

Town of Grand Lake Stormwater Management Plan

May 28th, 2024

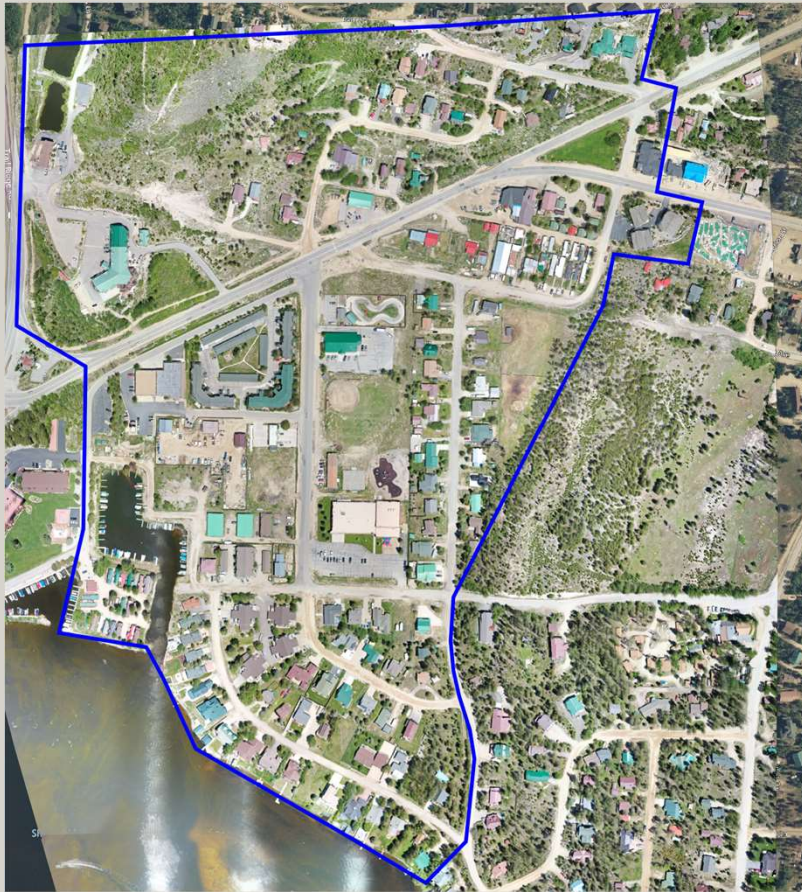


Goals & Objectives

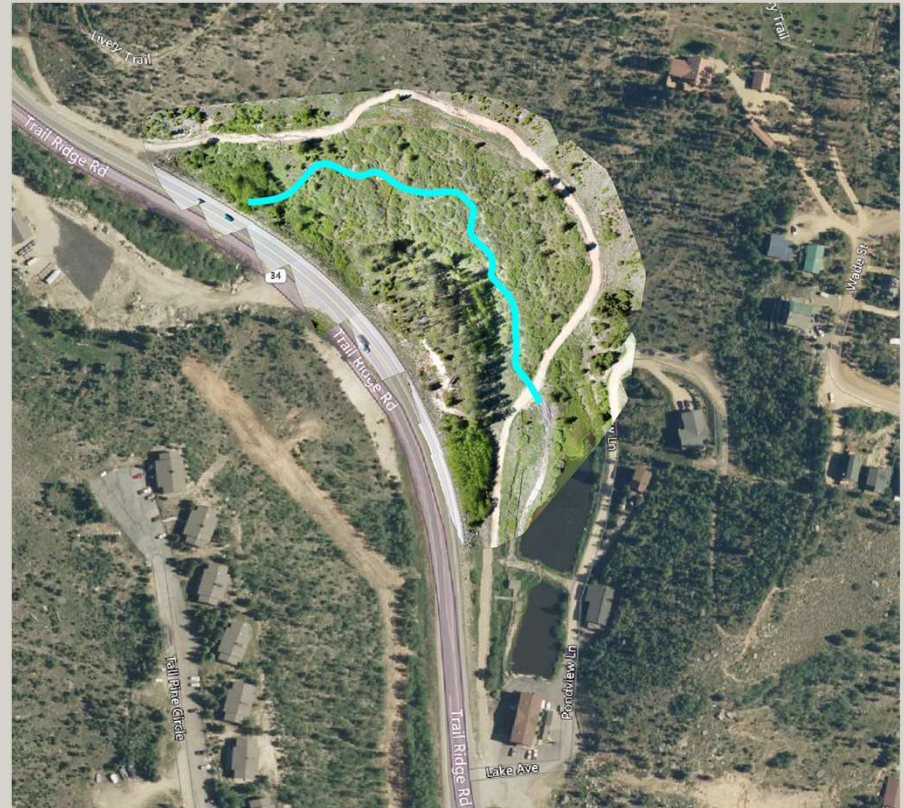
- GOAL – *“Develop cost-effective stormwater management solutions that integrate natural resource management”*
- OBJECTIVES
 - **Restore Natural Hydrologic Processes** by implementing Low Impact Development (LID) design solutions that infiltrate, store, and evaporate stormwater runoff to pre-development conditions.
 - **Preserve Natural Resources** by implementing nature-based and LID design solutions that integrate, and blend, into existing natural resources.
 - **Enhance Public Safety** by reducing the quantity of stormwater pollutants that enter Grand Lake and Shadow Mountain Reservoir through implementation of LID design solutions.
 - **Reduce Required Public Expenditures** by implementing LID design solutions that require less operations and maintenance funding than is currently being expended to manage sediment, water quality, and public safety issues.

Project Areas

Town



Little Columbine Creek



Problems

- Increased Stormwater Runoff due to Hydromodification
 - Development
 - Increased impervious areas = more runoff
 - Climate Change
 - Altered rainfall/snowfall patterns
 - Fires
 - Hydrophobic soils and reduced vegetative cover = more runoff
- Increased Sediment Loading & Pollutant Delivery
 - Development
 - Exposing erosive soils during construction increases sediment loading
 - Fires
 - Reduced vegetative cover results in more soil loss (erosion)
 - Several Pollutants Adsorb (stick to) Sediment
 - Managing sediment is critical to meeting the project goal

Work Completed

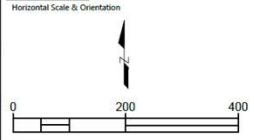
- Updated Aerial Imagery
- Watershed Assessment
 - Inventory existing stormwater infrastructure
 - Collect soil samples
 - Document existing sedimentation and flooding issues
 - Collect surface water quality data
 - Collect geomorphic assessment data (Little Columbine Creek)
- Hydrologic Modeling
 - Determine locations of flooding
 - Identify undersized stormwater infrastructure
 - Identify locations for additional stormwater infrastructure
- Preliminary Designs

Preliminary Designs

- Stormwater Quality Management Features
 - Bioretention – Two locations that provide a total of 11,000 square-feet of filtration.
 - Grass Swales – Eleven locations that provide 44,200 square-feet of filtration.
 - Porous Pavement – One Location that provides 7,000 square-feet of filtration.
 - Rock Check Swale – One location that stabilizes 370 feet of a highly erodible ditch.
- Stormwater Quantity Management Features
 - New Culverts – Nine locations to enhance cross-drainage and reduce flooding.
 - Upsized Culverts – Two locations enhance cross-drainage and reduce flooding.
 - Upside Storm System – 250 feet of storm system that conveys stormwater under Portal Road and into the western Grass Swale adjacent to Center Drive.
 - Improved Road Cross Section – 5,000 square-yards on Center Drive, Shadow Mountain Drive, and Marina Drive to reduce road flooding and direct stormwater runoff into Grass Swales for treatment.
 - Gutter Pans – 24 locations to promote stormwater conveyance in Grass Swales without obstructing flow.
- Little Columbine Creek
 - Beaver Dam Analogues – Four locations that produce a total of 10,200 square feet of filtration.

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Sub-Consultants:



- Legend
- GRASS SWALE
 - INFILTRATION BASIN
 - ROCK CHECK SWALE

Revision		By	Appd.	Y.Y.N.M.D.D	
Issued		By	Appd.	Y.Y.N.M.D.D	
File Name:		Dwn.	Chkd.	Dgn.	3/11/27

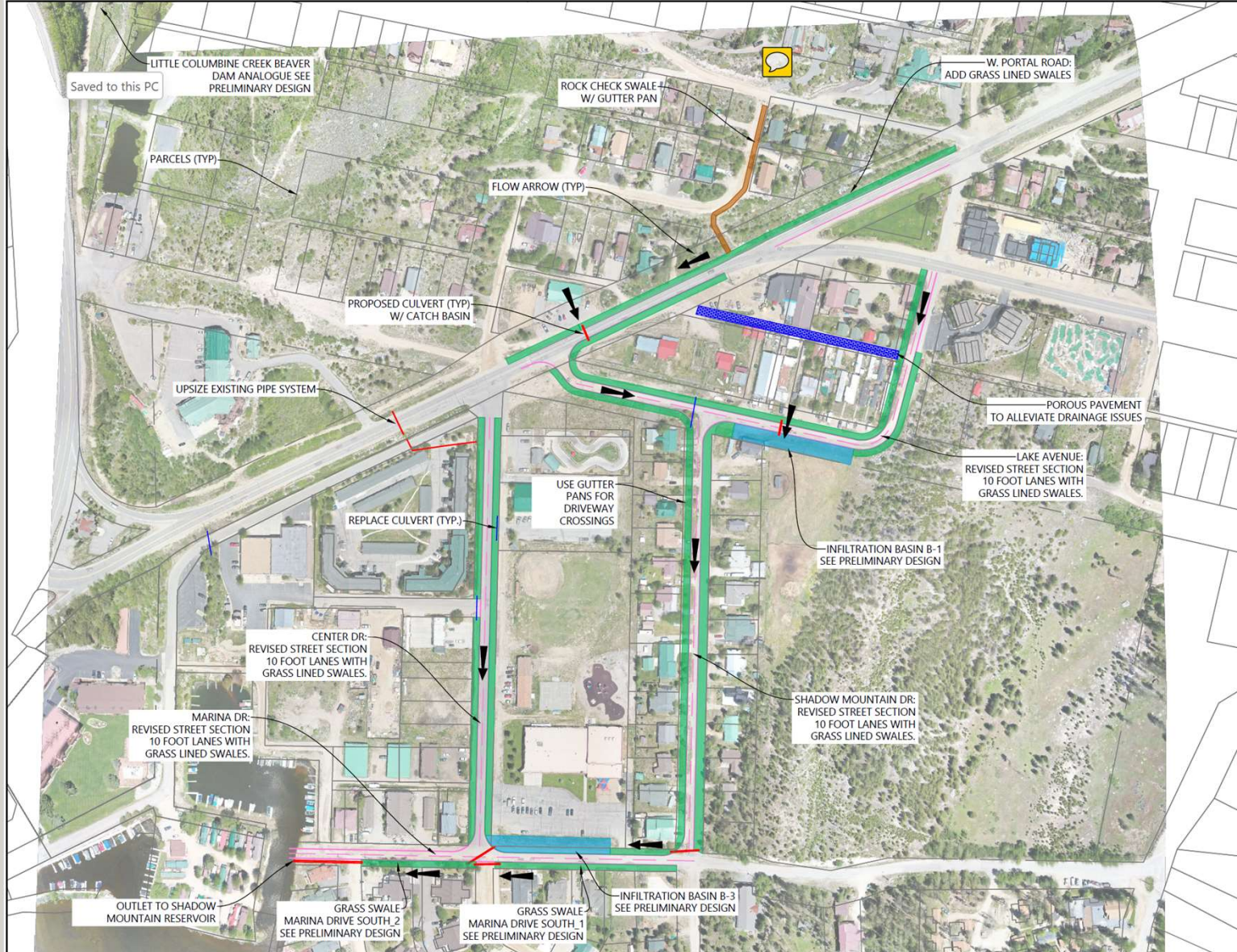


Client/Project
TOWN OF GRAND LAKE
STORMWATER MANAGEMENT PLAN

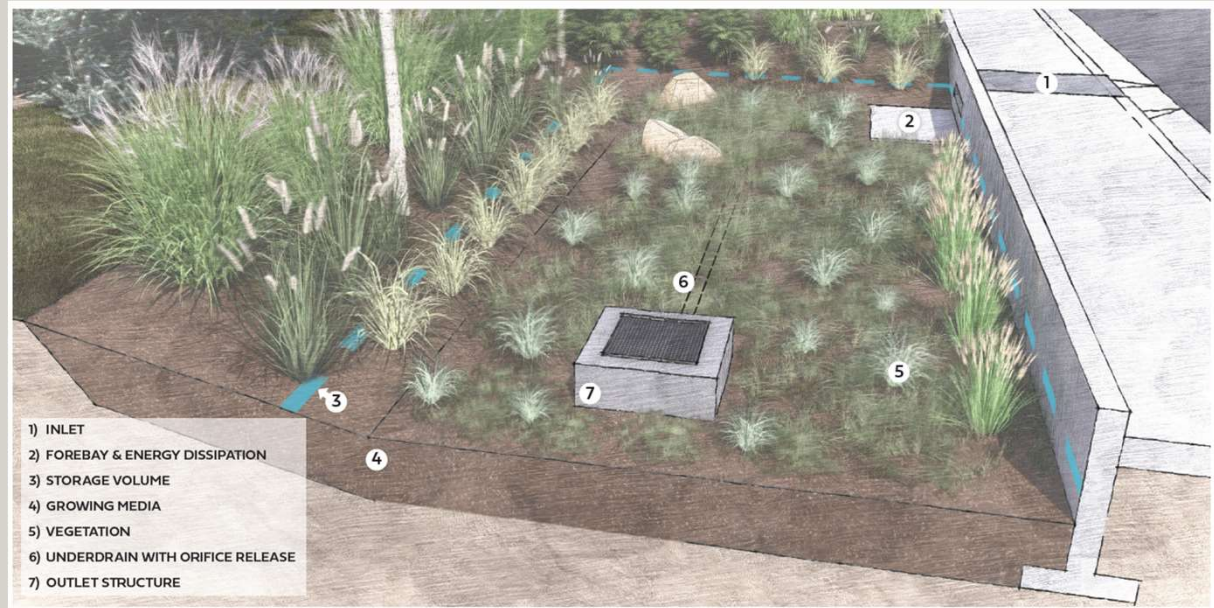
GRAND LAKE, CO

Project Milestone
PRELIMINARY

Sheet Name
CONCEPT PLAN



Bioretention



Grass Swales

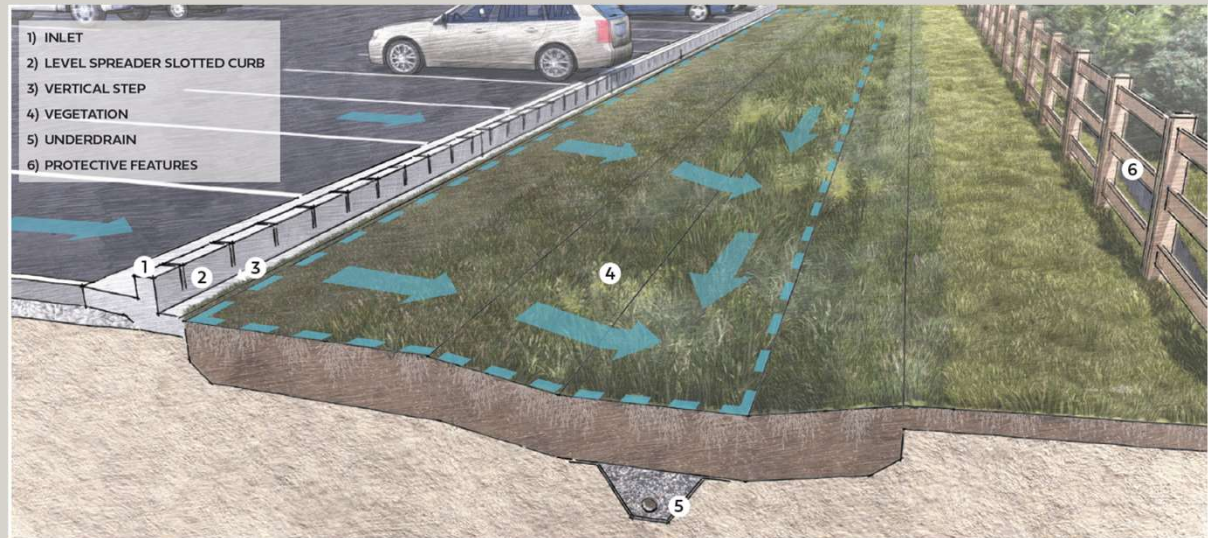
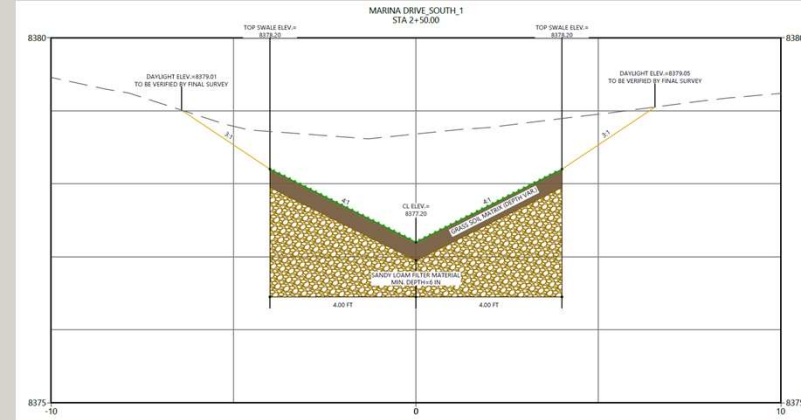


Photo Courtesy: Mile High Flood District

Porous Pavement

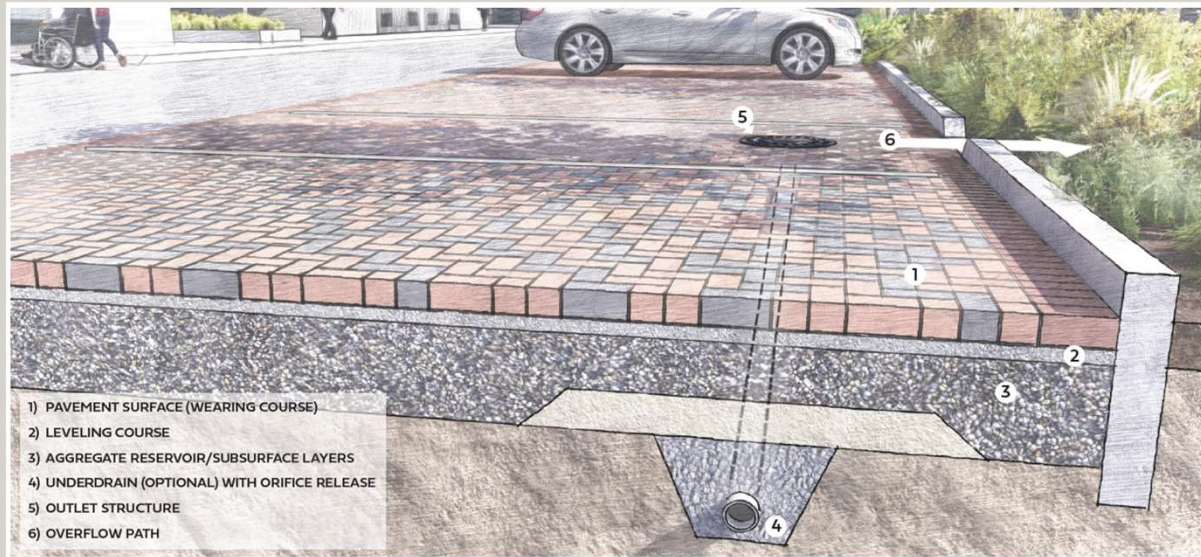
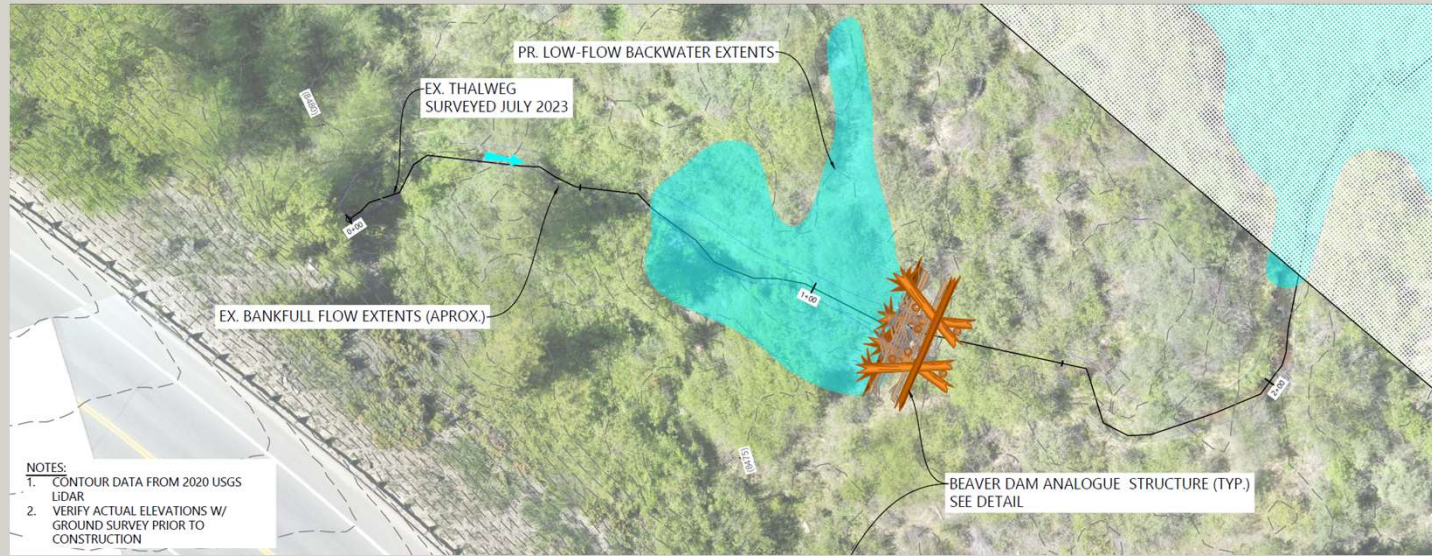


Photo Courtesy: Mile High Flood District

Beaver Dam Analogue



Pollutant Reduction by Feature

Feature	Total Nitrogen	Total Phosphorous	Total Suspended Solids
Bioretention	-21%	0%	-71%
Grass Swale	-29%	0%	-59%
Beaver Dam Analogue	-25%	-33%	-69%

