

INTEGRATED WATER CYCLE MANAGEMENT

EVALUATION STUDY

EXECUTIVE SUMMARY

PREPARED FOR:

ORANGE CITY COUNCIL

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Main Cover Photos:

Main – Aerial of stormwater harvesting batch ponds (foreground), Orange STP (middle) and Suma Park Reservoir (background) (Source: Kerry Fragar)

Left – Orange STP Trickling Filter (Source: OCC)

Middle – Somerset Wetland (Source: Kerry Fragar)

Right – Suma Park Reservoir (Source: Kerry Fragar)

Cover Photos:

Main – Suma Park Reservoir (Source: Kerry Fragar)

Top – Discharge of first harvested stormwater into Suma Park Reservoir (Source: OCC)

Middle – Orange STP Trickling Filter (Source: OCC)

Bottom – Suma Park Dam (Source: Kerry Fragar)

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Executive Summary

Integrated Water Cycle Management (IWCM) is a planning process developed by the NSW Department of Water and Energy (DWE), with defined steps to effectively integrate water supply, sewerage and stormwater to achieve sustainable management of these services. DWE developed the IWCM Guidelines in 2004 and a revised generic Scope of Work in December 2008 to provide guidance on IWCM. The Orange IWCM Evaluation Study has followed these guidelines.

IWCM is a way of managing water in which all components of the water system are integrated so that water is used optimally. For a local water utility such as Orange City Council (OCC), this means that the three main urban water services – water supply, sewerage and stormwater – should be planned and managed in an integrated way to ensure that the maximum value is obtained from the resources and that benefits to the environment and community are realised.

IWCM deals with the complex linkages between the different elements of the water cycle. It addresses issues facing local water utilities as well as the more general issues facing the environment. IWCM considers issues such as:

- The future urban water service needs and customer expectations;
- The availability of water including water sources such as surface water, groundwater, rainwater, effluent and stormwater; and
- The impact of water, sewerage and stormwater on other water users including the environment and future generations.

The 2008 DWE guidelines recommend a two-step IWCM process:

- Step 1: Evaluation Study to identify IWCM issues and assess if Business as Usual (BAU) actions are addressing the IWCM issues identified; and
- Step 2: Strategy Plan (if required) to solve the IWCM issues not addressed by the BAU Scenario.

Stakeholder consultation was undertaken to ensure that stakeholders contributed to the identification of water cycle management issues. This was achieved through the formation of a Project Reference Group which included representatives from OCC, government agencies, local organisations and the community.

Current Urban, Catchment and Water Resources Situation

The OCC IWCM Evaluation Study identifies catchment, water resource and urban water cycle management issues relevant to the management and operation of OCC's urban water service business.

OCC operate potable water supply schemes for the city of Orange and the villages of Lucknow and Spring Hill. The total population served with water is approximately 36,800. Water is sourced primarily from surface water systems and water stored in Gosling Creek, Spring Creek and Suma Park reservoirs. Groundwater is the primary water source for Lucknow and Spring Hill and is used to supplement the raw water supplies for Orange. OCC also operates two innovative stormwater harvesting schemes to supplement the city's raw water supplies.

Sewerage services are provided to the city of Orange and the villages of Lucknow and Spring Hill. OCC operates two sewage treatment plants (STPs) that treat the effluent to a tertiary standard. A water supply agreement supplies the majority of the treated effluent from the Orange STP to the Cadia gold mine where it is reused for industrial purposes. The treated effluent from the Spring Hill sewage treatment plant is reused through irrigation. The population served with sewerage is approximately 34,500. Areas that are not connected to the Council sewerage system utilise on-site sewage management systems.

Stormwater drainage infrastructure for the OCC Local Government Area (LGA) comprises conventional drainage systems in the urban areas with grassed roadside verges and swales in non-urban areas. OCC operates two stormwater harvesting schemes that supplement the city's raw water supplies. The Blackmans Swamp Creek stormwater harvesting scheme captures a portion of the runoff generated from a 30.5 km² predominately urban catchment. The Ploughmans Creek stormwater harvesting scheme uses a system of four constructed stormwater management wetlands and harvests a portion of the runoff generated from a 10.6 km² urban catchment. Currently the two schemes supply an average of about 870 ML per year which is about 16 % of the City's unrestricted water demand.

Urban Water Targets and Issues

The IWCM Evaluation Study provides a basis to understand the targets for the provision of water, sewerage and stormwater services. These were identified from the 2007 IWCM Concept Study and review of existing background information as well as through discussions with OCC staff and regulatory authorities and stakeholder consultation.

Water service utilities have requirements that relate to legislation, contracts, standards and agreed levels of service. Those requirements that are a 'must do' for the utility define the IWCM targets. Non-compliance with an IWCM target is described as an IWCM issue.

A summary of the IWCM targets and how they are addressed by the BAU Scenario is given in **Table S1**. An IWCM Strategy must be prepared if the BAU Scenario does not address all IWCM issues.

Table S1 – Summary of IWCM targets and BAU scenario

| Service | Summary of Key IWCM Targets | Business as Usual Scenario | Remaining IWCM Issue? |
|---------|---|--|-----------------------|
| Water | <ul style="list-style-type: none"> Town water supply licence limit of 7,800 ML/year | <ul style="list-style-type: none"> The highest peak annual water demand in recent times occurred in 2002 when 7,120 ML was consumed. OCC has implemented a comprehensive demand management strategy that has successfully reduced water consumption despite a growing population. The current estimated unrestricted demand is 5,400 ML/year which is well below the current town water licence limit. Forecast water demand under high population growth assumptions remain below the 7,800 ML/year limit over the 30 year IWCM planning period. | No |
| | <ul style="list-style-type: none"> Suma Park Dam licence (80SL046857) includes a condition for an environmental flow release of 12 L/s (equivalent to 1 ML/day), or the flow entering the dam, whichever is the lesser, into Summer Hill Creek downstream whenever there is flow entering the storage. | <ul style="list-style-type: none"> There is an upstream gauge which is continuous monitored to measure inflow to the dam. There is a small V-notch downstream to measure and permit adjustment of discharge; however this is not continuously recorded. OCC intends to upgrade the downstream V-notch weir to include monitoring and continuous data recording and will maintain records of environmental flow release. | No |
| | <ul style="list-style-type: none"> Volume of groundwater extraction for Lucknow and Spring Hill is limited to 75 ML/year. | <ul style="list-style-type: none"> Analysis of current and future demand indicates extraction for Lucknow and Spring Hill should remain below 75 ML/year for next 25 years. | No |
| | <ul style="list-style-type: none"> Volume of groundwater extraction from the showground, depot and Clifton Grove bores is limited to 462 ML/year. | <ul style="list-style-type: none"> OCC will operate these bores to remain within this licence limit. | No |
| | <ul style="list-style-type: none"> Environmental protection licence regulates water pollution resulting from the application of a copper based algicide at Suma Park and Spring Creek dams. | <ul style="list-style-type: none"> Algicide application has not been required in the last 10 years. OCC would comply with this licence if application is required. | No |
| | <ul style="list-style-type: none"> OCC owns five (5) dams which are all prescribed dams under the <i>Dams Safety Act, 1978</i>. | <ul style="list-style-type: none"> OCC continually works with the Dams Safety Committee (DSC) to ensure compliance with its requirements and the Dams Safety Act, 1978. Surveillance reporting completed as required and investigation and design works for Suma Park Dam safety upgrade works is in progress. Further investigation, documentation and reporting are in progress as required by the DSC based on an agreed 5 year plan. | No |

Table S1 – Summary of IWCM targets and BAU scenario

| Service | Summary of Key IWCM Targets | Business as Usual Scenario | Remaining IWCM Issue? |
|-------------------|--|--|-----------------------|
| Water (continued) | <ul style="list-style-type: none"> The water supply system does not comply with the 5/10/10 rule for imposing water restrictions. | <ul style="list-style-type: none"> The current 5/10/10 secure yield for the existing approved water supply system is 4,750 ML/year. This is short of the 2010 estimated unrestricted water demand of 5,400 ML/year for Orange, and under high growth assumptions the water demand in 2040 is estimated to be 6,655 ML/year. OCC's BAU Scenario includes the following water supply infrastructure options: <ul style="list-style-type: none"> Raising Suma Park Dam Full approval of the Blackmans Swamp Creek stormwater harvesting scheme Stage 2 of the Blackmans Swamp Creek stormwater harvesting scheme Connection of bores (achieved in March 2012) The Macquarie River to Orange pipeline The addition of these components would increase the system secure yield to 8,800 ML/year. | No |
| | <ul style="list-style-type: none"> OCC's adopted 2009 water supply management strategy resolved to deliver water supply infrastructure up to 10 years prior to the projected demand. | <ul style="list-style-type: none"> Current system secure yield is less than current (2010) unrestricted demand (see above). Proposed BAU water supply infrastructure options can be implemented (subject to gaining requisite approvals) to ensure secure yield is at least 10 years in front of the projected demand. | No |
| | <ul style="list-style-type: none"> Ensure the dual water reticulation area is provided with an approved alternative water supply source. | <ul style="list-style-type: none"> OCC has worked with the NSW Department of Planning and has obtained approval to use harvested stormwater in the dual reticulation system. Planning, design and construction are currently underway. | No |
| | <ul style="list-style-type: none"> OCC is committed to achieving 100% compliance with the Australian Drinking Water Guidelines for its potable supplies. | <ul style="list-style-type: none"> OCC has developed and implemented a risk based water quality management plan. Monitoring indicates 100% quality compliance. | No |
| | <ul style="list-style-type: none"> OCC is committed to achieving 100% compliance with the Australian Drinking Water Guidelines for its potable supplies through monitoring in accordance with NSW Department of Health's monitoring requirements. | <ul style="list-style-type: none"> All water quality monitoring is conducted in accordance with NSW Department of Health requirements. | No |
| | <ul style="list-style-type: none"> OCC has a contractual requirement to supply water from Lake Canobolas to the Nashdale water users. | <ul style="list-style-type: none"> Water is provided in accordance with the terms of the agreement. | No |
| | <ul style="list-style-type: none"> OCC is required to comply with Workplace Health and Safety in its water service operations. | <ul style="list-style-type: none"> Appropriate plans are in place and no breaches have been identified. | No |

Table S1 – Summary of IWCM targets and BAU scenario

| Service | Summary of Key IWCM Targets | Business as Usual Scenario | Remaining IWCM Issue? |
|-------------------|--|---|-----------------------|
| Water (continued) | <ul style="list-style-type: none"> Water consumption records analysed in the 2007 IWCM Concept Study indicated that annual unaccounted for water (UFW) is relatively high as the available data indicated it did not go below 20%. The typical amount is about 10% to allow for leakage and unmetered activities. | <ul style="list-style-type: none"> Orange City Council undertook a major leak and pressure reduction program in 2009 that has saved 500 ML/year; this would have been a component of the UFW. This would reduce the UFW to around 10%. A system wide water system model is being developed that will include additional metering and monitoring that will make UFW accounting more accurate. | No |
| | <ul style="list-style-type: none"> The 2007 IWCM Concept Study found the billing system does not categorise accounts according to their customer type making analysis of customer type consumption behaviour difficult to determine. | <ul style="list-style-type: none"> A system wide water model is being developed that will include additional metering and monitoring across customer type. | No |
| | <ul style="list-style-type: none"> Best practice requires compliance with six criteria: strategic business plan; pricing policy; demand management; drought management; performance reporting and IWCM. | <ul style="list-style-type: none"> OCC current status compared to the best practice criteria is: <ul style="list-style-type: none"> Strategic Business Plan in place; will require revision following completion of the IWCM Evaluation Study. Pricing policy (including Developer Charges, Liquid Trade Waste policy and Approvals) in place. Draft Demand Management Plan developed. Needs to be updated and linked to the Centroc Demand Management Plan which is in progress. Draft Drought Management Plan developed. Needs to be updated and linked to the Centroc Drought Management Plan which is in progress. Compliance with performance reporting. IWCM in progress. | No |
| Sewerage | <ul style="list-style-type: none"> OCC holds environment protection licences for the operation of the Orange and Spring Hill sewage treatment plants. There has been some exceedance of discharge limits at various times from both plants. | <ul style="list-style-type: none"> OCC is undertaking a feasibility assessment of using a de-chlorination unit for Orange STP and is continuing to implement recommendations in consultation with the EPA. A new flow meter is being installed at the Spring Hill plant. | No |
| | <ul style="list-style-type: none"> OCC has a water supply agreement with Cadia Holdings Pty Ltd to supply treated effluent from the Orange STP for industrial purposes. Treated effluent is supplied according to the following conditions: <ul style="list-style-type: none"> the initial 10 ML/day of treated effluent thereafter any remaining treated effluent up to a maximum of 3 ML/day thereafter any residual. | <ul style="list-style-type: none"> This agreement commenced in December 1997 and is set to continue for the life of the mine. The Cadia East project was recently approved and is expected to extend the life of the Cadia Valley Operations to approximately 2030. OCC is currently negotiating the terms of the existing water supply agreement. | No |
| | <ul style="list-style-type: none"> OCC is required to implement and maintain an on-site effluent management system register. | <ul style="list-style-type: none"> OCC has developed and implemented an on-site effluent management system policy and is conducting audits of the associated register. | No |

Table S1 – Summary of IWCM targets and BAU scenario

| Service | Summary of Key IWCM Targets | Business as Usual Scenario | Remaining IWCM Issue? |
|----------------------|--|---|-----------------------|
| Sewerage (continued) | <ul style="list-style-type: none"> OCC is required to comply with Workplace Health and Safety in its sewerage service operations. | <ul style="list-style-type: none"> Appropriate plans are in place and no breaches have been identified. | No |
| | <ul style="list-style-type: none"> The 2007 IWCM Concept Study reported a high wet weather inflow and infiltration to the sewerage system indicated by large spikes in inflow volumes at the Orange sewage treatment plant. | <ul style="list-style-type: none"> OCC has installed additional flow gauges throughout the system and has completed the development of a system wide model that can be used to identify problem areas which can then be targeted for rectification as required. | No |
| | <ul style="list-style-type: none"> Wastewater flow gauging data upstream and inside the Orange STP is not thought to be representative of the wastewater flows. | <ul style="list-style-type: none"> OCC has installed additional flow gauges throughout the system and has completed the development of a system wide model that can be used to identify problem areas which can then be targeted for rectification as required. | No |
| | <ul style="list-style-type: none"> The 2007 IWCM Concept Study identified that a compliant trade waste policy was not in place. | <ul style="list-style-type: none"> A liquid trade waste policy that fully satisfies DEUS requirements has been adopted by Council. | No |
| | <ul style="list-style-type: none"> Best practice requires compliance with six criteria: strategic business plan; pricing policy; demand management; drought management; performance reporting and IWCM. | <ul style="list-style-type: none"> OCC current status compared to the best practice criteria is: <ul style="list-style-type: none"> Strategic Business Plan in place; will require revision following completion of the IWCM Evaluation Study. Pricing policy (including Developer Charges, Liquid Trade Waste policy and Approvals) in place. Draft Demand Management Plan developed. Needs to be updated and linked to the Centroc Demand Management Plan which is in progress. Draft Drought Management Plan developed. Needs to be updated and linked to the Centroc Drought Management Plan which is in progress. Compliance with performance reporting. IWCM in progress. | No |

Table S1 – Summary of IWCM targets and BAU scenario

| Service | Summary of Key IWCM Targets | Business as Usual Scenario | Remaining IWCM Issue? |
|------------|--|--|-----------------------|
| Stormwater | <ul style="list-style-type: none"> The Blackmans Swamp Creek stormwater harvesting scheme has Emergency Approval to operate whenever Suma Park reservoir is less than 50%. | <ul style="list-style-type: none"> OCC is complying with this approval and is seeking a licence for permanent operation of the scheme. | No |
| | <ul style="list-style-type: none"> The NSW Office of Water has developed a water quality approval process for the two stormwater harvesting schemes. Permanent use of the schemes will not be approved until this process is completed. | <ul style="list-style-type: none"> OCC is working through the water quality approval process, collecting and reporting on operational data as required in each stage of this process. | No |
| | <ul style="list-style-type: none"> OCC has made an application to operate the Blackmans Swamp Creek harvesting scheme at all times when storage conditions permit. This application is pending NOW determination. | <ul style="list-style-type: none"> OCC is continuing to resolve permanent licensing through participation in a Local Land Board hearing. | No |
| | <ul style="list-style-type: none"> A licence was issued in August 2011 for the operation of the Ploughmans Creek stormwater harvesting scheme subject to operating rules. | <ul style="list-style-type: none"> To date (June 2012) the scheme has not been operated due to adequate storage levels. As the stormwater holding pond cannot be used until the licence application of the Blackmans Swamp Creek stormwater harvesting scheme is resolved, OCC is investigating a piping system that will enable the Ploughmans scheme to be used without the holding pond. | No |
| | <ul style="list-style-type: none"> OCC directed to prepare a Stormwater Management Plan under Section 12 of the <i>Protection of the Environment Administration Act, 1991</i> | <ul style="list-style-type: none"> OCC has complied with this directive and has implemented a Stormwater Management Plan which was last updated in 2008. | No |

Community Objectives and Referrals to Other Agencies

The IWCM process has identified community objectives that reflect what the community would like the urban water service to have or do. These community objectives are often about the things the community values and wishes to support and pay for (e.g. higher levels of environmental protection). Only the community objectives which relate to the provision of the urban water service are used in the IWCM process. Other community objectives may fall under the responsibility of other agencies or organisations and are referred to the relevant authority. A summary of the community objectives derived in the IWCM process that relate to the urban water service is provided in **Table S2**. Community objectives are considered when comparing ways to address any IWCM issues. The community objectives defined through the IWCM Evaluation Study will be used in the six year revisions.

Table S2 lists those community objectives that should be referred to other agencies.

Table S2 – Community objectives

| Utility Service and Element | Key Issue | Issues Raised/Comments |
|--------------------------------------|--------------------------|---|
| Water Supply | | |
| Typical residential bill (TRB) | Best Practice | Future level needs to reflect sustainable asset management at minimum cost. Required TRB will be an outcome of the need for water security |
| Availability/reliability of supply | Level of Service (LOS) | 100% compliance with LOS targets for water pressure, interruptions to supply, fire fighting and special customers |
| Demand management | Best Practice | Maintain demand < average median for inland Local Water Utilities (LWUs) |
| Response times for supply failure | LOS | 100% compliance with LOS targets |
| Response times for general inquiries | LOS | 100% compliance with LOS targets |
| Contamination | Health and environmental | <ul style="list-style-type: none"> • Protection of water supplies • Perceived risk of contamination of water supplies (accidental or sabotage). • Risk based drinking water quality plan in place • Implementation of Water Quality Management Plan • Development of Business Continuity Plan |
| Water supply | Governance | <ul style="list-style-type: none"> • Regional water supply cooperation • Regional water supply should be based on catchments. • Inter catchment transfers should be avoided. • Amalgamation of LWUs on a catchment basis. • Need for cooperation between LGAs to facilitate management of the water cycle (Blayney and Cabonne). • Should Council trade excess water on the water market? • Water and sewer utilities being overtaken by State Government/Federal/private – impacted by political and regulatory change. |
| Security of water supply | Agreed LOS | <ul style="list-style-type: none"> • Diverse water supply solutions • Lake Canobolas should remain in the mix of options being considered. • Raising the FSL of Suma Park Dam should remain in the mix of options being considered. • More knowledge required on groundwater resources. |

Table S2 – Community objectives

| Utility Service and Element | Key Issue | Issues Raised/Comments |
|-----------------------------|--|---|
| Security of water supply | Environmental flow | <p>High Priority Issues raised in Concept Study:</p> <ul style="list-style-type: none"> • Potential environmental flow requirements, under the macro water sharing plan, may impact on water supply system reliability. Summer Hill creek downstream of the dam is subject to erosion and reduced flow. • Need to return effluent to the environment as some creek systems require environmental water. • Need to ensure that natural flow regimes are maintained and that effluent is not used to alter these flows. • Need to understand the relationship between natural resources available and the demands of the urban area. <p>Comments:</p> <ul style="list-style-type: none"> • The draft <i>Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources</i> does not contain environmental flow requirements that will impact on Orange's secure yield. • Environmental flow requirements will be investigated as part of the planned raising of Suma Park Dam. These will consider the proposed environmental flow rules negotiated as part of the Blackmans Swamp Creek stormwater harvesting scheme. |
| Water quality | Health and environmental, protection of water supplies | <p>High Priority Issues raised in Concept Study:</p> <ul style="list-style-type: none"> • Salinity hazard is low and not thought to impact on waterways. • Soil degradation (development) leads to high TN and TP levels that lead to algal blooms. • Manganese and iron dissolution in dam waters, however downstream treatment means that these are presently being managed. • Urbanisation (also occurring in our water supply catchment including rural residential development) and agricultural land use increases pollutants loads. • Failure of on-site disposal systems could potentially increase pollutant loads on creeks. There is a lack of records of on-site systems and lack of resources to monitor and audit systems. • Loss of biodiversity leading to monodiversity (permanent ecological change) – willows and other exotics species in Orange compromise the natural riparian ecosystems and change channel morphology. • Lack of recognition of environmental/ecological services. <p>Comments:</p> <ul style="list-style-type: none"> • OCC has developed a Water Quality Risk Management Plan that specifically addresses water quality risks in the entire system (catchment to tap). • Extensive water quality monitoring program. • Urban catchment audit to highlight water quality pressures being undertaken. |
| Security of water supply | Understanding of potential groundwater resources | <p>High Priority Issues raised in Concept Study:</p> <ul style="list-style-type: none"> • The need to value groundwater as a resource, what role does it have in the future (what resource is available and what is being used already), what is the quality? • Groundwater study within pipeable distance of Orange. <p>Comments:</p> <ul style="list-style-type: none"> • Use of Showground, depot and Clifton Grove bores as part of water supply (licensed March 2012). • Initial groundwater studies and MAR business case complete. |
| Security of supply | Planning for climate change | <p>Issue raised in Concept Study:</p> <ul style="list-style-type: none"> • Defining our stance on climate change in terms of our strategic planning. <p>Comment:</p> <ul style="list-style-type: none"> • Climate change modelling undertaken as Part of the Evaluation Study. |
| Security of supply | Understanding demand drivers | <p>Issue raised in Concept Study:</p> <ul style="list-style-type: none"> • Future population, lifestyle changes and climate changes – these demand drivers are expected to increase the total water demands and wastewater flow production over time, potentially increasing the demand above the reliable water system yield. <p>Comments:</p> <ul style="list-style-type: none"> • Demand projections have been reviewed as part of the IWCM Evaluation Study. • Climate change modelling of the Business as Usual (BAU) Scenario completed. |

Table S2 – Community objectives

| Utility Service and Element | Key Issue | Issues Raised/Comments |
|---|---|--|
| Security of supply | Understanding surface water resources | Issue raised in Concept Study: <ul style="list-style-type: none"> Understanding surface water resources available within transferable/pipeable distance from towns. Source of supply outside the immediate area. Comment: <ul style="list-style-type: none"> Investigation of technically feasible surface water options has been undertaken as part of the IWCM Evaluation Study. |
| Security of supply | Appropriate use of treated effluent as a resource | Issue raised in Concept Study: <ul style="list-style-type: none"> Effluent is not available for reuse in Orange City, as it is currently pumped to Cadia Gold Mine, and the life of the mine is undetermined at this stage. Comments: <ul style="list-style-type: none"> The agreement is currently under negotiation and needs to be resolved. Mine has current approval through to 2031. |
| Sewerage | | |
| Typical residential bill (TRB) | Best Practice | Future level needs to reflect sustainable asset management at minimum cost |
| System capacity - frequency of system blockage | LOS | Performance target less than 20 blockages annually per 100km of sewer main |
| Availability of connection | LOS | 100% compliance with LOS targets |
| Average system failures | LOS | 100% compliance with LOS targets |
| Response times to system faults | LOS | 100% compliance with LOS targets |
| Response times to customer complaints & inquiries of a general nature | LOS | 100% compliance with LOS targets |
| Odour | LOS | Not more than 2 incidents per year that result in complaints |
| STP interaction | LOS | 100% compliance with LOS targets |
| Effluent discharge/biosolids management | LOS | 100% compliance with LOS targets |
| Recycled Water | Appropriate use of treated effluent as a resource | Issue raised in Concept Study: <ul style="list-style-type: none"> Effluent is not available for reuse in Orange City, as it is currently pumped to Cadia gold mine, and the life of the mine is undetermined at this stage. Comments: <ul style="list-style-type: none"> The agreement is currently under negotiation and needs to be resolved. Mine has current approval through to 2030. LOS target for effluent reuse is 75%. Average over past 5 years is 79%, ranging from 28% to 94%. |
| Effluent discharge | Minimise environmental impact of discharge | Issue raised in Concept Study: <ul style="list-style-type: none"> Effluent discharged into Summer Hill Creek from the Orange STP can be of poor quality under storm conditions (under by pass). Comments: <ul style="list-style-type: none"> Subject to EPA licence conditions. Options study complete. OCC continuing to work with EPA to implement recommendations. |

Table S2 – Community objectives

| Utility Service and Element | Key Issue | Issues Raised/Comments |
|-----------------------------|--|---|
| Stormwater | | |
| Urban catchment management | Manage urban stormwater quantity and quality | <p>High Priority Issues and possible solutions raised in Concept Study:</p> <ul style="list-style-type: none"> Urbanisation has increased impervious areas, causing increased stormwater runoff/rainfall intensity and decreased stormwater quality. Stormwater structures/natural creek system cannot convey larger floods effectively, causing nuisance flooding. The financial and social impact of stormwater inundation has not been assessed, but the draft Floodplain Risk Management Study is underway. Appropriate storages to use stormwater for industrial and domestic supply (pumping to dams) Feasibility study into stormwater harvesting (within pipeable distance of Orange). Audit current levels of surface water/storm water harvesting to investigate new more efficient methods of collecting stormwater. Increase water harvesting and reuse to minimise degradation to infrastructure and natural drainage systems e.g. retention basins. <p>Comments:</p> <ul style="list-style-type: none"> Floodplain Risk Management Study complete. Stormwater harvesting options examined and now a key part of the Orange water cycle. |
| Urban catchment management | Adoption of WSUD principles | <p>High Priority Issues raised in Concept Study:</p> <ul style="list-style-type: none"> Appropriate level of service for new development (infill and greenfield) in terms of stormwater is required. Incorporate water management principles into new developments and examine ways to do this retrospectively for established areas. Water Sensitive Urban Design (WSUD). Develop a Development Control Plan (DCP) to maximise the use of Greywater in new subdivisions. |

Table S3 – Issues referred to other authorities

| Issue Raised in Concept Study | Referred to | Derived From |
|---|----------------------------|--------------------------|
| <ul style="list-style-type: none"> How do we manage groundwater? The Orange basalts have been embargoed. Development application process to govern bores and small holding dams. Establish network of monitoring bores. Monitor bores located adjacent to watercourses. Urban water bores to be licensed, metered, monitored and volumetric charge for water extracted. Establish plan for dealing with stock and domestic bores within residential areas e.g. Albury has recently embargoed the aquifer underlying town for ne bores on land where potable town water supply is available. Review current bore logs and trends based on rainfall (i.e. hydrographic data from streams). Regulation process for groundwater use and buildings and educating community. | NSW Office of Water | 2007 Concept Study |
| Waters are not protected for all environmental values under the DEC Water Quality and River Flow Objectives. | CMA NSW Office of Water | 2007 Concept Study |
| Lack of a formal community catchment management committee or specific Catchment Management Plan to address the impacts of agriculture and urbanisation on creeks in terms of urban impacts and town water supply. | CMA NSW Office of Water | 2007 Concept Study |
| Management of farm dams associated with rural residential development potentially impacting on the available water resources for other users including the town. | NSW Office of Water | 2007 Concept Study PRG 2 |
| In-active irrigation licenses becoming active may impact on the available water resource. | NSW Office of Water | 2007 Concept Study |

Conclusion

It is concluded from the IWCM Evaluation Study that the BAU Scenario is considered to solve all of the IWCM issues as far as practicable.

The development of an IWCM Strategy is not required as there are no IWCM issues needing new actions or works. This conclusion will be reviewed in six years.

The community objectives defined through the IWCM Evaluation Study will be used in the six yearly revisions to inform the development of an IWCM Strategy if required.