



PW062612-08

CITY OF RAPID CITY

RAPID CITY, SOUTH DAKOTA 57701

Public Works Department

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MEMORANDUM

TO: Public Works Committee, Mayor Kooiker and City Council

FROM: Terry Wolterstorff PE, Public Works Director *TW*

DATE: June 22, 2012

RE: Memorial Park and Civic Center Irrigation Improvements

Parks and Recreation Department and Public Works Department staff have reviewed the Study Report conducted by 42nd Street Design Studio for the Memorial Park and Civic Center Irrigation Improvement. The Study indicated that the use of raw water can be a safe and cost effective alternative to using treated water for irrigation purposes. The Study offered two alternatives to using raw water, one using the existing Memorial Lake and the other using a future storm water pond planned near the intersection of 8th Street and Omaha Street. Alternative No. 1 (Memorial Lake) was the least expensive option, but still had a total cost of over \$860,000 once the cost of connecting retrofitting the systems was included.

Staff recommends that construction of a raw water pump station not be pursued at this time due to funding limitations. Staff does recommend proceeding with replacement of the existing Memorial Park irrigation system and implementation of a central control system that will utilize a weather station to provide greater efficiency and scheduling control based on real time climate data.

EQUAL HOUSING
OPPORTUNITY

EQUAL OPPORTUNITY EMPLOYER

EXECUTIVE SUMMARY

MEMORIAL PARK AND CIVIC CENTER IRRIGATION IMPROVEMENTS

42nd Street Design Studio, LLC and FMG, Inc. were retained to conduct the Memorial Park and Civic Center Irrigation Improvements Study. This Study was conducted from February 6 to April 16, 2012. The Study was commissioned because portions of the existing Memorial Park and the Civic Center irrigation systems have exceeded their useful life.

The irrigation systems are currently using treated water supplied by the Rapid City Municipal Water System. If feasible, the City of Rapid City would like to disconnect these irrigation systems from the treated water system and convert the systems to a non-treated (raw) water supply.

The goal of this Study is to determine if the use of raw water for irrigation is feasible or equitable, and if so, create a plan for implementing the necessary improvements.

Several key issues were investigated to determine the feasibility of this project. These key issues included:

1. What entities can benefit from the proposed raw water irrigation system?
2. How much water is necessary for irrigation?
3. Are water rights related to Rapid Creek available for raw water irrigation?
4. Is Rapid Creek water safe to use for irrigation of parks and recreation areas?
5. What issues may arise from performing construction in the floodplain?
6. What improvements to the existing irrigation systems would be required to convert them from treated water to raw water?
7. Based on the required improvements, what monetary impacts and benefits would be attributable to the participating entities?

The following sections briefly discuss the findings of the Study in relation to the key issues listed above.

What Entities Can Benefit from the Proposed Raw Water Irrigation System?

The original Study Area included Memorial Park, Central High School, and the Rushmore Plaza Civic Center. The Study determined that the Journey Museum would be a good additional candidate area because of its large turf area and proximity to the other entities. The Study Area is shown in Figure 1.0 at the end of the report. The total area of irrigated turf was determined to be 63.95 acres.

How Much Water for Irrigation is Necessary?

The irrigation season typically lasts from May through October each year. Currently, each of the various entities is responsible for control of their individual irrigation systems. The application of water varies greatly between each entity. The application rate also varies because of environmental factors such as heat and precipitation. Existing meter records were not sufficient to determine future irrigation demands. The Study needed to create a reliable estimate of the amount of water that would be needed during future wet, average, and drought irrigation seasons. The future irrigation demands for this Study were calculated using the Landscape Coefficient Method (LCM). The LCM includes effects from turf evapotranspiration (ET_c) and effective rainfall. See Table 1.2 in the body of the report for the irrigation requirements for a wet year, an average year, and a drought year.

Are Water Rights Related to Rapid Creek Available for Raw Water Irrigation?

Water rights are available. A new irrigation water right is recommended and would require the release of stored water from Pactola Reservoir. However, it is important to note that this water is already being diverted from storage rights in Pactola through the treated water system intakes at Meadowbrook and Girl Scout Galleries as well as the Mountain View Water Treatment Plant. This new water right would result in a net zero change to the use of stored water in Pactola Reservoir because the amount of stored water used in the raw water irrigation system would equal the amount currently used in the treated water irrigation system. There are restrictions tied to irrigation water rights that limit the rate and volume that can be diverted from the creek. Because of these restrictions, a storage pond would be a necessary component to the raw water irrigation system.

Is Rapid Creek Water Safe to Use for Irrigation of Parks and Recreation Areas?

This Study concludes, based on the Department of Environmental and Natural Resources' supported uses of domestic water supply, irrigation waters, and limited contact recreation, that Rapid Creek has sufficient water quality for supplying raw water for irrigation purposes within the Study Area.

What Issues May Arise from Performing Construction in the Floodplain?

The 100-year floodplain runs through the middle of the Study Area on both sides of Rapid Creek. City code limits the type of work that can be completed in the floodplain. The Study determined that any buildings, such as the raw water pump station, should not be placed in the floodway. If located in the flood fringe, the building should be elevated or flood-proofed. A Floodplain Development Permit and possibly a Conditional Use Permit would be required to be submitted and approved for the project.

What Improvements Would be Required to Convert from Treated Water to Raw Water?

The raw water irrigation system would require many similar features to the treated water system, but with less complexity. The notable feature missing from the raw water system would be treatment. The raw water system components would include an intake, some type of storage, a pump station, and transmission pipelines. The transmission pipelines would deliver water to the existing or improved irrigation systems that are located at each of the facilities to be served by the raw water irrigation system.

Two raw water system alternatives were evaluated in the Study.

Alternative No. 1—Memorial Lake Storage and New Pump Station

The existing Memorial Lake would provide an excellent storage component to the raw water system. Use of the lake as storage would have no negative effects to the current use or operation of the lake. A new buried infiltration gallery would be constructed on the west shore and then raw water would be conveyed via buried pipe to a raw water pump building located 150 feet west of the lake. See Figure 6.1 for the layout of the proposed system.

Alternative No. 2—8th Street and Omaha Street Storm Water Pond and New Pump Station

There are future plans to remove the tennis courts near 8th and Omaha Streets and construct a park that includes a large storm water quality improvement pond. If this project was modified to include a storage provision for irrigation water, it would meet design goals for two projects at the same time. The system components for the storm water pond would be similar to the Memorial Lake alternative (Alternative 2) and would include a buried infiltration gallery and raw water pump building. See Figure 6.2 for the layout of the proposed system.

In order to allow all entities to connect to the new system, there would be improvements required within the existing irrigation systems. All of the connected systems would need to be controlled by one central control system. The central control system would communicate with a dedicated weather station to determine the correct amount of irrigation water to be applied on a daily basis. The improvements vary for each entity, but generally include new system controllers and upgrades to any zones within the system that are currently segregated from each other in terms of logic control.

The costs to install a new raw water irrigation system and improve the existing irrigation systems were divided between the entities based on irrigated turf area.

Alternative No. 1—Memorial Lake Storage and New Pump Station

Cost Share for City	\$312,821
Cost Share for Civic Center	\$100,451
Cost Share for Central High School	\$85,132
Cost Share for Journey Museum	\$36,916
Overall Estimated Construction Cost	\$535,320

Alternative No. 2—8th Street and Omaha Street Storm Water Pond and New Pump Station

Cost Share for City	\$349,776
Cost Share for Civic Center	\$112,318
Cost Share for Central High School	\$95,189
Cost Share for Journey Museum	\$41,277
Overall Estimated Construction Cost*	\$598,560

*This cost is over and above the estimated \$1,200,000 needed to construct the storm water pond and park as originally planned. All costs associated with the original plan are attributable to the City and are not included in any payback analysis.

What Monetary Impacts and Benefits Would be Attributable to the Participating Entities?

The Study determined that by converting from a treated irrigation water system to a raw water irrigation system there would be a 60 percent reduction of monthly water costs in an average year. The tables below detail the anticipated savings for each entity in an average year.

Memorial Park

Average Year Irrigation Application

Treated Water Irrigation Cost*	\$114,521.33
Raw Water Irrigation Cost*	\$47,109.08
Potential Savings*	\$67,412.25

*The City does not bill itself for water use. However, there is still value to the water.

Civic Center

Average Year Irrigation Application

Treated Water Irrigation Cost	\$37,284.94
Raw Water Irrigation Cost	\$15,744.81
Potential Savings	\$21,540.13

Central High School

Average Year Irrigation Application

Treated Water Irrigation Cost	\$31,994.82
Raw Water Irrigation Cost	\$13,324.66

Savings **\$18,670.16**

Journey Museum

Average Year Irrigation Application

Treated Water Irrigation Cost	\$14,383.37
Raw Water Irrigation Cost	\$6,214.45
Potential Savings	\$8,168.92

The recommendation of the Study is to proceed with Alternative No. 1—Memorial Lake and New Pump Station because of its lower construction cost and ease of using the existing storage components rather than constructing new storage components.

If the participating parties provided the required funding to construct Alternative No. 1, there would be substantial future savings and a payback of the initial investment.

Memorial Park

Cost-Benefit Analysis

Shared Construction Cost*	\$312,821
Individual Upgrade Costs*	\$183,534
<u>Average Annual Savings*</u>	<u>\$67,412</u>

Payback Period **7.36 seasons**

*The City does not bill itself for water use. However, there is still value to the water.

Civic Center

Cost-Benefit Analysis

Shared Construction Cost	\$100,451
Individual Upgrade Costs	\$119,673
<u>Average Annual Savings</u>	<u>\$21,540</u>

Payback Period **10.22 seasons**

Central High School

Cost-Benefit Analysis

Shared Construction Cost	\$85,132
Individual Upgrade Costs	\$15,120
<u>Average Annual Savings</u>	<u>\$18,670</u>

Payback Period **5.37 seasons**

Journey Museum

Cost-Benefit Analysis

Shared Construction Cost	\$36,916
Individual Upgrade Costs	\$15,120
<u>Average Annual Savings</u>	<u>\$8,168</u>

Payback Period **6.37 seasons**

Cost Benefit and Repayment for Alternate 1 and 2

Location	Alternative No. 1			Alternative No. 2			Potential Average Yearly Cost of Treated Irrigation Water	Potential Average Yearly Cost of Non-Treated Irrigation Water	Difference	Repayment of Alternative 1 Costs using irrigation difference (Years)	Repayment of Alternative 2 Costs using irrigation difference (Years)
	Connection to System	Portion of Construction Costs	Total	Connection to System	Portion of Construction Costs	Total					
Central High School	\$ 15,120.00	\$ 85,132.20	\$ 100,252.20	\$ 15,120.00	\$ 95,189.29	\$ 110,309.29	\$ 31,994.82	\$ 13,324.66	\$ 18,670.16	5.37	5.91
Rushmore Plaza Civic Center	\$ 119,673.00	\$ 100,450.98	\$ 220,123.98	\$ 119,673.00	\$ 112,317.75	\$ 231,990.75	\$ 37,284.94	\$ 15,744.81	\$ 21,540.13	10.22	10.77
Memorial Park	\$ 183,534.00	\$ 312,821.98	\$ 496,355.98	\$ 1,383,534.00	\$ 349,776.19	\$ 1,733,310.19	\$ 114,521.33	\$ 47,109.08	\$ 67,412.25	7.36	25.71
The Journey Museum	\$ 15,120.00	\$ 36,915.73	\$ 52,035.73	\$ 15,120.00	\$ 41,276.77	\$ 56,396.77	\$ 14,383.37	\$ 6,214.45	\$ 8,168.92	6.37	6.90
Totals	\$ 333,447.00	\$ 535,320.89	\$ 868,767.89	\$ 1,533,447.00	\$ 598,560.00	\$ 2,132,007.00	\$ 198,184.46	\$ 82,393.00	\$ 115,791.46		

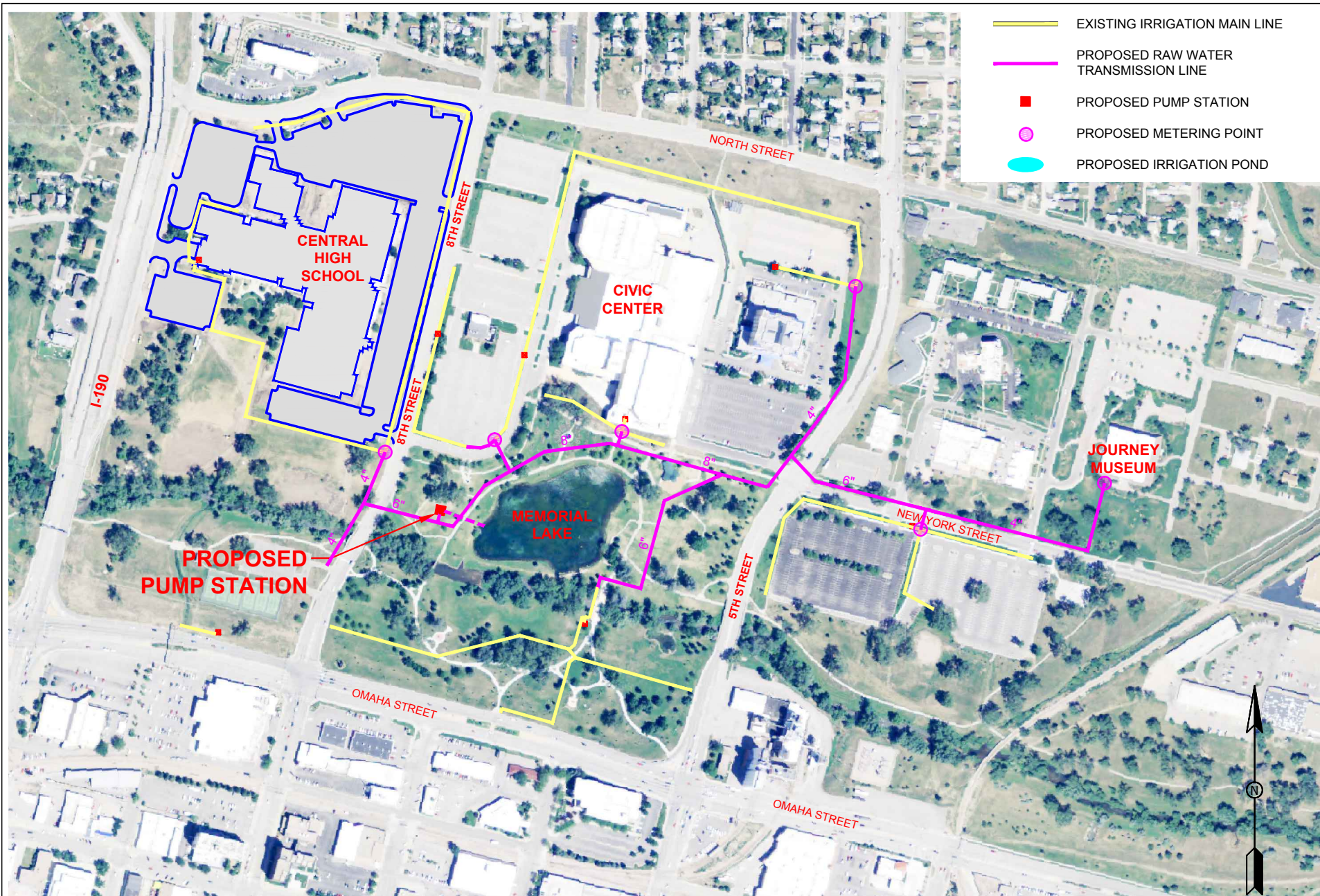
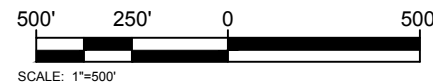
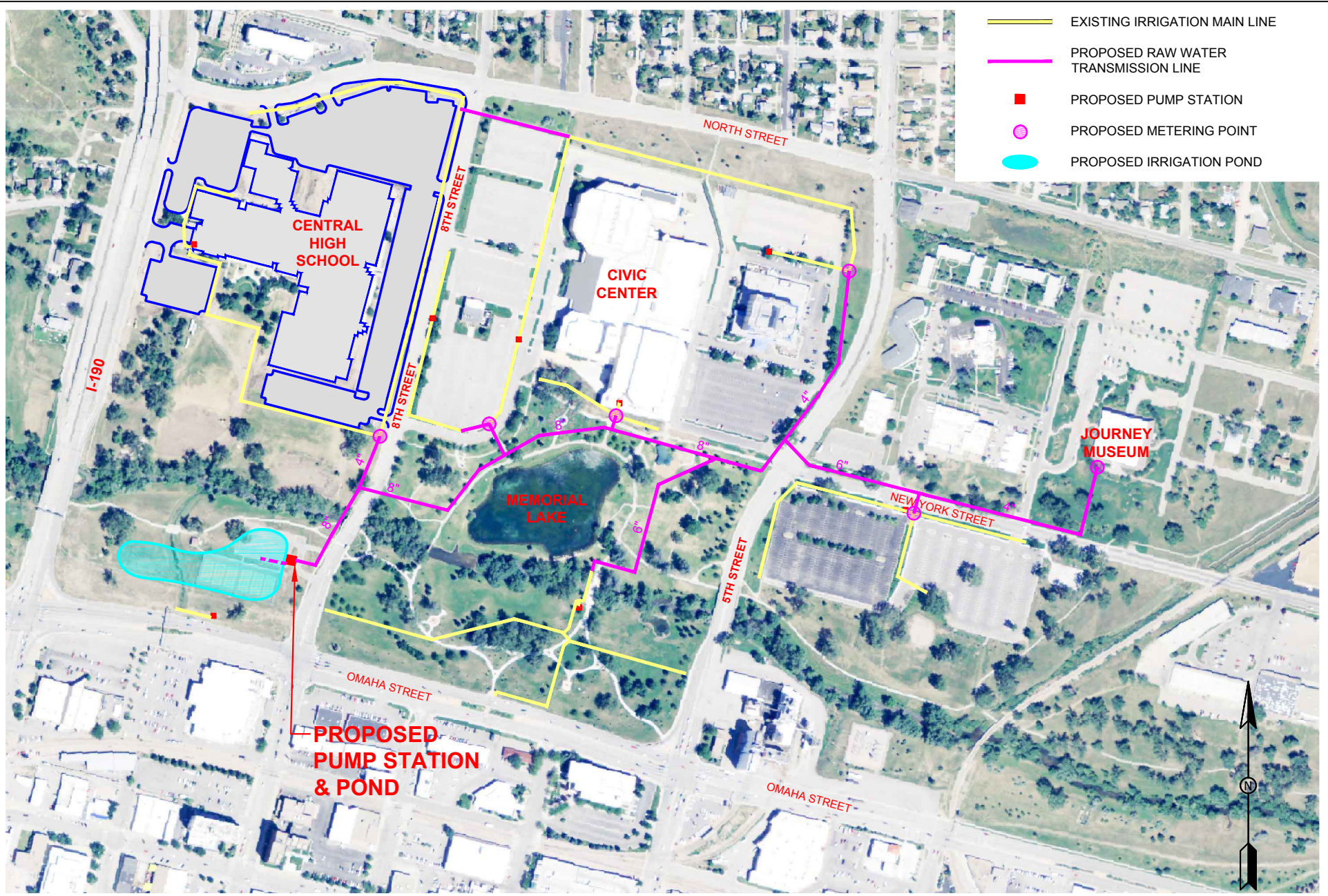


FIGURE 6.1
MEMORIAL LAKE STORAGE
AND PUMP STATION





MEMORIAL PARK
 IRRIGATION STUDY - TASK 1
 PROJECT NO 12-2002 / CIP NO. 50896

FIGURE 6.2
 8th & OMAHA ST. STORM WATER
 POND AND PUMP STATION

