

Adran yr Economi a'r Seilwaith
Department for Economy and Infrastructure



Objection Ref OBJ0270

Llywodraeth Cymru
Welsh Government

File Ref WG/REB/OBJ0270.13 – GWT/Rich

Response to Objector's Evidence: Lindi Rich

(Gwent Wildlife Trust)

1. GROUNDS FOR OBJECTION

1.1. Details

- 1.1.1. Lindi Rich on behalf of Gwent Wildlife Trust submitted a Statement of Evidence dated February 2017 in relation to the draft statutory Orders associated with the Welsh Government's proposals for the M4 Corridor around Newport, which has been received via the Programme Officer.
- 1.1.2. The Welsh Government understands the evidence submitted within both Statements to be based on the following:

Water Quality

1. Asserts that Section 4.1.2 of the Drainage Strategy Report (forming Appendix 2.2 to the March 2016 ES) incorrectly states that the road run-off water will discharge to main NRW reens where there is a greater flow of water. Relies on evidence of Tony Pickup to suggest that the drainage should discharge to NRW Main River. Asserts that it appears as though engineers designed the Scheme drainage as though there were no SSSI present.
2. Considers that the sluice system on the Gwent Levels will result in a build-up of Water Treatment Area (WTA) outfall pollutants in the reen system. The Highways Agency Water Risk Assessment Tool (HAWRAT) does not take into consideration within the risk assessment tool the presence of a downstream structure, lake, pond, or canal which reduces velocity.
3. Considers that some reens and ditches in the vicinity of WTA outfalls are dead-ends resulting in a build-up of pollutants and sediment.
4. Considers that the scheme has not provided any actual data from existing water treatment schemes.
5. Considers that statements within the DMRB risk assessment are asserting that pollution within the reens would increase compared to the baseline: Section 4.5.4 of the Water Treatment Area DMRB Risk Assessment (forming Appendix 16.3 to the March 2016 ES) states: 'In addition to the minimal in-reen dilution that can be expected at each WTA outfall for treated run-off, it can be reasonably concluded that departures from existing baseline quality can be expected'.

6. Considers that the values used in relation to removal efficiencies do not accurately represent the actual efficiency that could be expected and that the water treatment proposals and associated water treatment risk assessment have not presented the 'worst case' in its assessment of water treatment efficiency and likely impacts on the SSSI reen system.
7. Considers that there is an existing pollution problem within the reens of the Gwent Levels and that utilising mean existing pollutant figures in the HAWRAT risk assessment has largely removed exceedances from the data.
8. Considers that recorded results of elevated heavy metals at some locations (e.g. TATA steel works) would result in cumulative effects associated with WTA discharges.
9. Notes that zinc has been recorded at levels well above Water Framework Directive (WFD) Environmental Quality Standards (EQS) levels at a number of locations across the levels and would also result in cumulative effects.
10. Considers that it would only take one severe pollution event to cause major ecosystem damage in the reen system of the Gwent Levels, and that cumulative impacts of the scheme in combination with existing pollution problems are highly likely to damage the invertebrate features of the Gwent Levels SSSI.
11. Considers that insufficient attention has been given to the possibility and potential effect of overtopping of the grass lined channels.
12. Considers that maintenance of the WTAs has not been guaranteed which could result in a higher risk of pollution and damage to the SSSI features due to poorly maintained treatment mechanisms and a build-up of sediment.
13. States that the HAWRAT risk assessment has used the same flow rate for all outfall reens to assess impacts leading to incorrect predictions.
14. Considers that some WTA discharges are to the same reen leading to cumulative effects.
15. Disputes the statement that the 'significance of potential effects of water quality on the attribute of SSSI Biodiversity' are of 'negligible magnitude'

and 'neutral significance' for all 15 water treatment areas and does not agree that Welsh Government have adequately supported this conclusion.

16. Considers that reusing steelwork contaminated material under the motorway is another potential pollutant risk in association with existing pollution issues within the reens.
17. Considers that the position and number of sample locations selected for baselining the scheme is insufficient.
18. Considers that the M4 CaN scheme as proposed will cause significant direct water pollution to the Ebbw SINC (Site of Importance for Nature Conservation) and river Usk SSSI/SAC which feed into the Severn Estuary SAC/Ramsar.

Ecology

19. States that otters are a feature of the Usk SAC and are using the Ebbw. Considers that all impacts upon the species must be thoroughly reassessed to ensure scheme effects and in-combination effects on this feature of the SAC have been completed in an appropriate and thorough manner.

2. REBUTTAL**2.1. Points Raised**

2.1.1. Some of the above points have already been addressed in previous proofs of evidence. Others are dealt with by topic by the relevant witness in the following sections, in addition to their general proofs of evidence, to which readers should also make reference in their entirety for a full understanding of the Welsh Government's case. For ease of reference the places where the above points are addressed in this Rebuttal are listed in the table below:

Objector's point reference	Rebuttal paragraph reference	Objector's point reference	Rebuttal paragraph reference
1	2.2.1	11	2.2.11
2	2.2.2	12	2.2.12
3	2.2.3	13	2.2.13
4	2.2.4	14	2.2.14
5	2.2.5	15	2.2.15
6	2.2.6	16	2.2.16
7	2.2.7	17	2.2.17
8	2.2.8	18	2.2.18
9	2.2.9	19	2.3.1
10	2.2.10		

2.2. Richard Graham (Water Quality)

2.2.1. Response to **Point 1** (Incorrectly states in Section 4.1.2 of the Drainage Strategy Report (forming Appendix 2.2 to the March 2016 ES) that the road run-off water will discharge to main NRW reens where there is a greater flow of water):

1. Following NRW's response to the March 2016 ES (as quoted within OBJ270-13A, para 32, page 6), a number of meetings were held with NRW to discuss the principles of the proposed drainage scheme. NRW confirmed that they are satisfied with the principle of discharge to reens within the levels, having carefully considered the importance of water quality and trigger levels..
2. The drainage design does in part include proposed treated road run off discharges to main rivers where practicable including the Rivers Usk and Ebbw and the Mill Reen.
3. There is often no physical distinction between reens and NRW main rivers. For example, reens can be larger than some main rivers. This fact was collaborated in the evidence of Mr Pickup.
4. To avoid confusion in designation between main rivers and reens, it was agreed that references to 'main reens' should be removed within the drainage strategy report, and replaced with the term 'reens', which are referred to as IDD reens.
5. NRW have agreed to the proposed discharge of treated road run off to IDD reens within the Gwent Levels – inclusive of both IDD reens and NRW Main River reens. This is recorded in the Water Quality Statement of Common Ground between NRW and Welsh Government, specifically at paragraph 2.5.11 that:

'HAWRAT assessments as summarised in Appendix 16.3 and Appendix SS16.1 of the Environmental Statement have provided evidence to conclude that for metals and PAHs, whilst small increases in concentrations are predicted, the risk of breaching the NRW standards is very low and therefore unacceptable impacts on the Gwent Levels ecosystem from the Scheme's proposed treatment drainage discharges are unlikely'.

2.2.2. Response to **Point 2** (Considers that the sluice system on the Gwent Levels will result in a build-up of Water Treatment Area (WTA) outfall pollutants in the reens system. The Highways Agency Water Risk Assessment Tool (HAWRAT) doesn't take into consideration within the risk assessment tool the presence of a downstream structure, lake, pond, or canal which reduces velocity):

1. The HAWRAT risk assessments requires identification, via a simple tick box, of any 'structures' present within 100m of the proposed discharge point, simply to warn the user that flow reductions near such structures could result in reduced sediment dispersion and that the HAWRAT predictions may be affected. However, the HAWRAT model does not take into account this within its calculation – that is the HAWRAT prediction would be the same whether this box is ticked or not. Notwithstanding this, none of the proposed Water Treatment Area discharges are located within 100 m of a structure, which within the Gwent Levels is principally a sluice, the nearest being sluice 'C1', located approximately 0.5 km downstream of the proposed WTA 6 discharge point.
2. I am therefore satisfied that the results of the HAWRAT assessments have correctly accounted for this issue and that the presence of sluices will not present a risk of sediment accumulation within reens. Furthermore, the sediments in reens in the vicinity of WTA discharges will be tested for heavy metals and hydrocarbons on an annual basis for 5 years as part of a Surface Water Monitoring Protocol agreed with NRW. Should sediments be identified to be showing unacceptable concentrations of heavy metal and hydrocarbons, i.e. by breaching HAWRAT limits for toxicity to invertebrates, such sediments will be removed and disposed of at an appropriate disposal facility.
3. Commitments No. 5, No. 91 and No. 179 refer to the performance and subsequent quality requirements of the Water Treatment Area discharges.
4. NRW have agreed at paragraph 2.5.11 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:
'HAWRAT assessments as summarised in Appendix 16.3 and Appendix SS16.1 of the Environmental Statement have provided evidence to conclude that for metals and PAHs, whilst small increases in

concentrations are predicted, the risk of breaching the NRW standards is very low and therefore unacceptable impacts on the Gwent Levels ecosystem from the Scheme's proposed treatment drainage discharges are unlikely'.

2.2.3. Response to **Point 3** (Considers that some reens and ditches in the vicinity of WTA outfalls are dead-ends resulting in a build-up of pollutants and sediment)

1. Commitment No. 9 will provide mitigation measures for the SSSI to provide effective design to maintain hydrological connectivity of the reen systems during construction and operation. Additionally, Commitment No. 91 requires the provision of control measures and mitigation measures outlined in Section 6.5 of the pre-CEMP (forming Appendix 3.2 to the March 2016 ES) and includes for the maintenance of all existing reen connections across the new section of motorway. Maintaining connectivity of these reens following construction of the proposed scheme has been addressed within the Reen Mitigation Strategy. This strategy, developed following meetings with NRW, ensures that hydrological functionality of the reens is preserved. Accordingly, I am satisfied that the reen mitigation strategy allows the proposed WTA discharges to function as designed and that the discharges will not be significantly affected by dead-ends in the reen network.
2. All of the proposed WTA discharges are to existing reens or to a newly engineered highway runoff ditch which will discharge directly to Percoed Reen (Mike Vaughan, Questions of Elucidation). The minor field ditch as referred to in Paragraph 43 is not proposed to receive the discharge of WTA 4A or WTA 4B. WTA 4B has two reed beds now proposed, which will each have their own outfall. The first, to the west of the attenuation lagoon, will be culverted beneath the proposed carriage way at Percoed Reen Bridge. The outfall of the culvert is to the replacement reen diversion to Percoed Reen. The second reed bed outfall is to a new engineered highway ditch which flows northwards discharging directly to Percoed Reen.
3. Percoed Reen is identified by the IDD maps as flowing to the south west to Drenwydd Reen / Hawse Reen intersection (NRW Main River reens), both of which eventually discharge at the coast into the estuary.

4. NRW have agreed at paragraph 2.5.3 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'The design and assessment of the Water Treatment Area stages takes into account the concerns NRW have raised with respect to the requirements to discharge at a rate and quality compatible with the Gwent Level SSSIs.'

5. Furthermore, in relation to all proposed treated runoff discharges, NRW have agreed at paragraph 2.5.11 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'HAWRAT assessments as summarised in Appendix 16.3 and Appendix SS16.1 of the Environmental Statement have provided evidence to conclude that for metals and PAHs, whilst small increases in concentrations are predicted, the risk of breaching the NRW standards is very low and therefore unacceptable impacts on the Gwent Levels ecosystem from the Scheme's proposed treatment drainage discharges are unlikely'.

6. Finally, NRW have agreed at paragraph 2.5.3 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'The design and assessment of the Water Treatment Area stages takes into account the concerns NRW have raised with respect to the requirements to discharge at a rate and quality compatible with the Gwent Level SSSIs.'

2.2.4. Response to **Point 4** (Considers that the scheme has not provided any actual data from existing water treatment schemes):

1. There is a difficulty in making comparisons between the M4CaN and other treatment areas currently in use on the trunk road network. Two principal differences are present when making such a comparison.
2. Firstly, these existing water treatment systems do not match those proposed in scale and design, particularly in respect to the grass lined channels, attenuation lagoons and reed beds. A number of the WTAs for the M4CaN include the use of grass lined channels as a method of

conveyance to the WTA. The use of the grass lined channels of the length proposed for each WTA (up to a maximum length of 3,600m, with an average of 1,550m) offers a number of important benefits:

- settling and trapping of sediment in vegetation;
 - adhesion of sediment and pollutants to plants;
 - filtering and absorption in the underlying soils and plant roots;
 - nutrient uptake by plants
 - provide storage to capture and immobilise spills on the highway;
 - convey runoff from extreme rainfall events through the swale at low velocities without significantly remobilising sediment or causing erosion.
3. It is acknowledged that recently constructed road schemes in the UK have included systems design to treat road run off prior to discharge to water courses. In particular, the Newbury A34 bypass incorporates 9 water treatment areas of varying designs along the 13.5km section of dual carriageway, each with different catchments and specifications that include similar treatment systems to those proposed for the scheme including oil interceptors, sediment traps, grass channels, lagoons and reed beds.
4. I have reviewed two papers co-authored by Professor Ward, upon which he draws some comparisons on road run off treatment performance data. One is for two discharges from the A34 bypass at Newbury (Hares and Ward, 2004) - referred to as Pond J and Pond K - and the other is concerning discharges from the M25 at Oxted and Leatherhead (Hares and Ward, 1999). The Newbury discharges have been studied over a 3¼ year period starting from the year of commencement of operation in 1998 (Hares and Ward, 2004). For both treatment areas, run off flows through similar treatment areas prior to discharge into the River Lambourn. The treatment areas comprise an oil interceptor, silt trap incorporating a grass verge flowing into a combined flood attenuation pond and surface flow reed bed termed a biofiltration pond. The drained carriageways serving these treatment areas do not incorporate grass lined channels.

5. Heavy metals, comprising lead, cadmium, copper and zinc, were measured in sediments at both the inlet and outlet to the treatment areas allowing a treatment efficacy to be calculated. Pond J achieved reduction in sediment concentrations for the stated heavy metals of 59%, 59%, 65% and 76% respectively. Pond K achieved reduction in sediment concentrations for the stated heavy metals of 79%, 86%, 73% and 71% respectively. Both ponds showed higher degrees of efficacy at earlier stages of the 3 ¼ year operational life of the bypass.
6. For Pond K the conclusions of the study stated that a rapid decrease in heavy metal levels in sediment through the reed bed system was revealed and that the presence of a well-established reed bed system in this pond is responsible for dissipating stormwater inflow velocity thus allowing sedimentation processes to occur.
7. For Pond J, the study stated that in contrast, high heavy metal levels in sediments were reported throughout and also the outlet concluded to be due to an ill established reed bed system and thus a short residence time within this pond may limit sedimentation and filtration processes.
8. The M25 studies looked at heavy metal concentrations in water discharges. The designs of the two referenced treatment areas are different. The Oxted water treatment area comprises a silt trap leading to a dry pond, the outlet of which passes through an oil interceptor prior to discharge in the receiving watercourse. The Leatherhead system comprises a wet biofiltration, leading to an oil interceptor the outlet of which flows into sedimentation pond before passing through a second oil interceptor prior to discharge in the receiving watercourse. The drained carriageways serving these two treatment areas do not incorporate grass lined channels.
9. In conclusion, the M25 study states that the removal efficiencies of heavy metals within the biofiltration pond at Leatherhead are higher than those from the corresponding dry detention pond facility at Oxted and that the residence time is substantially longer at Leatherhead than at Oxted. It is noteworthy that all the proposed Scheme's water treatment areas comprise permanently wet attenuation lagoons acting as sedimentation ponds. The study also concludes that removal of particulate material

through the attainment of a long residence time from motorway surface to receiving watercourse will predominantly affect the heavy metal removal efficiency, especially as a majority of the motorway-derived heavy metals exist either as insoluble species or adhered to insoluble particulate material. By contrast, the proposed Scheme's water treatment areas with the inclusion of grass lined channels will achieve higher residence times than is achieved at these M25 examples.

10. Removal efficiencies are stated in the study for a wide range of heavy metals. For the metals studied in the A34 study, i.e. lead, cadmium, copper and zinc, the Leatherhead treatment area achieves a reduction in concentrations in water of 89%, 90%, 93% and 87% respectively. The study findings for the Oxted water treatment area were 89%, 95%, 88% and 84% respectively.
11. The Newbury bypass treatment areas only include grass slopes for water to flow down prior to entry into the main lagoon. The maximum length of the grass slopes is approximately 10m. The capacity for water treatment of the proposed scheme's grass lined channels is substantially larger in comparison.
12. The Newbury bypass treatment areas provide a single 'biofiltration' lagoon which is designed to provide simultaneous storm water volume balancing and biological treatment by reeds or other aquatic plants. Such biofiltration lagoons have reduced treatment efficacy due to compromised design requirements making them of considerably smaller volume and surface area of the separate lagoons and reed beds respectively than those proposed for the M4CaN scheme. As an example, the Newbury bypass treatment area Pond J is reported to have a drained area of 3.4 ha and a pond storage volume of 5,400 m³. The ratio of these properties of a treatment area is a factor for the comparison of designs. Pond J therefore has a ratio of approximately 490 m³/ha. The ratio for Pond K is approximately 560 m³/ha on the published data. Another study (Pontier et al., 2001) on a different Newbury bypass water treatment area termed Area 'C' is reported to have a drained area of 1.6ha and a pond storage volume of 1,050 m³. Pond C therefore has a ratio of approximately 650 m³/ha.

13. The ratios for the proposed M4CaN WTAs range from approximately 800 to 3,500 m³/ha with a mean value of 1140 m³/ha. This results in the proposed M4CaN lagoons providing greater dilution, lower flow velocities, increased sedimentation residence times and provides volume for sediments to settle and be retained. Taken together, and with the additional and significant addition of grass lined channels – features absent from the A34 Newbury and M25 examples – it is my opinion that the treatment provision of the proposed M4CaN Water Treatment Areas will outperform these already highly functional systems. Furthermore, the commitment to inspect and maintain the Scheme's WTAs, including the grass lined channels, will ensure high levels of treatment efficacy are reached. Further, more detailed consideration of the reasoning for this is provided as follows.
14. The proposed M4CaN WTAs incorporate separate reed bed systems designed to ensure satisfactory functionality and treatment efficacy. The use of a separate, bespoke reed bed sized to optimise the residence times of water according to design standards results in a far higher performance than the planted reeds will achieve within a biofiltration pond. Furthermore, the biofiltration ponds contain standing open water where the majority of water during storm events is not in contact with reed roots and will receive no water quality benefit as a result. In comparison, the proposed M4CaN WTA reed beds are sub surface flow systems which results in 100% of water flowing through the root zone of the reed bed ensuring maximum filtration potential for solids and conversion of metals from dissolved to non-dissolved forms. As this reed bed is not acting as a balancing pond as is the case for the Newbury bypass treatment areas, water flows at a slow and uniform rate ensuring long residence times as required by guidance on the construction of wetlands. This is simply not achievable given the design compromises inherent in a dual purpose biofiltration pond as used more commonly on the highways estate.
15. I am of the opinion that biofiltration ponds as employed on the Newbury A34 bypass and the M25 motorway at Oxted and Leatherhead, whilst achieving good levels of road run off attenuation have a reduced treatment efficacy compared to separate lagoons and reed beds and are

as such not comparable with the M4CaN WTA, which will provide far higher treatment provision.

16. Secondly, the primary issues considered responsible for unfavourably low treatment efficacy identified in many road run off treatment systems are the low residence times afforded to drainage water within the treatment and the lack of maintenance to ensure long term functionality.
17. To achieve good levels of water treatment efficacy, water residence times need to be appropriate for the systems employed. Low residence times limit the opportunity for filtration, dilution, stilling, sedimentation, biodegradation of organic substances and chemical transformation of metals from soluble to non-dissolved forms.
18. Typically, low residence times are a consequence of inappropriate or compromised sizing of treatment areas, for example as a consequence of limited land provision for such systems that require large areas. The design of the M4CaN WTA has been undertaken from the outset by the project team given the sensitive setting of the proposed discharges thus ensuring appropriate design and associated high functionality. The provision of systems capable of accommodating a 1 in 100 year extreme rainfall event including a 30% additional provision for climate change has ensured that the grass lined channels, attenuation ponds and reed beds are of a size capable of delivering high treatment efficacy. This is particularly important within the grass lined channels and attenuation lagoon where higher residence times result in the removal of sediments and within the reed beds where higher residence times within the root zone of reeds allows a higher degree of potential water pollutant removal to occur.
19. Water treatment systems designed for road run off require regular inspection and maintenance to ensure long term viability and treatment efficacy. This is recognised by DMRB and guidelines are provided (see Table 6.1 in DMRB Volume 4 Section 2 Part 1 HA103/06) to achieve this. Insufficient or untimely maintenance for such systems is identified as a contributing factor for many road treatment systems with the highway estate. A principal requirement of road scheme water treatment areas is to capture and retain suspended solids as these are associated with the

majority of potential pollutants in run off and can cause impact to rivers from smothering of plants and river beds. It is therefore important that sediment accumulation and recovery/disposal is undertaken as accumulation of sediment reduces filtration potential of grass lined channels and reed beds as well as increasing the risk of remobilising sediment within lagoons. Sediment accumulation also reduces storm water storage volumes and thus compromises the functionality of treatment areas for flood risk mitigation following extreme rainfall events.

20. NRW have agreed at paragraph 2.6.2 within the Water Quality Statement of Common Ground between NRW and Welsh Government that

'an effective maintenance and pollution management plan is required, building on the outline guidance in the DMRB and considering the specific detail of the treatment train and the receiving environment. Of particular importance are maintenance guidelines for the grass lined channels and lagoons, and criteria to assist SWTRA staff to decide when maintenance is required. This will be agreed between the parties as per Commitment 181.'

21. At paragraph 2.6.3 of the Water Quality Statement of Common Ground it is stated:

'Commitment 117 indicates that Welsh Government will agree a pollution protection plan with NRW, whilst Commitments 90-91 will require production of an emergency response plan.; and

'At the time of writing the parties are currently in discussions regarding the measures to be included in this plan, to ensure that proposed measures are feasible, effective and can be implemented swiftly.'

22. I am of the opinion that the scope of the inspection and maintenance schedule proposed will ensure the proposed WTA will be able to function at an acceptably high standard and thus maintain the necessary standard of treatment to afforded protection to the Gwent Levels SSSIs.

- 2.2.5. Response to **Point 5** (Considers that statements within the DMRB risk assessment are asserting that pollution within the reens would increase compared to the baseline: Section 4.5.4 of the Water Treatment Area DMRB Risk Assessment (forming Appendix 16.3 to the March 2016 ES) states: 'In addition to the minimal in-reen dilution that can be expected at each WTA

outfall for treated run-off, it can be reasonably concluded that departures from existing baseline quality can be expected’):

1. The HAWRAT risk assessment is a tool for identifying whether a proposed drainage discharge is of an unacceptable risk to water quality based potential for ecological harm. The purpose of risk assessment is to identify whether unacceptable water quality impacts could result. The approach requested by NRW to achieve this within the Gwent Levels SSSIs is the use of predominantly Water Framework Directive (WFD) compliant quality criteria referred to as Trigger Levels. These criteria are the concentrations, expressed either as maximum allowable concentrations or annual average concentrations, required to achieve good ecological status and are prescribed by NRW specifically for the proposed Scheme for the protection of the Gwent Levels SSSIs.
2. The need to maintain baseline water quality (otherwise known as the Ambient Background Concentration or ABC) is not a requirement of the DMRB assessment methodology nor of NRW in seeking to determine whether the proposed treated run off discharges are acceptable. The assessment undertaken within Appendix 16.3 of the March 2016 ES provided, for completion, the likely treatment efficacy required to both preserve the ABC and additionally to remain within the WFD water quality thresholds since adopted by NRW as trigger levels. Paragraph 4.5.6 of this report states:
3. *“It can be seen that the proposed WTA treatment train, whilst not achieving ree ABC within discharge waters, is likely to maintain ree conditions within the WQS/PNEC at the point of discharge.”*
4. The risk assessment therefore is supportive of the conclusion that the proposed provision of run off treatment systems is capable of protecting surface water quality to avoid pollution in accordance with the requirements of the Waster Framework Directive and NRW.
5. This conclusion, which is supported, is therefore in accordance with DMRB Vol.2, Sect 3, HD45/09, 2.13.
6. NRW have agreed at paragraph 2.2.1 of the Water Quality Statement of Common Ground between NRW and Welsh Government that baseline surveys have been undertaken in line with NRW guidance.

7. Additionally, NRW have agreed at paragraph 2.2.4 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'Baseline monitoring indicates that with respect to determinands likely to be release by road runoff (i.e. dissolved and suspended metals, hydrocarbons and salt), concentrations are low to very low and well within safe levels.'

8. Furthermore, NRW have agreed at paragraph 2.5.11 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'HAWRAT assessments as summarised in Appendix 16.3 and Appendix SS16.1 of the Environmental Statement have provided evidence to conclude that for metals and PAHs, whilst small increases in concentrations are predicted, the risk of breaching the NRW standards is very low and therefore unacceptable impacts on the Gwent Levels ecosystem from the Scheme's proposed treatment drainage discharges are unlikely'.

2.2.6. Response to **Point 6** (Considers that the values used in relation to removal efficiencies do not accurately represent the actual efficiency that could be expected and that the water treatment proposals and associated water treatment risk assessment have not presented the 'worst case' in its assessment of water treatment efficiency and likely impacts on the SSSI reen system):

1. The reduction of potential pollutant concentrations in run off prior to discharge to reens is based on DMRB guidelines on expected performance of each of the four stages of proposed run off treatment. Whilst pollution reduction efficacy of these systems is variable, the advice provided is based on sound knowledge of recommended typical performances informed from studies of road drainage schemes. Although there is a case to be made for using the upper bounds of the DMRB recommended efficacy figures, due to the robust design and scale of the proposed treatment systems, an assessment has been made on median (middle) figures to provide additional certainty of performance. I consider

this is a reasonable approach which allows the risk to surface water quality from treated road run off to be soundly judged.

2. The original assessment provided in Appendix 16.3 to the March 2016 ES utilised DMRB and CIRIA suggested treatment efficacy values. However, the CIRIA SuDS document (C609) has since been re-issued and no longer provides such data and recommends assessment of road drainage SuDS using DMRB guidance.
3. For the purposes of this rebuttal, and to simplify the evidence provided, only DMRB provided figures have been utilised as these are the most appropriate for the M4CaN and supported by Welsh Government.
4. The one aspect of the CIRIA SuDS guidance that has been retained for the purposes of assessing likely water environment impact is the use of the cumulative assessment methodology whereas only the first treatment stage efficacy data is used as recommended, with all subsequent stages using only half the recommended efficacy values. This approach ensures multiple treatment stages are assessed realistically by reducing expected performance by a factor of 50%, which I consider a significant factor of safety for the assessment of potential impact to the SSSI.
5. The assessment of the multi-stage water treatment utilising DMRB median efficacy data applied using the CIRIA cumulative methodology is provided as Annex A to this rebuttal. The two principal groups of contaminants assessed are total suspended solids (TSS) and dissolved metals. The former group includes, in addition to suspended sediment, non-dissolved heavy metals and Polynuclear Aromatic Hydrocarbons (PAH).
6. The results of this revised assessment of likely cumulative efficacy show that prior to discharge of road run off to reens, suspended solids and non-dissolved pollutants will be reduced by a median value of 94.4% and that dissolved metals would be reduced by a median value of 83.5%. These are not absolute predictions but the results of the prescribed and reasonable approach used for the numerical calculation of pollutant reducing efficacy properly taking into account likely variability and performance of a series of individual treatment systems.

7. I am therefore content that the cleaning efficacy of the proposed water treatment elements does accord with published information.
8. Furthermore, NRW have agreed at paragraph 2.5.11 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'HAWRAT assessments as summarised in Appendix 16.3 and Appendix SS16.1 of the Environmental Statement have provided evidence to conclude that for metals and PAHs, whilst small increases in concentrations are predicted, the risk of breaching the NRW standards is very low and therefore unacceptable impacts on the Gwent Levels ecosystem from the Scheme's proposed treatment drainage discharges are unlikely.'

9. Finally, NRW have agreed at paragraph 2.5.3 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'The design and assessment of the Water Treatment Area stages takes into account the concerns NRW have raised with respect to the requirements to discharge at a rate and quality compatible with the Gwent Level SSSIs.'

2.2.7. Response to **Point 7** (Considers that there is an existing pollution problem within the reens of the Gwent Levels and that utilising mean existing pollutant figures in the HAWRAT risk assessment has largely removed exceedances from the data):

1. The use of the averaged results in Appendix 16.3 (Environmental Statement, March 2016) have been used for the purpose of demonstrating a screening summary (Table 4.2) of monitoring results against the DMRB HARWAT utilised Runoff Specific Thresholds (RST), the calculated Predicted No Effect Concentration (PNECs) and Environmental Quality Standards (EQS). As stated throughout Chapter 16 of the ES, the full water quality monitoring dataset is available in Annex G of Appendix 16.2.

2. The reported data (averages or otherwise) is not used within the HARWAT risk assessment that calculates the effectiveness of the individual WTAs to meet. It is used for screening purposes only to compare against the calculated PNECs.
3. NRW have agreed at paragraph 2.2.4 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'Baseline monitoring indicates that with respect to determinands likely to be release by road runoff (i.e. dissolved and suspended metals, hydrocarbons and salt), concentrations are low to very low and well within safe levels.'

4. Furthermore, NRW have agreed at paragraph 2.5.11 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'HAWRAT assessments as summarised in Appendix 16.3 and Appendix SS16.1 of the Environmental Statement have provided evidence to conclude that for metals and PAHs, whilst small increases in concentrations are predicted, the risk of breaching the NRW standards is very low and therefore unacceptable impacts on the Gwent Levels ecosystem from the Scheme's proposed treatment drainage discharges are unlikely'.

1. Finally, NRW have agreed at paragraph 2.5.3 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'The design and assessment of the Water Treatment Area stages takes into account the concerns NRW have raised with respect to the requirements to discharge at a rate and quality compatible with the Gwent Level SSSIs.'

2.2.8. Response to **Point 8** (Considers that recorded results of elevated heavy metals at some locations (e.g. TATA steel works) would result in cumulative effects associated with WTA discharges):

1. Commitment Nos. 4, 91 and 179 ensure that the water quality discharged from the WTAs will be of a quality acceptable for the Gwent Levels SSSI

below the water quality limits agreed with NRW. Polluted water from the carriageway is to be directed to the water treatment areas via specially designed grass lined channels. These provide measures to effectively remove sediments, hydrocarbons and other potential pollutants. The treatment capacity of these lagoons is designed for the 1 in 100 year event with a 30% allowance for climate change. The discharge from the WTAs will be subject to a detailed programme of monitoring for both water quality, sediment quality and biological parameters to provide certainty of performance and ensure compliance. Further details of the Water Treatment Areas and their integrity can be found in the response to Point 10 below.

2. As stated within Section 4.8 of Appendix 16.2 to the ES (March 2016), there is a routine presence of low concentrations of dissolved metals such as arsenic, boron and zinc throughout the reens. Less frequent occurrences of the metals chromium, copper, nickel, selenium and lead and infrequent occurrences of cadmium have been identified during the quarterly surface water monitoring. Of these results, some have been recorded at locations within the vicinity of TATA steel. However the frequency heavy metals comprising Priority Substances under the Water Framework Directive such as cadmium is limited. For cadmium, to date, only three analyses of 128 have been recorded above the laboratory Limit of Detection (LOD). The three results above the LOD for cadmium were recorded on different reens across the Gwent Levels - Elver Pill Reen, Rush Wall Reen North and Pwll Bargoed Reen – the latter of which is located in Castleton. Further to this, analysis at Rush Wall Reen North and Pwll Bargoed Reen has been undertaken every quarter since May 2015, with no repeat occurrences of cadmium above the LOD.
3. The quality of the reens does not suggest a likelihood of impact when combined with the discharge from the WTAs, due to (1) the discharge from the WTAs being of an appropriately high quality agreed with NRW which includes stringent limits on heavy metal concentrations and (2) there being no evidence of existing significant impact on reens from heavy metals at present.

2.2.9. Response to **Point 9** (Notes that zinc has been recorded at levels well above Water Framework Directive (WFD) Environmental Quality Standards (EQS))

levels at a number of locations across the levels and would also result in cumulative effects):

1. The Environmental Quality Standard for surface water is for dissolved zinc and is based on the location specific bioavailability of dissolved zinc expressed as a Predicted No Effect Concentration (PNEC). Total zinc concentrations include the fraction of zinc associated with sediment and tend to be higher than dissolved concentrations. When reviewing the dissolved zinc concentrations at the monitoring locations identified on pages 25 – 26 of the objection, the results are considerably below the site specific PNEC that has been calculated for each WTA outfall, as seen in Table 1 below.
2. Further to this, locations where monitoring has been more consistent over the 2 year baseline period (those identified in Table 1 below), show that the total (unfiltered) concentrations observed are not representative of an ongoing trend in elevated zinc concentrations.
3. NRW have agreed at paragraph 2.2.4 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:
‘Baseline monitoring indicates that with respect to determinands likely to be release by road runoff (i.e. dissolved and suspended metals, hydrocarbons and salt), concentrations are low to very low and well within safe levels.’

Location	Parameter	PNEC (ug/l)	Monitoring Round	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
			Date	May/Jun 2015	Jul 2015	Oct 2015	Jan 2016	May 2016	Jul 2016	Oct 2016	Jan 2017
			Monthly Rainfall (mm)**	155.6/50.4	107.6	47.4	221.0	109.6*	25.2*	41.8*	76.0*
13.1	Zinc (ug/l)	47.8	(diss.filt)		<LOD	0.469	4.79	7.57	<LOD	3.18	9.76
			(tot.unfilt)		<LOD	4.11	45.3	5.48		3.21	15.2
	TSS (mg/l)			16	6.0	44.7	21.5	14.5	71.5	5	38.3
14.1	Zinc (ug/l)	45.08	(diss.filt)		0.942	1.72	1.62	0.938	1.99	2.87	2.7
			(tot.unfilt)		75.8	54.1	12.5	41.3		8.24	26.2
	TSS (mg/l)				31	12.5	120	21	11.5	17	69.7
18.1	Zinc (ug/l)	67.27	(diss.filt)	1.29	<LOD	0.986	2.31	9.73	1.35	5.22	4.23
			(tot.unfilt)		<LOD	30	75.8	24.2		<LOD	13.8
	TSS (mg/l)			15	4.5	32	121	50	26	86	59.7

Table 1: Comparison of highlighted Zinc concentrations

*provisional

**source: MetOffice - UK climate - Historic station data: Cardiff Bute Park (nearest station)

Highlighted Red: indicates data included within the objection, page 25.

4. Instances of elevated total zinc concentrations are shown to be broadly consistent with recorded Total Suspended Solid (TSS) concentrations in addition to events of higher than average rainfall. Higher than average rainfall within the Gwent Levels is expected to be broadly proportional to increased suspended solids in reens as a consequence of sediment washed from fields, roads and property into reens.

2.2.10. Response to **Point 10** (Considers that it would only take one severe pollution event to cause major ecosystem damage in the reen system of the Gwent Levels, and that cumulative impacts of the scheme in combination with existing pollution problems are highly likely to damage the invertebrate features of the Gwent Levels SSSI):

2. The Water Treatment Areas and the grass lined road side channels that intercept run off have been specified and designed to provide a very high likelihood that pollution to receiving reens within and beyond the SSSI can be minimised to an acceptable low level. All the components of the proposed run off treatment provisions are well documented and wholly appropriate for the reduction in potential pollutant levels through weather compensated capture (filtration and sedimentation), dilution, decay and controlled release.
3. These systems would be designed and constructed to sound engineering and environmental principals and be maintained by a regular inspection and maintenance schedule. Furthermore, every proposed discharge will be subject to a detailed programme of monitoring for both water quality and biological parameters to provide certainty of performance. Finally, a commitment will be made that water discharges to the SSSI will meet the requirements of the SSSI as required by NRW.
4. The use of grass lined channels, a pollution control lagoon, an attenuation lagoon and a constructed reed bed comprises a very high provision of run off treatment at a scale currently unmatched by similar systems in use within the UK serving roads or motorways.
5. Many of the treatment provisions found elsewhere in the UK comprise only one or two of the four systems proposed for the M4CaN and then

only much smaller in size and hence a lower level of protection afforded than for the M4CaN scheme.

6. Each of the four components of the drainage treatment strategy afford significant and complimentary mechanisms for the entrainment and reduction in potential pollutants within highways drainage. By the interception, slowing and storage of road run off prior to cleansing through purpose built reed beds, water quality is released back to the SSSI at an acceptably slow rate and with reductions in concentrations of potential pollutants to levels that do not pose an unacceptable risk to ree water quality.
7. Whilst some short term rises (<24 hours) in concentrations are possible, these have been assessed using a site specific risk tool (HAWRAT) to be within acceptable limits for the protection of invertebrates. Furthermore, it is likely that longer term, baseline concentrations of pollutants within reens will not be affected.
8. It is also the case that the M4CaN is subject to a number of environmental commitments which make the contractor liable for meeting the water quality requirements of the proposed discharges to standards requested by NRW to protect the Gwent Levels SSSIs.
9. NRW have agreed at paragraph 2.5.12 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

‘Certain provisions of the proposed drainage design, i.e. extensive low gradient grass lined channels, penstock controllable pollution prevention lagoons and large attenuation lagoons, provide opportunities to retard and capture potential major spills on the carriageway and prevent release of such spills to reens.’
10. NRW have agreed at paragraph 2.2.5 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

‘There were undesirable concentrations of nutrients and other signs of nutrient pressures, but these are not likely to be affected by road runoff.’
11. Furthermore, NRW have agreed at paragraph 2.5.11 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'HAWRAT assessments as summarised in Appendix 16.3 and Appendix SS16.1 of the Environmental Statement have provided evidence to conclude that for metals and PAHs, whilst small increases in concentrations are predicted, the risk of breaching the NRW standards is very low and therefore unacceptable impacts on the Gwent Levels ecosystem from the Scheme's proposed treatment drainage discharges are unlikely'.

12. Finally, NRW have agreed at paragraph 2.5.3 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'The design and assessment of the Water Treatment Area stages takes into account the concerns NRW have raised with respect to the requirements to discharge at a rate and quality compatible with the Gwent Level SSSIs.'

2.2.11. Response to **Point 11** (Considers that insufficient attention has been given to the possibility and potential effect of overtopping of the grass lined channels):

1. We can consider a response for all channels: the grass lined channels as part of the drainage Scheme, the water treatment areas; and the receiving watercourses.
2. The grass lined channels conform with the UK SuDS standard, as described in the 2015 CIRIA SuDS Manual (C753), with flow velocities of 0.1m/s to promote improvement of water quality. These channels are designed to accept highway runoff from the 1 in 100 year flood with 30% allowance for climate change. The channels are all 600mm wide at their base, but increase in size from 500mm at the upstream extent of a drainage run, to 800mm at the end of the longest runs.
3. Hydraulic modelling was used to size these channels. The models were tested with a range of storm durations to ensure capacity in the critical duration storms. The results of the modelling demonstrate that the grassed lined channels will not overtop during the 1 in 100 year flood with 30% allowance for climate change.
4. The lagoons are designed to attenuate the 1 in 100 year flood with 30% allowance for climate change to a runoff rate of 3.5 l/s/ha, and each

lagoon includes a measure of freeboard in its design. The risk of overtopping of the lagoons will be less and 1% per annum. This storage and attenuation will be achieved through use of a vortex flow regulator, which will pass forward the design flow, at 3.5 l/s/ha, at the specific design head.

5. The drainage design is based on the higher summer penning levels, in the receiving reens, as their discharge levels. As the existing reen network is heavily regulated and controlled, it is assumed that, with the natural baseflow contributions, the summer penning level would be maintained during any future drought periods without any losses from the system. This is precautionary: winter penning levels are lower.
6. Discharges from the lagoons are minimised through the releases being restricted to 3.5 l/s/ha for all events up to the 1 in 100 year storm with 30% allowance for climate change. The drainage and attenuated discharges have been included in the hydraulic modelling. The results from this modelling process demonstrate that the proposed drainage causes no detriment to fluvial or surface water flood risk from the reens: this may even reduce flood risk from those reens. The risk of overtopping within the receiving watercourses will be unchanged from the present day.
7. The Proof of Evidence of Michael Vaughan (WG 1.17.1) also addresses similar matters at paragraphs 4.65 to 4.81.

2.2.12. Response to **Point 12** (Considers that maintenance of the WTAs has not been guaranteed which could result in a higher risk of pollution and damage to the SSSI features due to poorly maintained treatment mechanisms and a build-up of sediment):

1. The provision of WTA inspection and maintenance is included with the Commitments Register and will be detailed within an Inspection and Maintenance Schedule (based on the suggested requirements given in the DMRB) to be produced and available at the opening of the new motorway, currently being agreed between NRW and Welsh Government.
2. Of note, the following commitments (Dec 2016 ESS: Appendix SR18.1 – Register of Commitments) will ensure maintenance of the treatment areas and reens and also mitigation of pollution events: 4, 5, 9, 89, 90, 91, 92, 93, 97, 98, 157, 158, 159, 160, 161.

3. A Statement of Common Ground on water quality has been reached between NRW and Welsh Government underpinned by an agreed Monitoring Protocol. This protocol outlines the monitoring to be undertaken for a minimum period of 5 years with respect to monthly water quality and annual sediment quality and invertebrate population monitoring.
4. Should chemical analysis undertaken on treated road run off indicate that water quality data is showing early signs of unexpected rising trends in receiving watercourses (but still below the set NRW trigger levels), actions would be undertaken immediately to address this.
7. NRW have agreed at paragraph 2.6.2 within the Water Quality Statement of Common Ground between NRW and Welsh Government that
'an effective maintenance and pollution management plan is required, building on the outline guidance in the DMRB and considering the specific detail of the treatment train and the receiving environment. Of particular importance are maintenance guidelines for the grass lined channels and lagoons, and criteria to assist SWTRA staff to decide when maintenance is required. This will be agreed between the parties as per Commitment 181.'
8. At paragraph 2.6.3 of the Water Quality Statement of Common Ground it is stated:
'Commitment 176 indicates that Welsh Government will agree a pollution protection plan with NRW, whilst Commitments 186 and 187 will require production of an emergency response plan.'; and
'At the time of writing the parties are currently in discussions regarding the measures to be included in this plan, to ensure that proposed measures are feasible, effective and can be implemented swiftly.'

2.2.13. Response to **Point 13** (States that the HAWRAT risk assessment has used the same flow rate for all outfall reens to assess impacts leading to incorrect predictions):

1. In the first instance, please refer to Appendix SS16.1 of the December 2016 ESS. Following comments from NRW, a reappraisal of the risk

assessment was carried out to increase conservatism and present the worst case scenario. This is presented in full detail within the appendix.

2. It is correct that the same flow rate has been used for all locations during the risk assessments. Given the nature of the reens and the summer penning levels, it is difficult to determine a flow rate. As a result, a universal and conservative Q95 flow rate was applied to all locations. This was originally 0.0005m³/s.
3. The revised assessment applied an even more conservative flow rate in the: a fivefold reduction in the assumed Q95 flow rate of the reen network from 0.0005 m³/s to 0.0001 m³/s. These are annualised flow rates and under whilst under summer penning some flow can be expected either following summer rainfall or where existing water losses downstream create flows locally.
4. NRW have agreed at paragraph 2.2.5 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:
‘There were undesirable concentrations of nutrients and other signs of nutrient pressures, but these are not likely to be affected by road runoff.’
5. Furthermore, with regard the appropriate use of HAWRAT, NRW have agreed at paragraph 2.5.11 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:
‘HAWRAT assessments as summarised in Appendix 16.3 and Appendix SS16.1 of the Environmental Statement have provided evidence to conclude that for metals and PAHs, whilst small increases in concentrations are predicted, the risk of breaching the NRW standards is very low and therefore unacceptable impacts on the Gwent Levels ecosystem from the Scheme’s proposed treatment drainage discharges are unlikely’.

2.2.14. Response to **Point 14** (Considers that some WTA discharges are to the same reen leading to cumulative effects):

1. Whilst there is an eventual connection between the receiving reens of WTA 6 and WTA 7, and of WTA 8 and WTA 8A, a distance of several

hundred metres separates the outfalls allowing for dilution prior to the confluence.

2. WTA 6 discharges to Lakes Reen, which connects to Julians Reen approximately 450m downstream. The outfall of WTA 7 to Julians Reen is located approximately 840m upstream of the confluence between these two reens.
3. WTA 8 discharges to Ellen Reen which connects to Chapel Reen from the north, after a distance of approximately 350m. The outfall of WTA 8A is to Blackwall Reen, which intersects Ellen Reen from the east approximately 590m downstream of the discharge point.
4. Following DMRB guidance, only discharges to the same reach of a watercourse and within 1km of each other would require a cumulative assessment. Accordingly the above discharges are not strictly considered to have a potential for a cumulative impact. NRW have not raised the proposed Water Treatment Area discharge locations as an issue in respect of the validity of the risk assessments. However, to provide additional evidence of an acceptable outcome within the receiving reens, a cumulative assessment has been undertaken for the above WTA. These are provided in Annex B to this rebuttal.
5. NRW have not requested further assessment of this discharge. Furthermore, NRW have agreed at paragraph 2.5.11 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'HAWRAT assessments as summarised in Appendix 16.3 and Appendix SS16.1 of the Environmental Statement have provided evidence to conclude that for metals and PAHs, whilst small increases in concentrations are predicted, the risk of breaching the NRW standards is very low and therefore unacceptable impacts on the Gwent Levels ecosystem from the Scheme's proposed treatment drainage discharges are unlikely'.
6. Finally, NRW have not requested further assessment of this discharge. Furthermore, NRW have agreed at paragraph 2.5.3 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'The design and assessment of the Water Treatment Area stages takes into account the concerns NRW have raised with respect to the requirements to discharge at a rate and quality compatible with the Gwent Level SSSIs.'

2.2.15. Response to **Point 15** (Disputes the statement that the 'significance of potential effects of water quality on the attribute of SSSI Biodiversity' are of 'negligible magnitude' and 'neutral significance' for all 15 water treatment areas and does not agree that Welsh Government have adequately supported this conclusion):

1. The definition of "negligible magnitude" and "neutral significance" regarding the potential effects on the water quality of the SSSI biodiversity has been determined using the Highways Agency DMRB document, tables A4.4 – A4.5 (HD 45/09). Classification of the significant and magnitude by completing the HARWAT assessment. If the assessment passes for both soluble and sediment-bound pollutants, it can be determined that no risk has been identified to the surface water environment.
2. Further detail regarding this approach can found within section 16.3 of the Environmental Statement (March 2016). Annex 1 of Appendix SS16.1 (December 2016 ESS) presents the results of the HARWAT assessment (with more conservative parameters applied). All locations passed the risk assessment and subsequently qualifies the status of 'neutral significance' and of 'negligible magnitude'.
3. Furthermore, NRW have agreed at paragraph 2.5.11 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'HAWRAT assessments as summarised in Appendix 16.3 and Appendix SS16.1 of the Environmental Statement have provided evidence to conclude that for metals and PAHs, whilst small increases in concentrations are predicted, the risk of breaching the NRW standards is very low and therefore unacceptable impacts on the Gwent Levels ecosystem from the Scheme's proposed treatment drainage discharges are unlikely'.

2.2.16. Response to **Point 16** (Considers that reusing steelwork contaminated material under the motorway is another potential pollutant risk in association with existing pollution issues within the reens):

1. Firstly, with regard to any potential adverse impact on any underlying groundwater, this has been assessed in Chapter 16 of the March 2016 ES (paragraphs 16.7.37 to 16.7.38) and is considered further in the September 2016 ES Supplement (paragraphs 4.7.14-15). No significant adverse impact on the quality of groundwater is expected as a result of the use of using treated materials from the Llanwern lagoons. This is because any increase in potential contaminants in shallow perched water migrating downwards (for instance via band drains) and entering the secondary aquifers causing an appreciable deterioration in groundwater quality is considered negligible for the following reasons:
 - i. Infiltration rates through the embankment will be extremely low (as described above)
 - ii. The porewater within the Tidal Flat Deposits (TFD) below Llanwern Steel Works is not considered to be an aquifer as it is not used as a water resource due to its low permeability and brackish (elevated chloride) content.
 - iii. Glaciofluvial Deposits and bedrock beneath the TFD are also considered poor aquifers, are not an important water resource which are not in hydraulic continuity with wider surface water.
 - iv. General fill including treated materials from the Llanwern lagoons will be subject to risk based suitability for re-use criteria that have been derived to the satisfaction of NRW to be suitably protective of the water environment.
2. Secondly, the potential risks of contaminants migrating from the core of the embankment and adversely impacting the reens during the operational phase of the motorway have been assessed and this is detailed within the March 2016 ES. Para 16.8.14 – 16.8.16 of the March 2016 ES assesses the potential mechanisms for rainfall on embankments. The risk of contaminants leaching and then migrating from the core of the

embankment and having an unacceptable effect on controlled waters is considered to be low for the following three key reasons:

- i. The low permeability of the road surface and the grass lined channel would ensure that any run-off water from the highway surface would be collected and drained to the water treatment areas, effectively preventing infiltration through the embankment fill across the width of the highway.
 - ii. Infiltration through the flanks of the embankment is considered to be very low considering their gradient (1:2 slope) and the low permeability of the compacted embankment fill. Furthermore, the flanks of the embankment will also be covered with clean soils as shown on Figures 16.7 and 16.8 (Chapter 16 of the March 2016 ES).
 - iii. Contaminated materials (including treated silt and slag materials from Llanwern Steel Works) would be tested to ensure compliance with suitable for re-use criteria. The suitable for re-use criteria will be developed to ensure that any water that does infiltrate through the embankment sides does not cause an unacceptable risk to controlled waters.
3. Finally, procedures to ensure treated materials meet the suitability for re-use criteria will be developed during detailed design and will be discussed with NRW, NCC and MCC prior to construction. This will include verification controls, sampling and analysis of treated materials.
 4. The Remediation Strategy Report (Commitment No. 176 of Appendix SR18.1, December 2016 ESS) will include a remediation verification plan that sets out 'lines of evidence' that will be generated during the remediation works that will ultimately be provided in a Remediation Verification Report. The 'lines of evidence' will be gathered and provided in the Remediation Verification Report (Commitment No. 145) to demonstrate to NRW, MCC and NCC that the remediation including treatment and placement of treated contaminated materials has been successfully completed. The Outline Remediation Strategy Report sets out some of the 'lines of evidence' that will be gathered.
 5. Monitoring of gas, surface waters and groundwater during construction and five years after construction will also be undertaken. The monitoring

will allow comparison against the current baseline conditions to determine compliance.

6. NRW have accepted in principal the Outline Remediation Strategy as published at Appendix 11.2 of the March 2016 ES as appropriate for the management and potential reuse of site won materials.

2.2.17. Response to **Point 17** (Considers that the position and number of sample locations selected for baselining the scheme is insufficient):

1. The baseline monitoring was agreed with NRW during scoping of the Environmental Statement and NRW have been satisfied this has been achieved in line with NRW guidance and in line with Commitment No.7.
2. I am satisfied that the baseline monitoring is appropriate for the assessment of potential impacts on the water environment.

2.2.18. Response to **Point 18** (Considers that the M4CaN scheme as proposed will cause significant direct water pollution to the Ebbw SINC (Site of Importance for Nature Conservation) and river Usk SSSI/SAC which feed into the Severn Estuary SAC/Ramsar):

1. The pollution control measures proposed for the River Ebbw meets those required by the DMRB for outfalls to coastal waters that pass the required DMRB risk assessment for effects of routine runoff on surface waters and pollution impacts from accidental spillages.
2. The lower level of pollution control proposed for the River Ebbw west and east outfalls relative to the Usk outfall reflect the lower environmental sensitivity and designation of the watercourse at the point of discharge. The boundary of the Severn Estuary / River Usk SAC, Severn Estuary SPA and Severn Estuary SSSI is situated approximately 500m south (downstream) of the proposed Ebbw crossing
3. In their response to the Draft Orders concerning the proposed M4 corridor around Newport dated 4 May 2016, NRW stated in paragraph 16.5.8 that they “are satisfied that discharges to the Rivers Usk and Ebbw have lesser requirements for attenuation and treatment and, provided these requirements are adequately covered to our satisfaction within the Statement of Commitments, we advise that that the proposals presented into these tidal waters are adequate”.

4. More recently, a Statement of Common Ground with respect to water quality has been agreed with NRW, who reiterate the above.
5. During construction commitment numbers 54, 91, 140, 176 and 122 (Appendix SR18.1 Register of Commitments, December 2016 ESS) will protect surface water features from pollution. For example commitment 89 requires the development of a Surface Water Management Plan, Pollution Prevention Plan and a Piling Risk Assessment for implementation during construction, all of which will require agreement with NRW.
6. Water pollution as a result of the published scheme is therefore not considered to be a risk.
9. Furthermore, NRW have agreed at paragraph 2.5.3 of the Water Quality Statement of Common Ground between NRW and Welsh Government that:

'The design and assessment of the Water treatment Areas stages takes into account the concerns NRW have raised with respect to the requirement to discharge at a rate and quality compatible with the Gwent Levels SSSIs.', and at paragraph 2.5.4:

'Discharges to the Rivers Usk and Ebbw have lesser requirements for attenuation and treatment and accordingly have a less complex treatment train.'

2.2.19. I confirm that the statement of truth and professional obligations to the inquiry from my main proof still applies.

2.3. Keith Jones (Ecology)

2.3.1. Response to **Point 19** (States that otters are a feature of the Usk SAC and are using the Ebbw. Considers that all impacts upon the species must be thoroughly reassessed to ensure scheme effects and in-combination effects on this feature of the SAC have been completed in an appropriate and thorough manner):

1. The Proof of Evidence of Geoff Liles on behalf of the Gwent Wildlife Trust is concerned with otters. Jonathan Davies has responded in detail on behalf of the Welsh Government to all the points made, including the potential effects of pollution.

2. As he explains, pollution issues are discussed in the evidence provided by Richard Graham and are summarised with regard to otters in Chapter 10 of the March 2016 ES. Mitigation measures that form part of the Scheme would ensure no significant pollution impact during construction or operation. It is confirmed that, as a precautionary measure, otter exclusion fencing would be installed around the primary siltation ponds in Water Treatment Areas to further reduce the risk.

2.3.2. I confirm that the statement of truth and professional obligations to the inquiry from my main proof still applies.