Orange City Council
Filter media upgrade
Jon Francis
Water Treatment Manager
Icely Road Water Filtration Plant

- supplies ~ 40,000 pop, ~ 16,500 connect, 38 ML/day cap
- **raw water sourced from Suma Park Dam**
  (inputs = rural catch, bores, stormwater, Macquarie River)
  norm = 2-4 NTU & storm = 20 NTU
- grazing, 1 dairy, sewered villages, septic tanks
- built 1959 with 4 filters + 4 more in 1985
- process components: pre-ozone; flocculation (ACH & filter aid); horizontal clarifiers (4); **dual media filters (8)**; ozone contact / BAC filters (3); chlorination
- 4 operators, 3 mech/elec, supervisor, consultant process eng
where we were in early 2013

- post std filter turbidity ~ 0.3 NTU’s (not optimal)
- final turbidity i.e. post ozone/BAC ~ 0.15 – 0.2 NTU’s
- backwash ~ every 20 hrs (air scour 5 min & backwash 8 mins)
- full filter overhaul not scheduled
- media top-up yearly
- roofing over filters
- good data – operators & individ filter turbid meters (Hach 1720E)
where we wanted to be

< 0.15 NTU please!

Table 21: Pathogen log reduction values estimated and validated at time of Blackmans Swamp Creek Stormwater Harvesting Scheme Risk Assessment Workshop

<table>
<thead>
<tr>
<th>Process step</th>
<th>Protozoa</th>
<th>Viruses</th>
<th>Bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holding pond</td>
<td>0.5°</td>
<td>0.5°</td>
<td>0.5°</td>
</tr>
<tr>
<td>Batch pond</td>
<td>0.5°</td>
<td>0.5°</td>
<td>0.5°</td>
</tr>
<tr>
<td>Suma Park Dam</td>
<td>1.0°</td>
<td>1.0°</td>
<td>1.0°</td>
</tr>
<tr>
<td>Coagulation-flocculation-sedimentation-filtration</td>
<td>4.0°</td>
<td>1.0°</td>
<td>2.0°</td>
</tr>
<tr>
<td>Ozonation</td>
<td>0.5°</td>
<td>4.0°</td>
<td>4.0°</td>
</tr>
<tr>
<td>Chlorination</td>
<td>0.0°</td>
<td>4.0°</td>
<td>4.0°</td>
</tr>
<tr>
<td>Total log reduction achieved</td>
<td><strong>6.5</strong></td>
<td><strong>11.0</strong></td>
<td><strong>12.0</strong></td>
</tr>
<tr>
<td>Log_{10} reduction values required^{1,*}</td>
<td>4.9</td>
<td>5.5</td>
<td>5.4</td>
</tr>
<tr>
<td>Margin of safety^{*}</td>
<td>1.6</td>
<td>5.5</td>
<td>6.6</td>
</tr>
</tbody>
</table>
where we are now

- post std filter turbidity ~ 0.04 – 0.08 NTU’s
- final turbidity i.e. post ozone/BAC ~ 0.04 – 0.07 NTU’s
- backwash ~ every 25-35 hrs (air scour 3 min & b’wash 5 mins)
- 6 yearly media replacement in budget & asset management plan
**where we are now**

**Turbidity Critical Control Point**

<table>
<thead>
<tr>
<th>What is being measured?</th>
<th>Turbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where/how is it being measured?</td>
<td>Individual filter effluent AND combined filter effluent. Monitored online and checked regularly by operator. Alarmed to operator.</td>
</tr>
<tr>
<td>What is the control point?</td>
<td>Filtration</td>
</tr>
<tr>
<td>What are the hazards?</td>
<td>Pathogens (4 log10 Cryptosporidium reduction credit as per USEPA 2006 Table IV.B-3 and Table IV.D-1). Algal cells. Turbidity. Metals.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating Target</th>
<th>Adjustment Limit</th>
<th>Critical Limit (combined filter effluent only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.15 NTU, with &lt;0.1 NTU at 95%ile monthly</td>
<td>&gt;0.3 NTU for more than 15 minutes</td>
<td>&gt;0.5* NTU</td>
</tr>
</tbody>
</table>

- Monitored on-line and regularly checked by operators
- Daily water quality checks of process steps throughout plant
- Automatic backwash system
- Regular equipment checks and calibration
- Low level alarm set at 0.15 NTU
- High level set at 0.3 NTU
- Operate to SWI221313
- CWT 2010, Turbidity and Pathogens

- Operator respond to alarm and fix problem immediately
- Check on performance of coagulation – operational target of <1 NTU, and critical limit of >3 NTU
- Check raw water turbidity
- Make required adjustments to coagulation (SWI221312)
- Check dosing pumps and coagulant quality and chemical feeders for proper operation and feed rates
- Initiate backwash
- Determine if one or all filters – take off line if possible
- Notify Supervisor when available

- Contact Supervisor (0419 267 869) or Water Treatment Manager (0419 019 729)
- Shut down plant

If this Critical Limit is exceeded the Public Health Unit will be notified as soon as practicable on Phone: 02) 6330 5941
Mobile: 0428 400 526 (ask for public health officer on-call)

*Exception of >0.8 NTU applies through until 1 March 2015*
how we got there - the plan

1. Backwash 15 mins 4 mins -3 mins
2. Change pol Poly L120 etc. Others MFSE
3. Change or add poly dosing points
4. Enhanced sedimentation
5. Lower pH
6. Upgrade filter media
how we got there
– HR frame

- Operator/Team Leader (18 yrs) to work through action list
- unsuccessfully trialled:
  - more backwash schedules
  - changes to ACH & polymer aid dosing rates & aid dosing location
- Aug 2013 we bit the bullet and got to the heart of the matter
  - jumped to action 5 “upgrade filter media”
  - Team Leader led media replacement as guided by supervisor
how we got there – technical frame

• Issues Paper (CWT) - 7 pages of optimal spec
• < $40k / filter + operator costs
  - old media removed with sucker truck by Polpure
  - coal, sand and garnet from River Sands
  - crane placed 1 tonne bags (bark blower not efficient)
  - cleaning old nozzles not efficient so new from Techpro
• cleared backwash pipework
• operator initiative of backwash to waste for filter ripening period (2)
knowledge gaps & benefits

• catchment Crypto risk not gauged – focus on treatment
  - future tuning Catchment Management Plans
• reliance on quality consultant advice
• need for effective 2 way communication with operators

• opportunity to engage operators in DWMS implementation
• improved community level of service
• sustainability – reduce energy use in b’wash & ozone generat.
• elevated team pride
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