Appendix C - 2017 Northwest Treatment Plant Business Case Evaluation (WIFIA)

City of Wichita Public Works and Utilities

Utilities Optimization Program

Appendix E

Northwest Water Treatment Business Case Evaluation

February 2017

Submitted to:

CITY OF WICHITA

Public Works and Utilities

Submitted by:

ch2m

In Association with:

TRC TABLE ROCK CAPITAL®

Goldman Sachs

Appendix E—Northwest Water Business Case Evaluation

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DATE:	February 28, 2017
PROJECT NUMBER:	668927

1. Introduction

The City of Wichita, Water Production and Pumping Division (Utility), uses a Business Case Evaluation (BCE) process for making balanced decisions related to important capital investments regarding asset rehabilitation, renewal, or replacement options. The BCE process provides a framework for evaluating alternative solutions for every capital project and evaluates those solutions against financial, environmental, and community and social values and benefits. The goal of the BCE process is to make consistent and defendable decisions regarding capital investment that meet the Utility's strategic plan and are in the best interest of the Utility customers. Once the BCE process is completed for a given capital investment, the project stakeholders will present the BCE recommendations to Utility management and, possibly, City Council for approval. Once approved, the BCE recommendations will be incorporated into the Utility's normal 10-year Capital Improvement Program (CIP) process for budgeting and scheduling. The BCE recommendations would then be implemented according to the CIP budget and schedule.

It is important to note that if the project were to experience significant changes, then a new BCE process, including updating project costs, should be completed. For example, if parameters such regulatory requirements change, performance and/or capacity requirements change, or site location and/or characteristics change, then alternatives for the project should be reevaluated to determine the best solution meeting the revised project scope. Also, project CIP budget and schedule should be revised accordingly. The Utility should consider a change in direction if it provides increased value to the community.

2. Project Background

CH2M is assisting the City of Wichita Utility with developing a Water and Sewer Utility Asset Management Plan that includes utility optimization and exploring alternative finance and project delivery options. While completing the project, if assets were found to be of high risk and potential imminent failure, then they were to be considered for immediate action or improvements. A series of high-risk assets of the water utility includes the East Water Quality Reclamation Facility (WQRF) located at the Main WQRF. The Main WQRF consists of the following main treatment components:

- **East WQRF, 30-million gallons per day (MGD) capacity—**aeration, rapid mix, flocculation, and softening and clarification
- **Central WQRF, 130-MGD capacity—**aeration, rapid mix, flocculation, and softening and clarification

- **Combined treatment, 160-MGD capacity—**instrumentation, chemical feed, filtration, disinfection, finished water storage and pumping, internal site pumping, and lime solids handling
- **Combined facilities—**electrical and control systems, heating/ventilation/air conditioning (HVAC) systems, plumbing systems, laboratory, administrative offices, maintenance facilities, and site and piping

The Main WQRF was originally built in 1940, and the treatment basin structures making up the East WQRF are approximately 75 years old. The East WQRF is a critical treatment component because these facilities provide added capacity and treatment flexibility during peak water demands. Currently, the treatment basins and equipment are at the end of their useful life with an average condition score of 4.68 out of 5.00. The poor condition score, which indicates a high likelihood of failure, coupled with the critical nature of the East WQRF and high consequence of failure, results in high overall risk. Due to the risk nature of the East WQRF, this high-level BCE was completed to develop an improvement strategy to minimize asset risk.

Asset condition scores are based on previous evaluation methodologies developed and adopted by the City Utility during the 2013 capacity, management, operations, and maintenance (CMOM) assessment. Investment considerations should include capital investment costs, as well as operations and maintenance (O&M) costs for true life-cycle cost consideration.

3. Improvement Alternatives—Decision Modeling

Improvement alternatives need to be adequately sized to meet current and projected future average-day and peak-day water demands. For this BCE, the current average-day and peak-day water demands assumed to be 60 MGD and 120 MGD, respectively. The projected future average-day and peak-day water demands are anticipated to be 80 MGD and 160 MGD, respectively. In addition to considering treatment capacity needed, improvement alternatives should also consider implementation and life-cycle costs over the 40-year planning period. The 12 improvement alternatives shown in Table 3-1 currently are being considered. With the improvement alternatives identified, decision modeling criteria, cost estimating, and evaluation of the improvement alternatives benefit-to-cost ratios should be completed.

For this BCE, decision modeling criteria pertaining to regulatory compliance, public confidence (disruptions and complaints), fiscal impact, environmental and public health impacts, system reliability, and employee health and safety were developed and weighted with respect to each other. These criteria will be used to determine which alternative provides the highest benefit to the Utility and its customers. The decision modeling criteria and weighting are shown in Table 3-2.

Table 3-1. Improvement Alternatives

Alternative No.	NW WQRF	East WQRF	Central WQRF	Main WQRF
1	No NW WQRF	30-MGD basin repair by 2020	130-MGD basin repair by 2037	160-MGD rehabilitation by 2039
2	80 MGD, year 2036 online	30-MGD basin repair by 2020	130-MGD basin repair by 2037	160-MGD rehabilitation by 2039
3	80 MGD, year 2023 online	30-MGD basin repair by 2020	130-MGD basin repair by 2037	160-MGD rehabilitation by 2039
4	120 MGD, year 2036 online	30-MGD basin repair by 2020	130-MGD basin repair by 2037	160-MGD rehabilitation by 2039

Table 3-1. Improvement Alternatives

Alternative No.	NW WQRF	East WQRF	Central WQRF	Main WQRF
5	120 MGD, year 2023 online	30-MGD basin repair by 2020	130-MGD basin repair by 2037	160-MGD rehabilitation by 2039
6	120 MGD, year 2023 online	80-MGD basin expansion by 2020	80-MGD basins by 2037	160-MGD rehabilitation by 2039
7	80 MGD, year 2036 online	80-MGD basin expansion by 2020	80-MGD basins by 2037	160-MGD rehabilitation by 2039
8	80 MGD, year 2023 online	80-MGD basin expansion by 2020	80-MGD basins by 2037	160-MGD rehabilitation by 2039
9	80 MGD, year 2023 online	80-MGD basin expansion by 2020, 80 MGD Filtration by 2049	80-MGD basins and filtration by 2039	Eliminate WQRF by 2049, replaced with NW, East, and Central WQRFs
10	120 MGD, year 2023 online	30-MGD basin repair by 2020	90-MGD basins by 2037	120-MGD rehabilitation by 2039
11	120 MGD, year 2023 online	30-MGD basin repair by 2020; eliminate facility in 2039	Eliminate facility in 2039	Construct entirely new 120-MGD WQRF by 2039 to replace East and Central WQRFs
12	160 MGD, year 2023 online	30-MGD basin repair by 2020; eliminate facility in 2039	Eliminate facility in 2039	Construct entirely new 80-MGD WQRF by 2039 to replace East and Central WQRFs

Table 3-2. Decision Modeling Criteria Weighting

	Project Service Criteria	A Regulatory Compliance	B Public Confidence	C Fiscal Impact	D Environmental and Public Health Impact	E System Reliability	F Employee Health and Safety	Total Scores	Weighting Percentage	Relative Weights
A	Regulatory Compliance	A	4	5	3	4	4	20	22.22	22.22
B	Public Confidence	2	B	5	2	2	4	15	16.67	16.67
C	Fiscal Impact	1	1	C	1	1	1	5	5.56	5.56
D	Environmental and Public Health Impact	3	4	5	D	3	4	19	21.11	21.11
E	System Reliability	2	4	5	3	E	4	18	20.00	20.00
F	Employee Health and Safety	2	2	5	2	2	F	13	14.44	14.44
Totals								**90**	**100.00**	**100**

4. Improvement Alternatives—Cost Estimating

Improvement alternative life-cycle cost estimates are typically critical decision points in determining which improvement alternative is the best solution to the problem. The life-cycle cost needs to be developed as accurately as possible; however, during most BCE evaluations, improvement alternatives are evaluated during the project's conceptual screening or feasibility stages.

The Association for the Advancement of Cost Engineering International (AACE) International (AACE International) guidelines should be used when developing cost estimates and understanding the cost estimate class and corresponding accuracy. Table 4-1 AACE Cost Estimate Classification System describes each cost estimate class and accuracy.

Table 4-1. AACE International Cost Estimate Classification System

Estimate Class	Estimate Purpose	Level of Project Definition	Expected Accuracy Range
Class 5	Concept Screening	0% to 2%	-50% to +100%
Class 4	Study or Feasibility	1% to 15%	-30% to + 50%
Class 3	Preliminary Budget Authorization or Control	10% to 40%	-20% to +30%
Class 2	Detailed Budget Authorization or Control	30% to 70%	-15% to +20%
Class 1	Bidding Estimate	50% to 100%	-10% to 15%

Final project costs and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, continuity of personnel and engineering, and other variable factors. However, to be able to compare improvement alternatives fairly, as well as projects competing for limited available funding, the following cost guidelines were used:

- **Project capital costs:**
  - Vendor quotes and recent bid unit pricing when practical
  - Additional project costs—costs calculated as a percentage of the project cost using the following markups; the percentage ranges depending on project characteristics and level of detail:
    - Overall site work—1 to 5 percent
    - Yard electrical—3 to 7 percent
    - Yard piping—3 to 9 percent
    - Supervisory control and data acquisition (SCADA) control systems—0 to 2 percent
  - Contractor mark-ups—costs calculated as a percentage applied to the sum of the project costs including additional project costs; the following contractor mark-ups are used and applied cumulatively in the following order:
    - Overhead—10 percent
    - Profit—5 percent
    - Mobilization, bonds, and insurance—5 percent
    - Construction contingency—15 to 50 percent
  - Non-construction project costs—costs calculated as a percentage applied to the sum of the project costs, additional project costs, and contractor mark-ups; the following non-construction costs are typically used and are not applied cumulatively:

  - City internal costs—3 to 13 percent
  - Permitting—1 to 3 percent
  - Engineering and design—8 to 12 percent
  - Services during construction—8 to 12 percent
  - Commissioning and start-up—1 to 5 percent
  - Legal and administration—1 to 3 percent
  - Project financing costs—5 to 10 percent
- Other assumptions:
  - Annual discount rate—5.5 percent
  - Typical financing cost—8. percent
  - Annual inflation rate—3.0 percent
  - Typical project service life—20 to 30 years
  - Typical financing term—20 to 30 years

- **Project O&M costs:**
  - Average labor rate (includes benefits)— $30 per hour
  - Cost of power—$0.07 per kilowatt-hour
  - Cost of chemicals—vendor quotes used

5. Improvement Alternative Evaluations

5.1 Benefit Scoring

With the improvement alternatives identified, the benefits of each alternative have been scored based on the decision criteria categories with respect to one another. The scores are then normalized based on the criteria weighting determined in Section 3. Tables 5-1 and 5-2 shows the results of the benefit scoring. Using the results of Tables 5-1 and 5-2, Figure 5-1 was developed. From this graphic, which alternative is most attractive from a benefit scoring perspective is easily determined. Figure 5-1 depicts benefits only and does not include any life-cycle cost information that will be compared in the next subsection.

Table 5-1. Evaluation of Alternatives—Raw Benefit Scores

Criteria		Alternatives—Raw Scores											
		Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**	**Alternative 6**	**Alternative 7**	**Alternative 8**	**Alternative 9**	**Alternative 10**	**Alternative 11**	**Alternative 12**
A	Regulatory Compliance	3.50	7.50	7.50	9.50	9.50	10.00	8.00	8.00	9.60	9.00	9.00	8.00
B	Public Confidence	1.00	6.00	8.00	6.00	10.00	10.00	6.00	8.00	8.00	10.00	10.00	10.00
C	Fiscal Impact	8.00	6.00	8.00	6.00	8.00	6.00	4.00	6.00	4.00	6.00	10.00	10.00
D	Environmental and Public Health Impact	1.00	4.00	6.00	6.00	8.00	8.00	4.00	6.00	6.00	8.00	8.00	10.00
E	System Reliability	0.00	5.00	5.00	7.50	7.50	7.50	5.00	5.00	10.00	7.50	7.50	5.00
F	Employee Health and Safety	1.00	4.00	6.00	6.00	8.00	8.00	4.00	6.00	6.00	8.00	8.00	10.00
	Totals	**14.5**	**32.5**	**40.5**	**41**	**51**	**49.5**	**31**	**39**	**43.6**	**48.5**	**52.5**	**53**

Table 5-2. Evaluation of Alternatives—Weighted Benefit Scores

Criteria		Alternatives—Weighted Benefit Scores											
		Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**	**Alternative 6**	**Alternative 7**	**Alternative 8**	**Alternative 9**	**Alternative 10**	**Alternative 11**	**Alternative 12**
A	Regulatory Compliance	0.78	1.67	1.67	2.11	2.11	2.22	1.78	1.78	2.13	2.00	2.00	1.78
B	Public Confidence	0.17	1.00	1.33	1.00	1.67	1.67	1.00	1.33	1.33	1.67	1.67	1.67
C	Fiscal Impact	0.44	0.33	0.44	0.33	0.44	0.33	0.22	0.33	0.22	0.33	0.56	0.56
D	Environmental and Public Health Impact	0.21	0.84	1.27	1.27	1.69	1.69	0.84	1.27	1.27	1.69	1.69	2.11
E	System Reliability	0.00	1.00	1.00	1.50	1.50	1.50	1.00	1.00	2.00	1.50	1.50	1.00
F	Employee Health and Safety	0.14	0.58	0.87	0.87	1.16	1.16	0.58	0.87	0.87	1.16	1.16	1.44
	Totals	**1.74**	**5.42**	**6.58**	**7.08**	**8.57**	**8.57**	**5.42**	**6.58**	**7.82**	**8.34**	**8.57**	**8.56**

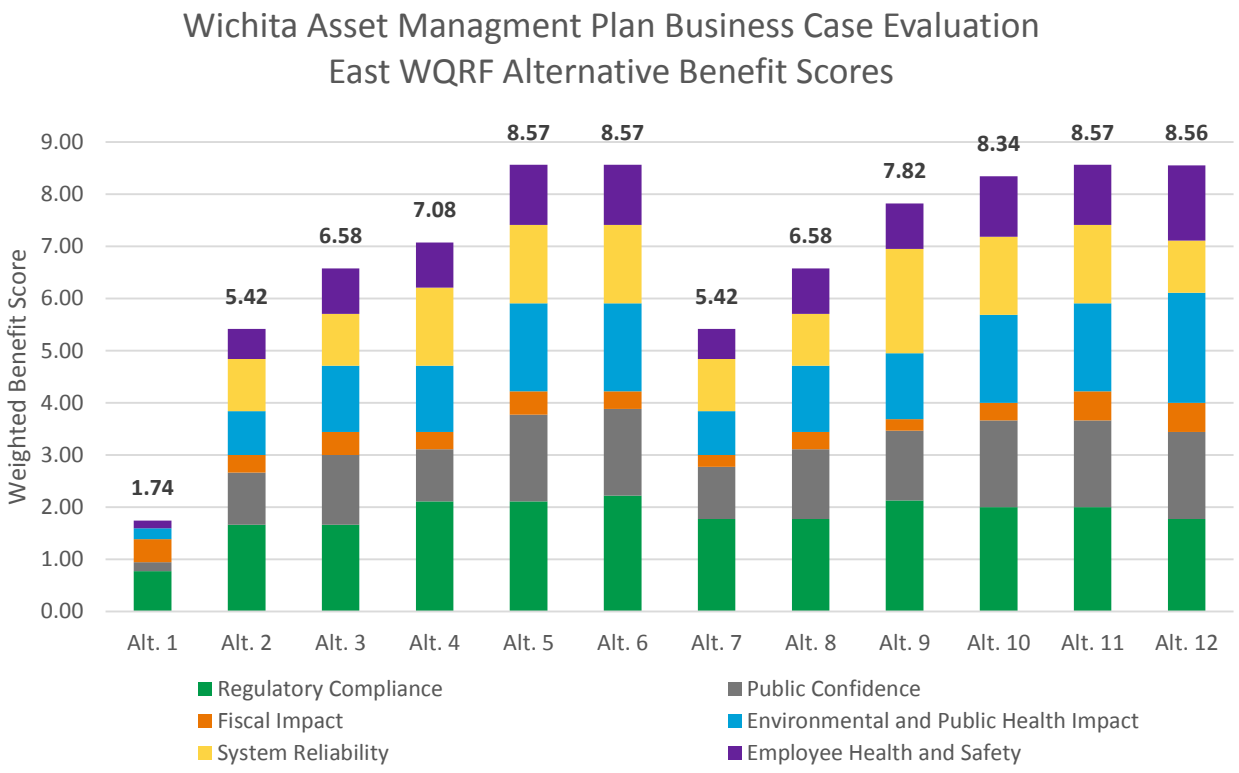


Figure 5-1. Normalized Project Service Benefit Scores

5.2 Benefit-to-Net Present Value Scoring

The improvement alternatives are compared based on the immediate project capital cost, long-term present value (PV) of capital costs associated with 20 years of proposed master plan projects, and the PV of associated long-term annual O&M cost. The total PV cost can be normalized based on the lowest priced alternative and a benefit-to-normalized PV score ratio can be established for each alternative. Attachment A presents a table of total PV and benefit-to-PV ratios. A higher benefit-to-normalized PV score indicates a higher benefit per dollar spent for a given alternative. Figure 5-2 represents how different alternatives are evaluated.

The improvement alternatives can be additionally compared based on the PV to total, firm, and redundant plant treatment capacities. Total treatment capacity is the total amount of treatment online assuming all equipment operating. Firm treatment capacity is the amount of treatment capacity online assuming the single largest treatment train is nonfunctional, either due to routine maintenance or an emergency event. Redundant plant treatment capacity is the available total capacity of completely independent treatment plants assuming the largest plant is nonfunctional either due to routine maintenance or an emergency event. Figure 5-3 represents how different alternatives are evaluated.

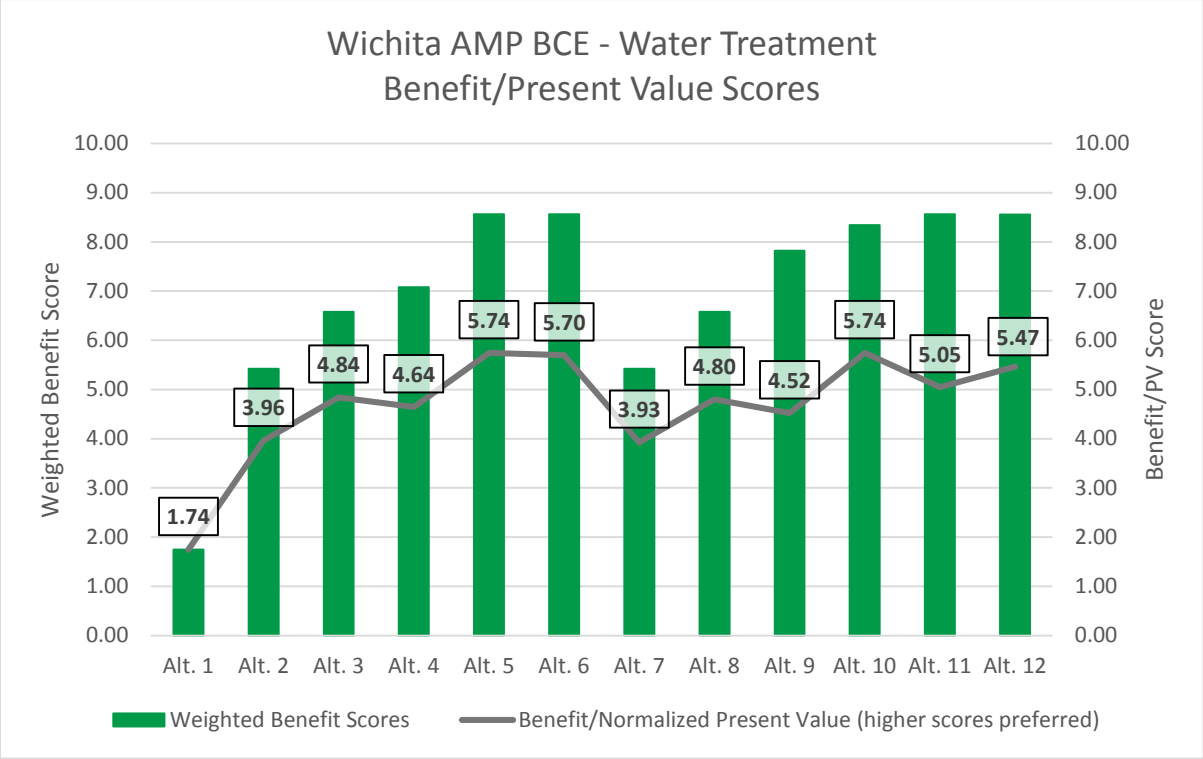


Figure 5-2. Benefit Scores and Benefit/NPV for Improvement Alternatives

5.3 Probability of Consequence Scoring

Each alternative should be evaluated for risk or probability of a consequence of failure occurring. Table 5-3 indicates the possible consequences being considered, an example of an event that could create a failure and therefore the consequence to occur, and the methodology used to develop the probability of the consequence of failure. Figure 5-4 represents the probability of consequence occurring throughout the 40-year planning period for each improvement alternative.

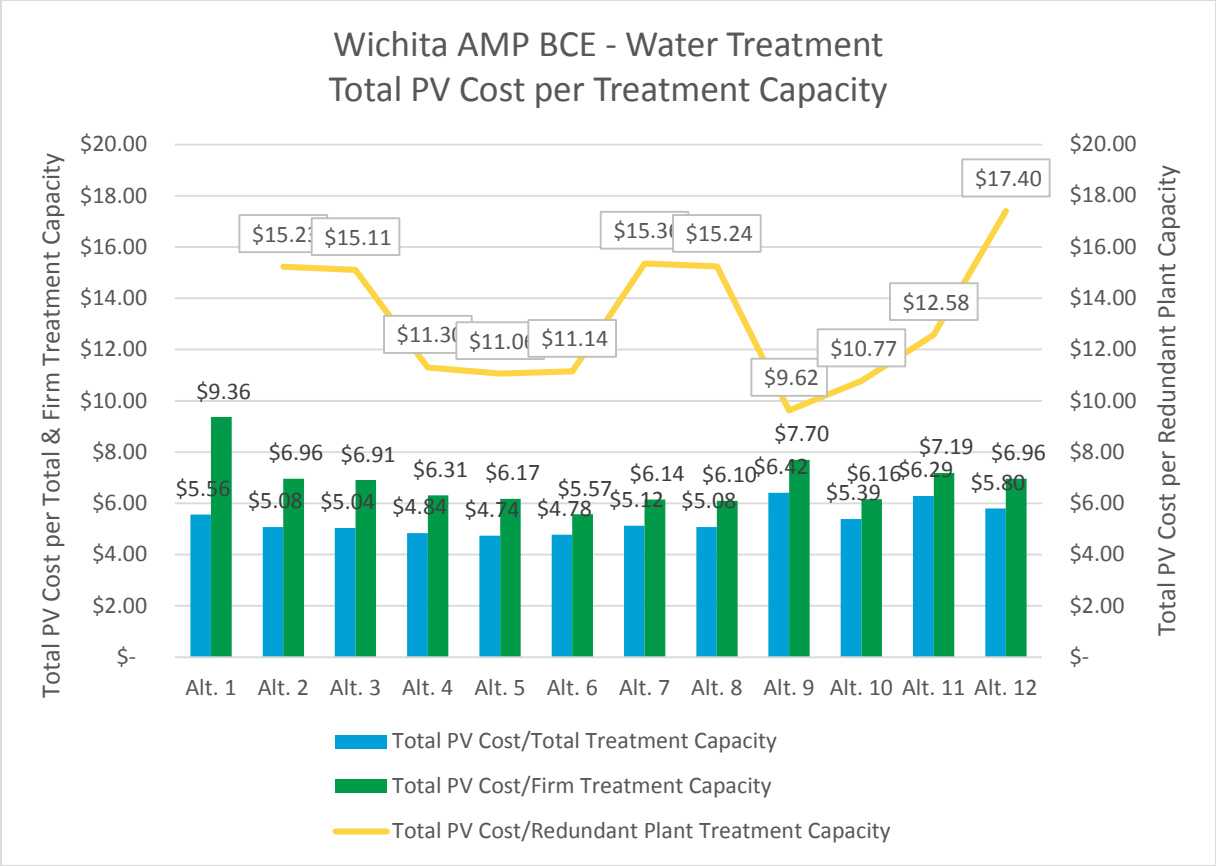


Figure 5-3. Total PV Cost per Treatment Capacity for Improvement Alternatives

Table 5-3. Probability of Consequence Methodology

Consequence	Example of Events	Probability Methodology
Permit violation	THMs, NTUs, lime solids release	1 percent probability, multiple facilities lower probability
Temporary Reduced Capacity, less than 160-MGD peak	Critical equipment failures, piping failure	Equipment 2 to 10 percent based on age, adequate firm capacity lowers probability
Temporary reduced capacity, less than 80 MGD average	Major and/or multiple critical equipment failures, piping failure	Equipment 1.5 to 7.5 percent based on age, multiple facilities lower probability
Out of service, 1 day to 2 weeks	Chemical delivery and/or accident, flood basement, raw piping failure	Chemical 0.5 percent, equipment 0.5 to 5 percent based on age, multiple facilities lower probability
Out of service, more than 2 weeks	Tornado, critical fire, terrorism	Tornado 0.1 percent, fire 0.1 to 2 percent based on age, terrorism 0.1 percent, multiple facilities lower probability

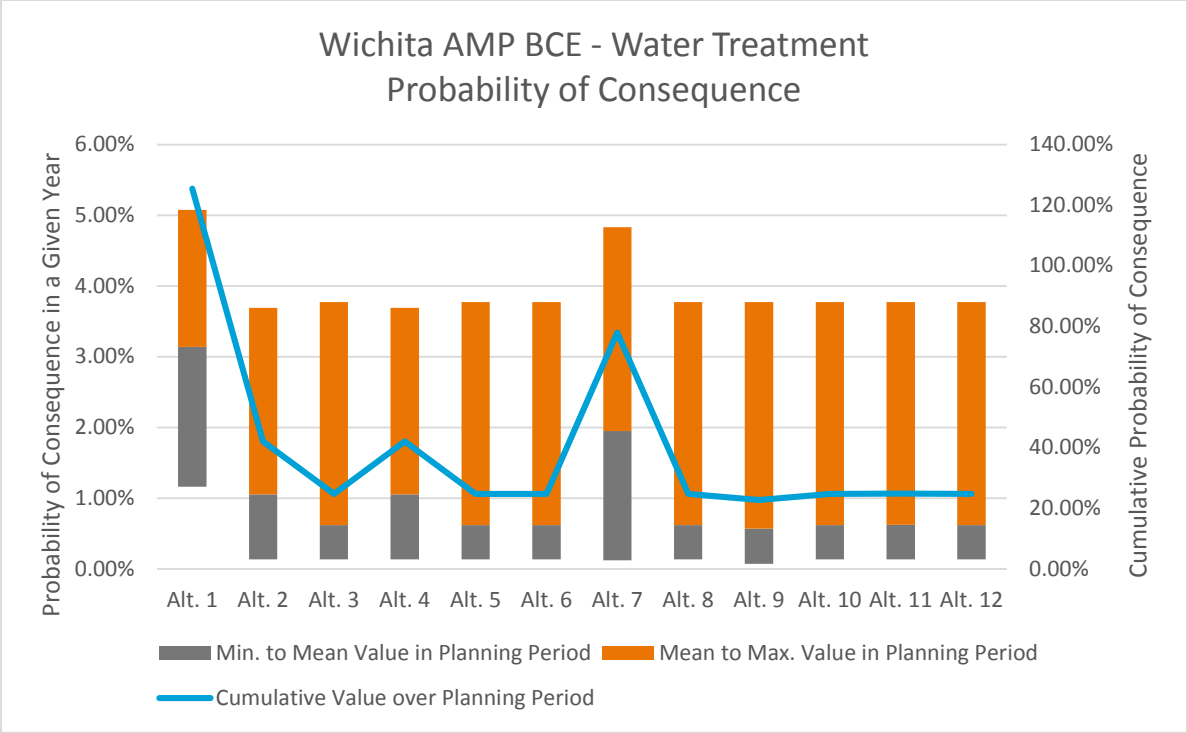


Figure 5-4. Probability of Consequence

6. Conclusions

Reviewing the East WQRF, it is apparent that the equipment and structure have reached the end of their useful life with an average condition score of 4.68 out of 5.00. This is indicated by the risk scoring that portrays a 90-percent probability of failure which may be considered complete failure of that component of the treatment system.

The BCE considered twelve improvement strategies based on the following:

- Total, firm, and redundant plant treatment capacity
- Non-economic benefit scoring
- Probability of consequence
- Total PV
- Various ratios of scores and total PV

Table 6-1 represents a ranking score, 1 through 12, for each improvement alternative and BCE evaluation criteria. When comparing improvement alternatives to each other, the improvement alternative with the best score received a ranking of 1.

The results indicate that improvement alternatives that implement a new NW WQRF early are favorable to improvement alternatives that implement the NW WQRF later. The top three scoring improvement alternatives all favor an early 120-MGD NW WQRF while improvement alternatives scored fourth and fifth indicate an early 80-MGD NW WQRF. The sixth scoring improvement alternative was the first improvement alternative favoring a late delivery of the NW WQRF. Table 6-2 summarizes the top-six scoring improvement alternatives.

Table 6-1. Ranking of Improvement Alternatives

BCE Evaluation Criteria	Rankings											
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**	**Alternative 6**	**Alternative 7**	**Alternative 8**	**Alternative 9**	**Alternative 10**	**Alternative 11**	**Alternative 12**
Total plant capacity	12	4	4	1	1	1	4	4	4	4	4	4
Firm plant capacity	12	10	10	2	2	1	6	6	6	4	4	6
Redundant plant capacity	12	7	7	2	2	2	7	7	1	2	2	7
Benefit	12	10	8	7	1	1	10	9	6	5	1	4
Cumulative probability of consequence	12	9	2	9	2	2	11	2	1	2	8	2
Total PV	1	3	2	9	7	8	5	4	12	6	11	10
Total PV/total plant capacity	9	5	4	3	1	2	7	6	12	8	11	10
Total PV/firm plant capacity	12	9	7	6	5	1	3	2	11	4	10	8
Total PV/redundant plant capacity	12	8	7	5	3	4	10	9	1	2	6	11
Benefit/normalized total PV	12	10	6	8	1	3	11	7	9	2	5	4
Total PV/benefit	12	10	6	8	1	3	11	7	9	2	5	4
Cumulative probability of construction times normalized total PV	12	9	1	10	4	5	11	2	7	3	8	6
Total PV/cumulative probability of consequence	12	7	1	10	4	5	11	2	8	3	9	6
Noneconomic total ranking scores	60	40	31	21	8	7	38	28	18	17	19	23
Economic total ranking scores	82	61	34	59	26	31	69	39	69	30	65	59
Total rank scores	142	101	65	80	34	38	107	67	87	47	84	82
Noneconomic rank	**12**	**11**	**9**	**6**	**2**	**1**	**10**	**8**	**4**	**3**	**5**	**7**
Economic rank	**12**	**8**	**4**	**6**	**1**	**3**	**10**	**5**	**10**	**2**	**9**	**6**
Overall rank	**12**	**10**	**4**	**6**	**1**	**2**	**11**	**5**	**9**	**3**	**8**	**7**

Table 6-2. Improvement Alternatives listed in Rank Order

Alternative No.	NW WQRF	East WQRF	Central WQRF	Main WQRF
5: 1 in scoring	120 MGD, year 2023 online	30-MGD basin repair by 2020	130-MGD basin repair by 2037	160-MGD rehabilitation by 2039
6: 2 in scoring	120 MGD, year 2023 online	80-MGD basin expansion by 2020	80-MGD basins by 2037	160-MGD rehabilitation by 2039
10: 3 in scoring	120 MGD, year 2023 online	30-MGD basin repair by 2020	90-MGD basins by 2037	120-MGD rehabilitation by 2039
3: 4 in scoring	80 MGD, year 2023 online	30-MGD basin repair by 2020	13- MGD basin repair by 2037	160-MGD rehabilitation by 2039
8: 5 in scoring	80 MGD, year 2023 online	80-MGD basin expansion by 2020	80-MGD Basins by 2037	160-MGD rehabilitation by 2039
4: 6 in scoring	120 MGD, year 2036 online	30-MGD basin repair by 2020	130-MGD basin repair by 2037	160-MGD rehabilitation by 2039
12: 7 in scoring	160 MGD, year 2023 online	30-MGD basin repair by 2020, eliminate facility in 2039	Eliminate facility in 2039	Construct entirely new 80-MGD WQRF by 2039 to replace East and Central WQRFs
11: 8 in scoring	120 MGD, year 2023 online	30-MGD basin repair by 2020, eliminate facility in 2039	Eliminate facility in 2039	Construct entirely new 120-MGD WQRF by 2039 to replace East and Central WQRFs
9: 9 in scoring	80 MGD, year 2023 online	80-MGD basin expansion by 2020, 80-MGD filtration by 2049	80-MGD basins and filtration by 2039	Eliminate facility by 2049, Replaced by NW, East, and Central WQRFs
2: 10 in scoring	80 MGD, year 2036 online	30-MGD basin repair by 2020	130-MGD basin repair by 2037	160-MGD rehabilitation by 2039
7: 11 in scoring	80 MGD, year 2036 online	80-MGD basin expansion by 2020	80-MGD Basins by 2037	160-MGD rehabilitation by 2039
1: 12 in scoring	No NW WQRF	30-MGD basin repair by 2020	130-MGD basin repair by 2037	160-MGD rehabilitation by 2039

Attachment A
Supporting Documents

Wichita AMP BCE Decision Modeling - Water Treatment

Non-Monetary Decision Criteria and Weights

	Project Service Criteria	A Regulatory Compliance	B Public Confidence	C Fiscal Impact	D Environmental and Public Health Impact	E System Reliability	F Employee Health and Safety	Total Scores	Weighting Percentage	Relative Weights
A	Regulatory Compliance	A	4	5	3	4	4	20	22.22%	22.22
B	Public Confidence	2	B	5	2	2	4	15	16.67%	16.67
C	Fiscal Impact	1	1	C	1	1	1	5	5.56%	5.56
D	Environmental and Public Health Impa	3	4	5	D	3	4	19	21.11%	21.11
E	System Reliability	2	4	5	3	E	4	18	20.00%	20.00
F	Employee Health and Safety	2	2	5	2	2	F	13	14.44%	14.44
							Totals	90	100.00%	100

Scores

5 = Significantly More Important
4 = More Important
3 = Equal in Importance
2 = Less Important
1 = Significantly Less Important

Instructions (for each Non-Monetary Decision Criteria and Weights scoring table):

1) Edit criteria in column B. Select criteria categories based on the project being evaluated. Criteria can be project service based when deciding between project alternatives or can be project delivery based when the project alternative is decided but trying to decide on optimal project delivery. Ten (10) criteria rows/columns are shown but the user does not need to use all 10 if not needed.

2) Edit numbers in the yellow cells. When doing this ask if the criteria in Column B is more or less important than criteria in Row 5. If Column B is more important, than the number in yellow will be

Potential criteria categories for consideration:

Project service based criteria categories:

levels of service, regulatory compliance, system reliability, environmental and public health impacts, employee health and safety, public confidence (disruptions and complaints), financial impacts, flexibility/risk, adaptability/phasing, proven experience, staffing, multiple processes, land/building requirements, sidestream impacts, social impacts

Wichita AMP BCE Decision Modeling - Water Treatment

	Alternative 1 - Rehab Existing Only	Alternative 2 - Rehab Existing, Future 80 NW WTP	Alternative 3 - Rehab Existing, 80 NW WTP Now	Alternative 4 - Rehab Existing, Future 120 NW WTP	Alternative 5 - Rehab Existing, 120 NW WTP Now	Alternative 6 - Expand East WTP, 120 NW WTP Now	Alternative 7 - Expand East WTP, Future 80 NW WTP	Alternative 8 - Expand East WTP, 80 NW WTP Now	Alternative 9 - 80/80/80	Alternative 10 - Reduce Existing, 120 NW WTP Now	Alternative 11 - 120 NW WTP Now, 120 Main WTP Future	Alternative 12 - 160 NW WTP Now, 80 Main WTP Future	
NW WTP	0	80 Late	80 Early	120 Late	120 Early	120 Early	80 Late	80 Early	80 Early	120 Early	120 Early	160 Early	
East WTP Basins	30	30	30	30	30	80	80	80	80	30	30	30	
East WTP Filters	0	0	0	0	0	0	0	0	80	0			
Central WTP Basins	130	130	130	130	130	80	80	80	80	90			
Central WTP Filters	0	0	0	0	0	0	0	0	80	0			
Main WTP Basins	0	0	0	0	0	0	0	0	0	0	120	80	
Main WTP Filters	160	160	160	160	160	160	160	160	0	120	120	80	
Total Capacity	160	240	240	280	280	280	240	240	240	240	240	240	
Firm Capacity	95	175	175	215	215	240	200	200	200	210	210	200	
Redundant Plant Capacity	0	80	80	120	120	120	80	80	160	120	120	80	
Fiscal Impact Score	8	6	8	6	8	6	4	6	4	6	10	10	Probability for change order, low probability
Public Confidence	1	6	8	6	10	10	6	8	8	10	10	10	Based on redundant plant and amounts of ch
Env and Public Health	1	4	6	6	8	8	4	6	6	8	8	10	Based on redundant plant and lime solids pu
Employee HSSE	1	4	6	6	8	8	4	6	6	8	8	10	New plant preferred
CIP PV	$ 301,000,000	$ 645,800,000	$ 645,800,000	$ 783,400,000	$ 763,900,000	$ 774,300,000	$ 656,200,000	$ 656,200,000	$ 990,450,000	$ 729,900,000	$ 959,400,000	$ 855,100,000	
O&M PV	$ 588,663,240	$ 572,475,001	$ 562,909,223	$ 572,475,001	$ 562,909,223	$ 562,909,223	$ 572,475,001	$ 562,909,223	$ 549,269,465	$ 562,909,223	$ 549,987,347	$ 537,155,206	
Total PV	$ 889,663,240	$ 1,218,275,001	$ 1,208,709,223	$ 1,355,875,001	$ 1,326,809,223	$ 1,337,209,223	$ 1,228,675,001	$ 1,219,109,223	$ 1,539,719,465	$ 1,292,809,223	$ 1,509,387,347	$ 1,392,255,207	
Total PV / Total Capacity	$ 5.56	$ 5.08	$ 5.04	$ 4.84	$ 4.74	$ 4.78	$ 5.12	$ 5.08	$ 6.42	$ 5.39	$ 6.29	$ 5.80	
Total PV / Firm Capacity	$ 9.36	$ 6.96	$ 6.91	$ 6.31	$ 6.17	$ 5.57	$ 6.14	$ 6.10	$ 7.70	$ 6.16	$ 7.19	$ 6.96	
Total PV / Redundant Plan	$ 100.00	$ 15.23	$ 15.11	$ 11.30	$ 11.06	$ 11.14	$ 15.36	$ 15.24	$ 9.62	$ 10.77	$ 12.58	$ 17.40	
Benefit/Normalized Preser	1.74	3.96	4.84	4.64	5.74	5.70	3.93	4.80	4.52	5.74	5.05	5.47	
PV/Benefit (lowest value p	$ 510,000,000	$ 224,690,000	$ 183,760,000	$ 191,570,000	$ 154,890,000	$ 156,100,000	$ 226,600,000	$ 185,340,000	$ 196,840,000	$ 154,940,000	$ 176,200,000	$ 162,740,000	

	Alternative 1 - Rehab Existing Only	Alternative 2 - Rehab Existing, Future 80 NW WTP	Alternative 3 - Rehab Existing, 80 NW WTP Now	Alternative 4 - Rehab Existing, Future 120 NW WTP	Alternative 5 - Rehab Existing, 120 NW WTP Now	Alternative 6 - Expand East WTP, 120 NW WTP Now	Alternative 7 - Expand East WTP, Future 80 NW WTP	Alternative 8 - Expand East WTP, 80 NW WTP Now	Alternative 9 - 80/80/80	Alternative 10 - Reduce Existing, 120 NW WTP Now	Alternative 11 - 120 NW WTP Now, 120 Main WTP Future	Alternative 12 - 160 NW WTP Now, 80 Main WTP Future
Benefit/Normalized Preser	12	10	6	8	1	3	11	7	9	2	5	4
PV/Benefit (lowest value p	12	10	6	8	1	3	11	7	9	2	5	4
Total PV / Total Capacity	9	5	4	3	1	2	7	6	12	8	11	10
Total PV / Firm Capacity	12	9	7	6	5	1	3	2	11	4	10	8
Total PV / Redundant Plan	12	8	7	5	3	4	10	9	1	2	6	11
Risk?												
Total	57	42	30	30	11	13	42	31	42	18	37	37
Rank	12	9	4	4	1	2	9	6	9	3	7	7

Wichita AMP BCE Decision Modeling - Water Treatment

Benefit Scoring

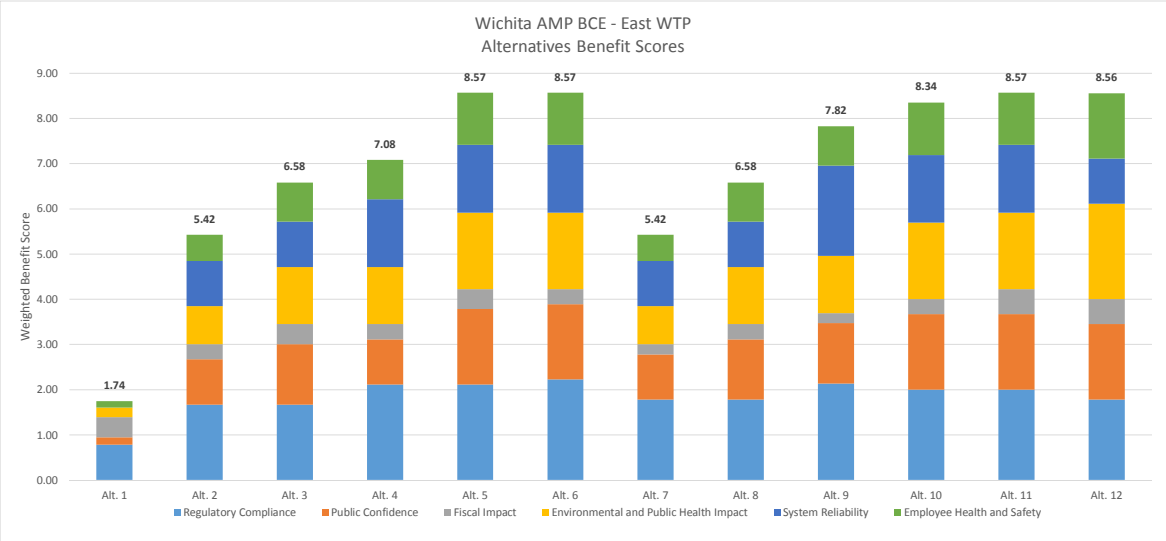
	Project Service Criteria	Project Service Alternatives - Raw Scores													Project Service Alternatives - Weighted Benefit Scores											
		Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9	Alt. 10	Alt. 11	Alt. 12	Criteria Weighting	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9	Alt. 10	Alt. 11	Alt. 12
A	Regulatory Compliand	3.50	7.50	7.50	9.50	9.50	10.00	8.00	8.00	9.60	9.00	9.00	8.00	22.22%	0.78	1.67	1.67	2.11	2.11	2.22	1.78	1.78	2.13	2.00	2.00	1.78
B	Public Confidence	1.00	6.00	8.00	6.00	10.00	10.00	6.00	8.00	8.00	10.00	10.00	10.00	16.67%	0.17	1.00	1.33	1.00	1.67	1.67	1.00	1.33	1.33	1.67	1.67	1.67
C	Fiscal Impact	8.00	6.00	8.00	6.00	8.00	6.00	4.00	6.00	4.00	6.00	10.00	10.00	5.56%	0.44	0.33	0.44	0.33	0.44	0.33	0.22	0.33	0.22	0.33	0.56	0.56
D	Environmental and Pu	1.00	4.00	6.00	6.00	8.00	8.00	4.00	6.00	6.00	8.00	8.00	10.00	21.11%	0.21	0.84	1.27	1.27	1.69	1.69	0.84	1.27	1.27	1.69	1.69	2.11
E	System Reliability	0.00	5.00	5.00	7.50	7.50	7.50	5.00	5.00	10.00	7.50	7.50	5.00	20.00%	0.00	1.00	1.00	1.50	1.50	1.50	1.00	1.00	2.00	1.50	1.50	1.00
F	Employee Health and	1.00	4.00	6.00	6.00	8.00	8.00	4.00	6.00	6.00	8.00	8.00	10.00	14.44%	0.14	0.58	0.87	0.87	1.16	1.16	0.58	0.87	0.87	1.16	1.16	1.44
	Totals	14.5	32.5	40.5	41	51	49.5	31	39	43.6	48.5	52.5	53	100.00%	1.74	5.42	6.58	7.08	8.57	8.57	5.42	6.58	7.82	8.34	8.57	8.56

	Alternative 1 - Rehab Existing Only	Alternative 2 - Rehab Existing, Future 80 NW WTP	Alternative 3 - Rehab Existing, 80 NW WTP Now	Alternative 4 - Rehab Existing, Future 120 NW WTP	Alternative 5 - Rehab Existing, 120 NW WTP Now	Alternative 6 - Expand East WTP, 120 NW WTP Now	Alternative 7 - Expand East WTP, Future 80 NW WTP	Alternative 8 - Expand East WTP, 80 NW WTP Now	Alternative 9 - 80/80/80	Alternative 10 - Reduce Existing, 120 NW WTP Now	Alternative 11 - 120 NW WTP Now, 120 Main WTP Future	Alternative 12 - 160 NW WTP Now, 80 Main WTP Future	Future Flows	0.73	1.56	1.56	1.98	1.98	2.08	1.67	1.67	2.00	1.88	1.88	1.67
Total Capacity	160	240	240	280	280	280	240	240	240	240	240	240	160	100%	150%	150%	175%	175%	175%	150%	150%	150%	150%	150%	150%
Firm Capacity	95	175	175	215	215	240	200	200	200	210	210	200	80	119%	219%	219%	269%	269%	300%	250%	250%	250%	263%	263%	250%
Redundant Plant Capacity	0	80	80	120	120	120	80	80	160	120	120	80	80	0%	100%	100%	150%	150%	150%	100%	100%	200%	150%	150%	100%

Scores

5 = Maximum Benefit
4 =
3 = Equal Benefit
2 =
1 = Minimum Benefit

Instructions:
1) Edit Row 5 with the Project Service Alternative Names which will be compared.
2) Edit the values in the yellow cells to represent the "Alternative's" benefit for a given criteria.



Alternative 1 - Rehab Existing Cuts

Component	Capacity, MGD	Units	Unit Cost	Start Year	Duration	PV, 0.0%	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057
NW WTP	0	0.000	$ 1.75	2018	5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
NW WTP Supporting Infrastructure	0	0.000	$ 0.56	2018	5	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
NW WTP O&M	0	0.000	$ 0.74	2023	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Basins	30	30.000	$ 0.50	2018	2	$ 15,000,000	$ 7,500,000	$ 7,725,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Filtration	0	0.000	$ 1.25	2018	50	$ 175,000,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Supporting Infrastructure	0	0.000	$ 0.15	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Demo	0	0.000	$ 0.10	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP O&M	30	0.000	$ 0.82	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Basins	130	130.000	$ 0.45	2015	2	$ 58,500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 68,345,793	$ 49,796,167	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Filtration	0	0.000	$ 3.05	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Supporting Infrastructure	0	0.000	$ 0.25	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Demo	0	0.000	$ 0.10	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP O&M	130	0.000	$ 0.82	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main WTP Basins	130	130.000	$ 1.50	2015	4	$ 195,000,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 85,576,222	$ 82,993,612	$ 85,480,420	$ 88,047,823	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main WTP Supporting Infrastructure	130	130.000	$ 0.25	2015	4	$ 32,500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 13,629,087	$ 13,822,268	$ 14,247,237	$ 14,674,654	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main WTP Demo	0	0.000	$ 0.10	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main WTP O&M	130	49.170	$ 0.82	2018	50	$ 588,641,260	$ 14,716,531	$ 15,158,078	$ 15,612,821	$ 16,081,205	$ 16,563,642	$ 17,060,551	$ 17,572,367	$ 18,099,538	$ 18,642,525	$ 19,201,800	$ 19,777,854	$ 20,371,190	$ 20,982,326	$ 21,611,795	$ 22,260,149	$ 22,927,954	$ 23,615,792	$ 24,324,266	$ 25,053,994	$ 25,805,614	$ 26,579,782	$ 27,377,176	$ 28,198,491	$ 29,044,646	$ 29,915,779	$ 30,813,252	$ 31,737,650	$ 32,689,780	$ 33,670,671	$ 34,680,587	$ 35,721,005	$ 36,792,635	$ 37,896,414	$ 39,033,306	$ 40,204,306	$ 41,410,435	$ 42,652,748	$ 43,932,330	$ 45,250,000	$ 46,607,809
Total CIP PV						$ 301,000,000																																								
Total O&M PV						$ 588,641,260																																								

Alternative 2 - Rehab Existing / Future NW WTP

Component	Capacity, MGD	Units	Unit Cost	Start Year	Duration	PV, 0.0%	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057
NW WTP	80	80.000	$ 1.75	2018	5	$ 300,000,000	$ 60,000,000	$ 61,800,000	$ 63,654,000	$ 65,563,620	$ 67,530,529	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
NW WTP Supporting Infrastructure	80	80.000	$ 0.56	2018	5	$ 44,800,000	$ 8,960,000	$ 9,228,800	$ 9,505,664	$ 9,790,834	$ 10,084,559	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
NW WTP O&M	80	24.585	$ 0.74	2023	50	$ 231,786,151	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,677,248	$ 7,907,565	$ 8,144,792	$ 8,389,136	$ 8,640,810	$ 8,900,034	$ 9,167,035	$ 9,442,047	$ 9,725,308	$ 10,017,067	$ 10,317,579	$ 10,627,107	$ 10,945,920	$ 11,274,297	$ 11,612,526	$ 11,960,902	$ 12,319,729	$ 12,689,321	$ 13,070,001	$ 13,462,101	$ 13,865,964	$ 14,281,943	$ 14,710,401	$ 15,151,713	$ 15,606,264	$ 16,074,652	$ 16,556,886	$ 17,053,386	$ 17,564,988	$ 18,091,938	$ 18,634,696	$ 19,193,736	$ 19,769,549	$ 20,362,635	$ 20,973,514
East WTP Basins	30	30.000	$ 0.50	2018	2	$ 15,000,000	$ 7,500,000	$ 7,725,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Filtration	0	0.000	$ 1.25	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Supporting Infrastructure	0	0.000	$ 0.15	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Demo	0	0.000	$ 0.10	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP O&M	30	0.000	$ 0.82	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Basins	130	130.000	$ 0.45	2015	2	$ 58,500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 68,345,793	$ 49,796,167	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Filtration	0	0.000	$ 3.05	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Supporting Infrastructure	0	0.000	$ 0.25	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Demo	0	0.000	$ 0.10	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP O&M	130	0.000	$ 0.82	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main WTP Basins	130	130.000	$ 1.50	2015	4	$ 195,000,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 85,576,222	$ 82,993,612	$ 85,480,420	$ 88,047,823	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main WTP Supporting Infrastructure	130	130.000	$ 0.25	2015	4	$ 32,500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 13,629,087	$ 13,822,268	$ 14,247,237	$ 14,674,654	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main WTP Demo	0	0.000	$ 0.10	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main WTP O&M	130	24.585	$ 0.82	2036	50	$ 161,882,391	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 12,526,997	$ 12,902,807	$ 13,289,891	$ 13,688,588	$ 14,099,246	$ 14,522,223	$ 14,957,890	$ 15,406,626	$ 15,868,825	$ 16,344,890	$ 16,835,236	$ 17,340,294	$ 17,860,502	$ 18,396,317	$ 18,948,207	$ 19,516,653	$ 20,102,153	$ 20,705,217	$ 21,326,374	$ 21,966,165	$ 22,625,150	$ 23,303,905
Total CIP PV						$ 172,675,001																																								
Total O&M PV						$ 645,800,000																																								

Alternative 3 - Rehab Existing / Future NW WTP Four

Component	Capacity, MGD	Units	Unit Cost	Start Year	Duration	PV, 0.0%	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057
NW WTP	80	80.000	$ 1.75	2018	5	$ 300,000,000	$ 60,000,000	$ 61,800,000	$ 63,654,000	$ 65,563,620	$ 67,530,529	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
NW WTP Supporting Infrastructure	80	80.000	$ 0.56	2018	5	$ 44,800,000	$ 8,960,000	$ 9,228,800	$ 9,505,664	$ 9,790,834	$ 10,084,559	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
NW WTP O&M	80	24.585	$ 0.74	2023	50	$ 231,786,151	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,677,248	$ 7,907,565	$ 8,144,792	$ 8,389,136	$ 8,640,810	$ 8,900,034	$ 9,167,035	$ 9,442,047	$ 9,725,308	$ 10,017,067	$ 10,317,579	$ 10,627,107	$ 10,945,920	$ 11,274,297	$ 11,612,526	$ 11,960,902	$ 12,319,729	$ 12,689,321	$ 13,070,001	$ 13,462,101	$ 13,865,964	$ 14,281,943	$ 14,710,401	$ 15,151,713	$ 15,606,264	$ 16,074,652	$ 16,556,886	$ 17,053,386	$ 17,564,988	$ 18,091,938	$ 18,634,696	$ 19,193,736	$ 19,769,549	$ 20,362,635	$ 20,973,514
East WTP Basins	30	30.000	$ 0.50	2018	2	$ 15,000,000	$ 7,500,000	$ 7,725,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Filtration	0	0.000	$ 1.25	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Supporting Infrastructure	0	0.000	$ 0.15	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Demo	0	0.000	$ 0.10	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP O&M	30	0.000	$ 0.82	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Basins	130	130.000	$ 0.45	2015	2	$ 58,500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 68,345,793	$ 49,796,167	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Filtration	0	0.000	$ 3.05	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Supporting Infrastructure	0	0.000	$ 0.25	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Demo	0	0.000	$ 0.10	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP O&M	130	0.000	$ 0.82	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main WTP Basins	130	130.000	$ 1.50	2015	4	$ 195,000,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 85,576,222	$ 82,993,612	$ 85,480,420	$ 88,047,823	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main WTP Supporting Infrastructure	130	130.000	$ 0.25	2015	4	$ 32,500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 13,629,087	$ 13,822,268	$ 14,247,237	$ 14,674,654	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main WTP Demo	0	0.000	$ 0.10	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main WTP O&M	130	24.585	$ 0.82	2036	50	$ 161,882,391	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 12,526,997	$ 12,902,807	$ 13,289,891	$ 13,688,588	$ 14,099,246	$ 14,522,223	$ 14,957,890	$ 15,406,626	$ 15,868,825	$ 16,344,890	$ 16,835,236	$ 17,340,294	$ 17,860,502	$ 18,396,317	$ 18,948,207	$ 19,516,653	$ 20,102,153	$ 20,705,217	$ 21,326,374	$ 21,966,165	$ 22,625,150	$ 23,303,905
Total CIP PV						$ 172,675,001																																								
Total O&M PV						$ 645,800,000																																								

Alternative 4 - Rehab Existing, Future 110 NW WTP

Component	Capacity, MGD	Units	Unit Cost	Start Year	Duration	PV, 0.0%	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057
NW WTP	120	120.000	$ 1.50	2029	7	$ 420,000,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 83,054,032	$ 85,545,653	$ 88,112,023	$ 90,755,383	$ 93,478,045	$ 96,282,386	$ 99,170,858	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
NW WTP Supporting Infrastructure	120	120.000	$ 0.52	2029	7	$ 62,400,000	$ 12,480,000	$ 12,854,400	$ 13,240,032	$ 13,637,233	$ 14,046,350	$ -	$ -	$ -	$ -	$ -	$ -	$ 12,100,456	$ 12,799,420	$ 13,090,024	$ 13,481,667	$ 13,886,167	$ 14,302,812	$ 14,733,916	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
NW WTP O&M	120	24.585	$ 0.74	2036	50	$ 145,694,152	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,274,297	$ 11,612,526	$ 11,960,902	$ 12,319,729	$ 12,689,321	$ 13,070,001	$ 13,462,101	$ 13,865,964	$ 14,281,943	$ 14,710,401	$ 15,151,713	$ 15,606,264	$ 16,074,652	$ 16,556,886	$ 17,053,386	$ 17,564,988	$ 18,091,938	$ 18,634,696	$ 19,193,736	$ 19,769,549	$ 20,362,635	$ 20,973,514
East WTP Basins	30	30.000	$ 0.50	2018	2	$ 15,000,000	$ 7,500,000	$ 7,725,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Filtration	0	0.000	$ 1.25	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Supporting Infrastructure	0	0.000	$ 0.15	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP Demo	0	0.000	$ 0.10	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
East WTP O&M	30	0.000	$ 0.82	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Basins	90	90.000	$ 0.45	2015	2	$ 40,500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 47,310,165	$ 34,474,269	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Filtration	0	0.000	$ 3.05	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Central WTP Supporting Infrastructure	0	0.000	$ 0.25	2018	50	$ -	$ -	$ -	$ -	$ -	$ -	$

Alternative 11 - 10 MGD NTP Flow, 10 ft Raise

| | | |

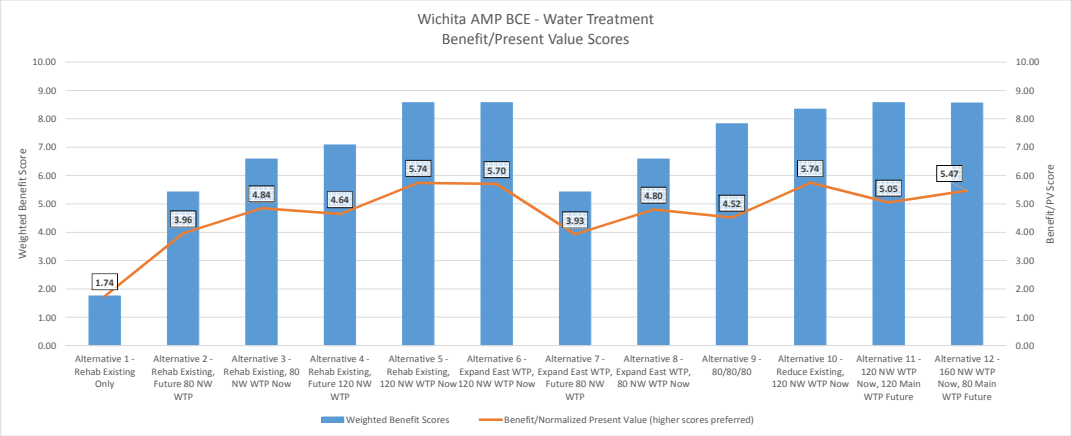
Wichita AMP BCE Decision Modeling - Water Treatment

Present Value Scoring

Cost Component	Units	Alternatives											
		Alternative 1 - Rehab Existing Only	Alternative 2 - Rehab Existing, Future 80 NW WTP	Alternative 3 - Rehab Existing, 80 NW WTP Now	Alternative 4 - Rehab Existing, Future 120 NW WTP	Alternative 5 - Rehab Existing, 120 NW WTP Now	Alternative 6 - Expand East WTP, 120 NW WTP Now	Alternative 7 - Expand East WTP, Future 80 NW WTP	Alternative 8 - Expand East WTP, 80 NW WTP Now	Alternative 9 - 80/80/80	Alternative 10 - Reduce Existing, 120 NW WTP Now	Alternative 11 - 120 NW WTP Now, 120 Main WTP Future	Alternative 12 - 160 NW WTP Now, 80 Main WTP Future
Capital Cost PV	2017 dollars, 40 years	$ 301,000,000	$ 645,800,000	$ 645,800,000	$ 783,400,000	$ 763,900,000	$ 774,300,000	$ 656,200,000	$ 656,200,000	$ 990,450,000	$ 729,900,000	$ 959,400,000	$ 855,100,000
Annual O&M Cost PV	2017 dollars, 40 years	$ 588,663,240	$ 572,475,001	$ 562,909,223	$ 572,475,001	$ 562,909,223	$ 562,909,223	$ 572,475,001	$ 562,909,223	$ 549,269,465	$ 562,909,223	$ 549,987,347	$ 537,155,206
Total PV Cost	**2017 dollars**	**$ 889,663,240**	**$1,218,275,001**	**$1,208,709,223**	**$1,355,875,001**	**$1,326,809,223**	**$1,337,209,223**	**$1,228,675,001**	**$1,219,109,223**	**$1,539,719,465**	**$1,292,809,223**	**$1,509,387,347**	**$1,392,255,207**
Normalized Present Value to Lowest Price Alternative		1.00	1.37	1.36	1.52	1.49	1.50	1.38	1.37	1.73	1.45	1.70	1.56
Weighted Benefit Scores		1.74	5.42	6.58	7.08	8.57	8.57	5.42	6.58	7.82	8.34	8.57	8.56
Benefit/Normalized Present Value (higher scores preferred)		**1.74**	**3.96**	**4.84**	**4.64**	**5.74**	**5.70**	**3.93**	**4.80**	**4.52**	**5.74**	**5.05**	**5.47**
PV/Benefit (lowest value preferred)		**$ 510,000,000**	**$ 224,690,000**	**$ 183,760,000**	**$ 191,570,000**	**$ 154,890,000**	**$ 156,100,000**	**$ 226,600,000**	**$ 185,340,000**	**$ 196,840,000**	**$ 154,940,000**	**$ 176,200,000**	**$ 162,740,000**

Instructions:
1) Alternatives should match and be pulled from the "Service Benefit" tab.
2) Edit the PV rate and years, cells C8 and C9, highlighted in yellow.
3) Edit the Project Capital Cost and Annual O&M Cost, highlighted in yellow, for each alternative. Values should be in current year dollar values. Costs should include all costs associated with land purchasing, permits, engineering, construction, inspection, engineering services during construction, startup, warranty, power, chemicals, labor, City internal project management costs, etc.

Weighted benefit scores should match and be pulled from the "Service Benefit" tab. A favorable alternative should have a high benefit to Normalized PV Cost or a low PV Cost to benefit.

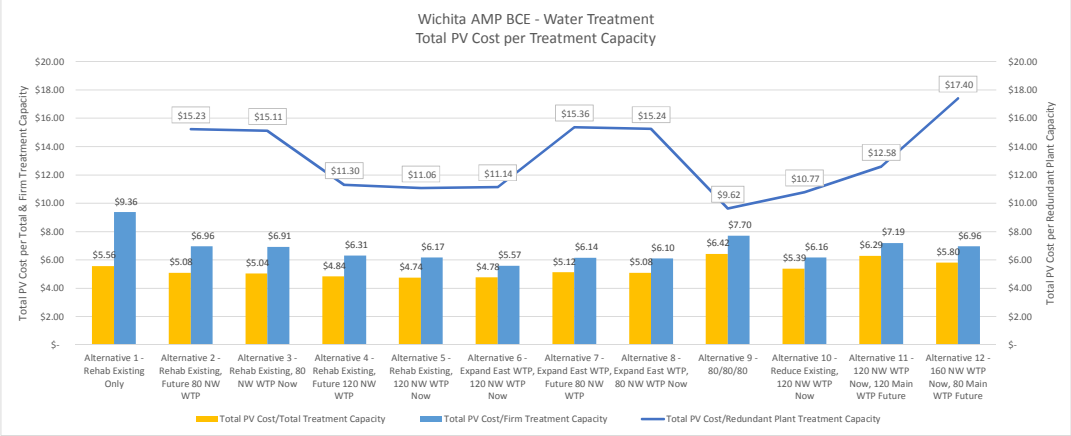


Capacity Scoring

Cost Component	Units	Alternatives											
		Alternative 1 - Rehab Existing Only	Alternative 2 - Rehab Existing, Future 80 NW WTP	Alternative 3 - Rehab Existing, 80 NW WTP Now	Alternative 4 - Rehab Existing, Future 120 NW WTP	Alternative 5 - Rehab Existing, 120 NW WTP Now	Alternative 6 - Expand East WTP, 120 NW WTP Now	Alternative 7 - Expand East WTP, Future 80 NW WTP	Alternative 8 - Expand East WTP, 80 NW WTP Now	Alternative 9 - 80/80/80	Alternative 10 - Reduce Existing, 120 NW WTP Now	Alternative 11 - 120 NW WTP Now, 120 Main WTP Future	Alternative 12 - 160 NW WTP Now, 80 Main WTP Future
Capital Cost PV	2017 dollars, 40 years	$ 301,000,000	$ 645,800,000	$ 645,800,000	$ 783,400,000	$ 763,900,000	$ 774,300,000	$ 656,200,000	$ 656,200,000	$ 990,450,000	$ 729,900,000	$ 959,400,000	$ 855,100,000
Annual O&M Cost PV	2017 dollars, 40 years	$ 588,663,240	$ 572,475,001	$ 562,909,223	$ 572,475,001	$ 562,909,223	$ 562,909,223	$ 572,475,001	$ 562,909,223	$ 549,269,465	$ 562,909,223	$ 549,987,347	$ 537,155,206
Total PV Cost	**2017 dollars**	**$ 889,663,240**	**$1,218,275,001**	**$1,208,709,223**	**$1,355,875,001**	**$1,326,809,223**	**$1,337,209,223**	**$1,228,675,001**	**$1,219,109,223**	**$1,539,719,465**	**$1,292,809,223**	**$1,509,387,347**	**$1,392,255,207**
Total Treatment Capacity, MGD		160	240	240	280	280	280	240	240	240	240	240	240
Firm Treatment Capacity, MGD		95	175	175	215	215	240	200	200	200	210	210	200
Redundant Plant Treatment Capcity, MGD		0	80	80	120	120	120	80	80	160	120	120	80
Total PV Cost/Total Treatment Capacity		**$ 5.56**	**$ 5.08**	**$ 5.04**	**$ 4.84**	**$ 4.74**	**$ 4.78**	**$ 5.12**	**$ 5.08**	**$ 6.42**	**$ 5.39**	**$ 6.29**	**$ 5.80**
Total PV Cost/Firm Treatment Capacity		**$ 9.36**	**$ 6.96**	**$ 6.91**	**$ 6.31**	**$ 6.17**	**$ 5.57**	**$ 6.14**	**$ 6.10**	**$ 7.70**	**$ 6.16**	**$ 7.19**	**$ 6.96**
Total PV Cost/Redundant Plant Treatment Capacity			**$ 15.23**	**$ 15.11**	**$ 11.30**	**$ 11.06**	**$ 11.14**	**$ 15.36**	**$ 15.24**	**$ 9.62**	**$ 10.77**	**$ 12.58**	**$ 17.40**

Instructions:
1) Alternatives should match and be pulled from the "Service Benefit" tab.
2) Edit the PV rate and years, cells C8 and C9, highlighted in yellow.
3) Edit the Project Capital Cost and Annual O&M Cost, highlighted in yellow, for each alternative. Values should be in current year dollar values. Costs should include all costs associated with land purchasing, permits, engineering, construction, inspection, engineering services during construction, startup, warranty, power, chemicals, labor, City internal project management costs, etc.

Weighted benefit scores should match and be pulled from the "Service Benefit" tab. A favorable alternative should have a high benefit to Normalized PV Cost or a low PV Cost to benefit.



Alternative 1 - Rehab Existing Only

Component	Capacity, MGD	Number of Trains	O&M Start	O&M Stop	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
Current WTP East Basins	30	1	1990	2019	30	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Current WTP Central Basins	130	2	1990	2036	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
Current WTP Filtration	160	14	1990	2038	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
NW WTP	0	4			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
East WTP Basins	30	1	2020	2060	0	0	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
East WTP Filtration	0	1			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central WTP Basins	130	2	2037	2060	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
Central WTP Filtration	0	1			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Main WTP Filtration	130	14	2039	2060	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
Total Firm Capacity	95 Min, 95 Avg., 95 Max	End of Planning Period Total Firm Capacity is: 95 MGD			95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
Total Redundant Plant Capacity	0 Min, 0 Avg., 0 Max	End of Planning Period Total Redundant Plant Capacity is: 0 MGD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Number of Redundant Plants	0 Min, 0 Avg., 0 Max	End of Planning Period Total Number of Redundant Plants is: 0 Facility			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Consequences	Event Types	Methodology	Min.	Mean	Max.	Initial Risk	Max Risk	Life Years	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
Permit Violation	THMs, NTUs, Lime Solids Release	1% Probability, Multiple Facilities Lower Probability	1.00%	1.00%	1.00%	1.00%		50	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Temporary Reduced Capacity, <160 MGD Peak	Critical Equipment Failures, Piping Failure	Equipment 2.0% to 10.0% based on age, Adequate Firm Capacity Lowers Probability	2.00%	5.88%	9.68%	2.00%	10.00%	50	6.48%	6.64%	6.80%	6.96%	7.12%	7.28%	7.44%	7.60%	7.76%	7.92%	8.08%	8.24%	8.40%	8.56%	8.72%	8.88%	9.04%	9.20%	9.36%	9.52%	9.68%	2.00%	2.16%	2.32%	2.48%	2.64%	2.80%	2.96%	3.12%	3.28%	3.44%	3.60%	3.76%	3.92%	4.08%	4.24%	4.40%	4.56%
Temporary Reduced Capacity, <80 MGD Avg.	Major/Multiple Critical Equipment Failures, Piping Failure	Equipment 1.5% to 7.5% based on age, Multiple Facilities Lower Probability	1.50%	4.41%	7.26%	1.50%	7.50%	50	4.86%	4.98%	5.10%	5.22%	5.34%	5.46%	5.58%	5.70%	5.82%	5.94%	6.06%	6.18%	6.30%	6.42%	6.54%	6.66%	6.78%	6.90%	7.02%	7.14%	7.26%	1.50%	1.62%	1.74%	1.86%	1.98%	2.10%	2.22%	2.34%	2.46%	2.58%	2.70%	2.82%	2.94%	3.06%	3.18%	3.30%	3.42%
Out of Service, 1 day to 2 weeks	Chemical Delivery/Accident, Flood Basement, Raw Piping Failure	Chemical 0.5%, Equipment 0.5% to 5% based on age, Multiple Facilities Lower Probability	1.00%	3.18%	5.32%	1.00%	5.50%	50	3.52%	3.61%	3.70%	3.79%	3.88%	3.97%	4.06%	4.15%	4.24%	4.33%	4.42%	4.51%	4.60%	4.69%	4.78%	4.87%	4.96%	5.05%	5.14%	5.23%	5.32%	1.00%	1.09%	1.18%	1.27%	1.36%	1.45%	1.54%	1.63%	1.72%	1.81%	1.90%	1.99%	2.08%	2.17%	2.26%	2.35%	2.44%
Out of Service, >2 weeks	Tornado, Critical Fire, Terrorism	Tornado 0.1%, Fire 0.1% to 2% based on age, Terrorism 0.1%, Multiple Facilities Lower Probability	0.30%	1.22%	2.12%	0.30%	2.20%	50	1.36%	1.40%	1.44%	1.48%	1.52%	1.55%	1.59%	1.63%	1.67%	1.71%	1.74%	1.78%	1.82%	1.86%	1.90%	1.93%	1.97%	2.01%	2.05%	2.09%	2.12%	0.30%	0.34%	0.38%	0.41%	0.45%	0.49%	0.53%	0.57%	0.60%	0.64%	0.68%	0.72%	0.76%	0.79%	0.83%	0.87%	0.91%
Average Probability of Consequences		125.47%	1.16%	3.14%	5.08%				3.44%	3.53%	3.63%	3.69%	3.77%	3.85%	3.93%	4.02%	4.10%	4.18%	4.26%	4.34%	4.42%	4.51%	4.59%	4.67%	4.75%	4.83%	4.91%	5.00%	5.08%	1.16%	1.24%	1.32%	1.40%	1.49%	1.57%	1.65%	1.73%	1.81%	1.89%	1.98%	2.06%	2.14%	2.22%	2.30%	2.38%	2.47%

Alternative 2 - Rehab Existing, Future 80 NW WTP

Component	Capacity, MGD	Number of Trains	O&M Start	O&M Stop	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
Current WTP East Basins	30	1	1990	2019	30	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Current WTP Central Basins	130	2	1990	2036	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
Current WTP Filtration	160	14	1990	2021	160	160	160	160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW WTP	80	4	2036	2060	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
East WTP Basins	30	1	2020	2060	0	0	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
East WTP Filtration	0	1			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central WTP Basins	130	2	2037	2060	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
Central WTP Filtration	0	1			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Main WTP Filtration	160	14	2022	2060	0	0	0	0	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Total Firm Capacity	95 Min, 139 Avg., 175 Max	End of Planning Period Total Firm Capacity is: 175 MGD			95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175
Total Redundant Plant Capacity	0 Min, 44 Avg., 80 Max	End of Planning Period Total Redundant Plant Capacity is: 80 MGD			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Total Number of Redundant Plants	0 Min, 0.55 Avg., 1 Max	End of Planning Period Total Number of Redundant Plants is: 1 Facility			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Consequences	Event Types	Methodology	Min.	Mean	Max.	Initial Risk	Max Risk	Life Years	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
Permit Violation	THMs, NTUs, Lime Solids Release	1% Probability, Multiple Facilities Lower Probability	0.50%	0.73%	1.00%	1.00%		50	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Temporary Reduced Capacity, <160 MGD Peak	Critical Equipment Failures, Piping Failure	Equipment 2.0% to 10.0% based on age, Adequate Firm Capacity Lowers Probability	0.08%	1.86%	6.96%	2.00%	10.00%	50	6.48%	6.64%	6.80%	6.96%	2.00%	2.16%	2.32%	2.48%	2.64%	2.80%	2.96%	3.12%	3.28%	3.44%	3.60%	3.76%	3.92%	4.08%	0.08%	0.10%	0.11%	0.12%	0.13%	0.14%	0.15%	0.17%	0.18%	0.20%	0.21%	0.23%	0.24%	0.26%	0.27%	0.29%	0.31%	0.33%	0.35%	0.37%
Temporary Reduced Capacity, <80 MGD Avg.	Major/Multiple Critical Equipment Failures, Piping Failure	Equipment 1.5% to 7.5% based on age, Multiple Facilities Lower Probability	0.05%	1.37%	5.22%	1.50%	7.50%	50	4.86%	4.98%	5.10%	5.22%	1.50%	1.62%	1.74%	1.86%	1.98%	2.10%	2.22%	2.34%	2.46%	2.58%	2.70%	2.82%	2.94%	3.06%	0.05%	0.05%	0.06%	0.07%	0.07%	0.08%	0.09%	0.09%	0.10%	0.11%	0.12%	0.13%	0.14%	0.15%	0.15%	0.16%	0.17%	0.18%	0.20%	0.21%
Out of Service, 1 day to 2 weeks	Chemical Delivery/Accident, Flood Basement, Raw Piping Failure	Chemical 0.5%, Equipment 0.5% to 5% based on age, Multiple Facilities Lower Probability	0.02%	0.96%	3.79%	1.00%	5.50%	50	3.52%	3.61%	3.70%	3.79%	1.00%	1.09%	1.18%	1.27%	1.36%	1.45%	1.54%	1.63%	1.72%	1.81%	1.90%	1.99%	2.08%	2.17%	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.05%	0.05%	0.06%	0.06%	0.07%	0.07%	0.08%	0.08%	0.09%	0.10%	0.10%	0.11%
Out of Service, >2 weeks	Tornado, Critical Fire, Terrorism	Tornado 0.1%, Fire 0.1% to 2% based on age, Terrorism 0.1%, Multiple Facilities Lower Probability	0.00%	0.34%	1.48%	0.30%	2.20%	50	1.36%	1.40%	1.44%	1.48%	0.30%	0.34%	0.38%	0.41%	0.45%	0.49%	0.53%	0.57%	0.60%	0.64%	0.68%	0.72%	0.76%	0.79%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Average Probability of Consequences		42.03%	0.13%	1.05%	3.69%				3.44%	3.53%	3.63%	3.69%	1.16%	1.24%	1.32%	1.40%	1.49%	1.57%	1.65%	1.73%	1.81%	1.89%	1.98%	2.06%	2.14%	2.22%	0.13%	0.14%	0.14%	0.14%	0.15%	0.15%	0.16%	0.16%	0.17%	0.17%	0.18%	0.19%	0.19%	0.20%	0.20%	0.21%	0.22%	0.22%	0.23%	0.24%

Alternative 3 - Rehab Existing, Rt NW WTP Now

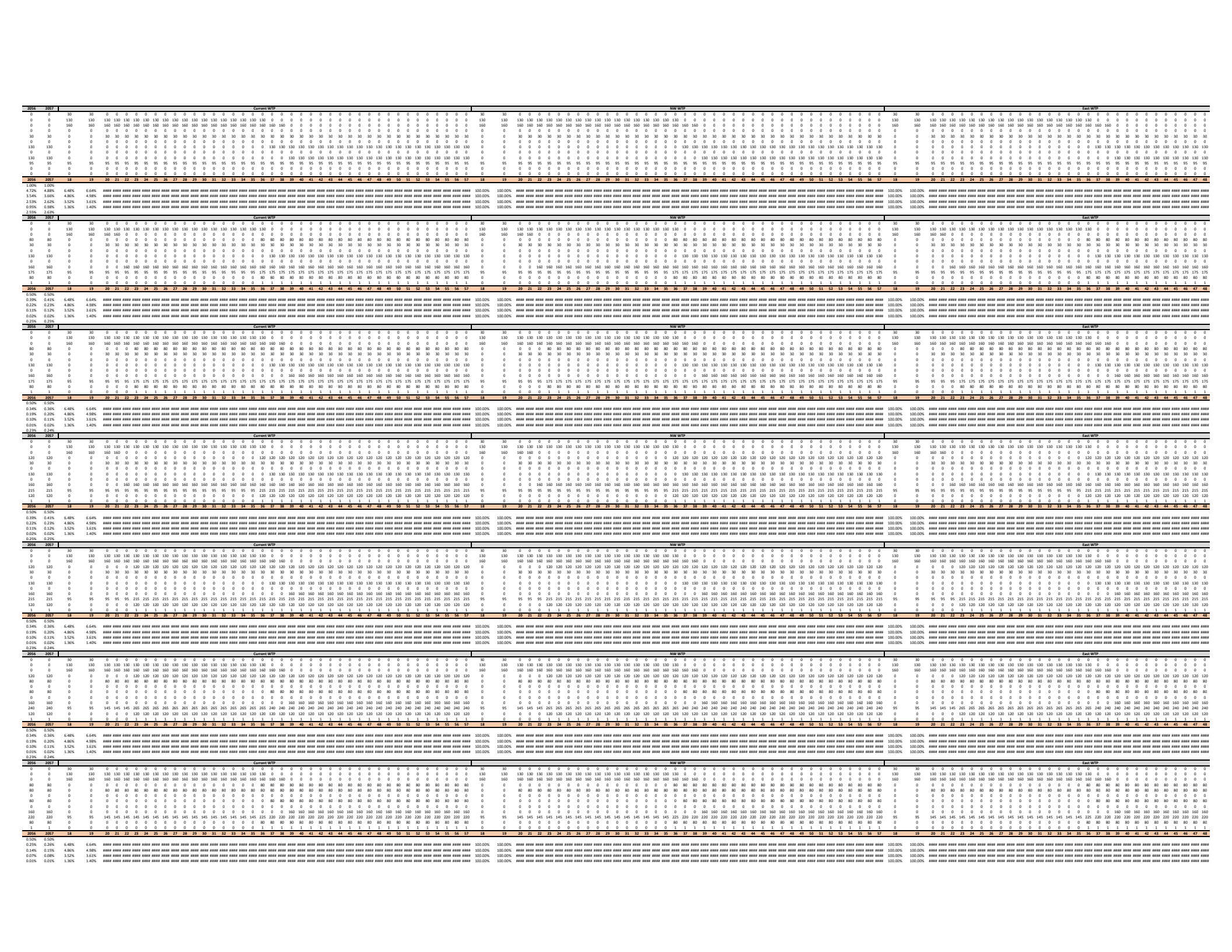
Component	Capacity, MGD	Number of Trains	O&M Start	O&M Stop	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
Current WTP East Basins	30	1	1990	2019	30	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Current WTP Central Basins	130	2	1990	2036	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
Current WTP Filtration	160	14	1990	2038	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
NW WTP	80	4	2023	2060	0	0	0	0	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
East WTP Basins	30	1	2020	2060	0	0	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
East WTP Filtration	0	1			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central WTP Basins	130	2	2037	2060	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
Central WTP Filtration	0	1			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Main WTP Filtration	160	14	2039	2060	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Total Firm Capacity	95 Min, 165 Avg., 175 Max	End of Planning Period Total Firm Capacity is: 175 MGD			95	95	95	95	95	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175
Total Redundant Plant Capacity	0 Min, 70 Avg., 80 Max	End of Planning Period Total Redundant Plant Capacity is: 80 MGD			0	0	0	0	0	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Total Number of Redundant Plants	0 Min, 0.875 Avg., 1 Max	End of Planning Period Total Number of Redundant Plants is: 1 Facility			0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Consequences	Event Types	Methodology	Min.	Mean	Max.	Initial Risk	Max Risk	Life Years	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
Permit Violation	THMs, NTUs, Lime Solids Release	1% Probability, Multiple Facilities Lower Probability	0.50%	0.56%	1.00%	1.00%		50	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Temporary Reduced Capacity, <160 MGD Peak	Critical Equipment Failures, Piping Failure	Equipment 2.0% to 10.0% based on age, Adequate Firm Capacity Lowers Probability	0.09%	1.06%	7.12%	2.00%	10.00%	50	6.48%	6.64%	6.80%	6.96%	7.12%	0.15%	0.16%	0.18%	0.19%	0.21%	0.23%	0.24%	0.26%	0.28%	0.30%	0.32%	0.34%	0.36%	0.38%	0.40%	0.43%	0.09%	0.10%	0.11%	0.12%	0.14%	0.15%	0.16%	0.18%	0.19%	0.21%	0.22%	0.24%	0.25%	0.27%	0.29%	0.31%	0.32%
Temporary Reduced Capacity, <80 MGD Avg.	Major/Multiple Critical Equipment Failures, Piping Failure	Equipment 1.5% to 7.5% based on age, Multiple Facilities Lower Probability	0.05%	0.76%	5.34%	1.50%	7.50%	50	4.86%	4.98%	5.10%	5.22%	5.34%	0.08%	0.09%	0.10%	0.11%	0.12%	0.13%	0.14%	0.15%	0.16%	0.17%	0.18%	0.19%	0.20%	0.21%	0.23%	0.24%	0.05%	0.06%	0.06%	0.07%	0.08%	0.08%	0.09%	0.10%	0.11%	0.12%	0.12%	0.13%	0.14%	0.15%	0.16%	0.17%	0.18%
Out of Service, 1 day to 2 weeks	Chemical Delivery/Accident, Flood Basement, Raw Piping Failure	Chemical 0.5%, Equipment 0.5% to 5% based on age, Multiple Facilities Lower Probability	0.02%	0.52%	3.88%	1.00%	5.50%	50	3.52%	3.61%	3.70%	3.79%	3.88%	0.04%	0.04%	0.05%	0.05%	0.06%	0.06%	0.07%	0.07%	0.08%	0.09%	0.09%	0.10%	0.11%	0.11%	0.12%	0.13%	0.02%	0.03%	0.03%	0.03%	0.04%	0.04%	0.05%	0.05%	0.05%	0.06%	0.06%	0.07%	0.07%	0.08%	0.08%	0.09%	0.09%
Out of Service, >2 weeks	Tornado, Critical Fire, Terrorism	Tornado 0.1%, Fire 0.1% to 2% based on age, Terrorism 0.1%, Multiple Facilities Lower Probability	0.00%	0.19%	1.52%	0.30%	2.20%	50	1.36%	1.40%	1.44%	1.48%	1.52%	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Average Probability of Consequences		24.75%	0.13%	0.62%	3.77%				3.44%	3.53%	3.63%	3.69%	3.77%	0.15%	0.16%	0.17%	0.17%	0.18%	0.19%	0.19%	0.20%	0.21%	0.21%	0.22%	0.23%	0.24%	0.24%	0.25%	0.26%	0.13%	0.14%	0.14%	0.15%	0.15%	0.16%	0.16%	0.17%	0.17%	0.18%	0.18%	0.19%	0.20%	0.20%	0.21%	0.22%	0.22%

Alternative 4 - Rehab Existing, Future 120 NW WTP

Component	Capacity, MGD	Number of Trains	O&M Start	O&M Stop	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
Current WTP East Basins	30	1	1990	2019	30	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Current WTP Central Basins	130	2	1990	2036	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
Current WTP Filtration	160	14	1990	2038	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
NW WTP	120	4	2023	2060	0	0	0	0	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
East WTP Basins	30	1	2020	2060	0	0	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
East WTP Filtration	0	1			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

| | | |


Current WTP
NW WTP
East WTP

0.19% 0.20%

| 2056 | 2057 | Current WTP | | |

	Central WTP		Main WTP	
0 0 0 0 0 0 0 0 0 0	30 30 0 0 0 0 0 0 0 0 0 0

| | | |

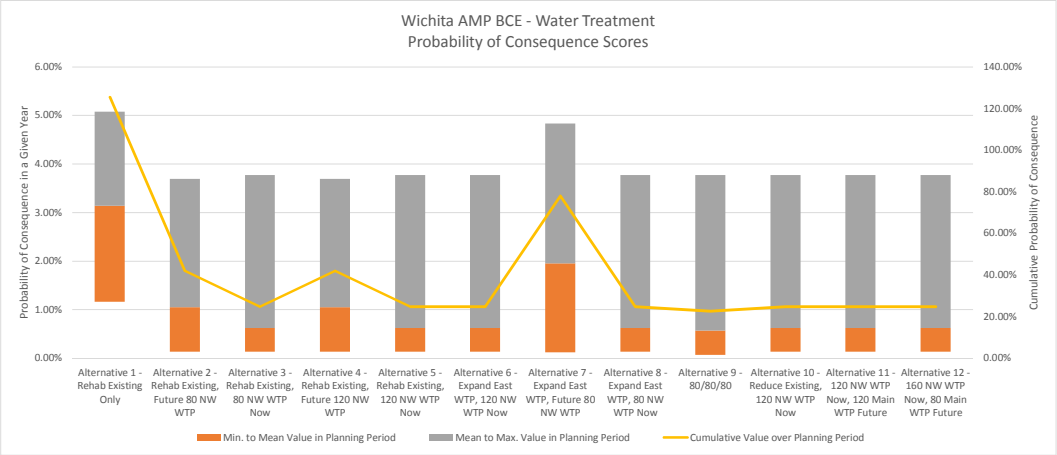
Wichita AMP BCE Decision Modeling - Water Treatment

Probability of Consequence Scoring

Probability of Consequence	Alternatives											
	Alternative 1 - Rehab Existing Only	Alternative 2 - Rehab Existing, Future 80 NW WTP	Alternative 3 - Rehab Existing, 80 NW WTP Now	Alternative 4 - Rehab Existing, Future 120 NW WTP	Alternative 5 - Rehab Existing, 120 NW WTP Now	Alternative 6 - Expand East WTP, 120 NW WTP Now	Alternative 7 - Expand East WTP, Future 80 NW WTP	Alternative 8 - Expand East WTP, 80 NW WTP Now	Alternative 9 - 80/80/80	Alternative 10 - Reduce Existing, 120 NW WTP Now	Alternative 11 - 120 NW WTP Now, 120 Main WTP Future	Alternative 12 - 160 NW WTP Now, 80 Main WTP Future
Zero, for chart purposes	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Minimum Value in Planning Period	1.16%	0.13%	0.13%	0.13%	0.13%	0.13%	0.12%	0.13%	0.07%	0.13%	0.14%	0.13%
Mean Value in Planning Period	3.14%	1.05%	0.62%	1.05%	0.62%	0.62%	1.95%	0.62%	0.57%	0.62%	0.62%	0.62%
Maximum Value in Planning Period	5.08%	3.69%	3.77%	3.69%	3.77%	3.77%	4.83%	3.77%	3.77%	3.77%	3.77%	3.77%
Cumulative Value over Planning Period	**125.47%**	**42.03%**	**24.75%**	**42.03%**	**24.75%**	**24.75%**	**77.94%**	**24.75%**	**22.65%**	**24.75%**	**24.82%**	**24.75%**

Instructions:
1) Alternatives should match and be pulled from the "Service Benefit" tab.
2) Edit the PV rate and years, cells C8 and C9, highlighted in yellow.
3) Edit the Project Capital Cost and Annual O&M Cost, highlighted in yellow, for each alternative. Values should be in current year dollar values. Costs should include all costs associated with land purchasing, permits, engineering, construction, inspection, engineering services during construction, startup, warranty, power, chemicals, labor, City internal project management costs, etc.

Weighted benefit scores should match and be pulled from the "Service Benefit" tab. A favorable alternative should have a high benefit to Normalized PV Cost or a low PV Cost to benefit.



Zero, for chart purposes	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Zero to Min. Value in Planning Period	1.16%	0.13%	0.13%	0.13%	0.13%	0.13%	0.12%	0.13%	0.07%	0.13%	0.14%	0.13%
Min. to Mean Value in Planning Period	1.98%	0.92%	0.48%	0.92%	0.48%	0.48%	1.83%	0.48%	0.50%	0.48%	0.49%	0.48%
Mean to Max. Value in Planning Period	1.94%	2.64%	3.15%	2.64%	3.15%	3.15%	2.88%	3.15%	3.20%	3.15%	3.15%	3.15%

Wichita AMP BCE Decision Modeling - Water Treatment

Ranking of Alternatives

Probability of Consequence	Desired Value	Alternatives											
		Alternative 1 - Rehab Existing Only	Alternative 2 - Rehab Existing, Future 80 NW WTP	Alternative 3 - Rehab Existing, 80 NW WTP Now	Alternative 4 - Rehab Existing, Future 120 NW WTP	Alternative 5 - Rehab Existing, 120 NW WTP Now	Alternative 6 - Expand East WTP, 120 NW WTP Now	Alternative 7 - Expand East WTP, Future 80 NW WTP	Alternative 8 - Expand East WTP, 80 NW WTP Now	Alternative 9 - 80/80/80	Alternative 10 - Reduce Existing, 120 NW WTP Now	Alternative 11 - 120 NW WTP Now, 120 Main WTP Future	Alternative 12 - 160 NW WTP Now, 80 Main WTP Future
Total Plant Capacity	Highest	160	240	240	280	280	280	240	240	240	240	240	240
Firm Plant Capacity	Highest	95	175	175	215	215	240	200	200	200	210	210	200
Redundant Plant Capacity	Highest	0	80	80	120	120	120	80	80	160	120	120	80
Benefit	Highest	1.74	5.42	6.58	7.08	8.57	8.57	5.42	6.58	7.82	8.34	8.57	8.56
Cumulative Probability of Consequence	Lowest	125.47%	42.03%	24.75%	42.03%	24.75%	24.75%	77.94%	24.75%	22.65%	24.75%	24.82%	24.75%
Total Present Value	Lowest	$ 889,663,240	$1,218,275,001	$1,208,709,223	$1,355,875,001	$1,326,809,223	$1,337,209,223	$1,228,675,001	$1,219,109,223	$1,539,719,465	$1,292,809,223	$1,509,387,347	$1,392,255,207
Total Present Value / Total Plant Capacity	Lowest	$ 5,560,395	$ 5,076,146	$ 5,036,288	$ 4,842,411	$ 4,738,604	$ 4,775,747	$ 5,119,479	$ 5,079,622	$ 6,415,498	$ 5,386,705	$ 6,289,114	$ 5,801,063
Total Present Value / Firm Plant Capacity	Lowest	$ 9,364,876	$ 6,961,571	$ 6,906,910	$ 6,306,395	$ 6,171,206	$ 5,571,705	$ 6,143,375	$ 6,095,546	$ 7,698,597	$ 6,156,234	$ 7,187,559	$ 6,961,276
Total Present Value / Redundant Plant Capacity	Lowest	N/A	$ 15,228,438	$ 15,108,865	$ 11,298,958	$ 11,056,744	$ 11,143,410	$ 15,358,438	$ 15,238,865	$ 9,623,247	$ 10,773,410	$ 12,578,228	$ 17,403,190
Benefit / Normalized Total Present Value	Highest	1.74	3.96	4.84	4.64	5.74	5.70	3.93	4.80	4.52	5.74	5.05	5.47
Total Present Value / Benefit	Lowest	$ 510,000,000	$ 224,690,000	$ 183,760,000	$ 191,570,000	$ 154,890,000	$ 156,100,000	$ 226,600,000	$ 185,340,000	$ 196,840,000	$ 154,940,000	$ 176,200,000	$ 162,740,000
Cumulative Prob. Of Cons. * Normalized TPV	Lowest	125.47%	57.56%	33.63%	64.06%	36.91%	37.20%	107.64%	33.91%	39.20%	35.97%	42.11%	38.73%
TPV / Cumulative Probability of Consequence	Lowest	N/A	$1,460,089,942	$1,200,062,749	$1,625,002,114	$1,317,317,923	$1,327,643,527	$2,585,098,253	$1,210,388,353	$1,497,515,377	$1,283,561,142	$1,499,624,619	$1,382,295,740
Rankings													
Total Plant Capacity	Lowest	12	4	4	1	1	1	4	4	4	4	4	4
Firm Plant Capacity	Lowest	12	10	10	2	2	1	6	6	6	4	4	6
Redundant Plant Capacity	Lowest	12	7	7	2	2	2	7	7	1	2	2	7
Benefit	Lowest	12	10	8	7	1	1	10	9	6	5	1	4
Cumulative Probability of Consequence	Lowest	12	9	2	9	2	2	11	2	1	2	8	2
Total Present Value	Lowest	1	3	2	9	7	8	5	4	12	6	11	10
Total Present Value / Total Plant Capacity	Lowest	9	5	4	3	1	2	7	6	12	8	11	10
Total Present Value / Firm Plant Capacity	Lowest	12	9	7	6	5	1	3	2	11	4	10	8
Total Present Value / Redundant Plant Capacity	Lowest	12	8	7	5	3	4	10	9	1	2	6	11
Benefit / Normalized Total Present Value	Lowest	12	10	6	8	1	3	11	7	9	2	5	4
Total Present Value / Benefit	Lowest	12	10	6	8	1	3	11	7	9	2	5	4
Cumulative Prob. Of Cons. * Normalized TPV	Lowest	12	9	1	10	4	5	11	2	7	3	8	6
TPV / Cumulative Probability of Consequence	Lowest	12	7	1	10	4	5	11	2	8	3	9	6
Non-Economic Total Ranking Scores	Lowest	60	40	31	21	8	7	38	28	18	17	19	23
Economic Total Ranking Scores	Lowest	82	61	34	59	26	31	69	39	69	30	65	59
Total Rank Scores	Lowest	142	101	65	80	34	38	107	67	87	47	84	82
Non-Economic Rank	**Lowest**	**12**	**11**	**9**	**6**	**2**	**1**	**10**	**8**	**4**	**3**	**5**	**7**
Economic Rank	**Lowest**	**12**	**8**	**4**	**6**	**1**	**3**	**10**	**5**	**10**	**2**	**9**	**6**
Overall Rank	**Lowest**	**12**	**10**	**4**	**6**	**1**	**2**	**11**	**5**	**9**	**3**	**8**	**7**