Submission to Draft Macquarie-Castlereagh Regional Water Strategy

Department of Planning Environment – Water
regionalwater.strategies@dpie.nsw.gov.au

Thank you for the opportunity to respond to the latest draft of the Macquarie-Castlereagh Regional Water Strategy (MCRWS).

I am a riparian landowner on Summer Hill Creek downstream of Orange for the past 46 years and prior to this resided in Orange. I am a member of a local Landcare group, Summer Hill Creekcare Inc. (for 18 years). I am also an appointed Crown Land Manager (for 14 years) for the Ophir Recreation Reserve, also situated on Summer Hill Creek downstream of Orange. The Summer Hill Creek water source is one of the 30 water sources covered under the Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012. It has been identified as having high instream value.

General Comments

All water belongs to the environment. The first humans to colonise the Australian continent lived in harmony with the environment and the seasons and saw no reason to claim possession of any of its resources. Until Europeans arrived, and human arrogance claimed the water resources, along with everything else, as a possession of the State, to be allocated at their whim or traded as a commodity, prioritising human needs as '*critical*' above those of the environment. All too often we determine there is insufficient to share any with the environment. We have allocated water that isn't even there, that we just expect would be there on cue. Our arrogant attitude dictates that any water that is not exploited for human need is a waste. This Regional Water Strategy continues this theme.

It is widely acknowledged that the water resources in the Murray-Darling Basin (MDB) have been over allocated and there is a real need to return more water for the environment. It is disappointing this over allocation is not acknowledged in the consultation paper and that this has not formed a basis for developing the strategy.

Rather, the MCRWS appears to have been predicated on fostering increasing regional populations and supporting future development expansion and economic growth in the region, i.e. opportunities for *"growing our regions"*. This can only be associated with growth in demand, placing more pressure on the limited water resource and the forgotten environment.

Although the draft strategy purports to provide options to improve water security, fostering any unsustainable growth-in-use would appear to be counterproductive in achieving any security of supply into the future. As stated in the document; *"We need to prepare now to do more with less water…."* however, many of the short listed options simply seek innovative ways to exploit more water from the system.

As acknowledged in the draft document, delivering water to the end of the system is a challenge. It is my belief therefore that the strategy should be predicated on the sustainable level of water use which can still deliver sufficient water through to the end of the system for environmental outcomes.

There appears to be a missed opportunity to prioritise the environment more in decision making. The environmental objectives proposed in the draft strategy document are to be commended, however these appear to focus just on the Macquarie River and Macquarie Marshes, with no consideration of the environmental assets and values of tributary water sources. More broadly, there are no actions or plans short listed to address the maintenance and enhancement of aquatic ecosystems or improving water quality to make our communities more liveable, particularly given the risks from further water resource development and the predicted climate change.

Each water source is hydrologically different. It is not feasible to develop a macro planning strategy which is a fit for every individual tributary water source. Some water sources, such as the Summer Hill Creek water source, have seen over development of water resources and short listing options

which would increase water resource development in the Summer Hill Creek system will unacceptably further maximise harm.

Challenge of Reducing Water Supply Risks

There must be recognition of a city's sustainable growth capacity based on its water resources. To continue to encourage population growth while faced with limited options for securing adequate security of water supplies is reckless and creates economic and social risks, and will only serve to present a burden for the state and on other region's and city's resources when supplies run short.

Orange has the smallest water storage capacity of almost any comparable regional city in NSW, yet its population is currently higher than Dubbo or Bathurst. Protracted dry periods in recent decades has seen Orange on severe and lengthy water restrictions. As noted in the consultation paper, worse events have occurred in the longer climate record and are likely to be experienced in the future. Any continuation of the most recent droughts could have resulted in a failure of Orange's water supply.

The most recent step change investment in water storage capacity was 60 years ago with the commissioning of Suma Park Dam.

Orange is geographically located at a relatively high altitude in the Central Tablelands with very limited upstream catchment and no local river drainage system. In the absence of any significant local aquifers there is little opportunity to rely on ground water sources to back up surface water resources.

The nearest significant additional water resource is the Macquarie River, 37 km north of Orange. There are significant pumping costs associated with delivering water via pipeline from the Macquarie River to Orange which would need to be borne by Orange residents.

A city's water supply resilience must be measured against a dry climate scenario rather than historical averaging. Demand can generally be met under wet conditions with minimal storage capacity but is tested when weather patterns return to dry conditions. Given latest predicted climate change forecasts with hotter temperatures, higher evaporation rates, less than average rainfall over longer and more intense dry periods together with reduced surface water flows, there should be constraints considered on future population expansion in Orange until a significant additional water resource is available. Blindly promoting continued growth will exacerbate the risk and consequences.

Attempts to supplement Orange's water supplies with stormwater harvesting during protracted dry spells will be inadequate to avoid a failure of supply under a dry future climate change scenario.

Recent storage behaviour trends of Orange's combined water storages during the two most recent dry periods show:

- Combined storage @ 100% capacity, December 2005
- Combined storage reduced to 23%, June 2010
- Period 4.5 years
- Included Blackmans Swamp Creek Stage 1 stormwater harvesting scheme operating for around 18 months

- Combined storage @ 100% capacity, 31 October 2016
- Combined storage reduced to 21.05%, 14 February 2020
- Period 3.3 years
- Included Blackmans Swamp Creek Stage 1 and Ploughmans Creek stormwater harvesting schemes and the Macquarie to Orange Pipeline in permanent operation for the full period.

This situation was exacerbated by Orange City Council (OCC) at each stage delaying the introduction of Water Restrictions beyond their established and published protocols for the implementation of the various restriction levels.

Development by OCC of future stormwater harvesting stages which cannot satisfy the city's current water supply requirements will merely serve to obfuscate the need for urgent investment in a more significant step change necessary to secure Orange's future water supply.

Challenge of Supporting a Growing Regional Economy in a Future of Reduced Water Availability

While industry is important to the regional economy for social benefits, supporting growth, particularly in any major water-reliant industries with less reliable water resources in a dry future climate scenario, may not be sustainable if the continued growth puts further added pressure on the available water resource, accelerating further decline on the water resource for currently established industries.

It would be appropriate to locate certain industries in more strategically suitable regions with adequate water resources, rather than causing shortages to other industries overall.

The big looser will be the environment, as the need to support these industries faced with declining water resources will lead to prioritise the dwindling water supplies for these industries, over any environmental needs.

The Challenge of Addressing Barriers to Aboriginal Water Rights

This concept is to be applauded if it were to lead to anything tangible and not be mere tokenistic rhetoric.

If I can elaborate; (By definition, an action is tokenistic if, **the person doing it wants to seem like they are helping a group of people who are treated unfairly in society, but their action is not meant to make lasting changes to how those people are treated.)**

Without a clearly defined pathway, which is lacking in the consultation paper, achieving any meaningful progress on this will I suspect be difficult and it may go nowhere.

Rather than select just one representative sight on Ewenmar Creek, the strategy should look to set aside sites on each of the water sources and allocate stream flow components accordingly. It is pointless just allocating a volume of water in any water source. It must translate into an actual flow at appropriate times and not be a flow volume designated from a natural flood or high flow event.

It is difficult to not be cynical about these things as I have been listening to these conversations for 70 years.

The Challenge of Maintaining and Improving the Health and Resilience of the Region's aquatic and Floodplain Ecosystems

I commend the admission of failure of water management and policy in this regards. As stated in the paper; *"A range of water reforms, including the dedication of water to the environment, have sought to stop further decline and improve the condition and resilience of these environmental assets. However, parts of the catchment are still in poor condition and projected climate change will increase the risk for many species and ecosystems."*

While the importance of the Macquarie Marshes is recognised in the strategy document, there is no mention of other water sources, except to acknowledge that; *"The health of fish communities, particularly in the upper unregulated reaches of the Macquarie-Castlereagh catchment is poor."*

There are many risks to critical environmental assets. While a potential dry future climate change scenario is a major concern, physical structures and infrastructure such as dams and weirs also poses risks. New water resource development and any growth-in-use poses further risks.

Council owned and operated dams or weirs such as in the Winburndale Rivulet and in the Summer Hill Creek water source pose a high risk to aquatic ecosystems downstream. There should be enforceable protection of environmental flow releases. Bathurst and Orange Councils have

suspended vital environmental releases when storage levels declined, causing cease-to-flow periods at critical periods of stress in the water course. It should be beholden on Councils to secure their water requirements under all climatic scenarios without the need to suspend environmental flows.

Priority 1 – Proposed Action 1.1

I support the approach of regional cities moving away from the concept of an *'acceptable level of risk'* and transitioning to an *'enduring level of supply'*. Guidelines however must also include minimum needs to meet community expectations for environmental outcomes in affected water sources.

As stated earlier, OCC has failed to invest in any significant/step change augmentation of their water storage infrastructure for 60 years. Instead Council has pursued minor stop gap supplementary supply schemes which have only served to obfuscate and delay necessary investment in any real supply augmentation.

Although talking up these supplementary supply schemes in terms of yield, they have fallen well short of predictions and have not staved off severe water restrictions.

- In the 2018/2019 water year, the Blackmans Swamp Creek Stormwater Harvesting Scheme - Stage 1 provided 418.72 ML, equating to 8% of the annual demand of 5234 ML under Level 4 water restrictions.
- In the 2019/2020 water year, the same stormwater harvesting scheme provided 479.22 ML, equating to 11.79% of the annual demand of 4064 ML under Level 5 restrictions.

It must be noted that some of this volume of water included natural surface water runoff captured into the stormwater harvesting schemes Holding Dam from the unnamed water course this new dam is located on.

There should be downstream community/landholder representatives, downstream licence holders and community environmental organisation representatives included in the governance framework.

Proposed Action 1.3

This Action of suspension environmental water releases from Suma Park and Winburndale dams is of major concern and is strongly opposed. This is a contradiction of the objectives of the Water Management Act 2000, s.5,(2)(a), (b), (c), & (d), s.5,(3)(a), (b) & (c), the Water Sharing Plan, s.10,(1, (2) & (3), and this Regional Water Strategy regarding the protection and enhancement of the environment.

These major instream barriers already impede natural flows and the downstream environment is reliant on environmental flow releases from these dams. The unlawful suspension of environmental releases from Winburndale dam by Bathurst Council in 2019/2020 was responsible for the local extinction of a population of Platypus in the Winburndale Rivulet below the dam. See figure 1.

Residents in the lower Winburndale Rivulet were shocked to see the rivulet completely dry up and this entire local population of Platypus wiped out when Bathurst Council cut-off these environmental flows downstream. Local residents along SHC fear a similar local extinction event of Platypus in Summer Hill Creek as a result of Orange City Council's planned increased extraction of stormwater under the proposed new Stage 2 harvesting.

Similarly, Orange City Council suspended environmental flow releases to Summer Hill Creek below Suma Park Dam in 2019/2020 which caused unprecedented cease-to-flow conditions for 35 days downstream at the Ophir Recreation Reserve, causing riffle sections to dry up, pool complexes to contract and disconnect, and in many instances dry up completely. See Figure 2.

These environmental flow release requirements formed part of the original licence approval conditions for these dams.

The environment should not have to pay the price for Bathurst and Orange City Council's failure to secure adequate water supply for urban needs.

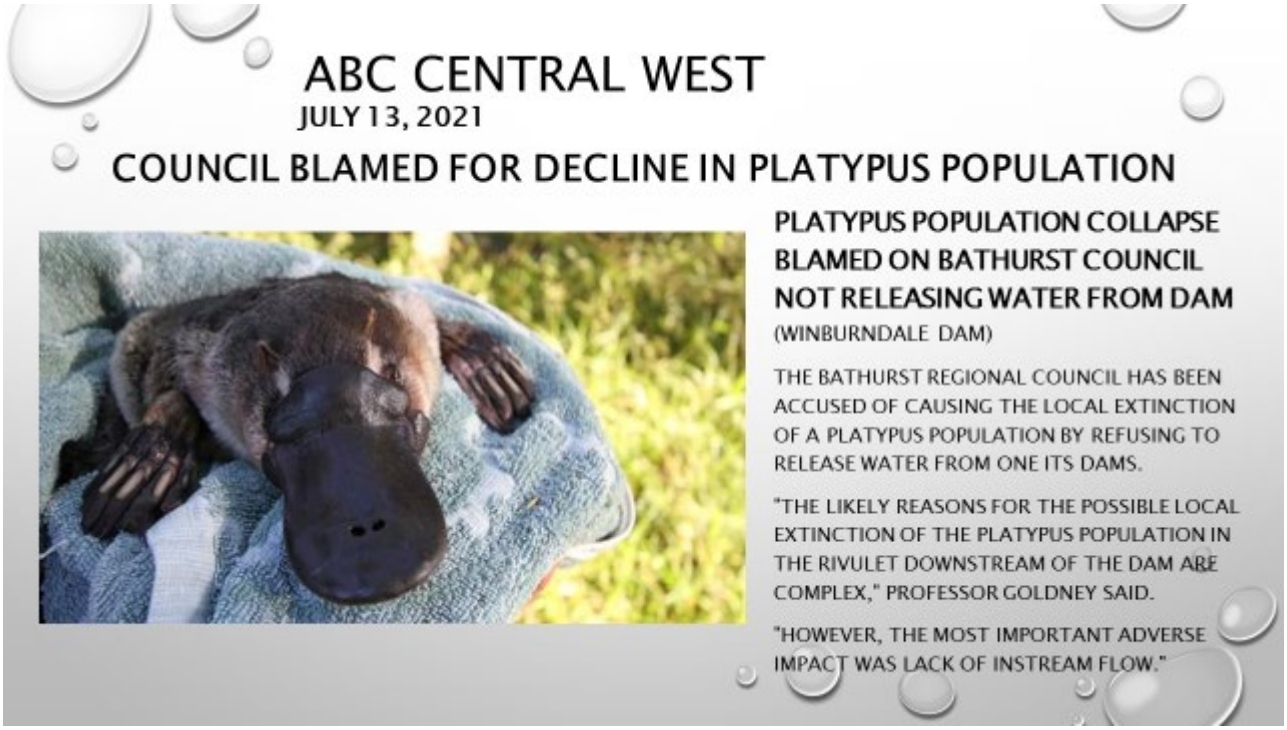


Figure 1.

Figure 2.

These photos are taken of SHC at the Fourth Crossing picnic area in the Central Mullion State Conservation Area above Ophir Recreation Reserve. The photo on the left was taken early January 2020. The photo on the right shows the creek under normal flow conditions.

The worry for landowners, licence holders and the environment is that up to a threefold increase in extraction of storm flow runoff up stream with the proposed Stage 2 Stormwater Harvesting (East

Orange Harvesting Wetland) will result in much longer and more frequent cease to flow periods downstream in the water source, especially under dry conditions when water needs are most critical.

Proposed Action 1.4

This Action is supported. The dividend from this Action should flow to the environment to support environmental flow releases.

Reducing leakage from pipes increases urban demand. See Table 1 below.

Table 1. WATER SUPPLY SERVICES - ORANGE CITY COUNCIL

The type and number of water supply service responses by maintenance staff are shown in the table below.

CATEGORY	JULY 2018 - JUNE 2019	JULY 2019 - JUNE 2020	JULY 2020 - JUNE 2021	JULY 2021 - JUNE 2022
Water - Leak (Meter)	418	393	327	288
Water - Burst Main	75	70	85	80
Service Break	4			
Service Leak	49			
Water - Leak (Main, Valve, Hydrant)	357	226	285	361
Total	**903**	**689**	**697**	**729**

Proposed Action 1.5

This Action concerning stormwater harvesting is strongly opposed in the Summer Hill Creek water source. OCC is proposing a Stage 2 of stormwater harvesting in Blackmans Swamp Creek above Summer Hill Creek. While it may be a suitable option in some water sources it will result in severe degradation to the Summer Hill Creek system downstream of the Orange urban area.

This stormwater represents the last water in the Summer Hill Creek system below Suma Park Dam when the dam is not spilling. The Stage 2 scheme, as proposed, will not just harvest stormwater runoff but will also intersect and divert 50% of all flows above 2 ML/day into an off stream holding basin (EOHW) for extraction.

Summer Hill Creek is already an ecosystem under high hydrological stress and high environmental stress (identified as such in the Stressed Rivers Assessment Report – DLWC 1998) and classified S1, the highest stress classification, an ecosystem in crisis. A further Stage of stormwater harvesting as proposed will likely lead to a local extinction event in the creek system below Blackmans Swamp Creek and Suma Park Dam.

The following Figures 3 - 37 give a description of the stormwater harvesting scheme in Blackmans Swamp Creek and the impacts of expanding this scheme with a Stage 2.

WATER SHARING PLAN MAP

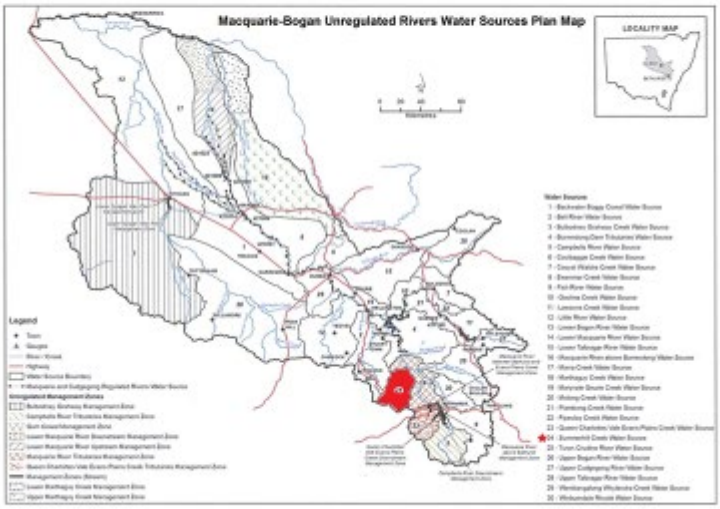


Figure 3

The Summer Hill Creek water source, shown here in red, is one of the 30 water sources in the Macquarie-Bogan catchment.
It makes up around 1.1% of the total area covered under the Water Sharing Plan, but it accounts for 5.9% of the total surface water entitlements in the entire Water Sharing Plan area.

SURFACE WATER ENTITLEMENTS AND BASIC LANDHOLDER RIGHTS REQUIREMENTS

– WSP MACQUARIE–BOGAN UNREGULATED RIVERS WATER SOURCES 2012 (PART 5, DIVISION 2 & 3)

Water Source No.	Water Source	Number of Licences	Total Water Access Licence Entitlements ML/year	Unregulated River Access Licence Components ML/year	Domestic & Stock Access Licence Components ML/year	Local Water Utility Components ML/year	Basic Landholder Rights Stock & Domestic Requirements ML/year	Percent Share of Total Access Entitlements
14	Lower Macquarie R	33	51,934.5	51,798.5	136		59	25.0%
13	Lower Bogan River	57	42,844	42,698	146		262	20.6%
16	Macquarie R above Burrendong	107	25,611	8,056	55	17,500	260	12.3%
9	Fish River	49	18,080.5	2,159.5	30	15,891	294	8.7%
24	Summer Hill Creek	96	12,251	4,320	131	7,800	151	5.9%
2	Bell River	108	7,878	6,886	197	795	237	3.8%
3	Bulbodney Grahway Creek	47	7,795	5,745	126	1,924	243	3.7%
27	Upper Cudgegong River	49	6,462.5	3,882	80.5	2,500	118	3.1%
20	Molong Creek	122	5,618	4,960	156	502	45	2.7%
18	Marthaguy Creel	44	4,458	4,312	146		162	2.1%
1	Backwater Boggy Cowal	20	4,449	4,409	40		82	2.1%
26	Upper Bogan River	39	2,821.5	2,635	154.5	32	261	1.4%
12	Little River	37	2,347	2,200	45	102	274	1.1%
5	Campbells River	57	2,116	2,058	58		240	1.0%

Figure 4

Of these 30 water sources identified in the Plan, Summer Hill Creek has the fifth highest level of surface water entitlements, fifth behind water sources with substantially higher flow rates such as the Macquarie, Bogan and Fish Rivers, but significantly higher ahead of other substantial water sources, like the upper Bogan, Little River and Campbells River.

Water Source No.	Water Source	Number of Licences	Total Water Access Licence Entitlements ML/year	Unregulated River Access Licence Components ML/year	Domestic & Stock Access Licence Components ML/year	Local Water Utility Components ML/year	Basic Landholder Rights Stock & Domestic Requirements ML/year	Percent Share of Total Access Entitlements
23	Queen Charlottes Vale Evans Plains Ck	54	1,908	1,861	47		217	0.9%
15	Lower Talbragar R.	14	1,701	1,661	40		308	0.8%
30	Winburndale Rivulet	30	1,636	585	51	1,000	178	0.8%
11	Lawsons Creek	32	1,499	1,443	56		133	0.7%
8	Ewenmar Creek	15	1,299	1,248.5	50.5		42	0.6%
21	Piambong Creek	14	974	962	12		139	0.5%
7	Cooyal Wialdra Ck.	29	820	672	37	111	169	0.4%
19	Maryvale Geurie Ck.	5	737	735	2		8	0.4%
4	Burrendong Dam Tributaries	13	579	572	7		294	0.3%
6	Coobaggie Creek	4	470	454	16		37	0.2%
22	Pipeclay Creek	14	426	413	13		65	0.2%
28	Upper Talbragar R.	9	382	370	12		245	0.2%
17	Marra Creek	18	374.5	307	67.5		64	0.2%
25	Turon Crudine R.	15	328	316	12		257	0.2%
29	Wambangalong Whylandra Creek	5	169	141	28		51	0.1%
10	Goolma Creek	0	0	0	0		71	0.0%

Figure 5

Significantly higher allocation than the lower and upper Talbragar River which combined accounts for only around 1% of entitlements, and the Winburndale Rivulet which supplies some of Bathurst's water entitlements.

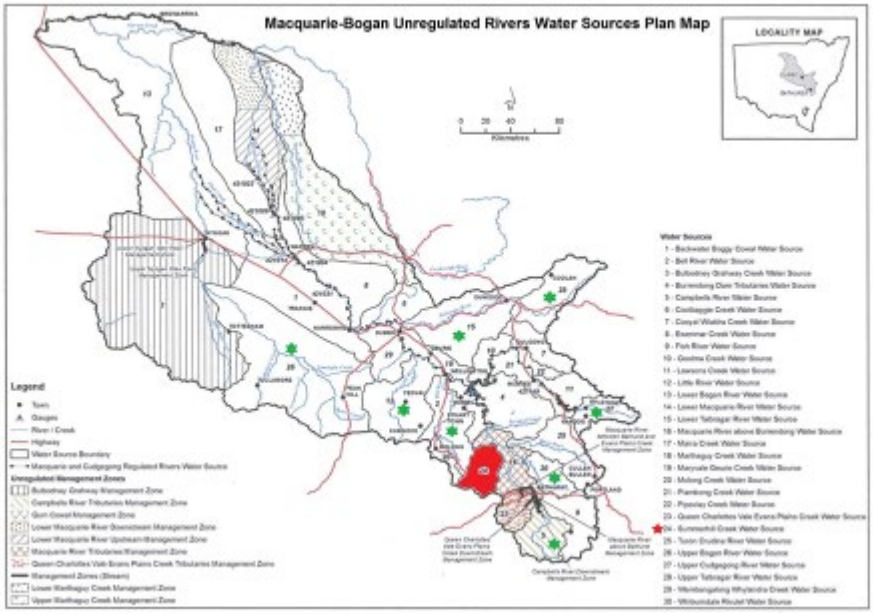


Figure 6

Looking at some examples:
The Winburndale Rivulet water source, No. 30, is a similar sized catchment to SHC, but SHC has seven and a half times more water allocations.

The Campbells River water source, No. 5, is a slightly larger catchment, but SHC has six times more water allocations.

The Upper Cudgegong River catchment, No. 27, is also a similar size to SHC, but SHC has almost twice the water entitlements.

The Bell River catchment, No. 2, is around twice the size of SHC, but SHC has one and half times more water entitlements.

The Little River catchment, No. 12, is more than two and a half times the size of SHC, but SHC has five times more water entitlements.

The Upper Bogan water source, No. 26, is around seven times larger, yet SHC has well over four times the entitlements.

Similarly, the Lower and Upper Talbragar River water sources combined, Nos. 15 & 28, are approximately 6 times larger than SHC, but SHC has close to six times the water allocations.

This surely suggests that SHC has been over allocated.
Orange is located very near the top of these catchment.

Attachment D new water reforms

6.28 SUMMER HILL CREEK

Subcatchment Number: 07
Stress Category: S1

	Low Env. Stress	Medium Env. Stress	High Env. Stress
High Extraction			✓
Medium Extraction			
Low Extraction			

Environmental Stress Factors:
1. *Riparian Vegetation* is in the **high** stress category, with 92% of aerial photographs covering the subcatchment, showing more than 50% of riparian vegetation in poor condition.
2. *Channel Stability* is in the **low** stress category, with 15% of streamlength assessed as being unstable.
3. *Instream Structures* is in the **high** stress category, with four large structures (>5 metres) and four medium structures (2-5 metres) recorded in the subcatchment.

Hydrologic Stress Factors:
1. The stress due to water extraction in this subcatchment is **high**.
2. There are 36 irrigation licences and 8 other licences on unregulated streams in this subcatchment.
3. The total area authorised for irrigation is 487 ha, of which 193 ha are estimated to be active.
4. Orange town water supply storages are located in this subcatchment. These being Suma Park Dam with a capacity of 18,800 ML, Spring Creek dam with a capacity of 4,700 ML and Gosling Creek dam with a capacity of 830 ML. Lake Canobolas is also in this subcatchment having a capacity of 700 ML.

High Conservation Value: No

Identified Conservation Values:
NPWS No NSW Fisheries Yes

Justification
- Threatened species present.

River flow (ML/day) at:
80th percentile 10 30th percentile 5

Full Development / Future Risk Considerations:
1. Types of development/activities that may impact on the future management of this subcatchment include rural-residential development, urban development, mining, agriculture, industry and forestry activities.
2. The risk rating determined by this activity is **very high**.
3. Hydrologic stress on the stream if full development was to occur has been rated as **high**.

Figure7

In 1998, the NSW Department of Land and Water Conservation completed a state wide Stressed Rivers Assessment Report of the states 680 unregulated sub catchments.
The Summer Hill Creek water source was classified as Stress Category S1, the highest Stress Category, with both a High Environmental stress factor and a High Hydrological stress factor.
The report identified that this stress was due to high water extraction and was to be given high priority in terms of resources and management to address both river flow and water quality objectives.

The surface water entitlements do not paint the full picture of water resource development in the SHC water source, particularly in the upper catchment. Combined, the full water resource development in the water source has a cumulative impact not reflected in the surface water allocations alone.

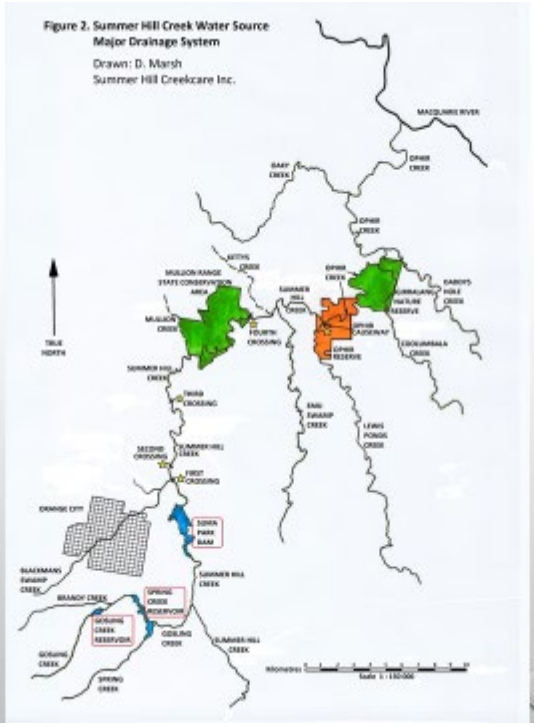


Figure 8

The Summer Hill Creek water source rises south of the city of Orange before flowing north, then north east to where it joins the Macquarie River. It should be noted that all tributaries below BSC are ephemeral streams which generally cease to flow during summer. In dry periods this can be up to more than 6 months of the year.
Orange City Council has constructed three water storage impoundments in the upper catchment. Gosling Creek Reservoir, Spring Creek Reservoir and Suma Park Dam.
When Suma Park Dam is less than 100%, these dams control all the flows from the upper catchment. The last remaining upper tributary not controlled by Council's dams is Blackmans Swamp Creek, however Council is now also targeting this tributary for extraction.

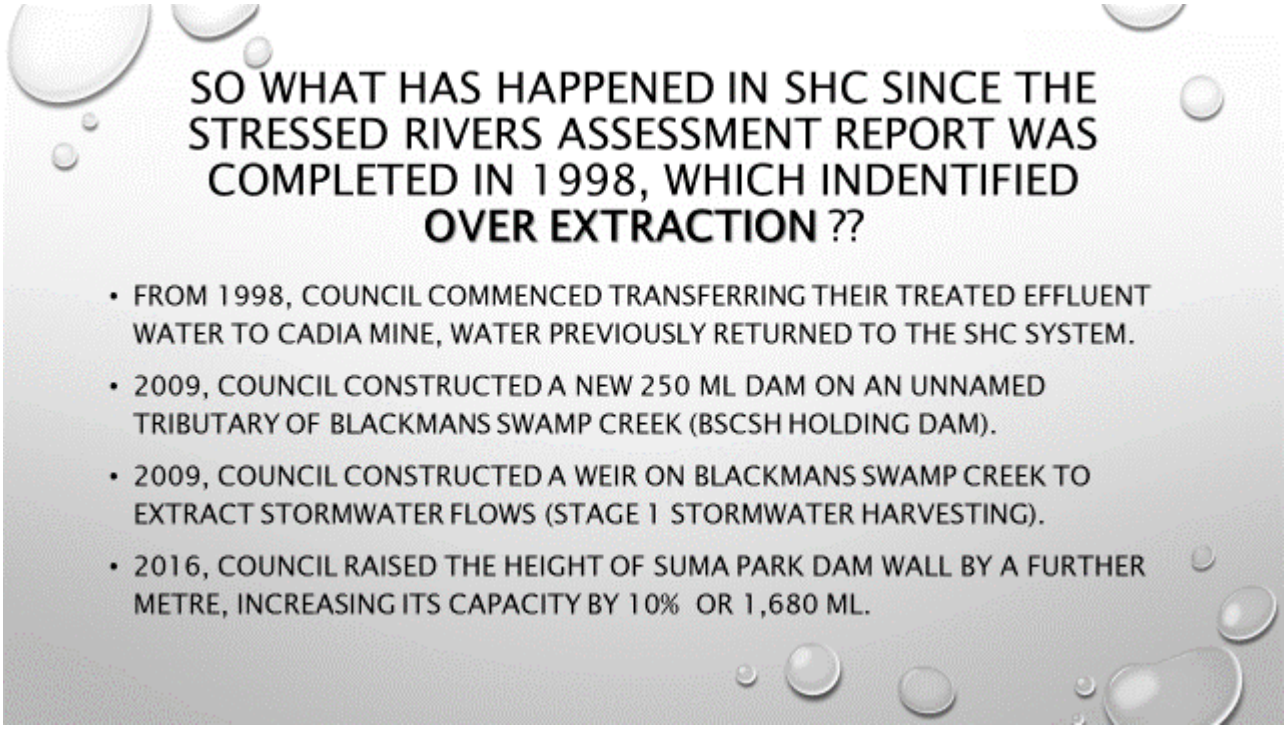


Figure 9

Orange's treated sewage effluent water is given away free of charge under contract to the mine instead of returning all this water back to the SHC system after being used by the residents of Orange. A loss of up to more than 11-12 million litres per day to the downstream SHC system.

The Holding Dam also captures natural flows from the dams catchment, which is later transferred into Suma Park Dam. There is no accounting of the water extracted from this water course.

Council's weir on BSC allows them to extract stormwater flows and transfer this into their stormwater Holding Dam, and after treatment, this is transferred into Suma Park Dam, effectively increasing the catchment of Suma Park Dam.

An analysis of harvest events in 2009/2010 by Geolyse, showed that while the extraction pumps are operating they can extract up to 56.9% of the creek flow volume occurring at the time. We'll come back to this shortly.

The raising of Suma Park Dam wall increased its storage capacity by 10%, enabling it to capture another 1,680 ML from the upper SHC catchment.
This would all seem at odds with prioritising management to address river flow and water quality.

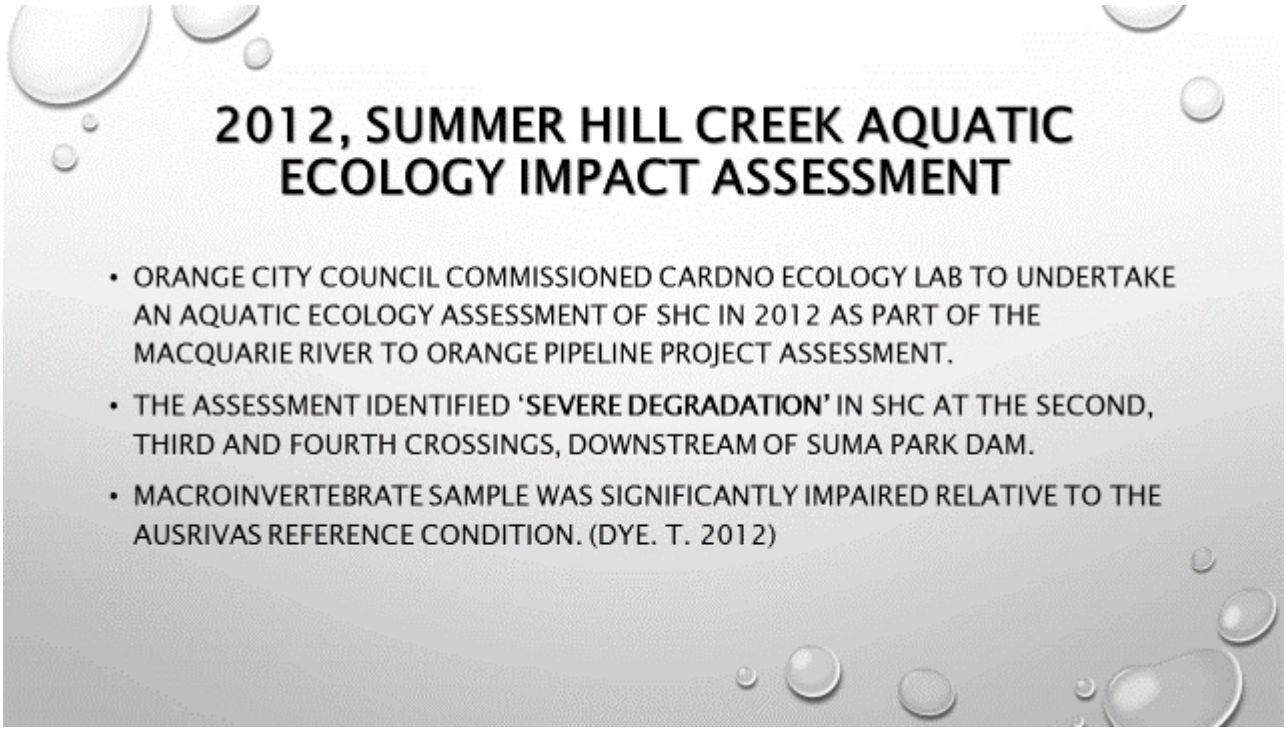


Figure 10

The above provides the result of a more recent study commissioned by OCC.

The total water inflow captured in Suma Park Dam in 2020/2021 was 13,452 ML during the year. That is 13,452 ML diverted from downstream SHC flows.

Again, this is still only part of the diversion story. In addition, there is the annual capture in Council's two other storage dams upstream.

And there is more. What is not measured and accounted for is the surface evaporation losses, and the dam surface's localised rainfall inputs in its catchment. Localised rainfall inputs on the dam's surface and local catchment is another water diversion and loss to downstream system flows.

Open water evaporation for the period was 870 – 900 m and rainfall input to the dam's 14.3 square km catchment was another 1,111 mm, roughly equivalent to an estimated combined catchment water volume of over 2,000 ML over the year. Without Council's dams, there wouldn't be evaporation losses and the localised rainfall to their dams would all add to downstream runoff.

And the latest blow in death by a thousand cuts was to come in 2009.

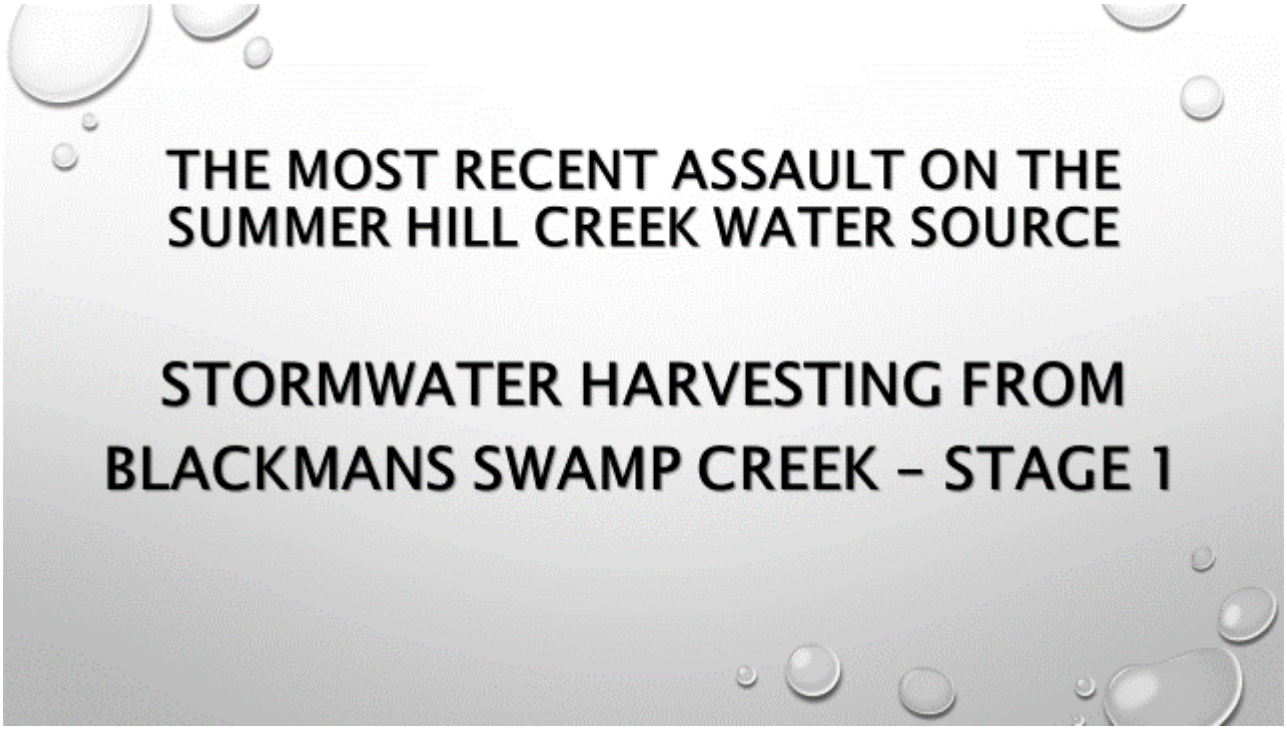


Figure 11

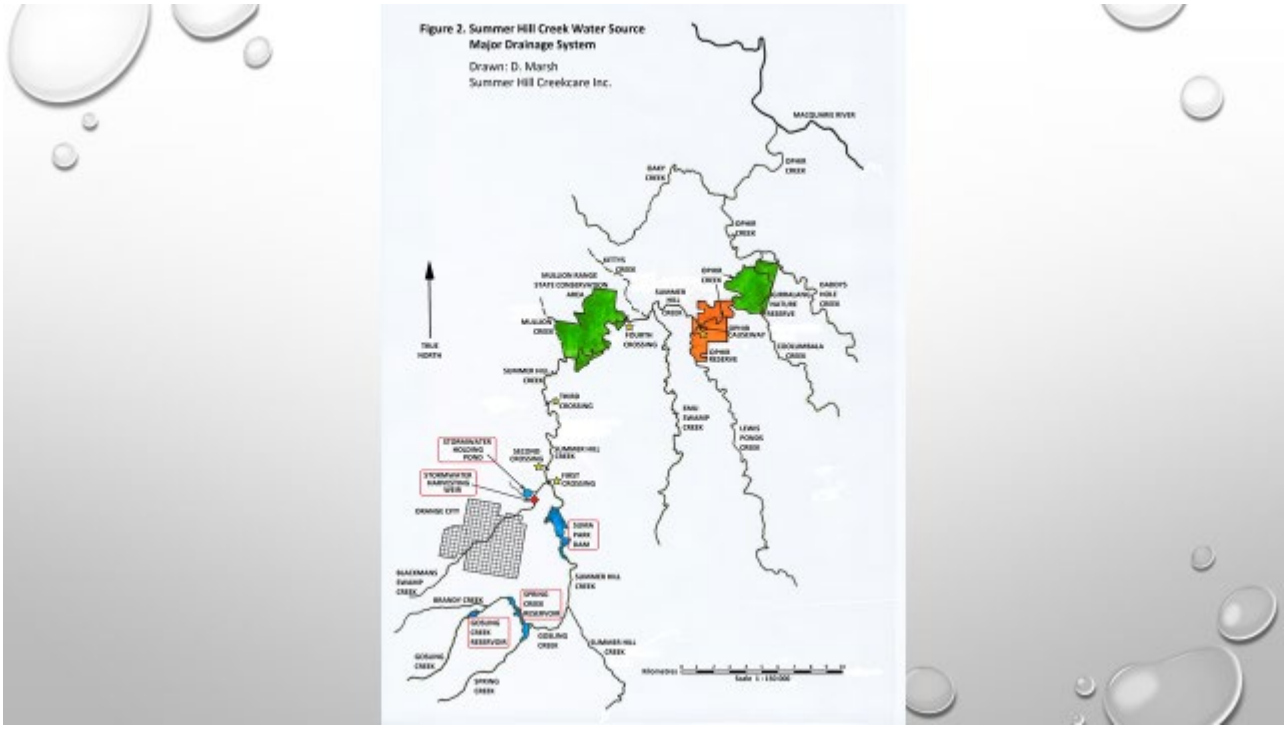


Figure12

As mentioned, Blackmans Swamp Creek was the last remaining uncontrolled upper tributary.

However Council is extracting storm flows from this creek system, currently with a Stage 1 harvesting scheme, and transfers this water into Suma Park Dam, effectively extending the catchment of Suma Park Dam.

Council now has plans to expand this with a Stage 2 harvesting scheme.

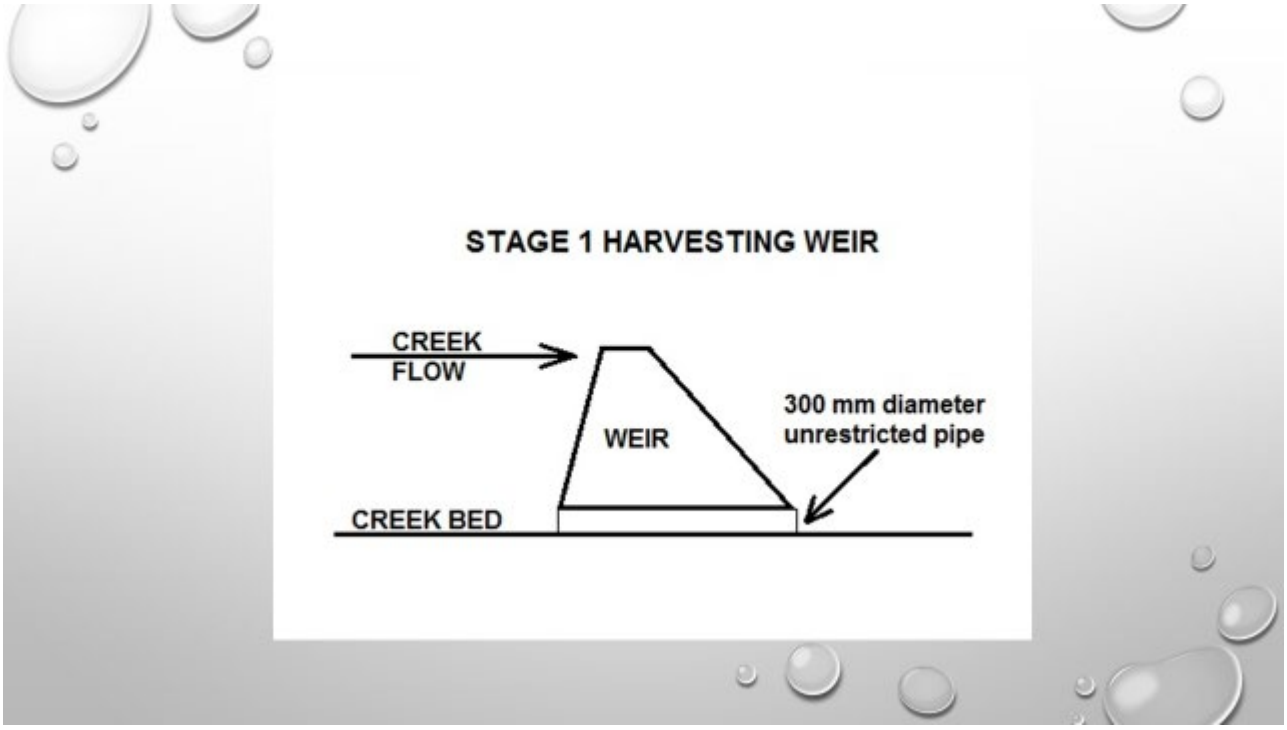


Figure 13

The unrestricted 300 mm diameter pipe allows creek flows up to 72 Litres/sec, (equivalent to 6.2 ML/day), the maximum pipe discharge with water level with the top of the pipe, to continue unrestricted downstream, ensuring base flows and minor creek flow fluctuations are not impeded.

This rule was imposed by Water NSW to protect minor freshes to maintain pool connectivity and protect environmental values and benefit water quality downstream in SHC.

There is a lag as the weir gradually fills to its full height of 2 metres, and with the increased head, the pipe discharge slowly increases to 260 litres/sec, (equivalent to 22.5 ML/day) before it over tops the weir.

If the creek flow continues to increase the harvesting extraction pumps cut in once a flow of 1,000 Litres/sec is reached.

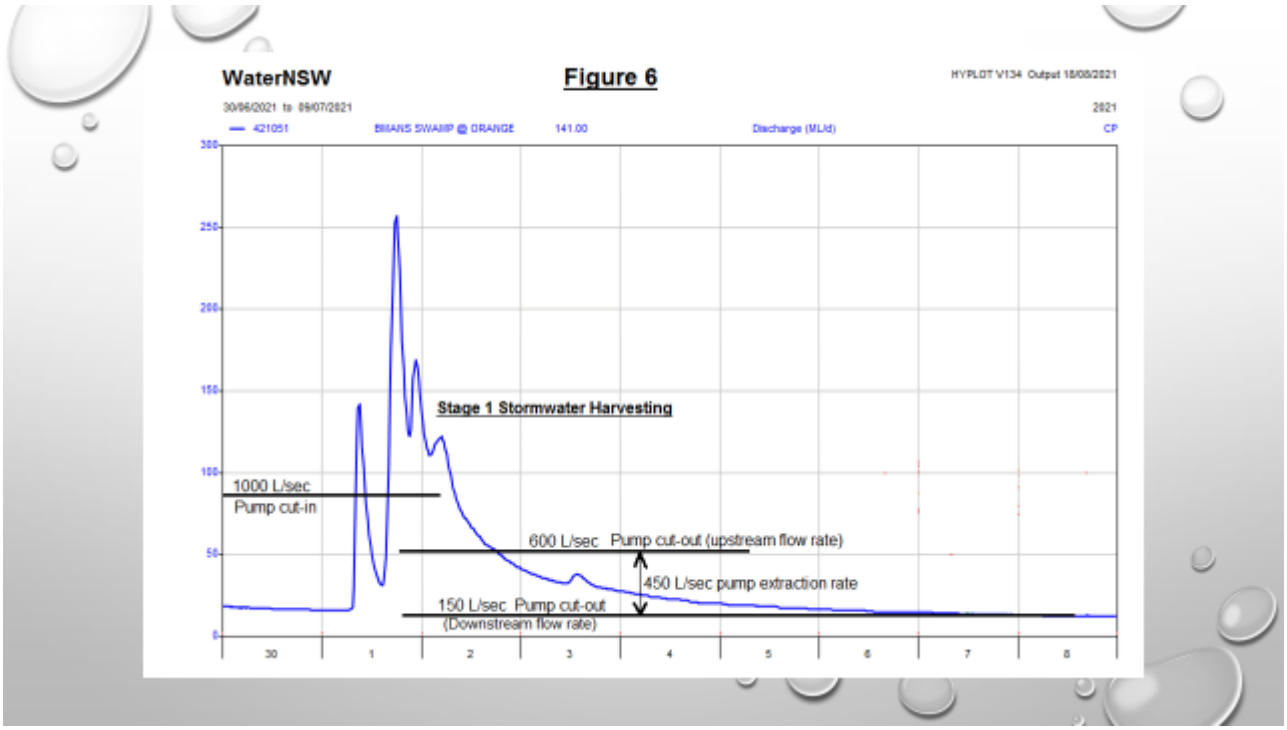


Figure 14

The hydrograph pictured shows how Stage 1 stormwater harvesting operates in relation to increased creek flow after a rainfall runoff event.

Creek flow must reach 1,000 Litres/sec (equivalent to 86.4 ML/day) before harvesting pumps cut-in.

As the flow drops back down to 150 Litres/sec downstream of the harvesting extraction pumps, (equivalent to 12.96 ML/day), pumping ceases and the tail end of the runoff event continues downstream.

The tail end of these runoff events is vital to dilute and diffuse the initially elevated “first flush” pollutant loads from the urban stormwater runoff.

An observed pattern in stormwater runoff quality identifies that the initial flush of water from an urban catchment is typically the dirtiest, i.e. pollutants build up in the catchment through deposition over time and when rainfall occurs, the initial runoff generated typically contains the bulk of pollutants as they are washed off the catchment. As rainfall continues, the concentration of pollutants in the stormwater becomes less as the catchment is cleaner.

Geolyse, 2008, suggested that a first flush effect is typical for storm flow in BSC.
Hence, tail end flow quantity is vital for water quality in downstream pool complexes loaded with pollutants from the “first flush” runoff.

TABLE 3.1 – SUMMARY OF HARVEST EVENTS

Event	Pump Start	Rainfall Recorded at STP mm	Inflow to Harvest Weir Pool (*), ML	Harvest Volume ML	% Harvested	Peak Flow Recorded D/S of Harvest Weir, L/s	Time Taken to Fill Harvest Weir Pool, Min.
3	27/05/2009	4	23.50	10.6	45.3%	1030	65
4	3/06/2009	5	20.23	9.2	45.6%		180
8	10/06/2009	17.5 day before	8.90	4.5	51%	1646	Na
10	24/06/2009	2	17.07	7.2	42.3%	1483	15
12	14/07/2009	4	15.65	7.1	45.2	1400	10
14	26/07/2009	10	24.77	12.4	49.9%	1030	30
15	24/08/2009	7.8	16.34	9.3	56.9%	998	50
17	30/08/2009	11 recorded at works depot	12.54	6.2	49.2%	994	20
18	3/09/2009	11.5	12.18	6.0	49.5%	1253	10
23	11/10/2009	5	15.10	7.0	46.3%	1212	55
25	15/10/2009	5	13.01	6.2	48.0%	1093	85
26	25/10/2009	11.5	18.88	8.1	42.9%	1209	45
28	18/12/2009	2.5	10.73	5.1	47.8%	1014	30
31	10/01/2010	8	8.61	4.5	51.9%	1050	45

Figure 15

The table is extracted from a Geolyse report to Council in 2010 and represents a sample of Stage 1 stormwater harvesting events as listed in Appendix 6 of the report.
(*) Inflow to the harvest weir is the volume of BSC flow extant while pumps operating.
The percent harvested is the portion of BSC flow volume extracted during the operation of the harvest pumps.
A smaller percentage is harvested from larger high intensity high flow events due to the pump capacity.
This clearly demonstrates the ability for Stage 1 Harvesting to extract a large proportion of flow from some runoff events.

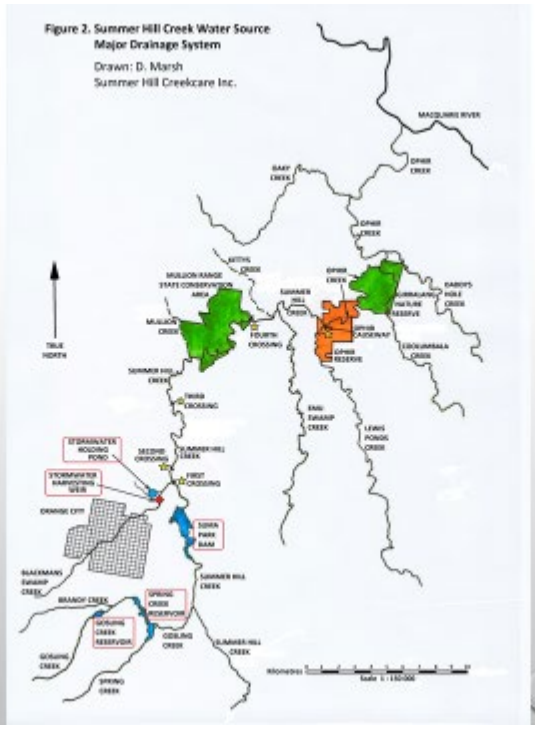


Figure 16

Coming back to the water source diagram, Water NSW has a stream flow gauge on BSC immediately below the stormwater harvesting weir which records BSC stream flow downstream of the harvesting pumps.
There is also a Water NSW stream flow gauge on SHC at the Third Crossing, a short distance downstream of BSC and Suma Park Dam, but as can be seen, well upstream of the water source's confluence with the Macquarie River, almost another 50 creek line kilometres downstream.
When Suma Park Dam is not spilling, most of the flow downstream in the SHC system is derived from BSC.
Geolyse, in the BSC Stormwater Harvesting REF, 2008, presented data which showed that when Suma Park Dam is not spilling, flows derived from BSC made up 98.5% of the flow at the 4TH Crossing of SHC for the 90th percentile, 99% of flow for the 80th percentile and 97.9% of flow for the 50th percentile.
Stormwater harvesting is only undertaken when Suma Park Dam is not spilling, therefore due to the significance of BSC flows, the impact of any extraction from BSC extends a considerable distance downstream in SHC.

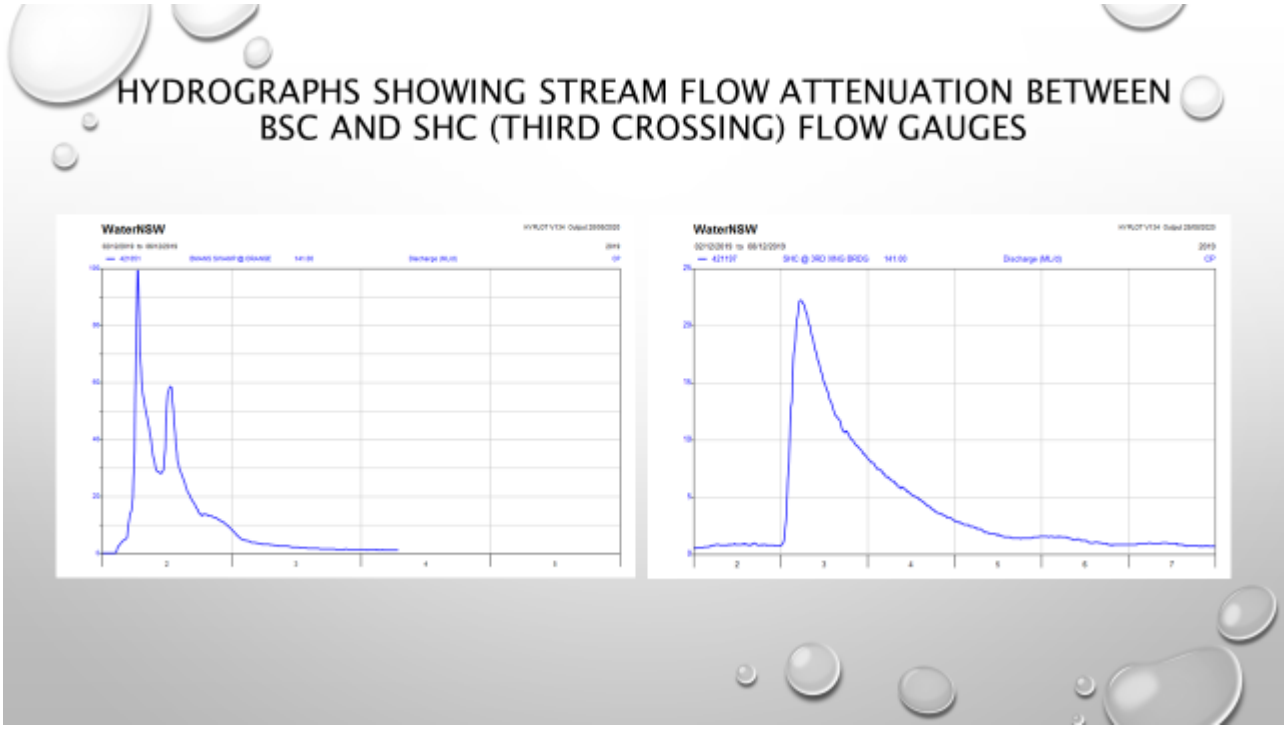


Figure 17

These Water NSW hydrographs demonstrate the stream flow attenuation between the two Water NSW stream flow gauges just a short distance downstream, and the impact that extracting flow upstream can have on the ability of flows to transport any distance downstream.
The hydrograph on the left shows a rainfall runoff event in BSC on 2 December 2019 under dry conditions.
Peak flow reached 99.323 ML/d and produced a runoff volume (after extracting 14.04 ML with Stage 1 stormwater harvesting) of 26.97 ML over 52.25 hours.
The hydrograph on the right shows the same runoff event measured downstream at the Third Crossing gauge in SHC on 3 December 2019.
The peak flow in SHC attenuated down from 99 ML/d to 22.257 ML/d over the 9 Km distance, resulting in a downstream runoff volume of 21.46 ML over 134.75 hours.
There was a hydrological loss of flow volume under dry conditions of 5.51 ML between the two hydrometric gauges for the runoff event.

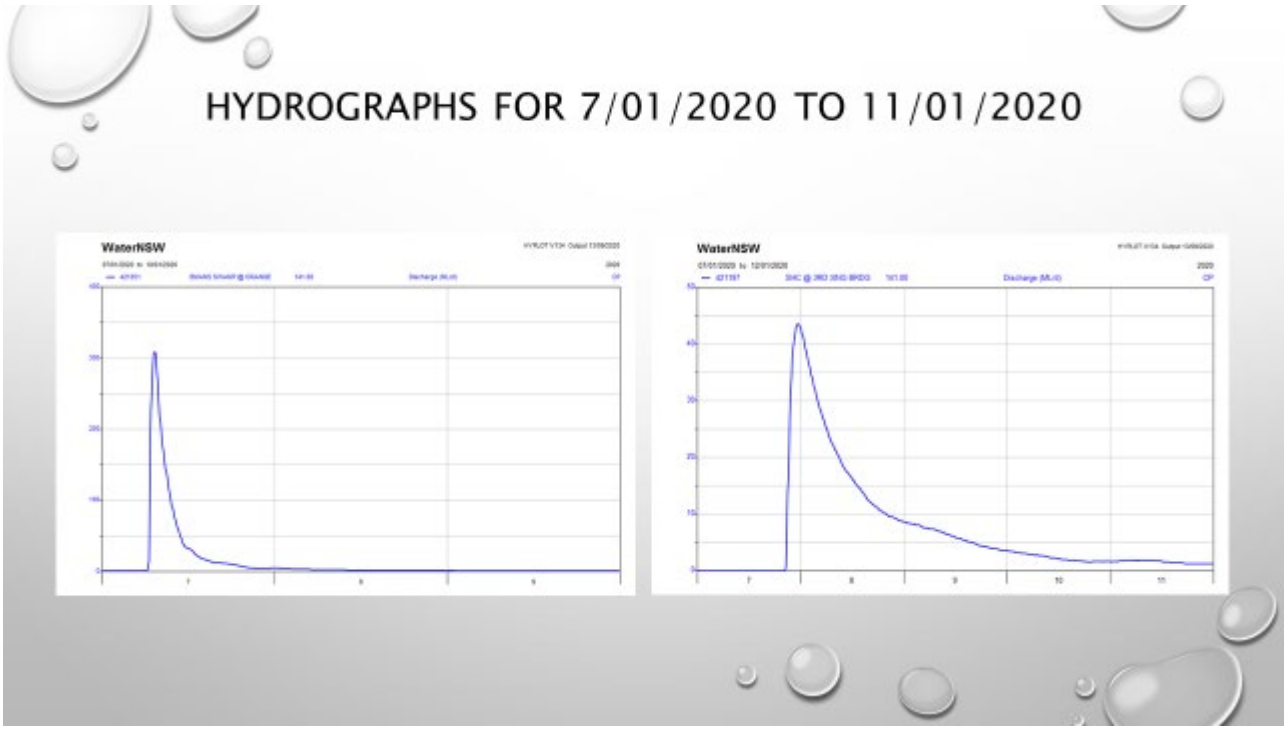


Figure 18

Similarly, the hydrograph on the left shows a rainfall runoff event in BSC on 7 January 2020.
Peak flow rate was 306.049 ML/d.
After harvesting 11.89 ML of stormwater runoff, the remaining downstream flow volume was 41.193 ML over 47.5 hours.
The hydrograph on the right shows the same runoff event measured downstream at the Third Crossing gauge in SHC on 7 January 2020.
Peak flow rate attenuated down from 306 ML/d to 42.324 ML/d.
Total runoff volume measured downstream at the Third Crossing was 31.089 ML over 92.5 hours.
There was a hydrological loss of flow volume, again under dry conditions, of 10.104 ML between the two hydrometric gauges for this runoff event.

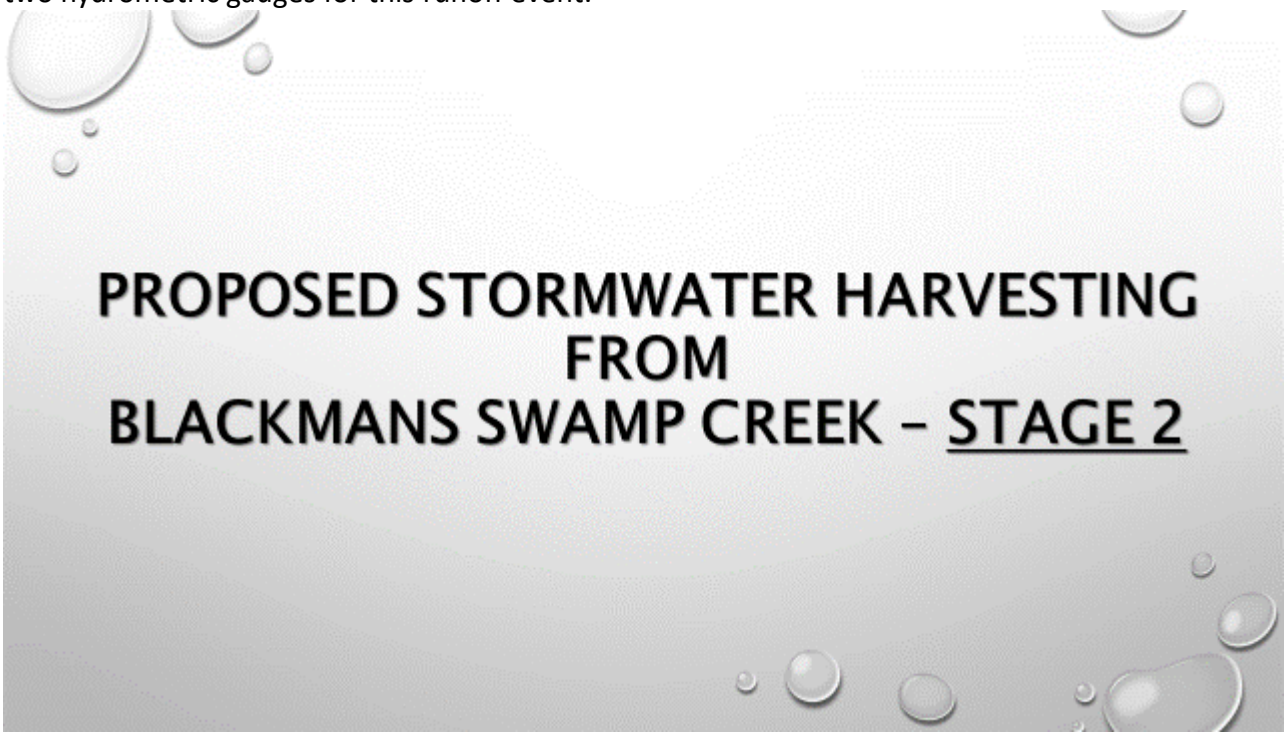


Figure 19

Which brings us to the new assault on the SHC water source by Orange City Council.

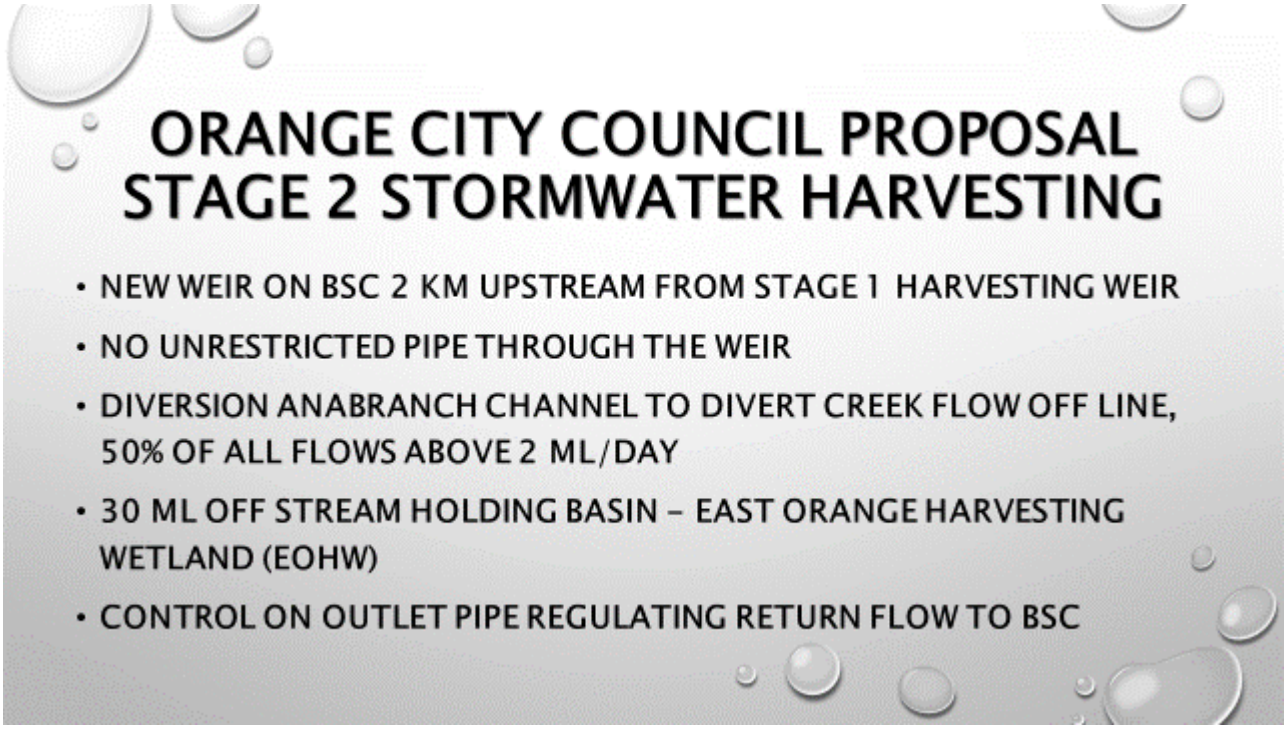


Figure 20

The new stormwater harvesting scheme being proposed consists of the elements as above.

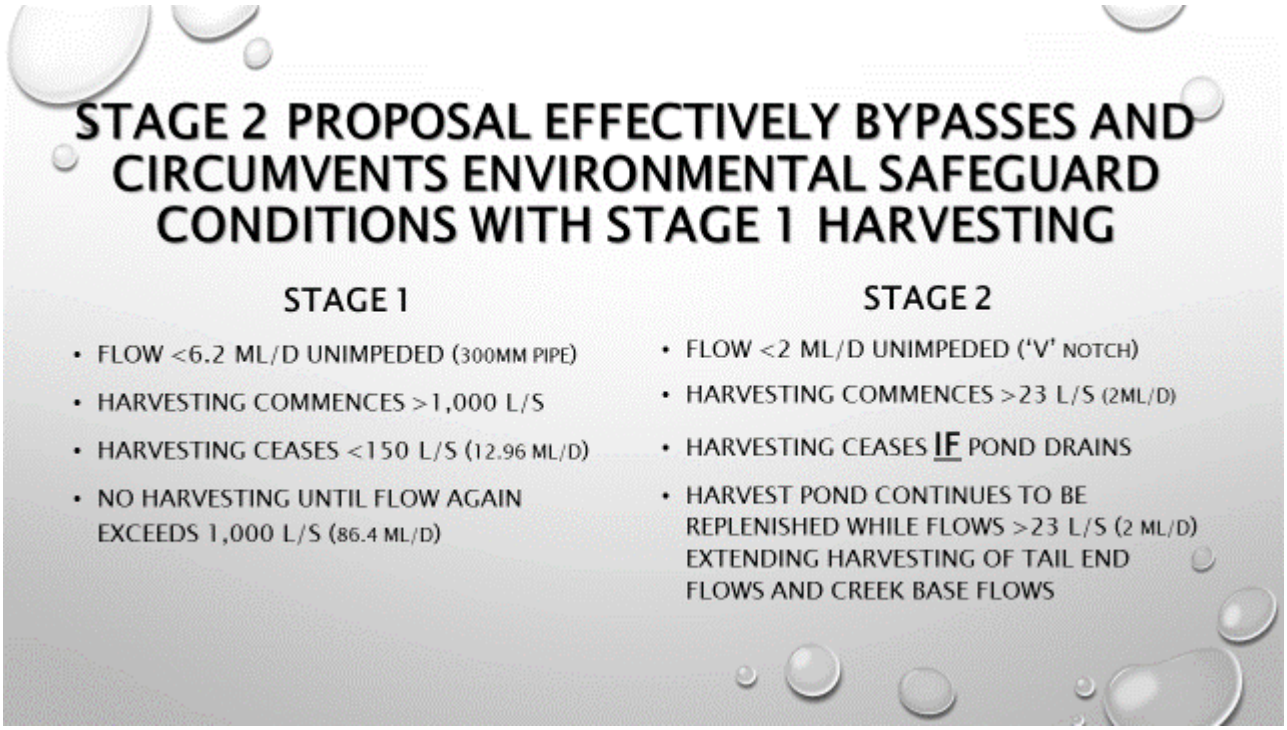


Figure 21

50% of all flows above 23 L/sec or 2 ML/day, will be diverted into the off creek wetland holding basin.

Draining of the wetland holding basin when full takes 33.3 hours (1.4 days) @ 250 L/sec. Meanwhile, the volume being drained from the holding basin will be replenished by all flows above 23 L/sec.

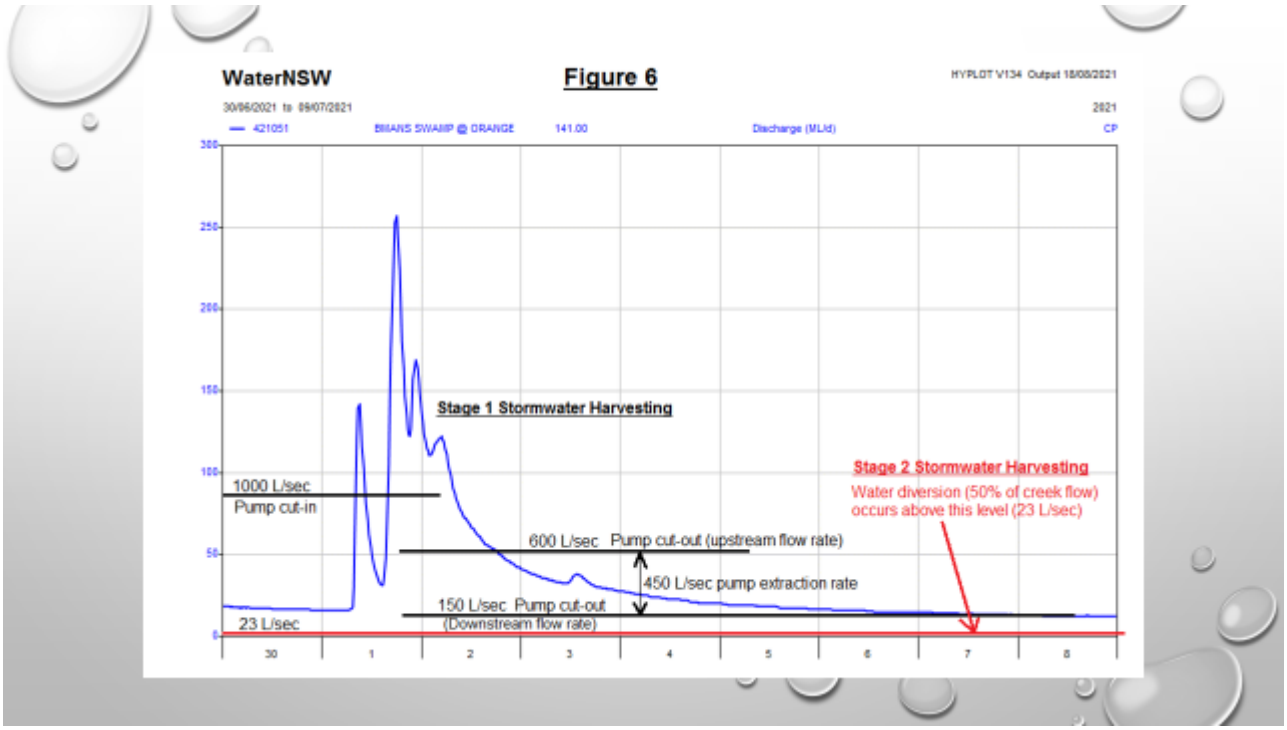
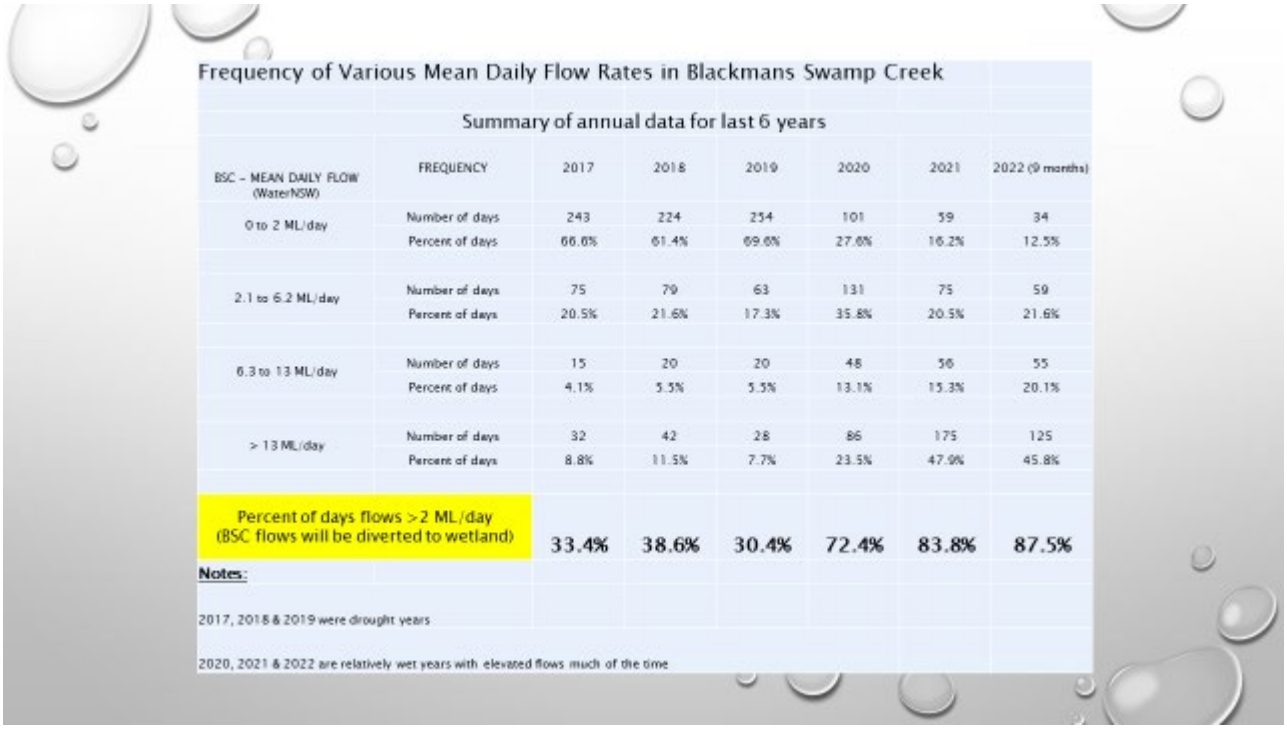


Figure 22

The difference between the Stage 1 and Stage 2 stormwater harvesting scheme's operating regimes is demonstrated on a hydrograph for a runoff event.



Frequency of Various Mean Daily Flow Rates in Blackmans Swamp Creek

Summary of annual data for last 6 years

BSC – MEAN DAILY FLOW (WaterNSW)	FREQUENCY	2017	2018	2019	2020	2021	2022 (9 months)
0 to 2 ML/day	Number of days	243	224	254	101	59	34
	Percent of days	66.6%	61.4%	69.6%	27.6%	16.2%	12.5%
2.1 to 6.2 ML/day	Number of days	75	79	63	131	75	59
	Percent of days	20.5%	21.6%	17.3%	35.8%	20.5%	21.6%
6.3 to 13 ML/day	Number of days	15	20	20	48	56	55
	Percent of days	4.1%	5.5%	5.5%	13.1%	15.3%	20.1%
> 13 ML/day	Number of days	32	42	28	86	175	125
	Percent of days	8.8%	11.5%	7.7%	23.5%	47.9%	45.8%
Percent of days flows >2 ML/day (BSC flows will be diverted to wetland)		33.4%	38.6%	30.4%	72.4%	83.8%	87.5%

Notes:

2017, 2018 & 2019 were drought years

2020, 2021 & 2022 are relatively wet years with elevated flows much of the time

Figure 23

This table presents data from Water NSW real time data hydrometric flow gauges.
The table shows that BSC flows during drought years are above 2 ML/day for around a third of days. Meaning flows would be diverted into the off stream holding basin around a third of days each year, or 4 months out of the year, splitting the flows and impeding base flows under drought conditions.
In wet years, BSC flows would be diverted into the off stream holding basin up to well over 80% of days in the year.

SUMMARY OF BSC STORMWATER RUNOFF EVENTS ANALYSIS

(Note: All runoff events not currently harvested)

SMALL RUNOFF EVENTS

				Stage 1 Harvesting (Current)		New Stage 1 & 2 Harvesting Combined		
Runoff Event Number	Runoff Event Date	Peak Flow Rate (ML/day)	Total Event Runoff Volume (ML)	Potential Runoff Volume Extracted Current Stage 1 (ML)	Potential Runoff Percent Volume Extracted Current Stage 1	Total Volume Extracted with Stages 1 & 2 (ML)	Percent of Total Runoff Volume Extracted Stages 1 & 2	Percentage Increase in extraction
1	14-16/04/2018	144.929	24.245	5.265	21.7%	10.904	45.0%	107.1%
2	8-9/06/2018	140.544	47.736	4.05	8.5%	0	0.0%	0.0%
3	8-12/12/2016	165.117	27.878	5.265	18.9%	12.488	44.8%	137.2%
4	19-22/02/2018	189.902	29.559	6.48	21.9%	15.946	53.9%	146.1%

MEDIUM RUNOFF EVENTS

				Stage 1 Harvesting (Current)		New Stage 1 & 2 Harvesting Combined		
Runoff Event Number	Runoff Event Date	Peak Flow Rate (ML/day)	Total Runoff Volume (ML)	Potential Runoff Volume Extracted Current Stage 1 (ML)	Potential Runoff Percent Volume Extracted Current Stage 1	Total Volume Extracted with Stages 1 & 2 (ML)	Percent of Total Runoff Volume Extracted Stages 1 & 2	Percentage Increase in Extraction
1	21-23/11/2016	301.763	38.582	6.48	16.8%	18.412	47.7%	184.1%
2	9-11/04/2017	492.786	57.416	8.1	14.1%	28.649	49.8%	253.7%
3	6-9/11/2017	322.849	37.467	7.695	20.5%	20.547	54.8%	167.0%
4	14-16/09/2017	271.322	50.775	9.72	19.1%	27.484	54.1%	182.8%
5	11-12/05/2018	351.152	123.792	19.035	15.4%	48.206	38.9%	153.2%
6	1-8/7/2021	256.842	265.17	48.6	18.3%	104.708	39.5%	115.4%

Figure 24

A detailed analysis of the operation of the Stage 1 and Stage 2 harvesting schemes demonstrates the increased creek flow volume which can be extracted with both schemes operating together.

All data is supplied by Water NSW and these are all events which were not currently harvested.

The table shows that for small runoff events, harvesting with Stages 1 and 2 combined more than doubles the extraction from BSC compared to the current Stage 1 harvesting.

For medium runoff events however, harvesting with Stage 1 and 2 combined can increase extraction by up to three and a half times compared to the current Stage 1 harvesting.

LARGE RUNOFF EVENTS

				Stage 1 Harvesting (Current)		New Stage 1 & 2 Harvesting Combined		
Runoff Event Number	Runoff Event Date	Peak Flow Rate (ML/day)	Total Runoff Volume (ML)	Potential Runoff Volume Extracted Current Stage 1 (ML)	Potential Runoff Percent Volume Extracted Current Stage 1	Total Volume Extracted with Stages 1 & 2 (ML)	Percent of Total Runoff Volume Extracted Stages 1 & 2	Percentage Increase in Extraction
1	12-15/10/2017	546.876	100.49	13.77	13.7%	43.814	43.6%	218.2%
2	4-7/03/2017	704.602	70.984	10.125	14.3%	37.586	52.9%	271.2%
3	20-23/10/2017	670.581	165.293	20.25	12.3%	51.443	31.1%	154.0%

EXTREME RUNOFF EVENTS

				Stage 1 Harvesting (Current)		New Stage 1 & 2 Harvesting Combined		
Runoff Event Number	Runoff Event Date	Peak Flow Rate (ML/day)	Total Runoff Volume (ML)	Potential Runoff Volume Extracted Current Stage 1 (ML)	Potential Runoff Percent Volume Extracted Current Stage 1	Total Volume Extracted with Stages 1 & 2 (ML)	Percent of Total Runoff Volume Extracted Stages 1 & 2	Percentage Increase in Extraction
1	20-23/01/2017	933.196	134.721	21.06	15.6%	51.171	38.0%	143.0%
2	2-6/12/2017	1137.625	351.01	42.12	12.0%	76.927	21.9%	82.6%
3	24-30/06/2021	1995.264	707.204	107.73	15.2%	162.799	23.0%	51.1%

Figure 25

For larger runoff events, again harvesting with Stage 1 and 2 combined can increase extraction from BSC by over 2 and a half to up to more than 3 and a half times compared to extraction with the current Stage 1.

With extreme run off events, the percentage increase in extraction with the proposed Stage 1 and 2 combined, drops back as more water is unable to be captured.

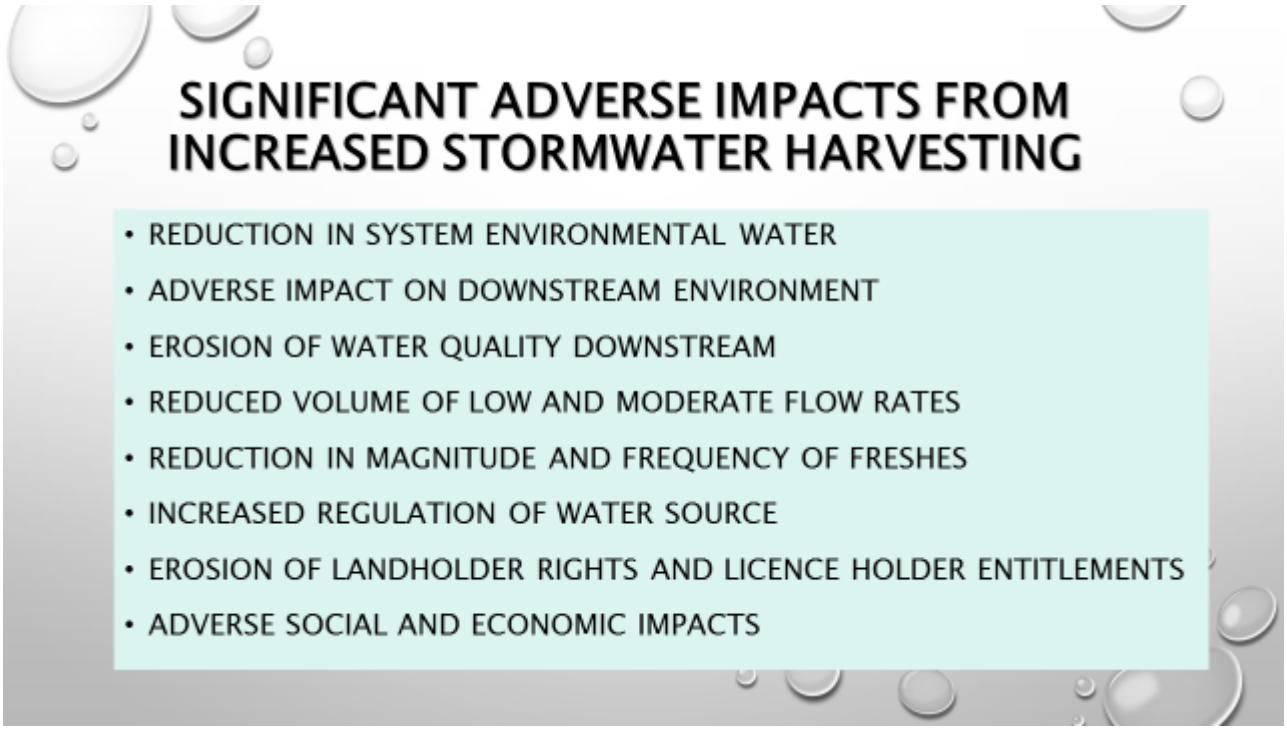


Figure 26

- Water remaining in the water source after accounting for allocation entitlements is considered environmental water. NSW has made commitments to protect this environmental water from further reduction. The proposed Stage2 stormwater harvesting scheme would significantly reduce the remaining environmental water in the water source. Part 1, Division 3, Section 8(3) of the Water Management Act requires environmental water rules to be established for all the water sources. Such rules should be in place before any new water supply works are authorised. As stated in the Water Resource Plan, water for the environment must be protected in law to at least the same level as was in place prior to the commencement of the Basin Plan in 2012.

- A key management principle under the Act states that the sharing of water from a water source must protect the water source and its dependent ecosystems. Adequate flow in the system is seen as vital for providing suitable habitat and food resources by maintaining riffle sections and connectivity between pool complexes. Increasing extraction with Stage 2 stormwater harvesting will have adverse impacts on the aquatic habitat and fauna, such as platypus, rakali and aquatic invertebrates. Aquatic habitats and biota are threatened by many processes, especially hydrologic changes due to water extraction.

- Another key water management principle in the Act includes, the water quality of all water sources should be protected and, wherever possible, enhanced. A significant reduction in the magnitude and duration of 'Freshes' through 50% diversion of creek flows off-stream, together with the increased extraction under the proposed new Stage 2 harvesting of stormflow runoff, restricts the ability to dilute pollutant loads downstream resulting from

urban stormwater runoff. Pool complexes are at risk of being loaded up with excessive pollutant loads through a reduction in tail end runoff volumes. Algal growth can be associated with reduced flow conditions from increased light penetration, concentrating nutrients and reduced flushing, which would otherwise remove fines and other biofilms from substrates and interstitial spaces. Lower flows can also cause the build-up of organic debris in edge habitats with negative consequences.

•The proposed new Stage 2 stormwater harvesting will further decrease flow rates downstream, exacerbating streamflow attenuation effects and hydrological losses which increase as flow rates decrease. Even when not harvesting stormwater runoff, the Stage 2 harvesting scheme will be diverting 50% of all BSC flows above 2 ML/day, which can be up to more than 80% of days.

•Diverting 50% of BSC flow above 2 ML/day off-stream for extraction will result in a reduction in the magnitude and duration of any freshes to the downstream SHC system and therefore must have an impact on this environment, extending some distance downstream. Low flows and reduction of freshes and high flows can result in negative changes in stream morphology. Freshes are ecologically the most important because they trigger breeding events for fish and waterbirds, improve water quality, allowing the input of fresh water and mixing in pools, help maintain the stream channel, improve oxygen levels and increase the distribution of food supplies.

•The SHC water source already suffers a high degree of regulation through OCC's numerous municipal water storage dams and the current Stage 1 stormwater harvesting weir. The proposed new water works would introduce another cumulative degree of regulation in the water source by diverting creek flow off stream through a holding basin and regulating return flows.

•Diverting streamflow off line for increased extraction upstream is further eroding basic riparian landholder's legal rights to access water for domestic and stock purposes, particularly during dry periods when access is more critical. Licence holders are also increasingly suffering loss of water access security and reduction in availability, particularly during critical demand periods.

•Increasing upstream water extraction and diversion from this already over exploited water source is further eroding downstream landholder basic rights for access to water, particularly at times of critical needs in dry periods. The reduction of water availability to fund water entitlements adversely affects productivity and loss of income for downstream landholders. Two horticulture businesses are reliant on access to water under their entitlements. In the most recent dry period, OCC turned off the environmental flows downstream in SHC and these horticulture businesses faced a water shortage crisis which not only risked significant economic loss of current production but also threatened the heath and longer term productivity of their trees.

•Other economic and social impacts warrant consideration when planning to increase diversion of water away from the downstream community.

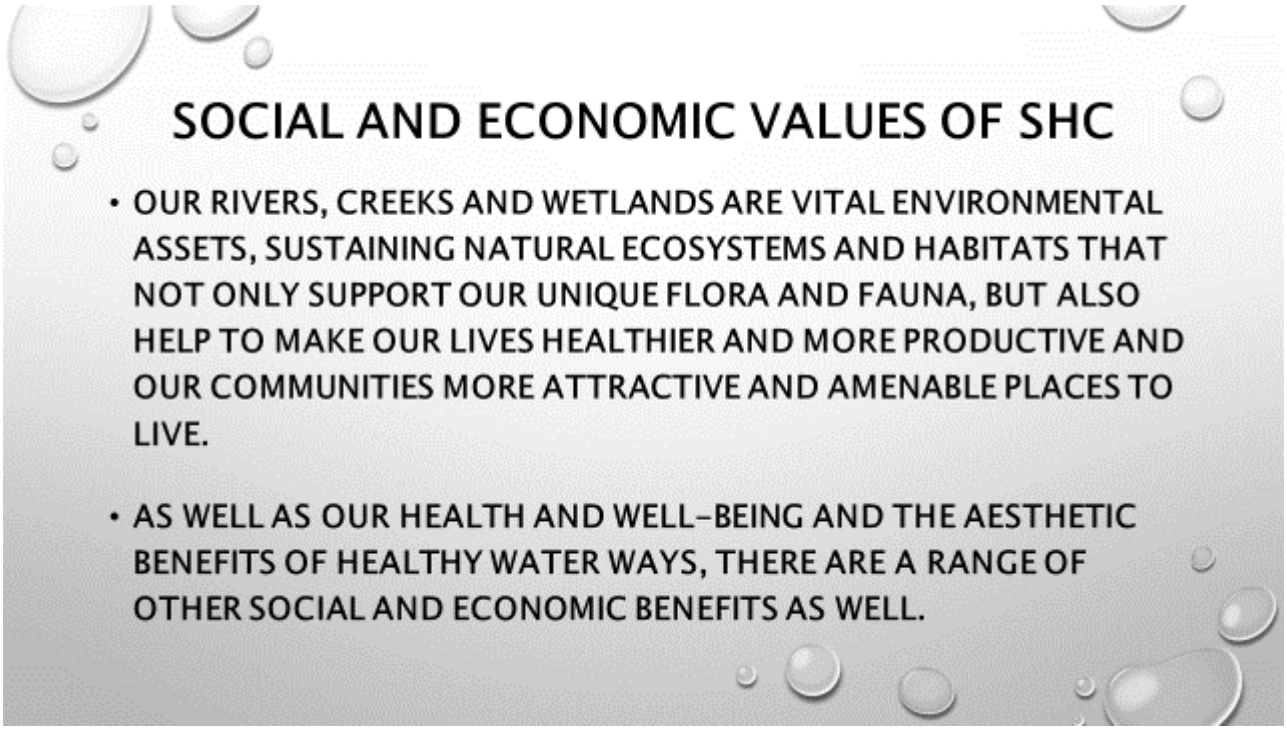


Figure 27

The water source has other values, besides being a source of water for Orange City Council.

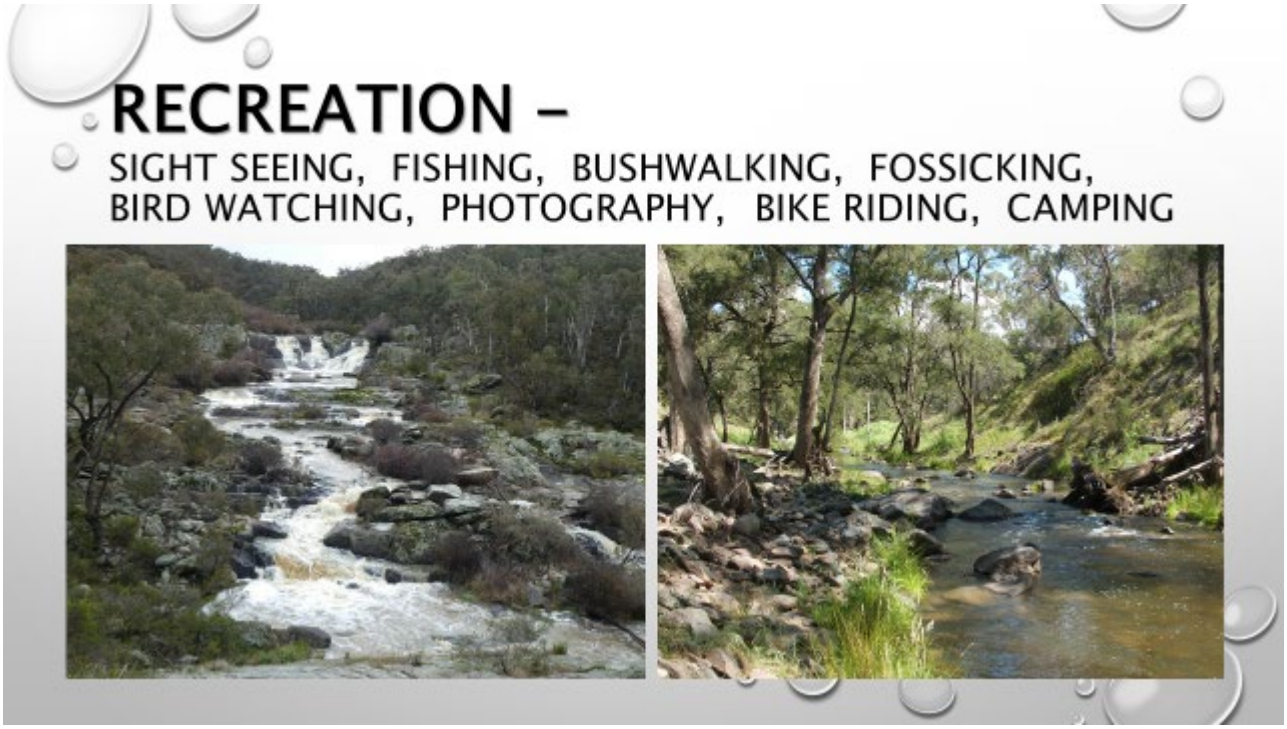


Figure 28

There are a number of important conservation reserves containing outstanding scenic values downstream on Summer Hill Creek, including Mullion Range State Conservation Area, Ophir Recreation Reserve and Girralang Nature Reserve, which protect a significant section of lands containing a wide range of remnant vegetation communities, including significant riparian vegetation. Many of the plant and animal species are at the limit of their range.
SHC and its riparian habitat is one of the most popular features and an integral and determining morphological feature of the landscape.
There are several walks in these Reserves alongside SHC, some featuring the splendid water falls.

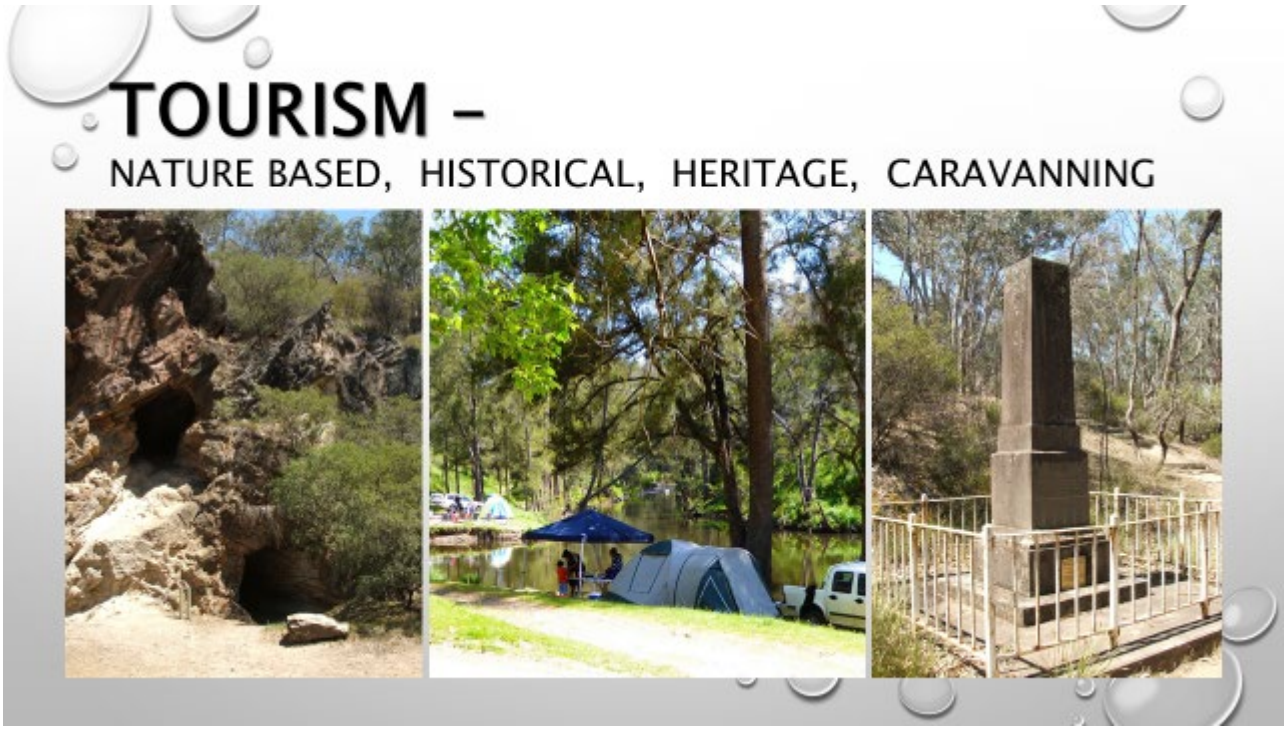


Figure 29

The Ophir Recreation Reserve attracts many thousands of regional, state, national and international visitors every year, offering unpowered camping and caravan sites.

Figure 30

Gazetted in 1936, Ophir Reserve, at the junction of SHC and Lewis Ponds Creek, is possibly the most significant historical and natural tourism drawcard in the region, second only to Mt. Canobolas.

The Reserve is prized for its recreational and nature conservation attributes, as well as its significance as the site of Australia's first gold rush in 1851.

Its especially attractive watercourses constitute a valuable local natural resource.
It is a historic site of national significance, recognised as being responsible for changing the course of history in Australia and for having a profound influence on the Central West and colonial NSW, resulting in vast socio-economic change and providing the impetus for the expansion and economic development of the state.

It is also the oldest continually worked goldfield in Australia.

Key principles for the management of Crown Land under the Crown Land Management 2016 includes; that environmental protection principles be observed in relation to the management and administration of Crown land, and that the natural resources of Crown land (including water, soil, flora, fauna and scenic quality) be conserved wherever possible, and that, where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity.

Maintaining water quality and a visible flow through the Reserve is an important management objective of the Crown Land Manager.

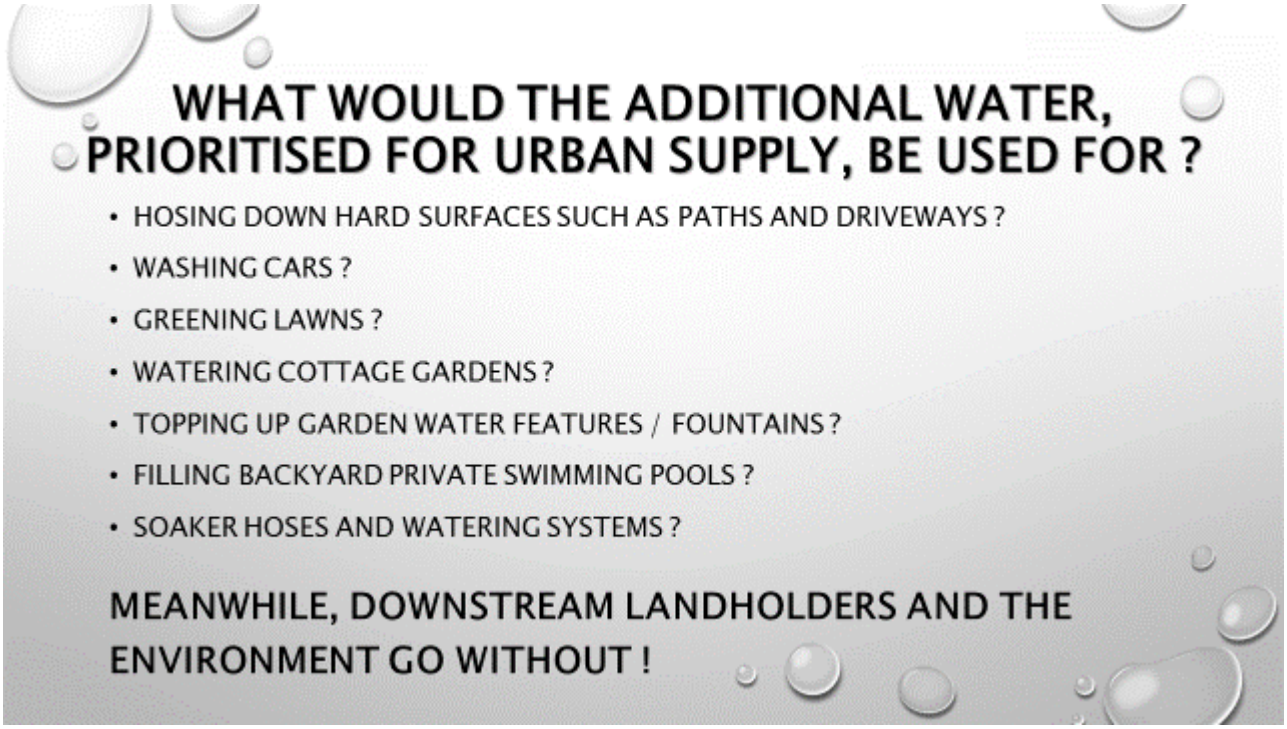


Figure 31

Downstream landowners view much of Orange's water use as an extravagant luxury or abuse of a limited precious water resource, rather than critical use.

Figure 32

These residences are all connected to Council's potable water supply. Downstream landholders are left wondering, is this a necessary and sustainable use of this valuable resource, while they are expected to make do without.

How many more exist, using up valuable potable water?

Figure 33

Looking at the Murray-Darling Basin map we see Orange right on the catchment boundary of the Northern and Southern basins.

If you wanted to build a large regional city in the worst possible place for a reliable water supply, you would put right where Orange is.

You have to wonder about the logic and sustainability of pushing perpetual growth in Orange with its current water storage capacity.

Orange has one of the smallest potable water supply capacities for any comparable regional cities anywhere in the NSW.

Hence, when not enjoying a wet year, their storages are drawn down relatively quickly from their small capacity starting base, then, when water is at its scarcest in the water source, the city wants to increase their water diversion, and minimise any flow escaping downstream, maximising harm to landowners and the environment.

When there is an abundance of water in the water source such as the last couple of years, OCC doesn't harvest any additional water, because of their undersized storages.

There is also absolutely no opportunity to bank any environmental water.

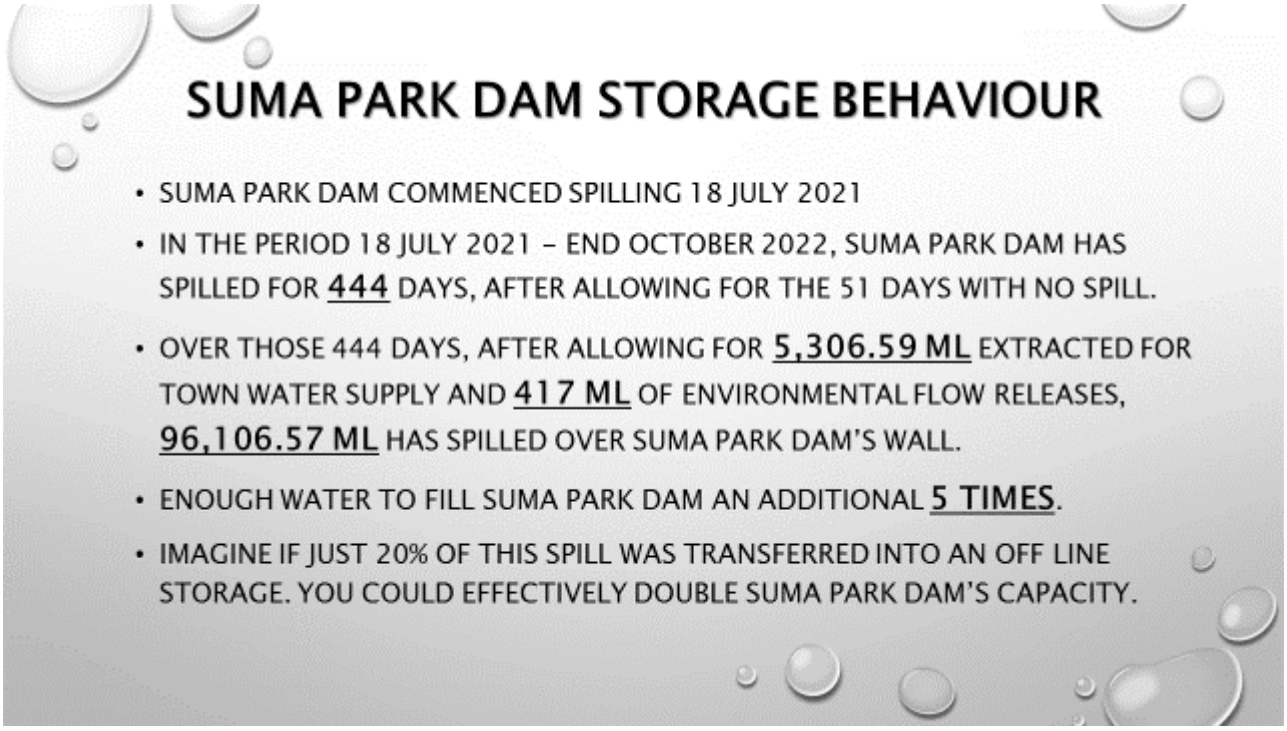


Figure 34

In wet years there is an abundance of water in the system for all water users', however Council is constrained by their small storage.

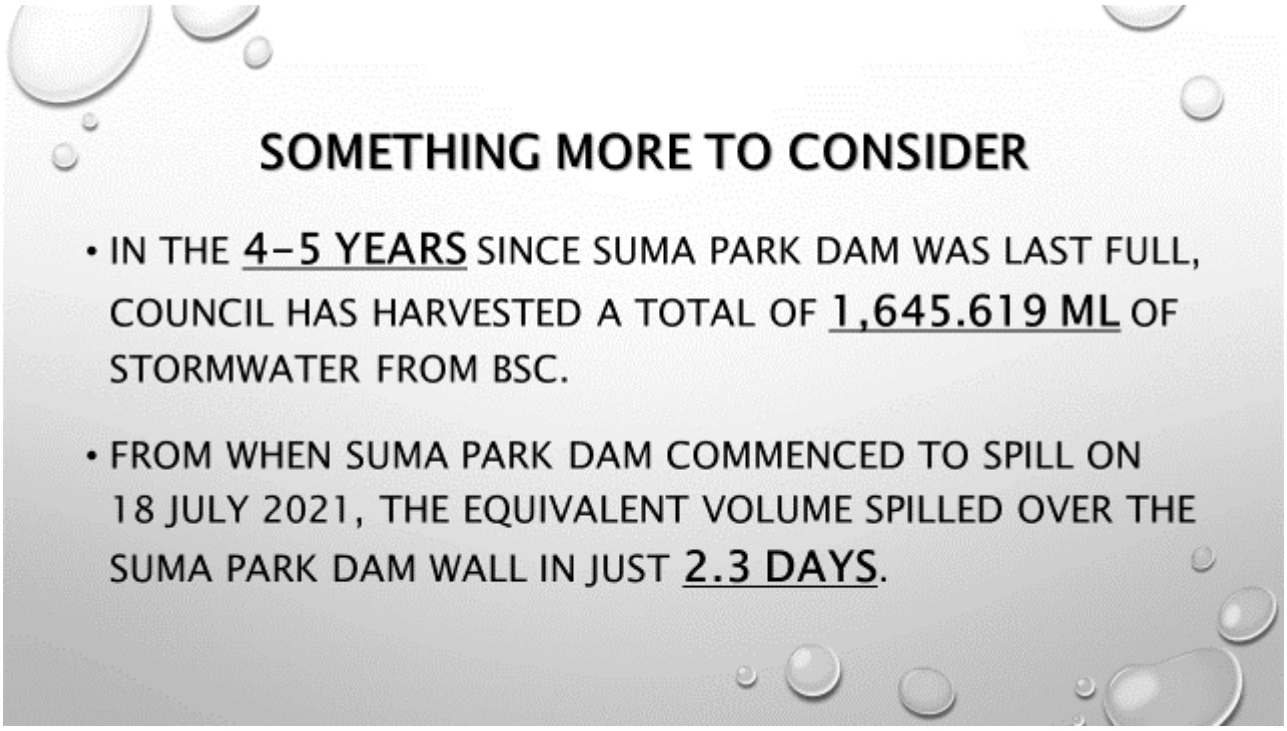


Figure 35

This could be seen as nothing more than just an exercise in altering the timing of flows to when the creek doesn't need extra water.

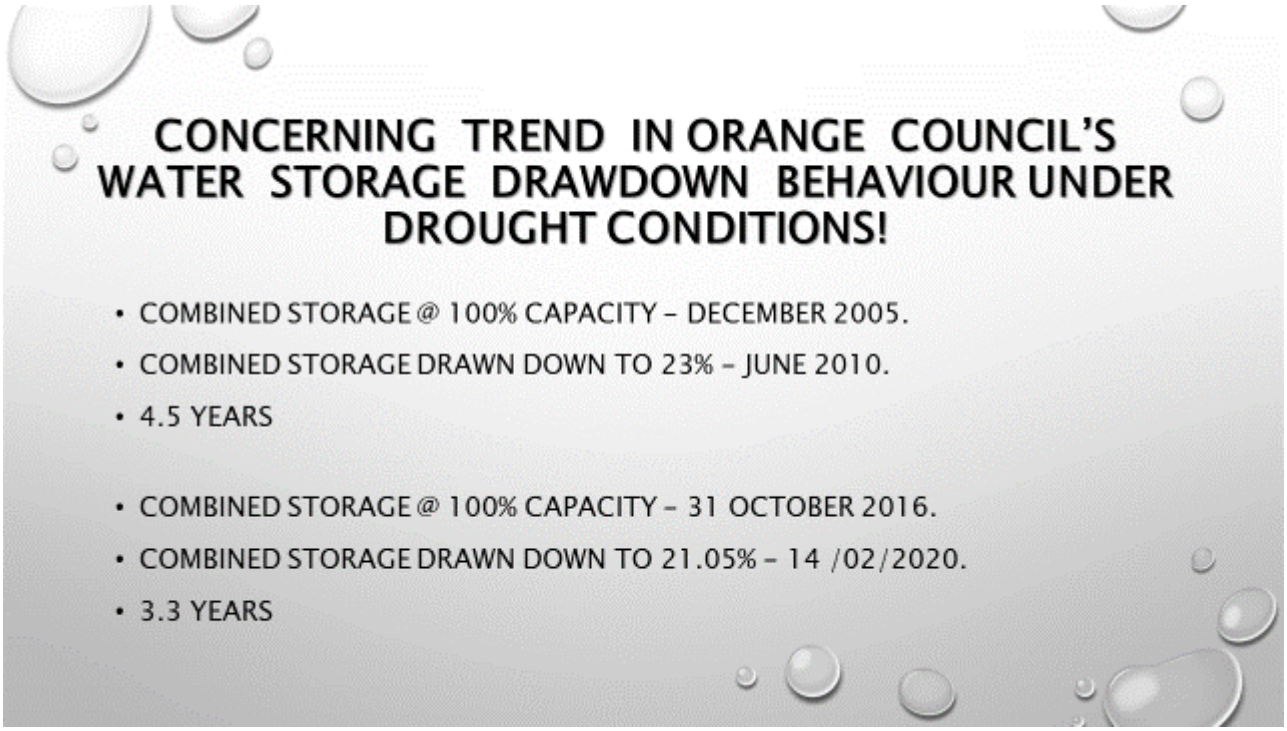


Figure 36

Stormwater Harvesting is unlikely to solve Orange's water security problems.

In the millennium drought water storages declined even with BSC Stage 1 Stormwater Harvesting operating from April 2009.

In the more recent drought, again, water storages declined even faster with BSC Stage 1 and Ploughmans Creek Stormwater Harvesting plus Macquarie River to Orange Pipeline in permanent operation, plus 10% increased capacity of Suma Park Dam.

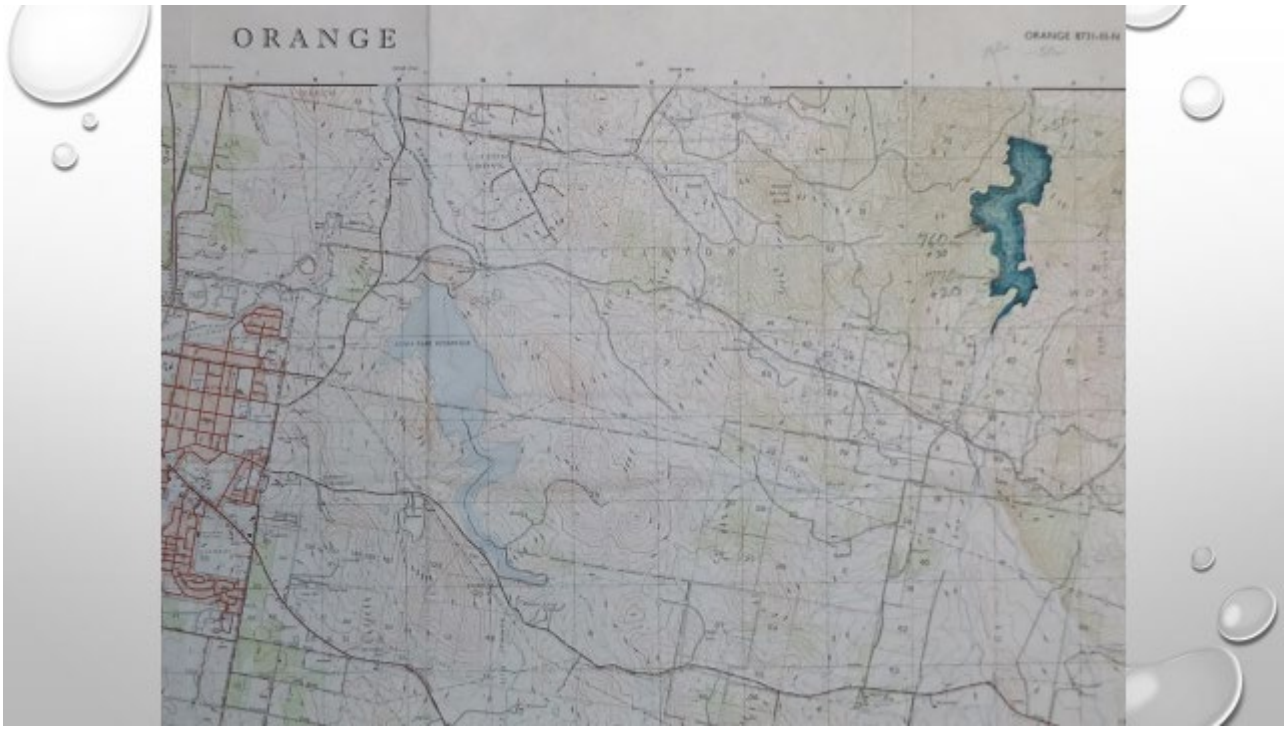


Figure 37

Trying to supplement water supply from declining rain events in the midst of a protracted drought has a significant risk of failure.

I believe Council's strategy needs to be questioned. An alternative is to build an off stream storage to hold excess water transferred from Suma Park Dam when it is spilling.

There is a potential site within 6 kilometres, just over the hill from Suma Park Dam, with a capacity roughly equivalent to the same volume of Suma Park Dam.

It could have twice the depth of Suma and with half the surface area, minimising evaporation.

Admittedly this option is ambitious and costly, but it has the potential to almost double Orange's water storage capacity, securing their water supply for at least another 3 or 4 decades.

All the natural stream flows could be passed through this new dam, therefore minimising any environmental harm.

This would seem a better option than pumping the water all the way back from the Macquarie River, only to see it spill over the wall and flow back downstream again.

And also a better option than sucking water up from Orange's gutters.

As this site is 70 metres lower than Suma Park Dam's full supply level, there could even be potential for a pumped hydro scheme.

Further comments re Action 1.5

The use of recycled water for Orange is not an option available since Orange Council has a contract to supply this treated effluent water to Cadia mine free of charge for the life of the mine.

As Orange sits at the very top of the catchment with not local aquifers, bores and not very productive, relying on cracked rock ground water sources. Managed aquifer recharge is unlikely to be an option for Orange.

Proposed Action 1.6

Three alternative options are suggested to augment Orange water supply, supply from the Lachlan Valley, a new dam on the Macquarie River at Dixons Long Point, and increasing the extraction licence for the Macquarie to Orange Pipeline project.

Each of these options is dependent on securing this water from existing licence holders. Also, these options all involve significant pumping costs which must be borne by ratepayers.

On the plus side, pipeline infrastructure has already been funded and is in place.

There may be an argument that a transfer of water from the Lachlan Valley might balance the quantity of water currently transferred from the Macquarie Valley to Cadia mine in the Lachlan catchment via the Orange effluent transfer facility. This transfer can equate to up to 3,500 ML in a year. Although in wet years when Cadia mines onsite storages remain at capacity from good runoff, this transfer volume can be zero. Generally, when Cadia's water storages are at or close to full supply level, Orange's storage dams are also at or close to full supply level so a valley transfer would not be necessary.

It is in periods of protracted dry spells when Cadia has a high demand for the effluent water and Orange's storage dams also face declining storage volumes.

If the cease-to-pump threshold remains as per OCC's current approval for the Macquarie River to Orange pipeline project extraction site, then, subject to increased licence volumes being sourced from other existing licences holders, this would be a good option which could be supported.

The proposal to construct a new instream dam on the Macquarie River is not supported. As mentioned earlier in this submission, an alternative storage proposal exists much closer to Orange with much less pumping costs involved.

In addition, a new dam on the Macquarie River would involve a significantly large investment which would be better allocated to the suggested alternative site within just six kilometres of Suma Park Dam.

Denis Marsh

denis.marsh@hotmail.com
841 Ophir Road, Summer Hill Creek. NSW. 2800
02 63658330