Controlling Urban Runoff to Cottonwood Creek

Final Report Phase 1 & 2

2.28.2021

Cottonwood Creek
9/2020

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Throughout this document, except for pages 14-15, all photos are taken from or of the actual sites being discussed.

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SDG would like to give special acknowledgment and thanks to the City of Wasilla for their support and contributions in both Phases of this project. We would also like to acknowledge our hardworking volunteers who helped make these project successful. And we would especially like to recognize DEC Technical Assistance for their support and guidance that exceeded all expectations.
SDG would also like to thank the MatSu Borough and AKDOT & PF for their support and contributions.

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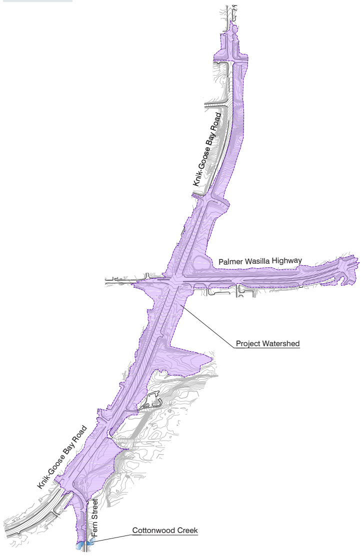
Project Introduction



The Fern Street watershed is extensive, collecting stormwater from both Knik Goose Bay Road and the Palmer-Wasilla Highway.

Fern Street is a 2-phase project that addressed an ACWA Restoration priority. These projects used the ***Cottonwood Creek Stormwater Analysis (2017)*** report by the MatSu Borough to select a recommended site for remediation. Here, using low impact development (LID) and green infrastructure (GI) to replace traditional piping, stormwater is captured and treated prior to entering Cottonwood Creek. With Cottonwood Creek defined as an impaired waterbody, both Fern Street phases designed and constructed demonstration projects at the selected sites. This location is easily accessible and visible year round, exhibiting the project benefits to treating runoff. In addition, LID and GI information was created for use by industry professionals and the general public. Information includes how to implement these techniques and why they are beneficial.

The overall intent of these projects was to improve the water quality in Cottonwood Creek. Water sampling identified high fecal coliform bacteria, along with other stormwater carried pollutants. During periods of active stormwater runoff, Cottonwood Creek waters showed an increase in the amounts of coliform bacteria and pollutants within the water column. This Fern Street site intercepted polluted stormwater from an extensive watershed that includes both Knik Goose Bay Road and the Palmer-Wasilla Highway. Treating runoff prior to it directly entering Cottonwood Creek has a significant effect on water quality.

Prior to the remediation, especially during spring break up, a large sediment plume created by stormwater runoff was visible near the Fern Street bridge. Runoff drained directly into Cottonwood Creek carrying pollutants and large amounts of suspended solids with it. Installing LID and GI techniques to collect and slow down runoff allowed stormwater to be treated prior to reaching Cottonwood Creek. These projects included collection and erosion control-slowing down water movement, infiltration-allowing stormwater to soak into soils, filtration-removal of suspended solids and pollutants, and phytoremediation-removal of pollutants by plant uptake.

Low Impact Development (LID) and Green Infrastructure (GI) are at work in these projects, helping to improve water quality and controlling storm flows.

The Importance of Implementing Low Impact Development (LID) and Green Infrastructure (GI)

Effective control of runoff involves reducing the velocity and flow of stormwater, as well as reducing pollutant discharges. A variety of stormwater management practices and systems may be used to reduce these effects. Some of these techniques, called best management practices (BMPs), focus on water quantity control, while others focus on improving water quality, and some perform both functions. Low impact development (LID) or green infrastructure (GI) techniques include runoff mitigation systems comprised of infiltration basins, bioretention systems, constructed wetlands, retention basins and similar devices.*

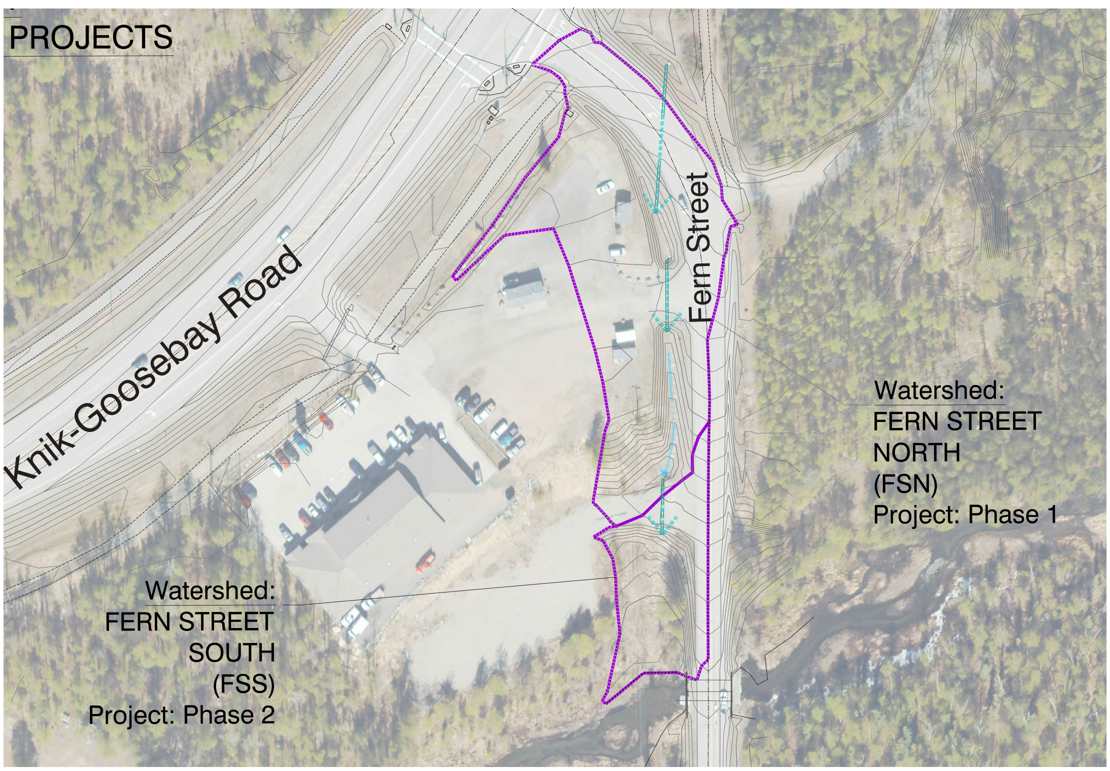
**EPA Addressing Green Infrastructure*

Project Location

Site Drainage

To fully understand the stormwater runoff and drainage effecting Cottonwood Creek, mapping the extent of the watershed draining through the site was important. This task provided an understanding of the potential pollutants contained in the runoff based on the land use within the watershed. Because this watershed is extensive, pollutants and bacteria may change or increase as road upgrades and land development occur.

Using available data, the current Fern Street watershed is estimated to be over 43 acres, covering 1,862,680 square feet of surface area, and extends almost 6000 feet up Knik Goose Bay Road and almost 2000 feet up the Palmer-Wasilla Highway. Approximately 35 acres along Knik Goose Bay Road drain through the Fern Street site.



As noted in the ***Cottonwood Creek Stormwater Analysis (2017)*** report, "Cottonwood Creek is a valuable community asset as an anadromous waterbody, supporting diverse fish and wildlife, as well as a visible resource." Identified as an impaired waterbody for fecal coliform bacterial pollution by the Alaska Department of Environmental Conservation (DEC) in 2010, road upgrades and land development continue to magnify stormwater runoff and drainage affecting Cottonwood Creek.

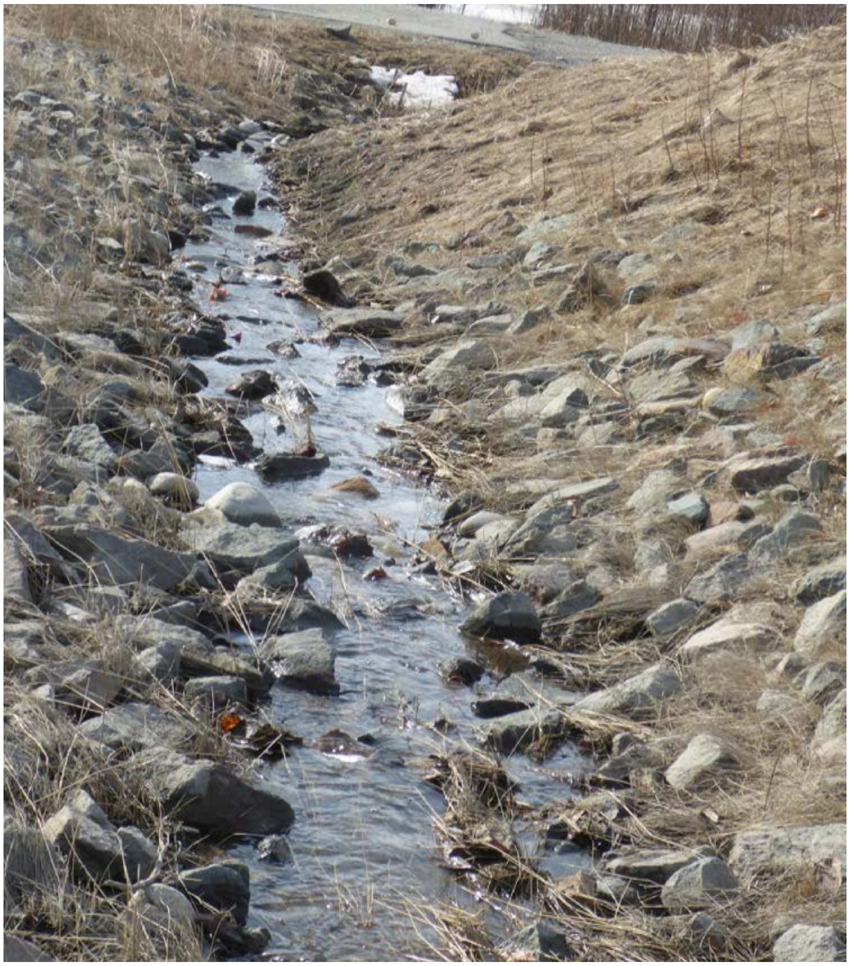
Cottonwood Creek Stormwater Analysis

Deficiency ID 13: Fern Street outfall and ditches along Palmer-Wasilla Highway and Knik Goose Bay Road

Stormwater runoff was identified by DEC as a “likely conveyance for a portion of the bacteria entering Cottonwood Creek.” ***Cottonwood Creek Stormwater Analysis (2017)*** identified and prioritized 13 functionally deficient stormwater runoff projects. Remediation focused on cost-effective mitigation of pollution originating from public and private sources, especially where projects could be located on public lands. With much of the stormwater runoff conveyed in roadside ditches, Sustainable Design Group LLC (SDG) reviewed the 13 listed projects for highest risk evaluating nearby development and proposed road upgrades. From that subgroup, the Fern Street project was chosen based on stakeholder interest, greatest impact to water quality improvement, site access, project cost(s), and land ownership.

2018: Water collection in spring runoff adjacent to Fern Street contains sediment and pollutants from Knik Goose Bay Road, Palmer-Wasilla Highway, and Fern Street. The sediment and pollutants smothered native vegetation and created a sediment plume within Cottonwood Creek.

Phase 1: Pre-Treatment Conditions



Spring 2019:
Phase 1 Fern Street Drainage

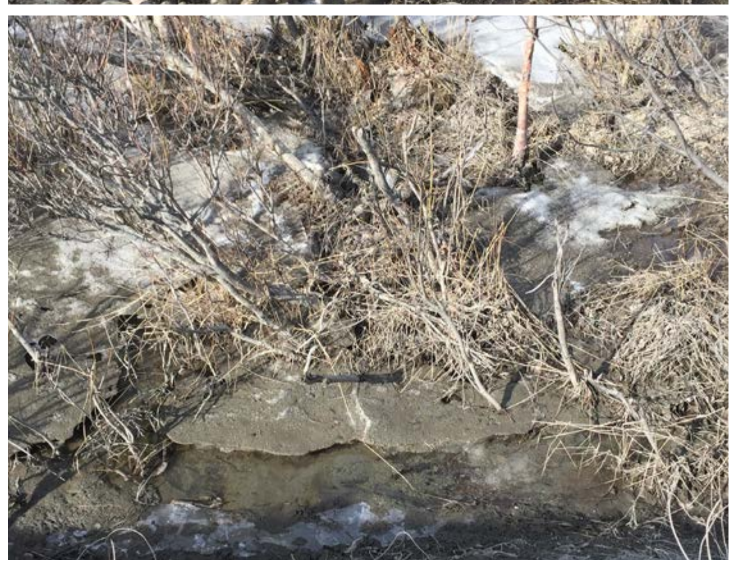
Based on site reconnaissance, drainage through the Fern Street site contains sediment and pollutants* collected from Knik Goose Bay Road (KGB) by the ATV track rather than the rock lined ditch. Sediment load of sand and salt is intensified from Fern Street, KGB, the Palmer-Wasilla Highway, and side streets adjoining the major collectors. Fern Street roadside ditches contain decaying organic matter, predominately composed of invasive plants. Trash and weed seeds are trapped by rock-lined ditches that provide minimal filtration of sediment and pollutants and few collection areas.

**Pollutants may include oil and petroleum hydrocarbons, heavy metals such as zinc, copper, and lead, nitrogen and phosphorus from pesticides and herbicides, along with coliform and bacteria.*

Phase 2: Pre-Treatment Conditions

Spring 2019:
Phase 2 Fern Street Drainage

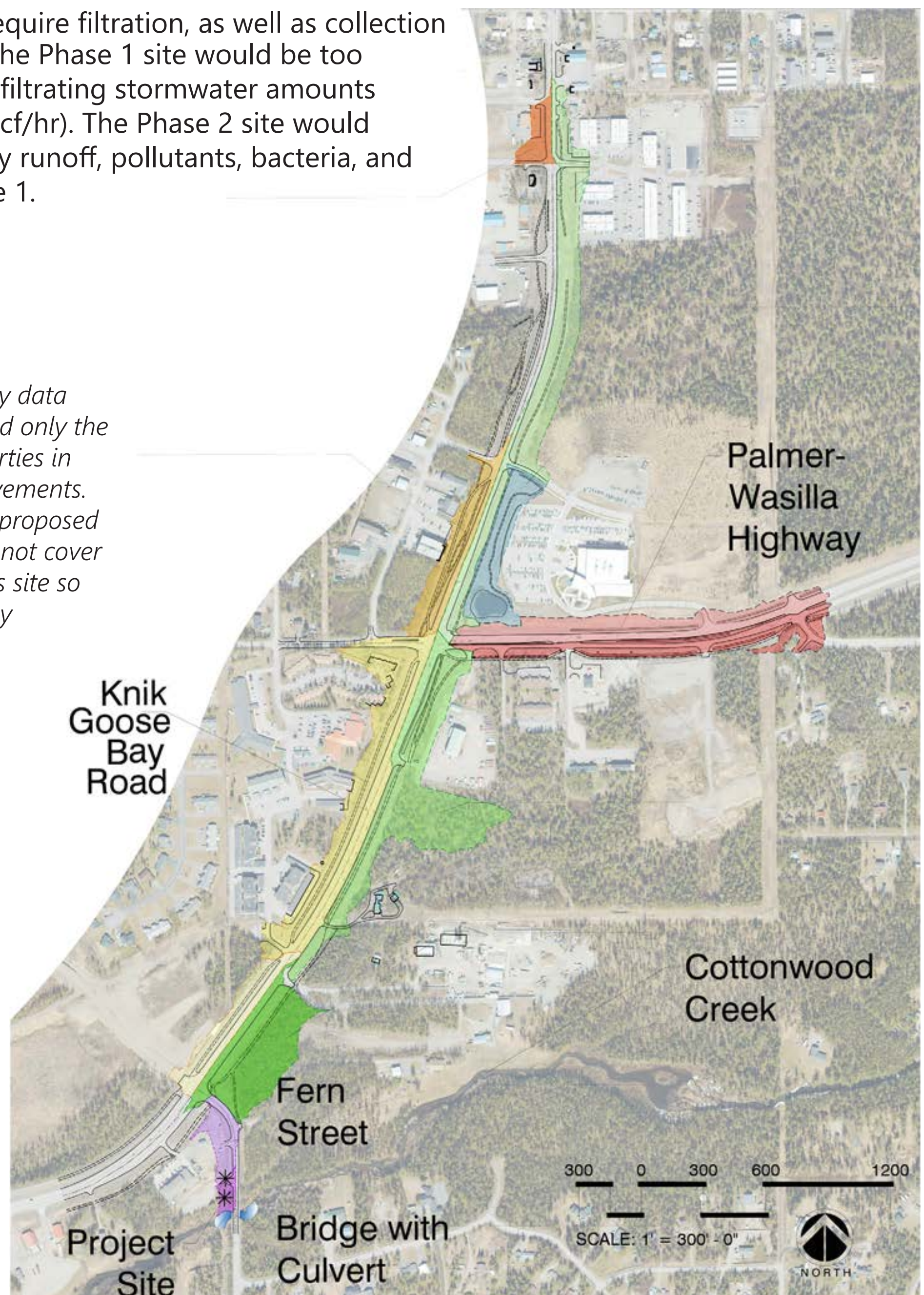
On the Phase 2 site, high volumes of stormwater flood native vegetation adjacent to Fern Street and Cottonwood Creek. This concentrated stormwater runoff contains large amounts of silt, gravel, sand, and pollutants. Water velocity flattens existing vegetation diminishing any filtration qualities it may have provided. The drainage area widens after leaving the driveway culvert, slowing runoff and allowing silt, gravel, sand, and pollutants to settle out. Debris and trash are deposited as the flow channel winds around a semi-buried silt fence. The runoff enters Cottonwood Creek as a drainage plume extending over the remaining creek ice to empty directly into open waters.



Project Watershed (approximate)*

Cottonwood Creek Watershed

Both Phase 1 and 2 of this project are located within the Cottonwood Creek Watershed, a locally important yet at-risk salmon habitat. Drainage from Knik Goose Bay Road (KGB) and Palmer-Wasilla Highway flows directly through these sites, and, then untreated, into Cottonwood Creek. The runoff is a significant stormwater contribution to the Cottonwood Creek watershed although it directly transports sediment and contaminates collected from the roadways. To reduce and treat this runoff entering Cottonwood Creek, remediation designs used AKDOT&PF survey data* to determine the approximate watershed draining through this site. During assessment, a series of sub-watershed volumes were calculated. The overall amount of stormwater runoff indicated remediation designs would require filtration, as well as collection and infiltration. Calculations indicated the Phase 1 site would be too small to accommodate retaining and infiltrating stormwater amounts entering the site (estimated at 435,000 cf/hr). The Phase 2 site would continue to be significantly impacted by runoff, pollutants, bacteria, and suspended solids not captured in Phase 1.



Watershed information was limited by survey data provided by AKDOT&PF. The data set included only the road rights-of-way with some adjacent properties in preparation for the planned KGB road improvements. Data did not provide any information on the proposed KGB design. The limits of the survey data did not cover the full extent of the watershed impacting this site so watershed surface areas and volumes are only calculated within the survey area provided.

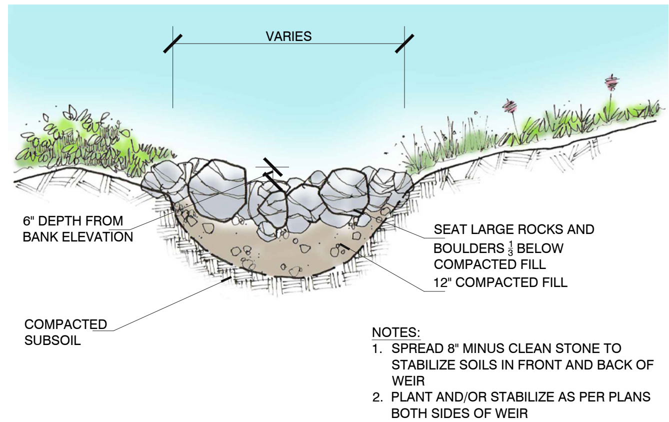
To address missing data in some locations, interpretation was applied between distant data points. Other parts of the watershed were truncated due to the locations of the included points. For these reasons, only minimal evaluation of the current amount of water entering the site was determined with the understanding that the watershed is larger than these plans show. Following KGB upgrades, the amount of impervious KGB roadway surface may essentially double. For this reason, the remediation designs respond to increased filtration needs. Maximum infiltration and holding capacity areas are provided for both Phase 1 and 2 sites.

Planned Mitigation and Remediation

Constructed Features (planned)

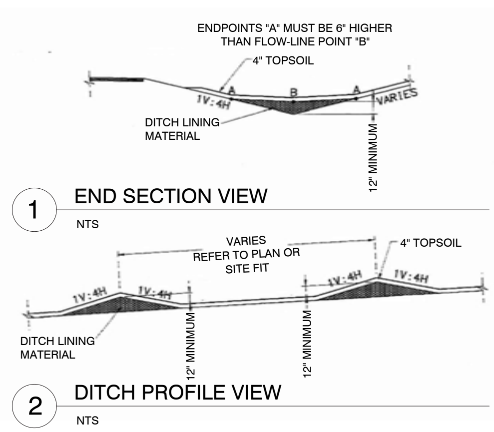
Natural Drainage Systems (NDS) are a combination of LID and GI stormwater management features. Small check dams, controlled spillways, collection pools, infiltration cells, and vegetated swales receive roadway stormwater and snowmelt runoff. Plantings filter sediment and contaminants, allowing for siltation and infiltration while stabilizing erosion.

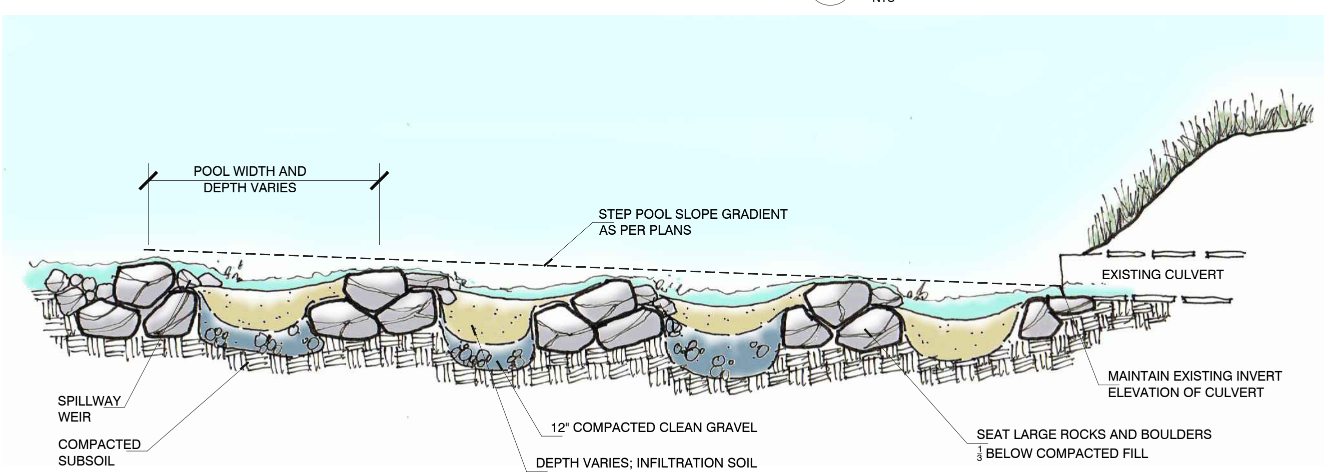
Implementing a Natural Drainage System to improve water quality entering Cottonwood Creek's salmon habitat is key to managing stormwater runoff. This system will reduce peak flows, mitigating the current drainage directly entering the creek. In addition, the NDS will enhance upland habitat and reduce maintenance costs associated with stormwater systems while improving local landscape aesthetics.



8 SPILLWAY WEIR
NTS

Ditch Check Structures Details





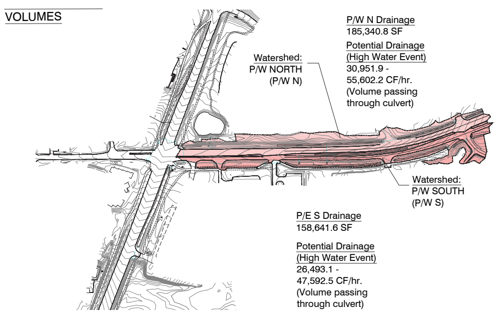
NOTES:
1. SPREAD 8" MINUS CLEAN STONE TO STABILIZE SOILS IN FRONT AND BACK OF WEIR
2. PLANT AND/OR STABILIZE AS PER PLANS

7 INFILTRATION STEP POOLS
NTS

Site Specific Design

Constructed Features

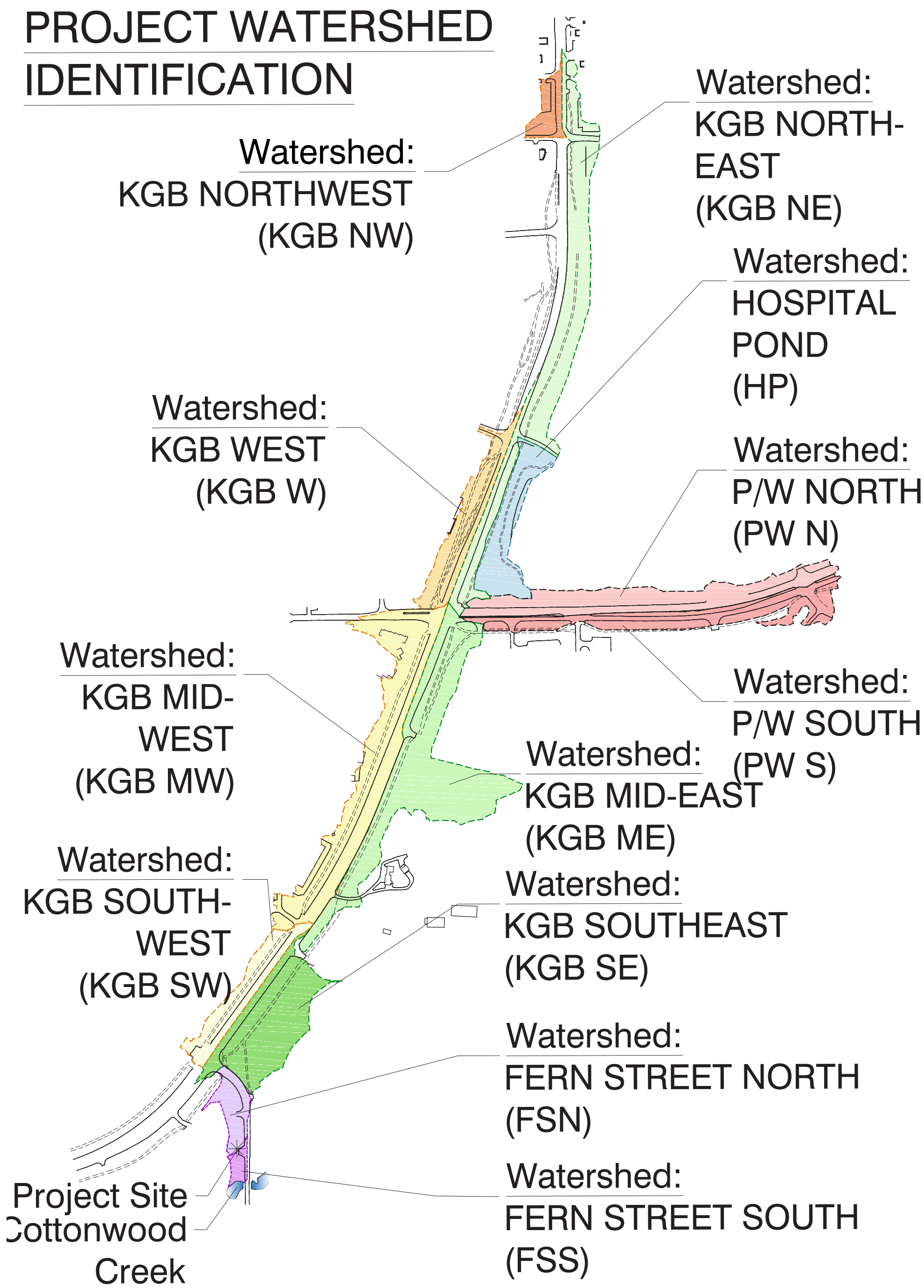
Using information ***Cottonwood Creek Stormwater Analysis (2017),*** SDG analyzed design options based on understanding the existing site conditions. Budget constraints dictated retaining channel alignment, connecting to existing culverts, and balancing site cut and fill. Because the Fern Street site discharges turbid water directly into Cottonwood Creek, surface flow entry points were identified and confirmed using mapping and existing data. The concepts developed for both Phase 1 and 2 followed these directives.



Along with the knowledge gained from site visits, assessments for future Fern Street drainage included increased runoff from Palmer-Wasilla Highway and Knik Goose Bay Road, based on anticipated road upgrades. Expected stormwater volumes were estimated using watershed mapping combined with precipitation and land cover data included in the ***Cottonwood Creek Stormwater Analysis (2017)***.

Remediation for Phases 1 and 2 was designed to manage the extensive amount of water passing through this site. Both sites offer demonstration projects with public access, observation, and education. Each phase was designed to improve water quality in Cottonwood Creek through stormwater management. LID and GI techniques included collection, treatment, and slowing runoff velocity. Implemented techniques were evaluated by project feasibility, access, and budget.

**Watershed areas were determined using AKDOT&PF provided data prior to upgrades to KGB or other roadways. See Appendix A for Phase 1 plans.*



Phase I: Pre-Development

Fern Street Existing Conditions and Issues

Prior to remediation, Fern Street ditches conveyed stormwater directly to low areas, stagnant pools, or directly into Cottonwood Creek. Multiple culverts and roadside ditches collect water from Knik Goose Bay Road. The Knik Goose Bay Road intersection with the Palmer-Wasilla Highway sees a convergence of stormwater from both road systems. Prior to entering the Fern Street ditches, few collection, water holding, or infiltration areas exist including the Hospital Pond Watershed that appears to collect runoff from the hospital site.

High volumes of runoff during spring breakup and from summer storms erode soils above the rock-lined ditches. Yet, as the runoff amounts are recede, silt, debris, and pollutants are deposited along the Fern Street ditches. In some locations, invasive weeds have taken root in the depositional materials, spreading to surrounding areas.

Trash and debris collect in rock-lined ditches as runoff slows. Siltation creates an ideal growing medium for invasive weeds that, without maintenance, choke off water channels forcing runoff waters outside of ditches where erosion, flooding, and glaciation can occur.

Stagnant water collecting in pond areas contains a high level of pollutants. Open stagnant water encourages mosquito breeding conditions.

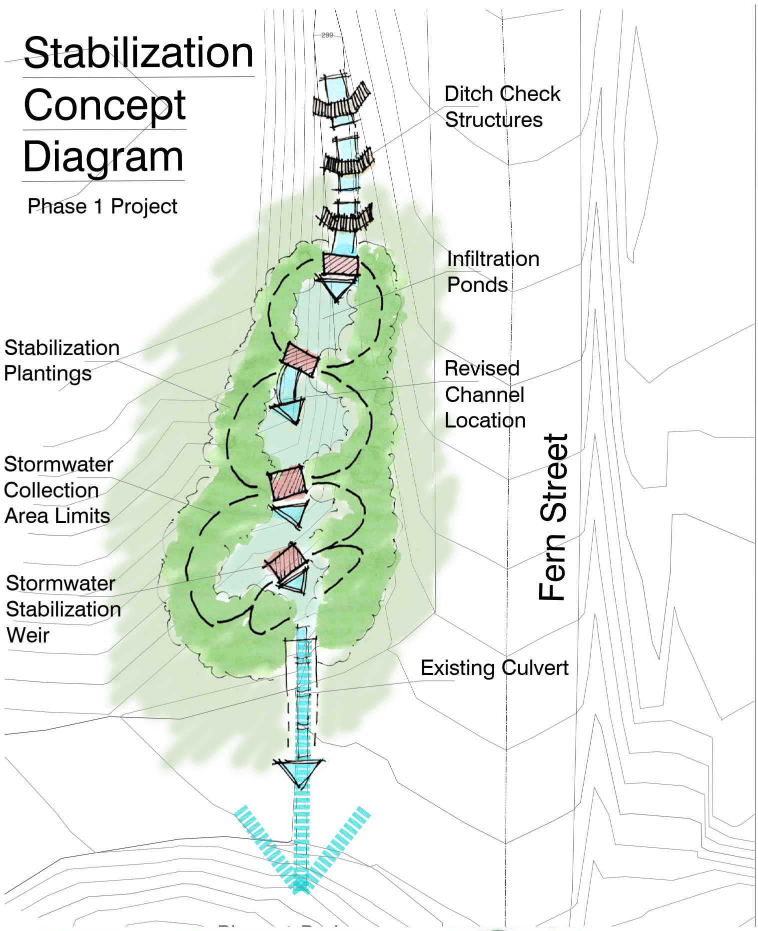
Phase 1: Concept and Stabilization Design

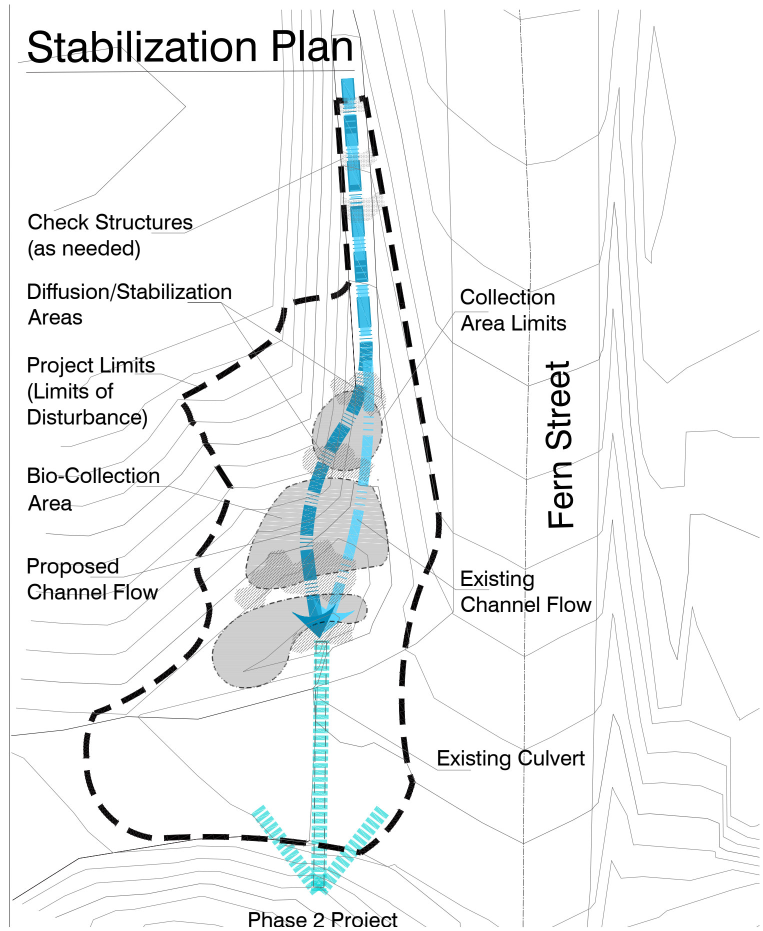
Fern Street Drainage

Implementing a Natural Drainage System (NDS) at Fern Street began with Phase I. The NDS will improve water quality entering Cottonwood Creek's salmon habitat while managing watershed runoff. The system reduces peak flows that drain into the creek and enhances upland habitat. Installing the NDS will reduce maintenance costs and improve local landscape aesthetics.

The Phase 1 NDS design consisted of water holding and infiltration areas coupled with energy-dissipating features. Working in unison, these techniques intended to stabilize and filter stormwater runoff. Plantings were predominately composed of native shrubs, ground covers, grasses and perennials. These elements served to enhance and unify the natural landscape while improving water quality at the same time. Plants in Phase 1 stabilize soils and filter sediment and contaminants. Biocells, check structures, infiltration ponds, and weirs provide improved natural drainage functions that help remove pollutants, suspended materials, and bacteria. Trees and large shrubs in conflict with overhead utilities were removed or relocated outside of the utility zones.

The Phase 1 concept design included a large bio-infiltration cell located north of the access driveway culvert. A series of spillways will diffuse energy during high water events and large volume spring runoff. In addition, each spillway is preceded by a vegetated filtration strip and followed by an infiltration pond. To maximize holding capacity in the infiltration ponds, the depth was increased. Small changes in the channel realigned water movement the culvert opening and allowed for additional treatment areas.





Phase 1: Construction

Final Design Documents and Fern Street Installation

Final drawings and construction details prepared for installation were reviewed with the City of Wasilla and DEC, and suggested improvements or revisions were incorporated. The final drawings included the watershed documentation, calculations, and revised design drawings. Following installation, an estimated 4,760 cubic feet of runoff is prevented from reaching and contaminating Cottonwood Creek.

Volunteers assisted with harvesting native plants from the site. These plants were replanted as part of Phase 1 remediation.

Trees were removed from under the utility lines. Riprap and stones were collected by volunteers and as part of excavation for reuse during construction of bio-infiltration cells and protecting channels from erosion.

Phase 1: Construction

During construction, each bio-infiltration cell was created by lining the area with geotextile fabric covered with a base layer of 8" minus stone and riprap to created large, water-holding voids. The base was then covered by additional geotextile fabric with a layer of infiltration soil (equal mix of native soils high in organic matter and sand) placed over the fabric. Stabilization vegetation, including the harvested plants, was installed in the infiltration soils. Exposed stone weirs help to dissipate runoff flows; stabilized vegetation now holds soils and filters contaminants; infiltration soils collect runoff allowing it to soak in; native vegetation is used as phytoremediation, removing pollutants from the stormwater entering the site.

Stabilization used harvested riprap, geotextile, and infiltration soils to create bio-infiltration cells, spillways, and filtration strips as part of the Natural Drainage System construction. Harvested site plants were reestablished along with native plantings that would tolerate flooding and deposition. Depth of bio-infiltration cells was increased to maximize water infiltration. Spillways with exposed rock and native shrubs will slow runoff. Removal of trees from under utility lines will decrease maintenance requirements.

Phase 1: Construction

During construction, SDG coordinated the site remediation and worked with local partners to coordinate construction tasks. Planning assured that required permit were in place and organized pre-construction tasks. Project labor, equipment, materials, and deliveries were organized within a tight schedule to meet deadlines and take advantage of good weather. Post-installation site observation, maintenance, and waterings were undertaken to assure project success.

Phase 1: (6/2019) Native grasses and wildflowers are established.

Phase 1: (6/2020) Healthy plant growth is visible with no ponding or erosion.

Phase 1 and 2: Site Evaluations

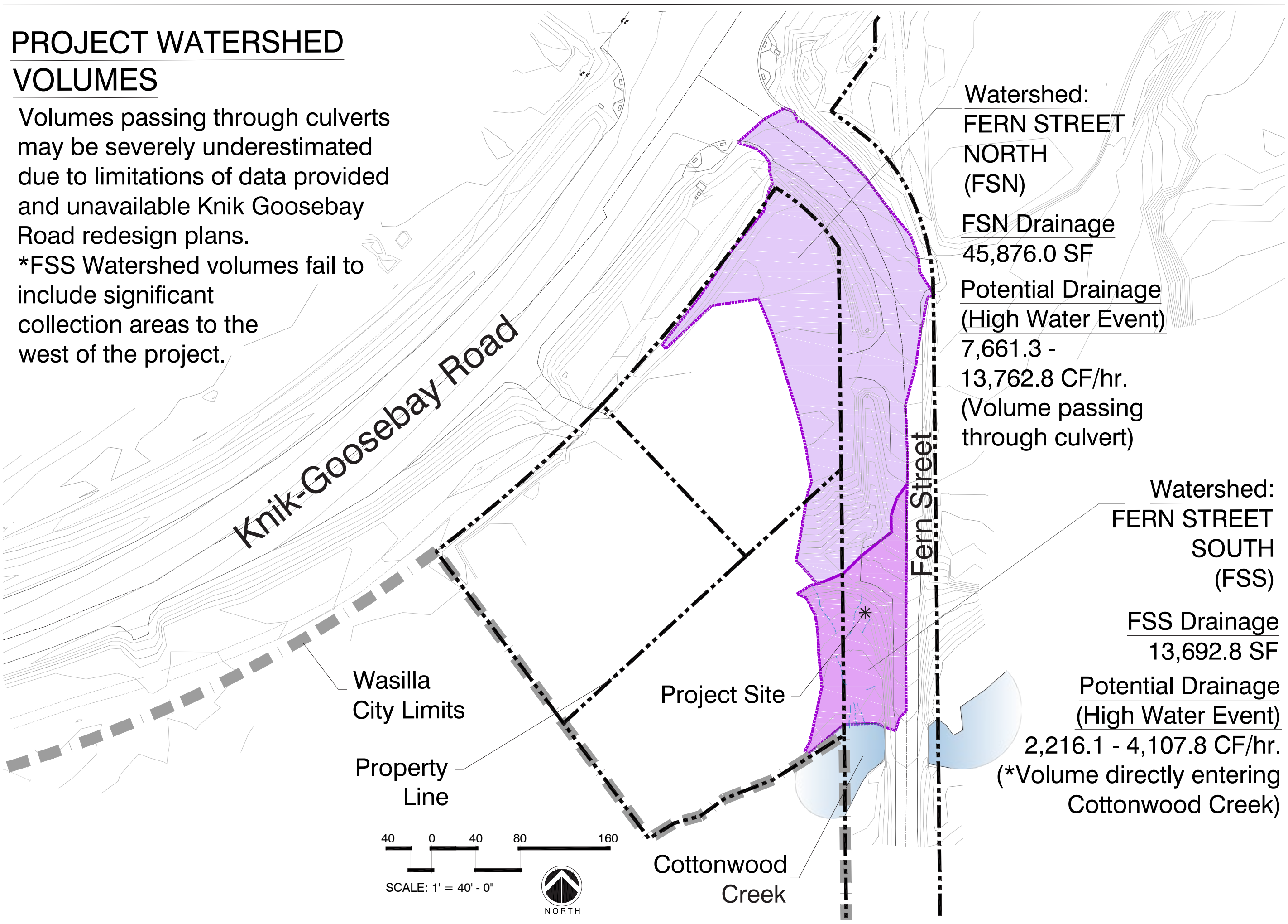
Phase I and 2 Coordination

In spring 2019, assessments of both Phase 1 and 2 sites identified project success and issues. Specifics associated with Phase 1 construction along with Phase 2 site issues were documented in a report prepared for DEC.

Observations of runoff on the Phase 2 site showed a significant reduction in the amount of silt being transported to Cottonwood Creek following the construction of the Phase 1 NDS. Ponding at the culvert entry in Phase 1 showed contaminants remaining within the water column. Runoff volumes on the Phase 2 site appeared to be less than in previous years although flooding from poor quality stormwater was evident. Concentrated flows exiting the driveway culvert continued to push stone, silt, and ice towards Cottonwood Creek. The NDS for Phase 2 would need to address excess runoff that could not be contained on site. In an effort to treat additional stormwater associated with the planned upgrades to Knik Goose Bay Road, the design will need to cope with runoff passing through this site.

PROJECT WATERSHED VOLUMES

Volumes passing through culverts may be severely underestimated due to limitations of data provided and unavailable Knik Goosebay Road redesign plans.
*FSS Watershed volumes fail to include significant collection areas to the west of the project.

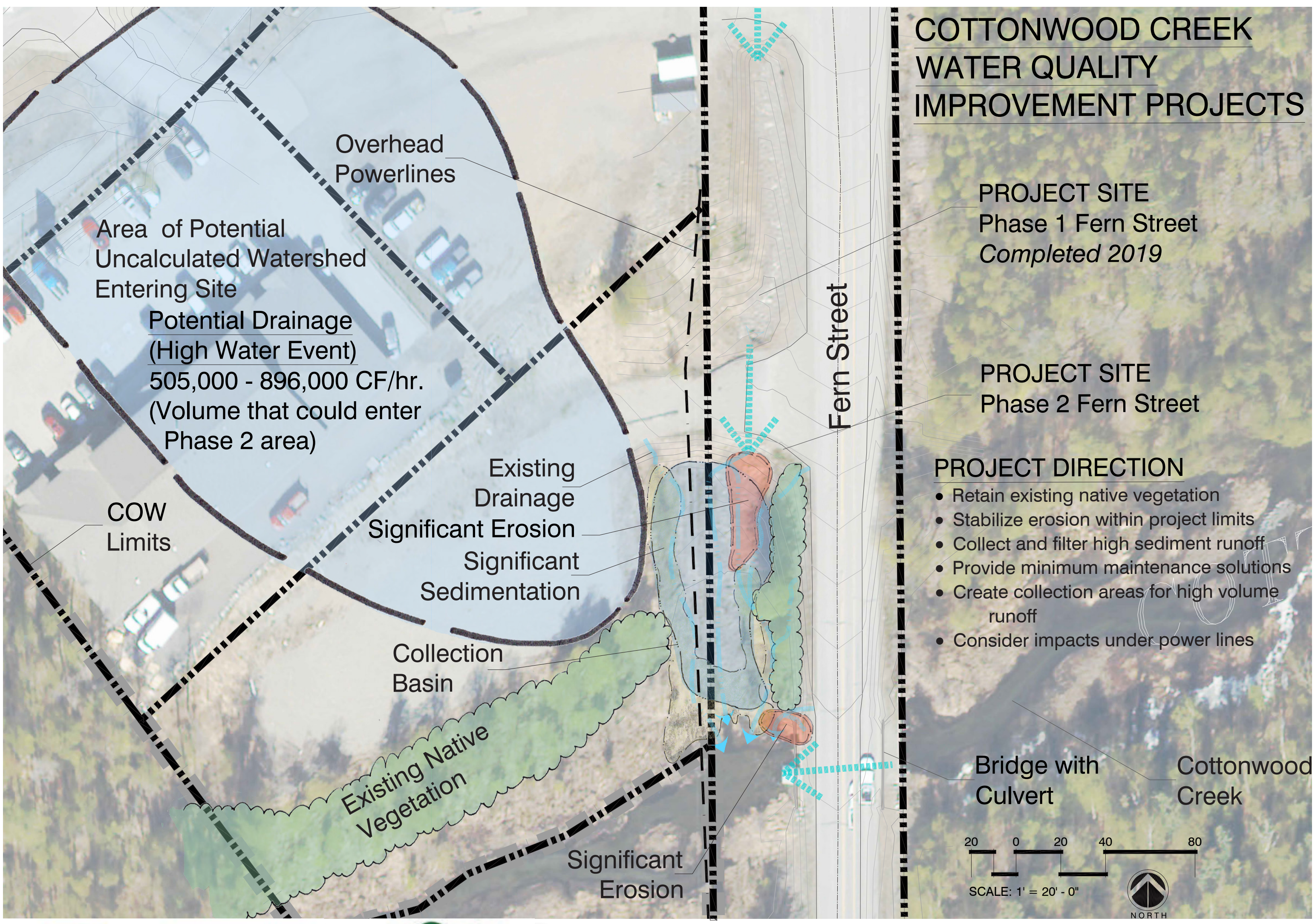


Phase 2: Site Analysis

Phase 2 Assessment

From site reconnaissance, it was noted that substantial drainage entering the Phase 2 site was outside the AKDOT&PF survey data limits and not calculated in previous calculations. Runoff from adjacent developed sites between Knik Goose Bay Road and Fern Street was estimated and added to overflow volumes passing through Phase 1. This runoff entering Phase 2's bowl-shaped land created a ring of sedimentation around the existing channel. In addition, large amounts of sand are washed into the site during runoff and snowmelt events. The bridge at Cottonwood Creek is devoid of vegetation and curbs, forcing water to enter the Phase 2 site at the north end of the bridge.

Existing vegetation along Fern Street and the banks of Cottonwood Creek stabilized soils while providing minimal filtration and stormwater treatment. Oversized vegetation is growing directly under the overhead utility lines where it creates a need for ongoing maintenance. Along with the concentrated, poor-quality stormwater exiting the driveway culvert, two locations of significant erosion were identified. As a directive for the NDS, stabilizing and filtering vegetation will be retained with minimal disturbance; vegetation in conflict with utilities will be relocated or removed; areas of erosion will be remediated.



Phase 2: Updated Mitigation and Remediation

Assessment of Phase 1 Performance and Phase 2 Options

The 2020 inventory of current conditions was documented through photographs during times of active runoff. Site impacts from the runoff as noted in the report prepared for DEC were assessed for potential LID and GI techniques that would be cost effective and tolerate additional runoff in future years.

In spring of 2020, runoff entering Phase 1 treatment areas contain high amounts of pollutants such as heavy metals, hydrocarbons, bacteria, and silt. Weirs and other stabilization used to slow runoff are visible in the channel.

In spring of 2020, stormwater entering Phase 2 remains significant yet appears much clearer after exiting the existing culvert. For the Phase 2 site, the concentrated runoff is highly prone to causing erosion as it moves through the site and exits into Cottonwood Creek.

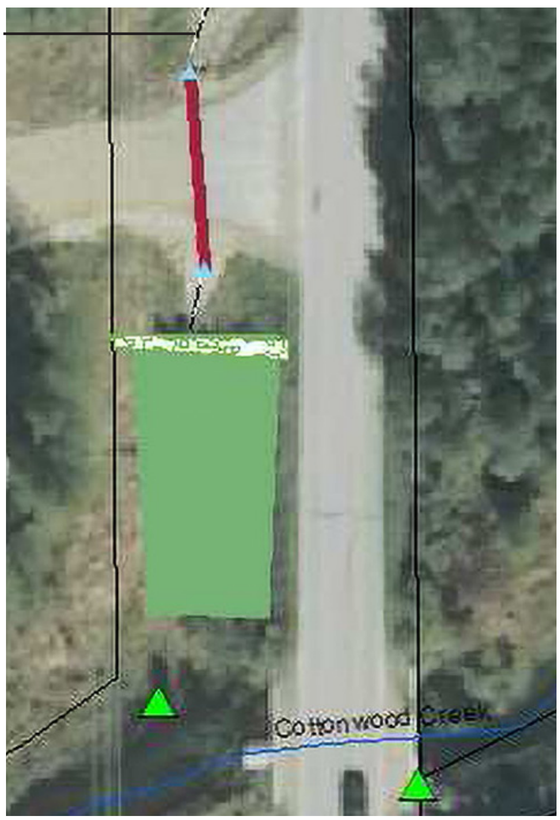
Assessment options for Phase 2 remediation focused on erosion, removal of contaminants, and filtration. The design approach would undertake removal of pollutants not captured in Phase 1, erosion and siltation occurring in Phase 2, and reducing turbidity and high water volumes entering Cottonwood Creek.

Phase 2: Pre-Development

Existing Conditions

Along with the design directives for Phase 2, existing vegetation was identified for invasive species, potential vegetation harvesting, and to determine soil conditions. Soils with high amounts of organic matter retain water; those with significant gravels and sands will allow infiltration. Native soils contained both gravels and organic matter which allowed costs to remain relatively low for importing topsoil.

A NDS was created that addressed recommendations from the ***Cottonwood Creek Stormwater Analysis (2017)*** report to design a "flow spreader" that would reduce turbidity and reduce channelization.[1] In addition, this report defines the flow spreader concept as "vegetated swales, bioretention facilities, and flow spreaders ... designed to handle the flow directed towards them, and these flows will vary with the size and imperviousness of the area contributing drainage to them. Therefore, site specific design is required."



Phase 2 is a natural bowl shape, collecting water from all sides that exits into Cottonwood Creek, to the south. Recommendations from **Cottonwood Creek Stormwater Analysis (2017)** *recognized the importance of using the Phase 2 site for stormwater treatment. "Flow Spreader" concepts from this report show construction in the Phase 2 site.*

NOTE: All photographs on this page are taken from the ***Cottonwood Creek Stormwater Analysis (2017)*** *report.*

[1] *5.2.5.1 Provide Flow Spreader*
A flow spreading device could be installed to spread out the concentrated flow and reduce channelization. As evident in the spring breakup photos, the runoff flows under the snow pack,indicating that the flow spreading device may function in spring, as well, as long as the flow spreading trench was not completely frozen. A conceptual rendering is shown in Figure 8 and the layout of a conceptual flow spreader is shown in Figure 15. Alternatively an OGS device in the piped system under Knik-Goose Bay Road could be considered to reduce the total sediment load, but sediment could still be picked up along the ditch system downstream of the OGS and reach Cottonwood Creek.

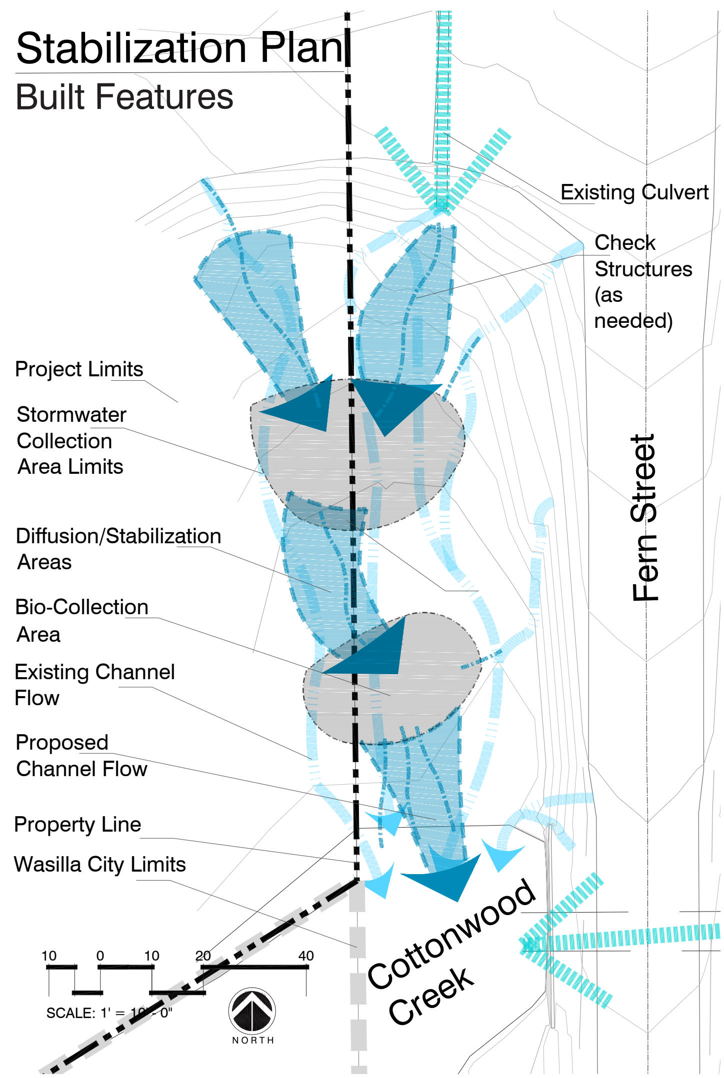
Phase 2: Concept and Stabilization Design

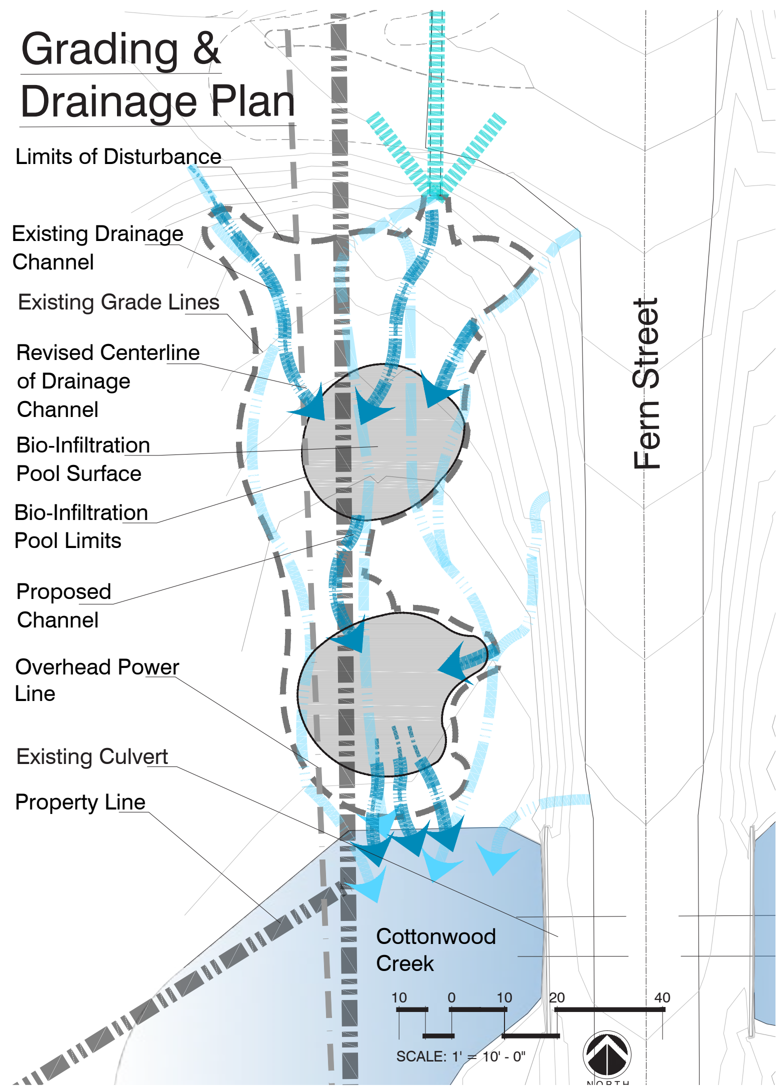
Stabilization Design

The Phase 2 Natural Drainage System (NDS) at Fern Street was designed to work in conjunction with Phase I. This site's NDS goal was also to improve water quality entering Cottonwood Creek by managing current and future watershed runoff. To reduce peak flows and enhancing the upland habitat, the NDS design in Phase 2 provided an opportunity to reduce maintenance costs and improve local landscape aesthetics.

Because the Phase 2 design was more complex, coordinating energy absorbing features with water holding areas was required. This would responded to the ***Cottonwood Creek Stormwater Analysis (2017)*** report recommendations to reduce turbidity and channelization through design of a "flow spreader." Energy would be dissipated by rock-lined channels, exposed rock weirs, and a rock-lined spillway weir. In addition, vegetated filter strips and stabilization plantings composed of woody native materials would provide filtering, tolerate high water, and survive deposition. Together, the plantings would removing pollutants using phytoremediation.

Using existing drainage patterns, the concept design included maximum capacity bioinfiltration cells. From the southern infiltration pool, the wide spillway spreads outflows, dissipating energy and allowing for filtration prior to entering Cottonwood Creek.



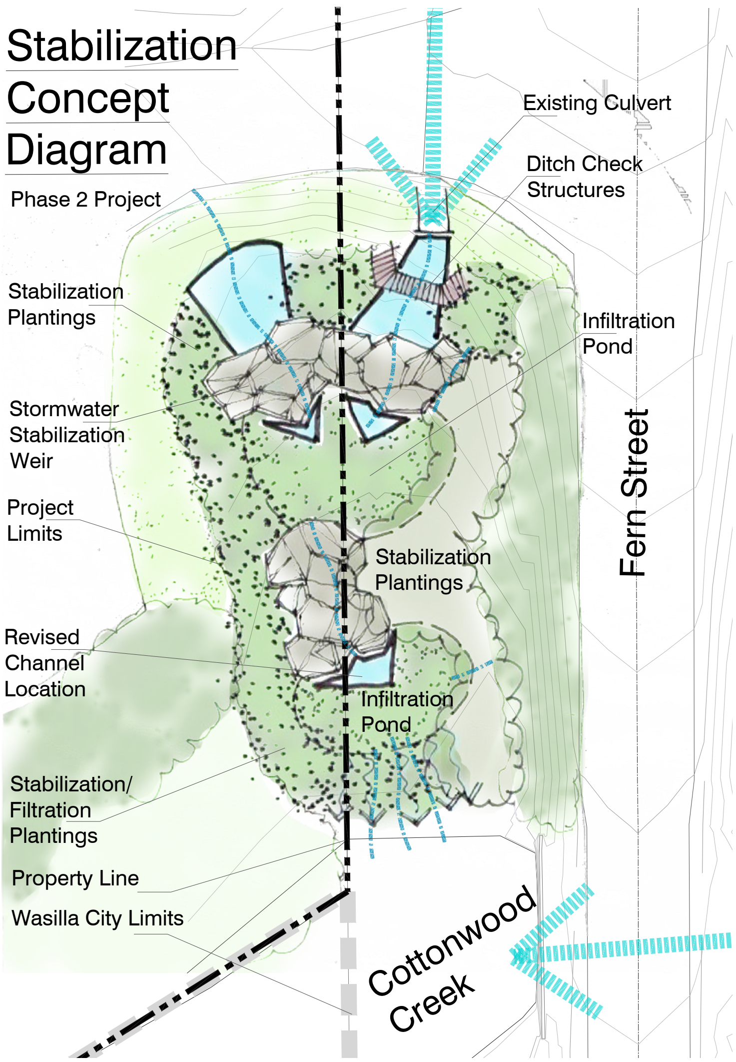


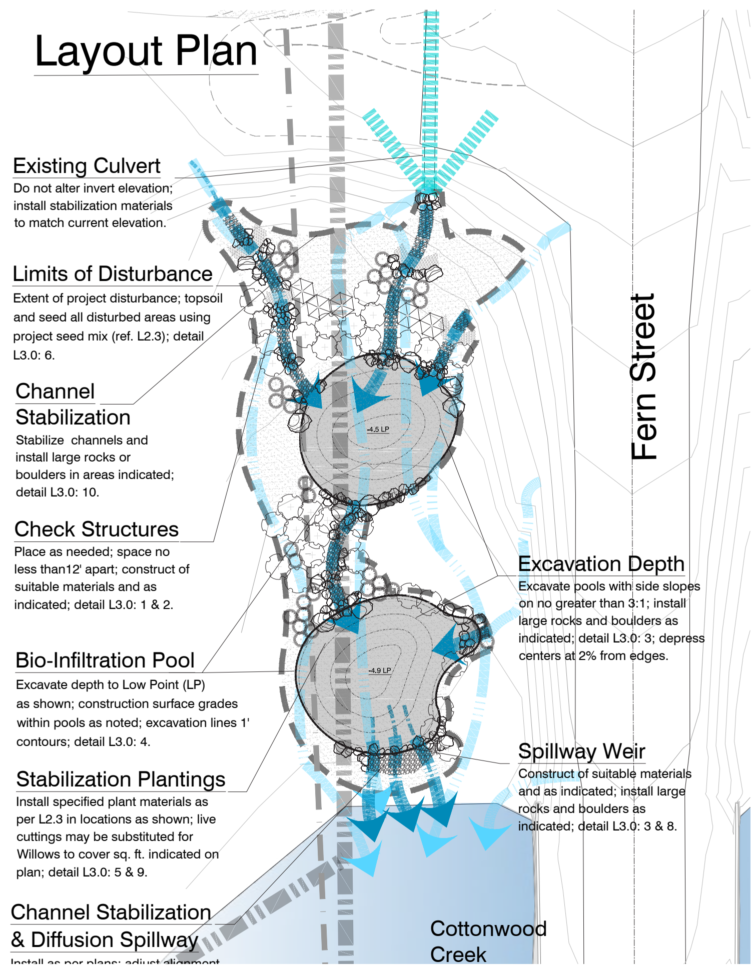
Phase 2: Concept and Stabilization

Concept Development & Construction Documents

Phase 2 concepts and final drawings were reviewed and discussed with the City of Wasilla and DEC. The final drawings included detailed designs for two large collection/bioinfiltration areas, stabilized channels, and filtration/diffusion techniques. After installation, an additional estimated 10,000 cubic feet of runoff is now prevented from reaching and contaminating Cottonwood Creek. Together with Phase 1, almost 15,000 cubic feet of runoff is collected and treated on these two sites

In spring of 2020, runoff entering Phase 2 areas shows impacts of spring runoff containing high amounts of pollutants and silt. LID and GI techniques will address stabilization, infiltration, collection, filtration, and dissipation when installed. Natural vegetation is flattened by runoff allowing polluted stormwater to drain directly into Cottonwood Creek.





Phase 2: Construction

Site Installation

On-site, the project was constructed within Fern Street's right-of-way (ROW). Existing vegetation along the Fern Street was retained for filtration of road runoff. Tall willows were removed to eliminate continued maintenance by Matanuska Electric Association (MEA) to avoid conflict with their overhead utility lines. Existing native plants were harvested for relocation and the half-buried, old silt fence was removed.

Stormwater channels were constructed and stabilized along with dissipation weirs and filter strips. Collection areas, the bioinfiltration ponds, were lined with geotextile fabric and constructed with a base layer of 8" minus stone. Over this are of large voids, additional geotextile fabric was installed. The geotextile was covered with infiltration soil (an equal mix of native soils high in organic matter and sand) where stabilization vegetation was planted. Exposed rock areas will collect depositional fill over time, creating voids for native plants.

Plantings in Phase 2 were predominately native shrubs, ground covers, grasses and perennials. These elements served to enhance and unify the natural landscape, stabilize soils, filter sediment and contaminants. In this Phase, specific plants were chosen to tolerate flooding, deposition, and pollutants while capable to withstanding high velocity flows. The infiltration soils provide natural drainage with a high water-holding capacity. Trees or large shrubs in conflict with overhead utilities were removed or relocated outside of the utility zones.

Phase 2: Construction

During Phase 2 construction, SDG coordinated the site remediation and worked with local partners to coordinate construction tasks. Project labor, equipment, materials, and deliveries were organized along with permit requirements. Post-installation site observation, maintenance, and waterings were undertaken to assure project success.

Phase 2: (6/2020) Native grasses and wildflowers are established.

Phase 2: (8/2020) Healthy plant growth is visible with no ponding or erosion.

Maintenance Plan

Retaining Project Integrity

Working with the City of Wasilla, a Maintenance Plan was prepared that addresses the best options to preserve the design, function, plantings, and overall project viability. The site upkeep was discussed for annual maintenance and general care as well as extended performance evaluation. Repairs to project features are relative to understanding the benefits of NDS, LID, and GI. Maintenance must respond to how the system functions, and, over time, how the project will mature. Retaining the integrity of both Phase 1 and Phase 2 will be imperative to functionality. These sites can continue the capture of pollutants, retaining runoff, and ultimately, improve stormwater quality entering Cottonwood Creek for an extended period of time.

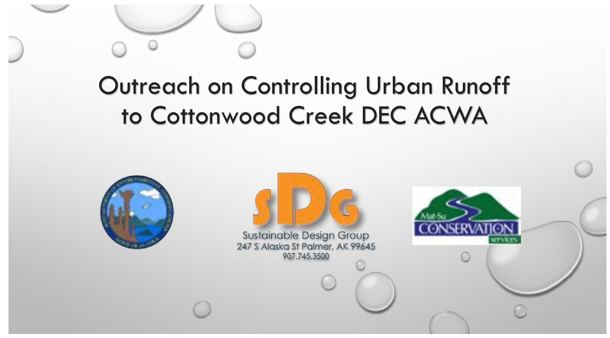
The City of Wasilla provided feedback on their understanding of the how the system works and best options to preserve the design, function, plantings, and project viability. Copies of the Fern Street Natural Drainage System (NDS) Maintenance Plan were provided to the City of Wasilla and DEC.


Controlling Urban Runoff to Cottonwood Creek
Maintenance Plan
12.20.2020

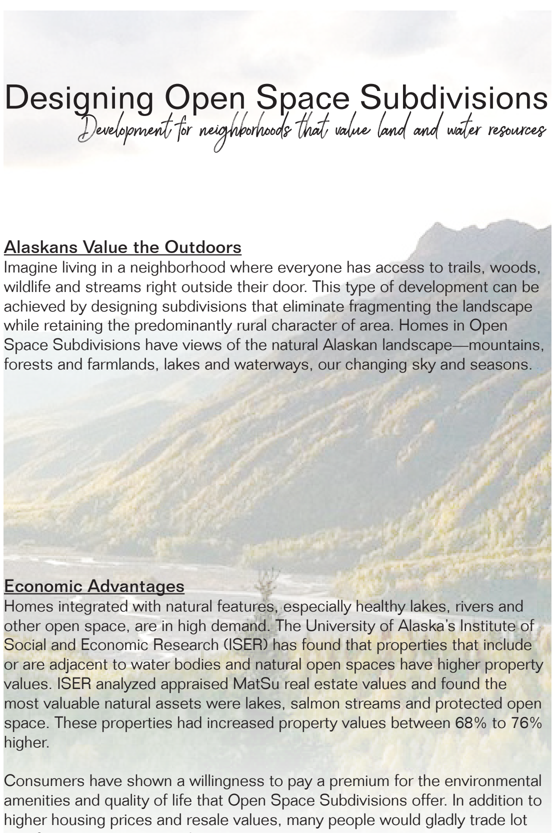
Outreach

Sharing Knowledge on LID and GI

The importance of improving water quality in Cottonwood Creek was shared with over 120 professionals at the 2018 MatSu Salmon Habitat Symposium. The restoration project was discussed as well as how to incorporate LID and GI techniques into projects. To share information with developers and the public, brochures, signs, and presentations were prepared.



A mini-workshop was held that provided education on stormwater management, the issues it poses to site development, and impacts to water quality within local watersheds. A working group has been meeting regularly for the purpose of discussing the approach to designing an “Open Space Subdivision” in the MatSu. Various low impact development and green infrastructure techniques have been examined that can mitigate different runoff issues in conjunction with site development, stormwater management, and drainage remediation. The workshop included production of an SDG publication on Open Space Subdivisions, the benefits to livable communities, and watershed health.



Designing Open Space Subdivisions

Development for neighborhoods that value land and water resources

Alaskans Value the Outdoors

Imagine living in a neighborhood where everyone has access to trails, woods, wildlife and streams right outside their door. This type of development can be achieved by designing subdivisions that eliminate fragmenting the landscape while retaining the predominantly rural character of area. Homes in Open Space Subdivisions have views of the natural Alaskan landscape—mountains, forests and farmlands, lakes and waterways, our changing sky and seasons.

Economic Advantages

Homes integrated with natural features, especially healthy lakes, rivers and other open space, are in high demand. The University of Alaska's Institute of Social and Economic Research (ISER) has found that properties that include or are adjacent to water bodies and natural open spaces have higher property values. ISER analyzed appraised MatSu real estate values and found the most valuable natural assets were lakes, salmon streams and protected open space. These properties had increased property values between 68% to 76% higher.

Consumers have shown a willingness to pay a premium for the environmental amenities and quality of life that Open Space Subdivisions offer. In addition to higher housing prices and resale values, many people would gladly trade lot size for proximity to natural scenery.

Designing for Open Space

Open Space Subdivisions start with looking at the natural assets of the site.
Do lakes, streams and other water features exist on the property?
Do natural trails connect to adjacent properties, other trails or neighborhoods?
What is the character of this site?
How do adjacent sites interact with this site?

These and many other questions would be considered through a design and mapping process that identifies a site's specific features. Following this assessment, house sites are located to minimize site impacts while capitalizing on the views. This process provides options where usable open space can be accessed. This creates cohesive neighborhoods where forest areas, water bodies and other natural features provide natural buffers, views, integrated stormwater management and recreation opportunities. Most importantly, Open Space Subdivisions retain the character of the site.

Open Space Subdivisions use a land assessment and site analysis approach that includes:

- Character analysis of the property relative to nearby natural features, land use and development
- Identifying and mapping undevelopable, constrained lands
- Analyzing and mapping lands with exceptional natural resources and features
- Identifying potential construction zones, water treatment areas, other development needs and recreation areas
- Locating buildable spaces (building envelopes)
- Linking streets, trails, sidewalks, and utilities
- Creating individual lot lines

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Outreach

Sharing Knowledge and Success

In February 2021, these projects were presented to the Wasilla City Council. The restoration project was discussed by phase with photos of the project as the restoration work progressed. Project goals to slow down and clean up stormwater runoff carrying pollutants into Cottonwood Creek were discussed along with the benefits of implementing LID and GI techniques. These projects made possible through funding by DEC's Alaska Clean Water Action grant funds and support from the City of Wasilla Public Works.






Many Thanks!

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- **City of Wasilla**

Mat-Su CONSERVATION services

Project Evaluation

Lessons Learned

1. Partnerships were key to project success. The City of Wasilla was extremely helpful, especially with design input, donations, and delivery of materials (sand, road signs, etc.). Our Open Space Subdivision working group provided input from a diverse group of community stakeholders with the capacity to educate others on runoff issues, as well as implementing Low Impact Development, and Green Infrastructure within our growing communities.
2. Coordinating a workshop through the Home Show proved to be difficult. Targeting specific audiences for workshops and activities has produced improved results.
3. On-site native plant material is an appropriate project budget gift. Harvesting and replanting native vegetation contributed to project success.
4. Alaska has a very short construction window that must include detailed planning. Understanding and working within DEC's grant cycle allowed for reasonable field schedules resulting in project and planting success within deadlines.
5. SDG's on-the-ground team (SDG, MatSu Conservation Services and Exigo Specialty Contracting) resulted in an excellent combination of knowledge and skills. Coordinated planning, design, outreach, and construction between locally-owned, small businesses kept these projects on schedule and within budget.
6. Future maintenance and information sharing on the project must include partners and stakeholders. The City of Wasilla remains our key partner in stormwater runoff remediation and demonstration projects.
7. Stakeholders, such as MEA and AKDOT&PF, will share benefits of these projects. As Knik Goose Bay Road upgrades are constructed similar LID and GI techniques could be included. MEA should see reductions in their ongoing power line maintenance.
8. Other stakeholders can be identified by direct and indirect benefits. These could include recreation enthusiasts, natural resource champions, local residents, and MatSu businesses. These projects provide opportunities for local developers to directly observe the benefits of implementing LID and GI techniques.