rethink water JOLIET

Final Report

Alternative Water Source Study – Phase II

JOLIET Illinois

City of Joliet, IL

December, 2019

CMT Crawford, Murphy & Tilly

EEI Engineering Enterprises, Inc.

Stantec

1. Executive Summary

An alternative source of water for Joliet has been studied since the 1970s. A 2015 study completed by the Illinois State Water Survey (ISWS) of the sandstone aquifers in Northeastern Illinois identified decreased groundwater levels. Further refinement of this model in 2018 concluded the City of Joliet's existing water source, the deep groundwater aquifer, will be depleted to the point of not being able to meet the City's maximum day water demands by the year 2030. This is a regional problem. Groundwater modeling conducted by the ISWS indicates that the deep groundwater wells in Joliet and neighboring communities will someday be depleted to the point of no longer being able to supply the region's future water demands.

Knowing this, the City of Joliet embarked on this Alternative Water Source Study to determine alternative water sources which could be used by not only the City of Joliet, but possibly the region as a long-term, sustainable, reliable water source.

1.1. Phase I and Phase II Studies

The Alternative Water Source Study began in July of 2018 and has been completed in two phases. While previous studies have been conducted, the City decided to start in Phase I with all possible alternatives on the table for evaluation due to changes in regulatory requirements, technology and evolving environmental considerations. Fourteen alternatives were evaluated in the Phase I Study. These fourteen alternatives covered the full range of possible water sources from groundwater, rivers and Lake Michigan. The focus of the Phase I Study was to narrow the alternatives down to those which could supply high quality water and sufficient water quantity to meet the demands for the City of Joliet, and possibly the region. The Phase I Study was completed in January 2019 and recommended five alternatives for further evaluation as feasible alternative water sources.

This Phase II Study took a deeper look into the five alternatives in order to determine the improvements that would be required to implement each alternative. Variations of the five alternatives were also included in the evaluation. The alternatives (and variations evaluated) included: Illinois River (Dresden Pool and Marseilles Pool), Kankakee River (Towpath Lane and Aqua Illinois), Lake Michigan Water – DuPage Water Commission (DWC) (City owned pipeline and DWC owned pipeline)**, Lake Michigan Water – Chicago Department of Water Management (CDWM) (City owned pipeline and CDWM owned pipeline) and Lake Michigan Water – New Indiana Intake.

**Per letter dated December 4, 2019 from DuPage Water Commission, they do not want to be considered as an alternative water source supplier for the City of Joliet. Therefore, the evaluation for this option has been removed from the Phase II study.

Water infrastructure improvements evaluated for each alternative included: raw water intake and pumping, raw water transmission, raw water treatment, finished water pumping and storage, finished water transmission, receiving station at a Joliet water site, Joliet distribution system modifications, storage in the Joliet water system and back-up water sources. Once the capital improvements were identified for each alternative, construction costs were established. Recognizing that the resulting water cost includes more than just construction costs, the total cost of water for each alternative was determined by including purchased water costs and operation and maintenance costs along with the construction costs to calculate a total cost of water for each alternative.

1.2. Study Goals and Objectives

This project serves as a new starting point in the City's effort to obtain a sustainable water supply in quantity and quality for the City of Joliet and, possibly, surrounding communities. The objective of the study was to consistently apply engineering best practices to allow for an un-biased comparison of the alternatives. The study was prepared in an open and transparent manner by a project team which included subject matter experts from each of the water source types under consideration (groundwater, river and Lake Michigan) under the guidance and direction of the City's Environmental Commission. The study involved considerable stakeholder engagement including monthly Environmental Commission meetings, three joint workshops between the Joliet City Council and Environmental Commission, presentations at neighborhood meetings, development of a project specific website, attendance at local events, E-blasts and social media. The goal of the project was to present the total water costs and non-cost considerations for water source alternatives that meet the City's (and regions) 2050 water demands and the City's water quality goals in order to allow the City to make a defensible decision when selecting an alternative water source.

1.3. Important Notes

It is important to note that this study is conceptual. This means that the location of facilities associated with each alternative, including intakes, transmission mains, pump stations, water treatment plants, etc. is approximate for the purpose of conceptually estimating cost. Siting of proposed facilities will be evaluated during preliminary design following the alternative water source selection. For the alternatives which include purchased water or access fees, it is important to note that no negotiations have taken place. The pricing included in this study is based on supplier provided information from meetings held with the project team or from the Water Supplier Request for Information. Formal negotiations will occur after alternative selection during preliminary design. While there is considerable information presented in this Phase II Study and Final Report, there is significant work that will still need to be completed following selection of the alternative water source.

1.4. Background Investigations

Before the Phase II evaluation of the alternative water sources could be completed, background information had to be established to fully develop the improvements and associated cost for each alternative. The background information established for the evaluation of alternatives is discussed in Chapter 5 and includes the following:

- Population and Water Usage Projections, Demand Scenario #1 (30 MGD) for Joliet only and Demand Scenario #2 (60 MGD) for Joliet plus regional partners – to establish capacity of new improvements
- Engagement of Potential Regional Partners – to gage the interest of potential regional community and industrial partners
- Non-Revenue Water Reduction Strategies – to reduce non-revenue water to less than 10% for Lake Michigan Allocation, if needed
- Groundwater Assessment – to determine the timeframe when the existing water source can no longer meet demands
- Short-term Groundwater Strategies – to determine groundwater improvements required to maintain existing water supply to 2030 and beyond as a back-up water supply
- River Water Assessment – to determine the viability of river water sources as an alternative water source
- Water Supplier Information – to establish terms and conditions for potential water suppliers
- Conceptual Design Parameters – to define the parameters and guidelines to which the alternative water source improvements would be conceptually designed
- Distribution System Modifications – to identify improvements required to switch City's distribution system from multiple entry points to single entry point with new alternative water source
- Back-up Water Source – to determine the capability of the existing water source, the deep groundwater aquifer, to be an online or offline back-up supply for the various alternatives
- Meetings with Illinois EPA, Illinois DNR, Indiana DEM, Indiana DNR – to lay the groundwork for implementation and permitting of the new improvements, including new Corrosion Control Study requirements

1.5. Alternatives Analysis

Each alternative water source was analyzed for two different demand scenarios – 30 MGD for Joliet only and 60 MGD for Joliet plus regional partners. The analysis of each alternative water source completed as part of this Phase II Study is described in Chapters 6 through 12 and consisted of the following components:

- Conceptual raw and finished water transmission main routing from intake (new supply) or metering point (purchased water supply) to receiving station in the City
- Hydraulic analysis along route to determine transmission main sizing, pipeline pressures and hydraulic gradelines and intermediate pumping requirements
- Identified overall improvements required for each water source alternative, including intake, raw water pumping station, raw water transmission main, water treatment plant, clearwell storage, pumping station, finished water transmission main, receiving station improvements, distribution system modifications, well collector improvements and non-revenue water efforts (as appropriate)
- Developed construction cost estimates for improvements which were reviewed by an Independent Cost Reviewer
- Regulatory/permitting considerations were identified for each water source alternative
- Implementation Schedule was identified for each water source alternative
- Key considerations were noted focusing on decision criteria highlighted in Sections 1.6 and 1.7 below

A summary of the improvements and resulting construction cost for each water source alternative is summarized in Table 1-1. Exhibit I-1 shows the overview of the improvements for the river water alternative water sources (Illinois River – Dresden Pool, Illinois River – Marseilles Pool, Kankakee River – Towpath Lane and Kankakee River – Aqua Illinois). Exhibit I-2 shows the overview of the improvements for the Lake Michigan Water alternatives (Lake Michigan Water – Chicago Department of Water Management and Lake Michigan Water- New Indiana Intake).

1.6. Total Cost of Water

Cost is a critical factor in the evaluation of Joliet's water supply alternatives. Summaries of total estimated construction cost for each of the alternatives are presented in Table 1-1. However, a total cost of water analysis that includes potential water purchase costs, operating and maintenance costs, and financing expenses is required to provide a comprehensive basis for comparison of the financial impact that each alternative would have on the City of Joliet.

A structured approach built around well-defined components has been used to facilitate the development of total cost of water for the water source alternatives. A description of each of the components of the total cost of water is contained in Chapter 13.

The total cost of water analysis and resulting 2030 estimated average monthly residential water bill increases for the water source alternatives are presented in Tables 1-2 and 1-3 for the 30 MGD (Joliet only) and 60 MGD (Joliet & Region) demand scenarios, respectively. Figures 1-1 and 1-2 provide an illustration of the likely impact of each water source alternative on a typical residential water bill in 2030. Figure 1-3 shows the projected total 50-year cost associated with each of the water supply alternatives. The bars shown in the figure are color-coded to provide an indication of relative contribution of various cost components to the total long-term cost of the project.

(This page has been intentionally left blank.)

Table 1-1: Comparison of Water Source Alternatives Improvements

					New Infrastructure Required													
Alternative	**Raw Water Source**	**Water Supplier**	**Target for Non-Revenue Water**	**Demand Scenario**	**Intake**	**Raw Water Pumping Station (PS)**	**Raw Water Transmission Main**	**Intermediate Raw Water Pumping Station (PS)**	**Water Treatment Plant (WTP)**	**Finished Water Transmission Main**	**Intermediate Finished Water Pumping Station (PS)**	**Finsihed Water Storage (not at Receiving Station)**	**Receiving Station Location**	**Receiving Station Improvements**	**Distribution System Improvements**	**Distribution System Storage (not at Receiving Station)**	**Back-up Supply Improvements**	**Construction Cost (rounded)**
ILLINOIS RIVER - DRESDEN POOL	Illinois River	--	12.5%	30 MGD	shoreline	33 MGD	48", 9.0 miles	--	33 MGD WTP, 5 MG Ground Storage, 30 MGD PS	42", 3.6 miles	--	--	Ridge Road Standpipe	3 MG Standpipe & 30 MGD PS	Ridge Road Standpipe Network	2 - 1.5 MG Elevated Tanks	online	$563,600,000
				60 MGD	shoreline	66 MGD	60", 9.0 miles	--	66 MGD WTP, 10 MG Ground Storage, 60 MGD PS	54", 3.6 miles	--	--	Ridge Road Standpipe	3 MG Standpipe & 30 MGD PS	Ridge Road Standpipe Network	2 - 1.5 MG Elevated Tanks	online	$713,300,000
ILLINOIS RIVER - MARSEILLES POOL	Illinois River	--	12.5%	30 MGD	shoreline	33 MGD	42", 32.6 miles	1 - 33 MGD	33 MGD WTP, 5 MG Ground Storage, 30 MGD PS	42", 3.6 miles	--	--	Ridge Road Standpipe	3 MG Standpipe & 30 MGD PS	Ridge Road Standpipe Network	2 - 1.5 MG Elevated Tanks	online	$701,900,000
				60 MGD	shoreline	66 MGD	60", 32.6 miles	--	66 MGD WTP, 10 MG Ground Storage, 60 MGD PS	54", 3.6 miles	--	--	Ridge Road Standpipe	3 MG Standpipe & 30 MGD PS	Ridge Road Standpipe Network	2 - 1.5 MG Elevated Tanks	online	$926,700,000
KANKAKEE RIVER - TOWPATH LANE	Kankakee River	--	12.5%	30 MGD	shoreline	33 MGD	42", 18.2 miles	1 - 33 MGD	33 MGD WTP, 5 MG Ground Storage, 30 MGD PS	42", 7.3 miles	--	--	Fairmont & Garvin PS	5 MG Standpipe & 30 MGD PS	Fairmont & Garvin PS Network	2 - 1.0 MG Elevated Tanks	online	$689,000,000
				60 MGD	shoreline	66 MGD	54",18.2 miles	1 - 66 MGD	66 MGD WTP, 10 MG Ground Storage, 60 MGD PS	54", 7.3 miles	--	--	Fairmont & Garvin PS	5 MG Standpipe & 30 MGD PS	Fairmont & Garvin PS Network	2 - 1.0 MG Elevated Tanks	online	$885,200,000
KANKAKEE RIVER - AQUA ILLINOIS	Kankakee River	Aqua Illinois	12.5%	30 MGD	---	---	---	---	---	42", 17.8 miles	--	--	Fairmont & Garvin PS	5 MG Standpipe & 30 MGD PS	Fairmont & Garvin PS Network	4 - 1.5 MG Elevated Tanks	offline	$306,800,000
				60 MGD	---	---	---	---	---	54", 17.8 miles	--	--	Fairmont & Garvin PS	5 MG Standpipe & 30 MGD PS	Fairmont & Garvin PS Network	4 - 1.5 MG Elevated Tanks	offline	$362,600,000
LAKE MICHIGAN WATER - CHICAGO DEPARTMENT OF WATER MANAGEMENT (City Owned Pipeline or CDWM Owned Pipeline)	Lake Michigan	City of Chicago	10%	30 MGD	---	---	---	---	---	48", 30.3 miles	30 MGD	17.9 MG	Fairmont & Garvin PS	5 MG Standpipe & 30 MGD PS	Fairmont & Garvin PS Network	2 - 2.5 MG Elevated Tanks	offline	$508,700,000
				60 MGD	---	---	---	---	---	60", 30.3 miles	60 MGD	17.9 MG	Fairmont & Garvin PS	5 MG Standpipe & 30 MGD PS	Fairmont & Garvin PS Network	2 - 2.5 MG Elevated Tanks	offline	$595,000,000
LAKE MICHIGAN WATER - NEW INDIANA INTAKE	Lake Michigan	--	10%	30 MGD	8,000' Pipe	33 MGD	54", 43.5 miles	33 MGD	33 MGD WTP, 10 MG Ground Storage, 30 MGD PS	54", 3.9 miles	--	--	Fairmont & Garvin PS	5 MG Standpipe & 30 MGD PS	Fairmont & Garvin PS Network	2 - 1.0 MG Elevated Tanks	offline	$909,800,000
				60 MGD	8,000' Pipe	66 MGD	66", 43.5 miles	66 MGD	66 MGD WTP, 10 MG Ground Storage, 60 MGD PS	66", 3.9 miles	--	--	Fairmont & Garvin PS	5 MG Standpipe & 30 MGD PS	Fairmont & Garvin PS Network	2 - 1.0 MG Elevated Tanks	offline	$1,130,400,000

Abbreviations:

MGD = Million Gallons Per Day
MG = Million Gallons
PS = Pumping Station
WTP = Water Treatment Plant

Note that cost estimates have been compiled and presented by the City of Joliet Staff and its consultant team. All costs are conceptual in nature and should only be used for comparison purposes as related to the Joliet Alternative Water Source Study. See the Phase II Study Report and the corresponding Phase II Questions and Answers as support for cost estimates.

Figure No.

Exhibit 1-1: River Water Alternatives Route Overview

City of Joliet, Alternative Water Source Study – Phase II

Ridge Road Receiving Station

Approximate Water Treatment Plant Location

Illinois River Marseilles Pool Route

Illinois River - Dresden Pool Route

Illinois River

Illinois River Intake Sites

Fairmont and Garvin Receiving Station

Approximate Water Treatment Plant Location

Kankakee River - Towpath Lane Route

Kankakee River Aqua Illinois Route

Kankakee River Intake Site

Supply Point

Kankakee River

N

0 10,000 20,000 Feet

(At original document size of 22x34) 1:120,000

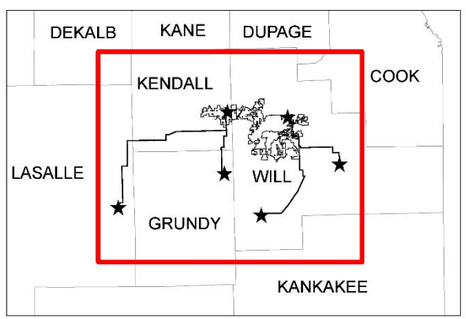
Legend

Proposed Facilities

- Connection Points
- Reservoir
- Pump Station
- Potential WTP Sites

Proposed Method of Construction

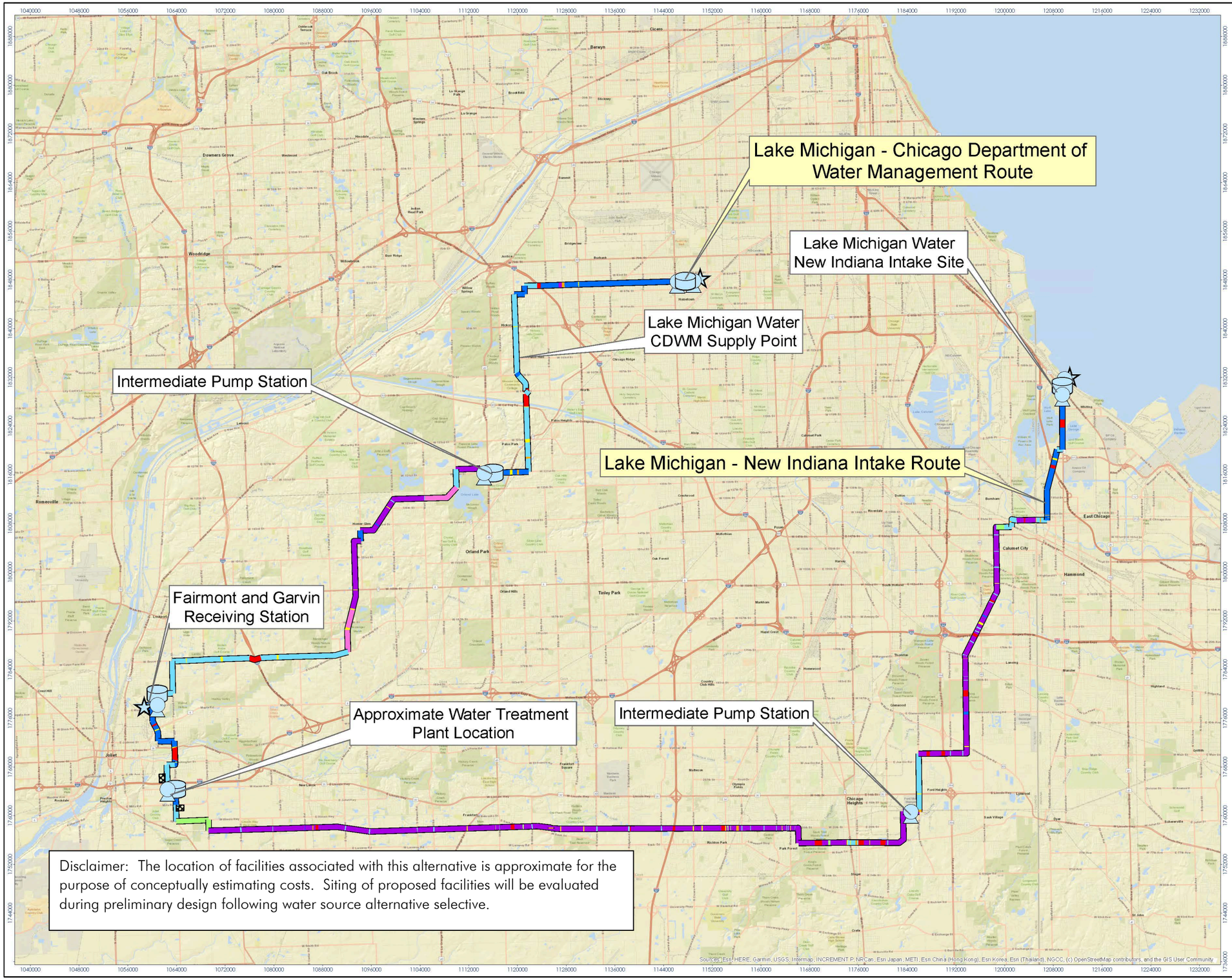
- Open Cut in ROW, Very Low Density
- Open Cut in ROW, Low Density
- Open Cut in ROW, Medium Density
- Open Cut in ROW, High Density
- Open Cut in Utility Corridor or Easement
- Open Cut in Utility Corridor or Easement witin Forest Preserve
- Trenchless, Minor Crossing
- Trenchless, Railroad Crossing
- Trenchless, Major Crossing



Location Map: Not to Scale

Notes
1. Coordinate System: GCS WGS 1984
2. Data Sources: WILL CO., COOK CO., DUPAGE CO., IDOT, INDOT, INDNR and USFWS DATA DOWNLOADED FROM WEB 3/11/2019 to 8/26/2019
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Disclaimer: The location of facilities associated with this alternative is approximate for the purpose of conceptually estimating alternative costs. Siting of proposed facilities will be evaluated during preliminary design following water source alternative selection.



rethink water JOLIET

JOLIET

Figure No.

Exhibit 1-2: Lake Michigan Water Alternatives Route Overview

City of Joliet, Alternative Water Source Study – Phase II

N

0 8,000 16,000 Feet
(At original document size of 22x34)
1:96,000

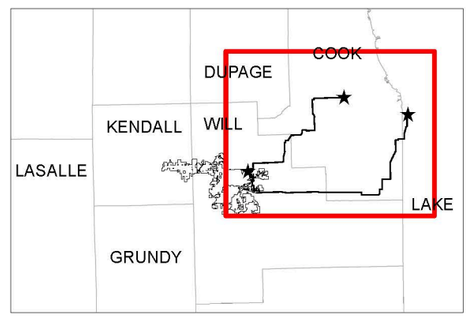
Legend

Proposed Facilities

- Connection Points
- Reservoir
- Pump Station
- Potential WTP Sites

Proposed Construction Method

- Open Cut in ROW, Very Low Density
- Open Cut in ROW, Low Density
- Open Cut in ROW, Medium Density
- Open Cut in ROW, High Density
- Open Cut in Utility Corridor or Easement
- Open Cut in Utility Corridor or Easement within Forest Preserve
- Trenchless, Minor Crossing
- Trenchless, Railroad Crossing
- Trenchless, Major Crossing



Location Map: Not to Scale

Notes

1. Coordinate System: NAD 1983 StatePlane Illinois East FIPS 1201 Feet
2. Data Sources: WILL CO., COOK CO., DUPAGE CO., IDOT, INDOT, INDNR and USFWS DATA DOWNLOADED FROM WEB 3/11/2019 to 8/26/2019
3. Background Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Outstanding Service – Every Client – Every Day

CMT Crawford, Murphy & Tilly

Stantec

Disclaimer: The location of facilities associated with this alternative is approximate for the purpose of conceptually estimating alternative costs. Siting of proposed facilities will be evaluated during preliminary design following water source alternative selection.

		Lake Michigan CDWM 30 MGD	Lake Michigan CDWM_2 30 MGD	Lake Michigan IN Intake 30 MGD	Illinois River Dresden Pool 30 MGD	Illinois River Marseilles 30 MGD	Kankakee River Towpath Lane 30 MGD	Kankakee River Aqua IL 30 MGD
Cost Category - All Costs for 2030 Unless Otherwise Noted		**Joliet owns pipeline**	**CDWM owns pipeline**	**Joliet owns system**	**Joliet owns system**	**Joliet owns system**	**Joliet owns system**	**Joliet owns system**
Estimated Capital Improvement Cost (2020 dollars)	$ million	$546	$160	$910	$564	$702	$689	$307
Estimated Escalated Capital Improvement Cost	$ million	$668	$196	$1,112	$689	$943	$919	$454
Estimated Up-front Buy-in Cost	$ million	$0.00	$0.00	$48.94	$0.00	$0.00	$0.00	$0.00
Estimated Year 1 Purchased Water Cost	$ million/year	$37.46	$55.52	$0.00	$0.00	$0.00	$0.00	$49.72
Estimated Year 1 Additional O&M Costs	$ million/year	-$2.23	-$3.72	$17.86	$17.26	$17.96	$18.15	-$3.02
Estimated Add'l Non-Revenue Water Reduction	$ million/year	$8.33	$8.33	$8.33	$0.00	$0.00	$0.00	$0.00
Estimated Joliet Average Bill Increase Components - 2030								
Buy-in Costs	$/month	$0.00	$0.00	$2.72	$0.00	$0.00	$0.00	$0.00
Purchased Water Costs	$/month	$30.36	$44.99	$0.00	$0.00	$0.00	$0.00	$42.24
New System Debt Service and O&M	$/month	$23.43	$2.57	$58.19	$42.04	$50.00	$49.47	$11.12
Add'l Non-Revenue Water Measures	$/month	$6.75	$6.75	$6.75	$0.00	$0.00	$0.00	$0.00
Estimated Increase in Average Water Bill	$/month	$60.54	$54.31	$67.66	$42.04	$50.00	$49.47	$53.35

Table 1-2: Estimated Residential Water Bill Increase – 30 MGD Joliet Only Scenarios

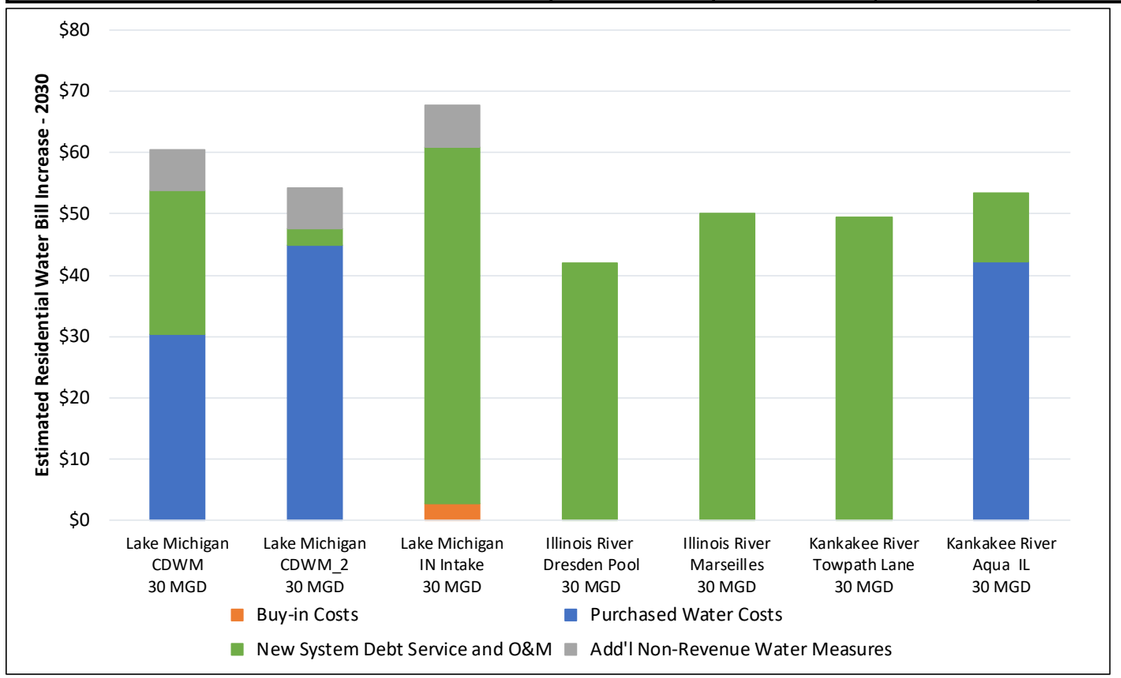


Figure 1-1: Estimated Residential Water Bill Increase for 2030 – 30 MGD Joliet Only Scenarios

Note that cost estimates have been compiled and presented by the City of Joliet Staff and its consultant team. All costs are conceptual in nature and should only be used for comparison purposes as related to the Joliet Alternative Water Source Study. See the Phase II Study Report and the corresponding Phase II Questions and Answers as support for cost estimates.

		Lake Michigan CDWM 60 MGD	Lake Michigan IN Intake 60 MGD	Illinois River Dresden Pool 60 MGD	Illinois River Marseilles 60 MGD	Kankakee River Towpath Lane 60 MGD	Kankakee River Aqua IL 60 MGD
Cost Category - All Costs for 2030 Unless Otherwise Noted		**Joliet owns pipeline**	**Joliet owns system**	**Joliet owns system**	**Joliet owns system**	**Joliet owns system**	**Joliet owns system**
Estimated Capital Improvement Cost (2020 dollars)	$ million	$651	$1,130	$713	$927	$885	$363
Estimated Escalated Capital Improvement Cost	$ million	$796	$1,382	$873	$1,133	$1,222	$570
Estimated Up-front Buy-in Cost	$ million	$0.00	$75.55	$0.00	$0.00	$0.00	$0.00
Estimated Year 1 Purchased Water Cost	$ million/year	$58.35	$0.00	$0.00	$0.00	$0.00	$77.45
Estimated Year 1 Additional O&M Costs	$ million/year	-$1.61	$29.39	$28.92	$29.54	$29.87	-$2.86
Estimated Add'l Non-Revenue Water Reduction	$ million/year	$8.33	$8.33	$0.00	$0.00	$0.00	$0.00
Estimated Joliet Average Bill Increase Components - 2030							
Buy-in Costs	$/month	$0.00	$2.49	$0.00	$0.00	$0.00	$0.00
Purchased Water Costs	$/month	$28.09	$0.00	$0.00	$0.00	$0.00	$38.33
New System Debt Service and O&M	$/month	$17.89	$46.51	$37.40	$44.21	$43.92	$9.40
Add'l Non-Revenue Water Measures	$/month	$6.75	$6.75	$0.00	$0.00	$0.00	$0.00
Estimated Increase in Average Water Bill	$/month	$51.77	$55.67	$37.40	$44.21	$43.92	$46.35

Table 1-3: Estimated Residential Water Bill Increase – 60 MGD Regional Scenarios

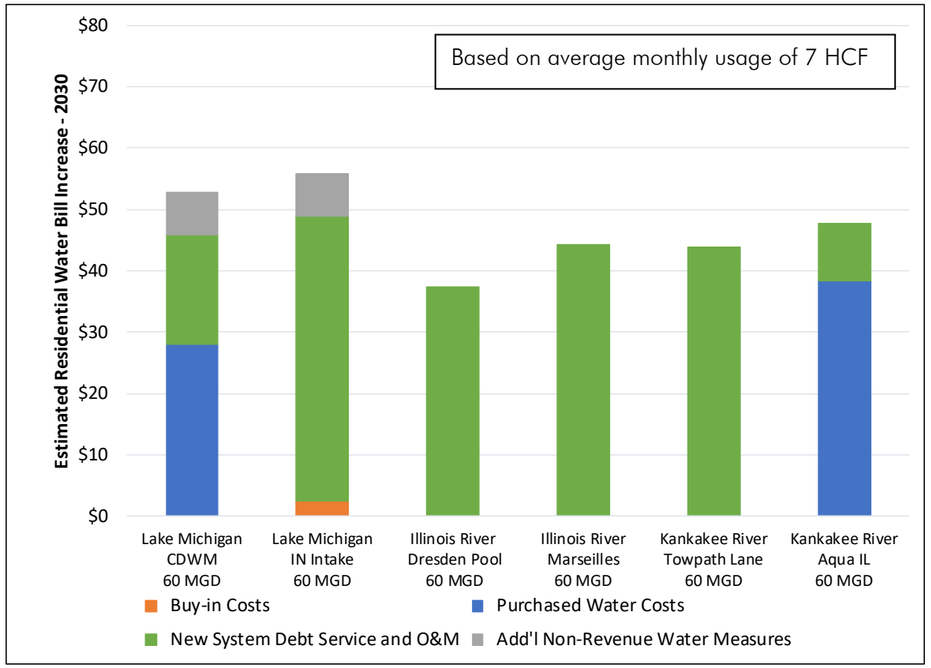


Figure 1-2: Estimated Residential Water Bill Increase for 2030 – 60 MGD Regional Scenarios

Note that cost estimates have been compiled and presented by the City of Joliet Staff and its consultant team. All costs are conceptual in nature and should only be used for comparison purposes as related to the Joliet Alternative Water Source Study. See the Phase II Study Report and the corresponding Phase II Questions and Answers as support for cost estimates.

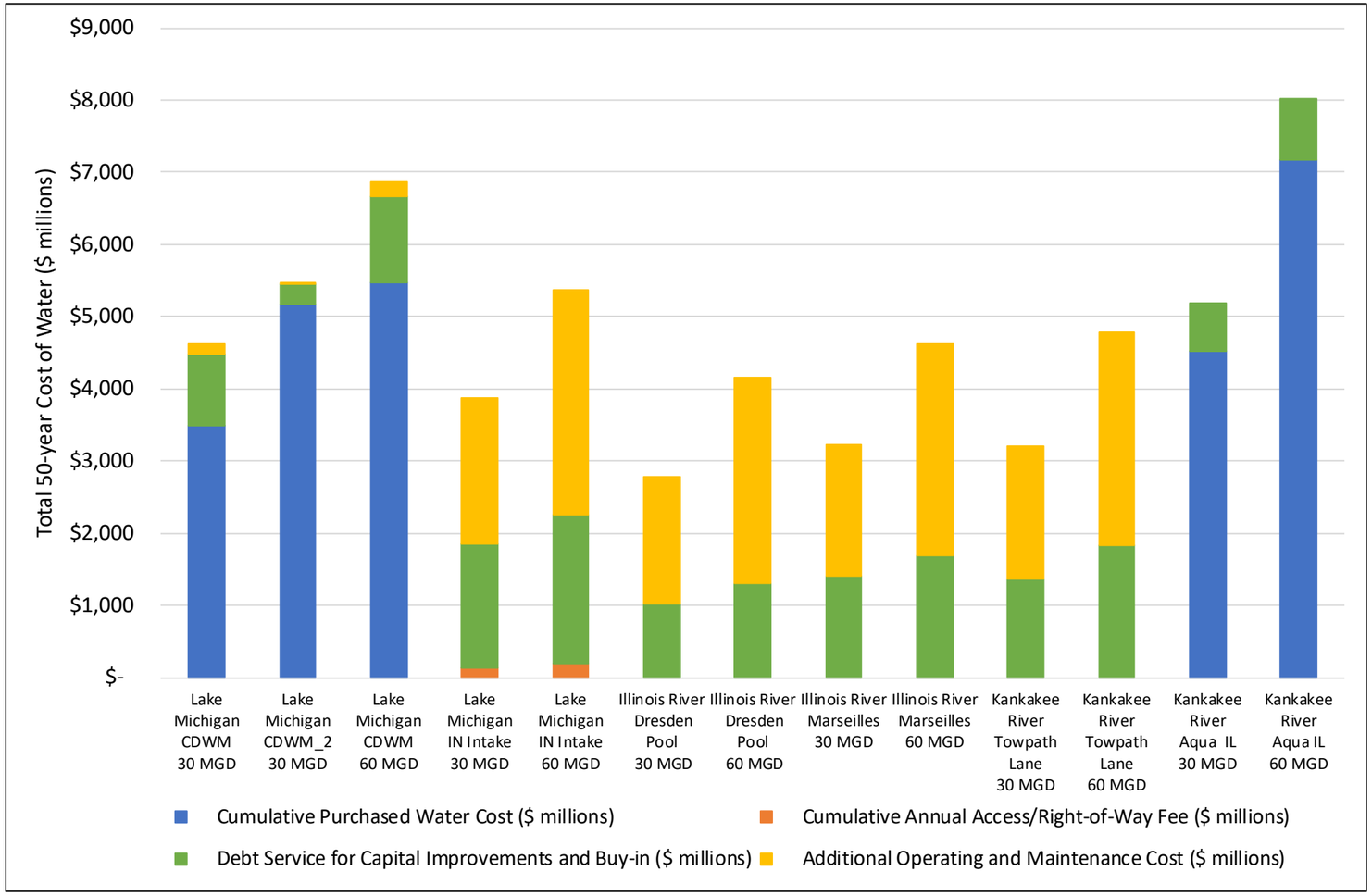


Figure 1-3: Estimated Total 50-year Cost of Water

Note that cost estimates have been compiled and presented by the City of Joliet Staff and its consultant team. All costs are conceptual in nature and should only be used for comparison purposes as related to the Joliet Alternative Water Source Study. See the Phase II Study Report and the corresponding Phase II Questions and Answers as support for cost estimates.

- Total 50-year cost of water is sum of (1) debt service (principal and interest) on construction and up front buy-in/access costs, (2) purchased water costs, (3) operating and maintenance costs, and (4) costs associated with reducing non-revenue water. Costs are reported in actual (not constant) dollars based on rates of inflation assumed as follows:
  - Construction costs assumed to increase 3%/year (factor used to convert 2020 costs into future construction costs)
  - Purchased water rates assumed to increase 2%/year
  - Annual O&M costs assumed to increase at 2%/year
- Debt service costs reflect assumed funding strategy as follows:
  - 49% of capital costs funded through WIFIA (30 year loan at 3% interest with repayment deferred for 5 years after completion of construction)
  - Up to $50 million/year funded through State Revolving Fund Loans (30 year loan at 2.5% interest)
  - Balance of capital costs funded through municipal bonds (20 year bond at 4% interest)

Major findings from the cost analysis include:

- The cost to implement a new water supply source for Joliet will be significant. Conceptual estimates completed for the Joliet only analysis indicate that the capital expenditures required for various options may range from $200 million to $900 million dollars. Financing and managing a program of this size will require significant investment on the part of the City and will significantly impact the amount that Joliet residents will have to pay for their water.

- Resulting 2030 estimated average residential monthly water bill increases range from an additional $42 to $68 per month. For reference, the City's current average residential water bill for a monthly usage of 7 HCF is $30.75. Based on impact to the typical residential water bill, current estimates suggest that the Illinois River – Dresden Pool, Illinois River – Marseilles, and Kankakee River – Towpath Lane option would provide the least costly approach to establishing a new source for Joliet. Costs for the other alternatives are generally within a narrow band, indicating that total cost may not be the most significant differentiator for evaluation of the alternatives.

- A comparison between the results for the Joliet only and the regional scenarios considered shows that there are economies of scale that come into play as the overall amount of water being supplied increases. These results suggest that the successful development of a regional water alternative for Joliet can create opportunity for serving neighboring communities while actually lowering the overall impact of the project on residents' bills by a modest amount.

- Findings from the 50 year cost of water analysis show that purchased water alternatives will cost more over a 50 year period than non-purchased water (new water treatment plant) alternatives.

1.7. Non-Cost Decision Criteria

As the selection of a new water source is critical for the City of Joliet, it is important to differentiate alternatives by more than just the resulting increase in monthly water bills. In addition to cost, there are several criteria that the City should consider when making this decision.

Phase II non-cost decision criteria including raw water quality, sustainability/water quantity, implementation risk, operation & maintenance and control (governance) are discussed below.

1.7.1. Raw Water Quality

The decision criteria "Raw Water Quality" relates to the quality and variability of the raw water source, which could make it more difficult to treat. Comparing the alternatives with regards to raw water quality, we note the following:

- No water is pure – contaminants exist in all alternative raw water sources.
- All raw water sources can be treated to meet finished water quality standards.
- Lake Michigan raw water quality is high and fairly consistent which makes it easier to treat.
- The southern end of Lake Michigan is shallower and more susceptible to sediment. This concern has been mitigated by including a longer intake for the New Indiana Intake option.
- River water sources have variable water quality which makes it more difficult to treat. This has been mitigated by including an online back-up source to maintain water quality during river water upsets.

1.7.2. Sustainability/Water Quantity

The decision criteria "Sustainability/Water Quantity" relates to the ability of the water source to supply not only the City of Joliet, but also the region. It also relates to the ability for the City to resell water. Comparing the alternatives with regards to sustainability/water quantity, we note the following:

- The Illinois River quantity is sufficient for both Joliet and the region with an online back-up supply to provide water during low flow conditions.
- Low flow conditions on the Kankakee River limit its ability to be a regional solution and would require water use restrictions during drought times for a Joliet only solution and could limit Joliet's future growth.
- Aqua Illinois' grandfathered IDNR permit capacity (80 MGD) limits its ability to be a regional solution and could limit Joliet's future growth.
- Lake Michigan water quantity and available allocation is sufficient for both Joliet and the region.

1.7.3. Implementation Risk

The decision criteria "Implementation Risk" relates to the complexity of implementation of the alternative including schedule, permitting and magnitude of improvements. Comparing the alternatives with regards to implementation risk, we note the following:

- All alternatives can be constructed by 2030.
- A corrosion control study to identify and mitigate potential water quality impacts when switching water sources is required for all alternatives.
- Purchased water alternatives (Aqua & CDWM) are less complex to implement because there is no treatment construction and permitting.
- Alternatives with new Water Treatment Plants (Rivers & New Indiana Intake) are more complex because there is treatment construction and permitting.
- Per guidance from IEPA, additional water quality sampling (minimum of 12 months of data) will be required for the Illinois River alternative.
- There will be more complexity with the New Indiana Intake option due to crossing state lines.

1.7.4. Operation & Maintenance

The decision criteria "Operation & Maintenance (O&M)" relates to the level of new O & M responsibility Joliet would assume and, whether the City would be maintaining facilities outside City limits. The more responsibility that Joliet has for facilities, especially facilities located outside City limits, represents a higher risk and potential liability. Comparing the alternatives with regards to operation & maintenance, we note the following:

- More responsibility means more liability. If Joliet owns & operates facilities and there is an issue, it is Joliet's issue to correct.
- One of the Lake Michigan Water alternatives (CDWM) has an option where the supplier would construct, own, operate and maintain the transmission pipeline. This results in less O&M for Joliet. All other alternatives have varying levels of improvements outside City limits.
- Alternatives with new Water Treatment Plants (Illinois River, Kankakee River and New Indiana Intake) have significant O&M responsibility for Joliet.
- None of the sources are close to the City. Supply points range from 9 miles to 43 miles from City limits.

1.7.5. Control (Governance)

The decision criteria "Control (Governance)" relates to the degree to which entities other than Joliet would have control over elements of the water source. It also relates to the level to which the City of Joliet might have some decision-making responsibility with a purchased water supply (governance). Comparing the alternatives with regards to control (governance), we note the following:

- There is limited/no control with purchased water alternatives (Kankakee River – Aqua Illinois, and Lake Michigan Water – CDWM).
- New water source alternatives (Illinois River, Kankakee River – Towpath Lane and Lake Michigan Water – New Indiana Intake) give the City total control over schedule, partnering, selling water, and setting rates.

1.8. Conclusions

As we consider the merits of each of the alternative water sources, we have to keep in mind that there is no perfect alternative. At this conceptual stage of the project, there is still significant effort required to fully develop whichever alternative is selected. Given that unknowns still exist with all of the options, it is recommended that the City select a primary alternative and secondary alternative, both of which could be further evaluated during preliminary design.

The project team has rated the alternatives based on the Phase II decision criteria. These ratings, which can be found in Table 1-4, are based on the technical knowledge and professional experience of the project team members. These ratings were provided to the City Council and Environmental Commission members in the form of a weighted decision matrix to assist with their decision making. With the weighted decision matrix, the decision criteria can be given different weights based on the user's preference to determine which alternative has the highest weighted total.

Based on the evaluation of the Phase II decision criteria, some alternatives are no longer recommended for implementation. These alternatives are:

- Kankakee River – Towpath Lane: Low flow conditions on the Kankakee River limit its ability to be a regional solution, would require water use restrictions during drought times for a Joliet only solution and could limit Joliet's future growth.
- Kankakee River – Aqua Illinois: Aqua Illinois' grandfathered IDNR permit capacity (80 MGD) limits its ability to be a regional solution and could limit Joliet's future growth.

Table 1-4: Summary of Phase II Decision Criteria Ratings for the Alternative Water Source

			Total Cost	Raw Water Quality	Sustainability/Water Quantity	Implementation Risk	Operation & Maintenance	Control
			What alternative has the least total cost?	What is quality and variability of the raw water source for this alternative?	Does the raw water source have sufficient quantity to supply not only Joliet, but also the region?	Will this alternative be easy to implement (schedule, permitting, magnitude of improvements)?	Does this alternative require significant O&M responsibility or O&M required for improvements outside of the City?	For this alternative, does the City maintain complete control of their water source?
			1 - Highest Total Water Cost	1 - Raw water quality is variable and can have upsets, making it more difficult to treat	1 - No, it cannot supply the City of Joliet's demands	1 - This alternative is risky to implement due to schedule, permitting or magnitude of improvements	1 - Yes, there is significant O&M responsibility or O&M for significant improvements outside of the City	1 - No, the City does not maintain control
			5 - Lowest Total Water Cost	5 - Raw water quality is more consistent and has less upsets, which makes it easier to treat	5 - Yes, it has more than sufficient quantity to supply the City of Joliet and the region.	5 - While none of the alternatives are easy, this alternative has the least amount of risk to implement	5 - O&M responsibility for this alternative is low and O&M is not required for improvements outside the City	5 - Yes, the City maintains complete control
Alternative	**Source**	**Supply Agency(is)**	**Value**	**Value**	**Value**	**Value**	**Value**	**Value**
ILLINOIS RIVER - DRESDEN POOL	Illinois River	--	5	2	4	1	3	5
ILLINOIS RIVER - MARSEILLES POOL	Illinois River	--	4	2	4	1	2	5
KANKAKEE RIVER - TOWPATH LANE	Kankakee River	--	4	3	2	3	3	5
KANKAKEE RIVER - AQUA ILLINOIS	Kankakee River	Aqua Illinois	2	3	3	3	4	1
LAKE MICHIGAN WATER - CHICAGO DEPARTMENT OF WATER MANAGEMENT (City Owned Pipeline)	Lake Michigan	City of Chicago	2	5	5	4	4	2
LAKE MICHIGAN WATER - CHICAGO DEPARTMENT OF WATER MANAGEMENT (CDWM Owned Pipeline)	Lake Michigan	City of Chicago	2	5	5	5	5	2
LAKE MICHIGAN WATER - NEW INDIANA INTAKE	Lake Michigan	--	2	4	5	2	1	5

(This page has been intentionally left blank.)

Taking into account limitations noted above with two of the alternatives, the three remaining water source alternatives that can feasibly be a long-term, sustainable and reliable water source for not only the City of Joliet, but also for the region are Illinois River (anywhere between Dresden Pool and Marseilles Pool), Lake Michigan Water - Chicago Department of Water Management and Lake Michigan Water – New Indiana Intake.

These three remaining water source alternatives vary in cost, raw water quality, sustainability/water quantity, O&M and control, as follows:

- The total cost of water is lowest with Illinois River and highest with Lake Michigan – New Indiana Intake, based on estimated 2030 average residential monthly water bill increases. However, looking at the total cost of water over a 50 year period results in the lowest cost with the Illinois River and the highest cost with the Lake Michigan - CDWM alternative.
- Lake Michigan – CDWM and Lake Michigan - New Indiana Intake have the highest raw water quality.
- All three alternatives have sufficient water quantity to be regional solutions.
- The O&M responsibility is highest with Lake Michigan – New Indiana Intake and lowest with Lake Michigan – CDWM.
- The City would have total control with Illinois River and Lake Michigan – New Indiana Intake and very limited control with Lake Michigan – CDWM.

In addition to cost and the other decision criteria discussed above, there are also several non-technical factors including public perception and acceptance of the water source, regional partner interest in certain water sources and perception of the potential water supplier that will need to be considered when selecting an alternative water source.

1.9. Selection Schedule

In order to have a new source of water online by 2030, it is critical that an alternative water source be selected in January 2020. The schedule established for selecting an alternative water source is presented below:

- Presentation of Phase II Study at Joint Workshop Meeting on November 13, 2019
- Public Forum on December 5, 2019
- Environmental Commission Recommendation at December 10, 2019 Meeting
- Alternative Water Source Selection at January 7, 2020 City Council Meeting

1.10. Post-Selection Next Steps

Once an alternative water source is selected, the City will need to continue their efforts to further develop the selected alternative water source in 2020 to ensure the new water source can be online by 2030. Some of the anticipated efforts that need to continue through 2020 include:

- Identification of regional partners with intent of executing intergovernmental agreements with potential regional partners by the end of 2021.
- Development of funding strategy (Bonds, SRF, WIFIA and possibly P3s) for financing of the selected water source with guidance from a financial advisor, including establishment of water rate structure and plan.
- Negotiations with water suppliers and/or access providers (if needed for selected alternative water source).
- Selection of design engineering team.
- Commencement of preliminary design of selected water source alternative, including:
    - Transmission main routing
    - Water facilities siting
- Begin land acquisition of water facility sites and easements along transmission main route.
- Meetings with regulatory agencies (IEPA, USEPA, IDNR, IDEM, etc.) to further establish permitting requirements for selected alternative water source.

The selection of an alternative water source will be the most significant and costly decision that the City of Joliet will make this century. The following ~600 pages of this Phase II Final Report provide detailed information on the alternative water source options that is needed to make an informed decision.