LID APPROACH EFFECTIVENESS & FUNCTIONALITY STUDY FINAL REPORT
Project ID: CEEn_2016CPST_003

by

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A Capstone Project Final Report

Submitted to

Chris Thompson
Spanish Fork City Public Works

Department of Civil and Environmental Engineering
Brigham Young University

4/16/2017

Executive Summary

PROJECT TITLE: LID Approach Effectiveness & Functionality Study
PROJECT ID: CEEn-2016CPST-003
PROJECT SPONSOR: Spanish Fork City Public Works
TEAM NAME: Team LID

Recently the Environmental Protection Agency has required that municipalities in Utah design their stormwater systems to retain the 90th percentile storm on site. The purpose of this project is to analyze the LID systems in Spanish Fork City for compliance with EPA standards. Team LID is to research rainfall data for Spanish Fork City, compute runoff volumes, measure percolation rates, and compare these data to confirm compliance with EPA regulations. Team LID will also predict system performance for larger storm intensities, such as 25 year, 50 year, and 100 year storms. Furthermore, silt build-up will be analyzed so that a proper cleaning and maintenance schedule can be determined.

After analysis, it was determined that the LID systems in Spanish Fork exceeded EPA standards. The total runoff volume for the specified area was less than half of the calculated system volume. In areas with highly permeable soil, the LID systems also performed well under the larger design storm intensities, but in the site analyzed that had poor soil permeability, the system is expected to have issues with overtopping. During inspection of the system, it was observed that there were issues with poor construction of the LID systems leading to leaf build-up in the entrance R-Tank, but no significant silt buildup was observed.

Based on the above observations and analysis, Team LID recommends that an access be added to existing systems that would allow leaves to be cleaned out easily from the entrance R-Tank. For future systems, it is recommended that a wire mesh is placed over the entrance of the Oil-Water-Debris Separator to prevent leaves and trash from entering the system, eliminating the need to include the access in future construction.

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Introduction

Recently, the EPA has required each state in the United States develop stormwater systems that meet certain retention specifications. Municipalities in Utah are required to develop Low Impact Development (hereafter LID) stormwater systems that are able to retain the 90th percentile storm on site, as opposed to piping it to the river as has been common practice in the past. Spanish Fork has developed a LID system and has asked Team LID to analyze their system and compare its performance with the EPA standards, while giving any recommendations for possible system improvements. Furthermore, Team LID has been asked to investigate the system for silt build-up in order to suggest a proper cleaning and maintenance schedule of the system.

System Overview

The current LID system in use consists of rows of R-Tank structures (Figure 1) that are stacked two deep and lined in shallow trenches (about 4 feet deep), covered with geotextile fabric, and then backfilled, with about a foot of cover on top. The R-tanks are backfilled along the sides with a layer of sand to improve permeability. Storm drains along the street provide inlets to the system, allowing runoff to enter these R-Tank structures and then percolate into the soil, replenishing the aquifer. See Figure 2 for the standard drawing of the system.

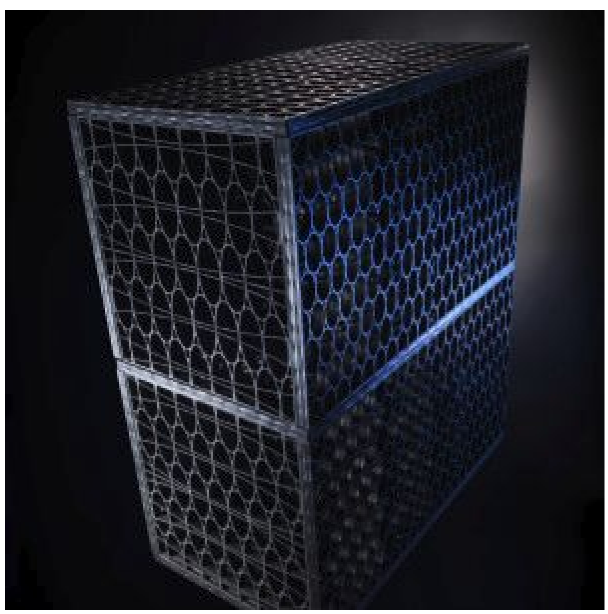

Figure 1. *R-Tank image from ACF Environmental website.*

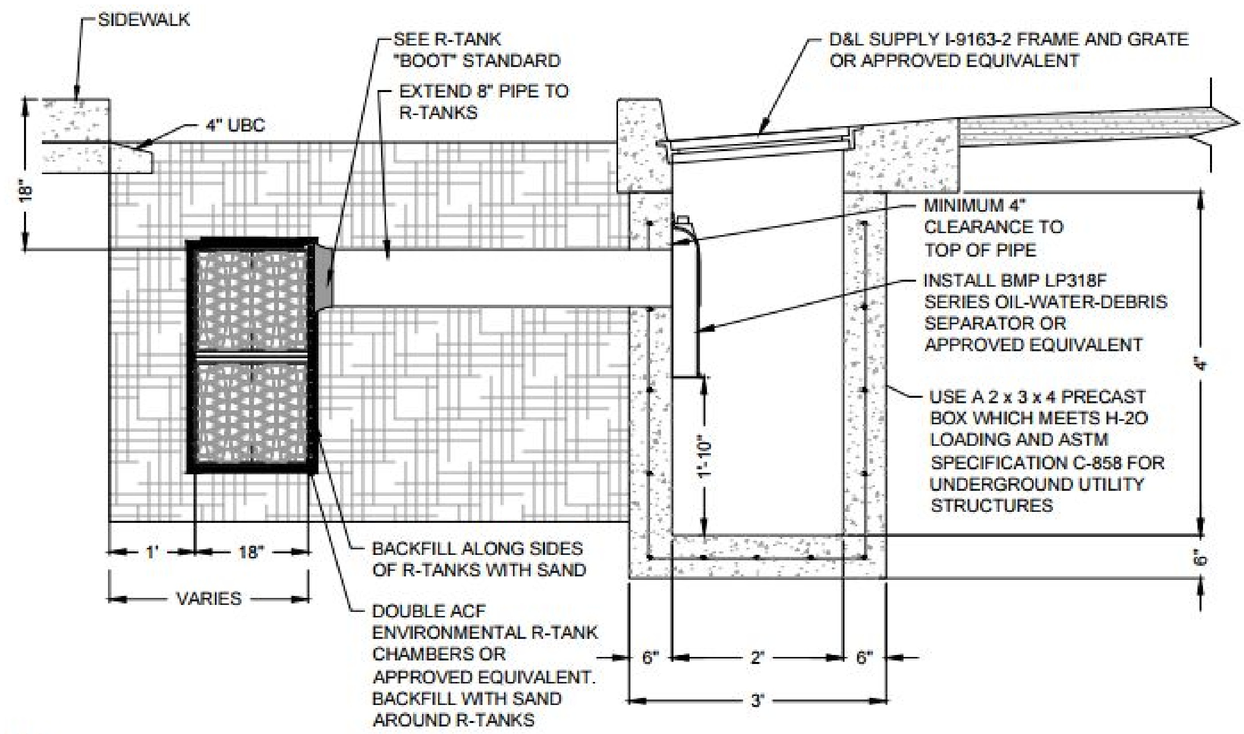

Figure 2*. Standard design drawing from Spanish Fork's website.*

Schedule

January

Su	M	Tu	W	Th	F	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

February

Su	M	Tu	W	Th	F	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

March

Su	M	Tu	W	Th	F	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

April

Su	M	Tu	W	Th	F	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

Milestones & Accomplishments

Jan 20	Initial site visit
Feb 6	Percolation test visit
Feb 13	Reconfirming percolation test visit
Mar 3	Finalized Percolation calculations
Mar 13	R-tank/silt build up inspection
Mar 29	R-tank/silt build up inspection
Mar 31	Determining required maintenance
Apr 3	Compare EPA standards
Apr 10	All Deliverables Complete

Assumptions & Limitations

Because Spanish Fork's LID system are fairly new in application, there are a few assumptions and limitations for this project. Assumptions and limitations should not affect whether Spanish Fork's LID system meets EPA standards or not because calculations are conservative.

Assumptions

Below is a list of assumptions:

- Calculations were done using the NRCS Curve Number Method. Table 5.7 (Table A6) from *Hydrology Water Quantity and Quality Control* was used to calculate the curve numbers for hydrologic soil groups. This table assumes an average percent impervious area. If this percentage were changed, the curve number would be changed. Cover type and hydrologic conditions used were Streets and roads: Paved; curbs and storm sewers and Residential districts by an average lot size of 1/8 acre.
- Calculations for percolation or storm events assumed that the water in the R-tanks will only drain through the bottom of the R-tank. This is a conservative assumption when in reality if the R-tank is full water will also drain to the sides of the R-tank.
- Assumed that all soil around R-tank has the same percolation rates as the percolation rates calculated after site visits.
- Of the two R-tanks inspected, silt build up was not a problem. Not all R-tanks are in similar situations.

Limitations

Below is a list of limitations Team LID faced:

- Limitations we used the curve method to estimate the runoff which isn't exact. The curve number is based on different ground conditions. The conditions used were residential areas and paved areas.
- Time and Resources were certainly a limitation because only two R-tanks were inspected as representations for all R-tanks set up in Spanish Fork.

Design, Analysis & Results

Percolation Test

To determine whether the R-tanks meet EPA standards, the percolation of 3 sites were first determined. All procedures are in general accordance to the falling head percolation test on the EPA standards. Steps and adjustments will be provided here. These adjustments are made based on the results and observations from an early site visit that we have done. Results were then compared to standard percolation rates (Table A5).

- According to the EPA standards, three holes 6 inches in diameters should be dug at each site. For our tests, three holes were dug at site 1. One hole was dug at the other two sites because high permeability. The weather also limited the length of time that we could work on the sites. The holes are also dug with 7 in diameter. This is done because the tool that we have access to can only allow us to have a 7 in diameter hole.

Figure 3. *Hole dug for percolation tests*

- All the holes are then filled with about 12 in of water. For the more clayey area, the holes have been soaked until water maintains its height. For the sites 2 and 3, which are mainly sand and gravel, holes were filled with water more than 4 times. After these preparations, the percolation tests are ready to proceed.

Figure 4. *Filling up the test hole with water*

Figure 5. *Test hole filled with 12 in water*

- For each site, the heights of the water and the elapsed times are recorded. The percolation rates are calculated using: percolation rate = time/height, which yields a result of min/in.

Table 1. *Percolation Test Data and Results.*

Site One						
Width (in)	Height (in)	Start Height (in)	End Height (in)	Elapsed Time (min)	Change in Height (in)	Permeability height/time (min/in)
7	12	10.5	9.00	20	1.5	13.33
7	12	11	8.50	121	2.5	48.4
7	11	10.75	8.00	112	2.75	40.7
Site Two						
8	12.5	14	0	1	14	0.07
Site Three						
7.5	12	6	2	3.68	4	0.92

Site One

Located on N Chappel Dr, Spanish Fork, UT. Currently not much development has happened at the site. There is an asphalt path on the east side of Chappel Dr. that runs nearly parallel to Chappel Dr. and crosses a stream. The stream, on the East side of Chappel Dr., also runs south, parallel with Chappel Dr. for a section, but then goes southwest under the road. Due to the season being winter the location was covered partially by snow, with little vegetation. The testing was done behind a storm drain. The soil had very low permeability as seen in Table 1, being made up of mostly clay with a layer of gravel.

Site Two

Located on 1430 S Mill Rd, Spanish Fork, UT. Currently the development is nearly completed. The testing was done on a corner vacant lot at the intersection of 1430 S and Mill Rd behind a storm drain. Surrounding lots are completed and occupied. Due to the winter season, the location was covered partially by snow. The soil had high permeability as seen in Table 1, being made up of mostly clayey sand with a layer of gravel.

Site Three

Located on 1100 S 1500 E, Spanish Fork, UT. Currently the neighborhood is being developed with few occupied homes. The testing was done behind a storm drain. Due to the lack of development, the area lacked vegetation. Due to the winter season, the location was covered partially by snow. The soil had high permeability as seen in Table 1, being made up of mostly clayey sand with a layer of gravel.

R-tank Inspections

The process of how the R-tanks were inspected was by digging down to where the R-tanks were located directly behind the storm drain as shown in Figure 6. Once the soil was removed the fabric surrounding the R-tank was removed. The R-tank directly connected to the storm drain pipe was then opened and inspected. The following are the

Figure 6. *The excavation of the R-tank.*

First Inspection

The first inspection of the R-tanks was done at Site two mentioned earlier. The purpose of this inspection was to observe how well the R-tanks had been functioning so far and to observe silt build-up so that a proper maintenance and cleaning schedule could be established. During this first visit we found that there were issues with leaves getting past the Oil-Water-Debris Separator, blocking the entrance to the R-tank. Furthermore, this first system had the entrance pipe butting against the outside of the R-tank, yet the standard drawings showed that the a hole was supposed to be cut in the side of the R-tank to allow the entrance pipe to penetrate the R-tank by a couple of inches. We learned that this was an older design that had later been improved upon in order to prevent this type of blockage in the entrance. The problem with the new design that allows the entrance pipe to penetrate the R-tank is that these leaves would still collect in the main chamber of the entrance R-tank and possibly fill it up. We also observed that the entrance pipe was not properly centered on the entrance R-tank. This seemed to be a recurring issue, as the second site also had this problem.

Second Inspection

When inspecting the R-tanks, a lot of the damage or problems were caused by not understanding how to properly install R-tanks. This is to be understood because R-tanks are a new idea of how to get stormwater back into the water table and installation changed with each development. Specific regulations we recommend are to insure the opening of the pipe connecting the R-tank to the storm drain box, is within the R-tank so that the walls of the R-tanks do not trap leaves at the opening of the pipe. Furthermore, we recommend that contractors place the entrance R-Tank first so that the entrance pipe is centered on the middle section of the R-tank, which would eliminate the need to cut the vertical, interior supports of the R-tank. This would not only decrease the time required to construct the system by eliminating the need to make after-market modifications to the R-tanks, but would also make sure that the R-tanks remain structurally sound.

Calculations

Total Volume of Runoff

The curve method is used to calculate the total volume of runoff in this development. The first step is to estimate the curve number, which is based on the area's hydrologic soil group, land use, treatment and hydrologic condition. After measuring the areas of residential areas and paved areas in the development. We obtained a curve number as 86.8. Curve number for urban land uses are in Table A6.

Table 2. *Curve Number for the Development*

	m^2	ft	Ratio	curve number
Total Area	30287	326007	1	86.8

Street	4297	46253	0.142	98
Residential	25990	279754	0.858	85

Then the runoff equation is applied to calculate the runoff in terms of inches. Runoff equation:

S’ = (1000/CN) - 10 (in)
R = (P - 0.2S’)^2/(P + 0.8S’) if P > 0.2S’
R = 0 if P < 0.2S’

Since we have obtained the total area of the development. The total volume of runoff is the multiplication of runoff in terms of height and the total area.

Table 3. *Volume of Total Runoff for Different Storm Intensities*

Storm Intensities	100yr	50yr	25yr	10yr	5yr	90th Percentile
Rain (in)	2.17	1.97	1.77	1.52	1.33	0.55
Runoff (in)	1.03	0.87	0.72	0.54	0.41	0.08
Runoff (ft)	0.09	0.07	0.06	0.05	0.03	0.01
Volume (ft^3)	28002.08	23727.34	19608.02	14729.46	11273.46	2301.23

Drainage Time

In order to perform a more detailed and conservative analysis, we have decided to perform calculations for not only the 90th percentile storm, but also the 100, 50, 25, 10 and 5 years storms. An assumption is made that all the water will only percolate out through the bottom of the R-tanks, in order to have a conservative estimate.

The development that needs to be analyzed have very good percolation rate, which is about 11.04 min/ft. The two other percolation rates are obtained from neighbouring areas, and they serve as comparison. The drainage times are calculated based on the total volume of runoff, the area of the bottom of the R-tanks and the percolation rate of the soils. Table 4 provides the detailed results.

Table 4. Drainage Time for Different Storm Intensities

Storm Intensities	Volume (ft^3)	Length (ft)	Width (ft)	Height (ft)	Rate (min/in)	Rate (min/ft)	Time (min)	Time (hr)

100 years	28002	2446.7	1.308	8.748	48	576	5038.6	209.9
100 years	28002	2446.7	1.308	8.748	0.07	0.84	7.3	0.3
100 years	28002	2446.7	1.308	8.748	0.92	11.04	96.6	4.0
50 years	23727	2446.7	1.308	7.412	48	576	4269.4	177.9
50 years	23727	2446.7	1.308	7.412	0.07	0.84	6.2	0.3
50 years	23727	2446.7	1.308	7.412	0.92	11.04	81.8	3.4
25 years	19608	2446.7	1.308	6.125	48	576	3528.2	147.0
25 years	19608	2446.7	1.308	6.125	0.07	0.84	5.1	0.2
25 years	19608	2446.7	1.308	6.125	0.92	11.04	67.6	2.8
10 years	14730	2446.7	1.308	4.602	48	576	2650.5	110.4
10 years	14730	2446.7	1.308	4.602	0.07	0.84	3.9	0.2
10 years	14730	2446.7	1.308	4.602	0.92	11.04	50.8	2.1
5 years	11274	2446.7	1.308	3.522	48	576	2028.6	84.5
5 years	11274	2446.7	1.308	3.522	0.07	0.84	3.0	0.1
5 years	11274	2446.7	1.308	3.522	0.92	11.04	38.9	1.6
90th percentile	2301	2446.7	1.308	0.719	48	576	414.0	17.3
90th percentile	2301	2446.7	1.308	0.719	0.07	0.84	0.6	0.0
90th percentile	2301	2446.7	1.308	0.719	0.92	11.04	7.9	0.3

Lessons Learned

Throughout the course of our project, we experienced delays due to poor weather conditions and schedule conflicts. These issues forced us to learn how to communicate efficiently via email and other devices when we weren't able to meet face-to-face. We also learned how to be prepared and work around complications that were outside of our control, like the weather, through effective scheduling and communication so that our deliverables would be met on time. We also encountered problems where we didn't have the technical expertise required to perform certain tasks. These problems quickly taught us how important it can be to be willing to ask for help when you aren't sure what you're doing. By asking others that were more experienced than us, we were able to properly perform the work that was required of us while expanding our own knowledge and experience. The things we learned not only helped us to complete the project on time and in a professional manner, but also gave us skills that will help us in our future careers.

Conclusions

Overall, it was determined that the LID stormwater system currently in use by Spanish Fork City is compliant with EPA regulations. There is ample storage to retain the 90th percentile storm on site with ideal soil quality. In areas where soil permeability was high, the R-tanks should be able to handle 50-yr and 100-yr storms without overtopping. It was also determined, however, that R-tanks in areas with poor permeability were not able to retain even the 5-yr storm. During our site visits to observe R-tank performance and analyze silt build-up, we noted that there were problems with leaf build-up in the entrance R-tanks, though the silt build-up was negligible. Because the company that manufactures the R-tanks recommends that the silt is cleaned out of the R-tanks when it reaches a depth of 5 inches. Because the silt build-up was less than a quarter of an inch after seven years of service, we don't anticipate that it will be necessary to vacuum the silt out of the systems during their service lifetime.

Recommendations

In order to combat the problems observed with leaves collecting in the entrance R-tank, we've developed two solutions, which can be observed in Figure 7. For the systems that have already been installed, we recommend cutting a hole in the top of the entrance R-tank and covering it with an 18 inch water meter box so that access can be provided for future cleaning without compromising the strength of the R-tank itself. An 18 inch diameter pipe would not only maintain the strength of the R-tank, but it would be large enough for the vacuum excavation truck to access the R-tank without changing hose attachments, making cleaning a simple process. For future LID stormwater construction projects, we recommend placing a wire mesh layer over the entrance to the R-tank system. This layer could be bolted to the inlet box and held down by the Oil-Water-Debris Separator, making future installation quick and simple. The wire mesh would prevent leaves and large debris from entering the entrance R-tank, removing the need to include a future access hole for cleaning. The layer itself shouldn't have any problem becoming clogged, but if there was an issue, the Oil-Water-Debris separator has a hole in the top through which water could be sprayed to clean off the wire mesh if necessary.

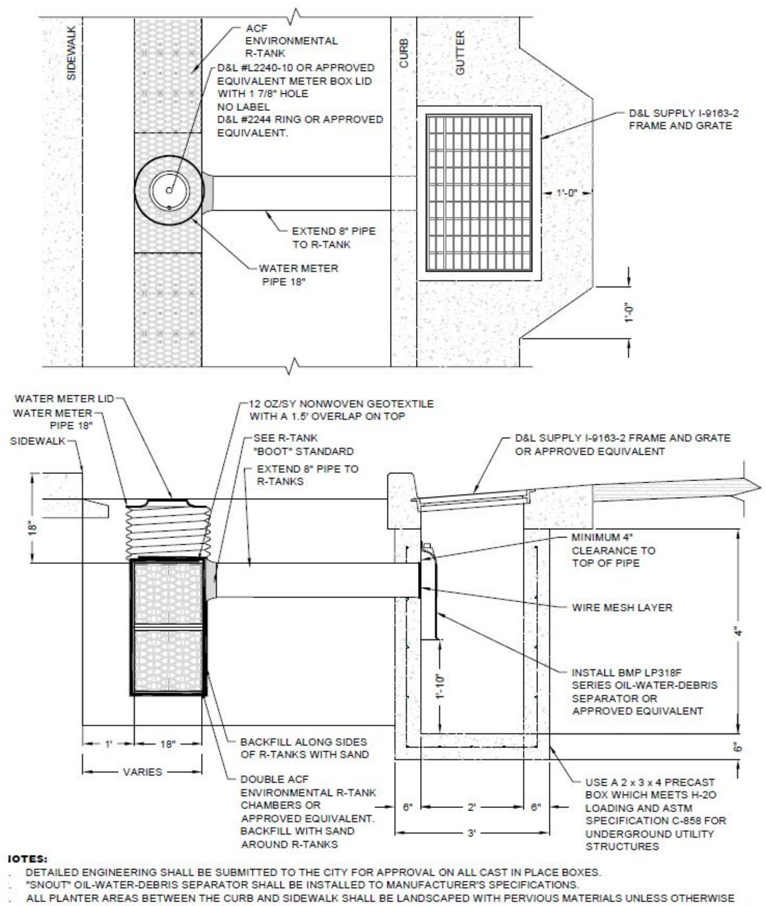

Figure 7. *Drawing of Improved R-tank Design*

Lastly, the two sites we visited had some alignment issues caused by improper placement of the R-tanks during construction. These alignment issues made construction difficult and compromised the strength of the R-tanks due to aftermarket cuts to the interior support structures. We recommend emphasizing proper placement to the contractors during construction, starting with the entrance R-tank so that it is properly aligned, then laying R-tanks outwards from the entrance. Furthermore, more stringent inspection during the initial laying of the R-tanks can ensure that the process is done properly until the contractor and his crew become more familiar with the proper construction of the system. This should help ensure that the entrance pipe enters centered on the entrance R-tank, removing the need to cut the interior supports in order to fit the system together.

Appendix A

Table A5. *Typical percolation values for different soil*

Description	USCS	min (m/s)	max (m/s)	Specific value (m/s)	Reference
Well graded gravel, sandy gravel, with little or no fines	GW	5.00E-04	5.00E-02		[1],
Poorly graded gravel, sandy gravel, with little or no fines	GP	5.00E-04	5.00E-02		[1],
Silty gravels, silty sandy gravels	GM	5.00E-08	5.00E-06		[1],
Alluvial sand and gravel	(GM)	4.00E-04	4.00E-03		[2&3 in 4]
Clayey gravels, clayey sandy gravels	GC	5.00E-09	5.00E-06		[1],
Well graded sands, gravelly sands, with little or no fines	SW	1.00E-08	1.00E-06		[1],
Very fine sand, very well sorted	(SW)			8.40E-05	[5] ,
Medium sand, very well sorted	(SW)			2.23E-03	[5] ,
Coarse sand, very well sorted	(SW)			3.69E-01	[5] ,
Poorly graded sands, gravelly sands, with little or no fines	SP	2.55E-05	5.35E-04		[1], [2&3 in 4]
Clean sands (good aquifers)	(SP-SW)	1.00E-05	1.00E-02		[5],
Uniform sand and gravel	(SP-GP)	4.00E-03	4.00E-01		[2&3 in 4]
Well graded sand and gravel without fines	(GW-SW)	4.00E-05	4.00E-03		[2&3 in 4]
Silty sands	SM	1.00E-08	5.00E-06		[1],
Clayey sands	SC	5.50E-09	5.50E-06		[1], [5]
Inorganic silts, silty or clayey fine sands, with slight plasticity	ML	5.00E-09	1.00E-06		[1],
Inorganic clays, silty clays, sandy clays of low plasticity	CL	5.00E-10	5.00E-08		[1],
Organic silts and organic silty clays of low plasticity	OL	5.00E-09	1.00E-07		[1],
Inorganic silts of high plasticity	MH	1.00E-10	5.00E-08		[1],
Inorganic clays of high plasticity	CH	1.00E-10	1.00E-07		[1],
Compacted silt	(ML-MH)	7.00E-10	7.00E-08		[2&3 in 4]
Compacted clay	(CL-CH)	-	1.00E-09		[2&3 in 4]
Organic clays of high plasticity	OH	5.00E-10	1.00E-07		[1],
Peat and other highly organic soils	Pt	-	-		

Table A6. *Curve Number for Urban Land Uses*

Land Use	Hydrologic Soil Group			
	A	B	C	D
Woods and Forests:				
Good (no grazing; brush covers ground)	30	55	70	77
Fair (grazing but not burned; some brush)	36	60	73	79
Poor (small trees/brush destroyed by over-grazing or burning)	45	66	77	83
Open Spaces (lawns, parks, golf courses, cemeteries, etc.):				
Good (grass covers > 75% of area)	39	61	74	80
Fair (grass covers 50 – 75% of area)	49	69	79	84
Pasture or Range Land:				
Brush (good, > 75% ground cover)	30	48	65	73
Meadow (grass, no grazing, mowed for hay)	30	58	71	78
Good (50 – 75% ground cover; not heavily grazed)	39	61	74	80
Poor (< 50% ground cover or heavily grazed)	68	79	86	89
Cultivated (Agricultural Crop) Land:				
With conservation treatment (terraces, contours)	62	71	78	81
Without conservation treatment (no terraces)	72	81	88	91
Residential Areas:				
1 Acre lots, about 20% impervious	51	68	79	84
1/2 Acre lots, about 25% impervious	54	70	80	85
1/4 Acre lots, about 38% impervious	61	75	83	87
1/8 Acre lots, about 65% impervious	77	85	90	92
Industrial Districts (72% impervious)	81	88	91	93
Commercial and Business Districts (85% impervious)	89	92	94	95
Streets and Roads:				
Dirt	72	82	87	89
Gravel	76	85	89	91
Paved with curbs and storm sewers	98	98	98	98
Paved parking lots, roofs, driveways	98	98	98	98

<u>Appendix B</u>

Treyton Michael Moore

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Objective

- Obtain an internship with the Central Utah Water Conservancy District

Education

B.S. Civil Engineering | Projected December 2017 | **GPA: 3.85/4.0** Brigham | Young University, Provo, UT

Relevant Coursework

- Fluid Mechanics, Hydraulic Engineering, Technical Writing
- Designed a basic water supply system for Miles City, Utah in Hydraulic Engineering

Experience

Water Resources Research Assistant | Brigham Young University | April 2016 - Present

- Managed data regarding the sediment transport of over 15,000 measurements
- Analyzed video of low-head dams to measure the lengths of differing hydraulic jumps

Mechanics of Materials TA | Brigham Young University | August 2015 - April 2016

- Mastered the concepts of stress, strain, and Mohr's Circle
- Taught the above concepts to 188 students to promote their success in the course

Compliance Agent | ForeverGreen International, LLC | September 2014 - August 2015

- Investigated websites of customers daily to ensure their compliance with the policies and procedures
- Tracked product complaints to ensure good manufacturing process

Skills & Abilities

Communication

- Co-authored a 20-page technical research paper that compared alternative fuel sources for vehicles
- Fluent in both written and spoken Italian

Leadership

- Taught basic communication (Italian) and financial management to new missionaries for 9 months
- Conducted the weekly meetings of an Italian church congregation of 25 people for six months
- Co-lead an Italian church congregation of 25 people for six months
- Instructed a group of 30 missionaries for five months in Italy

Technology

- VBA basic programming through Excel
- Microsoft Office Suite
- AutoCAD (3 years)

Awards:

- Tau Beta Pi Member, inducted 3/12/2016

Kevin Liang

1727 Willowbrook Dr, Provo UT 84606
(801) 471-6213 kevin9kai@gmail.com

Education

Bachelor Degree: Civil Engineering **December 2017**
Brigham Young University

Work Experience

Research Assistant **Sept 2016 - Current**
Brigham Young University - Provo, UT

- Developing a geotechnical web app for UDOT providing areas of liquefaction.
- Worked with Water Resource group and Unmanned Aerial Vehicle Group.
- Learned Python, Javascript, and HTML to design Tethys applications.
- Developed a web scraping application to find groundwater models.

Engineer in Training **Apr 2016 - Sept 2016**
Acute Engineering - Orem, UT

- Provided structural engineering for residential base plans.
- Prepared addendums for building plan modifications.
- Coordinated with PE engineers on structural plans.

Mechanical Drafter **June 2015 - Apr 2016**
Brigham Young University - Provo, UT

- Coordinated between engineers, architects and interior designers.
- Modeled over 30,000 sq. ft. of HVAC using Autodesk software.
- Trained new team members in Mechanical systems in Revit
- Estimated cost of mechanical systems of up to $10,000.

Volunteer Experience

Full-Time Volunteer Representative **Oct 2012 - Oct 2014**
The Church of Jesus Christ of Latter Day Saints

- Weekly trained 4-8 volunteers on professional communication skills.
- Provided service for the Surinamese Government.

Capstone **Aug 2014 - Current**

- Performed a low impact development effectiveness & functionality study.
- Provided recommendations to improve low impact developments.

BYU ITE **Jan 2015 - Current**

- Organized ITE activities.

Skills

- Civil 3D, AutoCAD, Revit, ArcGIS, Excel VBA, Python, HTML, Javascript
- Fluent Dutch and Cantonese

JOHN TAANI DE LEON, EIT

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EDUCATION

Master of Science in Civil Engineering (3.86/4.0) Expected Jun 2017
Brigham Young University, Provo, UT
- BYU Civil Engineering Graduate Department Scholarship 2015-2017

Bachelor of Science in Civil Engineering (3.81/4.0) Dec 2016
Brigham Young University, Provo, UT
- BYU Civil Engineering Department Scholarship, BYU Multicultural Student Scholarship, BYU General Academic Scholarship

WORK EXPERIENCE

Graduate Teaching Assistant Jan 2017 - Present
BYU Concrete Design Class, Provo UT
- Will instruct and supervise a lab work of up to 5 students
- Will operate concrete related equipment

Construction Engineering Inspector Summers 2015 and 2016 – Present
RB&G Engineering, Provo UT
- Inspected construction methods for million-dollar projects
- Learned city, state, and national construction standards

Graduate Research Assistant Jan 2016 – Present
BYU Civil Engineering Department, Provo UT
- Used several testing methods to determine deterioration levels on 7 bridges
- Analyzed deterioration curves for all of Utah's bridges

Technical Support Representative Jan 2015 – Apr 2015, Aug 2015 – Apr 2016
Aquaveo, Provo UT
- Learned how to use the features of WMS, GMS, and SMS
- Assisted 50+ users with running advanced computer models.

Teaching Assistant Aug 2013 – May 2014, Sept 2014 – Dec 2014
BYU Computational Methods Class, Provo UT
- Evaluated the work of 40+ students weekly
- Guided students in their learning of computer programming

VOLUNTEER EXPERIENCE

Cub Scout Wolf Den Leader Nov 2016 – Present
Provo, Utah
- Organize activities and tasks for 5 cub scouts on a weekly basis
- Record development and progress of 5 cub scouts throughout the year

President of BYU ASCE Student Chapter Jan 2015 – Apr 2015
Provo, Utah
- Coordinated activities, service projects, and engineering events for 300+ students
- Led/Trained 10 other officers in their various duties
- Won the Robert Ridgeway Award for best ASCE student chapter in the nation

Full-time Service Volunteer Jul 2010 – Jul 2012
Santiago, Dominican Republic
- Coordinated 35+ different trainings for improving work ethic/effectiveness
- Collaborated with people of many different backgrounds and cultures

OTHER JOBS/EXTRACURRICULARS

- Instructional Design Assistant, Residential Living Assistant, E-Commerce Clerk, Warehouse Personnel, Dishroom Worker, Assistant Salesman
- 2nd Vice President of ASCE Student Chapter Sept 2014 – Dec 2014; Provo Youth Mentor Sept 2009 – Apr 2010; National AP Scholar Spring 2009; Eagle Scout Mar 2009 - Present

RELEVANT COURSES/SKILLS

- Hydrology, Steel Design, Reinforced Concrete Design, Hydraulic Engineering, GIS applications, Concrete Mix and Design, Pavement Management, Pavement Design, Geometric Design of Highways, Seepage and Slope Stability
- 50 wpm; Proficient in Microsoft Office (Word, Excel, Powerpoint); fluent in Spanish;

Jingwen He

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Phone: (801)616-9103, E-mail:jingwenhe78@gmail.com

Education

Bachelor of Science, *Brigham Young University*, Provo, Utah, U.S. 9/2013-Present

- Major: Civil Engineering
- GPA: 3.97
- Graduation date: April, 2017

Work Experience

Geo-technology Research Assistance, *Brigham Young University*, Provo, Utah, U.S. 4/2016-Present

- Perform calculations for hundreds of earthquake data points
- Use EZ-FRISK to analyze earthquake damage

Transportation Research Assistance, *Brigham Young University*, Provo, Utah, U.S. 4/2016-9/2016

- Run models and perform site visits for highway safety analysis
- Review and test on 3 user's manuals
- Create more than 40 highway reports for UDOT

Instructor, *Brigham Young University*, Provo, Utah, U.S. 9/2015-4/2016

- Create curriculum for a 200 level Cantonese class
- Teach a college class of 6-8 students
- Plan and distribute assignments for the teaching assistant and have regular meetings with the assistant

Teacher, *Missionary Training Center*, Provo, Utah, U.S. 9/2013-8/2015

- Provided instructions on structure and grammar of Mandarin Chinese to over 300 students
- Presented daily training on communication, teaching skills, goal setting and conflict resolutions
- Conducted weekly discussions with co-worker to improve teaching methods

Service

Volunteer, *The Church of Jesus Christ of Latter-day Saints*, Melbourne, Australia 12/2011-5/2013

- Worked with volunteers from over 6 different countries
- Provided training to help other volunteers set effective goals and work with other people
- Made contact with about 30 people every day

Volunteer, *2010 Guangzhou Asian Games*, Guangzhou, China 10/2010-11/2010

- Coordinated work with other volunteers
- Provided guidance for people around the world

Skills and Qualities

- Fluent in Mandarin and Cantonese
- Global leadership skills
- Focused, diligent and patient
- Microsoft office, Auto CAD