highways england

A47 Wansford to Sutton Dualling

Scheme Number: TR010039

Volume 9

9.25 Applicant's Response to the Examining Authority's Further Written Questions (ExQ2) - Annexes

Infrastructure Planning (Examination Procedure) Rules 2010
Rule 8(1)(c)

Planning Act 2008

April 2022

Deadline 5

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Examination Procedure) Rules 2010

A47 Wansford to Sutton Development Consent Order 202[x]

9.25 APPLICANT'S RESPONSE TO THE EXAMINING AUTHORITY'S FURTHER WRITTEN QUESTIONS (EXQ2) - ANNEXES

Rule Number	Rule 8(1)(c)
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ANNEX A: ANGLIAN WATER PROTECTIVE PROVISIONS – OUTSTANDING ISSUES BETWEEN THE PARTIES

Annex A - Anglian Water Protective Provisions – Outstanding issues between the parties

ORDER TEXT			SUMMARY	PARTIES' COMMENTS	
Paragraph	**Applicant's Text**	**Anglian Water's Proposed Text**		**Anglian Water's Proposed Text*** [* note this is the Applicant's understanding of Anglian Water's position]	**Applicant's Response**
81	This Part of this Schedule does not apply to apparatus in respect of which the relations between the undertaker and Anglian Water are regulated by the provisions of Part 3 of the 1991 Act.	Where relations in relation to apparatus may be regulated by both this Part of this Schedule and Part 3 of the 1991, they shall be regulated by this Part of this Schedule unless the undertaker shall have given prior written notice to Anglian Water that they are to be regulated	This article sets out the circumstances in which the protective provisions will apply	1. Anglian Water needs this clause to be clear so that it knows when the New Roads and Street Works Act 1991 is being relied on and when the protective provisions will apply. 2. The Applicant's wording is not sufficiently clear.	1. Agreed 2. The Applicant considers that the wording used is clear. Firstly, this is the wording used in the standard protective provisions for water (and other undertakers) in Part 1 of Schedule 9 of the dDCO and is well-precedented – see for example • A14 Cambridge to Huntingdon Improvement Scheme Development Consent Order 2016 • M4 Motorway (Junctions 3 to 12) (Smart Motorway) Development Consent Order 2016. • The A19/A184 Testo's Junction Alteration Development Consent

		by Part 3 of the 1991 Act; in which case they shall be regulated by Part 3 of the 1991 Act to the exclusion of this Part of this Schedule			Order 2018 Secondly, the Applicant is not seeking to deviate from the standard position that where the New Roads and Street Works Act 1991 applies it will apply to the exclusion of the protective provisions. Thirdly, the Applicant does not consider that there are situations where both the 1991 Act and the protective provisions could apply. because the Applicant's wording entirely ousts the protective provisions where the 1991 Act applies.
				3. Anglian Water would like to see some additional wording to provide a default as to which powers are being used if the promoter does not mention which, when it is engaging with Anglian Water.	3. The Applicant considers that the dDCO already includes adequate wording that the New Roads and Street Works Act 1991 applies as a default; it is only where the 1991 Act does not apply that the protective provisions will apply.
				4. Anglian Water maintains that the lack of clarity provides National Highways with the opportunity to switch between the 1991 Act and the protective provisions which advantage the Applicant and to the disadvantage of Anglian Water customers and	4. The Applicant considers that the wording is clear. If the works are carried out in a street NRSWA applies; if they of not in a street then the protective provisions will apply.

				funds.	
88	(5) An amount which apart from this sub-paragraph would be payable to Anglian Water in respect of works by virtue of sub-paragraph (1), if the works include the placing of apparatus provided in substitution for apparatus placed more than 7 years and 6 months earlier so as to confer on Anglian Water any financial benefit by deferment of the time for renewal of the	**NONE** - Text should be deleted	This paragraph provides for a reduction in payments to Anglian Water to take into account the fact that the provision of new apparatus puts back the date when the existing apparatus would have to be replaced by Anglian Water (ie in a no scheme world). This is known as a "deferment of renewal" provision.	1. The renewal is not of Anglian Water's choosing and is required only because of the scheme. 2. Anglian Water would be paying part of the capital cost of the National Highways project when it does not have regulator approval for these costs and we cannot pass the majority of these uncompensated costs onto customers. The New Roads and Street Works Act gives highway authorities a couple of privileges. One is cost sharing and the other is deferment. (a) "Cost sharing" is set out in section 85(4) of the Act and regulations 3 to 5 of the Street Works (Sharing of Costs of Works) (England) Regulations 2000 – it doesn't really relate to any advantage to an	1. The Applicant acknowledges this point. 2. The deferment of renewal provisions reflect that there where apparatus is renewed there is a benefit to Anglian Water of having that renewed apparatus, and the delay in the date when they would (in a no scheme world) have to replace the apparatus. The deferment of renewal provision is the wording used in the standard protective provisions for water (and other undertakers) in Part 1 of Schedule 9 of the dDCO and is well-precedented – see for example: • A14 Cambridge to Huntingdon Improvement Scheme Development Consent Order 2016, • M4 Motorway (Junctions 3 to 12) (Smart Motorway) Development Consent Order 2016. • The A19/A184 Testo's Junction Alteration Development Consent Order 2018 It is also a principle found in statute. For example, there is a deferment of renewal provision reflects the terms of Part II of

	apparatus in the ordinary course, is to be reduced by the amount which represents that benefit.			infrastructure owner, but is just a mandate for the infrastructure owner to bear between 7½% and 18% of the cost of the highway authority's works in respect of that infrastructure. (b) The other is "deferment" and is referenced in section 85(5) of the Act and regulation 7 of the Street Works (Sharing of Costs of Works) (England) Regulations 2000. That sends you to Appendices E and F of the Code known as HAUC in order to work out the sum borne by the infrastructure owner. Deferment is supposed to relate to the benefit the infrastructure owner gets in having new for old. Anglian Water's point is that just because these privileges exist in NRSWA, it doesn't follow that they should be expanded into	Schedule 12 of the Highways Act 1980 (where highways are stopped up or diverted under that Act) which provides that: *"An amount which apart from this paragraph would be payable to undertakers in respect of works of theirs by virtue of paragraph 6 above (and having regard, where relevant, to paragraph 7 above) shall, if the works include the placing of apparatus provided in substitution for apparatus placed more than 7 1/2 years earlier so as to confer on the undertakers any financial benefit by deferment of the time for renewal of the apparatus in the ordinary course, be reduced by the amount which represents that benefit."* In considering deferment of renewal payments, it is also important to keep in mind the following: (a) The deferment of renewal provision applies on-street under the New Roads and Street Works 1991, entirely independently of the protective provisions. (b) The protective provisions only apply where the apparatus in question is not in a street, applying the same rule.

				other exercises of power by highway authorities, such as through a DCO. Anglian Water's view is that the principle is the same as for a classic compulsory purchase – that the acquiring authority should pay full all costs that the person on the receiving end of the power incurs. Because of the way it is funded, Anglian Water doesn't actually really gain any benefit from "new for old" and so would not support the expansion of NRSWA and HAUC deferment into the field of DCOs. Likewise, cost sharing doesn't reflect any kind of benefit and so that would not be supported either. That is not to be confused with two things that we have accepted in the past (from any acquiring authority): (i) That where the acquiring authority suggests a like for like replacement and	(c) The precise highway boundaries for this scheme have not been determined, however it is anticipated that the protective provisions will only apply to between 25% and 50% of works to Anglian Water's assets. (d) As stated above, this position "off-street" is the standard position for protective provisions for water undertakers. (e) Deferment of renewal calculations are carried out in accordance with well-known and well-understood principles. These were originally set out in the Highways Authorities Utilities Committee (HAUC) "Measures Necessary Where Apparatus is Affected by Major Works (Diversionary Works): A Code of Practice", approved by the Secretary of State for Transport in 1992 ("HAUC ACoP") which will be annexed to the Statement of Common Ground, and which mostly remains in force. The Preface on page 4 of the HAUC ACoP states that the code was "the subject of extensive consultation with interested organisations" including "the water and electricity supply industries". Paragraph 1.2(iii) states

				Anglian Water seeks something bigger or better for its own benefit, we would expect to pay the marginal amount – which we call "betterment" in its true sense; and (ii) We do not take issue that where financial benefit to Anglian Water can actually and objectively be demonstrated, Anglian Water should not expect compensation to that extent as well. Anglian Water's position is that benefit should not be assumed and applied mechanically as per paragraph 88(5) of the dDCO). Taken together the cost to Anglian Water across the scheme is not insignificant and then when all such reductions are taken together for similar works and projects this would prevent Anglian Water	that the HAUC ACoP "applies to any necessary off-site works". (f) The principles set out in Appendix E of the HAUC ACoP remain in place, however the original 6% rate of interest has been replaced by a 3.5% rate. Table 2 of Appendix E has therefore been replaced by an online calculator which can be found at [redacted] (the "DOR Calculator") (g) In practice, for much of the life of an asset, deferment of renewal payments are relatively low payments compared to the replacement value of the apparatus except at the very end of the lifetime of the asset: for almost off of the first half of the life of an asset they are less than 10% of replacement costs. To give a hypothetical example, calculated using the DOR calculator, assuming a 355mm diameter HDPE water main valued at £100,000 was affected significant length of the scheme. By way of illustration, Column (1) below sets out the number of years of life of the asset which has expired; Column (2) sets out the cost deduction:

				from undertaking some environmental improvement projects at waste water recycling facilities and combined sewage outfalls, for example.	**(1)** **(2)** 10 £661.57 20 £1,594.78 30 £2,911.16 40 £4,768.05 50 £7,387.38 60 £11,082.20 70 £16,294.11 80 £23,646.02 90 £34,016.61 100 £48,645.36 110 £69280.65 120 £98.388.77
				3. The consequence of part paying for new assets which we have not sought would be to reduce the capital available for priority environmental improvement projects which customers prioritise and the regulator requires Anglian Water to undertake or face financial penalties for not delivering with a consequent impact on future funding for improvements.	3. It is acknowledged that the timing of part of the payment for the renewal of the apparatus would be brought forward, although as explained above, this is in line with the usual position on deferment of renewal. In the long term the effect would be cost neutral because of the delay in replacing the apparatus. Given that renewal of apparatus would generally lead to fewer leaks and less maintenance, the Applicant would generally expect an undertaker to fund deferment of renewal payments from a maintenance or mains renewal budget or operational cost saving, rather than from

					its priority environmental improvements. Any works of asset renewal across its undertaking will reduce the funds Anglian Water has available for other projects, however that is not a reason to disapply the usual deferment of renewal provisions.
				4. That being the case the protective provisions put Anglian Water in a worse position than a private landowner, who would recover all his losses. We ask that they Examining Authority consider the position in law on recovery of all or part of the losses and the consequent delay in delivering environmental improvements for customers. Anglian Water notes that the Applicant has not said that Anglian Water and private landowners are treated on an equal basis.	4. It is not correct to say that the CPO Compensation Code always allows a private landowner would always recover all of their losses arising as the result of a scheme. Land compensation is generally calculated by reference to the diminution in the value of land, which may or may not reflect the financial loss suffered by a landowner. For example, Section 261 of the Highways Act 1980 provides that in assessing compensation for compulsory purchase under the Highways Act 1980 regard must be had to "the extent to which the remaining contiguous lands belonging to the same person may be benefited by the purpose for which the land is authorised to be acquired".
90	Where in consequence of the proposed construction	Where in consequence of the proposed construction	Anglian Water would like National Highways to use its	Anglian Water has a system and process that is used where developers and other parties apply for the creation of new water and sewerage	The proposed wording is designed to require the use Anglian Water's InFlow system (or its successor) where it is reasonably appropriate to do so. For the reasons explained below the Applicant does

	of any of the authorised development, the undertaker or Anglian Water requires the removal of apparatus under paragraph 85(2) or Anglian Water makes requirements for the protection or alteration of apparatus under paragraph 9, the undertaker must use all reasonable endeavours to co-ordinate the execution of the works in the interests of safety and the efficient and	of any of the authorised development, the undertaker or Anglian Water requires the removal of apparatus under paragraph 85(2) or Anglian Water makes requirements for the protection or alteration of apparatus under paragraph 9, the undertaker must use all reasonable endeavours to co-ordinate the execution of the works in the interests of safety and the efficient and	"InFlow" system in respect of works under the DCO.	infrastructure. It is used to allocate work in an efficient manner using the right resources, skills and tools. Not using the system without good reason will lead to avoidable inefficiency and confusion. The wording proposed does not force the undertaker to use the system in all circumstances but allows for bespoke process where appropriate Early engagement by the Applicants contractors through Inflow will enable the parties to agree detailed works and timescales including through direct liaison.	not consider that it is appropriate to use the Inflow system for this project. The Applicant's experience from projects such as the A47 Guyhirn junction project is that Inflow does not work in practice. In particular: • It requires an individual log in. • It is a sequential portal where progress cannot be made until each step is carried out. • The payment system (which requires payment by credit card) does not work for a scheme of this nature. • The portal does not allow interaction to allow problems such as these to be resolved. The Inflow system does not reflect how the Applicant works or is able to work. The Applicant is concerned about the suggested wording, as the premise is that Inflow is appropriate unless it can be shown otherwise, whereas the Applicant does not consider that the Inflow system is suitable for use for this project, and cannot accept that it would be appropriate to use it.

	economic execution of the authorised development and taking into account the need to ensure the safe and efficient operation of Anglian Water's undertaking and Anglian Water must use all reasonable endeavours to co-operate with the undertaker for that purpose.	economic execution of the authorised development and taking into account the need to ensure the safe and efficient operation of Anglian Water's undertaking using existing processes where requested by Anglian Water, provided it is appropriate to do so and Anglian Water must use all reasonable endeavours to co-operate with the undertaker for that purpose.			

ANNEX B: NATIONAL HIGHWAYS' PREFERRED PROTECTIVE PROVISIONS WITH ANGLIAN WATER

Annex B - National Highways' Preferred Protective Provisions with Anglian Water

PART [X]

FOR THE PROTECTION OF ANGLIAN WATER SERVICES LIMITED

Application
79. For the protection of Anglian Water the following provisions have effect, unless otherwise agreed in writing between the undertaker and Anglian Water.

Interpretation
80. In this Part of this Schedule—

"1991 Act" means the New Roads and Street Works Act 1991;
"alternative apparatus" means alternative apparatus adequate to enable Anglian Water to fulfil its statutory functions in a manner no less efficient than previously;

"Anglian Water" means Anglian Water Services Limited;

"apparatus" means:

(a) works, mains, pipes or other apparatus belonging to or maintained by Anglian Water for the purposes of water supply and sewerage;

(b) any drain or works vested in Anglian Water under the Water Industry Act 1991;

(c) any sewer which is so vested or is the subject of a notice of intention to adopt given under section 102(4) of that Act or an agreement to adopt made under section 104 of that Act, and

(d) includes a sludge main, disposal main or sewer outfall and any manholes, ventilating shafts, pumps or other accessories forming part of any such sewer, drain or works, and includes any structure in which apparatus is or is to be lodged or which gives or will give access to apparatus
and for the purpose of this definition, where words are defined by section 219 of the Water Industry Act 1991 they shall be taken to have the same meaning ;

"functions" includes powers and duties;

"in", in a context referring to apparatus or alternative apparatus in land, includes a reference to apparatus or alternative apparatus under, over or upon land;

"plan" includes all designs, drawings, specifications, method statements, soil reports, programmes, calculations, risk assessments and other documents that are reasonably necessary properly and sufficiently to describe the works to be executed;

On street apparatus
81. This Part of this Schedule does not apply to apparatus in respect of which the relations between the undertaker and Anglian Water are regulated by the provisions of Part 3 of the 1991 Act.

Apparatus in stopped up streets
82.—(1) Where any street is stopped up under article 18 (permanent stopping up and restriction of use of streets and private means of access), where Anglian Water has apparatus in the street or accessed by virtue of that street, it has the same powers and rights in respect of that apparatus as it enjoyed immediately before the stopping up and the undertaker must grant to Anglian Water legal easements reasonably satisfactory to Anglian Water in respect of such apparatus and access to it, but nothing in this paragraph affects any right of the undertaker or of Anglian Water to require the removal of that apparatus under paragraph 85 or the power of the undertaker to carry out works under paragraph 87.
(2) Regardless of the temporary stopping up or diversion of any highway under the powers conferred by article 17 (temporary alteration, diversion, prohibition and restriction of the use of streets), Anglian Water is

at liberty at all times to take all necessary access across any such stopped up highway and to execute and do all such works and things in, upon or under any such highway as may be reasonably necessary or desirable to enable it to maintain any apparatus which at the time of the stopping up or diversion was in that highway.

Protective works to buildings
83. The undertaker, in the case of the powers conferred by article 22 (protective work to buildings), must exercise those powers so as not to obstruct or render less convenient the access to any apparatus.

Acquisition of land
84. Regardless of any provision in this Order or anything shown on the land plans, the undertaker must not acquire any apparatus otherwise than by agreement.

Removal of apparatus
85.—(1) If, in the exercise of the powers conferred by this Order, the undertaker acquires any interest in any land in which any apparatus is placed or requires that Anglian Water's apparatus is relocated or diverted, that apparatus must not be removed under this Part of this Schedule, and any right of Anglian Water to maintain that apparatus in that land must not (without the prior written consent of Anglian Water) be extinguished, until:

(a) alternative apparatus has been constructed and is in operation to the reasonable satisfaction of Anglian Water in accordance with sub-paragraphs (2) to (8); and
(b) facilities and rights have been secured for that alternative apparatus in accordance with paragraph 86.

(2) If, for the purpose of executing any works in, on or under any land purchased, held, appropriated or used under this Order, the undertaker requires the removal of any apparatus placed in that land, the undertaker must give to Anglian Water 28 days' written notice of that requirement, together with a plan of the work proposed, and of the proposed position of the alternative apparatus to be provided or constructed and in that case (or if in consequence of the exercise of any of the powers conferred by this Order an undertaker reasonably needs to remove any of its apparatus) the undertaker must, subject to sub-paragraph (3), afford to Anglian Water the necessary facilities and rights for the construction of alternative apparatus in other land of the undertaker and subsequently for the maintenance of that apparatus.

(3) If alternative apparatus or any part of such apparatus is to be constructed elsewhere than in other land of the undertaker, or the undertaker is unable to afford such facilities and rights as are mentioned in sub-paragraph (2) in the land in which the alternative apparatus or part of such apparatus is to be constructed Anglian Water must, on receipt of a written notice to that effect from the undertaker, as soon as reasonably possible use its best endeavours to obtain the necessary facilities and rights in the land in which the alternative apparatus is to be constructed.

(4) Any alternative apparatus to be constructed in land of the undertaker under this Part of this Schedule must be constructed in such manner and in such line or situation as may be agreed between Anglian Water and the undertaker or in default of agreement settled by arbitration in accordance with article 54 (arbitration).

(5) Anglian Water must, after the alternative apparatus to be provided or constructed has been agreed or settled by arbitration in accordance with article 54, and after the grant to Anglian Water of any such facilities and rights as are referred to in sub-paragraphs (2) or (3), proceed without unnecessary delay to construct and bring into operation the alternative apparatus and subsequently to remove any apparatus required by the undertaker to be removed under the provisions of this Part of this Schedule.

(6) Regardless of anything in sub-paragraph (5), if Anglian Water gives notice in writing to the undertaker that it desires the undertaker to execute any work, or part of any work in connection with the construction or removal of apparatus in any land of the undertaker, or to the extent that Anglian Water fails to proceed with that work in accordance with sub-paragraph (5) or the undertaker and Anglian Water otherwise agree, that work, instead of being executed by Anglian Water, must be executed by the undertaker without unnecessary delay under the superintendence, if given, and to the reasonable satisfaction of Anglian Water.

(7) Notice under sub-paragraph (6) that Anglian Water desires the undertaker to execute any work, or part of any work, must be given within 14 days of agreement under sub-paragraph (4) or, in default of agreement, within 14 days of the date of settlement by arbitration under sub-paragraph (4).

(8) If Anglian Water fails either reasonably to approve, or to provide reasons for its failure to approve along with an indication of what would be required to make acceptable, any proposed details relating to required removal works under sub-paragraph (2) within 28 days of receiving a notice of the required works from the undertaker, then such details are deemed to have been approved. For the avoidance of doubt, any such "deemed consent" does not extend to the actual undertaking of the removal works, which shall remain the sole responsibility of Anglian Water or its contractors.

(9) Whenever alternative apparatus is to be or is being substituted for existing apparatus, the undertaker shall, before taking or requiring any further step in such substitution works, use best endeavours to comply with Anglian Water's reasonable requests for a reasonable period of time to enable Anglian Water to:
(a) make network contingency arrangements; or

(b) bring such matters as it may consider reasonably necessary to the attention of end users of the utility in question.

Facilities and rights for alternative apparatus

86.—(1) Where, in accordance with the provisions of this Part of this Schedule, the undertaker affords to a utility undertaker facilities and rights for the construction and maintenance in land of the undertaker of alternative apparatus in substitution for apparatus to be removed, those facilities and rights are to be granted upon such terms and conditions as may be agreed between the undertaker and Anglian Water or in default of agreement settled by arbitration in accordance with article 54 (arbitration).
(2) If the facilities and rights to be afforded by the undertaker in respect of any alternative apparatus, and the terms and conditions subject to which those facilities and rights are to be granted, are in the opinion of the arbitrator less favourable on the whole to Anglian Water than the facilities and rights enjoyed by it in respect of the apparatus to be removed and the terms and conditions to which those facilities and rights are subject, the arbitrator must make such provision for the payment of compensation by the undertaker to Anglian Water as appears to the arbitrator to be reasonable having regard to all the circumstances of the particular case.

(3) Such facilities and rights as are set out in this paragraph are deemed to include any statutory permits granted to the undertaker in respect of the apparatus in question, whether under the Environmental Permitting Regulations 2010 or other legislation.

Retained apparatus

87.—(1) Not less than 28 days before starting the execution of any works in, on or under any land purchased, held, appropriated or used under this Order that are near to, or will or may affect, any apparatus (or any means of access to it) the removal of which has not been required by the
undertaker under paragraph 85(2), the undertaker must submit to Anglian Water a plan of the works to be executed.
(2) Those works must be executed only in accordance with the plan submitted under sub-paragraph (1) and in accordance with such reasonable requirements as may be made in accordance with sub-paragraph (3) by Anglian Water for the alteration or otherwise for the protection of the apparatus, or for securing access to it, and Anglian Water is entitled to watch and inspect the execution of those works.

(3) Any requirements made by Anglian Water under sub-paragraph (2) must be made within a period of 21 days beginning with the date on which a plan under sub-paragraph (1) is submitted to it.

(4) If Anglian Water in accordance with sub-paragraph (3) and in consequence of the works proposed by the undertaker, reasonably requires the removal of any apparatus and gives written notice to the undertaker of that requirement, paragraphs 1 to 3 and 6 to 8 apply as if the removal of the apparatus had been required by the undertaker under paragraph 85(2).

(5) Nothing in this paragraph precludes the undertaker from submitting at any time or from time to time, but in no case less than 28 days before commencing the execution of any works, a new plan instead of the plan previously submitted, and having done so the provisions of this paragraph apply to and in respect of the new plan.

(6) The undertaker is not required to comply with sub-paragraph (1) in a case of emergency but in that case must give to Anglian Water notice as soon as is reasonably practicable and a plan of those works as soon as reasonably practicable subsequently and must comply with sub-paragraph (3) in so far as is reasonably practicable in the circumstances and will keep the impact of those emergency works on Anglian Water's apparatus, on the operation of its water and sewerage network and on end-users of the services Anglian Water provides to a minimum.

(7) For the purposes of sub-paragraph (1), works are deemed to be in land near Anglian Water's apparatus (where it is a pipe) if those works fall within the following distances measured from the medial line of such apparatus:
(a) 2.25 metres where the diameter of the pipe is less than 150 millimetres;

(b) 3 metres where the diameter of the pipe is between 150 and 450 millimetres

(c) 4.5 metres where the diameter of the pipe is between 451 and 750 millimetres; and

(d) 6 metres where the diameter of the pipe exceeds 750 millimetres.
Expenses and costs
88.—(1) Subject to the following provisions of this paragraph, the undertaker must repay to Anglian Water all expenses reasonably incurred by Anglian Water in, or in connection with, the inspection, removal, alteration or protection of any apparatus or the construction of any new apparatus which may be required in consequence of the execution of any such works as are referred to in this Part of the Schedule.
(2) There must be deducted from any sum payable under subparagraph (1) the value of any apparatus removed under the provisions of this Part of this Schedule that value being calculated after removal.

(3) If in accordance with the provisions of this Part of this Schedule—
(a) apparatus of better type, of greater capacity or of greater dimensions is placed in substitution for existing apparatus of worse type, of smaller capacity or of smaller dimensions; or

(b) apparatus (whether existing apparatus or apparatus substituted for existing apparatus) is placed at a depth greater than the depth at which the existing apparatus was situated, and the placing of apparatus of that type or capacity or of those dimensions or the placing of apparatus at that depth, as the case may be, is not agreed by the undertaker or, in default of agreement, is not determined by arbitration in accordance with article 54 (arbitration) to be necessary, then, if such placing involves cost in the construction of works under this Part of this Schedule exceeding that which would have been involved if the apparatus placed had been of the existing type, capacity or dimensions, or at the existing depth, as the case may be, the amount which apart from this sub-paragraph would be payable to Anglian Water by virtue of sub-paragraph (1) must be reduced by the amount of that excess.
(4) For the purposes of sub-paragraph (3)—
(a) an extension of apparatus to a length greater than the length of existing apparatus is not to be treated as a placing of apparatus of greater dimensions than those of the existing apparatus; and

(b) where the provision of a joint in a pipe or cable is agreed, or is determined to be necessary, the consequential provision of a jointing chamber or of a manhole is to be treated as if it also had been agreed or had been so determined.
(5) An amount which apart from this sub-paragraph would be payable to Anglian Water in respect of works by virtue of sub-paragraph (1), if the works include the placing of apparatus provided in substitution for apparatus placed more than 7 years and 6 months earlier so as to confer on Anglian Water any financial benefit by deferment of the time for renewal of the apparatus in the ordinary course, is to be reduced by the amount which represents that benefit.
89.—(1) Subject to sub-paragraphs (2) and (3), if by reason or in consequence of the construction of any such works referred to in paragraphs 83 or 85(2), or by reason of any subsidence resulting from such development or works, any damage is caused to any apparatus or alternative apparatus (other than apparatus the repair of which is not reasonably necessary in view of its intended removal for the purposes of those works) or property of Anglian Water, or there is any interruption in any service provided, or in the supply of any goods, by Anglian Water, the undertaker must—
(a) bear and pay the cost reasonably incurred by Anglian Water in making good such damage or restoring the supply; and

(b) make reasonable compensation to Anglian Water for any other expenses, loss, damages, penalty or costs incurred by the undertaker, by reason or in consequence of any such damage or interruption.
(2) The fact that any act or thing may have been done by Anglian Water on behalf of the undertaker or in accordance with a plan approved by Anglian Water or in accordance with any requirement of Anglian Water or under its supervision does not, subject to sub-paragraph (3), excuse the undertaker from liability under the provisions of sub-paragraph (1) unless Anglian Water fails to carry out and execute the works properly with due care and attention and in a skilful and professional like manner or in a manner that does not accord with the approved plan.

(3) Nothing in sub-paragraph (1) imposes any liability on the undertaker with respect to any damage or interruption to the extent that it is attributable to the act, neglect or default of Anglian Water, its officers, servants, contractors or agents.

(4) Anglian Water must give the undertaker reasonable notice of any such claim or demand and no settlement or compromise is to be made, without the consent of the undertaker (such consent not to be unreasonably withheld or delayed) who, if withholding such consent, has the sole conduct of any settlement or compromise or of any proceedings necessary to resist the claim or demand.

Cooperation

90. Where in consequence of the proposed construction of any of the authorised development, the undertaker or Anglian Water requires the removal of apparatus under paragraph 85(2) or Anglian Water makes requirements for the protection or alteration of apparatus under paragraph 9, the undertaker must use all reasonable endeavours to co-ordinate the execution of the works in the interests of safety and the efficient and economic execution of the authorised development and taking into account the need to ensure the safe and efficient operation of Anglian Water's undertaking and Anglian Water must use all reasonable endeavours to co-operate with the undertaker for that purpose.

91. Where the undertaker identifies any apparatus which may belong to or be maintainable by Anglian Water but which does not appear on any statutory map kept for the purpose by Anglian Water, it shall inform Anglian Water of the existence and location of the apparatus as soon as reasonably practicable.

92. Nothing in this Part of this Schedule affects the provisions of any enactment or agreement regulating the relations between the undertaker and Anglian Water in respect of any apparatus laid or erected in land belonging to the undertaker on the date on which this Order is made.

93. Any time period in which an action must be taken in this part of the Schedule may be amended by written agreement between the undertaker and Anglian Water.

ANNEX C: SOIL MANAGEMENT PLAN INDICATIVE STRUCTURE

Annex C - Soil Management Indicative Structure

The Soil Management Plan shall be provided in two parts:

1. Soil Handling Management Plan (SHMP)

The SHMP will provide an overview of the baseline soil and environmental conditions for land affected by permanent and temporary works associated with the scheme and immediate surroundings, along with details of the best practice methods and guidance for soil management onsite.

The following requirements should be included in the SHMP where relevant:

- how soils are to be managed in accordance with Department for Environment, Food, and Rural Affairs (Defra) Construction Code of Practice (CoP) for the Sustainable Use of Soils on Construction Sites
- how the quality of soil resources won from the site is maintained during construction so that they remain suitable for re-use
- measures for ensuring agricultural land used temporarily during construction is restored satisfactorily and avoid incurring compensation claims from landowners
- approximate areas of soil to be protected from earthworks and construction activities
- approximate volumes of topsoil and subsoil to be stripped from the development area, construction compounds, haul routes and their stockpile locations
- methods for stripping, stockpiling, re-spreading and ameliorating landscape soils

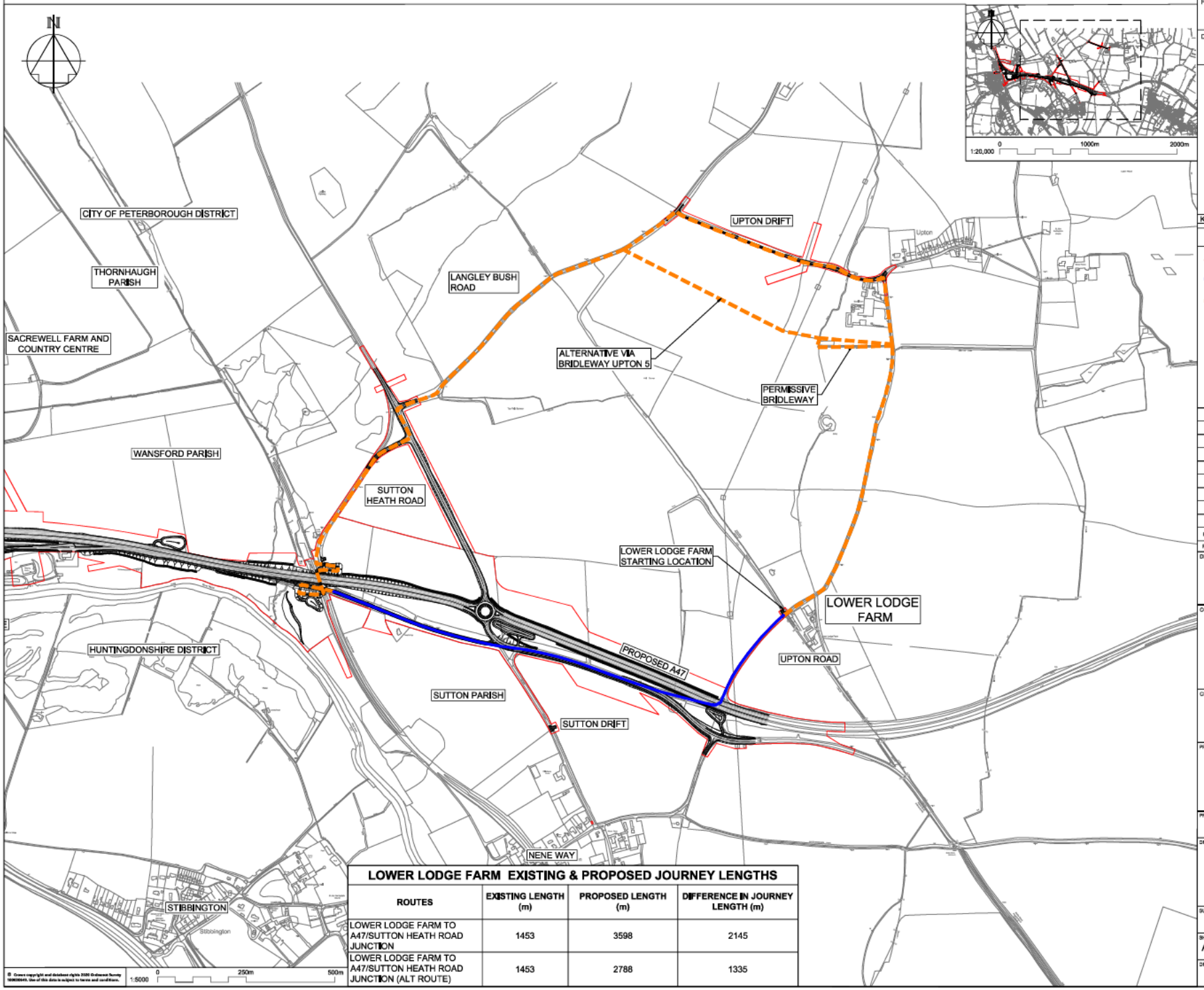
2. Soil Resource Plan (SRP) and Survey

The SRP will provide a detailed soil resource survey and plan providing information on soils and agricultural land quality for agricultural land which is affected by the scheme. All survey work shall be in accordance with 'Agricultural Land Classification of England and Wales – revised guidelines and criteria for grading the quality of agricultural land', Defra 1988.

The following requirements should be included in the SRP where relevant:

- review of the Agriculture Land Classification undertaken at Stage 3
- desk study of published soils, climatic and geological information
- calculation of the site-specific climatic data
- fieldwork for a soil resource assessment to assess site and soil conditions. This will involve auger boring and trial pits if required and soil sample collection and analysis by a UKAS and MCERTS accredited laboratory against Specification for Topsoil [BS3882:2015], Specification for Subsoil [BS8601:2013] and particle size distribution
- assessment of the subsoil and topsoil value for the scheme landscaping requirements as identified on the environmental masterplan to include soil wetness and drought risk for land quality.
- description and mapping of soil types which need to be handled separately during site work
- information relating to soil texture, depth, stone content and drainage characteristics
- quantities of the volumes of the agricultural and grassland topsoils and subsoils on site
- recommendations regarding the most efficient usage of existing agricultural and grassland topsoils and subsoils for landscaping purposes on site in line with the environmental masterplan.
- provision of a commentary on the chemical and physical composition of the soils based on the results of the laboratory analysis.
- maps showing soil types and areas of agricultural and grassland

ANNEX D: SEPARATION OF COMMUNITIES WALKING CYCLING AND HORSE RIDING LOWER LODGE FARM



LOWER LODGE FARM EXISTING & PROPOSED JOURNEY LENGTHS

ROUTES	EXISTING LENGTH (m)	PROPOSED LENGTH (m)	DIFFERENCE IN JOURNEY LENGTH (m)
LOWER LODGE FARM TO A47/SUTTON HEATH ROAD JUNCTION	1453	3598	2145
LOWER LODGE FARM TO A47/SUTTON HEATH ROAD JUNCTION (ALT ROUTE)	1453	2788	1335

NOTES

Purpose of use

FOR DCO SUBMISSION

Development Consent Order Number / Document

NOTES

1. ALL DIMENSONS ARE IN METERS UNLESS OTHERWISE STATED
2. EXISTING AND PROPOSED ROUTES ARE NOT EXHAUSTIVE AND ARE ONLY TO GIVE AN INDICATIVE ROUTE TO THE DESTINATIONS

KEY TO SYMBOLS

VEHICLE ROUTES

- ORDER LIMITS
- EXISTING ROUTES
- PROPOSED ROUTES

REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01	20/04/22	DEADLINE SUBMISSION 5	FWg	PE	MMur

DESIGNER

SWECO

CONTRACTOR

GallifordTry

CLIENT

highways england

PROJECT TITLE

A47 WANSFORD TO SUTTON DUALLING

PROJECT STAGE

PCF STAGE 4

DRAWING TITLE

SEPARATION OF COMMUNITIES
WALKING CYCLING HORSE RIDING
LOWER LODGE FARM

SUITABILITY

SUITABLE FOR INFORMATION

SHEET SIZE	SCALE	STATUS	REVISION
A1	1:5000	S2	P01

DRAWING NUMBER

HE551494-GTY-HGN-000-DR-CH-38017

ANNEX E: A47/A1 WESTERN ROUNDABOUT TRAFFIC SIGNAL OPTION ASSESSMENT TECHNICAL NOTE

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1. Introduction

1.1. Overview

1.1.1. As part of the Stage 3 assessment of the A47 Wansford to Sutton scheme, an existing traffic congestion issue at the A47/A1 Western roundabout has been identified. Galliford Try, supported by Sweco, have been commissioned to undertake a study of a potential traffic signalisation option at this junction.

1.1.2. This technical note provides a summary of the issues identified and the work undertaken to assess the effectiveness of converting the roundabout to a 4-arm signalised junction. The modelling analysis utilises the strategic Wansford Transport Model (WTM), based in SATURN, plus junction modelling using LinSIG and a VISSIM model. The option considered for assessment involves converting the roundabout to a signalised junction broadly within the existing highway boundary.

1.2. Background

1.2.1. As part of Highways England's Regional Delivery Partnership's (DIP), Galliford Try has commissioned Sweco as lead consultant to undertake the Project Control Framework (PCF) Stages 3 5 for the A47 Wansford to Sutton dualling scheme.

1.2.2. The single carriageway section of the A47, which runs from the A1 in the west (near Wansford) to the dual carriageway section near the village of Sutton in the east, is shown in Figure 1-1 below. Peterborough lies approximately 9km east of the link. Beyond Peterborough, the A47 continues to Norwich and the east coast at Great Yarmouth. The corridor intersects with key strategic routes including the A1, A10 and A11. These strategic roads provide links to other urban centres including Cambridge, Ely and London.

Figure 1-1: Location of the A47 scheme and the A47/A1 Western Roundabout

1.2.3. The A47 Wansford to Sutton scheme begins where the A47 meets the A1 at Wansford west of Peterborough and continues 2.5 km east to the Sutton roundabout.

1.2.4. To the west, the A1 and A47 are connected via a dumbbell arrangement, with the A47 crossing over the A1 dual carriageway. This dumbbell junction arrangement includes two roundabouts, referred to as the western and eastern roundabouts. The western roundabout provides access to the village of Wansford via the A6118.

1.3. Technical Note Structure

1.3.1. This note is structured as follows:

- Chapter 1: introduces the purpose of this technical note and summaries the background of the Stage 3 study assessment;
- Chapter 2: provides an overview of the strategic WTM modelling and the option testing assumptions;
- Chapter 3: presents the strategic assessment of the option using the WTM SATURN model;
- Chapter 4: presents the junction assessment using LINSIG and ARCADY;
- Chapter 5: details the results of the VISSIM modelling assessment; and
- Chapter 6: draws the conclusions and recommendations.

2. Modelling Assumption

2.1. Overview

2.1.1. The assessment of the traffic signal option has been undertaken using a three-level approach:

- Level 1: Strategic assessment using the WTM
  - The strategic model has been used to derive the forecast flows, the wider impact and to inform the flows at the junction for the detailed modelling of the traffic signal option.
  - The SATURN model assessment has been based on the demand from the Core scenario derived from the Variable Demand Modelling (VDM)
- Level 2: Junction modelling
  - LinSIG has been used to assess the capacity of the junction in isolation and to optimise the signal timing. The signal timing from LinSIG is then fed into the VISSIM model to assess the interaction with any other neighbouring junctions, including the A47/A1 eastern Roundabout
  - An iteration between the SATURN model was conducted to optimise the traffic signal layout and to derive re-assigned flows for the LinSIG mode
  - To derive an existing situation comparison model, ARCADY has been used to undertake an assessment of the current roundabout layout
- Level 3: VISSIM modelling
  - The VISSIM has been used to provide visual analysis of the signal option, formation of the queues and the interactions between the junctions and vehicles.

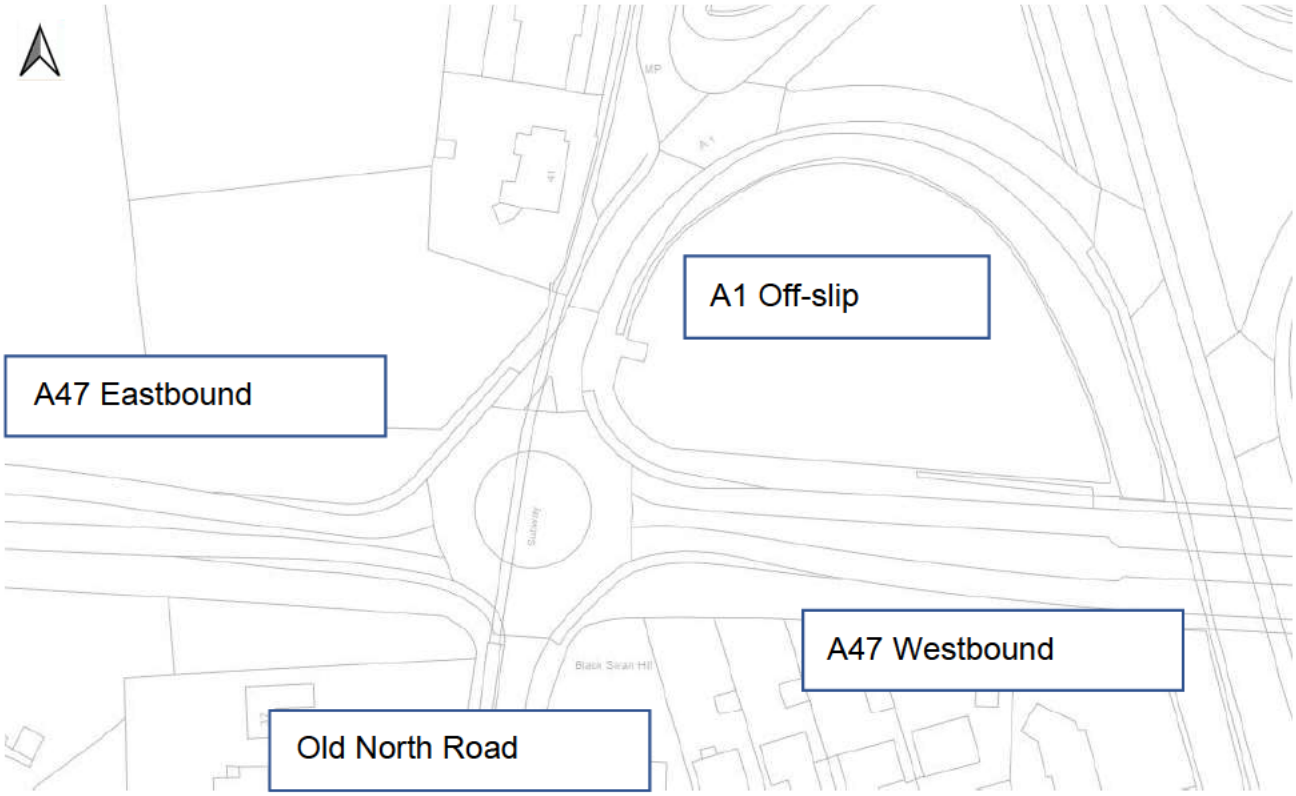
2.1.2. This section summarises the signalised junction option test assumptions as well as the local context of the A47/A1 western roundabout.

2.2. The Local Context

2.2.1. Figure 2.1 below shows the layout of the A47/A1 western roundabout and Figure 1-1 shows its location relative to the A47 Wansford to Sutton proposed dual carriageway section. From these figures it can be seen that:

- The A47/A1 western roundabout is located to the north of Wansford village;
- The roundabout is not within the boundaries of the proposed A47 Wansford to Sutton scheme. However, it is adjacent to the western extent of the scheme;
- The junction has four arms, including access\exit to\from the A1 northbound mainline carriageway. Therefore, the junction is situated along the primary route for strategic trips between the A1 and Peterborough
- The A47/A1 western roundabout provides access to the village of Wansford via Old North Road (A6118)

Figure 2.1: Layout of the A47/A1 Western roundabout



Source: SWECO.

2.3. The Traffic Signal option

2.3.1. Figure 2.2 below shows the layout of the proposed traffic signal option for the A47/A1 western roundabout. The diagram shows the proposed layout and lane

markings for a potential traffic signalised junction, which is contained broadly within the current highway boundary.

2.3.2. As the option assessment has been undertaken using outline design plans, this study therefore represents a high-level feasibility analysis of the impact of a potential traffic signalised junction. Therefore, further detailed analysis of this option will be required for any future studies.

Figure 2.2: Layout of the proposed traffic signal option

Source: SWECO.

2.4. Scenarios

2.4.1. The analysis in this study focuses on the comparison of the Do Something model (DS) Core scenario and the signalised option test (SIG). The only difference between the DS and the SIG network is the changes in the Western Roundabout where in the DS, the existing roundabout layout has been retained whereas in SIG option a 4-arm traffic light has been assumed. The comparison highlights the relative benefits of including the signalised junction option with the A47 Wansford to Sutton scheme in place.

3. Strategic Assessment

3.1. Base Year 2015

3.1.1. Table 3-1 below shows the existing traffic flows, delays and the volume over capacity ratios (V/C%) in the 2015 Base Year (BY) SATURN model. The V/C% is an indicator of the likely performance of a junction. For this assessment a benchmark V/C ratio of 85% has been used to add context to the model results. As it can be seen from this assessment, vehicles already experience congestion on Old North Road (AM peak 97% V/C), the A47 westbound (PM peak 101% V/C) and A47 eastbound (AM peak 97% V/C) approach arms to the junction. Therefore, in the BY the junction is operating above the V/C 85% benchmark in both the AM and PM peak periods.

Table 3-1: Base Year 2015 SATURN Assessment Junction Results

BY 2015	Sat Flow (PCU)	Actual Flow (PCU)		V/C (%)		Delay (Minutes)	
		AM	PM	AM	PM	AM	PM
A1 off slip (SB)		183	358	34%	46%	0.1	0.1
A47 (WB)		907	1,289	66%	101%	0.1	0.8
Old North Road (NB)		437	193	97%	77%	0.8	0.6
A47 (EB)		656	578	99%	84%	0.7	0.2

3.2. Option Assessment Network Assumptions

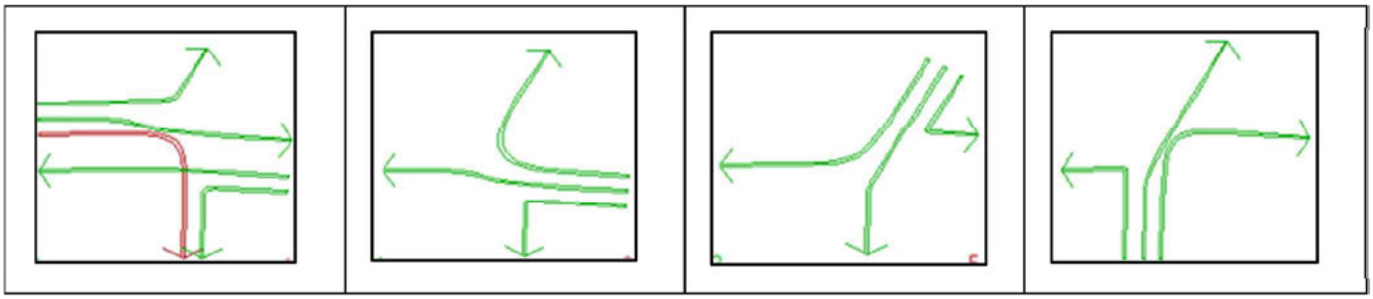
3.2.1. Figure 3.1 and Table 3-2 details the signalised junction coding stage plan and flare length assumptions adopted in the SATURN assessment. These assumptions have been derived from iterating the initial SATURN assignment flows with the LINSIG model.

3.2.2. In summary, Figure 3.1 shows a 4-stage signal plan where the A47 movements run in conjunction in stage 1. In stage 2 the A47 eastbound movement is switched off to allow the A47 westbound to A1 movement to run. In stages 3 and 4 the A1 and Old North Road movements run separately.

3.2.3. The signal stage plan adopted includes a 100 second cycle time with an inter-green of 5 seconds for each stage. No allowance for pedestrian movements has been included within the signal stage plan. It is likely that the inclusion of pedestrian movements would increase the lost time at the signal, and therefore reduce the overall capacity of the junction.

3.2.4. It should be noted that the maximum feasible length of the flare for each road is constrained by the available space currently allocated in the highway boundary.

Figure 3.1: A47\A1 Western junction option stage plan (SATURN)



Source: SWECO.

Table 3-2: A47\A1 Western junction option flare lengths (m)

Turn	Parameter	SIG option
A47 EB Left Turn	Length of Flare	80
	Approx. PUCs on Flare	13
A47 EB Straight	Length of Flare	-
	Approx. PUCs on Flare	-
A6118 SB Left Turn	Length of Flare	35
	Approx. PUCs on Flare	6
A47 WB Right Turn	Length of Flare	90
	Approx. PUCs on Flare	14

3.3. Signalisation: 2025 & 2040

3.3.1. Table 3-3 and Table 3-4 show the results for the Do-Something (DS) and Signalised Junction option (SIG) future year scenarios respectively:

- 2025 and 2040 'Core' Do Something (2025 DS & 2040 DS):
  - A47/ A1 western Roundabout - existing road layout
  - A47 Wansford to Sutton – dual carriageway alignment
- 2025 and 2040 With Signalisation (2025 SIG & 2040 SIG):
  - A47/A1 western Roundabout – Signalised Junction (See Section 2.3)
  - A47 Wansford to Sutton – dual carriageway alignment

Table 3-3: DS SATURN Assessment Junction Results

DS 2025	Sat Flow (PCU)	Actual Flow (PCU)		V/C (%)		Delay (Minutes)	
		AM	PM	AM	PM	AM	PM
A1 off slip (SB)		595	519	84%	61%	0.2	0.1
A47 (WB)		1,111	1,490	70%	103%	0.1	1.2
Old North Road (NB)		339	89	83%	44%	0.4	0.4
A47 (EB)		744	755	106%	98%	2.5	0.6
DS 2040	**Sat Flow (PCU)**	**Actual Flow (PCU)**		**V/C (%)**		**Delay (Minutes)**	
		AM	PM	AM	PM	AM	PM
A1 off slip (SB)		734	600	98%	78%	0.6	0.2
A47 (WB)		1,377	1,458	85%	103%	0.1	1.2
Old North Road (NB)		327	198	104%	98%	2.5	1.6
A47 (EB)		734	838	114%	103%	4.9	1.6

Table 3-4: SIG SATURN Assessment Junction Results

SIG 2025	Sat Flow (PCU)	Actual Flow (PCU)		V/C (%)		Delay (Minutes)	
		AM	PM	AM	PM	AM	PM
A1 off slip (SB)		616	392	96%	85%	1.4	1.0
A47 (WB)		985	1,524	72%	93%	1.3	1.2
Old North Road (NB)		199	121	92%	56%	1.9	1.0
A47 (EB)		755	755	103%	85%	2.7	0.9
SIG 2040	**Sat Flow (PCU)**	**Actual Flow (PCU)**		**V/C (%)**		**Delay (Minutes)**	
		AM	PM	AM	PM	AM	PM
A1 off slip (SB)		624	424	101%	96%	2.0	1.7
A47 (WB)		1,156	1,600	85%	98%	1.4	1.2
Old North Road (NB)		226	201	104%	93%	4.1	2.0
A47 (EB)		811	842	111%	100%	5.0	1.7

3.3.2. Analysis of Table 3-3 indicates that in the DS scenario the roundabout is either near to or exceeding the capacity constraints along the A47 eastbound approach during the AM and PM peaks in both 2025 and 2040. In the PM peak the roundabout is over capacity on the A47 westbound approach. Old North Road is close to its capacity limitation in the 2040 PM peak experiencing a delay of around 1.4 mins. In the 2040 AM scenario the A1 off-slip southbound movement is close to capacity (98%)

3.3.3. Table 3-4 shows the forecasted delays and V/C in the SIG scenario and Figure 3.3-Figure 3.3 show the increase in delays between the DS and SIG scenarios.

3.3.4. In the SIG scenario, an increase in delay across the junction is forecasted. Inspection of Figure 3.2 and Figure 3.3indicates that relatively large increases in delay on the A1 off-slip and Old North Road approaches are predicted in both

time periods. In the 2040 AM peak there is a large increase in delay on the A47 westbound.

Figure 3.2: Increase in Delay in the SIG option compared to the DS - 2025

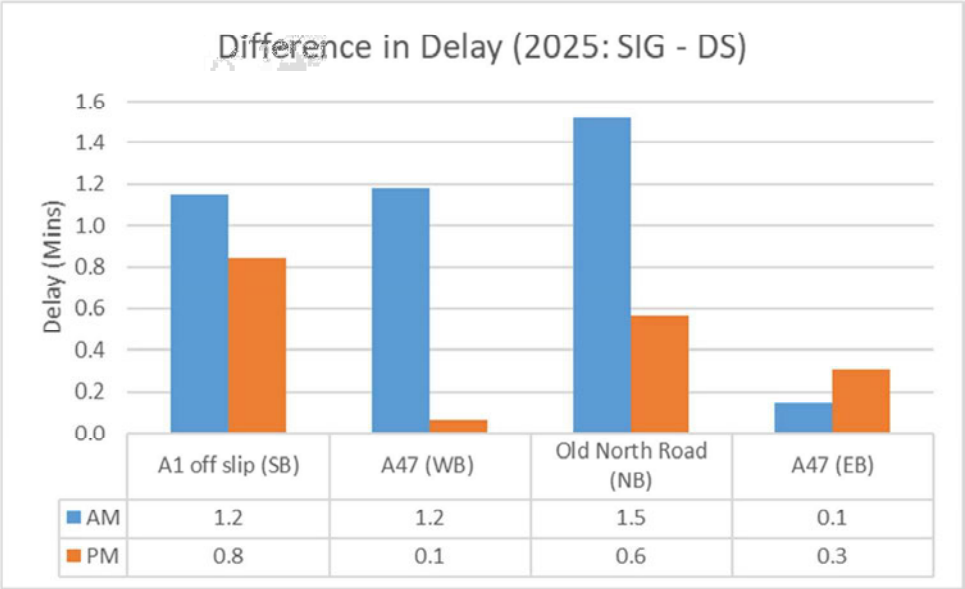
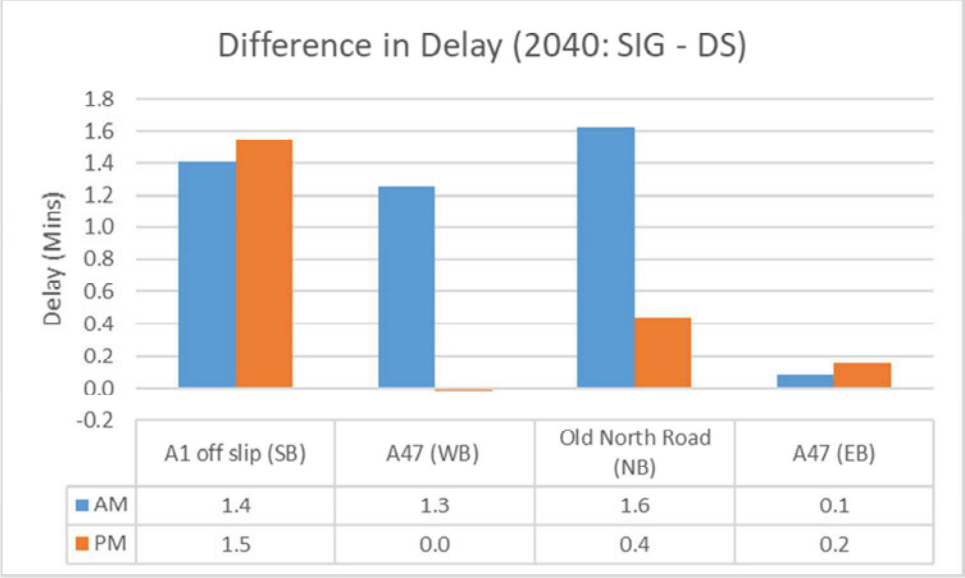


Figure 3.3: Increase in Delay in the SIG option compared to the DS - 2040



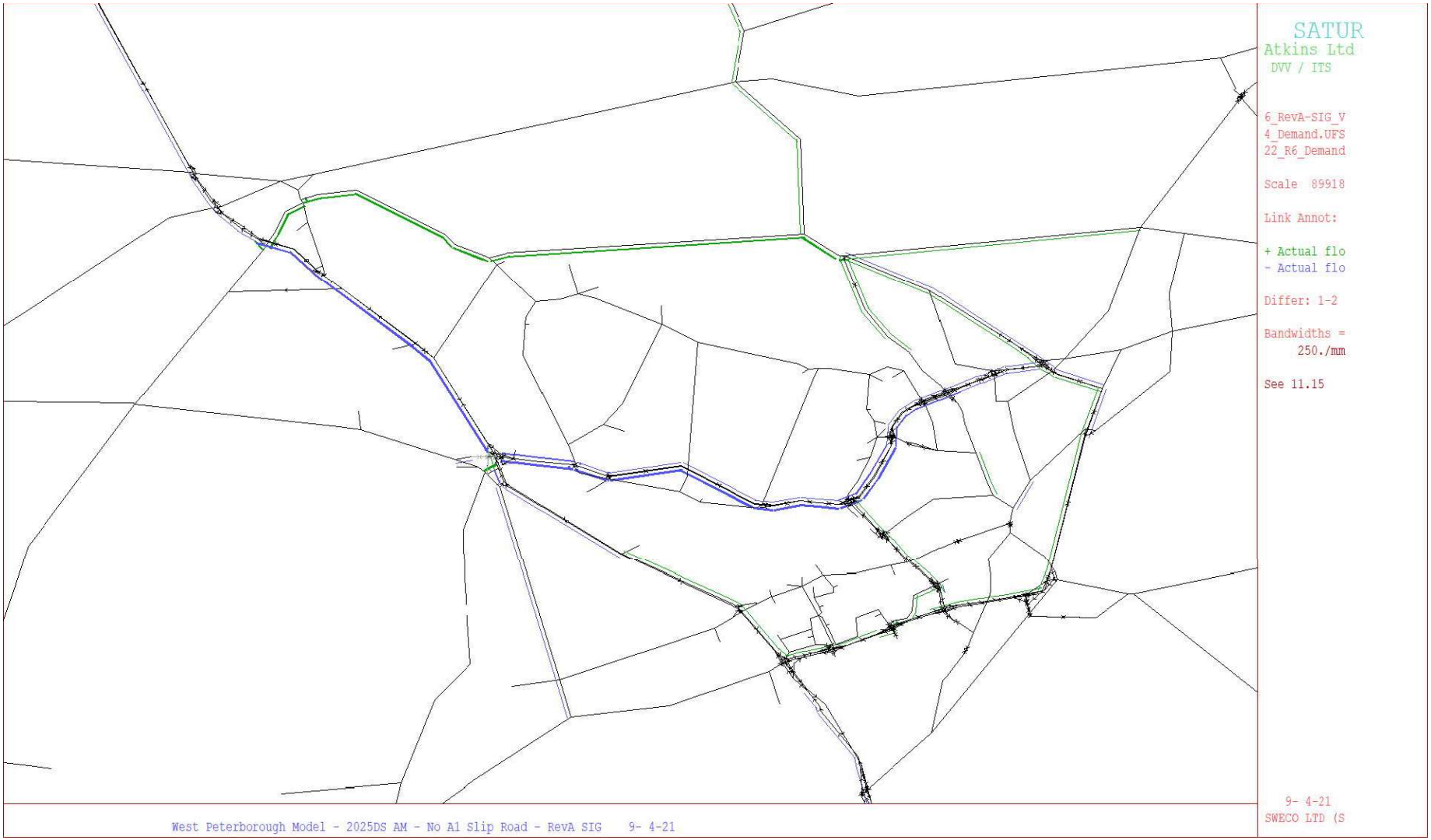
3.4. Strategic Impact (Re-Assignment)

3.4.1. Figure 3.4 to Figure 3.5 show the AM and PM peak wider area traffic reassignment impacts of the SIG option (SIG option minus DS. Green = Increase in SIG option, Blue = Decrease in SIG option) for 2025 and 2040.

3.4.2. Analysis of the AM peak plot shows a wider area reassignment of traffic flows with reductions on the A47 westbound and A1 northbound movements. The A47 traffic has reassigned to the parallel B1443 route via Stamford. The PM peak shows a relatively smaller wider area impact with a decrease in A1 northbound traffic, approaching the junction from the south, and an increase in A47 westbound traffic.

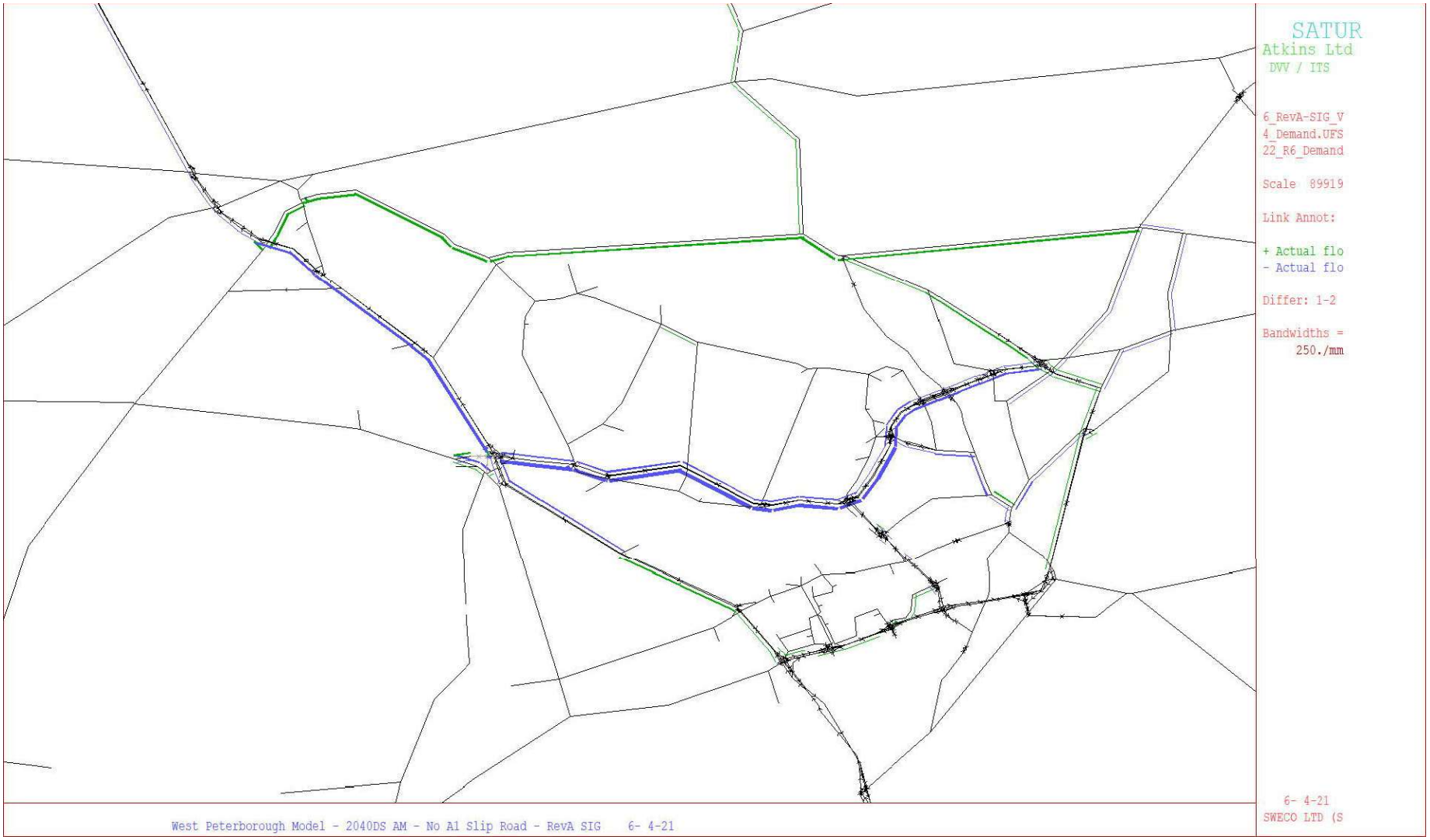
3.4.3. In addition, in conjunction with the signalised junction option, some traffic calming measures may be required through Wansford village in order to reduce any rat running and use of the local road, in particular along Peterborough Road and London Road.

Figure 3.4: Flow Difference 2025 AM Peak: SIG option minus DS (250 PCU\mm)



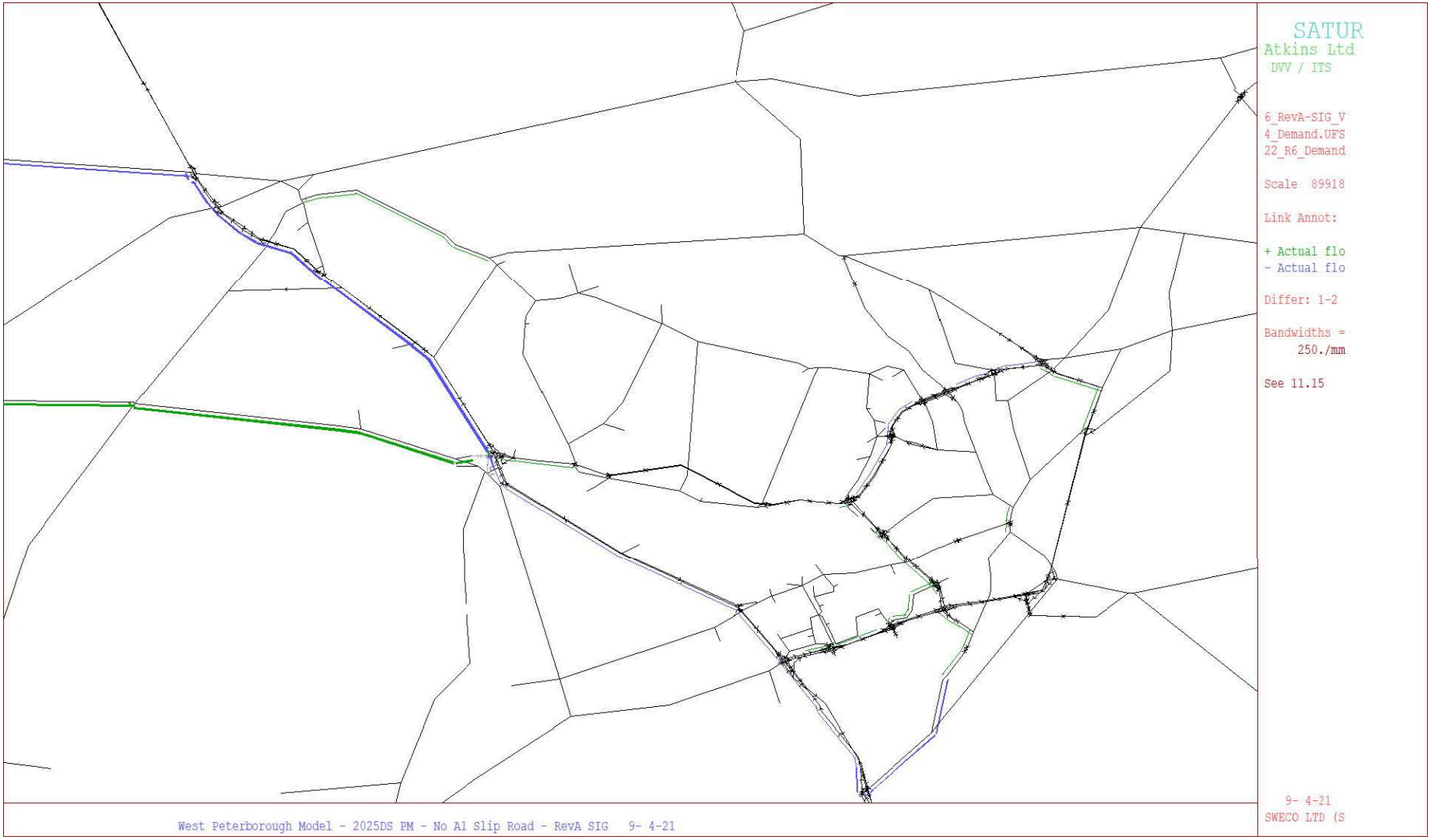
Source: SWECO.

Figure 3.5: Flow Difference 2040 AM Peak: SIG option minus DS (250 PCU\mm)



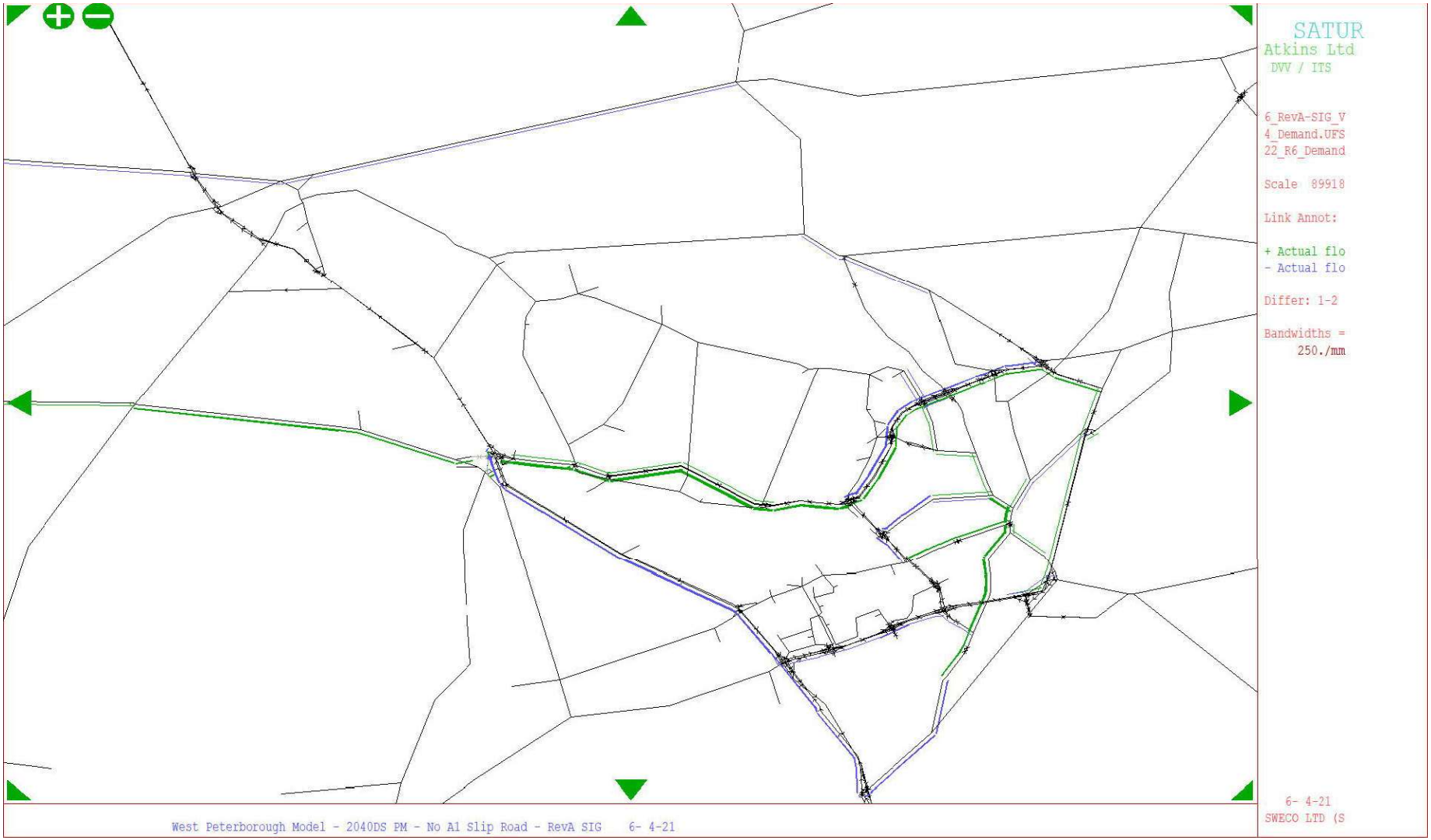
Source: SWECO.

Figure 3.6: Flow Difference 2025 PM Peak: SIG option minus DS (250 PCU\mm)



Source: SWECO.

Figure 3.7: Flow Difference 2040 PM Peak: SIG option minus DS (250 PCU\mm)



Source: SWECO.

3.5. Wider Area Network Statistics

3.5.1. The overall average speeds extracted from SATURN are displayed in Table 3-5.

3.5.2. From Table 3-5, there is a decrease in overall network speed in the SIG option compared to the DS in the AM peak by around 0.5 kph in 2025 and 2040 (2025: -0.8%., 2040 -0.9%). This indicates that the flow reassignment caused by the signal in the AM peak results in an overall reduction in network speeds.

3.5.3. The 2025 PM peak overall speeds stay relatively consistent between the DS and SIG scenarios. Whereas the 2040PM peak average speeds show a relative improvement in the SIG option.

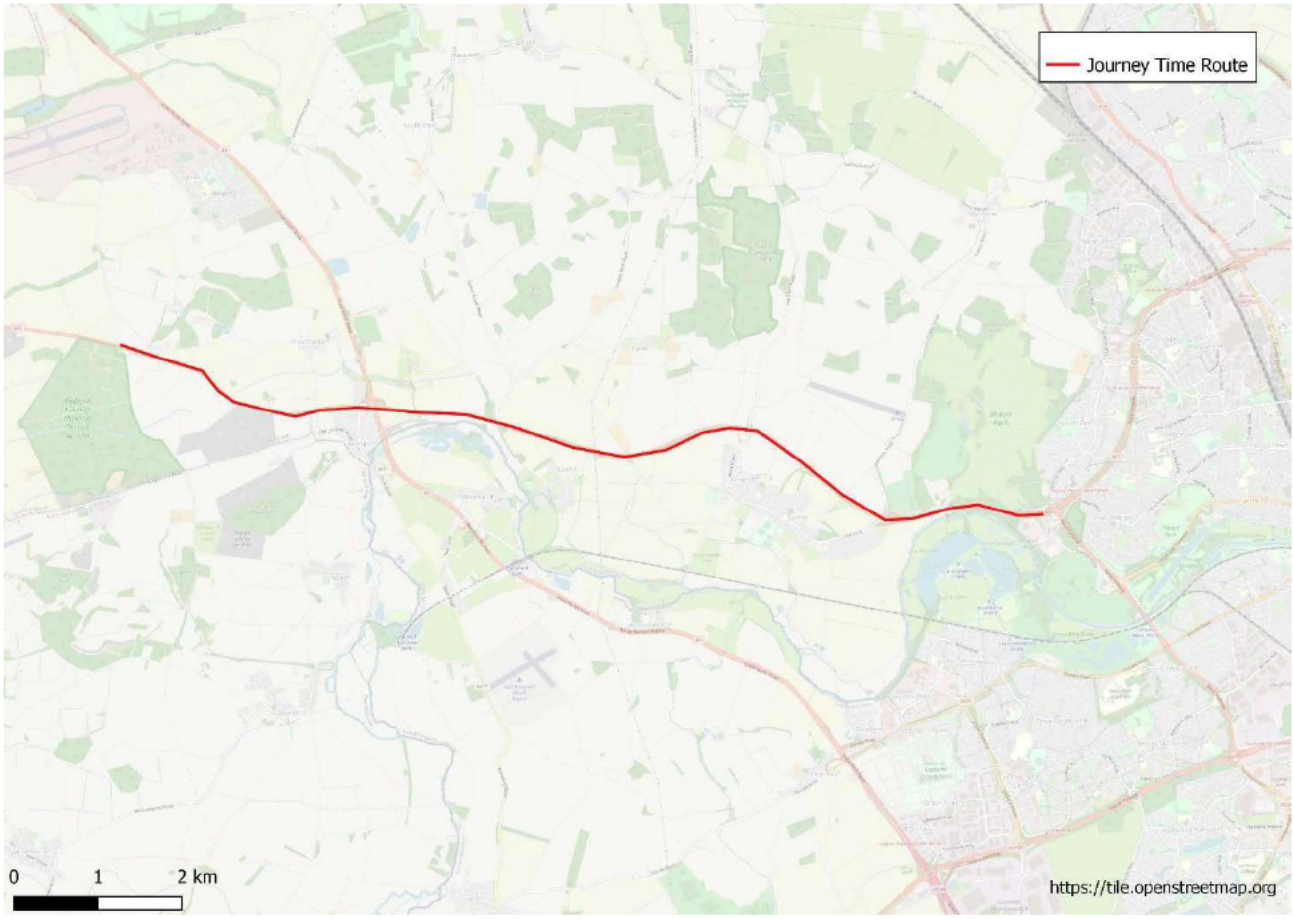
Table 3-5: SATURN Simulation Network Overall Average Speed (km/hr)

Scenario	AM	PM
2025 DS	64.5	63.1
2025 SIG	63.9	63.2
2025 SIG - DS	-0.5	0.1
2025 SIG - DS % difference	-0.8%	0.1%
2040 DS	58.2	56.2
2040 SIG	57.7	56.7
2040 SIG – DS	-0.5	0.4
2040 SIG - DS % difference	-0.9%	0.8%

3.6. Journey Times

3.6.1. To assess the journey time impacts from the signalisation of the A47\A1 western roundabout, journey time analysis has been carried out between A47 Old Oundle Rd and A47 J15 (the route used for High Level Requirements) as shown in Figure 3.8. The results of the journey time assessment are reported in Table 3-6.

Figure 3.8: A47 Journey Time Route (between A47 Old Oundle Rd and A47 J15)



Source: SWECO. This Map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Highways England 100030649 2016

Table 3-6: A47 Journey Times: DS vs SIG (Minutes)

Route/Direction	Scenario	2025		2040	
		AM	PM	AM	PM
A47 Old Oundle Rd to A47 J15 (EB)	DS	10.9	8.4	13.4	9.6
	SIG	10.8	8.6	13.3	9.6
	SIG - DS	**-0.1**	**0.2**	**-0.1**	**0.0**
	% Diff	**-1%**	**2%**	**-1%**	**0%**
A47 J15 to A47 Old Oundle Rd (WB)	DS	8.1	9.5	8.3	11.0
	SIG	9.1	9.6	9.3	10.2
	SIG - DS	**1.0**	**0.1**	**1.0**	**-0.8**
	% Diff	**13%**	**2%**	**12%**	**-7%**

3.6.2. In the eastbound direction the journey times across the A47 corridor are approximately the same between the DS and SIG options. However, in the westbound direction the DS is relatively less congested than the SIG option (2025 increase: AM 13%, PM 2%. 2040 increase: 12% AM). In general, this

aligns with the flow re-assignment analysis which shows the A47 westbound flow decreasing in the AM peak.

3.6.3. In the 2040 PM scenario there is a relative decrease in JT in the A47 westbound direction (-7%), from the wider re-assignment analysis there is an increase in A47 westbound flow.

3.7. Flows at the Western Roundabout (In-Flows)

3.7.1. Table 3-7 and Table 3-8 show the Junction 'In-flows' (Actual Flows PCU) on each arm for the DS and SIG scenarios in both 2025 and 2040.

3.7.2. In summary, as shown in the wider area reassignment (Section 3.4), the overall impact of the signalisation option decreases the total in-flow to the junction. The largest reduction in total traffic flow is in the AM peak (-9% 2025 and -11%). In 2040 this reduction in traffic flow is distributed across the A1 off-slip (-110 PCU), A47 westbound (-221 PCU) and Old North Road (-101 PCU). In the PM peak, although the total traffic flow decreases, the reduction is primarily driven by the decline in A1 Off-slip southbound traffic.

Table 3-7: A47/A1 Western Junction In-flows – AM peak

Road	2025				2040			
	DS	SIG	Diff	%	DS	SIG	Diff	%
A47 Eastbound	744	755	11	1%	734	811	77	10%
A1 Off-Slip	595	603	8	1%	734	624	-110	-15%
A47 Westbound	1,111	985	-126	-11%	1,377	1,156	-221	-16%
Old North Road	339	195	-144	-42%	327	226	-101	-31%
Total	**2,789**	**2,538**	**-251**	**-9%**	**3,172**	**2,817**	**-355**	**-11%**

Table 3-8: A47/A1 Western Junction In-flows – PM peak

Road	2025				2040			
	DS	SIG	Diff	%	DS	SIG	Diff	%
A47 Eastbound	755	755	0	0%	838	842	4	0%
A1 Off-Slip	520	392	-128	-25%	600	424	-176	-29%
A47 Westbound	1,487	1,524	37	2%	1,458	1,600	142	10%
Old North Road	89	121	32	36%	198	201	3	2%
Total	**2,851**	**2,792**	**-59**	**-2%**	**3,094**	**3,067**	**-27**	**-1%**

3.8. Summary

3.8.1. In summary the SATURN wider area model analysis shows the following trends:

Existing Situation

- There are existing traffic congestion issues in the BY, as the junction is operating above the V/C 85% benchmark in both the AM and PM peak periods

2025 & 2040 AM Peak

- Signalisation of the junction causes a reduction in traffic of around 9-11%
- Traffic Delays increase at the junction (by 2040, traffic delays increase around 1.5 mins on the A1 off-slip, the A47 EB and Old North Road)
- Journey Times across the A47 corridor in the westbound direction increase by around 13-14%
- The wider area re-assignment of the traffic causes a decrease in overall network speeds by approximately 1%

2025 & 2040 PM Peak

- Signalisation of the junction causes a reduction in traffic of around 1-2%
- Traffic delays increase at the junction particularly on the A1 off-slip (by 2040 traffic delays increase around 1.5 mins on the A1 off-slip)
- Journey Times across the A47 corridor increase by around 4% in 2025.
- However, in 2040 journey times reduce by around -8%. Similarly, overall network speeds increase by around 0.8%

4. Junction Assessment

4.1. Overview

4.1.1. The following scenarios have been considered in the junction modelling assessment:

- DS - Existing Roundabout layout – ARCADY
  - Turn flows derived from the DS core scenario
- OP1 - Signalised junction layout – LINSIG
  - Turn flows derived from the DS core scenario (i.e. no flow re-assignment)
- OP2 - Signalised junction layout – LINSIG
  - Turn flows derived from the SIG scenario

4.1.2. The comparison of the DS and OP1 scenarios shows the impact of the option using fixed flows. Whereas, the comparison of the DS and OP2 scenarios shows the impact of the option when flow re-assignment from the SATURN model is considered.

4.2. Junction Capacity and Delay Results

4.2.1. Table 4-1 to Table 4-3 show the Arcady results for the Do-Something (DS) and LinSIG OP1 and OP2 future year scenarios respectively. The Arcady results (V\C, Delays are the maximum average over 15-minute intervals) are presented for each approach arm to the junction, whereas the LINSIG results (V\C, average Delays) are broken down by each lane.

Table 4-1: Arcady junction results (DS)

DS 2025	V/C (%)		Delay (Seconds)	
	AM	PM	AM	PM
A1 off slip (SB)	95%	69%	62	15
A47 (WB)	76%	109%	10	155
Old North Road (NB)	82%	35%	43	21
A47 (EB)	103%	94%	117	53
DS 2040	**V/C (%)**		**Delay (Seconds)**	
	AM	PM	AM	PM
A1 off slip (SB)	111%	90%	225	41
A47 (WB)	91%	107%	25	129
Old North Road (NB)	98%	83%	115	71
A47 (EB)	108%	101%	163	91

4.2.2. Analysis of Table 4-1 indicates that in the DS scenario the roundabout is either near to or exceeding the capacity constraints along the A47 eastbound approach during the AM and PM peaks in both 2025 and 2040. In the PM peak the roundabout is over capacity on the A47 westbound approach. Old North Road is close to its capacity limitation in the 2040 AM peak experiencing a delay of around 2 minutes. In the 2040 AM the A1 off-slip southbound movement is over capacity (111%)

Table 4-2: LINSIG junction results – no reassignment (OP1)

OP1 2025	V/C (%)		Delay (Seconds)	
	AM	PM	AM	PM
A1 off slip (left turn lane)	103%	102%	140	136
A1 off slip (all movement)	103%	102%		
A47 WB (ahead left turn lane)	56%	68%	19	17
A47 WB (right turn lane)	100%	101%	110	110
Old North Road (NB)	101%	49%	148	59
A47 EB (ahead left turn lane)	98%	95%	85	65
A47 EB (ahead right turn lane)	98%	93%		
OP2 2040	**V/C (%)**		**Delay (Seconds)**	
	AM	**PM**	**AM**	**PM**
A1 off slip (left turn lane)	127%	99%	451	101
A1 off slip (all movement)	127%	99%		
A47 WB (ahead left turn lane)	70%	88%	21	33
A47 WB (right turn lane)	110%	97%	235	86
Old North Road (NB)	112%	97%	287	145
A47 EB (ahead left turn lane)	96%	99%	78	86
A47 EB (ahead right turn lane)	97%	99%		

Table 4-3: LINSIG junction results (OP2)

OP2 2025	V/C (%)		Delay (Seconds)	
	AM	PM	AM	PM
A1 off slip (left turn lane)	90%	87%	56	65
A1 off slip (all movement)	90%	87%		
A47 WB (ahead left turn lane)	57%	79%	19	20
A47 WB (right turn lane)	86%	81%	56	40
Old North Road (NB)	88%	65%	93	68
A47 EB (ahead left turn lane)	85%	74%	46	37
A47 EB (ahead right turn lane)	84%	73%		
OP2 2040	**V/C (%)**		**Delay (Seconds)**	
	AM	**PM**	**AM**	**PM**
A1 off slip (left turn lane)	94%	91%	67	74
A1 off slip (all movement)	94%	91%		
A47 WB (ahead left turn lane)	74%	90%	24	29
A47 WB (right turn lane)	91%	82%	69	45
Old North Road (NB)	91%	88%	100	96
A47 EB (ahead left turn lane)	87%	79%	46	38
A47 EB (ahead right turn lane)	85%	78%		

4.2.3. Analysis of Table 4-2 and Table 4-3 indicates that the signalised junction option is operating above its reasonable capacity limitations in both the OP1 and OP2 scenarios. In OP1, with fixed flows, the junction is either near to or exceeding the capacity constraints along the A47 eastbound and westbound approaches during the AM and PM peaks in both 2025 and 2040. In the reduced demand OP2 scenario, there is a relative reduction in V/C ratios in both the AM and PM peaks. However, in the OP2 2040 AM and PM peak scenarios, the junction is still operating above the reasonable capacity limitations on the A47.

4.2.4. In summary the OP1 and OP2 junction assessment shows the following:

- A1 Off-slip exceeds its reasonable capacity limitations in both OP1 and OP2
- The A47 westbound right turn lane is over its reasonable capacity limits in OP1. In OP2 its over 85% in the AM 2025 and 2040 peak periods
- Old North Road is its reasonable capacity limitations in both OP1 and OP2 in 2040
- The A47 eastbound is over its reasonable capacity limits in OP1. In OP2 its over 85% in the AM 2025 and 2040 peak periods.

4.2.5. Figure 4.1 and Figure 4.2 summarise the overall total delay at the junction (PCU Hours) for all scenarios in the AM and PM peaks.

Figure 4.1: Total Junction Delay (PCU Hours) – AM peak

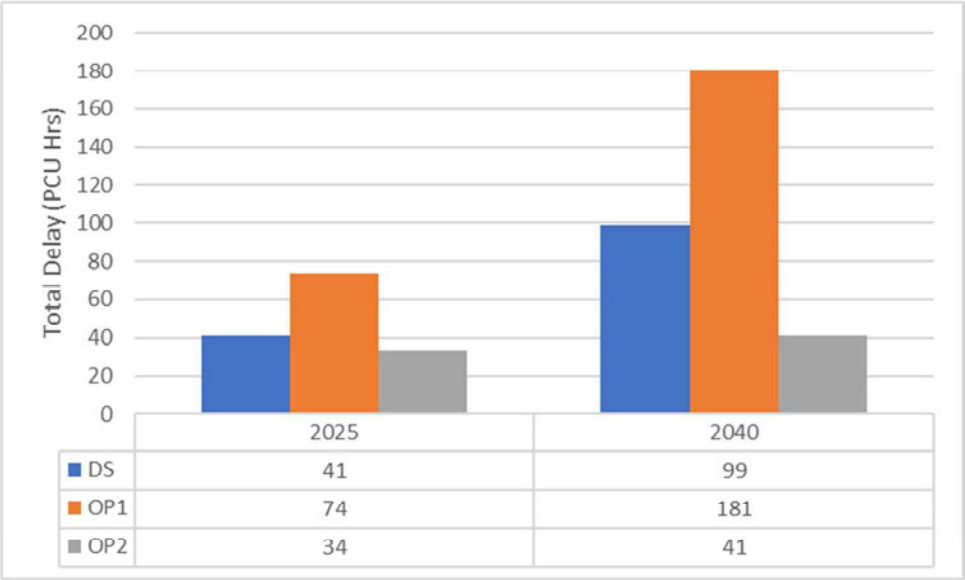
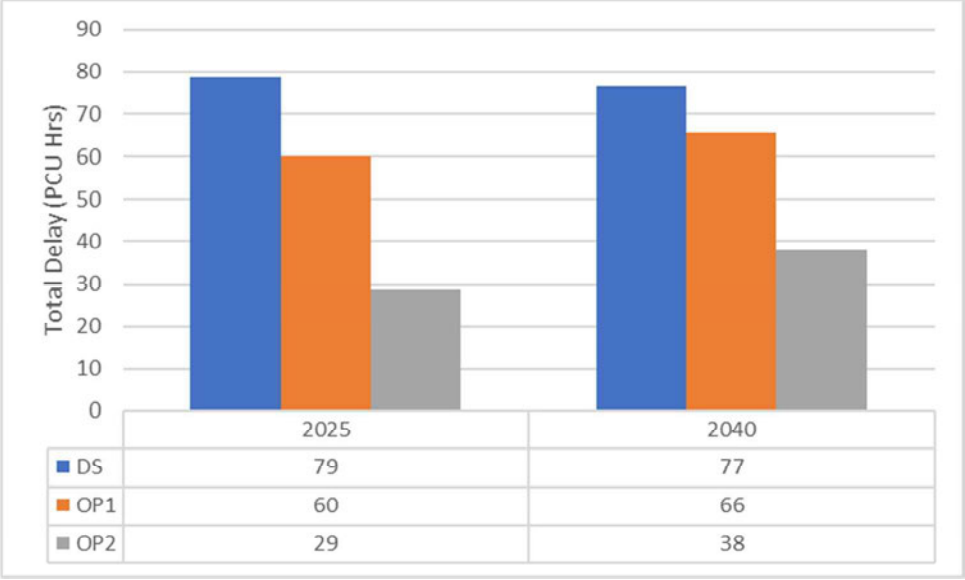


Figure 4.2: Total Junction Delay (PCU Hours) – PM peak



4.2.6. Overall, in the AM and PM OP2 scenarios, the signalised junction reduces the total delay in comparison to the DS roundabout configuration. However, when the fixed demand OP1 scenario in the AM peak is considered, it can be seen that the signalised junction provides less capacity and increases the total delay.

4.2.7. Although the PM peak results indicate an overall decrease in total delay, it should be noted that, even in the reduced demand OP2 scenario, the results still show that several of the approach roads are operating close to the reasonable capacity limitations. Therefore, the LINSIG assessment indicates that the signalised junction does not resolve the existing junction congestion issues.

4.2.8. In addition to the junction capacity issues highlighted by the LinSIG assessment, analysis of the WTM modelling assessment shows that the in the AM peak the signalised junction will cause an overall decrease in network performance along with a wider area re-assignment of traffic away from the junction. These impacts are likely to create a reduction in user benefits derived from the scheme, and hence a lower overall scheme Benefits to Cost Ratio (BCR).

4.2.9. It is also considered that further signal optimisation of the existing option is unlikely to improve the network operation unless major changes are introduced to the current signal layout. Potentially increasing the number of lanes on the approach roads and increasing the available exit width, could provide a better solution to the existing roundabout than the signal option.

5. VISSIM Assessment – SATURN

5.1. Overview

5.1.1. The 2040 Wansford VISSIM model was adopted to undertake a confirmatory check of the junction assessment results and to visually assess any interaction with the surrounding network. As part of the VISSIM assessment the cordon demand from the SATURN SIG option was applied in the VISSIM interface used to derive the DS core scenario assessment. Therefore, the same SATURN-VISSIM interface has been applied for both the SIG and DS scenarios to allow a comparable assessment. Thus, the VISSIM assessment of the signalised junction option includes the re-assignment impacts derived from the SATURN wider area assessment.

5.2. Delay Assessment

5.2.1. Table 5-1 shows the average vehicle delay results over the peak hour modelled period extracted from the VISSIM model. Analysis of these results confirms that delays will increase across the junction in the SIG option. In particular, delays on the A1 Off-slip increase in the range of about 0.5-1 min in both the AM and PM peak periods (AM 161%, PM 319%).

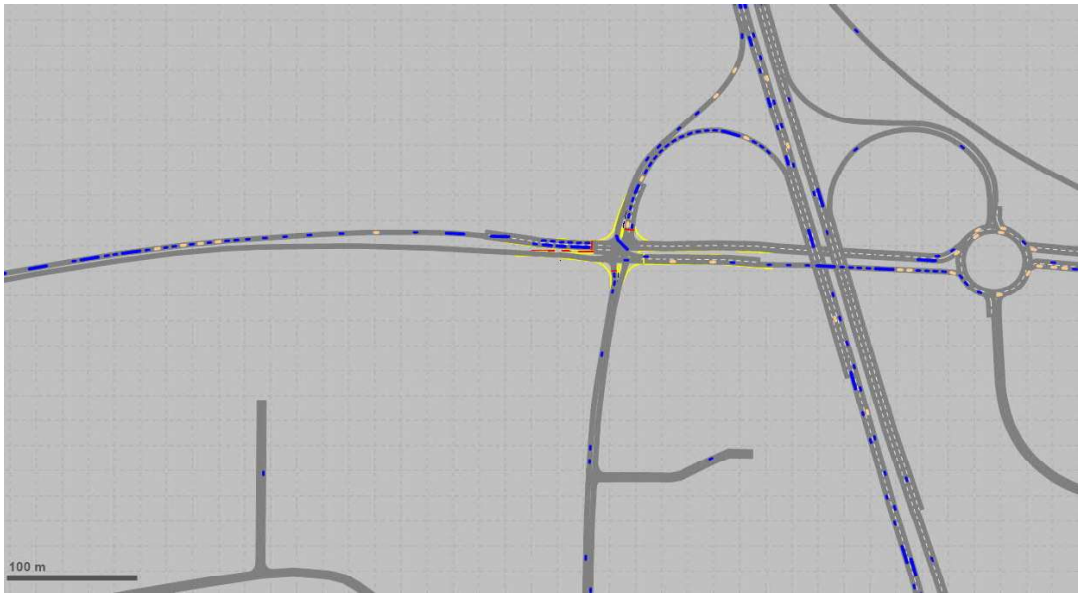
Table 5-1: VISSIM junction results – Average Delay (s)

Approach Road	AM				PM			
	DS	SIG	Diff	% Diff	DS	SIG	Diff	% Diff
A1 Slip	30	78	48	161%	12	49	38	319%
A47 WB	24	38	14	57%	30	34	4	13%
Old North Road	59	78	19	31%	88	48	-40	-45%
A47 EB	182	142	-41	-22%	22	50	28	125%

5.3. Visual Assessment

5.3.1. Figure 5.1 shows the traffic conditions at the A7/A1 western junction in the 2040 AM peak scenario at about 08:00. Visual inspection of the VISSIM model indicates that slow moving vehicles, either queuing or approaching a queue, extend back to the A47\A1 eastern roundabout on the A47 westbound approach. Similarly, on the A47 eastbound approach and the A1 southbound off-slip vehicles back extend to approximately the next junction (i.e.: A47/Old Leicester Road. The A1 main carriageway).

Figure 5.1: VISSIM traffic conditions – 2040 AM peak (08:00)



Source: SWECO.

6. Conclusion

6.1.1. This technical note documents the approach and results of the A47/A1 western roundabout signalisation option.

6.1.2. The junction signalisation test has been undertaken using the strategic Wansford Traffic Model, in conjunction with junction models based in Arcady and LINSIG. In addition to this a VISSIM assessment has been undertaken to verify the results of the junction modelling. The assumptions in the model remained unchanged from the DS scenario with the only differences relating to the A47/A1 western roundabout.

6.1.3. In conclusion, it is considered that the signalised junction option, as shown in Figure 2.2, is not an appropriate solution to resolve the traffic congestion issues at the A47/A1 western roundabout. Analysis of the three-level modelling assessment shows that in the AM peak, the signalised junction will cause an overall decrease in network performance along with a wider area re-assignment of traffic away from the junction. Furthermore, it should be noted that overall traffic congestion levels along the A47 are higher in the AM peak base year compared to the PM peak.

6.1.4. In both AM and PM peak periods analysis of the junction modelling results indicate that the implementation of the assessed signalised junction will not resolve the existing capacity issues. Even in the lower demand OP2 scenario, several of the approach roads are operating close to the reasonable capacity limitations

6.1.5. For the option considered in this technical note, the maximum feasible length of the flare for each road is broadly constrained to the available space currently allocated in the highway boundary. Options for a larger signalised junction (or a larger roundabout) with additional lanes, are limited by adjacent land constraints.

6.1.6. In summary the assessed signalised junction is not considered to be an appropriate option as it doesn’t substantially resolve the traffic congestion issues.

ANNEX F: WANSFORD FLYOVER LANE LAYOUT SAFETY RISK ASSESSMENT

Contents

Figures

Tables

1. Scheme introduction

1.1. Scheme

The A47 Wansford to Sutton dualling scheme is approximately 2.5 kilometres in length and is located in the county of Cambridgeshire between the A1 / A47 junction and the A47 Sutton Roundabout in Sutton, west of Peterborough.

The existing A47 single-carriageway is to be upgraded to dual-carriageway standard (D2AP). It will be constructed to the north of the existing A47 alignment until it ties into the existing dual carriageway to the east of the existing Sutton Roundabout.

1.2. Wansford flyover

The Wansford flyover carries the A47 Leicester to Lowestoft road over the A1 London to Edinburgh dual carriageway. The existing layout features the A47 as a dual carriageway over the structure with roundabouts at each end as shown in Figure 1-1.

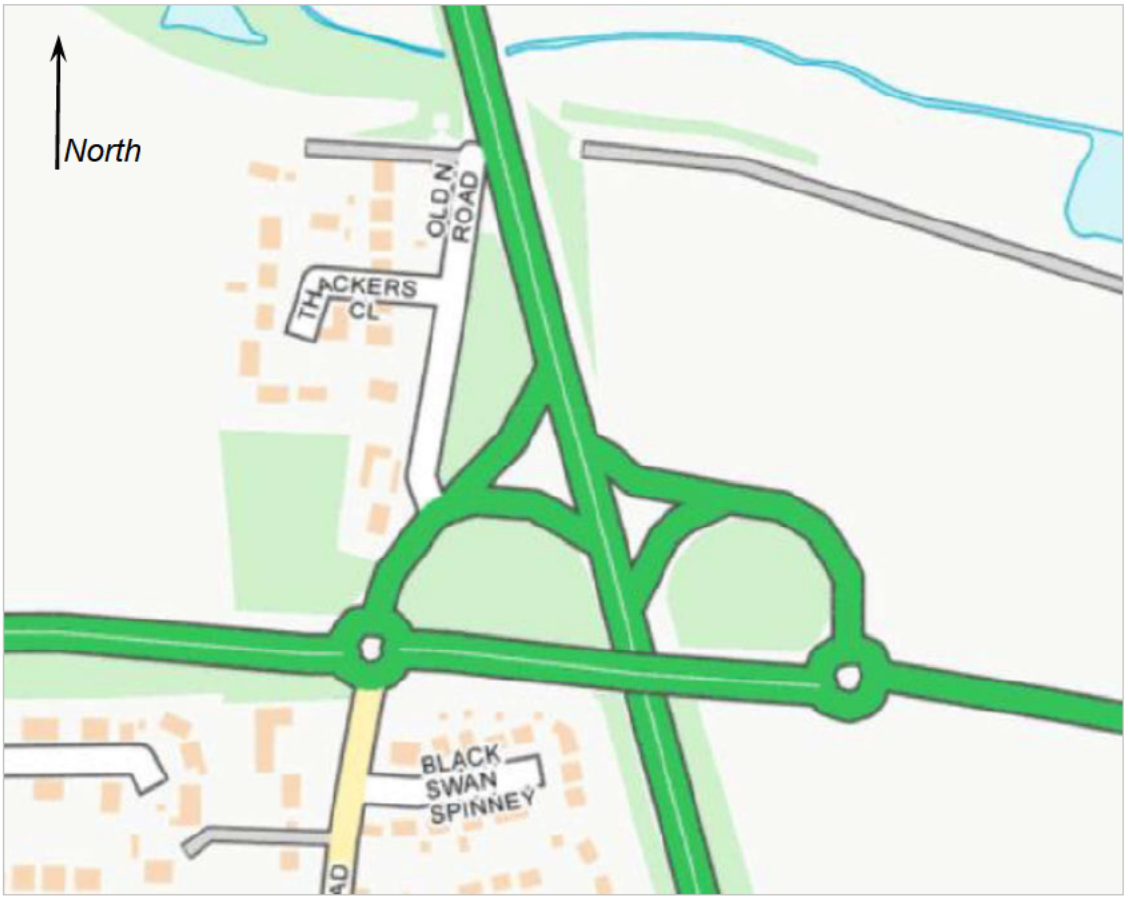


Figure 1-1: Location plan (OS Openmap)

The existing lane layout features a single lane exit from the roundabouts, flaring open to two lanes at the entry of the adjacent roundabouts. A short area of path for cyclists is provided on the westbound approach to the west roundabout.

1.3. Proposed layout

The proposed layout maintains the single lane exits from the east roundabout for westbound traffic towards Leicester, flaring to two lanes for the entry of the next roundabout. The eastbound link will be two lanes between the roundabouts.

Figure 1-2: East roundabout

Figure 1-3: West roundabout

1.4. Safety risk assessment activity

This safety risk assessment has been carried out to consider the following options:

Option 1: The existing arrangement –

- Eastbound - single lane exit from the west roundabout, opening to two lanes on the approach the east roundabout.
- Westbound – single lane exit from the east roundabout, with a flare to two lanes at the entry of the west roundabout.

Option 2: The proposed arrangement

- Eastbound – two lanes exit from the west roundabout, with two lanes continued across the flyover to the east roundabout.
- Westbound – as per existing, single lane exit from the east roundabout, with a flare to two lanes at the entry of the west roundabout.

Option 3: Alternative arrangement

- Eastbound – two lanes exit from the west roundabout, with two lanes continued across the flyover to the east roundabout.
- Westbound – two lanes exit from the east roundabout, with two lanes continued across the flyover to the west roundabout.

1.5. Assumptions

The following assumptions have been made for consideration of this safety risk assessment.

- No dedicated walking, cycling or horse-riding facilities have been included in the proposed or alternative arrangements. The existing arrangement has paved cycle paths at each end of the southern bridge (westbound).

2. Safety risk assessment process

2.1. Safety risk assessment planning

This safety risk assessment has been carried out to consider hazards and resultant risks associated with the Options considered as detailed in Section 1.4.

2.2. Categorisation of activity type

The activity categorisation has followed the guidance in GG104 as detailed in Table 2-1 with the outcomes summarised in Table 2-2. The activity category for this activity is Type A.

Table 2-1: Activity categorisation

Feature	Selection criteria	
	Type	Indicator
Extent of prior experience of activity. The degree of knowledge available from undertaking the activity previously or the degree to which knowledge is available from the activity being undertaken by other industries or organisations.	A	Activities for which there is significant experience within Highways England. Previous safety studies and data are available, and some activity features are codified in a standard or formal procedure.
	B	Activities for which there is limited experience within Highways England but there is transferable experience elsewhere in the UK or internationally. Activities for which there is limited experience in Highways England but there is experience elsewhere in the UK or internationally, including in different industries, which is deemed sufficiently similar to the activity in question to be deemed relevant. Activities for which there is experience within Highways England but that experience is in a different application of the activity and some adaptation will be required. There might also be local and site specific issues to take into account that can affect the relevance of the available experience.
	C	Activities for which there is no previous applicable experience from either Highways England or other industries.
Statutory and formal processes and procedures (including standards and legislation). Consideration of the applicability of current standards, formal processes or procedures, guidance and legislation.	A	The activity is substantially or entirely within the scope of existing standards, guidance, formal processes or procedures and applicable legislation. The activity requires minimal or no safety related departures from standard or safety related changes to formal processes or procedures (including any legislation).
	B	The activity is largely within the scope of existing standards, guidance, formal processes or procedures. There can be some safety related departures from standards needed and/or safety related changes to formal processes or procedures. The activity can need minor changes to existing legislation.
	C	Activities that are not within the scope of existing standards, formal pro- cesses or procedures and require new ones to be developed. Activities for which significant departures from standards, formal pro- cesses or procedures are required. Activities which require significant changes to existing legislation or new legislation to be written. Whilst the number of safety departures from standards, formal processes or procedures can affect the categorisation, the most important element in determining this is the nature and type of the departures. For example, a large number of safety departures that can be addressed straightforwardly will have less impact on feature type than a single safety departure that cannot and requires a detailed risk assessment to support it.
Impact on the organisation. The effect that the activity will have on current	A	The activity has no impact on Highways England. The activity has a minor impact on any of these for a finite period of time. Length of time Highways England is affected by decision to undertake the activity is short term.

Feature	Selection criteria	
	Type	Indicator
Highways England processes, procedures, structure, roles and responsibilities, competencies, policies and strategy, in addition to contractual and workforce arrangements.	B	The activity can lead to permanent minor changes to any of these. These minor changes can introduce new roles and responsibilities, policies, contractual and workforce arrangements. The activity can require a change to organisational arrangements. Length of time Highways England is affected by decision to undertake the activity is medium term.
	C	The activity has significant impact on any of these. The activity can change core safety roles and responsibilities. Length of time Highways England is affected by decision to undertake the activity is long term.
Activity scale. Consideration of the size and/or scale of the activity. Does or can the activity have an impact on the motorway and all-purpose trunk roads, either directly or indirectly.	A	The impact of the activity is limited in nature or scale.
	B	The impact of the activity is significant in nature or scale.
	C	The impact of the activity is wide ranging across the network, and/or significantly impacts infrastructure, interventions or workforce.
Technical. Measure of technical and/or technological novelty and/or innovation the activity involves	A	An activity where any processes, techniques, methodologies and/or technologies involved are currently in widespread use and re-examination is unlikely to be needed.
	B	There can be some experience of the processes, techniques, methodologies and/or technologies. The experience can be from use in either another application, or by another road authority, supplier, industry or perhaps from overseas in which case some additional work can be required to adapt them and/or to demonstrate that safety can be assured for the intended application.
	C	Activities that use new processes, techniques, methodologies and/or technologies for which there is no previous experience in the UK or else- where.
Stakeholder impact and interest. The quantity and/or impact of stakeholders, their interest in and resulting ability to influence or/impact on the activity. The degree to which the safety issues, as perceived, are capable of being understood and fully addressed.	A	Activities for which the quantity and/or impact of stakeholders, their interest in and resulting ability to influence or impact the activity is low
	B	Activities that have only a single or a few stakeholders but their impact, in terms of their attitude towards, or ability to influence, and/or interest in the successful achievement of the activities aim can be significant. Alternatively, it will represent an activity that has several stakeholders but the amount, or type, of safety issues involved are limited.
	C	Activities for which there are a large number of stakeholders and their impact in terms of their attitude towards, or ability to influence can be significant. Stakeholders with a strong interest in the potential safety impact of the activity on themselves. Activities where there are conflicting needs arising from different stake- holders or stakeholder groups.

Table 2-2: Justification of selected activity categorisation type

Feature	Type	Justification
Extent of prior experience of activity.	A	There is significant experience and knowledge of the operation of this type of junction layout.
Statutory and formal processes and procedures (including standards and legislation).	A	A Limited number of Departures may be required to accommodate the options being considered.
Impact on the organisation.	A	There will be very little impact on the organisation.
Activity scale.	A	There will be limited impact of this activity.
Technical.	A	There will be little technical innovation or novelty in the design and operation of the options.
Stakeholder impact and interest.	A	Very few stakeholders are affected.

2.3. Identification of affected populations

The affected populations are as identified in GG104 and shown in Table 2-3.

Table 2-3: Classifications of populations

Population	Classification
People directly employed by Highways England and who work on the motorway and all-purpose trunk roads either permanently e.g. traffic officers, or periodically e.g. those undertaking site visits; AND People in a contractual relationship with Highways England, including our national vehicle recovery contract operatives, all workers engaged in traffic management activities and incident support services, and any other activities where traffic is present, such as persons carrying out survey and inspection work.	Workers
All road users, including the police and emergency services, equestrians, cyclists and pedestrians, as well as those others, who are at work but are not in a contractual relationship with Highways England such as privately contracted vehicle recovery and vehicle repair providers.	Users
Other parties includes any person or persons who could be affected by the Highways England motorway and all-purpose trunk roads, but who are neither using it, nor working on it i.e. living or working adjacent to the motorway and all-purpose trunk roads, using other transport networks that intersect with the motorway and all-purpose trunk roads.	Other parties

The Options selected affected the following populations:

- Workers – maintainers and operators of the infrastructure
- Users – road users
- Other parties – not affected by this proposal.

2.4. Safety risk assessment scope

This safety risk assessment considers the safety implications associated with the Options detailed in Section 1.4.

2.5. Safety baseline and objective

Safety baseline

The safety baseline considers Workers and Users and follows the guidance of GG104:

Workers

No baseline information is available for workers.

Users

The safety baselines shown in Table 2-4have been set on the performance of the existing layout which is detailed in Section 2.6

Table 2-4: User safety baseline

Baseline	1	2
Metric	Annual average casualty numbers	Annual average FWI[1]
Value	1.8	0.054

Other parties

Not affected.

Safety Objectives

The safety objective for Workers is to manage risk as low as reasonably practicable.

Users

The safety objective for Users is for the Options to perform better than the baseline.

Other parties

Not affected.

[1] Fatally weighted injuries = ((1 x fatal casualties) + (0.1 x serious casualties) + (0.01 x slight casualties))

2.6. Collision analysis

The five-year reported injury collision data supplied by Highways England for the period 2015 to 2019 inclusive has been reviewed for the current layout of the Wansford flyover in Figure 2-1.

Over the five-year period there has been 7 slightly injured casualties and 2 seriously injured casualties.

This relates to annual collision rates of:

- 1.8 casualties per year
- 0.054 FWI per year

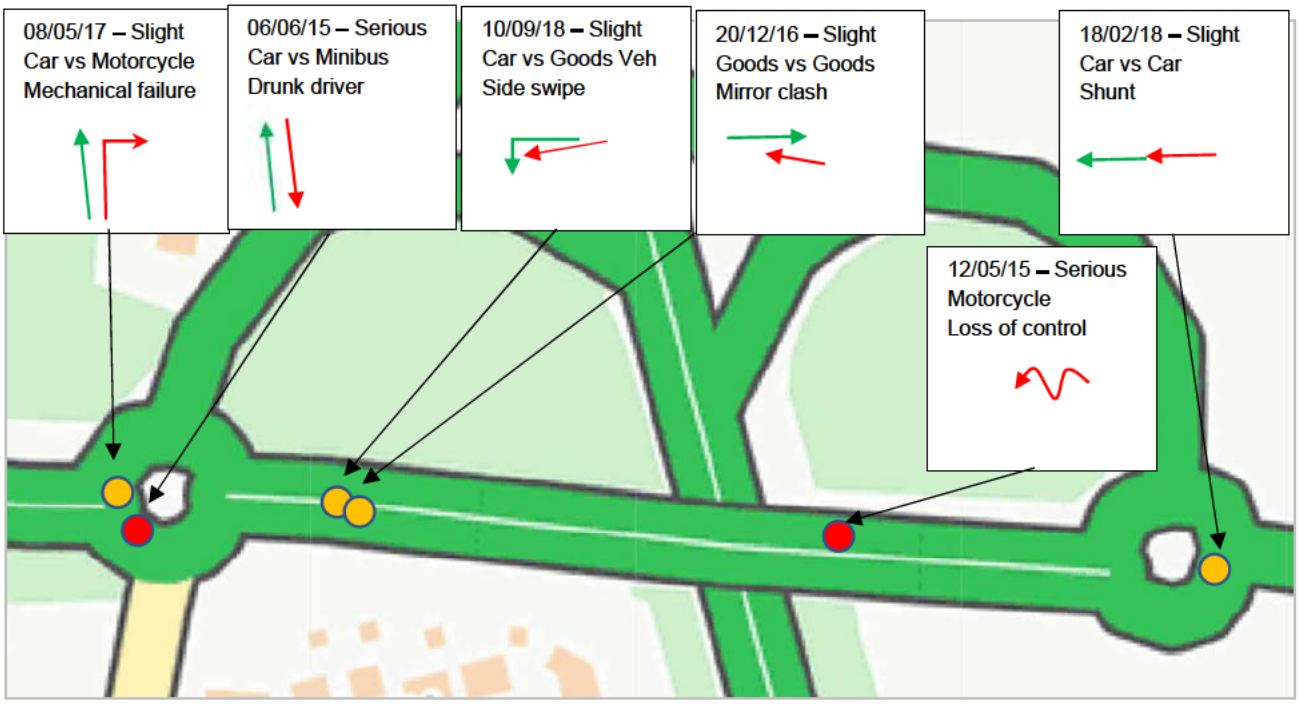


Figure 2-1: Reported injury collision plot

3. Safety risk assessment

3.1. Hazard identification

Workers

Table 3-1: Workers hazard identification

Item	Hazard	
1.1	Workers struck by vehicles.	Vehicles breaching traffic management striking workers.

Users

Table 3-2: Users hazard identification

Item	Hazard	
2.1	Collisions with traffic management.	Vehicles breaching traffic management and causing damage.
2.2	Side swipes between roundabouts.	Weaving collisions between the two roundabouts.
2.3	Give way collisions.	Collisions between circulatory and joining vehicles.
2.4	Side swipes on west roundabout.	Side swipes as vehicles from a two lane entry attempt to merge on the circulatory carriageway.

Other parties

Not affected.

3.2. Hazard analysis

Table 3-3: Workers hazard analysis

Ref	Affected	When/Where	How	What	Why
1.1	Workers	During road works.	Vehicle enters work zone.	Collides with workers.	Workers at risk of serious injury if struck by a vehicle.

Table 3-4: Users hazard analysis

Ref	Affected	When/Where	How	What	Why
2.1	Users	During road works.	Vehicle enters work zone.	Vehicle collides with traffic management or plant.	Collision is likely to result in vehicle damage.
2.2	Users	Between the roundabouts.	Vehicles making lane changes between the roundabouts.	Side swipes occur.	Side swipe collisions can result in slight injury to vehicle occupants.
2.3	Users	Circulatory carriageway of roundabout.	Vehicle enters roundabout striking circulating traffic and side swipes.	Side swipes with other vehicles on the roundabout, and “T-bone”	T-bone and side wipes may result in slight injury to

Ref	Affected	When/Where	How	What	Why
				with vehicles entering the roundabout.	vehicle occupants.
2.4	Users	West roundabout circulatory carriageway westbound.	Westbound traffic using two lanes entering the roundabout and attempting to merge into one on the exit.	Vehicles side swipes on the circulatory carriageway at the exit point.	Side swipes can result in slight injury to vehicle occupants.

3.3. Analysis of safety risk

The hazards identified have been analysed for risk using the risk table detailed in GG104 and shown in Figure 3-1.

Figure 3-1: Risk matrix

Likelihood (L) x Severity (S) = Risk value (R).		Severity (S)				
		Minor harm	Moderate harm	Serious harm	Major harm	Extreme harm
Likelihood (L)	Very unlikely	1	2	3	4	5
	Unlikely	2	4	6	8	10
	May happen	3	6	9	12	15
	Likely	4	8	12	16	20
	Almost certain	5	10	15	20	25
Definitions of Likelihood to population (L)						
Very unlikely		Greater than 25 years				
Unlikely		Once in 25 years				
May happen		Once in 10 years				
Likely		Once in 5 years				
Almost certain		Annual occurrences				
Definitions of Severity (S)						
Minor harm		Minor damage or loss with no injury				
Moderate harm		Slight injury or illness, moderate damage or loss				
Serious harm		Serious injury, illness, substantial damage or loss				
Major harm		Fatal injury, major damage or loss				
Extreme harm		Multiple fatalities, extreme loss or damage				
Risk values (R)						
Low (1-9)		Ensure assumed control measures are maintained and reviewed as necessary				
Medium (10-19)		Additional control measures needed to reduce risk rating to a level which is equivalent to a test of "reasonably required" for the population concerned.				

High (20-25)	Activity not permitted. Hazard to be avoided or risk to be reduced to tolerable.

Table 3-5 and

Table 3-6 use the matrix to consider the likelihood and severity of each risk associated with the hazards. The likelihood is based on the population affected, for example the small number of workers have a higher exposure to risk than individual users.

Table 3-5: Workers risk analysis

Activity / Decision						Date			16/12/2021				
Decision maker / Assessor		Eric Hill – Operational Safety Lead - Sweco				Contact Details			[redacted]				
Ref	Hazard / Risk description	L	S	R	Existing layout	L	S	R	Proposed layout	L	S	R	Alternate layout
1.1	Workers struck by vehicles.	3	3	9	The existing layout provides a wide single lane prior to the forming of two lanes, which provides limited room for lateral safety.	3	3	9	The eastbound being opened to two lanes allows for lane closures in that direction to provide lateral safety without requirement for extensive traffic management on the approaches or exits.	4	3	12	The opening of two lanes westbound would require extensive traffic management on the westbound dual carriageway approach.
				9				**9**				**12**	

Table 3-6: Users risk analysis

Activity / Decision						Date			16/12/2021				
Decision maker / Assessor		Eric Hill – Operational Safety Lead - Sweco				Contact Details			[redacted]				
Ref	Hazard / Risk description	L	S	R	Option 1: Existing layout	L	S	R	Option 2: Proposed layout	L	S	R	Option 3: Alternate layout
2.1	Collisions with traffic management.	3	1	3	The existing layout provides a wide single lane prior to the forming of two lanes, which provides limited room for lateral safety.	2	1	2	The eastbound being opened to two lanes allows for lane closures in that direction to provide lateral safety.	4	1	4	The opening of two lanes westbound would require extensive traffic management on the westbound dual carriageway approach.
2.2	Side swipes between roundabouts.	4	2	8	The existing layout minimises the risk of	4	2	8	The proposed layout features a full two-lane	5	2	10	The alternative of two lanes in both

Activity / Decision						Date			16/12/2021				
Decision maker / Assessor		Eric Hill – Operational Safety Lead - Sweco				Contact Details			[redacted]				
Ref	Hazard / Risk description	L	S	R	Option 1: Existing layout	L	S	R	Option 2: Proposed layout	L	S	R	Option 3: Alternate layout
					side swipes by having single lanes opening into two lanes.				section eastbound, however this is formed from single lane entries, reducing the weaving movement.				directions, has in increased risk of side swipes due to the two-lane approach through the roundabout and onto the short section over the flyover.
2.3	T-bone collisions at give ways.	3	2	6	Based on existing layout, no T-bone or side swipe (due to layout) collisions in 5 years.	3	2	6	The entry points remain unchanged and therefore the level of risk is similar to the existing.	4	2	8	The introduction of a two-lane free flow westbound may increase the speed of vehicles entering the roundabout increasing the risk of T-bone incidents with traffic joining from the A6118.
2.4	Side swipes on circulatory carriageway of west roundabout.	3	2	6	Based on existing layout no side swipes on west roundabout due to lane selection in 5 years.	3	2	6	The west roundabout layout will remain unchanged.	4	2	8	The two lane free flow section across the bridge may encourage users intending to continue west along the A47 to use both lanes. This increases the risk of side swipes occurring at the exit point from the circulatory carriageway.
				23				**22**				**30**	

3.4. Evaluation of safety risk

The three options considered have been assessed for the hazards identified which has concluded that the proposal presents the lowest overall risk for both workers and users.

The proposed layout is likely to have a slightly lower level of risk than the existing layout, however Option 3 has the greatest level of risk and two hazards that are deemed to be a medium risk which would require greater levels of mitigation.

3.5. Safety risk mitigations

Two of the hazards have been identified as medium risk for the alternate layout:

- Workers struck by vehicles entering the workspace.
- Users involved in side-swipes between the roundabouts.

Workers

The risk to workers is increased due to the requirement to reduce the dual carriageway approach to the east roundabout to a single lane, to allow for a lane closure on the flyover. This operation involves setting up, maintaining and removing a lane closure and taper on a high-speed road. This type of operation can be mitigated by use of impact protection vehicles for the workforce when setting up or removing the traffic management.

Users

The risk to users from side swipes comes from the weaving movement of the two-lane approach to the east roundabout for eastbound traffic.

Lane 2 of the dual carriageway approach may be used for turning towards the A1 southbound, or for continuing ahead onto lane two between the roundabouts. Similarly, lane 1 of the dual carriageway approach may be used to go ahead onto lane 1 between the roundabouts. However, vehicles going ahead in lane 1, may wish to change to lane 2 to access the A1 northbound slip.

To mitigate this would require lane designation signing on the westbound approach to the roundabout that deters the straight-ahead movement in lane 2. However, this would not be enforceable, and this route may be taken in certain traffic conditions to avoid slower traffic in lane 1.

4. Document and maintain the safety risk assessment

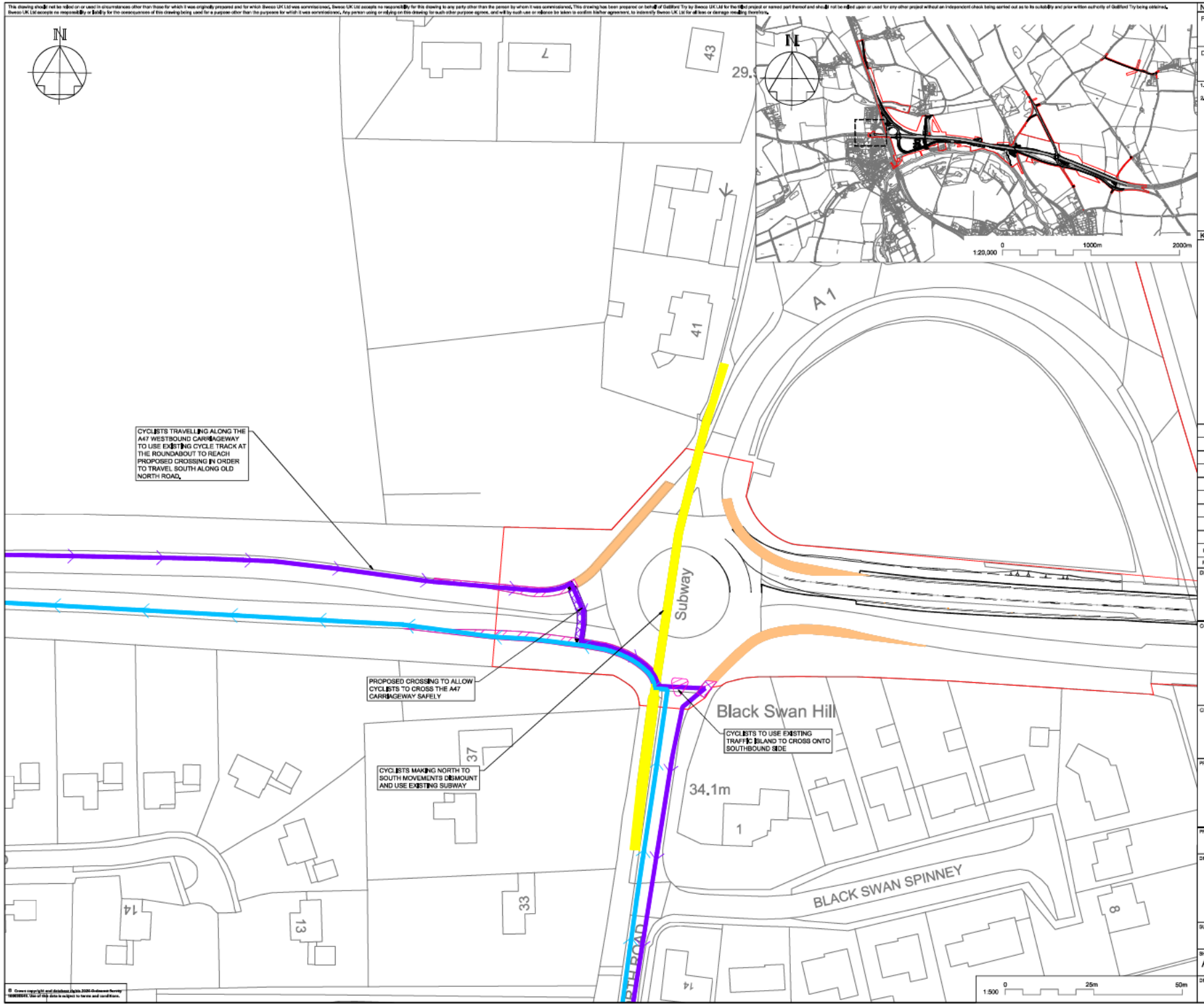
4.1. Update the safety risk assessment

This safety risk assessment should be updated as part of the Plan for Monitoring Operations and Monitoring Output.

4.2. Assumption validation and monitoring

Further monitoring should be carried out as part of routine performance measuring as per standard for a Type A activity.

ANNEX G: CYCLE ROUTES THROUGH WANSFORD WEST ROUNDABOUT



NOTES

Purpose of use

FOR DCO SUBMISSION

Development Consent Order Number / Document

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL PLANS AND DOCUMENTS INCLUDED IN THE DCO APPLICATION.
2. BASE MAP REPRODUCED FROM ORDNANCE SURVEY MAPPING.

KEY TO SYMBOLS

- ORDER LIMITS
- EXISTING CYCLE TRACK TO BE REMOVED
- EXISTING SUBWAY
- EXISTING CYCLE TRACK TO BE RETAINED
- EXISTING CYCLE ROUTE
- PROPOSED CYCLE ROUTE
- PROPOSED CROSSING

REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01	20/04/22	DEADLINE SUBMISSION 5	FWg	PE	MMur

DESIGNER

SWECO

CONTRACTOR

GallifordTry

CLIENT

highways england

PROJECT TITLE

A47 WANSFORD TO SUTTON DUALLING

PROJECT STAGE

PCF STAGE 4

DRAWING TITLE

CYCLE ROUTES
WANSFORD WEST ROUNDABOUT

SUITABILITY

SUITABLE FOR INFORMATION

SHEET SIZE	SCALE	STATUS	REVISION
A1	1:500	S2	P01

DRAWING NUMBER

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ANNEX H: WANSFORD WESTERN ROUNDABOUT – SAFETY ASSESSMENT

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Figures

Tables

1. Scheme introduction

1.1. Scheme Background

The A47 forms part of the Strategic Road Network (SRN) and provides for a variety of local, medium and long-distance trips between the A1 and the eastern coastline. The corridor connects the cities of Norwich and Peterborough, the towns of Wisbech, Kings Lynn, Dereham, Great Yarmouth and Lowestoft and a succession of villages in what is largely a rural area. A47 Wansford to Sutton is 1 of the 5 schemes considered in the Road Investment Strategy (RIS).

The A47 Wansford to Sutton dualling scheme is approximately 2.5 kilometres in length located in the county of Cambridgeshire between the A1 / A47 junction and the A47 Nene Way Roundabout in Sutton, west of Peterborough.

The existing A47 single-carriageway is to be upgraded to dual-carriageway standard (D2AP). It will be constructed slightly to the north of the existing A47 from the A4 / A47 junction for approximately 800m, before crossing the existing A47 where it will be constructed to the south of the existing alignment until it ties into the existing dual-carriageway east of Nene Way.

1.2. Activity Background

Location

The western roundabout of the Wansford interchange is a four arm roundabout with arms leading east and west for the A47 Leicester to Peterborough road, south on the A6118 (old A1 alignment) through the village of Wansford and north forming the slip roads to and from the northbound A1 dual carriageway. An access to a residential cul-de-sac (Old North Road and Thackers Close) is formed on these slip roads in Figure 1-1.

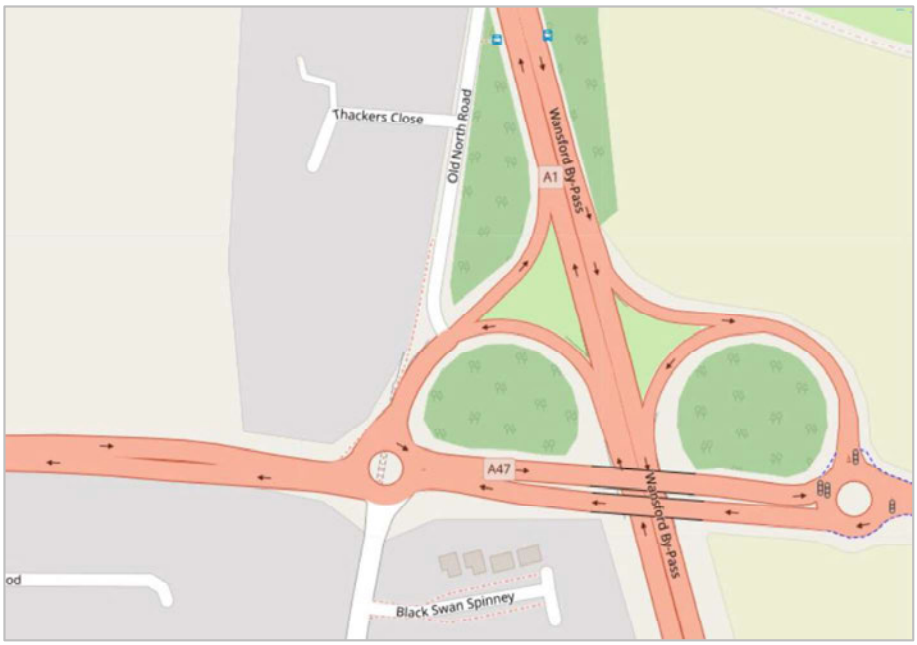


Figure 1-1: Location plan

Existing layout

The existing layout features:

A47

From the west the A47 is a two-lane single carriageway which becomes single lane dual carriageway on the approach to the roundabout.

From the roundabout east towards the Wansford East roundabout, the A47 is a single lane dual carriageway.

A1 Slip roads

The A1 slip roads have single lanes.

A6118

The A6118 through Wansford is a two-lane single carriageway.

Cyclist usage

Strava Heatmap has been used to give an indication of cyclist routes and usage throughout the junction and is shown in Figure 1-2.

Figure 1-2: Strava Heatmap

Proposals

The proposed alterations at Design Fix B as shown in Appendix A include:

A47

The A47 east of the roundabout will be upgraded to two lane dual carriageway over the A1 formed of lane 1 as a lane gain from a dedicated left turn from the A1 slip road, and lane 2 formed from the exit from the west roundabout.

The A47 west of the roundabout will be upgraded to two lane dual carriageway over a length of about 70m.

A1 Slip

The northbound exit slip from the A1 will open into two lanes at a point prior to the Old North Road junction. The lanes will be segregated by a chevron marking bounded by solid lines then by a separation island on the approach to the roundabout.

An uncontrolled cyclist crossing will be provided at the separation island.

2. Safety Risk Assessment Process

2.1. Safety risk assessment planning

This safety risk assessment has been carried out to consider the hazards and risks associated with the layout detailed in Section 1.2.

2.2. Categorisation of activity type

The activity categorisation has followed the guidance in *GG104 Requirement for safety risk assessment* as detailed in Table 2-1 with the outcomes summarised in

Table 2-2. The activity category for this activity is Type A.

Table 2-1: Categorisation of activity

Feature	Selection criteria	
	Type	Indicator
Extent of prior experience of activity. The degree of knowledge available from undertaking the activity previously or the degree to which knowledge is available from the activity being undertaken by other industries or organisations.	A	Activities for which there is significant experience within Highways England. Previous safety studies and data are available, and some activity features are codified in a standard or formal procedure.
	B	Activities for which there is limited experience within Highways England but there is transferable experience elsewhere in the UK or internationally. Activities for which there is limited experience in Highways England but there is experience elsewhere in the UK or internationally, including in different industries, which is deemed sufficiently similar to the activity in question to be deemed relevant. Activities for which there is experience within Highways England, but that experience is in a different application of the activity and some adaptation will be required. There might also be local and site-specific issues to take into account that can affect the relevance of the available experience.
	C	Activities for which there is no previous applicable experience from either Highways England or other industries.
Statutory and formal processes and procedures (including standards and legislation). Consideration of the applicability of current standards, formal processes or procedures, guidance and legislation.	A	The activity is substantially or entirely within the scope of existing standards, guidance, formal processes or procedures and applicable legislation. The activity requires minimal or no safety related departures from standard or safety related changes to formal processes or procedures (including any legislation).
	B	The activity is largely within the scope of existing standards, guidance, formal processes or procedures. There can be some safety related departures from standards needed and/or safety related changes to formal processes or procedures. The activity can need minor changes to existing legislation.
	C	Activities that are not within the scope of existing standards, formal processes or procedures and require new ones to be developed. Activities for which significant departures from standards, formal processes or procedures are required. Activities which require significant changes to existing legislation or new legislation to be written. Whilst the number of safety departures from standards, formal processes or procedures can affect the categorisation, the most important element in determining this is the nature and type of the departures. For example, a large number of safety departures that can be addressed straightforwardly will have less impact on feature type than a single safety departure that cannot and requires a detailed risk assessment to support it.
Impact on the organisation. The effect that the activity will have on current Highways England processes, procedures, structure, roles and	A	The activity has no impact on Highways England. The activity has a minor impact on any of these for a finite period of time. Length of time Highways England is affected by decision to undertake the activity is short term.

Feature	Selection criteria	
	Type	Indicator
responsibilities, competencies, policies and strategy, in addition to contractual and workforce arrangements.	B	The activity can lead to permanent minor changes to any of these. These minor changes can introduce new roles and responsibilities, policies, contractual and workforce arrangements. The activity can require a change to organisational arrangements. Length of time Highways England is affected by decision to undertake the activity is medium term.
	C	The activity has significant impact on any of these. The activity can change core safety roles and responsibilities. Length of time Highways England is affected by decision to undertake the activity is long term.
Activity scale. Consideration of the size and/or scale of the activity. Does or can the activity have an impact on the motorway and all-purpose trunk roads, either directly or indirectly.	A	The impact of the activity is limited in nature or scale.
	B	The impact of the activity is significant in nature or scale.
	C	The impact of the activity is wide ranging across the network, and/or significantly impacts infrastructure, interventions or workforce.
Technical. Measure of technical and/or technological novelty and/or innovation the activity involves	A	An activity where any processes, techniques, methodologies and/or technologies involved are currently in widespread use and re-examination is unlikely to be needed.
	B	There can be some experience of the processes, techniques, methodologies and/or technologies. The experience can be from use in either another application, or by another road authority, supplier, industry or perhaps from overseas in which case some additional work can be required to adapt them and/or to demonstrate that safety can be assured for the intended application.
	C	Activities that use new processes, techniques, methodologies and/or technologies for which there is no previous experience in the UK or elsewhere.
Stakeholder impact and interest. The quantity and/or impact of stakeholders, their interest in and resulting ability to influence or/impact on the activity. The degree to which the safety issues, as perceived, are capable of being understood and fully addressed.	A	Activities for which the quantity and/or impact of stakeholders, their interest in and resulting ability to influence or impact the activity is low
	B	Activities that have only a single or a few stakeholders but their impact, in terms of their attitude towards, or ability to influence, and/or interest in the successful achievement of the activities aim can be significant. Alternatively, it will represent an activity that has several stakeholders but the amount, or type, of safety issues involved are limited.
	C	Activities for which there are a large number of stakeholders and their impact in terms of their attitude towards, or ability to influence can be significant. Stakeholders with a strong interest in the potential safety impact of the activity on themselves. Activities where there are conflicting needs arising from different stakeholders or stakeholder groups.

Table 2-2: Justification of activity categorisation

Feature	Type	Justification
Extent of prior experience of activity.	A	There is significant experience and knowledge of the operation of roundabouts, dedicated left turns, taper merges, lane gains and slip roads.
Statutory and formal processes and procedures (including standards and legislation).	A	A Limited number of Departures may be required to accommodate the options being considered.
Impact on the organisation.	A	There will be very little impact on the organisation.
Activity scale.	A	There will be limited impact of this activity.
Technical.	A	There will be little technical innovation or novelty in the design and operation of the options.

Feature	Type	Justification
Stakeholder impact and interest.	A	Very few stakeholders are affected.

2.3. Identification of affected populations

In accordance with GG104, consideration has been given to the populations identified in Table 2-3.

Table 2-3: Explanation of populations

Population	Classification
People directly employed by Highways England and who work on the motorway and all-purpose trunk roads either permanently e.g. traffic officers, or periodically e.g. those undertaking site visits; AND People in a contractual relationship with Highways England, including our national vehicle recovery contract operatives, all workers engaged in traffic management activities and incident support services, and any other activities where traffic is present, such as persons carrying out survey and inspection work.	Workers
All road users, including the police and emergency services, equestrians, cyclists and pedestrians, as well as those others, who are at work but are not in a contractual relationship with Highways England such as privately contracted vehicle recovery and vehicle repair providers.	Users
Other parties includes any person or persons who could be affected by the Highways England motorway and all-purpose trunk roads, but who are neither using it, nor working on it i.e. living or working adjacent to the motorway and all-purpose trunk roads, using other transport networks that intersect with the motorway and all-purpose trunk roads.	Other parties

The populations affected by this activity have been confirmed as:

Workers – Risk to maintainers due additional infrastructure and maintenance.

Users – Risk to road users due to the alterations in the road layout.

Other parties – Risk to other parties on diversion routes whilst maintenance is undertaken on the Wansford junction.

2.4. Safety risk assessment scope

This safety risk assessment considers the safety implications of the proposed layout detailed in Section 1.2.

Two options are being assessed:

- Option 1: The existing layout.
- Option 2: The proposed Design Fix B layout.

2.5. Safety baseline and safety objective

Safety baseline

The safety baseline considers Workers and Users and follows the guidance of GG104. The collision figures for the five year period 2014-2018 have been provided by Highways England and shown in Appendix B.

Workers

One reported injury collision occurred on the A1 northbound at the vicinity of roadworks resulting in one slight injury to a vehicle occupant within the five year period 2014-2018 inclusive.

No collisions involving road workers have been reported within the five-year period 2014 to 2018.

Users

The five year reported injury collision data from 2014 to 2018 inclusive has identified the following casualties:

Slip Road – 1 serious and 2 slight casualties. Five-year FWI 0.12, annual average FWI 0.024

Roundabout – 1 serious and 7 slight casualties. Five year FWI 0.17, annual average FWI 0.034

A47 Eastbound approach – 3 slight casualties. Five year FWI 0.03, annual average FWI 0.006.

A47 Between Wansford roundabouts – 1 serious and 2 slight casualties. Five year FWI 0.12, annual average FWI 0.024

A review of Crashmap has revealed that no reported injury collisions involving cyclists have been recorded in the 20 year period 1999 to 2018 inclusive.

One reported injury pedestrian collision (2001) was recorded on the A1 to A47 slip road in the 20 year period 1999 to 2018 inclusive, resulting in a serious injury.

Others

The baseline for others is the safety performance of the surrounding network whilst closures are in place on the proposed layout.

Safety objectives

Workers

The safety objective for workers follows the ALARP "as low as reasonably practical" principles.

Users

The safety objective for users would be no worse than the baseline, and that no single user group would be placed at greater risk.

Other parties

The safety objective for other parties would be no worse than the baseline.

2.6. Assumptions

The following assumptions have been made in regard to this activity and safety risk assessment:

- All maintenance works would be undertaken by a competent contractor with traffic management in accordance with Chapter 8 of the Traffic Signs Manual.
- Vehicle speeds will be compliant with the 60mph speed limit.
- Warning signs will be erected on approaches to the uncontrolled crossing
- Pavement surfaces will have appropriate grip properties.

3. Safety Risk Assessment

3.1. Hazard identification

The hazards for workers, users and others associated with the proposed layout are listed in Table 3-1,

Table 3-2 and

Table 3-3.

These are hazards that are likely to have different levels of risk between the existing layout and the proposed Design Fix B layout.

Table 3-1: Worker hazard identification

Item	Hazard
1.1	Workers struck maintaining the separation island
1.2	Workers struck carrying out verge works on the slip road
1.3	Workers struck carrying out verge works on dual carriageway
1.4	Workers struck carrying out carriageway maintenance of the slip road
1.5	Workers struck carrying out maintenance of the A47 dual carriageway

Table 3-2: Users hazard identification

Item	Hazard
2.1	Side swipes selecting an appropriate lane
2.2	Shunts on the slip road due to queues from the roundabout
2.3	Shunts on the A47 approaches to the roundabout
2.4	Junction collisions with Old North Road
2.5	Cyclist collisions when crossing at roundabout approach
2.6	Cyclists being struck merging with mainline traffic on A47 Eastbound
2.7	Merging collisions involving eastbound traffic from the slip road
2.8	Weaving incidents between the west and east roundabouts

Table 3-3: Others hazard identification

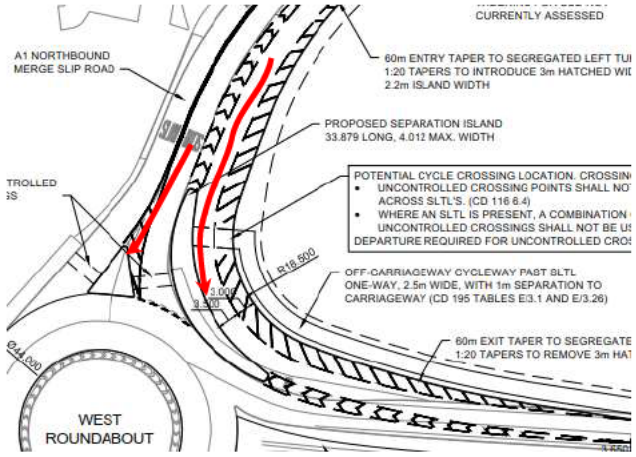
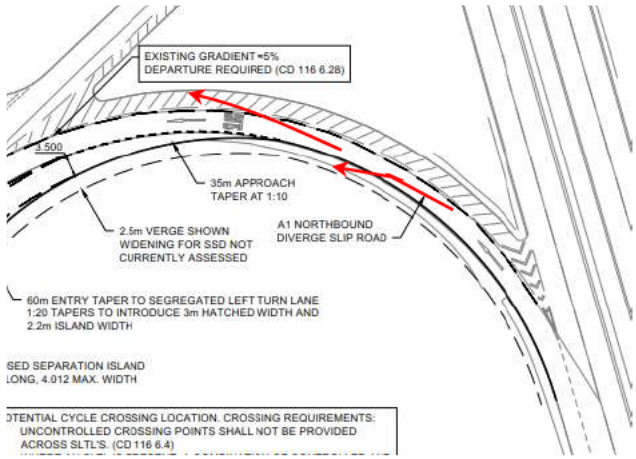
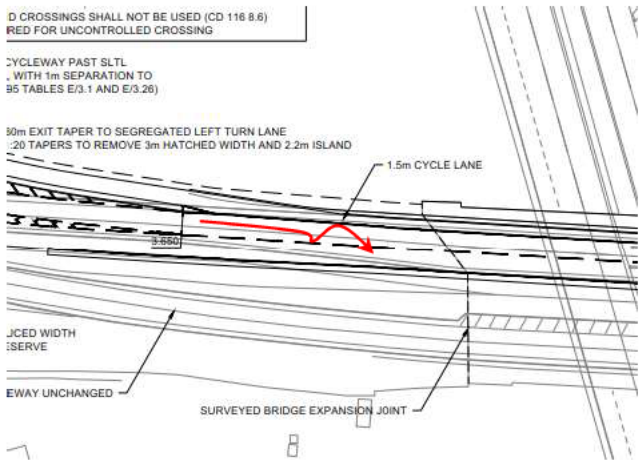
Item	Hazard
3.1	Others affected by diverted traffic during a slip road closure

3.2	Others affected by diverted traffic during an A47 dual carriageway closure

3.2. Hazard analysis

The analysis of the hazard considers how this hazard would develop and the likely outcomes and are shown in Table 3-4, Table 3-5 and Table 3-6.

Table 3-4: Workers hazard analysis

Item	Hazard	Analysis
1.1	**Workers struck maintaining the separation island.** The islands on the roundabout approach are likely to require maintenance, which increases the risk of a worker being struck and being seriously injured.	
1.2	**Workers struck carrying out verge works on slip road.** Road users reacting late to roadside works can lead to oversteer/understeer incidents resulting in workers being struck and seriously injured.	
1.3	**Workers struck carrying out verge works on dual carriageway.** Works on the carriageway increase the level of risk of workers being struck and seriously injured.	

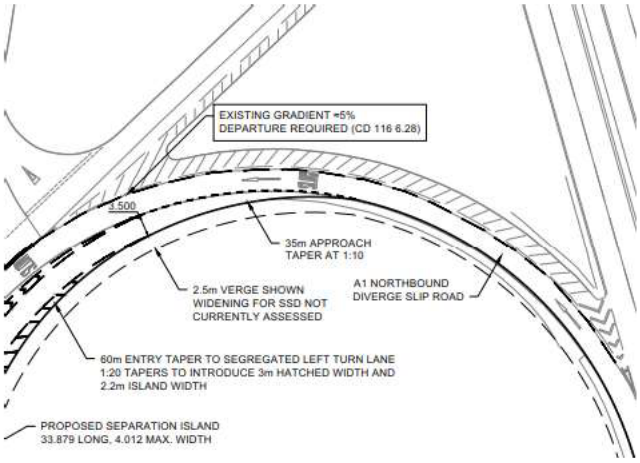
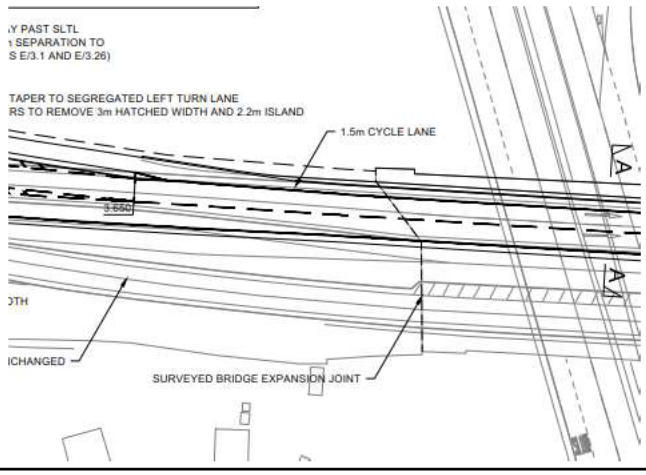
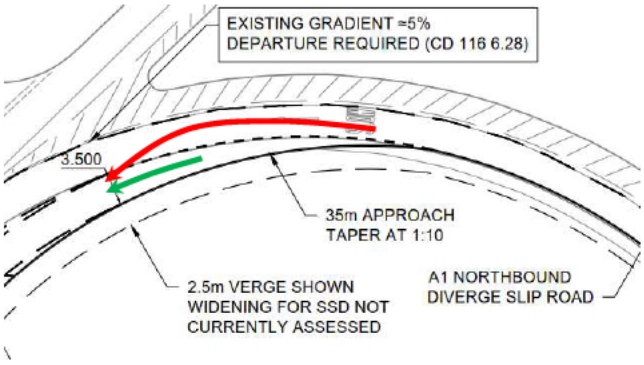
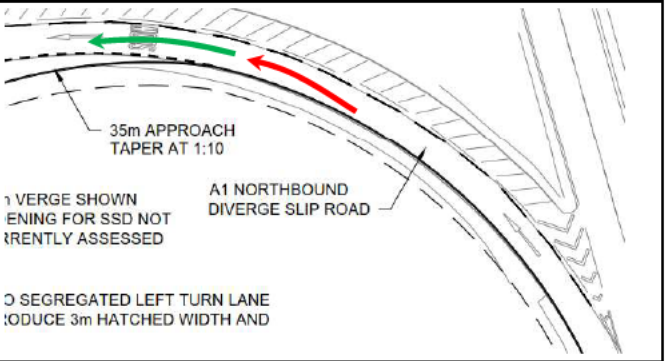
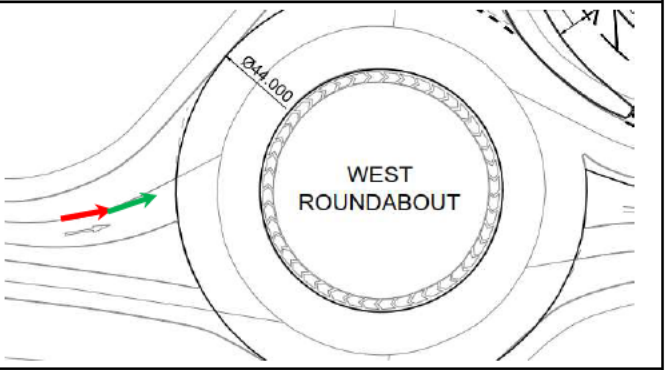
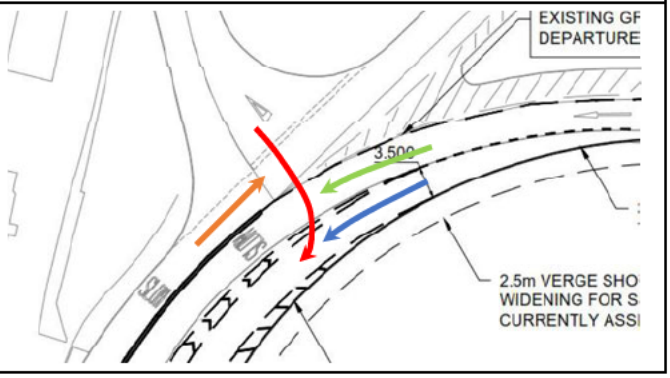
1.4	**Workers struck carrying out carriageway maintenance of the slip road.** Works on the carriageway increase the level of risk of workers being struck and seriously injured due to limitation on lateral safety.	
1.5	**Workers struck carrying out maintenance of the A47 dual carriageway.** Works on the carriageway increase the level of risk of workers being struck and seriously injured due to limitations on lateral safety.	

Table 3-5: Users hazard analysis

Item	Hazard	Analysis
2.1	**Side swipes selecting an appropriate lane on the slip road.** Users may carry out late lane changes on the approach to the junction, due to the short space available for junction signing on the diverge from the A1 to the start of the chevron lane markings. This type of collision may result in slight injury to vehicle occupants.	
2.2	**Shunts on the slip road due to queues from the roundabout** All current slip road collisions have been shunts due to queues. (1 serious and 2 slight injury casualties in five years).	
2.3	**Shunts reported on the A47 approaches to the roundabout** The eastbound has had a multiple vehicle shunt resulting in 3 slight injury casualties in five years.	
2.4	**Junction collisions with Old North Road** It may not be apparent to slip road users that there is an access off the slip road, increasing the risk of junction collisions that may result in serious injury to a vehicle occupant.	

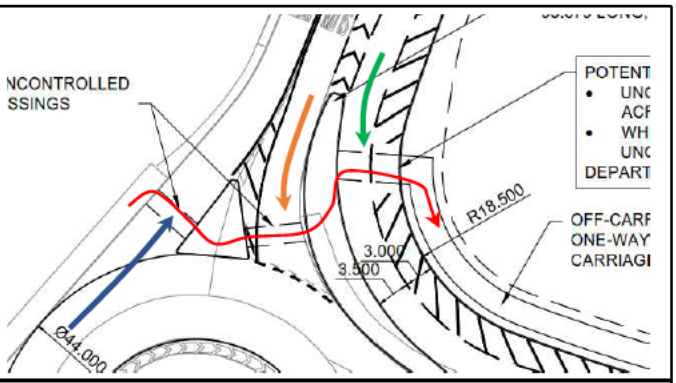
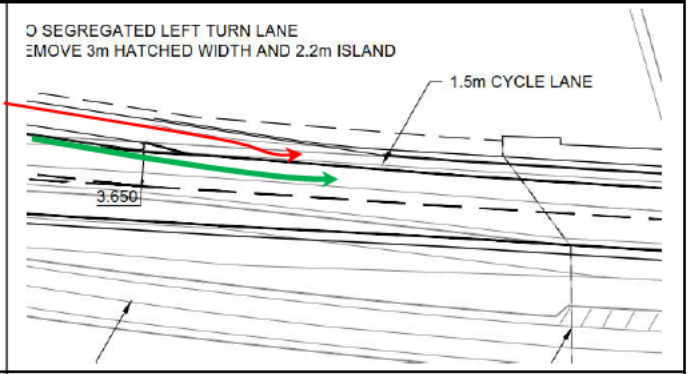
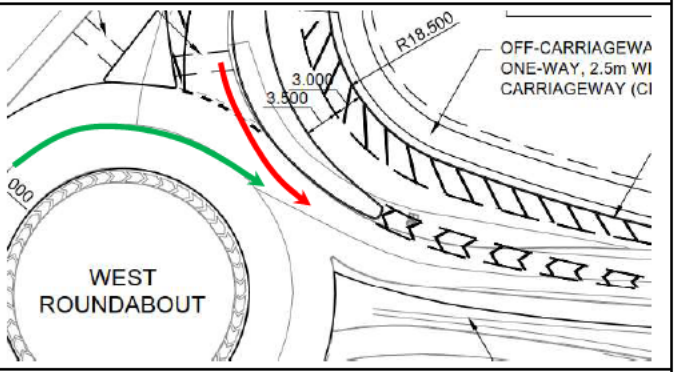
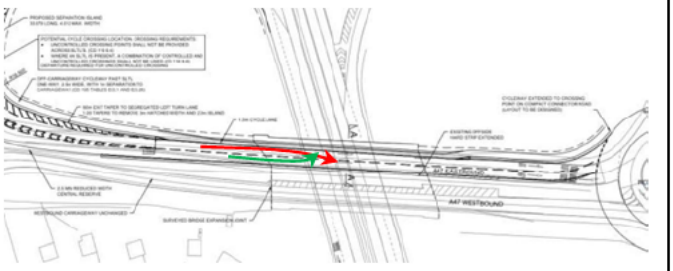
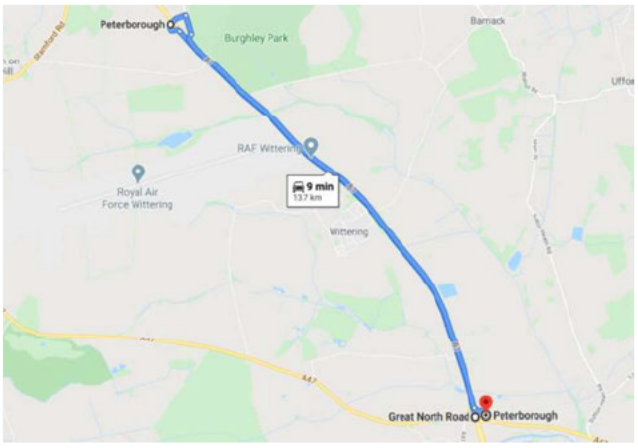
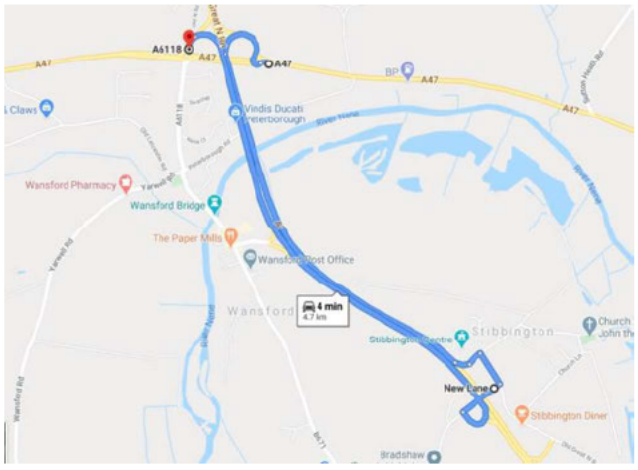
2.5	**Cyclist collisions at roundabout approach** The uncontrolled cycle crossings are on the entry and exit of the roundabout, increasing the risk of cyclists being struck resulting in serious injury.	
2.6	**Cyclists being struck merging with mainline traffic on A47 Eastbound.** Cyclists merging onto the carriageway are at risk of being struck by following vehicles resulting in serious injury to the cyclist.	
2.7	**Merging collisions involving eastbound traffic from the slip road** The current layout has all traffic merging at the roundabout, the proposed will separate eastbound via the dedicated lane to a lane gain. Roundabout collisions usually result in slight injuries.	
2.8	**Weaving incidents between the west and east roundabouts** The current layout is a single lane with almost no weaving until the roundabout entry. The proposed layout will have low speed weaving between roundabout that may result in damage only collisions.	

Table 3-6: Others hazard analysis

Item	Hazard	Analysis
3.1	**Others affected by diverted traffic during a slip road closure** If the northbound exit from the A1 is closed for maintenance, the diversion route via the A1 and a grade separated junction is approximately 13.7km in length. Alternatives includes using the urban route through Wansford. This increases traffic and risk on these routes.	
3.2	**Others affected by diverted traffic during an A47 dual carriageway closure.** The eastbound diversion would be similar to 3.1 above, the westbound would be 4.7km using a grade separated junction and a section of urban road. This increases traffic and risk on these routes.	

3.3. Analysis of safety risk

An analysis or safety risk has been carried out using a qualitive risk assessment to consider the likelihood and severity of collisions associated with the identified hazards. The risk matrix as detailed within GG104 and shown in Figure 3-1 has been adopted.

Likelihood (L) x Severity (S) = Risk value (R)		**Severity (S)**				
		Minor harm; Minor damage or loss no injury	**Moderate harm; Slight injury or illness, moderate damage or loss**	**Serious harm; Serious injury or ill-ness, substantial damage or loss**	**Major harm; Fatal injury, major damage or loss**	**Extreme harm; Multiple fatalities, extreme loss or damage**
Likelihood (L)	Very unlikely; Highly improbable, not known to occur	1	2	3	4	5
	Unlikely; Less than 1 per 10 years	2	4	6	8	10
	May happen; Once every 5-10 years	3	6	9	12	15
	Likely; Once every 1-4 years	4	8	12	16	20
	Almost certain; Once a year or more	5	10	15	20	25

Risk Value (R)	**Required action**
Low (1-9)	Ensure assumed control measures are maintained and reviewed as necessary.
Medium (10-19)	Additional control measures needed to reduce risk rating to a level which is equivalent to a test of "reasonably required" for the population concerned.
High (20-25)	Activity not permitted. Hazard to be avoided or risk to be reduced to tolerable.

Figure 3-1: Safety risk matrix

Table 3-7: Workers safety risk analysis

Reference	Option 1: Existing Layout				Option 2: Proposed Design			
	Description, controls and mitigations	Likelihood	Severity	Risk Value	Description, controls and mitigations	Likelihood	Severity	Risk Value
1.1	**Workers struck maintaining the separation island.** One island to maintain, although no recorded incidents identified	1	3	3	The additional island increases the maintenance requirements and therefore the exposure to traffic for workers.	2	3	6
1.2	**Workers struck carrying out verge works on the slip road** Wide hard strips and single lane operation on the slip road results in wider lateral safety zones and reduced speeds through the construction zone.	1	3	3	Lane closures on the slip road would be required to achieve lateral safety zones. These would include more extensive traffic management and therefore increase the exposure to traffic for workers.	2	3	6
1.3	**Workers struck carrying out verge works on dual carriageway.** Wide hard strips and single lane operation on the dual carriageway results in wider lateral safety zones and reduced speeds through the construction zone.	1	3	3	Lane closures on the dual carriageway would be required to achieve lateral safety zones. These would include more extensive traffic management and therefore increase the exposure to traffic for workers.	2	3	6
1.4	**Workers struck carrying out carriageway maintenance of the slip road.** Carrying out carriageway maintenance on the existing layout would require full closures, most likely during night hours in darkness. Although creating a safer workspace for traffic, traffic management would still be required on the mainline.	1	3	3	The wider carriageway would allow lane closures to carry out works, which would maintain a flow of traffic with full closures but increases the risk to workers from adjacent vehicles within the construction zone.	2	3	6
1.5	**Workers struck carrying out maintenance of the A47 dual carriageway.** Carrying out carriageway maintenance on the existing layout would require full closures under street lit conditions.	1	3	3	The wider carriageway would allow lane closures to carry out works, which would maintain a flow of traffic with full closures but increases the risk to workers from adjacent vehicles within the construction zone.	2	3	6

Reference	Option 1: Existing Layout				Option 2: Proposed Design			
	Description, controls and mitigations	Likelihood	Severity	Risk Value	Description, controls and mitigations	Likelihood	Severity	Risk Value
	Although creating a safer workspace for traffic, traffic management would still be required on the mainline.							

Table 3-8: Users safety risk analysis

Reference	Option 1: Existing Layout				Option 2: Proposed Design			
	Description, controls and mitigations	Likelihood	Severity	Risk Value	Description, controls and mitigations	Likelihood	Severity	Risk Value
2.1	**Side swipes selecting an appropriate lane on the slip road** The existing layout has a single lane layout on the slip road, flaring to two at the roundabout	2	2	4	There is little space between the A1 diverge and formation of the diverge for the roundabout. This may result in late lane changes.	3	2	6
2.2	**Shunts on the slip road due to queues from the roundabout** Current collision history of existing layout has 1 serious and 2 slight injury casualties in five years.	4	3	12	The additional lane will reduce queue lengths and the likelihood that vehicles exiting the A1 would run into the rear of stationary traffic.	3	3	9
2.3	**Shunts on the A47 approaches to the roundabout** Current collision history of existing layout has 3 slight injury casualties in 5 years.	4	2	8	The additional lanes will reduce queue lengths and therefore the likelihood of shunts on the approaches	3	2	6
2.4	**Junction collisions with Old North Road** No reported collisions in 20 years on the current layout.	1	3	3	The proposed layout may result in vehicles exiting the Old North Road crossing multiple lanes, although the layout will not significantly change from existing.	2	3	6
2.5	**Cyclist collisions when crossing at roundabout approach**	2	3	6	The proposed layout will breakdown the crossing of the northern arm of the	1	3	3

Reference	Option 1: Existing Layout				Option 2: Proposed Design			
	Description, controls and mitigations	Likelihood	Severity	Risk Value	Description, controls and mitigations	Likelihood	Severity	Risk Value
	No reported collisions involving cyclists in 20 years on the existing layout which features crossing the slip road at the point where it flares to two lanes entering the roundabout.				roundabout into three sections. Each crossing is of one lane which is no worse than the existing layout.			
2.6	**Cyclists being struck merging with mainline traffic on A47 Eastbound** No reported collisions involving cyclists in 20 years on the existing layout which features a merge from the cycle path onto the carriageway live lane.	2	3	6	The proposed layout is a dedicated lane gain for cyclists which almost eliminates the risk of a merging incident with cyclists.	1	3	3
2.7	**Merging collisions involving eastbound traffic from the slip road** Roundabout collisions have been reported in the last 10 years involving merging vehicles.	3	3	9	The proposed layout removes some roundabout manoeuvres and provides a lane gain which will reduce collision likelihood	2	3	6
2.8	**Weaving incidents between the west and east roundabouts** Minimal weaving will occur on the approach to the east roundabout due to the current layout.	2	1	2	The proposed layout has a weaving length across the bridge between the roundabouts, which may result in damage only collisions	4	1	4

Table 3-9: Others safety risk analysis

Reference	Option 1: Existing Layout				Option 2: Proposed Design			
	Description, controls and mitigations	Likelihood	Severity	Risk Value	Description, controls and mitigations	Likelihood	Severity	Risk Value
3.1	**Others affected by diverted traffic during a slip road closure** One slight injury casualty recorded during a closure of the slip for road works.	4	2	8	The widened slip road reduces the requirement for a full closure to carry out carriageway maintenance, therefore likelihood of a collision associated with a closure is reduced.	2	2	4
3.2	**Others affected by diverted traffic during an A47 dual carriageway closure** Similar to above there is a risk to other users in the event of vehicles using an alternative route, although no collisions identified associated with this activity in the past five years.	4	2	8	Similar to above, the reduced requirement to close the road due to the increased pavement width reduces the risk of collisions occurring on alternative routes.	2	2	4

3.4. Evaluation of safety risk

The levels of risk associated with the number of hazards is shown in Table 3-10.

Table 3-10: Hazard risk levels

Population	Existing Layout				Proposed Layout			
	Low	Medium	High	Total	Low	Medium	High	
Workers	5	0	0	5	5	0	0	5
Users	7	1	0	8	8	0	0	8
Other parties	2	0	0	2	2	0	0	2
Totals	**14**	**1**	**0**	**15**	**15**	**0**	**0**	**15**

Table 3-11 and

Table 3-12 provide the cumulative and average risk values for the hazards identified.

Table 3-11: Cumulative hazard risk values

Population	Existing Layout				Proposed Layout			
	Low	Medium	High	Total	Low	Medium	High	Total
Workers	15	0	0	15	30	0	0	30
Users	38	12	0	50	43	0	0	43
Other parties	16	0	0	16	8	0	0	8
Totals	**69**	**12**	**0**	**81**	**81**	**0**	**0**	**81**

Table 3-12: Average hazard risk values

Population	Existing Layout				Proposed Layout			
	Low	Medium	High	Total	Low	Medium	High	Total
Workers	3.0	0	0	3.0	6.0	0	0	6.0
Users	5.4	12.0	0	6.3	5.4	0	0	5.4
Other parties	8.0	0	0	7.0	4.0	0	0	5.0
Totals	**4.9**	**12.0**	**0**	**5.4**	**5.4**	**0**	**0**	**5.4**

It can be seen that one medium risk has been identified in the existing layout, all other risks are "**low**" **level risks.**

The cumulative and average risk values associated with the proposed layout are the same as the existing layout, however the proposed layout does not have any medium or high-level risks.

It is therefore expected that the proposed layout will achieve the safety baseline.

3.5. Safety risk mitigations

Where hazards are identified as medium or high-level risk, they should have mitigation measures to reduce or eliminate the risk. The proposed design only has low level risks associated with the hazards and therefore does not require further mitigation than standard safety governance through the design and maintenance processes.

If the existing layout was to be maintained, the medium risk associated with shunts occurring on the slip road should be considered for mitigation measures to eliminate or reduce the risk to low level.

4. Document and maintain the safety risk assessment

4.1. Document the safety risk assessment

This safety risk assessment documents the hazards and risks associated with the proposed west roundabout layout for Design Fix B.

4.2. Update the safety risk assessment

This safety risk assessment should be updated as part of the Plan for Monitoring Operations and Monitoring Output.

4.3. Assumption and validation monitoring

Further monitoring should be carried out as part of routine performance measuring as per standard for a Type A activity.

5. Conclusion

This safety risk assessment has considered the hazards and associated risks for proposed layout for the Wansford west roundabout.

The risk assessment identified the following populations at risk:

- Workers
- Users
- Others

Worker hazards included risk of workers being struck carrying out maintenance.

Users hazards included shunts on the approach to the roundabout, side swipes, junction and cyclist collisions.

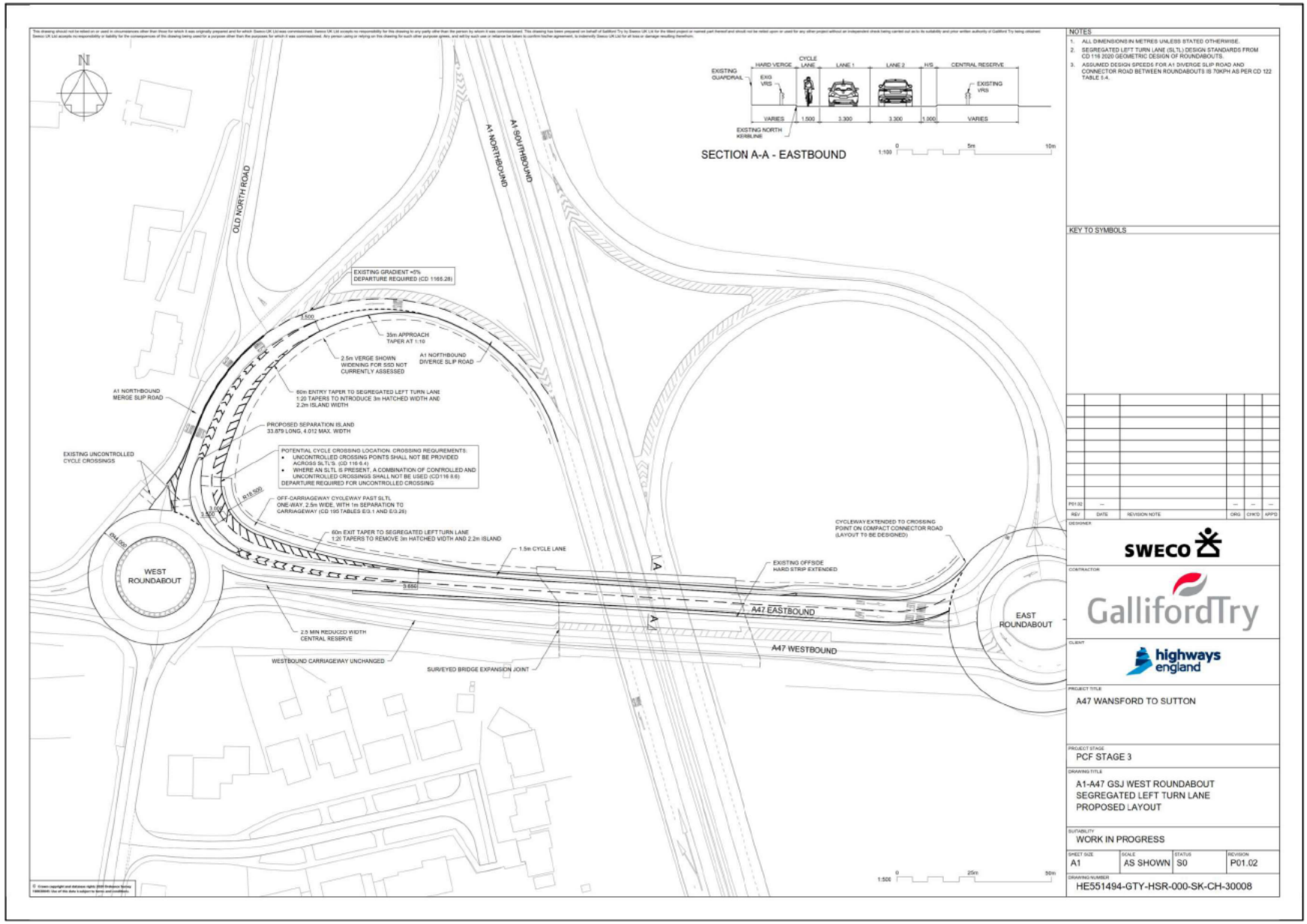
Others are affected by operational maintenance requirements that may result in closures of the slip roads or carriageway.

The risk assessment identified all of the hazards for the proposed layout to be low risk and are therefore considered to be “Broadly Acceptable” in accordance with the Health and Safety Executives Tolerance of Risk model.

The safety objectives for the activity are deemed to be achievable by the removal of the medium level risk and the cumulative risk values for all hazards being no worse than the existing situation.

Appendices

Appendix A. Design Fix B Layout



Appendix B. 2014 – 2018 Collision Plot