STORM Tool Discussion Paper

Introduction:

Many Victorian Councils have WSUD requirements in their local planning schemes. Assessment of these requirements is usually supported by the STORM (Stormwater Treatment Objective – Relative Measure) tool. This approach has been incredibly important in facilitating the integration of water sensitive urban design into small-scale development through early uptake in the planning process. This discussion paper considers the role of the STORM tool, identifying current issues and constraints of the tool and identifying some of the opportunities for improvement. The need to update current capabilities and deliver a contemporary 'fit for purpose' water sensitive urban design assessment tool for small scale development has been identified by water industry practitioners. A range of factors including , the tool's age and capabilities, potential policy reforms, industry uptake in recent years and advances in technology have all led to the tool aging over time. The need for clearer hosting and governance arrangements to underpin the tool has also been identified.

Background:

Water Sensitive Urban Design (WSUD) in the planning process is controlled through two main mechanisms. For larger scale development involving subdivision (mostly greenfield), Clause 56.07 of the Victorian Planning Provisions requires compliance with *Urban Stormwater: Best Practice Environmental Management (BPEM 1999)*. This is assessed through the planning approval process and demonstrated through an appropriate WSUD planning and design response with supporting MUSIC (Model for Urban Stormwater Improvement Conceptualisation) assessment and documentation.

Development that does not involve subdivision in the planning approval process does not currently trigger BPEM or a WSUD response through the Victoria Planning Provisions (VPPs). To address this, a number of local governments have integrated WSUD requirements into Local Planning Policy (LPPs). The reason for this is because most infill development (accounting for approximately 2/3 of current and future development under Plan Melbourne) would otherwise go ahead without meeting best practice stormwater standards and would therefore compound and exacerbate legacy stormwater issues in Victoria.

The STORM tool was developed in the mid 2000's by Melbourne Water. At this time, *Clause 22.08 Water Sensitive Urban Design (Stormwater Management)* of the Bayside City Council Planning Scheme was drafted as a frontrunner to another five WSUD local planning scheme amendments across metropolitan Melbourne. A further 8 - 10 councils have since implemented ESD planning amendments (including WSUD). Some councils also rely on the high level requirements set in SEPP Waters of Victoria and combined there are now around 20 councils requiring a WSUD response in the planning process.

The STORM tool has become the default mechanism for assessment of small scale developments and is referenced (alongside MUSIC) within the various local planning schemes. It is also linked to the Built Environment Sustainability Scorecard (BESS) which is the current assessment method for built form sustainability requirements in Local Planning Schemes in Victoria.

BESS was developed by local government in 2012 to replace Moreland and Port Phillip City Councils' STEPS and SDS tools which had also referenced the STORM tool since its inception. BESS now has 22 subscriber councils. MAV assisted the collaboration between the councils which resulted in CASBE being formed in 2008. The MAV owns BESS with funding provided by the CASBE member councils. It includes reference to the STORM tool for the assessment of stormwater outcomes, alongside other tools relating to sustainable

design. BESS is a tool which enables environmental sustainable design features to be incorporated by developers in their planning applications for new buildings and renovations.

In December 2016, the Victorian Government released the Better Apartments Design Standards which apply to all residential apartments and include references to BPEM requirements. Draft guidance notes for the Better Apartments Design Standards propose inclusion of STORM as the assessment method. This will further increase the use of the tool.

STORM Tool Capability:

Hosted by Melbourne Water, STORM has been designed to be accessible to non-experts specifically for small residential and industrial developments to rate how well stormwater treatment will be achieved. This is done by calculating results through a common measurement system where a 100% score reflects meeting BPEM minimum standards. The main characteristics include:

- Utilises Nitrogen as a surrogate for all BPEM water quality parameters
- Performance benchmarking is done via look up tables derived from MUSIC V3 performance curves
- Capable of calculating performance of treatment measures including
    - Rainwater tanks
    - Ponds
    - Wetlands
    - Rain gardens
    - Infiltration systems
    - Buffers
    - Swales

Limitations:

While the tool provides a vital function, there are a range of issues and deficiencies within the tool which if left unaddressed could lead to diminished outcomes, and potentially, obsolescence.

SEPP AND BPEM REVIEW

The current review of BPEM is likely to prescribe new performance requirements which could effectively render STORM obsolete unless an upgrade is undertaken.

- The current BPEM pollutant load reduction requirements of 80% TSS, 45% TN, 45% TP are assumed to be met when look up tables (derived from MUSIC performance curves) for nitrogen indicate a 45% load reduction has been achieved (based on choice and size of treatment elements relative to impervious surfaces). Any change to BPEM pollutant load reduction requirements could therefore render STORM's outputs inconsistent with policy.
- The integration of flow requirements into BPEM is also a possibility and would not be compatible with current STORM functionality as there is no onsite detention capability.
- If BPEM were to include variable performance requirements (e.g. higher standard for sensitive or high value receiving waterways), the STORM architecture would not be compatible.

CHANGE TO THE VICTORIAN PLANNING PROVISIONS

Planned changes to VPP's to include industrial and commercial would further stretch the current STORM tool as it is outside the functionality to accurately represent rainwater reuse. It is also unclear whether the

use of nitrogen as a surrogate becomes unreliable for industrial and commercial sites. Some sites may find total suspended solids the limiting factor for pollutant removal.

Moving with the Times

- The STORM tool provides the assessment pathway for meeting stormwater requirements. This means that treatment measures not represented in the tool are effectively excluded as viable options (because they can't be assessed). The lack of a green roof treatment measure is a significant factor in green roofs not being employed in small scale developments for their stormwater benefits.

Treatment Trains

- STORM cannot link treatment measures together. This reduces flexibility of, for example, a rainwater tank to a raingarden and can limit options. This can force outcomes which are less optimal for developers and the environment.

Tankwater reuse

- STORM sets a water use estimate of 20L per bedroom p/d (as a toilet use estimate). Limiting connection to toilet use excludes opportunities to plan and simulate connection to laundries and hot water services. Tank effectiveness is directly related to 'how hard it works' in particular, the speed at which draw down occurs in readiness for the next storm event.

The functionality of STORM no longer meets the expectations of community or industry and improvements in the tool could drive better outcomes for both the environment and industry practitioners. Upgraded functionality both in terms of the stormwater assessment capability and the user interface would be of benefit and could be undertaken in such a way not only to meet current needs but also to future proof the tool in relation to potential policy and technology changes in the medium term.

Hosting:

Current

Melbourne Water currently host the STORM tool but have indicated over the last few years that they do so reluctantly. They appear to be a natural home for the tool in their role as waterway and floodplain managers however they are not the relevant Referral Authority for the municipal local planning schemes which the tool services. This causes some ambiguity and has led to a reluctance to maintain and upgrade the tool.

Options

In 2016 attempts to upgrade the tool and integrate it with the BESS sustainability tool, owned by the Municipal Association of Victoria (MAV) and managed by the Council Alliance for the Sustainable Built Environment (CASBE), were unsuccessful. Although MAV and CASBE represent councils which administer local planning schemes, governance arrangements and responsibility for future maintenance were not able to be clarified due to resourcing considerations.

A hosting option that has not been explored in any detail would be for DELWP to host the tool. This would enable DELWP to maintain the tool in line with the SEPP and BPEM, in accordance with the policy requirements of the day. This would require an 'owner' within DELWP to be identified and the appropriate budget and web platform to be resourced. If, in the future, WSUD is included in the VPP's for infill development, as indicated in *Plan Melbourne* and *Water for Victoria*, it would be logical for DELWP to take a

leadership role in the upkeep and oversight of the tool. DELWP sponsored hosting could potentially link through the Smart Planning portal.

A further scenario that could be explored would be to enable the market to respond and provide the tool/s. For this to work as an option, it would be necessary for a guideline to be developed which stipulates minimum standards that a tool must meet and also define a tool endorsement process. There are currently a range of tools in the marketplace which could be adapted or built to meet the expectations of industry and policy makers. However, this may not be a good option due to the complexity involved with ensuring tools are developed and remain in compliance and also, that due to inconsistency between tools and lack of a 'one stop shop' the planning process could be harder to navigate for planners and developers alike.

Single supplier third party hosting is also an option. One possibility could be to investigate engaging EWater to develop an appropriate web interface for the MUSIC software program which caters for small scale development. This could provide consistent and high quality assessment but would require resolution of a range of governance and commercial arrangements. One factor in favour of this approach, beyond the technical benefits of linking directly to MUSIC, would be the public ownership of EWater which could serve to reduce some of the commercial complications with such an approach.

Conclusion:

Regardless of approach, a contemporary tool is needed to support the uptake of WSUD in small scale development where more complex specialist tools such as MUSIC are too onerous and costly. Some of the key features that this tool needs to include are:

- The ability to change pollutant load reduction targets (to enable place based standards and/or changes in standards over time)
- Updated treatment measures
- The ability to assess a treatment train approach
- The ability to assess onsite detention equivalency
- Improved rainwater tank usage functionality

This could be achieved through an upgrade of the current tool or a new tool/s could be developed.

As a leading stakeholder responsible for stormwater policy development and administration of the State Planning Policy Framework it is important for DELWP to take a leadership role in ensuring that a contemporary and 'fit for purpose' tool is available. There are a range of stakeholders who could play a role in the development, hosting and maintenance of such a tool and industry has shown willingness and initiative to work toward a solution. In order to align with current policy commitments and harness the support for change within the sector it would be timely to engage with industry stakeholders. This is a necessary step to resolve technical, hosting, governance and related issues which are currently an impediment to the delivery of an appropriate tool for assessing WSUD in small scale development.

Key Recommendation:

Following a meeting held in December 2017 with a range of key stakeholders, a working group will be established initially including representatives from DELWP, Melbourne Water, the Cities of Port Phillip, Kingston, Yarra, Greater Dandenong, Melbourne and Moreland The working group will be tasked with the following:

- to identify options for the upgrade and hosting of a small-scale stormwater assessment tool
- resolve governance arrangements (suggested model is the CASBE model)
- work with relevant stakeholders (CASBE, MAV etc) to scope tool needs

Attachment A- STORM tool replacement options

It is assumed that development of any revised or replacement STORM tool would be outsourced. However, there are different options for its ongoing operation, ownership and maintenance, which should be considered.

The following bookend governance options could occur in any combination and to any extent:

1. Developing the tool in house;
2. Out-sourcing development of the tool; and
3. Enabling private companies to develop tools in an open market.

These governance options are described in more detail below.

Governance options

Option 1 – In-house

One agency owns, operates and maintains the tool in-house. Some tasks are outsourced but the agency retains the IP, hosting and updates the tool.

Step 1. Consult with users (developers and consultants) and authorities (DELWP, Council) about needs to be addressed with a tool
Step 2. Prototype solutions and test with users
Step 3. Seek endorsement with authorities
Step 4. Host organization maintains tool and supports its use.

Option 2 - Outsource

Lead agency procures experts to develop the tool and pay ongoing license fees to enable tool to be hosted and maintained by a third party (private) entity.

Step 1. Consult with users (developers and consultants) and authorities (DELWP, Council) about needs to be addressed with a tool
Step 2. Prototype solutions and test with users
Step 3. Seek endorsement with authorities
Step 4. Host consultancy maintains tool and supports its use.

Option 3 – Open market

Project lead develops a set of guidelines for the tools, which are developed in collaboration with and maintained by private organizations. Examples of other privately developed tools include: EPA SWMM, InSite Water, etc.

Step 1. Create or refer to benchmark modelling principles (pollutant buildup, time step, pollutant removal functions, etc.), see diagram below as an example of a model process.

Step 2. Create or refer to rainfall and soil type data sets.

Step 3. Create or refer to model analysis and results presentation templates.

Step 4. Host consultancy maintains tool and supports its use.

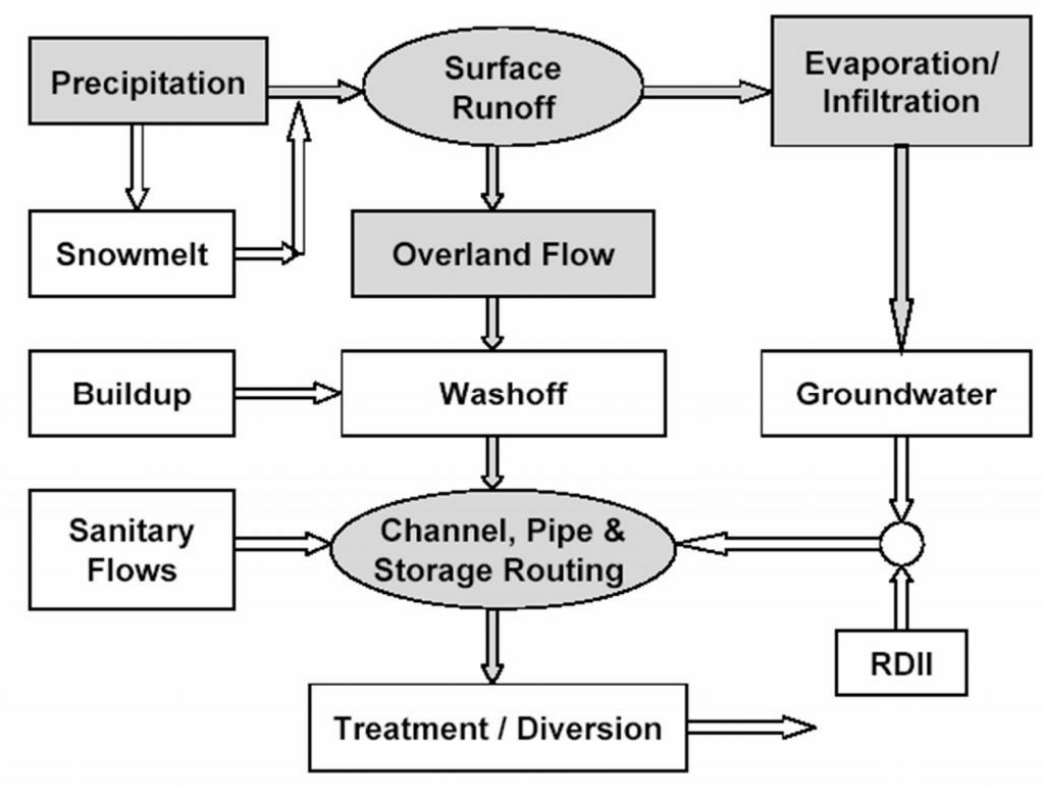

Figure 1 - EPA SWMM process model

Preliminary analysis of ongoing governance options – for discussion

Option	Pros	Cons
In-house	High level of control over output and maintenance. Good internal understanding of model function and capability.	High internal resources associated with production and maintenance. Maintenance / updates vulnerable to internal changes in management / resource priorities. In-house expertise / resources could be limiting Perceived conflict of interest if internally maintained by one agency.
Out-source	Moderately high level of control over output and maintenance. Ongoing maintenance guaranteed while contract is in place.	Highest costs for maintenance. Lower internal understanding of model capability and potential for upgrades than in-house operation.

	Potentially higher turn around (if in-house resources are limited) and higher quality if internal resources are combined with external expertise.	
Open market	Market forces may lead to a more innovative cost effective product, which is updated over time (due to demand). The lowest cost option.	Higher risk as this option has the lowest level of control over methodology and output (i.e. no guarantee that final product will be accurate or meet the needs of industry and government in other ways)

Attachment B - Stormwater Tools Comparison

Tool	Description	Cost and access	Comments
STORM	Non-expert tool capable of water quality for small scale developments but limited in application. Currently approx. 300 users per week and 600 sessions per week	Free access, hosted by Melbourne Water (web tool)	Cannot model treatment trains (for example, overflow from rainwater tank to raingarden). Outdated and buggy and average usability. Melbourne Water has indicated desire to 'retire' tool.
MUSIC	Expert user tool capable of being used for a wide range of water quality and water harvesting assessments (not flow assessments).	Expensive license fees for individual end users (downloadable/ subscription tool)	Not suitable for small scale developments in current form
S3QM	Non-expert user tool capable of water quality, water harvesting and flow assessments for small scale developments	Unknown cost, currently hosted by vendor under contract to Sydney Catchment Authority and other jurisdictions (web tool)	Suitable for small scale developments (would require update to Victorian climate and water quality standards). Usability is not great.
EPA SWMM	Expert user tool capable of being used for a wide range of water quality, water harvesting and flow assessments. Developed, maintained and updated by the U.S. Environmental Protection Agency's National Risk Management Research Laboratory	Free access (downloadable tool to run on Microsoft Windows Platform). Open source code.	Not suitable for 'non experts' – more complicated and time consuming to set up than MUSIC. Guidance would be needed for modelling Victorian stormwater standards. Potentially, a simple and more restricted web interface could be developed to automatically create an input file to run on the EPA SWMM engine. Innovyze, DHI and Autodesk have developed interfaces that use the SWMM engine.
National Green Values Calculator	Models runoff volume and volume retained through WSUD, but not water quality. Includes life cycle costs and benefits. http://greenvalues.cnt.org/national/calculator.php	Free, developed with US EPA	Not for modelling water quality

Urban Developer	Expert user tool capable of being used for a wide range of water harvesting and flow assessments with potential to integrate water quality assessment	Expensive license fees for individual end users (downloadable/subscription tool).	Not suitable for small scale developments in current form
Greenstar	Does not incorporate a water quality tool but includes water consumption calculators	Calculators and tools freely available online. Cost associated with certification of design	Not suitable for small scale developments
AutoDesk Green Stormwater Infrastructure	AutoDesk Infraworks 360 Model extension that models runoff volume and volume retained through WSUD, but not water quality.	Extension of AutoDesk Infraworks	Not for modelling water quality
InSite water	https://insitewater.com.au based on Storm Calculator plus water efficiency (WELS) and on-site detention using rational method	Developed by Ian Adams, commercial arrangements are not clear	Not a finished product.
Recarga Model	Model to evaluate the performance of bioretention facilities, rain gardens, and infiltration basins for water volume, not water quality	Free	Not for modelling water quality.
BESS	Scorecard for sustainability, for Victorian Councils. Includes water efficiency.	Councils pay annual subscription, free for developers	Water quality not currently embedded.

Attachment C - Case Studies and lessons learnt

Government Software Procurement

BESS - http://www.bess.net.au/

CASBE Councils, led by Moreland City Council, combined the SDS and STEPS assessment tools into a single online tool for assessing developer requirements relating to local Environmentally Sustainable Design policies.

Algorithm Development was outsourced to Viridis E3 consortium and Software Development was outsourced to Two Bulls Holdings. An industry technical reference panel provided input.

Moreland City Council's officers were heavily burdened during the development of BESS, taking them away from their other work duties.

It is difficult for a Council assessor to match the design drawings and other information submitted with the Planning Permit application to the BESS report.

MUSIC - www.ewater.org.au/products/music

MUSIC – Model for Urban Stormwater Improvement Conceptualisation – was first developed in 2001 by the CRC for Catchment Hydrology. It was commercialised and eWater has become a not for profit organisation that owns MUSIC. The licence fees for users start at $3,000 plus $500 per year for support, with version upgrades requiring a new licence. Industry and academic input for model improvements are difficult. eWater are moving to proprietary stormwater quality treatment product placement in the model. Melbourne Water and other organisations that contributed to the development of the product now need to pay to use it and have little control over updates.

Tools developed by publically funded research organisations or government departments should be kept in public hands, or made open source.

Successful practices from the private sector and government to build effective digital services.

(source: United States Digital Service - https://playbook.cio.gov/):

1. Understand what people need
   Include real users – property developers, architects, draftsmen, sustainable design consultants – in the design process.
2. Address the whole experience, from start to finish
   Understand the different points at which people will interact with the service – both online and in person. Develop metrics that will measure how well the service is meeting user needs at each step of the service.
3. Make it simple and intuitive
   Users should succeed the first time, unaided.
4. Build the service using agile and iterative practices
   Should use an incremental, fast-paced style of software development to reduce the risk of failure.
5. Structure budgets and contracts to support delivery

Contract specifies a warranty period where defects uncovered by the public are addressed by the vendor at no additional cost to the government. Contract includes a transition of services period and transition-out plan.

6. Assign one leader and hold that person accountable
7. Bring in experienced teams
8. Choose a modern technology stack
   Choices for hosting infrastructure, databases, software frameworks, programming languages and the rest of the technology stack should seek to avoid vendor lock-in.
9. Deploy in a flexible hosting environment
10. Automate testing and deployments
    How long does it take to build, test, and deploy a new feature into production?
11. Manage security and privacy through reusable processes
12. Use data to drive decisions
    A feedback mechanism should be in place for people to report issues directly.
13. Default to open
    Collaborate in the open and publish our data publicly.