

IMMINGHAM EASTERN RO-RO TERMINAL DCO APPLICATION

PINS REFERENCE TR030007

COMMENTS ON DEADLINE 6 SUBMISSIONS BY DFDS

Introduction

This document consists of comments on various documents submitted at Deadline 6 (13 November 2023) for the above application. The documents commented upon are:

- a. The revised draft DCO [[REP6-003](#)]
- b. Applicant's Response to DFDS D5 submissions [[REP6-029](#)]
- c. Applicant's Comments on DFDS NRA [[REP6-030](#)]
- d. Applicant's Additional Simulations Report (7-8 November 2023) [[REP6-035](#)]
- e. Applicant's DTA Transport Policy Mitigation Requirements [[REP6-034](#)]

The revised draft DCO [[REP6-003](#)]

1. A revised draft Development Consent Order was submitted by the Applicant at Deadline 6 [[REP6-003](#)]. Further to the discussions at ISH5 and ISH6 regarding the dDCO and the ExA's comments on the dDCO [[PD-019](#)], DFDS will not provide comments on the Applicant's version submitted at Deadline 6 [[REP6-003](#)] but instead comment on the ExA's comments on the dDCO [[PD-019](#)], and provide any further commentary when the Applicant submits its final version at Deadline 8.

Applicant's Response to DFDS D5 submissions [[REP6-029](#)]

2. Paragraph 3.2 - the Applicant notes that DFDS attended the simulations held at HR Wallingford in November 2023 and the Applicant suggests that this indicates that it engaged with stakeholders in a proper manner and met the obligation imposed by the ExA in ISH3 Action Point 17. DFDS refute this suggestion. Its concerns with the engagement and the additional simulations is set out in the written summary of oral representations at ISH5.
3. DFDS notes that, for its part, as it has done throughout the IERRT application process, it made considerable efforts to attend and engage with the Applicant at the November simulations, which included flying in Mr Jesper Nielsen from Denmark and required him to alter various pre-existing engagements. However, the Applicant's response entirely misses, or seeks to deflect, the point being made by DFDS. At hearing ISH3 on 27/28 September, the Applicant was tasked by the ExA with engaging with DFDS and other relevant interested parties to agree what additional navigational simulations were needed to try to address the various navigational safety concerns raised by those interested parties. In the event, the Applicant only sought to engage on this issue on Friday 20

October, the working day before Deadline 5 submissions were due and over three weeks after the action was issued to them. This left insufficient time for DFDS and other interested parties to discuss and agree mutually acceptable parameters for the new navigational simulations with the Applicant. As a result, although DFDS made the considerable effort to attend those simulations and to propose scenarios and conditions which should be included, many of the parameters proposed as being necessary by DFDS were rejected by the Applicant, resulting once again in a series of inadequate simulations.

4. Paragraph 3.8- the Applicant implies that there is no need for mitigation works at the junctions identified by DFDS in [REP5-042](#), with reference made to the document 'DTA Document 23325-36' [\[REP6-034\]](#). DFDS' response to the Applicant's position on the policy is contained within our response to [REP6-034](#) provided in paragraph 44 onwards in this document. DFDS position on the need for mitigation at five junctions is as presented in paragraphs 82-92 of [REP6-038](#). As an action from ISH5 (Action Point 22), DFDS has agreed to provide details of the proposed mitigation measures at the identified junctions where concerns have been raised regarding the capacity. DFDS have provided this information at their cost, for consideration by the Applicant (Action Point 29), noting that it is the responsibility of the Applicant to provide this information.
5. Paragraphs 3.9 and 4.20 -. DFDS have reviewed the updated technical note 2 [\[REP5-028\]](#) and note further errors which have been raised with the Applicant's Transport Consultant, DTA. However, the outstanding errors are expected to have a non-material influence in terms of the junction capacity assessments. None the less, these errors should be corrected as part of any further sensitivity assessment and updates to the Transport Assessment. DFDS maintain the position that the Transport Assessment [\[AS-008\]](#) needs to be revised fully to reflect the outcomes of [REP5-028](#) and the remaining sensitivity assessments to provide a clear summary of the Proposed Development's influence on onshore traffic. DFDS do not believe an addendum to the Transport Assessment is appropriate as key information within the Transport Assessment [\[AS-008\]](#) is incorrect, providing a high potential for inconsistencies throughout the Application documents, and future errors in data reference for those referencing the works after the Examination. DFDS await the Applicant's response to ISH5 Action Point 27 [\[EV10-016\]](#) which relates to this concern. To elaborate on this position, DFDS have also provided comments to Action Point 27 from ISH5 [\[EV10-016\]](#) in our cover letter.
6. Paragraphs 4.7-4.9 - DFDS note that notwithstanding the response by the Applicant that tidal flow direction data is all very difficult and hard to pin down, presumably to explain why it has consistently contested and ignored the position asserted by DFDS, the Harbour Master Humber has now formally accepted at the ISH5 hearing that the tidal flow direction north of IOT is indeed as DFDS has stated and maintained throughout this process.
7. Paragraph 4.13 - DFDS stands by its position that IOH and IERRT are not similar in the way suggested by the Applicant. DFDS has already submitted a note explaining why they are not similar but leaving aside a number of the differentiating factors set out in DFDS note at its most basic, IOH is not positioned immediately adjacent to, and does not require navigation of RoRo vessels behind the berths for, one of the UK's largest oil jetties.
8. Paragraph 4.14 - the Applicant's response seeks to avoid answering the point which DFDS was making. If the Applicant has tested the design limits of IERRT then, contrary to its assertion that it is not possible to prescribe limits for use of IERRT as a result of the simulations undertaken, DFDS

believes it should absolutely be possible for the Applicant, in conjunction with the HMH, to say what limits it has established such as, the vessel size, type and manoeuvring capabilities it is comfortable it can consistently and safely berth, in what maximum tidal and wind conditions and what additional assistance from tugs is needed. DFDS assume that reaching a clear view on these factors will be key to informing any operational restrictions which the Applicant / HMH may seek to place on operations at IERRT in order to try to ensure the safety of vessel movements.

9. Paragraph 4.16 - DFDS agree with the Applicant that the Designated Person should be an independent role. However, in respect of the Applicant this is not the case. As far as DFDS is aware, not least based on evidence provided by the Applicant during this process, the Designated Person for the Applicant has always been an employee of the Applicant (unlike many other non-ABP SHAs in the UK) and is currently Capt. McCartain, who is not only an employee of the Applicant but also a member of the Applicant's board and the Applicant director with overall responsibility for marine matters across the whole of the Applicant's UK business. It is hard to see how in any circumstances this could be stated to be an "independent role" when it comes to the Applicant.
10. Paragraph 4.17 - the Applicant's note "The Port of Immingham and River Humber - Management, Control and Regulation" [\[REP1-014\]](#) sets out the various statutory roles and duties which over time have all become vested in the Applicant on the Humber. DFDS has not disputed that these various roles and duties exist and are meant to be exercised independently of one another. What DFDS does dispute is that the Applicant has an adequate governance and management reporting structure to ensure that these roles and duties are, or indeed could with any degree of confidence ever be, exercised entirely independently in practical terms. The governance and management reporting structure of the Applicant present clear conflicts of interest for a number of the key individuals concerned.
11. Paragraph 4.18 - DFDS does not accept the position taken by the Applicant that the Designated Person can only act impartially if it does not attend any workshops during a project. It is perfectly possible for the Designated Person to attend as an observer at any workshops, especially those involving all interested parties, in order to understand the issues at stake and different stakeholders perspectives and concerns, without this impacting its impartiality. DFDS questions how the Designated Person can take properly informed positions or appropriately advise the Duty Holder if it is not provided with all, or indeed possibly any, relevant data to do so.
12. Paragraph 4.22- DFDS have made previous representations in regards to the effectiveness of the other methods identified, such as GPS and driver instructions. For clarity, DFDS' position remains that, as signage external to the Port is not secured through the DCO, the benefits of such should not be included within the Transport Assessment [\[AS-008\]](#). The Applicant should ensure that both National Highways and the Local Highway Authorities understand and are content with this approach in the context of achieving the assignment assumptions in the Transport Assessment. DFDS note that National Highways pre-application response dated 5th September 2022 [Annex B of [AS-008](#)] appears to suggest that they are expecting a signage scheme to be delivered.
13. Similarly, the other processes the Applicant refers to in paragraph 4.22, such as GPS and Gate booking systems needs to be justified and presented within the Transport Assessment [\[AS-008\]](#). This needs to include a description of how many vehicles this will apply to, the level of effectiveness anticipated and mitigations to operational concerns such as how the driver will be notified. As stated during ISH3 [\[REP4-024\]](#), DFDS' position is that there is limited differential between the East and

West Gate, coupled with the propensity of drivers actually utilising GPS, which limits the effectiveness of GPS identifying the East Gate as the preferred route. In addition, the Gate information which the Applicant has identified will be passed onto the haulier through the booking system and then would need to be cascaded down to the driver by the agent to be effective. In many cases, this does not occur with the driver selecting their routes. The Applicant would also need to address what the mitigation measures will be when the booking system is not adhered to, will the trucks be turned around, directed to another gate, told to park off site etc. If these mitigation measures are not deployed then there will be no consequence for the driver using their preferred route, and therefore degrading the effectiveness of these systems. The implications of these mitigation measures then need to be considered within the Transport Assessment, particularly for those that generate double movements (i.e. being turned around at gates). How this impacts movements at the gatehouse, utilisation of the road network and impacts on offsite facilities also needs to be addressed. This type of subtle wayfinding will be at odds with the current driver behaviours, particularly for those using the Killingholme facilities currently, which will influence the success rate which has not been reviewed or justified by the Applicant. All of these elements introduce a high level of uncertainty regarding gate assignment, which must be incorporated into a range of inputs into the proposed sensitivity analysis. DFDS have raised concerns regarding the route choice and methods of control since being notified of the Proposed Development, in particular in its response to statutory consultation in February 2022 [[REP2-048](#)], [REP1-032](#), and paragraph 161 of DFDS' Written Representation [[REP2-040](#)] and DFDS maintain this view as no new further evidence has been provided by the Applicant since. DFDS await the Applicant's response to Action Point 25 [[EV10-016](#)] (whether it will produce a freight management plan), as the Applicant has yet to provide evidence of the actual process by which driver notification will be undertaken.

14. Paragraph 5.1- during ISH5, the Applicant agreed to consider the insertion of a limit of 1,800 units per day, rather than the cap of 660,000 units per year currently included in Article 21 of the dDCO. This amendment to the dDCO would respond to DFDS' concern on the alignment of daily throughput limits in the DCO and the assumptions made within the Transport Assessment. DFDS note that the ExA has included this proposed change from an annual to a daily cap in Article 21 in the ExA's schedule of proposed changes to the dDCO [PD-019] and DFDS support this change.
15. Paragraph 6.1 - DFDS remain concerned that the Proposed Development poses a safety risk and adverse implications for other commercial operations at Port of Immingham. As discussed within this submission, DFDS have identified five junctions that are over an RFC of 0.85 that have not been properly assessed nor the impacts been mitigated. As part of response to Action Points 28 and 29 of ISH5 DFDS have provided their view on required amendments and mitigations at these junctions. Without these mitigations, there will likely be a negative influence on other users of the road network and port. In addition, as per DFDS [REP6-038](#) response on yard capacity and results of the recently updated yard capacity assessment presented within the ISH5 Action Point 22 response, DFDS is concerned that the yard maximum and operating capacity will be exceeded by the demand, which left unmitigated can lead to congestion on the port and external road network, as well as over utilisation of nearby freight assets such as truck stops. Again, this would have a negative influence on other uses of the road network and port. As the Applicant is yet to provide evidence of assessment of these issues, and mitigations to prevent these issues from arising, it is DFDS position that the IERRT project poses safety risk and adverse implications for other commercial operations.

16. Paragraph 6.10 - DFDS have reviewed the information provided by the Applicant on 7 November 2023 and DFDS confirmed by email dated 22 November 2023 the suitability of the committed development flows and origin destination matrices.
17. Paragraph 6.11 – DFDS’ position on strategic road network signage is covered in our response to Paragraph 4.22 (paragraph 12) above and it remains DFDS’ view that wayfinding should not be considered as part of the revision to the Transport Assessment [[AS-008](#)] unless further evidence is provided regarding its effectiveness as part of response to Action Point 25 [[EV10-016](#)].
18. Paragraph 7.1- DFDS has always maintained the position that all variables have an impact on the overall Transport Assessment when considered in combination with other parameters. DFDS’ position on the accompanied versus unaccompanied ratio is further discussed in [REP6-038](#) paragraph 116.
19. Paragraph 8.3 - As noted in its response at 4.13, DFDS has identified at least one more key difference between IOH and IERRT, namely the very close proximity of the proposed IERRT facility to the IOT. It is this difference which represents the most significant concern with the IERRT proposal. This concern is then amplified by the myriad failures in process by the Applicant during the IERRT application which have been identified by DFDS and other interested parties and which mean that the Applicant has consistently failed to demonstrate that the IERRT can be constructed and operated in its proposed location adjacent to the IOT without posing material risks to the IOT and the Eastern Jetty and consequently to existing operations at the Port of Immingham. If IERRT was being proposed elsewhere in the Port of Immingham and did not provide an ever present risk of RoRo vessels alliding with either the IOT jetty and pipelines or tankers and/or barges berthed at the IOT and/or vessels berthed at the Eastern Jetty, then some of the navigational safety concerns held by DFDS and IOT Operators might be of lesser consequence. However, that is not the case as the IERRT location as proposed is in a critical space which poses fundamental risks to the continued safety of the IOT facility and therefore to the Port of Immingham and the surrounding area as a whole.
20. Paragraph 9.10 - the Applicant covers their representation under ISH3 item 3f and raises the term “*cost effectiveness of controls*”. DFDS assume by this the Applicant means the Cost Benefit Analysis (CBA) which was referenced throughout the ISHs and within the Applicant NRA, yet no CBA has been produced for review. Furthermore, during ISH5, DFDS understands Mr Ben Hodgkin said that the Impact Protection Measures (IPM) had not been assessed in the CBA; however, within the Applicant’s NRA [[APP-089](#)] paragraph 9.9.24, it is plainly stated that impact protection was assessed in the CBA and subsequently dismissed. This further confuses matters. There is very little consistency and even less information made available with respect to the CBA what is said to have been undertaken, as set out in DFDS’ written summary of oral representations at ISH5.
21. Paragraph 10.5 - the Applicant’s attempt to justify its failure to include the presence of the tug barge on the Eastern Jetty during vessel simulations is simply not credible. This was a clear omission and oversight by the Applicant, simply one example of the many inadequacies of its navigational simulations, and should be accepted as such by the Applicant.
22. Paragraph 11.3 - the Applicant comments on their tolerability definition: “...*HASB was presented with the same risk matrices and associated descriptors of consequence and likelihood that were used in HAZID workshop 3. They were then asked to determine what outcomes were acceptable*”

to them in managing the risk– this was then modelled onto the risk matrices the HASB then being able to review and confirm the placement of the threshold of tolerance.” DFDS addressed this point within ISH5 and the Applicant’s tolerability is understood to be determined by the HASB, but due to the lack of definition for likelihoods the HASB could easily have entirely different perspective of what the likelihood values mean which could easily lead to the underestimation of risk from the stakeholders and the overestimation of tolerability from the HASB. In general, there is a lack of confidence that the correct assessment of risk has been made in the first place amongst stakeholders, or by the HASB when confirming tolerability.

23. Paragraph 11.4 - the Applicant further states that “...*it is best practice not to allow risk tolerance to influence the stance on risk outcomes when considering them in workshops.*” However, DFDS maintain that the understanding of tolerance by the stakeholders is vital so that stakeholders’ feedback can be gathered and further considered as part of the stakeholder engagement process so as to inform subsequent decision on the tolerability of risk. This allows stakeholders to be informed about risk, together with its relationship to tolerability, and also allows feedback and communication at an early stage to the risk assessors and the SHA.
24. Paragraphs 11.5 to 11.9 - the Applicant has drawn a comparison between the likelihood definitions used in Solent Gateway NRA [p.140-252 of [REP4-024](#)] and the DFDS shadow NRA [[REP2-043](#)]. DFDS consider the Applicant’s own criticisms can be equally applied to the comparison between the IERRT NRA and the IGET NRA. For example, the Applicant’s IERRT likelihood definitions are based around the “lifetime of the entity” which is listed in the Applicant’s NRA to be from a design life of 50 years (although the actual duration of the “lifetime” is unspecified given the intention to operate the facility for longer). The Applicant’s tolerability definitions are also understood to be determined by the HASB using the same likelihood and consequence descriptors used in the IERRT HAZID workshop 3 [[REP6-029](#) point 11.3] – that is on the basis of the lifetime of the project of circa 50 years. However, DFDS note that the IGET NRA has now added the 1 in 1 year to 1 in 1000 year probabilistic definitions to the same likelihood definitions table used in the IERRT NRA, although the same tolerability has been applied on both IERRT and IGET. If the Applicant has genuine concerns over the application of tolerability due to variances in likelihood definitions then these do not appear to have been raised during the preparation of the IGET NRA, and are not supported by their own statement in their comments on the DFDS shadow NRA [[REP6-030](#) point 5.6.3]: “*a direct comparison cannot be made between the two likelihood/frequency scales, due to the use of alternative methodology*”.
25. DFDS would refer the ExA to the previous comments made in DFDS’s Deadline 4 responses to Deadline 3 submissions [point 22 of [REP4-024](#)] and the NRA Differences summary note [Appendix 1 of [REP4-025](#)] for the reasoning underpinning the premise of the Solent Gateway NRA. This NRA used an assessment methodology that was agreed with ABP Southampton and used likelihood definitions provided by ABP Southampton to align with the port’s own baseline risk assessment (taken from MarNIS) – something DFDS note did not occur within the Applicant’s IERRT NRA. The Applicants simplistic comparison ignores this crucial point.
26. Furthermore, the Applicant’s criticisms on this point are on the basis of frequency definition – that is how frequently a hazard could occur; however, its own highly subjective likelihood definitions do not actually give any indication on how frequently the incident is expected to occur (once every year, every 2 years, every 5 years, etc).

27. Paragraph 11.13 - the Applicant states they are "...uncertain as to why DFDS have included the HSE decision making process titled 'Reducing risk, protecting people' (known as R2P2) at Appendix 4 of their submission regarding Navigational Risk [REP4-024]". The explanation of why is in point 20 of the same document reference [REP4-024]. There are no defined industry standards for acceptability or tolerability for human life to be applied to NRAs and the most appropriate benchmarking for risk to human life is best referenced against appropriate industry standards and guidance from the HSE. This forms the appropriate, justifiable and reasoned basis for defining an "appropriate standard of acceptability" (as stated within the PMSC). DFDS have previously identified and questioned what the reasoning behind the Applicant's definition of acceptability (i.e. tolerability) is and what appropriate standards of acceptability this relates back to. DFDS are unclear how appropriate standards of acceptability can allow a scenario in which two hazards with a likelihood of "unlikely", where one has a consequence to people of "a single fatality" and the other "multiple fatalities", would both would be equally tolerable. From a risk perspective, there is a considerable difference between a single fatality and multiple fatalities, and this distinction is significantly enhanced when considering members of the open public (who are affected bystanders in the hazardous scenario), instead of, or as well as, employed workers engaged in operations for which they are trained and risk-aware
28. This is further compounded by the Applicant's NRA's complete lack of reference to the potential for up to 100 passengers to be onboard all Ro-Pax vessels. Evidently, the Applicant has seemingly failed to risk assess a Ro-Pax vessel carrying up to 100 passengers and have only concentrated on RoRo vessels (that is, without passengers and carrying a maximum of 12 drivers only). Such assessments are fundamentally different due to the nature of operations and the challenges carrying people represent.
29. Paragraph 12.3 - the Applicant states the berthing criteria additional risk control would be done by the SHA when implementing the findings of the risk assessment into the MSMS. However, in this situation, there are already various other tidally restricted operations in an existing highly utilised navigational space (which has the potential, and indeed the Applicant's intention, to have even higher future utilisation). Whilst applying tidally restrictive berthing criteria for the IERRT vessel would reduce the specific risk assessed for the IERRT development, this could lead to an additionally constricted operational tidal window in which more vessels are then required to complete their movements. This could ultimately result in congestion and delays which will impact other waterway users and stakeholders, including DFDS, and potentially affect the operational capacity of the IERRT terminal itself. Because of this, any intention to introduce berthing criteria needs to be properly assessed at an early stage (to ensure no undue adverse effects would result) and this assessment cannot be made without an indication on what the berthing criteria may look like.
30. Paragraph 12.4 The Applicant notes that "*a further commercial workshop would have little merit given that the Applicant, as SHA, is confident that the additional vessel manoeuvres created by IERRT can be accommodated...*". DFDS would point out the Applicant's reference to a "further commercial workshop" is wholly misleading as it suggests that at least one commercial workshop was held. As DFDS has previously noted, a commercial workshop to discuss and examine possible impacts of IERRT on existing vessel movements and port operations was promised by the Applicant but was never held despite several requests by DFDS to do so. Furthermore, irrespective of the Applicant's own view that it need not engage with, or provide any comfort to, existing port users (including one of its largest customers in DFDS), it cannot be correct that such a request should

simply be ignored (despite the Applicant having agreed to it) nor that such a workshop would not have had merit in exploring concerns and views of parties other than the Applicant. This is sadly just an example of the Applicant's approach to the IERRT application as a whole and its lack of interest in genuine engagement with, or challenge by, interested parties which also have a material stake in the safe and efficient operation of the Port of Immingham.

Applicant's Comments on DFDS NRA [REP6-030]

31. Paragraph 4.4.9 - the Applicant perceives the DFDS shadow NRA to be “*seeking to impose its own expressed judgments*”. Despite the Applicant’s perception, DFDS are not imposing their own tolerability standards onto the Applicant or the SHA and the DFDS shadow NRA does not seek to do this. Its intention is not to replace the Applicant’s NRA, but rather to assess the risk appropriately and identify where there are failings of the Applicant’s NRA that have led to what DFDS believe is the Applicant’s incorrect judgement of risk acceptance. Ultimately, DFDS continue to have serious and legitimate safety concerns over the operation of the Proposed Development as well as the adequacy of the Applicant’s NRA to appropriately assess the significance of the risk – this extends across the NRA process undertaken, the determination of risk from the NRA, and the appropriateness of the tolerability to which the risk is assessed. For these reasons the DFDS shadow NRA was undertaken using a robust risk assessment methodology that has previously been applied to the successful risk assessment on other ABP schemes. This happens to also be consistent with robust, objective NRA practices being underpinned by appropriate and valid standards of acceptability for tolerability benchmarking (such as HSE as explained previously).
32. DFDS recognise the SHA have the responsibility to establish their tolerability towards risk; however, the concerns DFDS continue to have which relate to;
- a. the determination of tolerability by HASB (due to the subjective nature of the likelihood definitions);
 - b. whether the HASB had perceived risk and tolerability in the same way as stakeholders;
 - c. if the SHA’s tolerability definitions are benchmarked against any external appropriate standards of acceptability (such as how single and multiple fatalities can be equally tolerable at one likelihood); and
 - d. the determination of what are appropriate risk controls, including how the cost benefit analysis was undertaken and upon what basis the decisions on risk controls were made.
33. DFDS contend that their concerns relating to risk assessment and its relationship to tolerability could have been discussed and likely resolved if informed stakeholder consultation was undertaken (to include tolerability definitions). The Applicant’s misconceptions that stakeholders would intend on what the Applicant refers to as “*gaming the risk assessment*” [point 11.4 of [REP6-029](#)] on matters of legitimate safety concern are not supportive of the openness and collaborative process to facilitate professional feedback that is required of a qualitative risk assessment.
34. Paragraph 5.1.2 - the Applicant refers to the DFDS shadow NRA containing material in much of the document that “*is not material which either advances the position or undermines the Applicant’s NRA*”. DFDS reject this cursory dismissal of the far more insightful assessment of data and information which provides greater understanding of the possible constraints and navigational risks, such as identifying the potential for congestion-related issues which should be assessed, and significantly, the fact that IERRT vessels may contain 100 passengers on board which was omitted from the Applicant’s NRA.

35. Throughout Section 5.2, the Applicant criticises the DFDS shadow NRA for not undertaking stakeholder engagement. DFDS has already addressed this in earlier submissions and would refer the ExA to the NRA Differences summary note [Appendix 1 of [REP4-025](#), section 10] which covers this aspect. DFDS have also explained above that the purpose of the DFDS shadow NRA was not to replace the Applicant's NRA and undertaking an extensive stakeholder engagement, within the constrained timetable of this examination, would be disproportionate for a stakeholder that is not, itself, promoting the development. The DFDS shadow NRA used highly experienced individuals with local operational knowledge to assess risk in an objective and robust way. Strangely, the Applicant completely dismisses this and states that "...the frequency and consequence of risks along with potential control measures, does not take into consideration the expertise of those personnel that are most familiar with and currently or will operate within the Port of Immingham"; however, this is precisely what DFDS do on a daily basis – navigating large Ro-Ro vessels, within the Port of Immingham.
36. In Section 5.3, the Applicant believes the DFDS risk scoring approach is "...oversimplistic and does not take into consideration the fact that risks can not only affect more than one receptor" which is entirely incorrect. This has also been previously explained in the NRA Differences summary note [Appendix 1 of [REP4-025](#), section 10].
37. Paragraph 5.3.2 - the Applicant again questions the use of the risk scoring as adopted in the DFDS shadow NRA and expresses the incorrect perception that it "prevents a risk that scores highly for one receptor from being hidden by lower risk outcomes for other receptors by reducing the average." This has already been addressed in previous DFDS submissions at Deadline 5 [point 6 of REP5-042] and DFDS reaffirm that this as a misconception of the Applicant. The scoring system assesses all risks and high risks automatically increase the score which are then more closely considered to determine additional risk controls and a status of ALARP. The scoring system allows hazards to be ranked, but the risk to each receptor is assessed and this is shown in the hazard logs at Appendix A and B of the DFDS shadow NRA [[REP2-043](#)].
38. Throughout Section 5.4, the Applicant again questions tolerability and its misjudged perception that DFDS are attempting to impose their own standards of acceptability for the Harbour Authority. DFDS would refer to the responses provided above at paragraph 22.
39. In paragraphs 5.5.1 and 5.5.2, the Applicant compares the number risk controls identified between the DFDS shadow NRA and the Applicant's NRA. The Applicant incorrectly states that the DFDS shadow NRA had identified risk controls "to help manage navigational risk during the construction and operational phases of the IERRT Project"; however, it is made explicitly clear in the DFDS shadow NRA that the risk assessment was carried out only for the operational phase of the project and not the construction or construction + operational phases. Furthermore, the Applicant simply compares the number of controls identified, being 6 controls in the DFDS shadow NRA and 29 additional controls in the Applicants NRA, but fails to recognise the critically important factors:
- a. The 29 additional risk controls cover the construction phase as well, which the DFDS shadow NRA did not cover. The Applicant lists 13 of these as operational phase controls.
 - b. Of those operational phase risk controls, there are various controls that are duplicated or should have instead been considered as embedded risk controls, as explained further in NRA Differences summary note [Appendix 1 of [REP4-025](#)].

- c. It is not simply a larger number of risk controls that makes for a better, or more complete, NRA. The Applicant's risk controls are still not clearly defined and DFDS raised this concern in ISH3, explaining that the lack of definition of clarity in the Applicant's risk controls provides no confidence that the risk would be adequately reduced.
 - d. The six risk controls identified by the DFDS risk assessment team are appropriately grouped and clearly defined. Importantly, the hard risk controls to protect the IOT infrastructure was deemed essential, which DFDS notes was also the findings of the IOT's shadow NRA.
40. Despite the above, the Applicant contends that the DFDS shadow NRA has "*over-inflated the assessment of residual risk*". DFDS fundamentally disagree with this statement and maintain that the DFDS shadow NRA was undertaken using a robust, structured and transparent process which correctly determined risk. The Applicant continues to refute the seriousness of the consequences despite the continued expression of concern from stakeholders. The key concerns remain, as they always have been:
- a. The catastrophic and unacceptable consequences to all receptors through fatalities, pollution, damage and port closures that could result from a significant allision with the IOT Trunkway, IOT finger pier or the Eastern Jetty tanker and the credible potential for this to occur from day 1.
 - b. The close proximity to high-risk infrastructure. That is, the IOT which handles dangerous, flammable and volatile petroleum products, and the Eastern Jetty which handles hazardous chemical products.
 - c. Specifically in relation to the IOT Trunkway, the extended national significance of a full closure of the IOT and the resulting impacts to its onshore refineries.
 - d. The substantially increased risk due to 100 passengers being onboard the IERRT Ro-Pax vessels and the fatality and health risk this presents when combined with flammable products or hazardous chemical products.
 - e. The extremely low margin for error and minimal time for recovery in the event of a failure for the IERRT Ro-Pax vessels when manoeuvring near the IOT finger pier (to and from Berth 1), or near the Eastern Jetty tankers (to and from Berths 2 and 3), as well as the eastern jetty tug barge and berthed tugs there.
 - f. The existing and well-publicised challenging navigational environment due to the very high current flow rates and potential for high winds, both acting in the direction of either the IOT infrastructure or the Eastern Jetty.
 - g. Importantly, these influences are not mutually exclusive and all combine to significantly increase the risk. There is also the very credible potential for the occurrence of multiple hazards from the one incident – for example, mechanical failure of IERRT Ro-pax vessel in a strong ebb tide causing a contact with a moored tanker at the IOT Finger Pier causing a breakaway, causing the IOT tanker to contact the IOT trunkway, causing rupture of

pipelines. In this scenario, the IERRT Ro-Pax vessels would also have continued to impact the IOT finger pier handling flammable substances while having up to 100 passengers on board.

41. In paragraphs 5.5.6, 5.5.7 and 5.5.8, the Applicant makes unjustified criticisms of the risk assessment outcomes. This does not warrant an extensive response, but for the benefit of clarity for the both the ExA and the Applicant, the brief reasoning for these are:

- a. 5.5.6 – The particular hazard is for an allision with either the IOT finger pier itself or a vessel moored there. As the relocation of the finger pier risk control was for berths 8 and 9 only (the inner/southern berths) (as explained in the DFDS shadow NRA [[REP2-043](#) section 8.6]) the finger pier could still be easily struck by the IERRT vessel, hence the risk frequency remains possible.
- b. 5.5.7 – The proximity of the IOT infrastructure, the predominate wind direction, the higher strength of the ebb tide, the magnitude of compounding consequences in the event of an allision (including high thrust wash effects causing mooring failures of smaller vessels at IERRT) and the potential for tugs to be placed in compromised position that puts themselves in danger (due to the closer proximity of the IOT) required greater mitigation.
- c. 5.5.8 – The relocation of the finger pier risk control was for berths 8 and 9 (as explained above) and vessels using these berths would not transit in such close proximity the IERRT vessel. This makes movements to and from IOT finger pier, relocated berths and the IERRT clearer and less obstructed and with more time to react if needed, such as in the event of an abort.

42. In point 6.1.6 and Table 1 of point 6.6.7, the Applicant summarises its perspective on the approaches and differences between their NRA and the DFDS shadow NRA. DFDS has already discussed these differences in previously submitted responses and hearings and does not consider it necessary or appropriate to repeat or elaborate extensively on every disagreement, but would refer the ExA primarily to DFDS's NRA Differences summary note [Appendix 1 of [REP4-025](#)]. Fundamentally, DFDS do not agree with any of the Applicants points or the biased portrayal of its own NRA and the DFDS shadow NRA.

43. The Applicant's responses continue to try and pick holes in what is a robust, structured and methodical approach used in the DFDS shadow NRA; however, these criticisms do nothing to support their own approach and only serve to continually highlight the failings of their own NRA that DFDS have already identified in its approach and methodology.

Applicant's Additional Simulations Report (7-8 November 2023) [REP6-035]

44. DFDS agreed to the Applicant's proposed approach that the current was offset to represent the direction the vessels from DFDS experience every day but this was done as adjustment and therefore was adjusted back once vessel was clear of the IOT. While this was the best that could be achieved in the limited time available to carry out the additional simulations, this time constraint is entirely of the Applicant's making, given its refusal to heed DFDS' comments as to the tidal data which it has been raising consistently, even before the application was submitted. As explained in the DFDS written summary of oral representations at ISH5, and in the note from Jonathan Bush appended to that summary, DFDS continues to have serious concerns as to the tidal data used in the most recent simulations which do not reflect the reality experienced by mariners.
45. DFDS were happy to see that the tug barge was included with tugs on side in the most recent simulations. DFDS note that despite the Applicant's claim that they were aware of the presence of the tug barge with tugs at previous simulations conducted in 2022, then at least on run 10 and 55 should have been classified as failures rather than successes as they would have resulted in a collision between the moored tugboat and the tug boat used by the vessel manoeuvring to/from the IERRT (see the Appendix 3 to DFDS' Summary Note of ISH5).
46. DFDS considers it vital that the Proposed Development can be operated safely both from the start of the operation and also in the future. For the reasons explained in the DFDS summary of oral representations at ISH5, simulating with only the Stena T is not sufficient as that vessel is not comparable to the proposed design vessel. It is very disappointing for DFDS that their and other stakeholders' requests to include simulations of a vessel closer to the design specification were rejected. DFDS have heard two arguments from the Applicant as to why a vessel to meet the design specification has not been simulated:
 - a. The Applicant claims they have already demonstrated with the Jingling vessel that the Proposed Development is safe, but DFDS disputes this for two reasons:
 - i. Firstly, the Jinling vessels are highly manoeuvrable compared to other vessels that are closer in size to the design vessel, and as already mentioned only about 70% of the displacement of the design vessel; and
 - ii. Secondly, DFDS have showed in their numerous representations examples where the Applicant misjudges the power usage of the vessel and is claiming the manoeuvre to be safe despite the bow thruster running full to starboard for 13 minutes. DFDS believe only around a 1/3 of the runs were successful which cannot be accepted to be safe. To date, still only one run has been conducted with a larger vessel to berth 3.
 - b. The design vessel does not exist. However, there are vessels available today that are comparable to the design specification such as the Delphine class operated by CLdN. Even if a vessel does not physically exist, DFDS is of the opinion that within a period of weeks, a model of the size and tonnage of the design vessel could have been developed and used in the simulator. These modifications needed to be made at the eleventh hour in the DCO examination, but could (and should) have been made at the start of the vessel simulation campaign and there has been ample time and opportunity to have achieved this.

c. DFDS appreciate that the specific design vessel is not built and in operation yet; however, given the number of experienced mariners and technical specialists involved then the two accessible options for preparing a model that would be sufficient for a risk and feasibility study of the Proposed Development design would be:

- i. Adapt an existing design vessel sized model such as the Delphine class vessel that DFDS has previously recommended using its hull shape, physical size and displacement, and make modifications to the propulsion as needed. DFDS consider this would be possible to involve experienced ship handling personnel to determine its manoeuvrability is as expected; or
- ii. Use an existing design vessel sized model such as the Delphine class vessel that already exists, and without modification could be deemed representative of other future large vessels that could use the facilities (such as if they were chartered vessels).

47. In regard to the vessel used in simulations, as DFDS had explained in its correspondence with the Applicant immediately before these simulations and at ISH 5, there are more considerations than just physical size that need to be accounted for when determining the appropriate design vessel for use in simulations and DFDS does not support the use of the smaller Stena T class vessel over the maximum sized design vessel. A larger vessel will have more area above the water (higher windage area) and therefore larger wind drag force; deeper draft and therefore large current drag force; smaller under keel clearance (UKC) which can adversely affect manoeuvrability characteristics; and wider beam which will reduce the available sea room for other vessels. Furthermore, as explained by IOT, using ISH 5, the significantly larger displacement of the design vessel presents additional challenges of larger mass, high inertia and typically slower response to manoeuvring commands without substantial power and thrust (which presents other risks to vessels already berthed at other terminals, including the IOT finger pier, and the vessel's own assisting tugs). The use of a smaller vessel only now serves to increase the number of assumptions that must be made when considering how a larger vessel will be able to handle the same limiting conditions.

Applicant's DTA Transport Policy Mitigation Requirements [REP6-034]

48. In paragraph 1.2, the Applicant indicates that DFDS' comments regarding the assumptions made in the Transport Assessment [AS-008] should have been identified by DFDS during its Written Representation [REP2-040], rather than during ISH3 [REP4-025].
49. DFDS identified errors within the Transport Assessment [AS-008] in its Written Representation [REP2-040]. This was thought to result from variations in traffic counts from the baseline survey, however as further investigations unfolded, it was found to be an error with the PCU conversion factor. This level of detail is not typically investigated by Interested Parties, noting that no less than five parties, NH, NELC, NLC, CLdN and DFDS, and their respective consultants had reviewed the highway capacity modelling within the Transport Assessment [AS-008] to varying levels of detail. At this stage of a DCO application (or any planning application for that matter) it is expected that the assessments prepared by the Applicant's transport consultant should be error free and quality assured via internal checking processes prior to being submitted as part of the Application. The assessment should be fit for purpose in terms of providing a reliable basis upon which informed decisions regarding the need for mitigation or contributions can be considered in consultation with Local Highway Authorities. This was found not to be the case. It does not behove the Applicant to criticise DFDS for failing expeditiously to identify an error that should never have been present in the Applicant's Transport Assessment. It is unfortunate that DFDS has had to expend resources on transport consultants to identify such basis errors in the Applicant's assessment.
50. The issues identified by DFDS, which the Applicant refers to in paragraph 1.2 of REP6-034, are not in respect of assumptions made rather the incorrect application of defined input variables during the calculation process. It is DFDS' view that the underlying calculations of the Transport Assessment should be correct prior to the submission of the Application, and that it is not the responsibility of Interested Parties to quality assure the underlying calculations done by the Applicants consultants. The role of Interested Parties is to review and comment on the level of impact the Proposed Development may have in the context of the future operation of the network, and its implications for DFDS operations or other concerns.
51. The PCU error is attributable to the lack of clarity in the way traffic flow data was presented throughout the Transport Assessment [AS-008] both for existing volumes and committed development, using a series of junction matrices in Annex J which claimed to be PCU values. Confusingly, the traffic surveys included in Annex J were unrelated to the link flows presented within Table 1 (ATC results) and Table 2 (Two-way TRADS data) of the Transport Assessment which used different data sources as indicated. The lack of transparency created by this approach could have been avoided using consistent traffic flow data throughout the Assessment and provision of traffic flow diagrams for absolute volumes and PCUs, a point raised by DFDS during the first Transport Consultants Working Group meeting held 15 September 2023 (which commenced post ISH2).
52. Owing to this lack of clarity, the PCU error came to light during GHD's work to unpick these matrices and further validate the 2021 traffic survey data. Our view, discussed within DFDS' Written Representation [REP2-040] was that the available capacity on the highway network was being materially overstated in the highway capacity assessments published within the Transport Assessment [AS-008]. This has proved to be the case.

53. The PCU error was first identified by GHD in the week commencing 11 September 2023. Whilst this was after submissions of Written Representations at Deadline 2 (5 September 2023), it was then immediately checked and flagged to the Applicant's transport consultants, DTA at the Transport Consultants Working Group meeting held 15 September. During this meeting DFDS requested clarification on whether the volumes in the OD matrices [Appendix J of [AS-008](#)] and Junction Modelling have been assessed as PCU or Total Vehicles. A response from the Applicant's transport consultant in the form of a draft updated Technical Note 2 [[REP5-028](#)] which included revised modelling at all junctions, was received on the 26 September 2023, the day before ISH3. A revised version of this Technical Note was submitted to the Examination by the Applicant at Deadline 5 [[REP5-028](#)] (23 October 2023), which was not widely shared with other interested parties who were not part of the Transport Working Group. This includes National Highways, North Lincolnshire Council and North East Lincolnshire Council as evidenced by the summary of consultations presented within their respective Statement of Common Grounds [[REP5-009](#), [REP5-010](#) and [REP6-019](#)].
54. Paragraph 1.3 presents a summary of the corrected modelling result and notes that 'there are some junctions operating closer to capacity than originally forecast in 2032.' This is factually incorrect. The corrected modelling results show all junctions operating closer to capacity in all scenarios tested, and in several cases results in junctions operating in excess of their practical capacity, as indicated where an RFC of 0.85 is exceeded. This is in itself a material change from the forecasts presented in the Transport Assessment [[AS-008](#)] and has led to:
- a. the Transport Assessment [[AS-008](#)] and Chapter 17 of the ES (Traffic and Transport) [[APP-053](#)] being unable to appropriately identify and consider impacts upon sensitive parts of the highway network, particularly in terms of the impact upon driver delay; and
 - b. National Highways, North Lincolnshire Council, and North East Lincolnshire Council being consulted on modelling which materially overstated the available capacity of the future highway network.
55. The materiality of the PCU error has led to a position where the Applicant has spent significant amounts of time correcting errors in the Transport Assessment methodology and then defending the conclusions of the Transport Assessment [[AS-008](#)] even in instances where the updated modelling clearly shows the sensitivity of the network with several junctions operating in excess of an RFC of 0.85. The position of defending the incorrect Transport Assessment has inhibited the progression of productive discussions with IP's and highway authorities regarding what could be done to mitigate the impact of the Proposed Development and improve the operation of the highway network to satisfactory levels for the benefit of all, including the Applicant's own operations. These types of open and transparent discussions would routinely be expected as part of any planning application dealing with sensitive road networks.
56. A helpful reminder of the relevance of an RFC of 0.85 is found on Page 109 of the Junctions 10 User Guide, which is the software used for the modelling assessment:

'RFC: Ratio of flow to capacity. The RFC provides a basis for judging the acceptability of junction designs and typically an RFC of less than 0.85 is considered to indicate satisfactory performance. This depends however on the context of the study and so the user's own judgement is also required.'

And

'For Priority Intersections, a 'satisfactory' RFC depends on the speeds encountered at the junction. The capacity formulae used in PICADY were mainly developed from studies at UK major/ minor junctions on public roads. Most of these junctions had major roads with speed limits of 50 mph or less. At high-speed major roads, a lower RFC (e.g. 0.75) is recommended instead. Please see your relevant design guidelines, such as UK TA 23/81.'

See extract of *Junctions 10 User Guide* at **Appendix 1** of this document.

57. The reference to UK TA 23/81 is a traffic advice note. Whilst this was withdrawn in July 2019, it formed part of the Design Manual for Roads and Bridges (DMRB) since 1981 and is still referred to within the current junctions 10 manual as a useful reference. This document further explains that an error of prediction of +/- 15% can be expected for any given site and therefore an 'RFC of 0.85 (85%) would be sufficient for queues to be avoided most of the time.
58. It is clear from the above that there is significant uncertainty in terms of queueing where junctions operate in excess of RFC 0.85 due to the standard error of prediction, and a general recognition that junctions operating in excess of 0.85 are not likely to be satisfactory. It is therefore clear that any such occurrences are very sensitive to the addition of development traffic flows which can mean that increases in traffic at these locations can result in significant impacts to driver delay and therefore port operations. Such locations should have been identified and treated as sensitive receptors in the Environmental Statement in the context of current Institute of Environmental Management and Assessment (IEMA) guidance. This has not been done, as the Applicant was unaware of the sensitivity of the highway network at the time of preparing the Application in light of its error in the PCU conversion.
59. There is clearly a need for full and proper consultation with the relevant Local Highway Authorities to take place based on the corrected modelling to ensure that the future highway conditions are fully disclosed and any consequential need for mitigation is appropriately considered. Consideration as to whether an RFC of 0.75 is the most appropriate measure for junctions along the A160 corridor given the strategic nature of this route, should also be considered in consultation with National Highways.
60. At no point in the DTA Report 23325035 ([REP6-034](#)) does the Applicant state that the revisions to the Transport Assessment are attributable to the PCU error, rather attributing the reduction in capacity of the road network to committed development and growth (paragraph 1.4), which is factually incorrect.
61. Paragraphs 1.5 of REP6-034 onwards is mainly a repeat of the information provided within the Applicant's document 'Applicant's Issue Specific Hearing 3 Action Points for Deadline 5 – Appendix 2 - DTA Report 23325-27 including Annexes A-C' ([REP5-027](#)), particularly in respect of threshold for considering mitigation. DFDS has already responded to these elements above and in [REP6-038](#), paragraphs 7-47 and to avoid repetition, DFDS refers the ExA to its submissions at [REP6-038](#) in response to the items raised within [REP6-034](#). For the avoidance of doubt, DFDS consider that there are material changes in the operation of the highway network indicated by material increases in RFC and delay at sensitive junctions, and DFDS is concerned that the impact of the Proposed Development in these locations has not been appropriately assessed and discussed with the Local

Highway Authorities. There is also no evidence to demonstrate that National Highways, North Lincolnshire Council, and North East Lincolnshire Council agree that the Proposed Development has no material impact upon the operation of their respective highway networks.

62. The Applicant even goes as far as to reiterate at paragraph 2.9 of [REP6-034](#) that no wider improvements have been sought by National Highways on the A160. It is unclear to what extent National Highways have been consulted on the corrected modelling and are content for junctions to exceed recommended capacity thresholds on their network as the relevant Statement of Common Ground is silent on this point [REP5-009].
63. A further example of the Applicant's lack of transparency is evident within Annex A of [REP6-034](#), in that the RFCs set out within Annex A of the Technical Note 2 [REP5-028](#) not only correct the PCU conversion errors but incorporate a number of changes to the approaches agreed with National Highways, North Lincolnshire Council, and North East Lincolnshire Council and included within the Transport Assessment [AS-008](#). As such, it is not a like-for-like comparison of the impact of the correction of the PCU error. In the interest of transparency, DFDS suggest the changes made within the methodology for the Technical Note 2 [REP5-028](#) should be clearly set out along with evidence to demonstrate that the revised methodology has been fully discussed and agreed with National Highways, North Lincolnshire Council, and North East Lincolnshire Council.
64. The RFCs presented in the updated Technical Note 2 [REP5-028](#) are also not drawn from a consistent set of assumptions, as the Applicant has discretely applied the end user arrival profile (Stena) to any junction operating in excess of its practical capacity indicated by an RFC of 0.85 during the AM peak hour. In essence, this suppresses the potential impact of the Proposed Development. Evidence to demonstrate that this approach has been discussed and agreed with National Highways, North Lincolnshire Council, and North East Lincolnshire Council should be provided and DFDS request that all RFCs presented in Annex A of for the updated Technical Note 2 [REP5-028](#) should be updated to reflect the Port of Immingham profile for consistency, and to reflect the fact that the DCO would permit any alternative end user to occupy the Proposed Development, rather than restricting its use to Stena.
65. In addition, as part of the design input changes for the port capacity assessment (refer to response to Action Point 22 [EV10-016](#)), the Applicant has requested that the modelling consider several scenarios of vessel arrival and departure patterns to, in the Applicant's words, 'reflect the most efficient operation of the terminal'. These modifications to the vessel arrival and departure schedules means that the potential demand on the road network is not set out. An optimised arrival profile for the Transport Assessment may not align to the terminal capacity needs and the two need to be assessed in combination. It is DFDS' view that the Applicant should consider a reasonable worst-case for the arrival and departure profile for the Transport Assessment if a flexible vessel arrival and departure schedule is to be considered, further reinforcing the point that the assessment should maintain the use of the Port of Immingham profile as per the current approach within the Transport Assessment.
66. In addition to our comments raised in [REP6-038](#), DFDS would point out that the RFC values presented for the Transport Policy Mitigation Requirements [REP6-034](#) figures at the A180/ A1173 roundabout in Annex A appear to be incorrect for the period between 07:00-08:00 when compared to the results of the updated Technical Note 2 [REP5-028](#). This should be checked, clarified and updated as necessary.

67. .

68. The Applicant has set out a review of the NPSfP and NPPF setting out why they consider the impact of the Proposed Development is not substantial, not significant, and after mitigation, is not severe.

69. The issue of significance of impact should be viewed in the context of the IEMA Guidelines: Environmental Assessment of Traffic and Movement (July 2023), which recognises that motorists and freight vehicles are affected parties and that receptors that are sensitive to changes in traffic conditions include junctions and highway links at (or over) capacity. Such receptors (junctions operating at or over capacity) and impacts upon driver delay were not appropriately identified or considered in the ES.

70. In terms of significance of impact, the IEMA guidance also notes that:

d. *'delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system.'*

and that

e. *'highway mitigation defined to ensure conditions with development are not materially worse than would otherwise have been the case within the development and mitigation. The driver delay assessment should clearly present the 'with' and 'without' mitigation effects.'*

71. The impact of the Proposed Development flows is considered to be significant at these sensitive locations and there is a need to consider mitigation in these locations in consultation with Local Highway Authorities.

72. There was little attempt to mitigate the impact of the Proposed Development in the Transport Assessment [[AS-008](#)] given that the Applicant was not aware of the sensitivity of the network at the time it prepared its TA and did not know that the Proposed Development would add additional traffic through sensitive junctions operating over an RFC of 0.85 or push junctions over an RFC of 0.85. The concept of mitigation appears to be somewhat of an afterthought and it is not clear what, if any, mitigation the Applicant is now actually proposing to be incorporated within the DCO. This should be clearly set out before it can be determined whether this is sufficient to ensure that the Proposed Development does not exacerbate or create a severe impacts at sensitive locations on the highway network. This mitigation should also be agreed with National Highways, North Lincolnshire Council, and North East Lincolnshire Council and statements confirming this included in the respective Statements of Common Ground.



Junctions 10 User Guide



APPLICATION GUIDE 74

Written by James C Binning, Graham Burtenshaw

© Copyright TRL Software Limited 2021. All rights reserved.



Software manufactured under an ISO 9001 registered quality management system

DD: [REDACTED] E: software@trl.co.uk | <http://www.trlsoftware.com>
TRL Software | Crowthorne House | Nine Mile Ride | Wokingham | Berkshire | RG40 3GA | UK

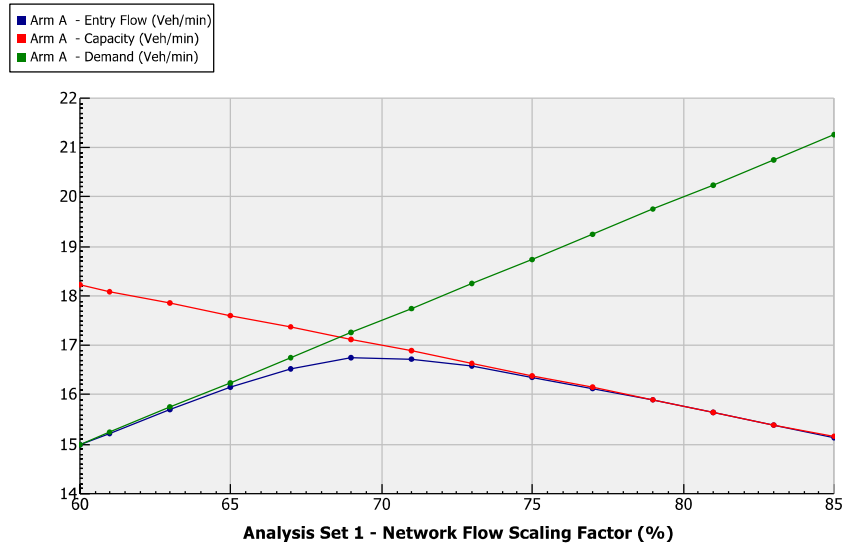
Data Editor	
Arm Results (08:30-08:45) (Arm 1)	
Total Demand (PCU/hr)	551
Junction Arrivals (PCU)	138
Circulating flow (PCU/hr)	384
Capacity (PCU/hr)	1203
RFC	0.458
Throughput (PCU/hr)	549
Throughput (exit side) (PCU/hr)	703
Start queue (PCU)	0.6
End queue (PCU)	0.9
Delay (s)	6.049
Unsignalised level of service	A
Total scheduled traffic demand during this time-segment (taking into account all scaling effects). Total = junction + bypass demand. Default: 0.00 PCU/hr	
Defaults	

Total Demand: This shows the total traffic demand on the arm, after all scaling effects.

Junction Arrivals: The total number of vehicles or PCU that arrive during this time segment (= demand x time segment length)

Circulating Flow: This is the calculated circulating flow past this arm (for roundabouts only)

Throughput (or Entry Flow): This is the calculated throughput across the give-way line. It is the lower of the demand or the capacity during the time segment, as shown by the blue line in the graph below. The graph shows the demand (green line) rising steadily as the network flow scaling factor is increased. The capacity (red line) decreases as the junction becomes busier. The throughput (blue line) initially follows the demand but is then restricted by the capacity, and then falls in line with the decreasing capacity. At the point where the demand is close to capacity (i.e. RFC is around 1.0), the throughput is less than both the demand and the capacity. This is due to the random nature of traffic arrivals and random queueing theory. When the RFC is close to 1.0, this randomness is most noticeable and means that vehicles may randomly bunch up and cause momentary queueing, which results in the throughput being less than the theoretically available capacity. At lower flow rates, this randomness has little effect, and at higher flow rates, there is likely to be continuous queueing which will negate any randomness.



Throughput (exit side) (or Exit Flow): This is the calculated flow OUT of the junction on this arm.

Pedestrian Demand: The two-way pedestrian flow (if any) across the arm.

Capacity: The calculated capacity of the entry. See the graph and discussion above.

RFC: Ratio of flow to capacity. The RFC provides a basis for judging the acceptability of junction designs and typically an RFC of less than 0.85 is considered to indicate satisfactory performance. This depends however on the context of the study and so the user's own judgement is also required. Also known as V/C ratio (traffic volume/capacity ratio).

For Priority Intersections, a 'satisfactory' RFC depends on the speeds encountered at the junction. The capacity formulae used in PICADY were mainly developed from studies at UK major/minor junctions on public roads. Most of these junctions had major roads with speed limits of 50 mph or less. At high-speed major roads, a lower RFC (e.g. 0.75) is recommended instead. Please see your relevant design guidelines, such as UK TA 23/81.

For Signalised Intersections, the RFC output is replaced with DOS (Degree Of Saturation), which has an equivalent meaning.

Start Queue / End Queue: The queue at the start and the end of the time segment. The difference between the two shows the evolution of the queue during this time segment. The values are the total number of queueing vehicles on the arm, regardless of their distribution on the road. E.g. a queue of 10 vehicles could be 10 single-file vehicles, or a row of 5 vehicles queueing two abreast. (If using Lane Simulation mode, you can however look at individual lane results to see more details.) Queues include slowly moving vehicles as well as stationary vehicles. As with most other outputs, the values shown are *expected* values and represent the value you would *expect* to observe on a typical day, at the start/end of the appropriate time segment. If comparing with observations you should bear in mind that your observations should be averaged over several days.

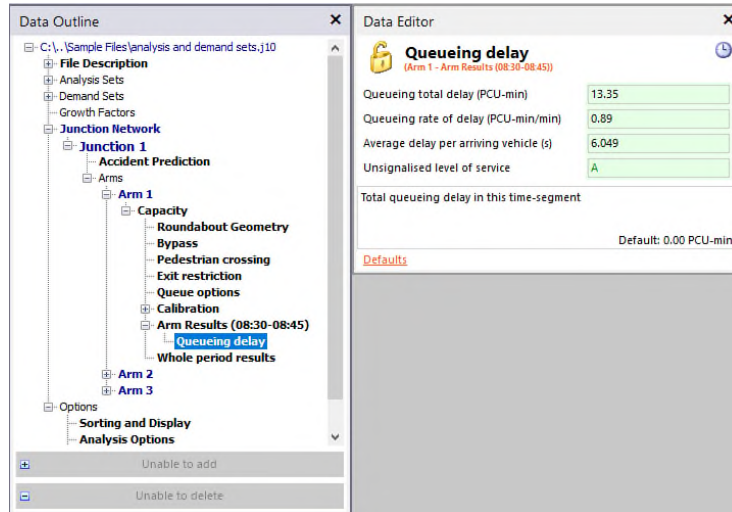
Delay: This is the average time that a vehicle must wait on the approach before it can enter the junction. See also: [Delay Units](#).

LOS: This is the unsignalised Level of Service. See [Queuing Delay](#) for details.

10.3.1 Queuing Delay

This sub-section of time segment results can be accessed by clicking the relevant section in the Data Outline, under the *Arm Results* or *Stream Results* section.

To view these results you must be in [Advanced Mode](#) and must also tick *Options>Analysis Options>Calculate detailed queuing delay*.



Queuing Total Delay: This is the delay suffered during the time segment by all the vehicles which are queuing during that time. See [Delay Units](#).

Queuing Rate of Delay: See [Delay Units](#).

The **Level of Service** (Highway Capacity Manual (HCM 2000)) outputs show the unsignalised, and/or equivalent signalised, level of service values for the time segment, based on the Average Delay per Arriving Vehicle. The transportation LOS system uses the letters A through F, with the definitions below being typical:

A	= Free flow
B	= Reasonably free flow
C	= Stable flow
D	= Approaching unstable flow
E	= Unstable flow
F	= Forced or breakdown flow

The thresholds A-F are based on the queuing delay on each arm, and these thresholds differ for unsignalised and signalised junctions. (One reason for this is that delay at a signalised junction is more 'acceptable', because drivers expect to be delayed at traffic lights. For example, a delay of around 20s may correspond to unsignalised LOS C, but signalised LOS B.) Junctions 10 shows the LOS according to both the unsignalised and the signalised thresholds, for comparison purposes. If the junction is a signalised one, the LOS shown in results will be the signalised LOS.

Note that the LOS in Junctions 10 is based purely on the queuing delay, taking into account delay experienced in previous time segments (i.e. the Average Delay Per Arriving Vehicle). In some definitions, the control delay at an intersection also includes elements of geometric delay; these are NOT included due to the extra amount of data that would be needed. If you are interested in including these elements, you should use the Geometric Delay model and add the resulting geometric delay values to the queuing delay and then use the published thresholds to look up the corresponding LOS.

For further details about Level of Service, see http://en.wikipedia.org/wiki/Level_of_service.