Where is Nambeelup Industrial Area?

7 km NE of Mandurah

Department of Planning initiated DSP project

- Potentially 1082 ha Industrial Development

Initial Priority Area: 556 ha
Nambeelup Environment

It’s Wet, Wet, Wet!

some existing inundated areas…

Poor grades in existing drains!
Nambeelup Environment

Many Wetlands!

Geomorphic Wetlands. Plus 2 EPP wetlands.
Nambeelup Environment: Modelled characteristics

partnered with Department of Water - Water Science Branch

- Refined advanced groundwater-surface water interaction modelling (MIKE-SHE) for Nambeelup DWMS from Murray DWMP Regional model.

Ben Marillier (2011)
Groundwater is close to, or above the natural surface for large portion of the development area!
Post-Development

Rainfall
(100%)

Increased recharge & subsoil discharge

ET
~65%

ET
~40%

Watertable
Winter
Summer

Industrial Development

Soak well
Sub-surface drainage
at Controlled Groundwater Level

Superficial aquifer
Leederville aquifer
Development – Drainage constraints

Constrained areas

Arterial Drainage Planning - DWMS
Four benefits of MAR in Nambeelup

1. **Aid in Drainage outcomes**
   - Shire prefers only dry swales,
     - mostly dry swales proposed
     - 3 corridors retained naturally seasonally inundated areas within POS,
   
   MAR can aid by reducing water level.

2. **Use for sub-soil water**

3. **Water Quality targets Peel-Harvey Estuary**

4. **Alleviate/supplement Potable water supplies**
Benefits for MAR:
2. Use of Sub-soil drainage Volume

Modelled sub-soil drainage volumes at given controlled groundwater level under continued current climate condition and no rainwater tanks.

<table>
<thead>
<tr>
<th>Subcatchment</th>
<th>Area (km²)</th>
<th>Average annual (mm)</th>
<th>Average annual (GL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fwy1</td>
<td>2.25</td>
<td>1254</td>
<td>0.89</td>
</tr>
<tr>
<td>Fwy3</td>
<td>1.49</td>
<td>696</td>
<td>0.58</td>
</tr>
<tr>
<td>Fwy4</td>
<td>0.22</td>
<td>320</td>
<td>0.03</td>
</tr>
<tr>
<td>Gull Rd Drain</td>
<td>2.54</td>
<td>904</td>
<td>0.43</td>
</tr>
<tr>
<td>Infiltration</td>
<td>0.07</td>
<td>55</td>
<td>0.00</td>
</tr>
<tr>
<td>Model domain</td>
<td>29.57</td>
<td>8</td>
<td>0.23</td>
</tr>
<tr>
<td>NB2</td>
<td>1.04</td>
<td>975</td>
<td>0.50</td>
</tr>
<tr>
<td>NB3</td>
<td>1.31</td>
<td>229</td>
<td>0.25</td>
</tr>
<tr>
<td>SR1</td>
<td>0.38</td>
<td>108</td>
<td>0.04</td>
</tr>
<tr>
<td>SR2/Wetlands</td>
<td>0.57</td>
<td>470</td>
<td>0.10</td>
</tr>
<tr>
<td>SR3/Wetlands</td>
<td>1.93</td>
<td>661</td>
<td>0.70</td>
</tr>
<tr>
<td>ToGullRd Drain</td>
<td>0.54</td>
<td>60</td>
<td>0.02</td>
</tr>
<tr>
<td>Wetlands3</td>
<td>0.23</td>
<td>273</td>
<td>0.01</td>
</tr>
<tr>
<td>Wetlands4</td>
<td>0.09</td>
<td>8</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>42.22</td>
<td>3.77</td>
<td></td>
</tr>
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</table>

Several Catchments with low-lying areas Generate adequate water for MAR injection ~2.6 GL
Reasons for MAR:
3. Aids in meeting Water Quality Targets

Existing Water Groundwater Quality (prior to treatment)
median concentrations range from 0.01 to 1.4 mg/L
one site peaking higher,

Allowable phosphorus export load per unit developed area is limited to 0.29 kg/ha/yr (Kelsey et al. 2010)
## Reasons for MAR: 4. Alternative Water Supply

Water Corporation water demand estimates for Nambeelup & non-potable demand

<table>
<thead>
<tr>
<th>Area Description</th>
<th>Gross Area (ha)</th>
<th>Water Corporation Initial Estimated Total Water Demand (*subject to change) ML/yr</th>
<th>Estimated low 20% portion that could be substituted for non-potable supply, ML/yr</th>
<th>Estimated Max 60% portion that could be substituted for non-potable supply, ML/yr</th>
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<td>Initial Assumed Development plus Lot 221</td>
<td>556</td>
<td>280 – 1670*</td>
<td>55 - 330</td>
<td>160 - 1000</td>
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Range is given for low water demand up to high water demand (based on total demand range of 500-3000kl/ha/yr)

* based on

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**Potable Water Demand**

- Henderson
- Midland
- Hamilton
- Wangara
- Davison
- Bayswater
- Maaga
- Forestfield
- Welshpool
- Kwinana
- Canning/Valleey
- Osborne
- Park
- Balcatta

**Pressure on Water Supplies**

- 2000-01
- 2004-05
- 2009-10
MAR Trial Cost Estimate (DoW) – 1 Catchment

DoW is attempting to establish a trial MAR project in the Nambeelup Industrial Area worth ~$7 million.

Cost includes infrastructure such as:

- Water treatment system
- One injection well, well development & head works
- Three monitoring wells & head works
- Worksite preparation
- Limited purple pipe distribution
- Hydrologic and geologic testing
MAR Trial (DoW)

- Water availability - enough subsoil volume available
- Challenge = retain, treat & inject water prior to leaving site
- Potential yield: related to size of storage & treatment rate

Figure: Potential volume of water that could be injected via MAR at 3 ML/day at four different retention basin volumes (Fwy 1 Catchment)

Potential to Inject 150 – 300 ML/yr from a 20 ML retention basin
Industrial water demand

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Range is given for low water demand up to high water demand (based on total demand range of 500-3000kL/ha/yr)

The trial could meet demand for the initial stage of development
Potential Cost offsets…..

Environmental
- Averted potential costs of eutrophication downstream of site
- MAR provides certainty for phosphorus treatment
- Achieving legislated phosphorous limits

Economic costs
- In order to avoid retaining inundated areas, Cost of extra fill to lift development area by further 0.3m is estimated to be in excess of $12 million* for JUST Fwy1 catchment

*Assuming - 1,930,000 m² ‘Fwy 1’ catchment development area
($20.9/m³ x 0.3m x 1,930,000 m² = $12 million)
Potential Cost offsets... Economic Cost

- For Initial development area 556 Ha (hashed areas), if potable water demand is higher than threshold peak instant demand of 9ML/day (>1800kL/ha/yr), a booster tank is required. Water Corp est. cost $5.5m.

Initial Development Area annual total demand: (Water Corporation, 2011)
278ML/yr (low demand 5000kL/ha) to 1667 ML/yr (high demand 3000kL/ha)

Trial Non Potable supply for Initial area, 150-300 ML/a
Potential Cost offsets... Economic Cost – Larger Area

- Water Corporation Long-term potable water supply for high water demand, (without non-potable supply) estimated cost = $45 million.
  › If non-potable supply, this infrastructure could be delayed and reduced.
Summary

• MAR can be used to achieve the three key principles of the DWMP
• MAR can create long-term cost offsets
• MAR can provide certainty to the industrial estate proponent that it will meet water quality requirements
• It can also provide a ‘smart, clean & green’ marketing image for the new industrial area
Any questions