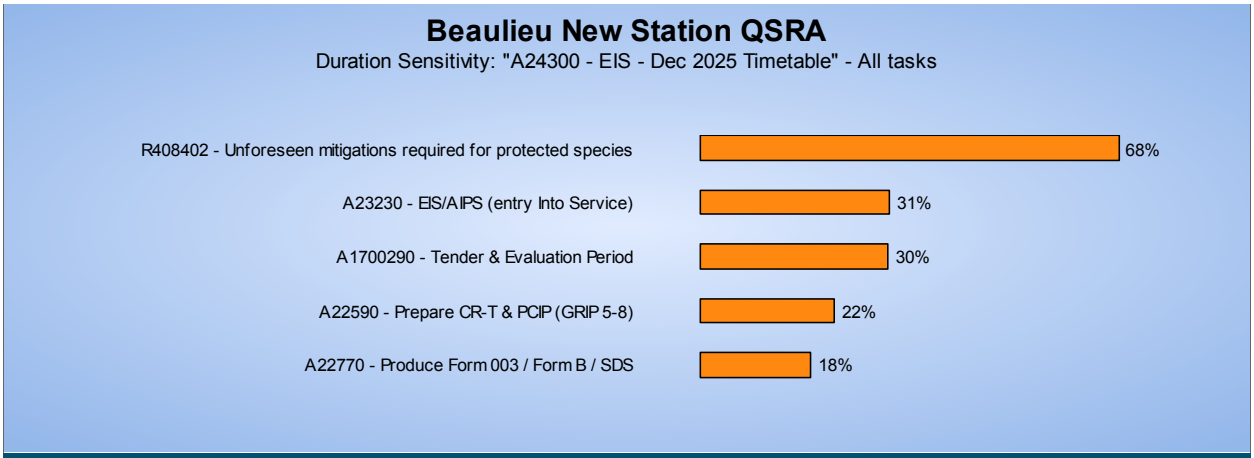


Figure 6.2 Duration sensitivity analysis for Scenario output of all TWAO related risks are mitigated.

6.2 Scenario 2 – Effects of COVID-19

Scenario 2 explores the impact of Covid-19 on the productivity of staff. This is due to compliance with safe-working practices and lockdown restrictions that could lead to the loss of efficiency. In order to stress-test this, all the activities in the programme that are due to complete by December 2020 along with the TWAO activities were set to a 20% increase in duration uncertainty. The results from this scenario are shown in Figure 6.3 and Table 6.2 below.

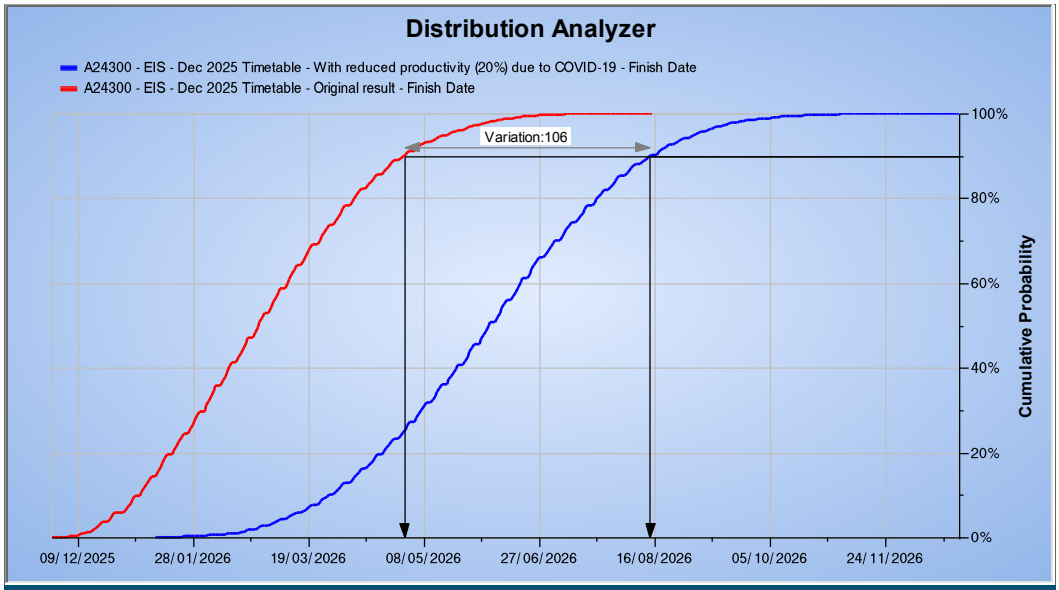


Figure 6.3 Distribution Analyser output from PRA for Scenario 2

Based on the results, there is a 5-month variance at P90 between the original result (Red curve) and the scenario result (Blue Curve).

Table 6.2 Simulated results from Scenario 2

Delay	Deterministic (planned) at 16/12/2025	P90 Confidence
Original result – Red curve	2%	28/04/2026
Scenario result with Covid-19 risk (loss of productivity) – Blue curve	<1%	14/08/2026

6.3 Scenario 3 – Additional Competitive Tender Process

Scenario 3 explores the impact of an additional competitive tender process which would delay Contract Award for GRIP 5-8. This was done by inserting an additional task with a duration uncertainty of up to 3 months to 'push out' *A22580 - Contract Award (GRIP 5-8).* The results from this scenario is shown in Figure 6.4 and Table 6.3 below.

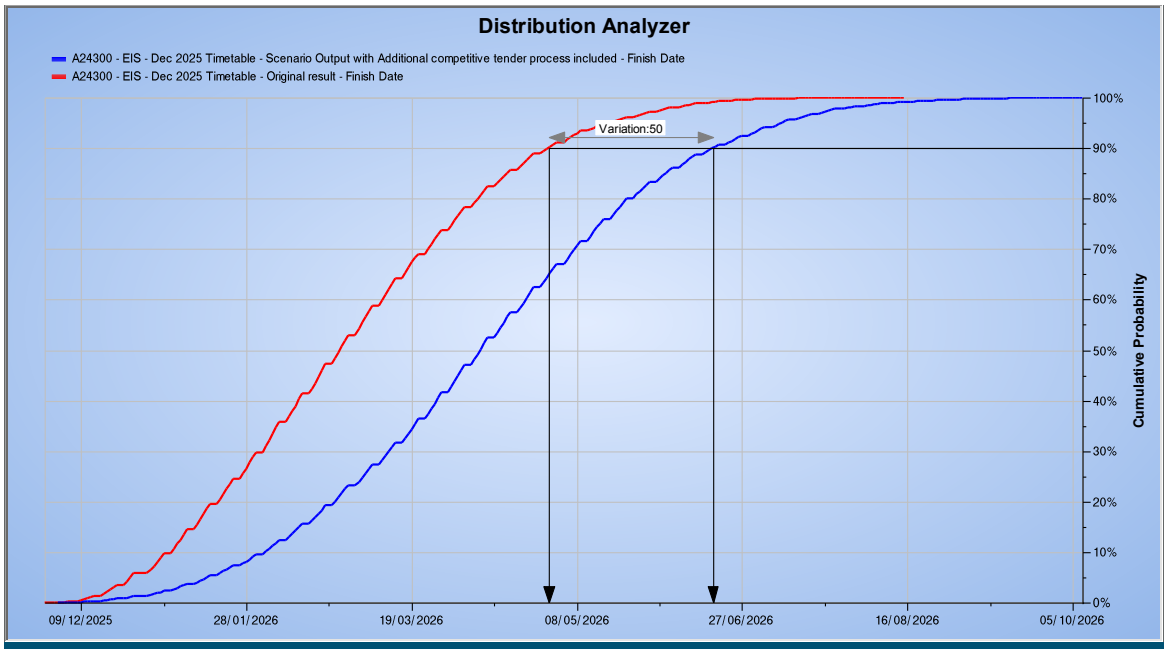


Figure 6.4 Distribution Analyser output from PRA for Scenario 3

The results at P90 confidence indicate a circa 3 months variance in achieving the deterministic EiS milestone. This means the project may not be able to even meet the May 2026 Timetable Change.

Table 6.3 Simulated results from Scenario 3

Delay	Deterministic (planned) at 16/12/2025	P90
Original result – Red curve	2%	28/04/2026
Scenario result with additional tender process – Blue curve	<1%	18/06/2026

7. Actions

The following actions were recorded in the workshop. Owners were assigned from people within the room. These actions should be entered into the project plan where capital expenditure or time is taken to complete the action.

	Action	Owner	Close Out Date
1	Ensure all exclusions captured in this report is communicated and made aware to the owners (e.g. Anglia Route, Council, etc.)	Mark Chettle	September 2020
2	The output of the QSRA after it has been signed off by Principal Risk & Value Manager is to be correlated and inputted in the QCRA model to cost delays of project prolongation.	Alex Todorova / Nigel Tang	September 2020
3	Review programme with Project Sponsor and funders	Mark Chettle	September 2020
4	Review mitigations and management actions for keys risks	Project Team	Ongoing

8. Conclusions and Recommendations

The aim of this report is to outline what the likelihood is to deliver the scheme at the agreed milestones. The recommendations from the output of this QSRA are detailed below:

- The results of the analysis identified that the project team can be 90% confident of completing Entry into Service (EIS) by 29th April 2026. This is roughly 4 months later than the deterministic date of 16th December 2025.

- It is strongly recommended that the project should potentially seek to expand the programme by proposing the new station to be opened in May 2026 Timetable Change; as the main results indicate a very low confidence in completing the works to meet December 2025 timetable Change. Whilst the scenario-test in Section 6.1 highlighted a slight increase in confidence provided all TWAO-related risks and uncertainties are mitigated; the project is still unable to complete works by the planned Timetable Change. This is due to uncertainties around activities such as *A23230 – EiS / APiS, A1700290 – Tender Evaluation Period, A22770 – Produce Form 003 / Form B* and the potential of Risk 408402 – Protected species.

- Furthermore, it is essential for the project to establish clear mitigations to manage all the key risks identified by referring to the actions table in Section 7. There are some critical key exclusions for the project to manage; these should be communicated clearly to the exclusion owners and the project team should be actively managing them as the loss of confidence in the stability of these excluded assumptions will critically alter the ability of the project to deliver to schedule.

- As the constructability report is not yet finalised, a re-run of the analysis in the next GRIP stage should incorporate the construction / delivery programme. This will enable us to analyse the deliverability of the project with its proposed access strategy. In particular, we can identify the confidence level in starting any key blockade(s); the robustness of proposed possession strategy and key risk factors that would compromise the delivery of works.

9. Appendix A – Attendees

Table 9.1 Attendees List – Workshop Date: 30/04/2020

Name	Role	Company
Glenn King	Project Manager	Network Rail
Alex Todorova	Risk & Value Analyst	Network Rail / Mott MacDonald
Nigel Tang	Risk & Value Analyst	Network Rail / Mott MacDonald
Mark Chettle	Scheme Project Manager	Network Rail
Duncan Thurston	Contractor's Engineering Manager (CEM)	WSP
Kevin Mainwaring	Project Manager (Design Team)	WSP

10. Appendix B – Modelling Notes and Duration Uncertainties

Evaluation was conducted using Monte Carlo analysis, using Primavera Risk Analysis software, 10,000 simulations were used. A tornado graph was created to identify the uncertainty that has the most influence on the project. The following duration uncertainties were identified by the attendees and included in the model.

Correlation was considered but none of the modelled risks were deemed to interact with each other.

			Modelled Durations		
Activity		Duration	Min	Most Likely	Max
A1700300	Gateway 4 Approval / Finalise Contract Doc & Raise PO (Post Authority)	29	25	29	29
A1700330	Stage 3 - Post Application Stage / SoS Decision Stage (TWAO)	120	80	120	180
A1700630	Stage 1 GRIP 4 - Pre Application Stage (TWAO)	94	94	94	99
A22880	External Network Change & Station Lease Documents Approval	60	30	60	80
A22980	Apply for Planning Consent (Local Authority)	20	10		20
A22990	Planning Consent Approval (Local Authority)	40	40	40	60
A23280	Prepare Network Change & Station Lease Documents	20	10		20
A23290	Internal Network Change & Station Lease Documents Approval	50	30	50	60
A22440	VM3 - Value Engineering Report	15	10	15	20
A23110	ROGS Verification	40	35		45
A23120	SSV Submission Production	88	83	88	93
A23390	Submit / Update F10	10	5	10	10
A23460	Review / Update Project Safety Strategy	20	10	20	20
A1702790	Produce CAF4 Report	10	10		15
A22430	Review GRIP 4 Stage Gate Checklist	5	4		6
A23190	Update Remaining GRIP 4 PM Products Required for Stage Gate 4 Review	20	15		25
A23270	Stage Kick Off Meeting	5	3		5
A1700550	Produce Signalling GRIP 4 AIP Design	75	75		85
A1700640	Signalling - MSRP Approval	20	20	20	30
A22390	Produce Form 002	70	65		80
A22800	Form 002 & Signalling - IP Engineering Approval	20	15		25
A23010	Kick off Meetings	4	3		5
A22590	Prepare CR-T & PCIP (GRIP 5-8)	20	15		25
A22600	PTC Negotiations Period	60	60	60	70
A22530	Prepare Investment Paper / PEST	5	4	5	5

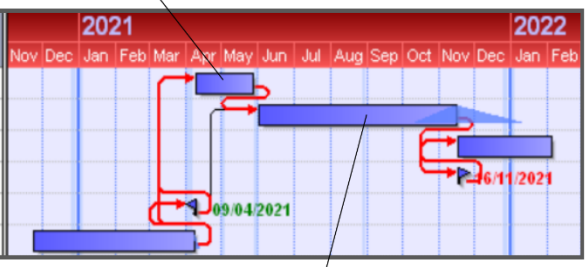
Activity		Duration	Modelled Durations		
			Min	Most Likely	Max
A22610	Gateway 4 Approval / Finalise Contract Doc & Raise PO (Post Authority)	29	25	29	29
A22770	Produce Form 003 / Form B / SDS	152	152		165
A22780	Form 003 / Form B / SDS - IP Engineering, RAM & MSRP Approvals	20	15	20	25
A23930	Review Stage Gate Checklist	5	3		5
A1702660	Draft T&Cs for IA	30	25		30
A1702670	Agree In Principle IA	10	10	10	15
A1702680	Sign IA	10	10	10	12
A22920	NR and TOC Approval Period	10	5		20
A22930	Close out of NR and TOC Comments and issue Final Report	14	14		25
A22350	Review Stage Gate Checklist	1	1		2
A22760	Update Route Requirements Document (DRRD) for GRIP5-8	10	5	10	20
A22900	Issue Engineering Compliance Certificate	5	4	5	6
A1700700	Project QCRA (GRIP 3 AIP Estimate)	1	1	1	2
A22360	GRIP 3 (AIP) - NR Approval & Endorsement of Estimate (Bea-8290)	14	9	14	34
A23830	GRIP 3 (AIP) - WSP Estimate / Cost Plan Preparation (Bea-8280)	27	27	27	37
A1700280	Prepare CR-T & PCIP (GRIP 4)	10	5		12
A1700290	Tender & Evaluation Period	78	73		83
A24060	Draft T&Cs for DSA	30	25	30	30
A24070	Agree In Principle	10	10	10	15
A24080	Sign DSA	9	9	9	12
A1700240	Prepare Investment Paper / PEST	5	4	5	5
A23480	Order Long Lead Items	5	3	5	5
A23490	SSI Interlockings (6 - 12 months)	240	120		240
A23510	S&C (6 - 9 months)	180	120		180
A1702800	Commissioning Period	15	10	15	20
A22040	Mobilisation	5	5	5	10
A23230	EIS/AIPS (entry Into Service)	60	50	60	80
A23960	Review Stage Gate Checklist	15	10	15	15
A24310	Final TOC Fit out	40	35	40	45

10.1 TWAO Timeline

The figure below outlines the TWAO activities in the programme and indicates the risks and uncertainty that were modelled. In particular, Activity A1700330 was modelled with a large range of uncertainty to reflect the project's unpredictability towards the SoS decision stage.

Modelled risk of expansion of TWAO (to include PRoW)

ID	Description	Remaining Duration	Start	Finish
A1700320	Stage 2 - Application Stage (TWAO)	35	09/04/2021	28/05/2021
A1700330	Stage 3 - Post Application Stage / SoS Decision Stage ...	120	01/06/2021	16/11/2021
A1700340	Stage 4 - Post Decision Stage (TWAO)	55	17/11/2021	04/02/2022
A1700350	Secretary of State's decision (TWAO)	0		16/11/2021
A1700360	TWAO Submission	0	09/04/2021	
A1700630	Stage 1 GRIP 4 - Pre Application Stage (TWAO)	94	23/11/2020	08/04/2021



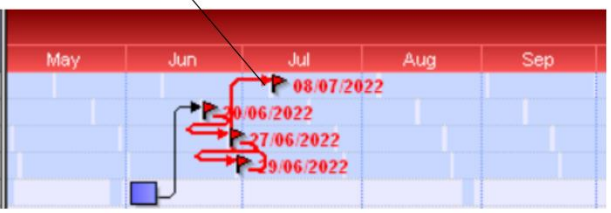
- Modelled duration uncertainty
- Modelled risk of delays in obtaining SoS approval on TWAO application (incl. Public enquiry, re-submit application, etc.) in Scenario Test A

10.2 Investment Authority Process

As mentioned in Section 5.3, the figure below shows the activities that have different calendars applied that reflect Anglia's panel dates.

Different sets of calendar inputted on the investment authority milestones

ID	Description	Remaining Duration	Start	Finish
A22490	GRIP 5-8 Authority- IP Meeting	0		08/07/2022
A22500	GRIP 5-8 - Anglia Submission	0		20/06/2022
A22510	GRIP 5-8 Authority- Anglia Meeting	0		27/06/2022
A22520	GRIP 5-8 - IP Submission	0		29/06/2022
A22530	Prepare Investment Paper / PEST	5	02/06/2022	08/06/2022



10.3 Guidance in Replicating the Scenario Modelling

10.3.1 Scenario 1 – TWAO process

In order to replicate Scenario 1, please refer to R408063-ST1 in OPRA model and change the Task Existence to 15% probability (1st Output) and 100% (2nd Output). To generate the 3rd output, please remove duration uncertainties for all TWAO activities (i.e. A1700310, A1700320, A1700330, A1700340, A1700630) and exclude all TWAO risks (i.e. R473533, R408063-ST1)

10.3.2 Scenario 2 – Covid-19

This is done by simply applying a 20% uplift on the duration uncertainties for all task activities in year 2020 and the TWAO activities. Please see table below for the following activities.

Activity		Duration	Modelled Durations		
			Min	Most Likely	Max
A1700240	Prepare Investment Paper / PEST	5	5		6
A1700280	Prepare CR-T & PCIP (GRIP 4)	11	11		14
A1700290	Tender & Evaluation Period	78	78		100
A22360	GRIP 3 (AIP) - NR Approval & Endorsement of Estimate (Bea-8290)	14	14		41
A22900	Issue Engineering Compliance Certificate	5	5		7
A22930	Close out of NR and TOC Comments and issue Final Report	14	14		30
A23830	GRIP 3 (AIP) - WSP Estimate / Cost Plan Preparation (Bea-8280)	9	9		23
A24060	Draft T&Cs for DSA	30	30		36
A24070	Agree In Principle	10	10		18
A24080	Sign DSA	10	10		14
A1700320	Stage 2 - Application Stage (TWAO)	35	35		42
A1700330	Stage 3 - Post Application Stage / SoS Decision Stage (TWAO)	120	120		216
A1700340	Stage 4 - Post Decision Stage (TWAO)	55	55		66
A1700630	Stage 1 GRIP 4 - Pre Application Stage (TWAO)	95	95		119
A22350	Review Stage Gate Checklist	1	1		2

10.3.3 Scenario 3 – Additional Tender process

This is done by changing the Task existence of R-ST2 to a 100% to generate the output.

11. Appendix D - Programme

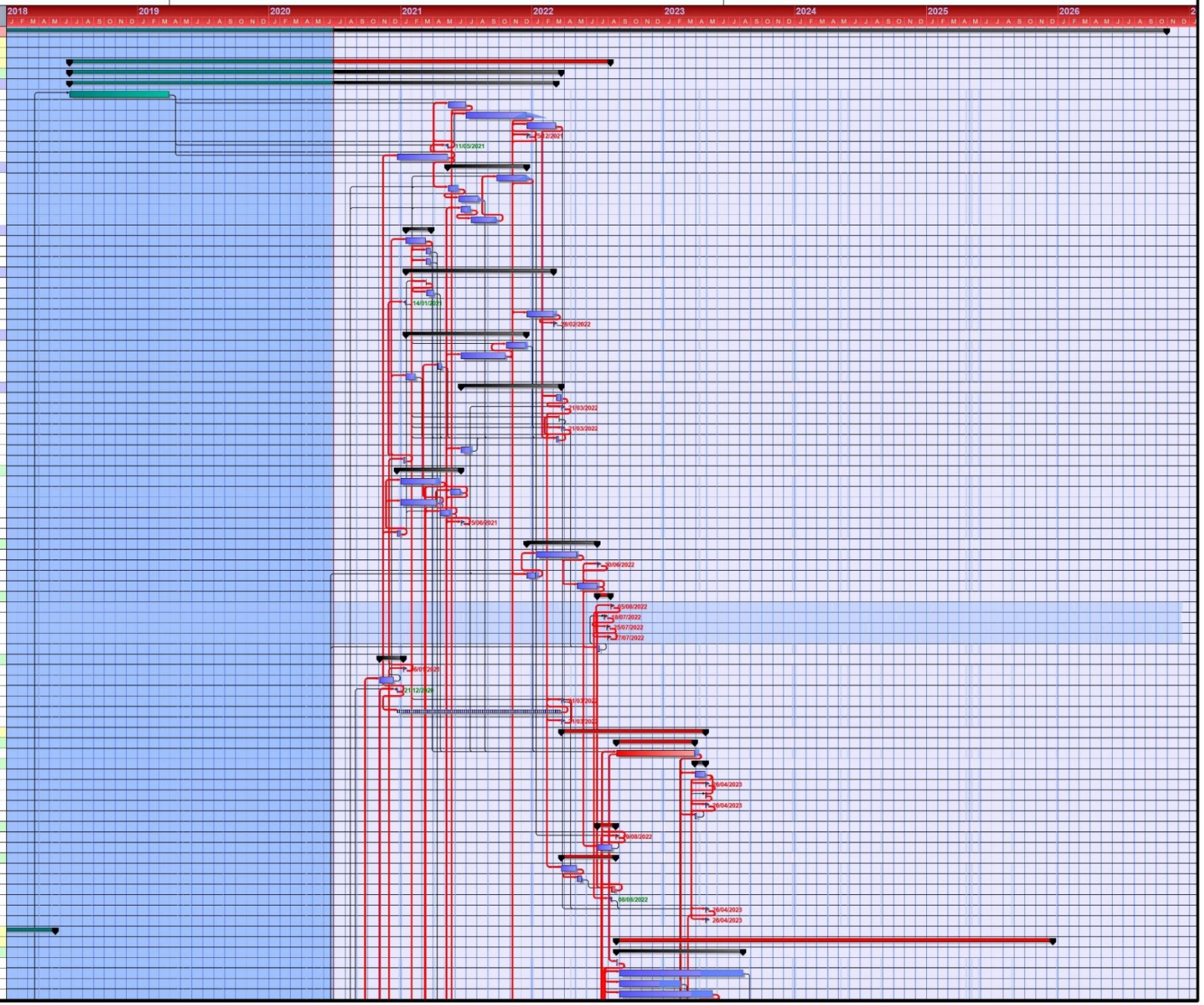
[Append a copy of the programme of the final version of the report]

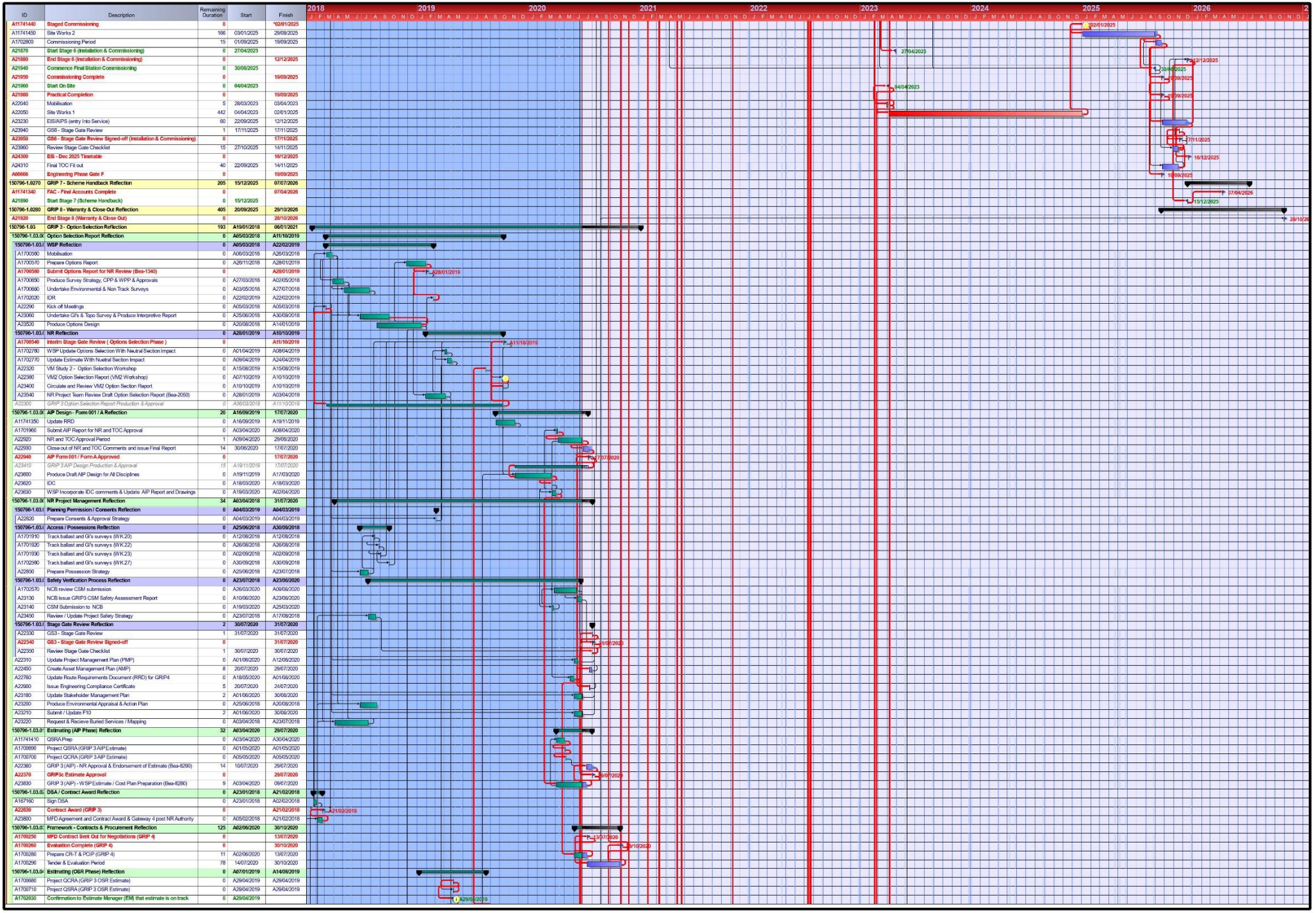
Beaulieu New Station QSRA

150796-1

Risk Inputs

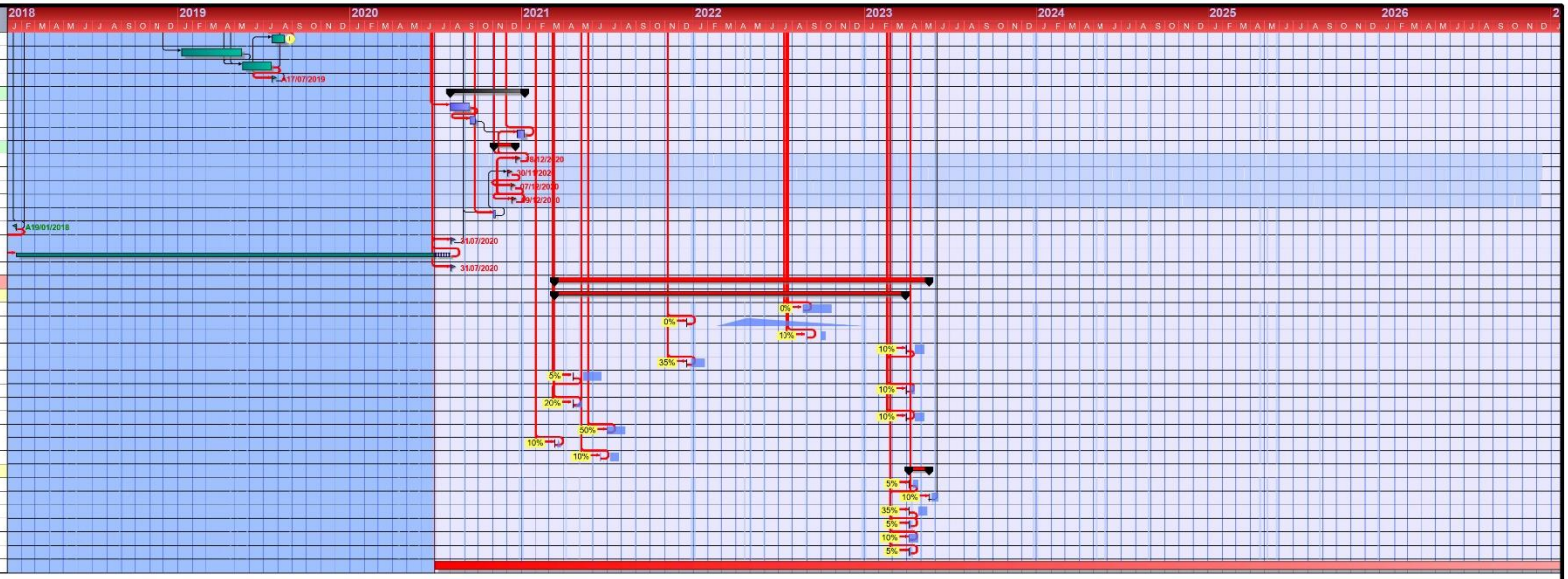
ID	Description	Remaining Duration	Start	Finish
150796-1	Beaulieu Station Reflection	2315	A10/08/2015	29/10/2026
150796-1.00	GRIP 0 - Pre-GRIP (Concept Stage) Reflection	0	A10/08/2015	A15/12/2015
150796-1.01	GRIP 1 - Output Definition (Pre-Authority) Reflection	0	A28/08/2015	A27/05/2016
150796-1.0120	GRIP 4 - Scheme Development Reflection	769	A25/06/2018	05/08/2022
150796-1.0120	NR Project Management Reflection	632	A25/06/2018	21/03/2022
150796-1.012	Transport Work Act Order (TWAO) - No Inquiry, No EIA Reflection	618	A25/06/2018	07/03/2022
A1700310	Stage 1 GRIP 3 - Pre Application Stage (Seasonal Surveys)	0	A25/06/2018	A28/03/2019
A1700320	Stage 2 - Application Stage (TWAO)	35	11/05/2021	29/06/2021
A1700330	Stage 3 - Post Application Stage / SoS Decision Stage (TWAO)	120	30/06/2021	15/12/2021
A1700340	Stage 4 - Post Decision Stage (TWAO)	55	16/12/2021	07/03/2022
A1700350	Secretary of State's decision (TWAO)	0		15/12/2021
A1700360	TWAO Submission	0	11/05/2021	
A1700630	Stage 1 GRIP 4 - Pre Application Stage (TWAO)	95	21/12/2020	10/05/2021
150796-1.012	Planning Permission / Consents Reflection	219	11/05/2021	15/12/2021
A22880	External Network Change & Station Lease Documents Approval	60	23/09/2021	15/12/2021
A22980	Apply for Planning Consent (Local Authority)	20	11/05/2021	08/06/2021
A22990	Planning Consent Approval (Local Authority)	40	09/06/2021	03/08/2021
A23280	Prepare Network Change & Station Lease Documents	20	16/06/2021	13/07/2021
A23290	Internal Network Change & Station Lease Documents Approval	50	14/07/2021	22/09/2021
150796-1.012	Access / Possessions Reflection	70	14/01/2021	24/03/2021
A22840	Disruptive Possession Planning / Negotiations	40	14/01/2021	10/03/2021
A23420	Book Blockade (2 years Prior)	10	11/03/2021	24/03/2021
A23430	Book Disruptive Possessions (37 Weeks prior)	10	11/03/2021	24/03/2021
150796-1.012	Estimating & Value Management Reflection	411	14/01/2021	28/02/2022
A22400	VM Study 3 - Meeting	1	11/03/2021	11/03/2021
A22440	VM3 - Value Engineering Report	15	12/03/2021	01/04/2021
A22460	Conduct a QSRA	0	14/01/2021	
A23240	GRIP 4 - IPS Produce & Validate Estimate	50	16/12/2021	28/02/2022
A23250	Definitive Estimate (GRIP 4) - Handover Estimate	0		28/02/2022
150796-1.012	Safety Verification Process Reflection	335	14/01/2021	14/12/2021
A23110	ROGS Verification	40	20/10/2021	14/12/2021
A23120	SSV Submission Production	88	16/06/2021	18/10/2021
A23390	Submit / Update F10	10	12/04/2021	23/04/2021
A23460	Review / Update Project Safety Strategy	20	14/01/2021	10/02/2021
150796-1.012	Stage Gate Review Reflection	279	16/06/2021	21/03/2022
A1702790	Produce CAF4 Report	10	08/03/2022	21/03/2022
A21930	CAF4 Report Available	0		21/03/2022
A22410	GS4 - Stage Gate Review	1	15/03/2022	15/03/2022
A22420	GS4 - Stage Gate Review Signed-off (Scheme Development)	0		21/03/2022
A22430	Review Stage Gate Checklist	5	08/03/2022	14/03/2022
A23190	Update Remaining GRIP 4 PM Products Required for Stage Gate 4 ...	20	16/06/2021	13/07/2021
A23270	Stage Kick Off Meeting	5	07/01/2021	13/01/2021
150796-1.0120	ARC Engineering Deliverables Reflection	177	21/12/2020	15/06/2021
A1700550	Produce Signalling GRIP 4 AIP Design	75	30/12/2020	16/04/2021
A1700640	Signalling - MSRP Approval	20	18/05/2021	15/06/2021
A22380	Produce Form 002	70	30/12/2020	09/04/2021
A22800	Form 002 & Signalling - IP Engineering Approval	20	19/04/2021	17/05/2021
A22950	Form 002 & Signalling Approved	0		15/06/2021
A23010	Kick off Meetings	5	21/12/2020	29/12/2020
150796-1.0120	Framework - Contracts & Procurement Reflection	197	16/12/2021	30/06/2022
A22560	SMDF GRIP 5-8 Tender Period	80	11/01/2022	04/05/2022
A22570	Evaluation Complete (GRIP 5-8)	0		30/06/2022
A22590	Prepare CR-T & PCIP (GRIP 5-8)	15	16/12/2021	10/01/2022
A22600	PTC Negotiations Period	40	05/05/2022	30/06/2022
150796-1.0120	Investment Authority Process Reflection	36	01/07/2022	05/08/2022
A22490	GRIP 5-8 Authority- IP Meeting	0		05/08/2022
A22500	GRIP 5-8 - Angle Submission	0		18/07/2022
A22510	GRIP 5-8 Authority- Angle Meeting	0		25/07/2022
A22520	GRIP 5-8 - IP Submission	0		27/07/2022
A22530	Prepare Investment Paper / PEST	5	01/07/2022	07/07/2022
150796-1.0120	Contract Award Reflection	66	02/11/2020	06/01/2021
A1700270	Contract Award (GRIP 4)	0		06/01/2021
A1700300	Gateway 4 Approval / Finalise Contract Doc & Raise PO (Post Auth...	29	02/11/2020	10/12/2020
A21830	Start Stage 4 (Scheme Development)	0	21/12/2020	
A21840	End Stage 4 (Scheme Development)	0		21/03/2022
A23850	150796 - GRIP 4 Summary (Design Deliverables & Network Change)	315	31/12/2020	21/03/2022
A44444	Engineering Phase Gate D	0		21/03/2022
150796-1.0180	GRIP 5 - Detailed Design Reflection	401	22/03/2022	26/04/2023
150796-1.0180	ARC Engineering Deliverables Reflection	218	22/08/2022	27/03/2023
A22770	Produce Form 003 / Form B / SDS	152	22/08/2022	27/03/2023
150796-1.0180	NR Project Management Reflection	30	28/03/2023	26/04/2023
A22780	Form 003 / Form B / SDS - IP Engineering, RAM & MSRP Approvals	20	28/03/2023	26/04/2023
A22910	Form 003 / Form B / SDS Approved	0		26/04/2023
A23910	GS5 - Stage Gate Review	1	26/04/2023	26/04/2023
A23920	GS5 - Stage Gate Review Signed-off (Detailed Design)	0		26/04/2023
A23930	Review Stage Gate Checklist	5	28/03/2023	03/04/2023
150796-1.0180	Contract Award Reflection	50	01/07/2022	19/08/2022
A22580	Contract Award (GRIP 5-8)	0		19/08/2022
A22610	Gateway 4 Approval / Finalise Contract Doc & Raise PO (Post Auth...	29	01/07/2022	10/08/2022
150796-1.0180	IA / 3rd Party Funding Reflection	151	22/03/2022	19/08/2022
A1702660	Draft T&Cs for IA	30	22/03/2022	04/05/2022
A1702670	Agree In Principle IA	10	05/05/2022	18/05/2022
A1702680	Sign IA	10	08/08/2022	19/08/2022
A21850	Start Stage 5 (Detailed Design)	0	08/08/2022	
A21860	End Stage 5 (Detailed Design)	0		26/04/2023
A55555	Engineering Phase Gate E	0		26/04/2023
150796-1.02	GRIP 2 - Feasibility Reflection	0	A15/04/2016	A16/05/2018
150796-1.0220	GRIP 6 - Installation & Commissioning Reflection	1213	22/08/2022	16/12/2025
150796-1.0220	Long Lead Items Reflection	353	22/08/2022	09/08/2023
A23480	Order Long Lead Items	5	22/08/2022	26/08/2022
A23490	SSI Interlockings (6 - 12 months)	240	30/08/2022	09/08/2023
A23500	Loc Cases (12 - 24 weeks)	120	30/08/2022	16/02/2023
A23510	S&C (6 - 9 months)	180	30/08/2022	16/05/2023





ID	Description	Remaining Duration	Start	Finish
A11741440	Staged Commissioning	0		*02/01/2025
A11741450	Site Works 2	166	03/01/2025	29/08/2025
A1702800	Commissioning Period	15	01/09/2025	19/09/2025
A21870	Start Stage 6 (Installation & Commissioning)	0	27/04/2023	
A21880	End Stage 6 (Installation & Commissioning)	0		12/12/2025
A21940	Commence Final Station Commissioning	0	30/08/2025	
A21950	Commissioning Complete	0		19/09/2025
A21960	Start On Site	0	04/04/2023	
A21980	Practical Completion	0		19/09/2025
A22040	Mobilisation	5	28/03/2023	03/04/2023
A22050	Site Works 1	442	04/04/2023	02/01/2025
A23230	EIS/AIPS (entry Into Service)	60	22/09/2025	12/12/2025
A23940	GS6 - Stage Gate Review	1	17/11/2025	17/11/2025
A23950	GS6 - Stage Gate Review Signed-off (Installation & Commissioning)	0		17/11/2025
A23960	Review Stage Gate Checklist	15	27/10/2025	14/11/2025
A24300	EIS - Dec 2025 Timetable	0		16/12/2025
A24310	Final TOC Fit out	40	22/09/2025	14/11/2025
A66666	Engineering Phase Gate F	0		19/09/2025
150796-1.0270	GRIP 7 - Scheme Handback Reflection	205	15/12/2025	07/07/2026
A11741340	FAC - Final Accounts Complete	0		07/04/2026
A21890	Start Stage 7 (Scheme Handback)	0	15/12/2025	
150796-1.0280	GRIP 8 - Warranty & Close Out Reflection	405	20/09/2025	29/10/2026
A21920	End Stage 8 (Warranty & Close Out)	0		28/10/2026
150796-1.03	GRIP 3 - Option Selection Reflection	193	A19/01/2018	06/01/2021
150796-1.03.0(	Option Selection Report Reflection	0	A05/03/2018	A11/10/2019
150796-1.03.(	WSP Reflection	0	A05/03/2018	A22/02/2019
A1700560	Mobilisation	0	A06/03/2018	A26/03/2018
A1700570	Prepare Options Report	0	A26/11/2018	A28/01/2019
A1700580	Submit Options Report for NR Review (Bea-1340)	0		A28/01/2019
A1700650	Produce Survey Strategy, CPP & WPP & Approvals	0	A27/03/2018	A02/05/2018
A1700660	Undertake Environmental & Non Track Surveys	0	A03/05/2018	A27/07/2018
A1702020	IDR	0	A22/02/2019	A22/02/2019
A22290	Kick off Meetings	0	A05/03/2018	A05/03/2018
A23060	Undertake GI's & Topo Survey & Produce Interpretive Report	0	A25/06/2018	A30/09/2018
A23520	Produce Options Design	0	A20/08/2018	A14/01/2019
150796-1.03.(	NR Reflection	0	A28/01/2019	A10/10/2019
A1700540	Interim Stage Gate Review (Options Selection Phase)	0		A11/10/2019
A1702760	WSP Update Options Selection With Neutral Section Impact	0	A01/04/2019	A08/04/2019
A1702770	Update Estimate With Neutral Section Impact	0	A09/04/2019	A24/04/2019
A22320	VM Study 2 - Option Selection Workshop	0	A15/08/2019	A15/08/2019
A22380	VM2 Option Selection Report (VM2 Workshop)	0	A07/10/2019	A10/10/2019
A23400	Circulate and Review VM2 Option Section Report	0	A10/10/2019	A10/10/2019
A23540	NR Project Team Review Draft Option Selection Report (Bea-2050)	0	A28/01/2019	A03/04/2019
A23300	GRIP 3 Option Selection Report Production & Approval	0	A06/03/2018	A11/10/2019
150796-1.03.0(	AIP Design - Form 001 / A Reflection	20	A16/09/2019	17/07/2020
A11741350	Update RRD	0	A16/09/2019	A19/11/2019
A1701960	Submit AIP Report for NR and TOC Approval	0	A03/04/2020	A08/04/2020
A22920	NR and TOC Approval Period	1	A09/04/2020	29/06/2020
A22930	Close out of NR and TOC Comments and issue Final Report	14	30/06/2020	17/07/2020
A22940	AIP Form 001 / Form A Approved	0		17/07/2020
A23410	GRIP 3 AIP Design Production & Approval	15	A19/11/2019	17/07/2020
A23800	Produce Draft AIP Design for All Disciplines	0	A19/11/2019	A17/03/2020
A23920	IDC	0	A18/03/2020	A18/03/2020
A23930	WSP Incoporate IDC comments & Update AIP Report and Drawings	0	A19/03/2020	A02/04/2020
150796-1.03.0(	NR Project Management Reflection	34	A03/04/2018	31/07/2020
150796-1.03.(	Planning Permission / Consents Reflection	0	A04/03/2019	A04/03/2019
A22820	Prepare Consents & Approval Strategy	0	A04/03/2019	A04/03/2019
150796-1.03.(	Access / Possessions Reflection	0	A25/06/2018	A30/09/2018
A1701910	Track ballast and GI's surveys (WK 20)	0	A12/08/2018	A12/08/2018
A1701920	Track ballast and GI's surveys (WK 22)	0	A26/08/2018	A26/08/2018
A1701930	Track ballast and GI's surveys (WK 23)	0	A02/09/2018	A02/09/2018
A1702560	Track ballast and GI's surveys (WK 27)	0	A30/09/2018	A30/09/2018
A22850	Prepare Possession Strategy	0	A25/06/2018	A23/07/2018
150796-1.03.(	Safety Verification Process Reflection	0	A23/07/2018	A23/06/2020
A1702570	NCB review CSM submission	0	A26/03/2020	A09/06/2020
A23130	NCB issue GRIP3 CSM Safety Assessment Report	0	A10/06/2020	A23/06/2020
A23140	CSM Submission to NCB	0	A19/03/2020	A25/03/2020
A23450	Review / Update Project Safety Strategy	0	A23/07/2018	A17/08/2018
150796-1.03.(	Stage Gate Review Reflection	2	30/07/2020	31/07/2020
A22330	GS3 - Stage Gate Review	1	31/07/2020	31/07/2020
A22340	GS3 - Stage Gate Review Signed-off	0		31/07/2020
A22350	Review Stage Gate Checklist	1	30/07/2020	30/07/2020
A22310	Update Project Management Plan (PMP)	0	A01/06/2020	A12/08/2020
A22450	Create Asset Management Plan (AMP)	8	20/07/2020	29/07/2020
A22760	Update Route Requirements Document (RRD) for GRIP4	0	A18/05/2020	A01/06/2020
A22900	Issue Engineering Compliance Certificate	5	20/07/2020	24/07/2020
A23180	Update Stakeholder Management Plan	2	A01/06/2020	30/06/2020
A23200	Produce Environmental Appraisal & Action Plan	0	A25/06/2018	A20/08/2018
A23210	Submit / Update F10	2	A01/06/2020	30/06/2020
A23220	Request & Recieve Buried Services / Mapping	0	A03/04/2018	A23/07/2018
150796-1.03.0(	Estimating (AIP Phase) Reflection	32	A03/04/2020	29/07/2020
A11741410	QSRA Prep	0	A03/04/2020	A30/04/2020
A1700690	Project QSRA (GRIP 3 AIP Estimate)	0	A01/05/2020	A01/05/2020
A1700700	Project QCRA (GRIP 3 AIP Estimate)	0	A05/05/2020	A05/05/2020
A22360	GRIP 3 (AIP) - NR Approval & Endorsement of Estimate (Bea-8290)	14	10/07/2020	29/07/2020
A22370	GRIP3c Estimate Approval	0		29/07/2020
A23830	GRIP 3 (AIP) - WSP Estimate / Cost Plan Preparation (Bea-8280)	9	A03/04/2020	09/07/2020
150796-1.03.0(	DSA / Contract Award Reflection	0	A23/01/2018	A21/02/2018
A167160	Sign DSA	0	A23/01/2018	A02/02/2018
A22630	Contract Award (GRIP 3)	0		A21/02/2018
A23800	MPD Agreement and Contract Award & Gateway 4 post NR Authority	0	A05/02/2018	A21/02/2018
150796-1.03.0(	Framework - Contracts & Procurement Reflection	125	A02/06/2020	30/10/2020
A1700250	MPD Contract Sent Out for Negotiations (GRIP 4)	0		13/07/2020
A1700260	Evaluation Complete (GRIP 4)	0		30/10/2020
A1700280	Prepare CR-T & PCIP (GRIP 4)	11	A02/06/2020	13/07/2020
A1700290	Tender & Evaluation Period	78	14/07/2020	30/10/2020
150796-1.03.0(	Estimating (OSR Phase) Reflection	0	A07/01/2019	A14/08/2019
A1700680	Project QCRA (GRIP 3 OSR Estimate)	0	A29/04/2019	A29/04/2019
A1700710	Project QSRA (GRIP 3 OSR Estimate)	0	A29/04/2019	A29/04/2019
A1702030	Confirmation to Estimate Manager (EM) that estimate is on track	0	A29/04/2019	

ID	Description	Remaining Duration	Start	Finish
A1702780	Preparation For Option Selection Workshop	0	A18/07/2019	A14/08/2019
A23070	GRIP 3 (OSR) - WSP Estimate / Cost Plan Preparation (Bea-8260)	0	A07/01/2019	A15/05/2019
A24020	GRIP 3 (OSR) - NR Approval & Endorsement of Estimate (Bea-8270)	0	A16/05/2019	A17/07/2019
A24100	GRIP 3b - NR Estimate Sign off Complete	0		A17/07/2019
150796-1.03.0	DSA / 3rd Party Funding Reflection	161	30/07/2020	06/01/2021
A24060	Draft T&Cs for DSA	30	30/07/2020	10/09/2020
A24070	Agree In Principle	10	11/09/2020	24/09/2020
A24080	Sign DSA	10	21/12/2020	06/01/2021
150796-1.03.1	Investment Authority Process Reflection	47	02/11/2020	18/12/2020
A1700209	GRIP 4 Authority- IP Meeting	0		18/12/2020
A1700219	GRIP 4 - Eastern Submission	0		30/11/2020
A1700229	GRIP 4 Authority- Eastern Meeting	0		07/12/2020
A1700239	GRIP 4 - IP Submission	0		09/12/2020
A1700240	Prepare Investment Paper / PEST	5	02/11/2020	06/11/2020
A21810	Start Stage 3 (Option Selection)	0	A19/01/2018	
A21820	End Stage 3 (Option Selection & AIP)	0		31/07/2020
A23840	150796 - GRIP 3 Summary	25	A19/01/2018	31/07/2020
A33333	Engineering Phase Gate C	0		31/07/2020
150796-R	Modelled Discrete Risks	797	11/03/2021	16/05/2023
150796-R1	Design Development Risks (Pre-GRIP 6)	747	11/03/2021	27/03/2023
R-ST2	Additional competitive tender process	0	22/08/2022	19/08/2022
R408063-ST1	Challenges and delays during TWAO (awaiting SoS to approve)	0	16/12/2021	15/12/2021
R408230	Proposed S&C solution rejected by RAM	0	30/08/2022	26/08/2022
R408253	Denied access to survey at required timescales (GRIP 5)	0	28/03/2023	27/03/2023
R408254	Delays in obtaining Network Change approval	0	16/12/2021	15/12/2021
R415441	Impact of CNEB Project on Infrastructure	0	19/04/2021	16/04/2021
R469983	Incomplete drainage design from Countryside Properties (Design int...	0	28/03/2023	27/03/2023
R470040	Overlapping design with nearby projects to update Signalling Records	0	19/04/2021	16/04/2021
R473531	Revalidation of Environmental Impact Assessment (EIA)	0	28/03/2023	27/03/2023
R473533	Expansion of TWAO application (due to Essex TWAO delays)	0	30/06/2021	29/06/2021
R486819	Access negotiations with TOCs/FOCs	0	11/03/2021	10/03/2021
R489943	Delays in obtaining MSRP approval	0	16/06/2021	15/06/2021
150796-R2	Delivery Risks (GRIP 6)	43	04/04/2023	16/05/2023
R408226	Contaminated land / Unforeseen ground conditions	0	04/04/2023	03/04/2023
R408251	Delays in manufacturing long lead items (S&C)	0	17/05/2023	16/05/2023
R408402	Unforeseen mitigations required for protected species	0	04/04/2023	03/04/2023
R408403	Invasive species found on site	0	04/04/2023	03/04/2023
R489977	Archaeological Sightings	0	04/04/2023	03/04/2023
R489946	Unexploded ordnance (UXO) disposal	0	04/04/2023	03/04/2023
DRIVER	Dummy Driver	10000	28/06/2020	13/11/2047



Normal Task | Normal, Critical | Normal, Actual | Summary Task | Summary, Critical | Start Milestone, Actual | Finish Milestone Task | Finish Milestone, Critical | Finish Milestone, Actual

Hammock Task | Hammock, Actual | Summary, Start | Summary, Finish

ORACLE

PRIMAVERA RISK ANALYSIS

Company: Mott MacDonald	Page 3 of 3	Sort: ID
Manager:	Plan Finish: 13/11/2047	Filter: None
Planner: TAN87716		

12. Appendix E – Quality Assurance Check

Self-Assurance

Completion by report author.

	Checked and Okay?
Was the schedule provided suitable for QSRA? If not detail corrective actions taken in comments.	Yes
Was the model prepared in accordance with IP-ERVM-202 QSRA for Project and Programmes work instruction? (including running a schedule check report where applicable). Detail separately if "no" with details why not.	Yes
Have you used any form of correlation modelling?	No
If so has this been detailed in the report?	N/A
Have any unusual results been explained in the report?	Yes
Have all interdependencies been captured and included in the model or noted in the report?	Yes
Was the workshop suitably attended with representation from key disciplines?	Yes
Were there any factors that could indicate optimism bias e.g. late running of QSRA ahead of a stage gate, late changes to the programme, project team under pressure to deliver to an available access window, lack of attendees in the workshop?	No
For LoC 1 and LoC 2 projects have the Assumptions been entered in ARM and the table within this report derived from ARM?	Yes
Is the QRA in your opinion free of any significant errors?	Yes
Has the next QSRA been booked and date recorded in the executive summary?	No
Any comments:	

Certified By:	
Name:	Nigel Tang
Title:	Risk and Value Analyst
RV5 competency score:	N/A
Date:	21/08/2020

Quality Assurance Check

Completion by Quality Approver with Level 4 or higher QSRA competence (RV5)

	Checked and Okay?
Consistent job reference, job title and dates used throughout?	Yes
Was the level of attendance at the workshop appropriate?	Yes
Has the Assumptions process been correctly followed?	Yes
Are the risks all clearly expressed and unambiguous?	Yes
Have you identified any obvious omissions in the risks modelled?	No

Have all risks been modelled correctly? (i.e. probability, impact, distribution type and mapped to tasks)	Yes
Have any opportunities that are included been modelled as a negative rather than a positive result?	N/A
Have all key milestones been identified and modelled?	Yes
Is the logic in the model suitable for QSRA? (including links, constraints, lags etc.)	Yes
Has correlation been correctly applied to the uncertainty and/or risk	N/A*
If so, does the correlation reflect a 'real world' scenario?	N/A
Has the stress/scenario testing been carried out?	Yes
Is the overall result in line with what you would expect? Detail separately if "no" with details why not.	Yes
Is the QRA in your opinion free of any significant errors?	Yes
Does the executive summary accurately reflect the results of the analysis?	Yes
Any comments:	*No correlation modelled.

QA Completed By:	
Name:	Cordu Roberts
Title:	Risk & Value Manager
RV5 competency score:	4
Date:	24th August 2020

Report Approval

By Risk & Value Manager or a Principal Risk & Value Manager with Level 4 or higher QSRA competence (unless local Risk & Value Management Plan dictates Authorisation by the Principal Risk & Value Manager)

	Checked and Okay?
Has the previous QA check been completed, signed off and comments updated?	Yes
Is the analysis appropriate for the type of project or programme?	Yes
Is the executive summary concise and makes appropriate recommendations	Yes
Is the overall result in line with what you would expect?	Yes
Does the result require escalation and has the escalation process been followed?	Yes
Any comments:	

Report Approved By:	
Name:	S Burton
Title:	PRVM
Date:	3 August 2020

Infrastructure Projects

IP Enterprise Risk and Value Management

Beaulieu New Station GRIP3 QCRA Report

Project Name: Beaulieu New Station
OP Reference: 150796
Project Manager: Mark Chettle
Sponsor: Paul McAleer
Version: 1.1

Authored By : Alex Todorova, Risk & Value Analyst

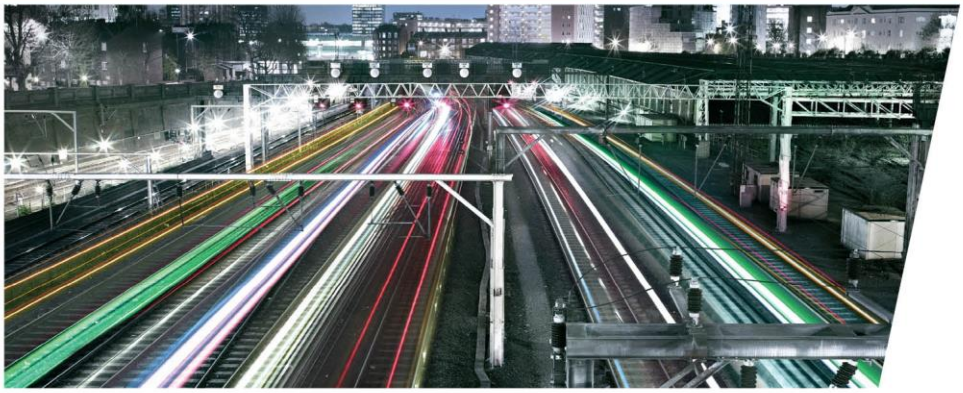
Signed: Alex Todorova	Date: 8/9/2020

Approved By : Simon Burton, Principal Risk and Value Manager

Signed:	Date: 7/9/2020

Accepted By : Mark Chettle, Project Manager

Signed: MChettle	Date: 16/09/2020



Version	Date	Author	Comments
0.1	12.06.2020	Alex Todorova	First draft
0.2	21.07.2020	Nigel Tang	Changes made after receiving new estimating uncertainty values.
0.3	31.07.2020	Alex Todorova	Final update following review with team
1	13.08.2020	Alex Todorova	With updates from PM, submitting for QA
1.1	26.08.20	Alex Todorova	Updates made following feedback from QA

Contents

GRIP Context

Current GRIP Stage:	GRIP3
GRIP Stage(s) to which this report relates:	GRIP3 – GRIP6
Estimated start of significant physical works:	Spring 2023

1. Executive Summary

A quantitative cost risk assessment (QCRA) was undertaken in Summer 2020 as part of the Beaulieu Station GRIP3 single option development to evaluate the project's overall risk exposure for the selected option and understand the contingency required for the delivery of the project for each option. The aim of this analysis is to understand what the risk exposure for this project is, which will inform the Cost Plan. This includes the risk exposure for the station scope, GEFF scope and finally the total exposure.

The project aims to develop a new railway station on the Great Eastern Main Line, 2.72 miles to the north-east of Chelmsford Station. This includes proposals for approximately 1,400 car parking spaces at the station, including 5% disabled spaces, comprising approximately 300 premium spaces and approximately 1,100 spaces in a multi-storey car park. Cycle parking and storage for 500 cycles will be provided. The station will also be an interchange for local bus and taxi services.

At GRIP3, the base cost estimate for GRIP 4-8 is £135 million. The P80 risk exposure including the estimating uncertainty for the scheme is £17m which is approximately 13% of the base cost. The breakdown of the costs for the overall scheme and other options are shown in Table 1.1.

It should be noted that as the project is third party funded for everything with the exception of the GEFF scope (which is funded by the RAM), NR will not be financially liable for any of the risks and exclusions outlined in this report.

Table 1.1 Risk Exposure

	Risk Exposure		
	Mean	**80%**	**90%**
Risk Exposure (Station only)	£14,643,777	£17,062,395	£18,353,069
Risk Exposure (GEFF only)	£314,240	£495,905	£784,505
Total risk exposure	£14,958,016	£17,357,774	£18,695,751

- **Showstopper Risks or Issues:**
  - Timely accreditation is not achieved in regard to CSM and TSI compliance.
  - Network Change is not approved and will not proceed as per programme.
  - The Secretary of State does not approve the TWAO within the required Ministry guidance timeframe and major objections raised.
  - The project does not gain TWAO approval and major objections received and that the Secretary of State will not approve the TWAO in accordance with timeframe given in Ministry Guidance.
  - The funding that Essex County Council requires is not received from the Housing Infrastructure Fund (HIF) or the grant will not be sufficient.
- **Top Cost Risks (based on sensitivity):**
  - Cancelled/Additional possessions
  - Changes in construction methodology

- Delays during construction

- **Key Assumptions:**
  - Countryside properties will have completed the foul water drainage system by December 2022.
  - Network Change will be approved and will proceed as per programme with no changes required.
  - Access strategy will be approved by TOCs and FOCs.

- **Exclusions and Constraints the model is based on:**
  - Inflation fluctuation
  - Effects of Brexit
  - Showstopper risks
  - Schedule 8 costs

- Conclusions and recommendations
  - Overall risk exposure has increased since the initial GRIP 3 QCRA run in 2019; however, it is lower than the expected benchmark of similar projects at this GRIP stage (15%-20%). This is due to the;
    - Increase of base costs
    - Closure and transfer of costs of some risk to base estimate
    - Closure of large impact risks following engagement with stakeholders
    - AIP being completed in this stage (GRIP 3) rather than GRIP 4. This means that most of the design is more in line with GRIP 4 where the benchmark is 12%-18%
  - Currently, the contractor risks have not been included in the base estimate costs. A high-level consideration of those has been made with the project team and included in this analysis. As a contractor is yet to be appointed, it is highly recommended that they are engaged and a more detailed exercise is carried out in order to better understand what the overall risk exposure for this project is.

2. Background

The provision of a new station at Beaulieu is a long-standing aspiration of stakeholders, politicians and local authorities, and has a strong consensus in favour of the scheme. The new mixed-use housing and business development at Beaulieu has planning permission and construction has already begun. The station also has outline planning permission, and is a key required output for the development, as housing construction would be curtailed without it.

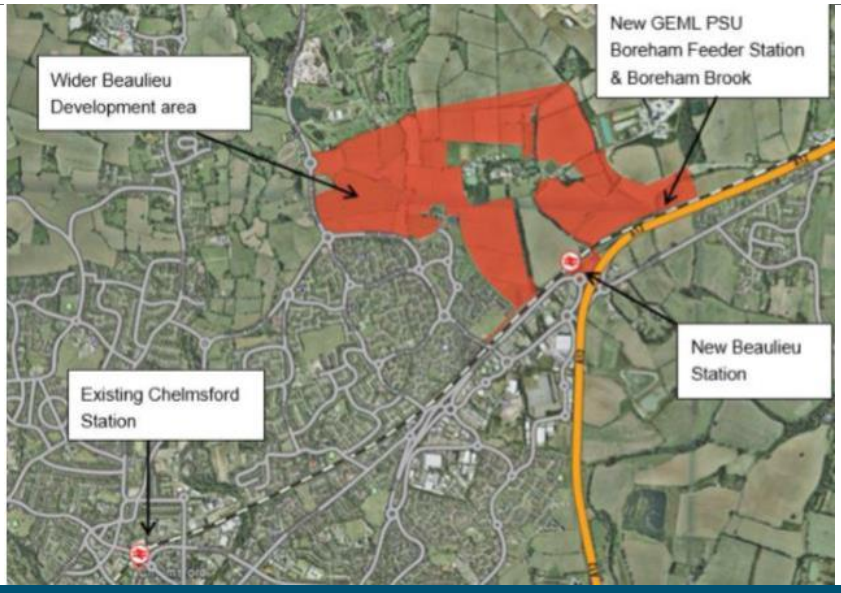


Figure 2.1 Site Overview

The new railway station will be developed on the Great Eastern Main Line (GEML), on a site 2.72 miles to the north-east of Chelmsford station. The scope of works includes:

- Full bi-directional rail loop with a 3-platform station arrangement (an island and single faced platforms);
- Two footbridges between the platforms (Access for All (AFA) and Second Means of Escape (SMoE));
- Lifts to serve the AFA footbridge;
- Platform coverage with waiting shelters;
- Retail units within the station building and on the platforms;
- Staff and passenger welfare and toilet facilities, within the station building and on the platforms;
- Approximately 1,400 station car parking spaces at the station including;
    - 5% disabled parking spaces;
    - Approximately 300 premium parking spaces;
    - Approximately 1,100 spaces in a multi-storey carpark;
    - Cycle parking and storage facilities for 500 bicycles; and
    - Provision for an interchange with local bus services.

The specification takes into account the longer-term strategy for the line up to 2043, and reflects the functionality that Network Rail judges requires to enable the station to be added to the network. Prior to 2014, the station scheme was promoted by the main development company for Beaulieu, Countryside Properties. Following the granting of outline planning permission and securing of funding for the scheme, the county and city councils have joined in partnership with Countryside to jointly promote and facilitate the design and construction of the new station.

The wider development includes: a new public highway junction connection, demolition of Generals Lane bridge and the construction of a new Radial Distributor Road (RDR) overbridge, new road and two new roundabouts in the proximity of the Proposed Scheme. The construction of this highway infrastructure is not part of the Proposed Scheme. The rail infrastructure elements of the Proposed Scheme are to be developed by Network Rail. The highway infrastructure, including the RDR overbridge, are to be developed by Countryside Properties, Chelmsford City Council (CCC) and Essex County Council (ECC).

2.1 GRIP 3 – Approval in Principle (AiP) Stage

An 'Option Selection Study (Dated 24/01/19) has already been carried out to determine the most appropriate solution to deliver the project Output, Requirements and Scope of Works. The selected option is Option 1 – bi-directional twin track that will provide for three platforms with a central 50mph full loop. The two outer main lines are to accommodate a line speed of 100mph.

The output of the project in GRIP 3 is to produce an Approval in Principle (AiP) design that is signed by the Train Operator and Route Asset Managers (RAMs) and an Anticipated Final Cost (AFC) estimate that has been approved through the Network Rail governance process.

In GRIP 3, the project is being delivered through the IP Anglia MFD framework and GRIP 4 is anticipated to be progressed as a standalone stage due to the requirement for Transport and Works Act Order (TWAO) and address the outline planning conditions. Design and delivery will then be let as a GRIP 5-8 package.

2.2 GEFF scope

During GRIP 3, additional scope has been added to the project. It consists of replacing the existing MK1 OLE infrastructure with GEFF infrastructure. As this was introduced later on, the exposure has been shown separately as well as combined to allow comparison with previous results.

3. Methodology

Quantitative Cost Risk Assessment (QCRA) workshops were held at Network Rail's office in One Stratford Place during GRIP 3 to identify, define and assess project specific risks and uncertainties that may affect the project. The workshops were attended by Project Manager, Project Sponsor, Estimating and Commercial Team, Designers and Engineers. The key objectives of the workshops were to:

- identify all possible risks and uncertainties (threats and opportunities) that may impact the delivery of the project;
- assess identified risks (in terms of impact and likelihood of happening);
- review the estimate and define potential variance in quantities and rates;
- identify actions to be undertaken to increase the probability of project success;
- conduct an assumption analysis and identify any constraints;
- present the results to the team after QCRA completion.

The risks to the project were identified during the workshops in the form of a brainstorming sessions and covered all key disciplines such as rail systems, civils and track. A risk owner was allocated, and a treatment strategy was defined to help minimising the cost impact.

The evaluation was conducted through Monte Carlo Simulation, using @Risk software whereby 10,000 simulations were run. The key outputs of the QCRA are considered to be a distribution of potential outputs and a tornado graph was created based on correlation of each risk on the overall risk exposure.

3.1 Bespoke Risks

Some of the risks that were analysed required a different approach in how they were modelled.

3.1.1 Discreet function

Three of the risks were modelled using a discreet function in @RISK as there were multiple possible outcomes, each with a different probability. It was therefore decided a discreet function is most appropriate to use.

3.1.2 Cancelled / curtailed possession sub-model

This was sub modelled as it takes into consideration the different causes which may result in a cancelled possession individually. Then the likelihood of this happening was analysed as well as the number of possessions the team felt this could affect based on experience. Furthermore, a range of cost was applied in accordance with the costs provided for the different possessions (27, 48 or 57h).

3.1.3 Correlated Risks

There are several risks in the model that were split into separate design and construction risks. These were correlated in order to simulate the simultaneous risk effect from one single event. In particular, the risks that were correlated in the model are “Cable routing from existing 650V SSP Chelmsford” (Risk 470628 and 470631), “Design changes due to RDR bridge interface” (Risk 408228 and 450971), “Increase in sustainability requirements” (Risk 470058 and 470648).

3.1.4 QSRA Risks

The output of the QSRA was factored into the model – in which the cumulative effect of the project’s schedule risks to the programme were costed with regards to additional design fees (i.e. design prolongation) and construction preliminaries (i.e. delays during construction stage). These are represented as Risk 470047 and Risk 470048 in the risk register. Figure 3.1 and 3.2 below are examples of the QSRA outputs that were used to cost the cumulative delays.

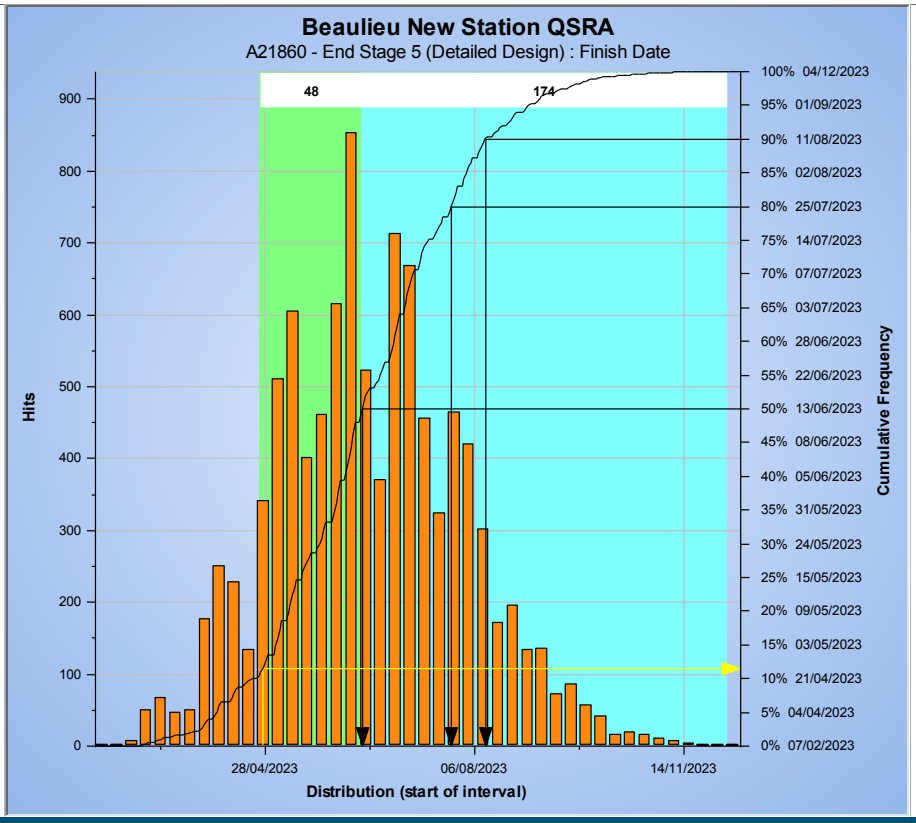


Figure 3.1 QSRA output for GRIP 5 completion

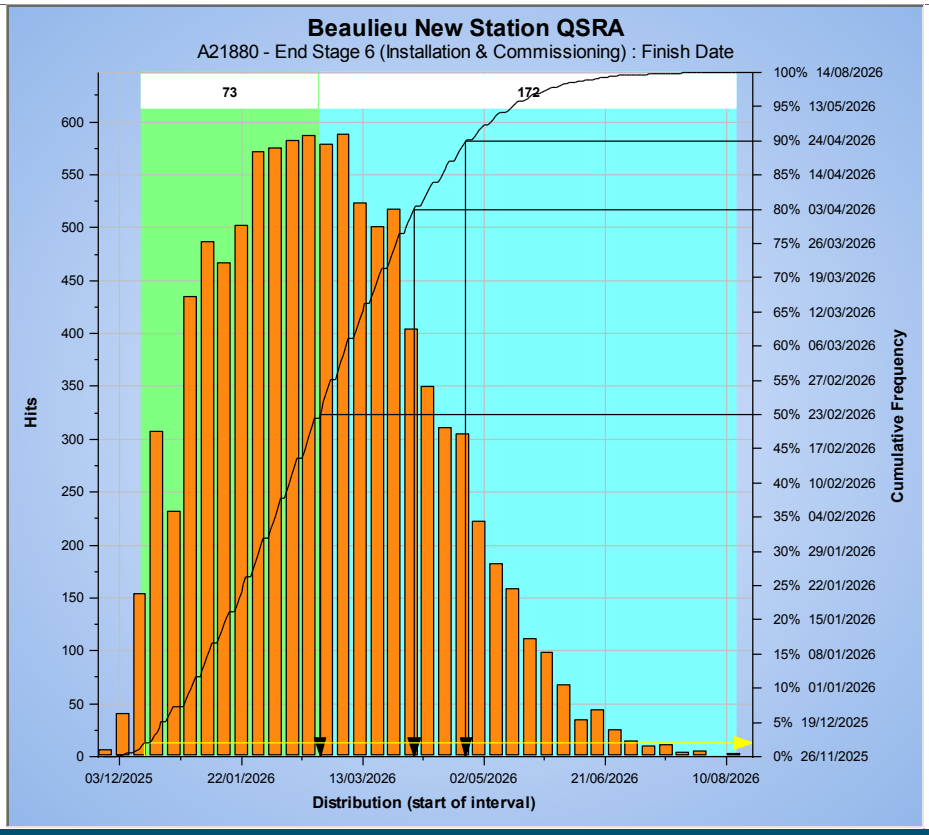


Figure 3.2 QSRA output for GRIP 6 completion

3.1.5 Effects of COVID-19

The QCRA also considered the effects of COVID-19. While the project is in design development phase, it has not experienced a severe impact as a result of the global pandemic. The project and design teams have adapted to remote working. Procurement of critical materials will not occur until late July 2022 and construction is not due to take place until 2023 at which point the current circumstances would have changed.

It is difficult to predict or quantify how COVID-19 may impact the project, the following considerations were made in the QSRA.

- Increase in duration uncertainty (20% uplift) for all activities in 2020.
- Increase in uncertainties and risks associated with TWAO as a backlog of applications may build up, resulting in additional delay in the process.

4. Assumptions Analysis

4.1 Assumptions that were modelled

A number of assumptions were identified, and an assumption analysis exercise was undertaken, details are shown in the table below. It should be noted that these assumptions are modelled as discrete risk events or duration uncertainties and actions should be taken to reduce their likelihood of occurrence or impact.

Table 4.1 Assumptions Analysis Key

Confidence	Impact
A B C D	A B C D
A – Very Confident	A – Minor Impact
B – Fairly Confident	B – Manageable Impact
C – Uncomfortable	C – Significant Impact
D – Very Uncomfortable	D – Critical Impact
Will the assumption turn out to be correct?	What impact would the assumption have on the project if it proved to be incorrect?

Assumption	Confidence	Confidence Justification	Impact	Impact Justification
1. The information provided by Essex county Council around the future construction of Chelmsford North East Bypass bridge is sufficient and will not affect the design of the Beaulieu project.	A	The parameters provided are sufficient and the team is liaising with Essex county council with progress of design.	B	If this is not the case, some redesign may be required if the design is misaligned. **Risk 415441**

Assumption	Confidence	Confidence Justification	Impact	Impact Justification
2. Access strategy will be approved by TOCs and FOCs	B	There have been ongoing discussions with the Route possession planning team who liaise with the TOCs/FOCs to ensure that they are aware of the project when planned access strategy is reviewed. Furthermore, local MPs local to the GEML will be lobbied in order to emphasise the importance of the project. Currently there is support from the local MP to facilitate this.	C	If this is not the case, then the access strategy will need to be revisited and updated. **Risk 486819**
3. Timely accreditation will be achieved to allow Approval to Place into Service (APIS) with regard to Common Safety Method (CSM) and Technical Specifications for Interoperability (TSI) compliance.	B	There has been ongoing engagement with NCB and they have given positive feedback so far.	C	If this is not the case, the project may incur cost as resource will be required to address any issues. **Risk 415444**
4. The RDR Bridge and associated road scheme will be completed to allow the project to use them as haul roads.	A	There are on-going discussions about the road scheme being completed by 2022. This is in advance of the Beaulieu work (Schedule to start in 2023)	B	Majority of the new road network is already in place. The RDR bridge will not be demolished until the construction of the new road is complete. Sufficient diversion route will be in place.
5. Countryside properties will have completed the foul water drainage system by Dec 2022.	B	A housing development is currently being built and is well progressed. This is needed for the development and must be in place, so the project is confident this will be completed in line with the project's needs.	C	There will be a cost to interface and also work around the drainage design issue. **Risk 469983**

Assumption	Confidence	Confidence Justification	Impact	Impact Justification
6. There is sufficient space at the Integrated Electronic Control Centre (IECC) workstation to accommodate the Beaulieu station	A	The Crossrail project have made the relevant work station scalable, on which Beaulieu Station will be controlled from.	B	Cost required to replace / modify the workstation. **Risk 472572**
7. The project will get the required permissions to remove any of the protected trees impacted by the designs	A	Project has an outline planning permission from the Chelmsford City Council who are a promoter of this scheme and work is within the planning boundary. The Arboriculture report has not identified any protected trees that will be affected by the scheme	B	It is likely that work around or different solutions can be found to manage the trees if assumption is false **Risk 408402**
8. Archaeological review will not find anything that may require extensive additional works	C	As works have not begun yet, there is no evidence to prove otherwise.	C	The impact is unknown but there will be a cost impact to the project. **Risk 469977 as part of QSRA**
9. RDR bridge can accommodate the passive provision for the auto transformer feeding.	A	The RDR Bridge clearance meets the requirements.	A	No impact on project but possibly on future project. **Risk 408228**
10. It is assumed that the S&C units will be accepted by the RAM.	A	The project team are managing this with the RAM and Track Team who understand the constraints of the site	B	The impact would be additional re-design may be required. **Risk 408230**
11. Network Change will be approved and will proceed as per programme with no significant changes required.	B	There are ongoing liaisons with the TOCs and FOCs to ensure they are regularly updated on the progress of the project	C	If Network Change is rejected or significant changes are required, redesign work will be required and therefore there may be additional costs associated with resource. **Risk 408254** **Risk modelled as part of QSRA**

Assumption	Confidence	Confidence Justification	Impact	Impact Justification
12. Japanese Knotweed will not be present on site.	B	No Japanese knotweed has been identified during GRIP 3 surveys	B	If this is not the case, additional costs will be incurred by the project to mitigate this on site. **Risk 408403**
13. There will be sufficient resources to carry out signalling design and commissioning.	C	National signalling resource shortage.	C	If the assumption is incorrect, the project may be unable to carry out the signalling design and testing which would lead to delays. The delay impact that could result in additional costs. **Risk 408065**
14. The project will gain TWAO approval and only minor objections would be received and that the Secretary of State will approve the TWAO in accordance with the timescales of the programme in line with Ministry Guidance.	C	The project has already received outline planning approval and there is widespread support for the project from local authorities, consequently it is not expected that significant objections are received against the scheme. The local planning authority are a key member of the project steering group. However, there are multiple schemes seeking TWAO and therefore there could be a back log built up.	C	If there is delay in granting Secretary of State approval then the project will require resources (PM, legal etc) to address any comments/objections. Furthermore, the project will not be able to commence the detail design phase. **Showstopper – public enquiry is a showstopper** **Risk 408063 – minor delay**
15. The Essex TWAO which includes the public right of way for Paynes and Noakes will not be delayed	C	The project has no control over this therefore confidence is not high	C	This can directly affect the projects TWAO by expanding it to include the public right of ways and therefore resulting in delays and additional costs **Risk 473533**

4.2 Showstoppers and Exclusions

4.2.1 Exclusions

The Beaulieu New Station project has defined showstoppers as:

- An event that would have a significant change in design or construction philosophy.
- An event that would have a significant change to the project cost or programme.

The following items have therefore been identified as showstopping exclusions and have not been modelled as part of the risk analysis as the impact would significantly alter the project:

- The project does not obtain Transport and Work Act Order (TWAO) due to the rejection from the Secretary of State (SoS).
- The project will gain access in a timely manner to conduct any unforeseen mitigations or survey(s) for any protected species found on site.
- The funding that Essex County Council will receive from the Housing Infrastructure Fund (HIF) grant is insufficient to support the continuity of the project.
- Homes England does not grant a 1-year extension (until March 2025) to allow for the HIF moneys to be spent.

Table 4.2 Assumptions excluded from the analysis

No	Assumption	Reason for exclusion	Owner
1	The project will gain TWAO and that the Secretary of State (SoS) will approve the TWAO in accordance with timeframe given in Ministry Guidance.	If there is protracted delay in granting Secretary of State approval, then the project will not be able to commence the detail design phase. The project has excluded the showstopping impact of the SoS rejecting the scheme and modelled a tolerable delay up to 3 months as part of the QSRA, and the potential costs associated with resource that may be required to deal with any queries that arise. In addition, there is a risk (**473533)** modelled regarding the expansion of the TWAO to include PROW for Paynes and Noakes. **Showstopping Exclusion**	Essex County Council (Project Funders)
2	The project will gain access in a timely manner to conduct any unforeseen mitigations or survey(s) for any protected species found on site.	The project has excluded the possibility of conducting ecological surveys or mitigations on any unidentified species outside the permitted calendar period. This meant the project would have to set up on next calendar period due to seasonal constraints which would result in a significant delay to the programme. Risks **408253** and **408402** were modelled that accounted for the risk of conducting these additional surveys or additional mitigations with a tolerable delay and does not include the prolongation of up to 6-months. **Showstopping Exclusion**	Essex County Council (Project Funders)
3	The funding that Essex County Council will receive from the Housing Infrastructure Fund (HIF) grant will be sufficient.	This is not something the project can manage or has control over. If the funding is insufficient, the project may be paused for a significant period of time. **Showstopping Exclusion**	Essex County Council

No	Assumption	Reason for exclusion	Owner
4	Homes England will grant an extension by 1 year until March 2025 to allow for the HIF moneys to be spent	This is not something the project can manage or has control over. If the extension is not granted, then it may not be possible for the awarded HIF moneys to be spent by the agreed deadline. **Showstopping Exclusion**	Essex County Council
5	Third party land beyond the defined development boundary will be made available to facilitate the construction of vehicle access.	There is an agreement in place with Countryside Zest and Chelmsford City Council that the project will be given the land it needs when required	Chelmsford City Council
6	Third party land beyond the NR boundary will be made available before start on site	Liaison with landowners and Chelmsford City Council is ongoing	Chelmsford City Council
7	Effects of Brexit	This is something beyond the projects control and it is impossible to quantify what the impact may be due to the large level of uncertainty	N/A

5. Results

A quantitative cost risk assessment (QCRA) was undertaken in June 2020 as part of the Beaulieu Station GRIP3 preferred option development to evaluate the project's overall risk exposure.

5.1 Overall Results

Table 5.1 outlines the risk exposure. Currently the base estimate is £135.6m for the main station works and £5m for the GEFF scope. The risk exposure at P80 is circa £17 million which is approximately 13% of the base costs. Table 5.1 outlines the risk exposure and Table 5.2 and 5.3 outlines the breakdown of Station and GEFF.

Table 5.1 Summary of results

	Risk Exposure		
	Mean	**80%**	**90%**
Risk Exposure (Station only)	£14,643,777	£17,062,395	£18,353,069
Risk Exposure (GEFF only)	£314,240	£495,905	£784,505
Total risk exposure	£14,958,016	£17,357,774	£18,695,751

5.1.2 QCRA Output for Station Only

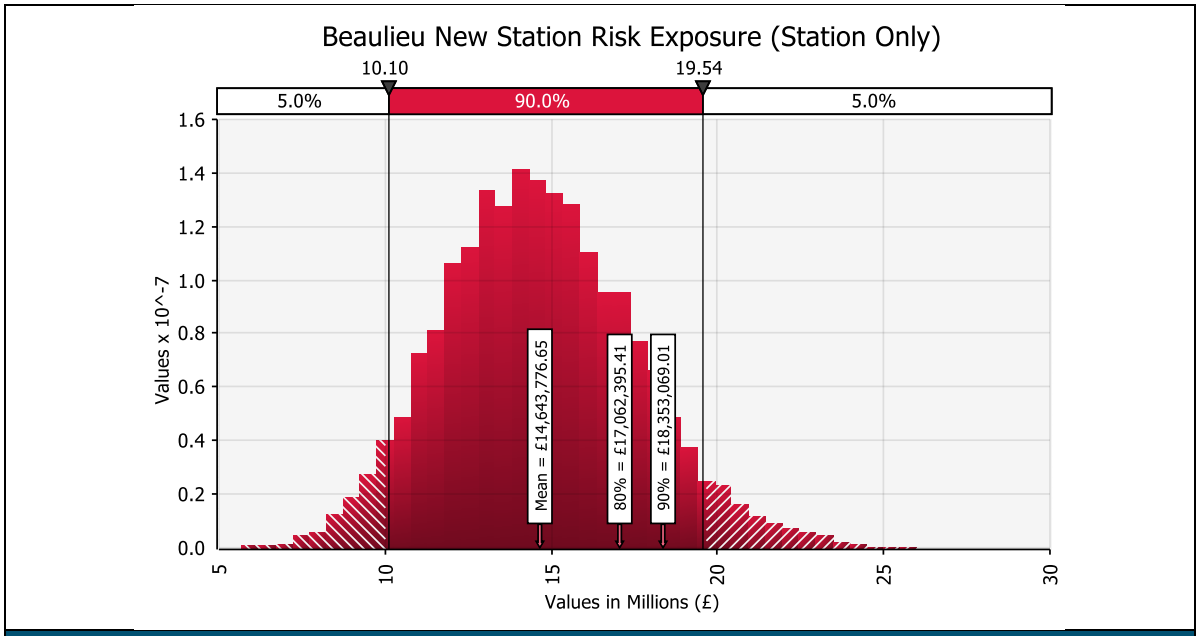


Figure 5.1 S-Curve for Station Only (excl. COVID-19)

The curve is mostly evenly distributed with a slight skewness to the left. This is because there are some lower probability risks which may result in a high impact. This is however counteracted by the ranges applied in the estimating uncertainty as well as one risk around changes to construction methodology following the onboarding of a contractor. This is both a threat and an opportunity however it may result if a noticeable change in costs.

Table 5.2 Breakdown of the risk exposure for Station Only

	Mean exposure
Project risks	£8,150,855
Estimating Uncertainty	£6,492,922
Total Exposure	£14,643,777

5.1.3 QCRA Output for GEFF Only

As previously mentioned, the GEFF scope is estimated at £5m. The P80 is circa £500k.

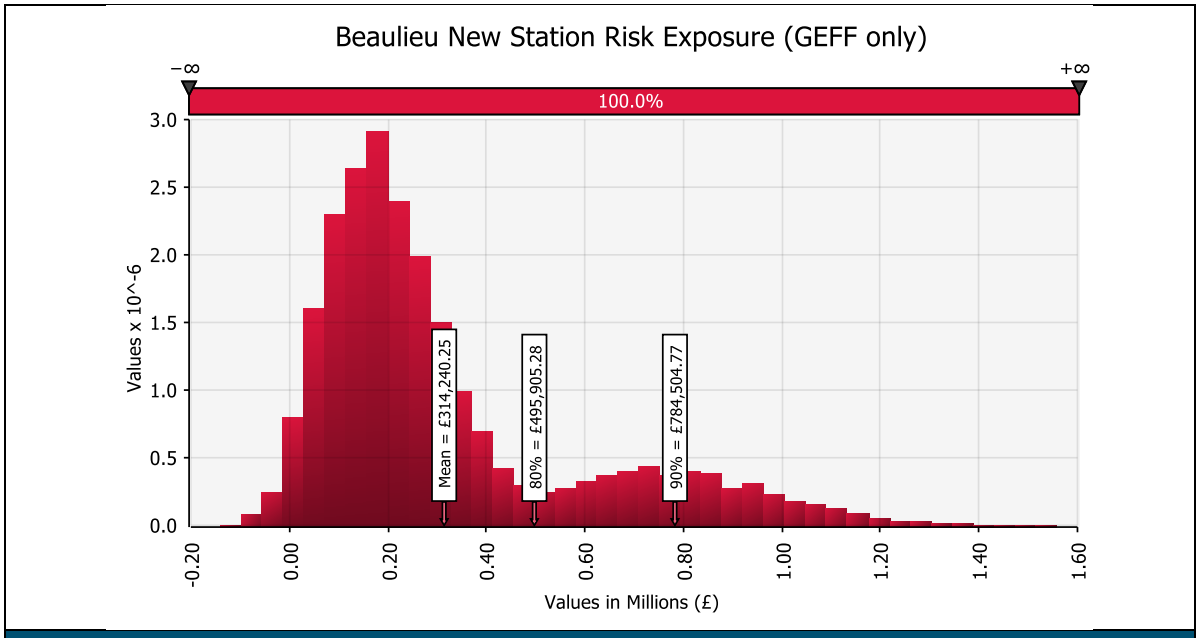


Figure 5.2 Risk Exposure for GEFF scope

There is noticeable tail in the above graph. This is due to the fact that most risks are less than or equal to 20% likelihood of realising, however, could bare significant costs. Table 5.3 outlines the b

Table 5.3 Breakdown of the risk exposure for GEFF Only

	Mean exposure (No COVID-19)
Project risks	£159,873
Estimating Uncertainty	£154,367
Total Exposure	£295,208

5.2 Top Risks

The sensitivity analysis outlines which risks have the biggest effect on the risk exposure. The top five risks to the scheme are shown in Figure 5.3. Further details of the top risks are shown in Table 5.3 below.

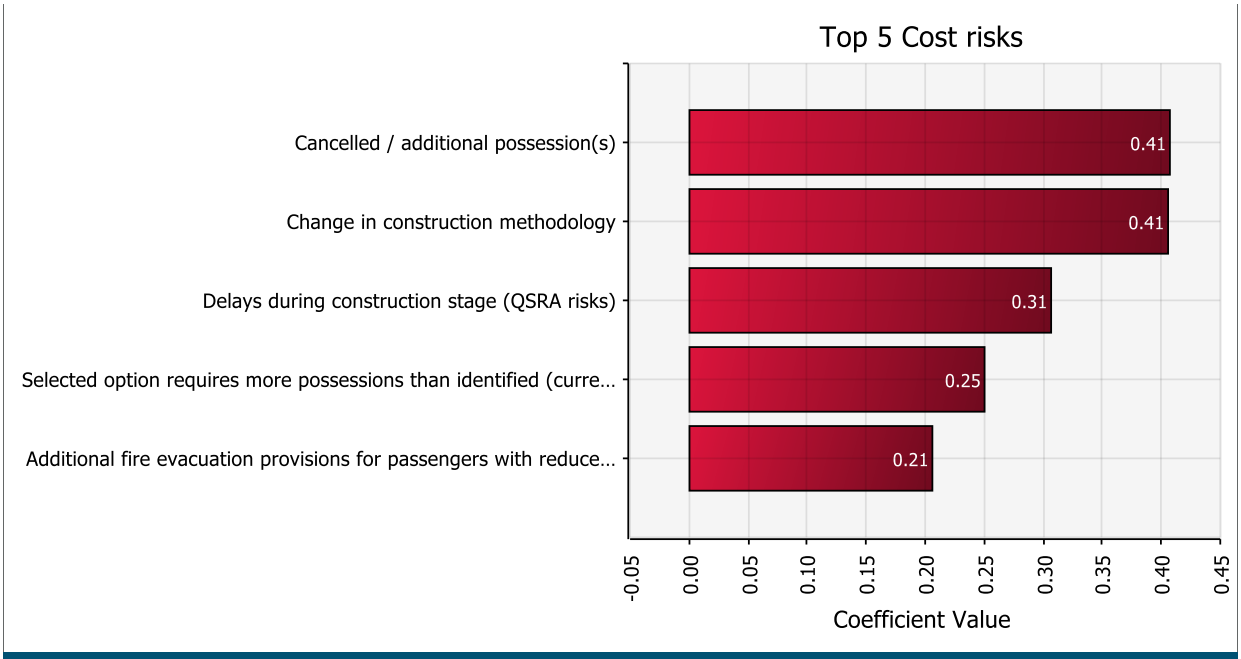


Figure 5.3 Sensitivity Bar Chart of Top Risks

Table 5.4 Top 5 Threats – by correlation

Risk ID	Risk Title and Description	Risk Owner	Mean Risk Exposure (£)	Action(s)	Action Owner	Action Due
470065	Cancelled/Additional possessions	Mark Chettle	£1,296,887	Ongoing engagement with the Anglia possession planning team	Mark Chettle /Delivery PM	Ongoing
496013	Change In construction Methodology	Mark Chettle	£416,000	Review and manage with contractor once appointed	Mark Chettle /Delivery PM	GRIP 5
470048	Delays during construction stage (QSRA risk)	Mark Chettle	£1,848,00	Review and manage with contractor once appointed	Mark Chettle /Delivery PM	GRIP 4/5
470626	Selected option requires more possession than identified	Mark Chettle	£399,600	Review constructability report and book possessions accordingly	Mark Chettle /Delivery PM	Ongoing

489816	Additional Fire evacuation provisions for passengers with reduced mobility	Mark Chettle	£350,000	Further development of design during GRIP 4. Specialist accessibility consultant to be engaged by project	Mark Chettle	GRIP 4

One of the key risks affecting the risk exposure the most is in relation to late notice cancellation of access which may result in additional possessions at a greater cost due to lost shifts and short notice bookings with the TOC.

Furthermore, as the main contractor has not been appointed and there has been no early contractor engagement, there is a risk that the project will be financially affected once the contractor is in place, due to changes to construction methodology. This is treated as both a threat and an opportunity

5.3 Conclusion and Recommendations

Overall risk exposure has increased since the initial GRIP 3 QCRA run in 2019; however, it is lower than the expected benchmark of similar projects at this GRIP stage (15%-20%). This is due to the;

- Increase of base costs
- Closure and transfer of costs of some risk to base estimate
- Closure of large impact risks following engagement with stakeholders
- AIP being completed in this stage (GRIP 3) rather than GRIP 4.This means that most of the design is more in line with GRIP 4 where the benchmark is 12%-18%

The project team need to focus on addressing the top risks mentioned above to further decrease the exposure in the next stage.

Currently, the contractor risks have not been included in the base estimate costs. A high-level consideration of those has been made with the project team and included in this analysis. As a contractor is yet to be appointed, it is highly recommended that they are engaged and a more detailed exercise is carried out in order to better understand what the overall risk exposure for this project is.

6. Final Actions

List Actions and owners recorded during the workshop. Owners were assigned from people within the room. These actions should be entered into the project plan where capital expenditure or time is taken to complete the action.

Table 6.1 Action Table

Action	Owner	Close Out Date
Present results to Project Manager	Alex Todorova/Nigel Tang	Completed
Explore contractor risks in more detail	PM team	GRIP 4
Evolve and refine the access strategy during the detail design phase once design is more robust	Mark Chettle	GRIP 5
Undertake preliminary consultation to support network change in GRIP 4	Mark Chettle	GRIP 4
Review the risk which affect the risk exposure the most and apply mitigation strategies to reduce the threat	Alex Todorova/Mark Chettle	GRIP 4

7. Appendix A – Attendees

Table 7.1 Attendees List

Name	Role	Company
Glenn King	Project Manager	Network Rail
Loren Chamberlain-Clark	DPE	Network Rail
Duncan Thurston	CEM-Design	WSP
Kevin Mainwaring	Project Manager (Design Team)	WSP
Mark Chettle	Scheme Project Manager	Network Rail
Alex Todorova	Risk Analyst	Mott MacDonald
Nigel Tang	Risk Analyst	Mott MacDonald

8. Appendix B – Risk Register

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
470065	Cancelled / additional possession(s)	Cause: Delayed trains (passenger/engineering trains) No locomotives Long lead item delays (due to external events, eg weather, breakdowns, accidents etc) Risk: There is a risk that possessions may be cancelled due to events outside of the projects control Effect: Costs for booking additional access	Risk was sub modelled, taking into account the number of booked access and costs for each possession Most suitable triangular values were used. Probability is based on the amount of time there is an impact (85% of the time)	85%	£ -	£ 575,899	£ 3,198,174	£ 1,069,321
496013	Change in construction methodology	Cause: Contractor not yet appointed Risk: There is a risk that the project costs may increase/decrease if any changes to the construction methodology are required once contractor is appointed Effect: Changes in costs	Construction costs are £104m. Min is decrease of 1% in costs Max is increase of 5% in costs	20%	-£ 1,040,000	-	£ 5,200,000	£ 416,000
470048	Delays during construction stage (QSRA risks)	Cause: The cumulative effect (QSRA output) of various schedule risks on the construction programme. Risk: There is a risk that the project will incur additional costs due to the delays during construction phase cause by various schedule risks. Effect: Additional costs incur to the project (e.g. preliminaries, mobilisation, project management costs, possession planning costs, etc.)	50% based on QSRA results Min: 73 days (2.4 months) Max: 172 days (5.7 months) Assuming 200k for prelims per month	50%	£ 480,000	-	£ 1,140,000	£ 405,000

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
408505	Asbestos	Cause: Asbestos identified beyond what was discovered during surveys Risk: There is a threat of the project coming into contact with asbestos requiring additional work to remove it from site (e.g. nearby building (close to driver walkway) Effect: Additional costs to remove the unidentified asbestos	Medium Probability Impact covers removal costs. Range is depending on volume, type and location of asbestos.	35%	£ 600,000	£ 800,000	£ 1,000,000	£ 280,000
470631	Assumptions from WSP design for the cable routing from existing 650V SSP at Chelmsford below viaduct prove to be incorrect. (Construction risk)	Cause: Design assumptions not validated sufficiently during wk 48 walk out Risk: Route from SSP at Chelmsford at ground level on the Up side vertically up the viaduct wall and on to the Down cess is not as expected by WSP Effect: Additional construction costs result.	minimum: Minimal clear out and a small possession max: significant survey and additional construction related works and possessions over that already identified	35%	£ 250,000	-	£ 800,000	£ 183,750
408065	Availability of resource for signalling, telecoms, OLE	Cause: '- Limited industry wide resource - Signalling resource prioritised for other projects -Volume of work is high at the end of the Control Period (when construction for the project is due to take place)' Risk: There is a threat that resources are not available to carry out critical works (signalling/telecoms/OLE) Effect: Delay to programme due to impact on testing and commissioning period (i.e. loss of possession)	low prob Costs associated with additional costs to secure resource (min), ML and Max also incorporate additional possessions if resource is not present at required times.	15%	£ 600,000	£ 1,000,000	£ 2,000,000	£ 180,000

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
484226	Temporary Speed Restriction not approved by TOC	Cause: Lack of approval from TOC on current speed restriction Risk: There is a risk that the project will need to rework some of the design and amend the construction methodology if the TOC does not approve the temporary speed restriction which the current design assumes. Effect: Redesign Re-shuffling of work leading to change in construction methodology Additional costs to the project	Min costs are for some minor redesign and expected resource to cover it Max costs for significant redesign with significant additional resource to cover it	50%	£ 200,000	-	£ 500,000	£ 175,000
472286	Critical plant availability	Cause: '-Critical plant not available (high demand in country etc)' Risk: There is a risk that the project will incur additional costs due to lack of availability of critical plant when required resulting in costs associated with additional possessions or alternative construction methodology solutions Effect: '-Additional possessions -Costs for alternative construction mythology solution '	Alternative solution may be implemented e.g. PEM-LEM. Range of costs covers this as well as additional possession access required to support it.	10%	£ 1,000,000	-	£ 2,000,000	£ 150,000
470626	Selected option requires more possessions than identified (currently 56 equivalent days identified)	Cause: Impact and developed solutions to signalling protection for the NS design is still evolving. Risk: There is a risk that the project will incur additional costs as more possessions may be required Effect: Increase cost and if not available / can't be contained in current window then additional time	Additional costs for possessions Min: 52-hour possession Max 3 x52 hour possessions	20%	£ 333,000	£ 666,000	£ 999,000	£ 133,200

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
408229	TWAO with public inquiry may be required	Cause: Permanent land take will be required to complete works and so needs to be brought into operational use Risk: TWAO with public inquiry might be required in order to transfer non-operational land into operational land. Effect: Delay to programme and additional cost for legal representation during public enquiry.	Low prob Min Some minor objection with minimal requirement for resource to resolve Max impact relates to additional resource e.g. Queens Counsellor, PM staff during enquiry, hearings etc), Potential showstopper due to major delays modelled as scenario in QSRA	10%	£ 500,000	-	£ 2,000,000	£ 125,000
472283	Revalidation of AIP and Surveys	Cause: '-Delays with TWAO resulting in a longer time period between design and construction phases' Risk: There is a risk that the project will incur additional costs or delays if any of the surveys or design will require revalidation due to prolonged agreement of TWAO Effect: Costs for repeat/revalidation of surveys or additional design	Costs cover additional surveys which may be required to be validated. Costs depend on location, time of year etc)	35%	£ 200,000	-	£ 400,000	£ 105,000
486819	Access strategy not approved by TOCs/FOCs	Cause: Planned access strategy is not accepted by TOC / FOCs Risk: The risk is that the project will have to re-plan the proposed access strategy due to disagreements with TOC / FOCs Effect: The project might have to deliver in a series of possessions rather than the blockade (loss of efficiency).	Costs largely associated with loss of productivity if blockades cannot be used, reducing active working time during possession, additional resource to mitigate productivity etc Min: Several longer possession (i.e. 72 hour possession) Max: Large volume of shorter weekends (I.e. 27 hour possessions) Modelled in QSRA - Delay is based only on re-negotiating any disagreements to obtain consensus in proposed access strategy.	10%	£ 500,000	-	£ 1,500,000	£ 100,000

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
470648	Increase in sustainability requirements for the project (Construction Risk) - GRIP 6	Cause: Sustainability requirements change GA requests excellent BREEAM rating Risk: Currently the team are designing to achieve Very Good BREEAM status. The risk is as the project develops the requirements for sustainability increase and therefore the need to achieve Excellent e.g. solar panels, causing an increase in the cost. Effect: Increase in cost to accommodate the associated work required	Cost related to rating required (currently going for very good, risk is related to achieving excellent status) Costs cover changes to construction methodology, type of materials needed, resources, additional mitigation etc	15%	£ 200,000	-	£ 1,000,000	£ 90,000
408402	Protected species (Unforeseen mitigations)	Cause: The protective species report (150796-WSP-REP-EEN-000002) identified the presence of the following species: - Badgers - Bats - Breeding birds - Reptiles (slow worms, common lizards and grass snakes) Risk: There is a risk that the project is required to implement appropriate mitigation measure(s) for the following protected species. Effect: '- Additional costs associated with setting up preventive and mitigation measures (e.g. protective barriers / fencing) - Potential delay to delivery programme (i.e. start of site works) due to restrictive work times imposed, closure of site due to habitats within vicinity or ecological enhancements required. '	Cost based on mitigation measures implemented. e.g. protective barriers fencing, relocating species - and resource required to cover this. Delay modelled in QSRA - Delay based on project having to wait at certain timescales to implement measures (20-40 days)	20%	£ 200,000	-	£ 600,000	£ 80,000

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
470053	Uncharted Services during construction	Cause: '-Services not in drawings/as built info -Services not identified in station ' Risk: There is a risk that the project may incur costs as redesign may be needed if uncharted services are discovered during construction Effect: Additional costs to mitigate if services are discovered during construction	Low risk Min: Minor protection measures required in order to continue working Max: Significant rediversion and/or protection required	10%	£ 100,000	-	£ 1,000,000	£ 55,000
470047	Design delays due to risk impacts (QSRA)	Cause: Risk impacts Risk: There is a risk that the project will incur additional costs due to the delay caused by risks Effect: Additional costs due to delays	50% based on QSRA results Min: 48 days (1.6 months) Max: 174 days (5.8 months) It is assumed that one month of delay will result in £25k during the design period	50%	£ 40,000	-	£ 145,000	£ 46,250

468898	Additional Mast is Required (GSM-R)	Cause: Compliance with GSM-R Requirements Risk: There is a risk that an additional mast is required due to GSM-R Requirements. Effect: Additional costs to the project	Additional cost due to: works include a new base station/REB or multiple antennas and multiple major works on existing or new GSM-R location 60% Chance of no impact on the GSM-R coverage. No associated cost outside of standard SMART & TD works. 25% Chance of minor impact. This will include minor works on aerials, and GSM-R assets. Cost associated -C.£50K 10% Chance of major impact. This will include relocation of a REB/GSM-R mast or an additional mast, repeater antennas, major works to existing GSM-R location(s) Cost associated -C.£150K 5% - Chance of enormous impact. Works would include a new base station/REB or multiple additional antennas and multiple major works on existing/new GSM-R location(s) Cost associated -C.£250,000 Risk has been sub modelled on @Risk using a discrete function however due to limitations of ARM, it has been inputted as a triangular function using the above values	40%	£ -	£ 50,000	£ 250,000	£ 40,000

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
473533	Expansion of TWAO application (due to Essex TWAO delays)	Cause: TWAO Expanded due to Essex TWAO either delayed or not successful for two public right of way (Paynes and Noakes) Risk: There is a risk that the projects incurs additional costs and delays as a result of delays with Essex TWAO which would require the projects TWAO to include the public right of way for Paynes and Noakes. Effect: '- Potential delay to programme to include the PRoW for Paynes and Noakes into the TWAO application - Additional costs due to prolonged costs (e.g. project management, etc.) '	Risk probability increased to 50% as Essex TWAO is experiencing some delays. Min: Minimal work required by project with some additional resource including some legal costs Max: Significant additional work for project team with more significant resource requirement including legal costs, consent team time etc Project delay modelled in QSRA	50%	£ 50,000	-	£ 100,000	£ 37,500
496010	Existing asset condition (non-compliances/defects)	Cause: non-compliant assets identified which will require modification Risk: There is a risk that the project will incur additional costs if non-compliant assets are identified Effect: Additional costs	Min: Minor modification with minimal work required from team Max: More significant/complex asset requiring modification	15%	£ 100,000	-	£ 400,000	£ 37,500
470628	Assumptions from WSP design for the cable routing from existing 650V SSP at Chelmsford below viaduct prove to be incorrect. (Design risk)	Cause: Design assumptions not validated sufficiently during wk 48 walk out Risk: Route from SSP at Chelmsford at ground level on the Up side vertically up the viaduct wall and on to the Down cess is not as expected by WSP Effect: Additional design and construction costs result.	minimum impact is redesign with simple possession for resurvey and multidiscipline design review, max is significant survey and additional resource required to cover redesign and multidiscipline design reviews	35%	£ 50,000	-	£ 150,000	£ 35,000

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
408230	S&C units may not be acceptable by the Track RAM	Cause: May have to avoid negative cant on contraflexure curves Risk: There is a risk that Track RAM will not accept the solution for the S&C Units Effect: Programme delay and additional costs	Low likelihood/ high impact Dialog has been ongoing with RAM during GRIP2 & 3; the RAM is aware of the size of the S&C and understood why they need to be so. Minimum cost is based on additional design changes affecting 1 S&C Max: More significant changes affecting multiple S&C requiring more severe design intervention and resource	5%	£ 100,000	-	£ 1,100,000	£ 30,000
408255	Change of requirements	Cause: Requirements are as per CRD / RRD. Risk is that these change (e.g. introduction of driver walkway on the upline) Risk: There is a risk of abortive design work and delay to programme as a result of having to re-design Effect: Additional cost and delay to programme	Low prob Cost range assumes some changes to design and resource to cover it (Depending on extent) QSRA model accounts for the delay associated with this risk	10%	£ 100,000	-	£ 500,000	£ 30,000
472273	Extent of temporary works	Cause: Works are carried out at height Failure of temporary works Construction staging has not been fully developed Early stage of design Risk: There is a risk that additional temporary works may be required in order to support construction Effect: Additional costs to re-design temporary works and possible additional construction cost		20%	£ 100,000	-	£ 200,000	£ 30,000

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
473531	Revalidation of Environmental Impact Assessment (EIA)	Cause: The latest ES addendum was submitted in 2013 and the specification for the proposed station has changed since outline planning permission was granted in 2013; this includes: - Requirement for additional land outside the application boundary (incl. extensions to the land take for temporary construction compounds) - Changes to design including amendments to height of the access footbridge. Risk: If the changes in specification resulted in significant adverse effects to the environment, there is a risk that the project may need to implement additional measures to be compliant. Effect: Depending on the output of the assessment, the project may need to implement additional measures to be compliant which will lead to additional costs and delay to programme	QCRA: Depending on gaps identified following review of scoping report. Min: some minor additional work required to address gaps with some additional mitigations Max: more significant work e.g. surveys, design, more significant mitigations required etc required. QSRA: Min: 1 month delay for some minor modifications Max :2 month delay for significant rework	10%	£ 50,000	-	£ 500,000	£ 27,500
408254	Network Change approval (additional modifications)	Cause: '- TOC / FOC has not approve the proposed Network Change' Risk: There is a risk that any delay in obtaining approval in Network Change will affect the project's progress into GRIP 5. Effect: '- Negotiations may introduce additional design modifications (re-design) - Delay to programme as this will impact signalling design package'	Delay is based on any additional modifications agreed to obtain Network change approval which will impact on design development (re-design) Min: 2 weeks delay Max: up to 2 months delay QCRA: costs vary depending on amount of queries and extent of resource required to cover these works	35%	£ 20,000	-	£ 100,000	£ 21,000

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
408228	Design changes due to RDR Bridge - Detailed Design Phase	Cause: Installation of new RDR bridge may cause changes to the infrastructure that impact on this project - signal sighting, height of OLE Risk: There may be a threat of re-design of signal sighting and OLE Effect: Additional costs to address design work	Prob - 10% AiP design has been issued MIN: revisit some of the design - 100k MAX: 300k around more significant design work	10%	£ 100,000	-	£ 300,000	£ 20,000
408403	Invasive Species	Cause: Unforeseen invasive species (e.g. Japanese Knotweed) present during mobilisation of site. Risk: There is a threat that the project may come into contact with invasive species (e.g. Japanese Knotweed) during site works. Effect: '- Additional costs incur to the project due to clearance. - Potential delay to site works depending on severity of the species. '	Cost impact is based on volume of knotweed that requires removal, level of protection required, late notice changes, contamination of materials etc Delay impact is 2-5 days to remove the knotweed. Modelled in QSRA	5%	£ 200,000	-	£ 400,000	£ 15,000
470054	Service strike during construction	Cause: '-Services not in drawings/as built info -Services not identified in surveys' Risk: There is a risk that the project may incur costs to repair a service strike during construction Effect: Additional costs to redesign if services are struck during construction Costs to compensate owner	Low risk Costs for redesign to accommodate for service (£100k if its minor, £500k if its major issue)	5%	£ 100,000	-	£ 500,000	£ 15,000

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
470057	Adverse weather conditions	Cause: Extreme weather conditions (1 in 10 year event) Risk: There is a risk that site works will be affected and potentially delayed due to weather conditions (e.g. winter, flood, etc.) Effect: '- Delays to the project due to loss of productivity during site works or potential loss of critical possessions. - Additional costs incur to the project due additional possessions, preliminaries, prolonged project management costs, etc.'	Costs for acceleration depending on severity of weather	10%	£ 50,000	-	£ 250,000	£ 15,000
470058	Increase in sustainability requirements for the project (Design Risk) - GRIP 3-5	Cause: Greater Anglia (TOC) request for Excellent rating Risk: Currently the team are designing to achieve Very Good BREEAM rating. The risk is that as the project develops the requirements for sustainability increase and therefore the need to achieve Excellent (e.g. solar panels) causing an increase in the cost. Effect: Additional costs to the project.	Cost related to rating required (currently going for very good, risk is related to achieving excellent status) Costs is associated with Design. Range depends on amount of changes and what other disciplines they impact within the project, resource required to cover design changes	15%	£ 75,000	-	£ 125,000	£ 15,000
472277	Damage to existing assets (during construction)	Cause: Complex works near existing assets Risk: There is a risk of damaging railway assets during construction Effect: Additional costs to fix damaged assets Additional temporary works may be required	Costs may vary depending on location and type of asset. Min: Some minor works required with some additional temporary works Max: Significant cost to make good with larger amount of temporary works required	20%	£ 50,000	-	£ 100,000	£ 15,000

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
472269	Uncharted services identified during surveys	Cause: Absence of drawing / historic data Lack of as built information Poor quality of as build information Risk: There is a risk of identification of unchartered services during surveys. Effect: Additional costs to dealt with unknown cable (e.g. additional redesign, construction methodology change	Probability low as no issues have been identified. Min costs associated with minimal redesign and associated resource Max is for more significant design and resource required to address it	15%	£ 50,000	-	£ 100,000	£ 11,250
450971	Design changes due to RDR Bridge - GRIP 3 Design Phase	Cause: Installation of new RDR bridge may cause changes to the infrastructure that impact on this project - signal sighting, height of OLE clearances. Risk: There may be a threat of re-design of signal sighting and OLE system due to any unforeseen changes to the RDR bridge. Effect: Programme delay and additional costs	Low probability Costs cover resources required to address issues identified at an earlier stage of the design. Range depends on extent of resource required to mitigate identified issues within design	10%	£ 50,000	£ 100,000	£ 150,000	£ 10,000
491485	Assumptions around proximity of working close to HP gas main	Cause: Assumptions made around proximity of working close to the gas main Risk: There is a risk that the assumptions around the HP gas main prove to be incorrect resulting in redesign of foundations for key equipment such as OLE structures. Effect: Additional costs for rework of design	Min costs accounts for single discipline impact (resource to cover design costs) Max costs accounts for more significant redesign affecting more disciplines	25%	£ 20,000	-	£ 50,000	£ 8,750

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
408226	Unforeseen ground conditions (residual) - Platform and building	Cause: GI surveys results indicated nothing abnormal. however, something may be uncovered during construction. Risk: There is a residual risk that the ground conditions may be worse than anticipated during construction. Effect: Depending on the severity of the ground conditions; project may incur additional costs in: - Re-designing works (e.g. piles), affecting construction works as well - Treatment costs or contaminated waste removal costs.	Prob - GI completed, therefore reduced chance of issues during construction (5%). Additional survey works and pile foundation design or specifications might need to be changed. Delay is modelled at 1-2 months delay	5%	£ 50,000	-	£ 250,000	£ 7,500
415444	Entry into service (APIS) rejected by the DfT	Cause: Entry into service documentation was not produced on time at the right quality Risk: There is a risk that the EIS will be rejected by DfT due to insufficient evidence to prove regulations were met (e.g. TSI and CSM Compliance) Effect: '- Delay to opening of the station - Trains unable to operate on revised infrastructure.'	Cost associated with resources required to produce information (evidence). Delay modelled in QSRA.	10%	£ 50,000	-	£ 100,000	£ 7,500
468897	Requirement for BMS for External Services (surface car park)	Cause: Currently, only one BMS is accounted for the Station. Risk: There is a risk that another BMS (Building Management System) is required for external services (surface car park) Effect: Additional cost		15%	-	£ 50,000	-	£ 7,500

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
470055	Plant Breakdown during construction	Cause: '-Technical issues with plant' Risk: There is a risk that the project will incur costs due to plant breakdown during construction Effect: Additional costs for spare plant, drivers, fitters etc	Min; costs for fitters and some materials to mitigate issue Max: Spare fitters on site for plant, spare materials/plant	10%	£ 50,000	-	£ 100,000	£ 7,500
472572	Additional work at Witham Work Station	Cause: The scaling done by Crossrail is not enough or it is determined that the space will not be sufficient. Risk: Currently it is assumed that there will be sufficient space at the Integrated Electronic Control Centre workstation as the Crossrail project have made the work station scalable. There is a risk that the project will need to do further work at Witham work station resulting in additional costs Effect: Additional costs for further modifications	Costs associated with design, and implementation of new solution depending on extent of work needed to be done	5%	£ 100,000	-	£ 200,000	£ 7,500
470040	Parallel (Overlapping) design with other projects	Cause: Parallel design is required to be done with nearby projects in order to update the source records. Risk: There is a risk that the project would need to dedicate resource to integrate (overlap) design with other projects. Effect: Additional costs due to resource. Possible delay in programme if this activity took longer than anticipated	Probability is based on the likelihood other project has already obtained/reserved the source record and there is a need to wait/share it. Cost impact is based on additional design resource required to carry out the parallel design. Costs cover resource required to address design issues. Minimum and maximum cost variance is based on the time taken to do this - which accounts for a month delay (modelled in QSRA)	20%	£ 10,000	£ 50,000	£ 50,000	£ 7,333

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
472284	Environmental approvals: Section 61 conditions	Cause: Concerns surrounding noise, dust, traffic management etc. Risk: Due to stakeholders concerns conditions may be placed around the section 61 e.g. Noise - restricted hours of working etc. This could lead to alterations in programming of works and additional costs. Effect: Additional costs due to noise barriers or additional possessions needed.	Costs associated.	20%	£ 20,000	-	£ 50,000	£ 7,000
460725	Replacement of existing cables	Cause: Some existing cables may need to be lifted and shifted inward or replaced as the track is slewed Risk: There is a risk that the cables are unable to be moved or slewed and will need to be replaced. Effect: Additional costs due to replacement of cables	Low risk. Current allowance for cable works is circa £850k Min is additional 10% of current allowance in estimate Max is additional 20% of current allowance in estimate	5%	£ 85,000	-	£ 170,000	£ 6,375
408062	Availability of DNO supply from Countryside Zest	Cause: Due to being unable to identify power requirements at a stage consistent with Countryside Zest plans. Need to know this as part of AiP Risk: Sufficient power available to power the DNO supplies required by the Station, lifts, lights, etc but may not be fixed at a sufficient cost or the proposed location from Countryside Zest is not practicable Effect: Additional costs	Impact - range of design costs from WSP in order to address design issues. Costs depend on extent of resource required and extent of additional work. Showstopper (If a new substation is needed, roughly £30M)	15%	£ 30,000	-	£ 50,000	£ 6,000

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
408241	Design Alterations (Visual and Lighting effects)	Cause: New station may be seen as a negative visual effect on the surrounding area (local opposition). Risk: There is a threat that the lighting may cause localised effects on nearby residents and ecology (e.g. deter bats from their commuting and foraging routes) leading to design alterations. Effect: Additional cost and programme delay	Impact - range of design costs from WSP in order to address design issues. Costs depend on extent of resource required and extent of additional work. Delay associated with this risk modelled in QSRA	10%	£ 20,000	-	£ 100,000	£ 6,000
415441	Chelmsford North East Bypass (CNEB) may cause changes to the infrastructure that impact on this project	Cause: Changes to the infrastructure/design as a result of the Chelmsford North East Bypass (CNEB) project Risk: There may be a threat of re-design of signal sighting and OLE Effect: Programme delay and additional costs	Impact - range of design costs from WSP in order to address issues Modelled in QSRA: Min: 1 month Max: 3 months	5%	£ 50,000	-	£ 150,000	£ 5,000
484221	Inconsistency in ProjectWise versions	Cause: Different versions of the software used Risk: There is a risk that the project will lose productivity and thus result in a delay due to different versions of Projectwise being used by WSP and NR. Effect: Delay in transfer of drawings Loss of productivity	Costs for managing data, Min: £5k for minor issues and delays Max: £20k for more significant issues	20%	£ 5,000	-	£ 20,000	£ 2,500

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
484220	Ownership of new culvert	Cause: Currently it is not yet agreed who the owner of the asset will be (at the minute existing culvert is owned by CCC and maintained by NR) It is not certain that NR will not own the extension Risk: There is a risk that the project will incur additional costs due to lack of agreement around the ownership of the extended culvert and the resource required to resolve the issue. Effect: Additional Staff costs	Costs may cover additional iteration of design, project management etc in order to resolve issue	10%	£ 5,000	-	£ 10,000	£ 750
408251	Long lead items manufactured and delivered on time	Cause: Due to the capacity of the manufacturer or late design and compressed programmes Risk: The risk is that the S&C components cannot be manufactured on time Effect: Delay to delivery programme due to loss of critical possession(s) / blockade Additional costs associated with possession planning costs and preliminaries (i.e. project management and contractor mobilisation costs)	Probability is residual and low Min: 1-week delay Max: 1-month delay	10%				
408253	Access to Survey Premises	Cause: Access to surveys is not granted which might cause the project to miss the survey window (influenced by growing season and species) Risk: There is a risk is that access may not be granted for AiP / GRIP 5 surveys at the required timescales on the operational railway and private land. Effect: Delay to programme as project would miss the survey timescale to access the operational railway and private land.	Delay based on project having to negotiate for the next available access to conduct relevant surveys in GRIP 5. Min: 1-month delay Max: 2-month delay	10%				

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
469977	Archaeological Findings	Cause: Archaeological finds during works Risk: There is a risk that the project will incur delays due to any archaeological finds during construction Effect: This will delay the delivery programme and additional costs incurred to the project to appoint archaeologists to inspect findings.	Modelled as part of QSRA, 10% 0-1 month	10%				
469983	Incomplete drainage design of Countryside properties	Cause: Foul water drainage design by Countryside Properties is delayed Risk: There is a risk that the project will incur some delay if the drainage design which is developed by Countryside Properties is not complete in a timely manner. Effect: Delay to programme due to re-design of the drainage outfall.	Min: 2 weeks of additional design work Max: 1 month of additional design work	10%				

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
489812	Viaduct Modifications	Cause: '-Condition of existing viaduct -Agreement with RAM required' Risk: Currently the proposed track alignment modifications may require additional works to the viaduct (e.g. strengthening). There is a risk that the project may incur additional costs as a result of this or that the modifications are deemed too severe resulting in redesign of the track alignment and therefore significant project costs or delays Effect: The three potential impacts depending on the severity of the risk: -No additional work required -Minor changes to the design with minimal impact to the viaduct -Some alteration to viaduct required -Major redesign to the track alignment which will adversely impact existing infrastructure and other disciplines (OLE, Signalling etc)	There are four potential impacts depending on the severity of the risk (modelled using discrete function on @risk): -No additional work required 10% -Minor changes to the design with minimal impact to the viaduct 35% £50k -Some alteration to viaduct required 35% £200k-£500k (range of costs applied as there is a range of different modifications which may be required) -Major redesign to the track alignment which will adversely impact existing infrastructure and other disciplines (OLE, Signalling etc) 20% £1.5mil to redesign the track alignment	0%				

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
489816	Additional fire evacuation provisions for passengers with reduced mobility	Cause: '-SME strategy/evacuation strategy deemed not fully compliant the Public Sector Equality Act -Current design provides refuge point on platforms 1/2 with no evacuation provision" Risk: There is uncertainty around the extent of evacuation provision required as the current solution may be deemed non-sufficient (refuge locations on platform) and therefore there is a risk that project may incur additional costs to modify the existing design to accommodate for additional provisions Effect: '-Additional costs for redesign to include some possible accessibility modifications such as: -Provisions for additional refuge point at barrow crossing -Installation ramps on proposed footbridge -Additional SME footbridge, evacuation lifts, modifications to the AFA footbridge to increase accessibility"	3 Potential impacts in terms of additional costs for redesign solutions modelled using @risk: -No change 30% -Provisions for additional refuge point at barrow crossing/additional ramps etc 60% £50k -Additional SME footbridge, evacuation lifts, modifications to the AFA footbridge to increase accessibility 10% £1m	0%				
489943	MSRP review (Additional modifications)	Cause: MSRP requiring additional changes to the signalling design Risk: There is a risk that project may have to alter the proposed design and construction of the signalling discipline due to modifications imposed by the MSRP. Effect: '- Additional design team costs due to re-design - Potential knock-on delay impact to construction programme'	Delay to programme with impact range based on experiences on other projects (e.g. Soham Station and Beam Park) Min: 1 month Max: 2 months	10%				

Risk ID	Risk Title	Risk Description	Impact description	Prob	Minimum	Most likely	Maximum	Mean
489946	Unexploded ordnance (UXO) disposal	Cause: The proposed site is nearby Chelmsford and was subject to some bombing during the Second World War. Risk: There is a risk that the project may encounter UXO during the enabling works stage. Effect: Delay to the construction programme as project will have to instruct an UXO disposal team to mitigate risk.	Delay is based on time taken for disposal unit to remove / inspect any potential UXO (2-5 days)	5%				

8.1 High level contractor risks

Risk ID	Risk Title	Risk Description	Prob	Minimum	Maximum	Mean
R1	Theft and Vandalism	There is a risk that additional costs will be incurred to replace plant or materials due to theft or vandalism on site	30%	£20,000	£200,000	£33,000
R2	Minor Plant Breakdown	There is a risk that productivity on site may be affected on day to day working due to minor plant breakdown	60%	£20,000	£50,000	£21,000
R3	Significant Plant breakdown	There is a risk that additional costs will be incurred to allow for spare plant where possible as well as fitters on site to mitigate issues or some additional possessions may be needed if any of the currently planned possessions are missed	30%	£250,000	£800,000	£157,500
R4	Construction Methodology change	There is a risk that additional costs will be incurred due to significant changes to the construction methodology caused by plant availability, contractor not in place	20%	£50,000	£250,000	£30,000
R5	Poor weather conditions	There is a risk that productivity on site may be affected on day to day working due to poor weather conditions	25%	£100,000	£500,000	£75,000
R6	Contractor contaminates worksite	There is a risk of additional costs in order to safely dispose of any contaminated caused during construction.	10%	£20,000	£50,000	£3,500
R7	Additional hoarding/fencing beyond what is foreseen is needed	There is a risk that additional hoarding or fencing may be required beyond what is currently allowed for within the estimate	15%	£50,000	£100,000	£11,250
R8	Site compound	There is a risk of additional costs beyond what is currently allowed for within the estimate for the site compound due to changes to location and/or parameters for the site compound	10%	£100,000	£250,000	£17,500

Risk ID	Risk Title	Risk Description	Prob	Minimum	Maximum	Mean
R9	Traffic management (over currently estimated)	There is a risk that additional allowances for traffic management may be required beyond what is currently allowed for within the estimate	10%	£20,000	£50,000	£3,500
R10	Resources	There is a risk that specialist resource may not be available during construction period, last minute cancellation	10%	£20,000	£50,000	£3,500
R11	Materials	There is a risk that there may be additional costs to address any issues with materials (quality damaged goods, delivery delays, spares, etc)	15%	£20,000	£100,000	£9,000

[Page Intentionally left blank]

9. Appendix B – Estimating Uncertainty

9.1 Estimating Uncertainty for Station Only

Table 9.1 Estimating uncertainty for Station Only

		Base Cost	Minimum	Maximum
1	Direct Construction Works			
1.01	Railway Control Systems	7,900,909.85		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	2,114,144.65	-5.00%	10.00%
	Cost Info (Suspect)	2,286,503.10	-5.00%	30.00%
	Allowances (Prov Sums)	3,500,262.10	-10.00%	85.00%
1.02	Train Power Systems (Station only)	6,838,178.80		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	6,154,591.58	-5.00%	10.00%
	Cost Info (Suspect)	-	-5.00%	30.00%
	Allowances (Prov Sums)	683,587.22	-10.00%	50.00%
1.03	Electric Power and Plant	2,897,140.42		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	1,466,065.29	-5.00%	10.00%
	Cost Info (Suspect)	91,500.00	-5.00%	30.00%
	Allowances (Prov Sums)	1,339,575.12	-10.00%	75.00%
1.04	Permanent Way	8,920,978.39		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	5,579,146.63	-5.00%	10.00%
	Cost Info (Suspect)	3,230,225.43	-5.00%	25.00%
	Allowances (Prov Sums)	111,606.33	-10.00%	45.00%
1.05	Operational Telecommunication Systems	4,609,703.88		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	1,114,385.55	-5.00%	10.00%
	Cost Info (Suspect)	2,580,455.49	-5.00%	30.00%
	Allowances (Prov Sums)	914,862.85	-10.00%	50.00%
1.06	Buildings and Property	22,151,954.17		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	17,092,198.71	-5.00%	10.00%
	Cost Info (Suspect)	3,809,139.81	-5.00%	25.00%
	Allowances (Prov Sums)	1,250,615.65	-10.00%	50.00%
1.07	Civil Engineering	20,719,527.16		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	13,092,635.49	-5.00%	25.00%

		Base Cost	Minimum	Maximum
	Cost Info (Suspect)	7,105,531.67	-5.00%	30.00%
	Allowances (Prov Sums)	521,360.00	-10.00%	50.00%
1.08	Enabling Works	1,130,962.87		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	423,210.00	-5.00%	10.00%
	Cost Info (Suspect)	123,750.00	-5.00%	30.00%
	Allowances (Prov Sums)	584,002.87	-10.00%	50.00%
2.01	Preliminaries	16,847,223.41		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	15,140,839.01	-5.00%	10.00%
	Cost Info (Suspect)	-	-10.00%	30.00%
	Allowances (Prov Sums)	1,706,384.40	-10.00%	50.00%
2.02	Contractor overhead and profit	8,281,492.10		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	-	-5.00%	10.00%
	Cost Info (Suspect)	8,281,492.10	-5.00%	35.00%
	Allowances (Prov Sums)	-	-10.00%	50.00%
3.01	Design team fees	7,496,602.02		
	COWD	1,358,058.00	0.00%	0.00%
	Quotes (exclude GEFF design)	5,431,615.63	0.00%	5.00%
	Cost Info (Reliable)	-	-5.00%	10.00%
	Cost Info (Suspect)	-	-10.00%	20.00%
	Allowances (Prov Sums)	706,928.38	-5.00%	20.00%
3.02	Project Management fees	10,063,440.00		
	COWD	1,636,707.00	0.00%	0.00%
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	8,426,733.00	-5.00%	10.00%
	Cost Info (Suspect)	-	-10.00%	40.00%
	Allowances (Prov Sums)	-	-10.00%	50.00%
3.03	Other Project costs	9,819,938.00		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	9,271,938.00	-5.00%	10.00%
	Cost Info (Suspect)	548,000.00	-10.00%	30.00%
	Allowances (Prov Sums)	-	-10.00%	50.00%
	NR Fee Fund 5%	5,661,853.82		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	5,661,853.82	-5.00%	10.00%
	Cost Info (Suspect)	-	-10.00%	40.00%
	Allowances (Prov Sums)	-	-10.00%	50.00%
	NR Industry Fee 2%	2,264,741.53		

		Base Cost	Minimum	Maximum
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	2,264,741.53	-5.00%	10.00%
	Cost Info (Suspect)	¬¬	-10.00%	40.00%
	Allowances (Prov Sums)	-	-10.00%	50.00%

The graph in Figure 9.1 below shows the simulated range of estimating uncertainty.

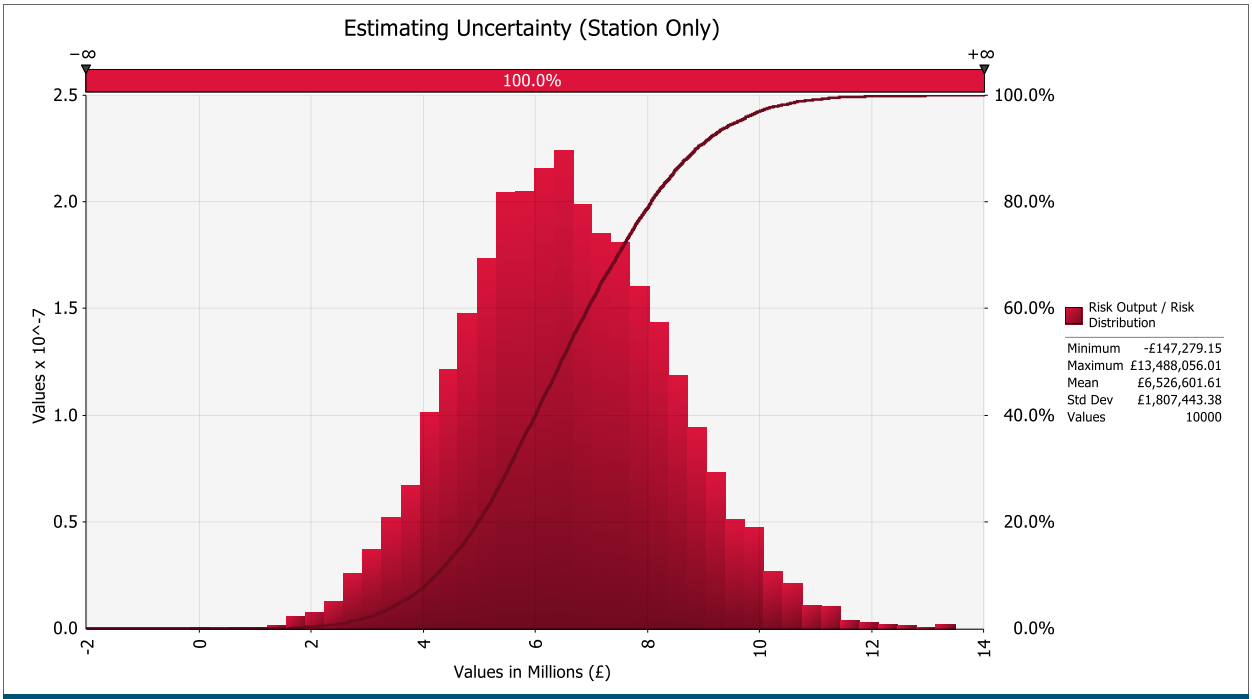


Figure 9.1 S-Curve showing estimating uncertainty for Station Only

9.2 Estimating Uncertainty for GEFF only

Table 9.2 Estimating uncertainty for GEFF Only

		Base Cost	Minimum	Maximum
1	**Direct Construction Works**			
1.02	Train Power Systems (GEFF only)	2,439,309		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	2,217,960	-5.00%	10.00%
	Cost Info (Suspect)	-	-5.00%	30.00%
	Allowances (Prov Sums)	221,349	-10.00%	50.00%
2.01	Preliminaries	1,305,767		
	Quotes	-	0.00%	5.00%

		Base Cost	Minimum	Maximum
	Cost Info (Reliable)	1,173,511	-5.00%	10.00%
	Cost Info (Suspect)	-	-10.00%	30.00%
	Allowances (Prov Sums)	132,256	-10.00%	50.00%
2.02	Contractor overhead and profit	337,057		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	-	-5.00%	10.00%
	Cost Info (Suspect)	337,057	-5.00%	35.00%
	Allowances (Prov Sums)	-	-10.00%	50.00%
3.01	Design team fees	331,913		
	COWD	-	0.00%	0.00%
	Quotes (GEFF only)	331,913	0.00%	5.00%
	Cost Info (Reliable)	-	-5.00%	10.00%
	Cost Info (Suspect)	-	-10.00%	20.00%
	Allowances (Prov Sums)	-	-5.00%	20.00%
3.03	Other Project costs	655,724		
	Quotes	-	0.00%	5.00%
	Cost Info (Reliable)	655,724	-5.00%	10.00%
	Cost Info (Suspect)	-	-10.00%	30.00%
	Allowances (Prov Sums)	-	-10.00%	50.00%

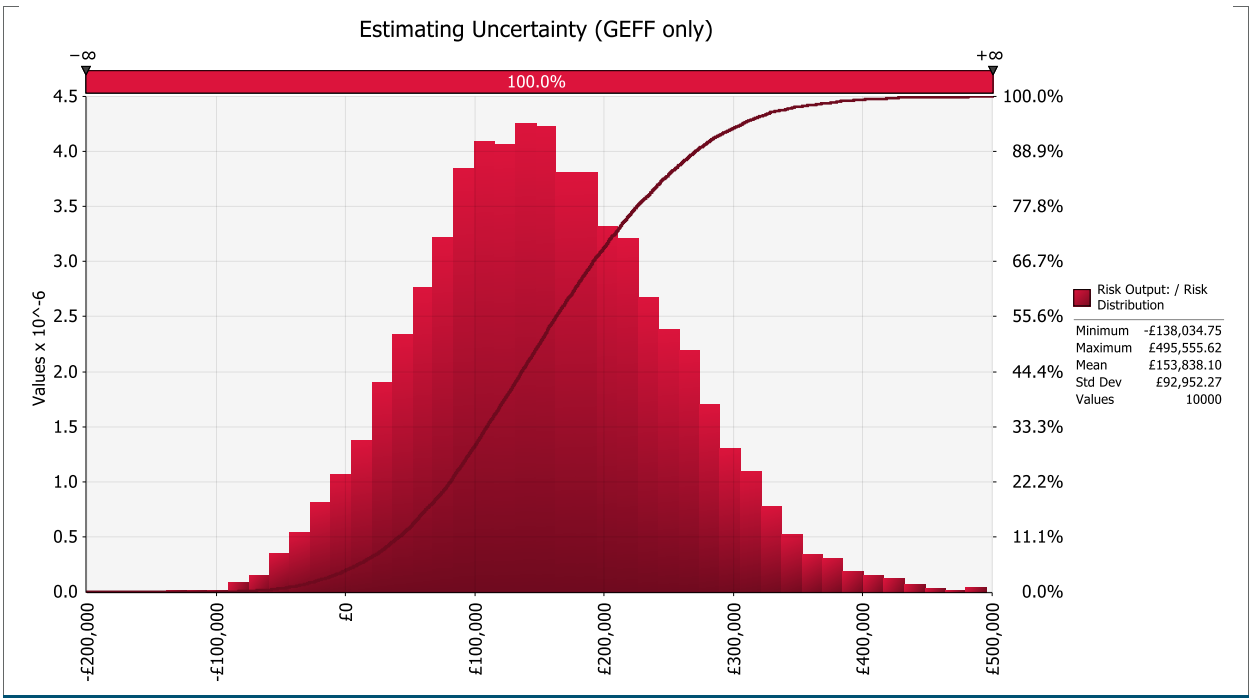


Figure 9.2 S-Curve showing estimating uncertainty for GEFF only

10. Appendix B – QSRA Outputs

10.1 Modelled risks

The following risks, from the risk register in Active Risk Manager (ARM), were incorporated within the analysis.

The duration uncertainties incorporated within the analysis are shown in Appendix B, page 30.

Table 10.1 Design development risks (Pre-GRIP 6) that were modelled

Risk ID	Risk Title	Risk Description	Impact Description	Activities Impacted	Prob.	Impact (days)			Mitigation
						Min	ML**	Max	
408253	Access to Survey Premises	There is a risk that access may not be granted in a timely manner to conduct surveys on the operational railway and private land during AiP or GRIP 5 stage.	Delay to programme as project will have to seek and negotiate for the next available access.	A22770 - Produce Form 003 / Form B / SDS	10%	20		40	Design consultant (WSP) to advise on survey strategy and early identification of survey needed and the survey opportunities. On-going action – Plan for access as per developed survey strategy.
408254	Network Change approval (additional modifications)	There is a risk that Network Change may not be approved and negotiations may introduce design modifications.	As Network Change approval is required for the project to progress to GRIP 5, any significant design modifications will cause a delay to the programme.	A22880 - External Network & Station Lease Documents Approval	35%	10		40	On-going liaison with TOCs/FOCs to provide advice on the scheme.

Risk ID	Risk Title	Risk Description	Impact Description	Activities Impacted	Prob.	Impact (days)			Mitigation
						Min	ML**	Max	
415441	Installation of the Chelmsford North East Bypass (CNEB) may cause changes to the infrastructure	There may be a threat where re-design of signal sighting and OLE system may be required.	As WSP's design do not take into consideration of the bridge interface with the bypass. If any acceleration of the CNEB programme will see the project incur a delay due to re-design.	A22390 - Produce Form 002	5%	20		60	NR to review the design parameters of CNEB programme and ensure to regular follow-up of the project's progress.
470040	Overlapping design with nearby projects to update Signalling Records	There is a risk that the project would need to dedicate resource to integrate design with other projects in order to update the source records.	If the risk is realised, dedicated resource is required to complete the work within a month.	A1700550 - Produce Signalling GRIP 4 AIP Design	20%	0	20	20	Put in an early request for the source records. If other projects have acquired it, ensure to liaise with project team to establish parallel designing procedures.
486819	Access strategy not approved by TOCs/FOCs	There is a risk that TOC/FOC will have disagreements about the access to the railway to complete the work.	The planning application will go in stipulating how the project plans to construct the station. However, if there are disagreements from TOC/FOC's about access to the railway to complete the work, this may see that the project must modify how it constructs and this will change the application.	A22840 - Disruptive Possession Planning / Negotiations	10%	5	10	15	Early engagement with TOC and FOC.

Risk ID	Risk Title	Risk Description	Impact Description	Activities Impacted	Prob.	Impact (days)			Mitigation
						Min	ML**	Max	
469983	Incomplete drainage design of Countryside Properties	There is a risk that the project will incur some delay if the drainage design which is developed by Countryside is not complete in a timely manner.	Delay to programme due to re-design of the drainage outfall.	A22770 - Produce Form 003 / Form B / SDS	10%	10		20	On-going liaison with Countryside to ensure the drainage design is complete.
473533	Expansion of TWAO application (due to Essex TWAO delays)	There is a risk that the project may incur additional costs and delays as a result of delays with Essex TWAO which would require the projects TWAO to include the public right of way for Paynes and Noakes.	Potential delay to programme to include the PRoW for Paynes and Noakes into the TWAO application	A1700330 - Stage 3 - Post Application Stage / SoS Decision Stage (TWAO)	50%	0		40	Await updates on progress of TWAO.
489943	Delays in obtaining MSRP approval	There is a risk that project may have to alter the proposed design and construction of the signalling discipline due to modifications imposed by the MSRP.	- Additional design team costs due to re-design - Potential knock-on delay impact to construction programme'	A1700640 - Signalling - MSRP Approval	10%	20		40	Ensure to communicate with MSRP if any significant changes to signalling design were done prior to panel review.
473531	Revalidation of Environmental Impact Assessment (EIA)	There is a risk that the project will incur additional costs if revalidation of EIA suggests that modifications to the design will be required to ensure project is compliant.	Depending on the output of the assessment, the project may need to implement additional measures to be compliant.	A22770 - Produce Form 003 / Form B / SDS	10%	20		40	Assess what additional intervention may be required following outcome of EIA revalidation.

Table 10.2 Delivery risks (GRIP 6) that were modelled

Risk ID	Risk Title	Risk Description	Impact Description	Activities Impacted	Prob.	Impact (days)			Mitigation
						Min	ML**	Max	
408251	Delays in manufacturing long lead items (S&C)	There is a risk that the S&C components cannot be manufactured on-time. This could be due to the capacity of the manufacturer, late design and compressed programme.	If S&C is not procured or delivered on time then major blockades may be cancelled, therefore impacting the construction methodology and result in a delay to the programme.	A22050 - Site Works	10%	5		20	Determine which long lead components are required and place order with manufacturer in a timely manner. Freeze design in accordance with lead time
489946	Unexploded ordnance (UXO) disposal	There is a risk that the project may encounter UXO during the enabling works stage.	Delay to the construction programme as project will have to instruct an UXO disposal team to mitigate risk.	A22050 - Site Works	5%	2		5	Further assessment of UXO presence and site supervision Consider providing explosive ordnance disposal expert supervision during enabling works if risk is deemed high.
408226	Contaminated land / Unforeseen ground conditions	There is a residual risk that the ground conditions may be worse than anticipated during construction.	Depending on the severity of the ground conditions; project may incur additional costs in: - Re-designing works (e.g. piles), affecting construction works as well - Treatment costs or contaminated waste removal costs.	A22050 - Site Works	5%	10		20	Ensure all GI works are carried out before starting AIP design and on-going monitoring once construction work starts.

Risk ID	Risk Title	Risk Description	Impact Description	Activities Impacted	Prob.	Impact (days)			Mitigation
						Min	ML**	Max	
408403	Invasive species found on site	There is a threat that the project may come into contact with invasive species (e.g. Japanese Knotweed) during site works.	- Additional costs incur to the project due to clearance. - Potential delay to site works depending on severity of the species.	A22050 - Site Works	5%	2		5	Complete a detailed ecological survey and verify the presence of invasive species by a qualified ecologist prior to start of construction.
469977	Archaeological Sightings	There is a risk that the project will incur delays due to any archaeological finds during construction	There is no evidence of archaeological remains on site. However, no studies were conducted to prove this. If there were any findings, it will incur a month delay.	A22050 - Site Works	10%	0		20	Monitor works and review survey results
408402	Unforeseen mitigations required for protected species	There is a threat that any unidentified protected species would require the project to set up mitigations to protect or move the species.	If the project has missed the survey calendar to carry out the appropriate mitigations, it would result in a significant delay to the programme.	A22040 - Mobilisation	35%	20		40	Understand the results of the initial survey to identify if any protected species are found in order to set up the appropriate mitigations.

11. QA Check and Authorisation Sign-off Sheet

Self-Assurance

Completion by report author

Was the model prepared in accordance with all the latest relevant procedures, templates and guidelines? Detail separately if "no" with details why not.	Yes
Did the workshop attendees represent the correct number of key stakeholders with the appropriate competencies for the project?	Yes
Were the appropriate requirements document provided for the workshop to set the context for the project e.g. CRD / RRD / DRRD / drawings / programme?	Yes
Was a detailed Point Estimate (excluding risk) provided to allow Estimating Uncertainty to be modelled?	Yes
Has the risk register been entered in ARM and the minimum fields report been checked?	Yes
Is the QRA in your opinion free of any significant errors?	Yes
ECAM submission?	N/A
Any comments:	
Certified By:	
Name:	Alex Todorova
Title:	Risk and Value Analyst
Date:	06/08/20

A list of R&V Team members who have the capability to undertake the QA Check and the report Authorisation can be found in the R&VM Product QA Capability Matrix IP-ERVM-370.

Quality Assurance Check

Completion by Quality Approver

	Checked and Okay?
Consistent job reference, job title and dates used throughout?	Yes
Has the ABCD process been correctly followed?	Yes
Have the ABCD assumptions been recorded in ARM?	Yes
Has the Point Estimate been modelled for estimating uncertainty and are the units consistent throughout (e.g. percentages not out by a factor of 100)?	Yes
Are the risks all clearly expressed and unambiguous?	Yes
Checked for any obvious omissions in the risks modelled?	Yes
Are there any low probability risks with an unacceptably high impact?	No
Have all risks been modelled? (i.e. probability, impact, distribution type and result for each)	Yes
Are units used consistent throughout? (e.g. no mixing of £ and £k, percentages not out by a factor of 100)	Yes

Is the overall result in line with what you would expect? Detail separately if "no" with details why not.	Yes
Is the QRA in your opinion free of any significant errors?	Yes
Does the covering report contain the correct data outputs? (including mean, P80, point estimate)	Yes
Does the report and Executive Summary present a logical outcome of the analysis / results with no flaws or omissions	Yes
If ARM has been used for modelling the following checks can be omitted	
Checked at least 1 risk per 20 for correct formulae, output etc.?	N/A
Have any opportunities that are included been modelled as a negative rather than a positive result if?	N/A
Checked for any adverse effect on results of "hidden" rows or columns in the model has been used?	N/A
Checked any sigma functions include entire range of data required?	N/A
Any comments:	

QA Approved By:	
Name:	Cordu Roberts
Title:	Risk and Value Manager
Date:	28th August 2020

Report Authorisation

ECAM submission by Principal Risk & Value Manager

Other submissions by Risk & Value Manager (unless local Risk & Value Management Plan dictates Authorisation by the Principal Risk & Value Manager e.g. for LoC 1& 2 projects)

	Checked and Okay?
Has the previous QA check been completed and signed off?	Yes
Is the level of analysis sufficient for the level of the job?	Yes
Are the risks all clearly expressed and unambiguous?	Yes
Checked for any obvious omissions in the options considered?	Yes
Is the overall result in line with what you would expect?	Yes
Is the QRA in your opinion free of any significant errors?	Yes
Does the report and Executive Summary present a logical outcome of the analysis / results with no flaws or omissions?	Yes
Any comments: I'd like confirmation of the IA between NR and the third party funders, specifically is this an emerging cost contract where NR is carries no exposed to cost any risks arising from the project. This has implications for once of the exclusions which is excluded from the modelling, and may be best managed by the Project Team but where the costs ultimately remain with the funders.	

Report Authorised By:	
Name:	Simon Burton
Title:	PRVM
Date:	7th September 2020

[Page Intentionally left blank]

Network Rail Infrastructure Projects
Milton Keynes
The Quadrant: MK
Elder Gate, Milton Keynes, MK9 1EN
T +44(0)1908 781000
www.networkrail.co.uk

PROJECT RISK REGISTER

PROJECT NAME: Chelmsford NE Bypass

STAGE: Preliminary Design

REVISION NUMBER: P02

VERSION DATE: 21/07/2020

	Risk Identification								Risk Assessment										
Rank	**Risk No (Identifier)**	**Discipline**	**Risk Owner**	**Risk Status**	**Risk Title**	**Risk Cause** *"Causes are definite events or sets of circumstances which exist in the project or its environment, and which give rise to uncertainty"* • Key words: is, do, has, has not... [present condition]"	**Risk Event** *"The uncertain event is the true risk, as it may or may not happen and gives rise to uncertain outcomes for the project"* • Key words: may, might, possibly... [uncertain future]	**Risk Effect** *"Effects are unplanned variations from the objectives, either positive or negative, which would arise as a result of risks occurring"* • Key words: would, could... [conditional future]	**Probability Score (1 to 5)**	**Cost Impact Score (1 to 5)**	**Time Impact Score (1 to 5)**	**Quality Impact Score (1 to 5)**	**Reputation Impact Score (1 to 5)**	**Overall Risk Ranking**	**Proposed Response Measure**	**Risk actionee name**	**Target Date for Close out of action**	**Status**	**Comments**
1	CNEB-034	Consenting / Orders	Richard McBride/Suki Coe	Open	Construction through mineral safeguarding areas	Mineral is commercially viable to extract.	Mineral resource assessment identifies need to extract mineral prior to construction.	Substantial delay to the project whilst minerals are extracted. Potential for Section 1B to be cancelled.	3	2	5	1	1	15	Carry out mineral resource assessment	Richard McBride	31/07/2020	Open	
2	CNEB-072	Funding	Chris Cooper	Open	Failure to spend funding with in HIF timescale	Very tight programme included in HIF bid with limited to no float.	Expenditure of funding outside the HIF deadline (March 2024) which Homes England do not endorse	Funding removed and potential project stoppage or seek alternative funding	3	5	5	1	5	15	1. Setup IAP to revalidate programme to completion including better understanding of construction, orders and CPO timescales 2. Report programme variations to ECC through project board regularly	Chris Cooper	1. Complete 2. 13/07/2020 (Ongoing)	Open	
3	CNEB-074	Land	Chris Cooper	Open	Failure to negotiate land purchase	Cannot come to agreeable terms with the landowners - cost / access / accommodation works etc	Failure to negotiate the advanced purchase of land requiring ECC to progress a CPO	CPO and risk of Public Inquiry. This would substantially delay programme and increase costs	4	2	4	1	4	16	1. Early negotiation to commence with landowners in advance of planning 2. CPO to be prepared for in parallel to negotiations to limit programme impacts	LSH Chris Cooper	31/07/2020 31/10/2020	Open	
4	CNEB-025	Construction	Ben Mills	Open	Hansons Backfill Programme Phasing of gravel backfill works relative to the scheme and its impact on the proposed drainage solutions	External market forces (sand and gravel)	Hansons fails to backfill full quantity (700,000m3) of material by 2021.	Short term delay: less consolidated fill requires greater ground improvement Long term delay: ground levels below required level so project funds backfill	3	4	5	1	3	15	1. Engagement with Hanson and ECC Planners to understand programme and level of this potential risk - monitor regularly 2. ECC and Hansons to formally agree that ECC will cover additional costs	1. Chris Cooper / Ben Mills 2. Mark Eves	1. 30/07/2020 2. 30/08/2020	Open	
5	CNEB-062	Stakeholder Engagement	Geoff Loader	Open	Political interface pre 2021 elections	Planning permission is proposed in advance of the 2021 Local Elections	Political influence affects progress of the project	The submission of planning application may be impacted by Purdah if submission is in March or April, potentially delaying planning. Even if Purdah is avoided, then in the lead up to the Local Elections, politicians may use the scheme as a political tool which could remove support for the scheme at planning (and beyond). Delay to the scheme / project stoppage	3	3	4	3	1	12	1) Plan for Purdah and be agile and flexible enough to mitigate any impact. 2) Engage Members through the proposed forums throughout 2020 3) Engaging and communicating with Politicians regularly and proactively 4) Continue to push for an earlier completion of the EIA and Planning Statement.	1), 2), 3) Geoff Loader 4) Richard McBride / Alex Nahani	1) 31/07/2020 2) 20/12/2020 3) 20/12/2020 4) 31/07/2020	Open	28/05/2020 - Communications plan is approved and covers a full programme of engagement. Covid-19 has impacted face-to-face engagement but a virtual exhibition is programmed for July with the option to host a public event once restrictions are eased. Stakeholder were updated on this in May. The purdah action is, therefore, ongoing but mitigated. 03/07/2020 - virtual engagement has moved forward considerably and is due to start on
	CNEB-085	Construction	Ben Mills	Open	Alignment and reconfiguring works in live traffic	Clash between construction works and public	Injuries / death to operatives and public	Project stoppage	3	5	4	1	5	15	1. Reassess alignment of Phase 2 for traffic management plan	Ben Mills	1. 31/07/2020	Open	
	CNEB-086	Construction	Ben Mills	Open	CPO/Land ownership as construction starting	Delay to CPO and land purchase	Construction required to be started before land acquired	Project stoppage / HIF Funding	3	5	4	1	3	15	1. Commence early land negotiation 2. Prepare CPO in parallel as land negotiation	1. LSH 2. Richard McBride	1. 31/07/2020 2. 30/09/2020	Open	
	CNEB-045	Environment	Una Wheeler	Open	Additional unplanned mitigation	Planners do not agree with the proposed mitigation put forward in the Environmental Statement.	Planning conditions require additional mitigation for protected species, specifically Great Crested Newts	Additional expenditure and possibly land required	4	3	3	3	3	12	1. Assessment and early discussion with Planners through pre planning application	Una Wheeler	1. 01/07/2020	Open	
	CNEB-007	Consenting / Orders	Chris Cooper	Open	Increases to Land Purchase Value	Land negotiations result in higher purchase rate to avoid CPO, accommodation works / development of design increases area required, and/or land required outside of safeguarded corridor results in non-agricultural rate for land.	Land purchase value increase over estimate included in HIF bid	Substantial increased cost for land purchase and exceedance of budget	4	3	1	1	2	12	1. Reassess land purchase costs on DFB design	LSH	31/07/2020	Open	09/04/2020 - LSH have not finished this yet and are late delivering it (Ongoing)
	CNEB-033	Construction	Keith Pearce	Open	UXO	Decommissioned airfield causes risk	Unearthing UXO during construction and advanced surveys	1. Potential explosion causing injury or fatality 2. Delays during Geotechnical surveys, or during construction. Additional costs for monitoring during construction/surveys	3	2	4	1	3	12	1. Review requirement for UXO survey in advance to identify areas of risk and programme accordingly	Keith Pearce	1. Complete	Open	

PROJECT RISK REGISTER

PROJECT NAME: Chelmsford NE Bypass

STAGE: Preliminary Design

REVISION NUMBER: P02

VERSION DATE: 21/07/2020

	Risk Identification								Risk Assessment									
Rank	**Risk No (Identifier)**	**Discipline**	**Risk Owner**	**Risk Status**	**Risk Title**	**Risk Cause** *"Causes are definite events or sets of circumstances which exist in the project or its environment, and which give rise to uncertainty"* • Key words: is, do, has, has not... [present condition]"	**Risk Event** *"The uncertain event is the true risk, as it may or may not happen and gives rise to uncertain outcomes for the project"* • Key words: may, might, possibly... [uncertain future]	**Risk Effect** *"Effects are unplanned variations from the objectives, either positive or negative, which would arise as a result of risks occurring"* • Key words: would, could... [conditional future]	**Probability Score (1 to 5)**	**Cost Impact Score (1 to 5)**	**Time Impact Score (1 to 5)**	**Quality Impact Score (1 to 5)**	**Reputation Impact Score (1 to 5)**	**Overall Risk Ranking**	**Proposed Response Measure**	**Risk actionee name**	**Target Date for Close out of action**	**Status**	**Comments**
	CNEB-017	Construction	Ben Mills	Open	Reusability of site-won material	Contamination of existing ground and poor geotechnical quality.	Percentage of re-usability of cut material: The cut material is currently assumed to be 100% suitable as fill material. This may be as low as Material re-usable to be assumed 50 – 80%	We may require to import more material which increases costs and delayed programme.	3	5	4	4	3	15	1. Finalise specification and issue GI tender. 2. Review outcome of the GI	Keith Pearce / Chris Cooper	1. Complete 2. 31/08/2020	Open	
	CNEB-010	Construction	Ben Mills	Open	Construction traffic routes	High level of construction running concurrently in region.	Longer and more complicated construction traffic routing	Increased costs in providing access / materials to site. Increases to programme logistics and complexity	3	3	3	4	4	12	1. Early involvement with ECC Highways, developer and Network Rail to establish joint programmes. 2. Scheme Construction Management Plan.	1. ECC 2. Ben Mills	1. TBC 2. 30/09/2020	Open	
	CNEB-037	Environment	Una Wheeler	Open	Archaeological Works	Insufficient time in the programme or difficulties securing land access to undertake archaeological trial trenches as part of the Environmental Impact Assessment/planning application. Trial Trenching then becomes a planning condition and needs to be undertaken prior to construction.	Failure to identify advanced ecological and archaeological mitigation works.	Delays to main construction activities	3	3	4	3	4	12	1) Advanced access to land to complete archaeological and ecological surveys	Una Wheeler	1. 31/07/2020	Open	
	CNEB-006	Consenting / Orders	Andrea Chadwick	Open	Stopping up may be objected to	Failure to obtain agreement to proposals with statutory consultees	Stopping up / diversion of PROWs and SROs are objected to	Additional costs going through Public Inquiry and delay to scheme delivery	3	3	4	2	3	12	1. Engage with statutory consultees	Alex Woodgate	31/08/2020	Open	11/03/2020 - Engagement has begun with PRoW officers in ECC, and Vicky Duff on SRO. 01/06/2020 - External engagement due to begin virtually in July
	CNEB-073	Land	Chris Cooper	Open	Wayleaves to share accesses between Highway Authority and land owners are not agreed to	Access arrangements proposed / wayleaves for joint Highway/landowner are not agreed	Additional accommodation works required for landowners	Additional accommodation work (such as overbridges) increasing costs and land requirements which impacts CPO and compensation. Late occurrence risks validity of EIA/ES	3	4	3	3	2	12	Early negotiation with landowners to agree access arrangements and avoid overbridges etc	LSH	1. 31/07/2020	Open	
	CNEB-019	Construction	Ben Mills	Open	Cut/Fill Imbalance	Imbalance in cut/fill quantities.	Lack of availability for imported fill may require borrow pits to obtain additional material for earthworks	Need to CPO/acquire additional land increasing costs and causing programme delay	2	3	3	1	5	10	1. Re-run cut-fill balance for DFB 2. Assessment of the affect on the Construction programme logistics	Grant Banester Ben Mills	1. Closed 2. 31/07/2020	Open	
	CNEB-012	Stakeholder Engagement	Geoff Loader	Open	Protester action	Poor engagement with the public	Protestor action on site	Potential delays to construction. Reputational risk to ECC should negative press be released	2	3	3	1	3	6	1) Engagement / Consultation with general public 2) Communications strategy to be regularly updated and internally distributed to cover project key messages 3) Ongoing delivery of key messages and response to public enquiries	Geoff Loader	1) 30/09/2020 2) & 3) 20/12/2024	Open	Engagement events cancelled because of Covid-19 but a virtual engagement is programmed for July with the option of a public event once the situation eases.
	CNEB-014	Construction	Ben Mills	Open	Unforeseen ground conditions	Insufficient testing sites and potential changes associated to seasonality or conditions	Unforeseen ground conditions not predicted by GI. (Hansons backfill is unengineered)	Additional localised ground improvement	3	3	3	1	1	9	1. Carry out GI surveys as soon as land is available 2. Review potential backfill Engineering Options 3. Agree intervention in backfill methodology 4. Understand agree commercial relationship required between Essex CC and Hansons.	1 & 2 . Keith Pearce 3. Mark Eves / Alex Woodgate 4. Mark Eves / Chris Cooper	1. Complete 2. 30/08/2020 3. 01/09/2020 4. 01/09/2020	Open	11/03/2020 - 4. Meeting to discuss formation of legal agreement between Hanson and ECC to be arranged 01/06/2020 - 1. GI to begin on site on Wednesday 03/06, 3. Hanson have been on furlough but are back in June. Next meeting on 10/06/2020

PROJECT RISK REGISTER

PROJECT NAME: Chelmsford NE Bypass

STAGE: Preliminary Design

REVISION NUMBER: P02

VERSION DATE: 21/07/2020

	Risk Identification								Risk Assessment									
Rank	Risk No (Identifier)	Discipline	Risk Owner	Risk Status	Risk Title	Risk Cause *"Causes are definite events or sets of circumstances which exist in the project or its environment, and which give rise to uncertainty"* *• Key words: is, do, has, has not... [present condition]"*	Risk Event *"The uncertain event is the true risk, as it may or may not happen and gives rise to uncertain outcomes for the project"* *• Key words: may, might, possibly... [uncertain future]*	Risk Effect *"Effects are unplanned variations from the objectives, either positive or negative, which would arise as a result of risks occurring"* *• Key words: would, could... [conditional future]*	Probability Score (1 to 5)	Cost Impact Score (1 to 5)	Time Impact Score (1 to 5)	Quality Impact Score (1 to 5)	Reputation Impact Score (1 to 5)	Overall Risk Ranking	Proposed Response Measure	Risk actionee name	Target Date for Close out of action	Status	Comments
	CNEB-015	Construction	Ben Mills	Open	Unforeseen contaminated material	Insufficient testing sites and potential changes associated to seasonality or conditions	Unforeseen contaminated material not detected by GI	Delays and costs in dealing with contaminated material	3	3	3	1	1	9	Carry out GI surveys as soon as land is available	Keith Pearce	31/07/2020	Open	
	CNEB-051	Stakeholder Engagement	Geoff Loader	Open	Landowner refusal	Due to lack of communication understanding or general understanding of the project	Landowners may refuse access to undertake surveys	Delays to site access and a season is potentially missed	2	3	3	1	1	6	1) Early engagement with landowners post-bid announcement 2) Investigate use of highways powers to gain access to key sites in advance.	1) Geoff Loader 2) ECC	1) 30/08/2020 2) Completed	Open	28/05/2020 - Engagement took place with landowners in May via an update and individual conversations to close out the action. Virtual meetings are being programmed for the summer to continue engagement with landowners.
	CNEB-061	Design	Chris Hook	Open	TM may change modelling conclusion or environmental assessment area.	Re-run of assessment with new Traffic Model	Update of traffic model may change modelling conclusion or environmental assessment area.	Re-work at a local level of the highways design or complete re-work of the air/noise quality modelling if substantial change, delaying EIA/planning milestones. Substantial change deemed unlikely at this stage.	3	1	3	2	1	9	1) Update of model commissioned under A&N scheme 2) Ensure that teams are liaising throughout the process to raise risk of major change early.	1. ECC 2. Chris Hook	1. Completed 2. 31/08/2020	Open	
	CNEB-063	Design	Chris Hook	Open	Late provision of traffic model forecast to environmental and highways team	Delays to traffic model update project	Late provision of traffic model forecast to environmental and highways team	Delays to environmental impact assessment and planning (critical path)	3	1	3	1	1	9	1. Work closely with traffic modelling team to share information. 2. Prepare forecast models in advance of receiving updated base model.	Chris Hook	31/08/2020	Open	
	CNEB-057	Design	Alex Woodgate	Open	Bus Stop relocation and routing	Disagreement of scoring applied to options presented.	ECC Passenger Transport team do not support the preferred solution to relocate a pair of bus stops on the existing A131.	Additional modelling required and potential changes to public information. May need to build a parallel route adjacent to the dual carriageway	3	3	3	1	2	9	1. Continue to investigate options and liaison with PT team. Raise at the Project Board 2. Discuss impact on busses ahead of PT	ECC	1. Completed 2. TBC	Open	11/03/2020 - Project Board delayed modelling taking place. It is anticipated that this risk will close but conflicting messages being received.
	CNEB-005	Consenting / Orders	Richard McBride/Suki Coe	Open	CPO (Compulsory Purchase Order) may be objected to.	Unable to acquire all interests in the land or those with interests in the land objecting to the scheme	Compulsory Purchase Order (CPO) is objected to and Public Inquiry is required	Additional costs going through Public Inquiry and substantial delay to scheme delivery. Likelihood limited by safeguarded corridor in local plan.	2	3	4	2	4	8	Negotiations for land purchase to start in November 2019 with strategy to purchase in advance, running in parallel to CPO.	LSH	31/07/2020	Open	
	CNEB-013	Funding	Chris Cooper	Open	Lack of labour force	Buoyant Highway construction market	Lack of industry workforce in context of number of highway schemes locally and nationally (A12, A120-A133 Link Rd, Garden Village, Lower Thames Crossing etc)	Potential programme delays leading to higher costs through inflation or higher tendered values due to increased demand	2	4	4	1	4	8	Consider in procurement strategy, including consideration of early contractor involvement with an attempt to secure labours / resources.	Colin McHugh	31/07/2020	Open	
	CNEB-039	Environment	Alex Woodgate	Open	Protected Lanes	Additional traffic due to side roads closure	Goodmans Lane and Boreham Road are protected lanes. Stopping up of side roads increases flow along these.	Side road changes/closures are challenged at planning application. Could require all three side roads to remain open.	2	3	2	2	3	6	Model impacts on traffic during scheme development and propose mitigation measures in advance in planning application. Address during planning process.	Chris Hook	31/07/2020	Open	
	CNEB-047	Environment	Jose Tavares	Open	Additional drainage infrastructure required	Change in standards, increase in surface water flood risk.	Lead Local Flood Authority may require additional attenuation/flood compensation storage for drainage	Additional costs for construction and potentially for land purchase	2	2	3	1	3	6	Early engagement with Lead Local Flood Authority and pre-application planning advice	Jose Tavares	31/07/2020	Open	
	CNEB-069	Design	LSH	Open	Risk of changes to the red line boundary	Requirements of GI and revised topo surveys, drainage and flood attenuation requirements and any off-site environmental mitigation/ecological translocation	Changes to the scheme red line boundary for planning could incorporate new land owners currently not being engaged with.	Reduced time for engagement prior to planning could lead to CPO difficulties/objections resulting in Public Inquiry.	2	4	3	2	3	8	RLB to be updated at each design fix with the latest input information with the final RLB for planning anticipated in the November 2020 fix. This will incorporate the requirements of GI, topo and environmental mitigation	Alex Woodgate ECC/LSH	31/08/2020	Open	01/06/2020 - Final RLB now in February 2021 following EIA. EIA fix of RLB at end of August.
	CNEB-075	Land	Chris Cooper	Open	Risk of random strip for marriage land (Cranham Road)	Diversion of stats equipment through Marriage land	Despite redesign to move side road out of Marriage land, there could be diversion of stats equipment through this land.	Increased risk of CPO (cost / programme impact) and/or increase land purchase costs	2	2	4	1	3	8	Progress C3 enquiries to define stats diversions and monitor design changes to avoid any further impacts on Marriage land	Grant Banester	31/08/2020	Open	

PROJECT RISK REGISTER

PROJECT NAME: Chelmsford NE Bypass

STAGE: Preliminary Design

REVISION NUMBER: P02

VERSION DATE: 21/07/2020

	Risk Identification								Risk Assessment									
Rank	**Risk No (Identifier)**	**Discipline**	**Risk Owner**	**Risk Status**	**Risk Title**	**Risk Cause** *"Causes are definite events or sets of circumstances which exist in the project or its environment, and which give rise to uncertainty"* • Key words: is, do, has, has not... [present condition]"	**Risk Event** *"The uncertain event is the true risk, as it may or may not happen and gives rise to uncertain outcomes for the project"* • Key words: may, might, possibly... [uncertain future]	**Risk Effect** *"Effects are unplanned variations from the objectives, either positive or negative, which would arise as a result of risks occurring"* • Key words: would, could... [conditional future]	**Probability Score (1 to 5)**	**Cost Impact Score (1 to 5)**	**Time Impact Score (1 to 5)**	**Quality Impact Score (1 to 5)**	**Reputation Impact Score (1 to 5)**	**Overall Risk Ranking**	**Proposed Response Measure**	**Risk actionee name**	**Target Date for Close out of action**	**Status**	**Comments**
	CNEB-036	Environment	Una Wheeler	Open	Unknown significant archaeological works	The risk of which were not identified within the archaeological desk-based assessment or follow-on surveys.	Discovery of nationally significant archaeological remains	Preservation in situ and re-design of scheme or excavation of archaeological area. Reputational impact and reprogramming sections of construction at last minute to divert resources - risks programme delivery	2	5	5	3	4	10	Undertake a comprehensive preliminary archaeological assessment	Christina Reade	31/08/2020	Open	Worst case delays the critical path by a year (redesign and preservation in situ)
	CNEB-041	Environment	Una Wheeler	Open	Additional noise mitigation (re-word)	Planners do not agree with the noise assessment and mitigation proposals in the Environmental Statement.	Planning conditions require additional mitigation for noise	Additional expenditure and possibly land required	2	3	3	3	5	10	Noise assessment and early discussion with Planners	Shanti Wisniewska	31/08/2020	Open	
	CNEB-042	Environment	Una Wheeler	Open	Additional screening (re-word)	Planners do not agree with the landscape and visual impact assessment and mitigation proposals in the Environmental Statement.	Planning conditions require additional mitigation for visual impact	Additional expenditure and possibly land required. Risk of change to alignment or screening required	2	3	3	3	5	10	Visual assessment and early discussion with Planners	Helen Alderman	30/09/2020	Open	01/07/2020 - This is currently programmed for the autumn. What we are doing is liaising regarding the viewpoints for the assessment and we are taking onboard the comments in the Scoping Opinion. They have flagged that they may want off-site mitigation for certain viewpoints, so this remains a risk
	CNEB-043	Environment	Una Wheeler	Open	Changes to design strategy	1. Failure to engage with ECC / LLFA and EA 2. Planners do not agree with the flood risk assessment and proposed compensation.	Planning conditions require additional mitigation for flooding compensation area	Additional expenditure and possibly land required Drainage solutions may require additional land outside safeguarded boundary	2	3	3	3	5	10	Engage early with LLFA and early discussion with Planners	Una Wheeler / Jose Tavares	31/07/2020	Open	Initial discussions have been held with ECC Planners/LLFA (14/2/20). It was agreed that hydraulic modelling is only required for Straw brook. LLFA do not require modelling from Boreham Brook.
	CNEB-020	Construction	Ben Mills	Open	Flooding during construction	High water table and potential adverse weather.	Surface water flooding during construction	Delay to construction programme and increase in costs	3	3	2	3	3	9	Review groundwater table levels from GI and conduct seepage analysis	Una Wheeler	15/08/2020	Open	
	CNEB-029	Design	Grant Banester	Open	Statutory undertakers	Unavailability and accuracy of information	Statutory Undertakers C2, C3 or C4 estimates may be late or inaccurate	Design omits provision for diversion routes leading to late re-design in areas outside redline boundary. Material change of planning app and delay to construction.	3	3	1	3	1	9	1) Timely interpretation of C2 responses. 2) Update C3 estimates as required.	1. Grant Banester 2. Paige Solutions	1. Completed 2. 30/06/2020	Open	
	CNEB-002	Consenting / Orders	Richard McBride	Open	Design outside protected corridor	Additional structures and design features required not foreseen in safeguarded corridor	Parts of construction requires outside of safeguarded corridor (i.e. Cranham Road/Drakes Lane)	Land required outside of safeguarded corridor potentially challenged at Planning / CPO or increased cost	2	4	4	3	4	8	1) Review impact of moving alignment and changing design 2) Await decision from Essex Board 3) Consult with developer in development of S106 Safeguarding 4) Record robust justification for any design outside of safeguarded corridor	1. & 2. ECC 3. & 4. Alex Woodgate	1)& 2) Complete 3) 30/07/2020 4) 30/06/2020	Open	01/06/2020 - Principle agreed at consortium meeting for 'safeguarding' through the development. Wording on DOV in Beaulieu Park being discussed
	CNEB-038	Environment	Una Wheeler	Open	Unknown protected species	Insufficient survey effort, surveys scoped out as advised by ECC's Place Services, land access constraints.	Unforeseen protected species found	Potential delays to construction	2	3	4	3	3	8	1) Undertake comprehensive ecology surveys to support the planning application 2) Immediately prior to construction, an ecology site walk over should be undertaken to identify any new species.	Emily Linney	1. 31/07/2020 2. 2022	Open	Prolongation cost (for part of the scheme) and translocation costs
	CNEB-040	Environment	Una Wheeler	Open	Additional compensatory planting (re-word)	Planners do not agree with Environmental Statement and proposed mitigation. Objections from stakeholders influence planners to request	Planning conditions may require additional compensatory tree planting	Additional expenditure and possibly land required	3	2	2	2	2	6	1. Early discussion with Planners and stakeholders of environmental mitigation requirements 2. Look to agree off-site 'offsetting' options with planning authority.	Place Services	1. 31/07/2020 2. 30/09/2020	Open	
	CNEB-064	Design	Alex Woodgate	Open	Non-approval of Departures	Severity too high or doesn't achieve scheme objectives.	Proposed departures are not approved	Re-design of elements and potential additional scheme costs	2	2	3	3	3	6	Discuss and agree proposed departures with client and ECC Highways	Alex Woodgate	30/08/2020	Open	
	CNEB-065	Consenting / Orders	Alex Woodgate	Open	Failure to identify TROs	Lack of engagement with ECC Network Assurance	Traffic regulation orders not identified or agreed to prior to scheme construction start.	1. Additional design costs 2. Potential delayed opening 3. Potential non-enforcement of regulations	2	2	3	3	4	8	1. Table to be established with orders, delivery timescales and requirements.(Next meeting with NA and ELS to be arranged.) - Draft list of TRO's prepared 2. Full set of TRO drawings completed	Grant Banester	1. 01/08/2020 2. 01/11/2020	Open	04/03/2020 - Initial meeting with Essex Highways to discuss the orders held. Looking to create a draft list within next few weeks.

PROJECT RISK REGISTER

PROJECT NAME: Chelmsford NE Bypass

STAGE: Preliminary Design

REVISION NUMBER: P02

VERSION DATE: 21/07/2020

	Risk Identification								Risk Assessment									
Rank	Risk No (Identifier)	Discipline	Risk Owner	Risk Status	Risk Title	Risk Cause *"Causes are definite events or sets of circumstances which exist in the project or its environment, and which give rise to uncertainty"* *• Key words: is, do, has, has not... [present condition]"*	Risk Event *"The uncertain event is the true risk, as it may or may not happen and gives rise to uncertain outcomes for the project"* *• Key words: may, might, possibly... [uncertain future]*	Risk Effect *"Effects are unplanned variations from the objectives, either positive or negative, which would arise as a result of risks occurring"* *• Key words: would, could... [conditional future]*	Probability Score (1 to 5)	Cost Impact Score (1 to 5)	Time Impact Score (1 to 5)	Quality Impact Score (1 to 5)	Reputation Impact Score (1 to 5)	Overall Risk Ranking	Proposed Response Measure	Risk actionee name	Target Date for Close out of action	Status	Comments
	CNEB-070	Design	Alex Woodgate	Open	2039 remodelling means more congestion	Increased demand, development, background growth potential	Changing the design year to 2039 (from current forecast year of 2036) may increase congestion/delay in the traffic model	Redesign of junctions to provide capacity for increased demand	3	2	2	2	1	6	Update base and forecast modelling for planning fix and review flows/turning movements as a result	Chris Hook	31/07/2020	Open	
	CNEB-076	Environment	Una Wheeler	Open	Treatment of dependent housing	An unforeseen number of planning applications are submitted prior to submittal of CNEB planning application.	The number and location of developments to be considered within the ES are greater than initially assumed.	Air/Noise traffic impact thresholds	3	1	2	3	1	9	Agree a cut-off date for when new developments need to be considered within the ES is to be agreed with ECC Planning Officer.	Richard McBride	31/07/2020	Open	15/04/2020 - Original date 30/3/20 - extended to July 2020.
	CNEB-077	Environment	Una Wheeler	Open	Granularity of detail from traffic models	Insufficient traffic data / lack of granularity of details	Air and Traffic Models cannot be completed due to insufficient traffic data / or shows in accurate findings/	Air/Noise traffic impacts and additional time required for remodelling.	2	1	2	4	2	8	Air and Noise teams to have regular communications with traffic team and review traffic data at key stages.	Mily Parveen	Completed	Open	03/03/2020 -Extent of the model network has been confirmed. Also limitations of the further extension have been discussed. We are currently reviewing the given ARN (Affected Road Network) in the base models to confirm delays being modelled sensibly.
	CNEB-071	Funding	Chris Cooper	Open	Funding on additional quarry works (Link to EWN-61A-002)	Solutions necessary / negotiated are more onerous than those previously considered.	Interfaces with the Bulls Lodge Quarry may exceed risk budget allocation - backfill of area around RDR2 junction, relocation of settlement pond and provision of conveyor bridge.	Additional construction costs. Potential delay to programme if solution are more complicated.	3	3	3	3	2	9	1. Liaise with Hanson representatives to come to agreement on solution (allowing quantification of cost/programme impacts) 2. Agree commercial agreement between ECC and Hanson	1. Ben Mills 2. ECC	1. 30/07/2020 2. TBC	Open	1. Delay due to COVID - liaison ongoing, however, progress made
	CNEB-080	Consenting / Orders	Richard McBride	Open	Resourcing at local authority delays planning determination	A change in Case Officer or personnel at the Council.	Inadequate resources (at the Council) to determine the application in the timeframe agreed in the Planning Performance Agreement.	Further work and delay. Delay to the overall scheme.	3	1	3	1	2	9	1. Issue PPA (Planning Performance Agreement) to secure resource and enter in to pre planning application 2. Engage with County and City Council Planning Officers. 3. Ongoing engagement with planning officer.	Richard McBride	1. 31/07/2020 2 & 3. 30/06/2020	Open	15/04/2020 - PPA Still with ECC Lawyers. Delay as a result of COVID-19
	CNEB-066	Design	Jose Tavares	Open	Lack of information/understanding of existing drainage systems	Lack of survey and as-built information	Incompatibility of drainage network solutions proposed with the existing highway and land drainage network	Abortive design work and potential for increased flood risk associated to the construction	3	2	2	3	3	9	Undertake detailed topographic and cctv drainage trace surveys to better understand networks	Richard Haspineall	30/07/2020	Open	
	CNEB-068	Design	Alex Woodgate	Open	Changes to standards i.e.. DMRB and climate change	DMRB guidance being wholesale reviewed and updated currently. Other guidance (EA, CIRIA, etc.) may also be impacted	The requirements for highway, drainage, structural and environmental design criteria change	Design becomes substandard without design standards freeze	2	2	2	3	1	6	1. Establish design standards freeze date for planning with client 2. Create Implementation of New Standards report to assess impact of incorporating changes to standards beyond standard freeze date	1. Alex Woodgate 2. Grant Banester	1. 30/08/2020 2. 30/11/2020	Open	
	CNEB-078	Environment	Una Wheeler	Open	ES scoping	Increased scope, additional planning and design cost	ECC Planner does not agree with Jacobs EIA Scoping Report.	Additional assessment is required for environmental topics scoped out.	2	1	2	2	1	4	1. Submittal of Detailed EIA Scoping Opinion and early liaison with statutory consultees. 2. Meet with ECC Planner to discuss impact on Environmental Assessment.	Una Wheeler	1. Closed 2. 30/07/2020	Open	15/04/2020 - 2. Delay in receipt of EIA scoping opinion decision from planner. Formal opinion was received 14/4/20. Decision is currently being reviewed, additional requirement for assessments will be identified. Date for close out has been extended from 31/3/20 to 30/4/20.
	CNEB-087	Design	Jose Tavares	Open	Overland drainage	Existing poor survey information	Flow paths of overland drainage flow are not as anticipated	Insufficient or too many culverts in wrong locations which results in flooding and/or unnecessary construction.						0	1. Source higher resolution survey data 2. Project specific TOPO	1. Jose Tavares 2. Richard Haspineall	1. Completed 2. 30/07/2020	Open	
	CNEB-083	Consenting / Orders	Richard McBride	Open	Hansons application for new planning for handover levels (restoration plan)	Hansons separating from the development group and going their own way with their operations	Hansons (quarry operators) amended planning application for working the land, affecting parcels of land required for the Scheme or conflict between the restoration plans (as per planning conditions) and the Scheme.	Further work and delay. Delay to the overall scheme. Additional negotiation required by ECC and Hansons	2	2	4	4	3	8	Engage with County and City Council Planning Officers. Ongoing engagement with planning officer.	Richard McBride	tbc	Open	15/04/2020 - Hansons application still waiting to be submitted to ECC

PROJECT RISK REGISTER

PROJECT NAME: Chelmsford NE Bypass

STAGE: Preliminary Design

REVISION NUMBER: P02

VERSION DATE: 21/07/2020

	Risk Identification								Risk Assessment									
Rank	**Risk No (Identifier)**	**Discipline**	**Risk Owner**	**Risk Status**	**Risk Title**	**Risk Cause** *"Causes are definite events or sets of circumstances which exist in the project or its environment, and which give rise to uncertainty"* • Key words: is, do, has, has not... [present condition]"	**Risk Event** *"The uncertain event is the true risk, as it may or may not happen and gives rise to uncertain outcomes for the project"* • Key words: may, might, possibly... [uncertain future]	**Risk Effect** *"Effects are unplanned variations from the objectives, either positive or negative, which would arise as a result of risks occurring"* • Key words: would, could... [conditional future]	**Probability Score (1 to 5)**	**Cost Impact Score (1 to 5)**	**Time Impact Score (1 to 5)**	**Quality Impact Score (1 to 5)**	**Reputation Impact Score (1 to 5)**	**Overall Risk Ranking**	**Proposed Response Measure**	**Risk actionee name**	**Target Date for Close out of action**	**Status**	**Comments**
	CNEB-035	Design	Jose Tavares	Open	Pumping may be required in section of cutting	Constraints in Highway vertical alignment	Pumping may be required in section of cut	Additional construction costs but large increase in whole-life maintenance costs.	3	2	2	2	1	6	1) Update suitable attenuation and outfall locations through site survey 2) Review groundwater table levels from GI	Jose Tavares	30/07/2020	Open	
	CNEB-088	Health & Safety	Chris Cooper	Open	COVID 19 impacts	Restrictions to travel due to COVID 19	Insufficient resources to undertake programme critical surveys / assessments	Delays to survey programme	3	1	3	4	2	12	1. Monitor ongoing NHS and Government advise regarding COVID19 2. Identify alternative survey resources and discipline to have a team of resources to support	1. Chris Cooper 2. Una Wheeler	1. Complete (Passed) 2. Complete	Open	
	CNEB-089	Environment	Una Wheeler	Open	Impact of drainage on Straw Brook	Current design of the two drainage attenuation adjacent to A131 shows their outfalls pointing at each other.	Current design may have an adverse impact on the geomorphology of Straw Brook.	Potential significant area of turbulent flow, risking bed and bank scour of Straw Brook	2	1	2	3	2	6	Meeting to be held on 10th March with the drainage design team to discuss alternative designs to avoid potential adverse significant effect on Straw Brook.	Rhys Kibble / Jose Tavares	31/07/2020	Open	15/04/2020 - Discussion was held with drainage team 11/3/20. Drainage team to take account of risks during design. Risk to be revisited later in the design - 31/7/20, following receipt of GI info.
	CNEB-090	Environment	Una Wheeler	Open	Compliance with Water Framework Directive	Current proposed drainage design of southern extent of scheme near Boreham Brook	Current drainage measures may cumulatively have a significant adverse effect on Boreham Brook. Design measures include:	Non- compliance Water Framework Directive Assessment for Boreham Brook	2	1	2	3	2		Meeting to be held between Water Environment team and Drainage Engineers on 10th March. Proposed mitigation measures which may be acceptable to the planning authorities and bring the scheme into compliance include:	Una Wheeler	31/07/2020	Open	15/04/2020 - Discussion was held with drainage team 11/3/20. Drainage team to take account of risks during design. Risk to be revisited later in the design - 31/7/20, following receipt of GI info.
	CNEB-067	Design	Jose Tavares	Open	Changes to design strategy	Failure to engage with ECC / LLFA and EA	ECC, LLFA and EA disagree to drainage design criteria and drainage strategy	Redesign and cost + programme impact Drainage solutions may require additional land outside safeguarded boundary	2	1	3	3	1	6	Continuous engagement with EA/LLFA. Next meeting to be established for early Feb 2020	Jose Tavares	30/07/2020	Open	
	CNEB-091	Environment	Una Wheeler	New - 15/04/2020	COVID 19 impacts	Restrictions to ecology surveys	Impact on ecology survey programme, unable to undertake surveys using standard methods	Potential programme delays to overall programme.	3	2	4	3	2	12	Discussions with the teams, alternative surveys methods are being investigated along with land access	Una Wheeler	15/08/2020	Open	
	CNEB-092	Environment	Una Wheeler	New - 15/04/2020	COVID 19 impacts	Unable to undertake AQ / Noise surveys	Unable to undertake AQ / Noise surveys	Alternative methods are being investigated and need to be agreed with ECC Planner	3	2	3	3	2	9	AQ/Noise team have identified alternative methods, these need to be agreed with ECC Planner	Una Wheeler	15/08/2020	Open	
	CNEB-028	Design	Grant Banester	Open	RSA	Auditor disagrees with design philosophy	Road safety audit may suggests major design or alignment changes	Outline redline boundary and associated re-design costs.	3	2	3	4	1	12	1) Operational Safety Reviews and incorporate any recommendations where possible	Grant Banester	31/05/2020	Open	
	CNEB-093	Design	Chris Hook	Open	Delays to Base VDM realism testing	Implausible results in the mode shift or errors in the model set up	Delays to Base VDM realism testing	Late provision of traffic model forecast to environmental and highways team	3	1	2	1	1	6	Work closely with traffic modelling team to share information	Chris Hook	17/07/2020	Open	
	CNEB-094	Design	Chris Hook	Open	Changes to our Uncertainty Log assumptions by ECC	Not all local plan sites included before	Changes to our Uncertainty Log assumptions by ECC	Late provision of traffic model forecast to environmental and highways team	2	1	2	1	1	4	Working with Army and Navy team to agree a final list	Chris Hook	17/07/2020	Open	
	CNEB-095	Design	Chris Hook	Open	DfT engagement on Army & Navy scheme	DfT will review the Army & Navy project using the same model and assumptions as CNEB in order to provide ECC efficiencies	DfT may comment on the traffic modelling around the Army & Navy scheme which can be perceived these issues in the CNEB modelling as well.	The programme risk and risk of further challenge in the modelling in future	2	1	3	4	1	8	Working with Army and Navy team in liaison with DfT engagement	Chris Hook	30/09/2020	Open	
	CNEB-096	Design	Chris Hook	Open	Forecast model convergence	Issues with high modelled flows causing capacity design issues or model convergence issues	Forecast model convergence	Late provision of traffic model forecast to environmental and highways team	3	1	3	2	1	9	Working with TM team to resolve any issue relating to convergence	Chris Hook	14/08/2020	Open	

PROJECT RISK REGISTER

PROJECT NAME: Chelmsford NE Bypass

STAGE: Preliminary Design

REVISION NUMBER: P02

VERSION DATE: 21/07/2020

	Risk Identification								Risk Assessment									
Rank	Risk No (Identifier)	Discipline	Risk Owner	Risk Status	Risk Title	Risk Cause *"Causes are definite events or sets of circumstances which exist in the project or its environment, and which give rise to uncertainty"* *• Key words: is, do, has, has not... [present condition]"*	Risk Event *"The uncertain event is the true risk, as it may or may not happen and gives rise to uncertain outcomes for the project"* *• Key words: may, might, possibly... [uncertain future]*	Risk Effect *"Effects are unplanned variations from the objectives, either positive or negative, which would arise as a result of risks occurring"* *• Key words: would, could... [conditional future]*	Probability Score (1 to 5)	Cost Impact Score (1 to 5)	Time Impact Score (1 to 5)	Quality Impact Score (1 to 5)	Reputation Impact Score (1 to 5)	Overall Risk Ranking	Proposed Response Measure	Risk actionee name	Target Date for Close out of action	Status	Comments
	CNEB-082	Consenting / Orders	Richard McBride	Closed	Local plan not being adopted or major changes to development sites linked to bypass	Change in local government administration. Emergence of preferential sites and associated infrastructure in the Local Plan.	Changes to Planning Policy designations and safeguarding for the Bypass	Removes the strategic framework which supports the scheme. Scheme uncertainty. Further work and delay.						0	Ongoing engagement with planning officer.	Richard McBride		Closed	
	CNEB-081	Consenting / Orders	Richard McBride	Closed	Construction outside of safeguarded corridor	Construction outside of safeguarded corridor	Cranham Road/Drakes Lane revised alignments outside of safeguarded corridor - risk that planners will not accept justification for this	Redesign of side road arrangement						0	1. Develop clear justification for all instances where construction goes outside of the safeguarded corridor and include in planning application	1. Richard McBride		Closed	
	CNEB-004	Consenting / Orders	Richard McBride	Closed	Restrictive planning conditions	Failure to pre-engage with planners	Planning is received but conditions prohibit effective and timely implementation	Further design work and delay. Additional mitigation costs dealing with conditions. Scheme could be less attractive to contractors due to onerous requirements						0	Pre-planning application and provision of detailed information with the application. Ongoing engagement with planning officer.	Richard McBride		Closed	
	CNEB-031	Design	Alex Woodgate	Closed	Departures	Poor design or late adoption of new standards	Late identification of departures	Poor performance leading to redesign and delay.						0	Ongoing technical review	Alex Woodgate		Closed	
	CNEB-058	Design	Alex Woodgate	Closed	NECGV Direct access to bypass		Countryside Zest are pushing for an entrance to a new development plot from the bypass adjacent to Rbt4 (the future northbound on-slip)	Whilst ECC do not support this, if it is allowed to proceed this would have severe safety implications, both for the existing Phase 1 and in exacerbating the existing departure (proximity of slips) for Phase 2. May require substantial mitigation to achieve worsened departure.						0	Agree alternative access, preferably from RDR1. Monitor as revised masterplan develops (first iteration due September 2020)	ECC		Closed	
	CNEB-003	Consenting / Orders	Richard McBride	Closed	Scheme may not obtain planning permission	Failure to engage with Stat undertakers Inadequate evidence base Political objections Public opposition	Scheme doesn't obtain planning permission	Further design required to then resubmit planning. Delay to the overall scheme.						0	Engage with County and City council planning officers	ECC/Jacobs		Closed	
	CNEB-008	Consenting / Orders	Ben Mills	Closed	Overlap of procurement and CPO	Pressure on delivery by March 2024	Commencement of main contractor procurement (exc. award) before completion of CPO process	Abortive procurement costs if CPO is unsuccessful or delayed. Delay to commencement on site, increase in costs and risk to funding.						0	Consider use of appropriate break-clauses in the tender documentation	Colin McHugh		Closed	
	CNEB-050	Funding	Chris Cooper	Closed	Certainty of Funding	Change in Governmental budgeting / policy priorities.	Reduction in political will / funding availability post-Brexit or post-election	Reduction or deferred scheme funding, delaying programme and increasing inflation effects on scheme cost. Worst case of scheme cancellation.						0	Monitor ongoing changes in political news. Keep in contact with MHCLG on their view of future funding security	ECC		Closed	
	CNEB-018	Construction	Ben Mills	Closed	Autumn/Winter Earthworks		Construction programme requires earthworks and mass haul during Autumn/Winter period.	Delay to / added complexity in the construction programme						0	1. Review construction programme 2. Investigate potential advanced earthworks contract.	1. Ben Mills 2. Colin McHugh		Closed	
	CNEB-060	Construction	Ben Mills	Closed		ISSUE	Provision of quarry access for Hansons may have to provide for vehicular traffic as well as the conveyor belt (To be reviewed)	Additional construction costs and maintenance of a structure in the longer term.						0	1) Investigate option for temporary structure such as bailey bridge 2) Determine if vehicular traffic needs to be accommodated 3) Consider combining bridge with developer access bridge to share costs and avoid rental costs of temp bridge	Jacobs ECC Jacobs/ECC		Closed	
	CNEB-032	Design	Grant Banester	Closed	Developer tie-in	Changes on site SSUE	As-built construction of developer RDR Roundabout 4 varies from current construction design.	Late design changes at Southern end tie-in						0	Obtain as-built surveys	Elliot Smith		Closed	

PROJECT RISK REGISTER

PROJECT NAME: Chelmsford NE Bypass

STAGE: Preliminary Design

REVISION NUMBER: P02

VERSION DATE: 21/07/2020

	Risk Identification								Risk Assessment									
Rank	Risk No (Identifier)	Discipline	Risk Owner	Risk Status	Risk Title	Risk Cause *"Causes are definite events or sets of circumstances which exist in the project or its environment, and which give rise to uncertainty"* *• Key words: is, do, has, has not... [present condition]"*	Risk Event *"The uncertain event is the true risk, as it may or may not happen and gives rise to uncertain outcomes for the project"* *• Key words: may, might, possibly... [uncertain future]*	Risk Effect *"Effects are unplanned variations from the objectives, either positive or negative, which would arise as a result of risks occurring"* *• Key words: would, could... [conditional future]*	Probability Score (1 to 5)	Cost Impact Score (1 to 5)	Time Impact Score (1 to 5)	Quality Impact Score (1 to 5)	Reputation Impact Score (1 to 5)	Overall Risk Ranking	Proposed Response Measure	Risk actionee name	Target Date for Close out of action	Status	Comments
	CNEB-054	Design	Chris Hook	Closed		ISSUE	Initial review of the traffic data is indicating that Section 1A (south of RDR2 junction) is very busy for a single carriageway even in the opening year.	Challenges at Planning Application which require further modelling / design and/or delay the scheme						0	Further assessment is being undertaken to understand the cause of this and updates to the modelling assumption may be required. Work to be completed prior to pre-planning consultation / application to enable design work to reflect any changes to results.	Jacobs		Closed	
	CNEB-059	Design	Alex Woodgate	Closed	NECGV Access Bridges	ISSUE	NECGV propose 2 separate grade-separated accesses (as well as access from RDR2 grade-separated junction) to the housing development plot east of the bypass. Whilst this doesn't directly impact the design of the bypass, CZ expect the design and cost of these to fall to the CNEB project.	Substantial addition cost in provision of 1 or 2 additional overbridge(s)						0	Agreement on the location of the structures and potential re-use of elements of structures, installation of abutments in Phase 1 etc. to be explored. Monitor as revised masterplan develops (first iteration due September 2020)	Ben Mills		Closed	
	CNEB-084	Funding	Ben Mills	Closed	Silt lagoon / settlement ponds	Bypass severs settlement regime and is lower than top of water level. ISSUE	May need to move existing Hansons silt lagoon to the East of the bypass	New lagoon to be dug at significant cost (approx. £1m)						0				Closed	
	CNEB-046	Environment	Una Wheeler	Closed	Mineral resource safeguarded area	ECC planners require minerals to be extracted following the findings of the minerals resource assessment and subsequent economic viability assessment.	Scheme passes through area of safeguarded mineral areas which may need to be extracted in advance	Delay to start of construction and change to the logistics / programming of construction						0	Review BGS data and opportunities for utilisation of extracted material Engagement with planner regarding requirements. Liaison with Landowner as to advance extraction	ECC/Jacobs		Closed	
	CNEB-023	Construction	Colin McHugh	Closed	Post-Brexit procurement	Unknown details of Brexit deal	Changes to OJEU procurement rules post-Brexit	Additional procurement costs and timescales likely						0	Monitor legal requirements and seek advice once interim Brexit deal agreed and confirmed. Procurement likely to fall within 'transition period'	Colin McHugh		Closed	
	CNEB-079	Environment	Una Wheeler	Closed	Additional environmental input required for GI works.	Magnitude of construction activity	Additional ecology and arboriculture site supervision needed for GI works.	Impact on programme if borehole locations are changed late in the programme. Cost implications for additional ecological / arboriculturally surveys.						0	Jacobs to engage early with ECC Place Services who will provide ecological/arb supervision. Early discussion have commences and Place Services have reviewed current borehole plan. Continuous engagement with Place Services will be necessary so that any changes to locations can be assessed early.			Closed	
	CNEB-044	Environment	Una Wheeler	Closed			Planning conditions require additional mitigation for protected species	Additional expenditure and possibly land required						0	Assessment and early discussion with Planners	Jacobs		Closed	
	CNEB-021	Construction	Chris Cooper	Closed			Risk of not achieving the delivery programme due to acceleration	Increased programme and costs. Worst case scenario is withdrawal of funds once works have commenced (ECC to find further funds)						0	Early engagement from construction professionals (Jacobs) to ensure continued viability of accelerated programme.	ECC		Closed	
	CNEB-053	Consenting / Orders		Closed			Valuable minerals may be identified within safeguarded corridor that are economically viable to extract.	Extraction must take place prior to bypass construction, delaying construction programme. Risk that scheme will have to pay for extraction (opportunity if material can be reused). This may change red line boundary.						0	1) Assess likelihood of minerals based on desktop assessment. 2) Undertake assessment on economic/practical viability of extraction	Jacobs ECC		Closed	
	CNEB-056	Construction		Closed			Hansons will not have completed the quarry backfill within the safeguarded corridor north of the ponds until 2023 on their current programme	This could overlap with our construction programme requiring re-phasing of construction or cause overall delay to overall construction programme						0	1) Meet with Hansons in July to better understand their programme and whether the completion of this can be brought forward. 2) Continue to liaise with Hansons at a senior level to promote earlier completion of this area - workshop in October	Jacobs ECC		Closed	
	CNEB-022	Construction		Closed			2-phase procurement / construction plan may inflate tenders compared to single award.	Inflated overall cumulative tender prices and logistical complexity of multiple sites / contractors (coordination and network impact challenges)						0	Procurement strategy review (cost/benefit)	Jacobs		Closed	

PROJECT RISK REGISTER

PROJECT NAME: Chelmsford NE Bypass

STAGE: Preliminary Design

REVISION NUMBER: P02

VERSION DATE: 21/07/2020

	Risk Identification								Risk Assessment								
Rank	Risk No (Identifier)	Discipline	Risk Owner	Risk Status	Risk Title	Risk Cause *"Causes are definite events or sets of circumstances which exist in the project or its environment, and which give rise to uncertainty"* *• Key words: is, do, has, has not... [present condition]"*	Risk Event *"The uncertain event is the true risk, as it may or may not happen and gives rise to uncertain outcomes for the project"* *• Key words: may, might, possibly... [uncertain future]*	Risk Effect *"Effects are unplanned variations from the objectives, either positive or negative, which would arise as a result of risks occurring"* *• Key words: would, could... [conditional future]*	Probability Score (1 to 5)	Cost Impact Score (1 to 5)	Time Impact Score (1 to 5)	Quality Impact Score (1 to 5)	Reputation Impact Score (1 to 5)	Overall Risk Ranking	Proposed Response Measure	Risk actionee name	Target Date for Close out of action	Status	Comments
	CNEB-030	Design		Closed			Quarry back fill may not provide a suitable foundation	Contaminated/ unconsolidated/ insufficient fill. Potential redesign e.g. ground treatment (piled load transfer platform), etc.						0	1) Consult with the Quarry operators to understand the details of the materials. 2) Undertake Ground Investigation works earlier to enable adequate solutions	Jacobs		Closed	
	CNEB-009	Construction		Closed			Physical constraints from developers may limit options for construction methods, including roundabout locations, drainage	More complicated construction solutions required in these locations						0	Continue close liaison with developer consortium to define/influence their design early	ECC/Jacobs		Closed	
	CNEB-026	Design		Closed			Local topography changes due to gravel/soil extraction altering earthwork / drainage requirements	Substantial redesign of route may need to be undertaken resulting in increase/decrease to construction costs						0	Early engagement with Hanson and ECC Planners to understand programme and level of this potential risk Influence areas of extraction to reflect CNEB corridor first	ECC/Jacobs		Closed	
	CNEB-048	Funding		Closed			Anticipated funding may not be available. Failure of HIF bid	Scheme is deferred and alternative government funding source sort. Delay to delivery of housing						0	Close-out scheme accordingly	ECC		Closed	
	CNEB-011	Construction		Closed			Construction works may cause unpalatable local impacts	Reputational Damage due to stakeholder complaints. More onerous working arrangements or routes for construction traffic need to be implemented.						0	1) Early stakeholder engagement 2) Review of suitable construction techniques 3) Continue to review buildability of the design 4) Produce construction strategy report	Jacobs		Closed	
	CNEB-001	Consenting / Orders		Closed			Chelmsford Local Plan is rejected and scheme is defined as exception to policy	Delay to scheme delivery and additional work required to achieve compliant proposals						0	Work with Chelmsford CC to assist them to get their plan through the Examination in Public	ECC		Closed	
	CNEB-052	Design		Closed			Future yr (+15yrs) modelling may be required if detrimental air/noise impacts are encountered/predicted using design year (2036, +11yrs)	Additional cost to widen model and run further forecast years						0	Early initial assessment of air/quality impacts to be undertaken to limit impact on overall programme.	Jacobs		Closed	
	CNEB-027	Design		Closed			NMU requirements may not be fully met	Design delays and additional land may be required						0	Develop NMU Context Report with Stakeholder input Produce collective strategy with developer consortium	ECC/Jacobs		Closed	
	CNEB-024	Construction		Closed			Delay to completion of Hanson's mineral extraction delays Ground Investigations	Delays critical path and overall programme						0	Early engagement with Hanson and ECC Planners to understand programme and level of this potential risk Influence areas of extraction to reflect CNEB corridor first	ECC/Jacobs		Closed	
	CNEB-049	Funding		Closed			Current proposed scheme business case may not be robust	Re-design/re-work may be required leading to a programme delay, and/or cost of re-design						0	Early engagement with stakeholders including Chelmsford City Council Planning	Jacobs/ECC		Closed	
	CNEB-016	Construction		Closed			Grossly contaminated cut material: Should the quarry material be grossly contaminated; the material will have to be treated or remove off site completely for landfill.	Delays and costs in dealing with contaminated material						0	1) Conduct desktop study 2) Carry out GI surveys as soon as quarry backfill is complete and land available	Jacobs		Closed	

PROJECT RISK REGISTER

PROJECT NAME: Chelmsford NE Bypass

STAGE: Preliminary Design

REVISION NUMBER: P02

VERSION DATE: 21/07/2020

	Risk Identification								Risk Assessment									
Rank	Risk No (Identifier)	Discipline	Risk Owner	Risk Status	Risk Title	Risk Cause *"Causes are definite events or sets of circumstances which exist in the project or its environment, and which give rise to uncertainty"* *• Key words: is, do, has, has not... [present condition]"*	Risk Event *"The uncertain event is the true risk, as it may or may not happen and gives rise to uncertain outcomes for the project"* *• Key words: may, might, possibly... [uncertain future]*	Risk Effect *"Effects are unplanned variations from the objectives, either positive or negative, which would arise as a result of risks occurring"* *• Key words: would, could... [conditional future]*	Probability Score (1 to 5)	Cost Impact Score (1 to 5)	Time Impact Score (1 to 5)	Quality Impact Score (1 to 5)	Reputation Impact Score (1 to 5)	Overall Risk Ranking	Proposed Response Measure	Risk actionee name	Target Date for Close out of action	Status	Comments
	CNEB-055	Design		Closed			Failure to agree solution at Rbt 4 RDR1 and Rbt 7 RDR2	Abortive construction work in amending developer Rbt4 and/or Rbt7 not fit for developer needs (negative perception of ECC)						0	1) Continue to meet with Developer Consortium to agree parameters. 2) Provide design for Rbt 4 for CZ to include in their design.	ECC Jacobs		Closed	

This risk map is a work in progress, detailed conversations have yet to take place with service colleagues and therefore there agreement has not been sought

Scheme Name:	Beaulieu Park Station
Project Total Cost	£171m
Funding	£123m HIF, £12m SELEP, £22m SI06,
Original Contingency	£44.629m
Current Project Contingency:	£16.044m
Project Summary:	A £157m project to build a train station located in Beaulieu park on the existing train line. This project forms part of the wider Chelmsford HIF scheme bid totalling £218m, the other project being delivered as part of this is Chelmsford North East Bypass. This project is due to be delivered by December 2025 though Treasury/MHCLG have asked if this project can be delivered sooner. Currently works are being undertaken to determine the costs of speeding up the project by as much as 18 months.
Status of governance:	We are not currently in contract with Homes England - a cabinet paper is required to enter into contract. A separate cabinet paper to enter into GRIP stage 4 is drafted and due for Feb Cabinet. Future governance will include ; business cases and a cabinet paper to enter into contract with the train station contractor.
Spend to date:	£4.6m funded by S106 Contributions , SELEP and ECC forward Funding.

Risk number	Risk	Detail	Overall RAG Rating (Impact and Probability)	Impact on Budget	Value of Impact on Budget £	Impact on programme timeline	Impact on Project Funding	Value of impact on Funding £	Mitigations	Next Steps	Is it quantified in risk assessment (or outside cont. allocation?	Supporting Documents
1	Due to the contractual requirement for ECC to fund the operational **Revenue** costs of Beaulieu Park Station for an indefinite period of time until the service breaks even there is a risk that the station does not breakeven which results in ECC being exposed to a substantial unfunded **revenue pressure for an indefinite period of time.** .	The GDA includes a clause requiring ECC to fund the operation of services, including rolling stock charges and costs until the service breaks even. This clause may create a new revenue financial liability for ECC as it exposes ECC to funding the net revenue operational cost of Beaulieu Park Station for an unquantified period until breakeven is achieved. Annexure 7 of the GDA will be drafted and will include the methodology to calculate ECCs liability. A requirement for open book accounting will be a pre-requisite to approval by ECC of the Annexure to ensure that ECC can undertake due diligence on the liability. As this part of the agreement is yet to be drafted and agreed there is a risk to ECC that the methodology could subsequently change exposing ECC to greater risk Jacobs (ECC contractor) have developed a model that looks to identify the different levels of risk exposure to ECC. This is based on a number of assumptions some of which are based on industry standards, some on other stations and some on professional judgement and detailed out in the following tab" Assumptions in Jacobs Model". Due to the number of assumptions and limitations to those assumptions, Finance do not give assurance that the modelling is reliable and represents what could be expected once the station is operational.	Red/ Very High- Total Score 12 - (Major Impact (3), - Almost certain probability (4)	Yes. If the risk materialised this results in an unfunded revenue pressure	Unquantified	Yes. Until a mitigation is found, ECC delays entering into contract with Homes England for Beaulieu Park Station and Chelmsford North East Bypass, the delay in signing the contract could result in delays in the programme.	Homes England are not willing to remove such clause, so if ECC were to terminate the risk by not entering into contract then the full HIF funding allocation would be lost	Up to £217m	Risk Strategy: To Transfer the risk (recommended): Would require the condition to be removed from the contract resulting in there being no liability to ECC to cover the operational revenue costs of the station and transfer to Greater Anglia, Network Rail, Dft ect. Or, requiring Dft to underwrite the obligation. Alternatively insurance against this risk could be sought but will be subject to market appetite and the price may be prohibitively high. This strategy was not successful and was rejected by all parties. To Terminate the risk: Would be to not enter into agreement with Homes England on the contract. However, this would result in the entire scheme being at risk and resulting in abortive costs. Or, Lobbying MPs for removal of clause all together would end this risk for ECC. To Treat the risk: The only way to treat this risk is to ensure that the passenger numbers using the station are sufficiently high to avoid a deficit. ECC have no influence over such numbers and therefore are unable to treat this risk. Tolerate: ECC will need to ensure independent third party due diligence is performed on the financial model which forecasts the operational cashflows for the station in order to understand the expected forecast financial performance and the circumstances under which it will be loss making. ECC should seek to set a cap on maximum exposure subject to agreement by other stakeholders. A task force has been set up and is being lead by Cllr Finch to resolve the clause in the contract. Currently, the task force is working to get this clause removed from the contract to mitigate against the risk. Phil Moat is reviewing the likely operational costs to provide a more accurate estimate of profit/loss of the new station.	A task force has been set up and is being lead by Cllr Finch to identify the best way forward for ECC on this risk. Risk strategy to be agreed. Transfer of risk is recommended. Should risk transfer prove impossible and termination is not politically acceptable, to tolerate this risk and protect the assets of ECC, an independent third party is instructed to perform due diligence on GA's financial model for the station cashflows. A cap be established accordingly. ECC should not be tolerating this risk without a cap being negotiated. the final step here is to agree the side agreement between ECC and Dft to ensure that as much risk is removed from the clause methodology as possible to limit ECC's exposure.	Outstanding - awaiting a copy of the quantified risk assessment to determine	1. officer briefing one-station operating costs 2. Beaulieu station indicative costs Revenue position
2	Due to the requirement for ECC to sign up to the Dft conditions that form part of the GDA, Jacobs (ECC Contractors) have undertaken modelling to identify what items will be included and excluded from the opex cost calculation there is a risk that: - as the side agreement will not be drafted or agreed prior to the signing of the GDA that the current assumptions around methodology change significantly and pose greater risk to ECC and subsequently result in an increased cost when the station opens - the assumptions within the model and outputs being presented at GDA signing stage differ significantly from what materialises when the station opens and ECC is exposed to increased costs above and beyond the worst case scenario that is being presented within the cabinet paper (Circa £500k cost to ECC)	The side agreement associated with Annexure 7 of the GDA detailing out the requirement for ECC to fund the operational cost of the station until it breaks even is yet to be drafted and agreed between ECC and Dft. This side agreement is anticipated to be drafted by Dft in the first instance with ECC reviewing and feeding into where possible. ECC are assuming that all of the assumptions within the Jacobs modelling to date feed through and are stipulated and agreed with Dft. This side agreement will not be signed before ECC enter into contract with Homes England (assuming the cabinet paper is approved).	Amber/ High Risk- Total Score Medium 6 probability Possible (2) Impact major (3)	Yes, if the risk materialised it could result in ECC being exposed to a greater operational cost that originally anticipated, resulting in a unfunded revenue pressure	Unquantified	It is assumed that this risk poses no impact on the programme timeline associated with delivering infrastructure.	Once ECC enters into contract with Homes England, any risk around the side agreement does not impact the HIF Funding.	N/A	Risk Strategy: To Treat the risk: Detailed negotiations have been undertaken with Dft to remove and agree in principle elements of the methodology to ensure ECC's risk exposure is limited. An email has been sent capturing all the items which ECC expect to be included and excluded from a side agreement with Dft. Once the side agreement with Dft is signed formally this risk will be treated. To Terminate the risk: ECC looked to have the clause removed all together which would have terminated the risk but this was unsuccessful. The only way in which to terminate this risk now would be not to enter into the GDA and stop the projects all together, this would include BPS and CNBP. Transfer risk: ECC looked at opportunities to transfer this risk to the operator of the station, but this was not accepted. No other options to transfer risk are available and can be considered. Tolerate risk: ECC would need to ensure it has sufficient and significant excess reserves to tolerate such a risk, or would need detailed, comprehensive analysis from the network providers providing assurance that a net cost position would never fall to ECC. This has not been done.	Agree the detail of a side agreement with Dft to include all the elements ECC require including financial requirements such as Open book accounting .	Outstanding - awaiting a copy of the quantified risk assessment to determine	Email to Dft outlining our assumptions on what will go into the side agreement. Jacobs modelling and wilder Philips report detailing potential risk exposure.
3	As a result of Treasury asking Network Rail to look at project acceleration, opportunities have been identified that result in the station opening sooner than the assumed baseline opening of December 2025, there is a risk that a) the station opens sooner than the baseline, but there could be lower than expected passenger numbers due to the risk that the housing trajectory is not in line with what was expected at the time of opening. This may result in increased net operational costs due to lower fare revenue meaning that ECC is exposed to an **increased unfunded revenue pressure** for a prolonged period of time until the housing deliverables catch up with what was expected with the housing trajectory submitted as part of the GDA and associated with a December 2025 station opening date.	If ECC is responsible to cover the net operational costs of the station and agrees for Network Rail to implement "project speed" opportunities which bring the baseline opening of the station forward, ECC could be exposed to the requirement to cover net operational costs for a longer period of time and at a greater cost exposure. This could be due to the fact that the station is being opened to support the housing delivery at beaulieu and the fact that if the station opens earlier than currently assumed the number of houses expected to be built and occupied could be less impacting the number of anticipated passengers using the station and therefore increasing the operating cost of the station and prolonging the period of exposure to ECC and breakeven period. Interdependency - Project Speed was created to minimise the risk of delivery going past the date for all claims on HIF funding to be enacted leaving ECC exposed to a funding gap which it would have to bridge at additional cost	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes- if the risk materialises.	Unquantified	A range of options are being considered at high level, which could reduce the timeline from between 6 and 18 months	Yes, this could enable ECC to draw down HIF monies sooner, which could help to mitigate the risks below about not being able to spend all HIF monies by the required deadline of March 2025.	Unquantified	Risk Strategy is as above (Cell J18) given this risk links directly into whether ECC takes on responsibility of covering operational costs associated with the opening of the train station but additional measures should ECC sign up to this clause include: To treat the risk would be to ensure ECC does not agree to any programme acceleration unless the benefit to ECC is greater than the cost ECC is exposed to if ECC does sign up to covering the net operational cost of the station. Tolerate: given project speed was established to avoid a funding gap due to delivery completing post Mar 25, ECC may wish to tolerate this risk if the benefit is greater than the potential cost of funding net operational costs.	BP Project speed has been established to consider MHCLG/Treasury ask to complete the project sooner. High level assessments shows that both time and financial savings can be made (subject to a set of assumptions). However significantly greater risk such as overlapping TWAO and GRIP stages. It is not known yet who will pick up these additional risks or costs	Outstanding - awaiting a copy of the quantified risk assessment to determine	
4	Due to Network Rail's "Project Speed", there is a risk that opportunities may be implemented that result in programme acceleration which may result in ECC being exposed to unfunded cost escalation.	As a result of treasury asking Network Rail to look at opportunities to accelerate the beaulieu park train station programme, NR have undertaken "project speed". Project speed looks at opportunities to generate programme efficiencies to open the station sooner than the current baseline delivery date of December 2025. Project Speed is in the initial stages and further work needs to be undertaken by the Grip 4 contractor Murphy's to identify whether these can practically be done, but the interim findings suggest that there are 3 opportunities, but with these opportunities could come increased costs to implement. Interdepencies- Project speed looks at opportunities to accelerate which inevitable will accelerate ECC's HIF drawdowns helping to mitigate against the risk that ECC do not draw down all funds by March 2025	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes- if this risk materialises ECC would be exposed to unfunded cost escalation.	Unquantified	Acceleration of programme reducing which would reduce the risk of not meeting the HIF expenditure deadline of March 25.	Yes, this could enable ECC to draw down HIF monies sooner, which could help to mitigate the risks below about not being able to spend all HIF monies by the required deadline of March 2025.	N/A	Risk Strategy is as above (Cell J18) given this risk links directly into whether ECC takes on responsibility of covering operational costs associated with the opening of the train station but additional measures should ECC sign up to this clause include: To treat the risk would be to ensure ECC does not agree to any programme acceleration unless the benefit to ECC is greater that the cost ECC is exposed too if ECC does sign up to covering the operational cost of the station.	Currently, a detailed review is needed of these proposals once Murphy's has commenced GRIP4 which will quantify the risks associated with each opportunity and the additional costs to implement.	Outstanding - awaiting a copy of the quantified risk assessment to determine	
5	As a result of the finalisation of the GRIP 3 report and subsequent revised cost estimate, there is a risk that cost efficiencies cannot be identified through the value engineering exercise leading to unfunded cost escalation (between £14m-£21m) that ECC is liable to cover as bidding authority. There is also a risk here that the Value Engineering exercise identifies more cost risk that opportunities therefore increasing the unfunded cost escalation above the current range of £14m-£21m	The current cost profile for Beaulieu Park station, identified as part of GRIP 3, is £171m as shown in the above table, this is £14m above the current budget allocation of £157m leaving £14m cost escalation. This differs to what is in the approved capital programme. Value engineering has become a critical activity of Grip stage 4 to review opportunities to bring the total cost within the available budget of £157m. However, whilst this exercise brings about potential opportunities for cost savings it also highlights cost risk, the quantum of both is currently unknown. The value engineering exercise is at the initial stages, and there is yet an evidence base to support opportunities and subsequently give ECC the assurance that the £14m cost escalation is mitigated. Currently, ECC is seeking an addition to the capital programme of £14m to be funded by prudential borrowing to allow the commitment within the GDA to be entered into subject to a requirement that this addition may not be spent without a further cabinet decision to authorise the expenditure once value engineering is complete.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes- Cost escalation	£14m-£21m	If funding cannot be sought then there is a risk that the programme may be delayed specifically with regards to the submission of TWAO as that requires the cost to be fully funded.	No	No	Treat (recommended): The current risk strategy is to treat this risk through a value engineering exercises that is expected to be completed in Grip 4, which will be informed by the outcome of Jacob's review of the cost estimate. Other risk strategy options: To Tolerate, would be to do nothing which isn't advisable given the cost impact and potential funding gap which could result in the project being undeliverable To Terminate: Ceasing the project all together which could lead to significant reputational damage and abortive costs BUT may be lower cost option over the life of the project To Transfer: ECC could have agreed fixed price contracts with network rail and subsequent contractors such as Murphy's and WSP which would transfer the risk of any cost escalation over to the contractor, but this has not been done therefore there is not an option for this risk to be transferred. Alternatively insurance could be sought but this will be subject to market appetite to take on the risk and is likely to incur a significant risk premium	Jacobs were commissioned to undertake a detailed review of network rails Grip 3 deliverables to identify where cost increases had occurred and identify opportunities to value enginer.This will feed into the value engineering exercise that will be undertaken when GRIP 4 goes live. A number of opportunities were identified that could bring the cost down including:	Outstanding - awaiting a copy of the quantified risk assessment to determine	3. Dft condition
6	There is a risk that the GRIP 3 cost estimate that was developed by WSP (GRIP 3 contractor) is inaccurate and incomplete due perceived poor quality output by Network Rail and therefore the cost escalation may be either under or over-stated. Whilst NR subsequently performed their own quality assurance additional cost escalation may arise as the scheme progresses that may lead to an unfunded capital pressure that falls to ECC to cover as bidding authority.	The Grip 3 cost estimate was developed by the contractor of GRIP 3 WSP and overseen by Network Rail. Throughout the review process Network Rail raised a number of quality issues with the WSP estimate, indicating poor quality. This included inconsistencies across design. This could pose a cost risk to ECC if the mitigations undertaken by Network Rail to verify the accuracy of the cost estimate have not been sufficient.	Total: Low/Green (3) (Impact - Major (3), Probability - Unlikely(1))	Yes	Unquantified	No	Yes, if cost estimate changes as a result of poor quality estimate then it could impact funding	Unquantified	The current risk strategy is to treat this risk via Network Rail's quality assurance work. Network Rail undertook a number of internal reviews to ensure the final estimate that informed the GRIP 3 estimate was of sufficient quality. The high level of involvement has given NR a lot more certainty on the cost estimate of £171m . Further to this Network Rail took this estimate through technical stage gateways and assurance and governance stress process to ensure they had confidence in the figure. This included a national governance panel review on 23rd September 2020. As above other risk strategy options could have included the below but these would have not been advisable given the potential cost impact: - Terminate: Ultimately ECC is responsible for cost escalation as bidding authority making it very difficult to terminate such risk without ceasing the project all together - Transfer: ECC could have agreed fixed price contracts with network rail and subsequent contractors such as Murphy's and WSP which would transfer the risk of any cost escalation over to the contractor, but this has not been done therefore there is not an option for this risk to be transfer.	n/a	Outstanding - awaiting a copy of the quantified risk assessment to determine	
7	As a result of WSP completing the revised cost estimate in GRIP 3, there is a risk that inflation was not calculated in accordance with Best Practise which may lead to the inflation figure being too low causing unfunded cost escalation	The Grip 3 cost review undertaken by Jacobs initial summary findings indicate that inflation has not been calculated in accordance with best practise . This element may lead to an increase in the overall cost if the forecast inflation is lower than actual inflation incurred during the project construction life cycle.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes	Unquantified	No	Yes, if cost increases due to inflation it would result in a gap in funding	Unquantified	The current risk strategy for this is unknown. The risk has only been recently flagged to finance. Transfer (Recommended): given this risk has materialised due to supplier failure to adequately perform their work to industry best practice, the supplier should be asked to fund the cost of their own error. Treat: RPI swap could be entered in to hedge this risk but it will incur a premium at extra cost to ECC Tolerate: depending on RPI increases versus the inflation rate adopted in the bid the impact may be insignificant Terminate: exit the project	To confirm whether or not inflation is included, on what basis it was calculated and at what value. Compare to RPI forecasts. Consider the benefit of swap arrangements to hedge the risk if material.	Outstanding - awaiting a copy of the quantified risk assessment to determine	Beaulieu Park Station Summary findings for GRIP 3 presentation
8	There is a risk that the revised cost estimate for the Beaulieu Park Train Station project does not include Industry Risk Fee Fund and Network Rail Fee Fund costs, which once added result in an increased total cost of the scheme, resulting in an unfunded capital cost to ECC	The most recent review of the GRIP 4 cost estimate saw an increase in cost due to the omission of the Industry Risk Fee Fund at 2% and Network Rail Fee Fund at 5% from the original estimate. As this had been missed from the original estimate there is a risk that this has not been included in other cost estimates and once added will bring about cost escalation. These Fee Funds are standard railway funds that all third parties pay into when commissioning work through Network Rail. The funds are used to cover the costs of any major risks that may occur outside of the projects control such as a natural disaster. But, should these risks not materialise the funds are not returned.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Yes- potential cost escalation on the capital programme	Unquantified	No	Yes- Would lead to a funding gap if cost escalation occurred as a result	Unquantified	The current risk strategy for this is unknown. The risk has only been recently flagged to finance. However potential strategies could include: - Treat (Recommended): Could involve reviewing all cost estimates to insure fee is included and then obtaining a revised cost impact and seeking additional funding to cover the gap. This could be via Homes England, S106 or any other potential funding streams with ECC being the funder at last resort. - Tolerate: do nothing which isn't advisable given the cost impact and potential funding gap which could result in the project being undeliverable - Terminate: Ultimately ECC is responsible for cost escalation as bidding authority making it very difficult to terminate such risk without ceasing the project all together	Undertake a review of total cost estimates for all GRIP stages 4-8 to ensure the risk fee is included. If there is cost escalation as a result seek compensation from Jacobs if the omission is a result of their failure to include.	Outstanding - awaiting a copy of the quantified risk assessment to determine	
9	There is a risk that the cost of GRIP 4 exceeds the current cost estimate of £5.54m Due to uncertainties within the GRIP 4 cost estimate developed by Network Rail there is a risk that costs increase leading to unfunded capital cost escalation that falls to ECC to fund as bidding authority.	The Grip 4 cost exceeds the budget available as part of the total £157m cost and efficiencies are not found elsewhere to mitigate resulting in an unfunded cost pressure. The Grip 4 cost includes estimates that are open to change, it also includes a risk allocation for known GRIP 4 risks, which may not be sufficient if risks materialise. The Grip 4 cost estimate also assumes that there is no public enquiry and the timeframe for TWAO is 9 months rather that the previously assumed 12 months. This therefore indicates that any small delays in this could result in cost escalation due to programme delays.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Yes	Unquantified	Yes. Any delay in GRIP 4 deliverables could result in programme delay and the ability to enter Grip 5-8 which is the construction period.	Potential	Unquantified	The current risk strategy for ECC is to treat this risk through regular review of the GRIP 4 costings and identification of circa £500K contingency pot within the GRIP 4 estimate (which sits outside of the overall scheme contingency pot identified at the top of this sheet). To transfer this risk would require network rail to take on ownership and responsibility for any cost escalation on GRIP 4. This is unlikely to be achieved. This risk cannot be terminated as ECC requires the completion of GRIP 4 to progress with this scheme through the require GRIP stages to ensure project completion. But if the project is terminated this risk disappears.	Ensure the contingency allocation by Network Rail is sufficient to cover any risk of cost escalation. A meeting is due to be held with Network Rail on Friday 11th December to determine the final cost estimate for Grip 4	Outstanding - awaiting a copy of the quantified risk assessment to determine	Yes- NR information provided
10	Due to the HIF Grant Terms and Conditions there is a requirement to spend all HIF monies by March 2025, there is a risk of programme slippage which could cause not all the HIF monies to be spent by the required timeframe, leaving ECC exposed to funding risk and the potential that they may have to bridge any future funding gap.	Homes England's has provided the funding on the basis that it will be fully spent by March 2025. If ECC does not spend the full HIF Grant allocation by this deadline, there is a risk of a funding gap as we may be unable to draw down the last elements of funding as all funding is claimed in arrears.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes	Unquantified	Yes	Yes- this could result in a reduction of funding leaving a funding gap/	Unquantified	The risk strategy is currently to treat this risk through programme acceleration including the proposal of "project speed" and the ECC project team are keeping under regular review the programme timeline. Other options in the future to treat this risk would be to lobby for clause removal or extension of deadline No other strategies are being considered as of present, as to terminate this risk would require termination of the project or removal of clause which homes England have confirmed they will not do and ECC is unable to transfer this risk to anyone else as ECC are the bidding authority and hold overall responsibility for this.	NR to continue with identifying the detail of opportunities in project speed to confirm practicality and associated risk.	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
11	As the current project budget assumes £22m of S106 Contributions, there could be failure in collection of S106 from Countryside by Chelmsford City Council which may result in a funding gap which ECC is liable to cover as bidding authority, if alternative funds cannot be obtained.	The Project is anticipated to be funded by £22m of S106 contributions	Total: Low/Green (3) (Impact - Major (3), Probability - Unlikely(1))	No	n/a	No	Yes	Up to £22m	The Risk Strategy is to tolerate as there is a S106 agreement in place with countryside to ensure receipt of S106.	Next steps are to ensure the funds are received from Chelmsford City Council in a timely manner for each GRIP stage	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
12	The current S106 agreement details out how the S106 receipts can be applied to fund expenditure on Beaulieu Park Station. There is a risk that this agreement limits the ability of ECC to use these funds post March 2025 if required to ensure the maximum HIF claim is made.	The s106 agreement is split into two types of receipts. Those receipts that should be used for GRIP stages 1-4 and receipts that should be used to contribute to the cost of construction. The S106 contributions										
13	There is a risk that ECC is unable to utilise the £12m of SELEP LGF funds on the station project due to a change in prioritisation or other unforeseen circumstances resulting in a funding gap, which might mean that ECC is required to find alternative funding to ensure the project can be delivered.	The project is anticipated to be funded by £12m of SELEP funds . It was agreed at a SELEP accountability board that this contribution did not have an end date	Total: Low/Green (3) (Impact - Major (3), Probability - Unlikely(1))	No	n/a	No	Yes	Up to £12m	The Risk Strategy is to tolerate as there is a agreement from the SELEP accountability board meaning this risk is not longer high rated.	n/a	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
14	Due to the need to acquire land to build the station, there is risk that all required land may not be transferred to the relevant party (NR/GA) which may result in programme delays which could put the HIF funding at risk if the programme delay means ECC do not drawdown the full allocation by March 2025, or it could lead to abortive costs as the project cannot procced.	ECC must comply with a number of conditions before it draws down each tranche of funding (with the exception of preliminary costs). Some of these conditions relate to land ownership. ECC does not currently own all the required land and may need to acquire this through CPO. ECC will not be able to make claims for any money with the exception of prelim costs until it has acquired all land for the whole project with a clean title and HE is satisfied.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	No	n/a	Yes	Yes, if ECC cannot get all the necessary evidence required to start drawing down expenditure, there may be ECC forward funding implications	Unquantified	The risk strategy is unknown. From brief discussions it would appear this risk is being treated but the detail is unknown. Additional information required to confirm.	Outstanding - further info to follow	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
15	Due to the nature of the project and key milestones within there is a risk of Public Enquiry which could result in a threat to the programme which may result in it not being delivered by the baseline deadline of December 2025. Subsequently a delayed programme may result in ECC not utilising the full HIF grant by the required deadline of March 2025 exposing ECC to unfunded costs/funding gap.	The current programme does not take account of a public enquiry. If the risk of a public enquiry materialise there could be an impact on the programme exposing the council to a risk that it cannot spend all the HIF monies by the required deadline March 2025. A generalised timeframe is about 6 months delay	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Unknown	Unquantified	Yes. The baseline programme does not account for a public enquiry therefore if such event occurred it would result in delays in the programme that may not be able to be recovered	Yes- if there are delays in the programme that cannot be mitigated elsewhere it could expose ECC to the funding risk in that it might not meet the funding deadline	Unquantified	Risk Strategy to be confirmed as to whether ECC is currently treating, toleration, transferring or terminate this risk	To be confirmed with the service.	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
16	As a result of the Transport and Works Act Order review there is a risk that permission is not granted leading to abortive costs to ECC . Further to this there is also a risk that permission is granted but with required design changes which once implemented result in unfunded cost escalation which may mean that as bidding authority ECC is liable to fund.	In order for the scheme to progress the TWAO needs approval. There is a risk that approval is not granted resulted in the scheme not being able to progress further or amendments required as a result of the TWAO that result in additional cost impact.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Unknown	Unquantified	Potentially, the baseline programme accounts for a specific timeframe for TWAO, if the process exceeds this it could lead to programme slippage putting funding at risk if as a result we cannot meet the spend deadline of March 2025	Yes- if there are delays in the programme that cannot be mitigated elsewhere it could expose ECC to the funding risk in that it might not meet the funding deadline	Unquantified	Risk Strategy to be confirmed as to whether ECC is currently treating, toleration, transferring or terminate this risk	To be confirmed with the service.	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
17	Caused by unforeseen circumstances, NR fails to obtain track access in the required timeframe resulting in programme delays, which might put funding at risk	There is a risk that track access is not obtained in a timely manner resulting in delays and potential programme slippage exposing ECC to a funding gap risk	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Unknown	Unquantified	Yes- delays in gaining track access could lead to programme delays	Yes- if there are delays in the programme that cannot be mitigated elsewhere it could expose ECC to the funding risk in that it might not meet the funding deadline	Unquantified	Risk Strategy to be confirmed as to whether ECC is currently treating, toleration, transferring or terminate this risk It has been noted at the Beaulieu Steering Group that Track access needs to be booked well in advance, this is a mitigation to ensure that access can be obtained therefore a mechanism to **treat** this risk.	To identify what decision needs to be made to ensure track access.	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
18	Due to unknowns there is a risk that abnormal arise which may lead to unfunded capital cost escalation and increased revenue cost pressures including the risk of Macro Economic shock post covid.	This risk is supporting that fact that major projects can experience unknowns throughout the programme that are unexpected leading to potential cost escalation and/or programme delay. This also highlights the risk of cost escalation being the result of any potential Macro economic shock post covid. As it is no known what potential impact this could have on interest rates, inflation, material prices ect. This is a risk to ECC in that it may result in capital cost escalation and increased revenue cost pressures as the risk may also impact PWLB interest rates and therefore any revenue cost of borrowing associated with funding any current or future capital cost escalation could increased should prudential borrowing be approved.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Yes	Unquantified	Potentially	This is not anticipated to impact any project funding available to date for this scheme	N/A	At the moment it would appear the risk strategy is to tolerate. To ensure this risk can be **treated**, ECC would need to have a sufficient contingency allocation for unknowns that sit outside of a quantified risk assessment to ensure there is the ability to call on additional funds should cost escalation appear through unknowns. Having a quantified risk assessment in place does help to treat this risk partially but there is still a risk of unknowns which are not factored into this assessment. To Terminate the risk ECC would have to not agree to enter into the contract with Homes England which signs ECC up to be funded of last resort for any cost escalation. To Transfer the risk ECC would have had to enter into fixed price contracts will all parties to ensure any risk of cost escalation was absorbed by the third party or I	To continually review the project costs and the wider macro economic impacts on the project costings.	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
19	Due to a number of factors that could result in the programme not continuing (such as; not signing the Contract with Homes England), this may lead to the risk of abortive costs that falls to ECC.	If the project cannot continue for any given reason , such as: - not signing the contract with homes England - TWAO approval not granted - unfunded cost escalation Then the project spend to date will become abortive. As if Nov 20, the spend to date is £4.047m. Further to this, due to the intrinsic link between Beaulieu park Station and Chelmsford North East bypass the spend to date on this scheme will also become abortive unless HE agree to separate the two the schemes and provide funding only for CNBP.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes- Abortive costs	As of Nov 20 it would total £11.2m £7.2m- CNBP £4m- Beaulieu	n/a	Yes- Any draw down of HIF funding to date may be at risk of clawback.	TBC	Risk Strategy is to **treat** this risk with all the mitigations and strategies identified above	n/a	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
20	Due to the requirements of the contract with Homes England and terms of conditions that support the Grant, there is a risk that the housing outputs required are not achieved in full and Homes England (as per the contract) can clawback funding ECC has received to date to cover costs incurred. As the bidding authority this would fall to ECC to fund.	Homes England requires ECC to oversee the delivery of housing at the Garden Community (referred to as 'housing outputs'). The delivery of these outputs are not in the control of ECC; they are in the control of the housing developer(s) and local planning authorities. If the housing outputs are delayed or reduced, then Homes England has a right under the GDA to cease further funding. This could leave ECC at risk of covering the cost of the remainder of the delivery of the Project.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Yes- unfunded capital cost to ECC if clawback of funding is required	TBC	no	Yes. HE clawback HIF funding	TBC	Risk Strategy to be confirmed as to whether ECC is currently treating, toleration, transferring or terminate this risk . It needs to be understood what mitigations are in place to ensure housing delivery. Although, the S106 agreement with countryside would provide a level of mitigation that houses are being delivered but the exact number is still at risk given unforeseen.#	Outstanding - further info to follow	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
21	As a result of the contract and requirements within to claim HIF monies in arrears of spend, there is a risk that ECC don't have sufficient evidence to support claims leading to cost being rejected by Homes England which could result in a funding gap, with no alternative funding available to mitigate	Under the contract, Homes England requires the total value of historic expenditure that has been incurred before the date the agreement is signed to be stipulated as well as this value being approved by Homes England (in its absolute discretion), this requires sufficient evidence to be provided to homes England for verification before any funds can be drawn down. There is a risk that Homes England do not authorise this historic expenditure resulting in a funding gap. The contract asks for the total preliminary costs to be stipulated, the total is £4.599m, there is a risk that if the amount stipulated in the contract is less that actual preliminary costs incurred that ECC may be liable to fund additional costs Claims are made in arrears and so any claims not approved will require ECC to funding the expenditure for which there is no provision	Green (Impact - Major, Probability - Unlikely)	Yes- Homes England may reject the evidence supporting claims resulting in ECC having to fund elements which would result in an unfunded capital pressure	TBC	no	Yes- Reduction in funding leading to a funding gap for ECC	TBC	Risk Strategy is currently to treat this risk with control measures in place to mitigate these include internal reporting requirements and sign off procedures to ensure that the claims are successful and all HIF monies can be drawn down to cover off spend incurred. A process has been set up between Homes England, the service and finance to ensure all sufficient evidence is obtained and all requirements for drawing down funds are met.	n/a	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
22	As a result of the contract and the requirements within to claim HIF monies, there is a risk that ECC haven't met all these requirements resulting in ECC not being able to submit a claim for funds, resulting in the requirement for ECC to forward fund, or subsequent funding gap if these requirements are never met by the HIF drawdown deadline of March 2025.	Under the contract, Homes England stipulates specific conditions that must be in place for certain stages of drawdown, for example it requires that ECC own all the land associated with the development of infrastructure which could limit ECC's ability to draw down all the HIF funds by the required deadline.										
23	The original bid into Homes England included the delivery of Beaulieu Park Station and Chelmsford North East bypass. Each project is being managed separately under the programme but under the bid they are treated as a single programme of works. This means there is a risk that should this project terminate, Chelmsford North East Bypass may also terminate leading to abortive costs on both projects.	The bid submitted for forward funding included 2 infrastructure projects; 1. Beulieu park Station 2. Chelmsford North East Bypass The total HIF allocation was for delivery of both infrastructure projects and the proposed contract with HE covers both schemes. Therefore, any termination of Beaulieu park station will result in termination of CNB.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes- Abortive costs	As of Nov 20 it would total £11.2m £7.2m- CNBP £4m- Beaulieu	n/a	Yes- Any draw down of HIF funding to date may be at risk of clawback.	TBC	Risk Strategy To Treat this risk : ECC would need to treat all the risks within this register to prevent the schemes being terminated and this risk crystalising. To terminate this risk: ECC could look to obtain agreement from Homes England to separate the two schemes to ensure Chelmsford North East Bypass can continue (with HIF funding) should Beaulieu Park station not. This would remove the risk all together To tolerate this risk: ECC would need to feel comfortable with the abortive costs associated with CNBP (circa £7m) and the risk that this project faces should Beaulieu not continue. To Transfer this risk: would require another party to take on ownership of delivery of both schemes	To undertake discussions with Homes England as to whether the two schemes can be separated should beaulieu not continue. This is something the service will be raising with Homes England.	Outstanding - awaiting a copy of the quantified risk assessment to determine	HIF BID document indicating the two projects being delivered
24	As the programme progresses through the relevant stages, there is a risk that programme delays are exposed (above those already referenced above), which may lead to the scheme not being at the required stage by March 2025 resulting in ECC not having drawn down all the available HIF monies, as March 2025 is the deadline for drawdown this may lead to a funding gap that requires mitigation, falling to ECC in the last instance as bidding authority	There is a risk throughout the whole programme that delays are encountered in terms of the programme and timescales which cannot be recovered and therefore lead to ECC missing the spend deadline of March 2025. This could occur for a number of unknown reasons that are not specifically identified elsewhere in this risk register.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes potentially programme delays could lead to increased cost for a number of reasons including increased management costs					Risk Strategy: To Transfer the risk : Would require another third party to take on the accountability for programme delays and funding any financial liabilities that consequently arise should they be directly responsibility for creating the delay. An indemnity agreement is being put in place with CCC for up to £5m to transfer a portion of this risk, the same is being negotiated with BDC. Other delivery partners are not accepting any other transfer of risk. To Terminate the risk: Would be to not enter into agreement with Homes England on the contract. However, this would result in the entire scheme being at risk and resulting in abortive costs. Or, removal of the spend deadline which would remove the pressure of needing to spend all HIF monies by March 2025. However, this would still leave ECC exposed to costs associated with delays. To Treat the risk: The only way to treat this risk is to ensure contingency is sufficient to cover any potential costs associated with programme delays, but due to the nature of the project and heavy involvement of Network Rail and their subcontractor Murphy's apart from regular engagement and ensuring enough time is built in for each stage, this is not recommended. Tolerate: ECC will need to monitor delivery performance very closely and hold delivery partners to account for meeting milestones, responding quickly to any delays and seeking redress with immediate effect. Escalation to happen swiftly across all affected partners to minimise further delays to redressing the programme slippage.	Delivery assurance framework to be designed and operating effectively prior to contract signing, with clear reporting requirements for delivery partners set out in the contracts. Clauses over information sharing to be mandatory.	Outstanding - awaiting a copy of the quantified risk assessment to determine	
25	There is a risk that the post-covid macro economy is fundamentally different to that upon which the current cost estimates and revenue forecasts are modelled and therefore costs and revenues are misstated leading to potential cost escalation.	The current cost profile for Beaulieu of £171m does not take account of any covid implications nor any other wider economic shocks resulting from covid/ Brexit which may directly affect material prices, labour availability and price, inflation, interest rates, Forex rates ect and therefore may be materially misstated should this risk crystallise.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes directly affects costs	Unquantified	Yes there is a potential that this could impact programme timeline	Potential	Unquantified	Risk Strategy: To transfer the risk: would require the authority to enter into swap arrangements on interest rates, inflation or interest rates at additional expense to the project. This is not recommended at the current time. To terminate the risk: would be to not enter into agreement with Homes England as referenced above. This is not recommended. To treat the risk: would require additional contingency to be held on the balance sheet to protect against future cost increases once the project is in delivery. This is being considered. Tolerate: Monitoring of the future forecasts for macroeconomic indicators will be required so that action to treat or transfer the risk can be taken should the risk increase in likelihood. Routine monitoring of costs actually incurred against budget to identify any cost creep materialising.	Monitoring of macro economic indicators to be established. Monitoring of actuals incurred happens through the monthly outturn process and regular monitoring by Jacobs.	Outstanding - awaiting a copy of the quantified risk assessment to determine	
26	There is a risk that Homes England reduce the maximum sum of HIF funds available to ECC resulting in a funding gap.	The contract between ECC and Homes England stipulates that ECC acknowledges and agrees that the maximum sum may be reduced by Home England under the following reasons: - in there exercise of its rights under the Homes England agreement - to accommodate factors such as (but without limitation) a) changes to infrastructure details, b) variations arising due to clause 8.2, c) changes to increases in income or other sources of financial assistance becoming available to the Grant recipient or the infrastructure developer in relation to the delivery of infrastructure works.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	No	n/a	Yes there is a potential that this could impact programme timeline	Yes	Unquantified		unknown	Outstanding - awaiting a copy of the quantified risk assessment to determine	GDA
27	The Bid stipulated that the project will result in additional business rates and council tax receipts. There is a risk that these do not impact the existing tax base and further to this that any receipts may be offset entirely by additional demand for services.	The bid submitted to Homes England and ECC's cabinet paper seeking approval to enter into contract with Homes England stipulate that there will be growth in both Council Tax, and Business Rates which may not come to fruition.	Medium/Amber - Total Score 4 (Probability - Possible (2), Impact - Moderate (2)	Potentially	Unquantified	no	no	N/A		unknown	Outstanding - awaiting a copy of the quantified risk assessment to determine	Bid Submitting and Cabinet Paper
28	There is a risk that the increase in infrastructure and housing subsequently results in the need for future infrastructure requirements which are currently not planned for or budgeted for.	No further detail.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Yes	Unquantified	no	no	N/A		unknown	Outstanding - awaiting a copy of the quantified risk assessment to determine	Bid Submitting and Cabinet Paper

This risk map is a work in progress, detailed conversations have yet to take place with service colleagues and agreement has not been sought

Scheme Name:	Chelmsford North East Bypass
Project total cost:	£95.584m
Funding	£93.360 HIF Grant, £2.224m S106
Original Contingency	£22.05m
Project Contingency:	£16.590m
Project Summary:	Provides a strategic link between Chelmsford, Braintree,
Status of governance:	No yet entered into contract with Homes England, cabinet paper required to do so
Spend to date:	£5.792m
Funding type spent to date	ECC resources' (forward Funded)

Risk number	Risk	Detail	Overall RAG Rating	Impact on Budget	Value of impact on budget	Impact on programme timeline	Impact on Funding	Value of impact on funding	Mitigations	Next Steps	Is it quantified in risk assessment (or outside cont. allocation?	Supporting docs
1	Due to the identification of Cost escalation ahead of the next design fix stage, there is a risk should mitigations fail that the project cost exceed the funded budget resulting in an unfunded capital budget pressure.	The interim position presented at project board on 5/11/20 highlighted a potential £10m cost escalation, largely associated with a surplus of excavated material and the costs required to include a permanent conveyor bridge rather than a temporary structure.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes	c. £10m	No	No	N/A	The current risk strategy is to treat this risk. The service alongside Jacobs are looking at potential mitigations to remove the cost escalation. This includes value engineering. The impact of this risk is too high to tolerate, and the only way to terminate would be to stop the project.	Value Engineering opportunities to be explored leading into the final design fix. The Final Design fix is in February 2021 and Value Engineering opportunities to be concluded prior to final design fix and a clear brief from Paul Crick to bring costs back into budget envelope	Outside	N/a
2	As a result of undertaking archaeological investigations there is a risk that archaeological finds are uncovered this may lead to programme delays which may result in cost escalation or an inability for ECC to drawdown all HIF monies by the required deadline of March 2024.	Archaeological trail trenches and investigations are usually undertaken once land is owned by ECC, but there is a risk that if these are done at the stage of ECC ownership, if an archaeological item is found and needs to be extracted it could result in significant delays to the project , which could bring about cost escalation and also ECC could miss the spending deadline of March 2024 and therefore could pose a funding gap risk . However, in conjunction with this accessing the land early prior to ownership requires negotiation with land owners and the purchase of licenses which brings about additional costs as these are not factored into the cost estimate . Tenders for these works are between £240 & £600k.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Gaining early access to the land could result in substantial compensation events which are not budgeted for in full. Tenders for Trial trenches are slightly higher than forecasted.	Unknown	Moderate	There is a risk if ECC wait until it owns the land to complete the trials, at this later stage it causes significant delay should there be significant findings from the trials. If the works are required post March 2024 ECC will be unable to claim the costs from Homes England. But to note by waiting until ownership ECC reduces compensation events.	Unknown	The current risk strategy is a combination of treat and tolerate. The service is looking to treat this partially by looking to complete 50% of trenches pre planning application and 50% post. This will enable them to reduce compensation events. But this approach still includes an element of toleration as not all trenches are completed prior to planning submission (which could cause delay to programme if we find roman artefacts for instance). LSH are discussing proposals with landowners but no figures for costs have been tabled yet	Await response from LSH discussions with landowners	Risk included, but trial trenches exceed forecast for this activity	N/a
3	Due to the amount of works required to undertake this scheme, there is a risk of Large surplus of excavated material on site, which may lead to cost escalation as a result of removing these materials from site.	There is surplus excavated material from works, that would require c. £10m to dispose of.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	If the mitigation is not effective there could be a budget pressure of up to £10m	Up to £10m	No	No	N/A	The current risk strategy is to treat this risk. It is not being tolerated as there is not sufficient budget available to cover the cost nor can it be transferred or terminated. The service are considering 'bunding' along the highway to use the excess material to create a large bank. This would successfully use the excess material but also have an added benefit of reducing noise pollution. This has been flagged as a value engineering task to be completed ahead of the final design fix in February 2021	Value Engineering opportunities to be explored leading into the final design fix. The Final Design fix is in February 2021 and Value Engineering opportunities to be concluded prior to final design fix and a clear brief from Paul Crick to bring costs back into budget envelope	Outside	N/a
4	As part of the project ECC are required to deliver an advanced package of works to provide a Conveyor Bridge over the proposed bypass for Hanson Aggregates to ensure that the existing quarry continues to operate, there is a risk that this bridge may result in unfunded cost escalation and programme delays which may also lead to funding risk if ECC cannot spend the HIF monies by the required deadline of March 2024.	ECC need to design and procure the conveyor bridge with a legal agreement required between ECC & Hanson regarding the specification, liabilities and handover of the ramp to Hanson's ownership. Various options available from temporary structure, permeant or a hybrid. A further risk is around the delivery of the bridge which should be in place by Spring 2022, should it be delivered late it could lead to compensation event. A delay of 6 weeks could result in late delivery and CE.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Yes	Yes - but it is probable that Chelmsford City Council contribute the value of upgrading the bridge from temporary to permanent. A CE may be triggered if the asset is not in place by Spring 2022.	No	Yes	Yes - but it is probable that CCC contribute the value of upgrading the bridge from temporary to permanent	ECC are currently attempting to treat this risk through discussions with Hanson and Threadneedle. As per the lagoon relocation, it is critical to commence legal discussions with Hanson and Threadneedle to ensure that specification, liabilities and ramp ownership/maintenance is defined and agreed. A permeant bridge is likely to be between £750k -£1.5m more than the temporary structure. CCC have indicated they are willing to pay for this additional element. To ensure the conveyor is in place by Spring 2022 the planning permission must be submitted by end of March 2021.	To be put in front of members at CCC as to whether they will pay for design and construction (gap between temp to perm structure) - This meeting may have already taken place	outside	N/a
5	Due to the complexities of the CNEB design in that it splits a current quarry site into two, there is a risk that the tasks required to resolve this issue lead to cost escalation that falls to ECC to fund as a last resort.	Follow-up meeting with Hanson proposed to agree final levels to fill to. This is likely to include for some additional fill to surcharge the unconsolidated earth. This will be informed by the recently completed GI.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Outstanding - further information to follow	Outstanding - further information to follow	Outstanding - further information to follow	Outstanding - further information to follow	Outstanding - further information to follow	A possible solution is to treat this risk by using additional soil on top to increase the weight. This will help it compact and settle quicker but will include a surcharge which is currently unknown	Outstanding - further information to follow	Outstanding - further information to follow	N/a
6	Due to the CNEB design proposal there is a requirement to separate two exsisting silk lagoons which are used in conjunction with the quarry to clean minerals, as a result of this there is a risk that the solutions agreed to mitigate this result in additional unfunded capital costs that fall to ECC to fund as bidding authority.	ECC discussions with Hanson and the landowner, Threadneedle. All parties on board but must commence legal/commercial discussion imminently as process likely to be extremely lengthy. The silk lagoons are essentially pools of water used to clean minerals. There are a few issues associated with relocating these including: - the road is lower than ground level which could cause flooding issues - the need to connect two separate lagoons together should they be separate may require a pipe but this cant go over the road - They need to keep the water levels constant The current solution is to move one of the lagoons so they both sit on one side of the road, but this is subject to procurement issues and ground investigation works , the currently flagged additional costs is estimated at £1m, but if GI poses risk the cost impact could be greater which may lead to cost escalation which would fall to ECC to fund as last resort	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Yes- potential cost implications if cost reductions cannot be found elsewhere	£1m	Process deemed to be lengthy so there is a risk of delay to the programme	No	No	The current risk strategy is to treat, discussions with Hanson and the landowner, Threadneedle. All parties on board but must commence legal/commercial discussion imminently as process likely to be extremely lengthy.	Legal/Commercial discussion to commence Hanson's were completing GI works for new silk lagoons	unknown	N/a
7	Due to the nature of the project and key milestones within there is a risk of Public Enquiry which could result in a threat to the programme which may result in it not being delivered by the baseline deadline Subsequently a delayed programme may result in ECC not utilising the full HIF grant by the required deadline of March 2024 exposing ECC to unfunded costs/funding gap.	The risk of Public enquiry is flagged frequently. This could result in significant programme delays of 6-12 months. This isn't factored into the baseline programme and the current assumption the project will complete by March 2024. Therefore, this risk is intrinsically linked to the risk that ECC need to spend HIF moneys by March 2024. If this deadline is not met due to public enquiry then ECC is exposed to a capital funding gap and as bidding authority is funder of last resort.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	No	N/a	Potential	Yes - if pushed beyond March 2024	Significant - for context there is planned spend of £46.6m in 2023/24 leading up to the HIF deadline. So each month of works beyond March 2024 would be unfunded.	Currently ahead of HIF bid programme. Early negotiation with landowners and maximisation of advanced contracts respectively. A public enquiry would be a min of 6 months delay. Risk Strategy to be confirmed by the service.	MHCLG allowed a year extension on Beaulieu Park. If it seems likely that the programme will slip, ECC could consider a similar request to extend the spend date	outside	N/a
8	Due to the requirements of the contract with Homes England and terms of conditions that support the Grant, there is a risk that the housing outputs required are not achieved in full and Homes England (as per the contract) can clawback funding ECC has received to date to cover costs incurred. As the bidding authority this would fall to ECC to fund.	Homes England requires ECC to oversee the delivery of housing at the Garden Community (referred to as 'housing outputs'). The delivery of these outputs are not in the control of ECC; they are in the control of the housing developer(s) and local planning authorities. If the housing outputs are delayed or reduced, then Homes England has a right under the GDA to cease further funding. This could leave ECC at risk of covering the cost of the remainder of the delivery of the Project	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	No	No	No	Yes	put to £93m of funding could be reclaimed	Risk strategy to be confirmed by the service	Mitigations to be confirmed by the service.	Outside	N/A
9	Due to a number of factors that could result in the programme not continuing (such as; not signing the Contract with Homes England), this may lead to the risk of abortive costs that falls to ECC.	If the project cannot continue for any given reason , such as: - not signing the contract with homes England - TWAO approval not granted - unfunded cost escalation Then the project spend to date will become abortive. As of the start of December 20, the spend to date on CNEB is £7.157m. Further to this, due to the intrinsic link between Beaulieu park Station and Chelmsford North East bypass the spend to date on this scheme will also become abortive unless HE agree to separate the two the schemes and provide funding only for CNEB.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	No	No	No	Yes	£93m of funding would be lost. The abortive costs to date are £7.1m	Service seek to overcome barriers to contracting, particularly the significant issue around opex costs on BPS	Service seek to overcome barriers to contracting, particularly the significant issue around opex costs on BPS	Outside	N/A
10	Due to the way in which ECC submitted a BID to homes England for Forward funding HIF which include delivery of Beaulieu Park Station and Chelmsford North East Bypass, there is a risk that should this project terminate, Chelmsford North East Bypass may also terminate leading to abortive costs on both projects.	The bid submitted for forward funding included 2 infrastructure projects; 1. Beulieu park Station 2. Chelmsford North East Bypass The total HIF allocation was for delivery of both infrastructure projects and the proposed contract with HE covers both schemes. Therefore, any termination of Beaulieu park station will result in termination on CNB.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	No	No	No	Yes	£93m of funding would be lost. The abortive costs to date are £7.1m	Service to consider the possibility of splitting out the two projects, but this will be a strategic position to take	Service to consider the possibility of splitting out the two projects, but this will be a strategic position to take	Outside	N/A
11	Due to design standards and the changes published on a regular basis there is a risk that the project experiences departures from design standards that require design changes to be resolved. This may lead to increased cost that may be unfunded and therefore fall to ECC to fund in the last resort	Recently there have been a number of departures from design standards that have been identified on the CNEB project. For example one departure relates to overtaking.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Yes- If design changes lead to cost escalation	Unknown	Yes potentially	No	-	**A risk strategy is in place to treat this risk with a recommendation in the technical note of 3/9:** It is recommended that a design standards freeze date of the end August 2020 is taken forward for the scheme to coincide with the design fix for the Environmental Impact Assessment. This is particularly pertinent now that DMRB standards can be updated monthly, not quarterly as under the old regime. In a wider sense, it is also recommended that a design standards freeze date be agreed at the start of each design stage of a project in future schemes, with ongoing vigilance and an appropriate assessment taken towards the end of the stage, and that this process is incorporated to any updates to the Essex Highways Major Projects Contract Manual where DMRB standards are suggested for use.	Mitigations to be confirmed by the service.	Outside	N/a
12	As a result of the Transport and Works Act Order review there is a risk that permission is not granted leading to abortive costs to ECC . Further to this there is also a risk that permission is granted but with required design changes which once implemented result in unfunded cost escalation which may mean that as bidding authority ECC is liable to fund.	Planning approval is required for the scheme to progress further, this is due to be approved by May 2021 . Any delays in approval or lack of approval could result in the scheme ending all together or delays in the programme exposing ECC to funding risk . There are sub-risk sitting underneath this around what design is being submitted into planning application due to red line boundary's issues as highlighted and this could lead to further delays and potential cost escalation if the design that is submitted and approved then needs to change	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Yes- If design changes lead to cost escalation	Unknown	Yes potentially	No	-	Risk Strategy **Treat**: Currently planning submission is programmed into the timeline to allow sufficient time for review and approval to ensure this process does not result in time delays. This includes insuring that all the required surveys and works that are required to be included in the application are complete. Known issues with the project are being worked on to prevent objections and issues being raised at planning approval stage (such as Service Station issues). This is not a risk that can be terminated as its a legal requirement to obtain planning and it cannot be transfer as it is ECC's responsibility as bidding authority to progress this through planning to enable construction and completion. This risk poses to much threat to tolerate.	Mitigations to be confirmed by the service.	-	N/a
13	Due to the need to acquire land in order to draw down all HIF monies, there is risk that all required land may not be acquired may result in programme delays which could put the HIF funding at risk if the programme delay means ECC do not drawdown the full allocation by March 2025, or it could lead to abortive costs if the project cannot procced.	ECC must comply with a number of conditions before it draws down each tranche of funding. Some of these relate to land ownership which are particularly onerous given that some of the land is owned by third parties and will need to be acquired, possibly compulsorily purchased. ECC is warranting that with respect to the land it acquires there are no securities, covenants or restrictions on any of the land that could hinder the works. Further information also needs to be provided to Homes England to demonstrate compliance with necessary consents, valuations of the land and certificates of title satisfactory to Homes England. ECC will not be able to make any claims for any money with the exception of the preliminary costs until it has acquired all land for the whole project with a clean title and HE is satisfied with the position. This represents a significant risk.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes- If design changes lead to cost escalation	Unknown	Yes potentially	Yes	If ECC does not meet conditions, it may not be able claim the funding	The risk strategy is unknown. From brief discussions it would appear this risk is being treated but the detail is unknown. Additional information required to confirm.	Outstanding - further information to follow	unknown	N/a
14	There is a risk that the post-covid macro economy is fundamentally different to that upon which the current cost estimates and revenue forecasts are modelled and therefore costs and revenues are misstated leading to potential cost escalation.	The current cost profile does not take account of any covid implications nor any other wider economic shocks resulting from covid/ Brexit which may directly affect material prices, labour availability and price, inflation, interest rates, Forex rates ect and therefore may be materially misstated should this risk crystallise.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes directly affects costs	Unquantified	Yes there is a potential that this could impact programme timeline	Potential	Unquantified	Risk Strategy: To transfer the risk: would require the authority to enter into swap arrangements on interest rates, inflation or interest rates at additional expense to the project. This is not recommended at the current time. To terminate the risk: would be to not enter into agreement with Homes England as referenced above. This is not recommended. To treat the risk: would require additional contingency to be held on the balance sheet to protect against future cost increases once the project is in delivery. This is being considered. Tolerate: Monitoring of the future forecasts for macroeconomic indicators will be required so that action to treat or transfer the risk can be taken should the risk increase in likelihood. Routine monitoring of costs actually incurred against budget to identify any cost creep materialising.	Monitoring of macro economic indicators to be established. Monitoring of actuals incurred happens through the monthly outturn process and regular monitoring by Jacobs.	Outstanding - awaiting a copy of the quantified risk assessment to determine	
15	There is a risk that Homes England reduce the maximum sum of HIF funds available to ECC resulting in a funding gap.	The contract between ECC and Homes England stipulates that ECC acknowledges and agrees that the maximum sum may be reduced by Home England under the following reasons: - in there exercise of its rights under the Homes England agreement - to accommodate factors such as (but without limitation) a) changes to infrastructure details, b) variations arising due to clause 8.2, c) changes to increases in income or other sources of financial assistance becoming available to the Grant recipient or the infrastructure developer in relation to the delivery of infrastructure works.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	No	n/a	Yes there is a potential that this could impact programme timeline	Yes	Unquantified		unknown	Outstanding - awaiting a copy of the quantified risk assessment to determine	GDA
16	The Bid stipulated that the project will result in additional business rates and council tax receipts. There is a risk that these do not impact the existing tax base and further to this that any receipts may be offset entirely by additional demand for services.	The bid submitted to Homes England and ECC's cabinet paper seeking approval to enter into contract with Homes England stipulate that there will be growth in both Council Tax, and Business Rates which may not come to fruition.	Medium/Amber - Total Score 4 (Probability - Possible (2), Impact - Moderate (2)	Potentially	Unquantified	no	no	N/A		unknown	Outstanding - awaiting a copy of the quantified risk assessment to determine	Bid Submitting and Cabinet Paper
17	There is a risk that the increase in infrastructure and housing subsequently results in the need for future infrastructure requirements which are currently not planned for or budgeted for.	No further detail.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Yes	Unquantified	no	no	N/A		unknown	Outstanding - awaiting a copy of the quantified risk assessment to determine	Bid Submitting and Cabinet Paper
18	Due to the HIF Grant Terms and Conditions there is a requirement to spend all HIF monies by March 2024, there is a risk of programme slippage which could cause not all the HIF monies to be spent by the required timeframe, leaving ECC exposed to funding risk and the potential that they may have to bridge any future funding gap.	Homes England's has provided the funding on the basis that it will be fully spent by March 2024. If ECC does not spend the full HIF Grant allocation by this deadline, there is a risk of a funding gap as we may be unable to draw down the last elements of funding as all funding is claimed in arrears.	Red/ High - Total Score: 9 Red (Impact - major (3), Probability (Likely) (3)	Yes	Unquantified	Yes	Yes- this could result in a reduction of funding leaving a funding gap/	Unquantified	The risk strategy is currently to treat this risk through programme acceleration including the proposal of "project speed" and the ECC project team are keeping under regular review the programme timeline. Other options in the future to treat this risk would be to lobby for clause removal or extension of deadline No other strategies are being considered as of present, as to terminate this risk would require termination of the project or removal of clause which homes England have confirmed they will not do and ECC is unable to transfer this risk to anyone else as ECC are the bidding authority and hold overall responsibility for this.	NR to continue with identifying the detail of opportunities in project speed to confirm practicality and associated risk.	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
19	The current S106 agreement details out how the S106 receipts can be applied to Chelmsford North East Bypass. There is a risk that this agreement limits the ability of ECC to use these funds post March 2024, if required to ensure the maximum HIF claim is made.	£2.224m of S106 has been received to contribute towards the delivery of the North East Bypass. The detail of this agreement and limitations within are currently unknown.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	no	no	no	Yes- could result in a funding gap	Unquantified	TBD	Obtain copy of S106 agreement and ensure limitations do not restrict its usage.		Email from project sponsor confirming allocation
20	Due to unknowns there is a risk that abnormal arise which may lead to unfunded capital cost escalation and increased revenue cost pressures including the risk of Macro Economic shock post covid.	This risk is supporting that fact that major projects can experience unknowns throughout the programme that are unexpected leading to potential cost escalation and/or programme delay. This also highlights the risk of cost escalation being the result of any potential Macro economic shock post covid. As it is no known what potential impact this could have on interest rates, inflation, material prices ect. This is a risk to ECC in that it may result in capital cost escalation and increased revenue cost pressures as the risk may also impact PWLB interest rates and therefore any revenue cost of borrowing associated with funding any current or future capital cost escalation could increased should prudential borrowing be approved.	Medium/Amber - Total Score 6 (Impact- Major (3) , Probability - possible (2))	Yes	Unquantified	Potentially	This is not anticipated to impact any project funding available to date for this scheme	N/A	At the moment it would appear the risk strategy is to tolerate. To ensure this risk can be **treated**, ECC would need to have a sufficient contingency allocation for unknowns that sit outside of a quantified risk assessment to ensure there is the ability to call on additional funds should cost escalation appear through unknowns. Having a quantified risk assessment in place does help to treat this risk partially but there is still a risk of unknowns which are not factored into this assessment. To Terminate the risk ECC would have to not agree to enter into the contract with Homes England which signs ECC up to be funded of last resort for any cost escalation.	To continually review the project costs and the wider macro economic impacts on the project costings.	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
21	Due to a number of factors that could result in the programme not continuing (such as; not signing the Contract with Homes England), this may lead to the risk of abortive costs that falls to ECC.	If the project cannot continue for any given reason , such as:	Red/ High - Total Score: 9	Yes- Abortive costs	As of Nov 20 it would total £14.7m	n/a	Yes- Any draw down of HIF funding to date may be at risk	TBC	Risk Strategy is to **treat** this risk with all the mitigations and strategies	n/a	Outstanding - awaiting a copy	Outstanding - further info to
22	As a result of the contract and requirements within to claim HIF monies in arrears of spend, there is a risk that ECC don't have sufficient evidence to support claims leading to cost being rejected by Homes England which could result in a funding gap, with no alternative funding available to mitigate	Under the contract, Homes England requires the total value of historic expenditure that has been incurred before the date the agreement is signed to be stipulated as well as this value being approved by Homes England (in its absolute discretion), this requires sufficient evidence to be provided to homes England for verification before any funds can be drawn down. There is a risk that Homes England do not authorise this historic expenditure resulting in a funding gap. The contract asks for the total preliminary costs to be stipulated, the total is £4.599m, there is a risk that if the amount stipulated in the contract is less that actual preliminary costs incurred that ECC may be liable to fund additional costs Claims are made in arrears and so any claims not approved will require ECC to funding the expenditure for which there is no provision.	Green (Impact - Major, Probability - Unlikely)	Yes- Homes England may reject the evidence supporting claims resulting in ECC having to fund elements which would result in an unfunded capital pressure	TBC	no	Yes- Reduction in funding leading to a funding gap for ECC	TBC	Risk Strategy is currently to treat this risk with control measures in place to mitigate these include internal reporting requirements and sign off procedures to ensure that the claims are successful and all HIF monies can be drawn down to cover off spend incurred. A process has been set up between Homes England, the service and finance to ensure all sufficient evidence is obtained and all requirements for drawing down funds are met.	n/a	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow
23	As a result of the contract and requirements within to claim HIF monies in arrears of spend, there is a risk that ECC don't have sufficient evidence to support claims leading to cost being rejected by Homes England which could result in a funding gap, with no alternative funding available to mitigate	Under the contract, Homes England requires the total value of historic expenditure that has been incurred before the date the agreement is signed to be stipulated as well as this value being approved by Homes England (in its absolute discretion), this requires sufficient evidence to be provided to homes England for verification before any funds can be drawn down. There is a risk that Homes England do not authorise this historic expenditure resulting in a funding gap. The contract asks for the total preliminary costs to be stipulated, the total is £4.599m, there is a risk that if the amount stipulated in the contract is less that actual preliminary costs incurred that ECC may be liable to fund additional costs Claims are made in arrears and so any claims not approved will require ECC to funding the expenditure for which there is no provision.	Green (Impact - Major, Probability - Unlikely)	Yes- Homes England may reject the evidence supporting claims resulting in ECC having to fund elements which would result in an unfunded capital pressure	TBC	no	Yes- Reduction in funding leading to a funding gap for ECC	Unquantified		n/a	Outstanding - awaiting a copy of the quantified risk assessment to determine	Outstanding - further info to follow