



SCOTTS VALLEY WATER DISTRICT

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Engineering and Water Resources Committee

Santa Margarita Community Room

2 Civic Center Drive, Scotts Valley, California

1/22/24 at 4:00 p.m.

This meeting is being conducted in a hybrid setting.

Members of the public may attend the meeting remotely or in person. Join the meeting

remotely using zoom link: 89008735923 or by phone:

1-253-215-8782 access code 890 0873 5923.

Remote access is available 5 minutes before the start of the meeting

Agenda

1. Convene
2. Oral Communications
3. Business Items (none)
4. Discussion Items
 - 4.1 Meeting Schedule and Objectives
 - 4.2 Bethany Tank Alternatives Analysis
 - 4.3 Mid-Year CIP Projects Update
5. District Updates
6. Committee Member Reports
7. Future Agenda Items
Water Supply Outlook
8. Adjourn

Posted:

Scotts Valley Water District

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E-mail Distribution:

Wade Leishman, Committee Member

Bill Ekwall, Committee Member

Greg Kassner, Committee Member

Allyson Violante, Committee Member

Chris Perri, 1st Alternate

Ruth Stiles, 2nd Alternate

Danny Reber, 3rd Alternate

ROBERT W. MILES
CONSULTING ENGINEERS

TECHNICAL MEMORANDUM NO. 2

Date: December 1, 2023
To: Nate Gillespie, Operations Manager
From: Robert W. Miles
Subject: Scotts Valley Water District
Bethany Reservoir
Analysis for Project Implementation
Engineering Analysis: Robert W. Miles, Bob Riley
Review: Rodney Cahill, Bob Riley

PURPOSE

The purpose of this memo is to develop, summarize, and record the development of the implementation plan for Bethany Reservoir.

ANALYSIS OF ALTERNATIVES FOR PROJECT IMPLEMENTATION

The project selection will involve evaluation of the following four alternative plans:

1. Rehabilitation of the existing reservoir
2. Replacement of the existing reservoir with two new tanks sized to mitigate issues with ridgetop fracturing
3. Replacement of the existing reservoir with a new reservoir located at a site further up the ridge away from the threat of ridge fracturing, and
4. Replacement with a new reservoir anchored to a new concrete slab foundation.

The alternate plans have been developed following review of the construction history of the existing installation, field review of condition of the steel reservoir as summarized in the field assessment memorandum, field reviews of the existing and proposed sites, interviews with the geotechnical engineer and geologist who have provided services for the existing facility, and input and review from the District management and operations staffs.

Each plan would retain or install a storage capacity of approximately 400,000 gallons. In addition to the alternate plans listed above, four additional alternatives assume that bolted steel reservoirs would be constructed instead of welded steel reservoirs.

Reservoir Alternative 1 – Rehabilitate Existing Reservoir

Description

The existing reservoir would be rehabilitated on the existing foundation. The modifications would include reducing the shell height to eliminate shell anchorage as a necessity for seismic resistance. A second smaller tank would be constructed at the site to restore the storage lost by the reduction in shell height of the existing reservoir. The existing reservoir would have a reduced capacity of approximately 300,000 gallons and the new smaller tank would store 100,000 gallons. The second tank water height would be 26 feet and the diameter would be 26 feet. The second tank would be designed to resist the effects of additional fracturing of the bedrock foundation by using a thick, mat-type foundation. Both the welded steel and bolted versions of the smaller tank would be anchored to the concrete foundation to resist the effects of earthquakes.

Advantages

This alternative would provide a modified existing reservoir with an enhanced cone roof. It would provide for optimal protection against the MCE (Maximum Considered Earthquake) and minimum future coating maintenance costs. The new smaller second tank would remain in service during outage of the existing reservoir for maintenance. No additional property would be required.

Disadvantages

The modified existing reservoir would still be subject to future issues with ridgetop fracturing. The new smaller tank would be designed to resist the effects of potential additional fracturing of the bedrock foundation, but would not be completely secure from the issues. The service life and maintenance painting cycles for the bolted tank would be significantly shorter.

Estimated Initial Capital Cost

The new replacement reservoir would require the following costs to be expended, indexed to the year 2023.

Items	Estimated Comparative Project Budget Cost, Welded \$	Estimated Comparative Project Budget Cost, Welded and Bolted\$
Rehab and New Roof for Existing Reservoir – 300,000 gallons		
Sitework		
Earthwork, paving	96,000	
Structural		
Removal of exist roof	114,000	
Enhanced cone roof	467,000	
Fittings, appurtenances, and CP	137,000	
Stairway, ladder, and platform	114,000	
Shell and bottom	278,000	

Overflow and drain	21,000	
Retrofit inlet/outlet piping	82,000	
Coatings		
Interior roof coatings	66,000	
Exterior roof coatings	41,000	
Interior shell/bottom coatings	164,000	
Exterior shell coatings	75,000	
Other	134,000	
Subtotal for Existing Reservoir	1,789,000	1,789,000
Second New Tank, 100,000 gallons, welded		Second New Tank, 100,000 gallons, bolted
Sitework and Foundation		
Earthwork, piping, foundation	568,000	580,000
Structural		
Dome roof	158,000	
Fittings, appurtenances	137,000	
Stairway, ladder, and platform	115,000	100,000
Shell and bottom	205,000	
Bolted steel tank and fittings		381,000
Overflow and drain	22,000	22,000
Inlet/outlet piping	82,000	84,000
Coatings		
Interior roof coatings	14,000	
Exterior roof coatings	12,000	
Interior shell/bottom coatings	60,000	
Exterior shell coatings	32,000	
Sealant stripe coatings		28,000
Other	38,000	
Subtotal for Second Tank	1,443,000	1,195,000
Project totals	3,232,000	2,984,000

Notes on cost levels: All the estimated budget costs in this memo are concept-level costs for the year 2023 developed using preliminary project concepts and criteria. An allowance for engineering, construction, environmental, and City administration services; changes during construction; and project contingency have been included at 45 percent for structural work and 33 percent for coatings.

Reservoir Alternative 2 – Replace Existing Reservoir with Two New Tanks

Description

The existing reservoir would be removed and replaced with two new tanks with diameters of approximately 28 feet. Both of the new tanks would require shell anchorage as a necessity for seismic resistance. The water heights of the new tanks would be approximately 44 feet, and each would have a storage capacity of approximately 200,000 gallons. Due to the presence of existing ridgetop fracturing, each tank would be founded on a thick mat-type foundation. The new tanks would provide for optimal protection against the MCE and minimum future coating maintenance costs.

Both the welded and bolted versions of the tanks would be anchored to the concrete foundation.

There are two potential site layouts for this alternative. The first layout would locate one tank at approximately the center of the existing one, and the second tank at the site of the

existing auxiliary tanks. A second layout would locate the two new tanks at the site of the auxiliary tanks, and would require about 40 feet of additional property towards the northeast direction.

Advantages

This alternative would provide two new reservoirs with optimal protection against the MCE and the minimum future coating maintenance costs. Each of the two new smaller tanks would remain in service during outage of the other for maintenance.

Disadvantages

The new smaller tanks would be designed to resist the effects of potential additional fracturing of the bedrock foundation, but would not be completely secure from the issues. Some additional property would be required. The service lives and maintenance painting cycles for the bolted tanks would be significantly shorter.

Estimated Initial Capital Cost

The new replacement reservoir would require the following costs to be expended, per additional tank, indexed to the year 2023.

Items	Estimated Comparative Project Budget Cost, Welded, \$	Estimated Comparative Project Budget Cost, Bolted, \$
Sitework and Foundation		
Earthwork, piping, foundation	1,299,000	1,299,000
Structural		
Dome roof	165,000	
Fittings, appurtenances	92,000	
Stairway, ladder, and platform	154,000	134,000
Shell and bottom	337,000	
Bolted tank and fittings		515,000
Overflow and drain	25,000	25,000
Inlet/outlet piping	80,000	80,000
Coatings		
Interior roof coatings	17,000	
Exterior roof coatings	14,000	
Interior shell/bottom coatings	113,000	
Exterior shell coatings	68,000	
Sealant stripe coatings		54,000
Other	44,000	
Project totals	2,408,000	2,107,000

The estimated cost for two tanks would be twice that shown in the table, \$4,816,000 for welded construction and \$4,214,000 for bolted construction.

Reservoir Alternative 3 – New Reservoir

Description

The existing reservoir would be replaced with a new 400,000-gallon reservoir constructed on the same ridge approximately 450 feet north of the existing reservoir. The bolted reservoir version would have a concrete bottom and embedded shell ring.

Advantages

This alternative would provide a new reservoir with an enhanced cone roof. It would provide for optimal protection against the effects of earthquakes and the minimum future coating maintenance costs.

Disadvantages

The new reservoir structure would be secure against future issues with ridgetop fracturing but the connecting piping would still be vulnerable, as it would have to cross the ridge to connect with the site piping at the existing facility. New property would be required for the new reservoir site and connection pipeline. The service life and maintenance painting cycles for the bolted tank would be significantly shorter.

Estimated Initial Capital Cost

The new replacement reservoir would require the following costs to be expended, indexed to the year 2023.

Items	Estimated Comparative Project Budget Cost, Welded \$	Estimated Comparative Project Budget Cost, Bolted \$
Sitework and Foundation		
Earthwork, piping, foundation	1,325,000	2,174,000
Connecting pipeline	325,000	330,000
Structural		
Enhanced cone roof	466,000	
Fittings, appurtenances	93,000	
Stairway, ladder, and platform	112,000	80,000
Shell and bottom	667,000	
Bolted steel reservoir and fittings		725,000
Overflow and drain	21,000	21,000
Inlet/outlet piping	80,000	81,000
Coatings		
Interior roof coatings	65,000	
Exterior roof coatings	41,000	
Interior shell/bottom coatings	162,000	
Exterior shell coatings	74,000	
Sealant stripe coatings		99,000
Other	132,000	
Project totals	3,563,000	3,510,000

Reservoir Alternative 4 – Replacement of Reservoir at Existing Site

Description

The existing reservoir would be replaced by a new reservoir on a new foundation. The new reservoir would have similar dimensions as the existing, but would be anchored to the foundation. The foundation would consist of a thick, reinforced concrete, mat-type foundation with an outer diameter of 50 feet. Since the existing ridge fractures are only about 30 feet apart, the new foundation would extend outside of the fractures and be potentially subject to continuation of sliding from beneath the periphery of the slab.

Advantages

This alternative would provide a new reservoir at the existing site with an enhanced cone roof. It would provide for optimal protection against the MCE and minimum future coating maintenance costs. No additional property would be required.

Disadvantages

The new replacement reservoir would still be subject to future issues with ridgetop fracturing. The new foundation would be designed to resist the effects of potential additional fracturing of the bedrock foundation to the extent feasible, but would not be completely secure from the issues. The probability of the new reservoir to remain in service following a damaging earthquake would be unknown due to the potential sliding away of the foundation rock. The service life and maintenance painting cycles for the bolted tank would be significantly shorter.

Estimated Initial Capital Cost

The new replacement reservoir would require the following costs to be expended, indexed to the year 2023.

Items	Estimated Comparative Project Budget Cost, Welded \$	Estimated Comparative Project Budget Cost, Bolted \$
Sitework and Foundation		
Earthwork, piping, foundation	2,188,000	2,427,000
Connecting pipeline	60,000	61,000
Structural		
Enhanced cone roof	464,000	
Fittings, appurtenances	92,000	
Stairway, ladder, and platform	112,000	80,000
Shell and bottom	665,000	
Bolted steel reservoir and fittings		727,000
Overflow and drain	21,000	21,000
Inlet/outlet piping	80,000	81,000
Coatings		
Interior roof coatings	65,000	
Exterior roof coatings	40,000	
Interior shell/bottom coatings	161,000	
Exterior shell coatings	74,000	

Sealant stripe coatings		99,000
Other	132,000	
Project totals	4,154,000	3,497,000

Other Alternatives Considered

Other alternatives are possible, as variations on the three presented above. As examples, both Alternative 1 and 2 could have phased construction, so that one reservoir is constructed at an earlier date with the second constructed at a later time. These types of refinements could be examined if either of those alternatives are selected for implementation.

Another alternative considered has been the concept of splitting the 400,000 gallons of storage between the Bethany site and a site at lower elevation. This plan would require a new variable speed pumping station at the lower site, with a standby generator and a hydropneumatic pressure tank. The lower site would not be as susceptible to geologic hazards as the Bethany site. If the new Bethany reservoir were to be out of service, then the new system would still provide the storage and pressure needed for continuation of service by use of the variable speed pumping system and hydropneumatics tank. The pumping station would need to be able to pump fire flows. The concept-level cost estimate would be about \$4,000,000 for this type of plan using welded reservoirs. Identification and purchase of a suitable site for the installation would be major time and economic challenges.

ECONOMIC EVALUATION

General

The alternatives can be evaluated for their economic efficiency to provide information about their initial capital costs and comparative long-term economic effectiveness.

Initial Capital Costs

Table A summarizes the initial capital required for each reservoir alternative.

**TABLE A
 SUMMARY OF INITIAL CAPITAL COSTS**

Alternative	Description	Welded \$	Bolted \$
1	Rehabilitate existing reservoir	3,232,000	2,984,000
2	Replace existing reservoir with two new tanks	4,816,000	4,214,000
3	Replace existing reservoir with a new reservoir located further north on the ridge	3,563,000	2,679,000
4	Replace existing reservoir with a new reservoir on existing site	4,154,000	3,497,000

The capital costs for Reservoir Alternatives 2 and 4 are substantially greater than that of Alternatives 1 and 3. Alternative 1 is the rehabilitation strategy, but in order to increase the seismic performance the water height must be reduced, which in turn requires that a second reservoir be constructed to restore the storage volume to 400,000 gallons. Alternative 1 does not mitigate the potential for damage due to ridgetop fracturing.

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Alternative 2 requires construction of two new 200,000-gallon tanks. But, in order to fit on the ridge between two suspected active fractures, the tank shell dimensions become 28 feet in diameter and 48 feet tall. These proportions are inefficient from a seismic performance perspective, resulting in anchored designs on thick concrete slab foundations. For both the welded and bolted versions of Alternative 2, the cost of the foundations would be approximately half of the total cost of the project.

Alternative 3, the replacement strategy at a new site, has the lowest capital cost due to its not having to deal with the ridgetop fracturing potential faced by Alternatives 1 and 2. A replacement reservoir at the site further up the ridge would not have a restricted diameter. The diameter would be selected to optimize resistance to the effects of earthquakes.

Alternative 3 would require additional property, which is not included in the cost estimates. Alternative 2 would require additional property for one of the two potential site layouts.

Alternative 1 has an initial cost competitive with that of Alternative 3, but carries a burden of uncertain performance with respect to potential ridgetop fracturing and lack of a concept for a responsive design. Alternative 4 is in a similar situation, in that it would require a design that does not have a clear basis. Due to these limitations, it is not recommended to continue consideration of Alternatives 1 and 4. Alternative 2 suffers from some of the same limitations as Alternatives 1 and 4, but the plan definition is to construct two tanks of relatively small diameter to fit between potential ridge fractures, which would be a more responsive design than that of Alternative 1.

Long-Term Economic Effectiveness

The present worth calculation has been selected as an indicator of economic efficiency over a study period of 200 years. The economic study period for facilities such as reservoirs is typically 50 years or greater, depending on the objectives of the evaluation. The Environmental Protection Agency recommends a range of 50 to 100 years. For this evaluation, a study period of 200 years is recommended because this length of time represents the minimum estimated service life of a welded steel reservoir with advanced design features.

The service life of a bolted tank has been assumed at 40 years for versions that use the conventional bolted tank floors and 50 years for tanks that can use reinforced concrete floors. These are aggressive estimates for service lives but both can be realized with suitable design and construction details. Both of these service life estimates assume advanced corrosion protection measures such as sealant strips for plate edges, bolt head encapsulation, and periodic maintenance painting of the interior surfaces. Without these measures, service lives will be in the range of 15 to 20 years, based upon observations of existing bolted steel tanks.

The "present worth" can be visualized as the lump sum payment at year 2024 necessary to provide for all the capital, maintenance, and replacement costs necessary to implement and sustain operation of each alternative over the 200-year study period 2024-2224. Alternatives that produce comparatively low present worth values are more cost-effective than those that yield higher values.

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The present worth values have been calculated using a minimum attractive rate of return of 6.0 percent. This rate has been set based upon the average annual yield of ten-year term treasury securities over the 1963 to 2022 period. Treasury bonds are an available alternative investment for the District ratepayers.

An annual inflation rate of 4.5 percent has been used for reservoir construction. An analysis has been made of historic construction costs using the Engineering News-Record 20 Cities Average Construction Cost Index. Between 1963 and 2022 this index increased at an annual compounded rate of 4.5 percent.

Although bond interest and inflation rates have been extremely low for last several years due to intense stimulation of the economy by the Federal Reserve Board, the long-term data show that the influence of recessions, economic policies, and other economic factors have relatively transitory effects on the long-term average rate.

Table B contains the results of the present worth analysis. The table illustrates the long-term cost impact of the greater effort for coatings maintenance and structure replacements anticipated for the bolted tank alternatives. Alternative 3, with bolted construction, has the lowest initial cost in Table A, but loses this advantage to its twin welded Alternative 3 when the long-term costs are considered.

**TABLE B
RESULTS OF ECONOMIC ANALYSIS
PRESENT WORTH METHOD**

Alternative	Description	Welded, \$	Bolted, \$
2	Replace existing reservoir with two new tanks	5,447,000	6,432,000
3	Replace existing reservoir with a new reservoir located further north on the ridge	4,151,000	5,005,000

Tables 2W, 2B, 3W, and 3B at the end of this memorandum contain the detailed economic analysis calculations.

EVALUATION OF ADDITIONAL FACTORS

General

Not all decision factors can be expressed in economic terms. To assist in evaluation of the two alternatives a brief review of non-economic factors is summarized in the following paragraphs. These factors have been contributed by the District staff during its review of an initial draft of this memo. Also included are factors that are difficult to evaluate for economic impacts at this stage of project development.

- Property acquisition
- Environmental processes
- System hydraulic conditions

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- Facilitation of maintenance activities
- Construction sequences and duration

Property Acquisition

Alternative 3 will involve acquisition of property from two different land owners. The process for acquisition will extend the times for design and construction. Due to the uncertainties about the cost of property, the costs have not been included in the project cost estimates. Alternative 2 can be implemented without acquisition of additional property if the site of the existing tank is used for one of the two tanks. If the two replacement tanks are located to the northeast from the existing tank, in the space now occupied by the two auxiliary tanks, some property acquisition may be necessary to fit the two new tanks within the expanded property lines.

Environmental Processes

Alternative 3 will require a full environmental review at a site that is relatively undisturbed at the present time. The review and subsequent environmental process will require time and budget. The costs for the environmental processes have not been included in the project cost estimates. Alternative 2 is expected to require environmental review, but the project is expected to be considered a system maintenance and replacement project.

System Hydraulic Conditions

Alternative 2 will provide two separate reservoirs with higher operating water surface elevations than will exist for Alternative 3. The higher water surfaces elevations will provide additional service pressure that is needed for the pumps that serve the next higher service zone.

Facilitation of Maintenance Activities

Alternative 2 will provide two tanks for service. This will allow one to be taken out of service for inspection and maintenance of the other. Alternative 3 does not provide this feature.

Construction Sequences and Durations

Between Alternatives 2 and 3, Alternative 3 provides the greatest possibility for project delay and an extended construction period. In addition, construction of Alternative 3 at a new site offers more opportunity for discovery of unknown conditions. The environmental review processes and mitigation measures will typically add substantial time and expense to this type of project. The time requirements for a full environmental review process can add a year or more to a project implementation schedule.

PROJECT SELECTION

Based upon review of the economic and additional factors, the District staff has selected Alternative 2, replacement with two new tanks, for implementation.

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Development of an appropriate design will be dependent on geologic and geotechnical engineering work to locate the ridge fractures, assess their potential future movements, and establish geotechnical and structural design criteria for the tank foundations. This geologic and geotechnical work should be the first activity during the next phase of the project to confirm the technical basis for implementation of Alternative 2.

TABLE 2W
ECONOMIC ANALYSIS FOR ALTERNATIVE 2-WELDED
Present Worth Method

Item	Description	Year	2023 Cost	Rate of Inflation	Present Worth
1	Const Welded Tan	2024	2,408,000	4.50	2,516,360
2	Recoat Welded Re	2064	174,000	4.50	102,821
3	Recoat Welded Re	2104	174,000	4.50	58,143
4	Recoat Welded Re	2144	174,000	4.50	32,879
5	Recoat Welded Re	2184	174,000	4.50	18,592
	Residual Value	2224	87,000	4.50	-5,257
6	Const Welded Tan	2024	2,408,000	4.50	2,516,360
7	Recoat Welded Ta	2064	174,000	4.50	102,821
8	Recoat Welded Ta	2104	174,000	4.50	58,143
9	Recoat Welded Ta	2144	174,000	4.50	32,879
10	Recoat Welded Ta	2184	174,000	4.50	18,592
	Residual Value	2224	87,000	4.50	-5,257
TOTAL PRESENT WORTH					5,447,078
Capital and Replacement Cost Items			5,032,720		
Energy Cost Items			0		
Operation and Maintenance Cost Items			424,871		
Revenue and Benefit Items			-10,514		
Total			5,447,078		

Minimum Attractive Rate of Return - 6.00 Percent
Study Life - 200 Years First Year of Study - 2024
File Identifier - BETH2W
File Date - 10/6/2023

TABLE 2B
ECONOMIC ANALYSIS FOR ALTERNATIVE 2-BOLTED
Present Worth Method

Item	Description	Year	2023 Cost	Rate of Inflation	Present Worth
1	Const Bolted Tan	2024	2,107,000	4.50	2,201,815
2	Recoat Bolted Ta	2044	130,000	4.50	102,157
3	Replace Bolted T	2064	703,000	4.50	415,421
4	Recoat Bolted Ta	2084	130,000	4.50	57,768
5	Replace Bolted T	2104	703,000	4.50	234,912
6	Recoat Bolted Ta	2124	130,000	4.50	32,666
7	Replace Bolted T	2144	703,000	4.50	132,838
8	Recoat Bolted Ta	2164	130,000	4.50	18,472
9	Replace Bolted T	2184	352,000	4.50	37,612
	Residual Value	2224	290,000	4.50	-17,523
10	Const Bolted Tan	2024	2,107,000	4.50	2,201,815
11	Recoat Bolted Ta	2044	130,000	4.50	102,157
12	Replace Bolted T	2064	703,000	4.50	415,421
13	Recoat Bolted Ta	2084	130,000	4.50	57,768
14	Replace Bolted T	2104	703,000	4.50	234,912
15	Recoat Bolted Ta	2124	130,000	4.50	32,666
16	Replace Bolted T	2144	703,000	4.50	132,838
17	Recoat Bolted Ta	2164	130,000	4.50	18,472
18	Replace Bolted T	2184	352,000	4.50	37,612
	Residual Value	2224	290,000	4.50	-17,523
TOTAL PRESENT WORTH					6,432,279
Capital and Replacement Cost Items			4,403,630		
Energy Cost Items			0		
Operation and Maintenance Cost Items			2,063,694		
Revenue and Benefit Items			-35,045		
Total			6,432,279		

Minimum Attractive Rate of Return - 6.00 Percent
Study Life - 200 Years First Year of Study - 2024
File Identifier - BETH2F
File Date - 10/6/2023

TABLE 3W
 ECONOMIC ANALYSIS FOR ALTERNATIVE 3-WELDED
 Present Worth Method

Item	Description	Year	2023 Cost	Rate of Inflation	Present Worth
1	Const Welded Res	2024	3,563,000	4.50	3,723,335
2	Recoat Welded Re	2064	359,000	4.50	212,143
3	Recoat Welded Re	2104	359,000	4.50	119,962
4	Recoat Welded Re	2144	359,000	4.50	67,836
5	Recoat Welded Re	2184	359,000	4.50	38,360
	Residual Value	2224	180,000	4.50	-10,876
TOTAL PRESENT WORTH					4,150,760
Capital and Replacement Cost Items			3,723,335		
Energy Cost Items			0		
Operation and Maintenance Cost Items			438,301		
Revenue and Benefit Items			-10,876		
Total			4,150,760		

Minimum Attractive Rate of Return - 6.00 Percent
 Study Life - 200 Years First Year of Study - 2024
 File Identifier - BETH3W
 File Date - 10/6/2023

TABLE 3B
ECONOMIC ANALYSIS FOR ALTERNATIVE 3-BOLTED
Present Worth Method

Item	Description	Year	2023 Cost	Rate of Inflation	Present Worth
1	Const Bolted Tan	2024	3,510,000	4.50	3,667,950
2	Recoat Bolted Ta	2044	458,000	4.50	359,907
3	Replace Bolted T	2074	805,000	4.50	412,509
4	Recoat Bolted Ta	2094	458,000	4.50	176,487
5	Replace Bolted T	2124	805,000	4.50	202,281
6	Recoat Bolted Ta	2144	458,000	4.50	86,543
7	Replace Bolted T	2174	805,000	4.50	99,192
TOTAL PRESENT WORTH					5,004,868
Capital and Replacement Cost Items			3,667,950		
Energy Cost Items			0		
Operation and Maintenance Cost Items			1,336,918		
Revenue and Benefit Items			0		
Total			5,004,868		

Minimum Attractive Rate of Return - 6.00 Percent
Study Life - 200 Years First Year of Study - 2024
File Identifier - BETH3B
File Date - 10/6/2023

SUMMARY
SUMMARY REPORT
Present Worth Method

Alternative	Present Worth
ALTERNATIVE 2-WELDED	5,447,078
ALTERNATIVE 2-BOLTED	6,432,279
ALTERNATIVE 3-WELDED	4,150,760
ALTERNATIVE 3-BOLTED	5,004,868

Study Life - 200 Years First Year of Study - 2024
Minimum Attractive Rate of Return - 6.00 Percent