Using Business Cases to Guide Investment Decisions
A WSSC Case Study

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Acknowledgements

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Thank you for your contributions!
Agenda

• Overview: Capital Project Development Process
• Business Case Methodology
• Case Studies
• Questions
Capital Project Development process

- Need Validation
- Need Prioritization
- Project Initiation Form
  - Life Cycle Cost
  - Risk Reduction
  - Benefit-Cost
  - Business Case Document
    - Prioritization
    - Proposed CIP
    - Capital Budget

Business Case
What is a **Business Case?**

**A business case** is a methodology for documenting and presenting a proposed Capital Improvement Project.
“A Business Case discusses and presents a need and related issues, documents the range of alternatives analyzed, reasons for accepting and rejecting each option, makes a recommendation on how the project should proceed, and provides the documented justification for proceeding with the project.”
Business Case Tools

- **Life Cycle Cost (LCC)**
  - Estimates total cost of ownership for each alternative

- **Risk Reduction**
  - Measures risk reduction for each alternative in $ terms

- **Benefit Cost**
  - Estimates Community and Organizational Benefits in TBL terms

- **Output**
  - LCC NPV
  - RR Cost Effectiveness Factor
  - Benefit/Cost Ratio
Main sections included in a business case:

- Executive Summary
- Project Background
- Existing Asset Information
- Alternatives
- Validation
- Results
- Recommended Alternative
The issues:

- The only supply line to Brink Elevated Tank is the existing 24-inch water main from Neelsville WPS
- Supply to Brink Elevated Tank and dependant service areas are susceptible to supply outages if the 24-inch water main fails
Objective

- Enhance reliability in water supply to Brink Elevated Tank by introducing redundancy in supply
- For example: Parallel Line
**Alternative 1:** New 24 inch parallel main

- **940 Pressure Zone**
- **836 Pressure Zone**
- **760 Pressure Zone**
- **660 Pressure Zone**

New 24-inch Parallel to Ex 24-inch
**Alternative 2: New WPS at Germantown tank and 24 inch main**

940 Pressure Zone

836 Pressure Zone

760 Pressure Zone

660 Pressure Zone
Alternative 3: New Booster PUMP AT between ex 48 inch and BRINK WPS
### Summary of Alternatives

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Major Advantages</th>
<th>Major Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - New Main to Existing Main</td>
<td>• Will provide the required redundancy in supply to Brink Elevated Tank</td>
<td>• Will cause significant traffic impacts during construction</td>
</tr>
<tr>
<td>2 – New PS at Germantown Tank &amp; New Main</td>
<td>• Will provide the required redundancy in supply to Brink Elevated Tank</td>
<td>• High cost</td>
</tr>
<tr>
<td>3 – New Booster Station at Brink Facility</td>
<td>• Lower cost (initial &amp; maintenance)</td>
<td>• Provides limited redundancy - dependant on 48 inch main</td>
</tr>
<tr>
<td></td>
<td>• No traffic impacts during construction</td>
<td></td>
</tr>
<tr>
<td>4 – Status Quo</td>
<td>• No upfront capital cost</td>
<td>• No redundancy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cannot meet future demand</td>
</tr>
<tr>
<td>5 – DO Nothing</td>
<td>• No cost</td>
<td>• No redundancy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• No water supply at the end of service life (2060)</td>
</tr>
</tbody>
</table>
### Recommendation

<table>
<thead>
<tr>
<th>Alternative</th>
<th>NPV of LCC</th>
<th>B/C Ratio</th>
<th>Total Risk Reduction ($)</th>
<th>Risk Reduction Cost Effectiveness Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - New Main to Existing Main</td>
<td>$8.1 MM</td>
<td>0.48</td>
<td>$26.1 MM</td>
<td>3.23</td>
</tr>
<tr>
<td>2 – New PS at Germantown Tank &amp; New Main</td>
<td>$19.1 MM</td>
<td>0.24</td>
<td>$26.2MM</td>
<td>1.38</td>
</tr>
<tr>
<td>3 – New Booster Station at Brink Facility</td>
<td>$4.5 MM</td>
<td>1.04</td>
<td>$25.1 MM</td>
<td>5.56</td>
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<tr>
<td>4 – Status Quo</td>
<td>$5.7 MM</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>5 – DO Nothing</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Alternative 3 has the lowest LCC, highest B/C ratio, and highest RR Cost effectiveness factor.
Potomac WFP 78-Inch Finished Water Main Redundancy

The Issue:

- WSSC has instituted an PCCP inspection program on a seven year cycle and the installation of an Acoustic Fiber Optic (AFO) monitoring system for detection of wire breaks, which requires the pipeline to be taken out of service.
- In reviewing pipelines for application of this new inspection and monitoring protocol, it was determined that there was very limited redundant backup to take the 78-in out of service.
- This lack of adequate redundancy is of concern not only in terms of implementation of inspection and monitoring, but in terms of the potential for an extended service outage to a large portion of the population in the event of a failure of the pipeline.
Potomac plant site

- Location of wye connection
- Surge tanks
- Headhouse
- 78” Finished water main
- 48” Finished water main
- Main zone ps
- High zone PS
- RWPS #1
- RWPS #2
- RWPS #1
- 48” Finished water main
- Headhouse
Alternatives Analysis

1. Do Nothing
2. Status Quo
3. New 84-inch pipeline along a southeast alignment
4. New 84-inch pipeline mainly following the northwest alignment
5. New 84-inch pipeline in a tunnel that runs straight north
6. New 84-inch pipeline in place of existing 48-inch
7. New Main Zone Pump Station and new 84-inch pipeline
# Risk Reduction Analysis Summary

<table>
<thead>
<tr>
<th>Alternative</th>
<th>PV of Project Costs</th>
<th>Redundancy</th>
<th>Adjusted PoF</th>
<th>CoF</th>
<th>Residual Risk Cost</th>
<th>Risk Reduction</th>
<th>Cost Effectiveness Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do Nothing</td>
<td>$18,609</td>
<td>50%</td>
<td>16.50%</td>
<td>$668,274</td>
<td>$110,265</td>
<td>$0</td>
<td>0.00</td>
</tr>
<tr>
<td>Status Quo</td>
<td>$19,200</td>
<td>50%</td>
<td>16.50%</td>
<td>$217,838</td>
<td>$35,943</td>
<td>$74,322</td>
<td>3.87</td>
</tr>
<tr>
<td>Southeast Alignment</td>
<td>$25,497</td>
<td>150%</td>
<td>0.55%</td>
<td>$408</td>
<td>$2</td>
<td>$110,263</td>
<td>4.28</td>
</tr>
<tr>
<td>Northwest Alignment</td>
<td>$29,571</td>
<td>150%</td>
<td>0.55%</td>
<td>$408</td>
<td>$2</td>
<td>$110,263</td>
<td>3.69</td>
</tr>
<tr>
<td>Tunnel Alignment</td>
<td>$22,511</td>
<td>150%</td>
<td>0.55%</td>
<td>$408</td>
<td>$2</td>
<td>$110,263</td>
<td>4.90</td>
</tr>
<tr>
<td>Northeast Alignment</td>
<td>$22,775</td>
<td>125%</td>
<td>0.77%</td>
<td>$408</td>
<td>$3</td>
<td>$110,262</td>
<td>4.71</td>
</tr>
<tr>
<td>New Main Zone PS</td>
<td>$42,075</td>
<td>125%</td>
<td>0.77%</td>
<td>$408</td>
<td>$3</td>
<td>$110,262</td>
<td>2.55</td>
</tr>
</tbody>
</table>
### Benefit/Cost Analysis Summary

<table>
<thead>
<tr>
<th>Alternative Description</th>
<th>Total Benefits</th>
<th>Total Costs</th>
<th>Benefit-Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action</td>
<td>$24</td>
<td>$18,659</td>
<td>0.00</td>
</tr>
<tr>
<td>Status Quo</td>
<td>$74,357</td>
<td>$19,200</td>
<td>3.87</td>
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<tr>
<td>Southeast Alignment</td>
<td>$110,348</td>
<td>$29,985</td>
<td>3.65</td>
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<tr>
<td>Northwest Alignment</td>
<td>$110,353</td>
<td>$29,571</td>
<td>3.70</td>
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<tr>
<td>Tunnel Alignment</td>
<td>$110,353</td>
<td>$22,511</td>
<td>4.90</td>
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<tr>
<td>Northeast Alignment</td>
<td>$110,353</td>
<td>$22,775</td>
<td>4.72</td>
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<tr>
<td>New Main Zone PS</td>
<td>$111,482</td>
<td>$42,075</td>
<td>2.58</td>
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</table>
Recommended Alternative

New 84” pipeline in tunnel

Headhouse

Location of wye connection

Surge tanks

High zone PS

78” Finished water main

48” Finished water main

Main zone PS

RWPS #1

RWPS #2

48” Finished water main

78” Finished water main

New 84” pipeline in tunnel

Location of wye connection

Surge tanks
Thank you