NORTH UNION CANAL FEASIBILITY STUDY

Project ID: CEEn_2016CPST_012

by

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A Capstone Final Report
Submitted to

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Department of Civil and Environmental Engineering
Brigham Young University

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Executive Summary

PROJECT TITLE: North Union Canal Feasibility Study
PROJECT ID: CEEn_2016CPST_012
PROJECT SPONSOR: J-U-B Engineers
TEAM NAME: Reidhead, Schwicht & Schwicht

The North Union Canal Feasibility Study involves an assessment of current canal conditions, and the creation of an intermediate deliverable, a shapefile showing photographs of the status of the canal. The final deliverable, this report, pulls together data collected for this and previous projects, including photographs and estimation of current canal losses. The report also includes one piping and two alternative plans, and a feasibility report briefly weighing costs and benefits of each plan. The report also includes the final recommendation of Reidhead, Schwicht & Schwicht.

The canal is currently being patched. Continued maintenance is far less expensive in the short term than undertaking piping or covering the canal. Patching can mitigate losses due to percolation through damaged areas, though losses to evaporation will continue. An uncovered canal also has the benefit of clearly manifesting damage that could remain hidden in an underground structure.

Piping the canal offers the benefits of improved safety (as drowning risk is a concern for all open canals); reduced water loss due to evaporation, percolation, and water poaching; and the option of creating a recreational trail on top of the piped canal. A trail is particularly attractive, due to the benefit to the community and the possibility of eligibility for governmental grants. However, piping a canal does mean decreased access to the canal for maintenance and requires leveling structures to ensure flow in each pipe remains similar.

The possibility of enclosing the canal in a box culvert was also explored. This option also improves safety, reduces evaporation, and allows the creation of an affordable multi-use trail which will benefit the community and may make the project eligible for additional funding. The box culvert poses a smaller issue of maintenance access than does piping, and the single flow profile does not require any leveling structures.

Weighing the costs and benefits, we recommend that J-U-B Engineers should move forward on a design for box culvert to be placed along the length of the canal, with a multi-use trail on top of the enclosed canal.

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Introduction

The segment of the North Union Canal discussed extends from the Palisade Dr. crossing in Provo, Utah, to the reservoir near the 600 E 200 N intersection in Lindon, Utah.

J-U-B Engineers, acting for Lindon city, is interested in more clearly understanding the current status of the North Union Canal and in considering the best way to resolve issues and benefit the community.

Prior to this report, we submitted to J-U-B Engineers a shapemap file with nested photographs showing the general conditions of the canal.

The current issues with the canal are safety and water loss. Regarding safety, the canal poses a drowning risk. Fencing has proven an insufficient deterrent to people entering the canal. Regarding water loss, the canal reportedly in such poor repair that it loses enough water through percolation for some homes along the canal to suffer flooding in basements. This is doubly problematic, as the loss of water meant for irrigation means decreased flow. The open canal also loses significant water due to evaporation.

This report assesses the current status of the North Union Canal and examines the feasibility of three alternative plans, weighing costs and benefits of each, making a final recommendation for J-U-B Engineers.

The three plans are to continue patching activities, to pipe the canal and build a recreational trail on top, or to install a covered box culvert and build a recreational trail on top.

Schedule

- Extended Site visit with analysis of canal base – November 29th
- Proposal approval – December 6, 2016
- Submittal: Shapefile with canal photographs – February 14, 2017
- Submittal: Feasibility report submittal – April 10, 2017
- Presentation: Project summary – April 10, 2017

Assumptions & Limitations

Water data found in the 2016 NRCS document provided may be inaccurate, due to flow measurements being taken during a period when water may have been drawn for irrigation. We treated the data as legitimate in this study, but the losses may have been significantly overestimated.

Design, Analysis & Results

Maintaining Canal without Enclosing

Open canal description

The canal cross-section changes several times along the 3.7 mile stretch between Palisades and the Lindon pond near 400 E. Figures 1 through 10 show the cross-sections of the current canal, existing diversion structures, siphons, and road crossings in order of appearance traveling downstream.

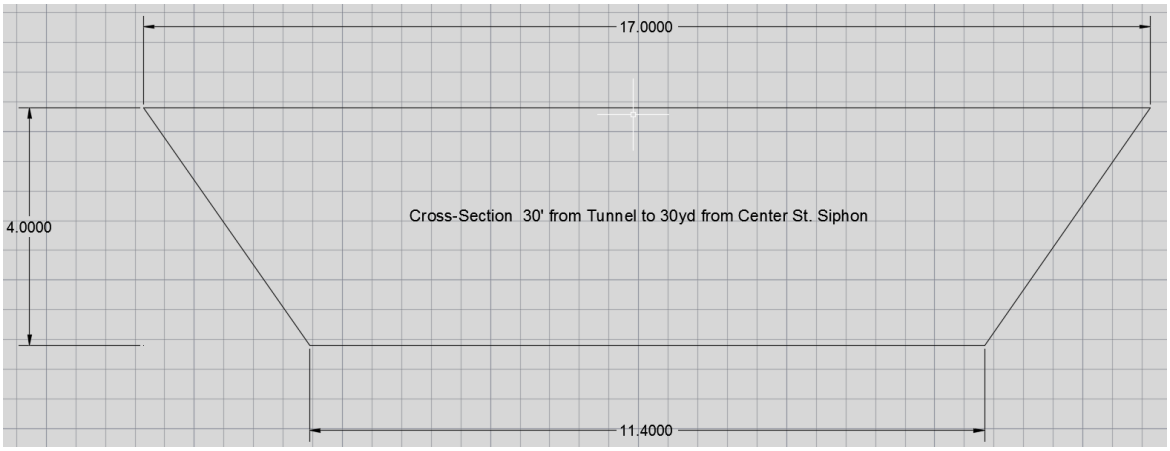

Figure 1. Cross-section from tunnel to 30 yd from Center St. siphon (ft)

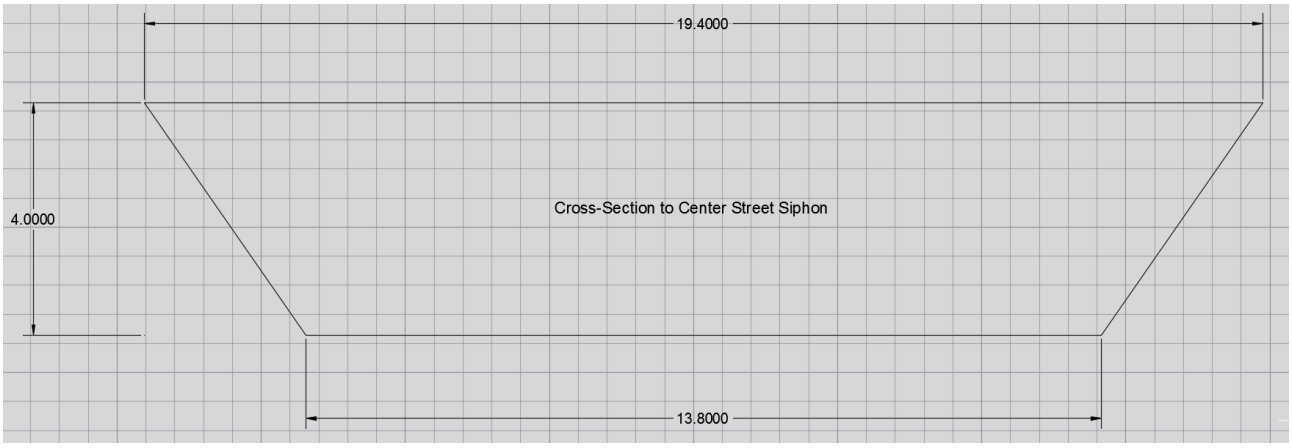

Figure 2. Cross-section to Center St. siphon (ft)

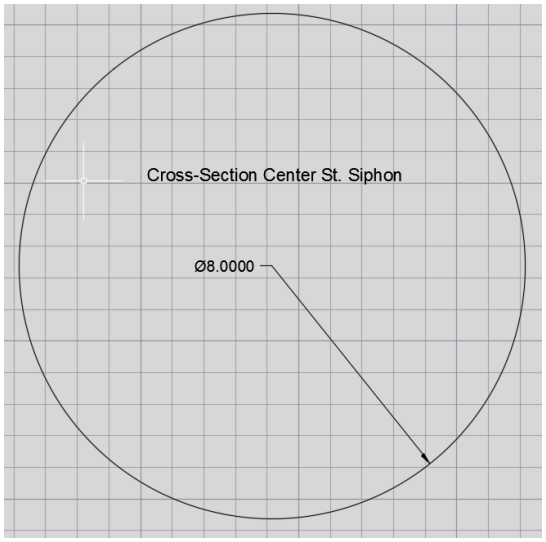

Figure 3. Cross-section Center St. siphon (ft)

Figure 4. Cross section from Center St. siphon to Palisade (ft)

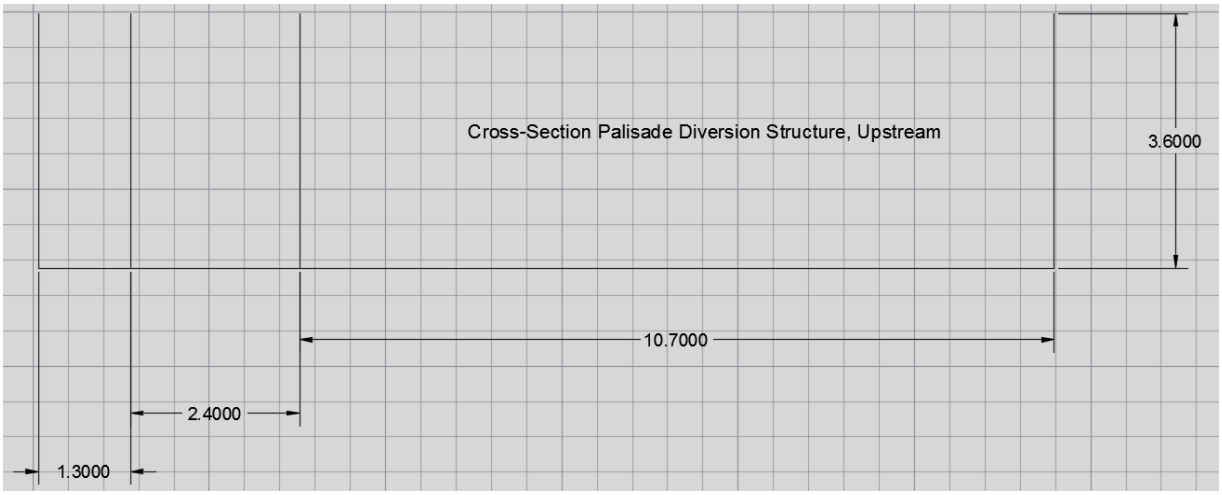

Figure 5. Cross-section Palisade diversion structure, upstream (ft)

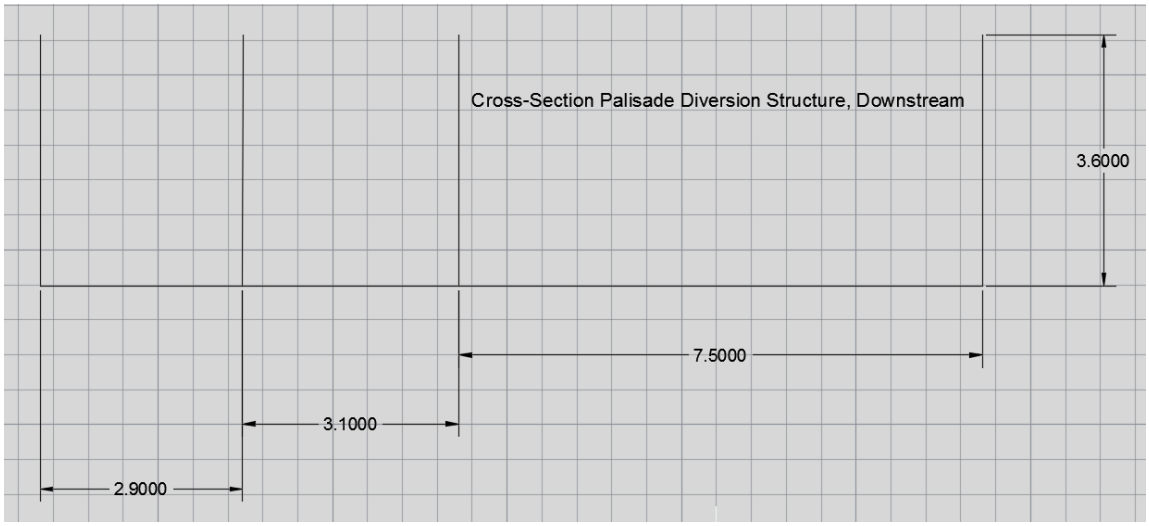

Figure 6. Cross-section Palisade diversion structure, downstream (ft)

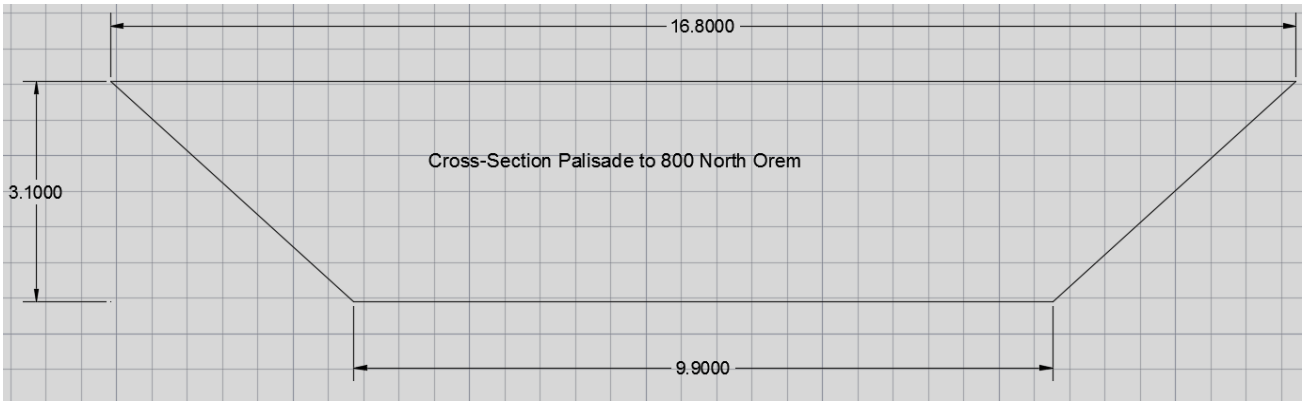

Figure 7. Cross-section Palisade to 800 North Orem (ft)

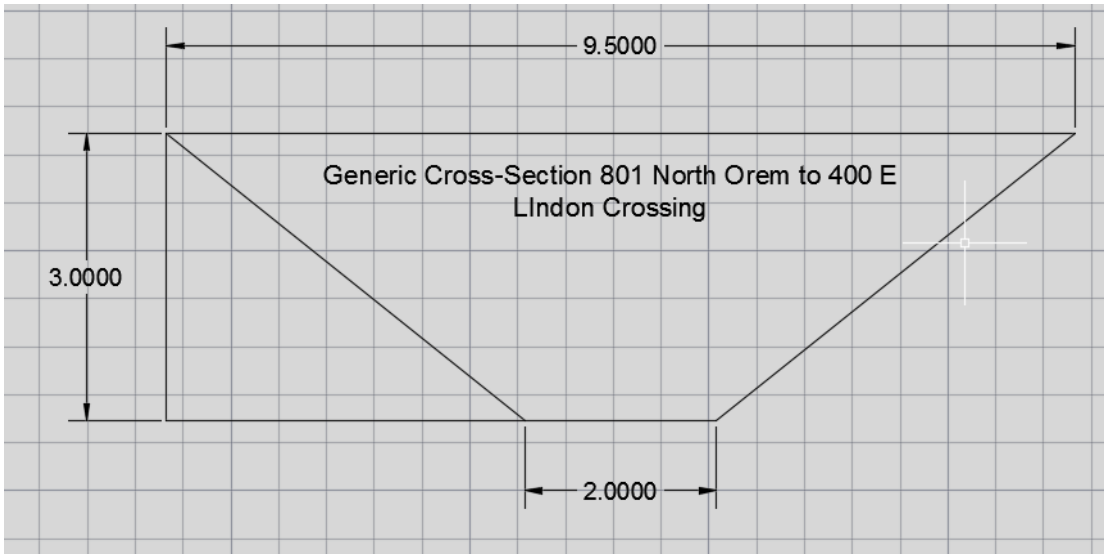

Figure 8. Cross-section 800 North Orem to 400 East Lindon crossing (ft)

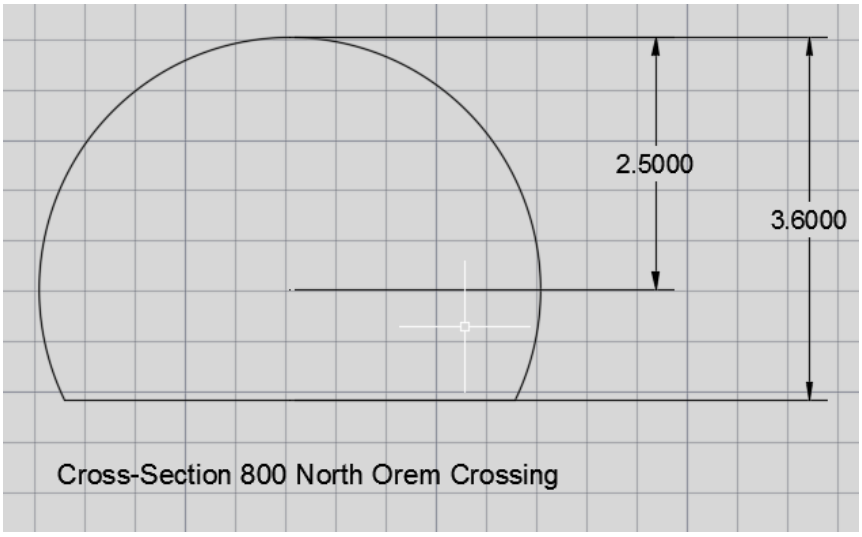

Figure 9. Cross-section 800 North Orem crossing (ft)

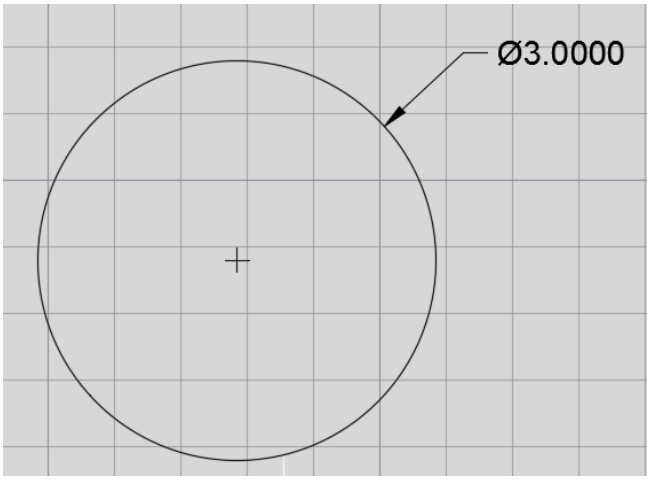

Figure 10. Cross-section Center St. and 175 North Lindon crossings (ft)

Safety

There is a very real danger for children or other citizens who do not realize the possibility of injury or drowning in the open canal. The canal is currently fenced along much of the length, though many gates along the canal were not locked during the site visit on 29 November, 2016.

The canal has an accumulation of broken glass from littered bottles, and even when the canal is dry the mud and other debris hides the glass strewn about, posing another danger to anyone in the canal.

Water losses

It is estimated that 8% to 10% are lost to evaporation in similar sized canals, but the specific losses for North Union Canal are estimated in Table 1, per a 2016 NRCS study. The data, taken over a period when no water was to be used from the canal, shows a 90% loss between Palisades and downstream of the pond.

Table 1. Flowrate measurements, July 14, 2016[1]

(Q in cubic feet per second, width and area in feet and square feet)

Location	Total Q	Top Q	Meas. Q	Bottom Q	Left Q	Right Q	Width	Total Area	Q/Area
Palisades	15.72	8.43	2.78	3.81	0.32	0.37	12.60	9.91	1.59
800 N (Orem)	10.54	5.34	2.25	2.50	0.29	0.15	9.90	8.26	1.28
203 S (Lindon)	9.69	4.60	2.10	2.33	0.33	0.33	6.26	4.84	2.01
Center - Canal Dr (Lindon)	9.58	3.34	3.49	2.25	0.25	0.26	5.75	6.10	1.57
200 N - Canal Dr (Lindon)	8.84	3.43	2.91	2.19	0.15	0.15	5.17	4.69	1.89
400 E (Lindon)	8.68	3.05	3.44	2.19	0.00	0.00	5.00	4.93	1.76
Above Pond 400 E (Lindon)	6.67	2.90	2.07	1.70	0.00	0.00	4.56	3.40	1.96
Downstream of Pond	1.20								

Current efforts to patch and repair the canal will hopefully mitigate losses due to percolation, although evaporation will continue to be an issue. A full repair of the canal would likely be necessary for long-term mitigation of seepage problems. After a full repair, losses would be likely around 9 to 11%, adding the evaporation losses to the through-wall seepage estimates found in Table 2.

Table 2. Through-wall seepage

per Rinker Materials Concrete Absorption Brief

Method of Transport	Greatest Wetted Perimeter (in)	Max ASTM Seepage (gal/in-mile-day)	Max Seepage Loss (gal)	Max Seepage Loss (cft)	Percent Loss assuming 52 cfs

[1] Taken from Water loss study on the North Union Canal and Provo Bench Canal, Nathaniel Todea, Utah NRCS State Hydraulic Engineer. Page 2.

Repaired Canal	248.82	200	184,127	24,614	0.55 %
3-24" Round Pipe	226.19	200	167,384	22,376	0.50 %
4'x8' Box Culvert	384	200	284,160	37,987	0.85 %

Estimated costs

J-U-B Engineers is familiar with the costs of the current patching and maintenance for the canal. Rough estimates for replacement with a new canal is outlined and compared with alternatives in Table 3.

Table 3. Canal repair option cost estimates

Method of Transport	Cross Section Area (ft^2)	Cost for Canal Demolition ($)	Cost of Change ($/ft)	Cost for Canal Replacement ($/ft)	Cost for Total (3.7 mile) Canal Replacement ($/ft)
Repair Canal	40.6	~70	~80	$150.00	$2,930,400.00
3-24" Round Pipe	9.42	~70	120	$160.00[2]	$3,125,760.00
4'x8' Box Culvert	32	~70	120	$149.00[3]	$2,910,864.00

Cleaning and maintenance are important and costly. As stated in previous reports, “property owners along the length of the canal often discard grass and tree clippings into the canal resulting in reduced flow capacities and cleaning problems. Water rights owners have to continually monitor and remove such debris to prevent the canal from clogging and overflowing. During the summer, algae growth becomes a major problem along the lining of the canal, which has to be removed to maintain efficiency.... At the first Center Street crossing, the water passes through a large inverted siphon. Because of the debris and sand in the water, the siphon has to be cleaned frequently.”[4]

Piping Canal

Possible pipe design

For the necessary capacity, three pipes of 24” diameter would be sufficient. Figure 2 shows a possible orientation of the pipes to be laid in the demolished canal channel.

[2] Pipe estimate per Geneva Precast
[3] Box culvert estimate per Harper Precast
[4] See North Union Canal Trail Concept Report

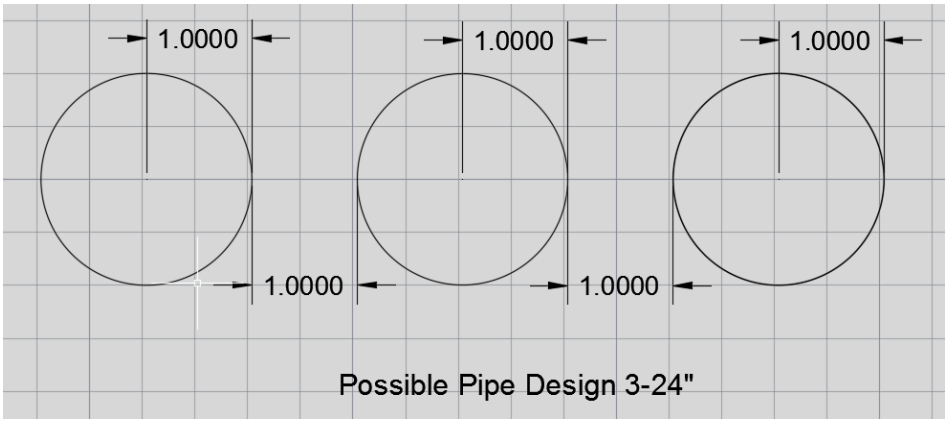

Figure 11. Possible pipe design (ft)

Safety

The primary safety concern regarding the canal is that of drowning. If piped, there will be almost zero possibility of drowning, as long as access areas are restricted to authorized and trained personnel.

Water losses

The average water loss from evaporation for a canal similar to the canal in question is 8% to 10%. Evaporation losses would be completely eliminated by piping. Per industry estimates, percolation losses shown in Table 2 come out to 0.5%.

Costs

When piped, maintenance costs will be greatly reduced, as no illicit dumping will be possible, and clogging and blocking of control structures will become far less frequent.

As of 2009, the Canal touched 323 different properties, and there are 18 areas where subdivision plats or lots of record have canal easements shown or described. These easement areas will have to be negotiated with the property owners before any significant repair or replacement work can take place.[5]

Based on estimates from various precast concrete suppliers in the Central Utah area, 24” precast concrete pipe can be purchased for a cost of just under 20$/ft. Placing 3 24” pipes side by side in the footprint of the canal and backfilling would be a simple and fairly economical solution.[6]

[5] See North Union Canal Trail Concept Report
[6] See Table 3. Canal repair option cost estimates

Enclosing Canal in Box Culvert

Possible box culvert design

For the capacity of the canal, an acceptable box culvert design is shown in Figure 12. The box culvert pricing was supplied by Harper precast.

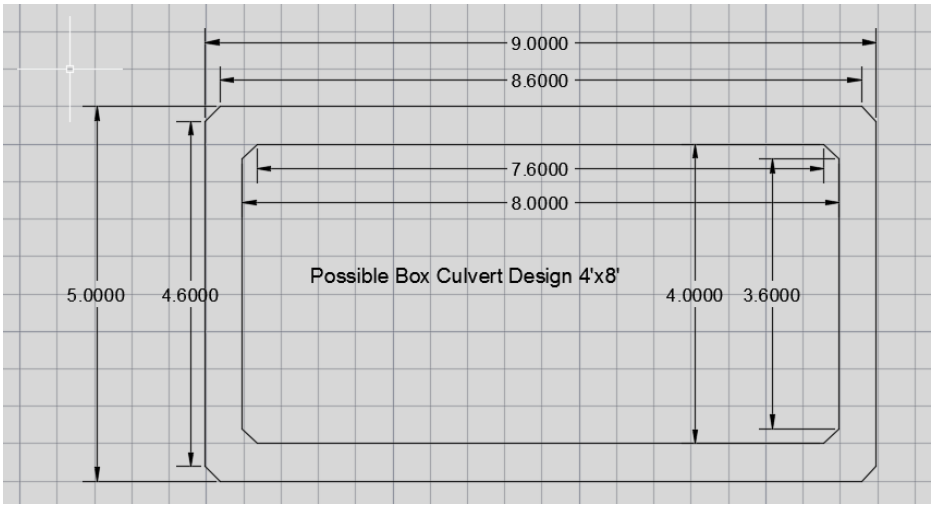

Figure 12. Possible box culvert design (ft)

Safety

The safety of a box culvert is equivalent to that of a pipe. If all sections are enclosed, only the beginning of the culvert is a dangerous area. A sufficiently sized box culvert will allow more convenient inspection of the canal interior once the canal has been drained.

Water losses

The losses on the new box culvert would eliminating evaporation. As estimated in Table 2, the box culvert would have losses of only around 0.85%.

Costs

As with piping, maintenance costs will be greatly reduced, as no illicit dumping will be possible, and clogging and blocking of control structures will become far less frequent.

Potential issues with easements and property lines are the same for the box culvert option as with the piping option.

Based on estimates from various precast concrete suppliers in the Central Utah area, a 4’x8’ precast box culvert can be purchased for a cost of $370 per 8’ section. With placement of one object in the place of the old canal, this may be the simplest option.[7]

[7] See Table 3. Canal repair option cost estimates

Recreational trail

Benefit to community

"Danger, Keep out" signs ought to cover the canal area as it now stands, but with investment, the entire area could become an attractive recreational area. If the canal were piped or enclosed in a box culvert, the easement of the canal could be topped with a multi-use trail for use by the community.

Cost

With grubbing and backfilling already completed by the placement of the pipes or culvert, the costs for this phase would be effectively zero, and with a small sum budgeted for finish grading of the subgrade, the placement of asphalt becomes the only costly portion of this part of the project. The costs put forth here are only sufficient for a fairly austere trail. No striping, rest spots, controlled crosswalks, or even landscaping are budgeted for in this estimate. A more full featured trail would require a larger investment, but if the simpler option is chosen to begin with, it can be expanded on and improved at a later time according to the amount of money available.
Eckles Paving has given a quote of $60 per linear foot of 18' wide trail for 3" asphalt over 6" road base.

Table 4. Trail cost estimates

Trail Building for 18' Trail	Cost per Foot ($)	Cost for Entire Canal Length ($)
Clearing/Grubbing	$0.00	$0.00
Sub Grading	$5.00	$97,680.00
(6") Base Course and (3") Paving[8]	$60.00	$1,172,160.00

Funding considerations

Recreational areas may be eligible for grants from the federal government:

- The Federal Highway Administration offers several for general community outreach and involvement,[9] and some specifically for recreational trail development.[10]

[8] Pricing of paving from estimate from Eckles Paving
[9] https://www.fhwa.dot.gov/discretionary/tcsp2011info.cfm
[10] https://www.fhwa.dot.gov/environment/recreational_trails/

- The EPA wants to address multiple community needs, and help with water use and transportation.[11] They also will help in building while construction is conducted in an environmentally responsible manner.[12]
- Many more grants are found Under Housing and Urban Development.[13]

The State of Utah also offers grants for this type of improvement. The Recreational Trails Program is a 50/50 program for Trails.[14]

Public Perception

While those at JUB are likely already familiar with Lindon City's needs and mindset, at a recent city council meeting a Ms. Chiffon Jolley introduced opportunities of improving the North Union Canal as a way of improving the availability of water to residents of Lindon.

On purchasing more water, Mr. Cowie stated "those costs could be multi-millions of dollars to increase capacity."[15] It could be done cheaper, collaborating with Orem, and maybe Provo by jointly improving the North Union Aqueduct; the main issue here is maluse of already owned water.

During the site visit on 29 November 2016, Laurie Long, a Lindon city resident on the 400 North Block whose property is split by the canal, expressed desire to have canal piped in and covered over.[16]

[11] https://www.epa.gov/urbanwaters/urban-waters-small-grants
[12] https://www.epa.gov/smartgrowth
[13] http://reconnectingamerica.org/resource-center/federal-grant-opportunities/
[14] https://stateparks.utah.gov/resources/grants/recreational-trails-program/
[15] Lindon City Council Staff Report, September 20, 2016, page 11.
[16] See Field Notes for contact information.

Conclusions

Canal replacement has an estimated upfront cost of $2,930,400. The inherent danger and inefficiency of an open canal decrease its attractiveness.

Piping the canal is estimated to have an upfront cost of $3,125,760. Piping is desirable for safety reasons and decreased losses to evaporation. Piping also allows for creation of a trail along the canal. A downside to piping is severely decreased access, complicating future maintenance.

The box culvert is estimated to have an upfront cost of $2,910,864. Improved safety, elimination of evaporation, and the possibility of creating a trail make a box culvert desirable. Additionally, though access is decreased from an open canal, access is superior than that offered by a pipe.

Recommendations

Continuing upkeep on the open canal is inexpensive in the short term, but delaying enclosing or covering the canal endangers community members.

We recommend converting the canal to an enclosed box culvert as the solution is less expensive and offers superior access than piping. A box culvert offers safety superior to the open canal. Due to the current condition of the canal, severe water losses will be best addressed by replacement, and a covered option means superior efficiency by resolving the issue of evaporation.

A recreational trail may be a strength for increased community enthusiasm. Considering community support alongside the opportunity to defray costs by obtaining governmental grants, creating a recreational trail along all or parts of the North Union Canal is worth consideration.

Appendix A: Team Member Resumes

Joshua Reidhead

• 2502 East Stonebury Loop, Springville, Utah 84663 • 385.259.3966 • joshua.reidhead@gmail.com

Education

- Brigham Young University, Undergraduate in Civil Engineering. Exp. Grad. Dec. 2017

Work Experience

- CUWCD, Orem, Utah Asset Management Intern June 2016-Present

Working under Blake Buehler and Heath Clark, improving asset management system. Thus far, I have digitally created hundreds of existing assets; Documented hydrologic processes; written instructional and mechanical documents; and walked on water…technically.

- BYU Engineering, Provo, Utah Intern May 2016-June2016

Working with Barry Holman, I performed cost analysis on hundreds of thousands of dollars' worth of work orders. Barry works directly under Paul Greenwood, the Director of Engineering at BYU.

- CUWCD, Orem, Utah *Assistant Lab Technician/Intern* May 2015 - August 2015

Working under Mike Rau the Water Quality Director, I collected and tested samples of water that almost One Million people depended on daily, and helped them to retain their "Phase IV Excellence in Water Treatment" award from the Partnership for safe water. An award that only 15 other plants in the nation have attained, which demonstrates a quality of water far exceeding current EPA standards.

Built spreadsheets in excel VBA that are still in use to speed up data gathering and report making.

- Springville City, Springville Utah *Part Time Intern* May 2015 - July 2015

Under direction of Jeff Anderson, for a city of more than 32,000 residents, I Inspected contractor bids with Noah Gordon. I took aerial photos of, then analyzed the beginnings of a large apartment complex "Outlook Apartments" using GIS modeling with Michael Philp, Springville GIS analyst.

- Plush Carpet Cleaning, Provo Carpet Cleaning Professional June 2014 – August 2014

After one hour of training, with little to no supervision, I cleaned over 100 homes, to customers' satisfaction. I negotiated and was responsible for the invoices and dues for each. I completely restored multiple pump sprayers and several hand-buffers mechanically and electrically.

- BYU, Provo, Utah *Laboratory Assistant* May 2013 – June 2014

Working directly with Dr. Lon Cook, Various tests and lab procedures performed in search of treatments for eye diseases. Most specifically Macular Degeneration and other retinal disorders.

Saw firsthand the importance of teamwork in small and large group settings.

Worked together with other universities and research teams worldwide.

- Geneva Rock, Salt Lake City, *Aggregate Quality Control* May 2008-Nov 2008

Working under Victor Johnson, personally, took over 1000 samples of aggregate, performed tests, directly aiding in improving and protecting more than 13,000 Tons of aggregate material used for many different projects, including the construction of Bangerter Highway to 2700 West, Phase 2 which received prestigious awards from UDOT, and Nationally, the "Gold Winner" from ACPA.

Service and Achievements

- Proselyting Missionary Service in Southern California from May 2010 - May 2012
Supervised 18 men for 8 months during that time. Through weekly meetings, one on one interviews and written reports, held each accountable and provided encouragement in order to improve, stretch and reach goals as a team. Also reported weekly to my own supervisors. Daily personally taught and worked with people from many different cultures and backgrounds.
- Community Service at Provo Rehabilitation and Nursing Center
More than 120 hours between Feb. and Aug. 2012, interacting with patients. Spanish Liaison.
- Eagle Scout: Organized and directed 35 youth in preparing and packaging almost 800 Health Care Kits for victims of the Sri Lanka Tsunami in 2004.

DANIEL SCHWICHT

dewschwicht@gmail.com | 385.204.3852

EDUCATION

- Brigham Young University, Seeking MS, Civil Engineering 2009 - present

RELEVANT EMPLOYMENT

- **Geology Illustrator** 2015
Brigham Young University, mentored by Dr. Ron Harris
  - Coordinating with Dr. Harris to illustrate geological concepts for his textbook
- **Geotechnical Engineering, Materials Testing and AutoCAD Intern** 2013 - 2015
Hattenburg Dilley & Linnell Engineering Consultants Anchorage, AK
  - Worked in certified lab, geotechnical drilling, and in field
  - Performed gradations (grain size), field and lab concrete tests, nuclear densometer tests, asphalt burn and rice tests, Atterbergs, etc.
  - Corrected and verified drawings in Autodesk, ArcGIS
- **Soils and Concrete Lab Technician** 2009
Anchorage Sand & Gravel, Anchorage AK
  - Executed industry-approved test methods for aggregate and concrete for in-house quality control and R&D lab
  - Assisted in research and development of concrete materials and methods for more favorable environmental impact and greater profitability

VOLUNTEER AND LEADERSHIP EXPERIENCE

- **Full-time Religious and Service Missionary** 2010 - 2012
Baltimore, MD
  - Two full years of unpaid, voluntary service
  - Developed contacts by word of mouth and referrals
  - Taught, sought out and performed community service
  - Trained other missionaries in teaching, contacting, etc.

AWARDS AND ACCOMPLISHMENTS

- **Benjamin B. Talley engineering scholarship** 2014
Society of American Military Engineers, Anchorage Alaska chapter
- **Eagle Scout** 2009
Boy Scouts of America, Great Alaska Council
  - Coordinated Eagle Scout service project landscaping at Blood Bank of Alaska

- Organized and directed over 500 man hours of service
- Solicited donations of construction materials and food

SKILLS AND CERTIFICATIONS

- Professional experience with Autodesk, ArcGIS, Excel, Word, and some Visual Basic (VBA)
- Troxler Nuclear Gauge Operator certified, HAZMAT certified, 2013
- American Concrete Institute (ACI) Concrete Strength Testing certified, 2013
- ACI Concrete Field Testing certified, 2013
- Spanish classes and translation experience, 2005 - 2012

Jeffrey Schwicht

971 North, 1000 West, Provo, UT 84606 (385)-275-8868 **J.Schwicht@gmail.com**

Objective

Obtain a challenging EIT position that makes use of skills and experience in Materials Testing, Construction Inspection, and Project Design.

Work Experience

Soils Inspector, Lab Technician, Engineering Intern
4/2015 to 8/2015 and 4/2012 to 12/2012 HDL Eng., Anchorage, AK
Monitored multiple projects simultaneously and worked with contractors across Anchorage Bowl and through much of South-Central AK while also conducting laboratory testing.
Created, revised, and finished professional technical drawings with AutoCAD and other programs.

Construction Special Inspector and Lab Technician
4/2014 to 8/2014 Northern Geotechnical Engineering, Anchorage, AK
Monitored progress and standard compliance on dozens of construction projects of various size across wide geographical area.
Ensured specification compliance and kept detailed records of work performed during construction, providing team of contractors, engineers, designers, and owners with rapid up-to-date feedback on construction progress.

Quality Control Manager
6/2013 to 8/2013 Ridge Contracting, Inc. Manokotak, AK
Ensured quality work and materials for 4.35 mile, six-million dollar road project in Bush Alaska for Western Federal Lands Highway Division.
Supervised two other Quality Control Personnel while also managing scheduling, timecards, hauling quantities, and traffic control for entire project over the season while working 14+ hour days, 7 days per week.

Military Experience

4th Year Army ROTC Cadet at Brigham Young University
12/2014 to Present, BYU Army ROTC, Provo, UT
Currently serving as Platoon Leader, with responsibilities including Flag Ceremonies, ROTC Fund-raising, and coordinating regular training for 45 cadets.
Planning to commission into UT National Guard and attend Engineer Officer Basic Training for three months, starting in May of 2017.

Education

Brigham Young University, Provo, UT. BS in Civil Engineering, April 2017

Skills

Certifications for testing Concrete, Soils, and Asphalt.
Experience with drafting software and Geographic Information Systems.

Fluent in Spanish of various regions due to two-year proselyting mission in Long Beach, CA. Two semesters of University German.

Literate in Microsoft Office, some experience in Visual Basic for Excel.

Clean Driving Record.

Appendix B: Site Visit Notes

Obstructions in the canal:
Road Crossings:

- 1 Palisade Dr. 2 1000 East,
- 3 200 South,
- 7 800 East,
- 8 Center Street,
- 9 400 East X 200 North,
- 11 400 North Orem,
- 12 500 North,
- 13 600 North,
- 14 800 North,
- 16 1200 North,
- 17 Timpanogos Blvd,
- 18 1600 North,
- 19 Main street Lindon,
- 21 200 S Lindon,
- 22 Center Street Lindon,
- From here on, two separate driveways then roughly two acres covered, then on and off covered until the reservoir, (at least 6 driveways and two street crossings.

Other non moveable crossings:
4 Cement walkway, 5 50 year old cement with rebar, 6 1 foot diameter pipe, 10 Foot Bridge, 16 foot diameter metal pipe, 18 LARGE grates
Movable crossings
15 boards, Walkway, 20 SEVERAL between Main street and Center Street Lindon.

At 800 North, the canal submerges under Berge Auto, who knows what's under there, and how secure it is…for the water.
Significant Narrowing occurs at 1600 North

Specific Measurements
9/23/16 Survey Data
Tunnel 1 Exit
7 ft, Square
0940

Canal Cross Section, 30' from tunnel
b= 11.4'

d= 4’
z=2
B= 17’

Tunnel 2 Entrance Siphon
8’ Dia
Before Tunnel,
b= 13.8’
d= 4’

Palisade
Before
b= 18.5’
d= 3.6

Right Diversion
b= 10.7 7.5
Center Diversion
b= 2.4 3.1
Left Diversion
b=1.3 2.9

Spillway, 3’ hump
b= 7.8 7.2

Palisade + 25 yd Cross Section
b= 9.9
B= 16.8
h= 3.1

Palisade + 75 yd Bridge
h= 3.2

950 E Crossing

1 Lane Bridge

800 E
h= 3’
Water Valve
2’, South

Center Street, 1140

Pump in Bucket

2’ and 1’ Valves, Pump

400 E
h= 3’

Pedestrian Bridge

E 400 N, 8” takeoff, North

800 North
Trunc. Circ
5’ D, 3.6’ d
b=7.6’
1246

12th North
Rect 2.6’
2’ Takeoff, West

1450 N Timp Blvd
Rect 3’

1600 N
2 Rect
3’+ of Mud
Brush Catcher above mud, unknown depth.

1601 N Cross Section
b=2’
B=9.5’
d=3’

E 1800 N
3’ Clearance Lindon
Caulking falling out in multiple places in canal wall

2005 Lindon
3’ Sunk Canal covered on other side ~=~10’ wide

Blocky transition
Out

Center Street
Brush Catcher
3’ Dia Corrugated Metal
Smacked

~40 yd 100 N canal, 3’ Dia, Concrete

175 N
Concrete 3’ Dia

Contact with resident, expressed desire to have canal piped in and covered over. Ease of access to own land cited as major reason.
Laurie Long 375 N Canal Drive, Lindon
801 623-7272

400 N
4’ Dia Concrete
Brush Gate
400 E
3’ Concrete
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