BYU ENGINEERING
Civil & Construction Engineering

CAPSTONE

Mitigating Submerged Hydraulic Jumps at Low-Head Dams

Project ID: CEEn_CPST_011

by

Dam Solutions
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A Capstone Project Final Report

Submitted to

Dr. Rollin Hotchkiss
Brigham Young University

Department of Civil and Construction Engineering
Brigham Young University

4/11/22

Executive Summary

PROJECT TITLE: MITIGATING SUBMERGED HYDRAULIC JUMPS AT LOW-HEAD DAMS
PROJECT ID: CEEn_CPST_011
PROJECT SPONSOR: Brigham Young University
TEAM NAME: Dam Solutions

Dam Solutions will investigate the occurrence of a submerged hydraulic jump in Taylorsville in the laboratory flume in CB 171. We will design a scale model for the low-head dam located at W 4430 S and S 500 W in Taylorsville as well as the proposed plans to mitigate the impacts of a submerged hydraulic jump. We plan on designing our model of the low head dam by surveying the dam, the stream bed immediately downstream from the dam, and the stream bed ~100 ft downstream of the dam. We will accomplish this by having a student hold a surveying rod in the river long enough to get readings at each location. This student will be equipped with a wetsuit and helmet and will also be tied off with two ropes. Two people on each side of the river will hold on to these ropes. We plan on hiring a machine shop to create a scaled 3D model of the surface of the stream bed made of foam. Once the model is created we will install and test it in the flume for a wide range of discharges and tailwater depths.

The end deliverable will be this report, an analysis and summary of our findings from the Taylorsville City dam. It will include what we found while testing our model of the current Jordan River Streambed as well as the proposed Taylorsville City retrofit solution. In addition, it will include our surveying efforts as well as the modeling process.

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Introduction

This project is an attempt to solve the dangers surrounding low-head dams. Low-head dams are short structures, typically less than 15 feet tall, extending from bank to bank across a river. These dams are built to divert water for irrigation or purposes.

Figure 1. Low-head dam in Taylorsville

Under high flow conditions, a phenomenon known as a submerged hydraulic jump can occur. Fast-moving water falls over the crest of the dam and meets deep slow-moving water (high tail-water). The fast-moving water rises and is pushed back to the face of the dam, creating a recirculating current. These currents are extremely difficult to escape, causing those caught in them to be trapped and drown. Our task was to create a scaled streambed of the low-head dam in the Jordan river by W 4430 S and S 500 W in Taylorsville, Utah, a known location of a submerged hydraulic jump. In addition, we were tasked with modeling Taylorsville city's proposed plan to reconstruct the existing streambed and eliminate the hydraulic jump.

Figure 2. Warning sign near Winchester Park low-head dam

Schedule

January 2022- Once Dam Solutions has received approval from BYU risk management, the team will travel to the project site and survey the low-head dam crossing on the Jordan River in Taylorsville.

February 2021- Use data collected while surveying to create a 3-D model of the streambed and give data to the manufacturing lab to create a model for BYU's laboratory flume.

February 2022- With guidance from the team's faculty advisor and relevant research, discuss the retrofit option idea applicable to low-head dam by W 4430 S and S 500 W in Taylorsville, Utah.

February 1st, 2022- Review the potential retrofit option plans as provided by Salt Lake County

March 2022- Test the designed model in the laboratory flume and determine its ability to prevent the formation of a hydraulic jump. In addition test the model of the current Taylorsville city dam

April 2022- Team members will present a report to the client including design drawings, experimental results, cost estimates of the prototype, as well as impacts this adjustment might have on society.

Assumptions & Limitations

Our first objective was to prepare for and survey the streambed below the low-head dam. For safety reasons, we were only planning to be in the water for at most an hour. It was winter, and the temperature was cold. We could not take as many points as might be optimal for a highly detailed model. We took about 140 points over our 100’ by 120’ survey area. We must assume our model was detailed enough, and we did prove that a submerged hydraulic jump did occur.

We were limited by the products and processes available to us for modeling. We used insulation foam, but we had to glue three pieces together to get the necessary thickness. The foam had imperfections and some water flowed through the model. The router itself was not able to reach all the way down in one area, so we had to manually sand it down to match the correct depth. We also had some pieces come off during the cutting we had to glue on after.

For testing we assumed high flow conditions because this is when a submerged hydraulic jump is most likely. Due to malfunctioning equipment, we were not able to monitor the flow in the flume as closely as we would have liked. This limited us to analyze how the models would perform in a window of limited flow rates. Due to the fact that the proposed retrofit plan for the Taylorsville dam is already approved we were not too concerned with this limitation. We assumed that the flow over the dam face should be 1100 cfs to cause a submerged hydraulic jump, this would scale to 0.157cfs in the flume. In addition, we assumed the test subject was a small child equipt with a life preserver. For this we used an inch long foam piece.

Design, Analysis & Results

We planned seriously for safety. We were prepared with a dry suit, a harness with two ropes on each side, low-head dam escape training, picking a time with low flow, BYU risk management approval, and plentiful supervision.

Figure 4. Jason with surveying safety gear

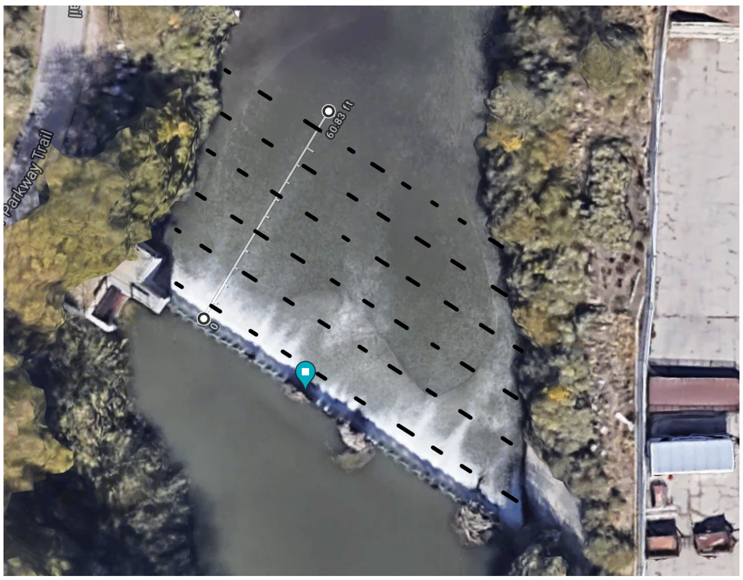


Figure 3. Surveying plan of Taylorsville dam

Figure 5. Dam survey spectators

We coordinated with Salt Lake County and Murray city office officials to have access to the dam and their nearby parking lot.
Student research assistants working for Dr. Hotchkiss were able to come and view the process.
Many photos and videos were taken to document the dam before it was removed in the following months.
Dr. Mitchell and his associate Todd Osbourn trained us on how to use the GPS Rover to take accurate survey points which we could use to create a 3D model of the streambed and dam using ArcGIS and Civil 3D.

Figure 6. Surveying with the Rover

We input the survey points into ArcGIS Pro, and added some more points to show the rising bank on both sides of the river. We also added points showing the concrete diversion structure and height of the dam itself. After confirming the accuracy of these points with overhead imagery, we opened these points in AutoCAD Civil 3D. Using online tutorials, we were able to create a mesh 3D net of the streambed using a TIN interpolation model.

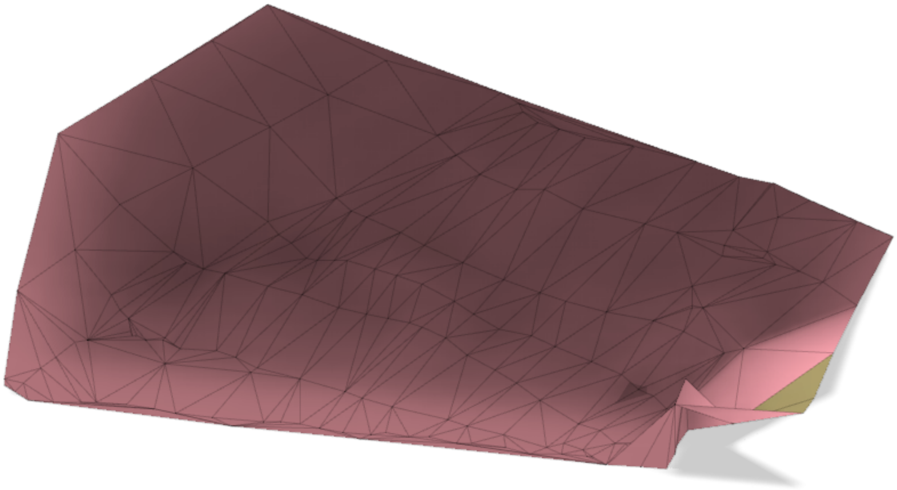


Figure 7. Mesh 3D model of streambed

We downloaded this model as a STL file and took it to the prototyping lab. Unfortunately, there were several problems with the file. The mesh surface previously interpolated had several areas of self intersecting geometry. We met with several different lab assistants in the BYU Mechanical Engineering Prototyping Lab and tried using Blender and SolidWorks to fix these surface errors. After several meetings and unsuccessful attempts to mend the 3D surface, the lab assistants recommended making an appointment with the MakerSpace in the HBLL. The MakerSpace works extensively

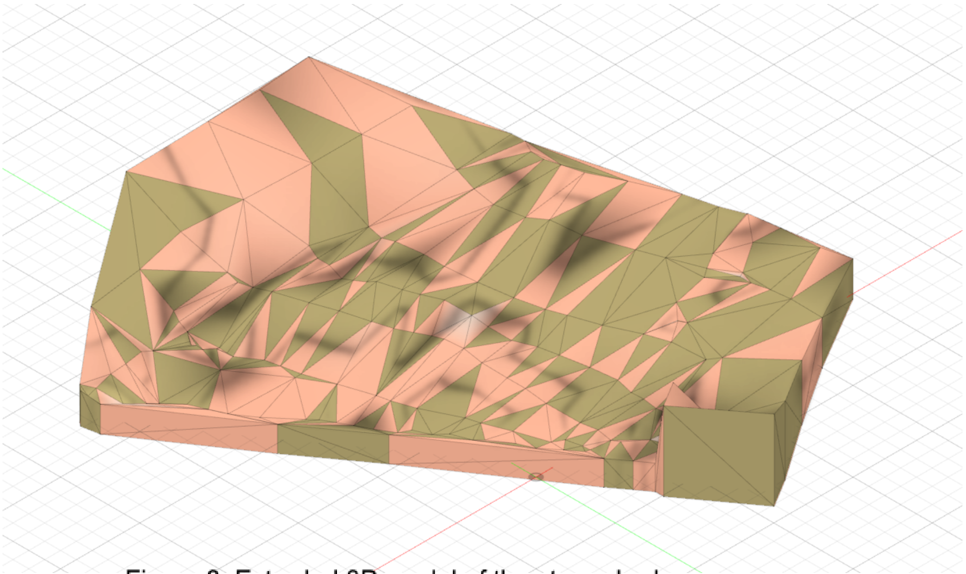


Figure 8. Extruded 3D model of the streambed

with STL files meant for 3D printing. They were able to successfully fix these surface errors with their software program and convert our mesh surface into a solid, thickened surface. We took this new file back to the Prototyping Lab and they were able to run it through their toolpathing program for the CNC Router.

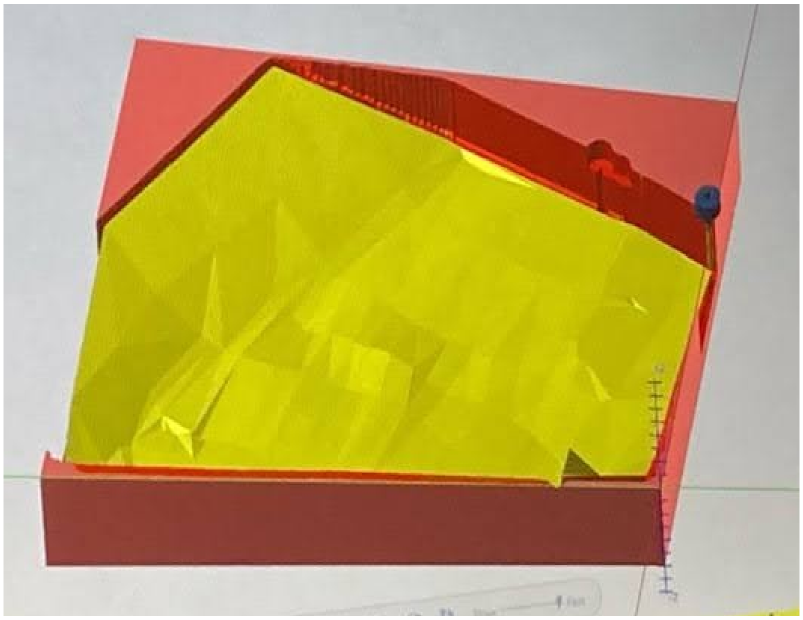


Figure 9. CNC router model of streambed

We had the choice of cut times of 2 hours, 4 hours, and 6 hours. As the cut time increased, so did the relative smoothness and the resolution of the model. After discussing our schedules, our team decided on a cut time of 4 hours and created a schedule where we would take shifts watching it since one of us was required to be there for the full duration.

Figure 10. CNC router cutting the model

We decided to use insulation foam for our final model. The foam came in 2” thick pieces, so we stacked three pieces on top of each other and glued them together using a high strength epoxy.


Figure 11. Cutting excess foam from model

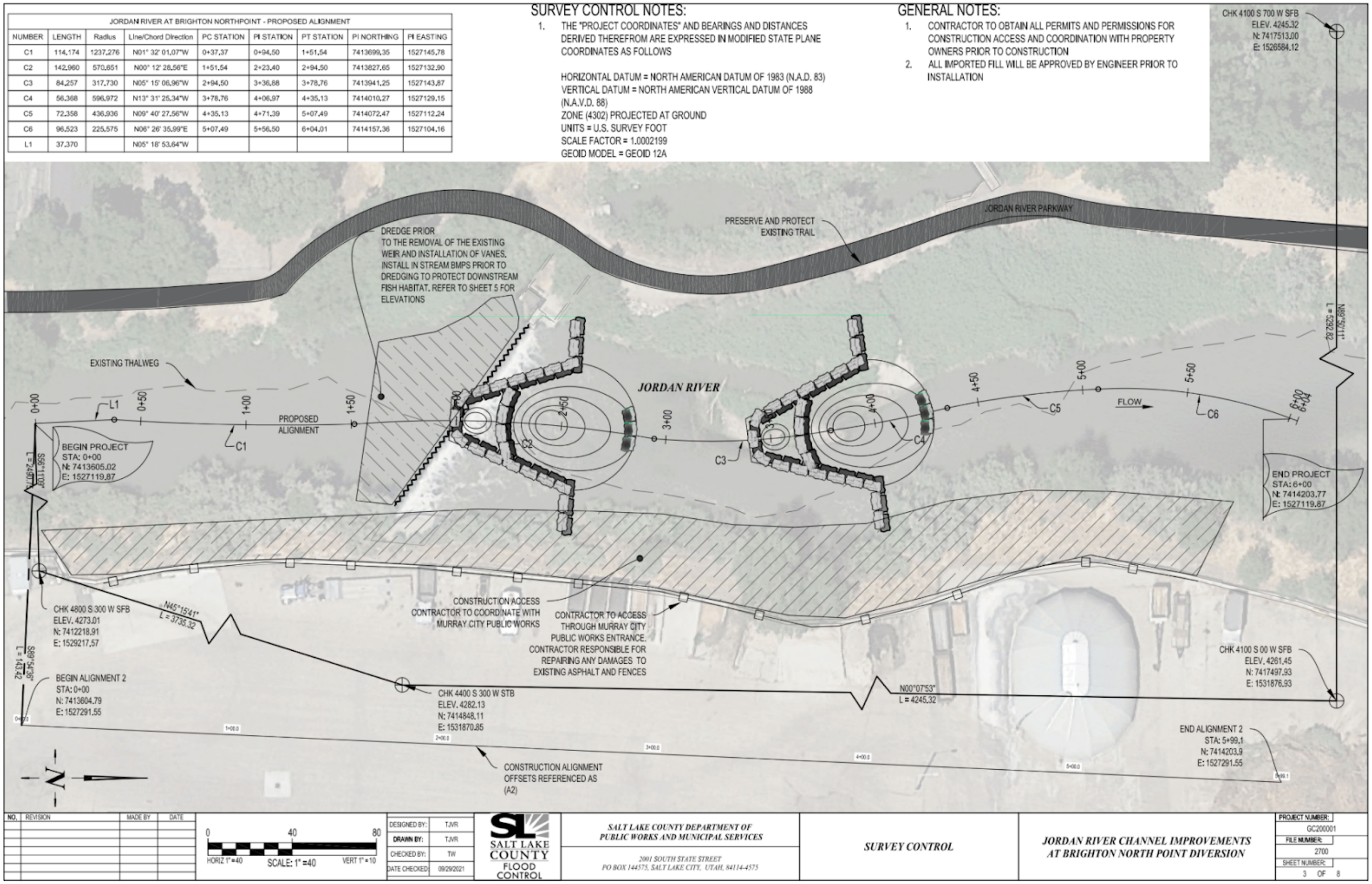
After the model was cut out by the CNC Router, we used a hot wire cutter to trim off the excess foam on each side. We placed heavy weights on top of the sides of the model due to the material's buoyant nature.

Once the foam was cut and the weights were placed on the sides of the model of the flume, we were ready to begin testing. We turned on the flume and slowly increased the flow until we successfully created a submerged hydraulic jump. To ensure we had successfully created a submerged hydraulic jump, we placed an earplug upstream and watched it get caught at the base of the low head dam. Once we were able to prove our model created a submerged hydraulic jump, we were ready to test Salt Lake County's retrofit design.


Figure 12. Finished model in flume

To model and test Salt Lake County's retrofit design, we created a streambed out of gravel, and used 1.5" aggregate to model the rock vanes. The aggregate was kept in place using two-by-fours. The depths of the scour pools and other parts of the model were all created to scale. Using the same flow rate we used for the model of existing conditions, we were able to ensure that there was no submerged hydraulic jump. To do this, we placed an earplug upstream and watched it safely flow downstream. According to our model, we can safely conclude that Salt Lake County's approved design will remove the submerged hydraulic jump at the observed low head dam.

Figure 13. Model of retrofit



JORDAN RIVER AT BRIGHTON NORTHPOINT - PROPOSED ALIGNMENT

NUMBER	LENGTH	Radius	Line/Chord Direction	PC STATION	PI STATION	PT STATION	PI NORTHING	PI EASTING
C1	114.174	1237.276	N01° 32' 01.07"W	0+37.37	0+94.50	1+51.54	7413699.35	1527145.78
C2	142.960	570.651	N00° 12' 28.56"E	1+51.54	2+23.40	2+94.50	7413827.65	1527132.90
C3	84.257	317.730	N05° 15' 06.96"W	2+94.50	3+36.88	3+78.76	7413941.25	1527143.87
C4	56.368	596.972	N13° 31' 25.34"W	3+78.76	4+06.97	4+35.13	7414010.27	1527129.15
C5	72.358	436.936	N09° 40' 27.56"W	4+35.13	4+71.39	5+07.49	7414072.47	1527112.24
C6	96.523	225.575	N06° 26' 35.99"E	5+07.49	5+56.50	6+04.01	7414157.36	1527104.16
L1	37.370		N05° 18' 53.64"W					

Figure 14. Salt Lake County retrofit plans

Related Issues

Our project shows that local low-head dams can be dangerous under high flow conditions. We surveyed the dam in the winter with low flow, and there was no submerged hydraulic jump. Two people died at this dam in the summer months, and we proved a submerged hydraulic jump does exist under those conditions with our model in the flume. Our results can be used to show the reality and variability of these dangers. Even dams that are safe 99% of the time can be very dangerous (rainstorms, floods, etc.). These dams need to be modified or removed for public health and safety, as well as fish passage. Low-head dams are found all across the country, especially in the East with old colonial mill dams and in the arid West for irrigation diversions. Action needs to be taken on a national scale.

The inaction by states because of fear of lawsuits shows us the flaws in our legal system. The purpose of the legal system is to protect the people and provide justice, and here it is preventing that. At the dam we surveyed it took deaths, a lawsuit, and a settlement to get the money required for the retrofit of the dam. Our results prove these dams are dangerous and can be retrofitted. The next task we must solve is how to get the required money and action from the government to solve this public safety crisis.

A potential way to get moving on this issue is to partner with stream connectivity advocates. Fish passage and the environmental movement is gaining steam and they also want to remove low-head dams, although for different reasons. More money can be found in this area than public safety at the moment.

Lessons Learned

We experienced many challenges in surveying the dam, and came up with solutions:
-Temperature: Average winter water temperatures in the Salt Lake area ranges from 37.8°F to 38.8°F. At these temperatures, 15 to 30 minutes of exposure can cause exhaustion and/or unconsciousness and can be fatal after 30 to 90 minutes of exposure. A drysuit with fleece layers, neoprene booties, a winter hat, `gloves are recommended. (source).
-Where to place the people/anchors and how to get the rope across: We could float the line down the river, but then the rope would be cold and wet, and whoever is in the water would have to tie themselves off. The rope would need to be very long and should be tied with a figure 8 knot that can be clipped in with a carabiner to the harness.
-Getting around trees - where will people/anchors stand: One group will stand in the Murray City office parking lot, the other will stand on the structure overlooking the dam on the other side. The safety ropes can be held here and anchored to other structures.
-Where to take points: The boil point seemed about 2 feet from the dam, so it would probably be best to take measurements starting 3 feet away from the dam at least, and then in 10 feet intervals starting with the west side across the dam and 10 feet intervals back about 60 feet (about 11 measurements 6 times, parallel to the dam.)
-The scour hole is much deeper than anticipated: Bring extension pieces to make the rover longer, or measure the deep section using grade rod from Fluids lab and subtract distance from a known elevation point
-There is a submerged hydraulic jump when we arrive: Leave and come back when no submerged hydraulic jump is present or tie off and enter the submerged hydraulic jump very carefully.

There were several challenges creating the 3D model and getting it to successfully run through the toolpathing program. None of us have much experience using Civil 3D, so creating the initial mesh surface was a challenge. We didn't realize that the mesh surface would have self intersecting geometry. The lab assistants working at the Prototyping Lab usually work with simple objects and had no experience with topographical surfaces. They were not able to fix the surface errors after several hours of trying. Luckily, the MakerSpace had the right type of computer software that easily mended the geometry, converted the surface from mesh to solid, and extruded it. While cutting, the CNC Router drill bit would snag on surfaces of the model that weren't glued together. We had to preserve those pieces and glue them on afterwards. The foam shavings produced while cutting the model out were extremely messy and covered the

CNC Router as well as the floor and walls of the lab. It took two hours to vacuum up the pieces; the shavings filled up two large trash bins. While creating the Salt Lake County model, we realized some of the aggregate may flow downstream in the flume. To avoid this, we placed wire mesh to catch these aggregates.

Conclusions

By recreating the streambed located in the Jordan river by W 4430 S and S 500 W we concluded that under high flow conditions this dam creates a submerged hydraulic jump. This hydraulic jump simulated in the lab produced strong currents that can be fatal. After modeling the city's new proposed streambed in the flume, we can conclude that there will be no danger of a hydraulic jump on this part of the Jordan River. The new sloped streambed and rock veins will allow the water to flow downstream without high tail-waters forming.

Recommendations

Our recommendations for the following project are as follows:

-Make a list and set of generalized retrofit plans for low-head dams with cost estimates, pros and cons, and other information. Make this publicly available.

-Publish new research actively online at dams.byu.edu and other places to increase awareness and following.

-Make a new YouTube video updating the public on our recent low-head dam work and direct them toward things they can do to help or donate.

Appendix A

point	northing (y	easting (x)	elevation	location	point	northing (y	easting (x)	elevation	location	point	northing (y	easting (x)	elevation	location	point	northing (y	easting (x)	elevation	location	point	northing (y	easting (x)	elevation
1	2259808.8	465436.24	1278.5033	NE BRIDGE	39	2259748.9	465476.7	1275.8955	River	77	2259744.1	465471.37	1275.4903	River	115	2259742.3	465459.85	1275.4945	River	153	2259753.6	465465.4	1276.485
2	2259808.8	465436.24	1278.5193	NE BRIDGE	40	2259748.7	465479.12	1275.9183	River	78	2259743.9	465472.83	1275.7594	River	116	2259742	465461.1	1275.474	River	154	2259754	465464.92	1276.501
3	2259741.3	465453.88	1279.828	PLATFORM	41	2259748.7	465480.76	1275.9419	River	79	2259743.7	465474.15	1275.8747	River	117	2259741.2	465462.06	1275.4849	River	155	2259753.8	465465.45	1276.5069
4	2259770.9	465469.21	1276.2984	River	42	2259748.4	465482.81	1275.9216	River	80	2259743.6	465474.87	1275.8461	River	118	2259740.3	465463.28	1275.4901	River	156	2259754.9	465466.79	1276.4693
5	2259765.2	465462.86	1276.3282	River	43	2259748.3	465483.66	1275.8614	River	81	2259743.1	465476.08	1275.6038	River	119	2259739.7	465464.42	1275.5065	River	157	2259757.7	465467.31	1276.552
6	2259764.8	465465.01	1276.2671	River	44	2259748.2	465484.7	1276.1251	River	82	2259742.6	465477.2	1275.5783	River	120	2259738.8	465465.88	1275.5183	River	158	2259759.8	465468.6	1276.5739
7	2259764.5	465467.92	1276.3129	River	45	2259744.6	465485.73	1276.1725	River	83	2259742.2	465478.48	1275.6735	River	121	2259738.2	465466.35	1275.5221	River	159	2259759.8	465466.2	1276.4314
8	2259764	465470.06	1276.4869	River	46	2259744.3	465484.78	1275.8972	River	84	2259741.4	465480.31	1275.8613	River	122	2259737.7	465467.7	1275.509	River	160	2259762.2	465467.89	1276.4365
9	2259763.6	465471.89	1276.2999	River	47	2259744.4	465484.08	1275.6381	River	85	2259740.9	465481.96	1275.9832	River	123	2259737.1	465468.35	1275.5245	River	161	2259764	465470.14	1276.4262
10	2259762.9	465474.3	1276.2083	River	48	2259744.3	465482.86	1275.4576	River	86	2259740.1	465484.18	1276.0101	River	124	2259736.5	465469.49	1275.5117	River				
11	2259761.7	465477.4	1276.1746	River	49	2259744.5	465482.19	1275.5376	River	87	2259739.7	465485.46	1275.7845	River	125	2259735.8	465469.87	1275.5162	River				
12	2259760.8	465479.89	1276.0374	River	50	2259744.9	465481.35	1275.7267	River	88	2259739.3	465486.18	1276.0191	River	126	2259735.1	465470.08	1275.5368	River				
13	2259760.6	465481.53	1275.8716	River	51	2259744.9	465480.8	1275.9053	River	89	2259739.2	465487.01	1276.3081	River	127	2259735	465471.06	1275.5424	River				
14	2259760.4	465482.66	1275.8199	River	52	2259745.3	465478.99	1276.1144	River	90	2259734.5	465486.58	1276.2439	River	128	2259734.5	465472.13	1275.5159	River				
15	2259760.3	465483.67	1275.8327	River	53	2259745.6	465477.81	1276.2523	River	91	2259734.2	465485.88	1275.9505	River	129	2259734	465473.04	1275.5185	River				
16	2259760.4	465484.42	1276.0878	River	54	2259746	465476.38	1276.3387	River	92	2259734	465484.96	1275.8492	River	130	2259733.5	465473.92	1275.5159	River				
17	2259760.3	465485.22	1276.2949	River	55	2259746.1	465474.43	1276.1195	River	93	2259733.7	465484.53	1275.4995	River	131	2259733.1	465474.47	1275.5146	River				
18	2259755.4	465484.88	1276.3472	River	56	2259746.5	465473.39	1275.7424	River	94	2259733.6	465484.16	1275.5648	River	132	2259731.6	465475.24	1275.5373	River				
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22	2259755.9	465477.93	1276.1107	River	60	2259747.9	465466.7	1275.5007	River	98	2259734.3	465482.65	1275.7489	River	136	2259729.1	465480.26	1275.5467	River				
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24	2259757.2	465472.31	1276.2232	River	62	2259748.1	465463.4	1275.4113	River	100	2259734.5	465481.8	1275.4497	River	138	2259727.8	465481.99	1275.4811	River				
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26	2259758.5	465467.85	1276.5459	River	64	2259747.8	465461.17	1275.5618	River	102	2259735.7	465479.24	1275.4525	River	140	2259725.8	465483.7	1275.5834	River				
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28	2259759.4	465465.31	1276.2976	River	66	2259747.9	465460.17	1275.8609	River	104	2259736.9	465475.71	1275.4654	River	142	2259725.5	465485.04	1275.9718	River				
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30	2259760	465462.59	1276.2913	River	68	2259746.5	465458.46	1276.1477	River	106	2259737.8	465472.44	1275.4473	River	144	2259726.6	465484.77	1275.7835	River				
31	2259753	465461.11	1276.4817	River	69	2259745.4	465459.13	1275.6607	River	107	2259738.3	465470.83	1275.4917	River	145	2259727.9	465485.08	1275.8579	River				
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34	2259752	465466.4	1275.9631	River	72	2259744	465460.26	1275.5917	River	110	2259740.4	465465.39	1275.4973	River	148	2259731.5	465485.23	1275.637	River				
35	2259750.9	465468.73	1275.918	River	73	2259743.8	465463.25	1275.5214	River	111	2259741.3	465463.08	1275.5219	River	149	2259733.1	465481.3	1275.5177	River				
36	2259750.2	465470.79	1275.9532	River	74	2259743.6	465465.96	1275.5042	River	112	2259742	465462.68	1275.4931	River	150	2259735.6	465477.83	1275.472	River				

CapstoneSURVEY

Figure 15. Points taken using the Rover for the streambed

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EDUCATION

B.S. **Brigham Young University, Provo, Utah**
Civil & Environmental Engineering, expected April 2022
Relevant Skills and Courses: Geographic Information Systems (GIS), Drafting w/CAD, Hydraulics and Fluid Flow Theory, Hydraulic Engineering, Environmental Engineering
Study Abroad: Infrastructure and Global Leadership in Italy, France, and the Netherlands

PROFESSIONAL AND VOLUNTEER EXPERIENCE

Civil Engineering Department, Provo, Utah *Research Assistant* *(08/2021-Present)*
-Supported civil engineering research related to irrigation, water utilities, and sustainability

BYU Women in Civil Engineering, Provo, Utah *Secretary* *(11/2020-Present)*
-Performed general administrative duties for academic club

Hansen, Allen, & Luce, Inc., South Jordan, Utah *Water Engineering Intern* *(05/2021-07/2021)*
-Performed energy analysis for Mapleton wells
-Drafted City Master Plans for Drinking Water, Secondary Water, and Wastewater
-Designed Unidirectional Flushing Sequences using GIS, EPANET, and Python
-Wrote technical memos
-Determined infiltration in wastewater systems
-Created Emergency Response Plans following EPA/AIWA requirements
-Completed Sewer Development using GIS and SSA

Civil Engineering Department, Provo, Utah *Research Assistant* *(09/2020-05/2021)*
-Populated database locations of low-head dams using Google Earth Pro

Concrete Canoe Team, Provo, Utah *Member* *(09/2017-04/2018)*
- Performed concrete canoe design
- Analyzed concrete specimen for structural strength

Chemical Engineering Department, Provo, Utah *Administrative Assistant* *(06/2016-06/2018)*
- Performed general administrative duties

WE@BYU Women's Research Mentorship, Provo, Utah *Research Intern* *(09/2016-04/2017)*
- Populated water database to support research
- Researched national water structures' engineering standards

RECOGNITION AND MEMBERSHIPS

- American Society of Civil Engineers BYU Student Chapter, *Member* (2016-Present)
- Women in Engineering Scholarship (Fall & Winter 2016-2017)
- National Center for Women & IT Aspirations in Computing Award Winner (2016)
- National Technical Honor Society (2014-2016)

LEADERSHIP AND COMPUTER SKILLS

- Proficient with Word, Excel, PowerPoint, CAD, GIS, Autodesk Inventor, and Revit
- Training Leader Volunteer, Church of Jesus Christ of Latter-day Saints (2018-2019)

Andrew M. Meyer

4583 Berklie Dr. Tallahassee, FL 32308 (850) 322-4981 Andrewmm8796@gmail.com

EDUCATION

Civil and Construction Engineering-Brigham Young University. Provo, UT
Graduation Date: **December 2022**

- **GPA: 3.79**
- Fluent in Spanish

Completed Core Courses:

CE EN 361 Intro to Transportation Eng.
CE EN 112 Engineering Drafting w/ CAD
CE EN 332 Hydraulics and Fluid Flow Theory
PHYS 121 Intro to Newtonian Mechanics
MATH 112 Calculus 1
MATH 113 Calculus 2
CE EN 321 Structural Analysis
CE EN 214 Geomatics (GIS Projection)
CE EN 170 Computational Methods
CE EN 231 Global Leadership
MATH 215 Computational Linear Algebra
MATH 314 Multivariable Calculus

Currently Enrolled Core Courses:

CE EN 341/342 Soil Properties & Mechanics
GEOL 330 Geology for Engineers
CE EN 304 Metals, Woods, and Composites
CE EN 306 Concrete, Masonry, and Asphalt
CE EN 471 Civil Engineering Practices

WORK EXPERIENCE

Geotechnical Lab Technician, Geostrata Engineering & Geosciences, Bluffdale, UT
Sept 2020- Current

- Manage laboratory testing for 3 Professional Engineers and 3 Professional Geologists
- Conduct laboratory tests in accordance with ASTM and AASHTO standards
- Train new technicians in laboratory soil testing
- Supervised drilling and logged data for geotechnical borehole explorations

Building Care and Maintanance, Brigham Young University, Provo, UT
Sept 2019- March 2020

- Provided on-site job training for new employees
- Worked in teams with other co-workers to maintain facilities

Summer Camp Counselor, Swift Creek Middle School, Tallahassee, FL
June 2016- August 2016

- Organized and led small to large group activities of students ages 9-14

Beekeeper, A. H Meyer and Sons, Madison, SD
June 2012- July 2015 (summers)

- Worked together with co-workers to find more effective solutions on how to care for and regulate beehives

OTHER EXPERIENCE

Volunteer Representative, The Church of Jesus Christ of Latter-day Saints, Boston, MA
June 2017-June 2019

- Provided leadership and development training for 22 volunteer representatives
- Managed well-being of volunteers and success in their area of work

Miscellaneous

- Eagle Scout- Boy Scouts of America

SKILLS

Computer

- Courses completed in AutoCAD, ARC GIS, Civil3D, and Revit
- Course completed in VBA Excel Coding

PATRICK MCDIVITT

680 East 350 North, Provo, UT, 84606 | (949) 690-4335 | patrick.mcdivitt22@gmail.com | Linkedin: Patrick McDivitt

Strong leader who has experience in project management, strong technical skills, great interpersonal skills, and speaks/reads/writes fluent Dutch. Will graduate with an M.S. in Civil Engineering in April 2024.

KEY QUALIFYING EXPERTISE INCLUDES:

Project Management | Interpersonal Skills | AutoCAD | Excel VBA | Microsoft Word
Dutch Fluency | Time Management | Handles Pressure Well | Problem Solving

EXPERIENCE

AECOM, Salt Lake City, UT — 2020 – Present
CONSTRUCTION SERVICES INTERN
Ensures roadway construction is progressing per plans and specifications.
- Communicates payments with contractors on state and federally funded projects.
- Western Alliance for Quality Transportation Construction (WAQTC) concrete testing certified.
- Sampling, Reduction and Density Testing Technician (SRDTT) certified.

EPIC ENGINEERING, Provo, UT — 2019 – 2020
STRUCTURAL ENGINEERING INTERN
Reviewed plans for solar panel installation.
- Worked with programs including Excel and AutoCAD to review plans for solar panel installation.
- Assisted drafters by reviewing and adjusting drawings in Revit.
- Assisted structural engineers using programs including Enercalc and Weyerhaeuser Forte.

BRIGHAM YOUNG UNIVERSITY, Provo, UT — 2018 – Present
STUDENT, TEACHING ASSISTANT, E.I.T.
Studying Civil and Environmental Engineering; Passed the Fundamentals of Engineering Exam
- Member of the BYU chapter of the Phi Eta Sigma Honor Society for exceptional grades; GPA: 3.81
- Experience with AutoCAD, Civil 3D, and Revit.
- Construction Manager of the Earthquake Engineering Research Institute at BYU, designing and competing balsa wood structures to withstand earthquake simulations.
- Teaching assistant for CCE 306: Civil Engineering Materials: Concrete, Masonry, and Asphalt

JAMBA JUICE, Provo, UT — 2018 – 2019
LEAD CREW SUPERVISOR
Ensured employees at both stores were working properly to provide excellent customer experience.
- Listened to customers' comments, responded appropriately, and effectively handled issues.
- Kept inventory and ordered new products of 2 campus Jamba Juice locations.
- Trained employees on proper use of equipment, store operation, and seasonal promotions.
- Assigned tasks and distributed work to keep a an efficient, friendly, and clean store.
- Corrected employees' inappropriate conduct.

THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS, LEIDEN, THE NETHERLANDS — 2016 – 2018
VOLUNTEER REPRESENTATIVE
Led and managed volunteer efforts across the Netherlands and Flanders, Belgium.
- Taught representatives in leadership positions how to better manage their assigned districts and zones.
- Managed an international campaign designed to reach Dutch and English-speaking students living in Belgium and the Netherlands using demographic targeted Facebook advertising, acquiring more than 3,000 leads.
- Assigned to lead and provide training to groups of up to 24 other representatives.
- Worked 70+ hour weeks to accomplish the assigned tasks and goals.

AWARDS AND HONORS

Received various awards and recognition for outstanding training and operations performance, including:
Phi Eta Sigma | Member of National Honor Society | President of Spanish National Honor Society

Jason Poff

https://www.linkedin.com/in/jason-poff-40511517a/
poffjason125@gmail.com +1 (503) 724 8687

EDUCATION

Brigham Young University — Provo, UT
Bachelor of Science in Civil Engineering — April 2022
- GPA: 3.96 / 4.00
- Passed Fundamentals of Engineering Exam November 2nd, 2021
- BYU Full Academic Scholarship
- Specializing in Water Resources and Environmental Engineering
- Architectural Lead of Earthquake Engineering Research Institute Club
- President of BYU Disc Golf Club

ENGINEERING EXPEREINCE

Brigham Young University — Provo, UT
Research Assistant with Dr. Hotchkiss — April 2021 - Present
- Write law review of 16 low-head dam drowning cases
- Create Google Earth database of over 300 potential low-head dam locations in Idaho
- Build stream slope map in ArcGIS Pro with 1m DEM data

Brigham Young University Grounds — Provo, UT
AutoCAD/GIS Specialist — April 2019 - Present
- Use AutoCAD and ArcGIS Online to map out and regularly update sprinkler systems, shrubs, and trees
- Create and update 70 hyperlinked maps accessed online for reference in the field for technicians
- Coded Excel VBA inventory system of outgoing and incoming sprinkler parts

GeoStrata — Bluffdale, UT
Geotechnical Lab Technician Intern — Oct 2020 - May 2021
- Performed soil tests (Proctor, Atterberg limits, Gradation, Collapse/Consol, etc.) by ASTM and AASHTO standards. Analyzed, calculated, and reported results
- Identified soil types in the field

INTERPERSONAL AND COMMUNICATION SKILLS

Encircle – Home for LGBTQ+ Youth — Provo, UT
Volunteer — May 2021 - Present
- Supervise over 20 youth during activities and friendship circles
- Provide support and friendship to youth

The Church of Jesus Christ of Latter-day Saints — Tokyo, Japan
Full-Time Volunteer Representative — June 2016 - July 2018
- Developed strong work ethic by working 12 hours a day to talk to, teach, and serve people
- Studied, learned, and spoke in Japanese
- Trained weekly in leadership positions (District & Zone Leader, Assistant to the President)
- Learned to love talking with people and how to establish relationships of trust
- Gained a deep appreciation and love for the Japanese people and culture