South Machias Rd–Machias Cutoff Intersection Improvements
PROJECT BENEFITS

- Improved roadway geometry to permit more efficient vehicle movement
- Reduced delay and congestion with the construction of a traffic signal and turn lanes
- Realigned and incorporated the Centennial Trail crossing into a pedestrian phase of the traffic signal to provide greater protection for trail users
- Installed new fish-passable culvert
- Added features specific to trail user types including bike rest and equestrian-height push buttons

PROJECT STATISTICS

- Length of project on S Machias Rd: 900 feet
- Length of project on Machias Cutoff: 260 feet
- Length of Centennial Trail paved: 600 feet
- Length of turn pockets added: 420 feet
- Push buttons added: 6
- Tons of asphalt used: 2,850
- Number of native trees and shrubs planted: 1,350
- Cost of project: $2.1 million
- Culverts replaced: 1
S Machias Rd is a minor arterial that carries traffic from Snohomish to Lake Stevens and onward to SR 92. Machias Cutoff branches off westerly from S Machias Rd, toward the south tip of Lake Stevens. Both roads are two-lane rural minor arterials that intersected at a skewed ‘T’ configuration. Before this improvement project, the intersection functioned as a three-legged, all-way stop with an overhead flashing beacon.

The Centennial Regional Trail crossed S Machias Rd approximately 130 feet east of the intersection and had an uncontrolled crossing, marked with a crosswalk. The location of the trail crossing was separated from, but adjacent to the intersection, creating a complex situation that was difficult for drivers and increased the risk for rear-end collisions.

In 2004, Snohomish County reconfigured the intersection from a one-direction stop to an all-way stop to reduce collisions. The improvements reduced the number of collisions by 71 percent but increased the delay and lowered the level of service for both the AM and PM peak hours.

This is a significant route for large trucks traveling from nearby rock quarries. A traffic study showed two percent of the average daily traffic is from heavy trucks, with peak hour volumes reaching up to five percent. This is also a common bypass route for commuters looking to avoid SR 9.

Williams Creek crosses underneath Machias Cutoff adjacent to the eastbound stop bar. Before this project, there was a 60-inch corrugated metal pipe culvert, with wetland areas on each side of the culvert as well as a third on the southeast side of the intersection. Williams Creek has been identified as fish bearing and the previous culvert posed a partial blockage to fish passage.

In the past, Beaver activity has blocked this culvert which had resulted in water flowing over the road. Snohomish County Road Maintenance installed beaver fencing as a temporary fix in 2017.

S Machias Rd is used by many dump trucks going to and from local quarries.

Beaver fencing around old culvert to prevent it from getting clogged.
PROJECT OVERVIEW

DESIGN ELEMENTS
During the design phase of this project, three design alternatives were considered, each with their own pros and cons. A roundabout and two intersection realignments were considered. The preferred alternative, that was constructed, realigned the intersection to prioritize the highest volume of movement. Over the years, as this area of the county transitioned from a destination with a train depot and post office, to a passthrough neighborhood for commuters, the dominant route on this road has changed.

The Centennial Trail users now have a dedicated signal phase which provides the best option to eliminate conflicts with vehicles and potential accidents or rear-end collisions due to double stopping caused by the previous stop sign and trail crossing. The new intersection operations improve the level of service of this intersection. This alternative also had the least impacts on adjacent wetlands, compared to the other options, and required the least amount of right-of-way to acquire.

TRAIL IMPACTS
The Centennial Trail serves as an important recreational asset to Snohomish County and nearby residents. More than 400,000 people use the trail each year for recreation and as a non-motorized commuter corridor. Previously, the trail crossed S Machias Rd with an uncontrolled crossing marked by a crosswalk. It was important that the new intersection configuration brought the trail crossing into the intersection. The selected alternative also provided an additional benefit of a signalized crossing, with a decreased risk in rear-end collisions due to potential conflicts between vehicles and trail users.

UTILITY RELOCATION
Most projects require utility relocations, but this intersection proved to have an unusually high density of utilities converging in one spot. The project required coordination with five utility companies. There were six overhead utility poles that had to be relocated by three utility companies (Snohomish County PUD, Frontier and Comcast) and in coordination with the Snohomish School District, who had communications equipment on a PUD pole. In addition, there was 500 feet of Puget Sound Energy-owned gas line and 66 feet of PUD-owned water line to be relocated. Two water lines owned by City of Snohomish and City of Everett had to be protected during construction to ensure they were not damaged. This was challenging during construction because at times there were mere inches between the lines and the roadway work. Due to the age and brittleness of the pipes, crews had to provide foam padding between the pipes to prevent any damage. All of the relocations occurred in a three-month timeframe between January and March 2019, before the project was advertised for bids.
CULVERT
While designing this project, Williams Creek was analyzed to determine the appropriate culvert size needed to allow for fish passage and meet the Washington Department of Fish and Wildlife (WDFW) fish passage requirements. Through the county’s analysis, it was determined that the culvert location should be shifted downstream to accommodate the widened roadway. The new precast concrete box culvert is 70 feet long, 17 feet wide and 6 feet tall. A hydraulic model was developed for Williams Creek by Snohomish County Surface Water Management that analyzed the impacts to streamflow with the construction of a fish passage culvert. The analysis included scenarios that considered beaver dams on the system.

STORMWATER DRAINAGE
The design team evaluated five stormwater best management practices (BMPs) alternatives for the S Machias Rd and Machias Cutoff Intersection Improvements Project. The drainage combination of a media filter drain and detention pond was selected based on engineering design and cost-effectiveness. The pond location avoided impacts to nearby private properties by utilizing Snohomish County-owned land between the existing roadway and the Centennial Trail. Due to the flat topography of the site, there were limited options to provide catch basins and piping along the new roadway without having to raise the roadway significantly. The drainage engineers were able to utilize the new roadway curvature to their advantage by designing the roadway to sheet flow to the drainage pond in the same direction as the required super elevation for the new road.

Crews installing the large 70-foot long culvert.

The county chose to locate the detention pond on already-owned county property as a cost-effective solution.
PROJECT MANAGEMENT AND CONTROL TECHNIQUES

PRE-CONSTRUCTION PHASE

Before Snohomish County Public Works advertised this project for bidding, our country experienced the longest federal government shutdown in history. The shutdown, which began on December 22, 2018, went on for 35 days and impacted the issuing of the US Army Corps of Engineers’ Section 404 Permit that was required for this project. This in turn delayed the project from getting advertised for bids by 30 days. Due to limited manufacturer options and long lead-times for a culvert of this size, staff were concerned that if the culvert procurement was part of the bid package, it could delay the project. To avoid missing the summer fish window for in-stream work that was needed to install the new culvert, and maintain the construction schedule through the summer construction season, county staff started thinking creatively. Staff began to work with the county’s purchasing personnel to procure the culvert separately. This did not come without risk or additional planning needed to ensure that the culvert could be safely stored and transported to the project location without sustaining damage.

Strider Construction was awarded the bid on May 22, 2019 for $2,224,311 and were given notice to proceed on June 6, 2019. Wasting no time, the contractor began construction one week later, on June 12, 2019.

CONSTRUCTION PHASE

To keep the project on track and the Centennial Trail fully open to the public, the contractor was given a very detailed plan set with comprehensive construction sequencing. Due to the high volume of trail users, it was very important that the trail remained open to the public. A paved, temporary trail detour was constructed so bicyclists, equestrians and pedestrians could safely utilize the trail during construction.

The construction of this intersection was complicated by the significant change in geometry. Each intersecting roadway was moved horizontally and vertically which is challenging to complete while traffic is on the roads. Transitioning from the existing roadway to newly constructed sections required careful planning to ensure drivers were able to safely navigate through the work zone. Lane shifts and temporary asphalt pavement were used to provide seamless movement between old and new.
Project managers had to carefully weigh the benefits of utilizing a full road closure, against the impacts to the public. It was determined that installing the culvert and reconstructing Machias Cutoff (the west leg of the intersection) was impractical under traffic due to the limited existing roadway width. The decision was made to allow a full road closure of Machias Cutoff with a four-mile detour to facilitate and expedite construction of this part of the project. On July 15, 2019, S Machias Rd closed for two weeks while the contractor installed the new culvert, constructed the new road alignment, and widened the shoulder of Machias Cutoff.

As the summer was ending and kids would be returning to school, the final paving needed to be completed. Due to the timing of this work and the close proximity of five schools within two miles of the project location, it was important to complete the paving and not disrupt the first day of school traffic. County staff were able to work with the contractor to complete the final paving at night, as to not impact daytime traffic.

Due to the size of the traffic signal poles, they were challenging to source and had a long lead time from the manufacturer, as was the signal controller. As to not delay the project and to utilize favorable weather for paving and other construction work, it was decided to complete the project on schedule except for the signal pole installation. The intersection was previously controlled by an all-way stop, so it made sense to continue using this traffic control method. In May 2020, the new traffic signal poles and controller cabinet were installed and the traffic signal was put into operation.

Snohomish County was able to partner with the contractor to complete the final paving at night, to avoid disrupting first day of school traffic.

Trail users were not impacted by the construction due to the bypass trail that was available.
SAFETY PERFORMANCE

The project was completed within the 100 working days specified in the contract, without a single lost-time incident. With a large amount of activity taking place, as well as a fully active trail and road, safety was the top priority for this project. Temporary traffic control during construction included the use of flaggers to control alternating one lane traffic, safety devices such as barrels, cones, candle, concrete barrier and advance warning signs. During construction hours, one flagger was typically dedicated to assist trail users crossing S Machias Road. Daily safety meetings were held prior to beginning work each day to discuss the planned work and specific safety measures associated with each activity. While the safety program, policies, discussions, and practices are important, the real measure of an effective safety culture is the result. Strider Construction and all of their subcontractors completed the project without a single lost-time incident.

Besides daily safety practices that crews implemented, many large-scale decisions were made to promote a safe work environment. A temporary paved trail detour was built to keep the Centennial Trail open and fully functional to all users. Had the temporary trail detour not been paved, cyclists would have had to dismount and walk their bikes through gravel. Signs were also placed on the trail in advance of the detour section to notify riders of the upcoming changes.

Construction plans also called for a temporary bypass road to be built, moving the traveling public further from the work zone. Crews were also able to use existing pavement and Parks Department right of way for staging which provided more space for construction activities.

During construction, safety devices such as barrels, cones, candles, concrete barriers and advance warning signs were used to keep the traveling public and construction crews safe.
COMMUNITY RELATIONS

When utility relocation began in early 2019, email communication was sent to the project subscribers to notify them of the upcoming work. Signs were placed on the road in early 2019 to inform commuters of the upcoming construction to occur the coming summer. Throughout construction, five email updates were sent to subscribers to notify them of the road closure, upcoming paving and more.

This is a busy rural intersection with daily traffic counts at about 10,000 vehicles. This intersection is within two miles of five schools and is a common route for school buses and parents taking kids to and from school. Before construction, we began communicating with the local school district to ensure we were on the same page and the construction did not inconvenience students or staff going to school. The construction contract also included restrictions that only allowed full road closures to occur outside of the school year.

About five percent of the daily traffic is heavy trucks, typically gravel-loaded double dump trucks going to and from the quarries nearby. This is a common route for those trying to avoid highways. Before construction we notified the local quarries of the upcoming roadwork and specifically stated that the posted detour route was only for vehicles under 10,000 pounds. This made it possible for them to plan ahead and use the highways to detour instead of the posted detour route.

During the design phase of this project, staff visited the intersection and noticed the high number of cyclists on the Centennial Trail, crossing S Machias Rd. An engineer on the team, also an avid cyclist, had seen bike rest stops at a trail crossing outside of Snohomish County. He designed a similar bike rest and it was constructed for this location. The bike rests are very useful for cyclists using clip-in pedals, so they don’t have to unclip while they wait for the light to turn and cross the road. A small investment like this has become a great public asset. Furthermore, restrictions were put in place to avoid construction related interruptions to already-scheduled trail events such as bike races. The local bike clubs were also notified of the upcoming construction and informed that the trail would remain open during construction. In addition, there are an estimated 40 equestrian riders per month on this segment of the trail. To accommodate these users at the trail intersection, push buttons were installed at a height suitable to equestrian riders.

This is a highly used intersection by commuters, school busses and trail users including bike commuters. Community engagement began early in the design process with the creation of a project webpage in 2016. An email subscriber list was created and over 800 people subscribed to receive updates about the project. In 2017, Snohomish County completed an environmental checklist as part of the State Environmental Policy Act (SEPA) review process. As part of the Land Disturbing Activity (LDA) permit and Determination of Non-Significance (DNS), there was a 21-day public comment period. The only comment received was from a local jurisdiction regarding their utility asset within the project area. This fostered communication between the two entities for improved coordination.

Bike rests were constructed for cyclists who use the trail, so they don’t have to unclip while waiting for the light to turn to cross the road.
ENVIRONMENTAL CONSIDERATIONS

PERMITTING

A preliminary Environmental Review Memo (ERM) was completed in November 2016. It was determined that three wetlands exist adjacent to the intersection. A large wetland is located northwest of the intersection, one southwest of the intersection and the third southeast of the intersection between the Centennial Trail and S Machias Rd. Williams Creek flows through the project site and crossed under Machias Cutoff, then flows south through a 60-inch culvert on the west side of the intersection. Williams Creek is classified as a fish-bearing stream. During the design alternatives review, seven permits were identified:

- US Army Corps of Engineers Section 404 Permit
- Section 7 Endangered Species Act (ESA)
- Washington State Hydraulic Project Approval
- Washington Department of Ecology Section 401 Water Quality Certification
- Critical Area Regulations
- Snohomish County Land Disturbing Activity (LDA) permit
- State Environmental Policy Act (SEPA)

Compensatory mitigation was required in order to comply with Snohomish County Critical Area Regulations (30.62A SCC) and as a condition of the Section 404 permit from the US Army Corps of Engineers for discharge of fill material to Waters of the United States (WOTUS).

The mitigation required to compensate for permanent impacts to the wetlands was satisfied through the purchase of 0.40 mitigation banking credits from the Skykomish Habitat Mitigation Bank (SHMB). The SHMB was selected because it is located nearest to the project site and its ecological goals correspond with mitigation requirements of the project. In addition to compensatory mitigation, critical area buffers temporarily impacted by construction were restored by planting native trees and shrubs. After one year, these plantings have shown overwhelming survival. Additional onsite opportunities for stream buffer restoration was able to be accomplished at the site where existing paved areas were removed as part of the intersection re-alignment.

CULVERT

The original culvert at this intersection was a partial fish barrier. Environmental planners coordinated with the Washington Department of Fish and Wildlife (WDFW) and the Tulalip Tribes on the design of the fish passage culvert to meet the WDFW fish passage requirements. Due to beaver activity in the area, it was determined that a substantially larger culvert would be the best option to prevent potential beaver-built dams from blocking the culvert. This also provides more resiliency for the roadway, in the event of future flooding events.

The old culvert was much smaller and was a partial barrier to fish.

1,350 native trees and shrubs were planted within the project area, including by the new, larger culvert.
WETLANDS

By selecting a design alternative that had the least impacts, the county was able to minimize wetland impacts. There were areas of pavement that were removed as part of the project to restore natural riparian habitat adjacent to the wetlands. These areas were planted with native shrubs and help to enhance the stream buffer at the culvert crossing. During the utility relocation, one of the poles had to remain in the wetland area, so a fiberglass pole was installed. Instead of using a traditional chemically treated pole, a more environmentally-friendly option was identified.

DRAINAGE & DESIGN FEATURES

The media filter drain used in this project is a linear flow-through stormwater runoff treatment device. This is a non-invasive way to provide runoff filtration and drainage to the road without disrupting the environment by constructing large underground vaults. The county was able to utilize Snohomish County-owned land between the existing roadway and the Centennial Trail to construct a drainage pond. The pond location avoided impacts to nearby private properties and reduced the need to purchase additional property. One of the design alternatives featured a roundabout, but it was determined that the impacts to wetlands would be too great, so a different option was selected.

CENTENNIAL TRAIL

It is worth noting, among the environmental benefits of this project are the improvements made to the Centennial Trail. Previously there was no signal or controlled road crossing for trail users. Each year there were many near-misses, potentially preventing people from choosing to bike commute due to the facilities available. This project fixed this problem by providing a controlled crossing. This is a major improvement for non-motorized mobility in the area and a step in the right direction towards regional reduction of carbon emissions.
UNUSUAL ACCOMPLISHMENTS

PRE-CONSTRUCTION

Six months before this project went to construction, county engineers and project managers had to overcome an unexpected challenge that was out of anyone’s control. On December 22, 2018, the longest federal government shutdown began. During the 35-day closure, everything at the federal level stood still. This impacted the issuing of the US Army Corps of Engineers’ Section 404 Permit, needed for this project. Staff worried this could delay the project causing it to miss the summer construction season and fish windows needed to install the culvert due to long lead times for a culvert of that size to be manufactured. To overcome this challenge, staff got creative and decided to remove the culvert procurement from the overall bid package. This did not come without risk or additional planning needed to ensure that the culvert could be safely stored and transported to the project location without sustaining damage.

In March 2020 construction was halted due to the global COVID-19 pandemic. Construction was paused for 5 weeks in compliance with Governor Inslee’s “Stay Home, Stay Safe” order. Staff and the contractor worked together to develop and implement proper health and safety measures to resume construction. By partnering with the Contractor to share in costs to restart the work safely and in an efficient manner, construction was completed on schedule in May 2020.

BELOW GROUND

This area has high amounts of groundwater that had to be overcome during construction. Crews had to de-water any time there was digging involved. Pumps and hoses were used to remove the water and drain it into the vegetated land nearby. The signal pole foundations were 17 feet deep. Due to this depth, drilling and installing the cast-in-place concrete foundations while de-watering was challenging.

During excavation for the new culvert and roadway alignment, the crew encountered logs that made up an old corduroy road. About ten logs had to be excavated before the culvert could be installed.
Cost Savings

The county made strategic decisions during the design phase of this project, such as selecting a design with a smaller footprint that didn’t require as much right-of-way acquisitions or mitigation, compared to other options.

Typically, for an intersection like this, signal poles are on the same side of the road as the lanes they serve. But due to the location of the adjacent wetlands, design engineers determined it was best to place one pole on the opposite side of the road and use a longer mast arm to locate the signal heads above the lanes served. Not only were the wetlands avoided, but utilizing a non-traditional design prevented the county from having to complete additional, costly mitigation.

An unusually long signal pole was used to avoid a second pole being placed within wetlands, requiring costly mitigation.

Typically, there would be a second pole as demonstrated here.
Snohomish County has developed a climate change tool that can inform engineers of potential climate change impacts to projects. It provides guidance and considerations to minimize impacts and better adapt to a changing climate. The tool analyzes temperature, precipitation, flood zone, and landslide risk data to make recommendations to increase resiliency of a project. As part of the recommendations of the climate change analysis and fish passage sizing requirements, the size of the culvert was increased from 5 feet diameter to 17 feet in width and 6 feet in height. With this increase in culvert size, this intersection will be more resilient with future climate changes including changes to precipitation patterns. In 2020, FEMA adopted new floodplain maps and this location is now within the floodplain. This further demonstrates the importance of the larger culvert that was constructed for this project. Other project elements to address climate change include the implementation of low-flow fish passage channel in the culvert and increased stormwater facility sizing to account for future potential changes to precipitation patterns.

Resiliency

Snohomish County Climate Impacts Decision-Support Tool

1/11/2018

Snohomish County

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SOUTH MACHIAS RD-MACHIAS CUTOFF INTERSECTION IMPROVEMENTS

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ACKNOWLEDGMENTS

The S Machias Rd / Machias Cutoff Intersection Improvements project was a success by any measure. It is a fantastic example of what can be accomplished when the right people come together with the right skills and a great attitude. This project wouldn’t have been possible, and wouldn’t have succeeded, without the following outstanding contributors: