R

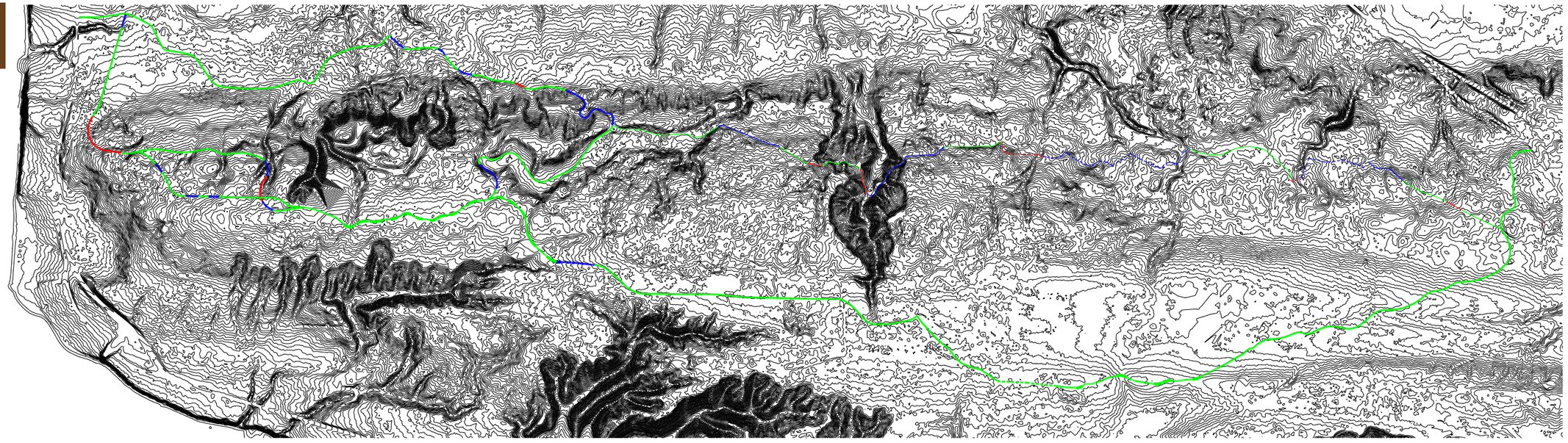


Figure 2R: Topo with Preliminary Trail Grades

Topography & Grades

Steep slopes, and the cost and environmental disturbance associated with building on them, are one of the major limitations for shared-use trails in this region. For the purpose of this feasibility study, there were two routes, previously identified by NKTA, that were the basis of investigation. As such, the scope for this study did not include significant investigation of alternate alignments that deviated from the general routes identified. However, there were a few areas near and between the two routes that were investigated with regard to topographic feasibility of connections.

One of the primary directives for the study was to analyze whether existing logging road corridors could be used for the shared-use trail, either beside the existing road or by sharing an improved roadbed. Analysis of existing road slopes was one of the first tasks performed in the planning process. LIDAR topographic data provided by the County was used to grossly calculate the slope along any given segment of the proposed alignment (Figure 2R). For planning purposes, existing slopes were identified in three categories:

- Less than 5% (considered accessible for a shared-use path per AASHTO standards). These segments are shown on the plan in Figure P as **green**.
- 5% to 8% (considered acceptable for a share-use path with mitigation). These segments are shown as **blue**.
- Greater than 8% (not recommended for a shared-use path). These segments are shown as **red**.

This planning analysis allowed us to understand, at a high level, where the significant problem areas were and to devise strategies for reducing slopes to below 8%.

The trail slopes as calculated during the planning-level analysis were:

Route:	**Combo**	**Upper**	**Lower**
• < 5% :	94%	86%	66%
• 5% to 8.33%:	5%	10%	27%
• > 8.33%:	1%	4%	6%

S

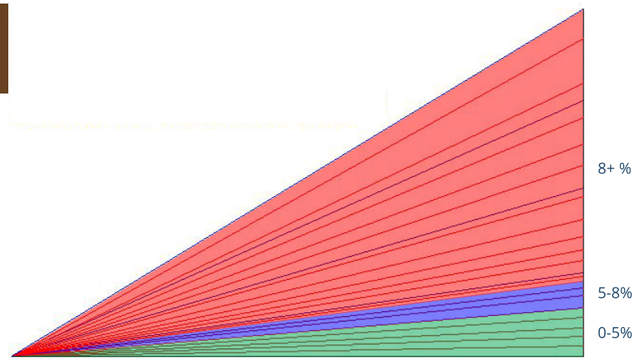


Figure 2S: Example of Trail Grade Thresholds

T

Figure 2T: Slope Field Verification

U

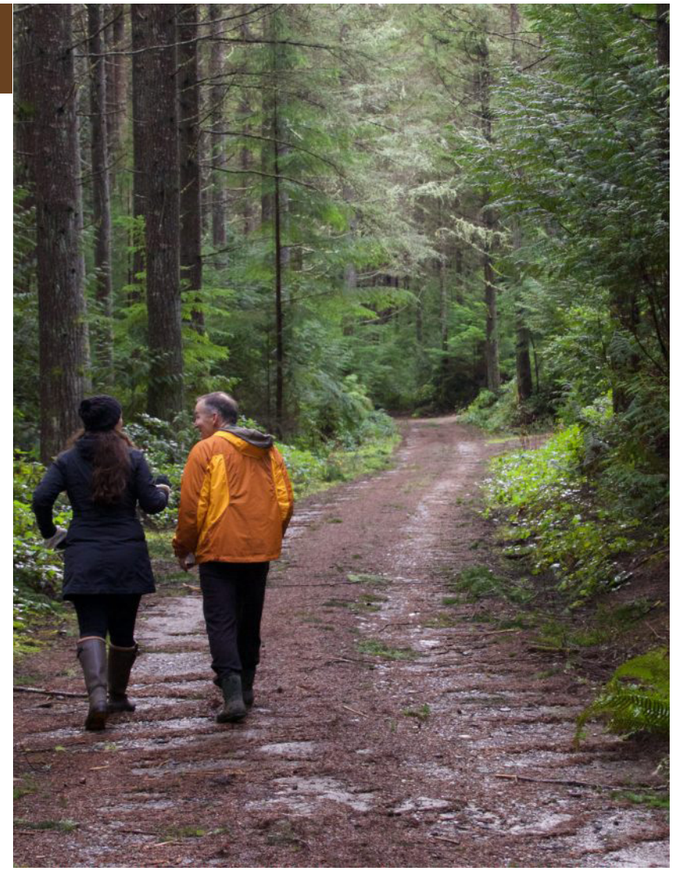


Figure 2U: Current Hiking Use (Photo Courtesy of Don Willott)

Slopes Per Preliminary Engineering

During the engineering phase, the engineer applied parameters to the design model to restrict the area of disturbance to a 40 foot wide corridor. The maximum side slopes will be 1.5:1 (horizontal distance: vertical distance) on cut slopes and 2:1 on fill slopes. After more detailed engineering of the alignment based on the LIDAR topography data, the slopes of the existing road were verified in several locations in the field (Figure 2T). Based on engineering and field verification, new vertical alignments for the path were developed.

In the end, the percentages of vertical slopes along two potential alignments were:

Engineering Analysis Route	Combo	Upper
• Less than 5% :	87%	86%
• 5% to 8.33%:	13%	8%
• Greater than 8.33%:	0%	6%

V

Figure 2V: Gated OPG Access

W

Figure 2W: Northwest Timber Harvest

Timber Harvest Schedule & Impact

The proposed trail will pass through forestlands owned and/or managed by OPG and the County. OPG retains the rights to one more timber harvest on land recently sold to the County. To minimize implementation costs and reduce environmental impacts, the County adopted a strategy to use the logging road bed as the base for a new, paved shared-use path where feasible. Due to that fact, the potential inconvenience of infrequent trail closures is acceptable to the County. To accommodate logging activity traffic, the width of the shared use path was increased from 10' wide to 14' wide.

Based on infrequency of use for logging activities, the corridor should be designated as a trail (as opposed to a road) designed to accommodate maintenance vehicles and, in identified sections, to accommodate logging trucks. As such, portions of trail will need to be closed during logging operations, which would be infrequent based on discussions with OPG.

Field investigation was done to determine the existing quality of various roads and their base courses to establish costs for changing those gravel roads to a wide, paved, shared-use path. Trail pavement sections (base course plus asphalt) for trail types were also developed by the engineer to inform costs for various trail segment development. These costs are reflected in Section 3 of this report.

During a Working Group meeting in April 2017, Adrian Miller (OPG Policy Resource Manager) provided a comprehensive summary of OPG's position and potential timber management strategies including:

- Tentative schedule for harvest blocks and years of harvest from 2017 through 2035.
- OPG supports sharing STO with the understanding that it will be closed periodically for harvesting.
- Trail should support logging trucks and will be designed as such (14' width).
- Hauling on weekends are less likely as mills don't operate and schedule typically starts early in the day and ends early in the day.
- Due to favorable site conditions winter logging is optimal.
- Majority of logs will "flow" off central blocks (recently acquired) with the topography to the east and use east/west roads, minimizing the need to use the Ridge road.
- Ridge road likely to be used more for hauling logs off the west OPG block, although closures would be for short segments for limited times.
- OPG will retain easements to use all current roads and future roads on land sold to the County.
- OPG has easements for interpretive/education signs- the STO trail will be a perfect location for these.
- We should plan for the "right" location of the trail based on all other criteria as harvest schedule and haul logistics are too uncertain at this point.
- OPG can do things to reduce user conflicts and provide access around closures using other trails.
- PUD will have easement for water line access.

X

Figure 2X: Wide Gravel Road Used by Logging Trucks

Y

Figure 2Y: Narrow Gravel Road Not Used by Logging Trucks

Z

Figure 2Z: Dirt Recreation Path

Summary of Existing Road & Trail Types

For the preferred Combo alignment, a majority (approximately 82%) of the proposed trail will be built upon existing logging and maintenance roads. Another 3% will be located adjacent to existing roads with a 5 foot wide buffer. The remaining 15% is proposed to be built where no current roadbed or trail exists. For the additional Upper segment, about half of the trail would be built upon an existing logging road (Road 1300). The other half will be newly constructed trail separated from a newly constructed road through the OPG development.

This strategy should minimize construction cost in addition to reducing disturbance to the landscape. As such, it is important to understand the current width and condition of sub-base for each existing road type. These factors will impact the cost to develop the trail on roadbeds of varying conditions.

Type 1 - Wide Gravel + Used by Logging Trucks

A majority of the preferred Combo alignment will utilize existing logging roads that are wide, surfaced with compacted gravel and have a solid base. These include the 1000, 1300 and 1800 Roads. These roads have been used and maintained for decades. Little effort and cost will be required to prepare a subbase for pavement. Little to no grading will be required except in those short segments that are over 8% in longitudinal slope and need to be regraded to meet slope requirements.

Type 2 - Narrow Gravel + Not Used by Logging Trucks

A small portion of the preferred Combo alignment will utilize old logging roads that are more commonly used for maintenance activities. These are less wide and do not have the level of existing base course as the existing logging roads. This includes the 1100 Road between the parking area and town of Port Gamble. These roads have also been used for decades but not maintained to the same level. Additional effort and cost will be required to prepare a subbase for pavement. Some grading will be required in short segments that are over 8.3% in longitudinal slope to bring them in under 8.3% to meet slope requirements.

Type 3 - Dirt Recreation Path

There may be a few short segments that follow existing dirt recreation trails. These contain no discernible road base and are considered new construction for costing purposes. New construction segments (not occurring on existing road base but on virgin soil or recreation trail) occur at the south end of the project where a new path will connect the 1800 Road southeast to Stottlemeyer Road. It will also exist on the additional Upper segment from the Ride Park down through the OPG development to the town of Port Gamble. This segment will run adjacent to the new development proposed by OPG for this area.

2.7 Alignments Considered

Over the course of the planning and feasibility study the consultant team and Working Group looked at variations to the two preliminary north-south routes identified by NKTA in 2014. The following section summarizes each of these segment considerations and discusses the reasons for integrating them or discarding them as possible improvements to the preliminary alignments.

South End Connection - Context

It should also be noted that this study is not addressing the feasibility of connection south of the Stottlemeyer Road trailhead to Poulsbo. Utilizing Stottlemeyer south to the roundabout at Noll and Lincoln looks the most promising. Bond Road is too busy and provides challenges with safety and aesthetics. The County's Non-motorized Committee will be having ongoing discussions about this connection. Michael Bateman (Transportation Engineer) from Poulsbo Public Works stated that there is no plan to put a traffic light at Big Valley Road and Bond as previously thought, which would be needed for a safe crossing of Bond Road for the STO route at that intersection. The Working Group agreed that a soft surface trail could still be implemented and maintained in the future through Millie's (if approved by the private landowner) as a recreation connection to the STO. Michael felt that a connection to Poulsbo utilizing Stottlemeyer would be preferable and most feasible.

South End Connection - West to Big Valley

The hand-drawn alignment and grading studies shown below in Figure AA was done early in the planning process to determine the best southern terminus for the trail feasibility study. It was determined by the Working Group that the study would not address the feasibility of a connection from the top of the ridge to the west, down what is known as the Millie's Trail connection to Big Valley Road. Instead, it was determined that the Stottlemeyer trailhead would be the southern terminus for this feasibility study. Three options were explored for the Millie's connection, two of which would require agreement with private landowners. Due to steep slopes and limited land in which to work, much of the trail would need to have 8% longitudinal slopes. Millie's family has agreed in the past to lease the trail easement to NKTA for access to OPG land as a recreational footpath. Use of their land for a wide shared-use segment of the STO trail would need to be explored with them.

The Working Group did not determine a connection west to Big Valley Road was infeasible; however, the County has determined that the focus of the study should direct resources at studying the feasibility of an STO route which connects through the Stottlemeyer Trailhead.

AA

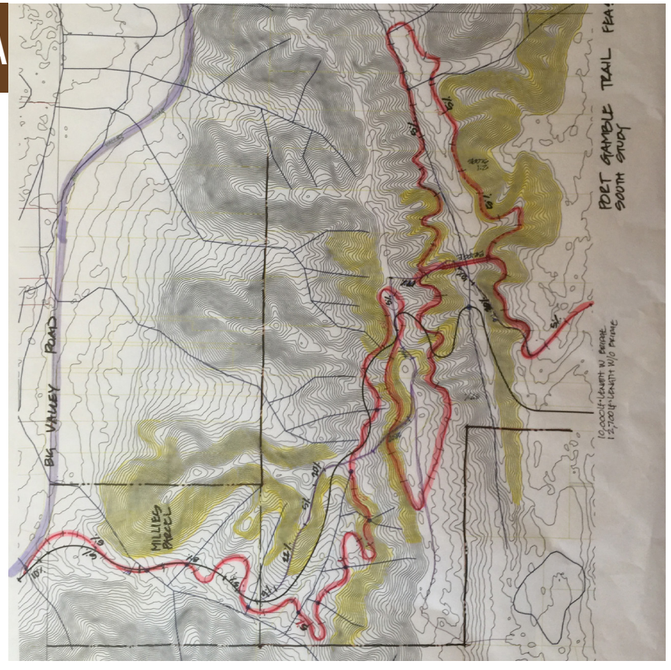


Figure 2AA: First Alignment of Millies Area (1/2017 Meeting)

AB

Figure 2AB: Field Investigation of Routes (Photo Courtesy of Don Willott)

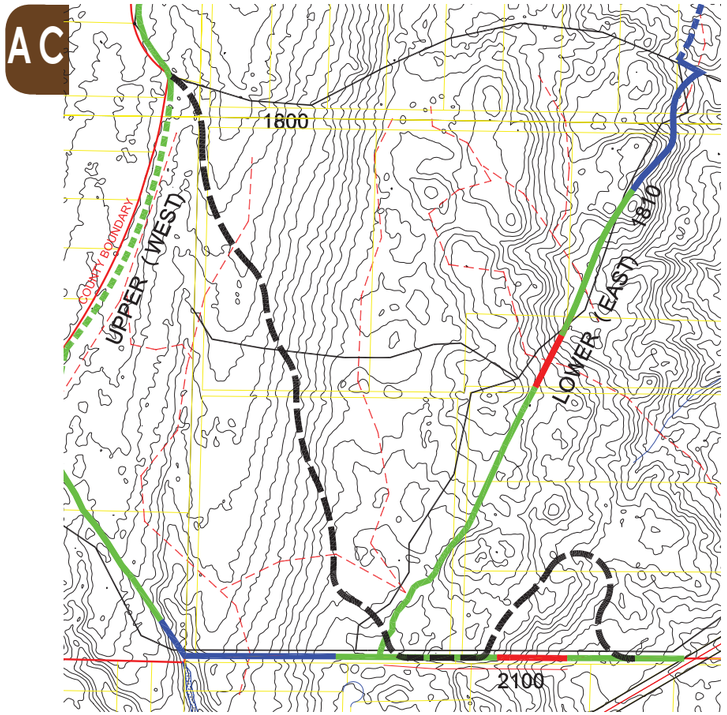


Figure 2AC: Route Identified from Ridge Road to Stottlemeyer

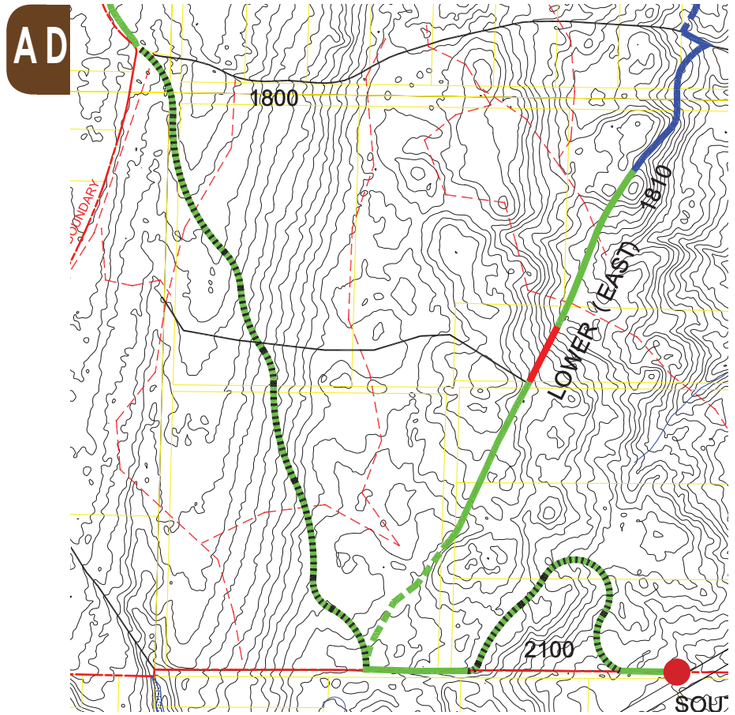


Figure 2AD: Evolution of Planning for the South Connection

Figure 2AE: Field Investigation of Routes (Photo Courtesy of Don Willott)

South End Connection - East to Stottlemeyer

Early field assessment and desktop engineering indicated that the southern half of the Lower alignment, as identified by NKTA, would be problematic due to steep longitudinal slopes of existing logging roads and trails that were being considered for the new path corridor. As such, a new route, not utilizing existing roads, was identified as shown in Figures 2AC and 2AD. This route would be under 5% in grade until it intersected with the 2100 Road at the south end of the project area. There is a steep section (over 8.3%) on this road so a bypass loop of new trail was proposed, ending at Stottlemeyer Road.

AF

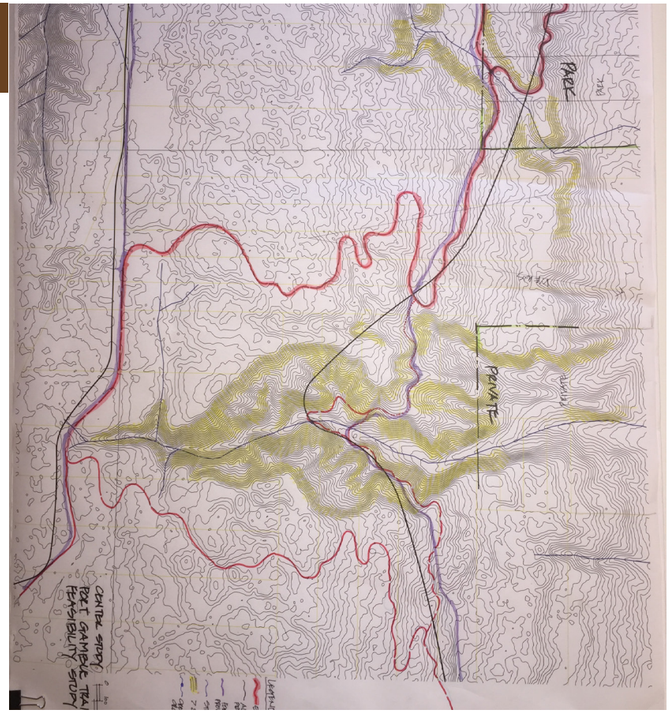


Figure 2AF: Study of Connection Between Upper and Lower (Jan.2017 Meeting)

AG

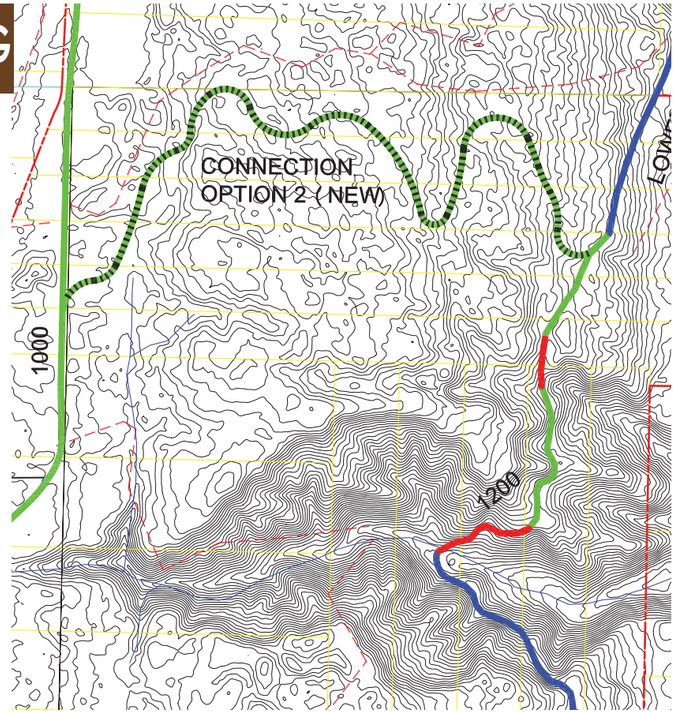


Figure 2AG: Study of Connection Between Upper and Lower (Feb .2017 Meeting)

AH

Figure 2AH: Field Investigation of Road Slopes

Connection Between Upper and Lower Routes - Early Studies

Since the southern portion of the Lower option was determined to be infeasible due to steep grades, other options were explored. One was the 1000 Road up to the 1300 Road, which was the route that was eventually selected as the preferred Combo alignment (see next section). Prior to that, other connections were studied between the southern segment of the Upper alignment and the northern segment of the Lower alignment.

Another connection option originally considered was further south of the 1300 Road (Figures 2AF and 2AG). The Working Group was concerned that an additional new path would add to habitat fragmentation and was not consistent with the County's Resource Stewardship & Access Plan. The connecting trail would be completely new trail to accommodate the grade requirements, and four wetlands were found in the vicinity of the proposed trail. As such, this alternate segment was not considered further and focus shifted to an existing corridor- the 1000 Road as a means to make a connection between the Upper and Lower routes.

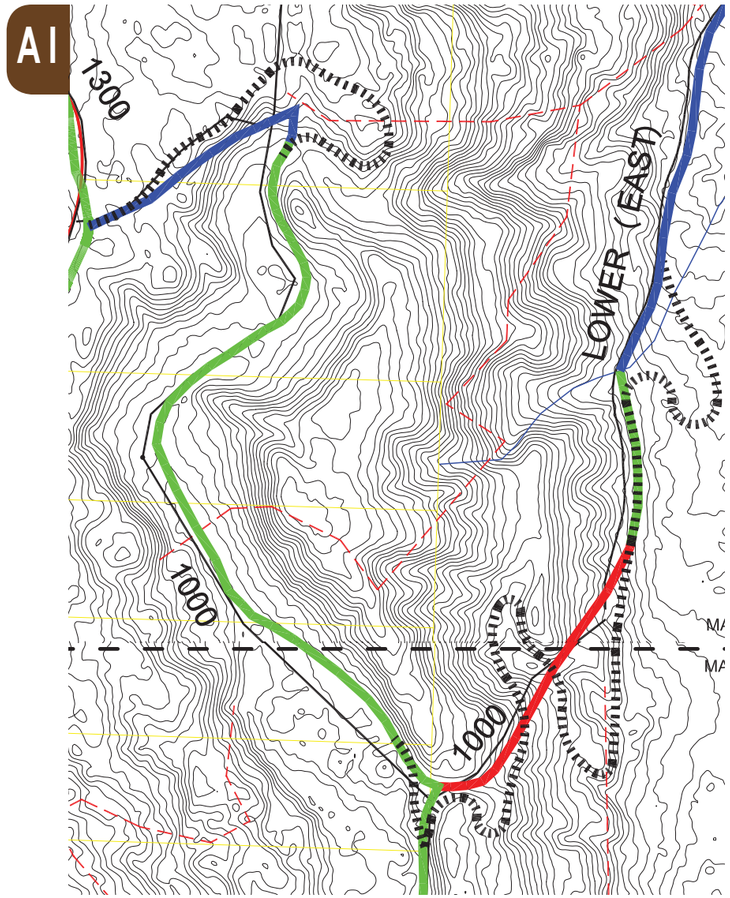


Figure 2AI: Existing Road Grades and Possible Alignments

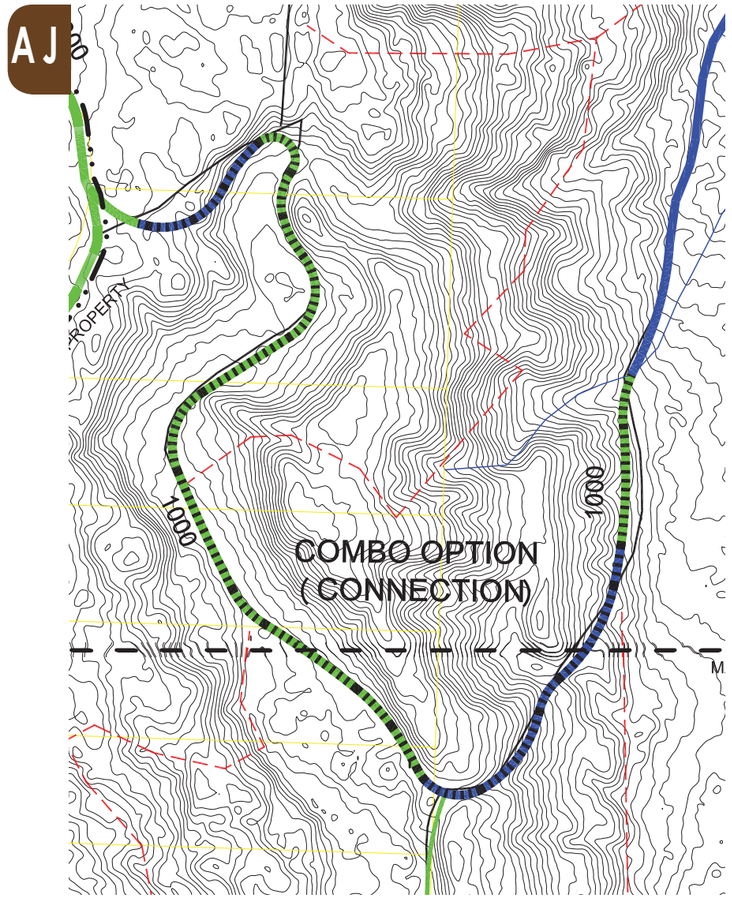


Figure 2AJ: Proposed Grades for Trail on 1000 Road

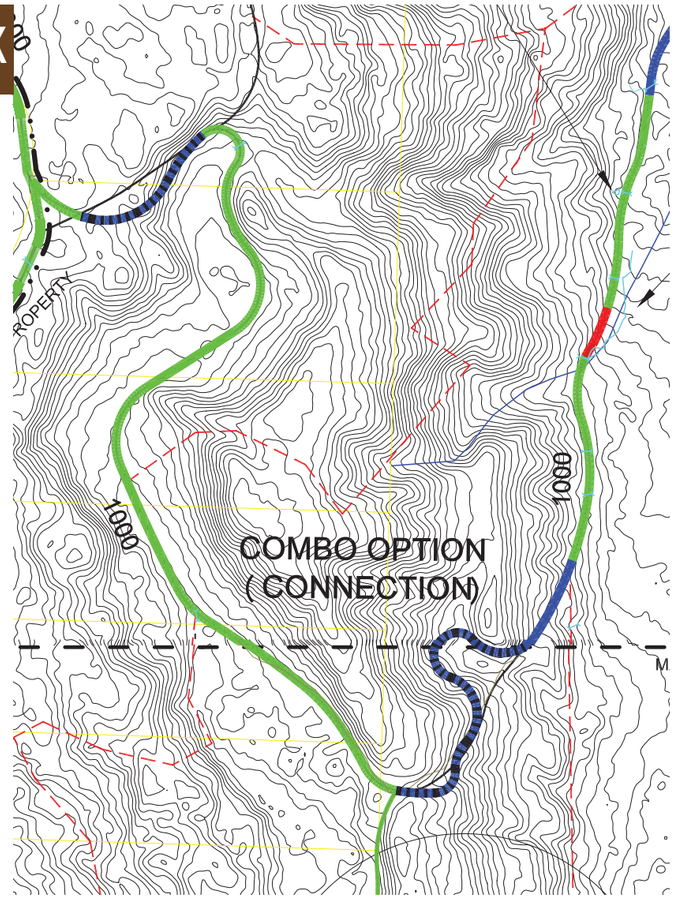


Figure 2AK: Refinement of Alignment Based on Field Study

Connection Between Upper and Lower Routes - The Evolution of the Combo Route

Through field work and desktop engineering, it was determined that the 1000 Road was the best opportunity to connect the Upper and Lower routes originally proposed by NKTA. However, this connection, a vital segment in the "Combo" alignment being proposed has significant slopes.

In Figure 2AI, an analysis map from one of the early Working Group meetings demonstrated that there were long segments of 5-8.3% slope (blue line) and 8.3% and greater slope (red line). As such, a new alignment for this corridor was identified and is depicted as the dashed black line. This alignment shows what is necessary for a 5% or less slope. It was determined that this would result in too great a cost and result in too much habitat disturbance. As such, the alignment was designed to have long sections of steeper slope (closer to the 8.3% maximum for a shared use trail (Figure 2AJ). It was at this point that decided to field test the slope of the existing roads in this area to see how accurate the LIDAR topo data was and whether we could rely on gross engineering we had performed to date. It became evident that there were several areas where a new small alignment would be required to stay under 8.3% in slope (Figure 2AK). There were also a few steep segments of over 8.3% that were short enough that it was determined these could be "graded out" while staying on the existing road corridor meaning that the grade of the road would only need to move up or down in that short segment (such as depicted by the short red line in Figure 2AK.

AL

Figure 2AL: First Alignment of North Problem Area (January 2017 Meeting)

AM

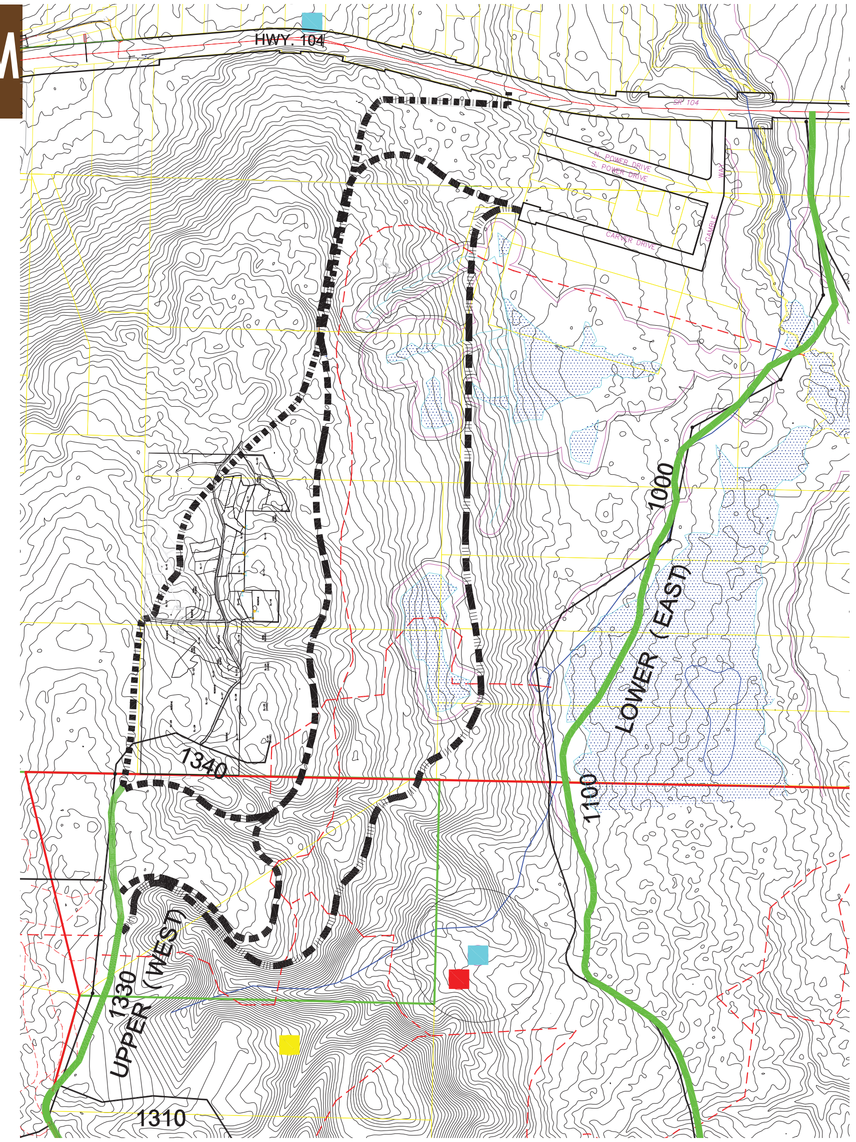


Figure 2AM: Initial Alignments Considered

AN

Figure 2AN: Field Investigation of Connection Between Upper Areas and Town (Photo Courtesy of Don Willott)

Upper Route - Connection Between the Ride Park and Port Gamble Town

One of the most significant challenges in this feasibility study, and one of the reasons for two alternate alignments on the north portion of the project, was how to get the shared-use path down off the plateau and into the Town of Port Gamble. Early desktop engineering on LIDAR topo reveals significant switchbacks (Figure AL). At this early stage of planning, utilizing the right-of-way of the proposed OPG road was not yet a consideration. A

After field investigation, a west route near the new OPG septic facility was identified. At the same time, OPG's development engineers suggested an east route through Babcock Farm (Figure 2AL and Figure 2AN). Discussions amongst the Working Group led to a consideration of a roadside path. While a roadside path is allowed to be over 8.3% if it meets the grade of the road, the group was concerned about user experience and OPG was concerned that development planning had not accommodated a wider ROW to this point.

AO

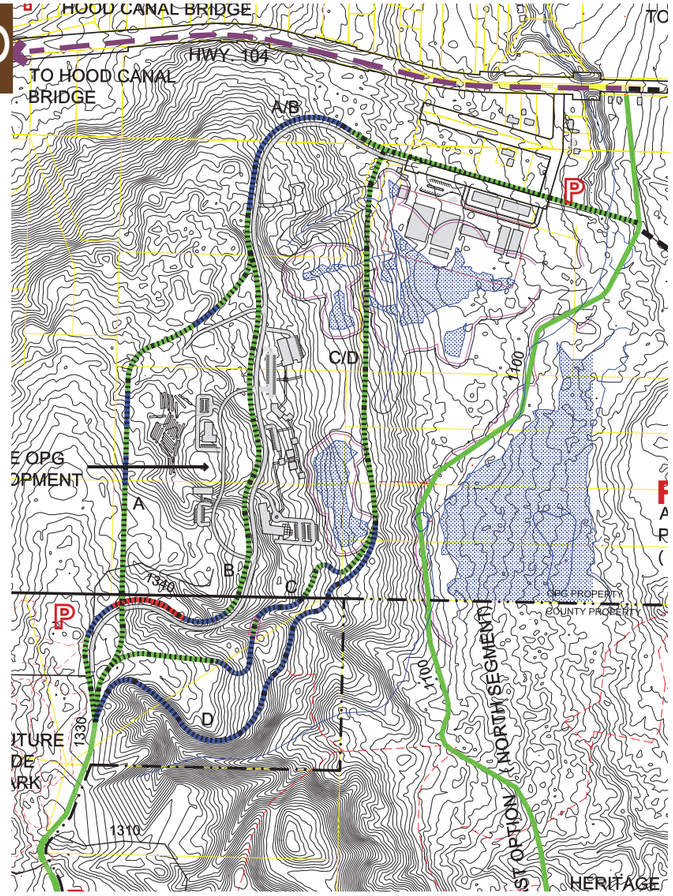


Figure 2AO: Four North End Routes Considered

Further field investigation helped to refine these four options, now labeled A through D (Figure 2AO). General grades of each were determined by desktop engineering and each was analyzed and metrics were presented at a Working Group meeting with regard to distances and slopes.

Additional field investigation by the consultant team and the Working Group identified significant challenges for options C and D including proximity to critical areas, what appeared to be sloughing slopes, terrain with extreme side slopes, the need for a bridge and disturbance of a mature forest. Due to these factors options C and D were not considered further. Two options emerged- A and B as shown in Figure 2AP.

AP

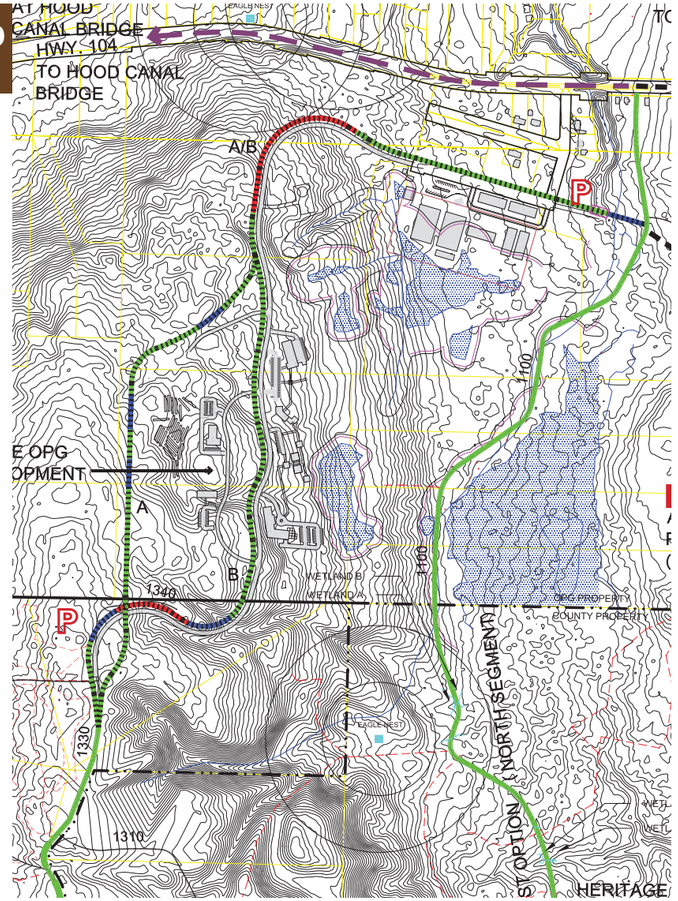


Figure 2AP: Evolution of the North End Routes

Since a majority of this segment is within OPG property and within their newly proposed development, finding a solution that OPG was agreeable to was important. Each successive proposal- whether it was based on field investigation or desktop engineering, was vetted internally by OPG to make sure it did not conflict with their program and goals for the area.

At this stage, OPG determined that the west route through the septic field area was not feasible for them and that they preferred a roadside trail through their proposed development. OPG then revised the ROW for their development plans to provide an additional 17 feet width for the 10 foot wide trail, two foot shoulders and five foot separation width from the edge of the road.

AQ

Figure 2AQ: Field Study of North End Routes - Babcock Farm (Photo Courtesy of Don Willott)

Option B is the route through OPG property that is included in the Preliminary Engineering plans and cost estimate for the feasibility study.

There is an opportunity to create a “loop” trail at the north end of the project using whichever alignment option is not eventually selected as the STO route. The 1000 road can connect the Upper (1300 Road) and Lower (1100 Road) routes at the south and the town can connect the routes at the north. This will be an amenity for the town. The loop segment that is not STO trail will likely require a different funding source than that used for the STO.

2.8 Analysis of Planning Alignments

For the first several months of field study, desktop engineering and Working Group meetings, three alternative alignments were being considered. Variations on each of the alignments were considered and the specific route of each of the alignments evolved over time, as is demonstrated by the options considered and discussed in the previous section. Per this analysis and discussion of the Working Group, the Lower option was removed from consideration for further study and more detailed engineering in March of 2017. Below are the statistics for each of the alignments at the time of this decision. If compared closely with the statistics for the Combo and Upper alignments as summarized in the following chapter, one will notice discrepancies. This is due to the alignments being continually refined during the planning process and more specific engineering design occurring during the preliminary engineering phase.

Comparison of Alternatives During the Planning Phase

	Combo	Upper	Lower
< than 5% :	95%	90%	66%
5% to 8.33%:	5%	10%	27%
> 8.33%:	0%	0%	6%
% Currently Trail:	2%	3%	15%
% Currently Road:	70%	66%	68%
% New Path:	28%	31%	17%
Distance:	7.4 Miles	6.1 Miles	6.3 Miles

Evaluation Criteria & Scoring Process

The evaluation of alternate routes was an iterative process, the pros and cons of each were discussed amongst Working Group members, each with a diverse expertise and interest related to the project. This is demonstrated by the various segments considered and discussed in the previous sections.

Early in the planning process and during the second Working Group meeting a list of evaluation criteria was presented to the group. The goal for developing these was to create a semi-quantitative means to track and score the alternate routes we were considering. The discussion resulted in additional criteria being added, categorization of the criteria, a potential value for each of the criteria (between 0 and 3), and a scoring of each route with regards to that criteria value. At each of two subsequent meetings we revisited the evaluation criteria based on changes to the evolving alternative alignments. The table on the following page represents the last scoring exercised performed, at which point the Working Group decided to focus further planning and engineering efforts on the Combo and Upper alignments, dropping the Lower alignment from further consideration.

AR

Figure 2AR: In-field Verification of Routes as Generated by Desktop Engineering (Photo Courtesy of Don Willott)

AS

		very important			not important	Upper / West	Score	Lower/East	Score	Combined-East/North & West/South	Score	Comments on Criteria
CONNECTIONS						Notes and/or quantities		Notes and/or quantities		Notes and/or quantities		
1	Meets shared-use path AASHTO design stds.. (eligible for funding)	3				83% is 5% or less, 10% is 5-8%, 7%is >8%	2	66% is 5% or less, 27% is 5-8%, 6% is >8%	2	90% is 5% or less, 10% is 5-8%, 0% is >8%	3	See standards provided in table and trail sections
2	Provides regional connectivity-STO Trail	3				Highway 104 to Stottlemeyer	3	Highway 104 to Stottlemeyer	3	Highway 104 to Stottlemeyer	3	To STO trail north & south ends
3	Provides regional connectivity-Communities	3				Poulsbo, Kingston, Port Gamble	3	Poulsbo, Kingston, Port Gamble	3	Poulsbo, Kingston, Port Gamble	3	Poulsbo, Kingston, Port Gamble
4	Connects to developed/proposed recreation facilities		2			Connects to proposed Ride Park	2	Connects to Airfield and Heritage Park	2	Connects to Airfield, Proposed Ride Park	2	Ride Park, Airfield, Heritage Park
5	Connects to recreation trails - mtn. biking + hiking		2			Mtn. Biking & Hiking	2	Mtn. Biking & Hiking	2	Mtn. Biking & Hiking	2	Throughout the site
6	Proximity to parking		2			Bridge P&Ride, Ride Park (proposed)	1	Airfield, Bridge P& Ride, Heritage (full)	2	Airfield Bridge P&Ride, New Lot (proposed)	1.5	Existing Bridge P&Ride,104 and proposed at Ride Park
7	Avoids conflicts with planned recreational uses (races)		2				2		1.5		1.5	Annual mountain bike and foot races- they use 1000 Road
8	Convenient ADA Access		2			Best once Ride Park complete	1.5	Acceptable with new lot	1.5	Acceptable with new lot	1.5	
9	Connects to highways and streets			1		104, Stottlemeyer	0.5	104, Stottlemeyer, Mid Pt.	1	104, Stottlemeyer, Mid Pt.	0.75	SR 104
10	Connects to future attractions			1		Winery, Amphi, H. barns, Info Ctr., Town	1	Town	0.5	Town, Airfield, Wetland Trails	0.75	
11	Connects to logging roads				0		0		0		0	Not determined to be important
LAND OWNERSHIP & LAND USE												
1	Located on public land	3					2.5		2.5		2.5	N. Portions on OPG- All, Assume 6/2017 purchase will occur
2	Uses existing logging roads and/or trails	3				66% Roads, 3% Trail, 31% New Trail	2	68% Road, 15% Trail, 17% New Trail	2.5	70% Road, 2% Trail, 28% New Trail	2	
3	Located on private land where easement is feasible			1			1		1		1	
ECOLOGY & LANDSCAPE CHARACTER												
1	Minimize disturbance- wetlands / drainages	3					3		1.5		2	Per ELS wetland assessments
2	Minimize disturbance- near identified habitat (eagle, etc..)	3					3		1		2	
3	Minimize disturbance- forest in protected mature stands	3										Need more data - where are these?
4	Minimize disturbance- topography /steep side slopes	3				1800 LF	2	3200 LF	1.5	800 LF	3	
5	Diversity of views and landscape character		2			Water, Forest, Farm & Mountain Views	2	Water, Forest, Ravine Views	1.5	Forest, Wetlands, Water, Farm & Mountain Views	2	
6	Minimize disturbance- forest in timber management areas			1			1		1		1	Most forest being actively managed for timber
7	Interpretive opportunities			1		Views, Forest Mgmt.	1	Views, Farm, Forest Mgmt.	0.5	Eagle, Habitat, Views, Forest Mgmt.	1	
CAPITAL COSTS												
1	Minimizes structures (bridges and walls)	3				Bridge near town needed	2	Culverts	2		1.5	
2	Minimize cost	3				Shortest, Moderate Retaining Walls	3	Mod Length, Most Slopes w/ Retaining Walls	2	Longest with fewest slopes/ retaining walls	2.5	
3	Minimizes overall length		2			31,957LF, 6.1 Miles	2	33,160 LF, 6.3 Miles	1.75	39,120 LF, 7.4 Miles	1.5	
		33	14	5	0		42.5		37.3		41	Maximum Points =52

Table 2AS: Evaluation Criteria & Scoring from Working Group Exercise

AT

Figure AT: Wetland Complex at Project Site (Photo Courtesy of Jeff Peterson)

2.9 Preliminary Engineering/Site Optimization Software

The feasibility of routing approximately six miles of trail through hilly terrain was made efficient through the use of various software. The alignments were engineered using both AutoCAD Civil 3D and SiteOps. AutoCAD was used to develop horizontal and vertical profiles for trail segments proposed on existing roadbeds. In the case of SiteOps, the alignment was draped over a terrain model (Figure 2AU), and minimum/maximum longitudinal centerline profile slopes were inputted, together with the proposed cross-section template and pavement section depths. SiteOPS analyzed the minimum/maximum elevations- every point can be based on the design thresholds inputted. The design thresholds were based on AASHTO standards summarized in Table 2D and shown graphically with trail cross sections in Section 3 of the report. The final step yields a finished grading plan and a quantity of materials for that alignment. This information was then imported into AutoCAD Civil 3D software to produce the feasibility plan and profile sheets found in Appendix A. A plan and profile sheet is shown an example on the opposite facing page in Figure 2AF.

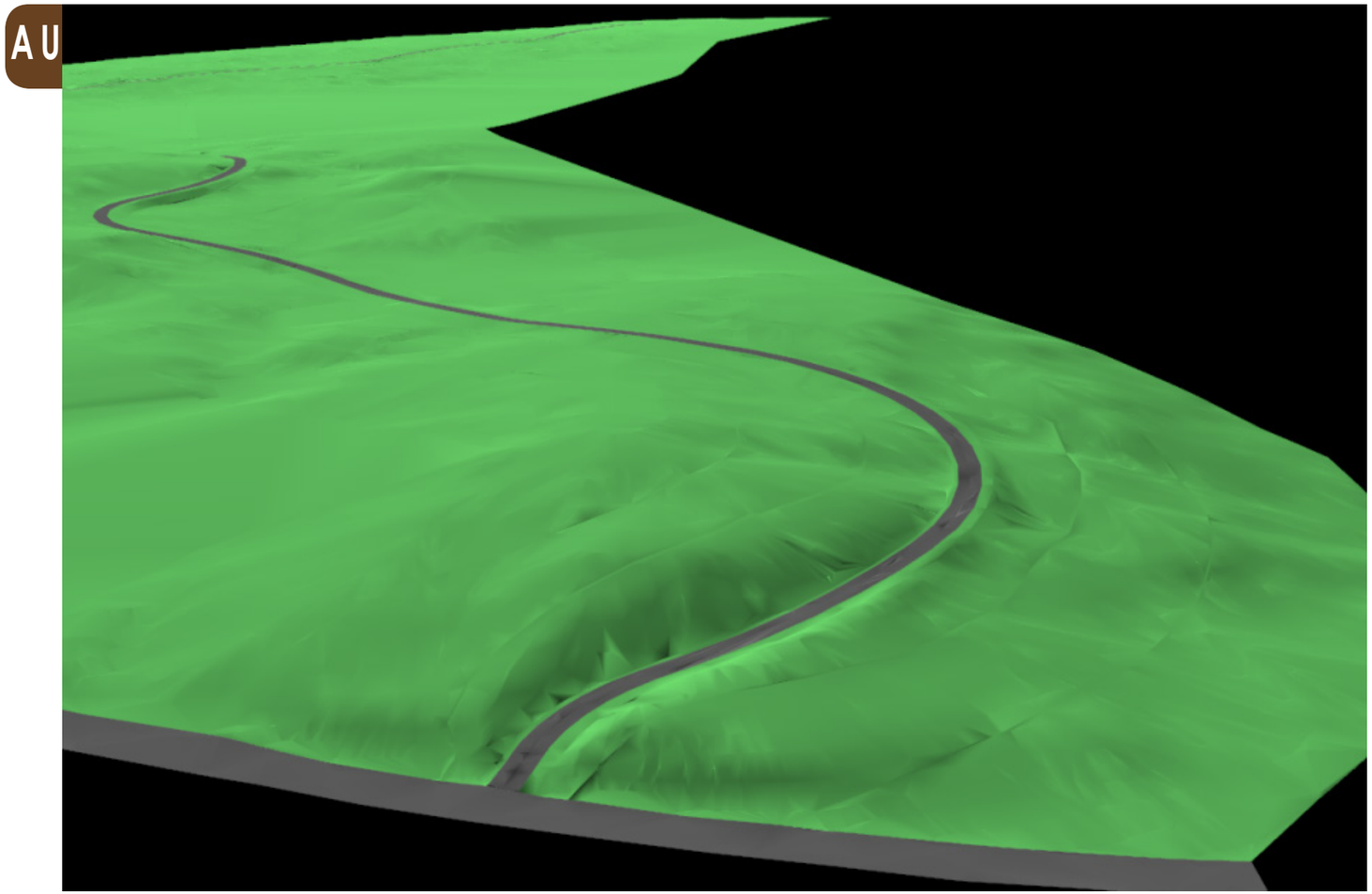
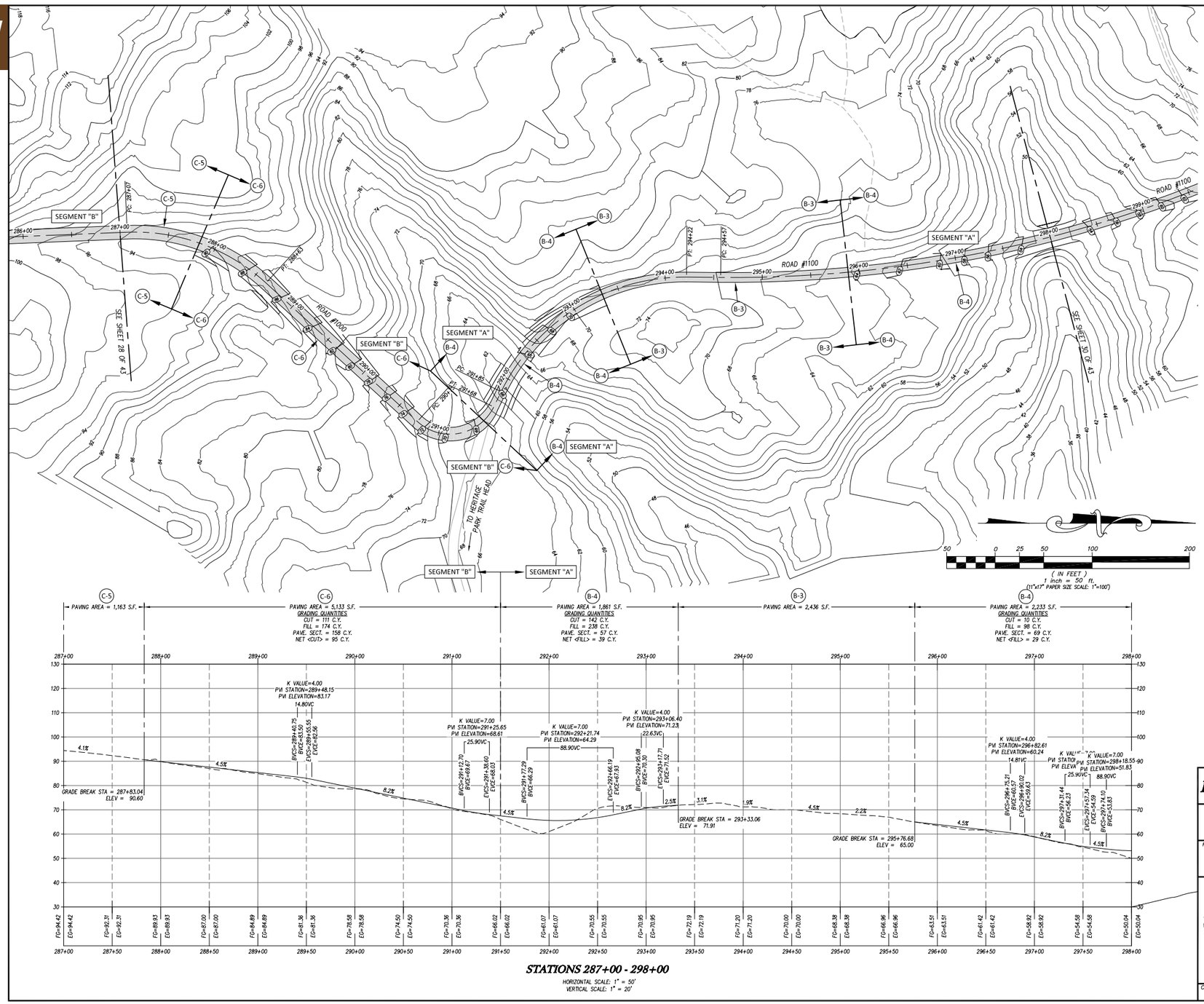


Figure 2AU: Graphic Output of Site Ops for Trail Segment off of Stottlemeyer Road (Image Courtesy of MAP)

AV



PROPOSED TRAIL TYPES/SECTIONS

A – 10' WIDTH: SEPARATED FROM ROAD

B – 10' WIDTH: SHARED (NO LOGGING)

C – 14' WIDTH: SHARED (LOGGING TRUCKS)

ROAD CATEGORIES

1 – 10' PAVEMENT WIDTH FOLLOWING EXISTING GRADE

2 – 10' PAVEMENT WIDTH AT NEW GRADE

3 – 10' PAVEMENT WIDTH ON EXISTING ROAD FOLLOWING EXISTING GRADE

4 – 10' PAVEMENT WIDTH ON EXISTING ROAD AT NEW GRADE

5 – 14' PAVEMENT WIDTH FOLLOWING EXISTING GRADE

6 – 14' PAVEMENT WIDTH AT NEW GRADE

7 – 14' PAVEMENT WIDTH ON EXISTING ROAD FOLLOWING EXISTING GRADE

8 – 14' PAVEMENT WIDTH ON EXISTING ROAD AT NEW GRADE

LEGEND

PROPOSED PORT GAMBLE TRAIL

N.K.T.A. EX. ROADS

CONTOURS PER KITSAP COUNTY LIDAR SOURCES

NO.	DATE	DESCRIPTION	BY
4	12-15-17	REVISED PER COMMENTS	KPF/QJD
3	11-22-17	REVISED PER COMMENTS	KPF/QJD
2	11-1-17	REVISED PER COMMENTS	KPF/QJD
1	9-28-17	REVISED PER COMMENTS	KPF/QJD

PORT GAMBLE TRAIL FEASIBILITY STUDY

STATION 287+00 - 298+00

FOR
FISCHER BOUMA PARTNERSHIP
310 MADISON AVE SOUTH, SUITE A
BAINBRIDGE ISLAND, WA 98110

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Silverdale 692-5525 • Seattle (206) 682-5574
Fax (360) 698-0546
ENGINEERING + SURVEYING
PLANNING

CALCULATED	DESIGN	DRAWN	CHECKED	DATE	SCALE	JOB NO.	SHEET
		QJD	KPF	7-17-17	1" = 50'	6696	29 OF 43

Figure 2AV: Engineering Plan and Profile Example

3

FINDINGS & RECOMMENDATIONS

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A

Figure 3A: Existing Gravel Road

CHAPTER 3: FINDINGS AND RECOMMENDATIONS

Chapter 3 summarizes the preferred trail alignment and highlights the opportunities and constraints associated with the alignment. Conceptual construction methods and materials are introduced including a discussion of the standard trail cross sections. A summary of the probable project costs, including construction costs and soft costs, such as environmental, permitting, design and engineering, are included at the end of the chapter.

3.1 Alternative Alignments

The following section summarizes the preferred Combo alignment and the additional Upper route segment and highlights some of the opportunities and constraints of each. Refer to Figure 3B for a graphic of the alignments.

Combo Alignment (Preferred) Data

Type A Trail (10’ width, separated):	1,130 LF	0.2 Mi.
Type B Trail (14’ width):	24,333 LF	4.6 Mi.
Type C Trail (10’ width):	9,852 LF	1.9 Mi.
Total Trail Length:	**35,315 LF**	**6.7 Mi.**

Eighty-seven percent (87%) of the trail will be under 5% in grade. Thirteen (13%) of the 6.67 mile trail will be between 5% and 8.3% in grade. None of the trail will be over 8.33%.

Upper Segment (Additional) Data

Type A Trail (10’ width, separated):	6,286 LF	1.2 Mi.
Type B Trail (14’ width):	3,923 LF	0.7 Mi.
Type C Trail (10’ width):	0 LF	0 Mi.
Total Segment Length:	**10,209 LF**	**1.9 Mi.**

Seventy-five percent (75%) of this segment will be under 5% in grade. Six (6%) of the 1.9 mile segment will be between 5% and 8.3% in grade. Nineteen (19%) of the segment will be over 8.33% along the proposed OPG development road.

Segment Descriptions

The following section describes each of the distinct segments of trail from south to north. The segment descriptions in this section are similar to, but do not exactly correspond, to segments for costing in the following section. The preferred Combo route segments are summarized first, followed by the additional Upper route segments.

Preferred Combo Alignment Segments:

1 - Stottlemeyer Road NW to 1800 Road

Starting from the existing parking/trailhead at Stottlemeyer, the trail will enter NW into the forest and begin climbing the slope up to the top of the plateau. There is a significant length (approximately 900 LF) of slopes between 5 and 8.33% at the beginning of the trail. This trail segment will be a Type C trail which is 10’ wide. It will not be placed on an existing roadbed; instead the trail will be new construction. This segment is approximately 4,750 linear feet (0.9 miles). There will not be a need for periodic closures during logging as this will only accommodate maintenance vehicles. The first 360 LF of trail off of Stottlemeyer will be on OPG property and will require an easement. The trail then crosses into County Park land. Refer to the detailed maps in the report for this area.

2 - 1800 Road North to 1000/1300 Road Junction

Once this trail climbs to the top of the ridge, it will intersect with the 1800 Road. The trail then turns north and runs approximately 15,800 LF (3.0 miles) until it intersects with the 1000/1300 Road junction. The trail will primarily be built on top of the existing logging road and will be Type B, which is 14’ in width. This is the longest and flattest segment- there is only 700 linear feet of slopes between 5 and 8.33% along this 3.0 mile segment. There will be a need for periodic closures during logging activities as this is the main spine road on top of the plateau.

3C - 1000/1300 Road Junction to 1100 Road Junction

This Combo alignment segment turns to the east from this junction and begins the descent off of the plateau down into the lowlands. It utilizes the existing 1000 Road; however, due to steep slopes the trail will be realigned in a few locations to

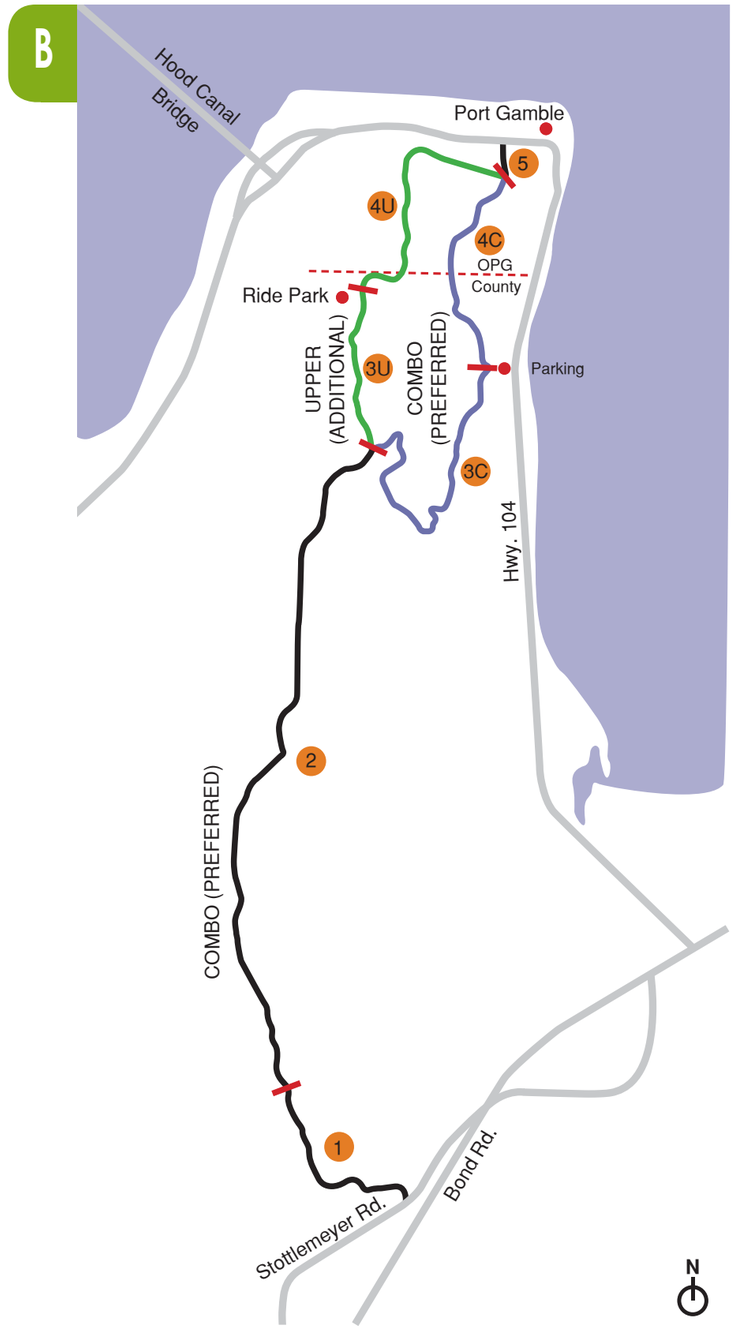


Figure 3B: Alignment Segments

provide the horizontal length required to achieve a grade of under 8.33%. The distance from the junction down to the 1100 Road junction near the Hwy 104 parking area is approximately 8,300 LF (1.6 miles) in length. The trail will be built primarily on top of the existing logging road and will be Type B which is 14' in width. This segment has several stretches totalling approximately 2,000 linear feet that are between 5% and 8.33% slope but nothing greater than 8.33%. There will be a need for periodic closures during logging activities as this is the main access road to the top of the plateau.

4C - 1100 Road Junction to Carver Drive/OPG Road

This Combo alignment segment runs from the 1000/1100 Road junction near the Hwy 104 parking area north through forest and adjacent to large lowland wetland complexes. It utilizes the existing 1100 Road. Approximately 150 LF of boardwalk will be required where the beaver pond frequently overflows the existing road as shown between stations 339+00 and 340+50 on the engineering plans. The boardwalk would be wide enough to accommodate the 10' wide trail and built directly on top of the existing road. Refer to page 51 of this report for an example of the PermaTrak system suggested, which utilizes concrete, not timber, planks. This trail segment ends at Carver Drive as designed by OPG in their most recent development plans. The distance is approximately 5,200 LF (1.0 mile) in length. The trail will be built primarily on top of the existing logging road and will be Type C which is 10' in width. This segment has a few stretches totalling approximately 600 linear feet that are between 5% and 8.33% slope but nothing greater than 8.33%. There will not be a need for periodic closures during logging activities as this segment will only be used by maintenance or emergency vehicles, not logging trucks.

5 - Carver Drive to Proposed Hwy. 104 Roundabout

At Carver Drive the trail would cross the street on a crosswalk and become separated from the road. It would be a Type A trail which is 10 feet wide. OPG has designed the development and roads in a way to allow for the 10' path, 2' shoulders on each side and a 5' separation from the road edge. The distance of this small segment is approximately 1,100 LF (0.2 miles) in length. The trail will be new construction next to the new road. This segment has a two stretches totalling approximately 400 linear feet that are between 5% and 8.33% slope but nothing greater than 8.33%. No vehicles will need to use this path as it will site adjacent to a road.

Additional Upper Route Segments:

3U - 1000/1300 Road Junction to Ride Park Road

This Upper alignment segment continues north from this junction on the plateau and continues to the proposed Ride Park and proposed OPG development. It utilizes the existing 1300 Road. It is relatively flat and primarily has slopes less than 5%. The distance from the junction to the Ride Park is approximately 3,800 LF (0.7 miles) in length. The trail will be built primarily on top of the existing logging road and will be Type B which is 14' in width. It is at the Ride park that the trail will transition from Type B to Type A and become a separated path adjacent to a new road accessing the Ride Park. There will be a need for periodic closures during logging activities as this is the main spine road on top of the plateau.

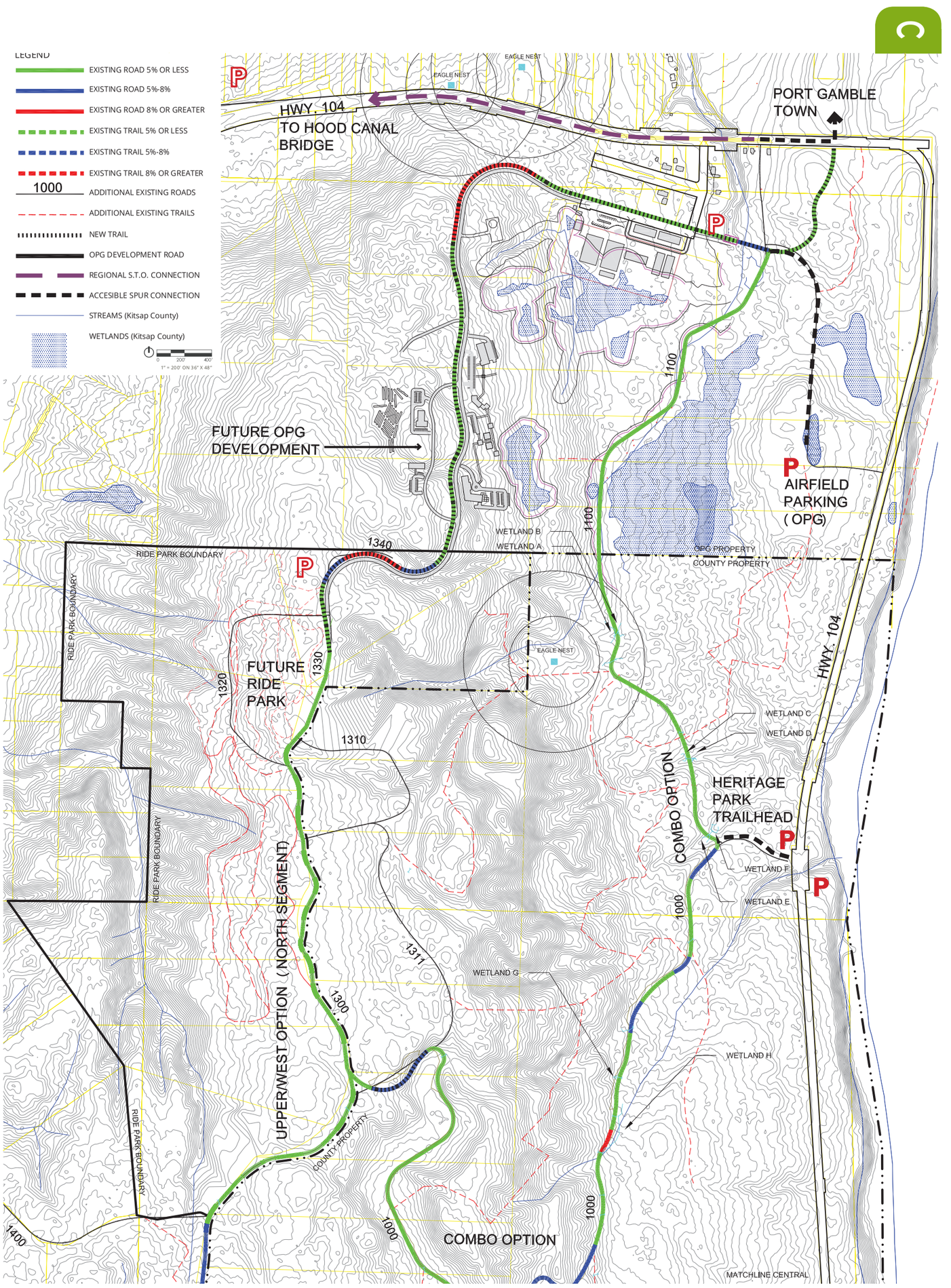
4U - Ride Park Road to Carver Drive

This Upper alignment segment runs from the proposed Ride Park for a few hundred feet to the County/OPG boundary line. It then runs through the proposed OPG development (currently in the area of Babcock Farm) along a proposed road named Carver Drive. It is descending steeply for a majority of this segment. For 600 linear feet between the Ride Park and the County/OPG property line, the grade of the road and adjacent trail would be 9%. It then turns east, continuing to follow Carver Drive until it reaches a point where the Combo route alignment intersects. At this bend where it turns east it becomes steep again- there are 800 linear feet with a grade of 9%. The distance of this segment is approximately 6,400 LF (1.2 miles) in length. It would be a Type A trail which is 10' wide and separated from the road. OPG has designed the development and roads in a way to allow for the 10' path, 2' shoulders on each side and a 5' separation from the road edge. In all, OPG has planned for an additional 17' of ROW for a trail along the road in their development. The trail will be Type A which is 10' in width. The trail will be new construction next to the new road. No vehicles will need to use this path as it will site adjacent to a road.

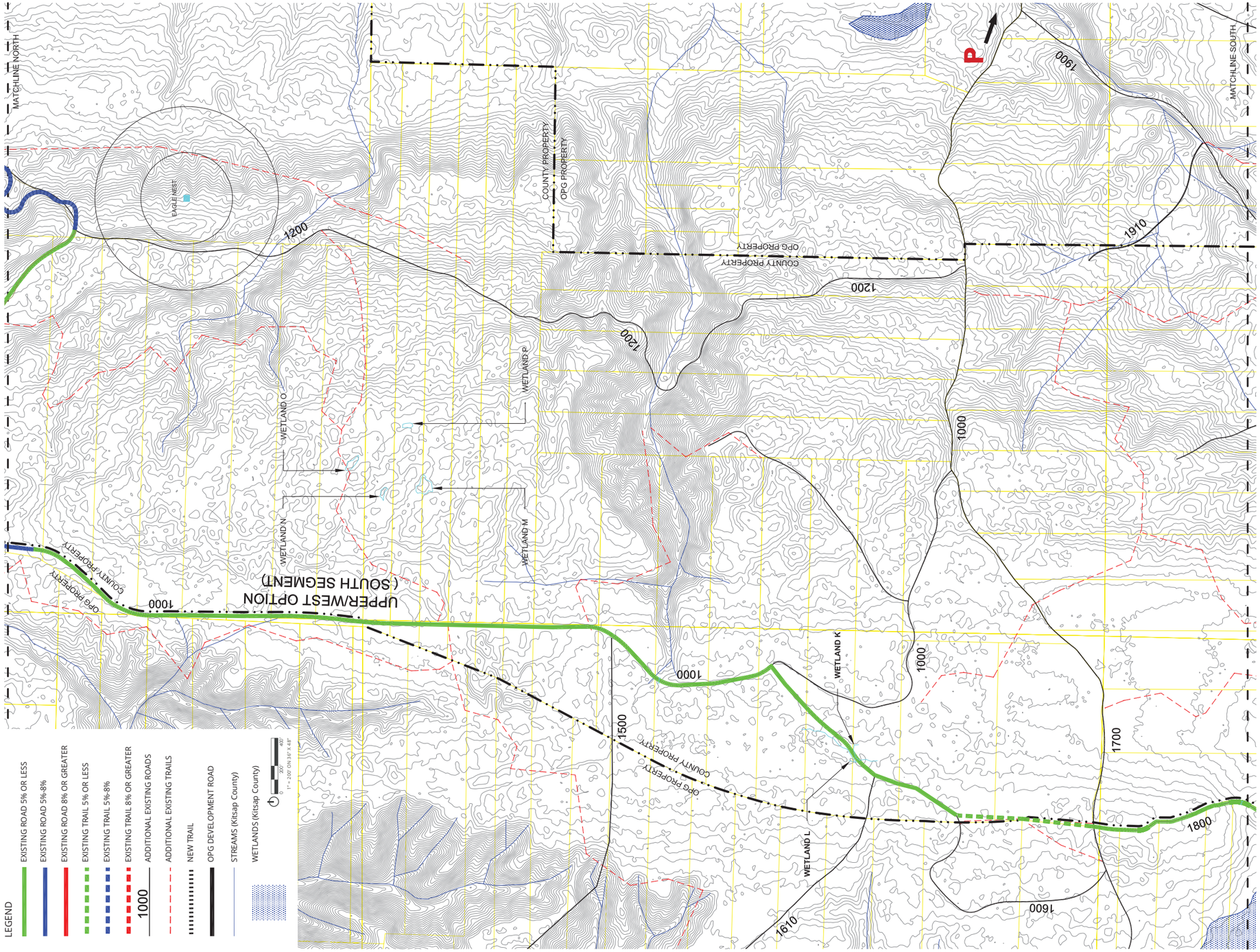
Comparing the Combo and Upper Northern Segments

Alignment:	COMBO (3C & 4C)	UPPER (3U & 4U)
Length (linear feet):	13,485 LF	10,209 LF
Length (miles):	2.6 Mi.	1.9 Mi.
Type A Trail (10' width):	0 LF	6,286 LF
Type B Trail (14' width):	8,385 LF	3,923 LF
Type C Trail (10' width):	5,100 LF	0 LF
On Existing Road:	9,346 LF	6,434 LF
New Construction:	4,089 LF	3,775 LF
<5% Grade	10,715 LF	7,669 LF
5-8.33% Grade	2,770 LF	655 LF
>8.33% Grade	0 LF	1,885 LF

Alignments (North)



Alignments (Central)



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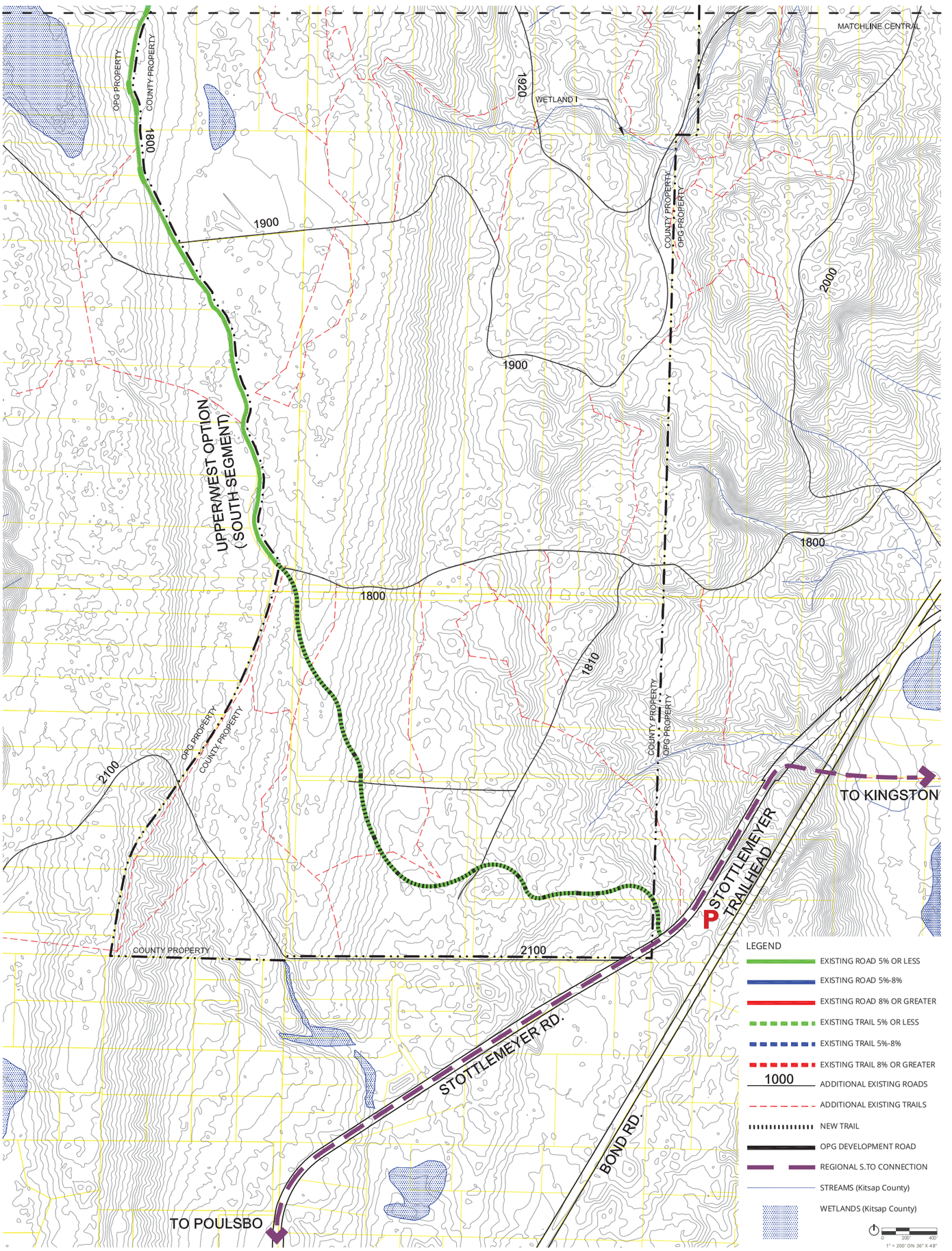

Alignment (South)

3.2 Elevation Profiles

The following diagrams show the elevation profiles for both the preferred Combo alignment (Figure D) and the additional Upper route segment at the north end of the project (Figure E). As is evident, a significant portion of the middle of the alignment is relatively flat- under the 5% grades as recommended in the guidelines. It is at both the southern and northern ends of the proposed alignment that challenges arise in getting down off the ridge. Figure D shows the entire length of the proposed trail while Figure E shows the additional segment from the 1300/1000 Road junction north, through the OPG development and down to the town of Port Gamble. The vertical scale has been exaggerated five times the horizontal scale for emphasis.

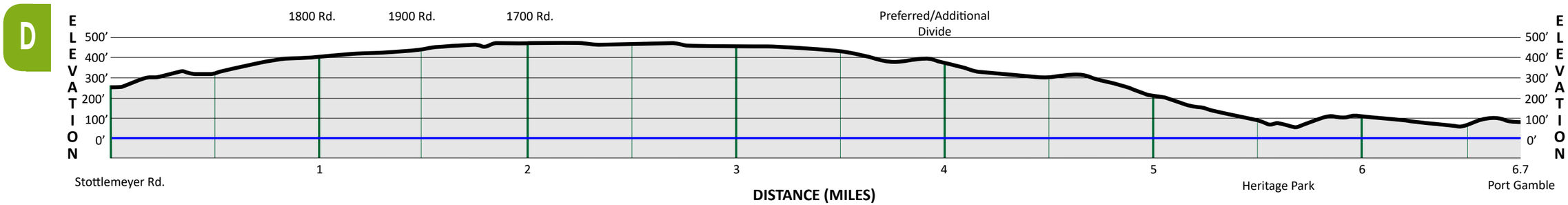

Figure 3D: Elevation Profile for the Preferred "Combo" Alignment

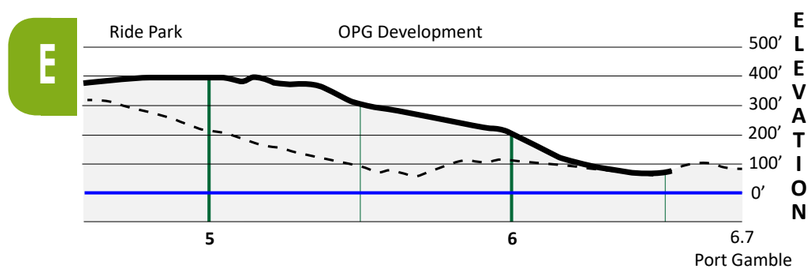

Figure 3E: Elevation Profile for the Additional "Upper" Segment

3.3 Comparison of Preferred and Additional Alignment Segments

The primary challenge from the beginning of the planning process was to find the best route from the Town of Port Gamble up to the top of the ridge. Two options, each with different issues, became evident during the early planning process. This study concluded that the Combo route was the preferred alignment for this northern section but that the Upper route provides an additional trail opportunity as a recreational loop trail. The Upper route could be considered viable as a feasible STO alternative should project conditions change with regard to the timing of the development of the OPG road up to the Ride Park.

Length and Grades

The north segment of the Upper segment, at 1.9 miles, is 0.7 miles shorter than the Combo segment. However, this segment has almost 1,900 linear feet that is over 8.3% in grade (between 9% and 10%). This segment does have approximately 2,100 less linear feet between 5% and 8.3% grade though. From a user experience standpoint, each route poses some challenges regarding difficult grades. Starting from Port Gamble town, one must begin ascending right away on the Upper route to get up to the ridge near the proposed Ride Park. For the Combo option, one has over a mile of flat terrain until the trail ascends the 1000 Road starting near the Stumps parking area. The Upper segment may require a bridge over a ravine along Carver Drive, depending on the road and bridge designed for this area by OPG.

Context & Views

The Upper segment will be able to take advantage of a recreation amenity already being planned for the area- the Ride Park. This will be a recreational amenity along the trail that has uses complimentary to the STO and facilities, such as parking, that would benefit the trail. There are also amazing views north of Mount Baker and the North Cascade Mountains from the Upper segment. However, this segment of the trail would be running adjacent to a proposed road in the OPG development at Babcock Farm. This presents completely different experience than riding on the north segment of the Combo segment which will wind through forest and between large wetlands.

Land Use and Development Complexity

There is uncertainty regarding the schedule for construction of the OPG road, which would provide the ROW width for the separated trail. The proposed development along this road is currently scheduled for a later phase of the OPG project. In the interim, the County and OPG will be coordinating to figure out the best way to provide access up to the Ride Park, which may or may not follow the proposed OPG development road. Both the Upper and Combo segments have a significant length within OPG lands which will require that the County obtain easements for the trail.

The pros and cons for each of the northern routes considered are summarized below.

Preferred Combo Segment PROS

- Utilizes existing logging roads
- Grade of the trail is all under 8.3%
- Proximity to the parking areas along Highway 104

Preferred Combo Segment CONS

- Longer than the Upper segment and a less direct route
- More of the trail will need to be shared with logging operations/uses
- Contains approximately 2,000 LF more of 5 to 8.3% grade
- Cost of construction is more
- More impact to wetlands and wetland buffers
- Section of boardwalk will be required over the beaver pond

Additional Upper Segment PROS

- Shorter and more direct route into Town of Port Gamble
- Less trail will need to be shared with logging uses
- It is relatively flat (<5%) along the top of the ridge
- Cost of construction is less
- Adjacent to the future Ride Park and parking area

Additional Upper Segment CONS

- Relies on OPG road to be developed
- OPG timing and funding of the road uncertain- schedule is not defined by OPG but could be as many as 10 years out or more
- New County road segment required to close the gap between OPG development road and Ride Park area (approximately 1,230 LF)
- Trail can not be built to standards without the construction of Carver Road
- More steep (between 8.3% and 10%), although still meeting standards when following a road
- User experience, due to steep grades and adjacency to a developed road, may be compromised
- An expensive pedestrian bridge along Carver Drive over a ravine may be required

3.4 Trail Types/Sections

Three trail types (represented as sections) are practical for the proposed trail within the study area. These sections were used in the preliminary engineering of the trail and development of the cost estimate. For a majority of the trail, these sections will be integrated with the existing roadbed. The cost estimate was generated based not only on the type/section being proposed but the condition of the existing roadbed upon which it would be built.

Type A - Sidepath Along Road

For roads where public use occurs or where the volume of traffic is frequent, the shared-use path will be located adjacent to the road with a 5 foot buffer as required by AASHTO standards. If this buffer is less than 5 feet then a physical barrier must be provided between the road and trail. The trail will be 10 feet wide in this case and have 2 foot minimum shoulders. This trail will not be open for use to any vehicles, including maintenance or emergency vehicles as they will be able to access areas of the trail from the adjacent road. The area of disturbance outside of the trail would be between 17 and 21 feet depending on the width of the shoulders. Figure 3F provides an image similar to this condition and Figure 3I provides a section of this condition.

Type B - Shared Path (14' Width)

The Working Group determined that the existing road corridor should be used for the shared-use path as well whenever possible. These roads are not open to the public and are used infrequently. The shared use path would be constructed on top of the existing roadbed. Use of the shared-use path will be restricted during periodic logging operations. As such, the increased width (4 feet wider than the AASHTO minimum standard) is meant to accommodate the largest anticipated vehicle which is a logging truck. The wider path will minimize damage to the edges of the path. The area of disturbance outside of the trail would be between 18 and 26 feet depending on the width of the shoulders. Figure 3J provides a section of this condition.

Type C - Shared Path (10' Width)

This is the same cross-section as Type B except that it is 10 feet wide instead of 14 feet wide. This trail section will be able to accommodate maintenance and the periodic emergency vehicles but not large logging trucks. The area of disturbance outside of the trail would be between 14 and 22 feet depending on the width of the shoulders. Figure 3G on this page provides an image similar to this condition and Figure 3K on the following page provides a section of this condition.

F

Figure 3F: Type A Trail Example

G

Figure 3G: Type C Trail Example

H

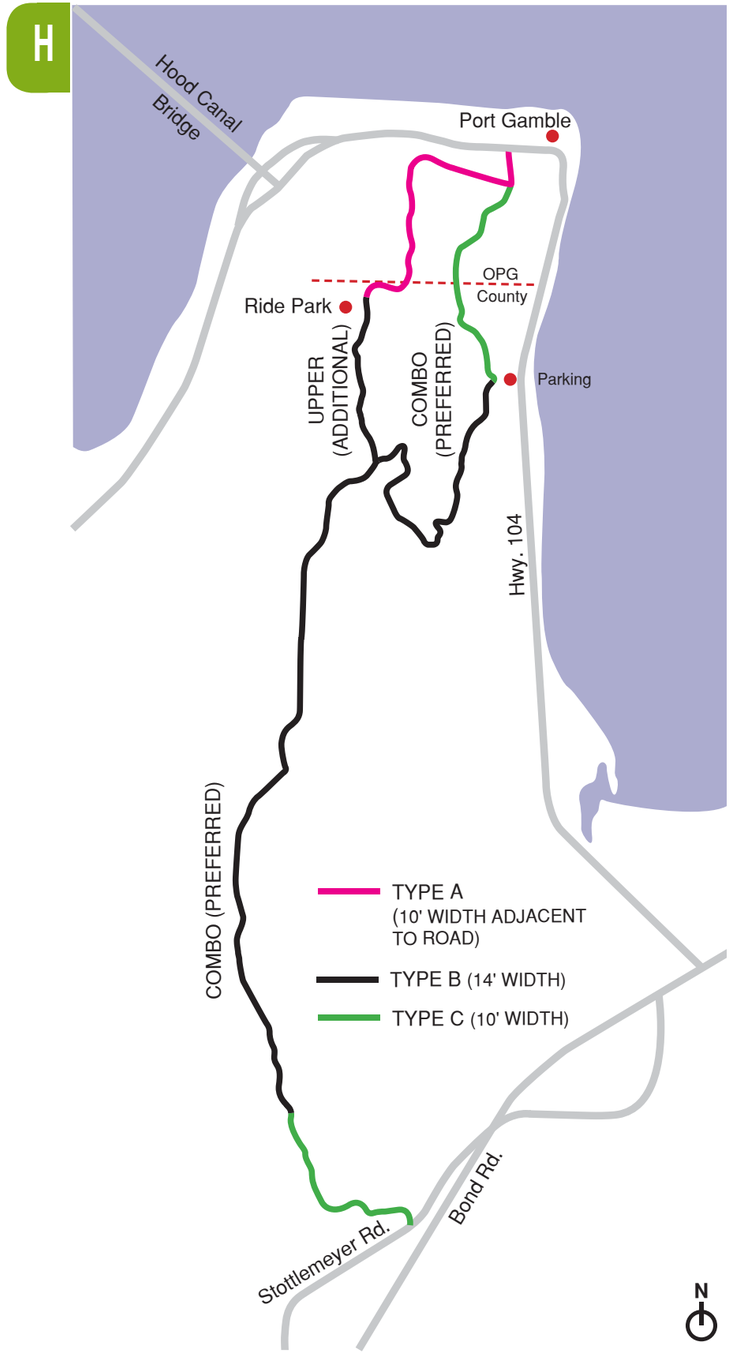

Figure 3H: Trail Type Location Diagram

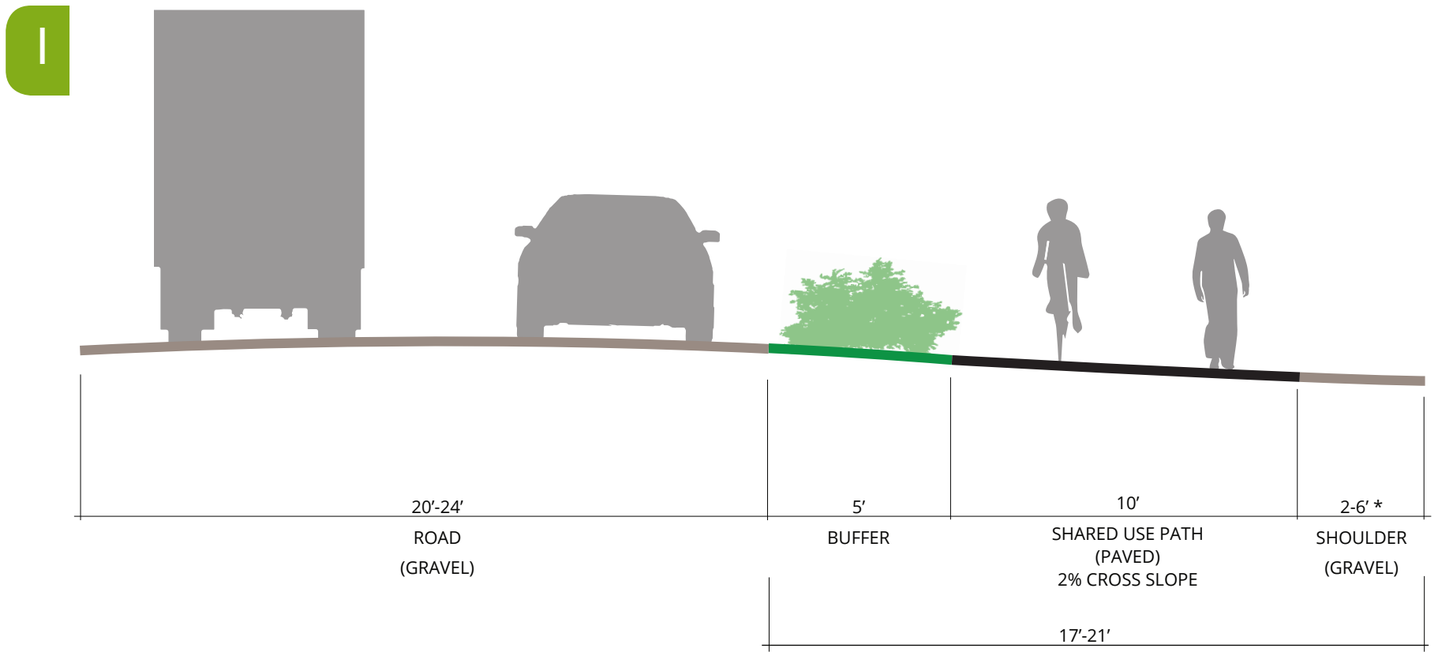

Figure 3I: Trail Type A - Sidepath Along Wide Road

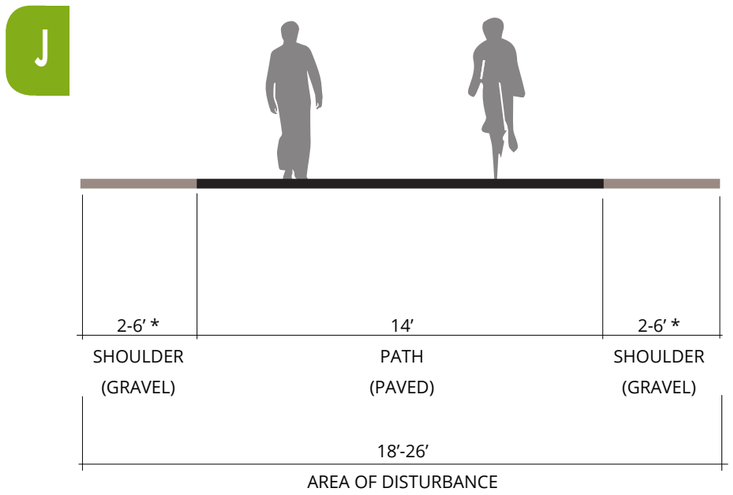

Figure 3J: Trail Type B - Shared Path (Closed When Used for Logging Activities)

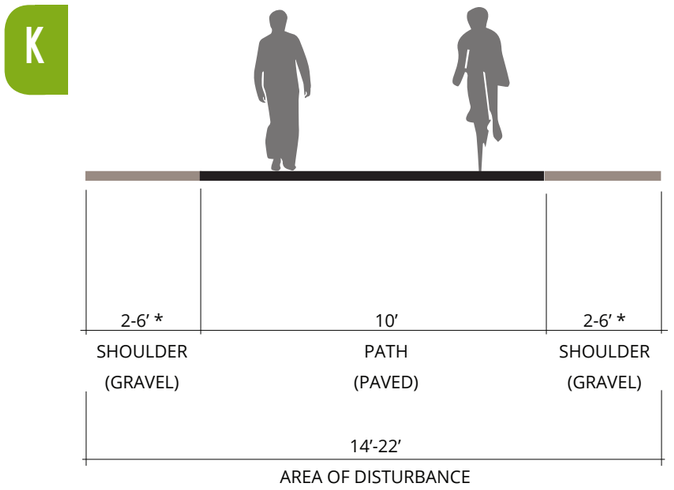

Figure 3K: Trail Type C - Shared Path (With Maintenance Vehicles Only)

3.5 Conceptual Construction Methods and Materials

Introduction

While the previous section described the alignment and site specific features along the preferred route, the following section describes in more detail construction methods, materials and other features that will be required to implement the trail and provide the whole user experience. A summary is provided for the element, method or material assumed to be best suited for the context of this particular project, which is reflected in the cost estimate. Additional methods or materials may also be discussed as a consideration by the County or design team during final engineering and implementation.

Typical Cross Sections

Standard Trail Cross Section

Figure 3M shows a typical shared-use path cross section where there is little cross slope. The dimensions are based on AASHTO standards and decisions by the County and consultant team during the design process. A summary narrative and table of the applicable AASHTO design standards was provided in Section 2.3 of the report. In this cross section, the paved trail is 10 foot wide with a 2% cross slope in the direction of the downhill side of the path. Gravel shoulders will be 2 feet wide on each side, except where the downhill slope exceeds 6:1 in which case the gravel shoulder on that side will be 5 feet wide. This cross section results in a disturbed width of 14 feet to 17 feet.

Cross Section on Steep Slope Without Retaining Walls

Figure 3M shows a shared-use path cross section where there is a significant cross slope without retaining walls. This cross section results in a disturbed width of 25 feet to 30 feet based on having to accommodate the steep cross slopes and providing a 1V:2H slope on the uphill (cut) side of the trail. In addition, a rail may be required on the downhill side of the trail if the shoulder is less than 5 feet width and the side slope is 1V:3H or steeper with a drop of 6 feet, 1V:2H or steeper with a drop of 4 feet, or 1V:1H or steeper with a drop of 1 foot (AASHTO Section 5.2.1).

Trail Cross Section on Steep Slope With Retaining Walls

Figure 3O shows a shared-use path cross section where there is significant cross slope using retaining walls to minimize site disturbance on either side of the trail. This cross section results in a disturbed width of only 20 feet compared to 25 feet to 30 feet when retaining walls are not used. A rail is required on the downhill side of the trail.

Use of Walls for This Study

There is usually a trade-off between cost savings (no wall) and impact to habitat that is considered when determining where to use each one of these two sections. In this project area it was determined walls would not be included to reduce costs, even if there would be more of an impact to adjacent habitat. Since most of the areas that will require additional grading will be logged in the future, preserving adjacent forest was determined as less critical.

Use of Existing Gravel Roads

Standard Trail Cross Section

Figure 3L shows where the trail will be built on an existing road and where it will be completely new construction. There are cost implications that are figured into the cost estimate for the trail in each of these scenarios. Obviously it will be less expensive to build a trail when a solid gravel road base already exists. For the preferred Combo alignment 82% of the trail would be built on existing road while 18% would be new construction.

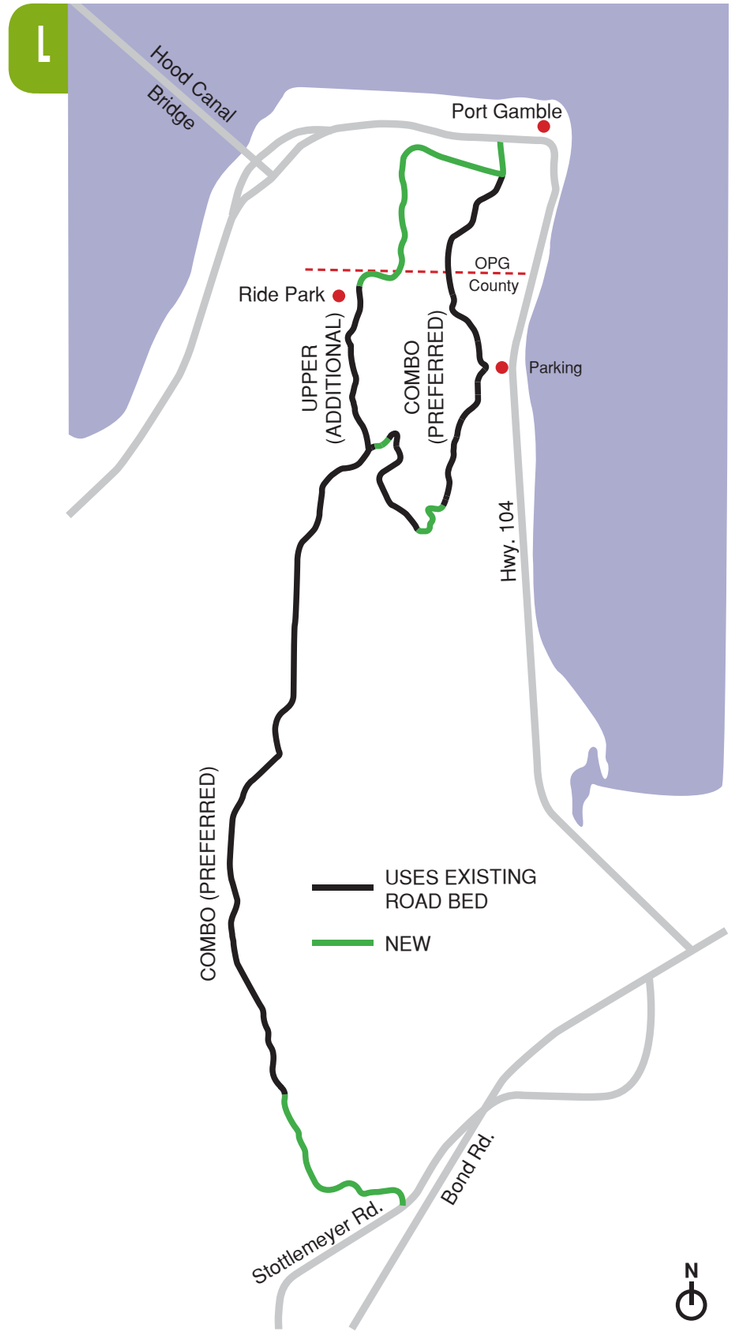

Figure 3L: Trail Proposed on Existing Road Versus New Trail

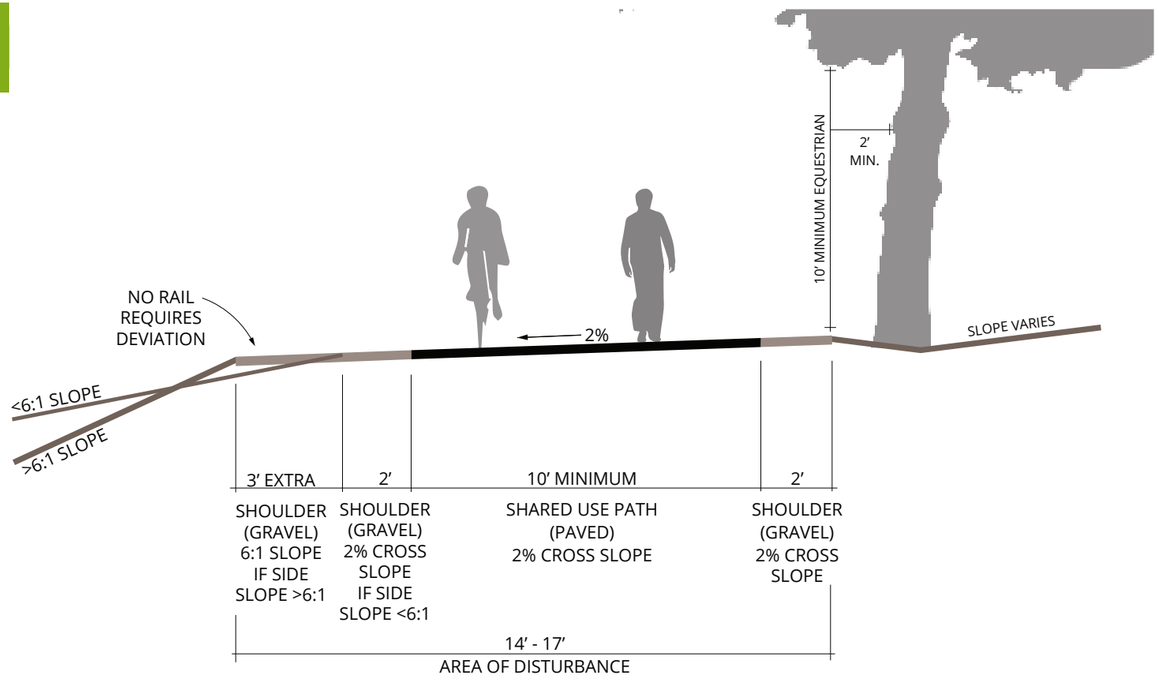

Figure 3M: Typical Trail Section on Minimal Cross-Slope

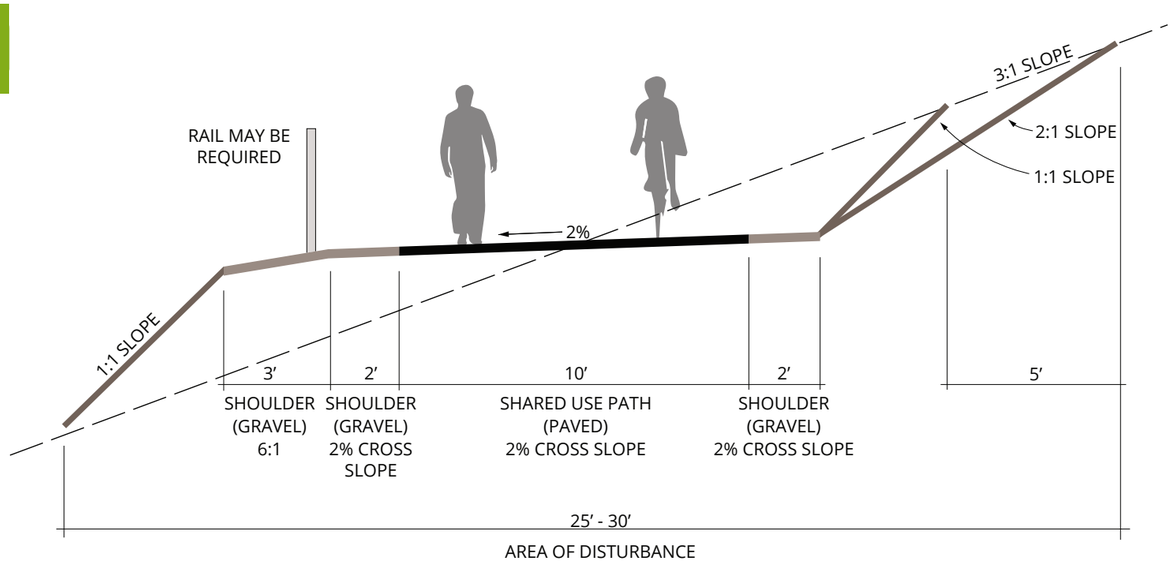

Figure 3N: Typical Trail Section on 3:1 Cross-Slope With No Walls

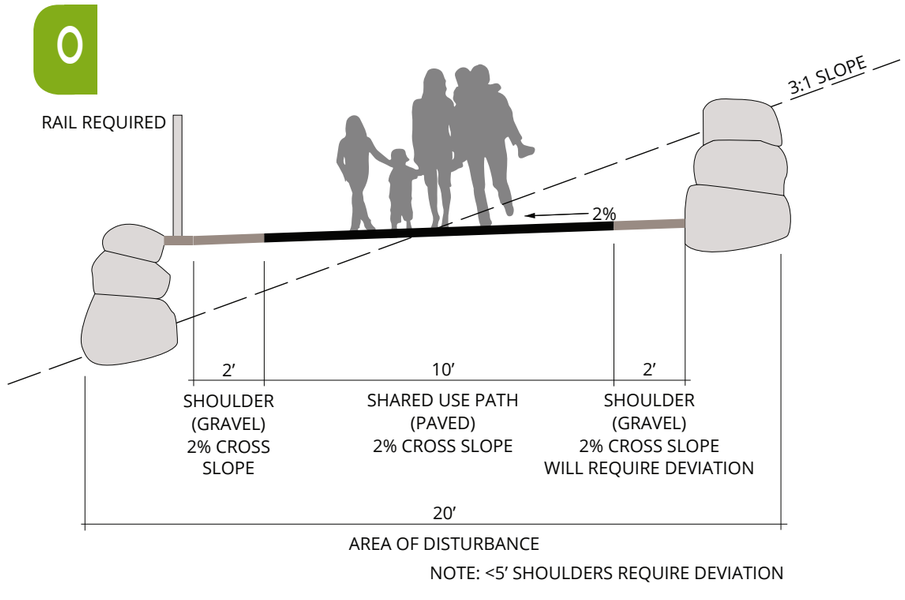

Figure 3O: Typical Trail Section on 3:1 Cross-Slope With Walls

P

Figure 3P: Typical Asphalt Pavement Surfacing

Trail Surfacing

For the purpose of this feasibility study, we have assumed that asphalt would be used as the pavement surface. Asphalt is easier to install and less expensive. However, asphalt is less durable than concrete with a life expectancy of 15-20 years. Asphalt requires more interim maintenance than concrete. The location of this path in a forest may make the asphalt path susceptible to heave from root growth beneath. Concrete has a higher installation cost but has a longer service life and reduced susceptibility to cracking and heaving from roots. For purpose of developing the cost estimate, the asphalt depth is assume to be 2 inch with a base course aggregate of 6 inch depth. Gravel shoulders would be 4" depth over compacted subgrade. This is the assumed pavement section for all trail/road types- whether used by logging trucks or not.

Q

Figure 3Q: Sketch of Trail Pullout

In-trail Landings

Several segments of the trail will have a grade over 5% but under the maximum 8.3% (1:12). There are no segments of trail over 8.3%. As such, FHWA standards require that a landing be provided every 200 linear feet along these steeper segments. These landings need to be level (2% cross slope) and under 5% in running slope. There are no pull-outs proposed along the trail as mitigation for steep slopes as there are no trail segments between 5% and 8.3% greater than 199 feet in length. There are instances where segments of steep slope (between 5% and 8.3%) occur back to back with a short segment of gentle (<5%) slope between them. For user enjoyment and convenience, future engineering may want to consider pull-outs or viewpoints in some locations.

R

Figure 3R: Example of Trail Crossing

Road Crossings

Trail crossings occur primarily on the additional Upper segment across proposed roads in the OPG development between the Ride Park and Town of Port Gamble. These roads will be low use on Port Gamble property.

For the purpose of this study and cost estimate, standard paint striping and signage are assumed to be the minimum that would be installed for safety. Guidance on the need for a signal and other traffic control devices is provided in the MUTCD and FHWA sources. Specific design of the crossing will occur in the engineering phase of the project.

S

Figure 3S: Typical Steel Bridge

T

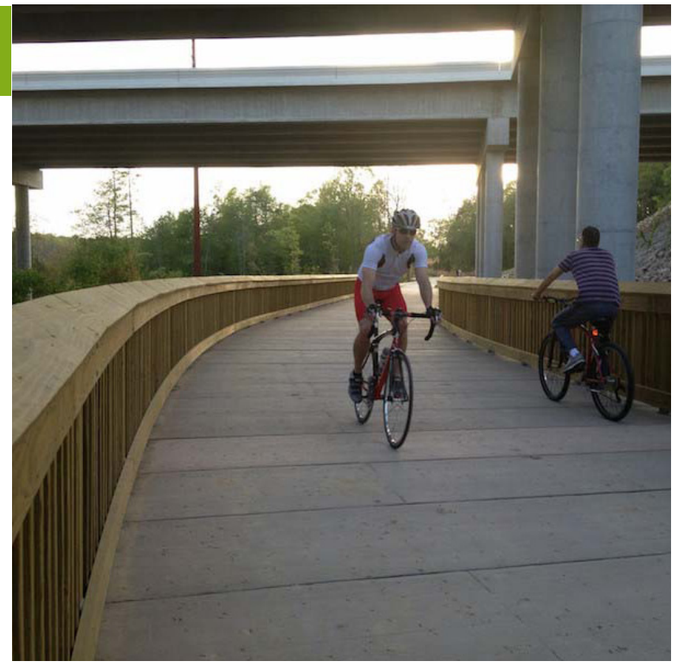

Figure 3T: Concrete Boardwalk (Image Courtesy of PermaTrak)

U

Figure 3U: Pin Pile Footings (Image Courtesy of Diamond Pier)

Bridges & Culverts

One 75-foot minimum span bridge over a ravine may be necessary in the additional Upper segment option. Carver Drive, a proposed OPG road, is shown in engineering plans as spanning this ravine. It is unclear at this time if it will need to be a road bridge. If so, it could be designed with additional width to accommodate the trail. For the purpose of this study we are assuming a separate pedestrian bridge as a cost analysis between the two options was not part of this study. Decking on the bridge would be paved similar to the adjacent trail. A pedestrian bridge, including abutments, will require design and engineering.

The preliminary engineering plans identify the need for new culverts. These occur where the existing road is being significantly regraded or where new roads have been proposed. Several other culverts already exist under existing roads and are not included in the estimate for replacement.

Boardwalk

Approximately 150 LF of boardwalk will be required in Segment A of the preferred Combo alignment. The existing road is within the wetland buffer and in one particular location- at the northern outlet, is constantly flooding in winter.

The live load should be designed to accommodate weights up to a small maintenance vehicle such as a Gator, as well as for wind, seismic, snow and equestrian use. The governing code for design of the boardwalk will be AASHTO LRFD Guide Specifications for Design of Pedestrian Bridges. For the purpose of the feasibility study and cost estimate, a concrete PermaTrak (http://www.permatrak.com/) boardwalk was estimated for cost. PermaTrak is an environmentally friendly precast concrete boardwalk system engineered for ease of flexibility. It requires little maintenance compared to timber. Timber can become slick in a wet environment such as the Pacific Northwest. Structural members of the PermaTrak system are also reinforced concrete. Timber may be considered as a lower cost alternative (approximately 25%-30% less) in he short-term but will incur higher maintenance and replacement costs over time. For the footing system, whether a PermaTrak boardwalk system or timber, a helical pile system is recommended due to the deep layer of bog soil that exists and the less impact this system has on critical areas. PermaTrak claims that its system can be constructed “top-down” which refers to the ability to install the boardwalk treads and beams from equipment operating on top of previously installed treads and beams. As such, sensitive areas can be protected during the construction phase.

Figure 3V: Example of Trailhead Kiosk

Figure 3W: Example of Wayfinding Sign Along Trail

Figure 3X: Typical Interpretive Sign Along Trail

Signage

Signs play an important role in the safety and enjoyment of a shared-use path. In a beautiful natural setting such as this, care should be taken not to install too many signs that could detract from the rural feel of the place. Three types of signs, described below, are required or would be appropriate for this section of path. They include regulatory signs, wayfinding signs and interpretation and education signs. Guidance is provided in AASHTO's Guide for the Development of Bicycle Facilities (2012, Fourth Edition).

Regulatory and Warning Signage

Regulatory and warning signs will be according to the MUTCD Part 9 which regulates the design and use of all traffic control devices. Regulatory signs, such as speed limit, yield, stop and others should be retroreflective and conform to the color, legend, and shaped requirements described in the MUTCD. Signs along the path may be reduced in size per Table 9B-1 of the MUTCD. Use of signs for shared-use paths are summarized in AASHTO Section 5.4.2. Regulatory signs have been included in the cost estimate.

Wayfinding Signage

Wayfinding is the process of navigating through a built or natural landscape whether familiar or unfamiliar, using information as provided. People navigate the environment based on a variety of queues; signage is only a portion of the information the user relies on to navigate the world. By thoughtfully designing and strategically locating wayfinding elements, confusion can be eliminated, thereby enhancing the use experience. Wayfinding signs should be:

- Simple and unobtrusive, not distracting from the user's experience
- Easy to find and comprehend
- Located primarily at intersections or decision points along pathways

Interpretation & Education (I & E) Signage

Interpretation provides an explanation or perspective to an experience. Interpretive signs should make visible and available any information that is not obvious while also emphasizing connections and patterns. The natural environment of the site and the timber production that occurs there provides several opportunities to educate the public and interpret the world around them. It is recommended that several interpretive signs be placed along this trail segment. A recreation signage plan for the trail system within Kitsap County is recommended to provide a consistent messaging and similar environmental graphics such as materials, colors, fonts, icons among all wayfinding and interpretive signs. This latter recommendation is not reflected in the cost estimate, although the design, fabrication and installation of interpretive signs for this segment of trail is included.

Y

Figure 3Y: Example of a Trail Overlook

Overlooks

There are several opportunities for overlooks along the trail. During the course of the study new views became evident as logging operations opened up views that were not previously evident. Spectacular views are available on the north end of the project, particularly on the Upper route that will descend down through the OPG development at what is now the Babcock Farm area. Views from here include Mount Baker to the north and the northern Cascade mountains. There are also views west to the Olympic mountains from various locations along the central portion of the proposed route that utilize what is now the 1000 Road. Specific costs for overlooks have not been included in the cost for this study. Locations for these amenities should be specifically identified by County Parks in the coming years since much of the timber will be removed by OPG as part of the land acquisition agreement, revealing opportunities for optimal locations.

Z

Figure 3Z: Example of Trailhead Parking

Trailheads and Parking

There are several existing parking lots and trailheads that will service the trail, although they also service a number of different recreation activities in Heritage Park and OPG timber lands. Expansion or upgrade to these parking areas will be necessary over time as both the County park and the town of Port Gamble continue to grow and become more popular as places to recreate. Costs associated with new or upgraded parking areas are not included in this study as these will also service other activities. However, amenities associated with trailheads, such as kiosks, are included. These may be located at parking areas or strategic nodes along the trail that connect to parking areas.

Additional parking locations in proximity to the trail have been identified during this study. These include a parking area that will serve the new Ride Park but will undoubtably receive use for those that will be looking for access to the new trail. Another potential parking area was identified by OPG during the planning process on land off of Carver Drive on the north end of the project. Also, the Park & Ride lot being proposed at the Hood Canal Bridge should be considered the official regional trailhead parking location on the north of the peninsula as Port Gamble town does not have the capacity to accommodate a large amount of parking.

AA

Figure 3AA: Example of Equestrian Trail Use(Photo Courtesy of Don Willott)

Equestrian Use

Although accommodation for equestrians is desired by the community, the referenced standards all require separated pathways. This would require additional land and would have significant impact on the landform and land cover if the equestrian path were to follow the shared-use path alignment. The 4 foot wide gravel shoulder can informally accommodate equestrian users. Trail management policy will not preclude use of the trail by equestrians; however, the trail will not be promoted as part of the equestrian trail system. Eventually a separate, independently aligned trail may be studied and implemented if found feasible.

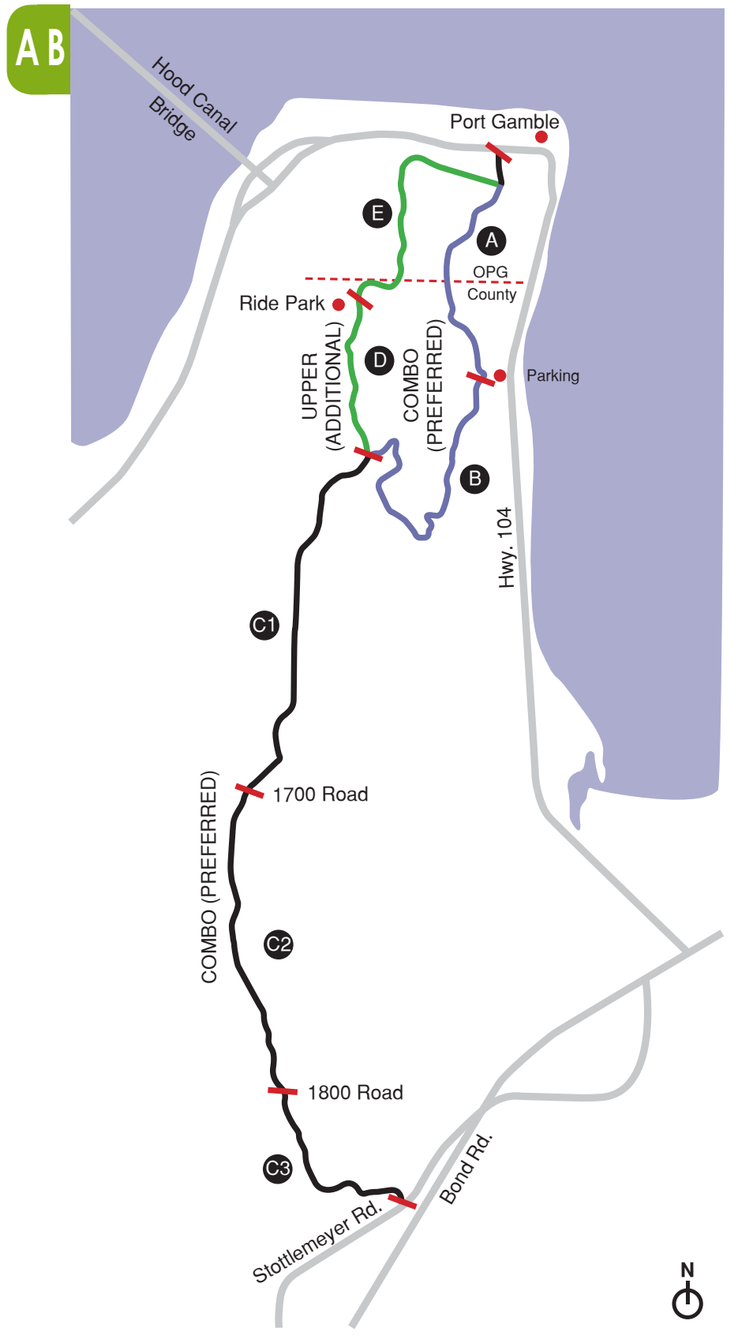

Figure 3AB: Trail Segments for Costing

3.6 Summary of Estimates of Probable Costs

Project costs are estimated in 2018 dollars and consist of both soft costs, such as environmental, permitting, design, engineering and construction management and hard costs, which are the construction costs.

For the preferred Combo alignment, the overall project cost for a 6.7 mile shared-use path meeting federal and state standards is estimated at $5,517,389. This includes $4,194,125 in construction costs and $1,323,263 in soft costs (32% of construction cost). The cost is approximately $156 per linear foot for the length of the 35,315 foot long trail.

For the additional Upper alternative segment, the cost for this 1.9 mile shared-use path meeting federal and state standards is estimated at $1,858,866. This includes $1,430,959 in construction costs and $427,907 in soft costs (30% of construction cost). The cost is approximately $182 per linear foot for the length of the 10,209 foot long trail. The cost is higher per linear foot because it includes the cost of a 1,230 LF paved road from the OPG property line to the Ride Park.

Not included are any costs associated with land acquisition. It is assumed that necessary land acquisitions would be completed prior to moving into final design of the trail. Quantities of several items were generated within the SiteOps engineering modeling program and costs were based on inputted unit costs from MAP. Other costs were generated based on comparable construction costs.

Costs in the report have been broken down by segment as shown in Figure 3AB. The preferred Combo route is comprised of segments A, B, C1, C2 and C3. The additional Upper route is comprised of segments D and E. Costs are provided by segment to give decision makers the information needed to acquire funding if phasing is necessary due to the large scope of the entire trail project. OPG development schedule, the County Ride Park project and STO funding opportunities (both transportation and recreation related) may impact what segments are built when.

Soft Costs

Soft costs are non-construction related costs and for this estimate are 1/3 of the construction cost and 1/4 of the total project cost for each of the alignments. Soft costs include:

- Engineer and Consultant Design Fees
- Owner Consultants – Survey, Geotechnical, Other
- Washington State Sales Tax
- Testing and Inspection
- Easements
- Permits
- Construction Administration Management
- Construction Contingency

Hard Costs

Hard costs are construction costs. Construction costs account for 3/4 of the total project cost for each alignment. For this shared-use path, the following costs are the most significant:

- Site Clearing
- Grading- Cut and Fill
- Asphalt Paving including Gravel Base Course
- Revegetation
- Erosion Control
- Bridge and Boardwalk
- Crosswalks
- Drainage & Culverts
- Kiosks and Signs

3.7 Cost Breakdown Per Segment

Combo Alignment (Preferred) Segments

SEGMENT	LINEAR FEET	TOTAL COST	COST PER FOOT
A	6,290	$978,065	$156
B	8,325	$1,683,122	$202
C1	10,350	$1,219,389	$118
C2	5,475	$659,338	$120
C3	4,875	$977,475	$201
TOTAL	**35,315**	**$5,517,389**	**$156**

Upper Route (Additional) Segments

SEGMENT		TOTAL COST	COST PER FOOT
D	3,312	$451,695	$136
E	6,897	$1,407,171	$204
TOTAL	**10,209**	**$1,858,866**	**$182**

Assumptions

For the additional Upper route, the cost of developing the road that the trail will follow will be incurred by OPG as it is on their land. OPG has set aside, in recent planning documents, a 17' width within the right-of-way for a shared-use trail. OPG's cost would include all rough grading, which is extensive, and development of the road. The County would pay for final trail grading, some stormwater, erosion control, trail base course trail paving and seeding. The development road would not be built by OPG all the way to the Ride Park, only to the property line. The County will need to extend the road another 1,230 feet, in addition to the trail.

Not included in the costs are parking area improvements associated with existing or potential trailheads, rest area pullouts adjacent to the steeper sections of the trail as the are all under the maximum 8.3% grade (mitigation not required), site lighting, fencing or restrooms. The focus of this feasibility study is on the feasibility and costs of this as a transportation corridor, although it will be used recreationally as well. County Parks should consider the cost of additional recreation amenities associated with the trail in budgeting and grant applications.

Also not included in the costs is 600 LF of spur trail that would connect the Heritage Park Parking Lot on Highway 104 to the STO route. Assuming the average cost of the trail is $156/LF, this additional item should be budgeted at about $93,600.

Detailed costs for each of the segments are provided on the following pages.

Figure 3AC: Trail Photo

ESTIMATE OF PROBABLE PROJECT COSTS FOR THE PORT GAMBLE TRAIL FEASIBILITY STUDY
SEGMENT A
2018 Dollars

CONSTRUCTION COSTS (Hard Costs)

ON-SITE PREPARATION

Work Activity	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL	NOTES
Site Clearing						
Clearing	1.10	AC	$10,250.00	$11,275		
Topsoil Strip/Cut	1,769	CY	$3.10	$5,484		12" STRIPPING DEPTH ASSUMED
Topsoil Fill	715	CY	$5.15	$3,682		ASSUME FILL SLOPES AMENDED WITH 12" TOPSOIL FROM ON-SITE
Topsoil Export	1,054	CY	$25.60	$26,982		
Total Site Clearing				$47,424	$47,424	Quantities and costs per MAP
Grading Cut						
Earth Cut	662	CY	$15.40	$10,195		
Total Grading Cut				$10,195	$10,195	Quantities and costs per MAP
Grading Fill						
Earth Fill	1,209	CY	$20.00	$24,180		
Total Grading Fill				$24,180	$24,180	Quantities and costs per MAP
Grading Import						
Earth Import	547	CY	$28.75	$15,726		
Total Grading Import				$15,726	$15,726	Quantities and costs per MAP
Retaining Wall	0	SF	$39.43		$0	Quantities and costs per MAP
Other Preparation						
Fine Grading Sub-Grade Prep	10,626	SY	$4.10	$43,567		
Erosion Control	1.10	AC	$4,100.00	$4,510		
Seeding/Slope Stabilization	0.55	AC	$20,500.00	$11,275		
Total Other Preparation				$59,352	$59,352	Quantities and costs per MAP
TOTAL ON-SITE PREPARATION					**$156,876**	

Table 3AD: Cost Estimate - SEGMENT A of the Preferred Alignment

AE

ON-SITE IMPROVEMENTS						
Work Activity	**QUANTITY**	**UNIT**	**UNIT COST**	**SUBTOTAL**	**TOTAL**	**NOTES**
Paving - Trail Section						
Asphalt Paving - Trail on existing road	3,922	SY	$21.98	$86,206		2" HMA OVER 2" CSTC
Asphalt Paving - New Trail/Trail along ex road	3,418	SY	$23.21	$79,332		2" HMA OVER 2" CSTC OVER 6" GRAVEL BASE
CSTC Gravel Shoulders	998	Ton	$41.00	$40,918		4" COMPACTED DEPTH, 7-ft along trail, 4-ft along roads
Total Paving - Asphalt				$206,455	$206,455	Quantities and costs per MAP
Boardwalk						
Boardwalk Segment at Beaver Pond	150	LF	$950.00	$142,500		$70/SF for 12' width, assumes PermaTrak concrete system, including pile foundations, design
Railings	150	LF	$50.00	$7,500		Assumes timber rail. Steel rail would be closer to $75-$100/LF
Total Boardwalk				$150,000	$150,000	
Other On-Site Improvements						
Trail Signage						
Regulatory Allowance	1	LS	$3,000.00	$3,000		Allowance
Wayfinding Allowance	1	LS	$3,000.00	$3,000		Allowance
Interpretive Allowance	1	LS	$5,000.00	$5,000		Allowance
Trailhead Kiosks	4	1	$7,500.00	$30,000		Allowance
Overlook	1	EA	$7,500.00	$7,500		Allowance
Crosswalk- at Carver Road	1	LS	$600.00	$600		
Crosswalk- at Talbot Street	1	LS	$600.00	$600		
Storm Drainage	5,100	LF	$12.38	$63,138		Concentrated and Sheetflow Dispersion Through Native Vegetation per BMP's T5.11 and T5.12
New Culverts	7	EA	$1,000.00	$7,000		Quantities and costs per MAP
Storm Drainage participation with OPG	1	LS	$50,000.00	$50,000		1,130 LF of trail
Wetland Mitigation- per ELS report	1	LS	$64,970.00	$64,970		Cost per wetland mitigation report by ELS, worst case scenario for wetland and buffers
Total - Other On-Site Improvements				$234,808	$234,808	
TOTAL ON-SITE IMPROVEMENTS			**TOTAL**		**$591,263**	
Contractor Mobilization @ 5%	1	LS	$37,406.98	$37,407		Industry standard percentage
TOTAL CONSTRUCTION			**TOTAL**		**$785,547**	
Design and Construction Management (Soft Costs)						
Engineering/Design Consultants 20%	1	LS	$88,252.67	$88,253		Excludes 20% of Boardwalk Estimate- Design & Enginnering are included in cost
Construction Management 12%	1	LS	$94,265.58	$94,266		
Conditional Use, SEPA, SDAP Permitting Fees	1	LS	$10,000.00	$10,000		
TOTAL Design Soft Costs and Construction Management			**TOTAL**		$192,518	
Total Project Costs (Construction and Soft Cost Estimate)					**$978,065**	

Not Included in Costs:
Parking area improvements associated with existing or potential trailheads, rest area pullouts adjacent to steep trail sections (all are under 8.3%), site lighting, fencing, restrooms

Table 3AE: Cost Estimate - SEGMENT A of the Preferred Alignment Continued

ESTIMATE OF PROBABLE PROJECT COSTS FOR THE PORT GAMBLE TRAIL FEASIBILITY STUDY
SEGMENT B
2018 Dollars

CONSTRUCTION COSTS (Hard Costs)

ON-SITE PREPARATION

Work Activity	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL	NOTES
Site Clearing						
Clearing	4.50	AC	$10,250.00	$46,125		
Topsoil Strip/Cut	7,258	CY	$3.10	$22,500		12" STRIPPING DEPTH ASSUMED
Topsoil Fill	2,388	CY	$5.15	$12,298		ASSUME FILL SLOPES AMENDED WITH 12" TOPSOIL FROM ON-SITE
Topsoil Export	4,870	CY	$25.60	$124,672		
Total Site Clearing				$205,595	$205,595	Quantities and costs per MAP
Grading Cut						
Earth Cut	9,416	CY	$15.40	$145,006		
Total Grading Cut				$145,006	$145,006	Quantities and costs per MAP
Grading Fill						
Earth Fill	4,923	CY	$20.00	$98,460		
Total Grading Fill				$98,460	$98,460	Quantities and costs per MAP
Grading Export						
Earth Export	1,499	CY	$25.60	$38,374		
Total Grading Export				$38,374	$38,374	Quantities and costs per MAP
Retaining Wall	0	SF	$39.43		$0	Quantities and costs per MAP
Other Preparation						
Fine Grading Sub-Grade Prep	17,622	SY	$4.10	$72,250		
Erosion Control	4.50	AC	$4,100.00	$18,450		
Seeding/Slope Stabilization	2.24	AC	$20,500.00	$45,920		
Total Other Preparation				$136,620	$136,620	Quantities and costs per MAP
TOTAL ON-SITE PREPARATION					**$624,056**	

Table 3AF: Cost Estimate - SEGMENT B of the Preferred Alignment

A G

ON-SITE IMPROVEMENTS						
Work Activity	**QUANTITY**	**UNIT**	**UNIT COST**	**SUBTOTAL**	**TOTAL**	**NOTES**
Paving - Trail Section						
Asphalt Paving - Trail on existing road	4,856	SY	$21.98	$106,735		2" HMA OVER 2" CSTC
Asphalt Paving - New Trail/Trail along ex road	8,134	SY	$23.21	$188,790		2" HMA OVER 2" CSTC OVER 6" GRAVEL BASE
CSTC Gravel Shoulders	1,465	Ton	$41.00	$60,065		4" COMPACTED DEPTH, 7-ft along trail, 4-ft along roads
Total Paving - Asphalt				$355,590	$355,590	Quantities and costs per MAP
Other On-Site Improvements						
Trail Signage						
Regulatory Allowance	1	LS	$3,000.00	$3,000		Allowance
Wayfinding Allowance	1	LS	$3,000.00	$3,000		Allowance
Interpretive Allowance	1	LS	$5,000.00	$5,000		Allowance
Trailhead Kiosks	1	EA	$7,500.00	$7,500		Allowance
Overlook	1	EA	$7,500.00	$7,500		Allowance
Storm Drainage	8,350	LF	$12.38	$103,373		Concentrated and Sheetflow Dispersion Through Native Vegetation per BMP's T5.11 and T5.12
New Culverts	12	EA	$1,000.00	$12,000		Quantities and costs per MAP
Wetland Mitigation- per ELS report	1	LS	$86,140.00	$86,140		Cost per wetland mitigation report by ELS, worst case scenario for wetland and buffers
Total - Other On-Site Improvements				$227,513	$227,513	
TOTAL ON-SITE IMPROVEMENTS			**TOTAL**		**$583,103**	
Contractor Mobilization @ 5%	1	LS	$60,357.95	$60,358		Industry standard percentage
TOTAL CONSTRUCTION			**TOTAL**		**$1,267,517**	
Design and Construction Management (Soft Costs)						
Engineering/Design Consultants 20%	1	LS	$253,503.39	$253,503		
Construction Management 12%	1	LS	$152,102.04	$152,102		
Conditional Use, SEPA, SDAP Permitting Fees	1	LS	$10,000.00	$10,000		
TOTAL Design Soft Costs and Construction Management			**TOTAL**		$415,605	
Total Project Costs (Construction and Soft Cost Estimate)					**$1,683,122**	

Not Included in Costs:
Parking area improvements associated with existing or potential trailheads, rest area pullouts adjacent to steep trail sections (all are under 8.3%), site lighting, fencing, restrooms

Table 3AG: Cost Estimate - SEGMENT B of the Preferred Alignment Continued

ESTIMATE OF PROBABLE PROJECT COSTS FOR THE PORT GAMBLE TRAIL FEASIBILITY STUDY
SEGMENT C-1
2018 Dollars

CONSTRUCTION COSTS (Hard Costs)

ON-SITE PREPARATION

Work Activity	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL	NOTES
Site Clearing						
Clearing	1.19	AC	$10,250.00	$12,198		
Topsoil Strip/Cut	1,916	CY	$3.10	$5,940		12" STRIPPING DEPTH ASSUMED
Topsoil Fill	436	CY	$5.15	$2,245		ASSUME FILL SLOPES AMENDED WITH 12" TOPSOIL FROM ON-SITE
Topsoil Export	1,480	CY	$25.60	$37,888		
Total Site Clearing				$58,271	$58,271	Quantities and costs per MAP
Grading Cut						
Earth Cut	781	CY	$15.40	$12,027		
Total Grading Cut				$12,027	$12,027	Quantities and costs per MAP
Grading Fill						
Earth Fill	8	CY	$20.00	$160		
Total Grading Fill				$160	$160	Quantities and costs per MAP
Grading Export						
Earth Export	773	CY	$25.60	$19,789		
Total Grading Export				$19,789	$19,789	Quantities and costs per MAP
Retaining Wall	0	SF	$39.43		$0	Quantities and costs per MAP
Other Preparation						
Fine Grading Sub-Grade Prep	21,852	SY	$4.10	$89,593		
Erosion Control	1.19	AC	$4,100.00	$4,879		
Seeding/Slope Stabilization	0.44	AC	$20,500.00	$9,020		
Total Other Preparation				$103,492	$103,492	Quantities and costs per MAP
TOTAL ON-SITE PREPARATION					**$193,739**	

Table 3AH: Cost Estimate - SEGMENT C-1 of the Preferred Alignment

AI

ON-SITE IMPROVEMENTS						
Work Activity	**QUANTITY**	**UNIT**	**UNIT COST**	**SUBTOTAL**	**TOTAL**	**NOTES**
Paving - Trail Section						
Asphalt Paving - Trail on existing road	13,432	SY	$21.98	$295,235		2" HMA OVER 2" CSTC
Asphalt Paving - New Trail/Trail along ex road	2,351	SY	$23.21	$54,567		2" HMA OVER 2" CSTC OVER 6" GRAVEL BASE
CSTC Gravel Shoulders	1,816	Ton	$41.00	$74,456		4" COMPACTED DEPTH, 7-ft along trail, 4-ft along roads
Total Paving - Asphalt				$424,258	$424,258	Quantities and costs per MAP
Other On-Site Improvements						
Trail Signage						
Regulatory Allowance	1	LS	$3,000.00	$3,000		Allowance
Wayfinding Allowance	1	LS	$3,000.00	$3,000		Allowance
Interpretive Allowance	1	LS	$5,000.00	$5,000		Allowance
Trailhead Kiosks	0	EA	$7,500.00	$0		Allowance
Overlook	1	EA	$7,500.00	$7,500		Allowance
Storm Drainage	10,350	LF	$12.38	$128,133		Concentrated and Sheetflow Dispersion Through Native Vegetation per BMP's T5.11 and T5.12
New Culverts	1	EA	$1,000.00	$1,000		Quantities and costs per MAP
Wetland Mitigation- per ELS report	1	LS	$106,945.00	$106,945		Cost per wetland mitigation report by ELS, worst case scenario for wetland and buffers
Total - Other On-Site Improvements				$254,578	$254,578	
TOTAL ON-SITE IMPROVEMENTS				**TOTAL**	**$678,836**	
Contractor Mobilization @ 5%	1	LS	$43,628.75	$43,629		Industry standard percentage
TOTAL CONSTRUCTION				**TOTAL**	**$916,204**	
Design and Construction Management (Soft Costs)						
Engineering/Design Consultants 20%	1	LS	$183,240.74	$183,241		
Construction Management 12%	1	LS	$109,944.45	$109,944		
Conditional Use, SEPA, SDAP Permitting Fees	1	LS	$10,000.00	$10,000		
TOTAL Design Soft Costs and Construction Management				**TOTAL**	$303,185	
Total Project Costs (Construction and Soft Cost Estimate)					**$1,219,389**	

Not Included in Costs:
Parking area improvements associated with existing or potential trailheads, rest area pullouts adjacent to steep trail sections (all are under 8.3%), site lighting, fencing, restrooms

Table 3AI: Cost Estimate - SEGMENT C-1 of the Preferred Alignment Continued

ESTIMATE OF PROBABLE PROJECT COSTS FOR THE PORT GAMBLE TRAIL FEASIBILITY STUDY
SEGMENT C-2
2018 Dollars

CONSTRUCTION COSTS (Hard Costs)

ON-SITE PREPARATION

Work Activity	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL	NOTES
Site Clearing						
Clearing	0.33	AC	$10,250.00	$3,383		
Topsoil Strip/Cut	531	CY	$3.10	$1,646		12" STRIPPING DEPTH ASSUMED
Topsoil Fill	64	CY	$5.15	$330		ASSUME FILL SLOPES AMENDED WITH 12" TOPSOIL FROM ON-SITE
Topsoil Export	467	CY	$25.60	$11,955		
Total Site Clearing				$17,313	$17,313	Quantities and costs per MAP
Grading Cut						
Earth Cut	375	CY	$15.40	$5,775		
Total Grading Cut				$5,775	$5,775	Quantities and costs per MAP
Grading Fill						
Earth Fill	186	CY	$20.00	$3,720		
Total Grading Fill				$3,720	$3,720	Quantities and costs per MAP
Grading Export						
Earth Export	189	CY	$25.60	$4,838		
Total Grading Export				$4,838	$4,838	Quantities and costs per MAP
Retaining Wall	0	SF	$39.43		$0	Quantities and costs per MAP
Other Preparation						
Fine Grading Sub-Grade Prep	11,550	SY	$4.10	$47,355		
Erosion Control	0.33	AC	$4,100.00	$1,353		
Seeding/Slope Stabilization	0.12	AC	$20,500.00	$2,460		
Total Other Preparation				$51,168	$51,168	Quantities and costs per MAP
TOTAL ON-SITE PREPARATION					**$82,815**	

Table 3AJ: Cost Estimate - SEGMENT C-2 of the Preferred Alignment

AK

ON-SITE IMPROVEMENTS						
Work Activity	**QUANTITY**	**UNIT**	**UNIT COST**	**SUBTOTAL**	**TOTAL**	**NOTES**
Paving - Trail Section						
Asphalt Paving - Trail on existing road	8,088	SY	$21.98	$177,774		2" HMA OVER 2" CSTC
Asphalt Paving - New Trail/Trail along ex road	739	SY	$23.21	$17,152		2" HMA OVER 2" CSTC OVER 6" GRAVEL BASE
CSTC Gravel Shoulders	961	Ton	$41.00	$39,401		4" COMPACTED DEPTH, 7-ft along trail, 4-ft along roads
Total Paving - Asphalt				$234,327	$234,327	Quantities and costs per MAP
Other On-Site Improvements						
Trail Signage						
Regulatory Allowance	1	LS	$3,000.00	$3,000		Allowance
Wayfinding Allowance	1	LS	$3,000.00	$3,000		Allowance
Interpretive Allowance	1	LS	$5,000.00	$5,000		Allowance
Trailhead Kiosks	1	EA	$7,500.00	$7,500		Allowance
Overlook	1	EA	$7,500.00	$7,500		Allowance
Storm Drainage	5,475	LF	$12.38	$67,781		Concentrated and Sheetflow Dispersion Through Native Vegetation per BMP's T5.11 and T5.12
New Culverts	1	EA	$1,000.00	$1,000		Quantities and costs per MAP
Wetland Mitigation- per ELS report	1	LS	$56,575.00	$56,575		Cost per wetland mitigation report by ELS, worst case scenario for wetland and buffers
Total - Other On-Site Improvements				$151,356	$151,356	
TOTAL ON-SITE IMPROVEMENTS				**TOTAL**	**$385,683**	
Contractor Mobilization @ 5%	1	LS	$23,424.89	$23,425		Industry standard percentage
TOTAL CONSTRUCTION				**TOTAL**	**$491,923**	

Design and Construction Management (Soft Costs)						
Engineering/Design Consultants 20%	1	LS	$98,384.52	$98,385		
Construction Management 12%	1	LS	$59,030.71	$59,031		
Conditional Use, SEPA, SDAP Permitting Fees	1	LS	$10,000.00	$10,000		
TOTAL Design Soft Costs and Construction Management				**TOTAL**	$167,415	

Total Project Costs (Construction and Soft Cost Estimate)	**$659,338**

Not Included in Costs:
Parking area improvements associated with existing or potential trailheads, rest area pullouts adjacent to steep trail sections (all are under 8.3%), site lighting, fencing, restrooms

Table 3AK: Cost Estimate - SEGMENT C-2 of the Preferred Alignment Continued

ESTIMATE OF PROBABLE PROJECT COSTS FOR THE PORT GAMBLE TRAIL FEASIBILITY STUDY
SEGMENT C-3
2018 Dollars

CONSTRUCTION COSTS (Hard Costs)

ON-SITE PREPARATION

Work Activity	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL	NOTES
Site Clearing						
Clearing	3.07	AC	$10,250.00	$31,468		
Topsoil Strip/Cut	4,953	CY	$3.10	$15,354		12" STRIPPING DEPTH ASSUMED
Topsoil Fill	1,421	CY	$5.15	$7,318		ASSUME FILL SLOPES AMENDED WITH 12" TOPSOIL FROM ON-SITE
Topsoil Export	3,532	CY	$25.60	$90,419		
Total Site Clearing				$144,559	$144,559	Quantities and costs per MAP
Grading Cut						
Earth Cut	4,594	CY	$15.40	$70,748		
Total Grading Cut				$70,748	$70,748	Quantities and costs per MAP
Grading Fill						
Earth Fill	1,120	CY	$20.00	$22,400		
Total Grading Fill				$22,400	$22,400	Quantities and costs per MAP
Grading Export						
Earth Export	3,474	CY	$25.60	$88,934		
Total Grading Export				$88,934	$88,934	Quantities and costs per MAP
Retaining Wall	0	SF	$39.43		$0	Quantities and costs per MAP
Other Preparation						
Fine Grading Sub-Grade Prep	8,113	SY	$4.10	$33,263		
Erosion Control	3.07	AC	$4,100.00	$12,587		
Seeding/Slope Stabilization	1.49	AC	$20,500.00	$30,545		
Total Other Preparation				$76,395	$76,395	Quantities and costs per MAP
TOTAL ON-SITE PREPARATION					**$403,036**	

Table 3AL: Cost Estimate - SEGMENT C-3 of the Preferred Alignment

ON-SITE IMPROVEMENTS						
Work Activity	**QUANTITY**	**UNIT**	**UNIT COST**	**SUBTOTAL**	**TOTAL**	**NOTES**
Paving - Trail Section						
Asphalt Paving - Trail on existing road	0	SY	$21.98	$0		2" HMA OVER 2" CSTC
Asphalt Paving - New Trail/Trail along ex road	5,335	SY	$23.21	$123,825		2" HMA OVER 2" CSTC OVER 6" GRAVEL BASE
CSTC Gravel Shoulders	840	Ton	$41.00	$34,440		4" COMPACTED DEPTH, 7-ft along trail, 4-ft along roads
Total Paving - Asphalt				$158,265	$158,265	Quantities and costs per MAP
Other On-Site Improvements						
Trail Signage						
Regulatory Allowance	1	LS	$3,000.00	$3,000		Allowance
Wayfinding Allowance	1	LS	$3,000.00	$3,000		Allowance
Interpretive Allowance	1	LS	$5,000.00	$5,000		Allowance
Trailhead Kiosks	1	EA	$7,500.00	$7,500		Allowance
Overlook	1	EA	$7,500.00	$7,500		Allowance
Storm Drainage	4,795	LF	$12.38	$59,362		Concentrated and Sheetflow Dispersion Through Native Vegetation per BMP's T5.11 and T5.12
New Culverts	1	EA	$1,000.00	$1,000		Quantities and costs per MAP
Wetland Mitigation- per ELS report	1	LS	$50,370.00	$50,370		Cost per wetland mitigation report by ELS, worst case scenario for wetland and buffers
Total - Other On-Site Improvements				$136,732	$136,732	
TOTAL ON-SITE IMPROVEMENTS				**TOTAL**	**$294,997**	
Contractor Mobilization @ 5%	1	LS	$34,901.70	$34,902		Industry standard percentage
TOTAL CONSTRUCTION				**TOTAL**	**$732,936**	
Design and Construction Management (Soft Costs)						
Engineering/Design Consultants 20%	1	LS	$146,587.12	$146,587		
Construction Management 12%	1	LS	$87,952.27	$87,952		
Conditional Use, SEPA, SDAP Permitting Fees	1	LS	$10,000.00	$10,000		
TOTAL Design Soft Costs and Construction Management				**TOTAL**	$244,539	
Total Project Costs (Construction and Soft Cost Estimate)					**$977,475**	

Not Included in Costs:
Parking area improvements associated with existing or potential trailheads, rest area pullouts adjacent to steep trail sections (all are under 8.3%), site lighting, fencing, restrooms

Assumption:
Type A trail (along road) in OPG development: OPG will provide rough grading. Cost estimate assumes final grading, base course and final pavement on trail.

Table 3AM: Cost Estimate - SEGMENT C-3 of the Preferred Alignment Continued

ESTIMATE OF PROBABLE PROJECT COSTS FOR THE PORT GAMBLE TRAIL FEASIBILITY STUDY
SEGMENT D
2018 Dollars

CONSTRUCTION COSTS (Hard Costs)

ON-SITE PREPARATION

Work Activity	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL	NOTES
Site Clearing						
Clearing	0.34	AC	$10,250.00	$3,485		
Topsoil Strip/Cut	551	CY	$3.10	$1,708		12" STRIPPING DEPTH ASSUMED
Topsoil Fill	0	CY	$5.15	$0		ASSUME FILL SLOPES AMENDED WITH 12" TOPSOIL FROM ON-SITE
Topsoil Export	551	CY	$25.60	$14,106		
Total Site Clearing				$19,299	$19,299	Quantities and costs per MAP
Grading Cut						
Earth Cut	511	CY	$15.40	$7,869		
Total Grading Cut				$7,869	$7,869	Quantities and costs per MAP
Grading Fill						
Earth Fill	10	CY	$20.00	$200		
Total Grading Fill				$200	$200	Quantities and costs per MAP
Grading Export						
Earth Export	501	CY	$25.60	$12,826		
Total Grading Export				$12,826	$12,826	Quantities and costs per MAP
Retaining Wall	0	SF	$39.43		$0	Quantities and costs per MAP
Other Preparation						
Fine Grading Sub-Grade Prep	6,966	SY	$4.10	$28,561		
Erosion Control	0.34	AC	$4,100.00	$1,394		
Seeding/Slope Stabilization	0.16	AC	$20,500.00	$3,280		
Total Other Preparation				$33,235	$33,235	Quantities and costs per MAP
TOTAL ON-SITE PREPARATION					**$73,428**	

Table 3AN: Cost Estimate - SEGMENT D of the Additional Upper Route

AO

ON-SITE IMPROVEMENTS						
Work Activity	**QUANTITY**	**UNIT**	**UNIT COST**	**SUBTOTAL**	**TOTAL**	**NOTES**
Paving - Trail Section						
Asphalt Paving - Trail on existing road	4,496	SY	$21.98	$98,822		2" HMA OVER 2" CSTC
Asphalt Paving - New Trail/Trail along ex road	637	SY	$23.21	$14,785		2" HMA OVER 2" CSTC OVER 6" GRAVEL BASE
CSTC Gravel Shoulders	579	Ton	$41.00	$23,739		4" COMPACTED DEPTH, 7-ft along trail, 4-ft along roads
Total Paving - Asphalt				$137,346	$137,346	Quantities and costs per MAP
Other On-Site Improvements						
Trail Signage						
Regulatory Allowance	1	LS	$3,000.00	$3,000		Allowance
Wayfinding Allowance	1	LS	$3,000.00	$3,000		Allowance
Interpretive Allowance	1	LS	$5,000.00	$5,000		Allowance
Trailhead Kiosks	1	EA	$7,500.00	$7,500		Allowance
Overlook	1	EA	$7,500.00	$7,500		Allowance
Storm Drainage	3,300	LF	$12.38	$40,854		Concentrated and Sheetflow Dispersion Through Native Vegetation per BMP's T5.11 and T5.12
New Culverts	2	EA	$1,000.00	$2,000		Quantities and costs per MAP
Wetland Mitigation- per ELS report	1	LS	$39,055.00	$39,055		Cost per wetland mitigation report by ELS, worst case scenario for wetland and buffers
Total - Other On-Site Improvements				$107,909	$107,909	
TOTAL ON-SITE IMPROVEMENTS			**TOTAL**		**$245,255**	
Contractor Mobilization @ 5%	1	LS	$15,934.16	$15,934		Industry standard percentage
TOTAL CONSTRUCTION			**TOTAL**		**$334,617**	

Design and Construction Management (Soft Costs)					
Engineering/Design Consultants 20%	1	LS	$66,923.46	$66,923	
Construction Management 12%	1	LS	$40,154.08	$40,154	
Conditional Use, SEPA, SDAP Permitting Fees	1	LS	$10,000.00	$10,000	
TOTAL Design Soft Costs and Construction Management			**TOTAL**		$117,078

Total Project Costs (Construction and Soft Cost Estimate)	$451,695

Not Included in Costs:
Parking area improvements associated with existing or potential trailheads, rest area pullouts adjacent to steep trail sections (all are under 8.3%), site lighting, fencing, restrooms

Assumption:
Type A trail (along road) in OPG development: OPG will provide rough grading. Cost estimate assumes final grading, base course and final pavement on trail.

Table 3AO: Cost Estimate - SEGMENT D of the Additional Upper Route

ESTIMATE OF PROBABLE PROJECT COSTS FOR THE PORT GAMBLE TRAIL FEASIBILITY STUDY
SEGMENT E
2018 Dollars

CONSTRUCTION COSTS (Hard Costs)

ON-SITE PREPARATION

Work Activity	QUANTITY	UNIT	UNIT COST	SUBTOTAL	TOTAL	NOTES
Site Clearing						
Clearing	0.00	AC	$10,250.00	$0		
Topsoil Strip/Cut	0	CY	$3.10	$0		12" STRIPPING DEPTH ASSUMED
Topsoil Fill	0	CY	$5.15	$0		ASSUME FILL SLOPES AMENDED WITH 12" TOPSOIL FROM ON-SITE
Topsoil Export	0	CY	$25.60	$0		
Total Site Clearing				$0	$0	Quantities and costs per MAP
Grading Cut						
Earth Cut	0	CY	$15.40	$0		
Total Grading Cut				$0	$0	Quantities and costs per MAP
Grading Fill						
Earth Fill	0	CY	$20.00	$0		
Total Grading Fill				$0	$0	Quantities and costs per MAP
Grading Export						
Earth Export	0	CY	$25.60	$0		
Total Grading Export				$0	$0	Quantities and costs per MAP
Retaining Wall	0	SF	$39.43		$0	Quantities and costs per MAP
Other Preparation						
Fine Grading Sub-Grade Prep	11,575	SY	$4.10	$47,458		
Erosion Control	0.00	AC	$4,100.00	$0		
Seeding/Slope Stabilization	0.00	AC	$20,500.00	$0		
Total Other Preparation				$47,458	$47,458	Quantities and costs per MAP
TOTAL ON-SITE PREPARATION					**$47,458**	

Table 3AP: Cost Estimate - SEGMENT D of the Additional Upper Route

AQ

ON-SITE IMPROVEMENTS						
Work Activity	**QUANTITY**	**UNIT**	**UNIT COST**	**SUBTOTAL**	**TOTAL**	**NOTES**
Paving - Trail Section						
Asphalt Paving - Trail on existing road	838	SY	$21.98	$18,419		2" HMA OVER 2" CSTC
Asphalt Paving - New Trail/Trail along ex road	7,085	SY	$23.21	$164,443		2" HMA OVER 2" CSTC OVER 6" GRAVEL BASE
CSTC Gravel Shoulders	735	Ton	$41.00	$30,135		4" COMPACTED DEPTH, 7-ft along trail, 4-ft along roads
Total Paving - Asphalt				$212,997	$212,997	Quantities and costs per MAP
Bridges						
Bridge	1	LS	$100,000.00	$100,000		
Abutments	2	LS	$10,000.00	$20,000		
Install + Crane	1	LS	$150,000.00	$150,000		
Total Bridges				$270,000	$270,000	
County Road, 24' W from OPG property to Ride Park						
Paved Road	1,230	LF	$240.00	$295,200		Costs per Triad (OPG Engineer based on development costs of OPG road
Total Bridges				$295,200	$295,200	
Other On-Site Improvements						
Trail Signage						
Regulatory Allowance	1	LS	$3,000.00	$3,000		Allowance
Wayfinding Allowance	1	LS	$3,000.00	$3,000		Allowance
Interpretive Allowance	1	LS	$5,000.00	$5,000		Allowance
Trailhead Kiosks	1	EA	$7,500.00	$7,500		Allowance
Overlook	1	EA	$7,500.00	$7,500		Allowance
Crosswalk- at Rose Loop	1	LS	$600.00	$600		
Crosswalk- at Rose Court	1	LS	$600.00	$600		
Crosswalk- at Gamble Way NE	1	LS	$600.00	$600		
Crosswalk- at Parking Near Gamble Way NE	1	LS	$600.00	$600		
Storm Drainage	540	LF	$12.38	$6,685		Concentrated and Sheetflow Dispersion Through Native Vegetation per BMP's T5.11 and T5.12
New Culverts	2	EA	$1,000.00	$2,000		Quantities and costs per MAP
Storm Drainage participation with OPG	1	LS	$100,000.00	$100,000		County and OPG to neogtiate based on future detailed engineering
Wetland Mitigation- per ELS report	1	LS	$81,395.00	$81,395		Cost per wetland mitigation report by ELS, worst case scenario for wetland and buffers
Total - Other On-Site Improvements				$218,480	$218,480	
TOTAL ON-SITE IMPROVEMENTS			**TOTAL**		**$996,677**	
Contractor Mobilization @ 5%	1	LS	$52,206.74	$52,207		Industry standard percentage
TOTAL CONSTRUCTION			**TOTAL**		**$1,096,342**	
Design and Construction Management (Soft Costs)						
Engineering/Design Consultants 20%	1	LS	$169,268.31	$169,268		Excludes 20% of Bridge Estimate- Design & Enginnering are included in cost
Construction Management 12%	1	LS	$131,560.98	$131,561		
Conditional Use, SEPA, SDAP Permitting Fees	1	LS	$10,000.00	$10,000		
TOTAL Design Soft Costs and Construction Management			**TOTAL**		$310,829	
Total Project Costs (Construction and Soft Cost Estimate)					**$1,407,171**	

Not Included in Costs:
Parking area improvements associated with existing or potential trailheads, rest area pullouts adjacent to steep trail sections (all are under 8.3%), site lighting, fencing, restrooms

Assumption:
Type A trail (along road) in OPG development: OPG will provide rough grading. Cost estimate assumes final grading, base course and final pavement on trail.
County will provide full road and trail development from the end of the OPG road up to the Ride Park at $approximately $240/LF. This cost has been included as the road is necessary for the development of a trail over 8.3% slope.

Table 3AQ: Cost Estimate - SEGMENT E of the Additional Upper Route

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IMPLEMENTATION AND NEXT STEPS

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A

Figure 4A: Large Group Activity Along a Shared-Use Path

CHAPTER 4: IMPLEMENTATION AND NEXT STEPS

Acceptance of this feasibility study by County Commissioners and incorporation into the County's TIP will allow additional planning, inclusion into adopted transport plans and implementation to commence. The preliminary plans in this document were developed using existing LIDAR topographic information provided by the County. The horizontal and vertical trail alignments are based on 2 foot contour intervals. Final engineering of the trail alignment will require a detailed land survey and additional field work to fit the trail into the landscape. Land use and required environmental and construction permits, which are listed below, will need to be acquired during detailed engineering design prior to implementation. An easement will also need to be created for a corridor within OPG's privately owned lands. An MOU will need to be developed between the County and OPG to define funding, implementation, management, maintenance and enforcement of the trail corridor. An formal easement will also need to be obtained by County Public Works from County Parks for the trail corridor.

Potential Funding Sources

- State and County Transportation Funds and/or Grants; TAP and STP funds
- Capital Campaigns
- Kitsap County Transportation or Parks Funds
- Grants from private foundations such as Birkenfeld
- Assistance from Non-Governmental Agencies such as Trust for Public Land, Forterra, or Great Peninsula Conservancy
- State Recreation, Conservation Grants including RCO, and WWRP
- Puget Sound Acquisition and Restoration Fund (PSAR)
- Special Assessments
- Tax Assessments or Bonds

Required Permits

Wetland & Buffer Permits

The permits needed for construction of the trail through wetlands and buffers vary depending on the level of impact on the wetlands, streams and buffers. Wetland impacts are regulated by the U.S. Army Corps of Engineers (Corps), Washington Department of Ecology (Ecology), and Kitsap County, when proposing filling, ditching, and/or dredging. Hydraulic Project Approvals (HPA) will be required from the Washington Department of Fish and Wildlife for stream crossings that require installation of culverts. Wetland impacts are mitigated to achieve a no net loss of wetland acreage and/or function to compensate for the loss of acreage and function in the impacted wetland. Buffer impacts do not result in direct impacts to wetland areas so are usually regulated only by local agencies.

Kitsap County- Impacts to wetlands and buffers are regulated by Kitsap County and require submittal of Site Development Activity Permit (SDAP). A State Environmental Policy Act (SEPA) checklist must be submitted along with the SDAP permit package. Wetland delineation and wetland/buffer mitigation plan reports are required as part of the SDAP permit. No individual critical area or wetland permits are required by Kitsap County. Mitigation for wetland impacts are varied and depend on the category of wetland and the method of mitigation (creation/reestablishment, rehabilitation, and/or enhancement). The lowest ratio for mitigation is 1.5:1 for wetland impacts to Category IV wetlands and the highest are 4:1 for Category I wetland impacts when proposing creation/reestablishment. The highest range of ratios is required when enhancement is proposed as compensation for wetland impacts because it does not result in a no-net-loss of wetland acreage. Kitsap County will usually defer to the U.S. Army Corps of Engineers and Washington Department of Ecology for mitigation of wetland impacts but require submittal mitigation and delineation reports. Buffer impacts are mitigated at a ratio of 1:1.

U.S. Army Corps of Engineers (Corps)- The Corps regulates direct impacts to wetland through Section 401 of the Clean Water Act, Nationwide Permit (NWP) process, which requires submittal of wetland delineation and mitigation plan reports along with the Joint Aquatic Resources Permit Application (JARPA). The list of possible NWPs for which a project can apply is extensive and the NWP for a specific project dependent on the type of activity and project proposed. This trail project will likely meet the criteria for NWP 14-Linear Transportation Project or NWP 18-Minor Discharges depending on the extent of impact and whether it meets all of the criteria. As part of the Corps process, cultural resources and biological assessment reports may be required if features of cultural importance are identified in the project area and if there will be impacts to endangered or threatened wildlife species, respectively. The Corps determine if these additional reports will be required. Consultation with the U.S. Fish and Wildlife Service (USFWS) and NOAA Fisheries (NOAA) will be necessary if a biological assessment is required to concur with the results of the assessment.

Washington Department of Ecology (Ecology)- Ecology regulates direct wetland impacts through the Water Quality Certification (WQC) process. The WQC is issued following issuance of the NWP and is sometimes issued as part of the NWP by the Corps who determines if the project meets the criteria of the WQC. The delineation and mitigation reports submitted to the Corps are also submitted to Ecology during the permitting process.

Figure 4B: Western Red Cedar

Washington Department of Fish and Wildlife (WDFW)- The WDFW issues Hydraulic Project Approval (HPA) for projects proposing to cross or otherwise disturb streams below the Ordinary High Water Mark (OHWM) or critical habitat. An HPA will be required for the culvert crossings of state regulated streams to ensure that the crossings will not have adverse impacts on the stream and habitat areas.

Construction Permits

A Site Development Activity Permit (SDAP) is a permit that the Department of Community Development reviews for land disturbing activities for a major development or a development in critical drainage areas. It provides a mechanism to ensure stormwater quantity and quality, as well as other infrastructure, including roads, utilities and landscape are addressed. A temporary erosion and sediment control plan for construction activities is required as part of the SDAP review, as well as site development construction plans and other stormwater

C

Figure 4C: Forest Near Proposed Trail Route

design documents. The SDAP process can be expected to take approximately 6 months to gain approval.

A National Pollution Discharge Elimination System (NPDES) Construction Stormwater Permit will be required by the Washington State Department of Ecology because more than 1 acre will be disturbed.

Other Permits That May Be Required

- Permit to Work in a County Right-of-Way (Public Works Permit)
- Permit to Use, Alter, and/or Improve Unopened County Right-of-Way (Public Works Permit)
- Forest Practice Application (FPA)
- Building Permit (for Structures, Lighting, Detention Vaults, Retaining Walls)
- Appropriate Land Use Approvals (as needed)

Next Steps

- Review and adoption of Plan by Kitsap County Commissioners
- Integrate Plan into County Comprehensive Plan- Transportation, Land Use, Rural and Resource Lands, Park, Recreation and Open Space elements
- Integrate Plan into the Capital Facilities Plan and annual work plans for County Departments
- Integrate Plan into Puget Sound Regional Council (PSRC) plan
- Land Acquisition- Continue negotiations with Olympic Property Group to acquire the land or easements in manner that conforms to federal regulations
- Land Acquisition- County Public Works to obtain formal easements from County Parks for the trail corridor
- Land Acquisition- Continue to discuss phasing of OPG development and engineering of road to accommodate a separated path
- Develop Funding Plan- Continue partnerships, submit grant applications and explore other funding sources
- Design Development, final engineering, environmental documentation and permits, construction documents and building/construction permits
- Work with NKTA to develop a comprehensive wayfinding, signage, interpretive and educational plan for the entire Sound to Olympics Trail
- Permits- Develop a comprehensive strategy and complete the required documentation

Conclusion

This study demonstrates that a shared-use path within the project area can be engineered to meet local, state and federal shared-use path design standards, allowing the project to be eligible for the fullest extent of funding possible. Due to the existing terrain, steep trail grades will be necessary in locations. However, the trail can be engineered and mitigation measures applied to meet applicable standards. Implementation would come at considerable cost- $5,517,389 for the preferred Combo alignment and an additional $1,858,866 for the Upper segment. Most proposed routes utilize existing maintenance and logging road corridors to reduce cost and minimize environmental impact. The proposed trail alignment would provide for a successful transportation corridor and recreation amenity for the community.

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