

# West Gate Tunnel Project

## Report of Melanie Collett

### 1 Introduction

My firm **AECOM** prepared the technical report titled **Surface Water Assessment (Technical Report)** which is included as Technical Report **E** to the Environment Effects Statement (**EES**) for the West Gate Tunnel Project (**Project**).

The role that I had in preparing the Technical Report was as the Reviewer and Approver. Other significant contributors to the Technical Report and their expertise is set out as follows:

Team Member	Role	Qualifications
Lisa Roach	Technical Report Author	BE (Env) Hons
Robin Bishop	Technical Report Author	BE (Env)

I adopt the Technical Report, in combination with this document, as my written expert evidence for the purposes of the West Gate Tunnel Project Inquiry and Advisory Committee's review of the EES, draft planning scheme amendment and works approval application.

### 2 Qualifications and experience

Appendix A contains a statement setting out my qualifications and experience, and the other matters raised by Planning Panels Victoria 'Guide to Expert Evidence'.

A copy of my curriculum vitae is provided in Appendix B.

### 3 Further work since preparation of the Technical Report

Since the Technical Report was finalised, I have not undertaken any further work in relation to the matters addressed in the Technical Report relevant to the Project.

### 4 Written Submissions

#### 4.1 Submissions Received

I have read the public submissions to the EES, draft planning scheme amendment and works approval application and identified those that are relevant to the Technical Report and my area of expertise. These include the following submissions:

17, 34, 106, 123, 138, 182, 184, 199, 317, 327, 343, 344, 354, 368, 378, 380, 422, 434, 441, 442, 454, 495

#### 4.2 Summary of Issues Raised

The submissions have raised the following issues relevant to my area of expertise:

Submission number	Issue/s
17	Where will the bank widening be undertaken?

Submission number	Issue/s
34	Concern about the impact of the project on the Maribyrnong River
106	Water quality monitoring required Use of recycled stormwater for irrigation
123	Land subsidence during construction could cause further flooding and drainage issues
138	Drainage of the shared use path and existing footpaths
182	The retarding basin at the northern portal including inundation due to retention of water at the maintenance road and the presence of insects and mosquitos in the wetland.
184	<p>Dynon Road Connection</p> <ul style="list-style-type: none"> <li>- Piers in the waterway (Moonee Ponds Creek)</li> <li>- Climate change impacts</li> <li>- Impact on flood levels in Arden/Macaulay</li> </ul> <p>Wurundjeri Way Extension</p> <ul style="list-style-type: none"> <li>- Piers in the waterway (Moonee Ponds Creek)</li> <li>- Flooding in Dudley Street</li> </ul> <p>Maribyrnong River crossing</p> <ul style="list-style-type: none"> <li>- Water quality during construction</li> <li>- Impact of bank widening works needs to be considered</li> </ul> <p>Veloway</p> <ul style="list-style-type: none"> <li>- Impact of the crossing over Moonee Ponds Creek</li> </ul> <p>Evaluation objectives</p> <ul style="list-style-type: none"> <li>- Impact of the project on water quality</li> <li>- Impact of the project on flood levels</li> <li>- Requirement for Water Sensitive Urban Design (WSUD)</li> <li>- Impact of the project on local drainage</li> </ul>
199	Building of flood gates
317	Flooding in Dudley Street
327	Sea level rise

Submission number	Issue/s
343	<p>Spills and litter entering Moonee Ponds Creek</p> <p>Maintenance requirements for Moonee Ponds Creek</p>
344	<p>Piers in Moonee Ponds Creek</p> <p>Water quality during construction</p> <p>Widening of the banks on Moonee Ponds Creek</p>
354	<p>Piers in Moonee Ponds Creek</p> <p>Water quality during construction</p> <p>Widening of the banks on Moonee Ponds Creek</p>
368	<p>Require baseline water and sediment quality monitoring program</p> <p>Recommend monitoring data be used to develop plans</p> <p>Require demonstrated compliance with State Environment Protection Policy Waters of Victoria (SEPP Wov)</p> <p>Require SW1 be re-worded</p> <p>Require the Construction Environmental Management Plan (CEMP) to include a Surface Water Management Plan</p>
378	<p>Water treatment and management</p> <p>Need to include WSUD and stormwater harvesting</p> <p>Managing compliance during construction (water quality)</p> <p>Drainage asset condition assessment prior to and following construction</p> <p>New drainage assets to be designed to 1 in 20 Annual Exceedance Probability (AEP) standard</p> <p>No increase in flood levels, or a Planning Scheme Amendment for new flood extents</p>
380	<p>Pollution of the Maribyrnong River</p>
422	<p>Piers in the Maribyrnong River</p> <p>Piers in Moonee Ponds Creek</p>

Submission number	Issue/s
434	<p>Kororoit Creek</p> <ul style="list-style-type: none"> <li>- Piers in the floodplain and requirement for debris clean-up following a flood event</li> <li>- Water quality</li> </ul> <p>Stony Creek</p> <ul style="list-style-type: none"> <li>- Piers in the floodplain and requirement for debris clean-up following a flood event</li> <li>- Water quality</li> </ul> <p>Maintenance of the wetlands</p> <p>Moonee Ponds Creek</p> <ul style="list-style-type: none"> <li>- Piers in the floodplain and requirement for debris clean-up following a flood event</li> </ul> <p>Additional details on the drainage and wastewater required</p>
441	<p>Melbourne Water would not like to see piers in waterways unless there is no alternative</p> <p>Concerned that the EES doesn't fully assess the cumulative impacts of the Project</p> <p>Water quality modelling – new guidelines</p> <p>Additional stormwater treatment is required to achieve acceptance by Melbourne Water. This could be achieved through offsets (in partnership with Melbourne water, local government, Parks Victoria, VicRoads and developers).</p> <p>The design doesn't meet Melbourne Water Performance Criteria. Further assessment of the detailed modelling will be undertaken to determine whether modelling approach is acceptable to Melbourne Water.</p> <p>Approval for Maribyrnong River and Moonee Ponds Creek mitigation measures is required – the use of vertical retaining walls and/or benching is not considered to be an acceptable solution</p>
442	Construction of piers and impact on flow in Stony Creek
454	Flood protection for tunnel portals and the impact of climate change on this
495	<p>Opportunity for water re-use from wetland</p> <p>Opportunity for creek re-naturalisation</p>

### 4.3 Response to Issues Raised

Set out below are my comments and response to the issues raised by the written submissions relevant to the area of my expertise. I have grouped these into four categories; water quality; waterways; flooding and other issues.

## **Water Quality**

Two submissions (184 and 378) request water sensitive urban design (WSUD) to be incorporated into the design. WSUD has been incorporated into the design where possible, with SWP2 requiring stormwater treatment be integrated into the design in accordance with the relevant VicRoads and Environment Protection Authority (EPA) guidelines.

Submissions 106, 378 and 495 request that stormwater harvesting be considered, for irrigation of roadside vegetation and public open spaces. SWP8 requires that stormwater or recycled water be used where available and practicable during construction. Stormwater harvesting is an appropriate technique to meet SWP2 and stormwater harvesting facilities may be considered as part of the detailed design.

A number of submissions (106, 184, 344, 354, 368 and 378) note their concerns with water quality during and after construction. SWP4 requires a baseline water quality monitoring program to be developed and implemented prior to construction (this addresses a request of submission 368). The results from this monitoring program would then be used to develop the surface water management requirements in the CEMP (SWP7) as requested by submission 368, and used to ensure that any discharges during construction meet the State Environment Protection Policy (SEPP) Waters of Victoria requirements (SWP1) – another request of submission 368. The CEMP will include details on how water quality will be monitored during construction, to ensure that it complies with the SEPP (WoV).

The design includes a wetland for water quality treatment near the northern portal, along with a number of other water quality facilities such as gross pollutant traps (GPT's) and swale drains. Submissions 182, 343 and 434 raise the issue of maintenance of these facilities. SWP2 requires that WSUD be integrated into the design in accordance with VicRoads Integrated Water Management Guidelines (June 2013). Section 3.5 of these guidelines requires that documentation be prepared for the construction, maintenance and handover of these assets. Therefore, maintenance will be part of the detailed design.

Submission 343 suggests that “spillage and littering from trucks .... should be collected.... to prevent contamination of Moonee Ponds Creek”. Spill containment is addressed through SWP5, and litter in SWP2. These two EPR's will reduce the risk of spills and litter entering the waterways.

The water quality (submission 380) and waterway health (submission 34) of the Maribyrnong River were noted as issues. The EPR's within the Surface Water Assessment, specifically SWP1, SWP2, SWP3, SWP4 SWP5, SWP6 and SWP7 are intended to minimise the impact of the project on water quality and waterway health in all waterways.

Submission 441 notes that “additional stormwater treatment to that outlined in the models is required”. The Surface Water Assessment report notes that a “stormwater quality offset payment to undertake water quality works elsewhere in the catchment would be made”. As submission 441 notes, this could be undertaken through consultation with Melbourne Water, local government, Parks Victoria, VicRoads, other developers and community interest groups.

Submission 441 notes that “some of the parameters and approaches used are not in line with new guidelines”. I understand that a number of guidelines including the SEPP WoV and the Best Practice Environmental Management Guidelines (BPEMG) are currently being reviewed. The parameters and approaches used in the impact assessment are in accordance with the currently approved guidelines.

## **Waterways**

A number of submissions (17, 184, 344 and 354) are concerned with the bank widening works for the Maribyrnong River and Moonee Ponds Creek. These works are required to mitigate the increase in flood levels predicted for the piers proposed at these locations. SWP10 notes that these works will be undertaken to the satisfaction of Melbourne Water (as noted in submission 441) and in consultation with relevant local councils.

Submission 495 suggests that there is an opportunity for creek naturalisation as part of this project. SWP10 requires any waterway modification works to be developed with regard to relevant development

plans to maximise the visual and aesthetic amenity of the waterways, having regard to relevant development plans. Re-naturalisation of the waterways may be considered in areas of waterway modification as they are documented in the relevant development plans.

Submissions 184, 344, 354, 422 and 441 question the need for piers within Moonee Ponds Creek. Melbourne Water Acceptance Criteria 1 – Long or single span bridges, or elevated roads, are preferred; and Criteria 2 – The number of piers within the waterway should be minimised; were taken into consideration during the design phases of the project (submission 441). Where possible, single span structures are proposed for the bridges across Moonee Ponds Creek. The ramps connecting West Gate Tunnel Project and Dynon Road are single span structures with no piers in the waterway. For the extension of Wurundjeri Way connection with Dynon Road, it was not possible to have a single span structure and also meet Melbourne Water Acceptance Criteria 9 – bridge or elevated road soffit levels should be set at a level at least 600 millimetres above the 1% AEP flood level. This is due to the elevation of the existing roads adjacent to the creek. To maintain the appropriate longitudinal grade on the road, the top of the road level needed to be reduced. The only way to achieve the freeboard specified by Melbourne Water is to reduce the depth of the bridge structure. The designers advised that the only way to do this in a cost-effective manner is to reduce the bridge spans, resulting in piers within the waterway.

Submission 422 notes that the impact of the 16 new piers in the Maribyrnong River cannot be minimised. From a hydraulic perspective, the impact of the piers is proposed to be mitigated to comply with SWP11, through bank widening works. SWP10 requires any modification works to maximise the visual and aesthetic amenity of the waterways having regard to relevant development plans and in consultation with Melbourne Water.

Submission 442 is concerned about the construction of the Hyde Street off-ramp and its associated piers. The hydraulic modelling undertaken for Stony Creek shows that the proposed permanent works do not increase inundation of private properties adjacent to Stony Creek. SWP11 requires that the Permanent Works and associated temporary construction works must not increase flood risk, to the requirements and satisfaction of Melbourne Water and in consultation with any other relevant drainage authority.

## **Flooding**

A number of submissions raised concerns with flooding either at a precinct scale (submission 184, 378 and 441) or a local scale (submissions 123, 138, 182, 184 and 317). SWP11 and SWP12 require permanent and temporary construction works do not increase flood risk and maintain existing floodplain storage capacity. These EPR's ensure that the design complies with the requirements of, and is to the satisfaction of Melbourne Water and any other relevant drainage authority.

Three submissions (184, 327 and 454) raise the issue of climate change and sea-level rise. Submission 454 emphasises the need to consider the impacts of climate change, specifically sea-level rise at the tunnel portals. The impacts of climate change have been considered in the hydrologic and hydraulic modelling, in accordance with Melbourne Water Acceptance Criteria and SWP11. This includes consideration of increased rainfall intensity and sea-level rise.

SWP11 requires flood modelling of the permanent and temporary works to be undertaken to the requirements and satisfaction of Melbourne Water and in consultation with any other relevant drainage authority. It is noted that Melbourne Water are currently reviewing the modelling (submission 441).

## **Other issues**

Submission 368 includes a request that SWP1 be modified to include “the characterisation, treatment and discharge to the satisfaction of the EPA, and prioritisation actions designed to maintain environmental quality and enhance beneficial uses”. This could be incorporated into the wording of SWP1, but would not change the intent of the EPR which is, that the project complies with the SEPP WoV. It is not recommended to modify the EPR, as it currently references the SEPP WoV which includes the components noted in this submission.

Submission 378 requests that an asset condition assessment be undertaken for local drainage assets before and after construction works. This is a design issue, not an environmental requirement and will not be addressed in this report.

Submission 378 also requests that “all existing Hobsons Bay City Council (HBCC) stormwater drainage system impacted by the WGT Project be upgraded for storms of up to one in 20 years Average Recurrence Interval (ARI) (or as approved by HBCC)”. This is a design issue, not an environmental requirement and will not be addressed in this report.

Submission 434 notes that permanent piers in the floodplain may lead to debris build-up after flood events, and operational maintenance specifications should include requirements to clear debris from these piers. The Project is not changing the environmental conditions or increasing the risk of debris getting caught on the piers.

- Kororoit Creek – the proposed piers are in line with the existing piers, therefore the debris load at the structure is not expected to change. The clean-up requirements will be the same as in the existing conditions.
- Stony Creek – there are a number of culverts and bridges upstream of the proposed works that will ‘trap’ most of the debris load before it reaches the proposed bridge location. The urban nature of the catchment upstream of the works means that there should be minimal additional debris load at the new structure, therefore no significant changes from the existing conditions are expected.
- Maribyrnong River – there are a number of bridges upstream of the proposed works that will ‘trap’ most of the debris load before it reaches the proposed bridge location. The highly modified nature of the catchment upstream of the works means that there should be minimal additional debris load at the new structure, therefore no significant changes from the existing conditions are expected.
- Moonee Ponds Creek – there are a number of bridges upstream of the proposed works that will ‘trap’ most of the debris load before it reaches the proposed bridge location. The highly modified nature of the catchment upstream of the works means that there should be minimal additional debris load at the new structure, therefore no significant changes from the existing conditions are expected.

Submission 434 notes that additional details are required for the local drainage; “treatment and management of surface water, drainage and wastewater are not yet clearly defined at a number of locations”. Some of the design details have not yet been resolved. Environmental issues such as water quality and flooding are addressed through the EPR’s, which nominate the relevant approval authorities for each of these issues.

Submission 441 notes their concern that the EES doesn’t fully assess the cumulative impacts of the Project, and requests an improvement to the EPR to include the following:

*“Design and construction around waterways should consider the ongoing catchment planning and upstream developments for each waterway and include consultation with Melbourne water, local councils, collaboration groups and other relevant agencies to mitigate cumulative impacts.”*

Section 8.0 of the Technical Report includes discussion on the cumulative impacts of other projects on the Maribyrnong River and Moonee Ponds Creek including the Metro Tunnel project. Melbourne Water have provided Performance Criteria (as documented in the Technical Report), as they do for all major projects. If all projects meet these criteria, the potential for cumulative impacts is minimised. A number of EPRs also include the requirement for the design to be “to the satisfaction of Melbourne Water” or “in consultation with Melbourne Water” (SWP9, SWP10, SWP11, SWP12, SWP14 and SWP15). These requirements allow Melbourne Water to review and/or approve the design prior to construction.

## **5 Response to IAC Questions and Further Information Request**

The “Preliminary Matters and Further Information Request” document issued by the Inquiry and Advisory Committee (IAC) did not include any questions on Surface Water.

### **Declaration**

I have made all the inquiries that I believe are desirable and appropriate and that no matters of significance which I regard as relevant have to my knowledge been withheld from the Inquiry and Advisory Committee.



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**Melanie Collett**

**Date: 31 July 2017**

## Appendix A Matters Raised by PPV Guide to Expert Evidence

- (a) the name and address of the expert;

**Melanie Jane Collett, Level 10, Tower 2, 727 Collins St, Melbourne, VIC 3008**

- (b) the expert's qualifications and experience;

**Bachelor of Engineering (Environmental) with Honours – The University of Melbourne, 1998.**

**Fellow of the Institution of Engineers Australia (FIEAust)**

**Chartered Professional Engineer, National Engineering Register (CPEng, NER)**

**Appendix B contains a copy of my Curriculum Vitae**

- (c) a statement identifying the expert's area of expertise to make the report;

**I have over 18 years of experience in hydrologic and hydraulic modelling and surface water management. I was the technical reviewer for the Surface Water report for the EES and was involved in the reference design for the project.**

- (d) a statement identifying all other significant contributors to the report and where necessary outlining their expertise;

<b>Team Member</b>	<b>Role</b>	<b>Qualifications</b>
Lisa Roach	Technical Report Author	BE (Env) Hons
Robin Bishop	Technical Report Author	BE (Env)

- (e) all instructions that define the scope of the report (original and supplementary and whether in writing or oral);

**I was requested to undertake the following work in a letter from Sallyanne Everett, Clayton Utz in regard to “West Gate Tunnel Project, Engagement of Expert Witness – Surface Water” dated 6<sup>th</sup> July 2017:**

- 1. Review the public submissions and identify those relevant to my area of expertise**
- 2. Review the Previous Report and identify whether there are any changes to the conclusions of the report arising out of the issues raised by the public submissions or as a consequence of any other relevant matter.**
- 3. Prepare an expert report that:**
  - a. Responds to the public submissions relevant to my area of expertise;**
  - b. Addresses the Previous Report and any changes to the conclusions reached; and**
  - c. Any other matter that you consider relevant to my area of expertise.**

4. Prepare a short power point presentation for presenting at the hearing.

5. Attend the hearing to give evidence in relation to my report.

I was also requested to review and address the IAC's Preliminary Matters and Further Information Request dated 18 July 2017 (email from Sallyanne Everett, Clayton Utz dated 30th July 2017).

- (f) the identity of the person who carried out any tests or experiments upon which the expert relied in making this report and the qualifications of that person;

The following people undertook the modelling that the EES was based on:

Team Member	Role	Qualifications
David Sheehan	Flood Lead	BEng, MEngSc, MIEAust, CPEng, NPER
Phil Pedruco	Hydrology Flood Lead	BSc, MSc, DIC
Clayton Johnson	Maribyrnong River Flood Modeller	MEng (Env), BComm, BA (Chinese)
Ben Baker	Moonee Ponds Creek Flood Modeller	BE Civil & Env (Hons) / BSc
Peter Crichton	Stony and Kororoit Creek Flood Modeller	BEng (Env)
Talia Guest	Flooding Technical Advice	BEng (Env), MEmergMgt, FIEAust, CPEng, NPER, RPEQ
Daniel Smith	Stormwater drainage network and WSRD design lead - West	BEng (Civil) (Hons)
Denham Alphonso	Stormwater drainage network and WSRD design lead - East	BEng (Civil) (Hons)

- (g) a statement setting out the key assumptions made in preparing the report;

I have made the following key assumptions in preparing this report;

- No significant design changes have been made since the Technical Report was written.

- **I am aware of ongoing discussions between Melbourne Water and the project team. I understand that these discussions include the modelling methodology for the Maribyrnong River and the piers in the waterway. The potential impact of this on the design is yet to be determined, but is not expected to result in a fundamental change to the design or mitigation measures for the Maribyrnong River.**

(h) a statement setting out any questions falling outside the expert's expertise and also a statement indicating whether the report is incomplete or inaccurate in any respect.

**Submission 182 raised the question of an increase in insects/mosquitos as a result of the proposed wetland system. I cannot comment on insect or mosquito habitat, or how the wetland could cause an increase in the number of insects or mosquitos.**

**Appendix B CV**

**Melanie Collett**  
**Associate Director - Water Resources****Qualifications**

BE (Hons) Env, The University of Melbourne  
FIEAust, CPEng, NER  
RPEQ (15810)

**Career History**

Melanie is an Associate Director in the Water Resources team with over 18 years of experience. She is the Water Resources, Technical Practice Lead for the Australia and New Zealand regions of AECOM.

Melanie has extensive experience in many aspects of Water Resource Management including, hydrologic and hydraulic modelling, Water Sensitive Urban Design, drainage design, coastal engineering and coastal zone management, floodplain management and the assessment of the impacts of climate change. She is experienced in both the management of consultancy projects and leading the technical assessments in these fields. Melanie is also experienced in Environmental Impact Assessments as the technical lead for the hydrology components on large projects for proposed road, rail and mining infrastructure.

Melanie specialises in the integration of surface water modelling and design and the impacts of climate change on flooding and coastal erosion, and how these affect the built environment. She is experienced in the development and assessment of mitigation and adaptation measures to address inundation and erosion impacts.

**Detailed Experience**

*AECOM Australia Pty Ltd  
May 2007 – to date*

*West Gate Tunnel Project (Victoria, Australia) –  
Technical Lead, Surface Water.*

Melanie was the technical lead for the surface water component for the West Gate Tunnel Project EES. This role included liaison with other technical specialists, review and interpretation of current applicable legislation, development of assessment criteria, ranking of options against the assessment criteria and preparation of a report summarising the investigations. She was involved in the risk assessment for the project and provided technical review for the Surface Water Assessment Report. Melanie also prepared a report on the Tunnel Flood Risk Assessment.

*North East Link (Victoria, Australia) – Technical  
Lead, Surface Water EES*

Melanie is the technical lead for the surface water component for the North East Link Project EES. This role includes liaison with other technical specialists, review and interpretation of current applicable legislation, development of assessment criteria, ranking of options against the assessment criteria and preparation of a report summarising the investigations.

*Christchurch Citywide Flood Modelling Project  
(Christchurch, New Zealand) – Technical Lead*

Melanie is the technical lead for the Christchurch Citywide Flood Modelling Project. This project includes developing a flood model for Christchurch using the MIKE software developed by DHI. This is a three-way coupled model with the overland flow modelled using flexible mesh, open channel flow modelled using MIKE11 and pipes modelled using MIKE URBAN. The purpose of this model is to assess the impact of the 2011 earthquake on flooding and drainage.

*Gracemere Industrial Access Project  
(Queensland, Australia) – Expert Evidence*

Melanie provided expert evidence on behalf of the Queensland Department of Transport and Main Roads on the hydraulic issues associated with the Gracemere Industrial Access Project.

*Gracemere Industrial Access Project  
(Queensland, Australia) – Hydraulic Design Peer  
Review*

Melanie was responsible for the internal review and verification of the modelling and documentation for the Gracemere Industrial Access Project – Hydraulic Design Peer Review, in Rockhampton.

This included review of the hydrologic and hydraulic modelling and associated reporting for this study.

*City-Link Tulla Widening Project – Independent  
Reviewer, Victoria, Australia*

Melanie was responsible for the independent review of the drainage and hydraulic components for the City-Link Tulla Widening Project on behalf of Transurban.

*Climate Change Risk Assessment, Stage 2.  
Department of Defence, Australia.*

Melanie was the Technical Lead for the Stage 2 study of a climate change risk assessment of 14 coastal sites for the Australian Department of Defence. The assessment focussed on the risks posed by flooding, sea level rise and storm surge to prioritise adaptation planning. This study included detailed modelling of inundation and erosion for a number of key Defence locations throughout Australia.

*Port Phillip Bay Adaptation Pathways Project,  
Victoria*

Melanie was the technical lead responsible for the inundation modelling and mapping for the Port Phillip Bay Adaptation Pathways Project being undertaken on behalf of the Municipal Association of Victoria, for four Bayside Municipalities. The purpose of this investigation was to determine the potential impacts of climate change on inundation of selected coastal environments around Port Phillip Bay, and the most cost effective adaptation pathways to address this inundation. Melanie's role on this project included data collection and collation, interpretation of flood modelling data, presenting at workshops with the Councils, determination of possible adaptation impacts and the potential benefits and report writing. Additional technical investigations which Melanie was involved in include a joint probability assessment of the impact of inundation due to marine and riverine flooding for Mordialloc, and the Monte Carlo modelling for the cost benefit analysis of adaptation options.

*Rockhampton FMS (Queensland, Australia) –  
Technical Review*

Melanie was responsible for the internal review and verification of the modelling and documentation for the Rockhampton Flood Management Services project. This included review of the hydrologic and hydraulic modelling and associated reporting for a number of catchments including; South Rockhampton, Frenchmans and Thozets Creek, Limestone Creek, Moores Creek and Ramsay Creek.

*Climate Change Risk Assessment, Stage 1.  
Department of Defence.*

Melanie was involved in the Stage 1 study of a climate change risk assessment of 38 coastal sites for the Australian Department of Defence. The assessment focussed on the risks posed by sea level rise and storm surge to prioritise adaptation planning and identify further required impact studies. Melanie was the technical lead for this investigation.

*Response to the Draft Victorian Coastal Strategy  
Association of Bayside Municipalities, Victoria,  
Australia*

Melanie was involved in the preparation of the response to the Draft Victorian Coastal Strategy on behalf of the Association of Bayside Municipalities (ABM).

*Melbourne Water Flood Strategy Concept Paper,  
Victoria, Australia*

Melanie worked with Melbourne Water to help develop the Flood and Drainage Strategy for Melbourne Water. Working with the Melbourne Water Flood Strategy team, from their office, Melanie reviewed the discussion papers and compiled a draft flood strategy concept paper. This paper included background information on flooding in the Port Philip and Westernport Catchments, along with the draft objectives and actions for Melbourne Water for the next five years. Through the development of this paper, Melanie has gained a unique insight into the challenges that Melbourne Water are facing in flood management over the next five years, and the objectives and actions that they are proposing to undertake to meet these challenges.

*Melbourne Water Flood Mapping Projects,  
Victoria*

Melanie was the project manager for various flood mapping projects for Melbourne Water, including Eltham West Main Drain, Footscray Main Drain, Ruffey Creek and Cranbourne Central Drainage Scheme. These projects involve hydrologic modelling using RORB and creation of combined one and two-dimensional TUFLOW models of the study area to determine the flood extent and flood hazard for the catchment. The results of these investigations will be incorporated into the Victorian Planning Scheme and used to determine what mitigation works are required for the catchment.

*Ashmore Precinct Concept Design, New South  
Wales, Australia*

Melanie was the technical lead for the flood investigations associated with the Ashmore Precinct in Erskineville, New South Wales.

This included updating and developing new hydraulic models to design overland flow and drainage infrastructure for the proposed redevelopment of the site.

*Rockdale City Aquatic Centre, New South Wales,  
Australia*

Melanie was technical lead for the flood investigations for the Rockdale City Aquatic Centre in Bexley, New South Wales.

*South Rockhampton Flood Levee Project  
(Queensland, Australia)*

Melanie was responsible for the internal review and verification of the technical documents for the South Rockhampton Flood Levee Project.

This included the hydrologic and hydraulic modelling reports for the Fitzroy River flooding, the failure analysis report and the failure impact assessment report.

*North Rockhampton Flood Mitigation Investigation  
(Queensland, Australia)*

Melanie was responsible for the internal review and verification of documentation for the North Rockhampton Flood Mitigation Investigation.

This included the hydrologic and hydraulic investigations undertaken and the Implementation Strategy.

*Fish Friendly Fitzroy River – Western Floodplain  
Connection Study (Queensland, Australia)*

Melanie was responsible for the internal review and verification of documentation for the Western floodplain connection study for the Fish Friendly Fitzroy River project.

This included review of the hydrologic and hydraulic investigations undertaken and the final report.

*Don River Flood Risk and Mitigation Study,  
(Queensland, Australia)*

Melanie was responsible for the internal review and verification of the documentation for the Don River Flood Risk and Mitigation Study.

*Emerald Flood Protection Scheme – Feasibility  
Study (Queensland, Australia)*

Melanie was responsible for the internal review and verification of the documentation for the Emerald Flood Protection Scheme Feasibility Study.

*Level Crossing Removal Project, Bayswater  
(Victoria, Australia) – Independent Design  
Verification*

Melanie is undertaking the independent design verification of the drainage components for the Level Crossing Removal Project for Bayswater.

*City-Link Tulla Widening Project, (Victoria, Australia)*

Melanie was the technical lead for the hydraulics and drainage components of the City-Link Tulla Widening Project. She managed a team of people developing the reference design for this section of the road. This included liaison with Authorities such as Melbourne Water and VicRoads to ensure that local requirements were met.

*South Morang Rail Extension Alliance Project, Victoria*

Melanie was responsible for the internal review and verification on flooding, drainage and WSUD modelling and design for the South Morang Rail Extension Project. She has provided high level technical assistance to the team working on the project. Melanie was part of the challenge team for the Value Engineering workshops.

*Regional Rail Link, Victoria*

Melanie was involved in the delivery of three sections of Regional Rail Link. She was the technical reviewer for part of the drainage design for RRL-A, RRL-B and RRL-F. She also led the hydrologic modelling for RRL-B.

*Hydrologic modelling of Arden Street and E-Gate Department of Transport, Victoria*

Melanie was the Project Manager for this investigation. The purpose of this study was to determine the existing flood extent and depths for the Arden Street Precinct, and identify and model potential flood mitigation measures. The results of this investigation will be used to inform future development scenarios for the precinct.

*RAAF Base Amberley – Flood Mitigation Strategy, Department of Defence, Queensland, Australia*

Melanie was the technical lead responsible for development of the flood mitigation strategy for the RAAF Base Amberley. Having been impacted by flooding in 2011 and 2013, the RAAF Base Amberley commissioned an investigation to develop a strategy to mitigate against flood damages in the future. The investigation included a risk assessment to quantify the likelihood and consequences of flooding on Defence's capability at the site.

*Base Engineering Assessment Program (BEAP), Department of Defence, Australia*

Melanie is the technical lead for the stormwater component for BEAP Stages 3, 4, 5 and 6. The purpose of these investigations is to determine the capacity, condition and compliance of the stormwater infrastructure within the base. This work includes detailed hydrologic and hydraulic modelling of the site to determine the capacity of

the existing stormwater infrastructure and to identify measures required to maintain capability.

*Melbourne Metro Phase 1 (Surface Water Investigation), Victoria*

Melanie was the technical lead for the surface water component for the first phase of the Melbourne Metro Rail project EES. This role included liaison with other technical specialists, review and interpretation of current applicable legislation, development of assessment criteria, ranking of options against the assessment criteria and preparation of a report summarising the investigations. She has been involved in the risk assessment for the project and worked with PTV and Melbourne Water to determine how the project could be delivered under the Major Transport Facilitation Act, 2009.

*Dingley Bypass Hydrologic and Hydraulic Investigations, Victoria*

Melanie was the project manager for the Dingley Bypass hydrologic and hydraulic investigations. This project involved working with VicRoads and Melbourne Water to develop a concept design for the cross-road drainage for the Tender Design phase of the investigation.

*Westlink (Surface Water Investigation), Victoria*

Melanie was the technical lead for the surface water component for the Westlink project in Melbourne. This role included liaison with other technical specialists, review and interpretation of current applicable legislation, development of assessment criteria, ranking of options against the assessment criteria and preparation of a report summarising the investigations. She has been involved in the risk assessment for the project and worked with LMA and Melbourne Water to determine how the project could be delivered under the Major Transport Facilitation Act, 2009.

*Coastal Spaces – Inundation and Erosion – Coastal Engineering Study, Portland, Victoria*

Melanie was the project manager for this investigation. The purpose of this investigation was to investigate the potential impact of climate change on the coastal area between Portland and Narrawong in Victoria. Melanie led a team of technical specialists including, climate change, coastal engineering, flood modelling, groundwater, geotechnical, maritime, and GIS specialists. Her role was to ensure that each of the specialist areas provide their input to the investigation on time and on budget and to prepare the final report summarising the results of the investigations. Melanie provided expert evidence in a Ministerial Panel Advisory Hearing on this issue in 2011.

*Stockman's Mine EIS (Surface Water Investigation), Victoria*

Melanie was the technical lead for the surface water investigations for the Stockman's Mine EIS. This work included preparation of the Surface Water section of the EIS, liaison with Authorities to determine water supply and water quality requirements, water balance modelling utilising spread sheets and GoldSim, a modified Environmental Flows Assessment, along with various hydrologic and hydraulic modelling tasks.

*Western Interstate Freight Terminal (Surface Water Investigation), Victoria*

Melanie was the technical lead for the surface water component for the route selection for the Western Interstate Freight Terminal project. This role included liaison with other technical specialists, review and interpretation of current applicable legislation, ranking of options against the assessment criteria and preparation of a report summarising the investigations.

*Western Highway Realignment – Anthony's Cutting – Alliance, Victoria*

Melanie has provided technical assistance in the design of road drainage, Water Sensitive Road Design components and flooding for the Western Highway Realignment – Anthony's Cutting.

*Mooroopna West Growth Corridor – Development Contributions Plan, Mooroopna, Victoria*

Melanie was the project manager for this investigation. She was involved in developing the drainage strategy and the Development Contribution Plan for the Mooroopna West Growth Corridor. This included analysis of local and regional flooding and drainage issues, as well as calculation of developer contributions and writing the Development Contribution Plan. Melanie attended the Panel hearings on behalf of AECOM and provided expert evidence at these hearings on Flooding and Drainage issues, along with the computations for the Development Contributions

*Bourke Street Main Drain Stormwater Harvesting Project, Docklands, Victoria*

Melanie was the project manager for the Bourke Street Main Drain Stormwater Harvesting Project in Docklands. This project involved the design of works in the Bourke Street Main Drain to enable the fresh water to be harvested and treated in existing infrastructure, before being used for irrigation in the park areas of Victoria Harbour.

*Edward-Wakool Floodplain Risk Management Study, New South Wales, Australia*

Melanie was the project manager for the final stages of the Edward-Wakool Floodplain Risk Management Study for the Department of Environment, Climate Change and Water.

*Northern Access Road Project, Brisbane, Queensland*

Melanie has provided technical assistance in the design of road drainage, Water Sensitive Road Design components, cross-road drainage and flooding for the Northern Access Road Project for the Brisbane Airport Corporation.

*Barwon Heads Bridge Afflux Study, Barwon Heads Bridge, Victoria*

Melanie was involved in the modelling used to determine afflux impacts due to the proposed Barwon Heads Bridge.

*Victoria Harbour Drainage, Docklands, Victoria*

Melanie has provided strategic review of drainage infrastructure designs for the Victoria Harbour precinct of Melbourne Docklands. Melanie was also involved in the concept and detailed design of Water Sensitive Urban Design components.

*Chapman Flooding Analysis, Canberra, ACT*

Melanie has undertaken an analysis of the flooding mechanisms for several properties in the Chapman area in Canberra. This includes recommendations for works to minimise flood damage to properties.

*Trackstar Alliance, Brisbane, Queensland*

Melanie has provided assistance with hydrologic and hydraulic analysis of bridges and culverts for several sections of Trackstar, the rail line between the Gold Coast and Sunshine Coast in Queensland.

**Publications and Technical Papers**

Marginson, S, **Collett, M**, Van Raalte, L, Quail, S, (2014) *"Using Hydrodynamic Modelling as an Input to a Cost Benefit Analysis of Climate Change Adaptation Measures"* Hydrology and Water Resources Symposium 2014, February 2014, Perth, Western Australia.

Marginson, S, **Collett, M**, and Aijaz, S, (2012), *"Using Joint Probability Analysis to Test Assumptions of Downstream Boundary Conditions for Flood Models in Areas Affected by Extreme Sea Levels"*, Hydrology and Water Resources Symposium 2012, November 2012, Sydney, New South Wales.

Marginson, S, **Collett, M**, Watkinson, R, and Johnson, L, (2012), *"Troubleshooting a Complex Linked One- and Two-Dimensional Hydraulic Model"*, Hydrology and Water Resources Symposium 2012, November 2012, Sydney, New South Wales.

Aijaz, S, **M.J. Collett**, and L. Nielsen, (2011). *"Coastal Erosion and Shoreline Changes in Response to Extreme Events and Sea Level Rise"*, Coasts and Ports 2011 PIANC Conference, Perth, September 2011.

Aijaz, S, P. Hartley, P. Miseles, **M.J. Collett**, and K.G. Dayananda, (2011). *"Joint Probability of Sea levels and Rainfall"*. Conference Proceedings, 34<sup>th</sup> International IAHR Congress, Brisbane, June 2011.

Aijaz S., **Collett M.**, Deam S., (2010) *"Coastal Hazard Assessment and Adaptation to Climate Change at Portland, Victoria"*, Practical Response to Climate Change Conference, September 2010, Melbourne Victoria.

**Dalton M.**, Howells L., Provis D., McKenzie G., Tierney G., (2005) *"After the Flood Study – Use of a Calibrated Hydraulic Model for Planning Purposes"*, Fourth Victorian Flood Management Conference, October 11-14, 2005, Shepparton, Victoria.

Grayson R., Candy R., Tan K.S., **McMaster M.**, Chiew F., Provis D., & Zhou S., (2004) *"Gippsland Lakes Flood Level Modelling Project"*, CEAH Report 01/04.

Tan, K.S., Grayson R.B., Chiew F.H.S, **McMaster M.J.**, Provis D.G and Candy R (2004), *"Estimating flood levels in complex estuarine systems using a stochastic-deterministic modelling-based joint probability approach"*.

**McMaster M.J.**, Provis D.G., Grayson R.G., and Bishop W.A., (2003), *"Calibration and testing of a Hydrodynamic Model of the Gippsland Lakes"*,

MODSIM 2003, International Congress on Modelling and Simulation, 14-17 July 2003, Townsville, QLD, Australia.

Wealands S.R., Grayson R.B., **McMaster M.J.**, Tan K.S., & Provis D.G., (2002), *"Representing terrain accurately for flood modelling in a large coastal lagoon"*, 27<sup>th</sup> Hydrology and Water Resources Symp., 20-23 May 2002, Melbourne, Australia.

**McMaster M.J.**, Provis D.G., Grayson R.G. and McCowan A.D., (2001), *"Modelling of Lakes Entrance"*, The 15<sup>th</sup> Australasian Coastal and Oceanographic Engineering Conference and the 8<sup>th</sup> Australasian Port and Harbour Conference, 25-28 September 2001, Cold Coast, QLD, Australia.

Grayson R., **McMaster M.J.** and McCowan A.D., (1999), *"Summary of work on the Gippsland Lakes, 1998/9 by the Centre for Environmental Applied Hydrology, University of Melbourne"*. Report to Gippsland Ports and Gippsland Coastal Board.

**Professional History**

2007- Present  
AECOM Australia Pty Ltd  
Associate Director – Water Resources

1997 - 2007  
Cardno Lawson Treloar Pty Ltd  
Project Engineer

1998 - 1999  
Cooperative Research Centre for Catchment Hydrology, The University of Melbourne  
Research Fellow