

WALGETT WEIR WATER SUPPLY SECURITY PROJECT WALGETT WEIR FISHWAY BUSINESS CASE

Walgett Shire Council

Draft Version C

16 January 2018

KEY PROPOSAL DETAILS

PROPOSAL INFORMATION	
Proposal name	Walgett Weir Water Supply Security Project – Walgett Weir Fishway
Lead proponent (e.g. Council)	Walgett Shire Council
Lead proponent ABN	88 769 076 385
Proposal partners	N/A
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PROPOSAL SCOPE	
Proposal summary for publication <i>Please provide 150 words or less</i>	<p>The Walgett Weir Fishway involves the construction of a new 30 slot, vertical-slot fishway and high flow full-width rock-ramp on the left (southern) abutment of Walgett Weir 11A. The fishway is part of the Walgett Weir Water Supply Security Project which includes a 1.0 m raising of Walgett Weir 11A, access road upgrade, and removal of the old Naomi Weir 10.</p> <p>This Business Case for Safe and Secure Water Program funding relates to detailed design and construction of the Walgett Weir Fishway only, however the complementary Walgett Weir 11A raising and Naomi Weir 10 removal projects are referenced heavily throughout to give context to the problem. The Walgett Weir raising and Namoi Weir removal projects have already secured funding through the Restart NSW: Water Security for the Regions program, but without funding for construction of the fishway, Council will not receive permission to continue with those already funded water security projects.</p>
PROPOSAL LOCATION	
Proposal address	The Walgett Weir Fishway will be located on the left (southern) abutment of Walgett Weir 11A on the Barwon River in north-western NSW. Coordinates: 29°59'58.7"S 148°05'55.6"E.
Local government area	Walgett Shire
NSW electorate	Barwon
Federal electorate	Parkes
SUPPORTING INFORMATION	
Attachments <i>Please list out all supporting information provided</i>	<ul style="list-style-type: none"> • Project Gantt Chart (Appendix M) • Project Team CVs (Appendix J) • Risk Register and Risk Management Plan • See full list of appendices to this plan on page 5

DOCUMENT INFORMATION

Document Summary Information	
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Document Security	

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Version	Amendment	Amendment Date	Amended by
Draft A	First draft to Walgett Shire Council	27 December 2017	Sylvester Otumbo Otieno, Jillian Kilby
Draft B	Final draft to Walgett Shire Council	10 January 2018	Sylvester Otumbo Otieno, Jillian Kilby
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CONTENTS

LIST OF REFERENCE DOCUMENTS.....	5
1 EXECUTIVE SUMMARY	6
2 CASE FOR CHANGE	7
2.1 BACKGROUND.....	7
2.2 RATIONALE FOR INVESTMENT	10
2.3 STRATEGIC ALIGNMENT	11
2.4 EXPECTED OUTCOMES.....	13
2.5 STAKEHOLDER & COMMUNITY SUPPORT.....	15
3 ANALYSIS OF THE PROPOSAL	17
3.1 OBJECTIVES & INDICATORS.....	17
3.2 THE BASE CASE	17
3.3 OTHER OPTIONS CONSIDERED	18
3.4 INFORMATION ABOUT THE PROPOSAL.....	23
3.5 PROJECTED COSTS	27
3.6 COST-BENEFIT ANALYSIS.....	28
3.7 FINANCIAL APPRAISAL.....	32
3.8 PROPOSED FUNDING ARRANGEMENTS	32
4 IMPLEMENTATION CASE	33
4.1 PROGRAM & MILESTONES.....	33
4.2 GOVERNANCE	34
4.3 KEY RISKS	36
4.4 LEGISLATIVE, REGULATORY ISSUES & APPROVALS	37
4.5 PROPOSED MANAGEMENT ACTIVITIES	39

LIST OF REFERENCE DOCUMENTS

The following documents were used in the creation of this Business Case and are a valuable addition to the funding submission.

Appendix	Report or document name	Abbreviation
A	NSW Public Works, Walgett Weir 11A Raising Concept and Fishway Feasibility, Report No. DC 13169, August 2014	<i>NSW Public Works Feasibility Report 2014</i>
B	NSW Public Works, Walgett Weir 11A Raising and Fishway Review of Environmental Factors, Report No. DC15238, February 2017	<i>NSW Public Works Review of Environmental Factors 2017</i>
C	DPI Fisheries, Walgett Weir 11A Weir Raising - Designing a Cost-Effective Fishway, August 2015	<i>DPI Fisheries Designing a Cost-Effective Fishway 2015</i>
D	Addendum to Appendix C – Revised Criteria January 2017	<i>Addendum – Revised Criteria January 2017</i>
E	URS, Walgett Weir Fishway Final Conceptual Design Report, August 2015	<i>URS Report 2015</i>
F	Walgett Shire Council's Community Strategic Plan 2017 – 2027	<i>WSC Community Strategic Plan</i>
G	Walgett Shire Council's Delivery Program 2017/18 – 2020/21 and Operational Plan 2017/18	<i>WSC Delivery Program and Operational Plan</i>
H	Walgett Weir Water Supply Security Proposal 2014	<i>Walgett Water Security Proposal 2014</i>
I	Progress Report by NSW Public Works Advisory 170808	<i>Progress Report</i>
J	Project Management Team CV's	
K	Project Design Drawings	
L	Summary of Fishway Options Considered, Extension to Section 3.3. This is a summary from Appendix C.	
M	Project Gantt Chart by NSW Public Works Advisory, Project Manager David Watson, August 2017	<i>Project Gantt Chart</i>
N	Risk Register by NSW Public Works Advisory	
O	Barwon Weir 11A Upgrade Proposal to the NSW Office of Water Department of Primary Industries Licence Application 85SL50005 September 2012 Draft 1 by Walgett Shire Council	<i>Proposal to NSW Office of Water 2012</i>
P	SSWP Cost Benefit Analysis Toolkit x 2 versions (Town User Population of 1730 and Shire Population of 6545) Walgett Shire Council Cost Estimate V6 Final	

1 EXECUTIVE SUMMARY

The Walgett Weir Fishway involves the construction of a new 30 slot, vertical-slot fishway and high flow full-width rock-ramp on the left (southern) abutment of Walgett Weir 11A. The fishway is part of the Walgett Weir Water Supply Security Project which includes a 1.0 m raising of Walgett Weir 11A, upgrading the access road, and removal of the old Namoi Weir 10.

This Business Case for funding relates to the detailed design and construction of the fishway only, however the complementary projects are referenced heavily throughout. Walgett Weir 11A and Namoi Weir 10 projects are funded under Restart NSW: Water Security for the Regions 2014. The NSW Weirs Policy¹ states that no work will be completed on a weir without the addition of a fishway. If funding is not secured to construct the fishway, Walgett Shire Council will not receive approval to continue.

An extensive analysis of alternative solutions, design, cost estimates, review of environmental factors, consultation with stakeholders and approvals have been undertaken by Walgett Shire Council since 2014.

The Benefit:Cost Analysis was completed using the SSWP provided toolkit. More than ten (10) independent reports and four (4) cost estimates were utilised in the completion of the analysis. The benefit to cost ratio (BCR) was positive and above 1.0 as required by SSWP. The BCR was 4.46 and 1.57 for a Shire and Town User population of 6545 and 1730 respectively, at a 7% discount rate and 30 year horizon.

This Business Case for the Walgett Weir Water Supply Security Project addresses the following problems:

1. **Water Security:** Walgett does not have a secure water supply to meet the current demand during severe and prolonged drought. Water does not back far enough up the weir pool to supply adequate water to the treatment plant intake pumps. The weir needs to be raised by 1.0 m.
2. **Approval:** The proposed weir raising triggers Section 218(5) of the *Fisheries Management Act 1994* (FMA), and NSW DPI Fisheries will not approve the construction to raise Walgett Weir 11A for water security, unless a fishway is included in the project.
3. **Fish Barriers:** Walgett Weir 11A and Namoi Weir 10 are barriers to fish migration. They are ranked by NSW DPI Fisheries as the second highest priority for fish passage in the Murray Darling Basin.
4. **Funding:** Raising the weir is already funded but cannot proceed until the fishway is funded for simultaneous construction.

Walgett Weir Water Supply Security Project and necessary Walgett Weir Fishway project are complementary and will achieve the following objectives:

1. Increase the drought security of Walgett's water supply through the provision of increased weir pool storage that can be drawn upon during drought periods.
2. Improve fish passage in the Murray Darling Basin through the provision of a fishway.
3. Eliminate two (2) fish barriers, reduce the maintenance burden, and eliminate the need to transfer water as part of drought management operations.²

This Business Case includes total base project cost of \$7.4M including \$2.3M for raising the weir and \$5.1M for the fishway. Additionally, there is contingency of \$1.5M and ongoing maintenance of 1% per year. Walgett Shire Council requests funding from SSWP of \$5,280,002 which represents 60% of total project cost. Walgett Shire Council confirms they will fund the gap of \$3,587,094.

The project is shovel ready.

¹ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 10, 2.4.1 NSW Weirs Policy

² Appendix B - NSW Public Works Review of Environmental Factors 2017, page 3, 1.3 Project Objectives

2 CASE FOR CHANGE

2.1 BACKGROUND

The town of Walgett is located in north-western NSW approximately 270 km north of Dubbo along the Castlereagh Highway and approximately halfway between the towns of Moree and Bourke. Walgett is located on the southern bank of the Namoi River immediately upstream of its confluence with the Barwon River (Figure 1-1).

The Walgett Weir Fishway involves the construction of a new 30 slot, vertical-slot fishway and high flow full-width rock-ramp on the left (southern) abutment of Walgett Weir 11A. The fishway is part of the Walgett Weir Water Supply Security Project which includes a 1.0 m raising of Walgett Weir 11A, upgrading the access road, and removal of the old Namoi Weir 10.

This Business Case relates to the detailed design and construction of the fishway only, however the complementary projects are referenced heavily throughout the document. Walgett Weir 11A and Namoi Weir 10 projects are funded under Restart NSW: Water Security for the Regions 2014, but the Fishway is not fully funded. If funding is not secured to construct the fishway, Walgett Shire Council will not receive approval to continue with the already approved projects. The NSW Weirs Policy³ states that no work will be completed on a weir without the addition of a fishway.

Walgett Weir Water Supply Security Project and necessary Walgett Weir Fishway project are complementary and will achieve the following objectives:

- 1) Increase the drought security of Walgett's water supply through the provision of increased weir pool storage that can be drawn upon during drought periods.
- 2) Improve fish passage in the Murray Darling Basin through the provision of a fishway.
- 3) Eliminate two (2) fish barriers, reduce the maintenance burden, and eliminate the need to transfer water as part of drought management operations.⁴

The proposed location of the Walgett Weir Fishway is Walgett Weir 11A (see figure 1-2) on the Barwon River approximately 3 km north west of Walgett and approximately 450 m downstream of the confluence with the Namoi River (see Figure 1-3). The Barwon River is unregulated whilst the Namoi River is regulated by WaterNSW (formerly State Water Corporation) with releases from Keepit Dam near Tamworth to the south-east. Walgett Weir 11A was constructed in 1955 and refurbishment works were undertaken in 2002. Walgett Weir 11A forms a weir pool that extends upstream within both the Barwon and Namoi Rivers. Raw water is typically extracted from the Namoi River arm of the weir pool for the Walgett water supply system.

The security of Walgett water supply is primarily dependent upon the water yielded from the Walgett Weir 11A weir pool.⁵ During drought, the Namoi River ceases to flow at Walgett and the Walgett Weir 11A weir pool does not provide sufficient volume for the existing river intakes. As a consequence, a "temporary" weir (referred to as Namoi Weir 10) was built downstream of one of the intake pumping stations. This allows water to be pumped upstream over Namoi Weir 10 from the weir pool of Weir 11A enabling water to be accessed by the upstream intake pumping station.

In order to improve the security of the town's water supply, Walgett Shire Council proposes to raise Walgett Weir 11A by 1.0 m, through construction of a reinforced concrete wall anchored to the existing concrete capping on the main steel sheet pile curtain wall. This will provide an increased weir pool storage volume

³ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 10, 2.4.1 NSW Weirs Policy

⁴ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 3, 1.3 Project Objectives

⁵ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 21, 3.2 Water Supply Security

that can be drawn upon during drought periods. There would be no change to the Council's water allocation and water extraction would remain within the water access licence limits. The proposed raised weir will increase the volume of the weir pool from 1,763 ML to 2,907 ML, resulting in a total increase of 1,145 ML.⁶ The raised weir will make redundant and therefore allow the removal of Namoi Weir 10, which will eliminate the maintenance burden and the need for the pumped transfer of river water as part of drought management operations.

Walgett Weir 11A and Namoi Weir 10 present barriers to fish migration. They are ranked by DPI Fisheries as the second highest priority fish passage barrier in the Murray Darling Basin. This project will open up an additional 205 km of upstream habitat and overcome the issues associated with fish movement.

A summary of the key work to date includes:

- Water security and fishway solutions were considered by Walgett Shire Council. NSW Public Works and specialist consultants were engaged to undertake option analysis, feasibility studies and concept designs in 2014. Further details can be found in the *NSW Public Works Feasibility Report 2014*⁷ (Appendix A).
- DPI Fisheries undertook an assessment to determine the ecological, hydrological and fishway hydrodynamic criteria, in order to select a preferred fishway design (*DPI Fisheries Designing a Cost-Effective Fishway 2015 Appendix C and Addendum – Revised Criteria January 2017 Appendix D*) with the purpose of selecting a preferred fishway design that meets key design criteria while limiting capital and operating expenditure. The preferred fishway design selected was a combination vertical-slot fishway and high flow full-width rock-ramp. Compared to the other fishway options, the vertical-slot fishway was found to provide the best outcome in meeting key ecological and hydrologic criteria relative to construction and operation expenditure. The high flow full-width rock-ramp was found to have low overall costs and provides effective fish passage at elevated river flows when the functionality of the vertical-slot fishway is reduced.⁸
- Consultation with DPI Fisheries has been ongoing during the process to develop the concept and prepare the detailed solutions and designs. Key design features and advanced detailed design plans of the fishway have been completed, with the most recently modified project design drawings completed in November 2017 (Appendix K).
- The NSW Public Works *Review of Environmental Factors 2017* (Appendix B) has been completed and determined that by adopting the safeguards identified in the assessment there would be no significant adverse environmental impacts associated with the proposal and an Environmental Impact Statement would not be required.⁹

⁶ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 53, 6.7.2 Operational Impacts

⁷ Appendix H - Walgett Water Security Proposal 2014, page 10, Solutions Considered

⁸ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 24-25, 4.1.2 Fishway

⁹ Appendix B - NSW Public Works Review of Environmental Factors 2017, page vi, Executive Summary

Figure 1-1: Location Map

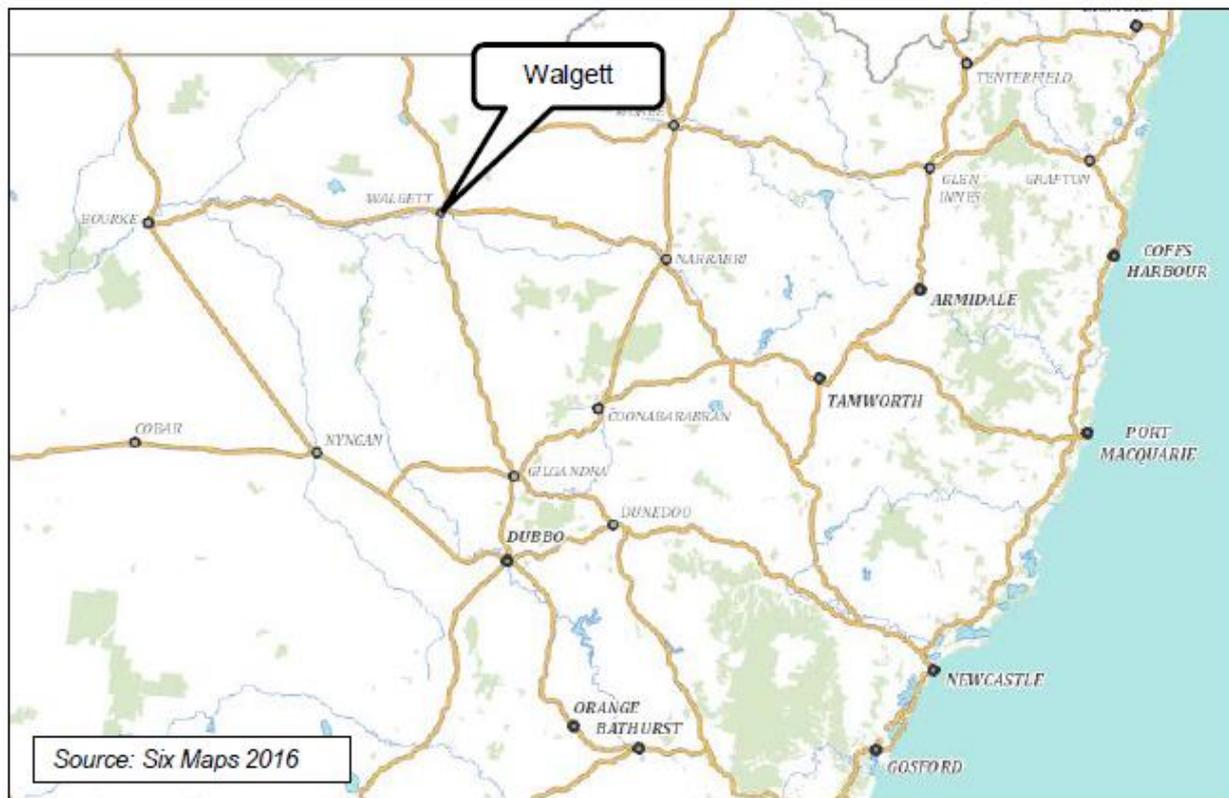


Figure 1-2: Aerial View of Walgett Weir 11A

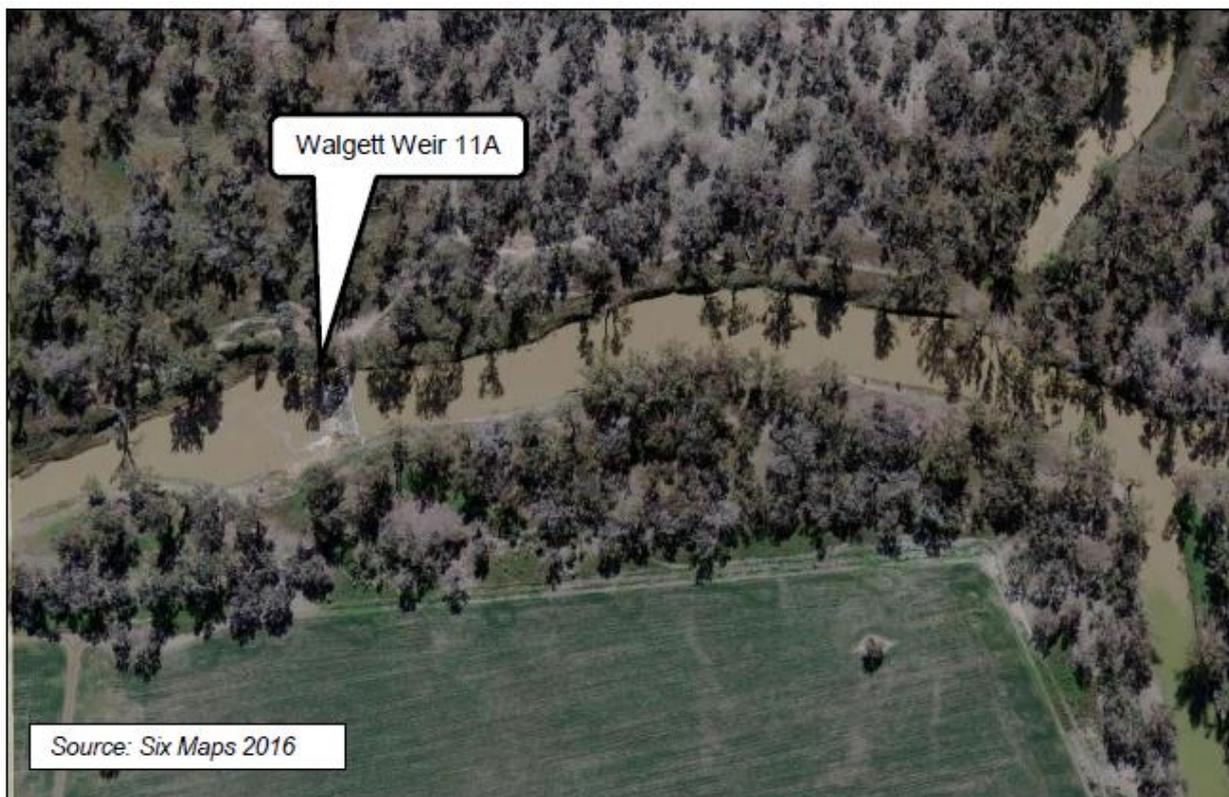
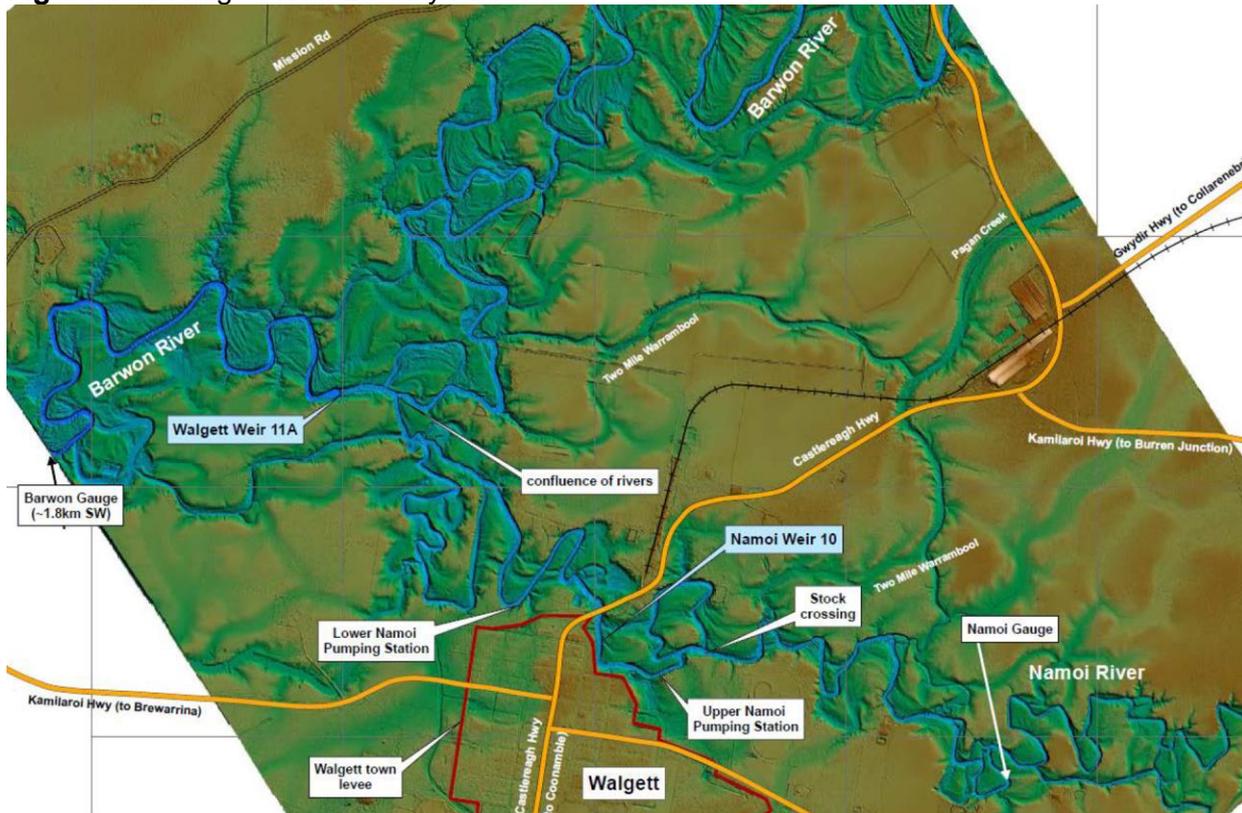


Figure 1-3: Walgett Weir Locality Plan



2.2 RATIONALE FOR INVESTMENT

- 1) **Provide Water Supply Security:** Walgett does not have a secure water supply to meet the current demand during severe and prolonged drought. Water does not back far enough up the weir pool to supply adequate water to the treatment plant intake pumps. In 2013, NSW Office of Water built a water and sanitation treatment plant worth over \$6.5 million and the weakest link is now water supply security from the weir pool. The Walgett Weir 11A needs to be raised by 1.0 m to provide town water security.
- 2) **Secure Construction Approval:** The proposed weir raising triggers Section 218(5) of the *Fisheries Management Act 1994* (FMA), and NSW DPI Fisheries will not approve the construction to raise Walgett Weir 11A for water security, unless a fishway is included in the project.
- 3) **Open Fish Passage:** Walgett Weir 11A and Namoi Weir 10 are barriers to fish migration. They are ranked by NSW DPI Fisheries as the second highest priority for fish passage in the Murray Darling Basin.
- 4) **Maximize Existing Funding:** Raising Walgett Weir 11A and removing Namoi Weir 10 projects are already funded but cannot proceed until the fishway is funded for simultaneous construction.

SSWP funding will allow the construction of the fishway, which will complete the whole Walgett Weir Water Supply Security Project. SSWP will ensure there is a safe supply of potable water into the future for the Walgett community.

2.3 STRATEGIC ALIGNMENT

The project aligns with current NSW Government and Council policies, strategies and initiatives. Table 2-1 below outlines how the Project addresses themes or requirements of each of the policies.

Table 2-1: Project Alignment with NSW Government and Council Policies

Policy	Alignment
<p>NSW Premier's/State Priorities¹⁰ identifies two related priorities</p> <ul style="list-style-type: none"> Accelerating Local Infrastructure through the Delivering Infrastructure priority Creating jobs 	<ul style="list-style-type: none"> The SSWP will accelerate the delivery of priority water infrastructure. The fishway will bring short term job creation during the construction phase. Long term job creation will come from the fishing and tourism industry. The project will secure jobs as industry gains confidence in water supply security.
<p>As part of the NSW Government's Rebuilding NSW Plan, the NSW State Infrastructure Strategy Update 2014¹¹ identified a priority to "Support the critical needs of regional industries and communities by ensuring water security and quality of supply".</p>	<ul style="list-style-type: none"> Walgett Shire was identified in this Strategy, included on the backlog of 71 projects from the original Country Town Water Supply and Sewerage Program which began in 1996.¹² The Safe and Secure Water Program (SSWP) is a result of the recommendations in the Rebuilding NSW Plan. This is a critical need project to create water security and quality of supply for regional industry and the Walgett community. Key points of alignment include: <ul style="list-style-type: none"> Provides water security for Walgett residents and industry Plans for the future by making the right infrastructure investments and building resilience and redundancy into water infrastructure Improves water management Delivers on immediate needs and long-term economic and environmental sustainability.
<p>Restart NSW Program</p>	<p>Raising Walgett Weir 11A was identified in the NSW Restart Program. The fishway construction is a vital component of the project, which has already received funding from Restart NSW.</p>
<p>The Safe and Secure Water Program (SSWP) is a \$1 billion NSW Government co-funding program that will target water and sewerage projects in regional</p>	<p>This Project is directly aligned with the objectives of the SSWP by providing infrastructure that meets contemporary standards for water security, public</p>

¹⁰ <https://www.nsw.gov.au/improving-nsw/premiers-priorities/delivering-infrastructure/>

¹¹ http://www.insw.com/media/1096/inf_j14_871_sis_report_ch06_web.pdf

¹² http://www.insw.com/media/1096/inf_j14_871_sis_report_ch06_web.pdf, page 16

<p>NSW to ensure infrastructure meets contemporary standards for water security, public health, environmental and safety outcomes into the future¹³.</p>	<p>health, environmental and safety outcomes into the future.</p>
<p>Walgett Shire Council's Community Strategic Plan 2017 - 2027 indicates the following goals and strategies within Section 4: Sustainable Living and Section 5: Infrastructure.</p> <p>Section 4: Sustainable Living¹⁴ Goal 4.2: Provide potable and raw water supply systems that ensures enhanced water security and meets health standards Strategy 4.2.1: Improve and upgrade the water supply infrastructure through an appropriate asset management framework.</p> <p>Section 5: Infrastructure¹⁵ Goal 5.4: Provision of facilities and communication services Strategy: 5.4.2 Represent the community with regard to external services including energy, communication, water, waste management and resource recovery.</p>	<p>The Project is directly aligned to the Community Strategic Plan by delivering Goal 4.2, Strategy 4.2.1, Goal 5.4 and Strategy 5.4.2 through water related infrastructure upgrades.</p>
<p>Walgett Shire Council's Delivery Program 2017/18 – 2020/21 and Operational Plan 2017/18 identifies that the community wants:</p> <ul style="list-style-type: none"> • Quality water supply • Sustainable river and catchment management • Environmental sustainability¹⁶ <p>It also identifies that over the ten year life of the Community Service Plan, Walgett Shire Council will focus on implementing the specific infrastructure strategies includes:</p> <ul style="list-style-type: none"> • Ensure that urban and rural infrastructure including water supply is effectively managed through an asset management framework • Undertake raising of the height of the Walgett Weir with grant funding allocated. • Complete Walgett water supply security infrastructure¹⁷ 	<p>The Project directly addresses the wishes of the community as outlined in the Council's Program and Plan.</p> <p>The SSWP funding for the construction of the fishway will result in the approval to raise Walgett Weir 11A and complete the Walgett Water Supply Security infrastructure.</p> <p>Without SSWP funding the raising of Walgett Weir 11A will not proceed, the Council's Programs and Plans will not be delivered.</p>
<p>Far West Regional Plan 2036¹⁸</p> <p>Goal 1 Direction 9 – Sustainably manage water</p>	<p>SSWP funding supports the Far West Regional Plan by providing water security for economic opportunities, reversing the impact we have had on</p>

¹³ <http://www.water.nsw.gov.au/urban-water/safe-secure>

¹⁴ Appendix F - WSC Community Strategic Plan, page 20

¹⁵ Appendix F - WSC Community Strategic Plan, page 22

¹⁶ Appendix G - WSC Delivery Program and Operational Plan, page 3

¹⁷ Appendix G - WSC Delivery Program and Operational Plan, page 10

¹⁸ <http://www.planning.nsw.gov.au/~media/Files/DPE/Plans-and-policies/far-west-regional-plan-08-2017.ashx>

<p>resources for economic opportunities</p> <p>Goal 2 Direction 14 Action 14.5 – Minimise impacts of development on fish habitat (including watercourses, wetlands and riparian lands) and help deliver the objectives of the Water Management Act 2000.</p> <p>Goal 3 Direction 26 Action 26.3 – Investigate ongoing water supply issues and collaborate with stakeholders to deliver long-term water security for residents and industries, including funding works from the <i>Water Security for Regions Program</i>.</p>	<p>fish habitat through fishway development, while respecting the need for water for industry.</p> <p>The project delivers the objectives of the Water Management Act 2000 by ensuring ecologically sustainable development (and rectification of past development) to ensure we meet the needs of future generations.</p> <p>Finally, Walgett Shire Council has spent 4 years collaborating with stakeholders and researching the optimum solution to address water supply issues. Per Goal 3, the goal is to deliver long-term water security for residents and stakeholders, including the environment.</p>
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2.4 EXPECTED OUTCOMES

The rationale for investment (section 2.2 of this report) identified four problems:

- Water supply security
- Requirements for approval
- Fish barriers
- Funding

The expected outcomes of the SSWP directly address and solve for these four problems.

Primary outcomes

- **Water Security:** The completion of the Walgett Weir Water Supply Security Project will achieve water security for the community and ensure that during drought, Walgett has water supply in excess of 365 days.¹⁹
- **Approval and Funding to Commence Work:** The SSWP will fund the construction of the Walgett Weir Fishway, which is required to be able complete the Walgett Weir Water Security Supply Project. With approved SSWP funding for the fishway, DPI Fisheries will grant the final approval for the 1.0 m raising of Walgett Weir 11A, Walgett Weir access road upgrade, and removal of Naomi Weir 10 (projects already funded). This will ensure compliance with the NSW Weirs Policy²⁰ which states that no work will be completed on a weir without the addition of a fishway.
- **Removal of Fish Barrier:** The Fishway and removal of Naomi Weir 10 will open one of the largest stretches of waterway in the Murray Darling Basin for fish passage²¹ and reduce habitat fragmentation. The inclusion of a fishway was determined to be the key factor influencing the positive or negative environmental outcome of raising the weir²².

¹⁹ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 21, 3.2 Water Supply Security

²⁰ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 10, 2.4.1 NSW Weirs Policy

²¹ Appendix B - NSW Public Works Review of Environmental Factors 2017, page v, Executive Summary

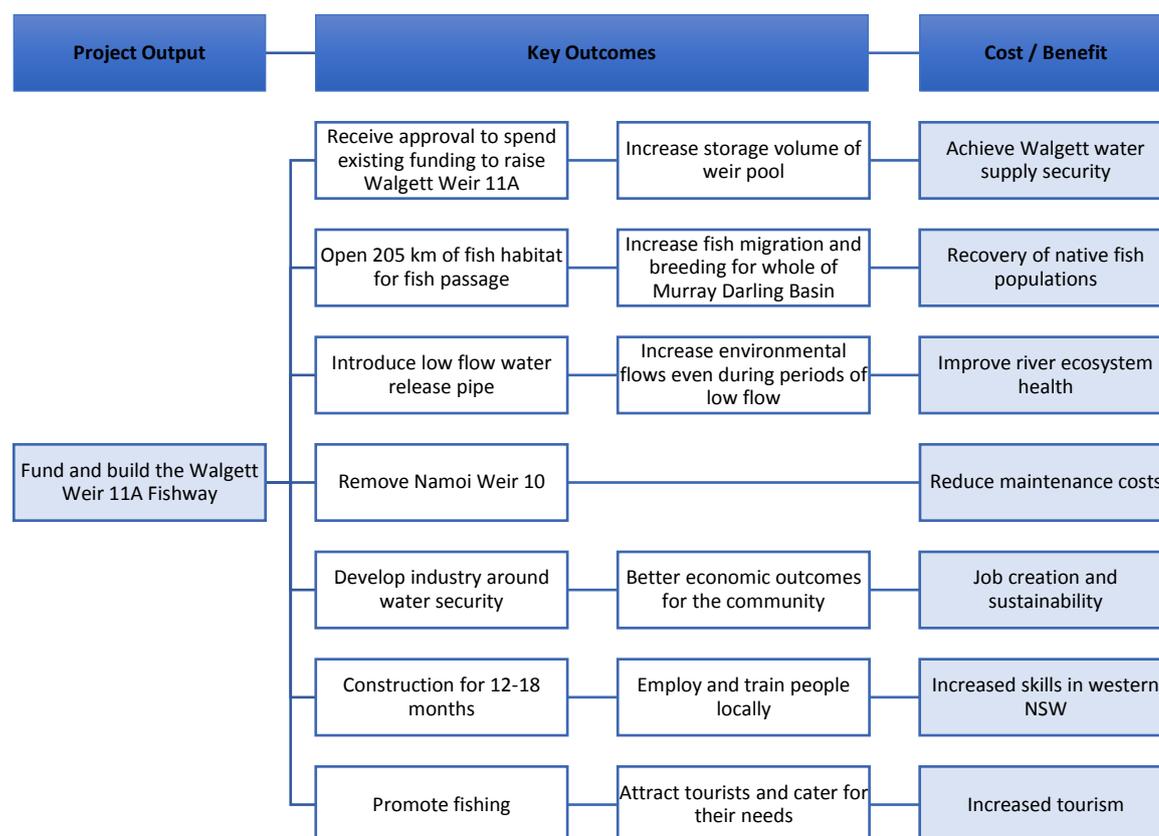
²² The detailed assessment of significance for proposed impacts to the aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River Endangered Ecological Community was delivered in the Ecological Assessment – Walgett Weir 11A Raising (OzArk, 2015a).

Other outcomes

- **Reduced Maintenance:** The removal of the temporary Namoi Weir 10 will remove maintenance and operation costs.
- **Whole of Murray Darling Basin Benefits:** Walgett Weir 11A is ranked as the second highest priority barrier for removal for fish passage in the Murray Darling Basin. The fishway will open an additional 205 km of upstream habitat, which is split between the Barwon River to Calmundi Weir (84 km) and the Namoi River up to Gunidgera Weir (121 km) (pers. comm. M Gordos, 22 April 2015).
- **Increased Environmental River Flow:** Consultation with DPI Fisheries has been ongoing as part of the concept and detailed design process. The operation of the fishway will allow a greater duration of downstream flows in all but extremely low flow conditions. Environmental flows are not satisfactory today and this project would allow environmental releases in response to inflows when the pool is drawn down below the raised weir crest but above the fishway exit invert.²³
- **Ecological outcomes:** The fishway will make a major contribution to the recovery of native fish populations. *DPI Fisheries Designing a Cost-Effective Fishway 2015* (Appendix C) achieves the following ecological priorities;
 - Fish passage targeted for rare and endangered fish in the Barwon River, as well as populations that have displayed historic declines in the Murray Darling Basin.
 - Sufficient depth to accommodate a wide range of fish sizes, including medium-bodied fish (up to 700 mm).
 - Sufficient low water velocities and turbulence to accommodate smaller-bodied fish (20 – 90 mm).²⁴
- **Economic development and industry:** Secure water supply is essential for economic development, commercial confidence if dependent on water, and personal investment confidence in resident's gardens and swimming pools.
- **Job creation:** The construction project will create short term jobs and business activity in Walgett
- **Tourism benefits:** Walgett will continue to increase in popularity as a hunting and fishing destination increasing the number of tourist visits each year.

²³ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 22, 3.3 Project Justification + page 63, 6.8.2 Downstream Impacts

²⁴ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 75, 6.10.2 Operational Impacts

Figure 2-1: Mapping of Expected Outcomes

2.5 STAKEHOLDER & COMMUNITY SUPPORT

Walgett Shire Council has been committed to the process of consulting with community and stakeholders for the past four (4) years, including significant engagement with NSW Water and DPI Fisheries during the research and design of this project.

Community support:

- This Project has secured a high level of support from the Walgett community and its diverse stakeholders.
- It is of high priority to the community, demonstrated by the continued pursuit by Walgett Shire Council.
- The *WSC Community Strategic Plan 2012 – 2022*²⁵ captured the needs and aspirations of the community during an extensive consultation process. This feedback was used to develop the *WSC Delivery Program 2012 – 2016 and Operational Plan 2012 - 2013*²⁶. The community's desire for water security and to undertake a raising of the Walgett Weir is clearly demonstrated. These needs and aspirations continue to be highlighted in the *WSC Community Strategic Plan 2017 – 2027* (Appendix F) and *WSC Delivery Program 2017/18 – 2020/21 and Operational Plan 2017/18* (Appendix G). Community support exists for the construction of the fishway and raising of the Walgett Weir 11A.

²⁵ <http://www.walgett.nsw.gov.au/f.ashx/Strategic-Community-Plan-Final-Mar.pdf>

²⁶ https://www.ipart.nsw.gov.au/files/cacfa76d-38b0-405a-aa61-a1a200a52a6a/Attachment_B_-_Delivery_and_Operational_Plan.pdf

Stakeholder consultation:

Stakeholder consultation has been extensive and on-going since 2012. It is considered thorough and complete for the purposes of the SSWP. Key activities, from oldest to newest, include:

- A project inception meeting was held in Walgett in August 2012 with stakeholder agencies including; Walgett Shire Council, DPI Fisheries, NSW Public Works, DPI Water and Dr Martin Mallen-Cooper, a fish biologist from Fishway Consulting Services.
- NSW Public Works and specialist consultants were engaged to undertake feasibility studies and concept designs in 2014. Please see the supplied *NSW Public Works Feasibility Report 2014*²⁷ (Appendix A).
- DPI Fisheries held a workshop in February 2015 with NSW Public Works and Fishway Consulting Services to reassess fishway options at Walgett Weir 11A. Based upon the workshop outcomes, DPI Fisheries produced the report *DPI Fisheries Designing a Cost-Effective Fishway 2015* (Appendix C) and engaged URS Australia Pty Ltd to complete a fishway concept design and costings for Walgett Weir 11A: *URS Report 2015* (Appendix E).
- The most extensive stakeholder consultation was undertaken as part of the *NSW Public Works Review of Environmental Factors 2017* (Appendix B). Stakeholders include: DPI Fisheries, NSW Public Works, WaterNSW (formerly DPI Water), Office of Environment and Heritage and the Environment Protection Authority. For the full stakeholder analysis from this consultation process, including the responses of each agency and how this has been addressed in the design of the fishway, please see *NSW Public Works Review of Environmental Factors 2017, page 14-19, Table 2-2 Summary of Consultation Responses*. A copy of the agency letters of support received are provided in *NSW Public Works Review of Environmental Factors 2017 as part of the report's own Appendix B*.

²⁷ Appendix H - Walgett Water Security Proposal 2014, page 10, Solutions Considered

3 ANALYSIS OF THE PROPOSAL

3.1 OBJECTIVES & INDICATORS

Table 3-1 outlines the objectives and the associated indicators of the Project, based on the problems and opportunities identified in Section 2.2.

Table 3-1: Proposal objectives

Key problem/issue	Key proposal objective	Key success indicator
Insufficient water security for Walgett during times of severe drought.	Complete the Walgett Weir Water Supply Security Project involving: raise Walgett Weir 11A, construct Walgett Weir Fishway, remove temporary Namoi Weir 10 and upgrade access roads.	Increase weir pool storage and provide water security in excess of 365 days.
Fish barrier at Walgett Weir 11A and Naomi Weir 10.	Construct the new 30 slot, vertical-slot fishway and high flow full-width rock-ramp on the left (southern) abutment of Walgett Weir 11A. Demolish Naomi Weir 10.	Day 1 success: open 205 km of connected fish habitat. Year 5 success: increase in number of fish and diversity of fish species in the Murray Darling Basin. Increased fish numbers will result in an increase of fishing tourists to the area, as counted by Walgett Visitor Centre.
Ongoing maintenance costs for a temporary weir structure.	Upon completion of the weir raising and fishway construction, Namoi Weir 10 will be removed.	Reduced operational costs for Walgett Shire Council.
Funding has been received for the raising of the weir, but it does not cover the cost of the fishway. NSW DPI Fisheries will not approve the construction to raise Walgett Weir 11A, unless a fishway is constructed as part of the project.	DPI Fisheries will approve the weir raising if SSWP funding is received to construct the fishway and ensure compliance with the NSW Weirs Policy.	All activities involved in the Walgett Weir Water Supply Security Project can be constructed and completed. Water security can be achieved.

3.2 THE BASE CASE

The base case is the “do-nothing” scenario with the continuation of the status quo with no water security infrastructure built at Walgett Weir 11A.

Under the Base Case:

- Walgett will not be able to raise the weir and Restart Funding will be returned to the State.
- The community will not have a minimum standard of water security.
- The weir pool supply will last less than 365 days.
- The Walgett water supply will fail to satisfy the NSW Office of Water 5:10:10 rule. (5: Water restrictions are applied more than 5% of the time, 10: Restrictions are imposed more often than 10% of years, and, 10: severity of restrictions exceeds 10% in that Walgett is not able to meet 90% of unrestricted demand).

- The informally designed and lightly constructed Namoi Weir 10 will burden Walgett Shire Council with maintenance costs.
- Walgett Weir 11A will remain as the second highest priority barrier for removal for fish passage in the Murray Darling Basin.

3.3 OTHER OPTIONS CONSIDERED

Do-nothing:

Section 3.2 outlines the base case, which is also the “do-nothing” option.

Do-later:

In 2014, it was proposed that the weir would be raised immediately with Restart Funding and the fishway would be built later as funding became available. This “do-later” option was rejected by NSW DPI Fisheries. No weir in NSW can be modified without the construction of a fishway and that continues to apply today.

Other options, including do-minimum:

A number of fishway options were considered by Walgett Shire Council.

The *NSW Public Works Feasibility Report 2014* (Appendix A) investigated the feasibility of raising the weir, and included an assessment of weir raising and fishway options. In this report, five (5) fishway options were considered for application at Walgett Weir 11A including:

1. Vertical-slot fishway,
2. Trapezoidal weir fishway,
3. Full-width rock-ramp fishway (FWRR)
4. Partial-width rock-ramp fishway (PWRR)
5. Fish lock.

To review the extracted and consolidated full details, advantages, disadvantages and images outlining each of these fishway options, please refer to Appendix L of this report and *Section 8.3: Fishway Options of The NSW Public Works Feasibility Report 2014* (Appendix A).

The vertical-slot fishway was selected as the recommended design, however, following the completion of the report, it was identified that funding was not available for this preferred vertical-slot fishway design.

In 2015, DPI Fisheries undertook an assessment to re-evaluate the original ecological, hydrological and fishway hydrodynamic criteria, with the purpose of selecting a preferred fishway design that meets key design criteria while limiting capital and operating expenditure. The result of that assessment was the *DPI Fisheries Designing a Cost-Effective Fishway 2015* report. See Appendix E and L for full details. In this report, eight (8) design options were explored:

1. Vertical-slot fishway
2. Denil fishway
3. Bypass fishway
4. Full-width rock-ramp fishway (FWRR)
5. Partial-width rock-ramp fishway (PWRR)
6. Trapezoidal weir
7. Lock fishway
8. High flow full-width rock-ramp fishway

3.3.1 Comparison of Options

Key criteria were used to compare the functional differences in the fishway options. Firstly the effectiveness of **attracting fish** into the fishway, which relates to entrance attraction discharge (more flow provides greater fish attraction) and entrance location (influenced by the 5.65 m tail water operating range), and secondly **passage** within the fishway.

Criteria 1: Effectiveness of Attracting Fish

The full-width rock-ramp (FWRR), trapezoidal, and to a lesser extent denil fishways display excellent attraction flow due to a large discharge through the fishway, as well as an outstanding fishway entrance location due to the entrance constantly migrating upstream with rising tailwater, thereby matching the upstream extent of fish aggregation.

Bypass and lock fishways also display very good attraction flow; however, both fishways have issues related to suitable entrance locations relative to rising tailwater levels. Within the bypass fishway, rising tailwater levels during higher flows creates a separation between the weir face and the first ridge displaying a head differential. This tailwater migration can reduce the effectiveness of fish in finding the bypass channel entrance, resulting in increased accumulations below the weir.

For lock fishways, fishway attraction flows can be tailored to target specific size classes during different lock cycles to attract and maintain fish within the lock chamber. However, due to the fixed location of the fishway entrance, the upstream tailwater migration at Walgett Weir 11A at higher flows can cause a sub-optimal separation between where fish aggregate unless a second fishway entrance is constructed.

A similar issue exists with the vertical-slot fishway entrance, which is why a second high-flow fishway entrance is recommended at Slot 22 (see Section 3.4.1 Scope of Works for full design details). However, prior to the initiation of flows through the second entrance, entrance attraction discharge through the lower vertical-slot entrance is relatively low compared to flows passing over the weir crest. A similar scenario exists for attraction flows down the partial-width rock-ramp fishway (PWRR), with the fishway entrance actually migrating downstream away from the weir face as tailwater levels rise.

Criteria 2: Effectiveness of Fish Passage

The passage of small-bodied and medium-bodied fish from 25 ML/D to weir drownout is a key ecological priority prescribed for Walgett Weir 11A. Of the proposed fishways, the vertical-slot fishway performs best for providing fish passage across various size classes and species over the full headwater range; however, limitations as explained above exist regarding attraction flow and fishway location when tailwater increases.

The denil fishway performs poorly when passing small-bodied fish, and has a limited headwater range thereby requiring the presence of multiple fishway exit channels controlled by automated solar powered gates.

Conversely, the PWRR design performs poorly at passing medium-bodied fish, with functionality limited primarily to low flows where headwater and tailwater are stable. Bypass, FWRR, and trapezoidal fishways display somewhat similar abilities to pass small-bodied and medium-bodied fish over varying tailwater and headwater ranges, with the exception being the trapezoidal fishway which has a limited headwater operating range of only 0.5 m.

The lock fishway is excellent at passing small-bodied fish, with up to 25,000 fish passing through such fishways each day in the southern Murray Darling Basin (Baumgartner pers. comm.). Lock fishways can pass medium-bodied fish if the fishway chamber is of suitable size and cycle times are kept to a minimum length (e.g. 15-20 min). One benefit of the lock fishway is that the design functions exceptionally well over the full headwater and tailwater range if the fishway entrance(s) is well located.

The high flow FWRR is designed to function over a narrow tailwater and headwater range (4,500 to 6,300 ML/D). At such flows, the fishway provides excellent attraction flow to the entrance which is always located at the upstream extent of fish migration. At such flows, small-bodied fish are not expected to migrate; however, a high biomass of medium and large-bodied fish is expected to approach and pass over the fishway at Walgett Weir 11A.

Table 3-1 Comparison of functionality of fishway options at Walgett Weir 11A

Fishway Option	Entrance Conditions		Passage within Fishway		Hydrology		
	Attraction Flow	Location	Small-Bodied Fish	Medium-Bodied Fish	Tailwater Range	Headwater Range	
Vertical Slot	●	●●	●●	●●●	●	●●●	
Denil	●●	●●●	○○	●●	●●	○	
Bypass	●●	○	●●	●	●●	●●	
FWRR	●●●	●●●	●●	●	●●●	●●●	
PWRR	●	○○	●	○○	○	○○	
Trapezoidal	●●●	●●●	●	●●	●●●	○○	
Lock	●●	●	●●●	●	●●●	●●●	
High Flow FWRR	●●●	●●●	○○	●●●	○	○	

FWRR = Full-Width Rock-Ramp
 PWRR = Partial-Width Rock-Ramp
 ○○○ Very Poor
 ○○ Poor
 ○ Fair
 ● Good
 ●● Very Good
 ●●● Excellent

3.3.2 Fishway Decision Matrix and Selection of Preferred Option

A second decision matrix was used to select the preferred option using a summary score of biological functionality and hydrologic range, with additional scoring for capital expenditure (CAPEX) and operation and maintenance (OPEX). This is shown in Table 3-2.

The denil fishway would cost less to construct relative to a vertical-slot fishway; however, long-term maintenance costs are expected to be greater due to the requirement of automated solar powered exit gates (3x) whose operation would be controlled by water levels sensors via a PLC program. Additionally, the denil fishway limits the passage of fish < 250 mm which negates one of the main ecological priorities identified for this project. Given that Walgett Weir 11A is listed as the second highest priority barrier in the Murray Darling Basin, the compromises expected for a denil fishway at this site do not warrant further consideration of this design.

The bypass, FWRR, and lock fishways all perform well with regards to biological and hydrologic functionality; however, CAPEX and OPEX expenditure for each are considerably higher compared to the vertical-slot fishway. As such, none of these options are proposed for further consideration.

The PWRR fishway provides reduced operational functionality and will cost more to construct and maintain relative to the vertical-slot fishway, and is therefore not considered further for Walgett Weir 11A.

The trapezoidal fishway scores similarly to the vertical-slot fishway with respect to biological functionality and CAPEX and OPEX; however, the fishway operates over a limited headwater range and thus is also not considered appropriate for the site.

The Preferred Option:

The preferred fishway at Walgett Weir 11A is a combination vertical-slot fishway, which ranks good to excellent for all four major design criteria, and the high flow FWRR which has a low CAPEX and OPEX and provides effective fish passage at elevated river flows when the functionality of the vertical-slot fishway is reduced. *URS Report 2015* (Appendix E) provides a concept design layout for the vertical-slot fishway.

Table 3.2 Decision matrix of fishway options at Walgett Weir 11A

Fishway Option	Biological Functionality	Hydrologic Range	CAPEX	OPEX
Vertical Slot	●●	●●	●	●●●
Denil	○	●	●●●	●
Bypass	●	●●	○	○
FWRR	●●	●●●	○○	○
PWRR	○	○○	○	○
Trapezoidal	●●	○	●	●●●
Lock	●●	●●●	○○	○○○
High Flow FWRR	●	●	●●●	●

FWRR = Full-Width Rock-Ramp
 PWRR = Partial-Width Rock-Ramp
 ○○○ Very Poor
 ○○ Poor
 ○ Fair
 ● Good
 ●● Very Good
 ●●● Excellent

Value Engineering:

A construction cost estimate and report was prepared by URS (*URS Report 2015*, Appendix E), which comprised of a 32 slot vertical fishway. The proposed vertical-slot fishway represents a 50% cost reduction relative to the original vertical-slot fishway estimate, with minimal compromise occurring on biological functionality.

A number of design measures have been integrated into the design to reduce capital expenditure and construction risk contingencies including reducing the design life from 100 years to 50 years, altering the proposed location of the fishway, and reconfiguring internal cell dimensions to reduce overall fishway length while maintaining suitable internal hydrodynamic conditions. The primary cost of the fishway (based on original estimates) was found to be the sheet pile walls which accounted for 70% of the project budget, with the potential for further optimisation of the pile design during the detailed design stage.²⁸

Consultation with DPI Fisheries has been ongoing during the process to develop the concept and prepare the detailed solutions and designs. Key design features and advanced detailed design plans of the fishway have been completed, see Section 3.4.1 Scope of Works for more details.

3.3.3 Selection of the Method to Raise Walgett Weir 11A

An equally extensive review was undertaken to determine the height and materials for raising Walgett Weir 11A. Formal studies by NSW Water and Walgett Shire Council preferred a 1.0 m raising through the construction of a reinforced concrete wall anchored to the existing concrete capping on the main steel sheet pile curtain wall. See *NSW Public Works Feasibility Report 2014* (Appendix A). Options considered:

- Raise weir with fish hatchery
- Install a pipe from the Barwon River to the Water Treatment Plant
- Implement stormwater harvesting
- Implement water recycling
- Use existing bores
- Drill new bores
- Cart water
- Construct a new raw water intakes
- Upgrade the lower Naomi river intake
- Maintain the status quo

The final design of the fishway has been based upon information presented in the report *DPI Fisheries Designing a Cost-Effective Fishway 2015* (Appendix C) and a related *Addendum - Revised Criteria January 2017* (Appendix D), as amended in consultation with DPI Fisheries. A range of detailed hydraulic assessments were undertaken for the fishway, please see the reports for full details. These were aimed at ensuring the fishway meets operational performance requirements for the effective passage of identified target fish species and sizes over a selected range of river flows between 25 ML/day and weir drown-out (~7000 ML/day). Please also refer to *URS Report 2015* (Appendix E) which provides greater detail about the vertical-slot design.

²⁸ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 24-25, 4.1.2 Fishway

3.4 INFORMATION ABOUT THE PROPOSAL

3.4.1 SCOPE OF WORKS

Extent of the Scope of Work

This scope of works covers the construction of a new 30 slot, vertical-slot fishway and high flow full-width rock-ramp on the left (southern) abutment of Walgett Weir 11A. It does not cover complementary construction involved in the larger water security project such as raising the weir by 1.0 m, upgrading the access road and removal of the temporary Namoi Weir 10. This can be provided upon request.

Location

The town of Walgett is located in north-western NSW approximately 270 km north of Dubbo along the Castlereagh Highway and approximately halfway between the towns of Moree and Bourke. Walgett is located on the southern bank of the Namoi River immediately upstream of its confluence with the Barwon River (Figure 1-1).

The proposed location of the Walgett Weir Fishway is Walgett Weir 11A (see figure 1-2) on the Barwon River approximately 3 km north west of Walgett and approximately 450 m downstream of the confluence with the Namoi River (Figure 1-3).

Details of the Final Design

Consultation with DPI Fisheries has been ongoing during the process to develop the supplied concept and prepare the detailed design. An advanced detailed design plan of the fishway is provided in Appendix K, which was most recently modified and completed in November 2017. The major changes noted from the selection of the preferred design in 2015, is the reduction of slots from 32 to 30.

The agreed design criteria are summarised in Appendix B, *NSW Public Works Review of Environmental Factors 2017, Table 5-1 Applied Fish and Flow Specific Fishway Design Criteria*, and the key design features of the fishway are outlined below:

- **29 bays/cells (30 slots)** – To provide fish passage for a design maximum difference in water levels across the weir (differential head, ΔH) of 4.425m.
- **Two entrance slots** - “A” (for lower river flows) and “B” (for higher river flows). Entrance “A” will be located in Bay 1 at the downstream end of the fishway with an effective sill/bed level (i.e. top of fishway floor rocks) of RL119.05mAHD. Entrance “B” will be located in Bay 22 towards the upstream end of the fishway with an effective raised sill level of RL123.9mAHD. Two entrances are required to effectively cover the fishway operating range.
 - For **Entrance “A”**, the tailwater depth at the commencement of fishway operation at 25 ML/day (RL120.25mAHD) is 1.2m, or 1.1m allowing for an assumed 0.1m lower tailwater level. The Entrance “A” sill level has been selected to minimise fishway performance sensitivity to operational increases in tailwater level as river flows increase.
 - For **Entrance “B”**, the tailwater depth at the commencement of the entrance operation at approximately 4,060 ML/day (RL124.3mAHD) is 0.4m. The internal fishway depth at Entrance “B” will be at least 1.95m. Entrance “B” will commence to operate after cessation of Entrance “A” operation and when there is a 0.3m depth over the top of the lower fishway portion (RL124.0mAHD).
- **Single fishway exit slot** - The single exit provides for operational simplicity by eliminating the need to operate or automate any fishway components. The exit is located at the upstream end of the fishway in

Bay 29 and has an effective sill/bed level of RL123.40mAHD. The weir pool depth over the exit sill at the commencement of fishway operation at 25 ML/day (RL124.575) is 1.18m (approx.). The depth with respect to the weir full supply level (RL124.49mAHD) is 1.09m (approx.).

- **Slot geometry** - The slot geometry has been designed to limit hydraulic turbulence, maximise fishway entrance slot attraction velocities, achieve effective opening spread over the full operational tailwater range, and meet slot width and height proportions to suit the size and swimming abilities of target fish species and specific flow ranges.
- **Low height baffles** - Downstream baffle numbers 2 to 21 will be of a constant height of 1.7m. These baffles immediately upstream of the Entrance “A” slot become submerged to various degrees at raised tailwater levels. This is aimed at extending the operational range of the fishway and Entrance “A”, inclusive of preservation of fishway entrance slot attraction flow velocities. A typical minimum Entrance “A” slot headloss of 50mm has been targeted.
- **Alternating tall baffles** - Alternating tall and low baffles (numbers 22 to 30) will be provided upstream of Entrance “B”, which is also aimed at extending the operational range of the fishway. Headloss criteria in this upper portion of the fishway has been relaxed generally from 150mm to 300mm for high river flows above 1,000 ML/day when larger fish with stronger swimming abilities are the target for fish passage via the fishway. The lower baffles are around 2.0m in height and become submerged to various degrees at raised tailwater levels for Entrance “A” operation. For Entrance “B” operation, the lower baffles become completely submerged.
- **Single layer of nominal 150 to 200mm diameter floor rocks** - Rocks will be provided over the whole of the internal fishway floor surface including adjacent to each baffle slot sill. The floor rocks are aimed at providing internal roughness to assist the passage of small fish.
- **Exit and entrance slot isolation gates (3 off)** - The three (3) gates are provided primarily for isolation and maintenance dewatering purposes. The two entrance slide gates need to be either installed or removed during maintenance operations using mobile cranes. The exit slide gate will be operated by manual means using a handwheel. During low river flow conditions the exit gate will be operated to prevent the weir pool from being unintentionally drawn down below the weir crest level or to allow the partial release of storage inflow volumes under a water sharing arrangement. (Note the weirpool storage is relied upon for water supply drought security for the town of Walgett.) As per the discussion above for the *single fishway exit slot*, the top 1.09m of the weirpool below the weir full supply level at RL124.49 (crest of low flow notch) is able to be drawn down via the fishway during no and low flow periods. At full supply level a flow of up to approximately 10.1 ML/day (117 L/s) is able to be drawn-off the weirpool storage via the fishway with fully open exit and Entrance “A” gates.
- **Operating platform grating and handrailing** - A galvanised steel grating floor and edge handrailing will be provided over the top of the whole fishway structure for safety reasons and to assist the exclusion of debris from entering the fishway during flood overtopping events. Heavy duty grating will be specified to minimise potential damage due to debris that may be deposited onto the fishway or impact handrailing (refer also to discussion on *exit slot trashscreen* and *log deflector barrier* below).
- **Exit slot trashscreen** - A trashscreen located upstream of the fishway exit and having clear openings of 150 and 250mm, consistent with baffle slot widths, will be provided to reduce potential obstructions and detrimental blockage of the fishway.
- **Log deflector wall** - A log deflector wall will be located over the left riverbank area upstream of the fishway to reduce the risk of large timber debris impacting or being deposited on top of the fishway during high river flow events that may overtop the fishway.

Construction works

Detailed information on the construction scope of works can be found in the supplied reports: *NSW Public Works Review of Environmental Factors 2017* (Appendix B) and *URS Report 2015* (Appendix E).

Construction of the fishway will involve the following sequence of works:

- 1) Site establishment, tree removal and clearing. Creation of laydown areas.
- 2) Cofferdamming (up and downstream) and dewatering.
- 3) Excavation of the left bank.
- 4) Drive sheet pile walls.
- 5) Undertake concreting works.
- 6) Backfill with compacted earth fill.
- 7) Placement of geofabric and bedding material.
- 8) Placement of rock protection.
- 9) Regrade and reshape the area.
- 10) Installation of walkway, handrails and other metalwork including exit gate and trash screens.

Fishway Construction Materials

Work Phase	Amount
Sheet pile walls	2,392 m ²
Concrete	109 m ³
Earthworks	400 m ³
Geofabric	710 m ²
Bedding material	71 m ³
Rock protection	355 m ³
Regrade / reshaping	464 m ²

The fishway is predicted to result in approximately 1,515 m³ of excavated material, some of which will be reused onsite.

Construction Equipment

The equipment required to carry out the weir raising, fishway construction and weir removal is expected to include the following general equipment:

- Backhoe
- Excavators
- Dewatering pumps
- Cranes
- Concrete trucks
- Pile drivers
- Dump trucks
- Staff vehicles
- A compactor/roller

Construction Environmental Management Plan

The dam construction would be undertaken in accordance with a Construction Environmental Management Plan (CEMP) prepared by the construction contractor and reviewed by Walgett Shire Council, DPI Fisheries and DPI Water prior to the commencement of works. The CEMP would incorporate all individual management plans and would include all the mitigation measures identified in the *NSW Public Works Review of Environmental Factors 2017* (Appendix B), plus any conditions of the project determination and any other licences/approvals.²⁹ The fishway would entail a consistent approach and high standard of accountability for the preparation and implementation of the CEMP.

Fishway Monitoring Post Construction

A monitoring plan developed in accordance with DPI Fisheries requirements will monitor the use and effectiveness of the vertical-slot fishway into the future.

3.4.2 PROPOSAL EXCLUSIONS

This scope of works does not cover complementary construction involved in the larger water security project such as raising the weir by 1.0 m, upgrading the access road and removal of the temporary Namoi Weir 10.

3.4.3 RELATED PROJECTS

The fishway is part of the Walgett Weir Water Supply Security Project which includes a 1.0 m raising of Walgett Weir 11A, upgrading the access road, and removal of the old Naomi Weir 10.

Walgett Weir 11A and Namoi Weir 10 projects are funded under Restart NSW: Water Security for the Regions 2014 but the Fishway is not fully funded. If funding is not secured to construct the fishway, Walgett Shire Council will not receive approval to continue with the already funded projects. The NSW Weirs Policy³⁰ states that no work will be completed on a weir without the addition of a fishway.

²⁹ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 36, 5.3.1 Construction Environmental Management Plan

³⁰ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 10, 2.4.1 NSW Weirs Policy

3.5 PROJECTED COSTS

3.5.1 PROJECTED CAPITAL COSTS

The cost estimates for the Walgett Weir and Fishway have been undertaken by independent experts engaged by Walgett Shire Council, including URS, SMEC, DPI Fisheries and NSW Public Works.

- NSW Public Advisory Works Progress Report and Cost Estimate 2017 (Appendix I)
- SMEC Construction Engineers Estimate and Comparison Rev 1.0 (2016)
- URS Construction Cost Estimate 2015 (Appendix E)
- DPI Fisheries Cost Estimate 2015 (Appendix C)

The cost used in the CBA Toolkit (Appendix P) and submitted for SSWP funding in the table below was based upon the latest Progress Report by David Watson, Project Manager for NSW Public Works Advisory. This has been checked with the project team and Walgett Shire Council prior to submission.

The base cost includes design, project management, site establishment, temporary works, materials, labour, equipment, post-construction monitoring, and is based on the independent consultant's experience with projects of similar scope.

A 20% contingency has been allowed, even though the work is quite straight forward there is a higher than average risk of flood damage and change, when working in a partially regulated river and with an older base structure. The weir was constructed in 1955 and a structural safety upgrade occurred in 2010. Escalation has been allowed for in the budget, it is expected to be minimal if contracts are let imminently.

Please refer to Appendix P Walgett Shire Council Cost Estimate V6 Final for all costs.

Table 3-2: Projected capital costs inclusive of contingency

Stage	2017-18	2018-19	2019-20	2020-21	Future Years	Total
Base cost estimate	\$2,561,480	\$4,218,767	\$203,000	\$203,000	\$203,000	7,389,247
Contingency	\$443,355	\$1,034,495				\$1,477,849
Escalation	\$0	Incl.	NA*	NA	NA	\$-
Nominal cost	\$3,004,834	\$5,253,261	\$203,000	\$203,000	\$203,000	\$8,867,096

* Escalation is not applicable in 2019-2022 as this cost has been provided by a Government agency.

3.5.2 PROJECTED ONGOING COSTS

The cost estimates for the ongoing operation and maintenance are low due to the weir and fishway design selected. They are assumed at 1% of project cost for the CBA. This amounts to \$84,123 per year and would include regular inspections and access road maintenance by Walgett Shire Council, asset maintenance by the asset owner. Note that there is no power, water, mechanical parts, or other upkeep expected. The SSWP would not be responsible for these costs.

3.6 COST-BENEFIT ANALYSIS

3.6.1 Costs

The key costs of this proposal include:

- 1) Design, investigation and project management
- 2) Construction of a new 30 slot, vertical-slot fishway and high flow full-width rock-ramp on the left (southern) abutment of Walgett Weir 11A
- 3) 1.0 m raising of Walgett Weir 11A
- 4) Upgrading the access road
- 5) Removal of the old Namoi Weir 10
- 6) Contingency

SSWP funding will be directed toward item 2, construction of the Fishway.

3.6.2 Benefits

It is difficult for a water project to demonstrate a net economic benefit from a purely quantitative standpoint. The raising of the Walgett Weir and Fishway demonstrates an opportunity for economic development, business security, environmental improvement and a significant benefit for the community and the greater region.³¹

There are many unquantifiable benefits to be taken into account when providing water, an essential service, in sparsely populated rural and remote communities. According to the NSW Treasury, there are the following types of benefits that are relevant: avoided costs, savings, revenues, benefits to consumers not reflected in revenue flows, benefits to the broader community.

The benefits are further listed here:

- Avoided social cost of water borne disease.
- Avoided water cartage and start-up capital expenditure.
- Willingness-to-pay to remove water restrictions.
- Avoided costs of household water filtration systems.
- Fishway passage willingness-to-pay.
- Avoided costs of water cartage and pumping: There will be a verifiable reduction in manpower. During extended dry periods, temporary pumps are set up, the river bed is dredged to form deeper pools and water is channelled to areas accessible by pump. Fuel is taken to the generators to drive the portable pumps daily. The float and intake is shifted accordingly. The work is difficult, dangerous and high risk.
- Ecological benefits achieved from the removal of Naomi Weir 10.

³¹ Appendix H - Walgett Water Security Proposal 2014, page 24, Economic Appraisal

- An increase in the level of the weir pool creates a greater recreational space for the community and residents. This increases community amenity, town aesthetics and ultimately makes Walgett a better place to live.
- Visual impact and tranquil benefit of a sustained expanse of water.
- Reduced risk of algae bloom and environmental benefits from filling the weir to maximum capacity in winter.
- Avoid the occurrence of ongoing flood damage to Naomi Weir 10 and thereby remove the need for subsequent repair and maintenance works to the weir during drought periods as part of drought management provisions.
- Restoration of 205 km of Murray Darling Basin fish passage.
- Increase in water revenues is unlikely, and the current user pays - demand charges system is unlikely to change. However, with water security comes business continuity and new opportunities for enterprises to start up. More consumers in the community can have a positive effect on water revenues.
- Work Health and Safety: Reducing truck traffic on rural roads if water carting is required and removing the need for people to work at heights on top of water trucks when filling.
- The project will ensure the maintenance of a certain standard of living that depends on water supply. This includes household activity, town amenity and attractiveness to passing trade.
- Having drought security provides a sense of confirmation of long term viability of the community and its assets. This in itself increases value of assets from an economic development perspective.
- The many small business operators, industry and local businesses would benefit from water supply security. It will allow them to enhance their business operations with a sense of future guarantee around water which is vital to business and residency. The project provides business continuity for all businesses and residents that rely on the water supply.

3.6.3 Benefit:Cost Analysis

The Benefit:Cost Analysis (CBA) was completed using the SSWP provided toolkit (Appendix P). More than ten (10) independent reports and four (4) cost estimates were utilised in the completion of the analysis. The benefit to cost ratio (BCR) was positive and above 1.0 as required by SSWP.

While the Shire population used for the CBA is 6545, a second CBA was completed for a Town User population of 1730. The BCR was 4.46 and 1.57 respectively, at a 7% discount rate and 30 year horizon. A summary is provided over the page.

Assumptions in the CBA that are particularly worth noting include:

- The Shire population will benefit from the water supply security and fish habitat improvement.
- When the weir pool gets low and there is a no flow situation in the Namoi and Barwon Rivers, algae, turbidity and odour become a problem at the Water Treatment Plant. Non-standard practices ensue such as hired pumps, new pipes and water carting begins. As a result, this proposal addresses both health and aesthetic requirements of ADWG.

- A water supply failure event is defined as a change to the status quo, beyond water restrictions. The assumption of 5 failures in 100 years is based on these significant historical events, documented in Appendix O *Proposal to NSW Office of Water 2012*.
 - 1955 Weir 11A constructed.
 - 1970 first request to raise the weir height, most likely a result of the 1965-68 drought. [Assumed failure 1]
 - 1979-83 Dept. Water Resources approval to raise weir, coincides with the 1982-83 drought regarded as the worst of the twentieth century for short-term rainfall deficiencies of up to one year and their over-all impact. [Assumed failure 2]
 - 1991 Construction of Namoi Weir 10 to back up the weir pool for raw water intake, followed by a flood in the same year. (page 13) [Assumed failure 3]
 - 1993-96 and 1998 WSC proposal progressed.
 - 2002 and the Millennium Drought 2001-10. In 2002 there was a severe no flow situation and WSC was pumping water using Namoi Weir (photo page 16). In 2003, two water releases did not arrive from Keepit Dam. [Assumed failure 4]
 - 2014 water at Keepit Dam was so low, water was requested from Split Rock Dam near Glen Innes. Water can take 6 to 8 weeks to reach Walgett when released during the driest months. The normal duration would be 16 to 18 days. [Assumed failure 5]
- Water supply failure duration is listed as 6 weeks based on information from Keepit Dam.
- Capital cost of a failure is estimated based on mobilising equipment for that period.

3.6.4 CBA for Shire population 6545

Benefit:Cost Analysis Summary Drinking Water Quality/ Water Security/ Dam Safety 30 Year Horizon Rate: 7%				
Project Name	Total Costs (Net Present Value)	Total Benefits (Net Present Value)	Net Benefits (Net Present Value)	BCR
Walgett Shire Council	\$9,540,319	\$42,554,326	\$33,014,007	4.46

Benefit:Cost Analysis Summary Drinking Water Quality/ Water Security/ Dam Safety 30 Year Horizon Sensitivity Analysis				
Rate	Total Costs	Total Benefits	Net Benefits	BCR
3%	\$10,447,100	\$68,740,058	\$58,292,958	6.58
7%	\$9,540,319	\$42,554,326	\$33,014,007	4.46
10%	\$9,098,586	\$31,472,614	\$22,374,027	3.46

3.6.5 CBA for user population 1730 (sensitivity analysis)

Benefit:Cost Analysis Summary Drinking Water Quality/ Water Security/ Rate: 7% 30 Year Horizon				
Project Name	Total Costs (Net Present Value)	Total Benefits (Net Present Value)	Net Benefits (Net Present Value)	BCR
Walgett Shire Council	\$9,540,319	\$14,989,771	\$5,449,452	1.57

Benefit:Cost Analysis Summary Drinking Water Quality/ Water Security/ Sensitivity Analysis 30 Year Horizon				
Rate	Total Costs	Total Benefits	Net Benefits	BCR
3%	\$10,447,100	\$24,037,856	\$13,590,756	2.30
7%	\$9,540,319	\$14,989,771	\$5,449,452	1.57
10%	\$9,098,586	\$10,989,690	\$1,891,104	1.21

3.7 FINANCIAL APPRAISAL

The key costs identified in Section 3.5 are:

- Capital costs associated with the raising of the weir and construction of the fishway
- Contingency associated with risk

There are no additional revenue benefits to report for the project.

Walgett Shire Council has reviewed the capital expenditure, asset management, whole of life costs, benefits, costs, and deem the project to be affordable with SSWP funding, and an unavoidable necessity of providing water supply security.

3.8 PROPOSED FUNDING ARRANGEMENTS

Table 3-3: Proposed capital funding contributions

Stage	2017-18	2018-19	2019-20	2020-21	2021-22	Remaining Years	Total
Proposal capital costs	\$3,004,835	\$5,253,261	\$203,000	\$203,000	\$203,000	-	\$8,867,096
Funding sources							
NSW Government (subject of this request)	\$1,584,002	\$3,696,004	-	-	-	-	\$5,280,006
Council contributions*	\$1,420,833	\$1,557,257	\$203,000	\$203,000	\$203,000	-	\$3,587,090
Industry contributions							
Community contributions							
Other government contributions							
Other funding sources (please detail)							
Sub-total	\$3,004,835	\$5,253,261	\$203,000	\$203,000	\$203,000	-	\$8,867,096

*This is funding already secured from Restart NSW 2014.

4 IMPLEMENTATION CASE

4.1 PROGRAM & MILESTONES

A Gantt Chart provided in August 2017 Progress Report by the Project Manager, NSW Public Works Advisory is provided in Appendix M. Below are key milestones relevant to this proposal.

Table 4-1: Key events

Event	Start	Finish
Detailed design (weir)	-	Complete
Detailed design (fishway)	-	90% complete
Environmental assessment	-	Complete
Approval for fishway funding	-	February 2018
Call Tenders	February 2018	March 2018
Review Tenders	March 2018	April 2018
Council approval to let tenders	May 2018	May 2018
Construction	May 2018	December 2018

4.2 GOVERNANCE

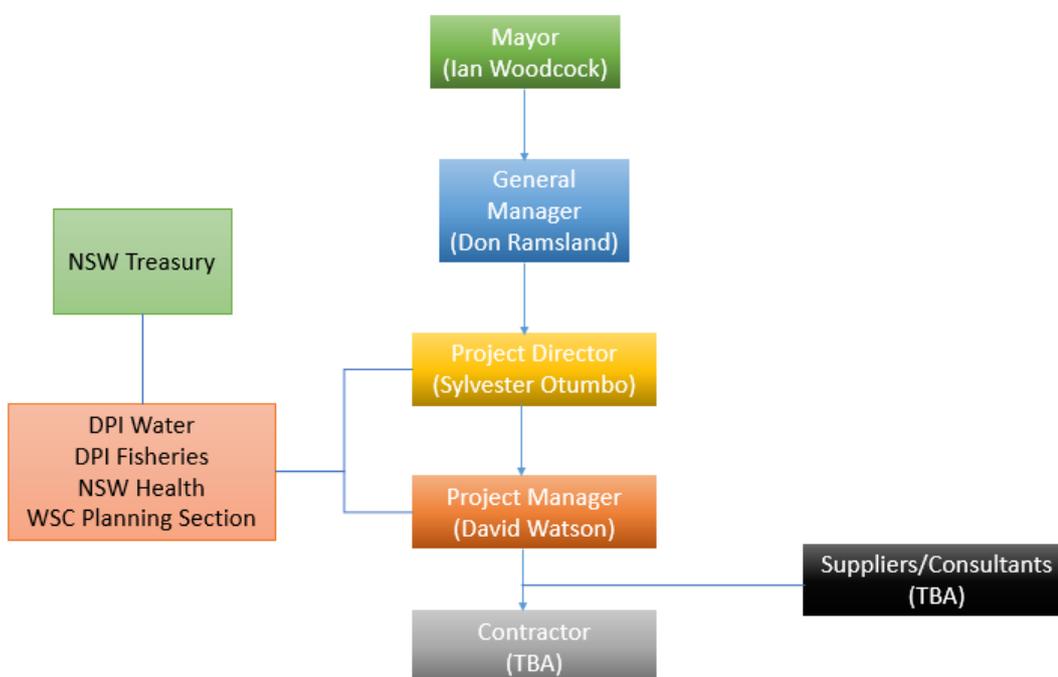
The project is currently being overseen by the Walgett Shire Council's Engineering/Technical Services Unit and NSW Public Works Advisory. This Unit will also be responsible for the delivery phase of the Project.

The Project Team will report to the General Manager monthly. Decisions will be escalated in line with the established delegation of authority.

A Steering Group will be in place for the Project. The Steering Group will consist of DPI Fisheries, DoI Water, SSWP representative and NSW Office of Water, and will review progress reports bi-monthly.

The proposed governance structure is illustrated in Figure 4.1

Figure 4-1: Proposed Governance Structure



Project Sponsor: Don Ramsland, General Manager, Walgett Shire Council

Project Manager: David Watson, NSW Public Works

David is a qualified & experienced Civil Engineer with experience in strategic planning, design, project management, construction management & contract administration of civil infrastructure projects. He has been nominated by NSW Public Works to manage the project on behalf of Council.

The Project Manager will be responsible for the day-to-day running of the Project, including:

- Managing the Request for Tender process to determine the preferred supplier
- Managing the preferred supplier's activities
- Managing the Project Team
- Reporting to the Steering Group, the General Manager and Councillors

- General project administration

Project Director: Sylvester Otumbo Otieno, Director of Engineering/Technical Services

Sylvester is a Civil Engineer with over 10 years' experience in project management, road feasibility studies, preliminary & detailed design, construction supervision, technical audits and Assets Management. He has been with Walgett Shire Council since 2012.

CVs for David and Sylvester are provided in Appendix J.

4.3 KEY RISKS

A full risk assessment has been undertaken, considering areas of scope, construction, financing, planning and approvals, legal, property acquisitions, utility relocation, procurement, change and sustainability.

The table below is a condensed summary of key risks, the full information is included in Appendix N.

Table 4-2: Key proposal risks

Risk	Proposed mitigation	Risk rating after mitigation		
		Consequence	Likelihood	Rating
Cost: tenders above the budget.	Review and revise project budget if required and seek and confirm funding with Client prior to award of tender or scope change if required.	Moderate	Likely	High
Time: Delays due to inclement weather.	Monitor the delays and determine impact on completion date. Council to construct all weather access prior to construction.	Moderate	High	High
Scope: Adverse site conditions discovered.	Obtain AS BUILT drawings of current weir, undertake Geotechnical testing.	Minor	Unlikely	Low
Quality: Defective work identified during Contract Period, During DLP and after DLP.	Ensure implementation of quality requirements during Contract period; (Tests and Certifications, ITPs of completed works submitted monthly with progress claims). Manage the defects promptly via defects register. Issue defects notice to Contractor to fix the defects within a stipulated time frame.	Minor	Likely	Medium
Safety: Work involves high risk activities (work near water, sheet piling, earthworks) and contractor injured.	Review, approve and strictly implement Project OHSMP. Ensure high risk activities are considered.	Moderate	Unlikely	Medium
Environment: Damage to heritage or flora and fauna.	Ensure contractor has a CEMP and that this adequately addresses how to respond if heritage flora items are found.	Unlikely	Moderate	Medium
Safety: Injury to contractor due to flooding.	Ensure contractor has monitoring systems in place and has a demobilisation plan.	Unlikely	Moderate	Medium

4.4 LEGISLATIVE, REGULATORY ISSUES & APPROVALS

Key legislation, environmental planning instruments, NSW Government policies and guidelines were reviewed as part of the review of environmental factors. A complete description of approvals applicable to the construction and operation of the Walgett Weir Water Supply Security Project are in the *NSW Public Works Review of Environmental Factors 2017, Section 2: Statutory Considerations* (Appendix B).

The proposal to raise the weir including a fishway is consistent with existing studies including: *The Priorities Action Statement - Actions for Lowland Darling River Aquatic Endangered Ecological Community* and *The Policy and Guidelines for Aquatic Habitat Management and Fish Conservation Update 2013* (DPI, 2013).³²

Statutory Considerations:

- Walgett Local Environmental Plan 2013
- State Environmental Planning Policy (Infrastructure) 2007
- State Environmental Planning Policy (State and Regional Development) 2011

Legislation:

- Environmental Planning and Assessment Act 1979 (NSW)
- Water Management Act 2000 (NSW)
- Fisheries Management Act 1994 (NSW)
- Threatened Species Conservation Act 1995 (NSW)
- National Parks and Wildlife Act 1974 (NSW)
- Protection of the Environmental Operations Act 1997 (NSW)
- Protection of the Environmental Operations (Waste) Regulation 2014 (NSW)
- Native Vegetation Act 2003 (NSW)
- Local Government Act 1993 (NSW)
- Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

Policies and Guidelines

- NSW Weirs Policy
- Policy and Guidelines - Aquatic Habitat Management and Fish Conservation Update 2013 (DPI, 2013)
- Controlled Activities on Waterfront Land - Guidelines for instream works on waterfront (NOW, 2012)
- Controlled Activities on Waterfront Land - Guidelines for vegetation management plans on waterfront land (NOW, 2012)

³² Appendix B - NSW Public Works Review of Environmental Factors 2017, page 75, 6.10.2 Operational Impacts

Summary of Approvals

Agency	Requirements	Reference
Walgett Shire Council	Determination of the proposal	Pt 5 of EP&A Act
WaterNSW	Land owner approval / determination of the proposal	Pt 5 of EP&A Act
DPI Fisheries	Dredging and reclamation works in 'waterland' for instream construction works for the weir raising, fishway and removal of Namoi Weir 10.	s200 of FM Act
	Notification to alter or modify a dam, weir or reservoir on a waterway	218(5) of FM Act
DPI Water	Water supply works approval*	s90 of WM Act
	Approval to construct or extend a dam	s60 of Local Government Act
	Amendment of existing water access licences	s56 of WM Act

*Water supply works approval is subject to concurrence of DPI Fisheries.

4.5 PROPOSED MANAGEMENT ACTIVITIES

4.5.1 RISK MANAGEMENT

The Risk Management Plan will be developed by the Project Team and will guide risk reporting, monitoring and mitigation activities during the delivery phase of the Project. This report is integrated as part of the integrated project management tool that Council uses on all Council projects.

Day-to-day risk monitoring will be overseen by the Project Team, led by the Project Manager. Generally, key risks and risk activities will be reported through the governance structure monthly i.e. to the General Manager, Steering Group and Councillors.

Should critical risks be identified by the Project Team, these risks will be escalated immediately through the governance structure.

A full risk assessment has been undertaken as part of NSW Public Works Advisory project management role. The information is included in Appendix N.

During consultation with stakeholders, potential construction problems that may arise during construction of the weir and the fishway were discussed and mitigation measures identified, including:

- 1) All necessary approvals from DPI Fisheries would be obtained prior to the commencement of construction works.
- 2) Final fishway designs must be prepared and signed off by DPI Fisheries as part of the requirement for the section 200 permit (under the Fisheries Management Act 1994) prior to works commencing. Additionally, documentation must be provided to DPI Fisheries that clearly identifies who will own, operate, and maintain both the weir and fishway before a permit will be issued.
- 3) DPI Fisheries review the CEMP for the works including the removal of Namoi Weir 10 prior to commencement of works and rehabilitation plans.
- 4) Fish passage would be maintained for the entire construction period.
- 5) High level soil and sedimentation controls will be implemented throughout the construction phase of the proposal.
- 6) Selection of construction materials for the weir will be made in accordance with Australian regulatory guidelines for waterways.
- 7) Any trees removed should be placed downstream of the weir within the waterway to create fish habitat in consultation with DPI Fisheries.³³

4.5.2 ASSET MANAGEMENT & OPERATIONS

The Project will involve the development, installation and maintenance of fishway and other ancillary works. The ownership and responsibility for the operations and maintenance of all assets developed as part of the Project shall be determined after consultations with NSW Water and DPI Fisheries.

Council will be required to engage contractors for future maintenance and replacement activities.

Typical activities that may need to be undertaken across the asset lifecycle are outlined in Table 4-3:

³³ Appendix B - NSW Public Works Review of Environmental Factors 2017, page 76-77, 6.10.3 Mitigation Measures

Table 4-3: Asset Management Cycle Asset Management Lifecycle

Stage	Description of Activities	Timeframes
Plan	Develop and refine specifications	0-1 years
Procure	Open tendering process	0-1 years
Operate and maintain	Fault management Parts replacement	1+ years
Improve and Dispose	Undertake periodic reviews Dispose of life-expired assets	Continual. Disposal will be dependent on performance