

**BEFORE A BOARD OF INQUIRY
MACKAYS TO PEKA PEKA EXPRESSWAY PROPOSAL**

UNDER the Resource Management Act 1991

IN THE MATTER OF applications for resource consents and a notice of requirement in relation to the MacKays to Peka Peka Expressway Proposal

BY New Zealand Transport Agency

**STATEMENT OF EVIDENCE OF ROBERT JOHN VAN BENTUM
ON BEHALF OF THE KAPITI COAST DISTRICT COUNCIL**

Stormwater and sediment control

DATE: 5 October 2012

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1. INTRODUCTION

- 1.1 My full name is Robert John van Bentum.
- 1.2 I am a Senior Water and Wastewater Engineer at MWH New Zealand Ltd (**MWH**) with team leadership responsibilities and a role of Senior Project Manager for the Wanganui office of MWH. I have had 20 years of professional experience in water and wastewater engineering, and in the planning and design and construction management of stormwater infrastructure.
- 1.3 I have a Bachelor of Agricultural Science (Engineering) from Massey University and a Master of Philosophy (Civil Engineering) from Loughborough University, UK. I am a Chartered Professional Engineer in the practice areas of Civil and Environmental Engineering and a Member of the Institution of Professional Engineers New Zealand, and a Member of the New Zealand Water and Wastes Association.
- 1.4 I have experience in engineering planning, design and construction management of municipal and highway infrastructure including stormwater planning, design and consenting for stormwater drainage and treatment on many residential, industrial and roading projects in the Manawatu, Hawke's Bay and Nelson. I have also provided technical support for consenting of stormwater management for Hawke's Bay Airport and several industrial growth areas in Hastings. This has included involvement with Best Practical Options approaches to stormwater treatment and technical review of stormwater drainage design including wetland treatment for the SH1 Waikato Expressway Rangiriri Section.
- 1.5 I am authorised by the Kāpiti Coast District Council (**Council**) to present this evidence on its behalf.
- 1.6 I am familiar with the area covered by the proposed MacKays to Peka Peka Expressway (**Expressway**) including the State Highway network and local roads in the area. I have visited most of the proposed alignment and all the areas where significant stormwater management devices, waterway crossings and treatment devices are to be constructed.

1.7 I have reviewed the following technical reports and their associated appendices in preparing my evidence:

- (a) Technical Report 22 – Assessment of Hydrology and Stormwater Effects;
- (b) Technical Report 25 – Contaminant Load Assessment;
- (c) Construction Environmental Management Plan (**CEMP**) Appendix H – Erosion and Sediment Control Plan;
- (d) Technical Report 4 – Construction Methodology Report and the associated Erosion and Sediment Control Plans;
- (e) Statement of Evidence prepared by Graham Levy (Hydrology) dated 30 August 2012; and
- (f) Statement of Evidence prepared by Graeme Ridley (Erosion and Sediment Control) dated 3 September 2012.

1.8 I have read and am familiar with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2011. I agree to comply with that Code. Other than where I state that I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

2. SCOPE OF EVIDENCE

2.1 My evidence will cover the following matters:

- (a) Matters raised in Council's submission;
- (b) Stormwater and runoff; and
- (c) Erosion and sediment control.

3. EXECUTIVE SUMMARY

3.1 The proposed Expressway traverses the coastal plain and crosses many watercourses flowing from east to west, ranging from minor drains to urban and rural streams including the Waikanae River. Potential hydrological and hydraulic effects from the project include increases in the volume and peak runoff flow rate of stormwater, loss of existing flood plain storage as well as potential impacts associated with watercourse crossings, sediment and contaminant discharge and impacts on aquatic species.

3.2 The project design sets out as far as practicable to avoid these potential effects through the use of grassed and wetland swales, treatment wetlands, offset storage and design

of culverts to facilitate fish passage and reduce the risk of erosion. However the Expressway passes through existing flood plains, wetlands and stream ecological areas which are very sensitive to relatively small changes in water level and water quality. While I support the proposed additional conditions, put forward by New Zealand Transport Agency (**NZTA**) witness Graham Levy (page 41, Proposed Stormwater Consent SW.1 and SW.2) to define performance standards, there are a number of impacts which I consider are not yet adequately covered and I have therefore recommended some further amendments.

- 3.3** Extensive modelling of the hydraulic stormwater impacts has been undertaken by Council's modelling consultant SKM in collaboration with NZTA to confirm specific mitigation measures. However on-going changes in design to date and proposed future changes to the design and location of specific offset storage and wetland treatment solutions lead to on-going uncertainty about the precise mitigation options proposed and their effectiveness. I have therefore proposed tightening obligations around final modelling checks prior to final design and have sought confirmation that all the solutions to be constructed will be included within the final designation corridor and thus on-going maintenance will be NZTA's responsibility.
- 3.4** Water quality impacts associated with the Expressway have been modelled by Beca on behalf of NZTA and reported in Technical Report 25 – Contaminant Load Assessment. The modelling work suggests that total contaminant loads discharged to each watercourse will be marginally reduced compared to the current State Highway situation. I consider, however, that the design approach does not adequately take into account the way in which Expressway stormwater would be positively directed to major watercourses along the alignment.
- 3.5** I consider that the approach does not adequately represent the potential for negative ecological effects if inadequately treated stormwater were to be discharged to these watercourses. I therefore recommend that the requirements for treatment be tightened and a more prescriptive approach be adopted for specifying treatment devices, particularly for discharges to high and moderate ecological value watercourses.
- 3.6** As with all large earthworks and road construction projects crossing a large number of watercourses, the Expressway will generate significant erosion and sediment volumes. Both erosion and sediment generation have the potential to result in significant negative impacts on wetland plants and watercourse aquatic species. I support the general management approach outlined in the Erosion and Sediment Control Plan.

3.7 I also support the requirement for site specific sediment and control strategies to be developed ahead of each phase and stage of the work. However I recommend a number of changes to the plan and the addition of consent conditions to provide additional protection. I support additional protection for a number of other sensitive wetlands (listed below), and protection against additional contamination risks at the Otaihanga Landfill, serious erosion of steep cut sand slopes and in respect of excessive sediment discharges from sediment control devices.

4. MATTERS RAISED IN SUBMISSION

4.1 The Council's submission of 10 August 2012 and specifically paragraph 78 sought appropriate conditions to specify NZTA's approach to mitigation to ensure the following potential hydrological and stormwater impacts from the proposed Expressway were addressed:

- (a) increases in peak flow discharge and loss of flood plain storage resulting in increased flooding risks for upstream residential and rural properties;
- (b) increased scour and erosion in existing waterways and around bridge structures associated with higher peak flows and altered stream flow paths;
- (c) increases in total annual volumes of contaminants discharged to local and sensitive watercourses and wetlands arising from stormwater runoff from the sealed and unsealed areas of the new Expressway; and
- (d) impacts on fish and aquatic species due to water quality and modifications to the watercourses at crossings resulting in reduced survival and declines in biodiversity.

4.2 The Council's submission also raised concerns about aspects of the erosion and sediment control plan and specifically concerns in relation to:

- (a) additional protection needed for a number of additional wetlands not currently included in the erosion and sediment control plan (clause 85); and
- (b) use of the stormwater wetland at the toe of the Otaihanga Landfill to dispose of treated stormwater from the main construction yard (clause 83).

4.3 I discuss these issues below.

5. STORMWATER AND RUNOFF

Design Approach

5.1 The design approach endorsed by NZTA has been to mitigate potential impacts of additional stormwater flows, increased flood levels, and filling of flood plain storage by provision of attenuation in swales and wetlands and creation of offset storage areas. I support the specific sections of proposed conditions SW.1 and SW.2 which define the performance criteria for mitigating the effects of the Expressway on stormwater and surface hydrology, including SW.1 Clause b) and SW.2 clauses b); c) and d). In my view it is important that the conditions are explicit in terms of requiring the use of swales and wetlands, provision of offset storage areas and design of low head culverts to adequately mitigate the effects of increased flood levels and the filling of existing floodplain storage.

5.2 While I support the two new stormwater consent conditions SW.1 and SW.2 in this sense, I have a concern around allowing for the option of “removal of downstream constraints” (SW.2 clause a) iii)) as an option for the project to mitigate loss of flood plain storage. I consider that allowing the project to utilise out of designation options to mitigate impacts (except in a few isolated cases – e.g. Ngarara Creek) has the potential to impact on the Council’s future options in respect of stormwater level of service improvements. I therefore strongly recommend that SW.2 clause a) iii) be deleted.

5.3 While addressing the majority of the potential effects, the proposed new stormwater conditions do not specifically set out performance criteria in respect of preventing scour and erosion of watercourses. The proposed consent conditions do not require the attenuation of flows in swales and wetlands and rip rap protected culverts and outlets at bridges to address this issue.

5.4 I recommend that a new condition be added to address this omission which requires that scour and erosion risks associated with peak design stormwater discharges be mitigated by attenuating flow velocities in swales and wetlands and providing rip-rap protection for culverts and outlets at bridges.

5.5 The project will require realignment of and changes to a number of existing open drains. As part of the mitigation of the effects on fish and aquatic life, NZTA has agreed that

new open channel drains and streams will be constructed to resemble natural streams with natural stream beds, riparian planting and refuges. However, after reviewing the documentation, I consider there is a lack of necessary clarity over which watercourses will receive this treatment and whether drains which are substantially modified will also be treated. I recommend that the works be undertaken to this standard in relation to all modified watercourses to ensure every opportunity is taken to enhance the stream and drain environment for the benefit of aquatic species present.

5.6 I therefore recommend that this requirement be captured by modification to or addition to consent conditions WS.1 to WS.7. I consider the condition is required to implement NZTA's stated intention and clarify which watercourses are to be treated. Specific drains and watercourses that I understand NZTA intends to cover include affected and modified sections of Mazengarb Drain, WWTP Drain, Muaupoko Stream, Waimeha Stream, Ngarara Creek, Kakariki Stream, Smithfield Drain through offset storage area 11 and sections of the upstream tributaries of the Paetawa Drain and the Hadfield / Te Kowhai Stream. The consent condition would require that all new, relocated or renovated drains or streams are constructed to resemble natural streams with natural stream beds, riparian planting and refuges.

5.7 The location of the final operational designation has yet to be confirmed, such that it is not clear that all off-set storage, ecological offsets and wetland treatment areas will be contained within the designation corridor. I consider that it is essential that the operational designation does indeed cover all of the above areas. I therefore agree with Graham Levy's evidence (paragraph 133) which recommends that a condition be provided.

5.8 I therefore recommend that a specific consent condition be provided which requires that the final operational designation be created so that it fully incorporates the areas of offset storage, ecological offset and wetland treatment (with the exception of offset storage area 6A which is discussed below in paragraph 5.25) so as to ensure that these mitigation works continue to function on an on-going basis.

Hydrological and Hydraulic Modelling

5.9 The impacts of the Expressway and stormwater runoff have been extensively modelled in collaboration with Council and Greater Wellington Regional Council nominated modellers. However, the on-going design changes and refinements that will occur leading up to the construction of the road (although cognisant of hydraulic neutrality) will

mean that the project will not necessarily continue to achieve targeted levels of service for hydraulic neutrality. While Graham Levy (at paragraph 134) in his evidence reports that the model has been updated, I consider that any update is only a partial or interim one and a further update is required as discussed below.

5.10 Mr Levy has proposed an additional consent condition SW.2 to provide for future updates. I recommend that this condition be strengthened to require that any modelling update be undertaken once final design changes are completed and in such a way as to ensure that:

- (a) the Council's stormwater requirements and associated accepted best practice, in particular the Stormwater Management Strategy and policy of on-site hydraulic neutrality, are adhered to;
- (b) the flow of stormwater and ground water from the hills to the coast (east-west) is not impeded; and
- (c) the natural flows in wetlands are not impeded.

5.11 In rural catchments, and in particular in the Poplar Avenue and Peka Peka Road north areas, the flood plain has not been mapped. Therefore these areas are not covered by the Council's flood model. I consider that for these areas there remains uncertainty around the specific design of the drainage works proposed and around the potential impacts on nearby affected properties, particularly in relation to the impact of higher water levels during flood events.

5.12 In the absence of a calibrated hydraulic and hydrological model, as is the case here, evidence of first principles assessment is recommended to support NZTA's assessment and enable independent confirmation of assumptions made. Specifically, I support a request for additional information being provided, prior to final design and tender, to support the hydraulic design assessments completed in order to confirm:

- (a) that Culvert 8 (1050 mm) under Poplar Avenue will result in less than minor impacts on Queen Elizabeth Park;
- (b) that Culvert 11 if constructed as a 3x2m box culvert will provide adequate capacity for the shortened crossing;

- (c) that Culvert 25.3 (600mm diameter) will adequately mitigate any adverse effects on isolated catchment 25.3; and
- (d) that offset storage is not required to mitigate enhanced flood risks for areas north of Peka Peka Road.

5.13 Should the further information fail to demonstrate adequate mitigation, then I recommend changes to the design to address this. To support these changes, I recommend a modification to proposed condition SW.2 to require NZTA to assess the effects of the filling, waterway crossing and Expressway stormwater discharges for areas outside the model's extent by review of manual calculations.

Water Quality

5.14 The application outlines a range of stormwater treatment approaches for different sections of the Expressway, including two stage treatment comprising swales followed by a constructed treatment wetland. I consider there is, however, insufficient detail around the specific provisions for stormwater treatment, such that it is difficult to assess the adequacy of the stormwater treatment proposed.

5.15 I consider that NZTA should provide further information around the proposed treatment and ultimate point of discharge for treated stormwater in general and specifically in the following locations:

- (a) Median stormwater drainage within the Expressway from chainage 2900 to 4100, chainage 4800 to 5400 and chainage 8900 to 9200 (directed to the Landfill Drain);
- (b) Type 2 sand swale runoff south of the Drain 7 crossing of the Expressway;
- (c) Possible use of a shared (with private land owner) treatment wetland as an alternative to wetland 5 south of Mazengarb Road and the specific guarantees around management and on-going performance if the wetland remains in private ownership;
- (d) Type 2 sand swale runoff to the attenuation section of wetland 6;

- (e) Wetland 9 design given stormwater runoff from catchments 23.3 and 23.4 is directed to the treatment wetland rather than bypassing as clear flow; and
- (f) Type 2 sand swale runoff to drain culverts at chainage 15800 and 15900.

5.16 Technical Report 22 and Graham Levy's evidence outline a distinction between swales and wetlands/storage areas. A distinction is made between areas intended for the treatment and attenuation of stormwater runoff (not suitable as natural areas) and those areas of off-set flood plain storage that can become natural areas with ecological value. Technical Report 22 (Stormwater Management section 4.4.2 i) Swales, page 68) makes reference to further detailed design/refinement of the specific swale in later design stages leading to the reduction or removal of the need for specific wetlands. In some areas stormwater runoff is directed to off-set storage areas.

5.17 I acknowledge that the term "wetland" can refer to both constructed wetlands for treatment and attenuation as well as off-set storage wetlands which might function as ecological wetlands. However, there appears to be some clouding of the function of both wetland types, particularly as many of these will be established as sediment control devices during construction. The application appears to seek the option to reduce attenuation provision (and associated treatment provision) during the final design phase within the ambit of the best practicable options (**BPO**) approach.

5.18 In my professional opinion, design should be sufficiently developed at the application stage to enable confirmation of the extent, size and nature of the stormwater attenuation and treatment to be provided. I therefore recommend that the specific provision for treatment wetlands set out in Technical Report 22 and related appendices should be considered a minimum requirement, except for allowance for minor changes in siting, size and detail of the design prior to construction. I recommend that the conditions require the provision of the constructed wetlands outlined in the consent application.

5.19 The application has used a BPO approach to define its approach to specific stormwater treatment. Technical Report 22 refers to provision of wetland swales that will function as long narrow wetlands. It is stated that these swales need not have standing water in them because the treatment provided by the swales comes from 'through flow' as opposed to extended detention.

- 5.20** In my professional opinion, wetland swales may indeed be constructed to provide wetland-like properties. However, unless they are specifically designed to detain minimum volumes of water to support wetland plants, they will fail to provide robust and consistent treatment of Expressway stormwater equivalent to constructed wetlands. If wetland treatment is considered necessary, then this should be provided by way of swales followed by engineered or constructed wetlands.
- 5.21** I also consider that as the Expressway serves to collect and channel stormwater via swales to specific watercourses for discharge, the potential impacts of inadequate treatment are more significant than with the current informal State Highway drainage system. I therefore recommend that a two stage approach (use of swales and constructed treatment wetlands) be provided for discharges to all high or moderately high ecological value watercourses, namely the Waikanae River, Wharemauku Stream and Whareroa Tributary as well as the currently low ecological value Waimeha Stream, Ngarara Creek and Kakariki Stream.
- 5.22** NZTA used the contaminant load model (**CLM**) assessment, described in Technical Report 25, to assess contaminant removal through the use of swale treatment only. The CLM method, however, demonstrates that significantly enhanced treatment can be achieved by the use of two devices in series (e.g. swales followed by constructed wetland). NZTA has proposed a two treatment train for stormwater treatment in a number of locations, without confirming the basis for the exclusion of other sites from this approach.
- 5.23** I recommend greater clarity around the basis for stormwater treatment selection, and to that end propose that an amendment be made to the proposed condition SW.1. The amendment would require all stormwater being discharged to the high/moderately high ecological value Waikanae River, Wharemauku Stream and Whareroa Tributary as well as the low ecological value Waimeha Stream, Ngarara Creek and Kakariki Stream to be treated before discharge by way of a two train system comprising swales followed by a constructed wetland.
- 5.24** For all other catchments, treatment would be provided via either wetland swales (holding water all year round) or grass swales followed by constructed wetlands. The design and construction requirements for the treatment devices would be as set out in the NZTA publication "Stormwater Treatment Standard for State Highway Infrastructure, 2010".

5.25 In relation to Culvert 17 – Landfill Drain Culvert and Offset Storage Area Wetland 6A, I have a concern that any disturbance of the existing ground to create additional storage may lead to increased downstream contamination. This is because this area is currently functioning as an informal treatment device for the groundwater draining from the old landfill. I therefore support the additions/amendments proposed by Brydon Hughes in his statement of evidence, in respect of additional surface and groundwater monitoring (paragraph 8.6 of his evidence). As these matters are covered in Mr Hughes' evidence I have not proposed any additional consent conditions here; however, I support Mr Hughes' proposed condition.

6. EROSION AND SEDIMENT CONTROL

6.1 NZTA's Erosion and Sediment Control Plan (CEMP Appendix H) provides detail of the proposed philosophy and approach as well as details of techniques and devices to be used to limit erosion and control sediment loss on the project. I support its general approach, and in particular the special attention and protection provided to sensitive environments including the Waikanae River, Te Harakeke/Kawakahia Wetland and its tributaries, the Waimeha Estuary and Wharemauku Stream Estuary.

6.2 However, I consider that there are a number of other wetlands which are also of value and require special attention in respect of sediment control. This is particularly because of the serious impact of sediment on any aquatic life. These wetlands comprise, at a minimum, El Rancho/Takamore Trust Wetland, Raumati Wetland (between Poplar Avenue and Raumati Road, and the Otaihanga Wetland (adjacent to Otaihanga Landfill), and I defer to the evidence of Associate Professor Death and Ms Myers in relation to this issue from an ecological perspective.

6.3 I therefore recommend that the Erosion and Sediment Control Plan be amended to include enhanced erosion and sediment control measures for, at a minimum, the following wetlands (i.e. in addition to those already specified): El Rancho/Takamore Trust Wetland, Raumati Wetland (between Poplar Avenue and Raumati Road), and the Otaihanga Wetland (adjacent to Otaihanga Landfill). Again, I defer to the evidence of Associate Professor Death and Ms Myers in relation to this issue from an ecological perspective.

6.4 The Erosion and Sediment Control Plan provides for reinstatement of cut and fill batters as a continuous process during the project, to minimise the period when slopes are exposed to wind and rain and therefore susceptible to erosion. While I support this approach, I note that for the larger cut slopes, NZTA proposes that these be reinstated

with topsoil and grass as a continuous process as excavation occurs. In my opinion, establishment of rapid vegetative cover on the larger cut slopes will require use of a mulch or hydro-seeding technique particularly during the drier months of the year in order to promote rapid and effective re-vegetation of slopes. I therefore recommend that the Erosion and Sediment Control Plan be amended to require mulch or hydro-seeding to be used on the larger cut sand slopes to minimise erosion of the slopes and sediment loss to the catchments.

- 6.5** One of the key construction staging areas for the project will be an area of land at the closed Otaihanga Landfill. This area is to be used to accommodate the construction office, plant yard and workshop as well as pre-cast concrete works. NZTA proposes using a single stormwater wetland for attenuation and treatment of sediments and contaminants from the site. Treated stormwater would be discharged to the existing stormwater wetland at the toe of the Otaihanga Landfill. This existing wetland receives leachate and runoff from the closed landfill, which then drains through shallow sand sediments to emerge in the Landfill Drain down gradient. At present there is no evidence of significant contaminants entering the landfill drain.
- 6.6** If increased runoff and contaminant discharges are directed to the wetland, there may be a change such that higher levels of contaminants may be carried downstream. While accepting that the wetland treatment proposed will minimise the discharge of any contaminants, I recommend that a consent condition be provided which requires water quality monitoring of the discharge from the wetland to ensure that levels of contaminants discharged to the Otaihanga landfill stormwater wetland are less than minor. If contaminant levels are more than minor then NZTA would be required to implement additional treatment to address the discharge.
- 6.7** The assumption of 95% efficiency for all sediment retention measures for the duration of the project through a variety of storm events appears overstated, particularly if detention ponds with physical treatment alone are proposed. I consider that the potential effect of sediment discharge to any receiving watercourse is likely to be more than minor. I therefore support the use of chemical treatment in combination with sediment ponds to ensure consistently high removal of sediment and particularly the clay fraction which contributes to colour. To achieve this, I recommend a modification to the proposed consent conditions to require that all Construction Erosion and Sediment Control Plans include chemical treatment in combination with sediment ponds, with appropriate selection of chemicals to ensure no negative impacts on the receiving environment.

7. CONCLUSION

- 7.1 Construction of the proposed Expressway has the potential to cause significant flooding, water quality and aquatic eco-system impacts within the catchments through which it passes. Mitigation of some of these effects is provided for through proposed consent conditions setting out performance requirements in respect of flooding, erosion and contaminant discharges to the receiving watercourses and flood plain areas. However, there are a number of areas where performance requirements are not specified or are unclear.
- 7.2 In order to provide greater certainty that mitigation will be adequate, I consider that several amendments and additions to the conditions are necessary (as described throughout my evidence), along with repeat modelling of the final road design prior to tender and the provision of additional information on the assessment of effects in areas where there is no flood plain model.
- 7.3 In my opinion some amendments to the erosion and sediment control plan and additional consent conditions are necessary to provide adequate protection in respect of sensitive wetlands, steep cut slopes in sand, wetland stormwater discharges from the main Otaihanga project office and yard and monitoring of sediment discharges from sediment control devices.



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