

SUSTAINABILITY

drives multi-million dollar upgrade to Woodman Point WWTP

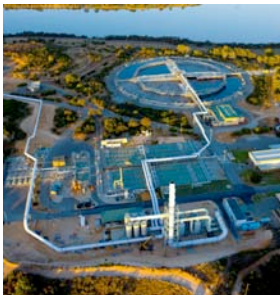
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Overview

- Project background
- Study objectives
- Conventional options analysis
- Expanded options analysis (sustainability assessment)
 - Qualitative
 - Quantitative
- Conclusions

Project background – Woodman Point WWTP



- Predicted growth: 650,000 people (2009) to 1.1 million people (2040)
- Current inflow 125 ML/d
- Predicted flow in 2040 220 ML/d
- Primary and secondary treatment, sludge treatment & odour control
- Industrial recycling: 17 ML/d
- Ocean discharge via 4 km outfall

Planning drivers



- Odour sensitive environment; land use incompatibility
- Perth's drying climate → increasing need for wastewater recycling
- Increasing community demands for responsible water & energy management
- Community expectations around ocean discharge quality

Objectives of Planning Study

- Develop a Planning Business Case – a strategic document that outlines required capital upgrades to 2040
- Determine the **most sustainable upgrade solution** to upgrade the capacity from 120 ML/d to 220 ML/d
- Proposed solution shall:
 - Meet the community's needs and expectations
 - Be affordable
 - Protect the local marine environment



Effluent scenarios to be considered

1. Current effluent quality: Full secondary treatment to meet Ministerial Conditions
2. Only partial secondary treatment and relaxed Ministerial Conditions (to be negotiated with DEC)
3. Full secondary treatment plus 60 ML/d recycled water to meet "medium-risk" end uses
4. Full secondary treatment plus 60 ML/d recycled water to meet "high-risk" end uses

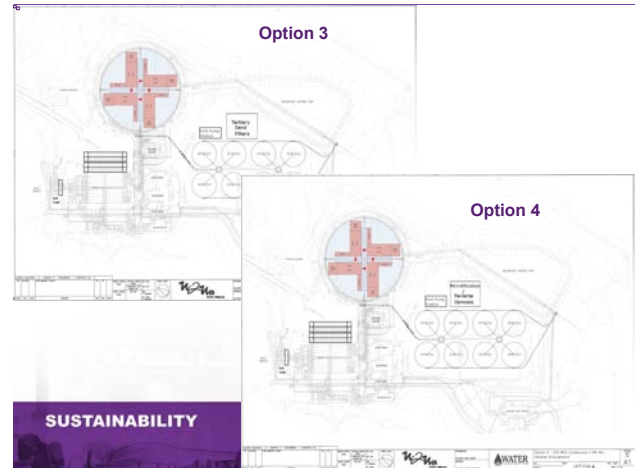
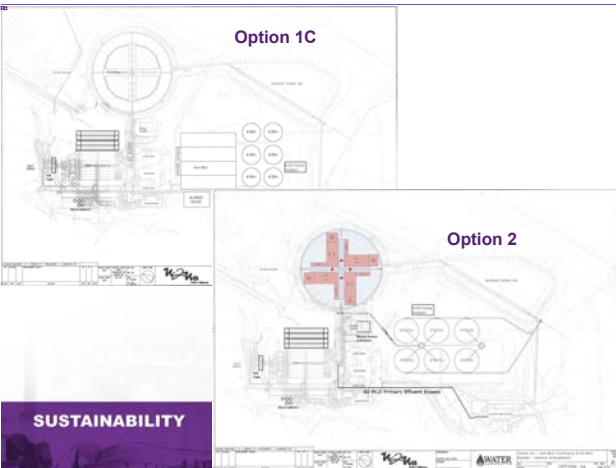
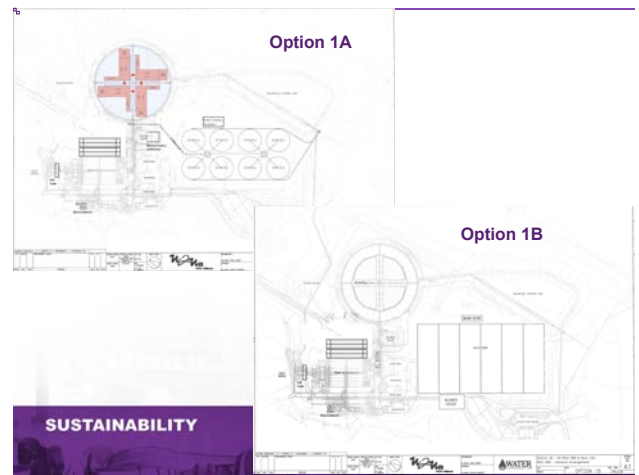
Final 6 viable options for assessment

- Option 1A: Conversion of SBR to 220 ML/d continuous system (MLE configuration) **Current DEC/ Ministerial Conditions**
- Option 1B: 90 ML/d through existing SBR and new 130 ML/d SBR process **Current licence + medium-risk RW**
- Option 1C: 90 ML/d through existing SBR and new 130 ML/d MLE process **Current licence + high-risk RW**
- Option 2: Bypass of 60 ML/d primary effluent direct to ocean & conversion of SBR to 160 ML/d continuous system (MLE) **Relaxed licence & M.Conditions**
- Option 3: Conversion to 220 ML/d continuous system and production of 60 ML/d medium-risk end use recycled water **Current licence + medium-risk RW**
- Option 4: Conversion to 220 ML/d continuous system and 60 ML/d high-risk end use recycled water **Current licence + high-risk RW**

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Options analysis – Conventional assessment

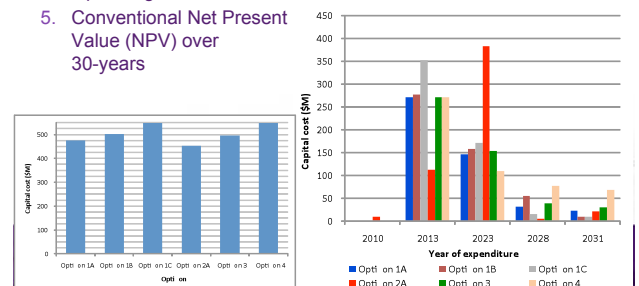
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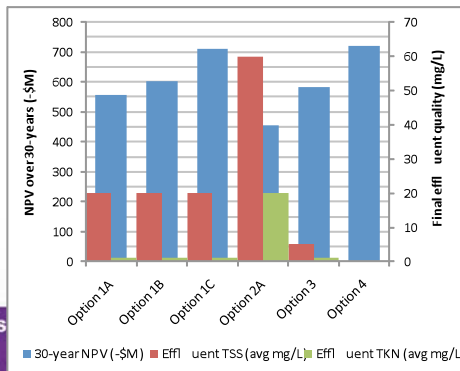
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Conventional options analysis

1. Technical feasibility analysis
2. Capital cost estimates
3. Staging of capital costs
4. Operating costs
5. Conventional Net Present Value (NPV) over 30-years



Net Present Value – Conventional assessment



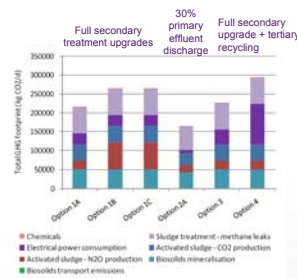
Options analysis – Sustainability assessment

Sustainability assessment methodology

1. Qualitative assessment
2. Quantitative analysis
 - Greenhouse gas assessment
 - Expanded net present value analysis

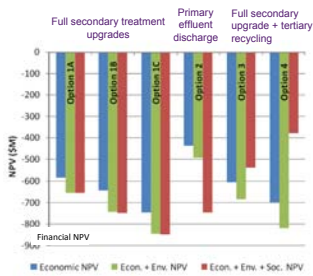
Parameter	Option 1A	Option 1B	Option 1C	Option 2A	Option 3	Option 4
Environment						
Energy consumption	***	***	***	****	***	**
GHG emissions	***	**	**	***	***	***
Discharge to marine env.	***	***	***	**	***	***
Social						
Odour emissions	***	**	**	***	***	***
Public perception	***	***	***	**	***	***
Water recycling potential	***	***	***	**	***	***
Economic						
Net economic impact	***	**	**	***	***	**
Affordability	***	**	**	***	***	**
Constructability	***	***	***	***	***	***
Complexity	****	***	***	***	***	***
Risk of technology	****	**	**	***	***	***
Staging/flexibility	***	****	****	***	***	***

Greenhouse gas assessment of design options



- In a carbon constrained economy, operating carbon footprints are significant
- It is likely organisations will receive a carbon 'cap'
- Reduction of operating carbon footprint allows more activities to be undertaken by organisation within carbon cap (↑ productivity)
- However carbon footprint is only one piece of the 'sustainability puzzle'

Expanded Net Present Value assessment



- 100-year period
- Environmental costs: GHG footprint at \$25/tonne in 2009, escalating to \$150/tonne by 2110
- Social externalities included:
 - > Odour emissions \$15,000/complaint
 - > Community 'willingness to pay' to avoid ocean discharge of untreated wastewater \$50/household/annum; surrogate based on Albany survey
 - > Value of recycled water: \$1/kL for medium quality, \$3/kL for high quality

Conclusions

- Expansion of an economic assessment to include 'externalities' can swing the decision-making process in a more sustainable direction
- Recycling options were considered very 'expensive', however when the long run marginal cost of water is included, recycling options become cost effective
- Production of recycled water may defer development of new, expensive water sources
- Although option 2 allows deferral of major capital expenditure for 10-15 years, the social risks are high



Conclusions

- A traditional financial analysis showed the most economically responsible solution is to construct a pipeline directly to the ocean to allow primary effluent discharge
- When a broader range of factors are included, the numbers showed a very different story
- Based on the outcomes of this study, the client decided to commit to a full secondary treatment upgrade
- Expanded NPV analysis can provide a holistic, integrated view of design options, allowing better long term decisions



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