STATE OF ALASKA

DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES SOUTHCOAST REGION

DESIGN STUDY REPORT

KTN: SOUTH TONGASS HIGHWAY DEERMOUNT STREET TO SAXMAN SAXMAN TO SURF STREET

STATE PROJECTS NO. Z676850000 & Z675710000
FEDERAL PROJECTS NO. 0902039 & 0902031
AUGUST 2019

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KTN: South Tongass Highway
Deermount St. to Saxman
Saxman to Surf St.
Design Services

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NOTICE TO USERS

The purpose of this report is to document the Alaska Department of Transportation and Public Facilities (DOT&PF) planning, preliminary design, and development of this project.

This report reflects design decisions as of the date of this document. Changes frequently occur during the design process and those who may rely on the information contained in this document should check with the DOT&PF for the most current design. Please contact the Engineering Manager at (907) 465–4443 for this information.

PLANNING CONSISTENCY

This document has been prepared for DOT&PF by HDR according to currently acceptable design standards and Federal regulations, and with the input offered by the local government and public.

CERTIFICATION

We hereby certify that this document was prepared in accordance with Section 520.4.1 of the current edition of the DOT&PF's Highway Preconstruction Manual and Code of Federal Regulations (CFR) Title 23, Highway Section 771.111(h).

The DOT&PF has considered the project's social and economic effects upon the community, its impacts on the environment, and its consistency with planning goals and objectives as approved by the local community. All records are on file with Southcoast Region - Design and Engineering Services Division, Preconstruction Section, 6860 Glacier Highway, Juneau, Alaska 99811.

Table of Contents

List of Figures

Acronyms and Abbreviations

AADT	annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
ADA	American Disabilities Act
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
APDES	Alaska Pollutant Discharge Elimination System
ATM/MUTCD	*Alaska Traffic Manual/Manual of Uniform Traffic Control Devices*
BMP	best management practice(s)
CDS	Coordinated Data System
CFR	Code of Federal Regulations
CGP	Construction General Permit
DOT&PF	Alaska Department of Transportation and Public Facilities
DHV	Design Hourly Volume
EFH	Essential Fish Habitat
ESAL	Equivalent Single Axel Load
FHWA	Federal Highway Administration
Green Book	*Policy on Geometric Design of Highways and Streets*
HPCM	*Highway Preconstruction Manual*
HMCP	Hazardous Material Control Plan
H:V	horizontal: vertical
ITS	Intelligent Transportation Systems
KGB	Ketchikan Gateway Borough
MHW	Mean High Water
MLLW	Mean Lower Low Water
M&O	Maintenance and Operations
MP	Milepost
mph	miles per hour
MSE	mechanically stabilized earth
NOI	Notice of Intent
OHW	Ordinary High Water
PIP	Public Involvement Plan
ROW	right-of-way
SHPO	State Historic Preservation Officer
SSD	stopping sight distance
SWPPP	Storm Water Pollution Prevention Plan
TCP	Traffic Control Plan
TMP	Traffic Management Plan
TOP	Transportation Operations Plan
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USCG	U.S. Coast Guard
vpd	vehicles per day

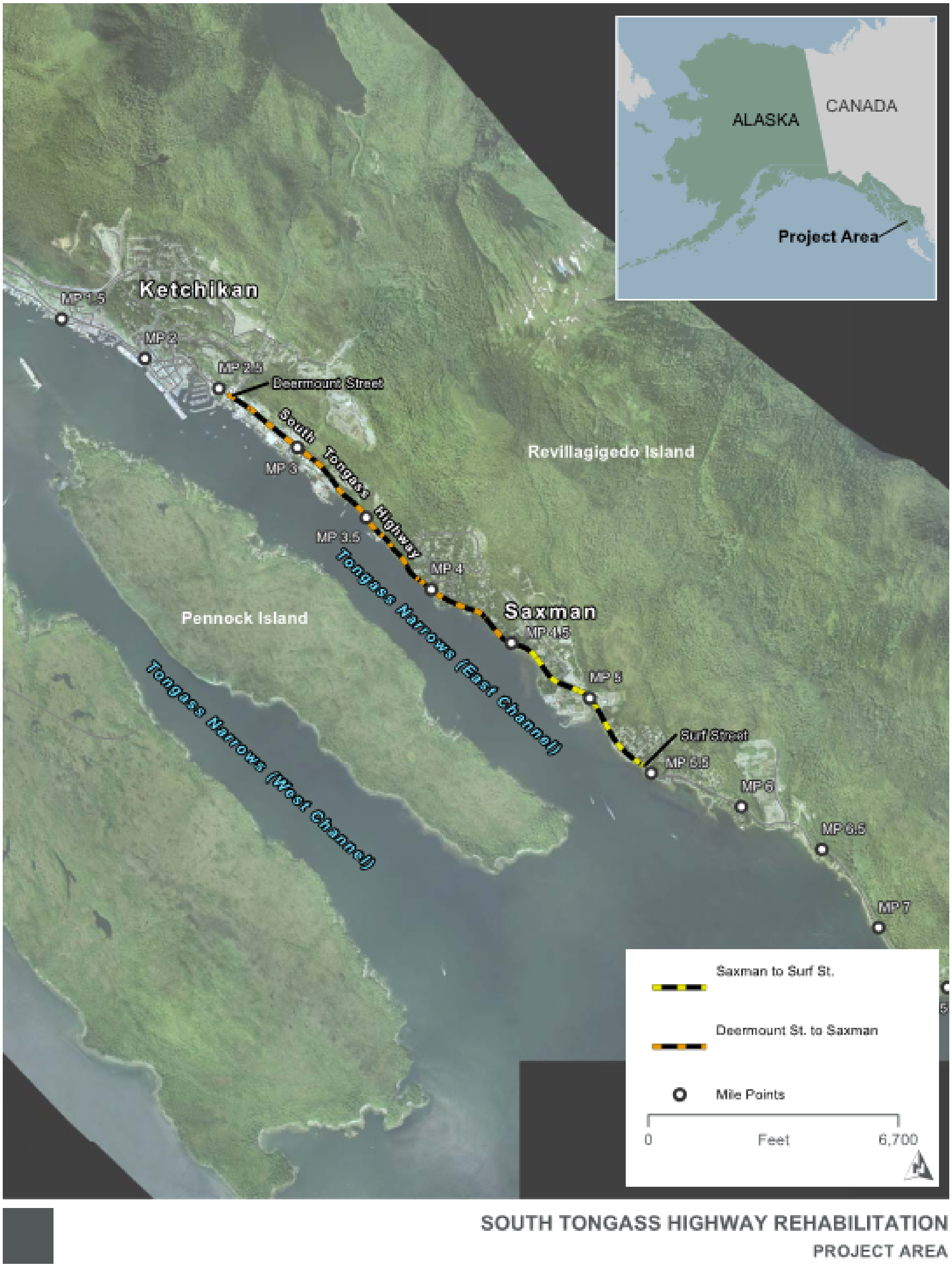


Figure 1: Project Area

1.0 PROJECT DESCRIPTION

1.1 Project Location and Description

This project is located in Southeast Alaska in the City of Ketchikan, on Revillagigedo Island (see Figure 1). The South Tongass Highway Coordinated Data System (CDS) Route #291400 begins at the Ferry Terminal Access Road in the city center and continues roughly 15 miles south to Beaver Falls. This project starts at Deermount Street (CDS MP 2.6) and ends at Surf Street (CDS MP 5.5). Within this section, the project is divided into two segments: Project #67685 Deermount Street intersection to Saxman (CDS MP 2.6 - 4.5) and Project #67571 Saxman to just past the Surf Street intersection (CDS MP 4.5 - 5.5). The Deermount Street to Saxman segment is further divided to reflect an urban section from Deermount Street CDS MP 2.6 to the U.S. Coast Guard (USCG) base CDS MP 3.4 and a rural section from CDS MP 3.4 to CDS MP 4.5. The rural section continues on from CDS MP 4.5 – 5.5. The posted speed limit is 30 miles per hour (mph) in the urban segments and 45 mph in the rural segments of the project with the exception of the City of Saxman which is posted at 30 mph.

1.2 Existing Facilities and Land Use

The Alaska Department of Transportation and Public Facilities (DOT&PF) functional classification for the South Tongass Highway is minor arterial. Consistent with the Federal Highway Administration (FHWA) Functional Classification Guidelines for minor arterials, South Tongass Highway is a medium traffic volume corridor carrying the major portion of trips, with downtown Ketchikan as a destination, and providing intra-area travel between the core business district and the outlying residential areas. Other adjacent roads in the project vicinity are two-way, two-lane roads functionally classified by DOT&PF as minor collectors and local roads.

The South Tongass Highway was originally constructed from Deermount Street to Herring Cove as a 16-foot-wide gravel surface between 1925 and 1932. In the middle 1950s, most of this road was reconstructed to a 20-foot-wide paved section with 2-foot gravel shoulders. In 1976, the section from Deermount Street to Saxman was reconstructed to its current geometry and in 2011 rehabilitated to have 11ft lanes and 2-foot shoulders. In 1996, a separated pathway was installed along the Tongass Narrows side of the road from the USCG base to approximately 900 feet north of Totem Row. South Tongass Highway is the only north-south roadway connecting Downtown Ketchikan to Saxman and the communities to the south, making it a critical route.

Sidewalk also exists on the Narrows side of the South Tongass Highway from Deermount Street to the USCG base. This sidewalk transitions into a pathway between the USCG base and ends at Saxman. It remains discontinuous through Saxman until it resumes beyond the project area south of Surf Street.

Drainage facilities along the highway typically consist of curb inlets, drainage pipes, and roadside ditches to convey storm water from the surrounding topography across the South Tongass Highway discharging into the Tongass Narrows. From approximately Deermount Street to the USCG base, curb and gutter on the Narrows side of the road convey water along the curb flow line to curb inlets. On the opposite side, there are intermittent curb and gutter and drainage ditches that convey surface runoff.

Beginning at Surf Street going north, the adjacent land use is overall primarily residential with some commercial/business mix throughout the project. As you approach City of Ketchikan on the north end of the project, the land use is primarily commercial, industrial, public lands and institutions, and the USCG base.

1.3 Purpose and Need

The purpose of the project is to extend the life of the roadway, improve safety, and decrease maintenance costs. The DOT&PF has identified the need to resurface, restore, and rehabilitate this portion of South Tongass Highway and related non-motorized facilities to improve access and enhance safe movement for vehicle, bicycle, and pedestrian traffic.

The project will smooth horizontal curves and cut back slopes in some locations to improve sight distances, which may reduce crashes at those locations. Restoring and resurfacing the roadway surface would reduce maintenance costs by facilitating efficient snow removal, reducing snow and ice entrapment in the wheel ruts. These improvements will also enhance the drivers comfort, drivability and aesthetics.

Existing drainage facilities, such as ditches and culverts are nearing their design life and display signs of failing. Rehabilitating and improving drainage will facilitate the conveyance and disposal of storm water collected along the roadway. Many of these facilities will be replaced or upgraded to improve the overall system wide drainage and also reduce maintenance costs.

Rock slopes along the highway are steep and are deteriorating with loose rock falling onto the traffic lanes. Similar conditions have contributed to recent rock slides on other sections of South Tongass Highway. The project will include stabilization of rock slopes by either reinforcement, removal or protection.

The existing pedestrian/bicycle pathway will be rehabilitated and a new pathway constructed to link Surf Street and Saxman. In some sections, the embankments and retaining walls along the existing pathway show varying degrees of distress and failure. These structures need to be restored or replaced to improve the structural integrity.

2.0 DESIGN STANDARDS

The designs of project alternatives discussed in this report are based on the following references:

- ADA Standards for Transportation Facilities, U.S. DOT, 2006.
- ADA Standards for Accessible Design, United States Department of Justice, 2010.
- A Policy on Geometric Design of Highways and Streets (PGDHS), 6th Edition, American Association of State Highway and Transportation Officials (AASHTO), 2011.
- Alaska Highway Drainage Manual (AHDM), State of Alaska, DOT&PF, 2006.
- Alaska Highway Preconstruction Manual (HPCM), State of Alaska, DOT&PF, 2005 as amended.
- The Alaska Traffic Manual (ATM), consisting of the Manual on Uniform Traffic Control Devices (MUTCD), 2009 as amended, U.S. DOT, Federal Highway Administration (FHWA) and the Alaska Traffic Manual Supplement (ATMS), State of Alaska, DOT&PF, 2016.
- Alaska Flexible Pavement Design Manual (PDM), State of Alaska, Department of Transportation and Public Facilities, 2004.
- Guide for the Development of Bicycle Facilities, 4th Edition, AASHTO, 2012.
- Guide for the Planning, Design, and Operation of Pedestrian Facilities, AASHTO, 2004.
- Roadside Design Guide (RDG), 4th Edition, AASHTO, 2011.

Appendix A contains the project Design Criteria and Design Designation.

3.0 ALTERNATIVES CONSIDERED

A no build, pavement overlay, and rehabilitation alternatives were considered for the project.

3.1 No-Build Alternative

Under the No Build alternative, the existing roadway will remain as is and continue to deteriorate. No work outside the existing footprint would be completed and existing structures (culverts and walls) would not be replaced or rehabilitated and continue to exhibit signs of distress. This alternative does not encompass the Purpose and Need of the project.

Based on the above considerations, this alternative was rejected.

3.2 Pavement Overlay

Under the Pavement Overlay alternative, repairs to damaged road sections would be completed as needed and the roadway would be resurfaced. No work outside the existing footprint would be completed and existing structures (culverts and walls) would not be replaced or rehabilitated and continue to exhibit signs of distress. While this alternative improves pavement conditions for vehicles in the short term, it does not fully encompass the purpose and need of the project.

Based on the above considerations, this alternative was rejected.

4.0 PREFERRED ALTERNATIVE

The build alternative combines several improvements to form a viable alternative to address the purpose and need of the project. This alternative will reconstruct the South Tongass Highway geometrics by; providing 11ft lanes and 5ft shoulders to enhance roadway safety, new asphalt pavement for a smooth driving surface to improve surface drainage and driver comfort, and new drainage structures to improve the water conveyance.

Rock slopes will be cut back or scaled to mitigate potential rock hazards. An existing box culvert will be replaced with a fish passage structure and appurtenances to enhance fish passage in the anadromous fish stream. The existing pathway from the USCG base to Saxman will be reconstructed and a new pathway between Saxman to Surf Street will connect the two existing pathways. The existing sidewalk on the Narrows side of the project between Deermount Street and the USCG base will be rebuilt to ADA standards and a new sidewalk on the mountain side of the project will be constructed starting at Deermount Street extending 600 feet south enhancing pedestrian safety.

Based on the above considerations, this alternative was selected.

5.0 TYPICAL SECTION

The South Tongass Highway preferred alternative has varying typical sections due to topographic and right-of-way (ROW) constraints. The proposed urban section, Deermount Street to the USCG base, is a two-lane typical section with 11-foot lanes and 5-foot shoulders to face-of-curb. Adjacent to this roadway, the Urban Typical Section consist of a 6-foot and 4-foot-wide sidewalk attached to the back of curb, as seen in Figure 2. The sidewalk on the mountain side (project left) of the project will terminate approximately 600 feet south of Deermount Street.

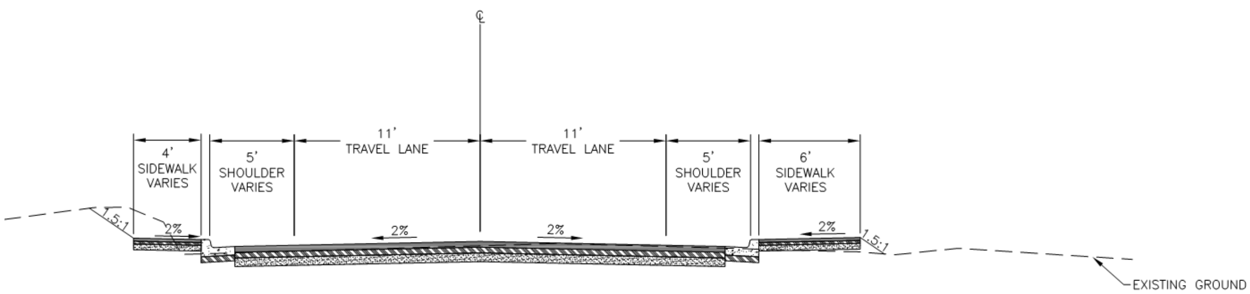


Figure 2: Urban Typical Section (Generic)

The proposed rural section from the USCG base to Surf Street, is a two-lane typical section with 11-foot lanes and 5-foot shoulders. Adjacent to this roadway on the Narrows side (project right) of the road, the Rural Typical Section consists of a variable width buffer and 8-foot pathway on one side and a v-ditch on the other side, as seen in Figure 3.

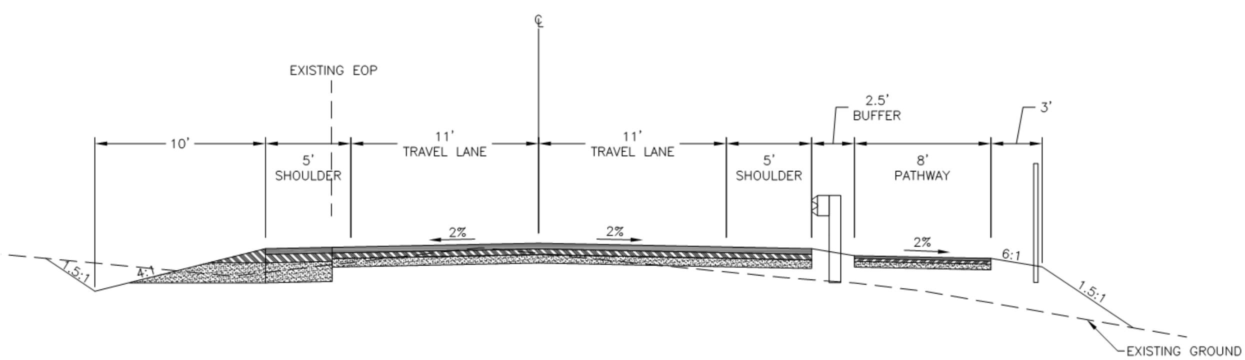


Figure 3: Rural Typical Section (Generic)

Due to the nature of the mountainous topography, the side slopes are 4:1 inside the clearzone where feasible, and back slopes steepened to a maximum 0.25:1 rock cuts. Guardrail and pathway fencing is placed in locations as needed where steep slopes are located.

Both the Urban and Rural typical section vary as they navigate within the footprint of the existing roadway balancing narrow ROW, multiple utilities, and challenging topography throughout the entire project. A more detailed summary of the project Typical Sections can be found in Appendix B.

6.0 HORIZONTAL AND VERTICAL ALIGNMENT

6.1 Horizontal Alignment

The 3R analysis compares horizontal curves within the project limits with new construction standards. Individual horizontal curves were also evaluated based on the number of crashes occurring along the curve and the predicted number of crashes. If the actual number of crashes is greater than the predicted number, the curve is recommended for upgrade to new construction standards unless it is not cost effective.

Standard horizontal curves may remain unchanged on 3R projects unless the actual number of crashes exceeds the predicted number of crashes and the curve has insufficient stopping sight distance (SSD). Four horizontal curves in the project limits do not meet the current radius standards for design speed or SSD. However, based on crash evaluation, none of the horizontal curves require improvement.

Nevertheless, the horizontal curve at CDS MP 3.6 is currently being evaluated for flattening due to its proximity to existing commercial development. Large commercial vehicles reduce sight distances at this location entering and exiting this development and the public has expressed several “close calls” with truck traffic. The horizontal curve at CDS MP 3.9 is also being evaluated for flattening the curve towards the Narrows side to minimize the rock cut impacts on the mountain side.

6.2 Vertical Alignment

The 3R analysis applies to crest vertical curves only; the methodology is not applicable to crashes for sag vertical curves. All of the vertical curves within the project limits were compared with current design standards. Individual vertical crest curves were evaluated based on the number of crashes occurring along the curve and the predicted number of crashes. If the actual number of crashes is greater than the predicted number, then the crest curve is recommended for upgrade to current design standard unless it is not cost effective.

Standard crest vertical curves may remain unchanged on 3R projects unless the actual number of crashes exceeds the predicted number of crashes and the curve has insufficient SSD. All of the existing vertical curves in the project limits meet the current mathematical standards for length and SSD. Based on this crash evaluation, none of the vertical crest curves require improvement.

7.0 EROSION AND SEDIMENT CONTROL

Erosion and Sediment Control Plans will be developed according to Chapter 16 of the *Alaska Highway Drainage Manual*. The contractor will also prepare and submit a Storm Water Pollution Prevention Plan (SWPPP) and Hazardous Material Control Plan (HMCP) to the DOT&PF for approval prior to the beginning of any construction activities. The contractor will submit a Notice of Intent (NOI) and associated fee to the Alaska Department of Environmental Conservation (ADEC) for coverage under the Alaska Pollutant Discharge Elimination System (APDES) Construction General Permit (CGP). A variety of best management practices (BMPs) will be implemented as necessary to avoid impacts on the adjacent streams, creeks, and tidally influenced areas.

8.0 DRAINAGE

The existing drainage system consists primarily of ditches along the mountain side of the highway, with cross culverts to outfalls flowing into the Tongass Narrows. Construction of the preferred alternative intends to maintain existing drainage patterns throughout the project and provide improvements where necessary.

From Deermount Street to the USCG base, a storm drain system exists with curb, gutter and inlet manholes which discharge into the Tongass Narrows. The proposed new sidewalk from Deermount Street south will include expansion of the storm drainage system which will tie into the existing system.

Ditches on the mountain side of the roadway are overgrown with vegetation, not allowing adequate drainage. These ditches will be reconditioned and culverts near the end of their operational life will be replaced.

Based on a hydrologic and hydraulic design field report conducted October 14–16, 2015, there are more than 50 drainage pipes, culverts, and structures along the project corridor. Initial analysis of these structures recommended more than half of these drainage structures be replaced in the same location. A select few of the structures are to be relocated and/or abandoned diverting flows to the nearest upgraded drainage system. Most of the culverts in the rural section of the project will be upgraded or upsized, while pipes and structures in the urban section will to be replaced in kind. One culvert has been designated by the Alaska Department of Fish and Game (ADF&G) to be fish habitat for anadromous species and will be replaced with a structure meeting the necessary requirements.

9.0 SOIL CONDITIONS

A geotechnical and geophysical exploration and rock structure mapping analyses took place along the highway between February 25 and August 8, 2017. The geotechnical data on the historic test hole logs indicated the soils along the alignment generally consist of a mixture of silty gravel, silty sand, and some organic material overlying bedrock. The existing pavement thickness varies from 2.5 inches upwards to 10 inches. Bedrock, or auger refusal on boulders, was encountered at depths ranging from 2.8 to 11.5 feet. Bedrock consists of dark gray, slightly weathered foliated, micaceous phyllite. Design rock cuts have been established with a maximum of 0.25:1 slopes.

Other site conditions observed February 2017 investigation included:

- evidence of sulfide mineralization including pyrite, iron staining on rock cuts, and quartz and calcite veining
- a sheet pile wall near Deermount showed signs of corrosion
- soldier pile walls between the existing roadway and pathway had dry rot in the timber lagging and wall rotation.
- welded wire basket walls to support the pathway south of the USCG base displayed signs of soil loss along with tension cracking and distress in the pavement.

All existing retaining walls are being considered for replacement.

10.0 ACCESS CONTROL FEATURES

South Tongass Highway is functionally classified as a minor arterial by DOT&PF. According to AASHTO's Green Book, a minor arterial facility purpose is divided between mobility and access, with a greater emphasis placed on mobility. South Tongass Highway will provide ample access to abutting properties along its corridor and with appropriate driveway and access permits, the desirable functionality will be maintained. DOT&PF is the permitting authority for private driveway and public access onto South Tongass Highway. Private entrances will be analyzed and where feasible, driveways will be combined.

11.0 TRAFFIC ANALYSIS

The 3R Report evaluated annual average daily traffic (AADT) and level of service (LOS) ratings for the design year (2035) traffic conditions. The LOS ratings were within the minimum urban standards of a "D" with the 2035 projected traffic volume. The project LOS from Deermount Avenue to Saxman and from Saxman to Surf Street, in 2015 were LOS B–C and A–B, respectively, and are projected to remain relatively the same through the 20-year forecast ending in 2035. Details of this analysis can be found in Appendix C.

The preferred alternative would add left-turn pockets at key intersections decreases the number of potential conflict points allowing for smoother operation of the South Tongass Highway.

Table 1: Project Area Traffic Volumes: Existing and Forecast for 2025 and 2035

Road Segment	Annual Average Daily Traffic Vehicles Per Day		
	2015 (Existing Year)	2025 (Mid-Year)	2035 (Design Year)
Deermount Street to Saxman	6,020	6,330	6,650
Saxman to Surf Street	2,860	3,000	3,160

12.0 SAFETY IMPROVEMENTS

12.1 Improving Roadway Geometry

A 3R Analysis and Safety Recommendations Technical Memorandum was completed by HDR in February 2016. The 3R analysis is a guide used to identify potential safety improvements along a corridor. Improvements within any specific project corridor may warrant further consideration beyond the scope of a 3R analysis. Typical recommendations of a 3R analysis include widening the traveled way, mitigating roadside geometry to address run-off-the-road crashes, and flattening horizontal and vertical curvature. The results of the 3R analysis are presented in Appendix C.

In summary, the South Tongass Highway 3R analysis does not require widening the travel way. South Tongass Highway #71670 was completed in 2006 immediately to the south of the proposed project with a top width of 32 feet, with 11-foot lanes and 5-foot shoulders. For enhanced safety and user consistency through the overall South Tongass Highway corridor, this project will match the 2006 project with 11-foot lanes and 5-foot shoulders. A wider top width has the potential to further reduce the number of single-vehicle run-off-the-road crashes as well as rear-end collisions of left-turning vehicles.

12.2 Improving Multimodal Facilities

Pedestrian and bicycle facilities are discontinuous, and many are at the end of their design life. Existing sidewalks and curb ramps do not meet current Americans with Disabilities Act (ADA) standards. Bicycle facilities are limited to a pathway from the USCG base to Totem Row, 1-2 foot narrow shoulders adjacent to the road, or use of the existing traffic lanes.

This project intends to provide a fully continuous pathway from the USCG base through Saxman. The construction of 5-foot shoulders matches the adjacent 2006 project provides a continuous wider shoulder for bicyclists to enhance safety. The new pathway will be separated from the shoulder by a 5 feet buffer where feasible.

Currently, Ketchikan Gateway Borough (KGB) transit's Sliver Line South runs along South Tongass Highway, serving businesses and residents with select bus stops from downtown Ketchikan to Mountain Point. Most existing stops consist of a gravel shoulder with bus stop signage, while some stops have basic shelters. With minimal to no shoulders, buses stop in the travel lane and cause traffic to back up on the two-lane highway.

Where the restriction from topographical features and/or the limitations of ROW are not impacting the corridor, proposed improvements will construct bus pullouts reducing vehicle and pedestrian conflicts and improving bus stop pedestrian access and safety. Locations will be coordinated with KGB's transit authority.

12.3 Improving Drainage and Hydrology

Drainage patterns will remain relatively the same throughout the project corridor, but most ditches and many pipes require improvements. Ditches on the mountain side of the roadway are overgrown with vegetation, which does not allow adequate drainage. New side slopes on the mountain side of the corridor will be constructed at 4H:1V where practical, increasing the ditch depth to 2.5 feet. In areas of cross-drainage, pipes are to be installed and ditches will be deepened to allow for proper cover. Pipes will be upsized to accommodate the increase of storm water conveyance. On the mountain side of the road from Deermount to 600 feet south, new inlets and a storm drainage system will be constructed to tie into the existing system on the Narrows side. There is one large box culvert in an anadromous fish stream that does not meet current fish passage standards. This culvert will be replaced to improve fish passage.

12.4 Improving Roadside Conditions

The 3R process evaluates cross-section geometry and obstacles within the clearzone based on Section 1160.3.6 of the HPCM. The total top width of the roadway will be widened and include the addition of a 5 foot. shoulder. The clear zone will also be improved where practical and does not significantly impact adjacent properties. These improvements will create a greater recovery area for a vehicle leaving the roadway.

12.5 Improving Intersections

As part of the 3R analysis, four intersections were examined in the project area to determine if any modifications are recommended. Table 2 displays the results of the intersection crash analysis. There were 18 intersection-related crashes at these intersections: 10 at Deermount Street, 2 at Cemetery Road, 4 at Forest Park Drive, and 2 at Totem Row. Based on the intersection crash analysis, these intersection crash rates do not exceed the upper control limit, therefore modifications are not required as part of the 3R analysis.

Table 2: Intersections Crash Rate Summary, 2003–2012[a]

Intersection Location		Total Crashes	Millions of Entering Vehicles in Period	Accident Rate (AR)	Critical Acc. Rate (CAR)	Safety Index (AR/CAR)	Severity Indicator
Street 1	Street 2						
South Tongass Highway	Deermount Street	10	21.973	0.46	0.73	0.62	0.002
South Tongass Highway	Cemetery Road	2	21.973	0.09	0.73	0.12	
South Tongass Highway	Forest Park Drive	4	21.973	0.18	0.73	0.25	0.001
South Tongass Highway	Totem Row	2	10.439	0.19	0.86	0.22	

[a] Source: 3R Analysis and Safety Recommendations Technical Memorandum

Although the 3R analysis does not require intersection modifications, NCHRP 745 recommends consideration for left-turn bays for Deermount Street, Forest Park Drive, and Totem Row due to their elevated turning movements. Left turn bays allow for improved traffic flow and access of the South Tongass Highway thereby decreasing the number of potential conflict points.

Deermount Street would benefit from a left-turn lane, however, due to narrow ROW and adjoining structures, the design will not provide a left-turn lane. The design will provide improvements ot the existing intersection for traffic and pedestrian movement. One modification considered is consolidating driveway access to businesses to improve vehicle flow and enhance pedestrian safety. This would require reconfiguration of adjoining parking lots and business access routes; thereby reducing the number of conflict points, intersection congestion and improving overall pedestrian safety.

Forest Park Drive and Totem Row will include a wider cross section with the additional left-turn lane pocket. The separation of the multi-use path from the roadway at these location will be reduced to accommodate ROW and topographical restrictions.

13.0 RIGHT-OF-WAY REQUIREMENTS

State ROW width varies throughout the project. Several properties currently have encroachments which include buildings, staircases, garages, parked large vehicles and heavy equipment, landscaping and other obstructions. Property owners will be advised by the State to move property off of the designated State ROW, however, some encroachments may be permitted.

Sections of the roadway will be widened to accommodate wider shoulders, drainage improvements and new pathway construction. These sections have cut/fill limits extending beyond the ROW and will require property acquisitions, easements, temporary construction easements, and/or other permits for construction. Based on the 2017 Preliminary ROW Impacts analysis, approximately 123 properties may be impacted.

14.0 PEDESTRIAN AND BICYCLE FACILITIES

Existing pedestrian and bicycle facilities are not continuous, and many are in disrepair. The preferred alternative seeks to incorporate the following improvements into the design.

In the urban section, from Deermount to the USCG, curb and sidewalk will be provided on both sides of the highway. ADA ramps and sidewalks will be brought up to current design standards. Cross walks are being evaluated at the intersections of Deermount Street, Lower USCG base access, Forest Park Drive, and Totem Row. The local community advisory groups recommended these crosswalks be designed with proper signage and markings, if they meet warrant conditions. The FHWA conducted a Roadside Safety Assessment (RSA) in July 2013 in Saxman and recommended crosswalk markings and signage improvements at the Totem Row intersection with South Tongass Highway. This is consistent with recommendations for additional crosswalks and in the Ketchikan Indian Community 2007 Long Range Tribal Transportation Plan.

In the rural section, a separated pathway on the Narrows side will be provided. The pathway will connect the USCG base and existing pathway at the southern extent of the project. Both AASHTO and the HPCM recommend 5 feet of separation from the edge of pavement roadway to the edge of pathway. The 5-foot shoulder will match the adjacent project to the south providing a continuous wider shoulder for bicyclists. However, there are numerous locations along the project where existing structures or narrow ROW prevents the 5 foot separation between roadway and detached pathway. In these locations, the design will provide a curb and gutter and attach the pathway.

Locations for exceptions to the 5 foot separation design standard include in the vicinity of Forest Park Drive and Shoup Street.

15.0 UTILITY RELOCATION AND COORDINATION

Several utility providers have utilities in the project vicinity. City-run water and sewer utilities run under the highway throughout the project corridor. Ketchikan Public Utilities operates overhead electrical lines along the highway that also carry GCI communication lines. Private fuel/gas lines cross the highway near the Petro Marine facility.

Utilities will be impacted by this project and relocations will be necessary. The primary area of utility conflict is between the intersections of Deermount Street and Cemetery Road. At this location, new sidewalk and curb and gutter sections on the mountain side are in conflict with existing utility poles. Additional overhead utility lines crossing the project may require adjustment due to new cut/fill slopes or relocation if conflicts appear to be unavoidable. Utility poles currently located within the pathway will be relocated. Replacement of storm water pipes and culverts throughout the project area will likely impact buried utilities.

16.0 PRELIMINARY WORK ZONE TRAFFIC CONTROL

The HPCM, Section 1400.2 sets forth the criteria for determining if a project is to be classified as a "Significant Project" for purposes of determining the level of effort required in developing a Traffic Management Plan (TMP). This project meets the definition of "Significant" and therefore requires a TMP. The TMP addresses delays and queuing times by limiting road closures to night time on weekdays only. Components of the TMP include a Traffic Control Plan (TCP), Public Information Plan (PIP), and Transportation Operations Plan (TOP).

16.1 Traffic Control Plan (TCP)

The contractor will develop a TCP to safely guide and protect the traveling public in work zones, in accordance with the ATM and the project specifications. TCP and detour plans will be reviewed and approved by the Construction Project Engineer and the Traffic Control Engineer prior to implementation. TCP is required for all construction work within the road ROW which alters vehicular, bicycle and/or pedestrian traffic patterns and are necessary to ensure the safe and efficient movement of traffic through construction work zones. The contractor is responsible for providing advance notice to the general public of their construction activities which cause delays or affect access to adjacent properties.

16.2 Public Information Plan (PIP)

A PIP will be developed, prior to beginning construction that specifies the ways and means the contractor will inform the public of upcoming activities that may impact local stakeholders, businesses general roadway users and public entities. The PIP will contain measures to inform stakeholders of project scope, expected work zone impacts, closure details, and recommended action to avoid impacts and changing conditions during construction. Measures to disseminate information include:

- Contractor's Worksite Traffic Supervisor
- Department's Construction section thru the Department's 511 system
- Department's Navigator website
- Television, Radio, and/or newspaper
- Other location-specific communication tools
- The Contractor shall also be responsible to notify emergency services such as fire, police and hospitals, and local governmental offices of his activities

The traveling public and emergency services should not be caught unaware by any closures, detours, delays, night work, or any potentially disruptive activity.

16.3 Transportation Operations Plan (TOP)

The Department will coordinate with relevant public agencies and event organizers, and incorporate means and methods for minimizing traffic impacts with the contractor not covered by the TCP or the PIP within the project plans.

17.0 STRUCTURAL SECTION AND PAVEMENT DESIGN

The selected pavement design is based on the preliminary Material Recommendations found in Appendix D.

Proposed Pavement Section:

- 2" Hot Mix Asphalt, Super Pave, Class B
- 2" Hot Mix Asphalt, Type II, Class B
- 4" D-1 Base Course
- 8" Selected Material, Type A

Proposed Pavement Section on soft or organic subgrade:

- 2” Hot Mix Asphalt, Super Pave, Class B
- 2” Hot Mix Asphalt, Type II, Class B
- 6” D-1 Base Course
- 18” Selected Material, Type A

Proposed Pathway Section:

- 2” Hot Mix Asphalt, Type II, Class B
- 2” D-1 Base Course
- 4” Selected Material, Type A

18.0 COST ESTIMATE

18.1 No Build Alternative

This alternative provides for no improvements and for the continued operation and maintenance of the facility in its current condition and configuration.

Cost estimate: $0

18.2 Pavement Overlay Alternative

This alternative provides for minimal repairs to damaged road sections as needed and will plane and overlay the existing pavement.

A cost estimate for the pavement overlay alternative in current year dollars (2019) for the proposed projects is as follows:

Deermount Street to Saxman	
Design Engineering	$500,000
Right-of-Way	$0
Utilities	$0
Construction	$1,800,000
Total	$2,300,000

Saxman to Surf Street	
Design Engineering	$500,000
Right-of-Way	$0
Utilities	$0
Construction	$1,100,000
Total	$1,600,000

18.3 Preferred Alternative – Reconstruct South Tongass Highway

This alternative will reconstruct the South Tongass Highway providing consistent 11 foot lanes and 5 foot widened shoulders, improved geometric alignment, upgraded sight distance and clear zone at select locations. This alternative also improves drainage management with new curb/gutter and storm drain systems along with a new fish passage structure. Other structural improvements include new retaining walls in several locations. This alternative enhances pedestrian safety by reconstructing existing sidewalks and pathways, adding stripping, signing, extending a new sidewalk on the mountain side from Deermount Street to 600 feet south, and constructing a separated pathway from Saxman to Surf Street.

A cost estimate for the preferred alternative in current year dollars (2019) for the proposed projects is as follows:

Deermount Street to Saxman	
Design Engineering	*$4,500,000
Right-of-Way	*$5,200,000
Utilities	*$1,400,000
Construction	$20,100,000
Total	$31,200,000

Saxman to Surf Street	
Design Engineering	*$2,700,000
Right-of-Way	*$1,100,000
Utilities	*$2,000,000
Construction	$9,100,000
Total	$14,900,000

** This figure is a placeholder from the allocated 2018-2021 STIP and is pending future task amendments for proposed ROW needs and utility relocation costs.*

This construction cost estimate was developed using historical bid data from DOT&PF projects, and per-mile and quantity take offs were also used to verify this estimate, which will be updated as final design details and schedules are determined.

Costs for ROW and utilities are based upon the maximum expected impact. As the project moves through the design process, these estimates will be further refined to reflect the true costs of the project.

19.0 ENVIRONMENTAL COMMITMENTS

The following commitments are from the approved Categorical Exclusion document signed August 9, 2017. This document is located in Appendix E.

- Comply with Subsection 107-1.07 specifications for Archeological or Historic Discoveries.
  - If cultural, archaeological, or historical sites are discovered during construction, all work that may affect these resources will stop until DOT&PF consults with the SHPO to determine the appropriate correction action and guidance on how to proceed.
- Comply with SR Special Provision 201-3.01 for the Migratory Bird Treaty Act.
  - In Forested areas clearing is restricted between April 15 and July 15
- Comply with SR Special Provision 201-3.07 Specifications for Control of Invasive Plant Species.
- Comply with Subsection 203-3.01 specifications regarding excavation.
  - The contractor is responsible for obtaining all necessary permits and clearances for materials sites, disposal sites, and staging areas unless DOT&PF has obtained all necessary permits.
- Comply with Section 641 specifications for Erosion, Sediment and Pollution Control.
  - Comply with Subsection 641-2.02 specifications for the Hazardous Materials Control Plan.
- Comply with Section 643 specifications for Traffic Maintenance.
  - The contractor is responsible for creating a Traffic Control Plan and providing advance notice to the public and businesses of construction activities that could cause delays, cause detours, or affect access to adjacent properties
- As a commitment of the Essential Fish Habitat (EFH) Assessment, the Contractor shall remove visible plastic debris to minimize the potential for these materials to be inadvertently dispersed into marine waters prior to work in the intertidal area.
  - Intertidal fill will be placed during low tide conditions to minimize impacts to federally managed fish species, EFH, and marine mammals.
- Comply with conditions outlined in the ADF&G Title 16 Fish Habitat Permit.
- Comply with the conditions of the USACE section 10/404 Fill in Wetlands and Waters of the US
  - Existing drainage patterns will be maintained; properly sized and designed culverts will be used in appropriate locations to maintain the natural flow patterns and timing of surface water inflows to adjacent wetlands and waters.

    - Existing drainage patterns will be maintained; properly sized and designed culverts will be used in appropriate locations to maintain the natural flow patterns and timing of surface water inflows to adjacent wetlands and water.
    - The contractor will use clean, contaminant-free fill material during construction.
- Comply with the provisions of the Bald and Golden Eagle take permit.
    - Noise and vibration producing construction activities will be restricted during the breeding season from March 1st to when the eaglets fledge, approximately August 15th. Restricted activities will be listed in the permit.
- If contamination or hazardous materials are encountered during construction, all work in the vicinity of the contamination will stop until DOT&PF consults with the ADEC to determine the appropriate corrective action.

The contractor is responsible for obtaining all necessary permits and clearances for materials sites, disposal sites, and staging areas unless DOT&PF has obtained all necessary permits.

20.0 BRIDGES AND RETAINING WALLS

20.1 <u>Bridges</u>

There are no bridges located on this project.

20.2 <u>Retaining Walls</u>

Existing retaining walls show signs of corrosion, soil loss and wall rotation. The preferred alternative seeks to incorporate the following improvements into the design.

New retaining walls alternatives will consist of either material stabilized embankment or drilled shaft/soldier pile walls depending on area constraints. Wall heights range from 3-20 feet.

21.0 EXCEPTIONS TO STANDARDS

No design exceptions are needed.

22.0 MAINTENANCE CONSIDERATIONS

Maintenance will remain the responsibility of the State of Alaska and the local DOT&PF Maintenance and Operations Station located at 5148 North Tongass Hwy.

The project will increase maintenance efforts with the additional of approximately 1 mile of pathway from Saxman to Surf Street and wider 5 foott shoulders from Deermount Street to Surf Street. Maintenance efforts will be reduced by the stabilization of rock slopes, replacement of deteriorating culverts, clearing vegetation and cleaning of drainage ditches, and enhancing the roadside clearzone. The entire roadway and pathway will be repaved reducing the maintenance costs incurred with repairing damaged pavement.

23.0 ITS FEATURES

There are no Intelligent Transportation Systems (ITS) on this project.

APPENDIX A

Approved Design Criteria and Design Designation

DESIGN DESIGNATION

State Route Number: *291400* Route Name: *South Tongass*

Project Limits: *South Tongass: Deermount (MP 2.601) to Totem Row (MP 4.753)*

State Project Number: *67685* Federal Number: *STP-0902(039)*

Project Description: *Reconstruct South Tongass form Deermount to Totem Row*

Functional Classification:* *Minor Arterial*

*A functional reclassification may be requested from the FHWA - see Section 11-00.04.01, page 11-00(2)

Urban Class (1,2, or 3, - See Highway Capacity Manual, Chapt 11): *n/a*

Project Type (New Construction/Reconstruction, Rehabilitation (3R), or Other): *3R*

Project Design Life (usually 5, 10, or 20 years): *20*

	Last Year with Traffic Data	Year After Construction	Mid-Life Year	Future Year
	2013	*2017*	*2027*	*2037*
ADT**	*5900*	*6020*	*6330*	*6650*
DHV	*630*	*640*	*670*	*710*
Peak Hour Factor	*0.9*	*0.9*	*0.9*	*0.9*
Directional Distribution	*55/45*	*0/100*	*0/100*	*0/100*
Percent Commercial Trucks	*7.7%*	*7.7%*	*7.7%*	*7.7%*
Compound Growth Rate		*0.50%*	*0.50%*	*0.50%*
Pedestrians (Number/Day)	*No Data*	*No Data*	*No Data*	*No Data*
Bicyclists (Number/Day)	*No Data*	*No Data*	*No Data*	*No Data*

** If urban then ADT is not required. Intersection diagrams shall be attached as part of this document

Design Vehicles for turning: *WB-50*

Design Vehicle Loading (HS 15, HS20, or HS25): *HS 25*

Equivalent Axle Loads: *2,050,000*

Concurrence: [signature] Date: 5/12/16
Regional Traffic Engineer

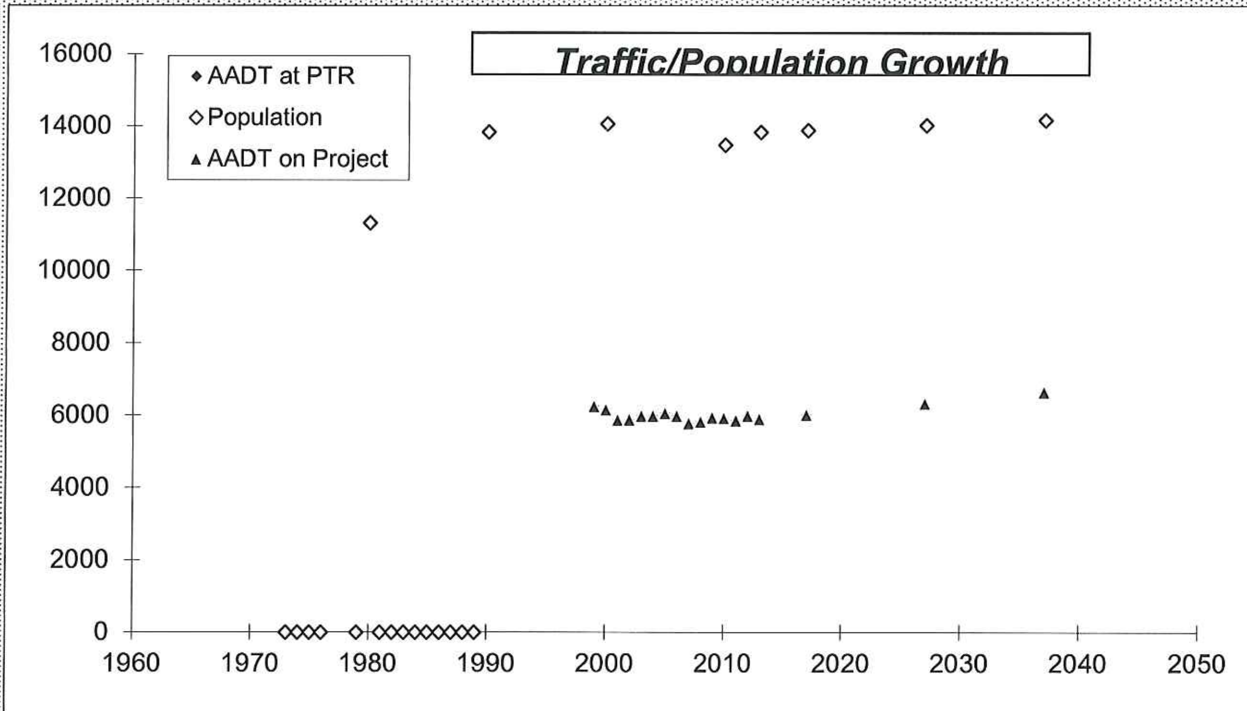
Concurrence: [signature] for Andy Hughes Date: 5/12/16
Planning

Approval [signature] Date: 5/12/16
Preconstruction Engineer
For Pat Carroll

Alaska DOT/PF, Southcoast Region

Traffic Projections

Project Name:	*South Tongass: Deermount to Totem Row*	Project Design Life:	*20*
State Project Number:	*67685*	**DHV/AADT (from PTR)**	*10.6%*
Community:	*Ketchikan*	PTR Location:	*South Tongass*
Year of Construction:	*2016*	Compiled By:	*Ryan Siverly*



Historical Population and Traffic Growth Rates (Compounded)	**Area Population**			**Average Annual Daily Traffic**			
	From	**To**		**From**	**To**	**at PTR**	**on Project**
	1970	1980	#N/A	2003	2013	N/A	-0.1%
	1980	1990	2.0%	2008	2013	0.2%	0.2%
	1990	2000	0.2%	2010	2013	-0.1%	-0.1%
	2000	2010	-0.4%	2011	2013	0.4%	0.4%
	2010	2013	0.9%	2012	2013	-1.5%	-1.5%

Projected Future Population and Traffic Volumes			**Area Population**	**AADT at PTR**	**AADT on Project**	**DHV on Project**
	Projected Compound Growth Rate		**0.1%**	**0.5%**	**0.5%**	
	Last Year with Pop. Data	2013	13828			
	Last Yr with Traffic Data	2013		5904	5904	**626**
	Year after Construction	2017	13883	6023	6023	**638**
	Mid Project Life	2027	14023	6331	6331	**671**
	End of Project Life	2037	14164	6655	6655	**705**

Comments/Rationale for projected growth rate

Page 3

State of Alaska

Department of Transportation and Public Facilities

Southcoast Region Traffic and Safety Section

Equivalent Axle Load Computations

Data from Page One			
Project Name: **South Tongass: Deermount to Totem Row**		One way AADT - Last yr w Traffic Data	*3,247*
State Project Number:	*67685*	One way AADT - 1st yr after construction	*3,313*
Community:	*Ketchikan*	One way AADT - Design Year	*3,660*
Year of Construction:	*2016*	Compound Growth Rate: present-Design Yr	*0.50%*
Project Design Life:	*20*	Compiled By:	*Ryan Siverly*

Input Data	
No of lanes in one direction:	1

Computed Data	
% of heavy vehicles (class 4-13) in design lane	1.00

% of heavy vehicles in the Design Lane	
No of lanes in one direction	% of heavy vehicles in Design Lane
1	100%
2	90%
3	80%

Equivalent Axle Loads by Class							
	Input	**Given**	**Computed**				
			Annual no of vehicles in design lane by class		**Annual EALs**		**EALs over project life**
Class	**% of Mix**	**Load Factor**	**Yr after Constr**	**Design Yr**	**Yr after Constr**	**Design Yr**	
1	0.47%		5634	6225			
2	72.05%	0.005	871164	962546	4356	4813	91,381
3	19.84%	0.005	239863	265024	1199	1325	25,161
LV Totals:	**92.35%**		**1,116,662**	**1,233,795**	**5,555**	**6,138**	**116,542**
4	1.86%	1.000	22489	24849	22489	24849	471,809
5	2.40%	0.500	28958	31996	14479	15998	303,759
6	1.18%	0.850	14268	15764	12127	13399	254,422
7	0.01%	1.200	157	174	189	208	3,957
8	0.10%	1.200	1221	1349	1465	1619	30,744
9	2.03%	1.550	24509	27080	37988	41973	796,964
10	0.03%	2.240	314	347	704	778	14,773
11	0.03%	1.550	314	347	487	538	10,223
12	0.00%	2.240	48	53	108	120	2,273
13	0.02%	2.240	218	240	488	539	10,228
Log Trucks		3.940					
HV Totals:	**7.65%**		**92,497**	**102,200**	**90,526**	**100,022**	**1,899,151**
Totals:	**100.00%**		**1,209,159**	**1,335,995**	**96,081**	**106,159**	***2,015,693***

Sources:	
Procedure:	4/12 and 4/17/91 memos from Eric Johnson
Load Factors:	1/8/92 memo from Eric Johnson

DESIGN DESIGNATION

State Route Number: *291400* Route Name: *South Tongass*

Project Limits: *South Tongass: Saxman to Surf Street*

State Project Number: *67571* Federal Number: *MGS-0902(31)*

Project Description: *Reconstruct South Tongass form Saxman to Surf Street*

Functional Classification:* *Minor Arterial*

*A functional reclassification may be requested from the FHWA - see Section 11-00.04.01, page 11-00(2)

Urban Class (1,2, or 3, - See Highway Capacity Manual, Chapt 11): *n/a*

Project Type (New Construction/Reconstruction, Rehabilitation (3R), or Other): *3R*

Project Design Life (usually 5, 10, or 20 years): *20*

	Last Year with Traffic Data	**Year After Construction**	**Mid-Life Year**	**Future Year**
	2013	*2017*	*2027*	*2037*
ADT**	*2800*	*2860*	*3000*	*3160*
DHV	*300*	*300*	*320*	*330*
Peak Hour Factor	*0.9*	*0.9*	*0.9*	*0.9*
Directional Distribution	*55/45*	*0/100*	*0/100*	*0/100*
Percent Commercial Trucks	*7.7%*	*7.7%*	*7.7%*	*7.7%*
Compound Growth Rate		*0.50%*	*0.50%*	*0.50%*
Pedestrians (Number/Day)	*No Data*	*No Data*	*No Data*	*No Data*
Bicyclists (Number/Day)	*No Data*	*No Data*	*No Data*	*No Data*

** If urban then ADT is not required. Intersection diagrams shall be attached as part of this document

Design Vehicles for turning: *WB-50*

Design Vehicle Loading (HS 15, HS20, or HS25): *HS 25*

Equivalent Axle Loads: *950,000*

Concurrence: [signature] Date: 5/12/16
Regional Traffic Engineer

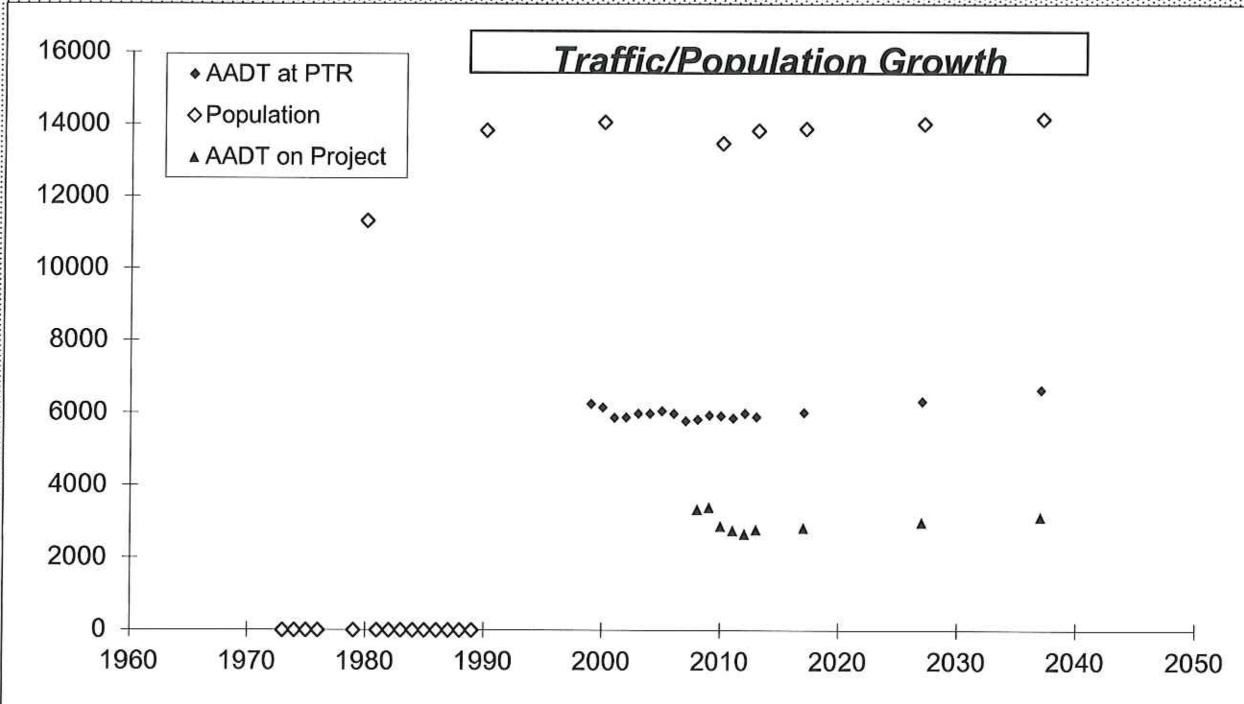
Concurrence: [signature] for Andy Hughes Date: 5/12/16
Planning

Approval [signature] Date: 5/12/16
Preconstruction Engineer
FOR PAT CARROLL

Alaska DOT/PF, Southcoast Region

Traffic Projections

Project Name:	***South Tongass: Saxman to Surf Street***	Project Design Life:	*20*
State Project Number:	*67571*	**DHV/AADT (from PTR)**	*10.6%*
Community:	*Ketchikan*	PTR Location:	*South Tongass*
Year of Construction:	*2016*	Compiled By:	*Ryan Siverly*



Historical Population and Traffic Growth Rates (Compounded)	**Area Population**			**Average Annual Daily Traffic**			
	From	**To**		**From**	**To**	**at PTR**	**on Project**
	1970	1980	#N/A	2003	2013	N/A	#DIV/0!
	1980	1990	2.0%	2008	2013	0.2%	-3.6%
	1990	2000	0.2%	2010	2013	-0.1%	-1.1%
	2000	2010	-0.4%	2011	2013	0.4%	0.4%
	2010	2013	0.9%	2012	2013	-1.5%	4.2%

Projected Future Population and Traffic Volumes			**Area Population**	**AADT at PTR**	**AADT on Project**	**DHV on Project**
	Projected Compound Growth Rate		**0.1%**	**0.5%**	**0.5%**	
	Last Year with Pop. Data	2013	13828			
	Last Yr with Traffic Data	2013		5904	2801	**297**
	Year after Construction	2017	13883	6023	2857	**303**
	Mid Project Life	2027	14023	6331	3004	**318**
	End of Project Life	2037	14164	6655	3157	**335**

Comments/Rationale for projected growth rate

State of Alaska

Department of Transportation and Public Facilities

Southcoast Region Traffic and Safety Section

Equivalent Axle Load Computations

Data from Page One			
Project Name: **South Tongass: Saxman to Surf Street**		One way AADT - Last yr w Traffic Data	*1,541*
State Project Number:	*67571*	One way AADT - 1st yr after construction	*1,572*
Community:	*Ketchikan*	One way AADT - Design Year	*1,736*
Year of Construction:	*2016*	Compound Growth Rate: present-Design Yr	*0.50%*
Project Design Life:	*20*	Compiled By:	*Ryan Siverly*

Input Data	
No of lanes in one direction:	1

Computed Data	
% of heavy vehicles (class 4-13) in design lane	1.00

% of heavy vehicles in the Design Lane	
No of lanes in one direction	% of heavy vehicles in Design Lane
1	100%
2	90%
3	80%

Equivalent Axle Loads by Class							
	Input	**Given**	**Computed**				
			Annual no of vehicles in design lane by class		**Annual EALs**		**EALs over project life**
Class	**% of Mix**	**Load Factor**	**Yr after Constr**	**Design Yr**	**Yr after Constr**	**Design Yr**	
1	0.47%		2673	2954			
2	72.05%	0.005	413301	456655	2067	2283	43,353
3	19.84%	0.005	113797	125734	569	629	11,937
LV Totals:	**92.35%**		**529,772**	**585,342**	**2,635**	**2,912**	**55,290**
4	1.86%	1.000	10670	11789	10670	11789	223,838
5	2.40%	0.500	13738	15180	6869	7590	144,110
6	1.18%	0.850	6769	7479	5754	6357	120,704
7	0.01%	1.200	75	82	89	99	1,877
8	0.10%	1.200	579	640	695	768	14,586
9	2.03%	1.550	11628	12847	18023	19913	378,099
10	0.03%	2.240	149	165	334	369	7,009
11	0.03%	1.550	149	165	231	255	4,850
12	0.00%	2.240	23	25	51	57	1,078
13	0.02%	2.240	103	114	231	256	4,852
Log Trucks		3.940					
HV Totals:	**7.65%**		**43,883**	**48,486**	**42,948**	**47,453**	**901,003**
Totals:	**100.00%**		**573,654**	**633,828**	**45,583**	**50,365**	***956,293***

Sources:	
Procedure:	4/12 and 4/17/91 memos from Eric Johnson
Load Factors:	1/8/92 memo from Eric Johnson

Project Name:	South Tongass Highway Deermount to Saxman Street		
☐ New Construction/Reconstruction	☑ Reconstruction (3R)	☐ Other:	
Project Number:	67685/0902039	☐ NHS	☑ Non NHS
Functional Classification:	Minor Arterial		
Design Year:	2037	**Present ADT:**	6020
Design Year ADT:	6650	**Mid Design Period ADT:**	6330
DHV:	10.6%	**Directional Split:**	55/45
Percent Trucks:	7.70%	**Equivalent Axle Loading:**	2,050,000
Pavement Design Year:	2037	**Design Vehicle:**	WB-50
Terrain:	Mountainous	**Number of Roadways:**	1

Design Speed:	30 MPH (PCM 1160.3.1) - CDS MP 2.6 to MP 3.4			
Width of Traveled Way:	11 feet (PCM 1160.3.2)			
Width of Shoulders:	**Outside:**	5 feet (PCM 1160.3.2)	**Inside:**	None
Cross Slope:	2% Normal crown (PCM 1130.1.2)			
Superelevation Rate:	eMax = 6% (PCM 1160.3.3)			
Minimum Radius of Curvature:	231 feet (PCM 1160.3.3)			
Minimum K-Value for Vertical Curve:	**Sag:**	37 (PCM 1160.3.4)	**Crest:**	19 (PCM 1160.3.4)
Maximum Allowable Grade:	8.0% (PCM 1160.3.11)			
Minimum Allowable Grade:	0.3 % (PCM 1160.3.11)			
Stopping Sight Distance:	200 feet (PCM 1160.3.4)			
Lateral Offset to Obstruction:	1.5 feet minimum			
Vertical Clearance:	Overhead Utilities: 20ft 6in; Pedestrian Structures: 17ft 6in , (PCM Table 1130-1)			
Bridge Width:				
Bridge Structural Capacity:				
Passing Sight Distance:	1090 feet (GB page 276)			
Surface Treatment:	**T/W:**	Paved	**Shoulders:**	Paved
Side Slope Ratios:	**Foreslopes:**	4:1 (w/in CZ)	**Backslopes:**	1.5:1 (outside CZ)
Degree of Access Control:	Partial (GB page 89)			
Median Treatment:	N/A			
Illumination:				
Curb Usage and Type:	For sidewalk separation and drainage conveyance; 6 inch Standard			
Bicycle Provisions:	Paved shoulder and paved pathway or sidewalk			
Pedestrian Provisions:	Paved pathway or sidewalk			
Misc. Criteria:				

Proposed - Designer/Consultant: [signature] **Date:** 8/20/2019

Accepted - Engineering Manager: ____________ **Date:** ________

Approved - Preconstruction Engineer: ____________ **Date:** ________

Shaded criteria are the *FWHA 13 controlling criteria*. For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual*. Otherwise a Design Exception must be approved.

Design Criterion marked with a " # " do not meet minimums and have a Design Exception(s) and/or Design Waiver(s) approved. See Appendix __ for Design Exception/Design Waiver approval(s) and approved design criteria values.

Project Name:	South Tongass Highway Deermount to Saxman Street			
☐ New Construction/Reconstruction	☑ Reconstruction (3R)	☐ Other:		
Project Number:	67685/0902039		☐ NHS	☑ Non NHS
Functional Classification:	Minor Arterial			
Design Year:	2037	Present ADT:	6,020	
Design Year ADT:	6,650	Mid Design Period ADT:	6,330	
DHV:	10.6%	Directional Split:	55/45	
Percent Trucks:	7.70%	Equivalent Axle Loading:	2,050,000	
Pavement Design Year:	2037	Design Vehicle:	WB-50	
Terrain:	Mountainous	Number of Roadways:	1	
Design Speed:	45 MPH (PCM 1160.3.1) - CDS MP 3.4 to MP 4.5			
Width of Traveled Way:	11 feet (PCM 1160.3.2)			
Width of Shoulders:	Outside:	5 feet (PCM 1160.3.2)	Inside:	None
Cross Slope:	2% Normal crown (PCM 1130.1.2)			
Superelevation Rate:	eMax = 6% (PCM 1160.3.3)			
Minimum Radius of Curvature:	231 feet (PCM 1160.3.3)			
Minimum K-Value for Vertical Curve:	Sag:	79 (PCM 1160.3.4)	Crest:	61 (PCM 1160.3.4)
Maximum Allowable Grade:	7.0% (PCM 1160.3.11)			
Minimum Allowable Grade:	0.3 % (PCM 1160.3.11)			
Stopping Sight Distance:	360 feet (PCM 1160.3.4)			
Lateral Offset to Obstruction:	1.5 feet minimum			
Vertical Clearance:	Overhead Utilities: 20ft 6in; Pedestrian Structures: 17ft 6in , (PCM Table 1130-1)			
Bridge Width:				
Bridge Structural Capacity:				
Passing Sight Distance:	1625 feet (GB page 276)			
Surface Treatment:	T/W:	Paved	Shoulders:	Paved
Side Slope Ratios:	Foreslopes:	4:1 (w/in CZ)	Backslopes:	1.5:1 (outside CZ)
Degree of Access Control:	Partial (GB page 89)			
Median Treatment:	N/A			
Illumination:				
Curb Usage and Type:	For sidewalk separation and drainage conveyance; 6 inch Standard			
Bicycle Provisions:	Paved shoulder and 8ft paved pathway			
Pedestrian Provisions:	8 ft Paved pathway			
Misc. Criteria:				

Proposed - Designer/Consultant: Christopher Croft **Date:** 8/20/2019

Accepted - Engineering Manager: ______________ **Date:** ______________

Approved - Preconstruction Engineer: ______________ **Date:** ______________

Shaded criteria are the *FWHA 13 controlling criteria*. For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual*. Otherwise a Design Exception must be approved.

Design Criterion marked with a " # " do not meet minimums and have a Design Exception(s) and/or Design Waiver(s) approved. See Appendix __ for Design Exception/Design Waiver approval(s) and approved design criteria values.

Project Name:	South Tongass Highway Saxman to Surf Street				
☐ New Construction/Reconstruction	☑ Reconstruction (3R)	☐ Other:			
Project Number:	67571/0902031			☐ NHS	☑ Non NHS
Functional Classification:	Minor Arterial (GB page 11)				
Design Year:	2037	**Present ADT:**		2860	
Design Year ADT:	3160	**Mid Design Period ADT:**		3,000	
DHV:	10.50%	**Directional Split:**		55/45	
Percent Trucks:	7.70%	**Equivalent Axle Loading:**		950,000	
Pavement Design Year:	2037	**Design Vehicle:**		WB-50	
Terrain:	Mountainous	**Number of Roadways:**		1	
Design Speed:	45 MPH (PCM 1160.3.1) - CDS MP 4.5 to MP 5.5				
Width of Traveled Way:	11 feet, Existing (PCM 1160.3.2)				
Width of Shoulders:	**Outside:**	5 feet, Existing (PCM 1160.3.2)	**Inside:**	None	
Cross Slope:	2% Normal crown (PCM 1130.1.2)				
Superelevation Rate:	eMax = 6% (PCM 1160.3.3)				
Minimum Radius of Curvature:	643 feet (PCM 1160.3.3)				
Minimum K-Value for Vertical Curve:	**Sag:**	79 (PCM 1160.3.4)	**Crest:**	61 (PCM 1160.3.4)	
Maximum Allowable Grade:	7.0% (PCM 1160.3.11)				
Minimum Allowable Grade:	0.3 percent (PCM 1160.3.11)				
Stopping Sight Distance:	360 feet (PCM 1160.3.4)				
Lateral Offset to Obstruction:	1.5 feet minimum				
Vertical Clearance:	Overhead Utilities: 20ft 6in; Pedestrian Structures: 17ft 6in , (PCM Table 1130-1)				
Bridge Width:					
Bridge Structural Capacity:					
Passing Sight Distance:	1625 feet (GB page 276)				
Surface Treatment:	**T/W:**	Paved	**Shoulders:**	Paved	
Side Slope Ratios:	**Foreslopes:**	4:1 (w/in CZ)	**Backslopes:**	1.5:1 (outside CZ)	
Degree of Access Control:	Partial (GB page 89)				
Median Treatment:	N/A				
Illumination:					
Curb Usage and Type:	For sidewalk separation and drainage conveyance; 6 inch Standard				
Bicycle Provisions:	Paved shoulder and 8ft paved pathway				
Pedestrian Provisions:	8 ft Paved pathway				
Misc. Criteria:					

Proposed - Designer/Consultant: [signature] **Date:** 8/20/2019

Accepted - Engineering Manager: ______________ **Date:** ______

Approved - Preconstruction Engineer: ______________ **Date:** ______

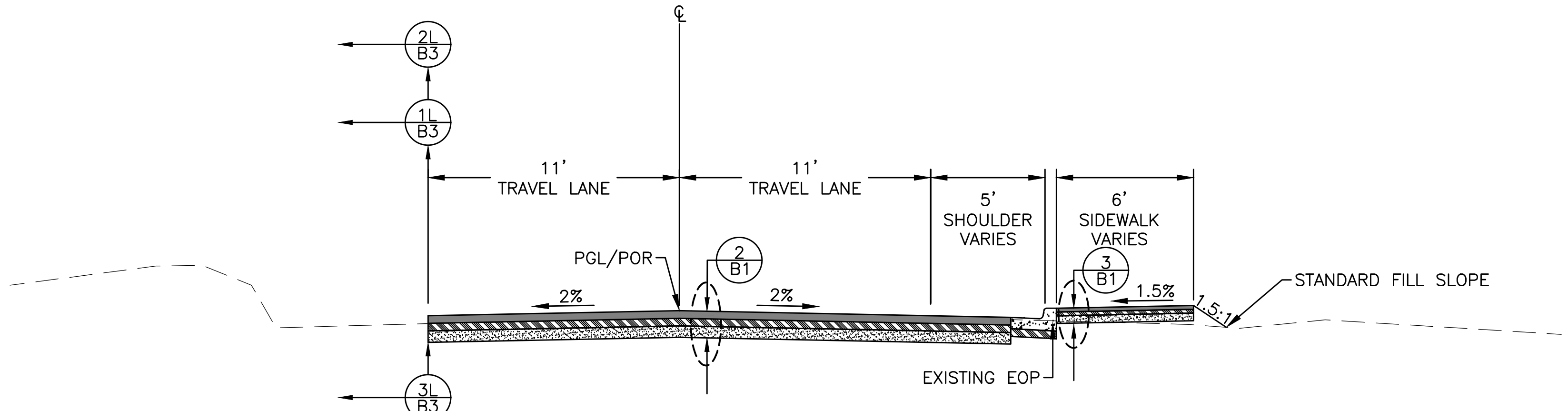
Shaded criteria are the *FWHA 13 controlling criteria*. For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual*. Otherwise a Design Exception must be approved.

Design Criterion marked with a " # " do not meet minimums and have a Design Exception(s) and/or Design Waiver(s) approved. See Appendix __ for Design Exception/Design Waiver approval(s) and approved design criteria values.

APPENDIX B

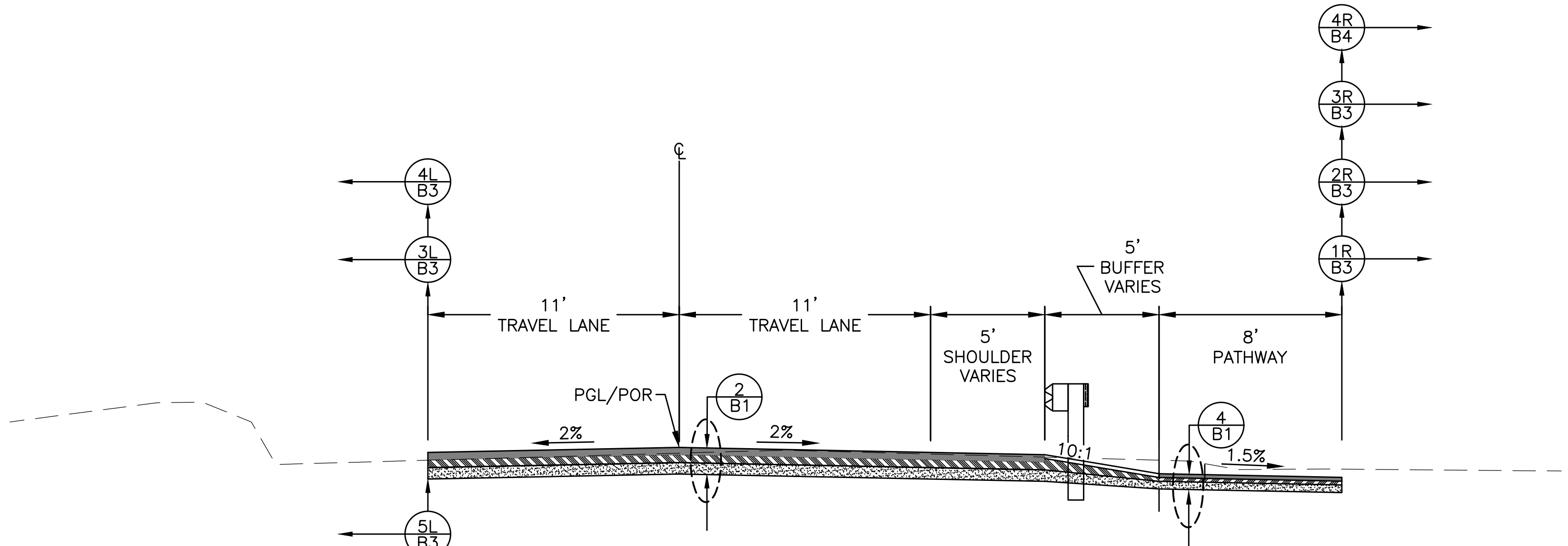
Typical Sections

NO.	DATE	REVISION	STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
			ALASKA	NH-0902(039)/67685	2021	B1	B4



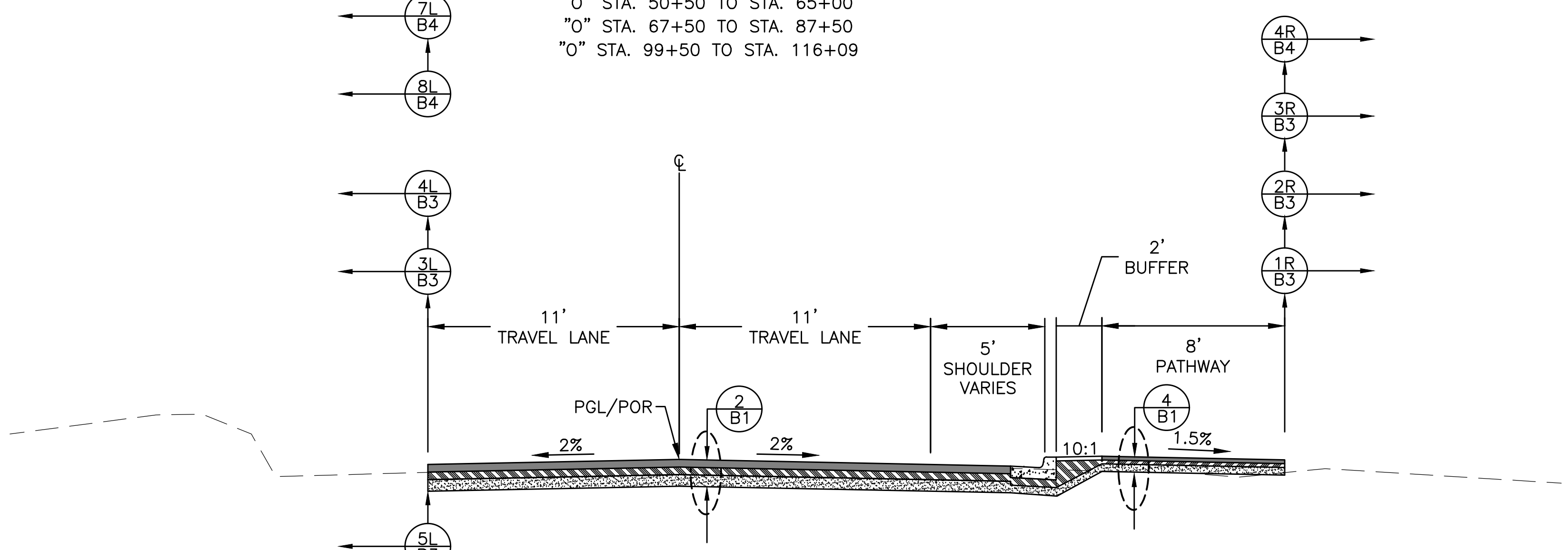
S. TONGASS HWY

"O" STA. 12+53 TO STA. 45+40



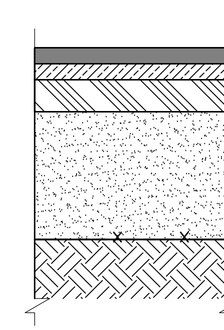
S. TONGASS HWY

"O" STA. 50+50 TO STA. 65+00
"O" STA. 67+50 TO STA. 87+50
"O" STA. 99+50 TO STA. 116+09



S. TONGASS HWY

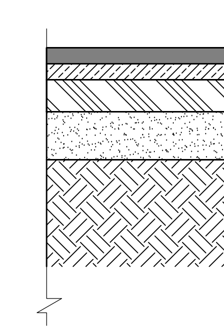
"O" STA. 45+40 TO STA. 50+50
"O" STA. 65+00 TO STA. 67+50
"O" STA. 87+50 TO STA. 99+50



1 B1 PAVEMENT SECTION NO. 1

SCALE: NOT TO SCALE

TO BE USED IN PROPOSED LOCATIONS BEYOND EXISTING EOP AND WHEN SOFT GROUND SECTIONS ARE ENCOUNTERED AS DETERMINED BY PROOF ROLLING EXISTING BED COURSE



2 B1 PAVEMENT SECTION NO. 2

SCALE: NOT TO SCALE

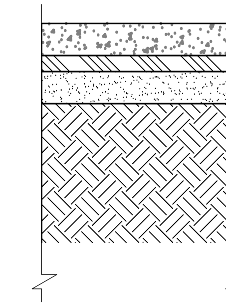
TO BE USED WHEN PROPOSED IS OVER EXISTING EOP, REMOVE ALL EXISTING PAVEMENT AND PROOF ROLL EXISTING BED COURSE TO VERIFY FIRM GROUND

TYPICAL SECTION NOTES:

1. ALL UNDESIGNATED FILL SHALL BE SELECT MATERIAL TYPE C.

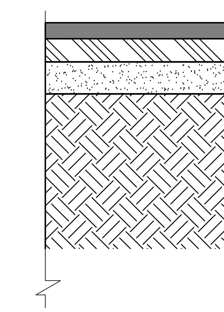
ESTIMATED SOFT GROUND SETIONS

BEGIN STATION	END STATION	DIGOUT DEPTH(FT)
24+90	25+40	1.1
35+00	35+50	4
39+90	40+40	4
47+75	48+25	5
88+90	89+75	11
95+25	96+50	5
99+60	100+20	N/A
109+50	110+00	1



3 B1 SIDEWALK SECTION NO. 3

SCALE: NOT TO SCALE



4 B1 PATHWAY SECTION NO. 4

SCALE: NOT TO SCALE

STATE OF ALASKA PLANS IN HAND REVIEW

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(907) 465-1763

SOUTH TONGASS HIGHWAY
DEERMOUNT STREET TO SAXMAN

TYPICAL SECTIONS

FIRM: HDR ALASKA | FILE: C:\pwworking\sea\d1811656\67685_B1 Typ.dwg | ADDRESS: 2525 C STREET, STE 500, ANCHORAGE AK, 99503 | DATE: 9/26/2019 10:18 | PHONE: (907) 644-2000 | LAYOUT: B1 | DESIGNED: ## | CHECKED: ## | CERTIFICATE OF AUTH #: | DRAFTED: #####

NO.	DATE	REVISION	STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
			ALASKA	NH-0902(039)/67685	2021	B2	B4

TYPICAL SECTION EXCEPTIONS

LEFT SIDE			RIGHT SIDE		
OPTION	BEGIN STATION	END STATION	OPTION	BEGIN STATION	END STATION
1L	12+53.21	19+68	3R	12+53.21	14+87
2L	19+68	35+45	WALL	14+87	17+88
8L	36+51	39+19	3R	17+88	45+70
5L	39+19	41+34	WALL	45+70	50+16
8L	41+34	42+97	3R	50+16	51+68
3L	45+14	50+31	2R	51+68	54+11
4L	50+80	51+64	3R	54+11	55+10
6L	51+64	53+10	2R	55+10	58+21
7L	53+10	53+96	3R	58+21	61+40
6L	53+96	54+33	2R	61+40	63+22
4L	54+33	55+60	3R	63+22	68+65
6L	55+60	60+69	2R	68+65	86+80
4L	60+69	62+92	3R	86+80	87+95
6L	62+92	66+17	WALL	87+95	89+23
4L	66+17	67+18	3R	89+23	93+98
6L	67+18	67+50	WALL	93+98	94+72
7L	67+50	68+60	3R	94+72	95+42
6L	68+60	78+19	WALL	95+42	96+05
7L	78+19	79+37	2R	96+05	97+25
6L	79+37	81+15	3R	97+25	100+79
7L	81+15	81+57	2R	100+79	114+15
4L	81+57	85+00	3R	114+15	116+09
6L	85+00	88+24			
9L	88+24	88+83			
3L	89+54	92+57			
4L	92+57	95+84			
3L	95+84	99+90			
4L	99+90	100+28			
10L	101+05	105+21			
6L	105+21	110+50			
4L	110+50	112+00			
8L	112+00	116+09			

PLANS IN HAND REVIEW

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
6860 GLACIER HIGHWAY, JUNEAU, AK 99811
(907) 465-1763

SOUTH TONGASS HIGHWAY
DEERMOUNT STREET TO SAXMAN

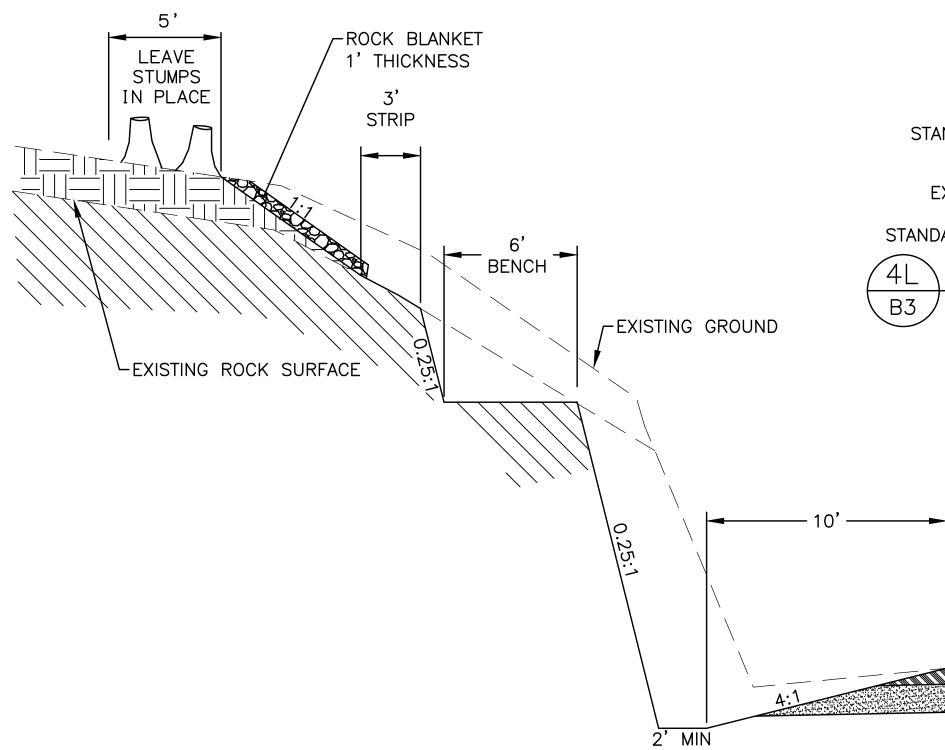
TYPICAL SECTIONS

FIRM HDR ALASKA | ADDRESS 2525 C STREET, STE 500, ANCHORAGE AK, 99503 | PHONE (907) 644-2000 | CERTIFICATE OF AUTH #:

FILE C:\pwworking\seo\d1811656\67685_B1 Typ.dwg | DATE 9/26/2019 10:18 | LAYOUT B2 | DESIGNED ## | CHECKED ## | DRAFTED #####

NO.	DATE	REVISION

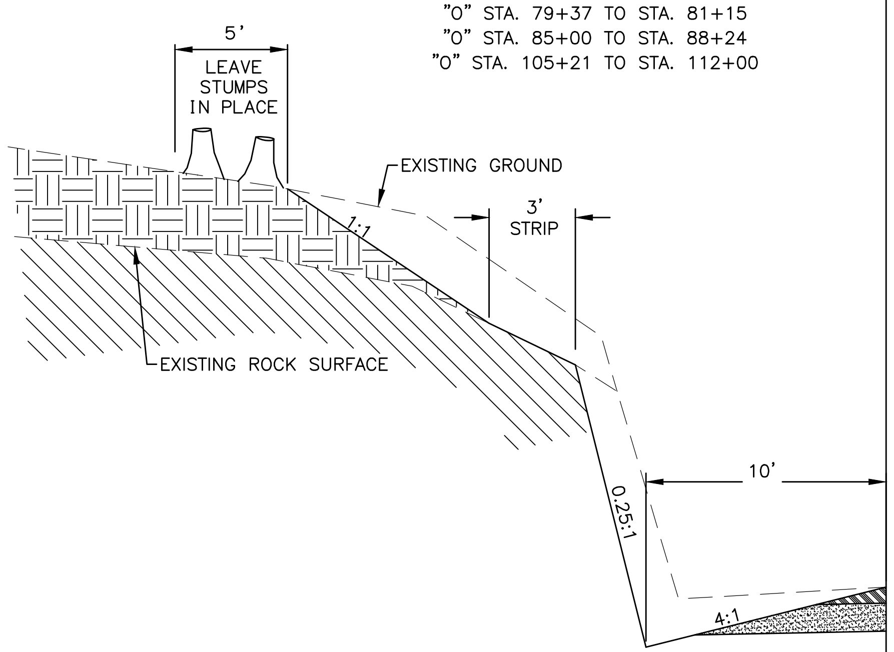
STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
ALASKA	NH-0902(039)/67685	2021	B3	B4



6L ROCK CUT – OPTION 2
B3

SCALE: NOT TO SCALE

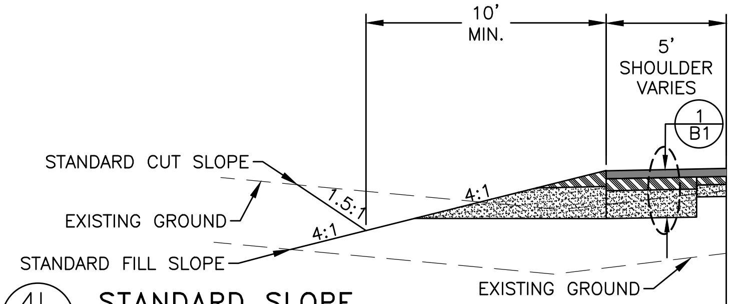
"O" STA. 51+64 TO STA. 53+10
"O" STA. 53+96 TO STA. 54+33
"O" STA. 55+60 TO STA. 60+69
"O" STA. 62+92 TO STA. 66+17
"O" STA. 67+18 TO STA. 67+50
"O" STA. 68+60 TO STA. 78+19
"O" STA. 79+37 TO STA. 81+15
"O" STA. 85+00 TO STA. 88+24
"O" STA. 105+21 TO STA. 112+00



5L ROCK CUT – OPTION 1
B3

SCALE: NOT TO SCALE

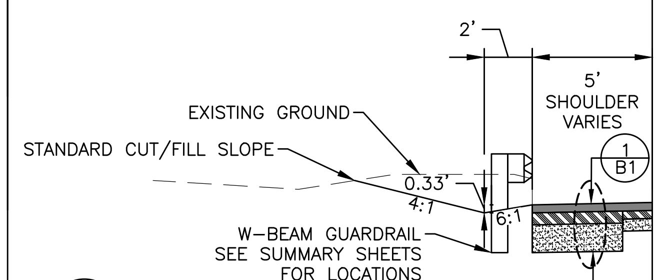
"O" STA. 39+19 TO STA. 41+34



4L STANDARD SLOPE
B3

SCALE: NOT TO SCALE

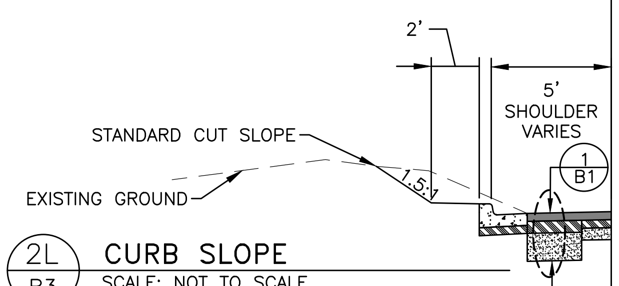
"O" STA. 50+80 TO STA. 51+64
"O" STA. 54+33 TO STA. 55+60
"O" STA. 60+69 TO STA. 62+92
"O" STA. 66+17 TO STA. 67+18
"O" STA. 81+57 TO STA. 85+00
"O" STA. 92+57 TO STA. 94+84
"O" STA. 99+90 TO STA. 100+28



3L GUARDRAIL SLOPE
B3

SCALE: NOT TO SCALE

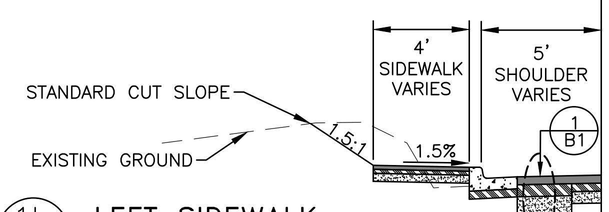
"O" STA. 45+14 TO STA. 50+31
"O" STA. 89+54 TO STA. 92+57
"O" STA. 95+84 TO STA. 99+90



2L CURB SLOPE
B3

SCALE: NOT TO SCALE

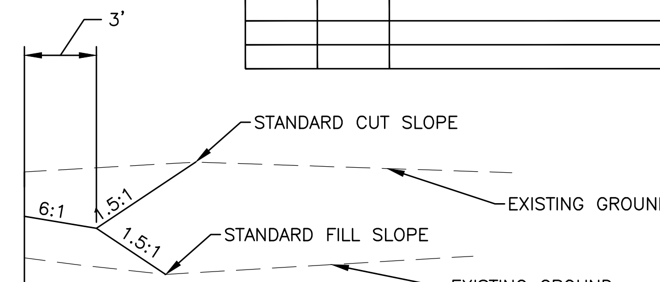
"O" STA. 19+68 TO STA. 35+45



1L LEFT SIDEWALK
B3

SCALE: NOT TO SCALE

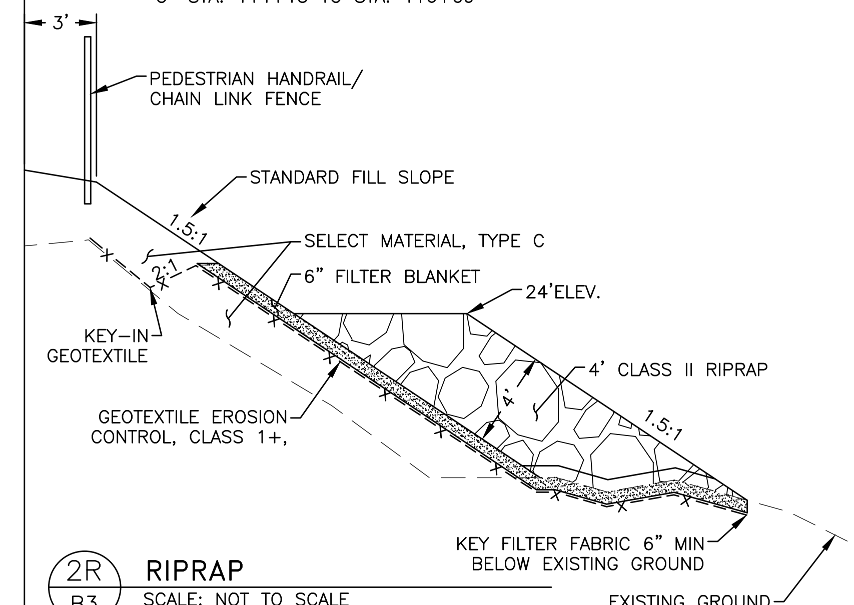
"O" STA. 12+53.21 TO STA. 19+68



3R STANDARD SLOPE
B3

SCALE: NOT TO SCALE

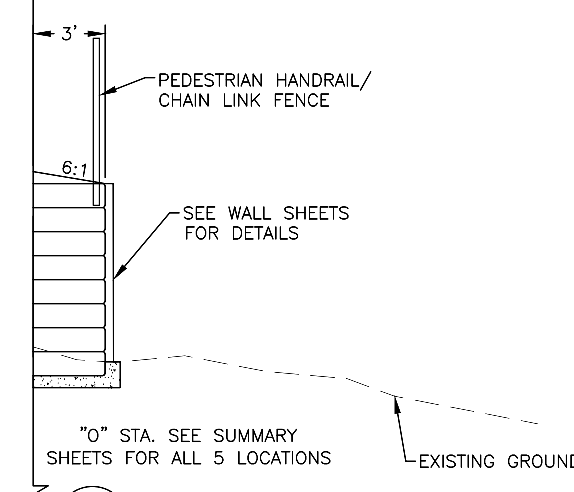
"O" STA. 12+53.21 TO STA. 14+87
"O" STA. 17+88 TO STA. 45+70
"O" STA. 50+16 TO STA. 51+68
"O" STA. 54+11 TO STA. 55+10
"O" STA. 58+21 TO STA. 61+40
"O" STA. 63+22 TO STA. 68+65
"O" STA. 86+80 TO STA. 87+95
"O" STA. 89+23 TO STA. 93+98
"O" STA. 94+72 TO STA. 95+42
"O" STA. 97+25 TO STA. 100+79
"O" STA. 114+15 TO STA. 116+09



2R RIPRAP
B3

SCALE: NOT TO SCALE

"O" STA. 51+68 TO STA. 54+11
"O" STA. 55+10 TO STA. 58+21
"O" STA. 61+40 TO STA. 63+22
"O" STA. 68+65 TO STA. 86+80
"O" STA. 96+05 TO STA. 97+25
"O" STA. 100+79 TO STA. 114+15



1R WALL
B3

SCALE: NOT TO SCALE

STATE OF ALASKA — PLANS IN HAND REVIEW — REGISTERED PROFESSIONAL ENG.

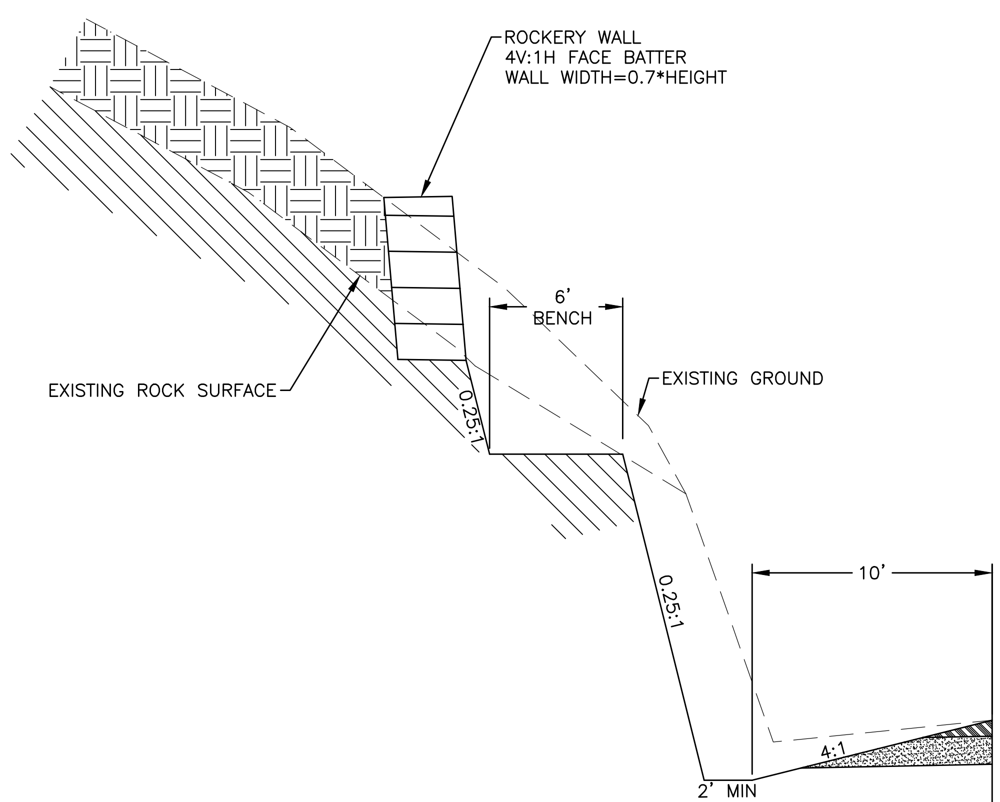
STATE OF ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
6860 GLACIER HIGHWAY, JUNEAU, AK 99811
(907) 465-1763

SOUTH TONGASS HIGHWAY
DEERMOUNT STREET TO SAXMAN

TYPICAL SECTIONS

FIRM HDR ALASKA | ADDRESS 2525 C STREET, STE 500, ANCHORAGE AK, 99503 | PHONE (907) 644-2000 | CERTIFICATE OF AUTH #:
FILE C:\pwworking\sea\d1811656\67685_B1 Typ.dwg | DATE 9/26/2019 10:18 | LAYOUT B3 | DESIGNED ## | CHECKED ## | DRAFTED #####

NO.	DATE	REVISION	STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
			ALASKA	NH-0902(039)/67685	2021	B4	B4

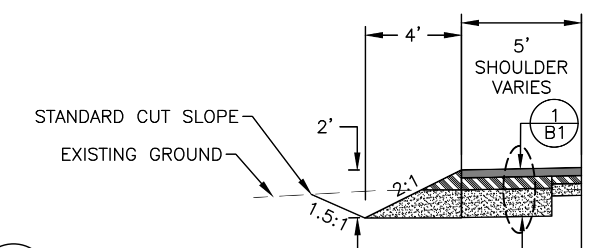


7L
B4

ROCK CUT – OPTION 3

SCALE: NOT TO SCALE

"O" STA. 53+10 TO STA. 53+96
"O" STA. 67+50 TO STA. 68+60
"O" STA. 78+19 TO STA. 79+37
"O" STA. 81+15 TO STA. 81+57

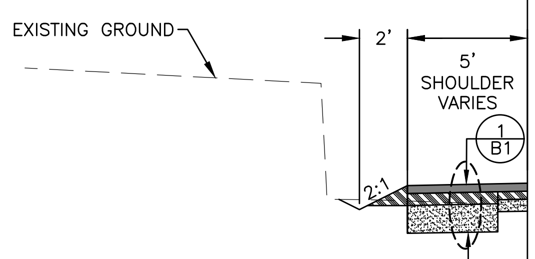


10L
B4

STANDARD SLOPE

SCALE: NOT TO SCALE

"O" STA. 101+05 TO STA. 105+21

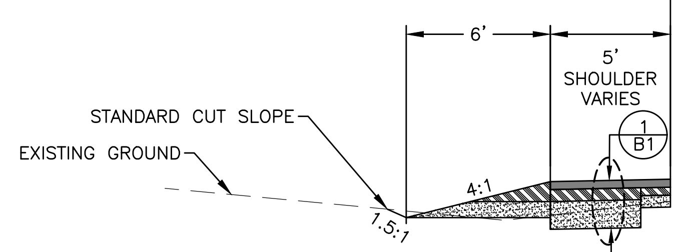


9L
B4

STANDARD SLOPE

SCALE: NOT TO SCALE

"O" STA. 88+24 TO STA. 88+83



8L
B4

ROW CONSTRAINED SLOPE

SCALE: NOT TO SCALE

"O" STA. 36+51 TO STA. 39+19
"O" STA. 41+34 TO STA. 42+97
"O" STA. 112+00 TO STA. 116+09

STATE OF ALASKA
PLANS IN HAND REVIEW
REGISTERED PROFESSIONAL ENG

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
6860 GLACIER HIGHWAY, JUNEAU, AK 99811
(907) 465-1763

SOUTH TONGASS HIGHWAY
DEERMOUNT STREET TO SAXMAN

TYPICAL SECTIONS

FIRM HDR ALASKA | ADDRESS 2525 C STREET, STE 500, ANCHORAGE AK, 99503 | PHONE (907) 644-2000 | CERTIFICATE OF AUTH #:
FILE C:\pwworking\sea\d1811656\67685_B1 Typ.dwg | DATE 9/26/2019 10:18 | LAYOUT B4 | DESIGNED ## | CHECKED ## | DRAFTED #####

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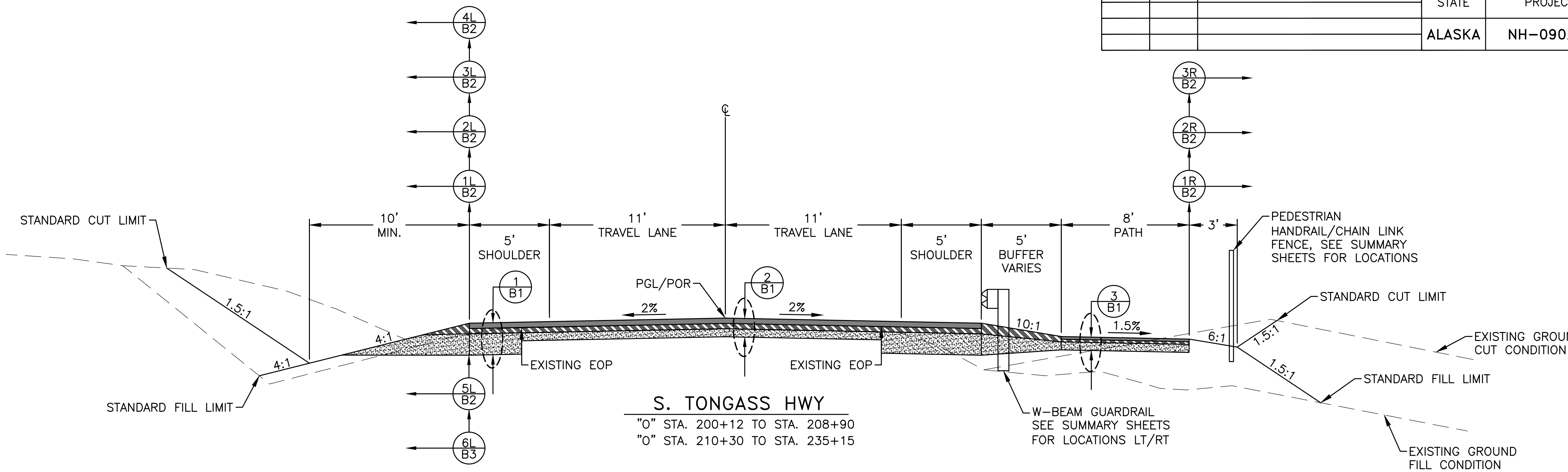
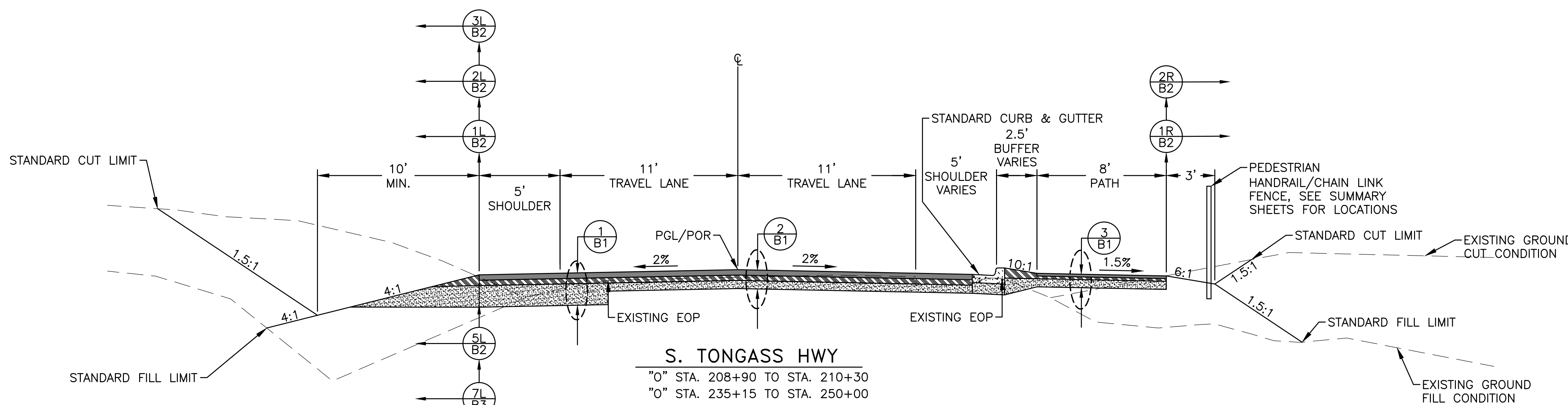
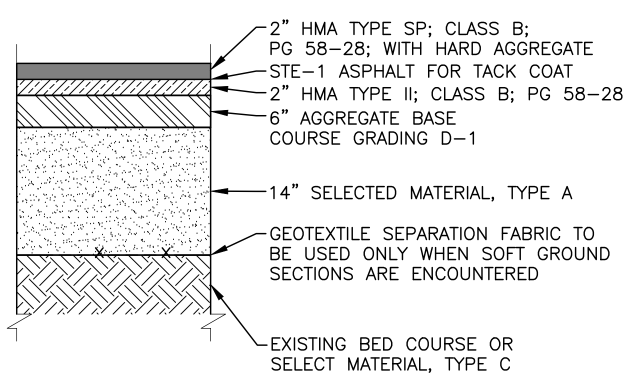


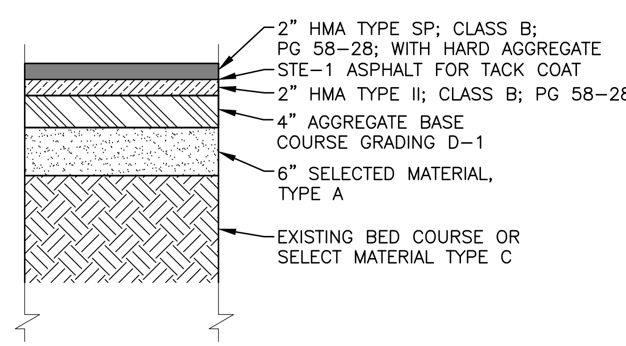




1 B1 PAVEMENT SECTION NO. 1

SCALE: NOT TO SCALE

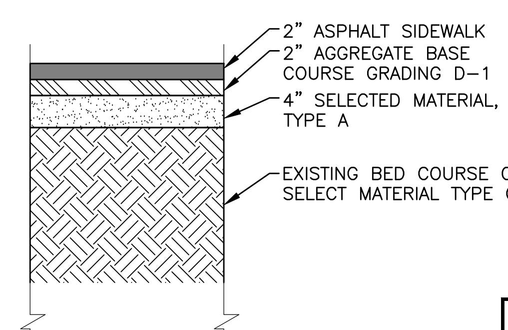
TO BE USED IN PROPOSED LOCATIONS BEYOND EXISTING EDGE OF PAVEMENT AND WHEN SOFT GROUND SECTIONS ARE ENCOUNTERED AS DETERMINED BY PROOF ROLLING EXISTING BED COURSE



2 B1 PAVEMENT SECTION NO. 2

SCALE: NOT TO SCALE

TO BE USED WHEN PROPOSED IS OVER EXISTING EDGE OF PAVEMENT, REMOVE ALL EXISTING PAVEMENT AND PROOF ROLL EXISTING BED COURSE TO VERIFY FIRM GROUND



3 B1 PATHWAY SECTION NO. 3

SCALE: NOT TO SCALE

ESTIMATED SOFT GROUND SECTIONS

BEGIN STATION	END STATION	DIGOUT DEPTH(FT)
117+50	120+75	4-6
124+15	124+65	3
128+90	129+40	2.5
135+25	135+75	3.5
138+75	139+25	3
145+00	146+50	2

STATE OF ALASKA PLANS IN HAND REVIEW REGISTERED PROFESSIONAL ENG.

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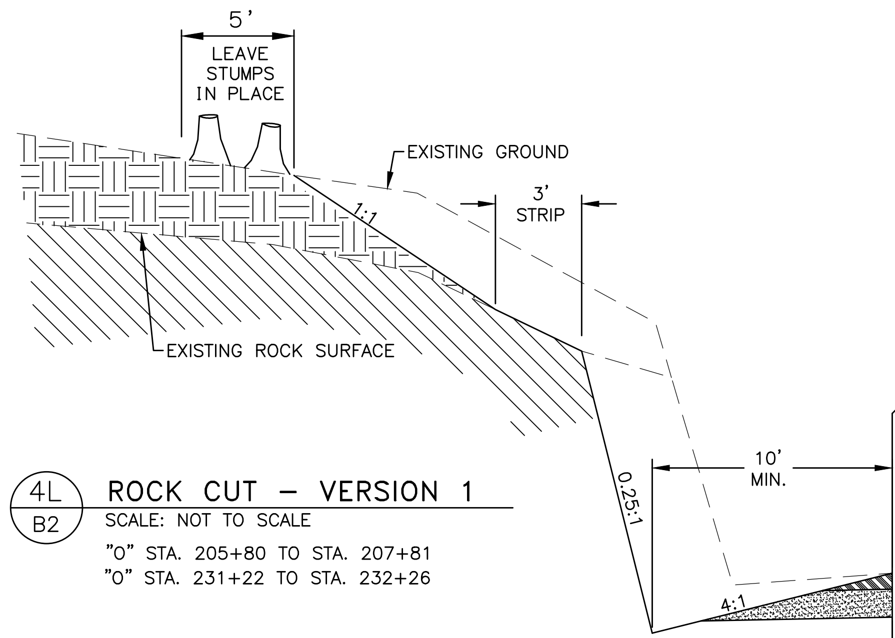
6860 GLACIER HIGHWAY, JUNEAU, AK 99811
(907) 465-1763

SOUTH TONGASS HIGHWAY
SAXMAN TO SURF

TYPICAL SECTIONS

FILE C:\pwworking\sea\d1811657\67571_B1 Typ.dwg | DATE 9/25/2019 16:49 | LAYOUT B1 | DESIGNED ## | CHECKED ## | DRAFTED #####

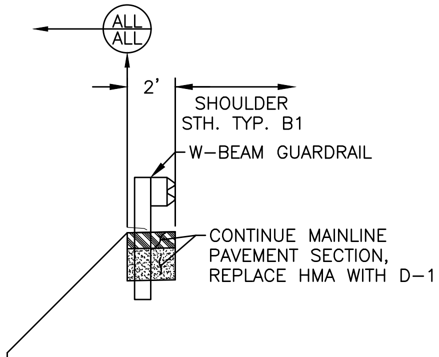
NO.	DATE	REVISION	STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
			ALASKA	NH-0902(031)/67571	2021	B2	B3



4L/B2 ROCK CUT – VERSION 1

SCALE: NOT TO SCALE

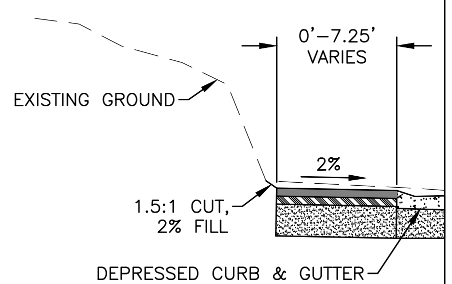
"0" STA. 205+80 TO STA. 207+81
"0" STA. 231+22 TO STA. 232+26



5L/B2 LEFT GUARDRAIL WIDENING

SCALE: NOT TO SCALE

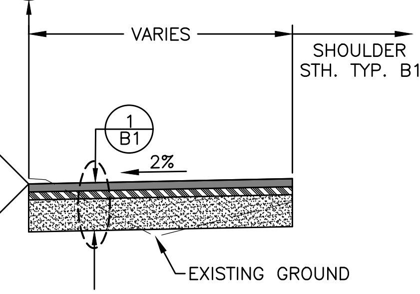
"0" STA. SEE SUMMARY SHEETS FOR LOCATIONS



3L/B2 VALLEY GUTTER

SCALE: NOT TO SCALE

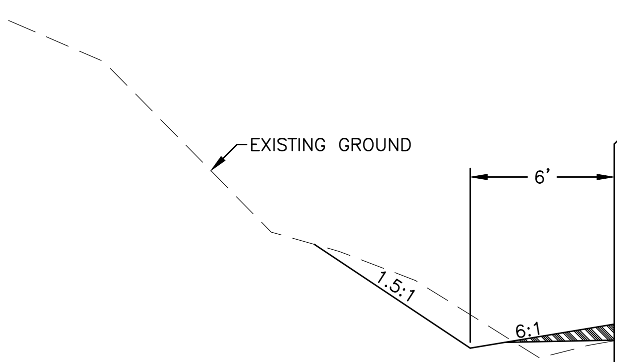
"0" STA. 237+73 TO STA. 244+30



1L/B2 LEFT PULLOUT WIDENING

SCALE: NOT TO SCALE

"0" STA. 202+90 TO STA. 204+10
"0" STA. 220+80 TO STA. 221+60
"0" STA. 243+00 TO STA. 244+30



2L/B2 SHALLOW DITCH

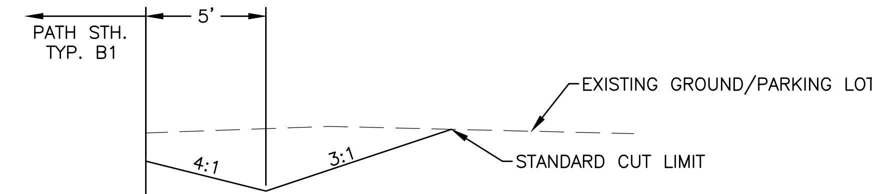
SCALE: NOT TO SCALE

"0" STA. 200+12 TO STA. 204+07
"0" STA. 220+11 TO STA. 222+01
"0" STA. 232+77 TO STA. 233+53
"0" STA. 237+15 TO STA. 237+73
"0" STA. 244+30 TO STA. 247+01

RIGHT PULLOUT WIDENING

MIRROR 1L/B2 DETAIL BEFORE BUFFER/CURB

"0" STA. 209+10 TO STA. 210+30
"0" STA. 221+50 TO STA. 222+50
"0" STA. 248+40 TO STA. 249+70



3R/B2 ACCESS CONTROL DITCH

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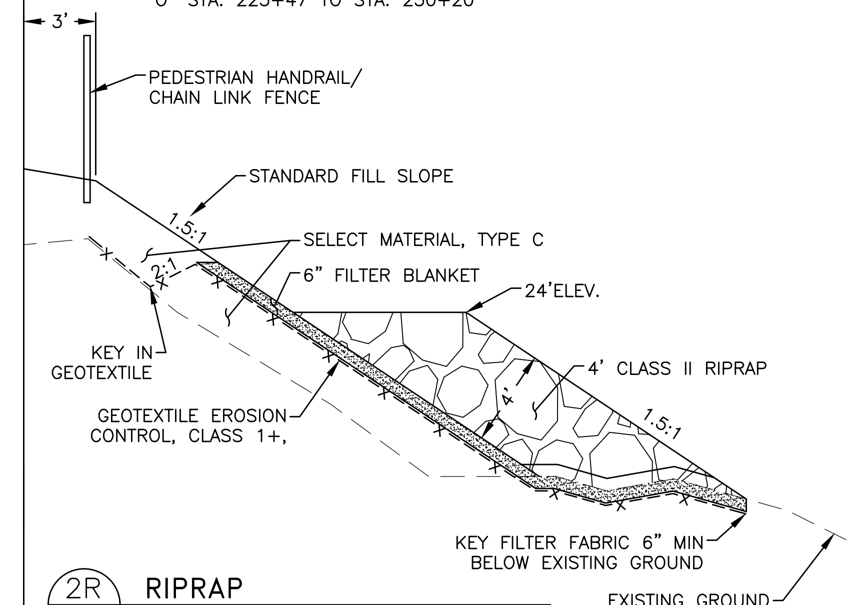
"0" STA. 225+47 TO STA. 230+20



2R/B2 RIPRAP

SCALE: NOT TO SCALE

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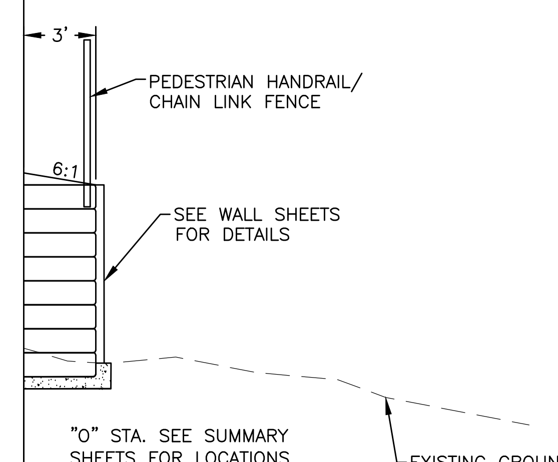
"0" STA. 248+76 TO STA. 249+06



"0" STA. SEE SUMMARY SHEETS FOR LOCATIONS

1R/B2 WALL

SCALE: NOT TO SCALE

STATE OF ALASKA PLANS IN HAND REVIEW

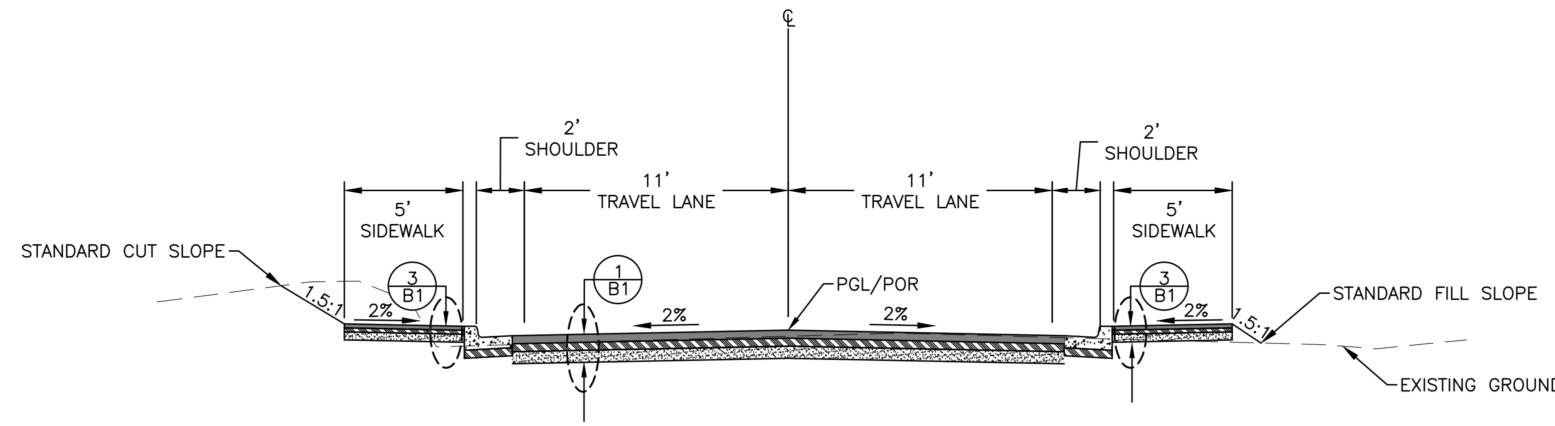
STATE OF ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
6860 GLACIER HIGHWAY, JUNEAU, AK 99811
(907) 465-1763

SOUTH TONGASS HIGHWAY
SAXMAN TO SURF

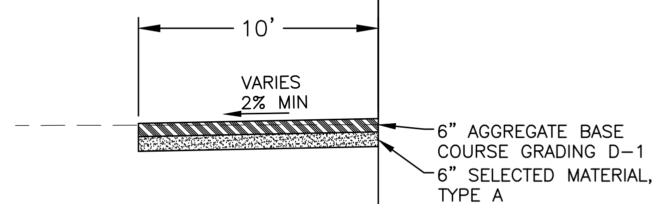
TYPICAL SECTION ALTERATIONS

FILE C:\pwworking\sea\d1811657\67571_B1 Typ.dwg | DATE 9/25/2019 16:49 | LAYOUT B2 | DESIGNED ## | CHECKED ## | DRAFTED #####

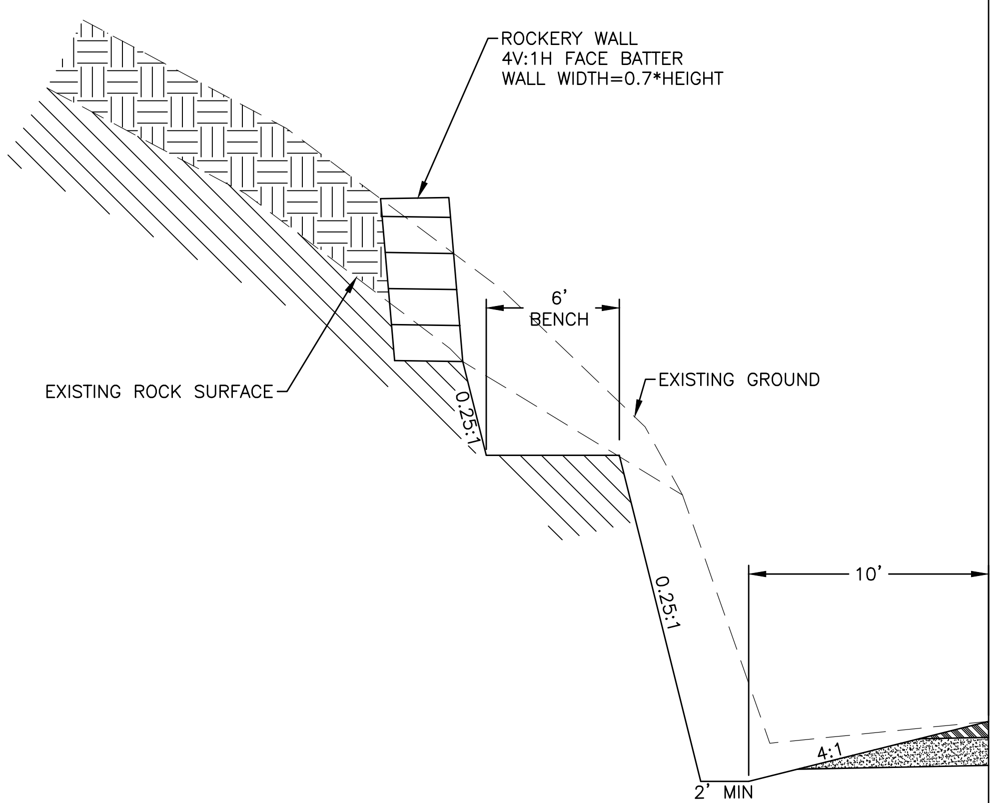
NO.	DATE	REVISION	STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
			ALASKA	NH-0902(031)/67571	2021	B3	B3



4
B3
TOTEM ROW
"TR" STA. 10+20 TO STA. 11+22



7L
B3
GRAVEL WIDENING
SCALE: NOT TO SCALE
"O" STA. 209+23 TO STA. 210+63



6L
B3
ROCK CUT – VERSION 2
SCALE: NOT TO SCALE
"O" STA. 230+00 TO STA. 231+22

PLANS IN HAND REVIEW

STATE OF ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
6860 GLACIER HIGHWAY, JUNEAU, AK 99811
(907) 465-1763

SOUTH TONGASS HIGHWAY
SAXMAN TO SURF

TYPICAL SECTION ALTERATIONS

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APPENDIX C

3R Analysis

The information in this report is compiled for highway safety planning purposes. Federal law prohibits its discovery or admissibility in litigation against state, tribal or local government that involves a location or locations mentioned in the collision data. 23 U.S.C. § 409; 23 U.S.C. § 148(g); *Walden v. DOT*, 27 P.3d 297, 304-305 (Alaska 2001).

3R Analysis and Safety Recommendations Technical Memorandum

South Tongass Highway: Deermount to Saxman and Saxman to Surf

Alaska Department of Transportation and Public Facilities

67685; 67571

June 2016

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Table of Contents

List of Tables

Appendices

Acronyms and Abbreviations

3R	Resurfacing, Restoration, and Rehabilitation
ADT	Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
DOT&PF	Alaska Department of Transportation and Public Facilities
FFS	Free-Flow Speed
GB	*A Policy on the Geometric Design of Highways and Streets 2001* (Green Book)
HCS	Highway Capacity Software
LOS	Level of Service
MP	Milepoint
mph	Miles per Hour
MVM	Million Vehicle Miles
pc/h	Passenger Cars per Hour
PCM	*Alaska Highway Preconstruction Manual*
PFFS	Percent of Free-Flow Speed
SSD	Stopping Sight Distance
UCL	Upper Control Limit

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Introduction

HDR Alaska has prepared a Resurfacing, Restoration, and Rehabilitation (3R) Analysis for the South Tongass Highway from Deermount Street (Milepoint [MP] 2.6) to Surf Street (MP 5.5), using electronic accident data provided by the Alaska Department of Transportation and Public Facilities (DOT&PF). Within this section, the project is divided into two segments: Deermount Street intersection to Saxman 1,600 feet inside the northern city limits (MP 4.5) and Saxman to just past the Surf Street intersection where it abuts a previous project limits (MP 5.5). The Deermount Street to Saxman segment is further divided to reflect an urban section from Deermount Street to the Coast Guard Base (MP 2.6 – 3.4) and a rural section from MP 3.4 to MP 4.5. The analysis is based on accident data from a 10-year period from 2003 through 2012 and uses the mid-study period Average Daily Traffic (ADT) from the year 2007.

Methodology

This analysis was conducted in accordance with Section 1160 -- Resurfacing, Restoration, and Rehabilitation Projects of the *Alaska Highway Preconstruction Manual* (PCM). This method is based on the procedures in Transportation Research Board (TRB) Special Report 214, Designing Safer Roads: Practices for Resurfacing, Restoration, and Rehabilitation.

Roadway geometry was determined from DOT&PF-provided survey centerline information for the horizontal and vertical alignments. Angle accidents are typically intersection or driveway related and are not used as part of the analysis.

The 3R analysis is a tool used to identify potential safety improvements along a corridor. The ultimate solution(s) to the problems within a specific project corridor may not result from the 3R analysis. The typical recommendations of a 3R analysis are to widen the traveled way, create a more forgiving roadside for run-off-the-road accidents, and to flatten horizontal and vertical curvature. The 3R analysis does not make recommendations for capacity improvements such as passing lanes, nor does it address recreational parking adjacent to the traveled way or recommend enforcement or education solutions to address the issues of driver inattention or driver impatience. Solutions such as these need to be identified though a qualitative analysis rather than the regimented analysis offered by the 3R procedure. Some potential solutions for mitigating accidents beyond the purview of the 3R recommendations are presented at the end of this report.

Corridor Crash Analysis

DOT&PF's crash database system reports there were 76 total crashes during the study years of 2003 through 2012. Of these, 62 crashes occurred on roadway segments and 14 occurred at intersections. Table 1 summarizes the segment crash data based on crash category and crash type.

Ninety-one (91) vehicles were involved in these crashes. Thirty-five (35) crashes involved only property damage. Twenty-seven (27) crashes involved personal injuries that resulted in two fatalities, seven major injuries, and 31 minor injuries.

Table 1: Number of Segment Crashes by Type, 2003–2012

Crash Category	Crash Type	Number of Crashes	Percent of Total Crashes
Collision With	Bicyclist	1	1.6
Motor Vehicle in Transport	Head On	3	4.8
	Rear End	6	9.7
	Angle	8	12.9
Fixed Object	Culvert	1	1.6
	Ditch	14	22.6
	Guardrail End	1	1.6
	Guardrail Face	1	1.6
	Mailbox	4	6.5
	Other Fixed Object	1	1.6
	Parked Vehicle	7	11.3
	Sign	1	1.6
	Utility Pole	2	3.2
Non-Collision	Ran Off Road	8	12.9
Other or Unknown	N/A	4	6.5
Total		**62**	

Crash Rates

A crash rate analysis compares crash rates in the study area to statewide crash rates. Crash rates consider the motorist's exposure and risk – by traffic volume and segment length – of being involved in a crash when using the facility. DOT&PF provides statewide average crash rates for segments and intersections in the *Alaska Highway Safety Improvement Program Handbook* (14th Ed., 2014).

Segment Crash Rates

There were 62 segment-related crashes (not including crashes at named intersections) between 2003 and 2013 within the project area. In Table 2, segment crash rates for the project area are compared to corresponding statewide average crash rates. The Rate Quality Control method of identifying hazardous road locations, as identified in the Federal Highway Administration's *Highway Safety Improvement Program Manual*, establishes an upper control limit (UCL) to determine if the facility's crash rate is significantly higher than crash rates in facilities with similar characteristics. The UCL or critical rate is determined statistically as a function of the statewide average crash rate for the facility category and vehicle exposure at the location being considered. By comparing the rate of the facility under analysis to the UCL, locations with rates higher than the upper control limit may be identified as problem areas.

Table 2: Segment Crash Rates, 2003–2012

Segment	Segment Crashes 2003–2012	Million Vehicle Miles (MVM)	Segment Crashes/ MVM	Statewide Average (2-lane rural; crashes/ MVM)	Statewide Average (2-lane urban; crashes/ MVM)	UCL @ 95.00% Confidence (rural; crashes/ MVM)	UCL @ 95.00% Confidence (urban; crashes/ MVM)	Above Average ? (Rural)	Above Average ? (Urban)	Above Critical ? (Rural)	Above Critical ? (Urban)
Deermount St. to Saxman	39	41.96	0.929	2.2	1.55	2.589	1.878	No	No	No	No
Urban	14	16.78	0.834	2.2	1.55	2.825	2.080	No	No	No	No
Rural	25	25.18	0.993	2.2	1.55	2.706	1.978	No	No	No	No
Saxman to Surf St.	23	12.78	1.800	2.2	1.55	2.922	2.162	No	Yes	No	No

UCL – Upper Control Limit

Segment crash rates indicate an overall substantive safety performance. Within segments where crash rates indicate safety performance issues, there are often discrete or overlapping geometric elements: horizontal curves, vertical curves, and roadway widths that are inadequate for the design speeds and are considered contributory to crashes. These geometric elements are subject to 3R analyses.

Lane and Shoulder Width Analysis

For the purposes of analyzing lane and shoulder widths (see Table 3), the existing top width is found to be less than required for new construction and thus follows the Case I 3R Procedure Outline in Table 1160-1 of the PCM. Accident rates for South Tongass Highway were compared with a predicted accident rate for a comparable section of roadway. The actual accident rate for the Deermount Street to Saxman and for the Saxman to Surf Street segments were found to be lower than the predicted accident rate and indicate that no action is required. If the actual accident rate was higher than the predicted accident rate, deficiencies are addressed in a 3R analysis by widening the road cross-section by a prescribed amount, up to the width required for new construction. The South Tongass Highway does not meet the American Association of State Highway and Transportation Officials (AASHTO) lane and shoulder width requirements, so the 3R procedure advises that the top width be increased by 1 foot on each side for each 10 percent increment by which the actual rate exceeds the predicted rate.

Table 3: Lane and Shoulder Width Computations

	Segment	
	Deermount Street to Saxman	**Saxman to Surf Street**
Begin CDS Milepoint	CDS MP 2.6	CDS MP 4.5
End CDS Milepoint	CDS MP 4.5	CDS MP 5.5
Computed A (Accidents per Mile per Year)		
Average Daily Traffic Mid-Study Period (ADT, 2007)	5,781	3,625
W (nominal lane width), feet	11	11
PA (nominal paved shoulder), feet	2	2
UP (unpaved shoulder), feet	0	0
H (hazard rating) from Figures 1160-1 to 1160-7	6	6
TER 1 (TER1=1 for flat terrain, 0 otherwise; from PCM 1160-4)	0	0
TER 2 (TER2=1 for mountainous terrain, 0 otherwise; from PCM 1160-4)	1	1
Total Computed A	3.81	2.52
$A = 0.0019(ADT)^{0.882} \times 0.879^{W} \times 0.919^{PA} \times .932^{UP} \times 1.236^{H} \times .882^{TER\ 1} \times 1.322^{TER\ 2}$		

	Segment	
	Deermount Street to Saxman	**Saxman to Surf Street**
Segment Length (miles) L	1.988	0.966
Analysis Period (years) P	10	10
2003–2012 Actual Encroachment and Cross-Section-Related Accidents		
Accidents Related to Lane Shoulders (accidents) A_L	39	23
Current Average Accident Rate (accidents per mile per year) AR_a	1.96	2.38
$AR_a = A_L / L / P$		
New Construction Design Standards Based on 2013 ADT		
Lanes (from GB for ADT>2000), feet	12	12
Shoulder (from GB for ADT>2000), feet	4	4
Total Pavement Width (new construction) feet	32	32
Existing Pavement Width (lane and shoulder), feet	26	26
Analysis of Need		
Case	I	I
Is Current Accident Rate (AR_a) >Computed Rate (A)?	No	No
Lane and Shoulder Action	No Action Required	No Action Required

CDS – Coordinated Data System
GB – *A Policy on the Geometric Design of Highways and Streets 2001* (Green Book)

Horizontal Curvature Analysis

The horizontal curves within the project limits were compared to new construction standards. Individual horizontal curves were evaluated based on the actual number of accidents occurring along the curve and the predicted number of accidents. Using a superelevation of 6 percent, the new construction standard radius is 275 feet at 30 miles per hour (mph) and 660 feet at 45 mph. If the actual number of accidents is greater than the predicted number, then the curve requires upgrading to new construction standards. See Appendix A for proposed design speeds and related design criteria.

Table 4 shows that four existing horizontal curves do not meet the new construction design speed. The actual accident rate is lower than the predicted accident rate, so the curves do not require correction.

Table 4: Horizontal Alignment Check

Curve Number	PI Station	Existing Radius (ft)	Existing Length (ft)	Design Speed (mph)	New Const. Radius (ft)	Radius Check
1	19+45	1,000	175	30	275	**OK**
2	22+38	1,500	116	30	275	**OK**
3	43+70	2,300	550	30	275	**OK**
4	47+24	750	41	30	275	**OK**
5	52+32	950	269	30	275	**OK**
6	59+07	1,800	635	45	660	**OK**
7	65+65	643	266	45	660	**NG**
8	69+33	800	233	45	660	**OK**
9	73+55	2,000	192	45	660	**OK**
10	77+21	700	224	45	660	**OK**
11	81+12	450	241	45	660	**NG**
12	84+87	1,500	159	45	660	**OK**
13	88+11	2,500	231	45	660	**OK**
14	94+14	2,850	913	45	660	**OK**
15	102+78	590	347	45	660	**NG**
16	112+93	658	420	45	660	**NG**
17	119+40	900	360	45	660	**OK**
18	130+04	722	418	45	660	**OK**
19	140+56	900	365	45	660	**OK**
20	156+80	1,877	912	45	660	**OK**
21	163+82	1,384	245	45	660	**OK**

NG – Does not conform to design standards
OK – Conforms to current design standards
PI – Point of Intersection

Because the actual accident rate is lower than the predicted accident rate, the accident analysis presented in Table 5 indicates that a cost benefit analysis is not required for the horizontal curve that is deficient in horizontal radius.

Table 5: Horizontal Curve Accident Analysis

<table>
<tr><th colspan="9">Segment Deermount to Saxman</th></tr>
<tr><th colspan="2">Total Segment Length (mi)</th><th>Straight Segment Length (mi)</th><th colspan="3">Analysis Period (Yr)</th><th colspan="3">Straight Segment Accident Rate (AR_s)</th></tr>
<tr><td colspan="2">2.0</td><td>1.04</td><td colspan="3">10</td><td colspan="3">0.64</td></tr>
<tr><th rowspan="2">Curve Number</th><th rowspan="2">PI Station</th><th rowspan="2">ADT on Segment</th><th rowspan="2">Radius (ft)</th><th colspan="2">L_c</th><th rowspan="2">D</th><th rowspan="2">A_h</th><th rowspan="2">A_a</th></tr>
<tr><th>(ft)</th><th>(mi)</th></tr>
<tr><td>7</td><td>65+65</td><td>5,781</td><td>643</td><td>266</td><td>0.050</td><td>8.9</td><td>7.30</td><td>0</td></tr>
<tr><td>11</td><td>81+12</td><td>5,781</td><td>450</td><td>241</td><td>0.046</td><td>12.7</td><td>9.92</td><td>1</td></tr>
<tr><td>15</td><td>102+78</td><td>5,781</td><td>590</td><td>347</td><td>0.066</td><td>9.7</td><td>8.17</td><td>7</td></tr>
<tr><td>16</td><td>112+93</td><td>5,781</td><td>659</td><td>420</td><td>0.080</td><td>8.7</td><td>7.73</td><td>1</td></tr>
<tr><td colspan="9">$A_h = AR_s (L)(V) + [0.0336 \times D \times V]$ for $L \geq L_c$</td></tr>
</table>

ADT –Average Daily Traffic of mid-study period (ADT 2007)
A_a – Actual Accidents
A_h – Predicted total number of accidents on the segment
AR_s – Accident rate on comparable straight segments in accidents per million vehicle miles
V – Total traffic volume in millions of vehicles
D – Curvature in degrees
L_c – Length of curved component in miles

Vertical Curvature and Stopping Sight Distance Analysis

The 3R analysis procedure applies to crest vertical curves only; the methodology is not applicable to accidents at sag vertical curves. All of the vertical curves within the project limits were compared with new construction standards. Individual vertical curves were evaluated based on the actual number of accidents occurring along the curve and the predicted number of accidents. If the actual number of accidents is greater than the predicted number, then the curve is recommended for upgrade to new construction standards.

As indicated in Table 6, all of the vertical curves meet the current standards for length and stopping sight distance.

Standard crest vertical curves may remain unchanged on 3R projects unless the actual number of accidents exceeds the predicted number of accidents and the curve has insufficient stopping sight distance. The results of an accident analysis for crest curves are shown in Table 7. The actual accident numbers include driveway and intersection accidents that may be related to stopping sight distance (SSD). None of the vertical curves require improvement.

Table 6: Crest Vertical Curve Check

PVI Station	Design Speed (mph)	Existing Grade In (%)	Existing Grade Out (%)	Existing A (%)	Existing Length (ft)	Design K Value	Design Length (ft)	Existing SSD (ft)	Design SSD (ft)
10+80	30	0.00	-2.57	2.57	128.35	19	49	484	200
21+38	30	1.41	-0.91	2.32	231.97	19	44	581	200
35+62	30	1.91	1.19	0.72	72.49	19	14	1,535	200
45+29	30	2.57	-3.08	5.66	394.94	19	108	388	200
59+84	45	-0.21	-1.31	1.10	110.49	61	67	1,036	360
74+21	45	1.73	-1.07	2.81	280.69	61	171	524	360
81+56	45	1.21	-0.77	1.98	197.58	61	121	644	360
131+35	45	5.00	-1.15	6.15	583.62	61	375	453	360
160+37	45	1.35	-0.66	2.01	201.20	61	123	637	360

A – Algebraic Difference in Grades
Design K Value – Rate of Curvature
PVI – Point of Vertical Intersection
SSD – Stopping Sight Distance

Table 7: Crest Vertical Curve Analysis

PVI Station	Existing SSD (ft)	Equivalent Speed (mph)	Hazard Rating	L_{vc}		a_0	a_1	L_r (m)	F_{ar}	N_c	N_a	Check $N_a < N_c$
				(ft)	(mi)							
10+80	484	50	Minor	128	0.024	0	29.4	0.014	0.0	0.48	0	**OK**
21+37	581	60	Minor	232	0.044	0	29.4	0.042	0.0	0.86	0	**OK**
35+62	1,535	>80	Significant	72	0.014	0	29.4	0.013	0.4	0.37	1	**NR**
45+29	388	45	Significant	395	0.075	0	29.4	0.103	0.4	2.28	0	**OK**
59+84	1,036	>80	Significant	110	0.021	0	80.2	0.055	0.4	0.84	0	**OK**
74+21	524	55	Significant	281	0.053	0	80.2	0.140	0.0	1.04	0	**OK**
81+56	644	65	Minor	198	0.037	0	80.2	0.099	1.0	2.67	1	**OK**
131+35	453	50	Major	584	0.111	0	80.2	0.306	1.0	9.93	3	**OK**
160+37	637	65	Significant	201	0.038	0	80.2	0.100	0.4	1.86	1	**OK**
$L_r = [a_0 + (a_1 \times A)] / 5280$						$N_c = AR_h(L_{vc})(V) + AR_h(L_r)(V)(F_{ar})$						

a_0 - Sight Distance Constant
a_1 - Sight Distance Constant
A – Absolute Value of Grade Difference (in percent)
F_{ar} - Accident Rate Factor
L_r - Length of Restricted Sight Distance (in miles)
Lvc - Length of Vertical Curve (in miles)
N_a - Number of Actual Accidents (recorded)
N_c - Number of Predicted Accidents (calculated)

NG - Does not conform to design standards
NR - No restriction; vertical SSD is greater than or equal to minimum design standards
OK - Conforms to current design standards
PVI – Point of Vertical Intersection
SSD – Stopping Sight Distance

Bridge Analysis

No bridges exist within the project limits.

Sideslopes and Clear Zones

The PCM Section 1160.3.6 recommends that section geometry and obstacles within the clear zone be evaluated when required by the Case I 3R Procedure Outline in Table 1160-1. The actual accident rate for the Deermount Street to Saxman segment was found to be lower than the predicted accident rate and does not require further analysis.

The actual accident rate for the Saxman to Surf Street segment was higher than the predicted accident rate. If the top width widening is unable to reduce the adjusted actual accident rate to equal or less than the predicted rate, roadside cross-sectional elements are to be evaluated in accordance with Section 1130 of the PCM. In the section from Saxman to Surf Street, reduction of the adjusted actual accident rate was less than the predicted rate and indicates no action required for roadside cross-sectional analysis.

Intersection Analysis

Intersection Crash Analysis

The PCM Section 1160.3.8 recommends that intersections be examined to determine if crashes can be attributed to intersection geometrics. Three major intersections were examined in the project area to determine if any modifications to the intersection would be required. Table 8 displays the results of the intersection crash analysis.

Table 8: Intersection Crash Rates, 2003–2012

Intersection Location		Total Accidents	Millions of Entering Vehicles in Period	Accident Rate (AR)	Critical Acc. Rate (CAR)	Safety Index (AR/CAR)	Severity Indicator
Street 1	Street 2						
South Tongass Highway	Deermount Street	10	21.973	0.46	0.73	0.62	0.002
South Tongass Highway	Cemetery Road	2	21.973	0.09	0.73	0.12	
South Tongass Highway	Forest Park Drive	4	21.973	0.18	0.73	0.25	0.001
South Tongass Highway	Totem Row	2	10.439	0.19	0.86	0.22	

Note: The state average accident rate (crashes per million entering vehicles) for 2003-2012 is 0.47.

Eighteen intersection-related crashes were recorded between 2003 and 2012: 10 at Deermount Street, 2 at Cemetery Road, 4 at Forest Park Drive, and 2 at Totem Row. Based on the intersection crash analysis, all intersections have crash rates that do not exceed the UCL of the location. No modifications are recommended at these intersections.

Intersection Capacity Analysis

South Tongass Highway is generally a two-lane minor arterial with a speed limit of 30 mph from Deermount Street to Mile Point 3.4 and 45 mph to Surf Street within the study area. The intersection at South Tongass Highway and Deermount Street is a four-legged intersection with stop control at the eastbound and westbound approaches on Deermount Street. The remaining three intersections at Forest Park Drive, Totem Row, and Cemetery Road are three-legged intersections with a stop sign at the westbound approach on the side street.

There are no right-turn or left-turn bays along South Tongass Highway at those four intersections; there is only one lane in each direction.

The existing traffic operational conditions at the studied intersections were evaluated using Level of Service (LOS) analysis. Based on the methodologies provided in the *Highway Capacity Manual* (HCM), LOS A represents free-flow conditions (motorists experience little or no delay and traffic levels are well below roadway capacity), LOS F represents forced-flow conditions (motorists experience very long delays and traffic levels exceed roadway capacity), and LOS B to E represent decreasingly desirable conditions. LOS D is generally used as an acceptable condition.

Table 9 presents LOS criteria for unsignalized intersections.

Table 9: LOS Criteria for Unsignalized Intersections

Level of Service	Control Delay Range (seconds)
A	<=10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50 or v/c > 1.0

Source: *2010 Highway Capacity Manual*, TRB
v/c – Volume to Capacity Ratio

Peak hour LOS analyses were conducted at the study area intersections for existing conditions based on the traffic count data collected by DOT&PF – Southcoast Region on October 21, 2015. The AM Peak Hour is identified to be between 7:15 AM and 8:15 AM, and the PM Peak Hour is identified to be 4:30 PM to 5:30 PM. Peak Hour Factors and Heavy Vehicle Factors were also collected from existing traffic counts and applied in the capacity analysis.

Highway Capacity Software (HCS), version 2010, was used to evaluate and report intersection delays and LOS under the existing conditions. Table 10 shows the HCS 2010 results of the intersection capacity analyses for the AM and PM peak hours. As shown in Table 10, all approaches at the four study area intersections on South Tongass Highway are currently operating at a LOS C or better, which is better than acceptable conditions. The turning movement traffic count data are included in Appendix B. HCS results are shown in Appendix C.

Table 10: Existing Intersection Delay and LOS for AM and PM Peak Hours

Intersection Name	Time Period	Northbound		Southbound		Westbound		Eastbound	
		Delay[a] (seconds)	LOS[b]	Delay[a] (seconds)	LOS[b]	Delay (seconds)	LOS	Delay (seconds)	LOS
South Tongass Highway and Deermount Street	AM Peak Hour	7.6	A	8.6	A	21	C	9.4	A
	PM Peak Hour	8	A	8.3	A	23.7	C	16.6	C
South Tongass Highway and Forest Park Drive	AM Peak Hour	-	-	8.2	A	11.5	B	-	-
	PM Peak Hour	-	-	7.9	A	11.3	B	-	-
South Tongass Highway and Totem Row	AM Peak Hour	-	-	8.1	A	10.7	B	-	-
	PM Peak Hour	-	-	7.7	A	10.5	B	-	-
South Tongass Highway and Cemetery Road	AM Peak Hour	-	-	8.2	A	10.9	B	-	-
	PM Peak Hour	-	-	*	*	-	-	-	-

[a] Indicates the control delay experienced by the left-turn traffic on the major street.
[b] Indicates the level of service (LOS) for the left-turn traffic on the major street.
* Existing traffic counts are missing for PM peak hours.

Corridor Capacity and LOS Analysis

HCM and HCS, version 2010, were used to evaluate and report corridor capacity and LOS for South Tongass Highway as a two-lane highway under both existing (Year 2015) and future (Year 2035) conditions.

The capacity of a two-lane highway under base conditions is 1,700 passenger cars per hour (pc/h) in one direction, with a limit of 3,200 pc/h for the total of the two directions. Because of the interactions between directional flows, when a capacity of 1,700 pc/h is reached in one direction, the maximum opposing flow would be limited to 1,500 pc/h.

Capacity conditions, however, are rarely observed except in short segments. Because service quality deteriorates at relatively low-demand flow rates, most two-lane highways are upgraded before demand approaches capacity.

Depending on the classifications of two-lane highways, three measures of effectiveness are incorporated into the HCM methodology to determine the automobile LOS: average travel speed, percent time spent following, and percent of free-flow speed (PFFS). Because it is defined as a Class III, two-lane highway, PFFS is used to define the LOS for South Tongass Highway. The LOS criteria for two-lane highways are shown in Table 11.

Table 11: LOS Criteria for Class III, Two-Lane Highways

Level of Service	PFFS (%)
A	>91.7
B	>83.3 and ≤91.7
C	>75.0 and ≤83.3
D	>66.7 and ≤75.0
E	≤66.7
F	v/c > 1.0

Source: *2010 Highway Capacity Manual*, TRB
PFFS – Percent of Free-Flow Speed
v/c – Volume to Capacity Ratio

Based on the methodologies provided in the HCM for Class III, two-lane highways, at LOS A, drivers should be able to maintain operating speeds close or equal to the free-flow speed (FFS) of the facility. At LOS B, it becomes difficult to maintain FFS operation, but the speed reduction is still relatively small. At LOS C, speeds are noticeably curtailed. At LOS D, the fall-off from FFS is now significant. At LOS E, speed is less than two-thirds the FFS. LOS F exists whenever demand flow in one or both directions exceeds the capacity of the segment. LOS F represents the unstable operating conditions with heavy congestion.

Table 12 and Table 13 show the input data provided by the project Design Designations and 2011 SE CDS Road Log and output results from the HCS 2010 program for both directions. The two-lane highway capacity and LOS analysis were performed for South Tongass Highway during the Design Hour. As shown in the two tables, all three segments along South Tongass Highway are operating at a LOS C or better for both directions under existing and future conditions. For both the existing (2015) and future (2035) years, Directional Distribution is 45/55, there is a 0.9 Peak Hour factor, and there is 1 percent Heavy Vehicles. HCS results for two-lane highways are shown in Appendix D.

Since the Saxman to Surf Street segment includes sections signed at both 30 and 45 mph, the analysis evaluated this segment at both 30- and 45-mph speeds. At the lower speed, the LOS for this segment drops slightly, but it continues to operate above LOS C for both existing and future conditions.

Table 12: Existing Year 2015 Two-Lane Highway Capacity and LOS

HCS Inputs										HCS Outputs		
Segment	Mile Point (MP)		Segment Length (mile)	Posted Speed Limit (mph)	Lane Width (ft)	Shoulder Width (ft)	ADT	DHV	LOS	v/c Ratio	Free-Flow Speed
	From	To									
Deermount Street to Saxman	MP 2.6	MP 3.4	0.8	30	11	4	5,960	632	C/C	0.23/0.19	83.1%/83.1%
Deermount Street to Saxman	MP 3.4	MP 4.5	1.2	45	12	2	5,960	632	B/B	0.23/0.19	86.7%/86.8%
Saxman to Surf Street	MP 4.5	MP 5.5	1.1	45	12	2	2,830	300	A/A	0.11/0.09	93.1%/92.5%
Saxman to Surf Street	MP 4.5	MP 5.5	1.1	30	12	2	2,830	300	B/B	0.11/0.09	91.1%/90.3%

Note: The LOS, v/c Ratio, and PFFS are calculated and shown for both directions on every highway segment.
ADT – Average Daily Traffic
DHV – Design Hourly Volume
HCS – Highway Capacity Software
LOS – Level of Service
v/c = Volume to Capacity Ratio

Table 13: Future Year 2035 Two-Lane Highway Capacity and LOS

HCS Inputs									HCS Outputs		
Segment	Mile Point		Segment Length (mile)	Posted Speed Limit (mph)	Lane Width (ft)	Shoulder Width (ft)	ADT	DHV	LOS	v/c Ratio	Free-Flow Speed
	From	To									
Deermount Street to Saxman	MP 2.6	MP 3.4	0.8	30	11	5	6,650	710	C/C	0.26/0.21	81.4%/81.6%
Deermount Street to Saxman	MP 3.4	MP 4.5	1.2	45	11	5	6,650	710	B/B	0.26/0.21	85.4%/85.6%
Saxman to Surf Street	MP 4.5	MP 5.5	1.1	45	11	5	3,160	330	A/A	0.12/0.10	92.3%/91.7%
Saxman to Surf Street	MP 4.5	MP 5.5	1.1	30	11	5	3,160	330	B/B	0.12/0.10	90.2%/89.5%

Note: The LOS, v/c Ratio, and PFFS are calculated and shown for both directions on every highway segment.
ADT – Average Daily Traffic
DHV – Design Hourly Volume
HCS – Highway Capacity Software
LOS – Level of Service
v/c = Volume to Capacity Ratio

Driveway Analysis

The PCM Section 1160.3.9 recommends that existing driveway geometry may remain unless accident records indicate an anomaly. No out-of-the-ordinary driveway accident patterns were found in the project area.

Grade Analysis

The PCM Section 1160.3.9 recommends that grades that do not meet new construction standards warrant evaluation as a potential factor to cluster accidents in the vicinity of a grade section. No grades in the project area exceed that of the new construction standards.

Safety Recommendations

The remainder of this report presents recommendations of measures to reduce accidents within the project corridor beyond the typical 3R analysis recommendations. The intent is to identify relatively low-cost safety improvements that will have a positive effect on the overall safety of the corridor. These recommendations stem from effective solutions that have been used elsewhere in the United States to improve safety.

Potential Measures to Mitigate Accidents

There are several countermeasures that could be implemented along the South Tongass Highway to potentially reduce the overall number of accidents within the corridor. The TRB has developed a report, NCHRP 440, which summarizes a variety of measures that could be implemented to reduce the occurrence of accidents. The report categorizes these measures into the following four areas:

- *Roadway:* This category includes improvements that could be implemented within the roadway cross section itself (i.e., shoulders).
- *Roadside:* This category relates to improvements that could be implemented outside of the actual roadway cross section (i.e., clear zone).
- *Intersection:* These improvements are specific to intersections or driveways that experience high numbers of accidents (i.e., advance signing).
- *Other:* The fourth category includes a variety of countermeasures that do not specially relate to the various roadway features (i.e., animals).

Specific accident data from the South Tongass Highway project were used to identify which measures in the NCHRP report are appropriate for this corridor.

Brief Discussion of Potential Improvements

The first category discussed is roadway elements. Based on preliminary discussions with DOT&PF, it is preferred to match the typical section of the adjacent project to the south #71670 Surf Street to Roosevelt Drive section. This section has a total top width of 32 feet with 11-foot lanes and 5-foot shoulders. While a 5-foot shoulder is not required by the 3R analysis, a wider top width will have the potential to further reduce the number of single-vehicle run-off-the-road accidents, and allow some escape for vehicles approaching from the rear of a left-turning vehicle.

Improvements to the geometric elements may also reduce the number of accidents along the corridor. There are four horizontal curves listed in Table 4 that have a radius smaller than the minimum new construction standard radius. Other horizontal curves near the U.S. Coast Guard base entrance and also near Misty Fjords evaluated during a recent field review had perceived horizontal curve concerns. The historic accident counts at these locations do not warrant major improvements based on the 3R analysis, but improvements to sight distance through curve flattening and cutbacks to slopes may reduce the number of accidents related to these locations. Left-turn lanes are also being considered, based on the recent field review at the Forest Park Drive and Totem Row locations.

In more urban sections of the project, curb, gutter, and sidewalk will be considered to improve pedestrian safety as well as to address drainage issues in narrow right-of-way sections. A separated recreational pathway will be rehabilitated in existing areas and a new one will be constructed to provide the missing link between Surf Street and Saxman.

There are also several other countermeasures than those in the previous paragraph above that could be implemented along the entire South Tongass Highway. These include improved enforcement, roadside information, and public education (public notices similar to the Construction *Navigator*).

Appendix A:
Proposed Design Criteria

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Project Name:	South Tongass Highway Deermount to Saxman Street			
☐ New Construction/Reconstruction	☑ Reconstruction (3R)	☐ Other:		
Project Number:	67685/0902039		☐ NHS	☑ Non NHS
Functional Classification:	Minor Arterial (GB page 11)			
Design Year:	2037	**Present ADT:**		6020
Design Year ADT:	6650	**Mid Design Period ADT:**		6330
DHV:	10.6%	**Directional Split:**		55/45
Percent Trucks:	7.70%	**Equivalent Axle Loading:**		2,050,000
Pavement Design Year:	2037	**Design Vehicle:**		WB-50
Terrain:	Mountainous	**Number of Roadways:**		1
Design Speed:	30 MPH (PCM 1160.3.1) - CDS MP 2.6 to MP 3.4			
Width of Traveled Way:	11 feet, Existing (PCM 1160.3.2)			
Width of Shoulders:	**Outside:**	5 feet, Existing (PCM 1160.3.2)	**Inside:**	None
Cross Slope:	2% Normal crown (PCM 1130.1.2)			
Superelevation Rate:	eMax = 6% (GB 3-45)			
Minimum Radius of Curvature:	231 feet (PCM 1160.3.3)			
Minimum K-Value for Vertical Curve:	**Sag:**	37 (PCM 1160.3.4)	**Crest:**	19 (PCM 1160.3.4)
Maximum Allowable Grade:	8.0% (PCM 1160.3.11)			
Minimum Allowable Grade:	0.5 percent (PCM 1160.3.11)			
Stopping Sight Distance:	200 feet (PCM 1160.3.4)			
Lateral Offset to Obstruction:	1.5 feet minimum			
Vertical Clearance:	Overhead Utilities: 20ft 6in; Pedestrian Structures: 17ft 6in , (PCM Table 1130-1)			
Bridge Width:				
Bridge Structural Capacity:				
Passing Sight Distance:	1090 feet (GB page 276)			
Surface Treatment:	**T/W:**	Paved	**Shoulders:**	Paved
Side Slope Ratios:	**Foreslopes:**	4:1 (w/in CZ)	**Backslopes:**	1.5:1 (outside CZ)
Degree of Access Control:	Partial (GB page 89)			
Median Treatment:	N/A			
Illumination:				
Curb Usage and Type:	For sidewalk separation and drainage conveyance; 6 inch Standard			
Bicycle Provisions:	Paved shoulder and paved pathway or sidewalk			
Pedestrian Provisions:	Paved pathway or sidewalk			
Misc. Criteria:				

Proposed - Designer/Consultant: ______________________ **Date:** ____________

Accepted - Engineering Manager: ______________________ **Date:** ____________

Approved - Preconstruction Engineer: ______________________ **Date:** ____________

Shaded criteria are the *FWHA 13 controlling criteria*. For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual*. Otherwise a Design Exception must be approved.

Design Criterion marked with a " # " do not meet minimums and have a Design Exception(s) and/or Design Waiver(s) approved. See Appendix __ for Design Exception/Design Waiver approval(s) and approved design criteria values.

Project Name:	South Tongass Highway Deermount to Saxman Street			
☐ New Construction/Reconstruction	☑ Reconstruction (3R)	☐ Other:		
Project Number:	67685/0902039		☐ NHS	☑ Non NHS
Functional Classification:	Minor Arterial (GB page 11)			
Design Year:	2037	**Present ADT:**	6020	
Design Year ADT:	6650	**Mid Design Period ADT:**	6330	
DHV:	10.6%	**Directional Split:**	55/45	
Percent Trucks:	7.70%	**Equivalent Axle Loading:**	2,050,000	
Pavement Design Year:	2037	**Design Vehicle:**	WB-50	
Terrain:	Mountainous	**Number of Roadways:**	1	
Design Speed:	45 MPH (PCM 1160.3.1) - CDS MP 3.4 to MP 4.5			
Width of Traveled Way:	11 feet, Existing (PCM 1160.3.2)			
Width of Shoulders:	**Outside:**	5 feet, Existing (PCM 1160.3.2)	**Inside:**	None
Cross Slope:	2% Normal crown (PCM 1130.1.2)			
Superelevation Rate:	eMax = 6% (GB 3-45)			
Minimum Radius of Curvature:	643 feet (PCM 1160.3.3)			
Minimum K-Value for Vertical Curve:	**Sag:**	79 (PCM 1160.3.4)	**Crest:**	61 (PCM 1160.3.4)
Maximum Allowable Grade:	7.0% (PCM 1160.3.11)			
Minimum Allowable Grade:	0.5 percent (PCM 1160.3.11)			
Stopping Sight Distance:	360 feet (PCM 1160.3.4)			
Lateral Offset to Obstruction:	1.5 feet minimum			
Vertical Clearance:	Overhead Utilities: 20ft 6in; Pedestrian Structures: 17ft 6in , (PCM Table 1130-1)			
Bridge Width:				
Bridge Structural Capacity:				
Passing Sight Distance:	1625 feet (GB page 276)			
Surface Treatment:	**T/W:**	Paved	**Shoulders:**	Paved
Side Slope Ratios:	**Foreslopes:**	4:1 (w/in CZ)	**Backslopes:**	1.5:1 (outside CZ)
Degree of Access Control:	Partial (GB page 89)			
Median Treatment:	N/A			
Illumination:				
Curb Usage and Type:	For sidewalk separation and drainage conveyance; 6 inch Standard			
Bicycle Provisions:	Paved shoulder and 8ft paved pathway			
Pedestrian Provisions:	8 ft Paved pathway			
Misc. Criteria:				

Proposed - Designer/Consultant: ______________________ **Date:** ______________

Accepted - Engineering Manager: ______________________ **Date:** ______________

Approved - Preconstruction Engineer: ______________________ **Date:** ______________

Shaded criteria are the *FWHA 13 controlling criteria*. For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual*. Otherwise a Design Exception must be approved.

Design Criterion marked with a " # " do not meet minimums and have a Design Exception(s) and/or Design Waiver(s) approved. See Appendix __ for Design Exception/Design Waiver approval(s) and approved design criteria values.

Project Name:	South Tongass Highway Saxman to Surf Street			
☐ New Construction/Reconstruction	☑ Reconstruction (3R)	☐ Other:		
Project Number:	67571/0902031		☐ NHS	☑ Non NHS
Functional Classification:	Minor Arterial (GB page 11)			
Design Year:	2037		**Present ADT:**	2860
Design Year ADT:	3160		**Mid Design Period ADT:**	3,000
DHV:	10.50%		**Directional Split:**	55/45
Percent Trucks:	7.70%		**Equivalent Axle Loading:**	950,000
Pavement Design Year:	2037		**Design Vehicle:**	WB-50
Terrain:	Mountainous		**Number of Roadways:**	1
Design Speed:	45 MPH (PCM 1160.3.1) - CDS MP 4.5 to MP 5.5			
Width of Traveled Way:	11 feet, Existing (PCM 1160.3.2)			
Width of Shoulders:	**Outside:**	5 feet, Existing (PCM 1160.3.2)	**Inside:**	None
Cross Slope:	2% Normal crown (PCM 1130.1.2)			
Superelevation Rate:	eMax = 6% (GB 3-45)			
Minimum Radius of Curvature:	643 feet (PCM 1160.3.3)			
Minimum K-Value for Vertical Curve:	**Sag:**	79 (PCM 1160.3.4)	**Crest:**	61 (PCM 1160.3.4)
Maximum Allowable Grade:	7.0% (PCM 1160.3.11)			
Minimum Allowable Grade:	0.5 percent (PCM 1160.3.11)			
Stopping Sight Distance:	360 feet (PCM 1160.3.4)			
Lateral Offset to Obstruction:	1.5 feet minimum			
Vertical Clearance:	Overhead Utilities: 20ft 6in; Pedestrian Structures: 17ft 6in , (PCM Table 1130-1)			
Bridge Width:				
Bridge Structural Capacity:				
Passing Sight Distance:	1625 feet (GB page 276)			
Surface Treatment:	**T/W:**	Paved	**Shoulders:**	Paved
Side Slope Ratios:	**Foreslopes:**	4:1 (w/in CZ)	**Backslopes:**	1.5:1 (outside CZ)
Degree of Access Control:	Partial (GB page 89)			
Median Treatment:	N/A			
Illumination:				
Curb Usage and Type:	For sidewalk separation and drainage conveyance; 6 inch Standard			
Bicycle Provisions:	Paved shoulder and 8ft paved pathway			
Pedestrian Provisions:	8 ft Paved pathway			
Misc. Criteria:				

Proposed - Designer/Consultant: ______________________ **Date:** ______________

Accepted - Engineering Manager: ______________________ **Date:** ______________

Approved - Preconstruction Engineer: ______________________ **Date:** ______________

Shaded criteria are the *FWHA 13 controlling criteria* . For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual* . Otherwise a Design Exception must be approved.

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See Appendix __ for Design Exception/Design Waiver approval(s) and approved design criteria values.

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Appendix B:
Turning Movement Data

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Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov
Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Deermount Street
Site Code:
Start Date: 10/21/2015

Turning Movement Data

Start Time	South Tongass Southbound					Deermount Street Westbound					South Tongass Northbound					Driveway Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
12:00 AM	0	1	2	0	3	1	0	3	0	4	0	0	0	0	0	0	0	0	0	0	7
12:15 AM	0	2	2	0	4	1	0	3	0	4	0	4	0	0	4	0	0	0	0	0	12
12:30 AM	0	2	0	0	2	0	0	0	0	0	1	3	0	0	4	0	0	0	0	0	6
12:45 AM	0	3	1	0	4	1	0	0	1	1	1	0	0	0	1	0	0	0	0	0	6
Hourly Total	0	8	5	0	13	3	0	6	1	9	2	7	0	0	9	0	0	0	0	0	31
1:00 AM	0	2	0	0	2	1	0	1	0	2	0	1	0	0	1	0	0	0	0	0	5
1:15 AM	0	1	0	0	1	0	0	0	0	0	1	2	0	0	3	0	0	0	0	0	4
1:30 AM	0	2	1	0	3	0	0	1	0	1	1	1	0	0	2	0	0	0	0	0	6
1:45 AM	0	2	2	0	4	0	0	1	0	1	0	2	0	0	2	0	0	0	0	0	7
Hourly Total	0	7	3	0	10	1	0	3	0	4	2	6	0	0	8	0	0	0	0	0	22
2:00 AM	0	1	1	0	2	4	0	1	0	5	0	0	0	0	0	0	0	0	0	0	7
2:15 AM	0	3	0	0	3	1	0	1	0	2	0	2	0	0	2	0	0	0	0	0	7
2:30 AM	0	2	1	0	3	1	0	0	0	1	0	3	0	0	3	0	0	0	0	0	7
2:45 AM	0	1	1	0	2	0	0	1	0	1	0	4	0	0	4	0	0	0	0	0	7
Hourly Total	0	7	3	0	10	6	0	3	0	9	0	9	0	0	9	0	0	0	0	0	28
3:00 AM	0	1	0	0	1	0	0	1	0	1	1	2	0	0	3	0	0	0	0	0	5
3:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:30 AM	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
3:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	2	1	0	3	0	0	1	0	1	1	3	0	0	4	0	0	0	0	0	8
4:00 AM	0	1	1	0	2	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	4
4:15 AM	0	1	1	0	2	0	0	1	0	1	0	2	0	0	2	0	0	0	0	0	5
4:30 AM	0	1	0	0	1	0	0	0	1	0	1	1	0	0	2	0	0	0	1	0	3
4:45 AM	0	1	1	0	2	0	0	0	0	0	2	6	0	0	8	0	0	0	0	0	10
Hourly Total	0	4	3	0	7	1	0	1	1	2	3	10	0	0	13	0	0	0	1	0	22
5:00 AM	0	1	1	0	2	3	0	1	0	4	1	1	0	0	2	0	0	0	0	0	8
5:15 AM	0	2	3	0	5	6	0	2	1	8	2	1	0	0	3	0	0	0	0	0	16
5:30 AM	0	8	0	0	8	1	0	1	0	2	4	7	0	0	11	0	0	0	0	0	21
5:45 AM	0	10	2	0	12	5	0	2	0	7	9	17	0	0	26	0	0	0	0	0	45
Hourly Total	0	21	6	0	27	15	0	6	1	21	16	26	0	0	42	0	0	0	0	0	90
6:00 AM	0	16	3	0	19	1	0	5	0	6	2	14	0	0	16	0	0	0	0	0	41
6:15 AM	0	18	4	0	22	3	1	9	0	13	3	25	0	0	28	0	0	0	0	0	63
6:30 AM	0	17	3	0	20	3	0	9	0	12	8	56	0	0	64	0	0	1	0	1	97
6:45 AM	0	33	1	0	34	5	1	6	2	12	9	51	0	0	60	0	0	0	0	0	106

Hourly Total	0	84	11	0	95	12	2	29	2	43	22	146	0	0	168	0	0	1	0	1	307
7:00 AM	0	32	8	0	40	8	0	9	0	17	7	38	0	0	45	0	0	0	1	0	102
7:15 AM	0	29	9	0	38	7	0	8	1	15	22	61	0	1	83	0	0	0	3	0	136
7:30 AM	0	39	6	0	45	14	0	24	0	38	27	86	0	2	113	0	0	0	1	0	196
7:45 AM	2	49	10	0	61	9	0	17	5	26	20	100	0	1	120	1	0	0	2	1	208
Hourly Total	2	149	33	0	184	38	0	58	6	96	76	285	0	4	361	1	0	0	7	1	642
8:00 AM	0	34	10	0	44	10	0	14	2	24	8	50	0	0	58	0	0	0	0	0	126
8:15 AM	0	46	8	0	54	9	0	12	2	21	5	52	0	0	57	0	0	0	1	0	132
8:30 AM	0	41	8	0	49	16	0	12	0	28	11	39	1	2	51	0	1	0	2	1	129
8:45 AM	1	55	11	0	67	4	0	16	4	20	16	61	2	2	79	0	0	1	3	1	167
Hourly Total	1	176	37	0	214	39	0	54	8	93	40	202	3	4	245	0	1	1	6	2	554
9:00 AM	2	28	7	0	37	12	0	9	2	21	3	47	0	0	50	0	0	1	0	1	109
9:15 AM	3	39	11	1	53	12	0	12	3	24	9	44	0	2	53	0	0	1	2	1	131
9:30 AM	0	38	10	0	48	10	0	7	5	17	10	51	0	0	61	0	0	0	1	0	126
9:45 AM	1	43	4	0	48	8	0	10	3	18	10	52	0	0	62	0	0	0	1	0	128
Hourly Total	6	148	32	1	186	42	0	38	13	80	32	194	0	2	226	0	0	2	4	2	494
10:00 AM	4	38	13	0	55	10	0	8	9	18	19	57	0	5	76	0	0	1	7	1	150
10:15 AM	3	46	12	1	61	9	0	4	6	13	12	52	0	2	64	0	0	0	3	0	138
10:30 AM	1	42	5	0	48	15	0	11	4	26	7	48	1	2	56	0	0	0	5	0	130
10:45 AM	1	40	8	0	49	11	0	4	3	15	9	43	0	0	52	0	0	0	1	0	116
Hourly Total	9	166	38	1	213	45	0	27	22	72	47	200	1	9	248	0	0	1	16	1	534
11:00 AM	0	56	12	1	68	7	1	9	5	17	7	51	2	6	60	1	0	1	8	2	147
11:15 AM	2	46	12	0	60	12	0	4	2	16	7	51	0	3	58	0	0	0	3	0	134
11:30 AM	1	53	10	2	64	8	0	5	6	13	13	44	0	3	57	0	0	0	4	0	134
11:45 AM	1	58	14	1	73	30	0	9	10	39	11	69	0	0	80	0	0	0	0	0	192
Hourly Total	4	213	48	4	265	57	1	27	23	85	38	215	2	12	255	1	0	1	15	2	607
12:00 PM	2	45	14	0	61	15	0	10	4	25	7	52	0	17	59	1	0	1	18	2	147
12:15 PM	3	53	7	0	63	18	0	5	7	23	16	54	0	10	70	0	0	0	12	0	156
12:30 PM	0	48	11	0	59	18	0	7	4	25	10	61	0	3	71	0	0	0	5	0	155
12:45 PM	3	69	14	1	86	18	0	13	0	31	9	61	0	5	70	0	0	0	9	0	187
Hourly Total	8	215	46	1	269	69	0	35	15	104	42	228	0	35	270	1	0	1	44	2	645
1:00 PM	1	63	12	0	76	12	0	6	2	18	4	58	1	3	63	0	0	1	3	1	158
1:15 PM	5	47	14	0	66	16	0	11	4	27	4	54	1	3	59	1	0	0	3	1	153
1:30 PM	3	45	14	0	62	15	1	6	4	22	10	61	0	4	71	1	0	0	7	1	156
1:45 PM	0	55	11	1	66	19	1	13	2	33	9	55	0	0	64	0	0	0	0	0	163
Hourly Total	9	210	51	1	270	62	2	36	12	100	27	228	2	10	257	2	0	1	13	3	630
2:00 PM	0	48	14	2	62	22	0	7	3	29	11	47	0	3	58	0	0	0	4	0	149
2:15 PM	3	40	17	1	60	14	0	8	4	22	17	52	1	4	70	0	0	0	6	0	152
2:30 PM	1	54	12	2	67	19	0	11	4	30	10	63	0	3	73	0	0	2	3	2	172
2:45 PM	0	63	10	2	73	11	0	14	14	25	16	60	0	6	76	0	1	1	6	2	176
Hourly Total	4	205	53	7	262	66	0	40	25	106	54	222	1	16	277	0	1	3	19	4	649
3:00 PM	0	77	28	0	105	14	0	15	9	29	10	55	0	7	65	0	0	0	7	0	199
3:15 PM	2	56	11	0	69	16	0	11	10	27	19	60	0	3	79	0	0	0	3	0	175
3:30 PM	2	58	11	2	71	20	0	9	7	29	12	70	0	2	82	0	0	0	4	0	182
3:45 PM	3	65	13	0	81	25	0	20	16	45	11	71	0	5	82	1	0	0	6	1	209
Hourly Total	7	256	63	2	326	75	0	55	42	130	52	256	0	17	308	1	0	0	20	1	765
4:00 PM	3	77	12	0	92	24	2	11	9	37	10	69	0	3	79	0	0	0	4	0	208
4:15 PM	2	74	9	0	85	14	1	17	4	32	13	73	1	3	87	0	0	0	4	0	204
4:30 PM	1	92	9	0	102	19	1	15	3	35	16	76	0	1	92	0	0	1	1	1	230
4:45 PM	2	91	17	2	110	18	0	19	1	37	15	67	0	3	82	0	0	1	1	1	230
Hourly Total	8	334	47	2	389	75	4	62	17	141	54	285	1	10	340	0	0	2	10	2	872
5:00 PM	0	90	17	1	107	19	0	21	4	40	14	55	0	0	69	2	0	0	0	2	218

5:15 PM	1	85	11	0	97	15	0	19	6	34	17	68	0	0	85	0	0	0	1	0	216
5:30 PM	0	82	13	0	95	10	0	19	0	29	12	42	0	1	54	0	0	0	4	0	178
5:45 PM	0	63	8	1	71	13	0	8	13	21	7	39	0	4	46	0	0	1	5	1	139
Hourly Total	1	320	49	2	370	57	0	67	23	124	50	204	0	5	254	2	0	1	10	3	751
6:00 PM	2	52	6	0	60	9	1	14	4	24	7	36	0	2	43	0	0	0	1	0	127
6:15 PM	2	57	9	0	68	10	0	12	2	22	6	29	0	1	35	0	0	0	1	0	125
6:30 PM	1	32	7	0	40	6	0	12	2	18	12	37	0	2	49	0	0	0	0	0	107
6:45 PM	0	42	9	0	51	8	0	12	0	20	6	28	0	0	34	0	0	0	0	0	105
Hourly Total	5	183	31	0	219	33	1	50	8	84	31	130	0	5	161	0	0	0	1	0	464
7:00 PM	1	30	6	0	37	3	1	7	3	11	5	50	0	1	55	0	0	0	1	0	103
7:15 PM	1	37	16	0	54	9	0	6	4	15	5	43	0	0	48	0	0	0	0	0	117
7:30 PM	0	23	9	0	32	6	0	6	3	12	1	18	0	0	19	0	0	0	3	0	63
7:45 PM	0	28	2	0	30	6	0	8	5	14	4	28	1	0	33	0	0	0	0	0	77
Hourly Total	2	118	33	0	153	24	1	27	15	52	15	139	1	1	155	0	0	0	4	0	360
8:00 PM	0	25	4	0	29	7	0	3	6	10	5	14	0	0	19	0	0	0	0	0	58
8:15 PM	0	29	6	0	35	3	0	7	0	10	3	38	0	0	41	0	0	0	0	0	86
8:30 PM	0	29	5	0	34	2	0	4	1	6	3	23	0	1	26	0	0	0	3	0	66
8:45 PM	1	25	4	0	30	5	0	6	6	11	5	12	0	2	17	0	0	0	2	0	58
Hourly Total	1	108	19	0	128	17	0	20	13	37	16	87	0	3	103	0	0	0	5	0	268
9:00 PM	0	14	3	0	17	6	0	5	5	11	0	10	0	0	10	0	0	0	0	0	38
9:15 PM	0	17	3	0	20	5	0	3	5	8	2	14	0	0	16	0	0	0	0	0	44
9:30 PM	1	23	3	0	27	4	1	7	1	12	3	8	0	0	11	0	0	0	0	0	50
9:45 PM	0	7	2	0	9	4	0	0	3	4	0	9	0	0	9	0	0	0	1	0	22
Hourly Total	1	61	11	0	73	19	1	15	14	35	5	41	0	0	46	0	0	0	1	0	154
10:00 PM	0	12	2	0	14	3	0	1	0	4	0	5	0	0	5	0	0	0	0	0	23
10:15 PM	0	15	2	0	17	4	0	3	4	7	1	5	0	0	6	0	0	0	0	0	30
10:30 PM	0	10	0	0	10	3	0	1	4	4	3	6	0	3	9	0	0	0	3	0	23
10:45 PM	0	6	3	0	9	3	0	2	1	5	0	5	0	0	5	0	0	0	0	0	19
Hourly Total	0	43	7	0	50	13	0	7	9	20	4	21	0	3	25	0	0	0	3	0	95
11:00 PM	0	7	1	0	8	3	0	2	2	5	0	6	0	0	6	0	0	0	0	0	19
11:15 PM	0	7	4	0	11	4	0	1	1	5	0	1	0	0	1	0	0	0	0	0	17
11:30 PM	0	2	3	0	5	3	0	1	1	4	1	5	0	0	6	0	0	0	0	0	15
11:45 PM	0	6	5	0	11	1	0	1	0	2	0	3	0	0	3	0	0	0	0	0	16
Hourly Total	0	22	13	0	35	11	0	5	4	16	1	15	0	0	16	0	0	0	0	0	67
Grand Total	68	3060	643	21	3771	780	12	672	274	1464	630	3159	11	136	3800	8	2	14	179	24	9059
Approach %	1.8	81.1	17.1	-	-	53.3	0.8	45.9	-	-	16.6	83.1	0.3	-	-	33.3	8.3	58.3	-	-	-
Total %	0.8	33.8	7.1	-	41.6	8.6	0.1	7.4	-	16.2	7.0	34.9	0.1	-	41.9	0.1	0.0	0.2	-	0.3	-
Motorcycles	0	2	0	-	2	0	0	0	-	0	0	2	0	-	2	0	0	0	-	0	4
% Motorcycles	0.0	0.1	0.0	-	0.1	0.0	0.0	0.0	-	0.0	0.0	0.1	0.0	-	0.1	0.0	0.0	0.0	-	0.0	0.0
Cars	39	1947	422	-	2408	503	7	439	-	949	382	2039	4	-	2425	2	2	12	-	16	5798
% Cars	57.4	63.6	65.6	-	63.9	64.5	58.3	65.3	-	64.8	60.6	64.5	36.4	-	63.8	25.0	100.0	85.7	-	66.7	64.0
Light Goods Vehicles	23	986	185	-	1194	240	4	207	-	451	217	1005	7	-	1229	5	0	2	-	7	2881
% Light Goods Vehicles	33.8	32.2	28.8	-	31.7	30.8	33.3	30.8	-	30.8	34.4	31.8	63.6	-	32.3	62.5	0.0	14.3	-	29.2	31.8
Buses	1	38	19	-	58	15	0	17	-	32	18	35	0	-	53	0	0	0	-	0	143
% Buses	1.5	1.2	3.0	-	1.5	1.9	0.0	2.5	-	2.2	2.9	1.1	0.0	-	1.4	0.0	0.0	0.0	-	0.0	1.6
Single-Unit Trucks	3	73	15	-	91	18	1	8	-	27	13	61	0	-	74	0	0	0	-	0	192
% Single-Unit Trucks	4.4	2.4	2.3	-	2.4	2.3	8.3	1.2	-	1.8	2.1	1.9	0.0	-	1.9	0.0	0.0	0.0	-	0.0	2.1
Articulated Trucks	1	4	2	-	7	3	0	0	-	3	0	7	0	-	7	0	0	0	-	0	17
% Articulated Trucks	1.5	0.1	0.3	-	0.2	0.4	0.0	0.0	-	0.2	0.0	0.2	0.0	-	0.2	0.0	0.0	0.0	-	0.0	0.2
Bicycles on Road	1	10	0	-	11	1	0	1	-	2	0	10	0	-	10	1	0	0	-	1	24
% Bicycles on Road	1.5	0.3	0.0	-	0.3	0.1	0.0	0.1	-	0.1	0.0	0.3	0.0	-	0.3	12.5	0.0	0.0	-	4.2	0.3

Bicycles on Crosswalk	-	-	-	2	-	-	-	-	5	-	-	-	-	0	-	-	-	-	4	-	-
% Bicycles on Crosswalk	-	-	-	9.5	-	-	-	-	1.8	-	-	-	-	0.0	-	-	-	-	2.2	-	-
Pedestrians	-	-	-	19	-	-	-	-	269	-	-	-	-	136	-	-	-	-	175	-	-
% Pedestrians	-	-	-	90.5	-	-	-	-	98.2	-	-	-	-	100.0	-	-	-	-	97.8	-	-

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
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Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Deermount Street
Site Code:
Start Date: 10/21/2015
Page No: 5

10/21/2015 12:00 AM
Ending At
10/22/2015 12:00 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

South Tongass [SB]

Out	In	Total
2	2	4
2554	2408	4962
1247	1194	2441
50	58	108
100	109	209
3953	**3771**	**7724**

R	T	L	P
0	2	0	0
39	1947	422	0
23	986	185	0
1	38	19	0
5	87	17	21
68	**3060**	**643**	**21**

Driveway [EB]

Out	In	Total
0	0	0
50	16	66
34	7	41
1	0	1
6	1	7
91	**24**	**115**

L	T	R	P
0	0	0	0
12	2	2	0
2	0	5	0
0	0	0	0
0	0	1	179
14	**2**	**8**	**179**

Deermount Street [WB]

Out	In	Total
0	0	0
806	949	1755
402	451	853
37	32	69
30	32	62
1275	**1464**	**2739**

R	T	L	P
0	0	0	0
503	7	439	0
240	4	207	0
15	0	17	0
22	1	9	274
780	**12**	**672**	**274**

South Tongass [NB]

L	T	R	P
0	2	0	0
4	2039	382	0
7	1005	217	0
0	35	18	0
0	78	13	136
11	**3159**	**630**	**136**

Out	In	Total
2	2	4
2388	2425	4813
1198	1229	2427
55	53	108
97	91	188
3740	**3800**	**7540**

Alaska Department of Transportation & Public Facilities -- Southeast Region

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Count Name: South Tongass & Deermount Street
Site Code:
Start Date: 10/21/2015
Page No: 7

Turning Movement Peak Hour Data (7:15 AM)

Start Time	South Tongass Southbound					Deermount Street Westbound					South Tongass Northbound					Driveway Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
7:15 AM	0	29	9	0	38	7	0	8	1	15	22	61	0	1	83	0	0	0	3	0	136
7:30 AM	0	39	6	0	45	14	0	24	0	38	27	86	0	2	113	0	0	0	1	0	196
7:45 AM	2	49	10	0	61	9	0	17	5	26	20	100	0	1	120	1	0	0	2	1	208
8:00 AM	0	34	10	0	44	10	0	14	2	24	8	50	0	0	58	0	0	0	0	0	126
Total	2	151	35	0	188	40	0	63	8	103	77	297	0	4	374	1	0	0	6	1	666
Approach %	1.1	80.3	18.6	-	-	38.8	0.0	61.2	-	-	20.6	79.4	0.0	-	-	100.0	0.0	0.0	-	-	-
Total %	0.3	22.7	5.3	-	28.2	6.0	0.0	9.5	-	15.5	11.6	44.6	0.0	-	56.2	0.2	0.0	0.0	-	0.2	-
PHF	0.250	0.770	0.875	-	0.770	0.714	0.000	0.656	-	0.678	0.713	0.743	0.000	-	0.779	0.250	0.000	0.000	-	0.250	0.800
Motorcycles	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0	-	-	-	0.0	0.0
Cars	1	88	26	-	115	25	0	42	-	67	50	191	0	-	241	1	0	0	-	1	424
% Cars	50.0	58.3	74.3	-	61.2	62.5	-	66.7	-	65.0	64.9	64.3	-	-	64.4	100.0	-	-	-	100.0	63.7
Light Goods Vehicles	1	55	8	-	64	14	0	18	-	32	21	99	0	-	120	0	0	0	-	0	216
% Light Goods Vehicles	50.0	36.4	22.9	-	34.0	35.0	-	28.6	-	31.1	27.3	33.3	-	-	32.1	0.0	-	-	-	0.0	32.4
Buses	0	4	1	-	5	1	0	3	-	4	6	4	0	-	10	0	0	0	-	0	19
% Buses	0.0	2.6	2.9	-	2.7	2.5	-	4.8	-	3.9	7.8	1.3	-	-	2.7	0.0	-	-	-	0.0	2.9
Single-Unit Trucks	0	4	0	-	4	0	0	0	-	0	0	2	0	-	2	0	0	0	-	0	6
% Single-Unit Trucks	0.0	2.6	0.0	-	2.1	0.0	-	0.0	-	0.0	0.0	0.7	-	-	0.5	0.0	-	-	-	0.0	0.9
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0	-	-	-	0.0	0.0
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	1	0	-	1	0	0	0	-	0	1
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.3	-	-	0.3	0.0	-	-	-	0.0	0.2
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	16.7	-	-
Pedestrians	-	-	-	0	-	-	-	-	8	-	-	-	-	4	-	-	-	-	5	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	83.3	-	-

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

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Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Deermount Street
Site Code:
Start Date: 10/21/2015
Page No: 8

Peak Hour Data

10/21/2015 7:15 AM
Ending At
10/21/2015 8:15 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

South Tongass [SB]

Out	In	Total
0	0	0
216	115	331
113	64	177
5	5	10
3	4	7
337	**188**	**525**

R	T	L	P
0	0	0	0
1	88	26	0
1	55	8	0
0	4	1	0
0	4	0	0
2	**151**	**35**	**0**

Driveway [EB]

Out	In	Total
0	0	0
1	1	2
1	0	1
0	0	0
0	0	0
2	**1**	**3**

L	T	R	P
0	0	0	0
0	0	1	0
0	0	0	0
0	0	0	0
0	0	0	6
0	**0**	**1**	**6**

Deermount Street [WB]

Out	In	Total
0	0	0
76	67	143
29	32	61
7	4	11
0	0	0
112	**103**	**215**

R	T	L	P
0	0	0	0
25	0	42	0
14	0	18	0
1	0	3	0
0	0	0	8
40	**0**	**63**	**8**

L	T	R	P
0	0	0	0
0	191	50	0
0	99	21	0
0	4	6	0
0	3	0	4
0	**297**	**77**	**4**

Out	In	Total
0	0	0
131	241	372
73	120	193
7	10	17
4	3	7
215	**374**	**589**

South Tongass [NB]

Alaska Department of Transportation & Public Facilities -- Southeast Region
6860 Glacier Highway

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Count Name: South Tongass & Deermount Street
Site Code:
Start Date: 10/21/2015
Page No: 10

Turning Movement Peak Hour Data (4:30 PM)

Start Time	South Tongass Southbound					Deermount Street Westbound					South Tongass Northbound					Driveway Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
4:30 PM	1	92	9	0	102	19	1	15	3	35	16	76	0	1	92	0	0	1	1	1	230
4:45 PM	2	91	17	2	110	18	0	19	1	37	15	67	0	3	82	0	0	1	1	1	230
5:00 PM	0	90	17	1	107	19	0	21	4	40	14	55	0	0	69	2	0	0	0	2	218
5:15 PM	1	85	11	0	97	15	0	19	6	34	17	68	0	0	85	0	0	0	1	0	216
Total	4	358	54	3	416	71	1	74	14	146	62	266	0	4	328	2	0	2	3	4	894
Approach %	1.0	86.1	13.0	-	-	48.6	0.7	50.7	-	-	18.9	81.1	0.0	-	-	50.0	0.0	50.0	-	-	-
Total %	0.4	40.0	6.0	-	46.5	7.9	0.1	8.3	-	16.3	6.9	29.8	0.0	-	36.7	0.2	0.0	0.2	-	0.4	-
PHF	0.500	0.973	0.794	-	0.945	0.934	0.250	0.881	-	0.913	0.912	0.875	0.000	-	0.891	0.250	0.000	0.500	-	0.500	0.972
Motorcycles	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	1
% Motorcycles	0.0	0.3	0.0	-	0.2	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	-	0.0	0.1
Cars	2	225	34	-	261	50	1	48	-	99	42	182	0	-	224	0	0	2	-	2	586
% Cars	50.0	62.8	63.0	-	62.7	70.4	100.0	64.9	-	67.8	67.7	68.4	-	-	68.3	0.0	-	100.0	-	50.0	65.5
Light Goods Vehicles	2	125	19	-	146	21	0	25	-	46	20	81	0	-	101	2	0	0	-	2	295
% Light Goods Vehicles	50.0	34.9	35.2	-	35.1	29.6	0.0	33.8	-	31.5	32.3	30.5	-	-	30.8	100.0	-	0.0	-	50.0	33.0
Buses	0	1	1	-	2	0	0	1	-	1	0	1	0	-	1	0	0	0	-	0	4
% Buses	0.0	0.3	1.9	-	0.5	0.0	0.0	1.4	-	0.7	0.0	0.4	-	-	0.3	0.0	-	0.0	-	0.0	0.4
Single-Unit Trucks	0	5	0	-	5	0	0	0	-	0	0	2	0	-	2	0	0	0	-	0	7
% Single-Unit Trucks	0.0	1.4	0.0	-	1.2	0.0	0.0	0.0	-	0.0	0.0	0.8	-	-	0.6	0.0	-	0.0	-	0.0	0.8
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	-	0.0	0.0
Bicycles on Road	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	1
% Bicycles on Road	0.0	0.3	0.0	-	0.2	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0	-	0.0	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	1	-	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	33.3	-	-	-	-	7.1	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	2	-	-	-	-	13	-	-	-	-	4	-	-	-	-	3	-	-
% Pedestrians	-	-	-	66.7	-	-	-	-	92.9	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov
Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Deermount Street
Site Code:
Start Date: 10/21/2015
Page No: 11

Peak Hour Data

10/21/2015 4:30 PM
Ending At
10/21/2015 5:30 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

South Tongass [SB]

Out	In	Total
0	1	1
234	261	495
102	146	248
1	2	3
2	6	8
339	**416**	**755**

R	T	L	P
0	1	0	0
2	225	34	0
2	125	19	0
0	1	1	0
0	6	0	3
4	**358**	**54**	**3**

Driveway [EB]

Out	In	Total
0	0	0
3	2	5
2	2	4
0	0	0
0	0	0
5	**4**	**9**

L	T	R	P
0	0	0	0
2	0	0	0
0	0	2	0
0	0	0	0
0	0	0	3
2	**0**	**2**	**3**

Deermount Street [WB]

Out	In	Total
0	0	0
76	99	175
39	46	85
1	1	2
0	0	0
116	**146**	**262**

R	T	L	P
0	0	0	0
50	1	48	0
21	0	25	0
0	0	1	0
0	0	0	14
71	**1**	**74**	**14**

L	T	R	P
0	0	0	0
0	182	42	0
0	81	20	0
0	1	0	0
0	2	0	4
0	**266**	**62**	**4**

Out	In	Total
1	0	1
273	224	497
152	101	253
2	1	3
6	2	8
434	**328**	**762**

South Tongass [NB]

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov
Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Forest Park Drive
Site Code:
Start Date: 10/21/2015

Turning Movement Data

Start Time	South Tongass Southbound					Forest Park Drive Westbound					South Tongass Northbound					Bikes/Peds on Shoulder Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
12:00 AM	0	4	0	0	4	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	5
12:15 AM	0	4	1	0	5	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	8
12:30 AM	0	2	1	0	3	0	0	1	0	1	0	3	0	0	3	0	0	0	0	0	7
12:45 AM	0	1	1	0	2	1	0	0	0	1	1	1	0	0	2	0	0	0	0	0	5
Hourly Total	0	11	3	0	14	2	0	1	0	3	2	6	0	0	8	0	0	0	0	0	25
1:00 AM	0	2	1	0	3	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	5
1:15 AM	0	1	0	0	1	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	3
1:30 AM	0	2	0	0	2	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	4
1:45 AM	0	2	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Hourly Total	0	7	1	0	8	2	0	1	2	3	0	3	0	0	3	0	0	0	0	0	14
2:00 AM	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
2:15 AM	0	3	1	0	4	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	6
2:30 AM	0	1	0	0	1	0	0	0	0	0	1	3	0	0	4	0	0	0	0	0	5
2:45 AM	0	1	0	0	1	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	4
Hourly Total	0	7	1	0	8	1	0	1	0	2	1	6	0	0	7	0	0	0	0	0	17
3:00 AM	0	0	1	0	1	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	4
3:15 AM	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
3:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
3:45 AM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	1
Hourly Total	0	2	2	0	4	1	0	1	0	2	0	3	0	0	3	0	0	0	1	0	9
4:00 AM	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
4:15 AM	0	1	1	0	2	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	4
4:30 AM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
4:45 AM	0	1	0	0	1	3	0	0	0	3	0	5	0	0	5	0	0	0	0	0	9
Hourly Total	0	2	1	1	3	3	0	0	0	3	0	10	0	0	10	0	0	0	0	0	16
5:00 AM	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
5:15 AM	0	1	0	0	1	1	0	0	0	1	0	4	0	0	4	0	0	0	0	0	6
5:30 AM	0	5	1	0	6	5	0	0	0	5	0	6	0	0	6	0	0	0	0	0	17
5:45 AM	0	3	1	0	4	7	0	0	0	7	0	20	0	0	20	0	0	0	0	0	31
Hourly Total	0	10	2	0	12	13	0	0	0	13	0	32	0	0	32	0	0	0	0	0	57
6:00 AM	0	7	2	0	9	3	0	0	0	3	0	11	0	0	11	0	0	0	0	0	23
6:15 AM	0	4	2	0	6	8	0	0	0	8	0	30	0	0	30	0	0	0	0	0	44
6:30 AM	0	5	0	0	5	9	0	0	0	9	0	58	0	0	58	0	0	0	2	0	72
6:45 AM	0	11	3	0	14	8	0	0	0	8	0	40	0	0	40	0	0	0	2	0	62

Hourly Total	0	27	7	0	34	28	0	0	0	28	0	139	0	0	139	0	0	0	4	0	201
7:00 AM	0	14	2	0	16	12	0	0	0	12	1	41	0	0	42	0	0	0	0	0	70
7:15 AM	0	15	3	0	18	22	0	2	0	24	0	79	0	0	79	0	0	0	0	0	121
7:30 AM	0	30	5	0	35	26	0	2	0	28	0	90	0	0	90	0	0	0	2	0	153
7:45 AM	0	30	6	0	36	20	0	1	0	21	3	74	0	0	77	0	0	0	0	0	134
Hourly Total	0	89	16	0	105	80	0	5	0	85	4	284	0	0	288	0	0	0	2	0	478
8:00 AM	0	30	4	1	34	13	0	2	0	15	0	39	0	0	39	0	0	0	0	0	88
8:15 AM	0	26	5	0	31	10	0	3	0	13	4	36	0	0	40	0	0	0	0	0	84
8:30 AM	0	37	4	2	41	9	0	2	0	11	2	27	0	0	29	0	0	0	0	0	81
8:45 AM	0	34	7	0	41	9	0	5	0	14	3	43	0	0	46	0	0	0	0	0	101
Hourly Total	0	127	20	3	147	41	0	12	0	53	9	145	0	0	154	0	0	0	0	0	354
9:00 AM	0	24	4	0	28	8	0	3	0	11	2	36	0	0	38	0	0	0	1	0	77
9:15 AM	0	21	8	0	29	7	0	2	0	9	2	31	0	0	33	0	0	0	1	0	71
9:30 AM	0	30	5	1	35	11	0	2	0	13	0	27	0	0	27	0	0	1	0	1	76
9:45 AM	0	24	4	0	28	7	0	2	0	9	2	40	0	0	42	0	0	0	1	0	79
Hourly Total	0	99	21	1	120	33	0	9	0	42	6	134	0	0	140	0	0	1	3	1	303
10:00 AM	0	21	5	0	26	13	0	1	0	14	6	38	0	0	44	0	0	0	0	0	84
10:15 AM	0	20	5	0	25	7	0	0	0	7	1	30	0	0	31	0	0	0	0	0	63
10:30 AM	0	25	4	1	29	6	0	3	0	9	3	27	0	0	30	0	0	0	0	0	68
10:45 AM	0	29	6	0	35	9	0	2	0	11	1	26	0	0	27	0	0	0	0	0	73
Hourly Total	0	95	20	1	115	35	0	6	0	41	11	121	0	0	132	0	0	0	0	0	288
11:00 AM	0	29	7	0	36	7	0	2	0	9	1	29	0	0	30	0	0	0	1	0	75
11:15 AM	0	35	9	0	44	8	0	0	0	8	1	29	0	1	30	0	0	0	0	0	82
11:30 AM	0	26	6	1	32	6	0	1	0	7	1	34	0	0	35	0	0	0	0	0	74
11:45 AM	0	34	12	0	46	8	0	1	0	9	2	48	0	0	50	0	0	0	1	0	105
Hourly Total	0	124	34	1	158	29	0	4	0	33	5	140	0	1	145	0	0	0	2	0	336
12:00 PM	0	34	5	1	39	8	0	1	0	9	0	30	0	0	30	0	0	0	1	0	78
12:15 PM	0	36	6	0	42	9	0	0	0	9	3	35	0	0	38	0	0	0	0	0	89
12:30 PM	0	27	5	0	32	9	0	1	0	10	3	40	0	0	43	0	0	0	1	0	85
12:45 PM	0	37	14	0	51	10	0	4	0	14	4	30	0	0	34	0	0	0	0	0	99
Hourly Total	0	134	30	1	164	36	0	6	0	42	10	135	0	0	145	0	0	0	2	0	351
1:00 PM	0	39	15	1	54	11	0	0	0	11	1	29	0	0	30	0	0	0	0	0	95
1:15 PM	0	32	10	0	42	7	0	2	0	9	2	32	0	0	34	0	0	0	0	0	85
1:30 PM	1	29	8	0	38	5	0	4	0	9	0	39	0	1	39	0	0	0	0	0	86
1:45 PM	0	37	5	0	42	10	0	1	0	11	1	25	0	1	26	0	0	1	0	1	80
Hourly Total	1	137	38	1	176	33	0	7	0	40	4	125	0	2	129	0	0	1	0	1	346
2:00 PM	0	29	4	0	33	8	0	2	0	10	1	31	0	0	32	0	0	0	0	0	75
2:15 PM	0	34	4	0	38	9	0	1	0	10	0	28	0	0	28	0	0	0	0	0	76
2:30 PM	0	29	8	0	37	3	0	0	0	3	1	39	0	0	40	0	0	0	0	0	80
2:45 PM	0	52	6	4	58	10	0	2	1	12	3	31	0	1	34	0	0	0	1	0	104
Hourly Total	0	144	22	4	166	30	0	5	1	35	5	129	0	1	134	0	0	0	1	0	335
3:00 PM	0	54	7	10	61	9	0	1	0	10	3	38	0	0	41	0	0	0	0	0	112
3:15 PM	0	60	6	0	66	6	0	4	0	10	0	45	0	0	45	0	0	0	0	0	121
3:30 PM	0	35	7	0	42	6	0	2	0	8	7	61	0	1	68	0	0	0	1	0	118
3:45 PM	0	54	22	0	76	9	0	2	0	11	2	38	0	0	40	0	0	0	0	0	127
Hourly Total	0	203	42	10	245	30	0	9	0	39	12	182	0	1	194	0	0	0	1	0	478
4:00 PM	1	56	18	3	75	12	0	0	0	12	7	28	0	0	35	0	0	0	0	0	122
4:15 PM	0	55	21	0	76	8	0	2	0	10	0	41	0	0	41	0	0	0	0	0	127
4:30 PM	0	60	21	0	81	13	0	3	0	16	6	51	0	0	57	0	0	0	2	0	154
4:45 PM	0	74	15	0	89	14	0	4	0	18	2	36	0	0	38	0	0	0	0	0	145
Hourly Total	1	245	75	3	321	47	0	9	0	56	15	156	0	0	171	0	0	0	2	0	548
5:00 PM	0	75	24	0	99	7	0	1	0	8	1	39	0	0	40	0	0	0	0	0	147

5:15 PM	0	91	10	0	101	9	0	2	0	11	1	39	0	0	40	0	0	0	0	0	152
5:30 PM	0	67	17	0	84	7	0	1	0	8	2	28	0	0	30	0	0	0	0	0	122
5:45 PM	0	60	9	0	69	11	0	1	0	12	0	26	0	0	26	0	0	0	2	0	107
Hourly Total	0	293	60	0	353	34	0	5	0	39	4	132	0	0	136	0	0	0	2	0	528
6:00 PM	0	43	16	0	59	8	0	0	0	8	1	24	0	0	25	0	0	0	2	0	92
6:15 PM	0	57	13	0	70	7	0	3	0	10	1	22	0	0	23	0	0	0	0	0	103
6:30 PM	0	40	4	0	44	13	0	0	0	13	3	31	0	0	34	0	0	0	0	0	91
6:45 PM	0	33	12	0	45	6	0	3	0	9	10	26	0	0	36	0	0	0	0	0	90
Hourly Total	0	173	45	0	218	34	0	6	0	40	15	103	0	0	118	0	0	0	2	0	376
7:00 PM	0	32	5	0	37	5	0	5	0	10	4	46	0	0	50	0	0	0	0	0	97
7:15 PM	0	29	7	0	36	5	0	0	0	5	1	26	0	0	27	0	0	0	0	0	68
7:30 PM	1	23	5	0	29	5	0	0	0	5	4	7	0	0	11	0	0	0	0	0	45
7:45 PM	0	18	4	0	22	7	0	2	0	9	2	9	0	0	11	0	0	0	0	0	42
Hourly Total	1	102	21	0	124	22	0	7	0	29	11	88	0	0	99	0	0	0	0	0	252
8:00 PM	0	19	9	0	28	7	0	1	0	8	2	9	0	0	11	0	0	0	0	0	47
8:15 PM	0	30	13	0	43	4	0	1	0	5	0	32	0	0	32	0	0	0	0	0	80
8:30 PM	0	21	6	0	27	1	0	1	0	2	0	17	0	0	17	0	0	0	0	0	46
8:45 PM	0	27	4	0	31	2	0	0	0	2	0	10	0	0	10	0	0	0	0	0	43
Hourly Total	0	97	32	0	129	14	0	3	0	17	2	68	0	0	70	0	0	0	0	0	216
9:00 PM	0	15	9	0	24	2	0	1	0	3	2	6	0	0	8	0	0	0	0	0	35
9:15 PM	0	13	5	0	18	2	0	0	0	2	0	10	0	0	10	0	0	0	0	0	30
9:30 PM	0	20	4	0	24	2	0	0	0	2	1	7	0	0	8	0	0	0	0	0	34
9:45 PM	0	6	2	0	8	1	0	0	0	1	0	4	0	0	4	0	0	0	0	0	13
Hourly Total	0	54	20	0	74	7	0	1	0	8	3	27	0	0	30	0	0	0	0	0	112
10:00 PM	0	4	3	0	7	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	10
10:15 PM	0	12	4	0	16	1	0	1	0	2	0	1	0	0	1	0	0	0	0	0	19
10:30 PM	0	5	7	0	12	4	0	0	0	4	1	4	0	0	5	0	0	0	0	0	21
10:45 PM	0	5	1	0	6	1	0	1	0	2	2	3	0	0	5	0	0	0	0	0	13
Hourly Total	0	26	15	0	41	7	0	2	0	9	3	10	0	0	13	0	0	0	0	0	63
11:00 PM	0	5	1	0	6	2	0	2	0	4	2	3	0	0	5	0	0	0	0	0	15
11:15 PM	0	7	0	0	7	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	9
11:30 PM	0	2	0	0	2	1	0	0	0	1	0	3	0	0	3	0	0	0	0	0	6
11:45 PM	0	4	2	0	6	1	0	1	0	2	2	2	0	0	4	0	0	0	0	0	12
Hourly Total	0	18	3	0	21	4	0	4	0	8	4	9	0	0	13	0	0	0	0	0	42
Grand Total	3	2226	531	26	2760	566	0	104	3	670	126	2187	0	5	2313	0	0	2	22	2	5745
Approach %	0.1	80.7	19.2	-	-	84.5	0.0	15.5	-	-	5.4	94.6	0.0	-	-	0.0	0.0	100.0	-	-	-
Total %	0.1	38.7	9.2	-	48.0	9.9	0.0	1.8	-	11.7	2.2	38.1	0.0	-	40.3	0.0	0.0	0.0	-	0.0	-
Motorcycles	0	2	0	-	2	0	0	0	-	0	0	2	0	-	2	0	0	0	-	0	4
% Motorcycles	0.0	0.1	0.0	-	0.1	0.0	-	0.0	-	0.0	0.0	0.1	-	-	0.1	-	-	0.0	-	0.0	0.1
Cars	3	1523	328	-	1854	337	0	64	-	401	74	1519	0	-	1593	0	0	2	-	2	3850
% Cars	100.0	68.4	61.8	-	67.2	59.5	-	61.5	-	59.9	58.7	69.5	-	-	68.9	-	-	100.0	-	100.0	67.0
Light Goods Vehicles	0	611	193	-	804	210	0	38	-	248	41	588	0	-	629	0	0	0	-	0	1681
% Light Goods Vehicles	0.0	27.4	36.3	-	29.1	37.1	-	36.5	-	37.0	32.5	26.9	-	-	27.2	-	-	0.0	-	0.0	29.3
Buses	0	51	4	-	55	7	0	2	-	9	5	48	0	-	53	0	0	0	-	0	117
% Buses	0.0	2.3	0.8	-	2.0	1.2	-	1.9	-	1.3	4.0	2.2	-	-	2.3	-	-	0.0	-	0.0	2.0
Single-Unit Trucks	0	30	5	-	35	11	0	0	-	11	6	27	0	-	33	0	0	0	-	0	79
% Single-Unit Trucks	0.0	1.3	0.9	-	1.3	1.9	-	0.0	-	1.6	4.8	1.2	-	-	1.4	-	-	0.0	-	0.0	1.4
Articulated Trucks	0	1	0	-	1	0	0	0	-	0	0	1	0	-	1	0	0	0	-	0	2
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	0.0	-	0.0	0.0
Bicycles on Road	0	8	1	-	9	1	0	0	-	1	0	2	0	-	2	0	0	0	-	0	12
% Bicycles on Road	0.0	0.4	0.2	-	0.3	0.2	-	0.0	-	0.1	0.0	0.1	-	-	0.1	-	-	0.0	-	0.0	0.2

Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	4	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	18.2	-	-
Pedestrians	-	-	-	26	-	-	-	-	3	-	-	-	-	5	-	-	-	-	18	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	81.8	-	-

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov

Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Forest Park Drive
Site Code:
Start Date: 10/21/2015
Page No: 5

South Tongass [SB]

Out	In	Total
2	2	4
1858	1854	3712
798	804	1602
55	55	110
42	45	87
2755	**2760**	**5515**

R	T	L	P
0	2	0	0
3	1523	328	0
0	611	193	0
0	51	4	0
0	39	6	26
3	**2226**	**531**	**26**

Bikes/Peds on Shoulder [E

Out	In	Total
0	0	0
3	2	5
0	0	0
0	0	0
0	0	0
3	**2**	**5**

L	T	R	P
0	0	0	0
2	0	0	0
0	0	0	0
0	0	0	0
0	0	0	22
2	**0**	**0**	**22**

10/21/2015 12:00 AM
Ending At
10/22/2015 12:00 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

R	T	L	P
0	0	0	0
337	0	64	0
210	0	38	0
7	0	2	0
12	0	0	3
566	**0**	**104**	**3**

Forest Park Drive [WB]

Out	In	Total
0	0	0
402	401	803
234	248	482
9	9	18
12	12	24
657	**670**	**1327**

L	T	R	P
0	2	0	0
0	1519	74	0
0	588	41	0
0	48	5	0
0	30	6	5
0	**2187**	**126**	**5**

Out	In	Total
2	2	4
1587	1593	3180
649	629	1278
53	53	106
39	36	75
2330	**2313**	**4643**

South Tongass [NB]

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov

Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Forest Park Drive
Site Code:
Start Date: 10/21/2015

Turning Movement Peak Hour Data (7:15 AM)

Start Time	South Tongass					Forest Park Drive					South Tongass					Bikes/Peds on Shoulder					
	Southbound					Westbound					Northbound					Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
7:15 AM	0	15	3	0	18	22	0	2	0	24	0	79	0	0	79	0	0	0	0	0	121
7:30 AM	0	30	5	0	35	26	0	2	0	28	0	90	0	0	90	0	0	0	2	0	153
7:45 AM	0	30	6	0	36	20	0	1	0	21	3	74	0	0	77	0	0	0	0	0	134
8:00 AM	0	30	4	1	34	13	0	2	0	15	0	39	0	0	39	0	0	0	0	0	88
Total	0	105	18	1	123	81	0	7	0	88	3	282	0	0	285	0	0	0	2	0	496
Approach %	0.0	85.4	14.6	-	-	92.0	0.0	8.0	-	-	1.1	98.9	0.0	-	-	NaN	NaN	NaN	-	-	-
Total %	0.0	21.2	3.6	-	24.8	16.3	0.0	1.4	-	17.7	0.6	56.9	0.0	-	57.5	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.875	0.750	-	0.854	0.779	0.000	0.875	-	0.786	0.250	0.783	0.000	-	0.792	0.000	0.000	0.000	-	0.000	0.810
Motorcycles	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Motorcycles	-	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	0.0
Cars	0	58	12	-	70	53	0	4	-	57	1	203	0	-	204	0	0	0	-	0	331
% Cars	-	55.2	66.7	-	56.9	65.4	-	57.1	-	64.8	33.3	72.0	-	-	71.6	-	-	-	-	-	66.7
Light Goods Vehicles	0	39	5	-	44	27	0	2	-	29	2	66	0	-	68	0	0	0	-	0	141
% Light Goods Vehicles	-	37.1	27.8	-	35.8	33.3	-	28.6	-	33.0	66.7	23.4	-	-	23.9	-	-	-	-	-	28.4
Buses	0	7	1	-	8	0	0	1	-	1	0	11	0	-	11	0	0	0	-	0	20
% Buses	-	6.7	5.6	-	6.5	0.0	-	14.3	-	1.1	0.0	3.9	-	-	3.9	-	-	-	-	-	4.0
Single-Unit Trucks	0	1	0	-	1	0	0	0	-	0	0	2	0	-	2	0	0	0	-	0	3
% Single-Unit Trucks	-	1.0	0.0	-	0.8	0.0	-	0.0	-	0.0	0.0	0.7	-	-	0.7	-	-	-	-	-	0.6
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	0.0
Bicycles on Road	0	0	0	-	0	1	0	0	-	1	0	0	0	-	0	0	0	0	-	0	1
% Bicycles on Road	-	0.0	0.0	-	0.0	1.2	-	0.0	-	1.1	0.0	0.0	-	-	0.0	-	-	-	-	-	0.2
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-	-	-	2	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov
Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Forest Park Drive
Site Code:
Start Date: 10/21/2015
Page No: 8

Peak Hour Data

10/21/2015 7:15 AM
Ending At
10/21/2015 8:15 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

South Tongass [SB]

Out	In	Total
0	0	0
256	70	326
93	44	137
11	8	19
3	1	4
363	**123**	**486**

R	T	L	P
0	0	0	0
0	58	12	0
0	39	5	0
0	7	1	0
0	1	0	1
0	**105**	**18**	**1**

Bikes/Peds on Shoulder [E

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T	R	P
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	2
0	**0**	**0**	**2**

Forest Park Drive [WB]

Out	In	Total
0	0	0
13	57	70
7	29	36
1	1	2
0	1	1
21	**88**	**109**

R	T	L	P
0	0	0	0
53	0	4	0
27	0	2	0
0	0	1	0
1	0	0	0
81	**0**	**7**	**0**

L	T	R	P
0	0	0	0
0	203	1	0
0	66	2	0
0	11	0	0
0	2	0	0
0	**282**	**3**	**0**

Out	In	Total
0	0	0
62	204	266
41	68	109
8	11	19
1	2	3
112	**285**	**397**

South Tongass [NB]

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov
Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Forest Park Drive
Site Code:
Start Date: 10/21/2015

Turning Movement Peak Hour Data (4:30 PM)

Start Time	South Tongass Southbound					Forest Park Drive Westbound					South Tongass Northbound					Bikes/Peds on Shoulder Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
4:30 PM	0	60	21	0	81	13	0	3	0	16	6	51	0	0	57	0	0	0	2	0	154
4:45 PM	0	74	15	0	89	14	0	4	0	18	2	36	0	0	38	0	0	0	0	0	145
5:00 PM	0	75	24	0	99	7	0	1	0	8	1	39	0	0	40	0	0	0	0	0	147
5:15 PM	0	91	10	0	101	9	0	2	0	11	1	39	0	0	40	0	0	0	0	0	152
Total	0	300	70	0	370	43	0	10	0	53	10	165	0	0	175	0	0	0	2	0	598
Approach %	0.0	81.1	18.9	-	-	81.1	0.0	18.9	-	-	5.7	94.3	0.0	-	-	NaN	NaN	NaN	-	-	-
Total %	0.0	50.2	11.7	-	61.9	7.2	0.0	1.7	-	8.9	1.7	27.6	0.0	-	29.3	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.824	0.729	-	0.916	0.768	0.000	0.625	-	0.736	0.417	0.809	0.000	-	0.768	0.000	0.000	0.000	-	0.000	0.971
Motorcycles	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	1
% Motorcycles	-	0.3	0.0	-	0.3	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	0.2
Cars	0	206	38	-	244	25	0	8	-	33	7	122	0	-	129	0	0	0	-	0	406
% Cars	-	68.7	54.3	-	65.9	58.1	-	80.0	-	62.3	70.0	73.9	-	-	73.7	-	-	-	-	-	67.9
Light Goods Vehicles	0	89	32	-	121	17	0	2	-	19	3	41	0	-	44	0	0	0	-	0	184
% Light Goods Vehicles	-	29.7	45.7	-	32.7	39.5	-	20.0	-	35.8	30.0	24.8	-	-	25.1	-	-	-	-	-	30.8
Buses	0	2	0	-	2	0	0	0	-	0	0	1	0	-	1	0	0	0	-	0	3
% Buses	-	0.7	0.0	-	0.5	0.0	-	0.0	-	0.0	0.0	0.6	-	-	0.6	-	-	-	-	-	0.5
Single-Unit Trucks	0	1	0	-	1	1	0	0	-	1	0	1	0	-	1	0	0	0	-	0	3
% Single-Unit Trucks	-	0.3	0.0	-	0.3	2.3	-	0.0	-	1.9	0.0	0.6	-	-	0.6	-	-	-	-	-	0.5
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	0.0
Bicycles on Road	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	1
% Bicycles on Road	-	0.3	0.0	-	0.3	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	0.2
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
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Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Forest Park Drive
Site Code:
Start Date: 10/21/2015
Page No: 11

Peak Hour Data

10/21/2015 4:30 PM
Ending At
10/21/2015 5:30 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

South Tongass [SB]

Out	In	Total
0	1	1
147	244	391
58	121	179
1	2	3
2	2	4
208	**370**	**578**

R	T	L	P
0	1	0	0
0	206	38	0
0	89	32	0
0	2	0	0
0	2	0	0
0	**300**	**70**	**0**

Bikes/Peds on Shoulder [E

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T	R	P
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	2
0	**0**	**0**	**2**

Forest Park Drive [WB]

Out	In	Total
0	0	0
45	33	78
35	19	54
0	0	0
0	1	1
80	**53**	**133**

R	T	L	P
0	0	0	0
25	0	8	0
17	0	2	0
0	0	0	0
1	0	0	0
43	**0**	**10**	**0**

L	T	R	P
0	0	0	0
0	122	7	0
0	41	3	0
0	1	0	0
0	1	0	0
0	**165**	**10**	**0**

Out	In	Total
1	0	1
214	129	343
91	44	135
2	1	3
2	1	3
310	**175**	**485**

South Tongass [NB]

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov

Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Totem Way
Site Code:
Start Date: 10/21/2015
Page No: 1

Turning Movement Data

	South Tongass Southbound					Totem Row Westbound					South Tongass Northbound					Bikes/Peds on Shoulder Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
12:00 AM	0	3	0	0	3	0	0	0	0	0	0	2	0	1	2	0	0	0	0	0	5
12:15 AM	0	5	0	0	5	0	0	0	0	0	1	1	0	1	2	0	0	0	0	0	7
12:30 AM	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
12:45 AM	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	4
Hourly Total	0	12	0	0	12	0	0	0	0	0	1	8	0	2	9	0	0	0	0	0	21
1:00 AM	0	2	1	0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	4
1:15 AM	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
1:30 AM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
1:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	5	1	0	6	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	9
2:00 AM	0	2	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
2:15 AM	0	5	0	0	5	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	7
2:30 AM	0	1	0	0	1	1	0	0	0	1	0	3	0	0	3	0	0	0	0	0	5
2:45 AM	0	0	1	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
Hourly Total	0	8	1	1	9	1	0	0	0	1	0	7	0	0	7	0	0	0	0	0	17
3:00 AM	0	1	0	0	1	2	0	1	0	3	0	0	0	0	0	0	0	0	0	0	4
3:15 AM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 AM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Hourly Total	0	1	2	0	3	2	0	1	0	3	0	0	0	0	0	0	0	0	0	0	6
4:00 AM	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	2
4:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
4:30 AM	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
4:45 AM	0	1	0	0	1	4	0	1	0	5	0	1	0	0	1	0	0	0	0	0	7
Hourly Total	0	2	0	0	2	4	0	2	0	6	0	5	0	0	5	0	0	0	0	0	13
5:00 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
5:15 AM	0	1	0	0	1	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	5
5:30 AM	0	5	0	0	5	1	0	0	0	1	1	7	0	0	8	0	0	0	0	0	14
5:45 AM	0	3	0	0	3	1	0	0	0	1	0	15	0	0	15	0	0	0	0	0	19
Hourly Total	0	10	0	0	10	2	0	0	0	2	1	27	0	0	28	0	0	0	0	0	40
6:00 AM	0	7	1	0	8	1	0	0	0	1	0	10	0	0	10	0	0	0	1	0	19
6:15 AM	0	3	0	0	3	2	0	0	0	2	0	27	0	0	27	0	0	0	0	0	32
6:30 AM	0	4	0	0	4	4	0	2	0	6	1	55	0	0	56	0	0	0	1	0	66
6:45 AM	0	10	2	0	12	3	0	0	0	3	0	34	0	0	34	0	0	0	1	0	49

Hourly Total	0	24	3	0	27	10	0	2	0	12	1	126	0	0	127	0	0	0	3	0	166
7:00 AM	0	11	1	0	12	2	0	1	0	3	0	34	0	0	34	0	0	0	0	0	49
7:15 AM	0	14	1	0	15	7	0	1	0	8	2	72	0	0	74	0	0	0	0	0	97
7:30 AM	0	28	3	0	31	9	0	1	0	10	1	73	0	0	74	0	0	0	0	0	115
7:45 AM	0	29	3	0	32	6	0	1	0	7	1	66	0	0	67	0	0	0	0	0	106
Hourly Total	0	82	8	0	90	24	0	4	0	28	4	245	0	0	249	0	0	0	0	0	367
8:00 AM	0	27	4	0	31	6	0	1	0	7	2	31	0	0	33	0	0	0	0	0	71
8:15 AM	0	22	3	0	25	7	0	2	0	9	1	30	0	0	31	0	0	0	1	0	65
8:30 AM	0	37	4	0	41	4	0	2	0	6	1	22	0	0	23	0	0	0	1	0	70
8:45 AM	0	34	3	0	37	1	0	1	0	2	2	43	0	0	45	0	0	0	1	0	84
Hourly Total	0	120	14	0	134	18	0	6	0	24	6	126	0	0	132	0	0	0	3	0	290
9:00 AM	0	25	4	1	29	5	0	1	0	6	0	36	0	0	36	0	0	0	0	0	71
9:15 AM	0	18	3	0	21	5	0	1	0	6	0	24	0	0	24	0	0	0	0	0	51
9:30 AM	0	29	3	0	32	3	0	1	0	4	0	26	0	0	26	0	0	0	0	0	62
9:45 AM	0	15	5	1	20	5	0	1	0	6	0	36	0	0	36	0	0	0	1	0	62
Hourly Total	0	87	15	2	102	18	0	4	0	22	0	122	0	0	122	0	0	0	1	0	246
10:00 AM	0	24	1	0	25	10	0	1	0	11	5	30	0	0	35	0	0	0	0	0	71
10:15 AM	0	17	3	0	20	6	0	1	0	7	0	23	0	0	23	0	0	0	0	0	50
10:30 AM	0	26	2	0	28	6	0	0	0	6	0	24	0	0	24	0	0	0	0	0	58
10:45 AM	0	28	2	0	30	1	0	0	0	1	0	26	0	0	26	0	0	0	1	0	57
Hourly Total	0	95	8	0	103	23	0	2	0	25	5	103	0	0	108	0	0	0	1	0	236
11:00 AM	0	25	4	0	29	5	0	0	0	5	1	25	0	0	26	0	0	0	0	0	60
11:15 AM	0	30	1	0	31	6	0	1	0	7	3	24	0	0	27	0	0	0	0	0	65
11:30 AM	0	22	6	0	28	6	0	0	0	6	1	29	0	0	30	0	0	0	0	0	64
11:45 AM	0	31	2	0	33	6	0	2	0	8	1	37	0	0	38	0	0	0	0	0	79
Hourly Total	0	108	13	0	121	23	0	3	0	26	6	115	0	0	121	0	0	0	0	0	268
12:00 PM	0	29	7	0	36	6	0	1	0	7	1	28	0	2	29	0	0	0	0	0	72
12:15 PM	0	34	4	1	38	6	0	0	0	6	0	32	0	0	32	0	0	0	0	0	76
12:30 PM	0	23	4	0	27	7	0	0	0	7	1	37	0	0	38	0	0	0	0	0	72
12:45 PM	0	32	6	0	38	8	0	2	0	10	0	22	0	0	22	0	0	0	0	0	70
Hourly Total	0	118	21	1	139	27	0	3	0	30	2	119	0	2	121	0	0	0	0	0	290
1:00 PM	0	31	7	0	38	3	0	1	0	4	0	24	0	0	24	0	0	0	1	0	66
1:15 PM	0	30	3	0	33	7	0	0	0	7	0	29	0	0	29	0	0	0	1	0	69
1:30 PM	0	27	6	0	33	6	0	2	1	8	0	27	0	0	27	0	0	0	1	0	68
1:45 PM	0	31	3	0	34	4	0	0	0	4	1	22	0	0	23	0	0	0	0	0	61
Hourly Total	0	119	19	0	138	20	0	3	1	23	1	102	0	0	103	0	0	0	3	0	264
2:00 PM	0	24	7	0	31	4	0	1	0	5	0	28	0	1	28	0	0	0	1	0	64
2:15 PM	0	25	7	0	32	3	0	2	0	5	0	30	0	0	30	0	0	0	0	0	67
2:30 PM	0	22	5	0	27	8	0	1	0	9	0	25	0	0	25	0	0	0	1	0	61
2:45 PM	0	39	10	0	49	10	0	1	0	11	0	26	0	0	26	0	0	0	0	0	86
Hourly Total	0	110	29	0	139	25	0	5	0	30	0	109	0	1	109	0	0	0	2	0	278
3:00 PM	0	41	11	0	52	6	0	5	0	11	1	29	0	0	30	0	0	0	0	0	93
3:15 PM	0	61	6	0	67	9	0	2	0	11	2	31	0	0	33	0	0	0	2	0	111
3:30 PM	0	24	7	0	31	8	0	2	0	10	1	61	0	0	62	0	0	0	0	0	103
3:45 PM	0	41	12	0	53	13	0	1	0	14	2	27	0	3	29	0	0	0	1	0	96
Hourly Total	0	167	36	0	203	36	0	10	0	46	6	148	0	3	154	0	0	0	3	0	403
4:00 PM	0	51	5	0	56	3	0	1	0	4	2	30	0	5	32	0	0	0	0	0	92
4:15 PM	0	42	9	0	51	7	0	2	0	9	1	35	0	0	36	0	0	0	0	0	96
4:30 PM	0	56	4	0	60	10	0	0	0	10	2	49	0	0	51	0	0	0	0	0	121
4:45 PM	0	68	7	0	75	2	0	0	0	2	0	31	0	0	31	0	0	0	0	0	108
Hourly Total	0	217	25	0	242	22	0	3	0	25	5	145	0	5	150	0	0	0	0	0	417
5:00 PM	0	58	13	0	71	3	0	2	0	5	1	42	0	1	43	0	0	0	1	0	119

5:15 PM	0	76	10	0	86	6	0	3	0	9	1	32	0	0	33	0	0	0	0	0	128
5:30 PM	0	62	7	0	69	2	0	0	0	2	1	27	0	0	28	0	0	0	0	0	99
5:45 PM	0	52	6	0	58	5	0	0	0	5	0	19	0	1	19	0	0	0	0	0	82
Hourly Total	0	248	36	0	284	16	0	5	0	21	3	120	0	2	123	0	0	0	1	0	428
6:00 PM	0	35	8	0	43	6	0	0	0	6	0	24	0	0	24	0	0	0	1	0	73
6:15 PM	0	54	4	0	58	3	0	1	0	4	0	15	0	0	15	0	0	0	1	0	77
6:30 PM	0	35	3	0	38	5	0	2	0	7	0	24	0	0	24	0	0	0	0	0	69
6:45 PM	0	34	3	0	37	6	0	0	0	6	1	31	0	1	32	0	0	0	0	0	75
Hourly Total	0	158	18	0	176	20	0	3	0	23	1	94	0	1	95	0	0	0	2	0	294
7:00 PM	0	30	4	1	34	5	0	2	1	7	0	43	0	0	43	0	0	0	1	0	84
7:15 PM	0	23	8	0	31	5	0	0	0	5	2	23	0	0	25	0	0	0	0	0	61
7:30 PM	0	22	2	0	24	1	0	0	0	1	0	10	0	0	10	0	0	0	0	0	35
7:45 PM	0	16	1	0	17	5	0	0	0	5	1	4	0	0	5	0	0	0	0	0	27
Hourly Total	0	91	15	1	106	16	0	2	1	18	3	80	0	0	83	0	0	0	1	0	207
8:00 PM	0	19	2	0	21	2	0	0	0	2	0	7	0	0	7	0	0	0	0	0	30
8:15 PM	0	18	4	0	22	2	0	0	0	2	1	31	0	0	32	0	0	0	0	0	56
8:30 PM	0	21	6	0	27	4	0	0	0	4	1	11	0	0	12	0	0	0	0	0	43
8:45 PM	0	19	8	0	27	5	0	1	0	6	1	6	0	0	7	0	0	0	0	0	40
Hourly Total	0	77	20	0	97	13	0	1	0	14	3	55	0	0	58	0	0	0	0	0	169
9:00 PM	0	11	3	0	14	3	0	0	0	3	1	8	0	0	9	0	0	0	0	0	26
9:15 PM	0	9	2	0	11	2	0	0	0	2	1	4	0	0	5	0	0	0	0	0	18
9:30 PM	0	11	3	0	14	1	0	0	0	1	0	6	0	0	6	0	0	0	0	0	21
9:45 PM	0	7	1	0	8	2	0	0	0	2	0	2	0	0	2	0	0	0	0	0	12
Hourly Total	0	38	9	0	47	8	0	0	0	8	2	20	0	0	22	0	0	0	0	0	77
10:00 PM	0	3	0	0	3	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	5
10:15 PM	0	7	5	0	12	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	15
10:30 PM	0	4	2	0	6	2	0	1	0	3	0	1	0	0	1	0	0	0	0	0	10
10:45 PM	0	3	1	0	4	1	0	0	0	1	0	5	0	0	5	0	0	0	0	0	10
Hourly Total	0	17	8	0	25	4	0	1	0	5	0	10	0	0	10	0	0	0	0	0	40
11:00 PM	0	7	2	0	9	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	14
11:15 PM	0	7	1	0	8	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	9
11:30 PM	0	2	0	0	2	0	0	0	0	0	1	3	0	0	4	0	0	0	0	0	6
11:45 PM	0	5	0	0	5	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	9
Hourly Total	0	21	3	0	24	0	0	1	0	1	1	12	0	0	13	0	0	0	0	0	38
Grand Total	0	1935	304	5	2239	333	0	61	2	394	51	1900	0	16	1951	0	0	0	20	0	4584
Approach %	0.0	86.4	13.6	-	-	84.5	0.0	15.5	-	-	2.6	97.4	0.0	-	-	NaN	NaN	NaN	-	-	-
Total %	0.0	42.2	6.6	-	48.8	7.3	0.0	1.3	-	8.6	1.1	41.4	0.0	-	42.6	0.0	0.0	0.0	-	0.0	-
Motorcycles	0	1	0	-	1	0	0	0	-	0	0	2	0	-	2	0	0	0	-	0	3
% Motorcycles	-	0.1	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.1	-	-	0.1	-	-	-	-	-	0.1
Cars	0	1278	245	-	1523	259	0	40	-	299	39	1319	0	-	1358	0	0	0	-	0	3180
% Cars	-	66.0	80.6	-	68.0	77.8	-	65.6	-	75.9	76.5	69.4	-	-	69.6	-	-	-	-	-	69.4
Light Goods Vehicles	0	577	45	-	622	40	0	14	-	54	9	520	0	-	529	0	0	0	-	0	1205
% Light Goods Vehicles	-	29.8	14.8	-	27.8	12.0	-	23.0	-	13.7	17.6	27.4	-	-	27.1	-	-	-	-	-	26.3
Buses	0	43	10	-	53	32	0	6	-	38	2	22	0	-	24	0	0	0	-	0	115
% Buses	-	2.2	3.3	-	2.4	9.6	-	9.8	-	9.6	3.9	1.2	-	-	1.2	-	-	-	-	-	2.5
Single-Unit Trucks	0	31	3	-	34	1	0	1	-	2	1	33	0	-	34	0	0	0	-	0	70
% Single-Unit Trucks	-	1.6	1.0	-	1.5	0.3	-	1.6	-	0.5	2.0	1.7	-	-	1.7	-	-	-	-	-	1.5
Articulated Trucks	0	1	0	-	1	0	0	0	-	0	0	1	0	-	1	0	0	0	-	0	2
% Articulated Trucks	-	0.1	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.1	-	-	0.1	-	-	-	-	-	0.0
Bicycles on Road	0	4	1	-	5	1	0	0	-	1	0	3	0	-	3	0	0	0	-	0	9
% Bicycles on Road	-	0.2	0.3	-	0.2	0.3	-	0.0	-	0.3	0.0	0.2	-	-	0.2	-	-	-	-	-	0.2

Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	8	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	40.0	-	-
Pedestrians	-	-	-	5	-	-	-	-	2	-	-	-	-	16	-	-	-	-	12	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	60.0	-	-

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov

Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Totem Way
Site Code:
Start Date: 10/21/2015

10/21/2015 12:00 AM
Ending At
10/22/2015 12:00 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

South Tongass [SB]

Out	In	Total
2	1	3
1578	1523	3101
560	622	1182
54	53	107
39	40	79
2233	**2239**	**4472**

R	T	L	P
0	1	0	0
0	1278	245	0
0	577	45	0
0	43	10	0
0	36	4	5
0	**1935**	**304**	**5**

Bikes/Peds on Shoulder [E

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T	R	P
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	20
0	**0**	**0**	**20**

Totem Row [WB]

Out	In	Total
0	0	0
284	299	583
54	54	108
12	38	50
5	3	8
355	**394**	**749**

R	T	L	P
0	0	0	0
259	0	40	0
40	0	14	0
32	0	6	0
2	0	1	2
333	**0**	**61**	**2**

L	T	R	P
0	2	0	0
0	1319	39	0
0	520	9	0
0	22	2	0
0	37	1	16
0	**1900**	**51**	**16**

Out	In	Total
1	2	3
1318	1358	2676
591	529	1120
49	24	73
37	38	75
1996	**1951**	**3947**

South Tongass [NB]

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov
Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Totem Way
Site Code:
Start Date: 10/21/2015

Turning Movement Peak Hour Data (7:15 AM)

Start Time	South Tongass					Totem Row					South Tongass					Bikes/Peds on Shoulder					
	Southbound					Westbound					Northbound					Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
7:15 AM	0	14	1	0	15	7	0	1	0	8	2	72	0	0	74	0	0	0	0	0	97
7:30 AM	0	28	3	0	31	9	0	1	0	10	1	73	0	0	74	0	0	0	0	0	115
7:45 AM	0	29	3	0	32	6	0	1	0	7	1	66	0	0	67	0	0	0	0	0	106
8:00 AM	0	27	4	0	31	6	0	1	0	7	2	31	0	0	33	0	0	0	0	0	71
Total	0	98	11	0	109	28	0	4	0	32	6	242	0	0	248	0	0	0	0	0	389
Approach %	0.0	89.9	10.1	-	-	87.5	0.0	12.5	-	-	2.4	97.6	0.0	-	-	NaN	NaN	NaN	-	-	-
Total %	0.0	25.2	2.8	-	28.0	7.2	0.0	1.0	-	8.2	1.5	62.2	0.0	-	63.8	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.845	0.688	-	0.852	0.778	0.000	1.000	-	0.800	0.750	0.829	0.000	-	0.838	0.000	0.000	0.000	-	0.000	0.846
Motorcycles	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Motorcycles	-	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	0.0
Cars	0	58	6	-	64	14	0	2	-	16	4	158	0	-	162	0	0	0	-	0	242
% Cars	-	59.2	54.5	-	58.7	50.0	-	50.0	-	50.0	66.7	65.3	-	-	65.3	-	-	-	-	-	62.2
Light Goods Vehicles	0	33	3	-	36	7	0	1	-	8	2	77	0	-	79	0	0	0	-	0	123
% Light Goods Vehicles	-	33.7	27.3	-	33.0	25.0	-	25.0	-	25.0	33.3	31.8	-	-	31.9	-	-	-	-	-	31.6
Buses	0	6	2	-	8	7	0	1	-	8	0	5	0	-	5	0	0	0	-	0	21
% Buses	-	6.1	18.2	-	7.3	25.0	-	25.0	-	25.0	0.0	2.1	-	-	2.0	-	-	-	-	-	5.4
Single-Unit Trucks	0	1	0	-	1	0	0	0	-	0	0	2	0	-	2	0	0	0	-	0	3
% Single-Unit Trucks	-	1.0	0.0	-	0.9	0.0	-	0.0	-	0.0	0.0	0.8	-	-	0.8	-	-	-	-	-	0.8
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	0.0
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov

Keep Alaska moving through service and infrastructure.

Peak Hour Data

10/21/2015 7:15 AM
Ending At
10/21/2015 8:15 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

South Tongass [SB]

Out	In	Total
0	0	0
172	64	236
84	36	120
12	8	20
2	1	3
270	**109**	**379**

R	T	L	P
0	0	0	0
0	58	6	0
0	33	3	0
0	6	2	0
0	1	0	0
0	**98**	**11**	**0**

Bikes/Peds on Shoulder [E

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T	R	P
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	**0**	**0**	**0**

Totem Row [WB]

Out	In	Total
0	0	0
10	16	26
5	8	13
2	8	10
0	0	0
17	**32**	**49**

R	T	L	P
0	0	0	0
14	0	2	0
7	0	1	0
7	0	1	0
0	0	0	0
28	**0**	**4**	**0**

L	T	R	P
0	0	0	0
0	158	4	0
0	77	2	0
0	5	0	0
0	2	0	0
0	**242**	**6**	**0**

Out	In	Total
0	0	0
60	162	222
34	79	113
7	5	12
1	2	3
102	**248**	**350**

South Tongass [NB]

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov
Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Totem Way
Site Code:
Start Date: 10/21/2015

Turning Movement Peak Hour Data (4:30 PM)

Start Time	South Tongass Southbound					Totem Row Westbound					South Tongass Northbound					Bikes/Peds on Shoulder Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
4:30 PM	0	56	4	0	60	10	0	0	0	10	2	49	0	0	51	0	0	0	0	0	121
4:45 PM	0	68	7	0	75	2	0	0	0	2	0	31	0	0	31	0	0	0	0	0	108
5:00 PM	0	58	13	0	71	3	0	2	0	5	1	42	0	1	43	0	0	0	1	0	119
5:15 PM	0	76	10	0	86	6	0	3	0	9	1	32	0	0	33	0	0	0	0	0	128
Total	0	258	34	0	292	21	0	5	0	26	4	154	0	1	158	0	0	0	1	0	476
Approach %	0.0	88.4	11.6	-	-	80.8	0.0	19.2	-	-	2.5	97.5	0.0	-	-	NaN	NaN	NaN	-	-	-
Total %	0.0	54.2	7.1	-	61.3	4.4	0.0	1.1	-	5.5	0.8	32.4	0.0	-	33.2	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.849	0.654	-	0.849	0.525	0.000	0.417	-	0.650	0.500	0.786	0.000	-	0.775	0.000	0.000	0.000	-	0.000	0.930
Motorcycles	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Motorcycles	-	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	0.0
Cars	0	178	23	-	201	17	0	4	-	21	3	115	0	-	118	0	0	0	-	0	340
% Cars	-	69.0	67.6	-	68.8	81.0	-	80.0	-	80.8	75.0	74.7	-	-	74.7	-	-	-	-	-	71.4
Light Goods Vehicles	0	76	11	-	87	3	0	1	-	4	1	37	0	-	38	0	0	0	-	0	129
% Light Goods Vehicles	-	29.5	32.4	-	29.8	14.3	-	20.0	-	15.4	25.0	24.0	-	-	24.1	-	-	-	-	-	27.1
Buses	0	2	0	-	2	1	0	0	-	1	0	0	0	-	0	0	0	0	-	0	3
% Buses	-	0.8	0.0	-	0.7	4.8	-	0.0	-	3.8	0.0	0.0	-	-	0.0	-	-	-	-	-	0.6
Single-Unit Trucks	0	1	0	-	1	0	0	0	-	0	0	1	0	-	1	0	0	0	-	0	2
% Single-Unit Trucks	-	0.4	0.0	-	0.3	0.0	-	0.0	-	0.0	0.0	0.6	-	-	0.6	-	-	-	-	-	0.4
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	0.0
Bicycles on Road	0	1	0	-	1	0	0	0	-	0	0	1	0	-	1	0	0	0	-	0	2
% Bicycles on Road	-	0.4	0.0	-	0.3	0.0	-	0.0	-	0.0	0.0	0.6	-	-	0.6	-	-	-	-	-	0.4
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Alaska Department of Transportation & Public Facilities -- Southeast Region
6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov

Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Totem Way
Site Code:
Start Date: 10/21/2015

Peak Hour Data

10/21/2015 4:30 PM
Ending At
10/21/2015 5:30 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

South Tongass [SB]

Out	In	Total
0	0	0
132	201	333
40	87	127
1	2	3
2	2	4
175	**292**	**467**

R	T	L	P
0	0	0	0
0	178	23	0
0	76	11	0
0	2	0	0
0	2	0	0
0	**258**	**34**	**0**

Bikes/Peds on Shoulder [E

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T	R	P
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	1
0	**0**	**0**	**1**

Totem Row [WB]

Out	In	Total
0	0	0
26	21	47
12	4	16
0	1	1
0	0	0
38	**26**	**64**

R	T	L	P
0	0	0	0
17	0	4	0
3	0	1	0
1	0	0	0
0	0	0	0
21	**0**	**5**	**0**

L	T	R	P
0	0	0	0
0	115	3	0
0	37	1	0
0	0	0	0
0	2	0	1
0	**154**	**4**	**1**

South Tongass [NB]

Out	In	Total
0	0	0
182	118	300
77	38	115
2	0	2
2	2	4
263	**158**	**421**

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov

Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Cemetery Road
Site Code:
Start Date: 10/21/2015

Turning Movement Data

Start Time	South Tongass Southbound				Cemetery Road Westbound				South Tongass Northbound				Bikes/Peds on Shoulder Eastbound		
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Peds	App. Total	Int. Total
12:00 AM	5	0	0	5	0	0	0	0	0	0	0	0	0	0	5
12:15 AM	5	0	0	5	0	0	0	0	0	3	0	3	0	0	8
12:30 AM	2	0	0	2	0	0	0	0	0	3	0	3	0	0	5
12:45 AM	3	0	0	3	0	0	0	0	0	2	0	2	0	0	5
Hourly Total	15	0	0	15	0	0	0	0	0	8	0	8	0	0	23
1:00 AM	2	0	0	2	0	0	0	0	0	1	0	1	0	0	3
1:15 AM	1	0	0	1	0	0	0	0	0	2	0	2	0	0	3
1:30 AM	2	0	0	2	1	0	0	1	0	0	0	0	0	0	3
1:45 AM	3	0	0	3	0	0	0	0	0	2	0	2	0	0	5
Hourly Total	8	0	0	8	1	0	0	1	0	5	0	5	0	0	14
2:00 AM	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
2:15 AM	4	0	0	4	0	0	0	0	0	2	0	2	0	0	6
2:30 AM	2	0	0	2	0	0	0	0	0	3	0	3	0	0	5
2:45 AM	1	0	0	1	0	0	0	0	0	3	0	3	0	0	4
Hourly Total	9	0	0	9	0	0	0	0	0	8	0	8	0	0	17
3:00 AM	2	0	0	2	0	0	0	0	0	3	0	3	0	0	5
3:15 AM	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
3:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1
3:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	4	0	0	4	0	0	0	0	0	4	0	4	1	0	8
4:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1
4:15 AM	2	0	0	2	0	0	0	0	0	1	0	1	1	0	3
4:30 AM	1	0	0	1	0	0	0	0	0	2	0	2	1	0	3
4:45 AM	1	0	0	1	0	0	0	0	0	7	0	7	0	0	8
Hourly Total	4	0	0	4	0	0	0	0	0	11	0	11	2	0	15
5:00 AM	1	0	0	1	0	0	0	0	0	2	0	2	0	0	3
5:15 AM	4	1	0	5	0	0	0	0	0	3	0	3	0	0	8
5:30 AM	5	1	0	6	0	0	0	0	0	11	0	11	0	0	17
5:45 AM	7	0	0	7	0	0	0	0	0	25	0	25	0	0	32
Hourly Total	17	2	0	19	0	0	0	0	0	41	0	41	0	0	60
6:00 AM	16	0	0	16	0	0	0	0	0	10	0	10	0	0	26
6:15 AM	19	0	0	19	0	0	0	0	0	26	0	26	3	0	45
6:30 AM	19	0	0	19	1	0	0	1	0	57	0	57	1	0	77
6:45 AM	28	0	0	28	0	0	0	0	0	56	0	56	1	0	84

Hourly Total	82	0	0	82	1	0	0	1	0	149	0	149	5	0	232
7:00 AM	16	0	0	16	0	0	0	0	0	46	0	46	0	0	62
7:15 AM	33	1	1	34	0	0	0	0	0	82	0	82	1	0	116
7:30 AM	46	0	0	46	0	0	0	0	0	110	0	110	1	0	156
7:45 AM	46	2	0	48	0	0	0	0	1	107	0	108	0	0	156
Hourly Total	141	3	1	144	0	0	0	0	1	345	0	346	2	0	490
8:00 AM	29	0	0	29	1	0	0	1	0	41	1	41	0	0	71
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	29	0	0	29	1	0	0	1	0	41	1	41	0	0	71
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	309	5	1	314	3	0	0	3	1	612	1	613	10	0	930
Approach %	98.4	1.6	-	-	100.0	0.0	-	-	0.2	99.8	-	-	-	-	-
Total %	33.2	0.5	-	33.8	0.3	0.0	-	0.3	0.1	65.8	-	65.9	-	0.0	-
Motorcycles	0	0	-	0	0	0	-	0	0	2	-	2	-	0	2
% Motorcycles	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0	0.3	-	0.3	-	-	0.2
Cars	195	4	-	199	2	0	-	2	1	437	-	438	-	0	639
% Cars	63.1	80.0	-	63.4	66.7	-	-	66.7	100.0	71.4	-	71.5	-	-	68.7
Light Goods Vehicles	93	1	-	94	1	0	-	1	0	153	-	153	-	0	248
% Light Goods Vehicles	30.1	20.0	-	29.9	33.3	-	-	33.3	0.0	25.0	-	25.0	-	-	26.7
Buses	15	0	-	15	0	0	-	0	0	13	-	13	-	0	28
% Buses	4.9	0.0	-	4.8	0.0	-	-	0.0	0.0	2.1	-	2.1	-	-	3.0
Single-Unit Trucks	5	0	-	5	0	0	-	0	0	6	-	6	-	0	11
% Single-Unit Trucks	1.6	0.0	-	1.6	0.0	-	-	0.0	0.0	1.0	-	1.0	-	-	1.2
Articulated Trucks	0	0	-	0	0	0	-	0	0	0	-	0	-	0	0
% Articulated Trucks	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0	0.0	-	0.0	-	-	0.0
Bicycles on Road	1	0	-	1	0	0	-	0	0	1	-	1	-	0	2
% Bicycles on Road	0.3	0.0	-	0.3	0.0	-	-	0.0	0.0	0.2	-	0.2	-	-	0.2
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	0	-	5	-	-

% Bicycles on Crosswalk	-	-	0.0	-	-	-	-	-	-	-	0.0	-	50.0	-	-
Pedestrians	-	-	1	-	-	-	0	-	-	-	1	-	5	-	-
% Pedestrians	-	-	100.0	-	-	-	-	-	-	-	100.0	-	50.0	-	-

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov

Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Cemetery Road
Site Code:
Start Date: 10/21/2015
Page No: 5

South Tongass [SB]

Out	In	Total
2	0	2
439	199	638
154	94	248
13	15	28
7	6	13
615	**314**	**929**

0	0	0
195	4	0
93	1	0
15	0	0
6	0	1
309	**5**	**1**
T	L	P

Bikes/Peds on Shoulder [E

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

P
0
0
0
0
10
10

10/21/2015 12:00 AM
Ending At
10/22/2015 12:00 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

Cemetery Road [WB]

Out	In	Total
0	0	0
5	2	7
1	1	2
0	0	0
0	0	0
6	**3**	**9**

R	L	P
0	0	0
2	0	0
1	0	0
0	0	0
0	0	0
3	**0**	**0**

T	R	P
2	0	0
437	1	0
153	0	0
13	0	0
7	0	1
612	**1**	**1**

Out	In	Total
0	2	2
195	438	633
93	153	246
15	13	28
6	7	13
309	**613**	**922**

South Tongass [NB]

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov
Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Cemetery Road
Site Code:
Start Date: 10/21/2015
Page No: 7

Turning Movement Peak Hour Data (7:15 AM)

Start Time	South Tongass Southbound				Cemetery Road Westbound				South Tongass Northbound				Bikes/Peds on Shoulder Eastbound		
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Peds	App. Total	Int. Total
7:15 AM	33	1	1	34	0	0	0	0	0	82	0	82	1	0	116
7:30 AM	46	0	0	46	0	0	0	0	0	110	0	110	1	0	156
7:45 AM	46	2	0	48	0	0	0	0	1	107	0	108	0	0	156
8:00 AM	29	0	0	29	1	0	0	1	0	41	1	41	0	0	71
Total	154	3	1	157	1	0	0	1	1	340	1	341	2	0	499
Approach %	98.1	1.9	-	-	100.0	0.0	-	-	0.3	99.7	-	-	-	-	-
Total %	30.9	0.6	-	31.5	0.2	0.0	-	0.2	0.2	68.1	-	68.3	-	0.0	-
PHF	0.837	0.375	-	0.818	0.250	0.000	-	0.250	0.250	0.773	-	0.775	-	0.000	0.800
Motorcycles	0	0	-	0	0	0	-	0	0	0	-	0	-	0	0
% Motorcycles	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0	0.0	-	0.0	-	-	0.0
Cars	96	2	-	98	1	0	-	1	1	236	-	237	-	0	336
% Cars	62.3	66.7	-	62.4	100.0	-	-	100.0	100.0	69.4	-	69.5	-	-	67.3
Light Goods Vehicles	48	1	-	49	0	0	-	0	0	89	-	89	-	0	138
% Light Goods Vehicles	31.2	33.3	-	31.2	0.0	-	-	0.0	0.0	26.2	-	26.1	-	-	27.7
Buses	6	0	-	6	0	0	-	0	0	10	-	10	-	0	16
% Buses	3.9	0.0	-	3.8	0.0	-	-	0.0	0.0	2.9	-	2.9	-	-	3.2
Single-Unit Trucks	4	0	-	4	0	0	-	0	0	4	-	4	-	0	8
% Single-Unit Trucks	2.6	0.0	-	2.5	0.0	-	-	0.0	0.0	1.2	-	1.2	-	-	1.6
Articulated Trucks	0	0	-	0	0	0	-	0	0	0	-	0	-	0	0
% Articulated Trucks	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0	0.0	-	0.0	-	-	0.0
Bicycles on Road	0	0	-	0	0	0	-	0	0	1	-	1	-	0	1
% Bicycles on Road	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0	0.3	-	0.3	-	-	0.2
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	0	-	0	-	-
% Bicycles on Crosswalk	-	-	0.0	-	-	-	-	-	-	-	0.0	-	0.0	-	-
Pedestrians	-	-	1	-	-	-	0	-	-	-	1	-	2	-	-
% Pedestrians	-	-	100.0	-	-	-	-	-	-	-	100.0	-	100.0	-	-

Alaska Department of Transportation & Public Facilities -- Southeast Region
6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov
Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Cemetery Road
Site Code:
Start Date: 10/21/2015

Peak Hour Data

10/21/2015 7:15 AM
Ending At
10/21/2015 8:15 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

South Tongass [SB]

Out	In	Total
0	0	0
237	98	335
89	49	138
10	6	16
5	4	9
341	**157**	**498**

0	0	0
96	2	0
48	1	0
6	0	0
4	0	1
154	**3**	**1**
T	L	P

Bikes/Peds on Shoulder [E

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

0
0
0
0
2
2
P

Cemetery Road [WB]

Out	In	Total
0	0	0
3	1	4
1	0	1
0	0	0
0	0	0
4	**1**	**5**

0	0	0
1	0	0
0	0	0
0	0	0
0	0	0
1	**0**	**0**
R	L	P

T	R	P
0	0	0
236	1	0
89	0	0
10	0	0
5	0	1
340	**1**	**1**

0	0	0
96	237	333
48	89	137
6	10	16
4	5	9
154	**341**	**495**
Out	In	Total

South Tongass [NB]

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
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Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Cemetery Road
Site Code:
Start Date: 10/21/2015

Turning Movement Peak Hour Data (12:00 PM)

Start Time	South Tongass Southbound				Cemetery Road Westbound				South Tongass Northbound				Bikes/Peds on Shoulder Eastbound		
	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Peds	App. Total	Int. Total
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	NaN	NaN	-	-	NaN	NaN	-	-	NaN	NaN	-	-	-	-	-
Total %	NaN	NaN	-	NaN	NaN	NaN	-	NaN	NaN	NaN	-	NaN	-	NaN	-
PHF	0.000	0.000	-	0.000	0.000	0.000	-	0.000	0.000	0.000	-	0.000	-	0.000	0.000
Motorcycles	0	0	-	0	0	0	-	0	0	0	-	0	-	0	0
% Motorcycles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cars	0	0	-	0	0	0	-	0	0	0	-	0	-	0	0
% Cars	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Light Goods Vehicles	0	0	-	0	0	0	-	0	0	0	-	0	-	0	0
% Light Goods Vehicles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buses	0	0	-	0	0	0	-	0	0	0	-	0	-	0	0
% Buses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Single-Unit Trucks	0	0	-	0	0	0	-	0	0	0	-	0	-	0	0
% Single-Unit Trucks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Articulated Trucks	0	0	-	0	0	0	-	0	0	0	-	0	-	0	0
% Articulated Trucks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Road	0	0	-	0	0	0	-	0	0	0	-	0	-	0	0
% Bicycles on Road	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	0	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Alaska Department of Transportation & Public Facilities -- Southeast Region

6860 Glacier Highway

Juneau, Alaska, United States 99811
907.465.1007 ryan.siverly@alaska.gov
Keep Alaska moving through service and infrastructure.

Count Name: South Tongass & Cemetery Road
Site Code:
Start Date: 10/21/2015

Peak Hour Data

10/21/2015 12:00 PM
Ending At
10/21/2015 1:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

South Tongass [SB]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

T	L	P
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

Bikes/Peds on Shoulder [E

Total	In	Out	P
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	**0**	**0**	**0**

Cemetery Road [WB]

R	L	P	Out	In	Total
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	**0**	**0**	**0**	**0**	**0**

T	R	P
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

South Tongass [NB]

Appendix C:
Two-Way Stop Control Data

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*HZ*
Agency/Co.	*HDR*
Date Performed	*11/20/2015*
Analysis Time Period	*7:15 AM- -8:15 AM*

Site Information

Intersection	*S Tongass Ave & Deermount St*
Jurisdiction	*Alaska*
Analysis Year	*2015 Existing*

Project Description *South Tongass Highway Deermount to Saxman and Saxman to Surf*

East/West Street: *Deermount St/East St* | North/South Street:

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*0*	*297*	*77*	*35*	*151*	*2*
Peak-Hour Factor, PHF	*1.00*	*0.74*	*0.71*	*0.88*	*0.77*	*0.25*
Hourly Flow Rate, HFR (veh/h)	*0*	*401*	*108*	*39*	*196*	*8*
Percent Heavy Vehicles	*0*	*--*	*--*	*3*	*--*	*--*
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*0*	*0*	*1*	*63*	*0*	*40*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*0.25*	*0.66*	*1.00*	*0.71*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*4*	*95*	*0*	*56*
Percent Heavy Vehicles	*0*	*0*	*0*	*5*	*0*	*3*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*0*	*39*		*151*			*4*	
C (m) (veh/h)	*1366*	*1037*		*374*			*828*	
v/c	*0.00*	*0.04*		*0.40*			*0.00*	
95% queue length	*0.00*	*0.12*		*1.90*			*0.01*	
Control Delay (s/veh)	*7.6*	*8.6*		*21.0*			*9.4*	
LOS	*A*	*A*		*C*			*A*	
Approach Delay (s/veh)	--	--	*21.0*			*9.4*		
Approach LOS	--	--	*C*			*A*		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*HZ*
Agency/Co.	*HDR*
Date Performed	*11/20/2015*
Analysis Time Period	*4:30 PM- -5:30 PM*

Site Information

Intersection	*S Tongass Ave & Deermount St*
Jurisdiction	*Alaska*
Analysis Year	*2015 Existing*

Project Description *South Tongass Highway Deermount to Saxman and Saxman to Surf*

East/West Street: *Deermount St/East St* | North/South Street:

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*0*	*266*	*62*	*54*	*358*	*4*
Peak-Hour Factor, PHF	*1.00*	*0.88*	*0.91*	*0.79*	*0.97*	*0.50*
Hourly Flow Rate, HFR (veh/h)	*0*	*302*	*68*	*68*	*369*	*8*
Percent Heavy Vehicles	*0*	*--*	*--*	*0*	*--*	*--*
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*2*	*0*	*2*	*74*	*1*	*71*
Peak-Hour Factor, PHF	*0.25*	*1.00*	*0.25*	*0.88*	*0.25*	*0.93*
Hourly Flow Rate, HFR (veh/h)	*8*	*0*	*8*	*84*	*4*	*76*
Percent Heavy Vehicles	*0*	*0*	*0*	*2*	*0*	*0*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*0*	*68*		*164*			*16*	
C (m) (veh/h)	*1187*	*1172*		*353*			*326*	
v/c	*0.00*	*0.06*		*0.46*			*0.05*	
95% queue length	*0.00*	*0.18*		*2.37*			*0.15*	
Control Delay (s/veh)	*8.0*	*8.3*		*23.7*			*16.6*	
LOS	*A*	*A*		*C*			*C*	
Approach Delay (s/veh)	--	--	*23.7*			*16.6*		
Approach LOS	--	--	*C*			*C*		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*HZ*
Agency/Co.	*HDR*
Date Performed	*11/20/2015*
Analysis Time Period	*7:15 AM - 8:15 AM*

Site Information

Intersection	*S Tongass Hwy & Forest Park Dr*
Jurisdiction	*Alaska*
Analysis Year	*Existing 2015*

Project Description *South Tongass Highway Deermount to Saxman and Saxman to Surf*

East/West Street: *Forest Park Dr* | North/South Street: *S Tongass Highway*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*282*	*3*	*18*	*105*	
Peak-Hour Factor, PHF	*1.00*	*0.78*	*0.25*	*0.75*	*0.88*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*361*	*12*	*24*	*119*	*0*
Percent Heavy Vehicles	*0*	--	--	*6*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*7*		*81*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.88*	*1.00*	*0.78*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*7*	*0*	*103*
Percent Heavy Vehicles	*0*	*0*	*0*	*14*	*0*	*0*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (veh/h)		*24*		*110*				
C (m) (veh/h)		*1164*		*663*				
v/c		*0.02*		*0.17*				
95% queue length		*0.06*		*0.59*				
Control Delay (s/veh)		*8.2*		*11.5*				
LOS		*A*		*B*				
Approach Delay (s/veh)	--	--	*11.5*					
Approach LOS	--	--	*B*					

 HCS+™ Version 5.6 Generated: 11/24/2015 2:29 PM

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*HZ*
Agency/Co.	*HDR*
Date Performed	*11/20/2015*
Analysis Time Period	*4:30 PM - 5:30 PM*

Site Information

Intersection	*S Tongass Hwy & Forest Park Dr*
Jurisdiction	*Alaska*
Analysis Year	*Existing 2015*

Project Description *South Tongass Highway Deermount to Saxman and Saxman to Surf*

East/West Street: *Forest Park Dr* | North/South Street: *S Tongass Highway*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*165*	*10*	*70*	*300*	
Peak-Hour Factor, PHF	*1.00*	*0.81*	*0.42*	*0.73*	*0.82*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*203*	*23*	*95*	*365*	*0*
Percent Heavy Vehicles	*0*	*--*	*--*	*0*	*--*	*--*
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*10*		*43*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*0.63*	*1.00*	*0.77*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*15*	*0*	*55*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*2*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (veh/h)		*95*		*70*				
C (m) (veh/h)		*1354*		*637*				
v/c		*0.07*		*0.11*				
95% queue length		*0.23*		*0.37*				
Control Delay (s/veh)		*7.9*		*11.3*				
LOS		*A*		*B*				
Approach Delay (s/veh)	*--*	*--*		*11.3*				
Approach LOS	*--*	*--*		*B*				

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*HZ*
Agency/Co.	*HDR*
Date Performed	*11/20/2015*
Analysis Time Period	*7:15 AM - 8:15 AM*

Site Information

Intersection	*S Tongass Hwy & Totem Way*
Jurisdiction	*Alaska*
Analysis Year	*Existing 2015*

Project Description *South Tongass Highway Deermount to Saxman and Saxman to Surf*

East/West Street:

North/South Street: *S Tongass Highway*

Intersection Orientation: *North-South*

Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*242*	*6*	*11*	*98*	
Peak-Hour Factor, PHF	*1.00*	*0.83*	*0.75*	*0.69*	*0.85*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*291*	*8*	*15*	*115*	*0*
Percent Heavy Vehicles	*0*	*--*	*--*	*18*	*--*	*--*
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*4*		*28*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*0.77*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*4*	*0*	*36*
Percent Heavy Vehicles	*0*	*0*	*0*	*25*	*0*	*25*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (veh/h)		*15*		*40*				
C (m) (veh/h)		*1176*		*672*				
v/c		*0.01*		*0.06*				
95% queue length		*0.04*		*0.19*				
Control Delay (s/veh)		*8.1*		*10.7*				
LOS		*A*		*B*				
Approach Delay (s/veh)	*--*	*--*	*10.7*					
Approach LOS	*--*	*--*	*B*					

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	HZ
Agency/Co.	HDR
Date Performed	11/20/2015
Analysis Time Period	4:30 PM - 5:30 PM

Site Information

Intersection	S Tongass Hwy & Totem Way
Jurisdiction	Alaska
Analysis Year	Existing 2015

Project Description *South Tongass Highway Deermount to Saxman and Saxman to Surf*

East/West Street:

North/South Street: *S Tongass Highway*

Intersection Orientation: *North-South*

Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		154	4	34	258	
Peak-Hour Factor, PHF	1.00	0.79	0.50	0.65	0.85	1.00
Hourly Flow Rate, HFR (veh/h)	0	194	8	52	303	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				5		21
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.42	1.00	0.52
Hourly Flow Rate, HFR (veh/h)	0	0	0	11	0	40
Percent Heavy Vehicles	0	0	0	0	0	5
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
v (veh/h)		52		51				
C (m) (veh/h)		1382		703				
v/c		0.04		0.07				
95% queue length		0.12		0.23				
Control Delay (s/veh)		7.7		10.5				
LOS		A		B				
Approach Delay (s/veh)	--	--	10.5					
Approach LOS	--	--	B					

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*HZ*
Agency/Co.	*HDR*
Date Performed	*11/20/2015*
Analysis Time Period	*7:15 AM - 8:15 AM*

Site Information

Intersection	*S Tongass Hwy & Cemetery Road*
Jurisdiction	*Alaska*
Analysis Year	*Existing 2015*

Project Description *South Tongass Highway Deermount to Saxman and Saxman to Surf*

East/West Street: *Cemetery Road* | North/South Street: *Stedman St/S Tongass Highway*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*340*	*1*	*3*	*154*	
Peak-Hour Factor, PHF	*1.00*	*0.77*	*0.25*	*0.38*	*0.84*	*1.00*
Hourly Flow Rate, HFR (veh/h)	*0*	*441*	*4*	*7*	*183*	*0*
Percent Heavy Vehicles	*0*	*--*	*--*	*0*	*--*	*--*
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)				*0*		*1*
Peak-Hour Factor, PHF	*1.00*	*1.00*	*1.00*	*1.00*	*1.00*	*0.25*
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*0*	*0*	*4*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)	*0*			*0*		
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration					*LR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (veh/h)		*7*		*4*				
C (m) (veh/h)		*1126*		*617*				
v/c		*0.01*		*0.01*				
95% queue length		*0.02*		*0.02*				
Control Delay (s/veh)		*8.2*		*10.9*				
LOS		*A*		*B*				
Approach Delay (s/veh)	*--*	*--*	*10.9*					
Approach LOS	*--*	*--*	*B*					

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Appendix D:
Directional Two-Lane Highway Segment Worksheets

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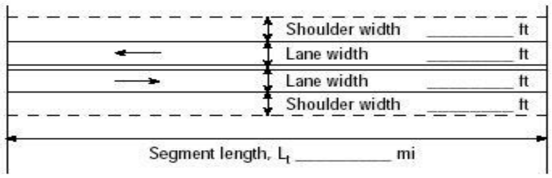
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Deermount to Saxman (30MPH)-D1*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Existing 2015*

Project Description: *South Tongass Highway*

Input Data



Analysis direction vol., V_d *348*veh/h

Opposing direction vol., V_o *284*veh/h

Shoulder width ft *4.0*

Lane Width ft *11.0*

Segment Length mi *0.8*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.90*

No-passing zone *20%*

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *22*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.997*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*388*	*317*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*45.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*5.5 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*37.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*31.4 mi/h*
		Percent free flow speed, PFFS	*83.1 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*387*	*316*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*40.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*34.2*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*59.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.23*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*83.1*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*386.7*
Effective width, Wv (Eq. 15-29) ft	*15.00*
Effective speed factor, S_t (Eq. 15-30)	*3.39*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.56*
Bicycle level of service (Exhibit 15-4)	*D*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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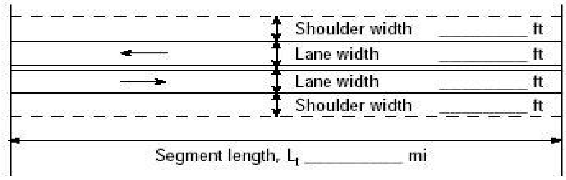
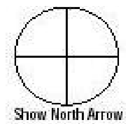
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Deermount to Saxman (30MPH)-D2*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Existing 2015*

Project Description: *South Tongass Highway*

Input Data





☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.90*

No-passing zone *20%*

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *22/mi*

Analysis direction vol., V_d *284*veh/h

Opposing direction vol., V_o *348*veh/h

Shoulder width ft *4.0*

Lane Width ft *11.0*

Segment Length mi *0.8*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.996*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*317*	*388*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*45.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*5.5 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*37.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*31.4 mi/h*
		Percent free flow speed, PFFS	*83.1 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*316*	*387*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*35.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*34.2*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*50.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.19*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*83.1*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*315.6*
Effective width, Wv (Eq. 15-29) ft	*15.00*
Effective speed factor, S_t (Eq. 15-30)	*3.39*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.46*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

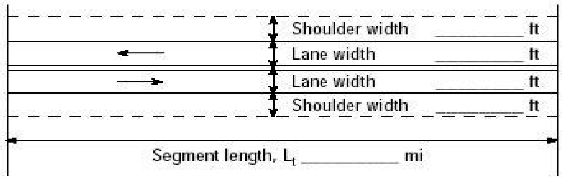
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

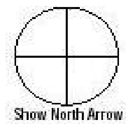
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Deermount to Saxman (45MPH)-D1*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Existing 2015*

Project Description: *South Tongass Highway*

Input Data





☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*348*veh/h
Opposing direction vol., V_o	*284*veh/h
Shoulder width ft	*4.0*
Lane Width ft	*11.0*
Segment Length mi	*1.2*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.90*
No-passing zone	*20%*
% Trucks and Buses , P_T	*1 %*
% Recreational vehicles, P_R	*0%*
Access points *mi*	*15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.997*	*0.996*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*388*	*317*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*49.5 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*43.0 mi/h*
		Percent free flow speed, PFFS	*86.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*387*	*316*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*40.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*34.2*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*59.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.23*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1693*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*86.7*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*386.7*
Effective width, Wv (Eq. 15-29) ft	*15.00*
Effective speed factor, S_t (Eq. 15-30)	*4.42*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.81*
Bicycle level of service (Exhibit 15-4)	*D*

Notes

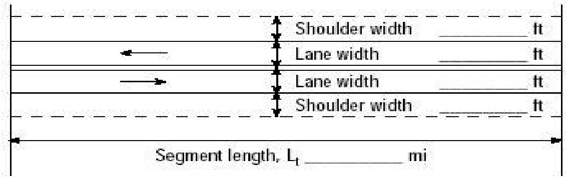
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

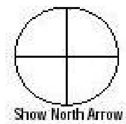
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Deermount to Saxman (45MPH)-D2*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Existing 2015*

Project Description: *South Tongass Highway*

Input Data





☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*284*veh/h
Opposing direction vol., V_o	*348*veh/h
Shoulder width ft	*4.0*
Lane Width ft	*11.0*
Segment Length mi	*1.2*
Peak-hour factor, PHF	*0.90*
No-passing zone	*20%*
% Trucks and Buses , P_T	*1 %*
% Recreational vehicles, P_R	*0%*
Access points *mi*	*15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/\ (1+ P_T (E_T -1)+P_R (E_R -1))$	*0.996*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*317*	*388*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.1 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*49.5 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*43.0 mi/h*
		Percent free flow speed, PFFS	*86.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/\ (1+ P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*316*	*387*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*35.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*34.2*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*50.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.19*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*86.8*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*315.6*
Effective width, Wv (Eq. 15-29) ft	*15.00*
Effective speed factor, S_t (Eq. 15-30)	*3.39*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.46*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

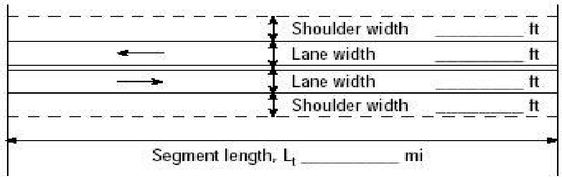
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Saxman to Surf (45MPH)-D1*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Existing 2015*

Project Description: *South Tongass Highway*

Input Data



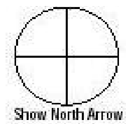
Analysis direction vol., V_d *165*veh/h

Opposing direction vol., V_o *135*veh/h

Shoulder width ft *2.0*

Lane Width ft *12.0*

Segment Length mi *1.1*



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.90*

No-passing zone *20%*

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *30*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.6*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.994*	*0.993*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*184*	*151*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*55.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*7.5 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.9 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.5 mi/h*	Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*41.8 mi/h*
		Percent free flow speed, PFFS	*93.1 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*184*	*150*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*20.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.7*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*39.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*A*
Volume to capacity ratio, *v/c*	*0.11*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1688*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*93.1*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*183.3*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.42*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.58*
Bicycle level of service (Exhibit 15-4)	*D*

Notes

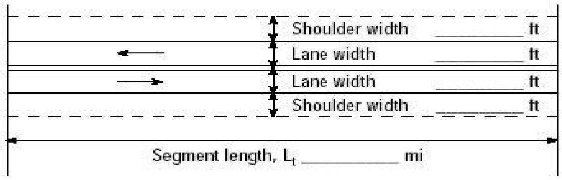
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

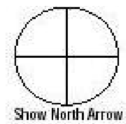
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Saxman to Surf (45MPH)-D2*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Existing 2015*

Project Description: *South Tongass Highway*

Input Data





☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*135*veh/h
Opposing direction vol., V_o	*165*veh/h
Shoulder width ft	*2.0*
Lane Width ft	*12.0*
Segment Length mi	*1.1*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.90*
No-passing zone	*20%*
% Trucks and Buses , P_T	*1 %*
% Recreational vehicles, P_R	*0%*
Access points *mi*	*30*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.7*	*1.6*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.993*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*151*	*184*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*55.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*7.5 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*44.9 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.8 mi/h*	Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*41.5 mi/h*
		Percent free flow speed, PFFS	*92.5 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*150*	*184*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*16.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.7*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*32.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*A*
Volume to capacity ratio, *v/c*	*0.09*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*92.5*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*150.0*
Effective width, Wv (Eq. 15-29) ft	*18.55*
Effective speed factor, S_t (Eq. 15-30)	*4.42*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.74*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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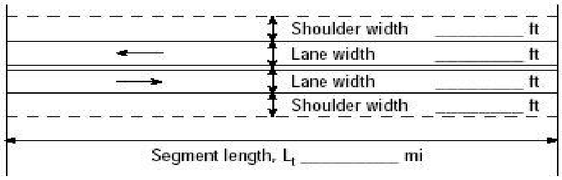
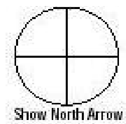
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Deermount to Saxman (30MPH)-D1*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Future Year 2037*

Project Description: *South Tongass Highway*

Input Data





☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*390*veh/h
Opposing direction vol., V_o	*320*veh/h
Shoulder width ft	*5.0*
Lane Width ft	*11.0*
Segment Length mi	*0.8*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.90*
No-passing zone	*20%*
% Trucks and Buses , P_T	*1 %*
% Recreational vehicles, P_R	*0%*
Access points *mi*	*22*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*435*	*357*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*45.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*5.5 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*37.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*30.8 mi/h*
		Percent free flow speed, PFFS	*81.4 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*433*	*356*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*44.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*31.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*61.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.26*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*81.4*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*433.3*
Effective width, Wv (Eq. 15-29) ft	*21.00*
Effective speed factor, S_t (Eq. 15-30)	*3.39*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.54*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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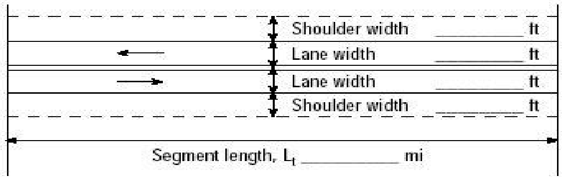
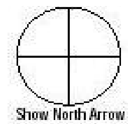
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	HZ	Highway / Direction of Travel	South Tongass Highway
Agency or Company	HDR, Inc	From/To	Deermount to Saxman (30MPH)-D2
Date Performed	12/2/2015	Jurisdiction	Alaska
Analysis Time Period	Design Hour	Analysis Year	Future Year 2037

Project Description: *South Tongass Highway*

Input Data





☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	320veh/h
Opposing direction vol., V_o	390veh/h
Shoulder width ft	5.0
Lane Width ft	11.0
Segment Length mi	0.8
Grade Length mi Up/down	
Peak-hour factor, PHF	0.90
No-passing zone	20%
% Trucks and Buses , P_T	1 %
% Recreational vehicles, P_R	0%
Access points *mi*	22/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.3	1.3
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	0.997	0.997
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	357	435

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	45.0 mi/h
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	1.7 mi/h
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	5.5 mi/h
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	37.8 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	0.8 mi/h	Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	30.8 mi/h
		Percent free flow speed, PFFS	81.6 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	1.1	1.0
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	0.999	1.000
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	356	433
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	40.3	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	31.4	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	54.5	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	C
Volume to capacity ratio, *v/c*	0.21
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	1695
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	1700
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	81.6

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	355.6
Effective width, Wv (Eq. 15-29) ft	21.00
Effective speed factor, S_t (Eq. 15-30)	3.39
Bicycle level of service score, BLOS (Eq. 15-31)	2.44
Bicycle level of service (Exhibit 15-4)	B

Notes

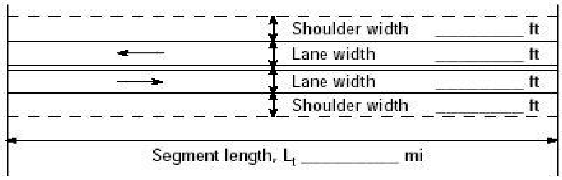
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

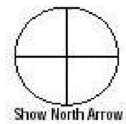
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Deermount to Saxman (45MPH)-D1*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Future Year 2037*

Project Description: *South Tongass Highway*

Input Data





☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*390*veh/h
Opposing direction vol., V_o	*320*veh/h
Shoulder width ft	*5.0*
Lane Width ft	*11.0*
Segment Length mi	*1.2*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.90*
No-passing zone	*20%*
% Trucks and Buses , P_T	*1 %*
% Recreational vehicles, P_R	*0%*
Access points *mi*	*15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.997*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*435*	*357*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*55.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS ($FSS=BFFS-f_{LS}-f_A$)	*49.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.1 mi/h*	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*42.3 mi/h*
		Percent free flow speed, PFFS	*85.4 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*433*	*356*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*44.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*31.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*61.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.26*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*85.4*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*433.3*
Effective width, Wv (Eq. 15-29) ft	*21.00*
Effective speed factor, S_t (Eq. 15-30)	*4.42*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.79*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If $v_i(v_d$ or $v_o)$ >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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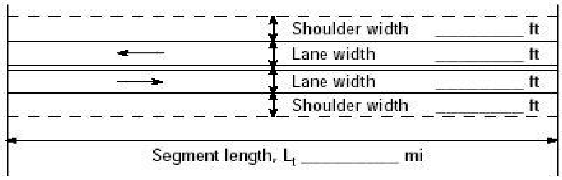
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Deermount to Saxman (45MPH)-D2*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Future Year 2037*

Project Description: *South Tongass Highway*

Input Data



Analysis direction vol., V_d *320*veh/h

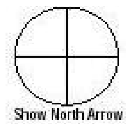
Opposing direction vol., V_o *390*veh/h

Shoulder width ft *5.0*

Lane Width ft *11.0*

Segment Length mi *1.2*

☐ Class I highway ☐ Class II highway ☑ Class III highway



Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.90*

No-passing zone *20%*

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.3*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.997*	*0.997*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*357*	*435*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
		Base free-flow speed[4], BFFS	*55.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*49.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.0 mi/h*	Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*42.4 mi/h*
		Percent free flow speed, PFFS	*85.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.999*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*356*	*433*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*40.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*31.4*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*54.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.21*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1695*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*85.6*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*355.6*
Effective width, Wv (Eq. 15-29) ft	*21.00*
Effective speed factor, S_t (Eq. 15-30)	*3.39*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.44*
Bicycle level of service (Exhibit 15-4)	*B*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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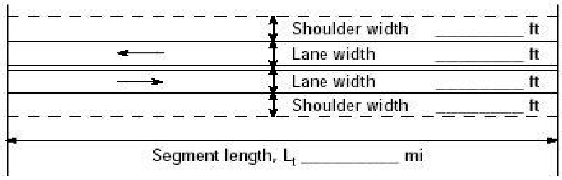
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

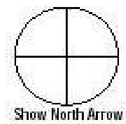
General Information		**Site Information**	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Saxman to Surf (45MPH)-D1*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Future Year 2037*

Project Description: *South Tongass Highway*

Input Data



Analysis direction vol., V_d *181*veh/h
Opposing direction vol., V_o *149*veh/h
Shoulder width ft *5.0*
Lane Width ft *11.0*
Segment Length mi *1.1*



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling
Grade Length mi Up/down
Peak-hour factor, PHF *0.90*
No-passing zone *20%*
% Trucks and Buses , P_T *1 %*
% Recreational vehicles, P_R *0%*
Access points *mi* *30*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.5*	*1.6*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.995*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*202*	*167*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
		Base free-flow speed[4], BFFS	*55.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Total demand flow rate, both directions, v		Adj. for access points[4], f_A (Exhibit 15-8)	*7.5 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*45.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.7 mi/h*	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*42.3 mi/h*
		Percent free flow speed, PFFS	*92.3 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}{}^* f_{g,PTSF})$	*201*	*166*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*21.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*37.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}{}^*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*42.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*A*
Volume to capacity ratio, *v/c*	*0.12*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*92.3*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*201.1*
Effective width, Wv (Eq. 15-29) ft	*21.00*
Effective speed factor, S_t (Eq. 15-30)	*4.42*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.40*
Bicycle level of service (Exhibit 15-4)	*B*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If $v_i(v_d$ or $v_o)$ >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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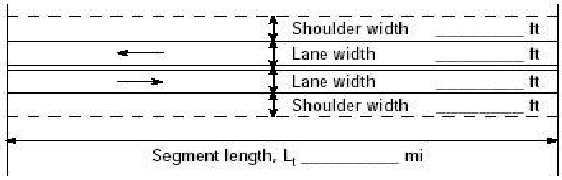
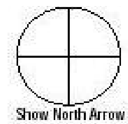
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Saxman to Surf (45MPH)-D2*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Future Year 2037*

Project Description: *South Tongass Highway*

Input Data





☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*149*veh/h
Opposing direction vol., V_o	*181*veh/h
Shoulder width ft	*5.0*
Lane Width ft	*11.0*
Segment Length mi	*1.1*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.90*
No-passing zone	*20%*
% Trucks and Buses , P_T	*1 %*
% Recreational vehicles, P_R	*0%*
Access points *mi*	*30*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.6*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.994*	*0.995*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*167*	*202*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*55.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*7.5 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS ($FSS=BFFS-f_{LS}-f_A$)	*45.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*42.0 mi/h*
		Percent free flow speed, PFFS	*91.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*166*	*201*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*18.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*37.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*35.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.10*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1692*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*91.7*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*165.6*
Effective width, Wv (Eq. 15-29) ft	*25.08*
Effective speed factor, S_t (Eq. 15-30)	*4.42*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.36*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

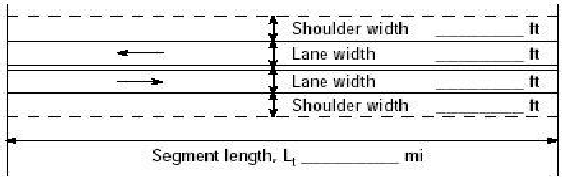
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If $v_i(v_d$ or $v_o)$ >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Saxman to Surf (30MPH)-D1*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Existing 2015*

Project Description: *South Tongass Highway*

Input Data



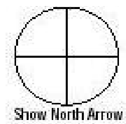
Analysis direction vol., V_d *165*veh/h

Opposing direction vol., V_o *135*veh/h

Shoulder width ft *2.0*

Lane Width ft *12.0*

Segment Length mi *1.1*



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.90*

No-passing zone *20%*

% Trucks and Buses , P_T *1* %

% Recreational vehicles, P_R *0%*

Access points *mi* *30*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.6*	*1.7*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.994*	*0.993*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF* f_{g,ATS} * f_{HV,ATS})$	*184*	*151*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*45.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*7.5 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*34.9 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.5 mi/h*	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*31.8 mi/h*
		Percent free flow speed, PFFS	*91.1 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*184*	*150*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*20.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*39.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.11*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1688*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*91.1*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*183.3*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.42*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.58*
Bicycle level of service (Exhibit 15-4)	*D*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If $v_i(v_d$ or $v_o)$ >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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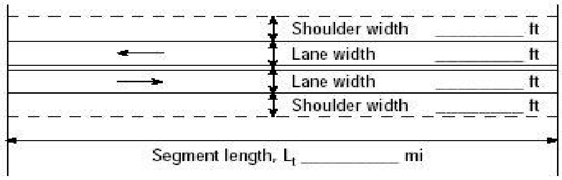
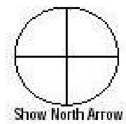
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Saxman to Surf (30MPH)-D2*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Existing 2015*

Project Description: *South Tongass Highway*

Input Data





☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	*0.90*
No-passing zone	*20%*
% Trucks and Buses , P_T	*1* %
% Recreational vehicles, P_R	*0%*
Access points *mi*	*30*/mi
Analysis direction vol., V_d	*135*veh/h
Opposing direction vol., V_o	*165*veh/h
Shoulder width ft	*2.0*
Lane Width ft	*12.0*
Segment Length mi	*1.1*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.7*	*1.6*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.993*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*151*	*184*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*45.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*7.5 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS ($FSS=BFFS-f_{LS}-f_A$)	*34.9 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.8 mi/h*	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*31.5 mi/h*
		Percent free flow speed, PFFS	*90.3 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*150*	*184*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*16.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*35.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*32.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.09*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*90.3*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*150.0*
Effective width, Wv (Eq. 15-29) ft	*18.55*
Effective speed factor, S_t (Eq. 15-30)	*4.42*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.74*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

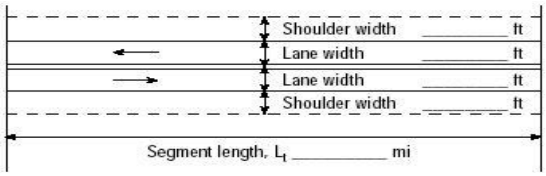
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If $v_i(v_d$ or $v_o)$ >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Saxman to Surf (30MPH)-D1*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Future Year 2037*

Project Description: *South Tongass Highway*

Input Data



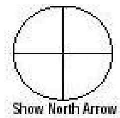
Analysis direction vol., V_d *181*veh/h

Opposing direction vol., V_o *149*veh/h

Shoulder width ft *5.0*

Lane Width ft *11.0*

Segment Length mi *1.1*



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.90*

No-passing zone *20%*

% Trucks and Buses , P_T *1* %

% Recreational vehicles, P_R *0%*

Access points *mi* *30*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.5*	*1.6*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T (E_T -1)+P_R (E_R -1))	*0.995*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*202*	*167*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*45.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Total demand flow rate, both directions, *v*		Adj. for access points[4], f_A (Exhibit 15-8)	*7.5 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*35.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.6 mi/h*	Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*32.3 mi/h*
		Percent free flow speed, PFFS	*90.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*201*	*166*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*21.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*37.2*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*42.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.12*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1690*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*90.2*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*201.1*
Effective width, Wv (Eq. 15-29) ft	*21.00*
Effective speed factor, S_t (Eq. 15-30)	*4.42*
Bicycle level of service score, BLOS (Eq. 15-31)	*2.40*
Bicycle level of service (Exhibit 15-4)	*B*

Notes

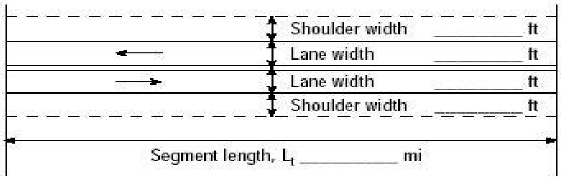
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*HZ*	Highway / Direction of Travel	*South Tongass Highway*
Agency or Company	*HDR, Inc*	From/To	*Saxman to Surf (30MPH)-D2*
Date Performed	*12/2/2015*	Jurisdiction	*Alaska*
Analysis Time Period	*Design Hour*	Analysis Year	*Future Year 2037*

Project Description: *South Tongass Highway*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.90*

No-passing zone *20%*

% Trucks and Buses , P_T *1 %*

% Recreational vehicles, P_R *0%*

Access points *mi* *30*/mi

Analysis direction vol., V_d *149*veh/h

Opposing direction vol., V_o *181*veh/h

Shoulder width ft *5.0*

Lane Width ft *11.0*

Segment Length mi *1.1*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.6*	*1.5*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.994*	*0.995*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*167*	*202*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*45.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.7 mi/h*
Total demand flow rate, both directions, v		Adj. for access points[4], f_A (Exhibit 15-8)	*7.5 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS ($FSS=BFFS-f_{LS}-f_A$)	*35.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*32.0 mi/h*
		Percent free flow speed, PFFS	*89.5 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.999*	*0.999*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*166*	*201*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*18.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*37.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*35.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.10*
Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1692*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1698*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*89.5*

Bicycle Level of Service

Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*165.6*
Effective width, Wv (Eq. 15-29) ft	*25.08*
Effective speed factor, S_t (Eq. 15-30)	*4.42*
Bicycle level of service score, BLOS (Eq. 15-31)	*1.36*
Bicycle level of service (Exhibit 15-4)	*A*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If $v_i(v_d$ or $v_o)$ >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

Appendix E:
Sample Calculations

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Lane-Shoulders & X-Section Analysis Deermount to Saxman Example:

Design Period	20
Current ADT	6020
Design Year ADT	6650
Mid Period ADT	6330
Percent Trucks	7.7%
Average Running Speed	30 MPH
Terrain Values	Use “0” TER1 and “1” TER2

Existing Lanes = 11 feet and Shoulders = 2 feet

Accident Study Period

2003 to 2012
Mid-study Period ADT 5,781

Cross-Section Elements

Roadside Hazard Rating selected as 6, see Figures 1160-1 through 1160-7

$A = 0.0019(ADT)^{0.882} \times 0.879^{W} \times 0.919^{PA} \times .932^{UP} \times 1.236^{H} \times .882^{TER\,1} \times 1.322^{TER\,2}$

$A = 0.0019(5781)^{0.882} \times 0.879^{11} \times 0.919^{2} \times .932^{0} \times 1.236^{6} \times .882^{0} \times 1.322^{1}$

= 3.81 accidents / mi / year

Actual Accident Rate Recorded

Segment Length:	10,500 feet
Analysis Period:	10 years
Accidents (from data):	39 qualifying accidents

= 1.96 accidents / mi / year

Actual rate 1.96 accidents <= Predicted Rate 3.81, no action required

Horizontal Curve Analysis Deermount to Saxman Example:

Accident Study Period

2003 to 2012

Mid-study Period ADT	5,781
Segment Length:	2.0 miles
Analysis Period:	10 years
Total Vehicle Miles =	5781 ADT x 365 days x 10 yrs. x 2.0 mi. = 42.2 mvm

Actual Accident Rate Recorded

Accidents (from data): 39 qualifying accidents
ARs = 39 acc. / 42.2 mvm = 0.92 acc/mvm

Sample Curve data for #11:

PI Station:	81+12
Radius:	450 ft
Curvature (D):	12.7
Length (L):	241 ft (0.046 mi)
Volume (V):	5781 ADT x 365 days x 10 yrs = 21.1 mvm
accidents at curve:	1 accident

$A_h = AR_s (L)(V) + [0.0336 \times D \times V]$ for $L \geq L_c$
= 0.92 x 0.046 x 21.1 + [0.0336 x 12.73 x 21.1] = 9.92 accidents

Actual rate, 1 accident <= Predicted Rate 9.92 accidents, no action required

Vertical Curve Analysis Deermount to Saxman Example:

Accident Study Period

2003 to 2012

Mid-study Period ADT	5,781
Segment Length:	2.0 miles
Analysis Period:	10 years
Total Vehicle Miles:	5781 ADT x 365 days x 10 yrs. x 2.0 mi. = 42.2 mvm
Design speed:	30 mph

Actual Accident Rate Recorded

Accidents (from data): 39 qualifying accidents

ARs = 39 acc. / 42.2 mvm = 0.92 acc/mvm

Sample Curve data for #1:

VPI Station:	10+80			
G1:	0.00 %			
G2:	-2.57 %			
A:	2.57			
Length (L):	128.35 ft (0.024 mi)			
S = ½ (L + 1327/A) =	½ (128.35 + 2158/2.57) =	484 ft	S > L	OK

Table 1160-3, 1160-4 Minor Hazard “0” = Far

Volume (V):	5781 ADT x 365 days x 10 yrs = 21.1 mvm
accidents at curve:	0

$N_c = AR_h(L_{vc})(V) + AR_h(L_r)(V)(F_{ar})$

= 0.92 x 0.024 x 21.1 + [0.92x 0.014 x 21.1 x 0.0] = 0.48 accidents

Actual rate, 0 accident <= Predicted Rate 0.48 accidents, no action required

APPENDIX D

Material Recommendations

December 19, 2019 Project No. 1523742

C. Peter Curtis, PE
HDR Alaska, Inc.
2525 C Street, Suite 305
Anchorage, AK 99503

RE: KETCHIKAN SAXMAN TO SURF STREET PAVEMENT REHABILITATION, PAVEMENT RECOMMENDATIONS MEMORANDUM, STATE PROJECT #67571

Dear Peter:

1.0 INTRODUCTION

Golder Associates Inc. (Golder) is pleased to provide this Pavement Recommendations Memorandum (PRM) to HDR Alaska Inc. (HDR) for the proposed improvements to South Tongass Highway from Saxman to Surf Street in Ketchikan, Alaska. The project begins approximately two miles south of downtown Ketchikan and extends from the City of Saxman to Surf Street (Station (STA) 200+12 to STA 250+00). Reference stationing for the project was provided by HDR on November 22, 2019 in the in the form of the plans in hand set dated October 2, 2019 (ADOT&PF, 2019). South Tongass Highway is located south of Ketchikan along the western coast of Revillagigedo Island. The Tongass Highway is a paved two-lane road and has been designated by Alaska Department of Transportation and Public Facilities (ADOT&PF) as a minor arterial that connects Ketchikan to the communities south of the town.

The ADOT&PF advanced ten test holes along this section of the alignment in 2002 as part of a geotechnical exploration. The test holes were advanced in the road section with depths up to 12.5 feet below ground surface (bgs). In February 2017, Golder performed a supplementary geotechnical exploration in the roadway that consisted of advancing six test holes up to 4.5 feet bgs, and twelve test holes up to 20.5 feet bgs for nearby retaining walls. The results from that exploration were provided to HDR in a Geotechnical Data Report on January 25, 2018. This geotechnical memorandum is supported by the findings presented in the project Geotechnical Data Report (Golder, 2018). The work presented in this report was performed in general accordance with our contracts dated May 24, 2017 and February 6, 2017 with HDR who is preparing the project plans and specifications on behalf of the ADOT&PF.

2.0 SUBSURFACE CONDITIONS

The subsurface conditions along South Tongass Highway from STA 200+12 to STA 250+00 generally consist of 2 to 11 inches of asphalt underlain by 2.8 to 7.5 feet of medium dense to dense granular fill, typically consisting of silty gravel and silty sand. The granular fill was typically overlying various amounts of loose to very loose silty sand, which extended to the bedrock surface. In select test holes, pockets of peat or organic silt were observed in place of the silty sand. Bedrock was encountered at depths ranging from 2.8 to 19 feet bgs. Boulders and cobbles were also observed overlying the bedrock. Groundwater was typically not observed in most of the test holes. However, groundwater was observed at the time of drilling in select test holes at depths ranging from 1.5 to 19 feet bgs. Based on observations made during drilling, it is possible that the observed groundwater was perched. Additional information on subsurface conditions is provided in the Geotechnical Data Report.

3.0 DESIGN CRITERIA

- Construction Year: 2016
- Design Life: 20 years
- AADT (2013): 2,800
- Design AADT (2037): 3,160 (1,736 each lane)
- EALs over Project Life: 956,293

Project design criteria was prepared by ADOT&PF Traffic Section dated May 12, 2016 and is included in Appendix A. As stated in the Alaska Flexible Pavement Design Manual, there is a balance between designed structural sections and economic structural sections. The South Tongass Highway pavement section has been designed with that balance in mind. The traffic loads were weighted for summer traffic level of about 35 percent but otherwise distributed equally. Typical mechanical properties were used for the pavement structural materials, but unfrozen properties were used during the winter due to the mild climate. The South Tongass Highway pavement design section has been developed using the American Association of State Highway and Transportation Officials (AASHTO) 1993 Guide for Design of Pavement Structures. The AASHTO Guide for Design of Pavement Structures methodology is a mechanistic-empirical method used by numerous Departments of Transportation and local entities across the United States for the design of pavement sections. Other design sections were also evaluated including the Alaska Flexible Pavement Design methodology. This methodology is a mechanistic approach and allows for the consideration of weather-related changes in resilient modulus values throughout the year. The sections developed using the AASHTO mechanistic-empirical design approach were selected by the design team, HDR and ADOT&PF, and are presented in Section 5.0. The design calculations are presented in Appendix B.

4.0 PAVEMENT ANALYSIS

Based on observations made during the geotechnical exploration, the existing pavement along South Tongass Highway generally appeared to be in satisfactory condition. Minor distressed pavement was observed in select areas, and mainly consisted of pavement fatigue, cracking, and potholes. However, sections of the highway have likely had numerous pavement overlays, as indicated by the thicker pavement sections with measurements up to 11 inches thick in some areas. Based on the existing data, there does not appear to be a correlation with pavement thickness and underlying subgrades stiffness or location of organic materials.

The materials that constitute the base course and subbase currently underlying the pavement was generally composed of granular fill with a high fines content (material passing the U.S. #200 sieve) ranging from 11 to 21 percent. The subgrade was generally very loose, with peat and organic silt observed in 11 test holes. The increased fines content in the base and subbase material combined with soft subgrade materials can cause poor pavement performance over time.

Our analysis also considered the effects of seasonal frost on the road section. Seasonal frost may penetrate approximately one to two feet below ground surface in the project area. In general, the frost depth is mostly contained within the pavement structural section consisting of lower fines content granular soils. Therefore, the likelihood of large seasonal frost movements in the structural section of the road is considered low. However, some minor frost related movement should be expected seasonally along the roadway, especially in areas where utilities have been trenched in and different backfill materials may be encountered.

5.0 RECOMMENDED PAVEMENT DESIGN SECTION

Along much of the road alignment, loose subgrade materials were typically present below the fill material. In 11 of the test holes advanced, layers of peat and organic soil, typically on the order of two to three feet thick, were observed at depths ranging from two feet to ten feet bgs. Based on observations made during drilling, the existing road section appears to be performing satisfactorily over the loose and organic subgrade. However, it is unknown why some sections of the road have a thicker pavement section. The thicker pavement sections may represent pavement overlays or patching in areas with poor performance in the past.

Since the proposed road surface finished grade is similar to the existing road surface, it is anticipated there will be little change to stress distribution on the subgrade. Therefore, the performance of a new structural section should be similar to the existing roadway. However, the organic material may continue to degrade over time and slowly compress causing settlement resulting in possible surface distress over the life of the roadway. For best long-term performance of the roadway, loose subgrade should be compacted, and unsuitable subgrade material should be removed and replaced with compacted Select Type B or Type C material as defined by the Standard Specification for Highway Construction (SSHC) (ADOT&PF, 2017).

5.1 Typical Road Section

The following road section presented in Table 1 is recommended for the majority of the roadway where a firm and unyielding subgrade can be achieved. The proposed pavement section assumes that the roadway will be designed for proper positive drainage away from the structural section.

Table 1: Proposed Pavement Section for Firm and Unyielding Subgrade

Material	AASHTO Design Thickness (inches)[1]
New Hot Mix Asphalt, Super Pave, Class B	2
Tack Coat: STE-1 Asphalt[2]	--
New Hot Mix Asphalt, Type II, Class B	2
New Asphalt Treated Base (SR Special 306) (New D-1 Base Course)[3]	3 (4)
New Subbase – Select A[4]	6

Material	AASHTO Design Thickness (inches)[1]
New Select B/C[4]	As needed to meet grade

1) Calculated using the 1993 AASHTO Design Guide.
2) Apply tack coat between two-inch lifts of hot mix asphalt
3) Section 2.3 of the Alaska Flexible Pavement Design Manual (2004) suggests that an exception for stabilized base courses can be utilized for cost-effectiveness.
4) ADOT&PF SSHC, Section 703-2.07 Selected Material

As an option, the existing asphalt pavement may be ground and stockpiled for reuse as recycled asphalt pavement (RAP). Two typical methods for reuse of the asphalt include use in stabilized base courses and small percentages incorporated into hot mix asphalt. Care should be taken to evaluate the RAP for appropriateness within the selected pavement section and it should meet standard specifications, as defined in SSHC Section 703-2.16 (ADOT&PF, 2017).

Laboratory testing performed on samples collected from the upper three feet of the test holes suggest that the average fines content was 14 percent, with all the samples exceeding 10 percent (Graph 5.2, in the Geotechnical Data Report). Based on the laboratory testing performed, it is unlikely that the material will meet the specifications for reuse as base course and subbase material. However, these soils may be useable as Select Type C material in deeper fill sections for adjacent embankments, provided that they are compactable and can be moisture conditioned.

5.2 Soft Subgrade Road Section Alternative

In areas with a soft subgrade, a partial overexcavation and replacement with structural fill is recommended. Table 2 identifies areas where loose fills organic soils were encountered. Test holes advanced in these areas indicate that organic soils were encountered under the road surface and adjacent to the road on the shoulder. As discussed previously, there were no obvious indications of pavement distress at locations where organic soils were encountered. Therefore, the extent of the organic or soft subgrade soils along the alignment between test holes is unknown and these materials may be encountered during pavement reconstruction and excavation efforts. For estimating purposes, we have used existing data, field observations, and local terrain to identify areas that may require a thicker pavement structural section.

Table 2: Summary of Areas Where Soft Subgrade Soils May be Encountered

Approximate Starting Station	Approximate Ending Station
201+50	204+75
208+15	208+65
212+90[1]	213+40[1]
219+25	219+75
222+75	223+25

Approximate Starting Station	Approximate Ending Station
229+00	230+50

1) Shallow groundwater observed at nearby test hole

In areas with organic or soft subgrade soils, the thicker pavement structural section presented in Table 3 is recommended. This thicker structural section will help bridge poor performing sections and may be used in lieu of a complete excavation. New Select B/C material should be placed beneath the new subbase (Select A) if additional material is required to meet grade. The proposed pavement section assumes that the roadway will be designed for proper positive drainage away from the structural section.

Table 3: Proposed Pavement Section for Soft or Organic Subgrade

Material	AASHTO Design Thickness (inches)[1]
New Hot Mix Asphalt, Super Pave, Class B	2
Tack Coat: STE-1 Asphalt[2]	--
New Hot Mix Asphalt, Type II, Class B	2
New Asphalt Treated Base (New D-1 Base Course)[3]	3 (6)
New Subbase – Select A[4]	14

1) Calculated using the 1993 AASHTO Design Guide
2) Apply tack coat between two-inch lifts of hot mix asphalt
3) Section 2.3 of the Alaska Flexible Pavement Design Manual (2004) suggests that an exception for stabilized base courses can be utilized for cost-effectiveness
4) ADOT&PF SSHC, Section 703-2.07 Selected Material

5.3 Pedestrian Pathway Section

Pedestrian pathways that experience little to no vehicular traffic can be constructed with a thinner structural section compared to the road sections presented above. The proposed section assumes that the pathway will be designed for proper positive drainage away from the structural section and constructed over compacted granular materials. If the pathway is anticipated to be subjected to frequent vehicle traffic, the proposed structural section presented in Table 4 should not be utilized, and the section should match the structural section utilized for the highway.

Table 4: Proposed Pedestrian Pathway Section

Material	Minimum Thickness (inches)
Hot Mix Asphalt	2
D-1 Base Course	2

Material	Minimum Thickness (inches)
Subbase – Select A[1]	4
Select B/C[1]	As needed to meet grade

1) ADOT&PF SSHC, Section 703-2.07 Selected Material

5.4 Binder Grade

The performance of the pavement is dependent on the selected binder grade for the hot mix asphalt. The binder grade is selected based in part on climatic data, anticipated loading conditions, and target rut depth. The Federal Highway Administration (FHWA) provides an online tool, LTTPBind, which can be used to help select the asphalt binder performance grade (PG) (FHWA, 2019). Based on our LTTPBind Analysis (target rut depth of 5 mm) and conversations with Robert Trousil of ADOT&PF, we recommend that the following performance-grade asphalt binder be used for the hot mix asphalt: PG 52-28.

5.5 Hard Aggregate

The ADOT&PF, through the 2013 Hard Aggregate Policy, requires the use of hard aggregate when the AADT per lane is greater than 5,000 and recommends its use when the roadway is known to experience pavement rutting due to studded tire wear (Rice, 2013). The AADT per lane along the South Tongass Highway between the city of Saxman and Surf Street is less than 5,000; and the highway does not appear to have a history of significant rutting due to studded tire wear. However, the use of hard aggregate will be used along this alignment to provide pavement surface course continuity throughout the North and South Tongass Highway Corridor.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Site Preparation

Site preparation includes removal of the existing pavement and excavation of the underlying soils to design elevations, scarifying the subgrade and proof compacting. The in-place material should be scarified, moisture conditioned, and compacted using vibratory compaction equipment as outlined in the ADOT&PF SSHC manual. If soft or yielding material is encountered during the proof compacting, the material should be over-excavated to the minimum depth outlined in Table 3, replaced with structural fill and compacted. In all overexcavated areas, a separation geosynthetic such as Mirafi 180N should be placed below structural fill. Placement and compaction should follow the guidelines outlined in the ADOT&PF SSHC manual.

6.2 Asphalt Pavement

Hot mix asphalt should be placed in two-inch lifts to ensure that adequate compaction of the surface and wearing courses can be achieved. In addition, a tack coat should be placed between each lift of hot mix asphalt to adhere the upper lift to the lower lift.

6.3 Excavations Around Existing Utilities

Road rehabilitation in select areas of the alignment may require excavations near or around existing buried utilities. Based on the limited utility as-built records available, it appears that in most cases the water and sewer utilities are installed deeper than the proposed road reconstruction efforts. The satisfactory performance of piped utilities is highly dependent upon the quality of soil under and along the sides of the pipe. Consequently, bedding around the utilities should conform to the requirements of the governing utility and the procedures outlined in the current ADOT&PF SSHC manual.

6.4 Groundwater Control

Based on the findings from the geotechnical exploration, it is possible that groundwater may be encountered in excavations along portions of the alignment. To facilitate excavation and backfill operations, it is recommended to perform the excavation with provisions for a sump to collect any water that accumulates in the excavation and provide for a dewatering pump to remove it. Appropriate water discharge best management practices meeting the project Storm Water Pollution Prevention Plan should be used.

7.0 USE OF THIS MEMORANDUM

This PRM has been prepared for the use by HDR and ADOT&PF for proposed improvements to South Tongass Highway from Saxman to Surf Street in Ketchikan, Alaska. If there are significant changes in nature, design, or location of these activities, we should be notified so that we may review our conclusions and recommendations in light of the proposed changes and provide written modification or verification of the changes. This evaluation presented herein followed the standard of care expected of professionals undertaking similar work in the State of Alaska under similar conditions. No warranty expressed or implied is made.

8.0 CLOSING

It has been a pleasure to assist you with this interesting project. As the project proceeds, please feel free to contact us with any questions or concerns. We look forward to our continued involvement with ADOT&PF on this and future projects.

Golder Associates Inc.

Alyson Mathers, EIT
Staff Engineer

John Thornley, PE
Associate and Senior Geotechnical Engineer

AMM/JDT

Attachments: Appendix A – Project Design Criteria
Appendix B – Design Calculations

References

ADOT&PF, 2004, Alaska Flexible Pavement Design Manual, Alaska Department of Transportation and Public Facilities.

ADOT&PF, 2017, Standard Specification for Highway Construction, Alaska Department of Transportation and Public Facilities.

ADOT&PF (Alaska Department of Transportation and Public Facilities). 2019. South Tongass Highway Improvements. Deermount Street to Saxman; Saxman to Surf Street. Project No. NH-0902(039)/Z67685000; NH-0902(031)/Z675710000. Plans in Hand Set, dated October 2, 2019. Anchorage, AK.

Golder Associates, Inc. (Golder), 2018, Geotechnical Data Report, Ketchikan South Tongass – Saxman to Surf St. Pavement Rehabilitation, ADOT&PF Project Number: 67571.

Rice, K., 2013, Hard Aggregate Usage Policy, Memorandum, Alaska Department of Transportation and Public Facilities.

APPENDIX A

Project Design Criteria

DESIGN DESIGNATION

State Route Number: *291400* Route Name: *South Tongass*

Project Limits: *South Tongass: Saxman to Surf Street*

State Project Number: *67571* Federal Number: *MGS-0902(31)*

Project Description: *Reconstruct South Tongass form Saxman to Surf Street*

Functional Classification:* *Minor Arterial*

*A functional reclassification may be requested from the FHWA - see Section 11-00.04.01, page 11-00(2)

Urban Class (1,2, or 3, - See Highway Capacity Manual, Chapt 11): *n/a*

Project Type (New Construction/Reconstruction, Rehabilitation (3R), or Other): *3R*

Project Design Life (usually 5, 10, or 20 years): *20*

	Last Year with Traffic Data	**Year After Construction**	**Mid-Life Year**	**Future Year**
	2013	*2017*	*2027*	*2037*
ADT**	*2800*	*2860*	*3000*	*3160*
DHV	*300*	*300*	*320*	*330*
Peak Hour Factor	*0.9*	*0.9*	*0.9*	*0.9*
Directional Distribution	*55/45*	*0/100*	*0/100*	*0/100*
Percent Commercial Trucks	*7.7%*	*7.7%*	*7.7%*	*7.7%*
Compound Growth Rate		*0.50%*	*0.50%*	*0.50%*
Pedestrians (Number/Day)	*No Data*	*No Data*	*No Data*	*No Data*
Bicyclists (Number/Day)	*No Data*	*No Data*	*No Data*	*No Data*

** If urban then ADT is not required. Intersection diagrams shall be attached as part of this document

Design Vehicles for turning: *WB-50*

Design Vehicle Loading (HS 15, HS20, or HS25): *HS 25*

Equivalent Axle Loads: *950,000*

Concurrence: [signature] Date: 5/12/16
Regional Traffic Engineer

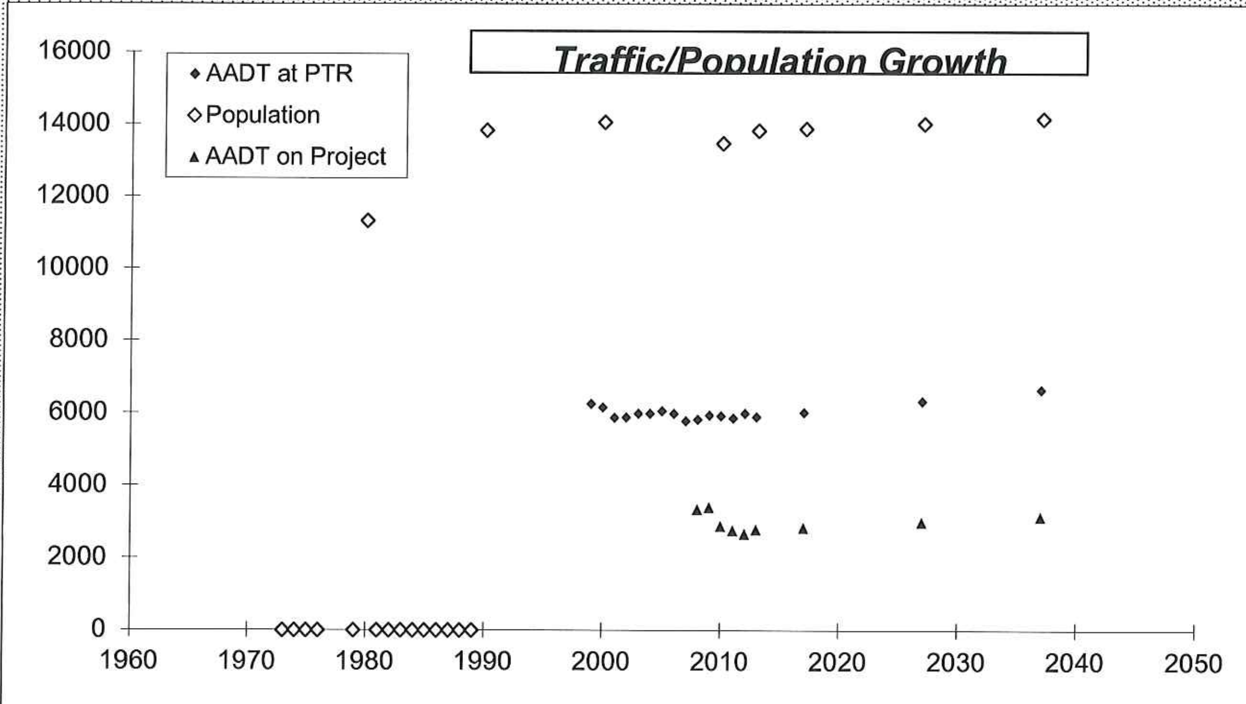
Concurrence: [signature] for Andy Hughes Date: 5/12/16
Planning

Approval [signature] Date: 5/12/16
Preconstruction Engineer
FOR PAT CARROLL

Alaska DOT/PF, Southcoast Region

Traffic Projections

Project Name:	*South Tongass: Saxman to Surf Street*	Project Design Life:	*20*
State Project Number:	*67571*	**DHV/AADT (from PTR)**	*10.6%*
Community:	*Ketchikan*	PTR Location:	*South Tongass*
Year of Construction:	*2016*	Compiled By:	*Ryan Siverly*



Historical Population and Traffic Growth Rates (Compounded)	**Area Population**			**Average Annual Daily Traffic**			
	From	**To**		**From**	**To**	**at PTR**	**on Project**
	1970	1980	#N/A	2003	2013	N/A	#DIV/0!
	1980	1990	2.0%	2008	2013	0.2%	-3.6%
	1990	2000	0.2%	2010	2013	-0.1%	-1.1%
	2000	2010	-0.4%	2011	2013	0.4%	0.4%
	2010	2013	0.9%	2012	2013	-1.5%	4.2%

Projected Future Population and Traffic Volumes			**Area Population**	**AADT at PTR**	**AADT on Project**	**DHV on Project**
	Projected Compound Growth Rate		**0.1%**	**0.5%**	**0.5%**	
	Last Year with Pop. Data	2013	13828			
	Last Yr with Traffic Data	2013		5904	2801	**297**
	Year after Construction	2017	13883	6023	2857	**303**
	Mid Project Life	2027	14023	6331	3004	**318**
	End of Project Life	2037	14164	6655	3157	**335**

Comments/Rationale for projected growth rate

State of Alaska

Department of Transportation and Public Facilities

Southcoast Region Traffic and Safety Section

Equivalent Axle Load Computations

Data from Page One			
Project Name: **South Tongass: Saxman to Surf Street**		One way AADT - Last yr w Traffic Data	*1,541*
State Project Number:	*67571*	One way AADT - 1st yr after construction	*1,572*
Community:	*Ketchikan*	One way AADT - Design Year	*1,736*
Year of Construction:	*2016*	Compound Growth Rate: present-Design Yr	*0.50%*
Project Design Life:	*20*	Compiled By:	*Ryan Siverly*

Input Data	
No of lanes in one direction:	1

Computed Data	
% of heavy vehicles (class 4-13) in design lane	1.00

% of heavy vehicles in the Design Lane	
No of lanes in one direction	% of heavy vehicles in Design Lane
1	100%
2	90%
3	80%

Equivalent Axle Loads by Class							
	Input	**Given**	**Computed**				
			Annual no of vehicles in design lane by class		**Annual EALs**		**EALs over project life**
Class	**% of Mix**	**Load Factor**	**Yr after Constr**	**Design Yr**	**Yr after Constr**	**Design Yr**	
1	0.47%		2673	2954			
2	72.05%	0.005	413301	456655	2067	2283	43,353
3	19.84%	0.005	113797	125734	569	629	11,937
LV Totals:	**92.35%**		**529,772**	**585,342**	**2,635**	**2,912**	**55,290**
4	1.86%	1.000	10670	11789	10670	11789	223,838
5	2.40%	0.500	13738	15180	6869	7590	144,110
6	1.18%	0.850	6769	7479	5754	6357	120,704
7	0.01%	1.200	75	82	89	99	1,877
8	0.10%	1.200	579	640	695	768	14,586
9	2.03%	1.550	11628	12847	18023	19913	378,099
10	0.03%	2.240	149	165	334	369	7,009
11	0.03%	1.550	149	165	231	255	4,850
12	0.00%	2.240	23	25	51	57	1,078
13	0.02%	2.240	103	114	231	256	4,852
Log Trucks		3.940					
HV Totals:	**7.65%**		**43,883**	**48,486**	**42,948**	**47,453**	**901,003**
Totals:	**100.00%**		**573,654**	**633,828**	**45,583**	**50,365**	***956,293***

Sources:	
Procedure:	4/12 and 4/17/91 memos from Eric Johnson
Load Factors:	1/8/92 memo from Eric Johnson

APPENDIX B

Design Calculations

South Tongass Highway Upgrades
Design by B. Savikko
Date 3/21/2018

Flexible Pavement Design following AASHTO 1993 Guide for Design of Pavement Structures

Data from ADOT&PF:

Design Life	20	years	
Design ESAL	950,000	18-kip ESALs	

Assumptions:

		Reference
Traffic Growth Rate	0.5%	per year
Reliability	90%	AASHTO Guide for Design of Pavement Structures, Section 4.1.1, Page II-69
Standard Dev.	0.49	"Pavement Analysis and Design", Page 508
Initial Serviceability Index (Po)	4.2	"Pavement Analysis and Design", Page 509
Terminal Serviceability Index (Pt)	2	"Pavement Analysis and Design", Page 509
Design Serviceability Loss, ΔPSI (Po-Pt)	2.2	

Analysis Assumptions:

Assumed Soil Profile

Soil Profile	Depths
Asphalt	D1
D1 Base Course	D2
Select Fill Type A	D3
In-situ Subgrade	

D1	Asphalt Assumptions			Reference
		Resilient Modulus (M_R), (ksi)	450	AASHTO Guide for Design of Pavement Structures, Figure 2.5, Page II-18. Verified with "ADOT Alaska Flexible Pavement Design Manual", Table 5-1, page 5-1
		Structural Coefficient, a_1	0.44	AASHTO Guide for Design of Pavement Structures, Figure 2.5, Page II-18.
		Structural Number (SN_1)	1.8	AASHTO Guide for Design of Pavement Structures, Figure 3.1, Page II-32, using M_R for layer below
D2	D1 Base Course Assumptions			
		Resilient Modulus (M_R), (ksi)	40	"ADOT Alaska Flexible Pavement Design Manual", Table 5-1, page 5-1
		Layer Coefficient, a_2	0.18	"Pavement Analysis and Design", Figure 7.15, Page 296
		Drainage Coefficient, m_2	0.8	"Pavement Analysis and Design", Table 11.20, Page 518
		Structural Number (SN2)	2.2	"Pavement Analysis and Design", Figure 11-25, Page 513 using M_R for layer below
D3	Select Fill Type A			
		Resilient Modulus (M_R), (ksi)	25	"ADOT Alaska Flexible Pavement Design Manual", Table 5-1, page 5-1
		Layer Coefficient, a_3	0.16	"Pavement Analysis and Design", Figure 7.15, Page 296
		Drainage Coefficient, m_3	0.8	"Pavement Analysis and Design", Table 11.20, Page 518
		Structural Number (SN_3) for very loose in-situ subbase	3	"Pavement Analysis and Design", Figure 11-25, Page 513 using M_R for layer below
	In-situ Subgrade (medium dense) Assumptions			
		Resilient Modulus (M_R), (ksi)	10	

Analysis:

Assuming a medium dense subgrade

D1	4.1	inches	"Pavement Analysis and Design", Page 519
D2	2.8	inches	"Pavement Analysis and Design", Page 519
D3	6.3	inches	"Pavement Analysis and Design", Page 520
Total	13.1	inches	
	1.1	feet	

Analysis:

Assuming a medium dense subgrade with 4 inches of D1 Base Course

D1	4.0	inches	"Pavement Analysis and Design", Page 519
D2	4.0	inches	"Pavement Analysis and Design", Page 519
D3	5.2	inches	"Pavement Analysis and Design", Page 520
Total	13.2	inches	
	1.1	feet	

Design Section

D1	4.0	inches
D2	4.0	inches
D3	6.0	inches
Total	14.0	inches
	1.2	feet

December 20, 2019 Project No. 1523742

C. Peter Curtis, PE
HDR Alaska Inc.
2525 C Street, Suite 305
Anchorage, AK 99503

KETCHIKAN DEERMOUNT STREET TO SAXMAN PAVEMENT REHABILITATION – SOUTH TONGASS, PAVEMENT RECOMMENDATIONS MEMORANDUM, STATE PROJECT #67685

Dear Peter:

1.0 INTRODUCTION

Golder Associates Inc. (Golder) is pleased to provide this Pavement Recommendations Memorandum (PRM) to HDR Alaska Inc. (HDR) for the proposed improvements to South Tongass Highway from Deermount Street to Saxman in Ketchikan, Alaska. The project begins at approximately 300 feet northwest of the intersection of Deermount Street and Stedman Street (Station (STA) 12+53) and extends approximately 2 miles east to the City of Saxman (STA 116+09). Reference stationing for the project was provided by HDR on November 22, 2019 in the plans in hand set dated October 2, 2019. South Tongass Highway is located south of Ketchikan along the western coast of Revillagigedo Island. The Tongass Highway is a paved two-lane road and has been designated by Alaska Department of Transportation and Public Facilities (ADOT&PF) as a minor arterial that connects Ketchikan to the communities south of the town.

The ADOT&PF advanced nineteen test holes along this section of the alignment in December 2002 as part of a geotechnical exploration program for the widening and reconstruction of the road. The test holes were advanced in the road section with depths up to 19.5 feet below ground surface (bgs). In March 2017, Golder performed a supplementary geotechnical exploration in the roadway that consisted of advancing a total of seventy-five test holes along the alignment. These test holes were divided into two series identified as CL-series (advanced within the road section), and RW-series (advanced at locations were existing or proposed retaining walls were identified). Eighteen CL-series test holes were completed to a maximum depth of 7.3 feet bgs, while fifty-seven RW-series test holes were completed depths up to 30.5 feet bgs.

General soil stratigraphy as well as laboratory test results from Golder's exploration were provided to HDR in a Geotechnical Data Report (GDR) dated April 18, 2018. This pavement recommendations memorandum is supported by the findings presented in the project Geotechnical Data Report (Golder 2018). The work presented herein was performed in general accordance with our contracts dated October 29, 2018 with HDR who is preparing the project plans and specifications on behalf of the ADOT&PF.

Golder Associates Inc.
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2.0 SUBSURFACE CONDITIONS

The subsurface conditions along South Tongass Highway from STA 12+53 to STA 116+09 generally consist of 2 to 11 inches of asphalt pavement underlain by fill materials consisting mainly of a mixture of medium dense to dense, fine to coarse grained sand and gravel with varying amounts of silt. Thickness of the fill varies along the length of the alignment from approximately 1 to 20.5 feet. Between STA 12+70 and 48+50 Portland cement concrete (PCC) was directly encountered below the asphalt pavement in several test holes. It is not clear whether the PCC is continuous across the width of the roadway and whether it is in good condition. PCC has often been used to patch utility trenches in southeast Alaska. Along this section of roadway there are numerous buried utilities, which may have been patched using PCC.

The granular fill below the pavement was typically overlying various amounts of loose silty sand and silty gravel, which extended to the bedrock surface in most of the test holes. Pockets of peat or organic silt were observed underlying the native silty sands and gravels in some locations (TH-064, TH-066, TH-067, TH-076, TH-078, TH-079, TH-081). Similarly, cobbles and boulders were observed in some of the test holes underlying the native materials and overlying bedrock. Bedrock was encountered at shallow depths ranging from 2.2 to 22 feet bgs. Groundwater was not observed in most of the test holes; however, groundwater was observed at the time of drilling in thirteen test holes at depths ranging from 2 to 20 feet bgs. Based on observations made during drilling, it is possible that the observed groundwater was perched. Additional Information on subsurface conditions is provided in the Geotechnical Data Report (Golder, 2018).

3.0 DESIGN CRITERIA

- Construction Year: 2016
- Design Life: 20 Years
- AADT (2013): 5900
- Design AADT (2037): 6650 (3,660 per lane)
- EALs over Project Life: 2,050,000

Project design criteria was prepared by ADOT&PF Traffic Section dated May 12, 2016 and is summarized below and included in Appendix A. As stated in the Alaska Flexible Pavement Design Manual, there is a balance between designed structural sections and economic structural sections. The South Tongass Highway pavement section has been designed with that balance in mind. The traffic loads were weighted for summer traffic level of about 41 percent, spring traffic of about 25 percent, and fall and winter traffic of 17 percent. Typical mechanical properties were used for the pavement structural materials, but unfrozen properties were used during the winter due to the mild climate.

The South Tongass Highway pavement design section was developed using the American Association of State Highway and Transportation Officials (AASHTO) 1993 Guide for Design of Pavement Structures. The AASHTO Guide for Design of Pavement Structures methodology is a mechanistic-empirical method used by numerous Departments of Transportation and local entities across the United States for the design of pavement sections. Other design sections were also evaluated using the Alaska Flexible Pavement Design. This methodology is a mechanistic approach and allows for the consideration of weather-related changes in resilient modulus values throughout the year. The sections developed using the AASHTO mechanistic-empirical design approach were selected by the design team, HDR and ADOT&PF, and are presented in Section 5.0. The design calculations are presented in Appendix B.

4.0 PAVEMENT ANALYSIS

Based on observations made during the geotechnical exploration, the existing pavement along South Tongass Highway generally appeared to be in adequate condition. Minor distressed pavement was observed in select areas and mainly consisted of pavement fatigue cracking within the wheel paths and potholes. However, sections of the highway have likely had numerous pavement overlays, as indicated by thicker pavement sections with measurements up to 11 inches thick in some areas. Based on the existing data, there does not appear to be a correlation with pavement thickness and underlying subgrade stiffness or location of organic materials.

The materials that constitute the base course and subbase currently underlying the pavement were generally composed of granular fill with a high fines content (material passing the U.S. #200 sieve) ranging from approximately 7.5 to 18 percent. The subgrade was generally very loose, with peat and organic silt observed in 7 test holes. The high fines content in the base and subbase material combined with soft subgrade material can cause poor pavement performance over time.

Golder's analysis also considered the effects of seasonal frost on the road section. Seasonal frost may penetrate approximately one to two feet below ground surface in the project area. In general, the frost depth is mostly contained within the pavement structural section consisting of lower fines content granular soils. Therefore, the likelihood of large seasonal frost movements in the structural section of the road is considered low. However, some minor frost related movement should be expected seasonally along the roadway, especially in areas where utilities have been trenched in and may consist of different backfill materials.

5.0 RECOMMENDED PAVEMENT DESIGN SECTION

Along much of the road alignment, loose subgrade materials were typically present below the fill material. In seven of the test holes advanced, one to 8.5-foot thick layers of peat and organic soil were observed at depths between three and 11.5 feet bgs. Based on observations made during drilling, the existing road section appears to be performing satisfactorily over the loose and organic subgrade; however, it is unknown why some sections of the road have a thicker pavement section. The thicker pavement sections may represent pavement overlays or patching in areas with poor performance in the past. Construction issues related to the PCC encountered below the existing asphalt pavement are discussed in Section 6.1.

Since the proposed road surface finished grade is similar to the existing road surface, it is anticipated there will be little change to stress distribution on the subgrade. Therefore, the performance of a new structural section should be similar to the existing roadway. However, the organic material may continue to degrade over time and slowly creep causing settlement resulting in possible surface distress over the life of the roadway. For best long-term performance of the roadway, loose subgrade should be compacted, and unsuitable subgrade material should be removed and replaced with compacted Selected Material Type B or Type C as defined by the Standard Specification for Highway Construction (SSHC) (ADOT&PF, 2017).

5.1 Typical Road Section

The following road section presented in Table 1 is recommended for the majority of the roadway where a firm and unyielding subgrade can be achieved. The recommended compacted asphalt lift thickness is two inches. The proposed pavement section assumes that the roadway will be designed for proper positive drainage away from the structural section.

Table 1: Proposed Pavement Section Options-Firm and Unyielding Subgrade

Material	AASHTO Design Thickness (inches)[1]
New Hot Mix Asphalt, Super Pave, Class B	2
Tack Coat: STE-1 Asphalt[2]	--
New Hot Mix Asphalt, Type II, Class B	2
New Asphalt Treated Base (SR Special 306) (New D-1 Base Course)[3]	3 (4)
New Subbase – Select A[4]	7.5 (use 8 for constructability)
New Select B/C[4]	As needed to meet grade

1. Calculated using the 1993 AASHTO Design Guide.
2. Apply tack coat between two-inch lifts of hot mix asphalt
3. Section 2.3 of the Alaska Flexible Pavement Design Manual (2004) suggests that an exception for stabilized base courses may be utilized for cost-effectiveness.
4. ADOT&PF SSHC, Section 703-2.07 Selected Material

As an option, the existing asphalt pavement may be ground and stockpiled for reuse as recycled asphalt pavement (RAP). Two typical methods for reuse of the asphalt include use in stabilized base courses and small percentages incorporated into hot mix asphalt. Care should be taken to evaluate the RAP for appropriateness within the selected pavement section and it should meet standard specifications, as defined the SSHC Section 703-2.16 (ADOT&PF, 2017).

Laboratory testing performed on samples collected from the upper three feet of the test holes suggest that the average fines content was 11.7 percent, with all the samples exceeding 4.5 percent as presented on Graph 5.2 of the Geotechnical Data Report (Golder, 2018). Based on the laboratory testing, it is unlikely that the material will meet the specifications for reuse as base course and subbase material. However, these soils may be useable as Select Type C material in deeper fill sections, provided that they are compactable and can be moisture conditioned.

5.2 Soft Subgrade Road Section Alternative

In areas with a soft subgrade, a partial overexcavation and replacement with structural fill is recommended. Table 2 identifies areas where loose fill and organic soils were encountered. Test holes advanced in these areas indicate that organic soils were encountered under the road surface and adjacent to the road on the shoulder. As discussed previously, there were no obvious indications of pavement distress at locations where organic soils were encountered. Therefore, the extent of the organic or soft subgrade soils along the alignment between test holes is unknown; and these materials may be encountered during pavement reconstruction and excavation efforts. For estimating purposes, we have used existing data, field observations, and local terrain to identify areas that may require a thicker pavement structural section.

Table 2: Summary of Areas Where Soft Subgrade Soils May Be Encountered

Approximate Starting Station	Approximate Ending Station
24+90	25+40
35+00	35+50
39+90	40+40
47+75	48+25
51+30	51+70
95+25	96+50
99+60	100+20
109+50	110+00

In areas with organic or soft subgrade soils, the thicker road structural section presented in Table 3 is recommended. This thicker structural section will help bridge poor performing sections and may be used in lieu of a complete excavation. New Select B/C material should be placed beneath the new subbase (Select A) if additional material is required to meet grade. The proposed pavement section assumes that the roadway will be designed for proper positive drainage away from the structural section.

Table 3: Proposed Pavement Section Options-Soft or Organic Subgrade

Material	AASHTO Design Thickness (inches)[1]
New Hot Mix Asphalt, Super Pave, Class B	2
Tack Coat: STE-1 Asphalt[2]	--
New Hot Mix Asphalt, Type II, Class B	2
New Asphalt Treated Base (New D-1 Base Course)[3]	3 (6)
New Subbase – Select A[4]	17.5 (use 18 for constructability)

1. Calculated using the 1993 AASHTO Design Guide.
2. Apply tack coat between two-inch lifts of hot mix asphalt
3. Section 2.3 of the Alaska Flexible Pavement Design Manual (2004) suggests that an exception for stabilized base courses can be utilized for cost-effectiveness.
4. ADOT&PF SSHC, Section 703-2.07 Selected Material

5.3 Pedestrian Pathway Section

Pedestrian pathways that experience little to no vehicular traffic can be constructed with a thinner structural section compared to the road sections presented above. The proposed section assumes that the pathway will be designed for proper positive drainage away from the structural section and constructed over compacted granular materials. If the pathway is anticipated to be subjected to frequent vehicle traffic, the proposed structural section presented in Table 4 should not be utilized, and the section should match the structural section utilized for the highway.

Table 4: Proposed Pedestrian Pathway Section

Material	Minimum Thickness (inches)
Hot Mix Asphalt	2
D-1 Base Course	2
Subbase – Select A[1]	4
Select B/C[1]	As needed to meet grade

1. ADOT&PF SSHC, Section 703-2.07 Selected Material

5.4 Binder Grade

The performance of the pavement is dependent on the selected binder grade for the hot mix ashalt. The binder grade is selected based in part on climatic data, anticipated loading conditions, and target ruts depths. The Federal Highway Administration (FHWA) provides an online tool called LTTPBind which can be used to help select the asphalt binder performance grade (PG) (FHWA, 2019). Based on our LTTPBind Analysis (target rut depth of 5 mm) and conversations with Robert Trousil of ADOT&PF, we recommend that the following performance-grade asphalt binder be used for the hot mix asphalt: PG 52-28.

5.5 Hard Aggregate

The ADOT&PF, through the 2013 Hard Aggregate Policy, requires the use of hard aggregate when the AADT per lane is greater than 5,000 and recommends its use when the roadway is known to experience pavement rutting due to studded tire wear (Rice, 2013). The AADT per lane along the South Tongass Highway between the Deermount Street and the city of Saxman is less than 5,000; and the highway does not appear to have a history of significant rutting due to studded tire wear. However, the use of hard aggregate will be used along this alignment to provide pavement surface course continuity throughout the North and South Tongass Highway Corridor.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Site Preparation

Site preparation includes removal of the existing pavement and excavation of the underlying soils to design elevations, scarifying the subgrade and proof compacting. The in-place material should be scarified, moisture conditioned, and compacted using vibratory compaction equipment as outlined in the SSHC manual (ADOT&PF 2017). If soft or yielding material is encountered during the proof compacting, the material should be over-excavated to the minimum depth outlined in Table 3, replaced with structural fill and compacted. In all overexcavated areas, a separation geosynthetic such as Mirafi 180N should be placed below structural fill. Placement and compaction should follow the guidelines outlined in the ADOT&PF SSHC manual.

As discussed previously, PCC was encountered below the asphalt in eight of the test holes advanced, primarily at the north end of the alignment. The PCC was encountered directly beneath the asphalt (0.2 to 0.5 feet bgs) in seven of the test holes advanced (TH-083, CL-4, CL-7, TH-081, CL-8, CL-9, CL-13). It was also present in test hole RW-02 at 4 feet bgs (possibly a dead man anchor for the adjacent sheet pile wall). The condition and extent of the existing PCC is unknown. The contractor should be made aware of the potential for PCC to be encountered if milling of the existing roadway is used, as this could damage milling equipment. Provided the PCC is related to trench patching or historic pavement the concrete should be removed and replaced with compacted structural fill.

6.2 Asphalt Pavement

Hot mix asphalt should be placed in two-inch lifts to ensure that adequate compaction of the surface and wearing courses can be achieved. In addition, a tack coat should be placed between each lift of hot mix asphalt to adhere the upper lift to the lower lift.

6.3 Excavations Around Existing Utilities

Road rehabilitation in select areas of the alignment may require excavations near or around existing buried utilities. Based on the limited utility as-built records available, it appears that in most cases the water and sewer utilities are installed deeper than the proposed road reconstruction efforts. The satisfactory performance of piped utilities is highly dependent upon the quality of soil under and along the sides of the pipe. Consequently, if the soils near or around existing buried utilities are excavated, the placed bedding around the utilities should conform to the requirements of the governing utility and the procedures outlined in the current ADOT&PF SSHC manual.

6.4 Groundwater Control

Based on the findings from the geotechnical exploration, it is possible that groundwater may be encountered in excavations along portions of the alignment. To facilitate excavation and backfill operations, it is recommended to perform the excavation with provisions for a sump to collect any water that accumulates in the excavation and provide for a dewatering pump to remove it. Appropriate water discharge best management practices meeting the project Storm Water Pollution Prevention Plan should be used.

7.0 USE OF THIS MEMORANDUM

This PRM has been prepared for the use by HDR and ADOT&PF for proposed improvements to South Tongass Highway from Deermount Street to Saxman in Ketchikan, Alaska. If there are significant changes in nature, design or location of these activities, we should be notified so that we may review our conclusions and recommendations in light of the proposed changes and provide written modification or verification of the changes. This evaluation presented herein followed the standard of care expected of professionals undertaking similar work in the State of Alaska under similar conditions. No warranty expressed or implied is made.

8.0 CLOSING

It has been a pleasure to assist you with this interesting project. As the project proceeds, please feel free to contact us with any questions or concerns. We look forward to our continued involvement with HDR and ADOT&PF on this and future projects.

Golder Associates Inc.

Alyson Mathers, EIT
Staff Engineer

John Thornley, PE
Associate and Senior Geotechnical Engineer

AMM/JDT

Appendices: Appendix A – Project Design Criteria
Appendix B – Design Calculations

References

ADOT&PF, 2004, Alaska Flexible Pavement Design Manual, Alaska Department of Transportation and Public Facilities.

ADOT&PF, 2017, Standard Specification for Highway Construction, Alaska Department of Transportation and Public Facilities.

Golder Associates, Inc. (Golder), 2018, Geotechnical Data Report, Ketchikan South Tongass – Deermount St. to Saxman Pavement Rehabilitation, ADOT&PF Project Number: 67685.

Rice, K., 2013, Hard Aggregate Usage Policy, Memorandum, Alaska Department of Transportation and Public Facilities.

APPENDIX A

Project Design Criteria

APPENDIX B

Design Calculations

APPENDIX E

Approved Environmental Document

State of Alaska
Department of Transportation & Public Facilities

CATEGORICAL EXCLUSION DOCUMENTATION FORM FOR FEDERAL HIGHWAY ADMINISTRATION PROJECTS

Project Name: S. Tongass Highway Deermount to Saxman Widening and Saxman to Surf Street Pavement Rehabilitation

Project Number (state/federal): Deermount to Saxman – 67685, Saxman to Surf Street – 67571 / Deermount to Saxman MGS-0902(31), Saxman to Surf STP-0902(039)

Date: August 9, 2017

CE Designation: 23 CFR 771.117(d)(13)

List of Attachments:

Figure 1 : Project Area
Attachment A: Environmental Justice Analysis Report
Attachment B: Section 106 Documentation
Attachment C: Wetland and Waterbody Delineation and Aquatic Site Assessment
Attachment D: Essential Fish Habitat Assessment and Coordination with NMFS
Attachment E: Bald Eagle Consultation Documentation
Attachment F: Phase I Environmental Site Assessment Reports
Attachment G: Hydrologic and Hydraulic Report
Attachment H: Section 4(f)/6(f) Documentation
Attachment I: Public and Agency Involvement

I. Project Purpose and Need

Background The South Tongass Highway is

- an undivided, two-lane roadway with many private driveways, limited shoulders, and an adjacent multi-use pathway along most sections, and
- is the only highway on Revillagigedo Island that provides travel connections between the City of Ketchikan and the communities to the south, including the City of Saxman. The South Tongass Highway rehabilitation project starts at the Deermount Street intersection at milepost (MP) 2.6 and ends at MP 5.5, approximately at Surf Street (see Figure 1).

Need DOT&PF has identified the need to resurface, restore, and rehabilitate this portion of the South Tongass Highway and related non-motorized facilities to improve the safe movement of vehicle, bicycle, and pedestrian traffic. Rock slopes along the highway are over-steep and show signs of raveling. Similar conditions have contributed to recent rock slides on other sections of the South Tongass Highway.

In some highway sections sight distance is less than desired and pavement is in need of restoration along the entire length of the project.

The existing multi-purpose path is discontinous south of Saxman. In some areas, the embankments and retaining walls along the existing pathway show varying degrees of distress and failure. These need to be restored for improved structural integrity and safety for path users.

Purpose

The goal of the South Tongass Highway Rehabilitation project is

- to improve operations along South Tongass Highway between Deermount Street and Surf Street in the Ketchikan Gateway Borough (Borough)
- restore structural integrity of the multi-purpose path, and
- construct a portion of new path to make the multi-purpose path continous

II. Project Description

The South Tongass Highway Rehabilitation project would widen the highway to current design standards, reconstruct the multi-use pathway, extend the pathway through Saxman, improve drainage (including new inlets, storm drains, ditches, and culverts), and relocate utilities. Rock cuts may be needed to widen the road in some locations. Bus stop turnouts and shelters would be constructed at locations determined in coordination with the Borough Transit Manager and the City of Saxman.

Exact improvements have not been determined, but the project would include the following components, as necessary:

- Modification of horizontal and vertical alignment where warranted and cost effective to improve safety;
- Rock excavation to accommodate realignment and widening;
- Excavation and reconstruction of the existing embankment at select locations;
- Construction of mechanically stabilized earth walls or other wall structures as appropriate;
- Drainage improvements, including culvert replacement and ditching;
- Removal and replacement of guardrail as warranted;

- Replacement of handrails and chain link fence;
- Replacement of public and private staircases for access to adjacent properties;
- Resolution of right-of-way (ROW) encroachments (removal or permitting);
- Relocation of overhead or underground utilities;
- Construction of bus stop turnout and shelters; and
- Associated lighting replacements/improvements

The project would be accomplished during two construction phases:

- Phase 1: Rehabilitation of the southern portion of the project from Saxman (MP 4.5) to Surf Street (MP 5.5) is planned to occur in 2018.
- Phase 2: Road widening between Deermount Street (MP 2.6) and Saxman (MP 4.5) is anticipated to begin in 2019.

Construction dates are contingent on the availability of funding, acquisition of required permits, and other factors.

III. Environmental Consequences

➢ For each yes, summarize the activity evaluated and the magnitude of the impact.

➢ For any consequence category with an asterisk (*), additional information must be attached such as an alternatives analysis, agency coordination or consultation, avoidance measures, public notices, or mitigation statement.

➢ Include direct and indirect impacts in each analysis.

A. <u>Right-of-Way Impacts</u>	N/A	YES	NO
1. Additional right-of-way required.		☒	☐
• Permanent easements required.	☐	☒	☐
• Estimated number of parcels: <u>58 temporary and permanent easements</u>			
• Full or partial property acquisition required.	☐	☒	☐
• Estimated number of full parcels: <u>11 full acquisitions</u>			
• Estimated number of partial parcels: <u>40 partial acquisitions</u>			
• Property transfer from state or federal agency required. *If yes, list agency in No. 4 below.*	☐	☒	☐
• Business or residential relocations required. If yes, summarize the findings of the conceptual stage relocation study in No. 4 below and attach the conceptual stage relocation study.	☐	☐*	☒
• Number of relocations: <u>0</u>			
• Type of relocation: Residential: ☐ Business: ☐ Residential (Indicate number: _____) Business (Indicate number: _____)			
• Last-resort housing required.	☐	☐	☒

2. Will the project or activity have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations as defined in E.O. 12898 (FHWA Order 6640.23A, June 2012)? ☐ ☒

See Attachment A: *Environmental Justice Analysis Report.*

3. The project will involve use of ANILCA land that requires an ANILCA Title XI approval. *If yes, the project is not assigned to the State per the 6004 MOU and the CE must be processed by FHWA.* ☐ ☒

4. Summarize the right-of-way impacts, if any:

The proposed project would require the acquisition of both fee simple and easement interests to expand the existing DOT&PF ROW for the South Tongass Highway improvements.

Approximately 40 parcels would be affected by cuts and fills, requiring acquistion of a small portion of each lot. Any acquisitions would conform to the requirements of the Uniform Relocation Assistance and Real Property Acquisition Act. Approximately 58 other parcels may require temporary construction and/or permanent easements for completion of the project.

The United States Coast Guard (USCG), the State of Alaska Department of Natural Resources, the University of Alaska, and the City of Saxman are public landowners that would be affected by the project. Tatsuda Grocery may need parking lot re-configuration. However no loss of parking spots would occur. No Alaska National Interest Lands Conservation Act (ANILCA) lands (in the form of Conservation System Units) are present in the project area.

The project would require the full acquisition of 11 parcels. No property displacements (relocations) are anticipated. However, the project would resolve approximately 50 existing ROW encroachments in coordination with the project acquisition phase. Personal and real property located in the existing ROW must be removed or permitted to resolve encroachments.

According to data available from the U.S. Census 2010-2014 American Community Survey (ACS), the median household incomes in the project area are:

- $47,409 in Census Tract 3, Block Group 3 (includes the northern portion of the project: Deermount Street to south of the USCG Station Ketchikan)
- $75,417 in Census Tract 4, Block Group 1 (includes the middle portion of the project area: Forest Park and Saxman)
- $108,036 in Census Tract 4, Block Group 2 (includes the southern portion of the project area: Saxman to Surf Street)

These incomes are above the U.S Department of Health and Human Services poverty guidelines for Alaska, which set a 2016 threshold of $25,200 for a family of three (average Borough household size was 2.52 for 2010-2014).

The project would not result in disproportionately high and adverse human health or environmental effects on minority populations or low-income populations as defined by Executive Order 12898. See Attachment A: *Environmental Justice Analysis Report* for more detail.

For the reasons described above, no adverse ROW impacts are expected to occur as a result of the proposed project.

B. Social and Cultural Impacts

	N/A	YES	NO
1. The project will affect neighborhoods or community cohesion.		☐	☒
2. The project will affect travel patterns and accessibility (e.g. vehicular, commuter, bicycle, or pedestrian).		☒	☐
3. The project will affect school boundaries, recreation areas, churches, businesses, police and fire protection, etc.		☒	☐
4. The project will affect the elderly, handicapped, nondrivers, transit-dependent, minority and ethnic groups, or the economically disadvantaged.		☒	☐
5. There are unresolved project issues or concerns of a federally-recognized Indian Tribe [as defined in 36 CFR 800.16(m)]. *If yes, the project is not assigned to the State per the 6004 MOU and the CE must be processed by FHWA.*		☐	☒

6. Summarize the social and cultural impacts, if any:

The proposed project is intended to improve travel and safety conditions in the project area, resulting in long-term benefits to the traveling public. The proposed project, once constructed, would not alter overall travel patterns, although some driveway ingress or egress may change. The proposed project would improve accessibility in the project area by connecting and improving the multi-use pathway, benefiting pedestrian, bicycle users and persons with disabilities (improvements would conform to ADA design standards). The long-term benefits of improved vehicular and pedestrian facilities with the proposed project would enhance neighborhood and community cohesion by providing a safer travel corridor between communities.

The transportation improvements would also benefit access to schools, recreation areas, churches, and businesses for all social groups. Travel for police, fire protection, and emergency response would be improved.

C. Economic Impacts

	N/A	YES	NO
1. The project will have adverse economic impacts on the regional and/or local economy, such as effects on development, tax revenues and public expenditures, employment opportunities, accessibility, and retail sales.		☐	☒
2. The project will adversely affect established businesses or business districts.		☐	☒

3. Summarize the economic impacts, if any:

The proposed project is not expected to adversely affect the regional or local economy. Improved safety and efficiency of travel on the South Tongass Highway is expected to provide long-term economic benefits. Transportation improvements would enhance access to the commercial areas in Ketchikan and along South Tongass Highway, support recreational activities for users of the multi-use pathway, and support any subsistence use of the waterfront with improved access from the multi-use trail. In addition, improved transportation facilities on this segment of South Tongass Highway would support tourism to Totem Park in Saxman and other tourist destinations south of Ketchikan. DOT&PF has identified areas to replace lost parking from partial acquistions however there may be a minimal loss of residential parking.

D. **Land Use and Transportation Plans**	N/A	YES	NO
1. Project is consistent with land use plan(s).	☐	☒	☐
a. Identify the land use plan(s) and date. Ketchikan Gateway Borough Comprehensive Plan 2020 (2009)			
2. Project is consistent with transportation plan(s).	☐	☒	☐
a. Identify the transportation plan(s) and date. Ketchikan's Coordinated Transportation Plan 2015 Update (2015)			
3. Project would induce adverse indirect and cumulative effects on land use or transportation. *If yes, attach analysis.*		☐	☒

4. Summarize how the project is consistent or inconsistent with the land use plan(s) and transportation plan(s):

The proposed project is not specifically identified in the local land use or transportation plans; however, it is consistent with the goals and objectives stated therein. The Ketchikan Gateway Borough Comprehensive Plan 2020 (2009) states that the Borough "supports regulations to include guidelines and criteria consistent with nationally-recognized standards which provide for safe and convenient on-site traffic flow, adequate pedestrian ways and sidewalks, as well as sufficient on-site parking for both motorized and non-motorized vehicles" (Pg. 30).

Ketchikan's Coordinated Transportation Plan 2015 Update (2015) provides a comprehensive review of the City's transportation system. The plan characterizes the importance of the Tongass Highway because it "provides access to residential areas outside the limits of the City of Ketchikan" (pg. 17). The South Tongass Highway connects transit users, pedestrians, cyclists, and drivers to the Ketchikan area and vicinity. The plan states the potential for the walking/biking path on the South Tongass Highway to Saxman. The plan also states the importance of the South Tongass Highway with respect to Saxman community members who rely on public transportation for travel to and from employment, shopping, and other amenities in Ketchikan. Additionally, the plan notes that 7,000 visitors ride the public transportation service to view Saxman's Totem Park each summer. An improved South Tongass Highway in this project area increases safety and connectivity between Ketchikan and Saxman with pedestrian, bicycling, and public and private vehicle use.

E. **Impacts to Historic Properties**	N/A	YES	NO
1. Does the project involve a road that is included on the "List of Roads Treated as Eligible" in the Alaska Historic Roads PA? *If yes, follow the Interim Guidance for Addressing Alaska Historic Roads.*		☒	☐
2. Does the project qualify as a Programmatic Allowance under the Section 106 Programmatic Agreement? *If yes, attach the Section 106 PA Streamlined Project Review Screening Record approved by the Regional PQI.*		☐*	☒
3. Is a National Register of Historic Places listed or eligible property in the Area of Potential Effect?	☐	☒	☐

4. Date Consultation/Initiation letters sent: April 10, 2013 *Attach copies to this form.*

5. a. List consulting parties:

Alaska State Historic Preservation Officer (SHPO)
Organized Village of Saxman
Ketchikan Indian Community
Cape Fox Corporation
Central Council of Tlingit and Haida Tribes
Sealaska Corporation
City of Ketchikan Planning Commission
Ketchikan Gateway Borough
Sealaska Heritage Institute
Ketchikan Historic Commission
Historic Ketchikan Inc.

b. If no letters were sent, explain why not. *Attach "Section 106 Proceed Directly to Findings Worksheet", if applicable.*

6. Date "Finding of Effect" letters sent: March 9, 2017 *Attach copies to this form*
   a. State any changes to consulting parties: None
7. List responding consulting parties, comment date, and summarize:
   There were no responding consulting parties.
8. Are there any unresolved issues with consulting parties? ☐ ☐ ☒
   a. If yes, list:
9. Date SHPO concurred with "Finding of Effect": April 14, 2017 *Attach copy to this form.*
10. Will there be an adverse effect on a historic property? *If yes, attach correspondence (including response from ACHP) and signed MOA. If yes, Programmatic Agreements (PCEs) do not apply.* ☐ ☐ ☒

Summarize any effects to historic properties. *List affected sites (by AHRS number only) and any commitments or mitigative measures. Include any commitments or mitigative measures in Section VI.*

A cultural resources investigation was conducted for the proposed project and is summarized in this section (the full *Cultural Resources Investigation Report* is on file with DOT&PF). The investigation included a database search and field survey of the Area of Potential Effects (APE).

The direct APE for the proposed project consists of all areas of ground-disturbing activities including vegetation clearing, construction and staging, and ingress and egress for the project. The direct APE generally conforms to the alignment of the South Tongass Highway, but is wider in locations where additional project activities may occur. The area included in the direct APE totals 31.9 acres. The indirect APE is larger, totaling 236 acres. It encompasses the area in which visual and audible effects from traffic changes as well as construction and maintenance could affect cultural resources.

A review of the Alaska Heritage Resource Survey (AHRS) for properties with historical, archaeological, and cultural significance within the APE was conducted in October 2015. Two cultural resources surveys were conducted, in November 2015 and April 2016, in the proposed project area. The AHRS review process and cultural resource investigation revealed the following sites within the direct APE:

- One National Register of Historic Places (NRHP)-listed site (KET-00060, Saxman Totem Park)
- One NRHP-eligible site (KET-01391, Cannery Bunkhouse)
- Four sites that are not eligible for inclusion in the NRHP (KET-00435, Ketchikan Dump; and KET-01240, 1715 S. Tongass Highway; KET-01249, 2259 S. Tongass Highway; KET-01395, 2191 S. Tongass Highway)

Within the indirect APE, there is one site listed on the NRHP (KET-00343, Chief Kashakes House), six sites have been determined eligible for listing, nine sites remain unevaluated for the NRHP, and 44 sites are not eligible for inclusion in the NRHP.

The South Tongass Highway is considered a "Treated as Eligible" property as stipulated in the Interim Guidance for Addressing Alaska Historic Roads issued by DOT&PF (2012). The interim guidance lists a predefined set of road maintenance and modifications activities that would have either limited potential to affect, no potential to affect, or no adverse effect to historic properties, such as minor road widening, realignment, surface material change, maintenance of drainage features, and culvert replacement. As currently planned, proposed project activities fall within these listed modifications and, therefore, would not adversely impact the South Tongass Highway.

Based on current design, the proposed project would not adversely affect the NRHP-listed and NRHP-eligible sites located within the direct APE (i.e., portions of the Saxman Totem Park and the Cannery Bunkhouse). Project activities are not likely to have a visual or audible adverse effect to NRHP-listed and eligible sites within the indirect APE. Project activities planned within the viewshed of these sites consist primarily of road repaving and improvements. As the sites are currently within the viewshed of a modern asphalt road, project activities will not significantly alter the characteristics that make these resources eligible for the NRHP. Furthermore, the nine unevaluated sites within the indirect APE are not visible or had very limited visibility from the ROW and would, therefore, not be adversely affected by the proposed project.

Section 106 consultation documentation is provided in Attachment B.

F.	**Wetland Impacts**	N/A	YES	NO
1.	Project affects wetlands as defined by the U.S. Army Corps of Engineers (USACE). *If yes, document public and agency coordination required per E.O. 11990, Protection of Wetlands.*		☒*	☐
2.	Are the wetlands delineated in accordance with the *"Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Version 2.0) Sept. 2007"?*	☐	☒	☐
3.	Estimated area of wetland involvement (acres): 0.5 acre			
4.	Estimated fill quantities (cubic yards): 380 cy			
5.	Estimated dredge quantities (cubic yards): 0 cy			
6.	Is a USACE authorization anticipated? *If yes, identify type*: NWP ☒ Individual ☐ General Permit ☐ Other ☐	☐	☒	☐

7. Wetlands Finding. *Attach the following supporting documentation as appropriate:*
   - *Avoidance and Minimization Checklist, and Mitigation Statement*
   - *Wetlands Delineation*
   - *Jurisdictional Determination*
   - *Copies of public and resource agency letters received in response to the request for comments*

	N/A	YES	NO
Are there practicable alternatives to the proposed construction in wetlands? If yes, the project cannot be approved as proposed.	☐	☐	☒
Does the project include all practicable measures to minimize harm to wetlands? If no, the project cannot be approved as proposed.	☐	☒	☐
Only practicable alternative: Based on the evaluation of avoidance and minimization alternatives, there are no practicable alternatives that would avoid the project's impacts on wetlands. The project includes all practicable measures to minimize harm to the affected wetlands as a result of construction. If no, the project cannot be approved as proposed.	☐	☒	☐

8. Summarize the wetlands impacts and mitigation, if any. *Include any commitments or mitigative measures in Section VI.*

Wetlands in the project area were delineated in 2015 using the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Version 2.0) Sept. 2007. Results are presented in Attachment C: *Wetland and Waterbody Delineation and Aquatic Site Assessment*. Approximately 2.4 acres of the 73-acre study area consists of wetlands (3.3 percent of the study area). The mapping effort identified two types of forested wetlands and four types of emergent wetlands and other jurisdictional waterbodies. Figure 3 of Attachment C shows the wetlands within the study area. Most of the potentially affected wetlands (2.0 acres) are forested wetlands.

Impacts to wetlands and other jurisdictional waters (including fill into streams and fill on 4 acres below the high tide line (HTL) that are discussed in Section G "Water Body Involvement") would result from the permanent placement of fill required to rehabilitate the highway. The existing alignment is adjacent to existing wetlands and waters; thus, total avoidance was not possible in order to meet the purpose of the project. Impacts would be minimized by using 2:1 side slopes as a recommended minimum for slope stability and traffic safety where practicable.

Section 404/10 permit authorization from the USACE to place fill in wetlands and other waters would be sought and obtained prior to construction. Section VI identifies avoidance and minimization measures. The DOT&PF would comply with Section 404(b)(1) mitigation guidelines for impacts to jurisdictional waters that cannot otherwise be avoided.

Summary of Impacts

Type	Impact (acres)
Wetlands	0.5
Other Waters of the US (inter-tidal rocky shore)	4.0

G. Water Body Involvement

	N/A	YES	NO
1. Project affects a water body.		☒	☐

2. Project affects a navigable water body as defined by USCG (*i.e.*, Section 9). ☐ ☒* ☐
3. Project affects Waters of the U.S. as defined by the USACE, Section 404. ☐ ☒* ☐
4. Project affects Navigable Waters of the U.S. as defined by the USACE (Section 10). ☐ ☒* ☐
5. Project affects fish passage across a stream frequented by salmon or other fish (*i.e.*, Title 16.05.841). ☐ ☒ ☐
6. Project affects a cataloged anadromous fish stream, river or lake (*i.e.*, Title 16.05.871). ☐ ☒* ☐
7. Project affects a designated Wild and Scenic River or land adjacent to a Wild and Scenic River. *If yes, the Regional Environmental Manager should consult with the Statewide NEPA Manager (assigned CEs) or FHWA Area Engineer and FHWA Environmental Program Manager (non-assigned CEs) to determine applicability of Section 4(f).* ☐ ☒
8. Proposed water body involvement: Bridge ☐ Culvert ☒ Embankment Fill ☒ Relocation ☐ Diversion ☒ Temporary ☒ Permanent ☒ Other ☐ ☐
9. Type of stream or river habitat impacted: Spawning ☒ Rearing ☒ Pool ☐ Riffle ☐ Undercut bank ☐ Other ☐ ☐
10. Amount of fill below (cubic yards): OHW 80 cy MHW 34,050 cy HTL 53,730 cy
11. Summarize the water body impacts and mitigation, if any. *Include any commitments or mitigative measures in Section VI.*

Impacts:

Water bodies within the project area are described in Attachment C: *Wetland and Waterbody Delineation and Aquatic Site Assessment* and illustrated in the figures of Attachment D: *Essential Fish Habitat Assessment and Coordination with NMFS.* Approximately 53,730 cubic yards of fill will be placed across approximately 4 acres of jurisdictional waters below the high tide line (HTL) in Tongass Narrows, which is a navigable waterbody as defined by USACE and USCG.

In addition, an estimated 80 cubic yards of permanent fill would be placed in or along approximately 1,125 linear feet of approximately twenty small water bodies under USACE jurisdiction. The fill is associated with actions to install new or replacement culverts. Most of the streams are non-fish bearing drainages. One unnamed perennial stream is identified as anadromous fish stream #101-47-10300 in the Alaska Department of Fish and Game (ADF&G) Anadromous Waters Catalog. As surveyed by ADF&G, the creek measures 14 feet wide at ordinary high water and passes under the highway through a 52-foot long wooden culvert that is 10 feet wide and 8 feet tall. Anadromous fish are not documented upstream of the culvert due to the existing culvert's outlet being perched by 3 feet. The construction contractor would be required to comply with conditions outlined in the ADF&G Title 16 Fish Habitat Permit.

No permanent impacts to navigation or recreational water bodies would result from the proposed project. The project does not involve a bridge over a navigable waterbody; therefore, a USCG permit (Section 9) is not required. Section 404/10 permit authorization from the USACE to place fill in wetlands (0.5 acres, see Section F) and other waters would be sought and obtained prior to construction.

Wetland impacts and mitigation are described above in Section F and Section VI. Impacts to fish and wildlife and related mitigation measures are described in Section H and Section VI.

H. Fish and Wildlife

	N/A	YES	NO
1. Anadromous and resident fish habitat. *Any activity or project that is conducted below the ordinary high water mark of an anadromous stream, river, or lake requires a Fish Habitat Permit.*			
a. Database name(s) and date(s) queried: ADF&G *Atlas to the Catalog of Waters Important to the Spawning, Rearing, or Migration of Anadromous Fishes*; ADF&G Alaska Freshwater Fish Inventory Database; ADF&G Culvert Inventory database; National Oceanic and Atmospheric Administration (NOAA) Habitat Conservation EFH Data Inventory and Mapper; NOAA Nearshore Fish Atlas of Alaska and Alaska Shorezone Interactive Mapping program; queried November 2016.			
b. Anadromous fish habitat present in project area.		☒*	☐
c. Resident fish habitat present in project area.		☒*	☐
d. Adverse effect on spawning habitat.	☐	☐*	☒
e. Adverse effect on rearing habitat.	☐	☐*	☒
f. Adverse effect on migration corridors.	☐	☐*	☒
g. Adverse effect on subsistence species.	☐	☐*	☒
2. Essential Fish Habitat (EFH). *EFH includes any anadromous stream used by any of the five species of Pacific salmon for migration, spawning or rearing, as well as other coastal, nearshore and offshore areas as designated by NMFS.*			
a. Database name(s) and date(s) queried: ADF&G *Atlas to the Catalog of Waters Important to the Spawning, Rearing, or Migration of Anadromous Fishes*; NOAA Habitat Conservation EFH Data Inventory and Mapper; NOAA Nearshore Fish Atlas of Alaska and Alaska Shorezone Interactive Mapping program; queried November 2016.			
b. EFH present in project area.		☒	☐
c. Project proposes construction in EFH. *If yes, describe EFH impacts in H.6.*	☐	☒	☐
d. Project may adversely affect EFH. *If yes, attach EFH Assessment.*	☐	☒*	☐
e. Project includes conservation recommendations proposed by NMFS. *If NMFS conservation recommendations are not adopted, formal notification must be made to NMFS. Summarize the final conservation measures in H.6 and list in Section VI.*	☐	☒	☐
3. Wildlife Resources:			
a. Project is in area of high wildlife/vehicle accidents.		☐	☒
b. Project would bisect migration corridors.		☐	☒
c. Project would segment habitat.		☐	☒
4. Bald and Golden Eagle Protection Act. *If yes to any below, consult with USFWS and attach documentation of consultation.*			
a. Eagle data source(s) and date(s) : USFWS, November 21, 2016 (documentation in Attachment E)			
b. Project visible from an eagle nesting tree?		☒*	☐
c. Project within 330 feet of an eagle nesting tree?		☒*	☐
d. Project within 660 feet of an eagle nesting tree?		☒*	☐

e. Will the project require blasting, pile driving, guardrail post driving, or other activities that produce extreme loud noises within 1/2 a mile from an active nest? ☒* ☐

f. Is an eagle permit required? ☒* ☐

5. Is the project consistent with the Migratory Bird Treaty Act? ☒ ☐

6. Summarize fish and wildlife impacts and mitigation, including timing windows, if any. *Include any commitments or mitigative measures in Section VI.*

Anadromous and Resident Fish, Essential Fish Habitat

One anadromous fish stream (#101-47-10300) passes under the South Tongass Highway in the project area through a perched wooden culvert. The *Anadromous Waters Catalog* identifies the stream as habitat for anadromous pink and chum salmon downstream of the culvert; this habitat is therefore EFH for both species. A single juvenile coho salmon was captured downstream of the culvert in 2016, along with Dolly Varden and sculpin (see Attachment D: *EFH Assessment and Coordination with NMFS*). While the wooden box culvert is a barrier to upstream fish passage, resident Dolly Varden and cutthroat trout occur upstream of the culvert (Minnillo 2012; see Attachment D for full reference).

The proposed project would improve fish passage by replacing the perched wooden culvert with a new fish passage culvert. The new culvert would provide upstream access to habitat farther upstream, which is currently inaccessible to most fish; therefore, the project has the potential to increase the amount of available EFH in this stream.

Fill placement would eliminate about 2.67 acres of marine EFH across about 4,000 linear feet of shoreline habitat along the Tongass Narrows' East Channel. Existing substrate under the fill footprint would be permanently replaced. The ecological function of affected habitat would be altered due to the physical change in substrate (size and depth). Portions of the modified shoreline habitat may no longer be optimal or suitable for some managed species. By eliminating shallow, low to moderately sloped nearshore habitat, the project would eliminate habitat currently suitable for rockfish and other groundfish. While alteration of the physical habitat may affect habitat function in some areas, the project would not result in a blockage to juvenile or adult fish migration. Population-level impacts to managed fish species are not anticipated to result from this project. The amount of marine habitat eliminated would not constitute a substantial reduction in the overall amount of EFH available in the surrounding Tongass Narrows waters. The project would avoid placing fill and eliminating nearshore habitat that was mapped as high functioning (Category 1).

DOT&PF completed EFH consultation with NMFS on June 22, 2017, which included the identification of appropriate conservation measures. These include: incorporating 2:1 side slopes to minimize fill in wetlands and waterbodies, where feasible; complying with conditions in the fish habitat permit including any specified in-water work timing windows; re-contouring and re-seeding disturbed stream banks with native vegetation; and maintaining existing drainage patterns. For the full list and additional detail, see Attachment D: *EFH Assessment and Coordination with NMFS.*

Wildlife Resources

Most of the existing DOT&PF ROW is clear of trees and adjacent habitat. Expansion and upgrades to existing road would not create any additional habitat bisection or fragments. The proposed work is occurring on an existing transportation corridor and no increases in traffic would result from the proposed project.

Additional vegetative clearing will likely occur on both sides of the highway within the existing and newly acquired DOT&PF ROW. Although this will result in removal of some wildlife habitat, impacts to wildlife are likely to be minimal. No adverse impacts to wildlife or wildlife habitat are expected to occur as a result of the proposed project.

Bald and Golden Eagle Protection Act
There are three eagle nests adjacent to the South Tongass Highway that would be affected by the project. Noise and vibration producing construction activities will be restricted during the breeding season from March 1st to when the eaglets fledge, approximately August 15th. Restricted activities will be coordinated with USFWS and listed in the permit.

Migratory Bird Treaty Act
Migratory birds protected under the Migratory Bird Treaty Act could pass through the proposed project area. While bird species could be affected by vegetation clearing activity, this clearing would be minimal and would follow to the maximum extent possible, the U.S. Fish and Wildlife Service (USFWS) Land Clearing Timing Guidance for Alaska (https://www.fws.gov/alaska/fisheries/fieldoffice/anchorage/pdf/vegetation_clearing.pdf) to protect migratory birds. The recommended time period to avoid tree clearing would be April 15 – July 15, and the time period to avoid shrub clearing would be May 1 to September 15. No adverse impacts to migratory bird species are expected to occur as a result of the proposed project.

Marine Mammal Protection Act
All marine mammals are protected under the Marine Mammal Protection Act (MMPA). According to an April 2017 query of the National Marine Fisheries Service (NMFS), online Endangered Species Act (ESA) and MMPA mapper (https://alaskafisheries.noaa.gov/mapping/esa/), the following eight marine mammal species may use habitat in Tongass Narrows: harbor seal, Steller sea lion, humpback whale, killer whale, Dall's porpoise, Pacific white-sided dolphin, minke whale, and harbor porpoise. Both the Steller sea lion and the humpback whale are ESA-listed, however the distinct population segments that are respectively endangered and threatened are not likely to occur in Tongass Narrows. See Section III, subsection I for more detail.

DOT&PF met with NMFS on May 5, 2017, regarding the MMPA and ESA listed species in Tongass Narrows. DOT&PF described construction activities that could affect these species, noting particularly the proposed placement of fill below HTL. DOT&PF proposes to place the fill during low tide, in dry conditions, to avoid impacts to marine mammals. NMFS stated that DOT&PF, as the action agency, has the authority to make a determination of No Effect to Marine Mammals and Endangered/Threatened Species (see NMFS coordination meeting notes in Attachment D: *EFH Assessment and Coordination with NMFS*).

DOT&PF determined the placement of fill below HTL in dry conditions at low tide events would have No Effect on Marine Mammals or Endangered/Threatened Species (see May 5 meeting log in Attachment D). While the placement of fill in subtidal waters would permanently replace that habitat, the permanent loss of marine habitat is not anticipated to adversely affect marine mammals. Construction noise may temporarily affect marine mammals. In-air maximum noise levels measured at 50 feet were 76 dBA for a dump truck and 81 dBA for an excavator (Washington State Department of Transportation, *Biological Assessment Preparation for Transportation Projects - Advanced Training Manual*, 2015; available online at https://www.wsdot.wa.gov/Environment/Biology/BA/BAguidance.htm#Manual). Given the transmission loss that occurs when sound passes from air into water, and that typical noise levels from construction equipment are anticipated to be less than these maxima, underwater noise levels from placement of fill at low tide during dry conditions are not expected to disturb marine mammals.

I. Threatened and Endangered Species (T&E)

1. Database name(s) and date(s) queried: N/A YES NO

ADF&G Refuges, Sanctuaries, Critical Habitat Areas and Wildlife Ranges database; ADF&G State of Alaska Special Status State Endangered Species database; and USFWS Information for Planning and Conservation (IPaC) database. These databases were accessed at http://www.adfg.alaska.gov/ and https://ecos.fws.gov/ipac on February 3, 2017. The online ESA/MMPA mapper maintained by the NMFS was accessed on April 3, 2017 at https://alaskafisheries.noaa.gov/mapping/esa/. See also NMFS, Alaska Region. Occurrence of Endangered Species Act (ESA) Listed Humpback Whales off Alaska, revised December 12, 2016.

	N/A	YES	NO
2. Listed threatened or endangered species present in the project area.		☒*	☐
3. Threatened or endangered species migrate through the project area.		☒*	☐
4. Designated critical habitat in the project area.		☐*	☒
5. Proposed species present in project area.		☐*	☒
6. Candidate species present in project area.		☐*	☒

7. What is the effect determination for the project? *Select one.*
   1. Project has no effect on listed or proposed T&E species or designated critical habitat. ☒
   2. Project is not likely to adversely affect a listed or proposed T&E species or designated critical habitat. *Informal Section 7 consultation is required. Attach consultation documentation, including concurrence from the Federal agency, to this form.* ☐
   3. Project is likely to adversely affect a listed or proposed T&E species or designated critical habitat. *If yes, consult the FHWA Area Engineer (non-assigned projects) or Statewide NEPA Manager for 6004-assigned projects.* ☐

8. Summarize the findings of the consultation, conferencing, biological evaluation, or biological assessment and the opinion of the agency with jurisdiction, or state why no coordination was conducted. *Include any commitments or mitigative measures in Section VI.*

The USFWS, NMFS, and ADF&G databases were reviewed to determine if any threatened, endangered, proposed or candidate species under the federal Endangered Species Act or endangered species under Alaska Statute 16.20.190 are present within the proposed project corridor. Based on that database review, no species under USFWS jurisdiction or state listed species or critical habitat occurs within the proposed project corridor.

The NMFS database identifies Tongass Narrows as within the general distribution for the Steller sea lion and humpback whale. Steller sea lions in Alaska are comprised of two distinct population segments (DPS): the Western DPS and the Eastern DPS. Most Steller sea lions that occur in Southeast Alaska are from the Eastern DPS. Only the Western DPS of Steller sea lion is listed (endangered) and, based on its typical range, would not likely occur in the Tongass Narrows as it rarely occurs in or south of Sumner Strait. Two humpback whale DPSs that occur in Southeast Alaska: the Hawaii DPS and the Mexico DPS. Only the Mexico DPS is listed (threatened). Most humpback whales that occur in Southeast Alaska belong to the Hawaii DPS. A recent study estimated the probability of encountering humpbacks in Southeast Alaska from the Mexico DPS as 6.1 percent (per NMFS, Alaska Region. Occurrence of Endangered Species Act Listed Humpback Whales off Alaska, revised December 12, 2016).

No consultation or coordination with USFWS, or ADF&G was warranted for the proposed project. DOT&PF's T&E coordination with NMFS led to DOT&PF's determination that the project would have no effect on Mexico DPS of humpback whales.

J. Invasive Species	N/A	YES	NO
1. Database name(s) and date(s) queried: Alaska Natural Heritage Program (ANHP) Invasive Plants Mapper; University of Alaska Anchorage (UAA) Alaska Exotic Plants Information Clearinghouse (AKEPIC). Accessed June 29, 2016. A field survey was conducted August 9–12, 2016, to identify and map the presence and distribution of invasive plant species in the project corridor.			
2. Does the project include all practicable measures to minimize the introduction or spread invasive species, making the project consistent with E.O. 13112 (Invasive Species)? *If yes, list measures in J.3.*		☒	☐

3. Summarize invasive species impacts and minimization measures, if any. *Include any commitments or mitigative measures in Section VI.*

Several invasive plant species were identified within the project area along the existing ROW corridor. The DOT&PF will comply with E.O. 13112 by requiring the construction contractor to follow DOT&PF's Invasive Species Disposal and Control protocols to minimize the spread of invasive species during construction. The protocols include providing a map of known invasive species presence and guidance for construction staff to determine means and methods for controlling invasive species within the project footprint.

K. Hazardous Waste	N/A	YES	NO
1. Database name(s) and date(s) queried:			
Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Database and Mapper website; ADEC Underground Storage Tank Database Facility Search, reviewed June 20, 2016.			
2. There are potentially contaminated sites within or adjacent to the existing and/or proposed ROW.		☒	☐
3. There are identified contaminated sites within or adjacent to the existing and/or proposed ROW.		☒	☐
4. Extensive excavation is proposed adjacent to, or within, a known hazardous waste site, or the potential for encountering hazardous waste during construction is high. *If yes, attach the hazardous waste investigation report and approved ADEC Corrective Action Plan.*		☒*	☐

Corrective Action Plans may be needed for properties In the second construction phase; i.e., road widening between Deermount Street (MP 2.6) and Saxman (MP 4.5), which is anticipated to begin in 2019. Control Plans for those sites will be developed prior to final design.

5. Summarize the hazardous waste impacts and mitigation, if any. *Include any commitments or mitigative measures in Section VI.*

Based on a review of database information, eight facilities were identified as having the potential for near-surface soil and groundwater contamination that may adversely affect the project area. Phase I Environmental Site Assessments (Phase I ESAs) were completed for the eight properties, in accordance with ASTM International (ASTM) Practice E1527-13 (see Attachment F). The Phase I ESAs identified impacts to soil and groundwater at seven of the eight facilities that could affect the South Tongass Highway Rehabilitation project. The results of the Phase I ESAs, and the identified and potential impacts to soil and groundwater in the project area, are described below.

- **Anderes Oil, 900 Stedman Street, Ketchikan, Alaska.** The facility consists of a bulk petroleum facility with five large aboveground storage tanks (ASTs) within a concrete-lined secondary containment unit, several associated buildings, and a pier. According to historical documents, the property was first depicted as a bulk petroleum facility in 1969. Releases of petroleum products were reported in state databases. Based on the historic use of the property as a bulk petroleum facility since at least 1969, reported releases of petroleum products, and the potential for unreported releases of petroleum products to surface soils and/or groundwater during the facility's long operational history, impacts to the project area are considered likely. In addition, volatile organic compounds (VOCs) from petroleum products may be present in subsurface and could pose a vapor intrusion risk to construction workers if trenching is conducted in the area.
- **The Cleaners, 636 Stedman Street, Ketchikan, Alaska.** The Cleaners is a dry cleaning and commercial laundry facility located in a multi-tenant building. According to historical documents, the property was part of the Fidalgo Island Packing Company from at least 1927 to 1946, and a web tarring rack and tar vat occupied the site. By 1969, the property consisted of a welding building and a shop and pipe rack building. Based on the historic and current use of the facility, it is possible that subsurface contaminants may have impacted the property. Contaminants commonly associated with these uses include polycyclic aromatic hydrocarbons (PAHs), VOCs, petroleum constituents, and metals. VOCs in subsurface could also pose a vapor intrusion risk to construction workers if trenching is conducted in the area.

- **Ketchikan Tank Farm, 4 Mile Stedman Street, Ketchikan, Alaska.** The facility consists of a petroleum bulk facility with nine large ASTs within a concrete secondary containment unit. According to historical documents, the facility has been used as bulk petroleum storage since at least 1927. Underground petroleum pipelines connect Ketchikan Tank Farm with the Petro Marine facility located to the southeast. Petroleum-impacted soil was excavated from the facility multiple times in the 1990s, and shallow, petroleum-impacted groundwater was also discovered beneath portions of the site. Soil that exceeded the tank farm "above-liner clean level," established by the Alaska Department of Environmental Conservation (ADEC) as the cleanup concentration below which soils could be placed above the facility protective liner, was transported for offsite disposal in 1998. Although the facility received No Further Action (NFA) status with institutional controls in 2000, residual contamination may remain. In addition, use of the property as a bulk petroleum facility since at least 1927, and the potential for unreported releases of petroleum products to surface soils and/or groundwater during the facility's long operational history, may have resulted in undiscovered impacts to the project area. VOCs from petroleum products may also be present in subsurface and could pose a vapor intrusion risk to construction workers if trenching is conducted in the area.
- **Petro Marine Services, 1100 Stedman Street, Ketchikan, Alaska.** The facility consists of a bulk petroleum facility with 13 large ASTs in a concrete-lined secondary containment unit, several associated buildings, and two piers. According to historical documents, Petro Marine Services has been a bulk petroleum facility since at least 1948. Numerous spills were reported at the facility between 1998 and 2016. According to ADEC files, historical leakage has contaminated soil and groundwater at the facility. ADEC and Petro Marine Services coordinated development of a long-term monitoring, sampling, and analysis plan for the surface water-groundwater interface discharge at the seawall. Based on the existing contamination, the active institutional controls at the facility, and the potential for additional unreported releases of petroleum products to surface soils and/or groundwater during the facility's long operational history, impacts to the project area are considered likely. In addition, VOCs from petroleum products may be present in subsurface and could pose a vapor intrusion risk to construction workers if trenching is conducted in the area.

- **South Tongass Service Station, 2852 South Tongass Highway, Ketchikan, Alaska.** The facility consists of an active gas station, including two ASTs, aboveground and underground piping, dispensers, and a convenience store. Information regarding this facility was included in the Floyd's Onsite Repair Phase I ESA. In spring 1995, petroleum product was observed seeping from a rock retaining wall behind the main building. Three 5,000-gallon underground storage tanks (USTs) and piping appurtenance were removed. In June 2010, ADEC determined that cleanup actions excavated and adequately remediated contaminated soil and groundwater at the site. DOT&PF personnel noted surface water in a drainage near the facility had a petroleum odor during a June 2016 site walk. Based on the potential for residual contamination from the UST releases, and the proximity of the ASTs and piping to the potential acquisition area, impacts to the project area are considered likely. In addition, VOCs from petroleum products may be present in subsurface and could pose a vapor intrusion risk to construction workers if trenching is conducted in the area.
- **Tesoro Unocal Bulk Plant, 1010 Stedman Street, Ketchikan, Alaska.** According to historical documents, the facility was used as bulk petroleum storage between at least 1927 and 1999. It was first identified as a National Oceanic and Atmospheric Administration facility in 2013. One 500-gallon heating oil UST is currently in use. Several spills and emergency response notifications for the property were identified in the state database. Releases of diesel and gasoline into Tongass Narrows were recorded in 1995 and 1999, and there was a 10-gallon release of gasoline into soil in 1991 during maintenance pressure testing of a pipeline. Based on the historic use of the property as a bulk petroleum facility between at least 1927 and 1999, and the potential for unreported releases of petroleum products to surface soils and/or groundwater during the facility's long operational history, impacts to the project area are considered likely. In addition, VOCs from petroleum products may be present in subsurface and could pose a vapor intrusion risk to construction workers if trenching is conducted in the area.
- **United States Coast Guard (USCG) Base Ketchikan, 1300 Stedman Street, Ketchikan, Alaska.** USCG Base Ketchikan has been at its current location since at least 1948. The facility consists of barracks, a rifle range, boat storage, wharf and dry dock, several warehouses, hazardous material storage, and administration buildings, and is located on both sides of Stedman Street. Soils were excavated from the former small arms firing range (SAFR) in 2003 and 2004. Remaining lead concentrations in soil at the SAFR resulted in institutional controls. Leaking tanks located near the Commanding Officer's Quarters (diesel) and barracks (gasoline, metal, and polychlorinated biphenyls) are in the Voluntary Cleanup Program. Based on the existing contamination, and the potential for additional unreported releases of petroleum products to surface soils and/or groundwater during the facility's long operational history, impacts to the project area are considered likely. In addition, VOCs from petroleum products may be present in subsurface and could pose a vapor intrusion risk to construction workers if trenching is conducted in the area.

- **Henderson's Auto Service, 133 Forest Park Drive, Ketchikan, Alaska.** No indications of release to soil or groundwater were identified at Henderson's Auto Service, and the facility is not likely to have impacted the project area.

All seven of those sites are within the construction phase 2 portion of the project; i.e., road widening between Deermount Street (MP 2.6) and Saxman (MP 4.5). Contamination is expected to be encountered during construction. RP's are responsible to remove, store and dispose of contaminated soil prior to construction. DOT&PF will work with RP's and DEC during the ROW phase of the project to develop control plans in the event contamination is encountered. Contaminated soils will be stored by RP's in DEC approved stockpiles.

Sampling of surface water adjacent to South Tongass Service Station will also occur in prior to construction.

Additional Phase II Site Assessments are not planned at this time. DOT&PF would perform PID testing to indicate the presence of contamination. Further testing would be performed by the RP's. Contaminated soil and/or groundwater will be handled in accordance with the DEC publication, *Managing Petroleum-Contaminated Soil, Water, or Free Standing Product during Public Utility and Right of Way Construction and Maintenance Projects.*

Consultation with DEC is included at the end of Attachment F.

L. Air Quality (Conformity)	N/A	YES	NO
1. The project is located in an air quality maintenance area or nonattainment area (CO or PM-10 or PM-2.5). *If yes, indicate CO ☐ or PM-10 ☐ or PM-2.5 ☐, and complete the remainder of this section.*		☐	☒
2. The project is included in a conforming Long Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP).	☒	☐	☐
a. List dates of FHWA/FTA conformity determination: _____			
3. The project is exempt from an air quality analysis per 40 CFR 93.126 (Table 2 and Exempt Projects). *If no, a project-level air quality conformity determination is required for CO nonattainment and maintenance areas, and a qualitative project-level analysis is required for both PM-2.5 and PM-10 nonattainment and maintenance areas.*	☒	☐	☐
4. Has there been a significant change in the scope or the design concept as described in the most recent conforming TIP and LRTP? *If yes, describe changes in L.8. In addition, the project must satisfy the conformity rule's requirements for projects not from a plan and TIP, or the plan and TIP must be modified to incorporate the revised project (including a new conformity analysis).*	☒	☐	☐
5. A CO project-level analysis was completed meeting the requirements of Section 93.123 of the conformity rule. The results satisfy the requirements of Section 93.116(a) for all areas or 93.116(b) for nonattainment areas. *Attach a copy of the analysis.*	☒	☐*	☐
6. A PM-2.5 project-level air quality analysis was completed meeting the requirements of Section 93.123 of the conformity rule. The results satisfy the requirements of Section 93.116. *Attach a copy of the analysis.*	☒	☐*	☐

		N/A	YES	NO
7.	A PM-10 project-level air quality analysis was completed meeting the requirements of Section 93.123 of the conformity rule. The results satisfy the requirements of Section 93.116. *Attach a copy of the analysis.*	☒	☐*	☐

8. Summarize air quality impacts, mitigation, and agency coordination, if any. *Include any commitments or mitigative measures in Section VI.*

   Proposed project elements (e.g., pavement resurfacing and/or rehabilitation, shoulder improvements, and bicycle and pedestrian facilities) are exempt from air quality analysis per 40 CFR 93.126 (Table 2). The proposed project would not result in permanent change of traffic patterns, traffic volumes, or other factors that would result in a permanent change of air quality in the region.

M. Floodplain Impacts (23 CFR 650, Subpart A)

		N/A	YES	NO
1.	Project encroaches into the base (100 year) flood plain in fresh or marine waters. Identify floodplain map source and date: Flood Insurance Rate Map (FIRM) Panel 020003 0002B, April 16, 1990, Ketchikan Gateway Borough. *If yes, attach documentation of public involvement conducted per E.O. 11988 and 23 CFR 650.109. Consult with the regional or Statewide Hydraulics/Hydrology expert. Attach the required location hydraulic study developed per 23 CFR 650.111. Answer questions M.1.a through d.* *If no, skip to M.2.*		☒*	☐
	a. Is there a longitudinal encroachment into the 100-year floodplain?	☐	☒*	☐
	b. Is there significant encroachment as defined by 23 CFR 650.105(q)? *If yes, the project cannot be approved as proposed without a finding that the proposed action is the "Only Practicable Alternative" as defined in 23 CFR 650.113. Attach the finding for approval.*	☐	☐*	☒
	c. Project encroaches into a regulatory floodway.	☐	☐*	☒
	d. The proposed action would increase the base flood elevation one-foot or greater.	☐	☐*	☒
2.	Project conforms to local flood hazard requirements.	☐	☒	☐
3.	Project is consistent with E.O. 11988 (Floodplain Protection). *If no, the project cannot be approved as proposed.*		☒	☐

4. Summarize floodplain impacts and mitigation, if any. *Include any commitments or mitigative measures in Section VI.*

   None of the creeks spanned by the South Tongass Highway have been identified as having 100-year base flood elevations in the Flood Insurance Study (FIS) for the Ketchikan Gateway Borough (dated April 16, 1990).

   The Borough identifies the coastal floodplain associated with Tongass Narrows as having a base flood elevation at or below the 22-foot Mean Lower Low Water (MLLW) level. The FIS does not contain any reports of flooding along the South Tongass Highway, while only localized, non-riverine flooding was reported by DOT&PF maintenance and operations personnel.

   Modifications to the non-motorized path may extend below the approximate floodplain elevation of 22 feet MLLW; however, placing fill into the coastal environment is not anticipated to impact flood elevations within the localized area. See Attachment G, the Hydrologic and Hydraulic Report, Section 8, last paragraph, prepared for this project. This report was reviewed and approved by the Regional Hydraulic Engineer.

N. Noise Impacts (23 CFR 772)

	N/A	YES	NO
1. Does the project involve any of the following? *If yes, complete N.1.a.* *If no, a noise analysis is not required. Skip to section O.*		☐	☒

- Construction of highway on a new location.
- Substantial alteration in vertical or horizontal alignment as defined in 23 CFR 772.5.
- An increase in the number of through lanes.
- Addition of an auxiliary lane (except a turn lane).
- Addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange.
- Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane.
- Addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.

a. Identify below which category of land uses are adjacent: *A noise analysis is required if any lands in Categories A through E are identified, and the response to N.1 is 'yes'.*

	N/A	YES	NO
Category A: Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.	☐	☐	☐
Category B: Residential. *This includes undeveloped lands permitted for this category.*	☐	☐	☐
Category C (exterior): Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings. *This includes undeveloped lands permitted for this category.*	☐	☐	☐
Category D (interior): Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit	☐	☐	☐

institutional structures, radio studios, recording studios, schools, and television studios.

	N/A	YES	NO
Category E: Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not listed above. *This includes undeveloped lands permitted for this category.*	☐	☐	☐
2. Does the noise analysis identify a noise impact? *If yes, explain in N.3.*		☐	☐

3. Summarize the findings of the attached noise analysis and noise abatement worksheet, if applicable:

O. **Water Quality Impacts**	N/A	YES	NO
1. Project would involve a public or private drinking water source. *If yes, explain in O.7.*		☐	☒
2. Project would result in a discharge of storm water to a Water of the U.S. (per 40 CFR 230.3(s)).		☒	☐
3. Project would discharge storm water into or affect an ADEC designated Impaired Waterbody. *If any of the Impaired Waterbodies have an approved or established Total Maximum Daily Load, describe project impacts in O.7*		☐	☒

a. List name(s), location(s), and pollutant(s) causing impairment:

N/A

4. Estimate the acreage of ground-disturbing activities that will result from the project?

28.1 acres

	N/A	YES	NO
5. Is there a municipal separate storm sewer system (MS4) APDES permit, or will runoff be mixed with discharges from an APDES permitted industrial facility?		☐	☒

a. If yes, list APDES permit number and type: N/A

	N/A	YES	NO
6. Would the project discharge storm water to a water body within a national park or state park; a national or state wildlife refuge? *If yes and Alaska Construction General Permit applies to the project, consultation with ADEC is required at least 30 days prior to planned start of construction activities.*		☐	☒

7. Summarize the water quality impacts and mitigation, if any. *Include any commitments or mitigative measures in Section VI.*

According to the ADEC Drinking Water Protection Map website, the proposed project area is not in a location where it would increase risks or threats to the drinking water within protected zones.

The ADEC Impaired Waters mapper indicates that none of the receiving waters in the project area are impaired.

Stormwater runoff and snow meltwater within the project area drains to adjacent wetlands and water bodies via roadside ditches and overland flow. Existing drainage patterns would be maintained. Properly sized and designed culverts would be used in appropriate locations to maintain the natural flow patterns to adjacent wetlands and waters.

P. **Construction Impacts**	N/A	YES	NO
1. There will be temporary degradation of water quality.		☒	☐
2. There will be a temporary stream diversion.		☒	☐
3. There will be temporary degradation of air quality.		☒	☐
4. There will be temporary delays and detours of traffic.		☒	☐

5. There will be temporary impacts on businesses. ☒ ☐
6. There will be temporary noise impacts. ☒ ☐
7. There will be other construction impacts. ☒ ☐

8. Summarize construction impacts and mitigation for each 'yes' above. *Include any commitments or mitigative measures in Section VI.*

Temporary Water Quality Impacts
Construction activities could cause short-term direct and indirect water quality impacts as a result of clearing and grading, and other ground-disturbing activities. These construction activities expose soils to erosive forces and increased sedimentation in adjacent water bodies. There may be a temporary degradation of water quality and aquatic habitats due to ground-disturbing activities and storm water runoff. Other construction impacts to surface waters could include a temporary increase in turbidity levels during in-water work. During construction, best management practices (BMPs) would be in place to protect water quality, including erosion prevention and slope stabilizing measures. DOT&PF would prepare an Erosion and Sediment Control Plan as a guide for the construction contractor. A Stormwater Pollution Prevention Plan (SWPPP) would be prepared by the construction contractor to detail BMPs planned for the construction effort, as required by the APDES Construction General Permit for Storm Water Discharges from Large and Small Construction Sites.

Temporary Stream Diversion
Streams may need to be temporarily diverted to isolate the work areas from flowing water during construction. For example, the anadromous stream (#101-47-10300) would need to be temporarily diverted during culvert replacement. Temporarily diverting stream flow may result in temporary, localized, and relatively minor impacts to EFH (see Attachment D for more detail). Temporarily diverting flow from this fish stream may temporarily impair the function of affected habitat. Impacts to fish passage would be minor since the existing culvert is a passage barrier. To minimize potential impacts, the contractor would follow Title 16 permit stipulations and adhere to BMPs during construction, such as those outlined in the SWPPP.

Temporary Air Quality Impacts
The proposed project would result in localized construction-related exhaust emissions and airborne dust. These air quality impacts would be temporary and will be abated through watering disturbed surface areas for dust control during dry weather periods.

Temporary Delays and Detours of Traffic
Road users may be temporarily affected by construction. Construction activities would cause temporary traffic delays as a result of lane closures and reduced travel speeds in construction zones. The construction contractor would be required to develop and implement a Traffic Control Plan to protect and control vehicular, bicycle, and pedestrian traffic. The Traffic Control Plan would include measures to minimize temporary traffic impacts that may include delays and access limitations. The traffic control measures would include providing advance notice to the public and timing lane closures for off-peak hours.

Temporary Impacts to Businesses

Access between communities may be temporarily affected by the proposed project during construction. At least one lane of traffic would be open as practicable. Road closures during blasting would be limited to 1 hour, as practicable. Several businesses within the project area may be affected by changes in travel patterns and delays during construction. Construction near Deermount Street would affect egress/ingress at the IGA grocery store (Tatsuda's). This and other businesses adjacent to the construction zone may be impacted by delays of commercial traffic. Tourism travel, such as bus tours to Saxman Totem Park and Herring Bay, would also be affected by construction delays. Such delays could affect tour schedules and may reduce the numbers of tour participants. However, such impacts caused by the proposed project would be temporary, and access would be maintained throughout the construction process.

Temporary Noise Impacts

Temporary noise impacts would result from the operation of heavy equipment, the presence of construction crews, and other associated construction activities. Temporary noise impacts from construction equipment would be reduced through proper maintenance. Mufflers would be required. Blasting activity would be limited to daytime hours with adjacent businesses and residents provided advanced notice of the construction noise activity.

Other Construction Impacts

Temporary Impacts from Placing Fill in Marine Waters

Placing fill in marine waters may result in temporary, localized, and relatively minor impacts to EFH (see Attachment D for more detail). While most fill would be placed during low tidal stages to minimize impacts, placing fill in subtidal waters may bury marine organisms since those habitats would be inundated by water during fill placement. Placing fill may also result in a temporary increase in turbidity in surrounding waters, which has the potential to harm fish and temporarily reduce habitat quality. Impacts to fish and EFH from a temporary increase in turbidity are anticipated to be relatively minor, be localized, and not affect managed fish species at the population level. Impacts would be minimized by adhering to BMPs during construction, as outlined in the SWPPP, to prevent erosion and runoff from entering aquatic habitats.

Temporary Impacts to Marine Mammals

Impacts to fish prey species would be minor and would not affect their ability to feed in the area. The construction contractor will be limited to placing fill below HTL during low tide events in dry conditions to minimize potential temporary construction impacts on marine mammals. Underwater sound pressure levels from construction activities would not exceed marine mammal harassment thresholds (see Section H6).

Temporary Impacts to Bald Eagles

Noise and vibration producing construction activities will be restricted during the breeding season from March 1st to when the eaglets fledge, approximately August 15th. Restricted activities will be coordinated with USFWS and listed in the eagle take permit.

Q. Section 4(f)/6(f)

	N/A	YES	NO
1. Section 4(f) (23 CFR 774)			
a. Was detailed Section 4(f) resource identification conducted for this project, other than that required for Section 106 compliance? *If no, attach consultation with the Statewide NEPA Manager (assigned CEs) or FHWA Environmental Program Manager (non-assigned CEs) stating further Section 4(f) resource identification was not required.*		☒	☐
b. Does a Section 4(f) resource exist within the project area; or is the project adjacent to a Section 4(f) resource? *If yes, attach consultation with the Statewide NEPA Manager (assigned CEs) or FHWA Environmental Program Manager (non-assigned CEs) to determine applicability of Section 4(f).*	☐	☒	☐
c. Does an exception listed in 23 CFR 774.13 apply to this project? *If yes, attach consultation with the Statewide NEPA Manager (assigned CEs) or FHWA Environmental Program Manager (non-assigned CEs), and documentation from the official with jurisdiction, if required.*	☐	☒	☐
d. Does the project result in the "use" of a Section 4(f) property? *"Use" includes a permanent incorporation of land, adverse temporary occupancy, or constructive use.*	☐	☒	☐
e. Has a *de minimis* impact finding been prepared for the project? *If yes, attach the finding.*		☒	☐
f. Has a Programmatic Section 4(f) Evaluation been prepared for the project? *If yes, attach the evaluation.*		☐	☒
g. Does the project require an Individual Section 4(f) Evaluation? *If yes, the project is not assigned to the State per the 6004 MOU and the CE must be processed by FHWA. Attach the evaluation.*		☐	☒
2. Section 6(f) (36 CFR 59)			
a. Were funds from the Land and Water Conservation Fund Act (LWCFA) used for improvement to a property that will be affected by this project?	☐	☐	☒
b. Is the use of the property receiving LWCFA funds a "conversion of use" per Section 6(f) of the LWCFA? *Attach the correspondence received from the ADNR 6(f) Grants Administrator.*	☒	☐	☐

Summarize Section 4(f)/6(f) involvement, if any:

The analysis of Section 4(f) applicability resulted in a de minimis impact finding for historic sites, specifically Saxman Totem Park. The finding indicated that the proposed project's temporary construction and permanent easements would not directly or indirectly adversely affect potential historic values or compromise attributes of potentially eligible structures of Saxman Totem Park. SHPO concurred with the finding of no adverse effect on historic properties on April 14, 2017. (See Attachment B: Section 106 Documentation). An exemption to 4(f) from temporary occupancies near historic sites (23 CFR 774.13(d) also applies (see Appendix H).

An consultation was conducted on the Joseph C. Williams Sr. Coastal Trail, a Section 4(f) resource and discontinuous pedestrian path primarily used for recreational purposes. The recreational trail wholly exists within the DOT&PF ROW and may be temporarily restricted for public access during construction in the project area. However, the proposed project would improve the Section 4(f) resource overall by creating a continuous pathway and would not cause any adverse effects to the trail and its surrounding environment. The exception to 4(f) approval found in 23 CFR 774.13(f)(3) applies. See

Attachment H for more detail.

DOT&PF has determined that activities to improve the South Tongass Highway, a Treat as Eligible Road, and associated sidewalks meet the conditions for the exception to 4(f) approval found in 23 CFR 774.13(a)

No Section 6(f) properties lie adjacent to the proposed project ROW.

Section 4(f)/6(f) documentation and de minimis finding is provided in Attachment H.

IV. Permits and Authorizations

	N/A	YES	NO
1. USACE, Section 404/10 *Includes Abbreviated Permit Process, Nationwide Permit, and General Permit*		☒	☐
2. Coast Guard, Section 9		☐	☒
3. ADF&G Fish Habitat Permit (Title 16.05.871 and Title 16.05.841)		☒	☐
4. Flood Hazard		☐	☒
5. ADEC Non-domestic Wastewater Plan Approval		☐	☒
6. ADEC 401		☐	☒
7. ADEC APDES		☒	☐
8. Noise		☐	☒
9. Eagle Permit		☒	☐
10. Other. *If yes, list below:*		☐	☒

V. Comments and Coordination

	N/A	YES	NO
1. Public/agency involvement for project. *Required if protected resources are involved.*		☒	☐
2. Public Meetings. Date(s): Tuesday June 21 and Wednesday June 22, 2016; Tuesday December 6 and Wednesday December 7, 2016		☒	☐
3. Newspaper ads. *Attach certified affidavit of publication as an appendix.* Name of newspaper and date: Ketchikan Daily News June 7, 2016, November 11, 2016		☒	☐
4. Agency scoping letters. Date sent: May 4, 2016		☒	☐
5. Agency scoping meeting. Date of meeting: Tuesday June 21 and Wednesday June 22, 2016; Tuesday December 6 and Wednesday December 7, 2016		☒	☐
6. Field review. Date: October 6, 2015		☒	☐

7. Summarize comments and coordination efforts for this project. Discuss pertinent issues raised. *Attach correspondence that demonstrates coordination and that there are no unresolved issues.*

   DOT&PF's efforts to coordinate with the public and agencies regarding the project are demonstrated in Attachment H: *Comments and Coordination.* Included in Attachment H are the *Scoping Summary Report* and *Scoping Summary Report Addendum.* These documents include:

   - Summaries of the project-specific public open house meetings that occurred June 21-22 and December 6-7, 2016, in Saxman and Ketchikan
   - Certified affidavits of publication of meeting notices
   - Graphic advertisements used to inform stakeholders of the upcoming open house meeting and on-line open house availability
   - Notes from the meetings with stakeholder agencies and organizations
   - Public comments on the project and DOT&PF responses to those comments

   In addition to hosting the public open house meetings, DOT&PF shared project information on the project website (http://southtongasshighway.com). The website included online open-house meetings, project updates, and opportunities to provide comment.

   Comments included expressions of support for the rehabilitation of the South Tongass Highway and improvements to the multi-use pathway along the highway. Comments referenced the need for increased pedestrian and vehicle safety, parking along the South Tongass Highway, and additional turn lanes. There were objections to removing the Stedman Street access and concern for eagle nests along the South Tongass Highway. Comments also provided input on additional signage, bus stops, and pedestrian facilities to be included in the design and construction process. Comments and responses are included in Attachment H.

   Agency coordination consisted of a scoping letter sent to resource agencies, local governments, tribes, and native corporations on May 4, 2016. DOT&PF met with local agencies (City of Saxman, City of Ketchikan, and Ketchikan Gateway Borough) and tribes (Organized Village of Saxman and Ketchikan Indian Community) during the days of the public open house meetings. DOT&PF met with USCG representatives on December 6, 2016. The meetings addressed concerns, and DOT&PF adjusted the design, if possible, to address and resolve the issues and concerns and presented. Meeting notes are included in Attachment H.

   SHPO and other Section 106 consulting parties were invited to comment on the APE. SHPO was asked to concur with the Finding of Effect. Section 106 documentation is provided in Attachment B. DOT&PF coordinated with USFWS on mitigation for impacts to eagle nests (see Attachment E). DOT&PF coordinated with NMFS on the EFH Assessment (see Attachment D).

   There are no unresolved issues.

VI. Environmental Commitments and Mitigation Measures

List all environmental commitments and mitigation measures included in the project:

- Comply with Subsection 107-1.07 specifications for Archeological or Historic Discoveries.
    - If cultural, archaeological, or historical sites are discovered during construction, all work that may affect these resources will stop until DOT&PF consults with the SHPO to determine the appropriate correction action and guidance on how to proceed.
- Comply with SR Special Provision 201-3.01 for the Migratory Bird Treaty Act.
    - In Forested areas clearing is restricted between April 15 and July 15
    - In shrub or open areas clearing is restricted between May 1 and July 15
- Comply with SR Special Provision 201-3.07 Specifications for Control of Invasive Plant Species.
- Comply with Subsection 203-3.01 specifications regarding excavation.
    - The contractor is responsible for obtaining all necessary permits and clearances for materials sites, disposal sites, and staging areas unless DOT&PF has obtained all necessary permits.
- Comply with Section 641 specifications for Erosion, Sediment and Pollution Control.
    - Comply with Subsection 641-2.02 specifications for the Hazardous Materials Control Plan.
- Comply with Section 641 regarding Hazardous Material Control by adding a special provision under 641-2.02 that reads,
    - Any spills of oil or hazardous substance will be reported immediately to the National Response Center, ADEC and DOT&PF Environmental. .
    - The contractor will notify the engineer if any odors, sheens or other conditions are discovered during construction that indicates contamination. The engineer will contact DOT&PF Environmental Section who will in turn notify the Alaska Department of Environmental Conservation (ADEC). Work will cease in the vicinity of possible contamination until the extent of contamination is evaluated. In coordination with ADEC, DOT&PF Environmental will screen soils using a PID and notify the engineer which soils are to be stockpiled for further investigation.
    - As part of the Hazardous Material Control Plan (HMCP), the contractor will stockpile contaminated soils according to the requirements at 18 AAC 75.370. The contractor will not blend suspected contaminated soil with uncontaminated soil and shall store contaminated soil 100 feet or more from surface water, a private water well, a Class C public water system, or a fresh water supply system that uses groundwater or 200 feet or more from a water source serving a Class A or Class B public water system. The contractor will have a liner and cover available during construction that meets the requirements of 18 AAC 75.370 Table D (attached).
    - The contractor shall place contaminated soil on a liner meeting the minimum specifications of 18 AAC 75.370 Table D (attached). Petroleum contaminated

soils will use the short-term specifications. The contractor shall cover and protect the contaminated soil stockpile from weather with no less than a 6-mil, reinforced polyethylene liner or its equivalent, with the edge of the cover lapped over the bottom liner to prevent water running through the soil; and inspect and maintain the contaminated soil stockpile regularly to ensure that the cover remains intact and that the soil and any liquid leachate derived from the soil is contained.

- Comply with Section 641 regarding Hazardous Material Control by adding a Special Provision under 641-2.02 requiring a qualified hazardous materials monitor during excavation in areas adjacent to known hazardous material sites identified in Attachment F
- Comply with Section 643 specifications for Traffic Maintenance.
    - The contractor is responsible for creating a Traffic Control Plan and providing advance notice to the public and businesses of construction activities that could cause delays, cause detours, or affect access to adjacent properties
- As a commitment of the Essential Fish Habitat (EFH) Assessment,
    - the Contractor shall remove visible plastic debris to minimize the potential for these materials to be inadvertently dispersed into marine waters prior to work in the intertidal area.
    - Intertidal fill will be placed during low tide conditions to minimize impacts to federally managed fish species, EFH, and marine mammals.
- Comply with conditions outlined in the ADF&G Title 16 Fish Habitat Permit.
- Comply with the conditions of the USACE Section Nationwide Permit for Fill in Wetlands and Waters of the US
    - Existing drainage patterns would be maintained; properly sized and designed culverts would be used in appropriate locations to maintain the natural flow patterns and timing of surface water inflows to adjacent wetlands and waters.
    - Existing drainage patterns would be maintained; properly sized and designed culverts would be used in appropriate locations to maintain the natural flow patterns and timing of surface water inflows to adjacent wetlands and water.
    - The contractor would use clean, contaminant-free fill material during construction.
- Comply with the provisions of the Bald and Golden Eagle take permit.
    - Noise and vibration producing construction activities will be restricted during the breeding season from March 1st to when the eaglets fledge, approximately August 15th. Restricted activities will be listed in the permit.

VII. Environmental Documentation Approval

	N/A	YES	NO
1. Do any unusual circumstances exist, as described in 23 C.F.R. 771.117 (b)? *If yes, the CE Documentation form cannot be approved.*		☐	☒
2. Does this 6004 Program approval statement apply? "The State has determined that this project has no significant impact(s) on the environment and that there are no unusual circumstances as described in 23 CFR 771.117(b). As such, the project is categorically excluded from the requirements to prepare an environmental assessment or environmental impact statement under the National Environmental Policy Act. The State has been assigned, and hereby certifies that it has carried out, the responsibility to make this determination pursuant to Chapter 3 of title 23, United States Code, Section 326 and a Memorandum of Understanding dated September 18, 2015, executed between the FHWA and the State." *If no, the CE must be approved by FHWA.*		☒	☐
3. **For 6004 projects:** The project meets the criteria of the DOT&PF Programmatic Approval 2 authorized in the December 8, 2015 "Chief Engineer Directive – 6004 Programmatic Categorical Exclusions". *If* yes, *the CE may be approved by the Regional Environmental Manager. If no, the CE must be approved by a Statewide NEPA Manager.*	☐	☐	☒
4. **For non-assigned projects:** The project meets the criteria of the April 13, 2012 "Programmatic Categorical Exclusion for Use on Federal-Aid Highway Projects in Alaska" between FHWA and DOT&PF. *If yes, the CE may be approved by the Regional Environmental Manager. If no, the CE may be approved by the FHWA Area Engineer.*	☒	☐	☐

VIII. Environmental Documentation Approval Signatures

Prepared by: ______________________ Date: 8-9-17
[Sign] Environmental Impact Analyst

Jim Scholl
[Print Name] Environmental Impact Analyst

Reviewed by: ______________________ Date: 8/9/17
[Sign] Engineering Manager

David Pyeatt
[Print Name] Engineering Manager

Approved by: ______________________ Date: 8/9/17
[Sign] Regional Environmental Manager

John Barnett
[Print Name] Regional Environmental Manager

Assigned CE
Approved by: ______________________ Date: 08/09/17
[Sign] DOT&PF Statewide NEPA Manager

Melissa Goldstein
[Print Name] DOT&PF Statewide NEPA Manager

Non-Assigned CE
Approved by: ______________________ Date: ______
[Sign] FHWA Area Engineer

____
[Print Name] FHWA Area Engineer

APPENDIX F

Approved Design Exceptions and Design Waivers

APPENDIX G

Design Memos

At this time, no significant design changes were made after the approval of this document. The final as-built plans for this project will be available in Central Files within the Highway Design Section (4111 Aviation Avenue, Anchorage, AK 99502).