



GOYDER INSTITUTE MODEL METADATA TEMPLATE

METADATA REQUIRED	DETAILS
Model Name and version	Integrated Urban Water Management (IUWM) model
Date of lodgement of Metadata Template.	November 2014
Name of Metadata Provider	Ms Susan Cuddy susan.cuddy@csiro.au
Goyder Institute Project Number and Name	GOYDER INSTITUTE FOR WATER RESEARCH Project No. U.2.2 Optimal Water Resources Mix (OWRM)
Project Team	Project Leader: Ms Susan Cuddy susan.cuddy@csiro.au Task Leader: Dr Shiroma Maheepala Prof Graeme Dandy, graeme.dandy@adelaide.edu.au Dr Mark Thyer, mark.thyer@adelaide.edu.au Project Team: Fareed Mirza fareed.mirza@csiro.au Luis Neumann luis.neumann@csiro.au Guna Hewa guna.hewa@unisa.edu.au Rob Daly rob.daly@sawater.com.au Steve Kotz steve.kotz@sawater.com.au Andrew Wilkins andrew.wilkins@sawater.com.au Holger Maier holger.maier@adelaide.edu.au Wenyan Wu wenyan.wu@adelaide.edu.au Angela Marchi angela.marchi@adelaide.edu.au
Creator/Developer	Dr Shiroma Maheepala (see owner details)
Owner/Contact Person and contact details	Mr Steve Kotz, Water Security and Supply, SA Water Steve.kotz@sawater.com.au *** SEE IP PERMISSION SECTION FOR ANY SPECIFIC REQUIREMENTS ***
Model Location	<i>Where is the model archived?</i> <i>Provide contact details of individual and unit/group within designated organisation</i> Model housed with SA Water Mr Steve Kotz, Water Security and Supply, SA Water Steve.kotz@sawater.com.au <i>Is there a version of the model in active further development? Where is this active version located?</i> <i>Provide contact details of individual and unit/group within designated organisation</i> See above

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IP or other permission requirements	<p align="center">***** REFER TO GOYDER INSTITUTE FOR WATER RESEARCH AGREEMENT *****</p> <table border="1"> <thead> <tr> <th>Component</th> <th>IP holder</th> <th>Note</th> </tr> </thead> <tbody> <tr> <td>Source schematic & Insight modules (contained in the rsproj files)</td> <td>CSIRO Land and Water Flagship</td> <td>As these files contain SA Water confidential data, they cannot be distributed by CSIRO contact Susan Cuddy</td> </tr> <tr> <td>Rainwater tank module</td> <td>CSIRO Land & Water Flagship</td> <td>Available on request; contact Susan Cuddy</td> </tr> <tr> <td>Source catchment model</td> <td>SA EPA</td> <td>CSIRO has approval from EPA to distribute this model on request contact Shaun Thomas shaun.thomas@epa.sa.gov.au</td> </tr> <tr> <td>Wastewater inflows model</td> <td>SA Water</td> <td>contact Steve Kotz</td> </tr> <tr> <td>WAPABA model</td> <td>CSIRO/BoM</td> <td>Held under the Water Information Research and Development Alliance (WIRADA) with permission for on-distribution by CSIRO (or BoM) on request to the Alliance contact QJ Wang, Qj.wang@csiro.au</td> </tr> </tbody> </table>	Component	IP holder	Note	Source schematic & Insight modules (contained in the rsproj files)	CSIRO Land and Water Flagship	As these files contain SA Water confidential data, they cannot be distributed by CSIRO contact Susan Cuddy	Rainwater tank module	CSIRO Land & Water Flagship	Available on request; contact Susan Cuddy	Source catchment model	SA EPA	CSIRO has approval from EPA to distribute this model on request contact Shaun Thomas shaun.thomas@epa.sa.gov.au	Wastewater inflows model	SA Water	contact Steve Kotz	WAPABA model	CSIRO/BoM	Held under the Water Information Research and Development Alliance (WIRADA) with permission for on-distribution by CSIRO (or BoM) on request to the Alliance contact QJ Wang, Qj.wang@csiro.au
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Licences associated with model and/or dependencies	<p>** REFER TO GOYDER INSTITUTE FOR WATER RESEARCH AGREEMENT **</p> <p><i>Are there any licenses associated with the model and/or the dependencies that future users need to be aware of?</i></p> <p>Users need to be registered as an eWater Source user. While there is now a free version of Source, it is unlikely that that version would contain the necessary componentry to run the IUWM models.</p>																		
Confidentiality agreements associated with model and/or dependencies	<p><i>Are there any confidentiality agreements associated with the model and/or the dependencies that future users need to be aware of?</i></p> <p>Permission from SA Water would be needed to obtain access to SA Water data used in model development. See Owner contact details.</p>																		
Brief outline of model	<p>The IUWM model is an eWater Source application that has been developed with an aim to provide a modelling capability to inform identifying the most cost-effective and environmentally sustainable mix of water sources to meet potable and non-potable water demands in a given town/city. A proof-of-concept of this modelling capability has been developed based on metropolitan Adelaide and considers current (i.e. 2013), 2025 and 2050 potable and non-potable water demands and supply sources. Determining suitable mixes of water sources takes into account energy consumption, financial costs, and reliability of supply while seeking to minimise stormwater and wastewater discharges to the Gulf. It is a fully working implementation that contains representative datasets available at the time of implementation and simulation (catchment and schematic) and optimisation modules.</p>																		

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Area/region covered	<p>The study area (Error! Reference source not found.) is metropolitan Adelaide and the north of the town of Gawler in the north to Sellicks beach in the City of Onkaparinga in the south, and from the east of the towns of Bridgewater and One Tree Hill in the east, to the east coast of the Gulf St. Vincent. The study area included a majority of the area covered by Metropolitan Adelaide and the major growth areas located outside the Gawler local government area, i.e. Concordia and Roseworthy growth areas, and excluded a portion area governed by Adelaide Hills Local Government, between Kangaroo Creek and Mount Bold reservoirs.</p>  <p>Catchments (greater than 200km²)</p> <ul style="list-style-type: none"> 10 Bremer River 12 Ferris-McDonald 6 Finnis River 13 Gawler River 15 Light River 14 Long Plains 7 Marne River 9 Onkaparinga River 1 Patawalonga Basin 4 Reedy Creek 11 Salt & Templers Creeks 3 Sandergrove Plains 2 Saunders Creek 5 Smith & Adams Creeks 8 Torrens River <p>Legend:</p> <ul style="list-style-type: none"> Study Area Local Government Area Reservoir Watercourse Desalination plant <p>Scale: 0 5 10 15 20 Kilometres</p> <p>Metadata:</p> <p>Copyright under Creative Commons Attribution 3.0 Australia License http://www.sa.gov.au Copyright under Crown in right of the State of South Australia through Department of Environment, Water and Natural Resources 2012</p> <p>Produced by: SA Water (Data: Monitoring and knowledge Base; Map Projections: Lambert Conformal Conic; Geographic Datum of Adelaide 1981; Scale: 1:50,000)</p> <p>Government of South Australia Department of Environment, Water and Natural Resources</p> 

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Platform and language and version	<p>Source Schematic</p> <ul style="list-style-type: none"> eWater Source version 3.3.0 which expired in 2013 and needs an activation key from eWater to be operational. The IUWM 'code' is written using the Source Expression Editor, the syntax and grammar of which is most similar to Excel. <p>Source Insight (the optimisation module)</p> <ul style="list-style-type: none"> is installed with Source. The project produced a specialised version of the command line version to allow for the specification of constraints. <p>Source Catchment model</p> <ul style="list-style-type: none"> eWater Source version 3.5.0 which expired in mid 2014 and needs an activation key from eWater to be operational.
<p>Dependencies upon:</p> <ul style="list-style-type: none"> i) other models and/or platforms (including version) ii) essential data and data sources 	<p>Source Catchment model uses 3 plug-ins. Their availability is not critical, but they have been included in the hand-over package</p> <ul style="list-style-type: none"> CompareFlow DERMTools RRModellInputExplorer <p>The specialised version of the command line version of Insight is required. This was packaged with the application for hand-over. <i>(eWater included this on their upgrade/release schedule and it may now be included in the latest Source/Insight release, i.e. the specialised version produced by the project would not be required should the model be upgraded to the latest release of Source.</i> http://www.ewater.com.au/products/ewater-source/</p> <p>OTHER MODELS USED</p> <p>Three other models were used and or developed to provide input data:</p> <ul style="list-style-type: none"> Stochastic Rainwater tank model (RTModelling.exe) – compiled executable and instructions for use included in hand-over package. Wastewater inflow model - Matlab code for each WWTP included in hand-over package. CSIRO's WAPABA model was used to generate monthly inflow time series. WAPABA was developed under the WIRADA between CSIRO and the Bureau of Meteorology and permission needs to be sought from WIRADA to on-distribute. <p>ESSENTIAL DATA AND DATA SOURCES</p> <p>All essential data is packaged either within the Source project files (.rsproj) or included in the hand-over packages.</p> <p>SKILLS/RESOURCES REQUIRED TO RUN THE MODEL</p> <p>All models can be run by someone with no knowledge of how they work. Instructions on how to run the auxiliary models (i.e. the 'other' models) are included in the hand-over packages. Interpretation of results cannot be done without knowledge of the model conceptualisation, its data and assumptions.</p> <p>The hand-over package is held by SA Water. See Owner contact details.</p>

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How was model used	<ul style="list-style-type: none"> ○ <i>Parameterisation/Validation (if applicable; include time period of calibration/simulation)</i> The parameterisation of the model is fully described in Maheepala et al (2014). Comparison of simulated results to observed data was limited to inflow and outflows under the current (i.e. 2013) scenario (see Maheepala et al (2014), e.g. Table 22). The simulation period for the current scenario was 50 years (1963 to 2013), extended to 2025 and 2050 for future scenarios. Future climate series were obtained from CSIRO’s OzClim Climate Scenario Generator, based on moderate temperature and rainfall climate change scenarios; future population and households were derived from ABS projections. ○ <i>Scenarios and outputs from various runs (indicate where these are stored)</i> Simulation model (Source schematic) run results for scenarios are included in the hand-over package and are thus stored at SA Water. See Owner/Contact. ○ <i>Assumptions behind model (indicate where these are stored)</i> The build of the IUWM model and associated assumptions are fully described in Maheepala et al (2014). ○ <i>Limitations of model</i> Limitations are related to purpose of use – for example, the current aggregation of stormwater schemes would be considered a limitation if exploration of stormwater is an issue. It would not be considered a limitation if exploration of household water use were the issue. Limitations are caveats on use and interpretation are described in Maheepala et al (2014). ○ <i>Peer review process (if applicable)</i> An external peer review process was not undertaken. However the involvement of SA Water and EPA staff throughout the model development provided internal peer review at all stages of development of the model. In addition, key decisions and the consequences of those decisions were workshopped with members of the project’s reference panel. ○ <i>Extensibility of model (can it be run for different time periods)</i> The model could be run for any time period within the 50 year period, July 1963 to June 2013. To go outside that 50-year period would require generation of input data. The framework is universally applicable.

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Specificity of data	<p><i>Was data sourced from local field sites or literature</i></p> <p>Local Adelaide data were used where possible (ref following list), supplemented by data from other Australian capital cities or the literature.</p> <ol style="list-style-type: none"> 1. Storage volumes and depth-area curves for the three MLR storages 2. Observed inflow data to MLR storages 3. Monthly and daily residential and non-residential data for the consumption zones 4. Wastewater inflows for the wastewater treatment plants 5. Stormwater harvesting locations and operational status of harvesting schemes 6. Rainwater tank sizes, connected roof areas to tanks 7. Residential end use consumption data 8. Land uses: current, 2025 and 2050 9. Rainfall and evaporation: current, 2025 and 2050 10. Observed daily streamflow data for gauges in urban catchments (for calibration of Source Catchment model) 11. Bulk water supply infrastructure data (pipe sizes, pump capacities, etc) 12. Wastewater treatment capacities, recycle water production cap, recycle distribution capacities 13. Method of harvesting and parameters associated with harvesting for existing Stormwater harvesting schemes 14. Demand management methods and associated water savings 15. Population and dwelling distribution 16. Cost and energy consumption data related to infrastructure
Datasets/data products produced	<p><i>Include details of where datasets/products are located and contact details</i></p> <p>Model inputs and results are contained within the handover package which is held by SA Water. The large dataset containing the outputs from the optimisation is also held by SA Water.</p> <p>See Owner/Contact Person Details.</p>
Other Information	<p>Users need to be registered as an eWater Source user. While there is now a free version of Source, it is unlikely that that version would contain the necessary componentry to run the IUWM models.</p> <p>http://www.ewater.com.au/products/ewater-source/</p>

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Publications (papers and technical reports)	<p>Maheepala, S., Dandy, G., Marchi, A., Mirza, R., Wenyan, W., Daly, R., Hewa, G., Neumann, L., He, Y. and Thomas, S. (2014) A Decision Support Framework for identifying optimal water supply portfolios: Metropolitan Adelaide Case Study: Volumes 1 Main Report and 2 Appendices. Goyder Institute for Water Research Technical Report Series No. 14/17, Adelaide, South Australia</p> <p>Marchi, A., Dandy, G. and Maier, H. (2014) Financial costs, energy consumption and greenhouse gas emissions for major supply water sources & demand management options for metropolitan Adelaide. Goyder Institute for Water Research Technical Report Series No. 14/12, Adelaide, South Australia</p> <p>Mirza, F., Thomas, N., Maheepala, S. and Kotz, S. (2013) Towards building an integrated urban water system model to inform the identification of optimal water source mixes for Adelaide. In: Proc 20th international congress on Modelling and Simulation, Adelaide, Australia, 1-6 December 2013. Modelling and Simulation Society of Australia and New Zealand Inc. pp 2255–2261.</p> <p>Goyder Institute Technical Reports are available at: http://goyderinstitute.org/</p>
Collaborations and acknowledgements	SA EPA (Shaun Thomas), AMLR NRM Board (Steve Gatti)
Keywords	Integrated urban water modelling; urban water planning; water resource optimisation; multi-objective optimisation