FITZROY RIVER WATER
a commercial activity of
Rockhampton City Council
Central Queensland

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April 2004
Sewerage Rehabilitation

Combined Tendering
Risk Management
Cleaning and CCTV Camera Issues
Keywords

- Combined Tendering
- Sewer Rehabilitation
- Rehabilitation Contracts
- Infiltration / Inflow
- Structural Lining
- Cost Savings
- Risk Management
- Cleaning / CCTV Camera
Materials – Mains Network

- Earthenware – Vitrified Clay
- Asbestos Cement- AC
- Non-reinforced Concrete
- Upvc
- DICL Concrete lined pipe (creek crossings and above ground locations etc)
# Summary of Pipe Material Data by Decade

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthen-ware</td>
<td>97.4%</td>
<td>90.3%</td>
<td>27.4%</td>
<td>50.3%</td>
<td>6.8%</td>
<td>1.2%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Concrete</td>
<td>2.4%</td>
<td>9.6%</td>
<td>72.2%</td>
<td>49.5%</td>
<td>91.1%</td>
<td>8.3%</td>
<td>0.7%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Cast-Iron</td>
<td>0.2%</td>
<td>0.1%</td>
<td>0.4%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Upvc</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>2.0%</td>
<td>89.8%</td>
<td>99.3%</td>
<td>100%</td>
</tr>
<tr>
<td>Asbestos Cement</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.8%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
The Sewer Network

<table>
<thead>
<tr>
<th>Dia (mm)</th>
<th>Length (m)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>6044</td>
<td>1.2%</td>
</tr>
<tr>
<td>150</td>
<td>418438</td>
<td>80.4%</td>
</tr>
<tr>
<td>225</td>
<td>33959</td>
<td>6.5%</td>
</tr>
<tr>
<td>300</td>
<td>20115</td>
<td>3.9%</td>
</tr>
<tr>
<td>375</td>
<td>15117</td>
<td>2.9%</td>
</tr>
<tr>
<td>450</td>
<td>8326</td>
<td>1.6%</td>
</tr>
<tr>
<td>525</td>
<td>1145</td>
<td>0.2%</td>
</tr>
<tr>
<td>600</td>
<td>2243</td>
<td>0.4%</td>
</tr>
<tr>
<td>675</td>
<td>4092</td>
<td>0.8%</td>
</tr>
<tr>
<td>750</td>
<td>6552</td>
<td>1.3%</td>
</tr>
<tr>
<td>900</td>
<td>4517</td>
<td>0.9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>520548</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
FRW’s Sewerage Collection System

Length of sewer (m)

Diameter (mm)

Total Length
Length relined

418,438
# Summary of Wastewater Assets

<table>
<thead>
<tr>
<th>Asset Category</th>
<th>Replacement Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewage Pump Stations (29 active)</td>
<td>$4 056 799</td>
</tr>
<tr>
<td><strong>Sewage Treatment Plants</strong></td>
<td></td>
</tr>
<tr>
<td>South Plant</td>
<td>$5 171 700</td>
</tr>
<tr>
<td>West Plant</td>
<td>$4 836 150</td>
</tr>
<tr>
<td>North Plant</td>
<td>$10 763 000</td>
</tr>
<tr>
<td><strong>Reticulation</strong></td>
<td></td>
</tr>
<tr>
<td>Rising Mains</td>
<td>$2 143 742</td>
</tr>
<tr>
<td>Gravity Mains inc. Jump ups</td>
<td>$79 554 314</td>
</tr>
<tr>
<td>Manholes (11 429)</td>
<td>$29 200 000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$135 725 705</strong></td>
</tr>
</tbody>
</table>
Summary of Wastewater Mains/Jump Ups

Replacement Value (\textdollar m)

Diameter (mm)
Residual Life Profile of Existing Sewers (2001 year zero)
Rehabilitation Work

Was required due to:

- Age
- Gas Attack
- Longitudinal and transverse cracking
- Tree root intrusion etc.
- Illegal roof / stormwater connections
Typical Sewer Main Problems ...
Infiltration and Inflow

- Fitzroy River Water’s biggest challenge
- Public Health Issues
- November 2000 – 100 surcharges
- February 2003 – 140 surcharges
- Immediate actions included temporary overflows, targeted camera inspection for blockages, targeted house to house inspections, sewer upgrades.
Long Term Rehabilitation

- Systematic Condition Assessment
- Sewer Relining
- Sewerage Upgrades (SewerCad)
- Raising Manholes
- Examination, Repair and Raising of Service Jump-ups
- Systematic house to house inspections
- Smoke testing has been suspended
Combined Council Contract

Fitzroy River Water → Single Contractor → Mackay Water → Single Contractor → CitiWater - Townsville
Budget

- Imperative to rehabilitate infrastructure
- FRW $1.7 million
- Mackay Water $0.8 million
- CitiWater $2.0 million
Consideration for Combined Contract

- Encourage the establishment of a Contractor locally
- Maximise economies of scale
- Minimise Annual Contractor establishment costs
- Increase of local business trade
- Additional employment opportunities
Issues Considered for Contract

- Type and duration of Contract
- Timing
- Relocation
- Setting up of a branch/regional office – depot
- Cost benefits etc.
Contractors Preference

- Creation of a common technical specification
- Compliance with relevant Australian & Industry Standards
- Based on Sound Engineering Principles
- Forward planning
- Development
- Product expansion
- Additional significant Cost savings
Legal Review

Brad McCosker of McCullough Robertson Lawyers

General Conditions of Contract AS2124 (1992) amended and additional clauses inserted

- Industrial relations, WH&S, GST, Third party Warranties

Common Technical Specification

Each Council set up and sign individual Contracts with successful tender
Mackay and Rockhampton continued

- CitiWater Withdraws
- Reduced scope of works by 40%
- Tenders Called
- Closed 20 November 2002
Awarding the Contract

- Three tenders received
- Contract Awarded to Interflow Pty Ltd
- Proposal to install Rib Loc Expanda Pipe
  - Install liner in host pipe by reducing flows in the mains without closing down sections and bypassing pump around works
  - Reduced environmental risks
Installing Rib Loc Expanda Pipe
Conditions of Contract

- All works must be completed by 30 June 2003
- No extension of time due to weather
- Each Council reserves right to extend Contract for further 12 months
- Councils reserves right to vary location and extent of work. Delete or add sections of relining
- No provision made in the Schedule of Rates for mobilisation
  - Cost deemed included in rate per metre
  - Allowed Authorities to obtain an accurate cost per linear metre for each diameter of pipe
- Scope of works – relining trunk mains 750mm to 225mm and minor mains 150mm to 100mm
Contractors Perspective Interflow Pty Ltd

- Offered to undertake additional works at a reduced rate of 5%
- Set up a regional depot in Rockhampton
- Employ and train local personnel
- Commenced work on rehabilitation of trunk sewer mains
Starting a Contract

Two Components

- Establishment Costs
  - Transfer men, vehicles and supplies to site

- Contract Set Up
  - Bank guarantees, insurances, setting up project database, construction works packages and ordering materials
Realised Benefit to Councils

Significant cost reductions have been achieved:

- Overall saving of 12% for the year 2002/03
- $129 000
- 12% plus 5% reduction for future work = 17% saving for year 2003/04
- Additional $280 000 per annum sewer rehabilitation
- $1.4 million over next 5 years
- Creation of local employment and business opportunities
# Risk Management

Trunk sewerage assets have been grouped into risk categories

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Priority</th>
<th>Risk Category</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under major road or rail (If conc. or over 6m deep)</td>
<td>2 1</td>
<td>Concrete trunk sewers</td>
<td>2</td>
</tr>
<tr>
<td>Under buildings (If conc. or over 6m deep)</td>
<td>2 1</td>
<td>Marshy low lying areas</td>
<td>3</td>
</tr>
<tr>
<td>Over 6m deep (If concrete)</td>
<td>2 1</td>
<td>Non earthenware in industrial areas</td>
<td>3</td>
</tr>
<tr>
<td>Over 4m deep</td>
<td>3</td>
<td>Cast iron sewers</td>
<td>3</td>
</tr>
<tr>
<td>Downstream of pump station discharges</td>
<td>3</td>
<td>Other trunk sewers</td>
<td>4</td>
</tr>
</tbody>
</table>
Consequence of failure
Assume linked to depth and diameter

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Score D1</th>
<th>Diameter (mm)</th>
<th>Score D2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 2.0</td>
<td>2</td>
<td>225</td>
<td>3</td>
</tr>
<tr>
<td>2.1-2.5</td>
<td>3</td>
<td>300</td>
<td>5</td>
</tr>
<tr>
<td>2.6-3.0</td>
<td>4</td>
<td>375</td>
<td>7</td>
</tr>
<tr>
<td>3.1-3.5</td>
<td>5</td>
<td>450</td>
<td>8</td>
</tr>
<tr>
<td>3.6-4.0</td>
<td>6</td>
<td>525</td>
<td>9</td>
</tr>
<tr>
<td>4.1-4.5</td>
<td>7</td>
<td>600</td>
<td>10</td>
</tr>
<tr>
<td>4.6-5.0</td>
<td>8</td>
<td>675</td>
<td>10</td>
</tr>
<tr>
<td>5.1-5.5</td>
<td>9</td>
<td>750</td>
<td>10</td>
</tr>
<tr>
<td>5.6-6.0</td>
<td>10</td>
<td>900</td>
<td>10</td>
</tr>
</tbody>
</table>
## Estimate of Condition

Assume link to material type and age

<table>
<thead>
<tr>
<th>Material</th>
<th>Score (M1)</th>
<th>Constructed</th>
<th>Score (C1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>uPVC</td>
<td>1</td>
<td>1936-50</td>
<td>10</td>
</tr>
<tr>
<td>CICL</td>
<td>4</td>
<td>1951-62</td>
<td>8</td>
</tr>
<tr>
<td>EW / AC</td>
<td>8</td>
<td>1963-72</td>
<td>6</td>
</tr>
<tr>
<td>CONC</td>
<td>10</td>
<td>1973-85</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1986-Now</td>
<td>1</td>
</tr>
</tbody>
</table>
Risk Score

= (consequence x condition) / priority

= (depth score + diameter score) x (material type score + age score)

priority

Sewers with the highest score are attended to first
Prioritization of relining

- List of sewers to be rehabilitated is also determined by using available condition data; and
- Highest risk sewers either listed for urgent condition assessment or included on program (e.g. large diameter concrete sewers in locations where failure consequence is high)
Cleaning and Camera Survey

Need to clean sewers to carry out condition assessment but ......

The high pressure jet cleaning process is causing accelerated sewer collapses
To clean or not to clean?

- Should we camera first and clean after?
- Are there alternative cleaning options less likely to damage the sewer?
Conclusion
Get into combined contracts for sewer relining

- Networking
- Personal development of officers
- Skill and resource sharing
- Massive savings in sewer rehabilitation
- Reduction in reactive sewer maintenance
- Additional employment and business opportunities.
Conclusion
Sewer Cleaning and Inspection

Do you know if cleaning is damaging your sewers?

How are you managing this?
Conclusion
Risk Management

- Do you know your highest risk sewers?
- Do you know their condition?
- How are you managing the risk?