



# Meeting Records

Project number	<b>250310</b>	Meeting date	<b>24 May 2016</b>
Project name	<b>Northern Corridor Improvements</b>	Recorded by	<b>Matthew Yu</b>
Meeting/subject	<b>Auckland Council Stormwater Technical Meeting No. 1</b>	Page	<b>1 of 4</b>

Present	Apology	Copy	Name	Organisation	Contact details
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	David Hughes (DH)	Aurecon	David.W.Hughes@aurecongroup.com
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Item	Topic	Action by	Action due
<b>1</b>	<b>Introduction</b> DH introduced project background, progress and Alliance delivery model. DH explained the design team is currently gathering information and progressing to optioneering.	Note	N/A
<b>2</b>	<b>Flood model</b> KC explained the AC model was originally done in-house by North Shore District Council (2009). AECOM then took over model and updated through the years. Jahangir Islam (JI) has been working on the model for over 10 years and is currently looking after the model for Auckland Council. <i>Action – TK and JI to attend next technical meeting to discuss the model in further detail</i>	TK/JI	7 June



Item	Topic	Action by	Action due
3	<p><b>Greville Road flooding</b></p> <p>KC explained the existing flood issue at Greville Road is a concern for Auckland Transport, as it affects the level of service and safety of Greville Road during heavy rainfall events.</p> <p>KC noted previous options to improve the flooding issue include installing a 1m high bund to prevent stormwater from over-flowing from the channel running down the south side of Greville Road onto the road (existing private pond at landfill).</p> <p>KC explained that the NCI project may adversely affect the existing flood issue due to the proposed busway footprint (i.e. earthworks in the floodplain). However, DH and KC noted the effect is expected to be minor as the busway is constructed over a bridge, therefore minimising impacts on the existing overland flow path / flood plain.</p> <p><i>Action – MY to liaise with bridge designers to confirm bridge abutment locations. TK to quantify the effects (if any) of the proposed bridge on existing flooding.</i></p>	MY / TK	21 June
4	<p><b>Proposed Auckland Unitary Plan (PAUP)</b></p> <p>DH noted the NCI project consent timing will coincide with the transition between Regional Plan: Air Land and Water and the Proposed Unitary Plan.</p> <p>KC noted past discussions between Mark Izzard (MI) and Annise Raea (AR) from Opus identified that both the ALWP and PAUP need to be considered.</p> <p>KC introduced MY and DH to Adrian Percival, who will provide input from a regulatory perspective.</p> <p><i>Action – DH to discuss and confirm applicable regional requirements with the Auckland Council's regulatory team meeting on 26 May 2016. KC Lee to invite Mark Izzard to next Auckland Council meeting.</i></p>	DH / KCL	26 May
5	<p><b>Stormwater Management – General</b></p> <p>DH noted that NZTA do not typically prefer mixing stormwater assets with AC due to complexities around maintenance activities and Consent obligations.</p> <p>KC noted that if new stormwater devices are provided for the benefit of Auckland Council, cost-sharing can be considered for such assets. Generally, if there are upgrades to the existing SW assets that benefit AC and are requested by AC, the costs of these upgrade works should be funded by AC.</p> <p>MY noted a number of options are proposed in an SKM report. KC confirmed the options in the SKM and WET reports for pond upgrades have not yet been constructed.</p> <p>KC noted the design volumes in the SKM and WET reports should be used as a baseline for replacement devices (e.g. ARC Refuse Pond) as the report proposed options that could otherwise have been achieved without the NCI project.</p> <p>KC noted Auckland Council generally prefer wetlands over ponds, but ponds may be considered where the design is constrained.</p>	Note	N/A



Item	Topic	Action by	Action due
6	<p><b>Moro Pond</b></p> <p>KC noted the Detailed Business Case design removes the Moro Pond without replacing it. This may have an impact as the pond currently provides some attenuation.</p> <p>KC noted that Rowan Carter investigated options to upgrade the pond for stormwater treatment in 2010. However, all progress for upgrading ponds in the vicinity has been postponed due to the NCI project.</p> <p>KC noted Watercare Pond 2 currently overflows into Moro Pond during large rainfall events.</p> <p>MY and DH noted option to provide additional volume upstream in the proposed replacement ARC Refuse Pond to mitigate effects, with a through pipe replacing the existing open channel. This allows the space to be used for management of stormwater runoff from the motorway. KC pointed out that care must be taken to avoid reducing the existing overflow capacity of Pond 2 in any pipe option considered.</p> <p><i>Action – MY and TK to assess stormwater management options and effects on downstream environment.</i></p>	MY / TK	21 June
7	<p><b>Overflow into Watercare Ponds</b></p> <p>KC noted overflow into Watercare Ponds is not a concern from a catchment management perspective, as overflow to the ponds does not impact on existing properties / houses.</p> <p>KC noted overflow into Watercare Ponds may be a concern for Watercare due to long-term wastewater treatment operations. KC has provided future flood levels to Watercare but have not received further response on impacts to Watercare's operations.</p> <p>KC noted options that AC investigated involved the conversion of Pond 2 to stormwater pond with some options lowering the Pond 2 operational levels plus installing an additional pipe between Pond 1 and 2 to mitigate overtopping of the channel at Pond 1</p> <p>DH noted that preventing the overtopping of the interceptor channels by passing more flows downstream will require a number of very large culverts underneath the motorway, and will adversely affect downstream flooding and erosion.</p> <p><i>Action – MY and TK to assess stormwater management options and effects on downstream environment.</i></p>	MY / TK	21 June
8	<p><b>Constellation Pond (at Caribbean Drive)</b></p> <p>KC noted the existing pond volume is approximately 11,000m<sup>3</sup> based on weir levels, flood plain extents and contours.</p> <p>KC noted the existing pond attenuates stormwater discharge from the Unsworth Heights residential catchment to reduce peak flows discharging to Watercare's overland channel.</p> <p>KC noted that any replacement pond must not have a higher weir level than the existing pond. This will ensure hydraulics of the upstream stormwater network is not affected. Modelling had shown that the road sag point on Caribbean Drive just before the junction with Upper Harbour Highway has the potential to flood to a depth of more than 1m and is a H&amp;S concern.</p> <p><i>Action – MY and TK to assess stormwater management options and effects on downstream environment.</i></p>	MY / TK	21 June



Item	Topic	Action by	Action due
9	<p><b>Culvert Upgrades</b></p> <p>KC noted to be aware of downstream flooding effects when upgrading existing culverts. KC noted this is of particular concern for culverts at Rosedale Road and at Watercare Ponds. Therefore, culverts found to be in poor condition with sufficient capacity will typically be relined or replaced with a same sized culvert.</p> <p>MY raised question of applicable blockage factors. KC explained to use Auckland Council's flood model (no blockage) to assess effects of flood levels and flows on existing properties both upstream and downstream. KC noted any new culverts to be installed and the associated spill paths (overland flow paths), if any, will need to be designed for blockage based on the latest Auckland Council Stormwater Code of Practice.</p>	Note	N/A

**Next meeting:** Tuesday, 7 June 2016



# Meeting Records

Project number	<b>250310</b>	Meeting date	<b>12 July 2016</b>
Project name	<b>Northern Corridor Improvements</b>	Recorded by	<b>Matthew Yu</b>
Meeting/subject	<b>Auckland Council Stormwater Technical Meeting No. 2</b>	Pages	<b>2</b>

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Item	Topic	Action by	Action due
<b>1</b>	<b>Introduction</b> DH provided update since previous meeting, and noted Tony Miller from GHD will be representing the EPA for stormwater. DH noted project time frames are as per previously discussed.	Note	N/A
<b>2</b>	<b>Existing Model</b> JI noted AC model uses 2008 AC GIS impervious layer and noted there should be little change since. TK noted existing model does not include a number of NZTA ponds. TK will update model to properly reflect pre-dev scenario. JI advised that the pre-dev model should also adopt the same catchment delineations as the post-dev model, to remove potential artificial impacts to do with model setup rather than project impacts. TK to send KC/JI any further queries on existing model via email.	TK	Ongoing



Item	Topic	Action by	Action due
3	<p><b>Post-dev model</b></p> <p>JI noted 1D component only of model is better for optioneering because of the much shorter run-time compared to the 1D-2D coupled model.</p> <p>JI noted the same loading points can be used for pre and post-development model. Any further refinements can be done in detailed design.</p>	Note	N/A
4	<p><b>Climate change</b></p> <p>TK noted model will allow for climate change to 2120 to achieve NZTA level of service, by extrapolating mid-range temperature change of 2.1 degrees at 2090 (as per AC Stormwater CoP) to 2120.</p>	Note	N/A
5	<p><b>AC Review of model</b></p> <p>KC/JI noted that they can review model updates prior to lodgement. TK to send through model updates once completed with memo summarising key changes.</p>	TK	Ongoing
6	<p><b>New Bridges</b></p> <p>TK noted HEC-RAS will be used to determine change in flood levels at bridges where they impact on existing channels.</p>	TK	Ongoing
7	<p><b>Watercare ponds</b></p> <p>KC noted overflow into Watercare Ponds is not a stormwater issue as no flooding of properties or infrastructure results from it. Watercare has indicated that they may have an operational issue.</p> <p>KC noted options were investigated at Watercare's requests to minimise overtopping to Watercare's ponds – with use of a 1.2m bund along channels and upgrade of 1.5m Ø twin culvert under motorway.</p> <p>KC noted the council has a planned upgrade project for Pond 1 (Constellation pond) that involved raising the existing bund and modifying the pond outlet.</p> <p>DH noted it is not part of the NCI project scope to improve existing channel overtopping situation. However, project works should not adversely affect overtopping into Watercare ponds.</p> <p>MY to invite KC to upcoming Watercare meeting.</p>	MY	15 July
8	<p><b>Culvert strategy</b></p> <p>KC noted poor condition culverts that have adequate hydraulic capacity should be replaced with culverts of same size.</p> <p>KC noted culvert upgrades in built-up areas shall not increase upstream headwater levels, or downstream flowrates.</p> <p>KC noted assessment of existing culvert capacities do not need to include blockage factor. This is only required for design of overland flow paths.</p> <p>KC noted there is no preference on debris structure but the operational details have to be reviewed by the Stormwater Unit's Operations team.</p>	Note	N/A
9	<p><b>AC comments from DBC</b></p> <p>MY to update tracking register provided by Opus with current project progress and send to KC for comment.</p>	MY/KC	15 July

**Next meeting:** Tuesday, 26 July 2016



# Meeting Records

Project number	<b>250310</b>	Meeting date	<b>14 September 2016</b>
Project name	<b>Northern Corridor Improvements</b>	Recorded by	<b>Matthew Yu</b>
Meeting/subject	<b>Auckland Council Stormwater Technical Meeting No. 3</b>	Pages	<b>3</b>

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Item	Topic	Action by	Action due
<b>1</b>	<p><b>Introduction</b></p> <p>The main focus of the meeting was to discuss the results and proposed option for the replacement of the Auckland Council Ponds (Constellation Pond, ARC Refuse Pond and Moro Pond).</p> <p>DH provided update on project progress and time frames.</p> <p>DH noted the proposed solution is driven by water quantity control (flood attenuation). The purpose is to prove a concept that results in neutrality to allocate the required space for the project.</p>	Note	



Item	Topic	Action by	Action due
2	<p><b>AC Summary of Model Review</b></p> <p>KC provided a summary of the model review</p> <p>KC noted the model and options were reviewed in a series of internal Auckland Council workshops</p> <p>KC noted there are no major issues with the model and results have been run correctly</p> <p>KC noted results show a reduction in overflow volume to Pond 1, increase in Pond 2 but overall the overflow volume is reduced. Downstream, there are only slight increases in flows and flood levels due to the throttling effect of the 1200mm dia outfall culvert.</p> <p>KC noted this was achieved by passing flows through earlier to avoid the coincidence of peak flows from the ARC Refuse and Unsworth catchments.</p> <p>KC noted further refinements can be made to the proposed option, such as sizing of outlets and additional storage volume, to provide further improvements. DH and CM however noted that the goal of achieving hydraulic neutrality has been achieved by the proposed design.</p>	Note	
3	<p><b>Water Quantity Control – Downstream Hydraulic Effects</b></p> <p>KC and JI noted the system is throttled by the existing 1200mm outlet pipe downstream of the Watercare ponds.</p> <p>DH and CM noted the model results show there are no downstream adverse effects as a result of the project.</p> <p>KC agreed that apart from the increased overflow to Pond 2, there are no downstream adverse effects in terms of water quantity control.</p> <p>CM and KC noted that any additional pond volume increases from the proposed option would only be for the benefit of Watercare, due to the 1200mm outlet pipe throttle limiting further effects downstream.</p> <p>DH noted the proposed option has been tabled with Watercare, and they are accept in principle the modelling results which show that Pond 1 overflow has decreased, at the expense of a minor additional overflow into Pond 2. CM also noted that Aurecon had discussed the modelling results with Watercare and they understood that the only way to decrease overflows further was by providing a larger storage area which would create a larger impact and footprint on Watercare’s land which was not an acceptable outcome for them given their future expansion plans.</p> <p>KC noted as long as additional overflow into Pond 2 is acceptable to Watercare, then the proposed solution is acceptable to AC in terms of water quantity management as there are no adverse effects downstream of the Watercare Ponds.</p> <p><b>CM</b> to obtain written response from Watercare to confirm their acceptance of the modelling.</p>	CM	30 Sep





Item	Topic	Action by	Action due
4	<p><b>Water Quality Treatment</b></p> <p>KC noted Auckland Council's general preference is wetlands over wet ponds.</p> <p>DH noted the design proposes wetlands where possible for management of motorway stormwater runoff which in the case of the current design is in the majority of cases. However, to replicate WQ volumes in some existing Auckland Council wet ponds, wetlands are not achievable due to the land spatial constraints. In these instances it is currently proposed to provide a like for like solution (wet pond).</p> <p>Jl and KF noted there a number of Auckland Council wetlands that dry out without adequate base flow - wet ponds are less prone to drying out.</p> <p>DH noted the design will proceed to provide a wet pond to replace the WQV in the existing ARC Refuse Pond.</p>	Note	
5	<p><b>AC Planned Upgrades</b></p> <p>KC noted a pond upgrades optioneering exercise was undertaken a number of years ago.</p> <p>KC noted the construction budget for upgrades was in the order of \$1.5M.</p> <p>KC noted these upgrades were in Auckland Council's programme and was instructed to go on hold as a result of the NCI project.</p> <p>KC noted upgrades to catchment treatment were proposed and AC is concerned about the loss of opportunity to upgrade ponds for treatment as a result of the NCI project.</p> <p><b>KC</b> to provide WEC and SKM reports on pond upgrade options.</p>	KC	23 Sep
6	<p><b>Attenuation Requirements (Alexandra Stream Catchment)</b></p> <p>DH noted the PAUP required flooding to not be increased in other properties up to the 10-year ARI event.</p> <p>KC noted from a catchment management perspective, he is only concerned about flood protection of habitable floors. However, PAUP rules may require additional controls.</p> <p>KC noted MI is in a better position to advise on catchment attenuation requirements with regards to the PAUP rules.</p> <p><b>MY</b> to provide memo summarising flood attenuation requirements for MI to comment.</p>	MY	30 Sep

**Next meeting:** TBC



# Meeting Records

Project number	<b>250310</b>	Meeting date	<b>17 August 2016</b>
Project name	<b>Northern Corridor Improvements</b>	Recorded by	<b>Michelle Burns</b>
Meeting/subject	<b>Auckland Council Stormwater Unit Meeting</b>	Pages	<b>2</b>

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Item	Topic	Action by	Action due
1	<b>Overview of the Project</b> DH provided overview of project, going through the proposed design from south to north. Key things covered included, treatment / attenuation assessment strategy (as per consultation with KC Lee), detail to be provided for Consent, Cross drainage locations, works extents etc.	Note	
2	<b>Flood modelling progress update</b> DH noted that the NCI team had successfully completed their project flood assessment using the model information provided from Auckland Council (KC Lee) and were looking to send it back to Auckland Council for verification next week.	TK / MY	26/08
3	<b>Local Road drainage works</b> DH noted that there will be adjustments and connections to public AC stormwater assets within local road designations (outside of the NZTA designation), but finer details on this design wouldn't be confirmed until detailed design. MI appreciated this and advised that the AC CoP is to be referenced during the detailed design.	Note	



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4	<p><b>Retention</b></p> <p>The project falls within SMAF areas, which requires retention. MY explained however, for this project retention is not practically possible due to high localised groundwater levels and low soil infiltration rates (less than 2mm/hr), as well as there being no safe, feasible opportunity to re-use stormwater on-site, in accordance with the Auckland Unitary Plan Independent Hearing Panel Recommendation 22 July 2016. MY explained detention will be provided without reduction allowance for retention. An assessment has been carried out by the NCI Geotech team, which advises on infiltration rates. MI agreed and explained that the BPO approach is also acceptable. DH mentions the geotech technical memo will be provided with the Consent application.</p>	Note	
5	<p><b>Existing Network Discharge Consent</b></p> <p>MY noted that within the proposed designation, only one outfall was found that was covered by AC's network discharge consent. MI noted potential to use the NDC as a template for the other proposed outfalls.</p>	Note	
6	<p><b>Moro Pond Channel</b></p> <p>MI noted no concerns about culverting the man-made channel/stream north of Pond 2, however he did note that an assessment will need to show that there is compensatory SEV values elsewhere to mitigate any lost, which is expected to be small as it is a concrete channel.</p> <p>MB to confirm whether the channel is included in the definition of a stream.</p>	MB/DM	26/08
7	<p><b>Assets not covered by NDC</b></p> <p>Where there is no existing AC network discharge consent, asset owner approval is required. MI explained this can be carried out using a standard Auckland Council Engineering Approval Process.</p>	Note	
8	<p><b>Cut-off drains</b></p> <p>MY and DH noted motorway designation has been widened slightly at some locations where required to allow for stormwater cut-off drains. Cut-off drains are proposed to manage cross catchment flow such that flood risk to adjacent properties is appropriately mitigated.</p>	Note	
9	<p><b>NZTA and Auckland Council Assets</b></p> <p>DH noted that the philosophy from the beginning of the Project has been to keep AC and NZTA stormwater assets separate. This has been reflected in the design thus far.</p>	Note	
10	<p><b>Summary</b></p> <p>Overall, MI did not have concerns with the approach to stormwater management of the assessment that is being proposed for the NCI Project.</p> <p>MI noted that he was OK in principle with the level of detail that the stormwater team was proposing to put forward with the application.</p> <p>MI noted regular consultation should continue with KC Lee (Auckland Council) to align on flood assessment work.</p> <p>MI recognises that the NCI Project is a long process with multiple opportunities to refine technical details during the detailed design phase (i.e. during the Engineering Approval Process).</p>	Note	



# Meeting Records

Project number	<b>250310</b>	Meeting date	<b>26 May 2016</b>
Project name	<b>Northern Corridor Improvements</b>	Recorded by	<b>David Hughes</b>
Meeting/subject	<b>AC Construction Water Management and Stormwater Matters Meeting</b>	Page	<b>1 of 2</b>

Present	Apology	Copy	Name	Organisation	Contact details
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	David Hughes (DH)	Aurecon	David.W.Hughes@aurecongroup.com
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Owen Burn (OB)	Green Group	Owen@greengroup.co.nz
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Graeme Ridley (GR)	Ridley Dunphy	graeme@ridleydunphy.co.nz
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Andrew Gysberts (AG)	Auckland Council	Andrew.Gysberts@aucklandcouncil.govt.nz
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Matt Byrne (MB)	Auckland Council	Matt.byrne@aucklandcouncil.govt.nz
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Trent Sunich (TS)	4Sight Consulting	trents@4sight.co.nz
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hillary Johnston (HJ)	Auckland Council	Hillary.Johnston@aucklandcouncil.govt.nz
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Tallulah Kaegi	Aurecon	Tallulah.Kaegi@aurecongroup.com
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Matthew Yu	Aurecon	Matthew.Yu@aurecongroup.com
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Gary Moore	Aurecon	Gary.Moore@aurecongroup.com
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Andrew Douglas	Aurecon	Andrew.Douglas@aurecongroup.com
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Louise Strogen	Aurecon	Louise.Strogen@aurecongroup.com
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Peter Mitchell (PM)	AMA	Peter.Mitchell@ama.nzta.govt.nz
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Kenny See (KS)	NZTA	Kenny.See@nzta.govt.nz
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Ken Clive (KC)	Auckland Council	Ken.Clive@aucklandcouncil.govt.nz
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	David Greig (DG)	NZTA	David.Greig@nzta.govt.nz

Item	Topic	Action by	Action due
<b>1</b>	<b>Earthworks (Graeme R / Matt B)</b>		
1.1	Lodgement of consent expected end of October / November 2016.	Note	
1.2	PAUP subject to a 22 <sup>nd</sup> August decision and a 22 <sup>nd</sup> Sept appeals date.	Note	
1.3	Will not be aware of exact position of PAUP until after appeals however on current information it appears that earthwork provisions will not be amended significantly. Will need to also take into account the ARP: SC at this time however this has similar provisions from a technical perspective.	Note	
1.4	GR and MB will liaise over time on this matter.	Note	
1.5	Use of TP 90 / NZTA Guideline or Updated TP90 (GD05) – Matt B confirmed that project can use whatever is considered most appropriate however the use of the most stringent provisions will likely apply.	Note	
1.6	Due to the cut and cover principles and minimal use of traditional ESC measures this is not expected to be a significant issue.	Note	



Item	Topic	Action by	Action due
1.7	GR and Matt Byrne will liaise over time on this matter.	Note	
1.8	Matt Byrne will send a copy of GD05 (draft) to GR.	MB	completed
1.9	Lessons learnt from Southern Corridor – MB will advise. GR can also liaise with Bridget Wild on this aspect (GR to set up a meeting)	MB	completed
<b>2</b>	<b>Stormwater (David H, Trent S, Hillary J)</b>		
2.1	DH / OB provided a brief overview of the project, in particular project procurement, preliminary timeframes, stormwater design progress / philosophy, existing SW features.	Note	
2.2	DH queried design guidelines / rules to be applied for stormwater management (quality, quantity) - ALWP vs. PAUP. AG noted AC still unsure what the PAUP decisions (and appeals) will mean for SW provisions, TS will send through Council recommended PAUP Stormwater rules document for reference in the meantime.	TS	completed
2.3	DH noted use of proprietary SW treatment devices is likely for SW management over the project due to constrained works area. AC noted verification of proprietary design is required for lodgement. DH to ensure compliance.	Note	
2.4	DH noted flooding assessment underway based on model / info provided from AC SW unit (KC Lee on 28/04). OB noted that further discussion with AC unit should be limited to flood assessment coordination until decision on EPA in mid-June. DH to note.	Note	
2.5	DH noted all attempts would be made to provide treatment of existing and proposed impervious surfaces, with focus on high contaminant areas as with SCI. TS noted diminishing returns to be considered in SW design.	Note	
2.6	Thorough options and BPO assessment is to be provided in the application for areas where full compliance with treatment standard cannot be achieved due to site constraints. DH noted difficulty in achieving retention within the corridor due to impermeable geology and limited green space, TS noted that SMAF rules are in the process of being reviewed by the Independent Hearings Panel and await PAUP decisions in August 2016.	Note	
2.7	TS noted the need to consider water quantity assessment in relation to adverse erosion potential and flood risk resulting from the project. DH noted this is a key focus of the consent design and work has begun with the NCI environmental team and the AC SW unit to understand downstream effects associated with additional impervious areas.	Note	
2.8	DH noted coordination with WSL on management of NCI SW runoff from adjacent to existing WSL ponds is still ongoing.	Note	
2.9	DH to keep AC team informed on design progression, particularly over the next few months during the refinement of the alignment and associated stormwater management design decisions.	Note	

**Next meeting:** TBC – expected immediately following EPA decision

Date: 7-Sep 2016

	AC's Comments on Option 0A	Aurecon's Response (16 September 2016)	AC's Comments (19-Sep 2016)	Aurecon's Response (29 September 2016)
1	<b>CONSTELLATION POND</b>			
1.1	<p><b>Model review:</b> We have reviewed the model; the model review form prepared by Jahangir Islam is attached for your information. The comments will have only minor effects on the model.</p> <p>It appears that the re-configured smaller replacement pond (Option 0A) which passes flows downstream earlier performs slightly better than the existing pond configuration. Watercare may have some comments on the higher overflow volume into Pond 2 from an operations perspective.</p> <p>This is one possible option; we are unclear at this stage whether this would be the optimum pond size or best practical option for the pond configuration. It is possible that better overall benefits could be achieved by other improvements on the configuration of the existing Constellation Pond (no size reduction). We are unable to agree</p>	<p>Modelling review comments noted – we will amend the models based on review comments, and report back.</p> <p>Noted hydraulic performance improvement for Option 0A. Increased overflow volume to Pond 2 will be agreed with Watercare.</p> <p>The objective of the consent design is to demonstrate a BPO that minimises adverse effects and secure a designation required to achieve those results.</p> <p>As noted in meeting with Auckland Council on 14/09/16, the proposed</p>	<ul style="list-style-type: none"> <li>• Iwi will have strong views on whether the issue of stormwater entering the wastewater ponds should be resolved as part of this project. We recommend that NZTA take this to their Information Hui, as it would be a project risk to make the decision around the future of this situation without their consultation</li> <li>• The replacement SW ponds which are public assets should be vested to Council. Additionally, please note that Section 136 of the RMA requires the land under a dam to be in the same ownership as the consent holder. This will require the land under the proposed ponds to be vested to AC.</li> <li>• AC will require safe and unfettered maintenance access to the ponds and dam</li> </ul>	<p>The Iwi has been consulted through the design process and is aware of existing overflows into Watercare ponds.</p> <p>Noted – to be processed as part of the legalisation process post-construction.</p> <p>Noted – access track will be provided around replacement ponds. This</p>

	<p>to a reduction in pond size or commit to an “off-line” pond configuration at this stage. The replacement of the Constellation Pond should be on a “like for like” basis in terms of storage volume.</p>	<p>model demonstrates hydraulic neutrality in terms of downstream hydraulic effects. It was agreed in the meeting that any further volume increases of pond sizes from the proposed option will only benefit Watercare, as downstream is throttled by the existing 1200mm pipe but also disadvantage Watercare as the only land available to provide the additional storage (pond size) is owned by Watercare. Written confirmation will be obtained from Watercare for their acceptance of the proposed solution.</p>	<p>structures.</p> <ul style="list-style-type: none"> <li>• The peak flows downstream are actually higher post Option 0A than the pre-development scenario in both the 10-year and 100-year events although the volume spilling into Watercare’s Pond 1 is reduced. Hydraulic neutrality has not been achieved.</li> <li>• The overall benefit from the Constellation pond or its replacement is not only for Watercare, the other benefit required to be achieved by the pond is to the water quality which discharges ultimately into Lucas Creek.</li> </ul>	<p>will be included in the project requirements going forward.</p> <p>Noted minor increases. The effects of the minor increase will be reported on.</p> <p>The existing Constellation Pond does not currently provide treatment, therefore the replacement solution does not include treatment function – i.e. like for like. Any loss of opportunity of upgrades to be further discussed.</p>
1.2	<p><b>Stormwater Treatment:</b> The Constellation pond is currently a dry pond but there are plans to upgrade the pond to treat flows from the Unsworth Heights sub-catchment, to provide EDV to mitigate erosion downstream, provide fish passage, planting a buffer strip around the pond, provide a forebay, maintenance track and sediment drying area. This planned project has been “on-hold” for</p>	<p>Auckland Council’s upgrade desires require additional land from Watercare, which will impact on Watercare’s Wastewater Treatment Plan expansion plan.</p> <p>For consenting purposes, the design has demonstrated effects are not adversely increased from the pre-development scenario.</p>	<ul style="list-style-type: none"> <li>• We have planned to construct the proposed water quality improvement works within the area marked by the 100-year flood plain, in other words; no increase in the pond footprint was intended. With the replacement site, we require that the ability to carry out the project as planned should be retained. Whether the land is</li> </ul>	<p>As per comments above: The existing Constellation Pond does not currently provide treatment, therefore from an effects point of view, the replacement solution does not include treatment function – i.e. like for like replacement. Any loss of opportunity of upgrades to be further</p>

	<p>several years as it is affected by the NCI project.</p> <p>The ability to implement the abovementioned water quality project to TP10 requirements should not be lost with the replacement of the Constellation Pond.</p> <p>Option 0A proposes a wet pond of 850m<sup>3</sup> which does not appear to be TP 10 compliant. We prefer having a wetland to a wet pond and are open to the option of having a wetland with EDV and additional storage achieved by allowing stormwater to be impounded over the wetland. Further discussions on the treatment options will be useful for both parties.</p>	<p>As noted below in 2.1, a replacement of the ARC Refuse Pond will be provided on the west side of SH1. This removes the need for providing a wetland at Constellation Pond, as this was originally proposed to offset mitigate the loss of ARC Refuse Pond.</p>	<p>now smaller in area or larger compared to the earlier site is a matter of pond configuration and layout planning.</p> <ul style="list-style-type: none"> <li>• There is a project plan: N-CONT-0070 prepared in 2012 to upgrade the Constellation pond. The estimated project cost then was about \$1,600,000 and the planned construction year was 2014/15. AC's ability to carry out this project for improving stormwater quality in the catchment should be retained.</li> </ul>	<p>discussed.</p> <p>Noted. Any loss of opportunity of upgrades to be further discussed.</p>
2	<b>ARC REFUSE POND</b>			
2.1	<p><b>Stormwater Treatment:</b> The ARC Refuse pond serves a catchment of 15.2ha with the land use almost entirely of roads, motorway and commercial/industrial properties. There are existing plans to upgrade this pond as stated in the comments issued on 20-Aug 2015.</p> <p>The pond should be removed as the existing treatment of flows from the</p>	<p>A replacement wet pond with the same water quality volume will be provided on the west of SH1.</p>	<ul style="list-style-type: none"> <li>• The effects of relocating the ARC Refuse pond from its existing location to a new location west of the motorway need to be modelled and the effects, both upstream and downstream of the pond should be investigated.</li> <li>• The design of the treatment ponds including that for the</li> </ul>	<p>Model to be updated to include replacement pond.</p> <p>The consent design has demonstrated a</p>



	<p>15.2Ha catchment will be lost and so will the ability to implement the planned upgrade works. A suitable replacement site is required.</p>		<p>Constellation pond should be developed in close consultation with AC's HW bearing in mind that the preference is to have wetlands instead of wet ponds.</p> <ul style="list-style-type: none"> <li>• There is a project plan: N-CONT-0057 prepared in Feb 2012 to upgrade the ARC Refuse pond. The estimated project cost then was about \$450,000 and the planned construction year was 2014/15. AC's ability to carry out this project for improving stormwater quality in the catchment should be retained.</li> </ul>	<p>replacement wet pond can be provided within designation. Project requirements will require the delivery consortium to consult and obtain AC approval for assets to be vested in AC.</p> <p>Noted. Any loss of opportunity of upgrades to be further discussed.</p>
<p>2.2</p>	<p><b>Peak Flow Attenuation</b> The removal of the pond do increases discharge through the pipe immediately downstream of the pond although modelling has shown that in total there is a reduction in overflow volume resulting from the staggered peak flows. A lot more work need to be done before a conclusion can be drawn that the removal of the peak flow attenuation capability of the pond is indeed beneficial. Given the scenario, the replacement of the</p>	<p>As noted in meeting with Auckland Council on 14/09/16, the proposed model demonstrates hydraulic neutrality in terms of downstream hydraulic effects. It was agreed in the meeting that any further volume increases of pond sizes from the proposed option will only benefit Watercare, as downstream is throttled by the existing 1200mm pipe but also disadvantage Watercare as the only land</p>	<ul style="list-style-type: none"> <li>• A written confirmation from Watercare on their acceptance of the modelled overflows into Pond 1 and 2 (Option 0A) is required.</li> </ul>	<p>Noted. Written confirmation of Watercare's position will be obtained prior to lodgement.</p>

	ARC Refuse Pond should be “like for like” in terms of storage volume.	available to provide the additional storage (pond size) is owned by Watercare. Written confirmation will be obtained from Watercare for their acceptance of the proposed solution.		
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## MODEL QA/QC

### Stormwater Catchment: Oteha Valley

Review Number: 1

Reviewer: Jahangir Islam

Affiliation: AECOM

Model Created By (Person/Organisation): Tallulah Kaegi, Aurecon.

Date: 30 August 2016

### *General Information*

Items	Findings
Model Version	MIKE URBAN 2016
Model file names & dates	OtehaValley_MU_EDOptions_CC2121_100yr.mdb (converted to version 2014)

***Model review relates to the NCI pond replacement options models only.***

**Detailed Checklist:**

Rating at right of each table below: 0 – Not an issue    3 – Major Issue will effect model output

**Catchment Hydrology**

Item Checked	Findings & Comments	Rating	Response
Entire Catchment boundary check.	N/A	0	
Sub-Catchment area ranges.	Sub-catchments (OTH0199 – Pond 1 and OTH033 – Pond 2) impervious and pervious areas differ from the original Oteha Catchment model, which is not appropriate. Water bodies should be considered as impervious area.	2	Agree – has been updated. Note that the catchment shapefile provided by AC does not match the model parameters and it would be a good idea to update it to match.
Spot check of sub-catchment boundaries and their inflow node assignment.	N/A	0	
Hydrological modelling methodology used.	N/A	0	
Sub-Catchment pervious and impervious areas modelling method.	N/A	0	
Sub-Catchment impervious area % ranges in existing and future scenarios.	N/A	0	

<b>Item Checked</b>	<b>Findings &amp; Comments</b>	<b>Rating</b>	<b>Response</b>
Spot check of sub-catchment time of concentration.	N/A	0	
SCS CN ranges in existing and future scenarios.	N/A	0	
Initial abstraction (Ia) ranges in existing / future scenarios.	N/A	0	
Hydrological model simulation period and time steps.	Hydrological model simulation period (24 hours) and time step (60 sec) used in the model are appropriate.	0	

### ***Network Hydraulics***

<b>Item Checked</b>	<b>Findings &amp; Comments</b>	<b>Rating</b>	<b>Response</b>
Naming conventions used in the model.	N/A	0	
Node diameter ranges in the model.	Node diameters used in the options model are appropriate.	0	
Node cover type in the model.	Manhole cover types in the model are appropriate.	0	
Spot check of node invert levels in the model compared to the AC GIS asset database.	N/A	0	

Item Checked	Findings & Comments	Rating	Response
Spot check of node ground levels in the model compared to the AC GIS asset database.	N/A	0	
Spot check of model basin storage volume compared to the LiDAR contours.	N/A	0	
Basin modelling method and representation in the model.	Basin modelling method and representation in the model are appropriate.	0	
Checking of all depression areas included in the model.	N/A	0	
Spot check of model pipe diameters compared to the AC GIS asset database.	N/A	0	
Pipe diameter decreasing in downstream direction.	N/A	0	
Any negative pipe grade in the model.	N/A	0	
Pipe lengths less than 10m used in the model	N/A	0	
Spot check of modelled cross-sections compared to the LiDAR contours.	N/A	0	
Spot check of modelled cross-sections whether it included low flow channel.	N/A	0	

Item Checked	Findings & Comments	Rating	Response
Modelled overland flow paths locations and downstream connectivity.	Modelled overland flow paths are appropriate.	0	
Long section check through pipe/channel network.	Long profiles through the pipe network are appropriate.	0	
Manhole head losses in the model.	Manhole head losses are appropriate.	0	
Culvert/pipe inlet & outlet head losses in the model.	Pipe inlet (ARCPondOutlet) losses should be modelled using Classic Method (max loss limit – velocity head) with Total HLC = 0.5 (entrance loss).	1	Agree – has been updated.
Bridge modelling parameters in the model.	N/A	0	
Link roughness values used in 1D model (Manning's n).	Pipe (ARCOutletPipe) roughness should be modelled as "Concrete (Normal)".	1	Agree – has been updated.
Surface roughness values in 2D model (Manning's n).	N/A	0	
Soakage modelling methods and representation in the model.	N/A	0	
ARI capacity of soakage outlets.	N/A	0	
Culvert / basin overflow modelling method and representation in the model.	Basin overflow modelling method is appropriate.	0	
Spot check of model weir crest levels compared to the connecting manhole node ground levels.	Model weir crest levels were appropriate.	0	

Item Checked	Findings & Comments	Rating	Response
Weirs crest widths in the model.	Weir crest widths were appropriate.	0	
1D-2D linking/coupling parameters in the model.	N/A	0	
Spot check of modelled peak velocities in pipes.	Pipe velocities are appropriate.	0	
Comparison of hydraulic modelled peak flows and runoff volume with the TP108 graphical method at critical locations.	N/A	0	
Maximum dx value used in MIKE11 model.	N/A	0	
Blocking out cells when open channel modelled in MIKE11 model.	N/A	0	
Hydraulic model simulation period and time steps.	Hydraulic model simulation period (24 hours) and time step (1 to 5 sec) used in the model are appropriate.	0	

### **Boundary Conditions**

Item Checked	Findings & Comments	Rating	Response
Design rainstorm shape and total rainfall in the model.	100yr ARI 24-hour future (2121) rainfall depth should be 273mm.	1	We have not changed this as it is consistent with the rest of the project. We have provided rainfall calculations and assumptions in the stormwater report.



Downstream boundary condition.	N/A	0	
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### **Model Performance**

<b>Item Checked</b>	<b>Findings &amp; Comments</b>	<b>Rating</b>	<b>Response</b>
Overall mass balance (should be < 5%).	Mass balance is appropriate.	0	
Spot check of any instability in model results.	No major instabilities were found in the model.	0	

**Recommendations**

Item Checked	Findings & Comments	Response
<p><b>Actions to be undertaken</b></p>	<p>The following modelling issues are found which are expected to be of minor effects on the model results in relation to the predicted overflow volumes into Pond-1 and Pond-2:</p> <ul style="list-style-type: none"> <li>• Sub-catchments (OTH0199 – Pond 1 and OTH033 – Pond 2) impervious and pervious areas are different from the original Oteha Catchment model, which are not appropriate. Water bodies should be considered as impervious area.</li> <li>• The proposed pipe inlet losses at the proposed ponds should be modelled using Classic Method (max loss limit – velocity head) with Total HLC = 0.5 (entrance loss).</li> <li>• The proposed pipe roughness should be modelled as “Concrete (Normal)”, in some options modelled as “Concrete (smooth) which is not appropriate.</li> <li>• 100yr ARI 24-hour future (2121) rainfall depth should be 273mm, a rainfall depth of 270mm is used in the model which is not appropriate.</li> <li>• The predicted peak water levels in Pond-1 and Pond-2 can be used for comparisons between scenarios but should not be used as absolute values as the outfall in the model is based on old NSCC outfall and the initial water levels in the ponds used in the model are not the current operating levels.</li> </ul>	<p>Refer to responses above</p>