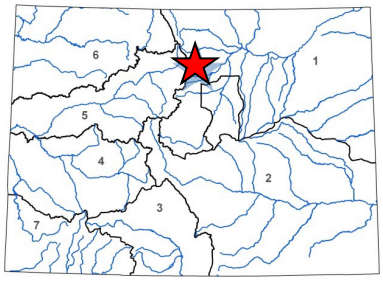
COLORADO
Colorado Water Conservation Board

Water Plan Grant Program Application

Lyons Water Plant Stream Restoration
Lyons Ute Hwy LLC
September 2022 Board Meeting



LOCATION	
County/Counties:	Boulder
Drainage Basin:	South Platte

DETAILS	
Total Project Cost:	$351,769
Colorado Water Plan Grant:	$199,869
Recommended amount:	$0
Other CWCB Funding:	$0
Other Funding Amount:	$151,900
Applicant Match:	$151,900
Project Type(s): Construction	
Project Category: Watershed Health and Recreation	
Measurable Result: 675 linear feet of restored stream	

Lyons Ute Hwy LLC seeks funding to complete stream bank restoration where the St. Vrain Creek meets the property located at 4652 Ute Highway – one of the final remaining stretches of the St. Vrain Creek that was not restored following the historic Lyons floods in 2013. The grant request includes funding for final design and construction funds for bank restoration, improvements to the river channel, new boulder walls and revegetation and will identify improvements to enhance the habitat and ecological environment.

The project will be completed as a design-build contract, with engineering work and estimating completed by S20 Design and Engineering for the stretch of the St. Vrain Creek located at 4652 Ute Highway. Lyons Ute Hwy LLC will work closely with the Town of Lyons, the St. Vrain and Left Hand Water Conservancy District, the Colorado Water Conservation Board, and the South Platte Basin Roundtable to ensure the success of the project.

Staff do not support funding for this project for several reasons:

- This project is not supported by the local watershed coalition, nor by Colorado Parks and Wildlife, which speaks to a lack of collaboration.
- The proposed length of stream to be restored is very short for the cost.
- The project contractor has not been competitively chosen.
- There are design components, such as three-foot boulders, that are not compatible with the low-gradient and transitional-zone nature of this reach of the St. Vrain.
- The applicant is invested in increasing the buildable footprint of the land, which will happen to the detriment of the floodplain footprint.

Any recreational enhancements will not be for the general public, but for customers of the privately-owned hotel to be built.

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Water Plan

Water Project Summary

Name of Applicant	Lyons Ute Hwy, LLC
Name of Water Project	Lyons Water Plant Stream Restoration
Grant Request Amount	**$199,868.94**
Primary Category	$199,868.94
Watershed Health & Recreation	
Total Applicant Match	**$151,900.40**
Applicant Cash Match	$151,900.40
Applicant In-Kind Match	$0.00
Total Other Sources of Funding	**$151,900.40**
Lyons Ute Hwy LLC	$151,900.40
Total Project Cost	**$503,669.74**

Applicant & Grantee Information

Name of Grantee: Lyons Ute Hwy, LLC
Mailing Address: 3222 Tejon St. Unit A Denver CO 80211
FEIN: 843,413,696

Organization Contact: Rene Doubleday
Position/Title:
Email: rene@thinkgenerator.com
Phone: 303-884-8158

Organization Contact - Alternate: Paul Tamburello
Position/Title:
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Phone: 3032106404

Grant Management Contact: Rene Doubleday
Position/Title:
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Phone: 303-884-8158

Grant Management Contact - Alternate: Jamie Giellis
Position/Title: President
Email: jamie@becentro.com
Phone: 303-345-8285

Engineering Contact: Nathan Werner, PE, CFM
Position/Title:
Email: nathan@s20design.com
Phone: 9702326486

Description of Grantee/Applicant

Real Estate Development

Type of Eligible Entity

- ☐ Public (Government)
- ☐ Public (District)
- ☐ Public (Municipality)
- ☐ Ditch Company
- ■ Private Incorporated
- ☐ Private Individual, Partnership, or Sole Proprietor
- ☐ Non-governmental Organization
- ☐ Covered Entity
- ☐ Other

Category of Water Project

- ☐ Agricultural Projects
  Developing communications materials that specifically work with and educate the agricultural community on headwater restoration, identifying the state of the science of this type of work to assist agricultural users among others.
- ☐ Conservation & Land Use Planning
  Activities and projects that implement long-term strategies for conservation, land use, and drought planning.
- ☐ Engagement & Innovation Activities
  Activities and projects that support water education, outreach, and innovation efforts. Please fill out the Supplemental Application on the website.
- ■ Watershed Restoration & Recreation
  Projects that promote watershed health, environmental health, and recreation.
- ☐ Water Storage & Supply
  Projects that facilitate the development of additional storage, artificial aquifer recharge, and dredging existing reservoirs to restore the reservoirs' full decreed capacity and Multi-beneficial projects and those projects identified in basin implementation plans to address the water supply and demand gap.

Location of Water Project

Latitude	0.123000
Longitude	0.123000
Lat Long Flag	Stream location: Coordinates based on general location on stream
Water Source	St. Vrain Creek
Basins	South Platte
Counties	Boulder
Districts	5-St. Vrain Creek

Water Project Overview

Major Water Use Type	
Type of Water Project	Construction
Scheduled Start Date - Design	11/1/2022
Scheduled Start Date - Construction	1/16/2023

Description

Lyons Ute Hwy LLC seeks funding to complete stream bank restoration where the St. Vrain Creek meets the property located at 4652 Ute Highway – one of the final remaining stretches of the St. Vrain Creek that was not restored following the historic Lyons floods in 2013. The grant request includes funding for final design and construction funds for bank restoration, improvements to the river channel, new boulder walls and revegetation and will specifically identify improvements to enhance the habitat and ecological environment. The project will be

completed as a design-build contract, building off of the St. Vrain Creek Watershed Master Plan and subsequent engineering work and estimating completed by S20 Design and Engineering for the stretch of the St. Vrain Creek located at 4652 Ute Highway. Lyons Ute Hwy LLC is and will continue to work closely with the Town of Lyons, the St. Vrain and Left Hand Water Conservancy District, the Colorado Water Conservancy Board, the South Platte Basin, the South Platte Basin Roundtable, Colorado Parks and Wildlife and other partners to ensure the success of the project.

Measurable Results

	New Storage Created (acre-feet)
	New Annual Water Supplies Developed or Conserved (acre-feet), Consumptive or Nonconsumptive
	Existing Storage Preserved or Enhanced (acre-feet)
	New Storage Created (acre-feet)
675	Length of Stream Restored or Protected (linear feet)
	Efficiency Savings (dollars/year)
	Efficiency Savings (acre-feet/year)
	Area of Restored or Preserved Habitat (acres)
	Quantity of Water Shared through Alternative Transfer Mechanisms or water sharing agreement (acre-feet)
	Number of Coloradans Impacted by Incorporating Water-Saving Actions into Land Use Planning
2,300	Number of Coloradans Impacted by Engagement Activity

Other

Area of restored habitat is 1.6 including channel

Additional outcomes are new public access points

Water Project Justification

The St. Vrain Creek Watershed – which includes the following creeks: South St. Vrain Creek, Middle St. Vrain Creek, North St. Vrain Creek and the main stem of St. Vrain Creek – is one of the most important natural features in the Colorado Front Range. It is unique in its richness of natural and ecological resources and in its diversity of historic and cultural features. Moreover, it is cherished for the recreational opportunities it provides and for the numerous economic, cultural and social opportunities afforded by the St. Vrain Creek corridor. As noted in the St. Vrain Creek Watershed Master Plan, the watershed “is an important part of the rich regional system of human communities and ecological services that defines the Colorado Front Range. Its wellbeing is critical to maintaining the health, biodiversity, character, and economy of communities within the region.” (St. Vrain Creek Watershed Master Plan, pg. 1-1)

In September 2013, St. Vrain Creek experienced a catastrophic 500-year flooding event that caused significant damage to the watershed and nearby properties in and around Lyons, Colorado. The flood destroyed large sections of Colorado Highway 7, US Highway 36, local roads and public residential and commercial properties along the St. Vrain Corridor.

One of the properties damaged was 4652 Ute Highway in Lyons, Colorado, which is located on the North Bank of the St. Vrain. This address is the location of the old Longmont water treatment plan. During the event, significant flood damage occurred to the stream bank of the property and extended up to the treatment buildings. Damage included steep, eroded stream banks and build-up of concrete and metal debris from old structures and piping located within the floodplain. Owned by the Town of Lyons at the time of the flood, the property was subsequently purchased by private developers Lyons Ute Hwy LLC (LUH), with the intent to repurpose the old plant into a hotel and visitor destination, and a commitment to restore the river bank and create access to the St. Vrain Creek as an amenity.

Through this grant application, LUH seeks funding support to realize the repairs to the St. Vrain Creek as detailed in the St. Vrain Creek Watershed Master Plan recommendations for Reach 3 (where the property is located) and further detailed in a study conducted for the specific site by S20 (as detailed in the next question). Among the improvements/investments to be made are restoration of the river bank, restoration of and improvements and enhancements to the habitat and ecological environment, addition of robust vegetation, addition of hard access points (taking into consideration future opportunities for tubing and other recreation) and work to ensure the improvements to this site take into consideration the upstream and downstream conditions and are complementary to other stream projects in the vicinity that have already been completed.

This project is in alignment with the objectives and goals of both the Colorado Water Plan (CWP) and the South Platte Basin Implementation Plan (SPBIP).

The CWP lays out values, objectives, goals and actions for the state's future as related to water supply and usage. We believe our proposed project meets each of those values in the following ways (CWP, Pg. 10-3):
1. Colorado's Water Plan values a productive economy that supports vibrant and sustainable cities; viable and productive agriculture; and a robust skiing, recreation and tourism industry: Recognizing that natural disasters will continue to occur as part of climate change, we seek to complete not only the restoration of the St. Vrain Creek's banks (one of the last remaining stretches to not see repair/restoration) but to put in protections against future disasters. As a private sector stakeholder, we are committed to partnerships with our municipal, county, state and community partners to make decisions for this stretch of the St. Vrain Creek that ensure it remains protected, while repairing and restoring vegetation and wildlife and creating hard access points which allow visitors to enjoy the amenity and utilize it safely.
2. Colorado's Water Plan values efficient and effective water infrastructure: Our plans are based on repair and restoration work already completed along other reaches of the St. Vrain Creek that were impacted by the 2013 flood, and close a critical gap in protecting the Town of Lyons and the surrounding properties.
3. Colorado's Water Plan values a strong environment that includes healthy watersheds, rivers, streams and wildlife: The St. Vrain Creek today along Reach 3 where this project is located remains littered with remnants of the flood. We intend to clean it, repair it, restore and make it a vibrant and healthy home for vegetation and wildlife.

Additionally, the CWP lays out nine Objectives, and specific goals under each objective. We believe this project best meets Objective F: Watershed Health, Environment and Recreation, which seeks to recover imperiled species, enhance environmental and recreational economic values, protect healthy environments, promote protection and restoration of water quality and protect and restore critical watersheds (CWP, Pg. 10-12). Specifically, this project meets the Objective F goals in the following ways:
Goal 1: Continue to support and participate in collaborative approaches to prevent listings under the Endangered Species Act by promoting the sustainability of endangered, threatened and imperiled aquatic- and riparian-dependent species and communities through a variety of efforts. This goal specifically notes that CWCB will support the strategic implementation of currently identified projects with technical and financial assistance. As previously noted, the intent of our work on this stretch of the St. Vrain Creek is to not only repair but to improve and enhance the habitat and ecological environment. Proposed work will align with guidance to improve habitat for the endangered Preble's Mouse.
Goal 7: Prioritize and implement projects identified in master planning efforts. This project was identified in the St. Vrain Coalition Master Plan with initial recommendations provided. We have built on this work with further site-specific analysis which is the guiding document for this grant application. The grant will support funding for a design/build approach to final investment.

We also believe this project meets at least one goal set out under Objective G: Funding to explore new funding

opportunities (CWP, Pg. 10-13). Specifically:
Goal 2: Explore a public-private partnership (P3) center of excellence that models how to develop P3 agreements and explores financial incentives for regionalization. While this project is not directly establishing a center, it is a good example of public and private funds being leveraged and partnerships being created for the betterment of Colorado's waterways.

The St. Vrain Creek is located in the South Platte Basin. The SPBIP centers around 12 goals (SPBIP, Pg. 2). We believe our proposed project best aligns with the following:
Goal 1: Encouraging project implementation of identified projects that meet existing and future M&I, agricultural and environmental/recreational water needs. This proposed project has already been preliminarily planned and needs documented. It will assist in addressing this goal through the following identified strategies (SP BIP, Pg. 26):
o Strategy 1.A: Promote implementation of identified projects for all water user categories
o Strategy 1.B: Work with project proponents to identify project funding opportunities, documenting successful collaborations and partnership that result in project implementation
Goal 6: Protecting and enhancing watershed function and environmental and recreational attributes. This project seeks to restore watershed function, remediate environmental concerns and create new recreational opportunities on the St. Vrain Creek. Specifically, the project will meet this goal by addressing the following specific strategies (SP BIP, Pg. 32):
o 6.A.2. Control erosion and sedimentation
o 6.A.3. Consider holistic impacts to water quality and watershed health during project development and implementation
o G.A.4. Identify, assess and implement actions, programs and measure that aim to minimize the adverse effects on wetlands, lakes, streams/rivers, and associated ecosystems from water pollution, nutrient overload, reduced streamflows, and filling or dredging.
o G.A.6. Conduct restoration projects and promote innovative strategies to improve water quality in impaired areas and downstream impacts.

Related Studies

In 2014, following the floods, a diverse group of eight stakeholders formed the St. Vrain Creek Coalition ("the Coalition") to develop the St. Vrain Creek Watershed Master Plan (SVCWMP) that provides the foundation for the long-term restoration of St. Vrain Creek and its tributaries. The purpose of the SVCWMP was to identify actions that, if implemented, would lead to a more resilient creek corridor. The SVCWMP focused on flood risk, ecological enhancements and community values using the best available science, expertise and public and diverse stakeholder input. The SVCWMP guided the County, its municipalities, and individual landowners in the identification and prioritization of stream rehabilitation and restoration projects, as well as activities related to economic recovery, hazard mitigation, and recreation. It was also meant to inform the public, property owners, stakeholders, and local decision makers about the current conditions of the watershed so that they would be better able to identify and prioritize risk reduction projects. The SVCWMP divided the St. Vrain Creek into "reaches" and created preliminary recommendations for each reach, noting that in order to transition the plan to implementation, additional analysis of proposed projects and funding would be necessary.

The former Longmont Water Plant property is located in Reach 3, which has not been restored since the floods. Restoration work has been conducted downstream of the site by Boulder County, and the property owner on the south side of the St. Vrain Creek has restored their banks, leaving this property as the sole property in the reach with remaining flood damage.

In February 2020, Lyons Ute Hwy LLC (LUH) acquired the property from the Town of Lyons and subsequently

hired S20 Design and Engineering (who was part of the team of contractors hired to create the St. Vrain Watershed Master Plan) to conduct a preliminary engineering analysis to evaluate ways to stabilize the stream and streambanks on the property that built upon the work done in the Master Plan. Seven alternatives were explored, largely based off of how the land use would be tied to the bank stabilization and waterway improvement work. The alternatives were established with considerations of natural stream processes as well as aesthetics, constructability, level of protection provided, and cost. The selected alternative was option #6, which is detailed in the attached report from S2O. The design work completed by S20 so far is designed to tie into the existing channel and references work that had happened downstream and the recommendations of the master plan. This report and the St. Vrain Creek Watershed Master Plan are the foundational plans upon which this project's final design and construction will be based.

Taxpayer Bill of Rights

There are no relevant TABOR issues that will affect our application.

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Last Updated: May 2021

Colorado Water Conservation Board
Water Plan Grant – Statement of Work – Exhibit A

Statement Of Work	
Date:	**June 24, 2022**
Name of Grantee:	**Lyons Ute Hwy LLC**
Name of Water Project:	**Lyons Water Plant Stream Restoration**
Funding Source:	**$199,868.94 Requested from CBCW Water Plan Grant; $151,900.40 to be provided by Lyons Ute Hwy LLC**

Water Project Overview:

Lyons Ute Hwy LLC seeks funding to complete stream bank restoration where the St. Vrain Creek meets the property located at 4652 Ute Highway – one of the final remaining stretches of the St. Vrain Creek that was not restored following the historic Lyons floods in 2013. The grant request includes funding for final design and construction funds for bank restoration, improvements to the river channel, new boulder walls and revegetation and will specifically identify improvements to enhance the habitat and ecological environment. The project will be completed as a design-build contract, building off of the St. Vrain Creek Watershed Master Plan and subsequent engineering work and estimating completed by S20 Design and Engineering for the stretch of the St. Vrain Creek located at 4652 Ute Highway. Lyons Ute Hwy LLC is and will continue to work closely with the Town of Lyons, the St. Vrain and Left Hand Water Conservancy District, the Colorado Water Conservancy Board, the South Platte Basin, the South Platte Basin Roundtable, Colorado Parks and Wildlife and other partners to ensure the success of the project.

Project Objectives:

This project will address the following objectives:

- Stabilize the banks of the site and provide a buildable area on the lot adjacent to the St. Vrain Creek
- Design/implement design of the riverbank to mimic its natural geomorphology
- Restore, improve and enhance the habitat and ecological environment
- Establish robust vegetation
- Create hard access points to the St. Vrain Creek
- Tie into other bank and waterway improvements already completed up- and down-stream
- Utilize innovative techniques and approaches to maximize the impact of this work

Last Updated: May 2021

Tasks
Task 1 – Final Engineering and Permitting
Description of Task:
Completion of final engineering and design work and completed construction drawings as well as submission of the floodplain development permit.
Method/Procedure:
▪ Comprehensive review of Colorado Water Plan, South Platte Basin Improvement Plan, St. Vrain Creek Watershed Master Plan, Lyons Comprehensive Plan (currently being updated) and any/all other planning documents that will impact this project ▪ Review of up- and down- stream improvements and meetings with adjacent property owners ▪ Meetings and coordination with the Town of Lyons, the St. Vrain and Left Hand Water Conservancy District, the Colorado Water Conservancy Board, the South Platte Basin, the South Platte Basin Roundtable, Colorado Parks and Wildlife and other partners as identified to review and obtain input for the project. These groups will be routinely consulted as the final design and construction approach is developed. ▪ Community engagement with Lyons area residents ▪ Final engineering and design documents ▪ Submittal for a floodplain development permit
Deliverable: Final design and engineering documents and floodplain development permit obtained

Last Updated: May 2021

Tasks
Task 2 – Site Setup
Description of Task:
Preparation for construction of the project and oversight of the construction
Method/Procedure:
▪ Obtain construction bonding and insurance for the project ▪ Mobilization and demobilization of the construction site ▪ Complete construction layout and as-built survey ▪ Install and maintain best management practices ▪ Construction observation

Last Updated: May 2021

Deliverable:
Coordinated and organized construction delivery

Tasks
Task 3 – Site Demolition
Description of Task:
Removing debris from the 2013 floods and other site debris to prepare it for construction
Method/Procedure:
▪ Clear and grub the site ▪ Demolish buildings in the flood plain ▪ Remove debris from the site
Deliverable:

Last Updated: May 2021

A clean and prepped site that is ready for construction

Tasks
Task 4 – River Channel Work
Description of Task:
Complete improvements to the river channel
Method/Procedure:
▪ Operate and maintain water control at the site while river channel work is being completed ▪ Earthwork to dredge/reshape the water flows ▪ Furnish and install boulders in the waterway ▪ HOW DO WE SAY SOMETHING HERE ABOUT REINTRODUCING WILDLIFE, OR DO WE?
Deliverable:

Last Updated: May 2021

A healthy, restored waterway

Tasks
Task 5 – Stabilize Banks; Install New Bank Walls
Description of Task:
Excavate as needed, install new bank walls and replace top soil in preparation for revegetation
Method/Procedure:
▪ Complete excavation and earthwork in preparation for installation of the three unique wall segments – upstream, middle section and downstream ▪ Install erosion control blanket throughout ▪ Furnish and install 3' boulder walls, 3:1 grade ▪ Install public access stones, crusher fines trail and handrails ▪ Replace top soil in anticipation of installation of new vegetation
Deliverable:

Completed bank walls
Completed public access trails
Topsoil installed

Tasks
Task 6 – Revegetation
Description of Task:
Replant and rebuild the vegetation natural to the area
Method/Procedure:
▪ Identify appropriate vegetation for the area ▪ Plant and ensure appropriate access to nutrients and water
Deliverable:

Last Updated: May 2021

A healthy, revegetated river bank

Budget and Schedule

This Statement of Work shall be accompanied by a combined Budget and Schedule that reflects the Tasks identified in the Statement of Work and shall be submitted to CWCB in excel format.

Reporting Requirements

Progress Reports: The applicant shall provide the CWCB a progress report every 6 months, beginning from the date of issuance of a purchase order, or the execution of a contract. The progress report shall describe the status of the tasks identified in the statement of work, including a description of any major issues that have occurred and any corrective action taken to address these issues.

Final Report: At completion of the project, the applicant shall provide the CWCB a Final Report on the applicant's letterhead that:

- Summarizes the project and how the project was completed.
- Describes any obstacles encountered, and how these obstacles were overcome.
- Confirms that all matching commitments have been fulfilled.
- Includes photographs, summaries of meetings and engineering reports/designs.

The CWCB will pay out the last 10% of the budget when the Final Report is completed to the satisfaction of CWCB staff. Once the Final Report has been accepted, and final payment has been issued, the purchase order or grant will be closed without any further payment.

Payment

Payment will be made based on actual expenditures and must include invoices for all work completed. The request for payment must include a description of the work accomplished by task, an estimate of the percent completion for individual tasks and the entire Project in relation to the percentage of budget spent, identification of any major issues, and proposed or implemented corrective actions.

Costs incurred prior to the effective date of this contract are not reimbursable. The last 10% of the entire grant will be paid out when the final deliverable has been received. All products, data and information developed as a result of this contract must be provided to as part of the project documentation.

Last Updated: May 2021

Performance Measures
Performance measures for this contract shall include the following: (a) Performance standards and evaluation: Grantee will produce detailed deliverables for each task as specified. Grantee shall maintain receipts for all project expenses and documentation of the minimum in-kind contributions (if applicable) per the budget in Exhibit C. Per Grant Guidelines, the CWCB will pay out the last 10% of the budget when the Final Report is completed to the satisfaction of CWCB staff. Once the Final Report has been accepted, and final payment has been issued, the purchase order or grant will be closed without any further payment. (b) Accountability: Per Grant Guidelines full documentation of project progress must be submitted with each invoice for reimbursement. Grantee must confirm that all grant conditions have been complied with on each invoice. In addition, per Grant Guidelines, Progress Reports must be submitted at least once every 6 months. A Final Report must be submitted and approved before final project payment. (c) Monitoring Requirements: Grantee is responsible for ongoing monitoring of project progress per Exhibit A. Progress shall be detailed in each invoice and in each Progress Report, as detailed above. Additional inspections or field consultations will be arranged as may be necessary. (d) Noncompliance Resolution: Payment will be withheld if grantee is not current on all grant conditions. Flagrant disregard for grant conditions will result in a stop work order and cancellation of the Grant Agreement.

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Colorado Water Conservation Board

Water Plan Grant - Detailed Budget Estimate
Fair and Reasonable Estimate

Prepared Date: 24-Jun-22
Name of Applicant: Lyons Ute Hwy LLC
Name of Water Project: Lyons Water Plant Stream Restoration

Construction (Design/Build)

Task 1 - Final Engineering and Permitting

Sub-task	Unit	Quantity	Unit Cost	Total Cost	CWCB Funds	Matching Funds	
Final Engineering and Permitting	%	12	266,491.93	$31,979.03	$23,984.27	$7,994.76	75% from CWCB for final design; remaining items for constrution all calcuated at 50%

Task 2 - Site Setup

Sub-task	Unit	Quantity	Unit Cost	Total Cost	CWCB Funds	Matching Funds
Construction Bonding/Insurance	LS	1	8,436.93	$8,436.93	$4,218.47	$4,218.47
Mobilization and Demobilization	LS	1	7,000.00	$7,000.00	$3,500.00	$1,750.00
Construction Layout and As-Built Survey	LS	1	5,000.00	$5,000.00	$2,500.00	$1,250.00
Install & Maintain Best Management Practice	LS	1	5,000.00	$5,000.00	$2,500.00	$2,500.00
Construction Observation	%	5	266,491.93	$13,324.60	$6,662.30	$6,662.30

Task 3 - Site Demolition

Sub-task	Unit	Quantity	Unit Cost	Total Cost	CWCB Funds	Matching Funds
Clear and Grub	AC	1	2,500.00	$2,500.00	$1,250.00	$1,250.00
Debris Removal	CY	300	50.00	$15,000.00	$7,500.00	$7,500.00
Total Site Exported Cut	CY	1000	30.00	$30,000.00	$15,000.00	$15,000.00

Task 4 - River Channel Work

Sub-task	Unit	Quantity	Unit Cost	Total Cost	CWCB Funds	Matching Funds
Operate & Maintain Water Control	LS	1	5,000.00	$5,000.00	$2,500.00	$2,500.00
Earthwork	CY	2060	13.00	$26,780.00	$13,390.00	$13,390.00
Furnish and Install Boulders (36")	EA	5	270.00	$1,350.00	$675.00	$675.00

Task 5 -Stablize Banks; Install New Bank Wal

Sub-task	Unit	Quantity	Unit Cost	Total Cost	CWCB Funds	Matching Funds
US SECTION 3x3' BOULDER WALLS, 3:1 GRADE						
Earthwork	CY	375	13.00	$4,875.00	$2,437.50	$2,437.50
Erosion Control Blanket	SY	0	13.00	$0.00	$0.00	$0.00

Topsoil	CY	0	65.00	$0.00	$0.00	$0.00
Furnsh and Install Boulder Walls	LF	540	100.00	$54,000.00	$27,000.00	$27,000.00
MIDDLE SECTION						
Excavation	CY	1300	13.00	$16,900.00	$8,450.00	$8,450.00
Erosion Control Blanket	SY	400	13.00	$5,200.00	$2,600.00	$2,600.00
Topsoil	CY	130	65.00	$8,450.00	$4,225.00	$4,225.00
Public Access Stones	LS	1	12,500.00	$12,500.00	$6,250.00	$6,250.00
Public Access Handrails	LS	1	6,000.00	$6,000.00	$3,000.00	$3,000.00
Crusher Fines Trail	SF	1800	3.50	$6,300.00	$3,150.00	$3,150.00
DS SECTION 3:1 GRADE						
Earthwork	CY	1200	13.00	$15,600.00	$7,800.00	$7,800.00
Erosion Control Blanket	SY	450	13.00	$5,850.00	$2,925.00	$2,925.00
Topsoil	CY	150	65.00	$9,750.00	$4,875.00	$4,875.00
Task 6 - Revegetation						
Sub-task	Unit	Quantity	Unit Cost	Total Cost	**CWCB Funds**	**Matching Funds**
Revegetation	LS	1	15,000.00	$15,000.00	$7,500.00	$7,500.00
Contingency						
Sub-task	Unit	Quantity	Unit Cost	Total Cost	**CWCB Funds**	**Matching Funds**
Contingency	%	15	266,491.93	$39,973.79	$19,986.90	$19,986.90
TOTAL				$351,769.34	$199,868.94	$151,900.40

TECHNICAL MEMO

TO: Rene Doubleday, Think Generator

UPDATE: July 14, 2020

PROJECT: Lyons Water Plant Stream Restoration

Introduction:

In 2013 a 500-year flood occurred on the St. Vrain River near Lyons, Colorado that caused significant damage to the watershed and nearby properties. One of the properties damaged was 4652 Ute Highway in Lyons, Colorado, which is located on the North Bank of the St. Vrain. This address is the location of the old Longmont water treatment plant. During the event, significant flood damage occurred to the stream bank of the property and extended up to the treatment buildings. Damage included steep, eroded stream banks and build-up of concrete and metal debris from old structures and piping located within the floodplain.

S2o has conducted a preliminary engineering analysis to evaluate ways to stabilize the stream and streambanks on the property. The analysis included a site visit and assessment, existing conditions hydraulic modeling, alternative analysis of potential designs, and proposed condition hydraulic modeling. The alternatives were established with considerations of natural stream processes as well as aesthetics, constructability, level of protection provided, and cost. The alternatives were also developed with considerations of the floodplain boundaries and elevations for the 100-year flood which will determine the buildable footprint and flood insurance implications.

S2o did not perform any structural analysis or inspection of existing structures on the site.

After the in-person meeting on June 4th, it was requested that additional designs be considered to maximize buildable area as much as possible, with less emphasis on flood reduction from the existing conditions.

After the follow up meeting on July 2nd, it was requested that S2o analyze the maximum rise in the 100-year flood that would result from pinching the bankfull bench close to the top of bank for the entire site. This was intended to provide an upper limit of rise possible if a CLOMR were to be pursued.

Existing Conditions:

The creek through this reach is one of the last reaches of the St. Vrain that has not be restored after the floods. Restoration work has been conducted downstream of the site by Boulder County and the property owner on the south side of the St. Vrain Creek has restored their banks, leaving this property as the sole property in the reach with remaining flood damage. The river in this reach is gently sloped and largely linear in nature. Several cottonwoods have survived the flood on this bank and there is an existing drop structure at the upstream end of the property that spans the river.

The Figures below show the existing conditions at the site:

Figure 1 Upstream design area from the middle of the site

Figure 2 Downstream design area from the middle of the site

Survey Information and Baseline Hydraulic Model:

A site survey was conducted by Flatirons, Inc. in 2017. This site survey included topography for the streambank area and stream. This survey information was blended, where needed, with LiDAR that was collected post flood in 2014 to create a valid existing conditions geometry in preparation for hydraulic modeling.

The hydraulic modeling was based on the Colorado Hazard Mapping Program (CHAMP) model. The CHAMP model is the best information available as the basis of comparison for the hydraulic modeling and was utilized as the existing conditions model.

Preliminary Design:

Design Methodology

The preliminary design started with the creation of 6 Design alternatives for evaluation. These design alternatives were created to provide the Client with the opportunity to evaluate the feasible alternatives that meet their stated objectives and that are feasible within the regulatory environment for Lyons and Boulder County. The designs were evaluated, in part, through the creation of the corrected effective model by updating the CHAMP model to contain more survey detail (as described above) to accurately model the site and proposed design alternatives. The proposed designs were modeled and compared to

the corrected effective model to determine which design alternatives best met the project goals and regulatory requirements.

In order to stabilize the banks of the site and provide a buildable area, the river channel must first be designed to mimic its natural geomorphology. From analysis of the regional hydrology and the local hydraulics, it was determined that the St. Vrain has a bankfull flow of approximately 900 cfs at this location. Through a process of geomorphic analysis, a bankfull channel, profile, and sample cross section was determined to convey the bankfull flow through the site.

The bankfull channel was designed to a 1.5 to 2-year storm event, so that the river can be expected to overtop its banks and activate the floodplain at that flowrate. This geometry is a design requirement for the river at this location and therefore, for all of the design alternatives shown below, the river channel layout and profile remain constant. One adjustment that was made between different alternatives was the size or width of the bankfull bench. This is land that is graded out from the limits of the bankfull channel at a constant elevation. It provides the river a chance to spread out and dissipate energy during a storm where it has breached its banks. A section of a typical bench is shown below in Figure 3:

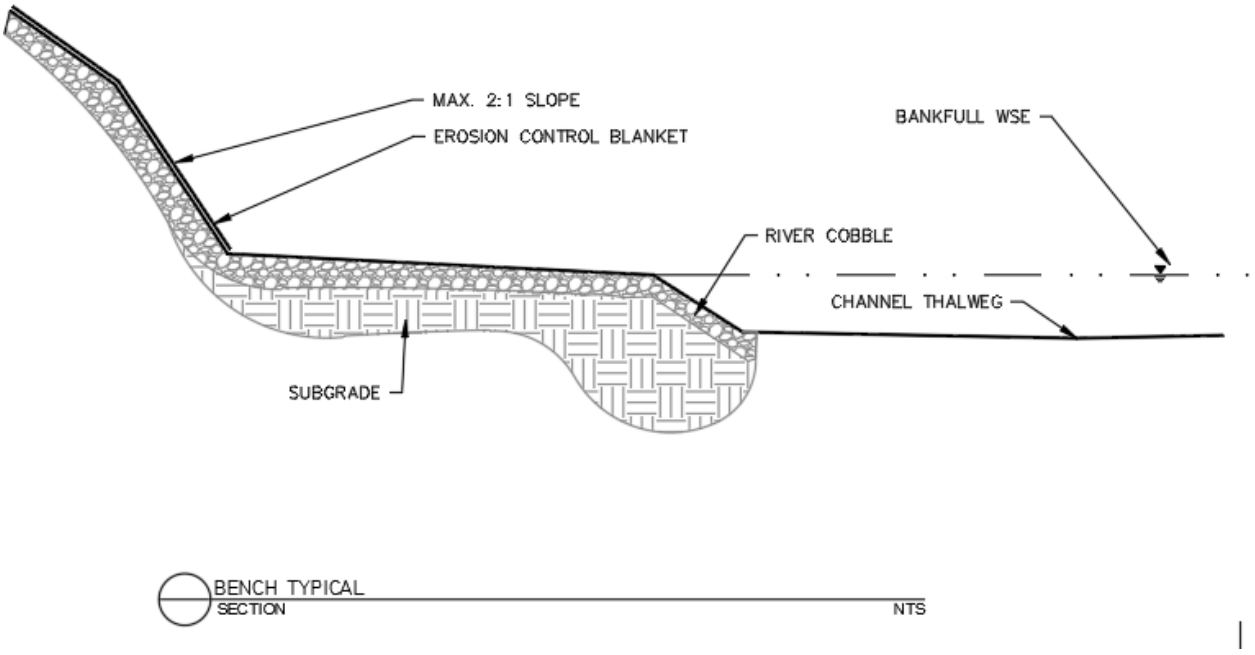

Figure 3 Channel and floodplain bench typical cross section

The right bank of the river was designed such that construction will not impact the neighbor's property. The profile has been set so the right bankfull limit will roughly tie in to work done on that bank without any additional grading. S2o anticipates that the best final configuration will require some blending with the property on this side and recommends that the Client begin a process of dialogue with the neighboring property regarding this effort.

The left bank of the river is designed to have varying widths of a bankfull bench that will daylight to existing grades. The design was created to maximize buildable area on the Client's property while allowing

adequate benching to accommodate a flood event naturally. The left bank can be divided into 3 separate design areas which are labeled in this report as upstream, middle, and downstream. In these design areas alternatives will be mixed and matched depending on the clients wishes and functionality of the system shown in the results of the one-dimensional HEC-RAS hydraulic modelling. The grading of the "middle" section as well as the river channel itself remain constant between design alternatives except Alternative 6.

The six design alternatives include

- Alternative 1: Graded banks upstream and downstream at 2:1 slope.
- Alternative 2: 5-foot boulder walls upstream and downstream, with 3:1 graded slope tie-out.
- Alternative 3: Two 3-foot walls with 6' spacing in between, and 3:1 graded slope tie-out upstream. Downstream bank graded at 3:1 slope.
- Alternative 4: Three 3-foot walls with 6-foot and 3-foot spacing, and 3:1 graded slope upstream. Downstream bank graded at 3:1 slope.
- Alternative 5: Three 3-foot walls with 5-foot and 2-foot spacing, and 2:1 graded slope upstream. Downstream bank graded at 3:1 slope. Design has a wider bankfull bench.
- Alternative 6: Same design as Alternative 5, with the higher ground area of the site graded flat.

Modeling Methodology

Existing Condition Hydraulic Model

As noted above, the CHAMP model was utilized to model existing conditions. It contained cross sections upstream of the site, one through the middle of the site, and more downstream of the site. An additional two cross sections were added through the site for detail to analyze the proposed designs. This updated existing conditions model is known as the "Corrected Effective". Figure 4 shows the CHAMP model cross sections with the project site circled and Figure 5 shows the additional cross sections in the existing conditions model.

Figure 4 Existing Hydraulic Model Cross Sections

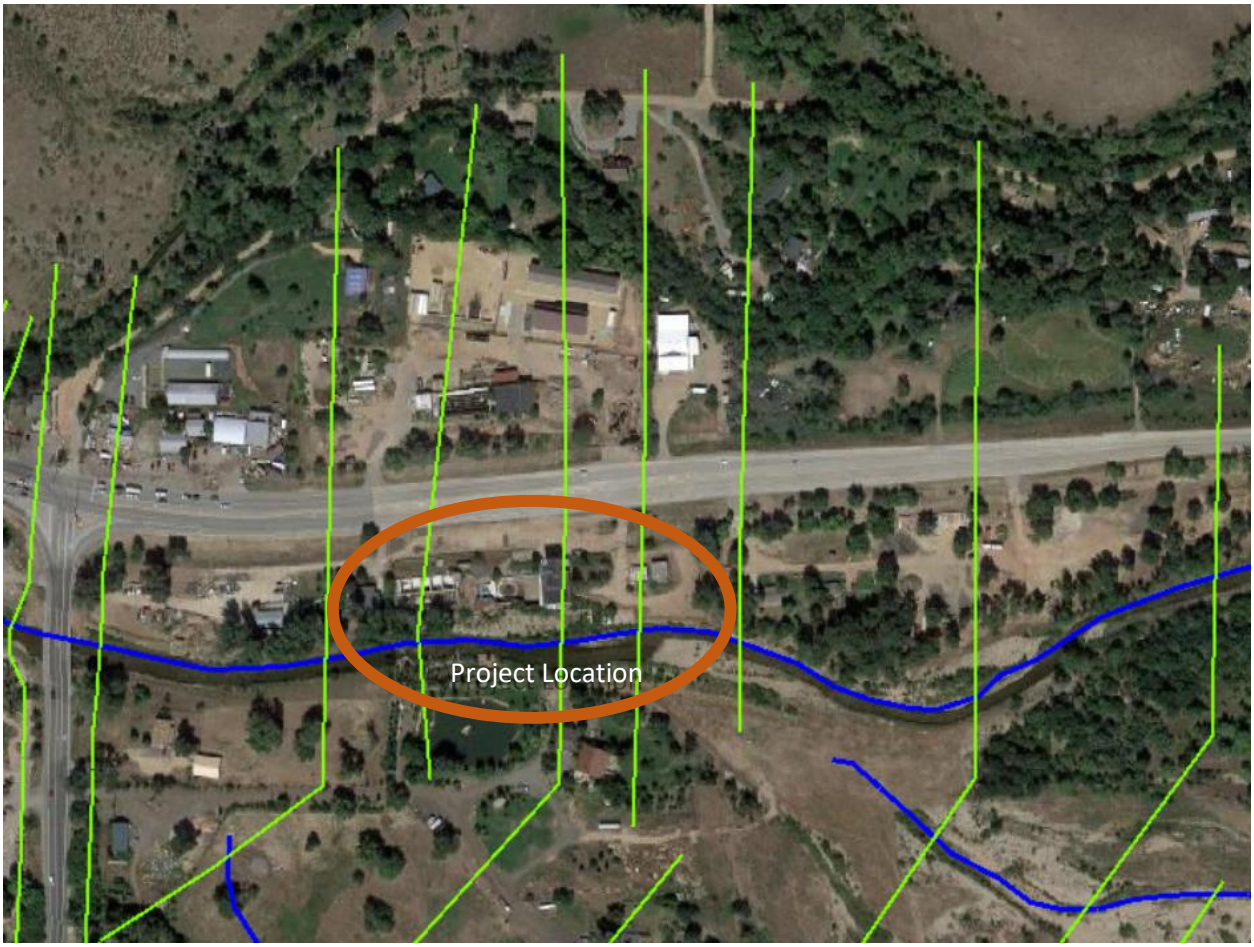

Figure 5 Existing Conditions Hydraulic Model Cross Sections

The inclusion of the additional cross sections caused an increase in the water surface elevations at the 100 year flow rate, as shown in Figure 6. This increase in water surface elevation is a result of adding a cross-section at a more restrictive location. It more accurately models the real conditions at the project site. The difference in the water surface elevation is shown in Table 1.

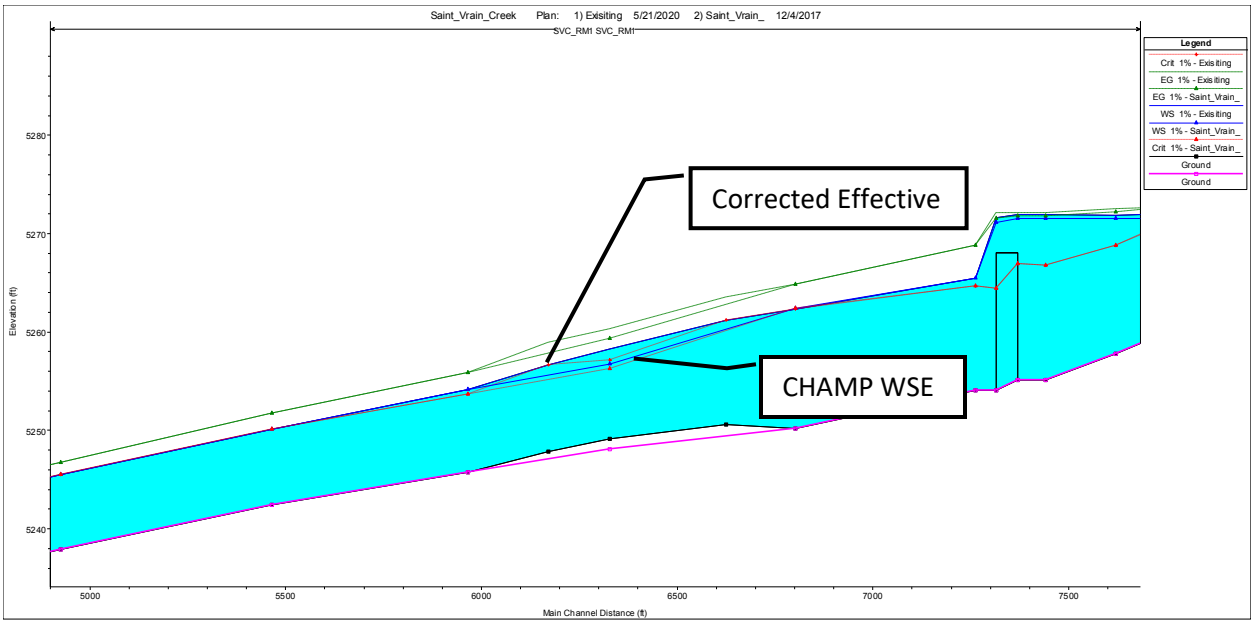

Figure 6 Water Surface Elevation Profiles

Table 1 Difference in Water Surface Elevations

	Water Surface Elevation (ft)	
River Station	**CHAMP Model**	**Existing (EC) Model**
176324.2	5262.36	5262.36
176137.1	5260.15*	5261.20
175848.2	5256.75	5258.28
175692.7	5255.63*	5256.65
175486.2	5254.15	5254.13

Note: CHAMP model results with an Asterix (*) have been interpolated, as those cross sections did not exist in that model.

Proposed Condition Hydraulic Model

The corrected effective model, with the additional cross sections, was updated with the proposed design alternative's geometries to investigate the alternative's impact on the hydraulic conditions on the site. As discussed above the debris removal, channel grading, and grading on the south bank are the same with all the alternatives.

Alternative Analysis of Potential Designs

As mentioned in the "Preliminary Design" portion of this memo, the possible designs of this site can be mixed and matched to achieve the goals of the client, maximize buildable area, and contain the 100-year flood. These alternatives contemplate the width of the bankfull bench, and then the grading slopes and types of the left bank to the existing surface. The design of the river channel and the right bank grading remain constant through these alternatives. To accurately assess these different scenarios, we created 3D models in Civil 3D and then analyzed multiple hydraulic models with HEC-RAS.

All the alternatives will also require a site cleanup and demolition of the existing debris. This debris includes concrete structures, metal pipes, and other general flood debris. A photo showing an example of the debris to be removed is shown in Figure 7. This debris should be disposed of at an approved facility.

Cost estimates for each Alternative has been included as well. Earthwork numbers were generated from the 3D models created in Civil3D and used to determine an overall price for each section of the project. This allows any mixing and matching done by the client to be easily assessed for price. Some alternatives are more material balanced than others, with differing amounts of either cut or fill material needing to be hauled onto or off the site. The boulder walls typically reduced the amount of fill material needing to be hauled and disposed of, however acquiring and installing these boulders is a larger cost.

Quantities of topsoil and erosion control blankets were also measured using our 3D models. Site setup, site demolition, and revegetation are based on percentages of the total cost and have been estimated from S2O's past experiences with similar projects. As these are preliminary designs, a 15% contingency was included for each alternative, as well as 12% for final design and permitting and 5% for construction oversight. These costs would be refined based on the selected alternative.

Figure 7 Debris to be removed

Alternative 1

The first alternative concept that was analyzed was also the simplest; a 2:1 slope tie-out from the bankfull bench across the whole left bank of the site, shown in Figure 8. A 2:1 slope is the steepest slope that any vegetation can be established, and it may be challenging to be successful, but it became a good baseline comparison for the other alternatives. Figure 9 is a typical detail of what these upstream and downstream graded slopes would look like, and how they would be constructed. The steep slopes on this design meant we could fit the widest bankfull bench and take up the least room with grading. Because of this, it was expected that it would have the best flood conveyance, as shown in the model results in Table 2. These results show water surface elevations consistently lower than the existing hydraulic model, with a maximum difference of 0.98' at cross-section 175848.

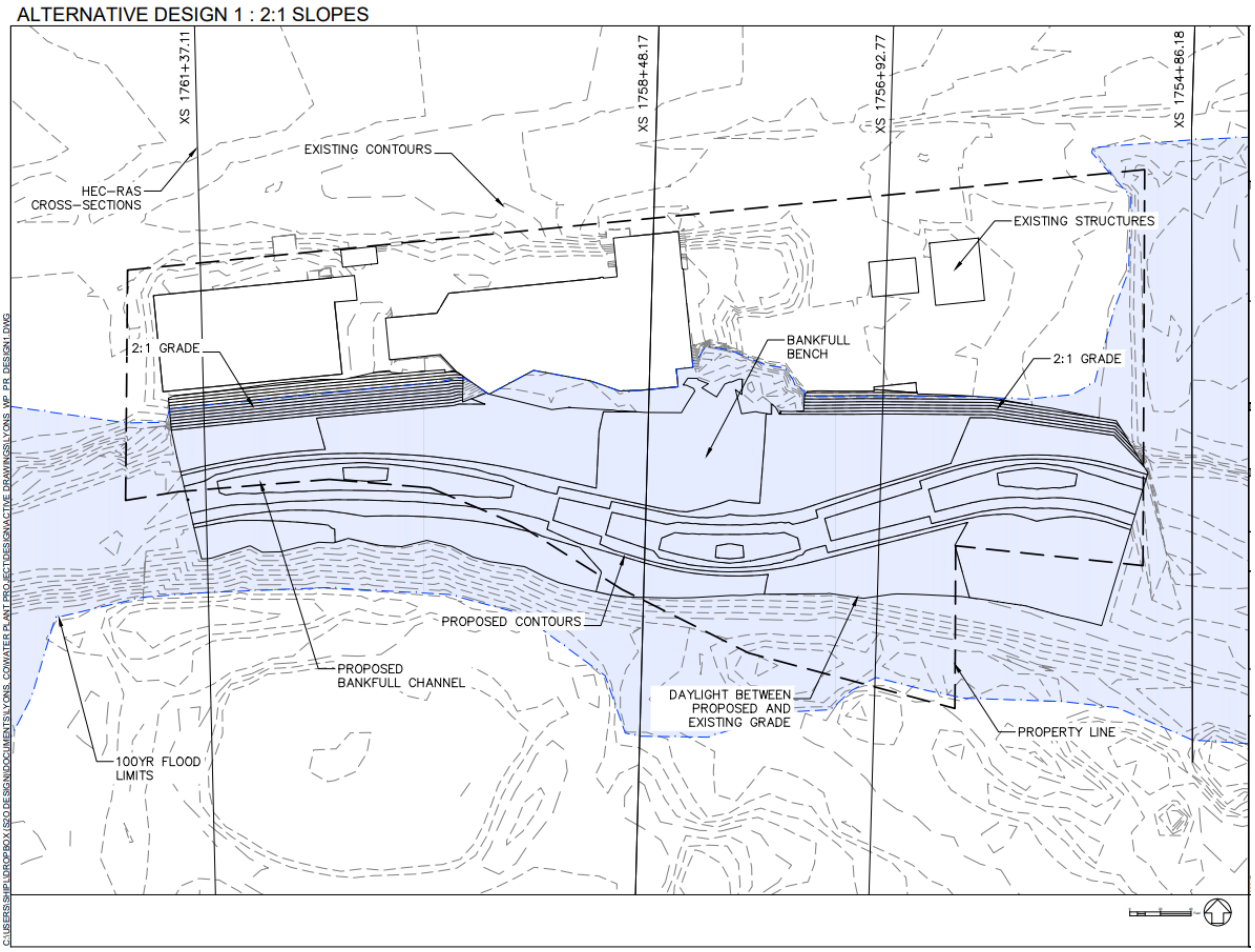

Figure 8 Alternative Design 1

Table 2 Difference in Water Surface Elevations With Alternative Design 1.

	Water Surface Elevation (ft)	
River Station	**Existing (EC) Model**	**Alt Design 1**
176324.2	5262.36	5262.36
176137.1	5261.2	5260.97
175848.2	5258.28	5257.3
175692.7	5256.65	5256.53
175486.2	5254.13	5254.13

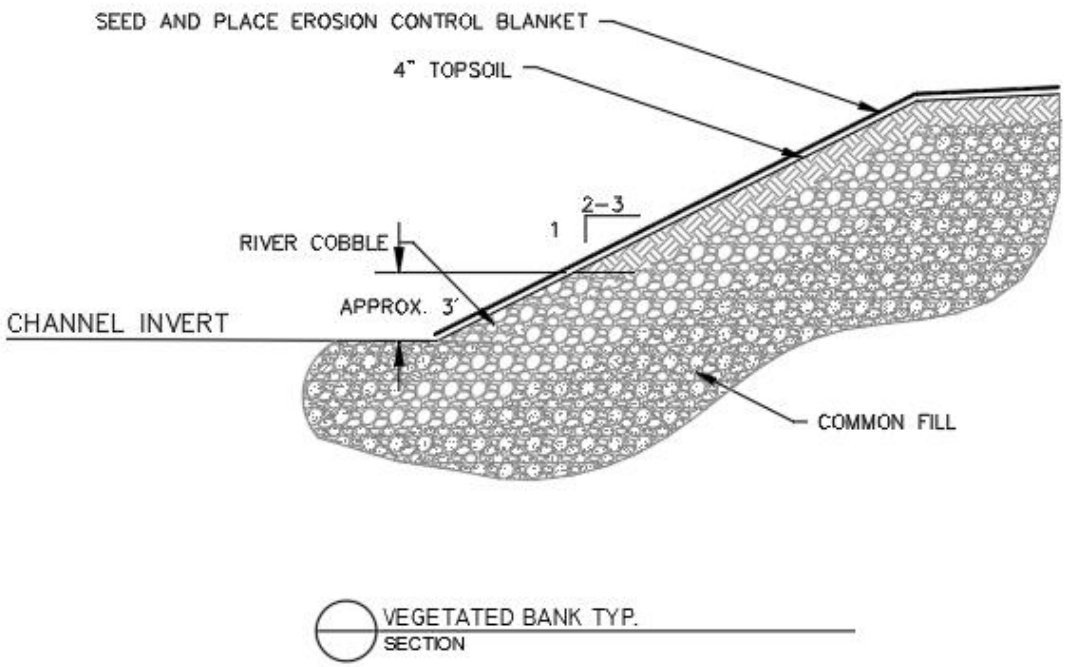

Figure 9 Vegetated bank typical detail

Table 3 contains the cost estimate for Alternative 1. As seen, it has the lowest total price, mostly due to the lack of large boulders used in the design with a net construction cost of $146,716. With final design, permitting, construction oversight and contingencies it is a total cost of $193,665.

Table 3 Preliminary Cost Assessment for Alternative 1

Project: Lyons Water Park
Issue Date: 05/20/2020
Alternative Design 1: US and DS 2:1 grade slopes

Lyons Water Park Cost Estimate

Description	Quantity	Unit	Unit Cost	Item Total Cost
Site Setup				
Construction Bonding/Insurance	1	LS	$ 4,386.55	$ 4,386.55
Mobilization and Demobilization	1	LS	$ 7,000.00	$ 7,000.00
Construction Layout and As-built Survey	1.0	LS	$ 5,000.00	$ 5,000.00
Install & Maintain Best Management Practices	1.0	LS	$ 5,000.00	$ 5,000.00
Site Demolition				
Clear and Grub	1.0	AC	$ 2,500.00	$ 2,500.00
Debris Removal	300.0	CY	$ 50.00	$ 15,000.00
Total Site Imported Fill	500.0	CY	$ 25.00	$ 12,500.00
River Channel				
Operate & Maintain Water Control	1.0	LS	$ 5,000.00	$ 5,000.00
Earthwork	2060.0	CY	$ 12.00	$ 24,720.00
Furnish and Install Boulders (36")	5.0	EA	$ 250.00	$ 1,250.00
US SECTION 2:1 GRADE				
Earthwork	850.0	CY	$ 12.00	$ 10,200.00
Erosion Control Blanket	500.0	SY	$ 12.00	$ 6,000.00
Topsoil	160.0	CY	$ 60.00	$ 9,600.00
MIDDLE SECTION				
Earthwork	570.0	CY	$ 12.00	$ 6,840.00
Erosion Control Blanket	0.0	SY	$ 12.00	$ -
Topsoil	0.0	CY	$ 60.00	$ -
DS SECTION 2:1 GRADE				
Earthwork	1080.0	CY	$ 12.00	$ 12,960.00
Erosion Control Blanket	280.0	SY	$ 12.00	$ 3,360.00
Topsoil	90.0	CY	$ 60.00	$ 5,400.00
Revegetation	1.0	LS	$ 10,000.00	$ 10,000.00
Net Construction Cost				$ 146,716.55
Additional Included Items:				
Final Enigneering and Permitting	12	%	$ 146,716.55	$ 17,605.99
Construction Observation	5	%	$ 146,716.55	$ 7,335.83
PROJECT SUBTOTAL				
Contingency	15	%	$ 146,716.55	$ 22,007.48
CONSTRUCTION SUBTOTAL				$ 193,665.85

Alternative 2

To provide more stability in the design of the left bank while keeping a bankfull bench that was slightly reduced, 5-foot-tall stacked boulder walls were implemented into the design instead of the 2:1 slope. These walls are 5 feet tall laid back at a 1:1, with 6-foot landings in between. The walls have been proposed as a maximum of 5 feet tall with landings between them to avoid the need for a structural design of the walls. If walls taller than 5 feet are desired, they would need to be designed by a structural engineer to ensure stability. These walls may necessitate handrails for safety. Because the erosion on site has created 10'-15' near vertical banks, the upstream section would require 2 sets of walls to meet existing, while the downstream portion would only require 1 wall (Figure 10). These walls tie out to existing at a 3:1 grade. Like Alternative 1, the model results for this design show water surface elevations consistently lower than the existing hydraulic model, with a -0.84' maximum difference at the same cross section as Alternative 1's maximum difference (Table 4). Boulder walls can provide a higher level of protection against flood erosional forces and can be installed as an aesthetic feature. See either Figure 11 or Figure 12 for typical detail cross sections of what this bank could look like once constructed. Boulder walls significantly increase the cost of the stabilization, as can be seen in the cost estimate in Table 5. With the walls we have suggested however, the 6' spacing in between can also provide plenty of space for either a level walking path or a variety of vegetation.

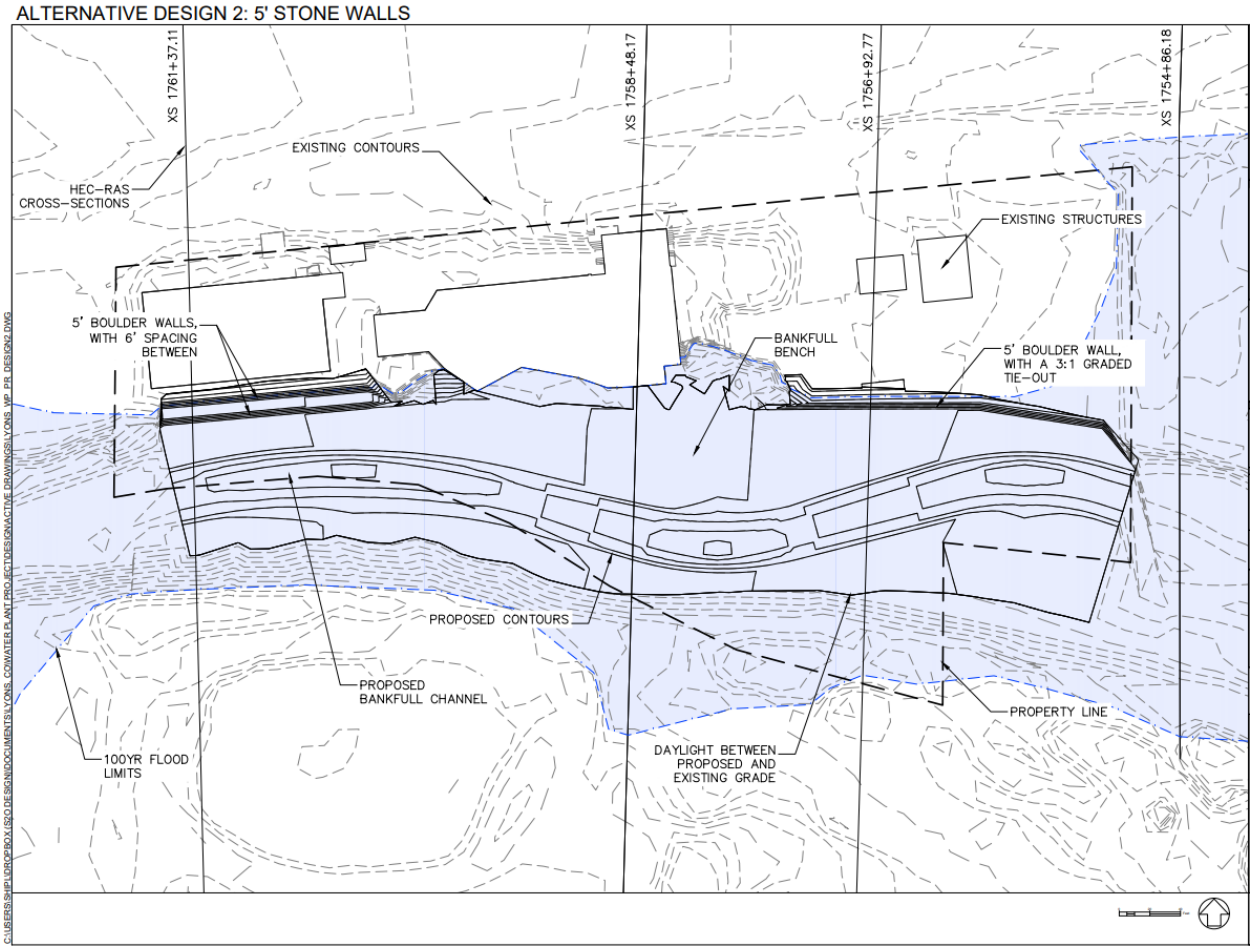

Figure 10 Alternative Design 2

Table 4 Difference in Water Surface Elevations With Alternative Design 2

	Water Surface Elevation (ft)	
River Station	**Existing (EC) Model**	**Alt Design 2**
176324.2	5262.36	5262.36
176137.1	5261.2	5260.98
175848.2	5258.28	5257.44
175692.7	5256.65	5256.45
175486.2	5254.13	5254.13

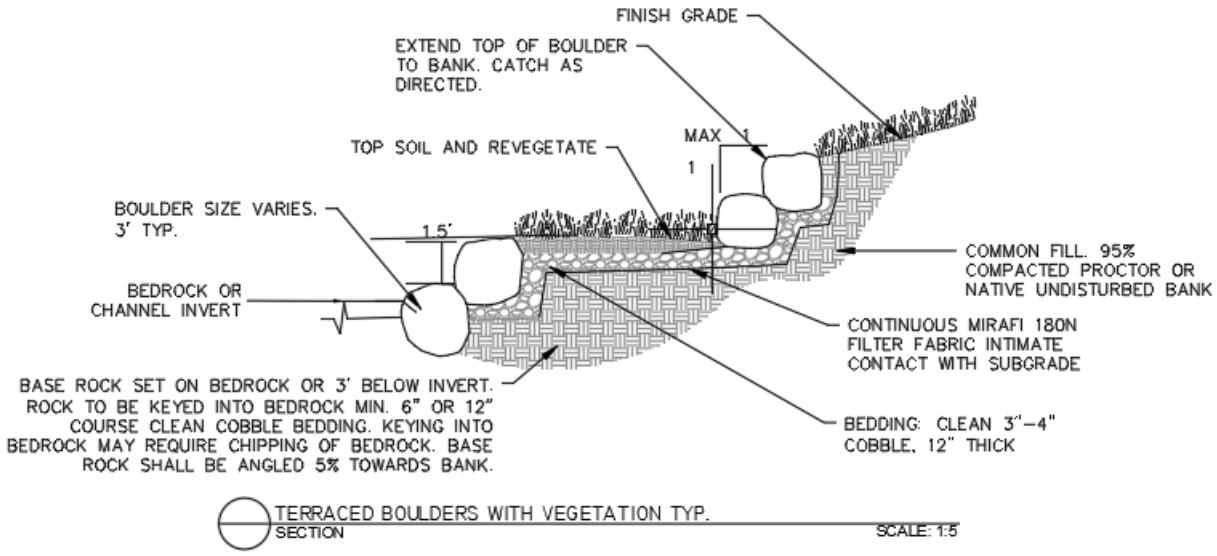

Figure 11 Typical Terraced boulder with vegetated landing

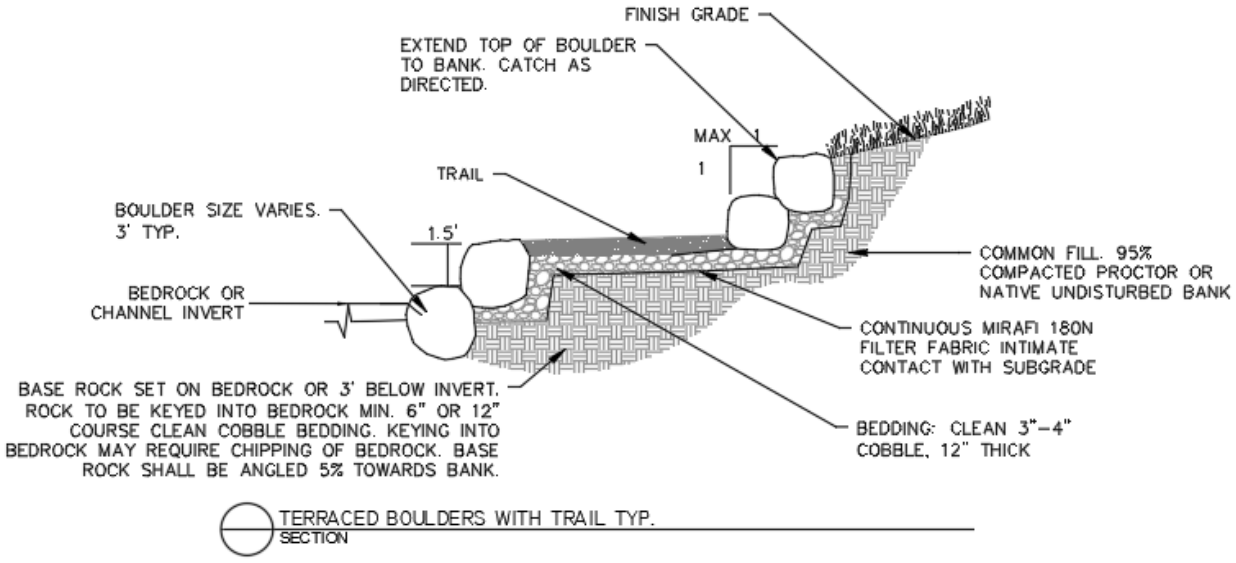

Figure 12 Typical Terraced boulder with trail landing

Table 5 contains the cost estimate for Alternative 2. As seen, this alternative has a net construction cost of $185,358. With final design, permitting, construction oversight and contingencies it is a total cost of $249.953. The boulder walls add expense compared to Alternative 1.

Table 5 Preliminary Cost Assessment for Alternative 2

Project: Lyons Water Park
Issue Date: 05/20/2020
Alternative Design 2: US and DS 5' Stone Walls

Lyons Water Park Cost Estimate

Description	Quantity	Unit	Unit Cost	Item Total Cost
Site Setup				
Construction Bonding/Insurance	1	LS	$ 5,828.55	$ 5,828.55
Mobilization and Demobilization	1	LS	$ 7,000.00	$ 7,000.00
Construction Layout and As-built Survey	1.0	LS	$ 5,000.00	$ 5,000.00
Install & Maintain Best Management Practices	1.0	LS	$ 5,000.00	$ 5,000.00
Site Demolition				
Clear and Grub	1.0	AC	$ 2,500.00	$ 2,500.00
Debris Removal	300.0	CY	$ 50.00	$ 15,000.00
Total Site Imported Fill	0.0	CY	$ 25.00	$ -
River Channel				
Operate & Maintain Water Control	1.0	LS	$ 5,000.00	$ 5,000.00
Earthwork	2060.0	CY	$ 12.00	$ 24,720.00
Furnish and Install Boulders (36")	5.0	EA	$ 250.00	$ 1,250.00
US SECTION 5' BOULDER WALL, 3:1 GRADE				
Earthwork	700.0	CY	$ 12.00	$ 8,400.00
Erosion Control Blanket	130.0	SY	$ 12.00	$ 1,560.00
Topsoil	40.0	CY	$ 60.00	$ 2,400.00
Furnish and Install Boulder Wall	260.0	LF	$ 160.00	$ 41,600.00
MIDDLE SECTION				
Earthwork	570.0	CY	$ 12.00	$ 6,840.00
Erosion Control Blanket	0.0	SY	$ 12.00	$ -
Topsoil	0.0	CY	$ 60.00	$ -
DS SECTION 5' BOULDER WALL, 3:1 GRADE				
Earthwork	1075.0	CY	$ 12.00	$ 12,900.00
Erosion Control Blanket	130.0	SY	$ 12.00	$ 1,560.00
Topsoil	40.0	CY	$ 60.00	$ 2,400.00
Furnish and Install Boulder Wall	190.0	LF	$ 160.00	$ 30,400.00
Revegetation	1.0	LS	$ 10,000.00	$ 10,000.00
Net Construction Cost				$ 189,358.55
Additional Included Items:				
Final Enigneering and Permitting	12	%	$ 189,358.55	$ 22,723.03
Construction Observation	5	%	$ 189,358.55	$ 9,467.93
PROJECT SUBTOTAL				
Contingency	15	%	$ 189,358.55	$ 28,403.78
CONSTRUCTION SUBTOTAL				$ 249,953.29

Alternative 3

Alternative 3 was considered to see what hydraulic results a less steep slope on the left bank would yield. Instead of three 5' walls on the upstream portion, two 3' boulder walls were applied, with the same 6' landing between walls, and tied-out to existing top of bank at a relaxed 3:1. The downstream section was graded at a 3:1 slope as well, with no boulder walls. See Figure 9 for a detail of how the downstream left bank would be constructed, and either Figure 11 or Figure 12 for more information on the upstream bank. To maintain a sizeable buildable area on the property, the bankfull bench was pinched in closer to the river to accommodate the more gradual slopes. The benefit of Alternative 3 is vegetation will be easier to establish on the slopes, providing more stability overall. The shorter boulder walls, while taking up the same footprint, and still allowing the 6' landing between for either a walking path or some native vegetation. However, because the bankfull bench width was reduced, the 100-year flood with this alternative is slightly higher (Table 6) than previous alternatives, but still less than the existing 100-year water surface elevation. The maximum difference in water surface elevation is -0.9' less than the existing hydraulic model, and on the upstream portion of the site a minimum of -0.04'.

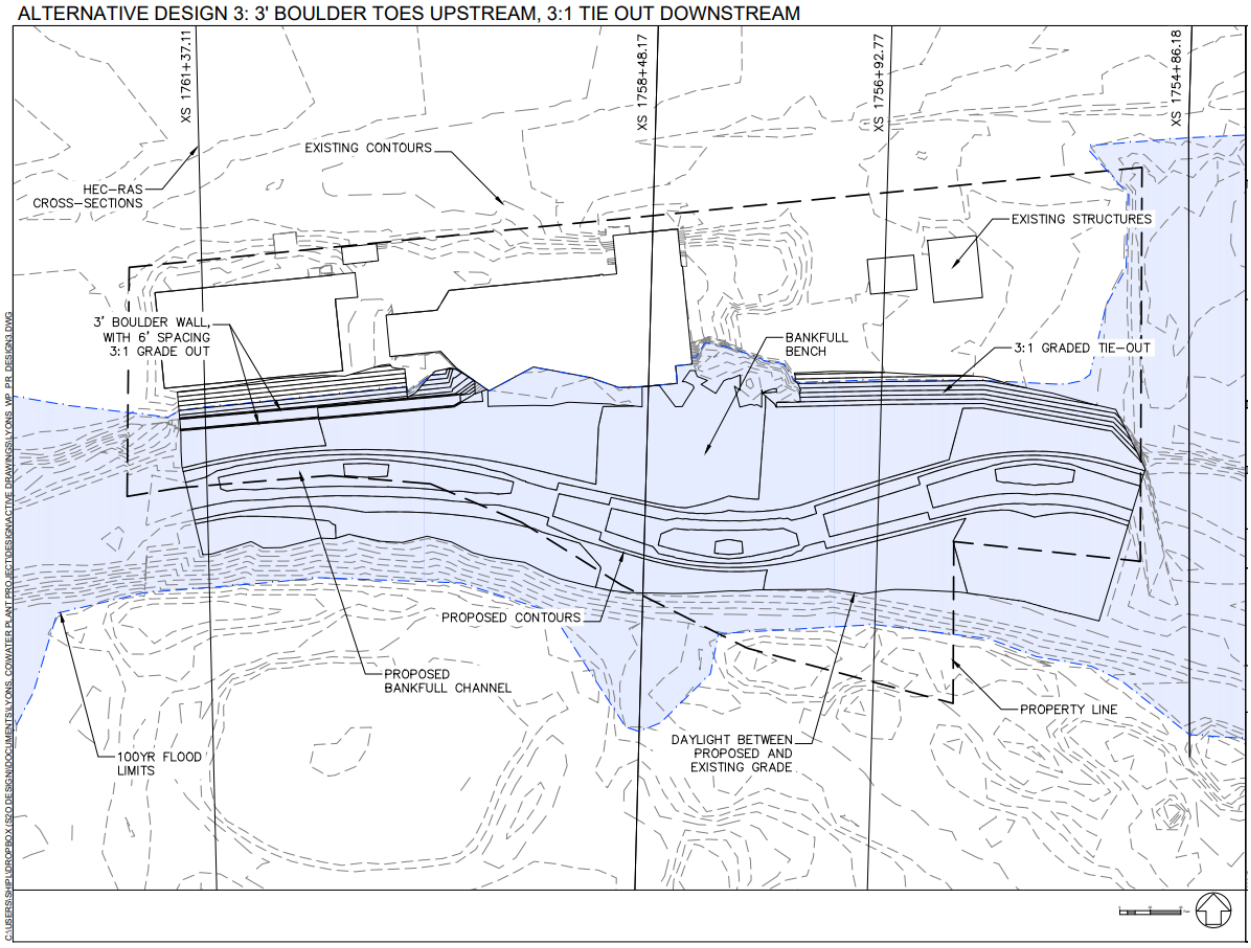

Figure 13 Alternative Design 3

Table 6 Difference in Water Surface Elevations With Alternative Design 3.

River Station	Water Surface Elevation (ft) Existing (EC) Model	Alt Design 3
176324.2	5262.36	5262.4
176137.1	5261.2	5261.16
175848.2	5258.28	5257.38
175692.7	5256.65	5256.4
175486.2	5254.13	5254.13

Table 7 contains the cost estimate for Alternative 3 which has a net construction cost of $171,453. With final design, permitting, construction oversight and contingencies it is a total cost of $226,318. Alternative 3 has noticeably less in expenses than Alternative 2, with the smaller amounts of rock needed to construct the boulder walls displays these details.

Table 7 Preliminary Cost Assessment for Alternative 3

Project: Lyons Water Park
Issue Date: 05/20/2020
Alternative Design 3: US 2x 3' boulder walls and DS 3:1 grade slopes

Lyons Water Park Cost Estimate

Description	Quantity	Unit	Unit Cost	Item Total Cost
Site Setup				
Construction Bonding/Insurance	1	LS	$ 5,223.05	$ 5,223.05
Mobilization and Demobilization	1	LS	$ 7,000.00	$ 7,000.00
Construction Layout and As-built Survey	1.0	LS	$ 5,000.00	$ 5,000.00
Install & Maintain Best Management Practices	1.0	LS	$ 5,000.00	$ 5,000.00
Site Demolition				
Clear and Grub	1.0	AC	$ 2,500.00	$ 2,500.00
Debris Removal	300.0	CY	$ 50.00	$ 15,000.00
Total Site Imported Fill	280.0	CY	$ 25.00	$ 7,000.00
River Channel				
Operate & Maintain Water Control	1.0	LS	$ 5,000.00	$ 5,000.00
Earthwork	2060.0	CY	$ 12.00	$ 24,720.00
Furnish and Install Boulders (36")	5.0	EA	$ 250.00	$ 1,250.00
US SECTION 2x3' BOULDER WALLS, 3:1 GRADE				
Earthwork	630.0	CY	$ 12.00	$ 7,560.00
Erosion Control Blanket	330.0	SY	$ 12.00	$ 3,960.00
Topsoil	100.0	CY	$ 60.00	$ 6,000.00
Furnish and Install Boulder Walls	360.0	LF	$ 80.00	$ 28,800.00
MIDDLE SECTION				
Excavation	570.0	CY	$ 12.00	$ 6,840.00
Erosion Control Blanket	0.0	SY	$ 12.00	$ -
Topsoil	0.0	CY	$ 60.00	$ -
DS SECTION 3:1 GRADE				
Excavation	1350.0	CY	$ 12.00	$ 16,200.00
Erosion Control Blanket	450.0	SY	$ 12.00	$ 5,400.00
Topsoil	150.0	CY	$ 60.00	$ 9,000.00
Revegetation	1.0	LS	$ 10,000.00	$ 10,000.00
Net Construction Cost				$ 171,453.05
Additional Included Items:				
Final Enigneering and Permitting	12	%	$ 171,453.05	$ 20,574.37
Construction Observation	5	%	$ 171,453.05	$ 8,572.65
PROJECT SUBTOTAL				
Contingency	15	%	$ 171,453.05	$ 25,717.96
CONSTRUCTION SUBTOTAL				$ 226,318.03

Alternative 4

Alternative 4 was created with the same middle and downstream portion as Alternative 3 due to the stability and cost savings it provided. However, to lower the 100-year flood on the upstream section, the width of the bankfull bench was increased, so that three 3’ boulder toes would be necessary. The 6’ space is kept in between the first two walls for vegetation or a walking path, and the second and third have a 3’ space, enough for small vegetation. This shift allowed a wider bankfull bench as well as a relaxed 3:1 tie out to existing (Figure 14). See Figure 9 for a detail of how the downstream left bank would be constructed, and either Figure 11 or Figure 12 for more information on the upstream bank. The hydraulic model results did improve from this, with a lower 100-year flood elevation at the upstream portion, and nearly equal elevation to alternative 3 on the downstream end.

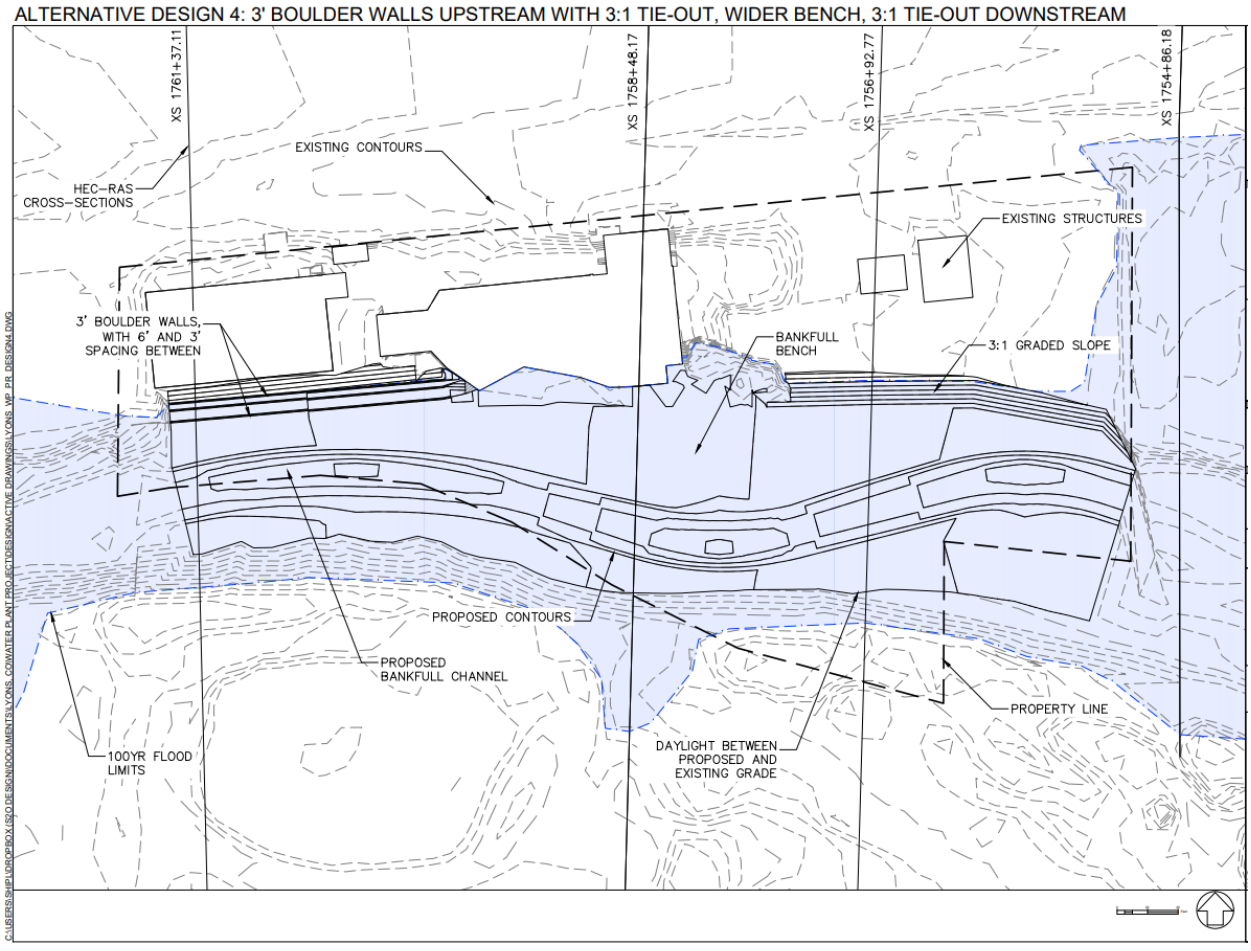

Figure 14 Alternative Design 4

Table 8 Difference in Water Surface Elevations With Alternative Design 4.

River Station	Existing (EC) Model	Alt Design 4
176324.2	5262.36	5262.36
176137.1	5261.2	5260.94
175848.2	5258.28	5257.4
175692.7	5256.65	5256.35
175486.2	5254.13	5254.13

The costs associated with Alternative 4 and its improved flood conveyance are detailed in Table 9. This alternative has a net construction cost of $177,704. With final design, permitting, construction oversight and contingencies it is a total cost of $234,570.

Table 9 Preliminary Cost Assessment for Alternative 4

Project: Lyons Water Park
Issue Date: 05/20/2020
Alternative Design 4: US 3x 3' boulder walls and DS 3:1 grade slopes

Lyons Water Park Cost Estimate

Description	Quantity	Unit	Unit Cost	Item Total Cost
Site Setup				
Construction Bonding/Insurance	1	LS	$ 5,434.45	$ 5,434.45
Mobilization and Demobilization	1	LS	$ 7,000.00	$ 7,000.00
Construction Layout and As-built Survey	1.0	LS	$ 5,000.00	$ 5,000.00
Install & Maintain Best Management Practices	1.0	LS	$ 5,000.00	$ 5,000.00
Site Demolition				
Clear and Grub	1.0	AC	$ 2,500.00	$ 2,500.00
Debris Removal	300.0	CY	$ 50.00	$ 15,000.00
Total Site Exported Cut	80.0	CY	$ 25.00	$ 2,000.00
River Channel				
Operate & Maintain Water Control	1.0	LS	$ 5,000.00	$ 5,000.00
Earthwork	2060.0	CY	$ 12.00	$ 24,720.00
Furnish and Install Boulders (36")	5.0	EA	$ 250.00	$ 1,250.00
US SECTION 3x3' BOULDER WALLS, 3:1 GRADE				
Earthwork	860.0	CY	$ 12.00	$ 10,320.00
Erosion Control Blanket	120.0	SY	$ 12.00	$ 1,440.00
Topsoil	40.0	CY	$ 60.00	$ 2,400.00
Furnish and Install Boulder Walls	540.0	LF	$ 80.00	$ 43,200.00
MIDDLE SECTION				
Excavation	570.0	CY	$ 12.00	$ 6,840.00
Erosion Control Blanket	0.0	SY	$ 12.00	$ -
Topsoil	0.0	CY	$ 60.00	$ -
DS SECTION 3:1 GRADE				
Earthwork	1350.0	CY	$ 12.00	$ 16,200.00
Erosion Control Blanket	450.0	SY	$ 12.00	$ 5,400.00
Topsoil	150.0	CY	$ 60.00	$ 9,000.00
Revegetation	1.0	LS	$ 10,000.00	$ 10,000.00
Net Construction Cost				$ 177,704.45
Additional Included Items:				
Final Enigneering and Permitting	12	%	$ 177,704.45	$ 21,324.53
Construction Observation	5	%	$ 177,704.45	$ 8,885.22
PROJECT SUBTOTAL				
Contingency	15	%	$ 177,704.45	$ 26,655.67
CONSTRUCTION SUBTOTAL				$ 234,569.87

Alternative 5

After the team meeting on June 4th, these designs were reevaluated and it was decided that while Alternative 4 was the most appealing, it was also possible to further increase the buildable area on the property. Alternative 5 is consistent with the overall design of Alternative 4, but adjustments were made to both the upstream and downstream sections. Downstream, the bank remains a 3:1 graded slope, but the bankfull bench was pinched as narrow as possible while containing the flood level to the same elevation as existing. The upstream section has the same set of 3' boulder walls, however the distances between them were each reduced by one foot. The bankfull bench was also narrowed as much as possible, and from the top boulder wall a 2:1 tie out was used. These alterations allowed enough flood conveyance to match existing while fitting 95 feet minimum of buildable width (Figure 15).

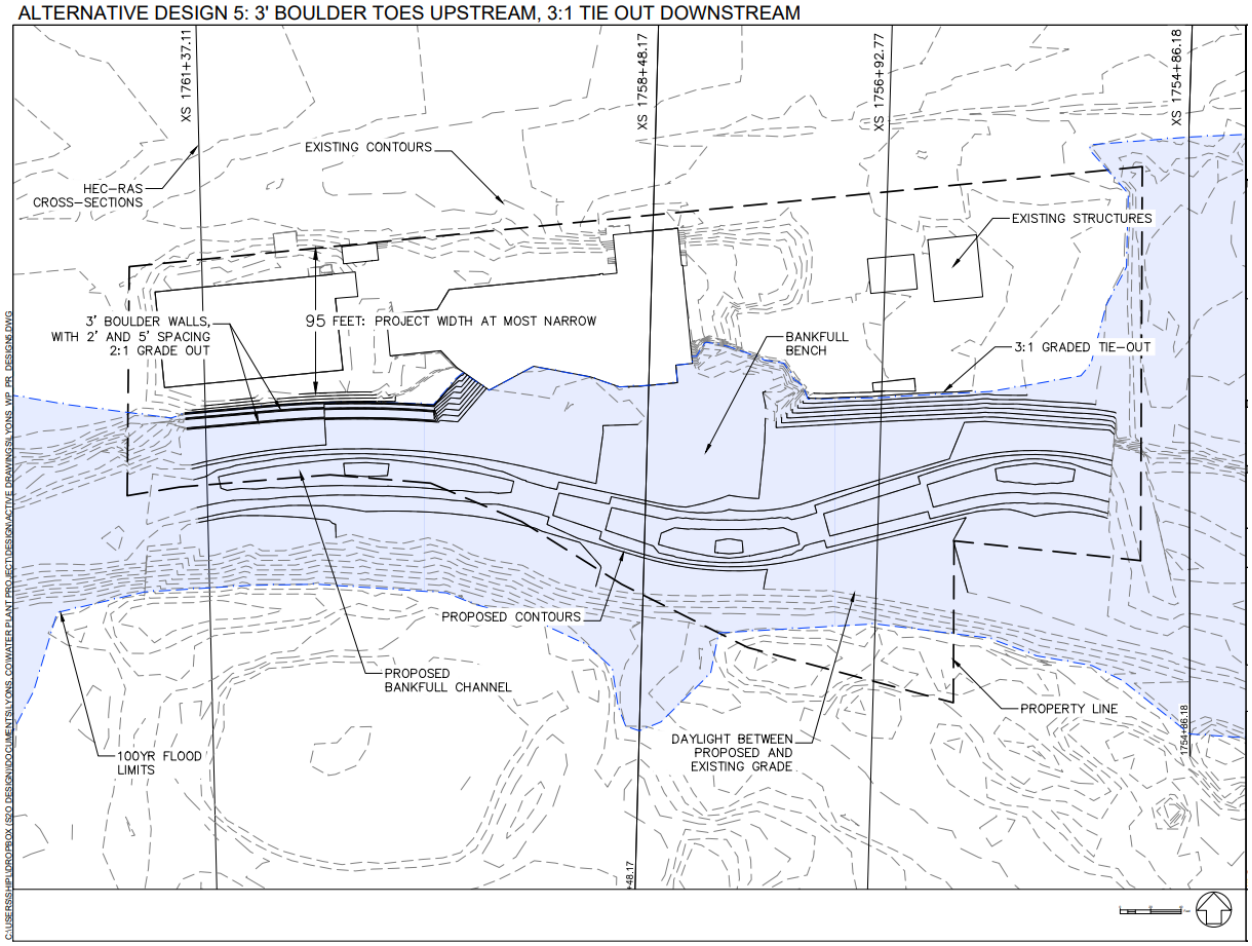

Figure 15 Alternative Design 5

Table 10 Difference in Water Surface Elevations With Alternative Design 5.

River Station	Existing (EC) Model	Alt Design 5
176324.2	5262.36	5262.36
176137.1	5261.20	5261.2
175848.2	5258.28	5257.44
175692.7	5256.65	5256.64
175486.2	5254.13	5254.13

Because the bankfull bench has been narrowed, the construction of the upstream and downstream banks will involve much less cut and excavation of material, driving the site total earthworks to be heavier on fill material. This will increase the cost of the project.

The costs associated with Alternative 5 and its increased buildable area are detailed in Table 11. This alternative has a net construction cost of $195,000. With final design, permitting, construction oversight and contingencies it is a total cost of $257,400.

Table 11 Preliminary Cost Assessment for Alternative 5

Project: Lyons Water Park
Issue Date: 06/15/2020
Alternative Design 5: US 3x 3' boulder walls and DS 3:1 grade slopes - Narrowed bankfull bench

Lyons Water Park Cost Estimate

Description	Quantity	Unit	Unit Cost	Item Total Cost
Site Setup				
Construction Bonding/Insurance	1	LS	$ 6,019.30	$ 6,019.30
Mobilization and Demobilization	1	LS	$ 7,000.00	$ 7,000.00
Construction Layout and As-built Survey	1.0	LS	$ 5,000.00	$ 5,000.00
Install & Maintain Best Management Practices	1.0	LS	$ 5,000.00	$ 5,000.00
Site Demolition				
Clear and Grub	1.0	AC	$ 2,500.00	$ 2,500.00
Debris Removal	300.0	CY	$ 50.00	$ 15,000.00
Total Site Imported Fill	1190.0	CY	$ 25.00	$ 29,750.00
River Channel				
Operate & Maintain Water Control	1.0	LS	$ 5,000.00	$ 5,000.00
Earthwork	2060.0	CY	$ 12.00	$ 24,720.00
Furnish and Install Boulders (36")	5.0	EA	$ 250.00	$ 1,250.00
US SECTION 3x3' BOULDER WALLS, 3:1 GRADE				
Earthwork	490.0	CY	$ 12.00	$ 5,880.00
Erosion Control Blanket	60.0	SY	$ 12.00	$ 720.00
Topsoil	20.0	CY	$ 60.00	$ 1,200.00
Furnish and Install Boulder Walls	540.0	LF	$ 80.00	$ 43,200.00
MIDDLE SECTION				
Excavation	550.0	CY	$ 12.00	$ 6,600.00
Erosion Control Blanket	0.0	SY	$ 12.00	$ -
Topsoil	0.0	CY	$ 60.00	$ -
DS SECTION 3:1 GRADE				
Earthwork	980.0	CY	$ 12.00	$ 11,760.00
Erosion Control Blanket	450.0	SY	$ 12.00	$ 5,400.00
Topsoil	150.0	CY	$ 60.00	$ 9,000.00
Revegetation	1.0	LS	$ 10,000.00	$ 10,000.00
Net Construction Cost				$ 194,999.30
Additional Included Items:				
Final Enigneering and Permitting	12	%	$ 194,999.30	$ 23,399.92
Construction Observation	5	%	$ 194,999.30	$ 9,749.97
PROJECT SUBTOTAL				
Contingency	15	%	$ 194,999.30	$ 29,249.90
CONSTRUCTION SUBTOTAL				$ 257,399.08

Alternative 6

The final alternative implements the same design as Alternative 5 with the narrower bankfull bench but continues the 3:1 graded slope further upstream to demonstrate what the site might look like if the existing buildings were removed. The property is currently on higher ground than surrounding areas, so the idea here was that if the site were levelled out, buildable area would be increased. When modeled, the results for this alternative there is a 0.01' rise at one of the cross sections, despite the pinch in the bankfull bench at the middle cross section. This amount of rise is minor and will be designed out in the final design.

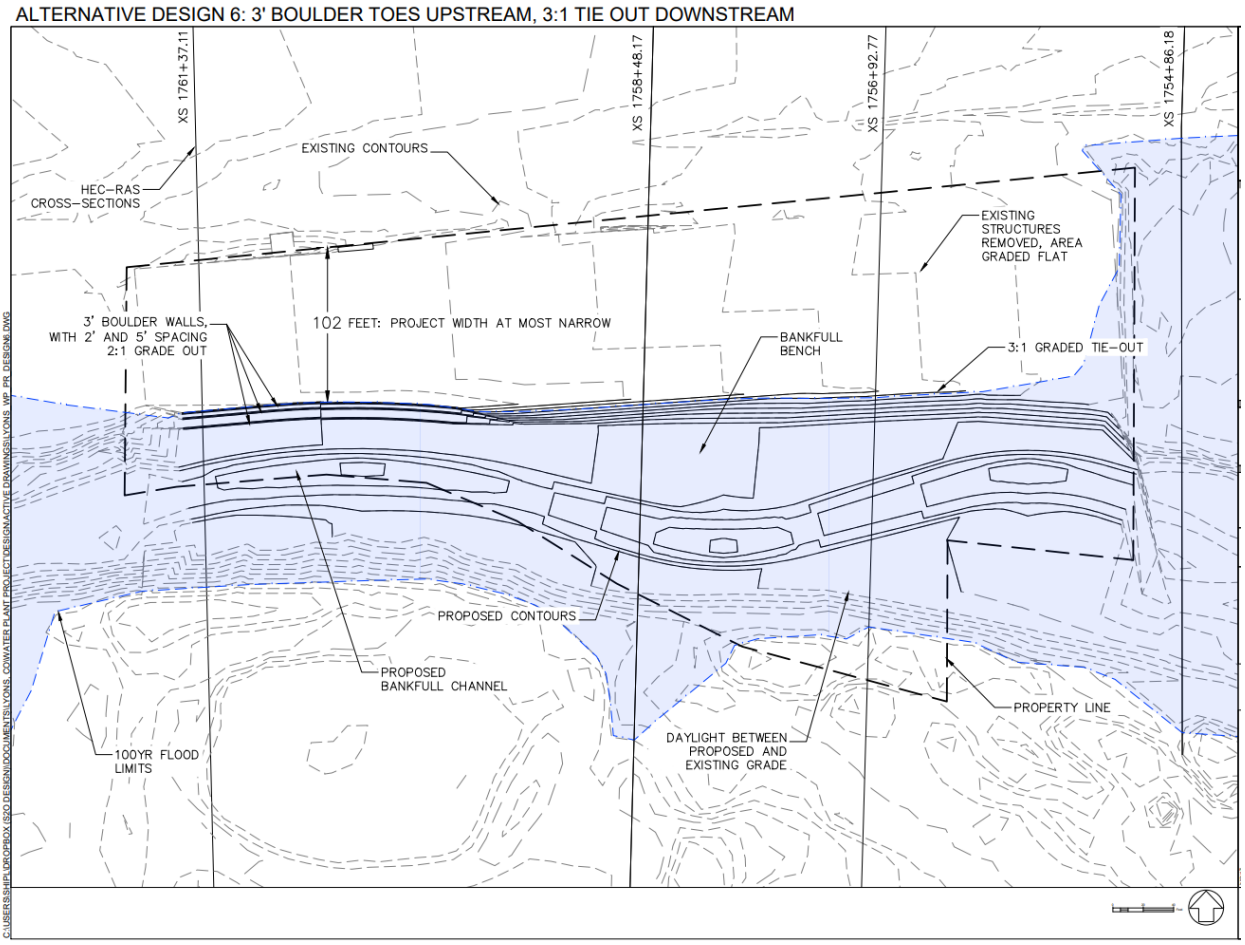

Figure 16 Alternative Design 6

Table 12 Difference in Water Surface Elevations With Alternative Design 6.

River Station	Existing (EC) Model	Alt Design 6
176324.2	5262.36	5262.36
176137.1	5261.20	5261.2
175848.2	5258.28	5258.03
175692.7	5256.65	5256.66
175486.2	5254.13	5254.13

Alternative 6 has the greatest buildable area of all the concept designs. However, it does come at a cost. Not considering the flattened upland portion of the project, the river channel and banks are around 1,370 cubic yards of net fill, meaning that material would need to be imported onto the project. The removal of existing buildings and flattening of the upland area would generate a lot of cut material from the area. Demolition of the existing building adds uncertainty to the project and further examination is required to refine the cut fill quantities. Therefore the cost of Alternative 6 does not include the grading of the top area, only the river channel and bank grading as displayed as proposed contours in Figure 16.

The costs associated with Alternative 6 and its increased buildable area are detailed in Table 13. This alternative has a net construction cost of $243,240. Additional cost was added for the demolition of the existing buildings. With final design, permitting, construction oversight and contingencies it is a total cost of $321,077.

Table 13 Preliminary Cost Assessment for Alternative 6

Project: Lyons Water Park
Issue Date: 06/15/2020
Alternative Design 6: US 3x 3' boulder walls and DS 3:1 grade slopes - Narrowed bankfull bench - Exisiting buildings replaced with grading

Lyons Water Park Cost Estimate

Description	Quantity	Unit	Unit Cost	Item Total Cost
Site Setup				
Construction Bonding/Insurance	1	LS	$ 7,650.65	$ 7,650.65
Mobilization and Demobilization	1	LS	$ 7,000.00	$ 7,000.00
Construction Layout and As-built Survey	1.0	LS	$ 5,000.00	$ 5,000.00
Install & Maintain Best Management Practices	1.0	LS	$ 5,000.00	$ 5,000.00
Site Demolition				
Clear and Grub	1.0	AC	$ 2,500.00	$ 2,500.00
Building Demolition	1.0	AC	$ 20,000.00	$ 20,000.00
Debris Removal	300.0	CY	$ 50.00	$ 15,000.00
Total Site Exported Cut	1640.0	CY	$ 25.00	$ 41,000.00
River Channel				
Operate & Maintain Water Control	1.0	LS	$ 5,000.00	$ 5,000.00
Earthwork	2060.0	CY	$ 12.00	$ 24,720.00
Furnish and Install Boulders (36")	5.0	EA	$ 250.00	$ 1,250.00
US SECTION 3x3' BOULDER WALLS, 3:1 GRADE				
Earthwork	350.0	CY	$ 12.00	$ 4,200.00
Erosion Control Blanket	0.0	SY	$ 12.00	$ -
Topsoil	0.0	CY	$ 60.00	$ -
Furnish and Install Boulder Walls	540.0	LF	$ 80.00	$ 43,200.00
MIDDLE SECTION				
Excavation	1080.0	CY	$ 12.00	$ 12,960.00
Erosion Control Blanket	400.0	SY	$ 12.00	$ 4,800.00
Topsoil	130.0	CY	$ 60.00	$ 7,800.00
DS SECTION 3:1 GRADE				
Earthwork	980.0	CY	$ 12.00	$ 11,760.00
Erosion Control Blanket	450.0	SY	$ 12.00	$ 5,400.00
Topsoil	150.0	CY	$ 60.00	$ 9,000.00
Revegetation	1.0	LS	$ 10,000.00	$ 10,000.00
Net Construction Cost				$ 243,240.65
Additional Included Items:				
Final Enigneering and Permitting	12	%	$ 243,240.65	$ 29,188.88
Construction Observation	5	%	$ 243,240.65	$ 12,162.03
PROJECT SUBTOTAL				
Contingency	15	%	$ 243,240.65	$ 36,486.10
CONSTRUCTION SUBTOTAL				$ 321,077.66

Alternative 7

In the meeting on July 2nd, it was requested that S2o look at pinching the bankfull bench as much as possible to analyze the maximum rise that would cause. This alternative looked at narrowing the floodplain bench downstream of the upper wall area. Figure 17 below shows the extent to which the banks were pinched and the bankfull bench was narrowed to be closer to the river edge.

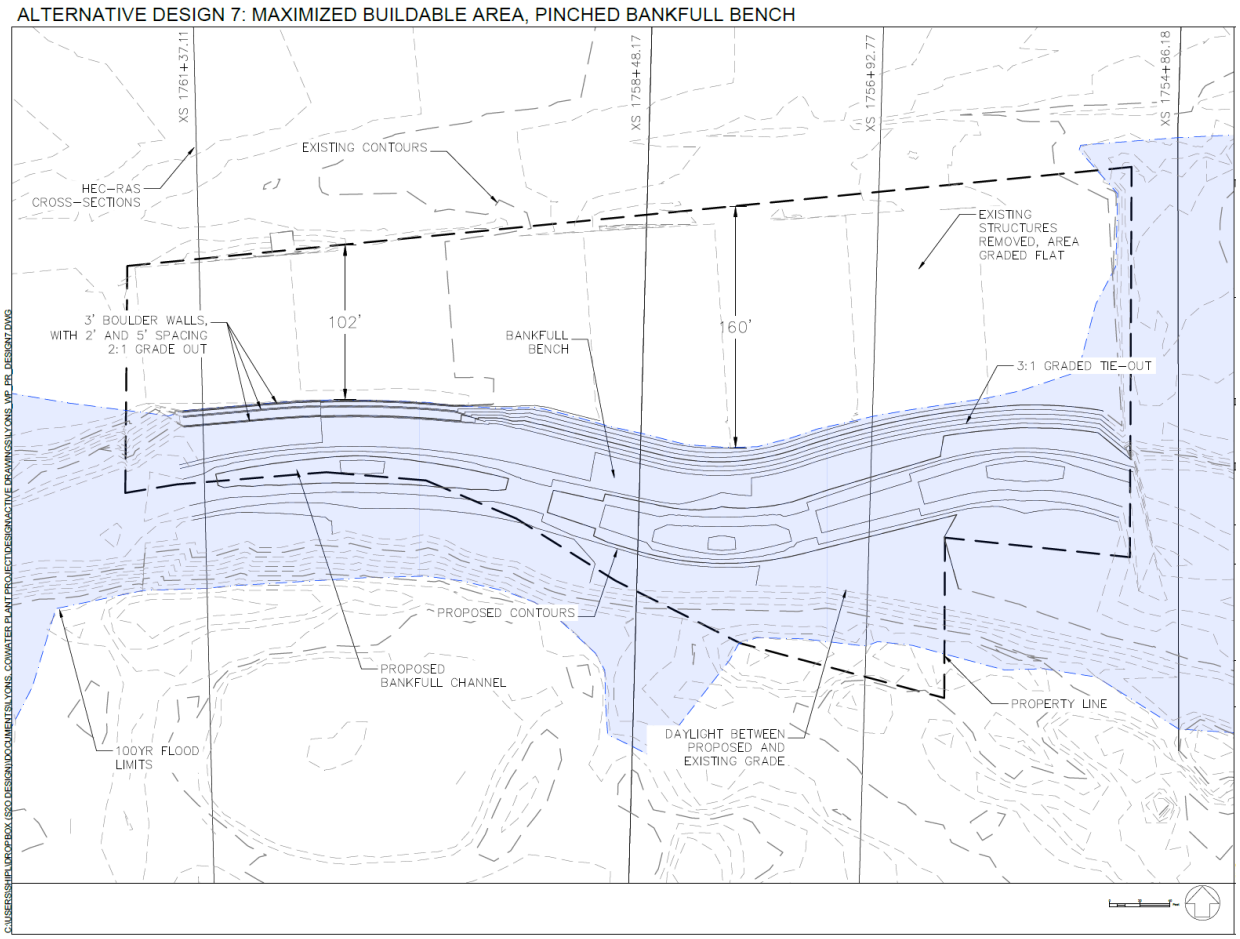

Figure 17 "Alternative 7" Evaluated for maximum flood possibilities and buildable area.

Any additional narrowing of the floodplain bench caused the resulting 100-year flood elevation to exceed the top of the bank and flood the entire site. This would result in the entire site being in the floodplain and would reduce the buildable area. The grading in Figure 17 shows the maximum confinement the river could endure without flooding. The highest rise in flood level is 0.86 feet.

Table 14 Flood Level Results

River Station	CHAMP Model	Existing (EC) Model	Alt Design 7
176324.2	5262.36	5262.36	5262.36
176137.1	5260.15*	5261.2	5262.06
175848.2	5256.75	5258.28	5258.66
175692.7	5255.63*	5256.65	5257.24
175486.2	5254.15	5254.13	5254.13

This alternative only looked at the maximum encroachment that would be feasible and the resulting rise in the water surface elevation at the 100-year flow rate. The quantities and a cost estimate were not developed for this alterative.

Recommendations

The buildable area from all these alternatives is comparable, with multiple being essentially the same. While the 3D models provided in Figure 8, Figure 10, Figure 13, and Figure 14 are preliminary, they provide an accurate representation for the hydraulic model. An estimate of buildable area for any alternative, which is visually demonstrated in the above listed figures, would be dependent on what the client wishes to do with the existing structures on site. The hydraulic models have been completed with the existing walls in place that do play a role in confining the 100-year flood.

The development intent and programing of the site will influence the final configuration of the proposed site. All four alternatives presented are feasible and portions could be carried from the various alternatives. These alternatives all meet the goal of improving the flood boundary on the property. The hydraulic results of all alternatives compared to one another are shown below in **Error! Reference source not found.**.

Table 15 Difference in Water Surface Elevations of all Alternatives

Water Surface Elevation (ft)

River Station	CHAMP Model	Existing (EC) Model	Alt Design 1	Alt Design 2	Alt Design 3	Alt Design 4
176324.2	5262.36	5262.36	5262.36	5262.36	5262.4	5262.36
176137.1	5260.15*	5261.20	5260.97	5260.98	5261.16	5260.94
175848.2	5256.75	5258.28	5257.3	5257.44	5257.38	5257.4
175692.7	5255.63*	5256.65	5256.53	5256.45	5256.4	5256.35
175486.2	5254.15	5254.13	5254.13	5254.13	5254.13	5254.13

River Station	CHAMP Model	Existing (EC) Model	Alt Design 5	Alt Design 6	Alt Design 7
176324.2	5262.36	5262.36	5262.36	5262.36	5262.36
176137.1	5260.15*	5261.20	5261.2	5261.2	5262.06
175848.2	5256.75	5258.28	5257.44	5258.03	5258.66
175692.7	5255.63*	5256.65	5256.64	5256.66	5257.24
175486.2	5254.15	5254.13	5254.13	5254.13	5254.13

Note: CHAMP model results with an Asterix (*) have been interpolated, as those cross sections did not exist in that model.

All the presented alternatives are feasible solutions to stabilize the channel and streambanks on the property. These alternatives can have elements incorporated in combination with each alternative as the development of the property is designed. The next steps for the project would be for the client to decide on a preferred alternative, or combination of alternative elements to advance to a final design. The final design will advance the design and details to a permittable and constructible stage.

The permits required to construct this project will include a floodplain development permit and Army Corps of Engineers (ACOE) 404 permit. The floodplain development permit will be based on the final hydraulic model and will include a hydraulic report and permit application. If the property has been annexed by the Town of Lyons the floodplain permit would be reviewed and approved by the Town. If it has not been annexed the permit would be handled by Boulder County, and it would necessitate a Boulder County Land Use permit. The ACOE 404 permit should qualify for a Nationwide permit for the work. The 404 permit will include historical and environmental impacts and mitigation, if necessary. It will also include the State of Colorado 401 certification for water quality.

Alternatives 1 through 6 all maintain a no-rise condition within the regulatory floodplain. It is potentially possible to pursue an alternative that causes a rise to the 100-year flood elevation, however that would require a Conditional Letter of Map Revision (CLOMR) from FEMA. The process to obtain a CLOMR would be expected to take 18 to 24 months and have an additional cost of $30,000 to $40,000. This process would also require consensus and approval from neighboring properties where the base flood elevation is increased.

Alternative 7 was analyzed to provide the most buildable area could be extended and the maximum rise it would cause, so that if a CLOMR was pursued, we would have an idea of what could be achieved. While being cautious not to inundate the site, the maximum width achieved is 160’ of higher ground for construction, and a 100-year flood elevation of 0.86’ higher than existing.