

City of North Bay - New Water Filtration Plant

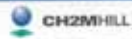


Value Engineering – An Owners Perspective

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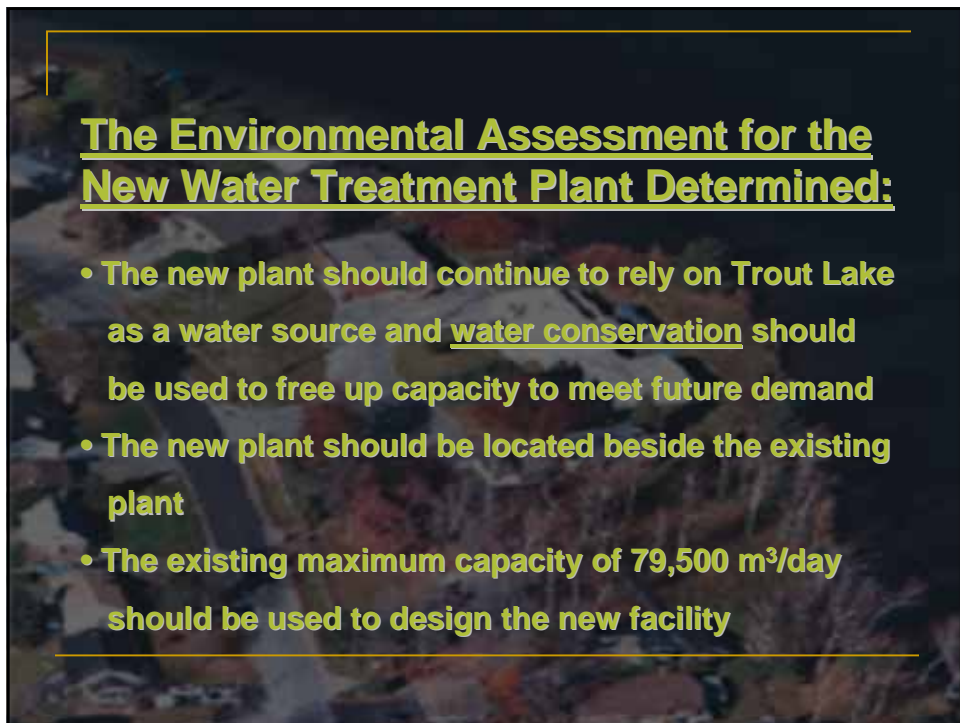
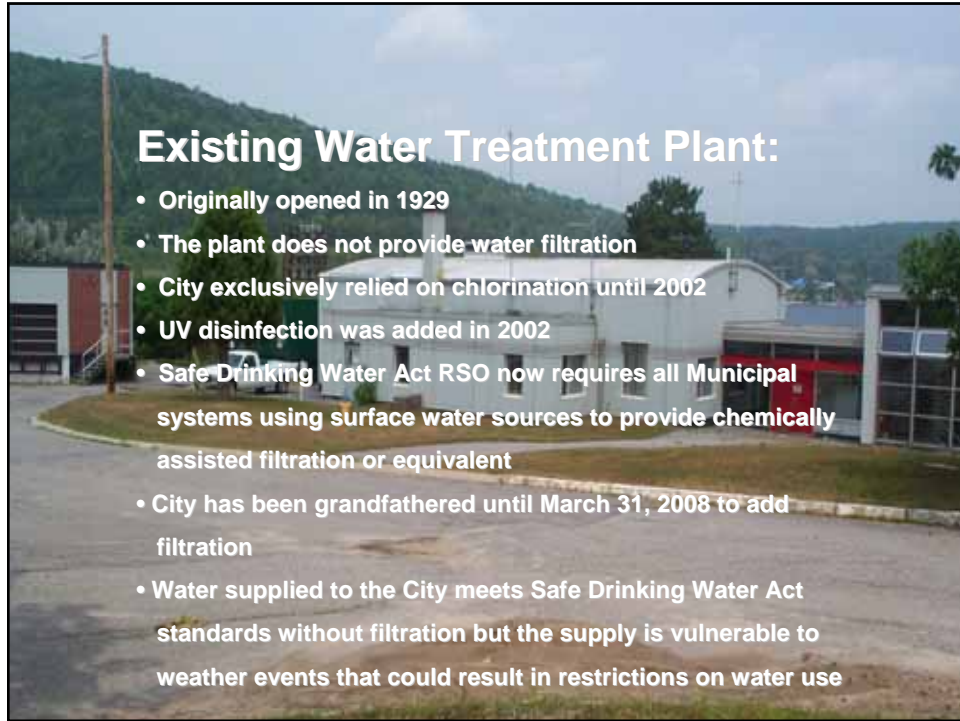


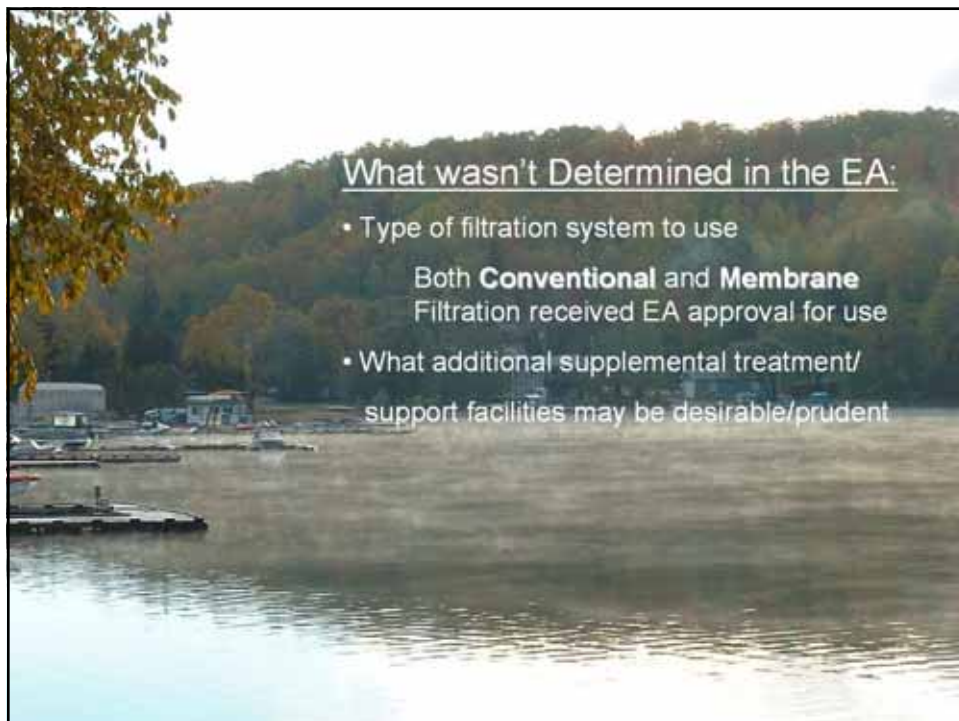
CITY OF NORTH BAY
WATER TREATMENT PLANT

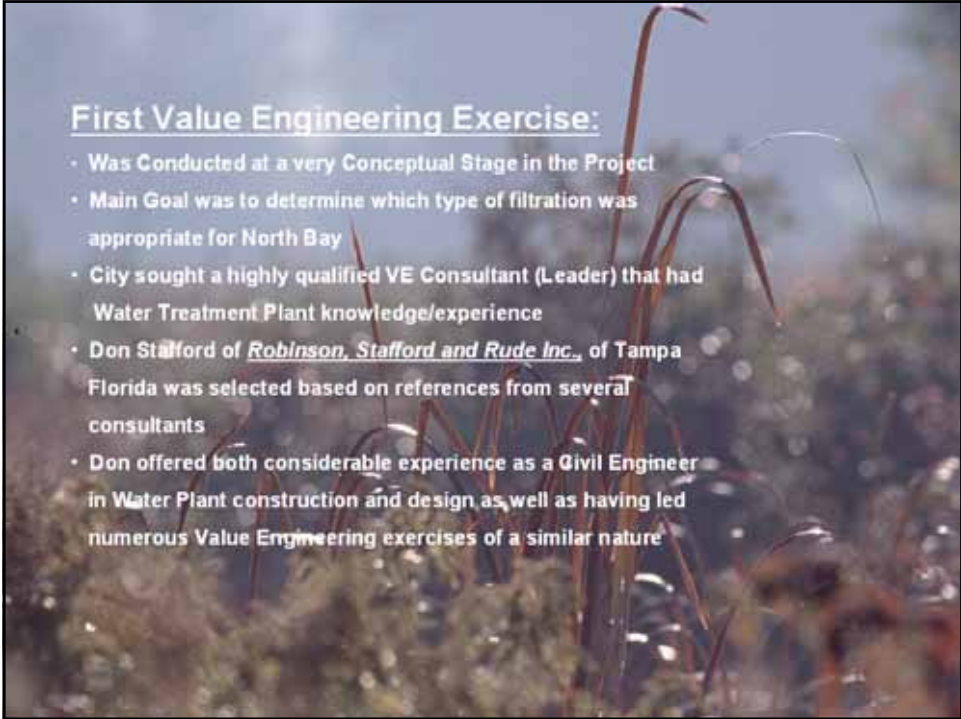
North Bay

- **Population: 55,000**
- **Water is sourced from Trout Lake**
- **Source has excellent water quality but limited supply capacity**
- **After the decision to construct a New Water Plant, it took 5 years to complete the Environmental Assessment and Detailed Design**
- **The project was subject to 2 separate Value Engineering exercises – each with a different purpose**









First Value Engineering Exercise:

- Was Conducted at a very Conceptual Stage in the Project
- Main Goal was to determine which type of filtration was appropriate for North Bay
- City sought a highly qualified VE Consultant (Leader) that had Water Treatment Plant knowledge/experience
- Don Stafford of Robinson, Stafford and Rude Inc., of Tampa Florida was selected based on references from several consultants
- Don offered both considerable experience as a Civil Engineer in Water Plant construction and design as well as having led numerous Value Engineering exercises of a similar nature



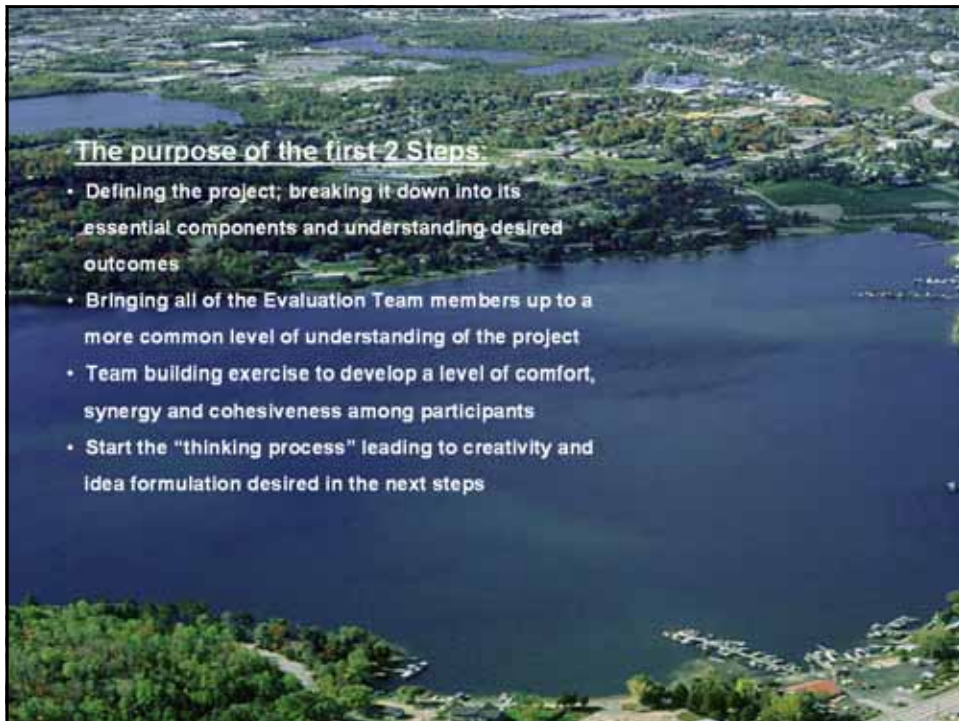
First Value Engineering Analysis

- Was held over a 3-day period (Feb 2003)
"Off Site" to avoid interruptions
- Approximately 10 participants took part
- Review Team was primarily made up of stakeholders with 2 outside experts added
- The process was broken into 6 separate phases



Value Engineering Process Phases

1. Information Phase
2. Function Analysis Phase
3. Creative Phase
4. Evaluation Phase
5. Development Phase
6. Presentation Phase



The purpose of the first 2 Steps:

- Defining the project; breaking it down into its essential components and understanding desired outcomes
- Bringing all of the Evaluation Team members up to a more common level of understanding of the project
- Team building exercise to develop a level of comfort, synergy and cohesiveness among participants
- Start the "thinking process" leading to creativity and idea formulation desired in the next steps



Evaluation and Development Phases:

- The top 10 to 15 ideas selected were evaluated in detail as potential ideas to be incorporated into each of the designs
- A “weighted matrix” was used to compare detailed ideas to determine their overall attractiveness
- The two optimized filtration plants were then compared to determine which represented the best Value to the City

Idea No.	Description	Selection
Conventional Treatment Process		
C-2	Use ballasted flocculation instead of conventional settling	
C-4	Return filter to waste flow to head of plant	X
C-6	Put chemical building functions in new building	X
C-8	Use DAF for initial treatment	
C-9	Use upflow solids blanket clarifier	
C-10	Use UV treatment system of 100% capacity	
C-11	Continue to use the UV system in its existing location	
C-12	Use dual media filter plant	
C-13	Use an in-tank mixer instead of an in-line mixer	
C-14	Put granular activated carbon (GAC) filters following dual media filters	

Presentation Phase

- VE leader presented a summation of the analysis and evaluation completed by the team and made his recommendations to both the team and a broader audience of owners/stakeholders





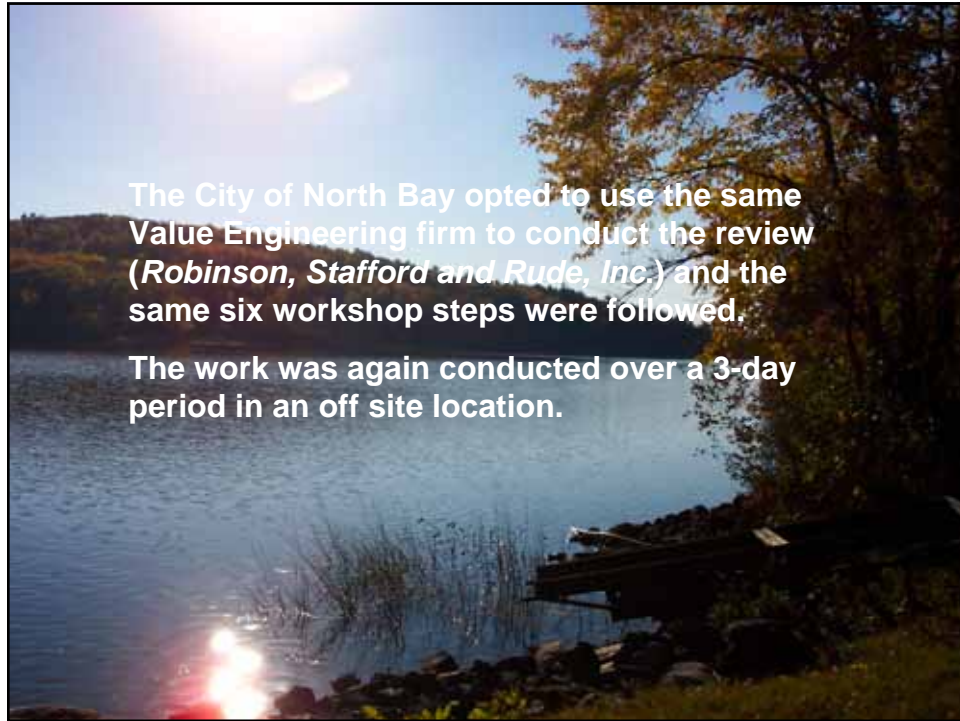
Impact:

- Permitted the owner/stakeholders to develop a detailed understanding of the project's complexity and cost factors
- The process recommended membrane filtration and the VE leader suggested that cartridge filtration was a potential alternative to consider
- Influenced critical design features of the plant including the total abandonment of the old plant/chemical building; addition of waste treatment facilities to recover more water which was placed back into the production train; addition of chlorine contact tanks; conversion of the water stabilization chemical to sodium hydroxide (from soda ash); realization that office, lab and operator room space was needed which was added to the design
- Developed unanimity between stakeholders and the owner as well as a sense of ownership in the design



Value Engineering Study #2

- The second VE session was held in March 2005 at the end of the Preliminary Design Phase of the project; the City had previously completed pilot testing of four different membrane filtration systems and selected the Pall Cartridge Filtration System based on performance and cost; the preliminary design developed a "Greenfield" plant design around this filtration system
- The purpose of the VE was to review the design for thoroughness and for opportunities to optimize the design



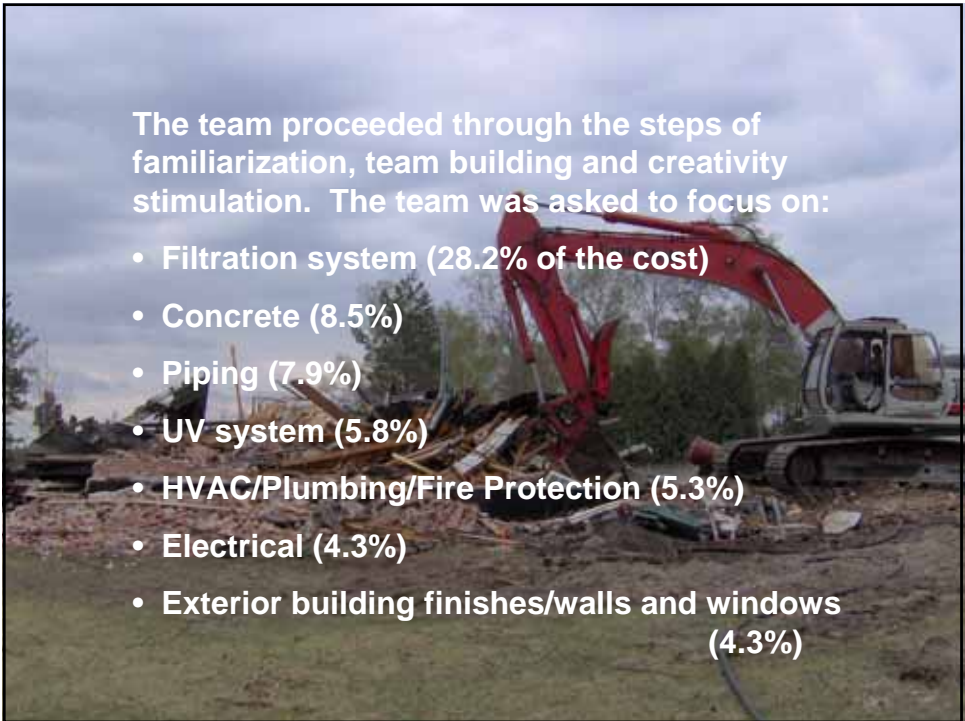
The City of North Bay opted to use the same Value Engineering firm to conduct the review (*Robinson, Stafford and Rude, Inc.*) and the same six workshop steps were followed.

The work was again conducted over a 3-day period in an off site location.



The Evaluation Team was supplemented with “experts” in key disciplines including:

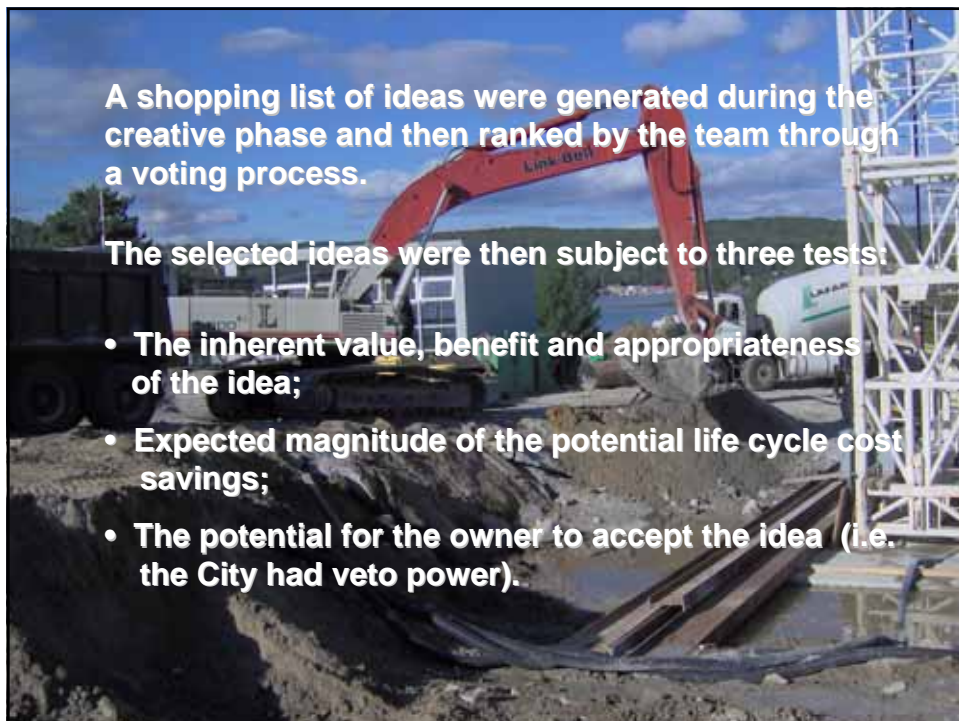
- LEED Certified Architect
- HVAC Expert
- Electrical/Energy Management
- Structural/Constructability
- Process Design Specialist
- Cost Estimator
- The Membrane Supplier
- The Team totaled 19 participants – a few opted to only participate on one day





The optimization ideas were separated into three project components:

- Building
- Process
- Site Features



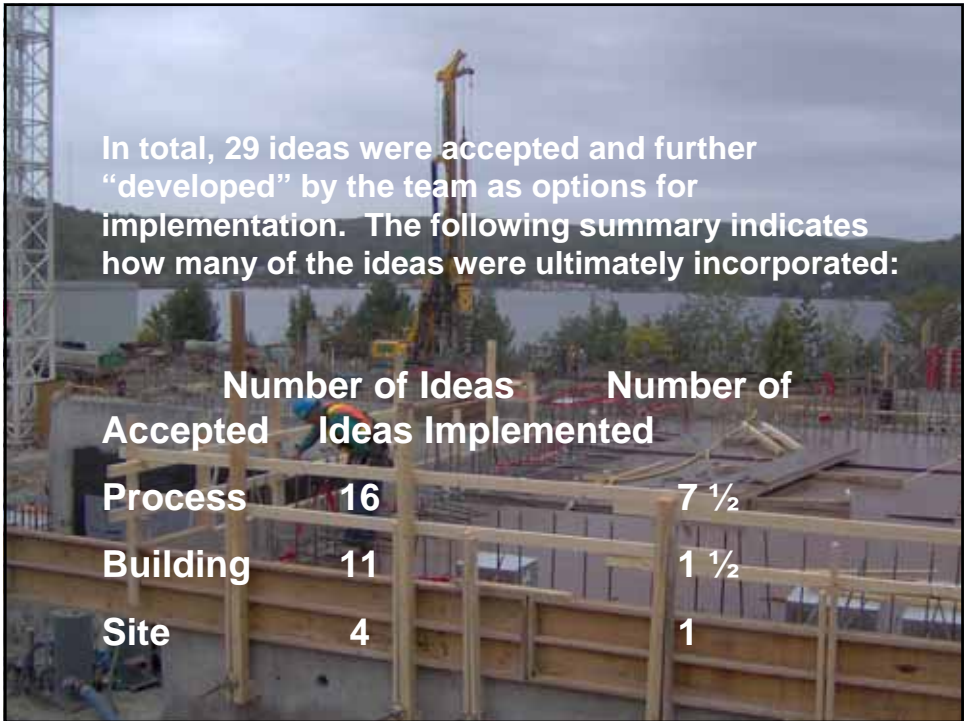
A shopping list of ideas were generated during the creative phase and then ranked by the team through a voting process.

The selected ideas were then subject to three tests:

- The inherent value, benefit and appropriateness of the idea;
- Expected magnitude of the potential life cycle cost savings;
- The potential for the owner to accept the idea (i.e. the City had veto power).

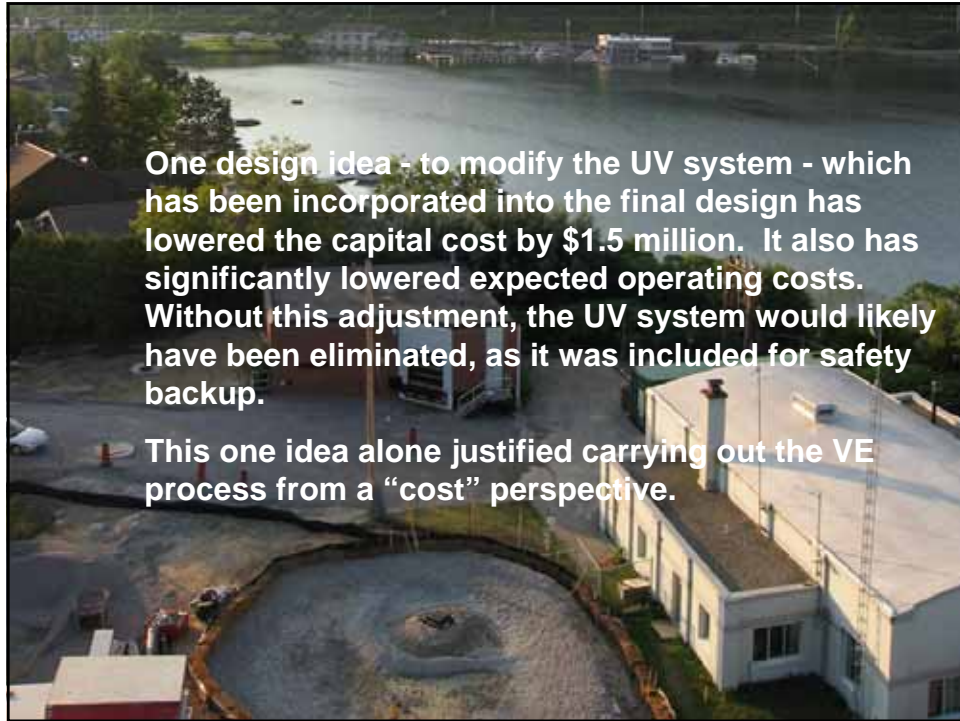


A few of the ideas that did not meet the potential for life cycle cost savings were accepted by the team for development anyway or were otherwise incorporated into the final recommendation as design suggestions



In total, 29 ideas were accepted and further “developed” by the team as options for implementation. The following summary indicates how many of the ideas were ultimately incorporated:

	Number of Ideas Accepted	Number of Ideas Implemented
Process	16	7 ½
Building	11	1 ½
Site	4	1



One design idea - to modify the UV system - which has been incorporated into the final design has lowered the capital cost by \$1.5 million. It also has significantly lowered expected operating costs. Without this adjustment, the UV system would likely have been eliminated, as it was included for safety backup.

This one idea alone justified carrying out the VE process from a “cost” perspective.

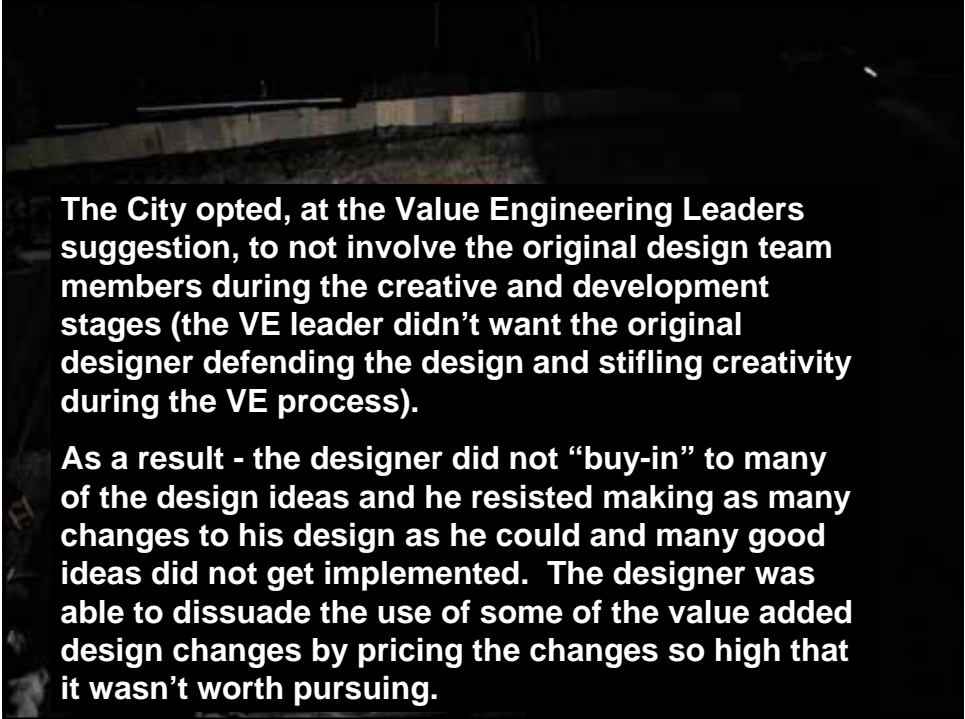


The City of North Bay did not reduce overall project costs by undertaking the VE evaluation which was an expectation of City Council when we sought permission to undertake the VE.

Rather, the process identified holes in the design and design philosophies, and while optimization was achieved, the cost of adding the missing components exceeded the optimization benefits.

Having proceeded to construction without adding the missing parts would have lead to major difficulties during construction including costly extras for trying to fix problems in the midst of construction

08/16/2006



The City opted, at the Value Engineering Leaders suggestion, to not involve the original design team members during the creative and development stages (the VE leader didn't want the original designer defending the design and stifling creativity during the VE process).

As a result - the designer did not "buy-in" to many of the design ideas and he resisted making as many changes to his design as he could and many good ideas did not get implemented. The designer was able to dissuade the use of some of the value added design changes by pricing the changes so high that it wasn't worth pursuing.



Overall Benefits of the VE exercise:

The second VE fixed a date in time for the designer to complete the Preliminary Design, as the process had been subject to numerous delays. Once a date was selected the designer had to generate the information for the VE team in advance and to make the initial presentation. Otherwise, the Preliminary design would have continued on for many months (without focus).

The VE allowed the owner to view many small decisions that were made "on the fly" by the designer as it is not possible to consult on every decision. More importantly it allowed the owner to discover some missing components that have been subsequently fixed at the design stage.

08/28/2006
The process created buy-in from stakeholders and a sense of ownership in the design



Disadvantages:

Finding holes in the design actually increased the overall cost and this raised some political eyebrows

Overall operating costs increased because the water stabilization chemical was changed to a more expensive process

The VE exercise created a situation where the Designer defended the original design while trying to implement many of the good VE ideas and this resulted in some good ideas not being implemented

The process dealt with overall costs and not impacts to grants. Project capital costs are heavily subsidized but operating costs are not, and thus expensive capital cost items that lowered operating costs were advantageous but not properly evaluated



The project began in April 2006 and it is now 6 months into a 2 year construction period

There has been very limited opportunity for the General Contractor to make claims for extras as the design is solid and the owner is confident in the decisions made during design

A large part of this is due to the VE assessment that was carried out to find and solve problems at the design stage rather than during construction

Overall, both VE sessions were worth doing and the benefits are far more reaching than just saving or more wisely spending \$

This included building broader ownership in the project and stakeholder buy-in and a general sense that the owner has a solid plan



Thank you

Questions?