MEMORANDUM

State of Alaska
Department of Transportation & Public Facilities
Northern Region
Design, Engineering, & Construction

TO: State of Alaska
Department of Natural Resources
Division of Mining, Land and Water
Northern Region

DATE: 05/21/2026

PHONE NO: (907)451-5483

FROM: Katie McCarthy
DOT&PF - Northern Region
Right of Way Agent III

SUBJECT: Dalton Highway MP 214.7
DOT&PF M&O
Land Use Permit Application

An unnamed stream channel near Milepost 214.7 on the Dalton Highway has changed route towards a culvert that is not sufficiently sized. The State of Alaska Department of Transportation and Public Facilities (DOT&PF) would like to construct a dike to re-route the stream into its original stream channel, so it flows to the culverts that were designed for it.

After thorough investigation and research, DOT&PF Maintenance & Operations (M&O) is proposing to construct a dike that would be approximately 100 ft long, 4 ft high and 20 ft wide. The work area to construct the dike is approximately 1/2 acre from where the dike will be constructed to no more than 500 ft upstream of the dike. Access to site is approximately 2000 ft from DOT&PF Dalton Highway ROW to where the dike would be constructed. The work area would be accessed by the existing stream channel and construction time is estimated to take 1-3 days.

Current conditions are causing consistent icing up of the highway in the winter and sedimentation and overflow in the summer causing rill erosion on the shoulders and creating ongoing maintenance difficulties along this section of the Dalton Highway. DOT&PF requests expedient processing of this application as it is necessary that steps be taken to mitigate these issues as soon as possible to prevent further highway deterioration. Please let me know if you need any additional information to review this application or if there is anything I can do to help expedite the process. If you foresee any problems or have any questions, please contact me at (907) 451-5483 or by email at katie.mccarthy@alaska.gov.

Enclosure:

DNR Land Use Permit Application
Figure 1 – Location Map
Figure 2 – Dike Cross-Section & Layout
Figure 3 – Sit Photos
Hydraulic Summary Report

STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

Division of Mining, Land and Water

Northern Region Land Office, Fairbanks	Southcentral Region Land Office, Anchorage	Southeast Region Land Office, Juneau
(907) 451-2740	(907) 269-8503	(907) 465-3400

The Department of Natural Resources, Division of Mining, Land and Water's (DMLW) regional land offices are responsible for managing state land and resources. Certain activities on state land require a land use permit, while other activities are considered "generally allowed" or require other authorizations. Commercial recreation facilities that remain no longer than 14 days in any one site may obtain a commercial recreation permit rather than a land use permit. Additional information and forms are available online or at any Division of Mining, Land and Water regional land office and the Public Information Centers in Anchorage and Fairbanks. The following text describes information that is required to be filled out by applicants for your application to be considered complete.

Land Use Permits:

- Authorize the temporary use of state land or resources;
- can be issued for up to five years;
- do not convey any interest in state land;
- are revocable with or without cause;
- are not transferable; and
- do not constitute waiver of any other state, federal, or local laws.

Complete Land Use Permit Application Packages include the following documents:

- A Land Use Permit application form completed and signed by the applicant;
- A completed Supplemental Questionnaire for Use of State-Owned Uplands if the use or activity includes use of state-owned uplands - **including a Site Development Diagram**;
- A completed Supplemental Questionnaire for Off-Road Travel if the use or activity includes travel by or with means that exceed those that are generally allowed; and/or
- A completed Supplemental Questionnaire for Use of State-Owned Waters (Shorelands, Tidelands, and Submerged Lands) if the use or activity includes uses on tide and submerged lands below the mean high tide line in marine environments or uses on state-owned shorelands below the ordinary high-water line in freshwater environments - **including a Site Development Diagram**.
- A Site Development Diagram showing each item labeled so that it corresponds with your description in the Questionnaire. The Site Development Diagram must include:
  - **Location** - Section, Township, and Range lines; North arrow; scale; title; and include a legend (these items may be attached if necessary).
  - **Boundaries** – Boundaries and dimensions of proposed area of use and their relation to geographic features, including water bodies, and existing trails or rights-of-way.
  - **Structures and Storage** - Location and dimensions of buildings, tent platforms, out-buildings and other improvements, and of equipment parking and storage areas, including snow storage areas.
  - **Hazardous substances** – Location and dimensions of storage facilities for hazardous substances, including but not limited to oil, lubricants, fuel oil, gasoline, solvents, and diesel fuel. Include method and dimensions of storage (tank, drum, etc.).

Other items that must accompany the application package include:

- **Map** - a topographic map or aerial photo of sufficient scale to show the location of the proposed activity.
- **Filing Fees** - A non-refundable filing fee required by regulation (11 AAC 05.010(5)(B)). See the current Director's Fee Order for applicable fees. Make checks payable to the "State of Alaska".
- **Other Miscellaneous Items**: Items specifically identified and required in any of the supplemental questionnaires.

Completed Land Use Permit Applications must be submitted electronically to an email address below or mailed to one of the following offices closest to the proposed use or activity on state lands:

Northern Region Land Office
3700 Airport Way
Fairbanks, AK 99709-4699
(907) 451-2740
nro.lands@alaska.gov

Southcentral Region Land Office
550 West 7th Ave, Suite 900C
Anchorage, AK 99501-3577
(907) 269-8503
dnr.scro.permitting@alaska.gov

Southeast Region Land Office
P. O. Box 111020
Juneau, AK 99811-1020
(907) 465-3400
sero@alaska.gov

Statewide TTY – 771 for Alaska Relay or 1-800-770-8973

Prior to issuance of a permit, an applicant is required to submit one or more of the following:

- **Use Fees** - The use fee depends on the type of activity, length of use and the acreage authorized for use. See the current Director's Fee Order or contact your regional office for applicable fees.
- **Performance Guaranty (Bond)** - A performance guaranty is held by the state to incentivize performance and to pay for corrective action if the use of state land fails to comply with the requirements of the permit. Acceptable types of performance guaranties include:
  - cash or check made out to the State of Alaska;
  - a Certificate of Deposit (CD) in the state's name; or
  - a corporate surety bond.
- **Insurance** – Proof of insurance to protect you and the state from liabilities incurred through the use of state land.
- **Survey and Location** - Surveys are generally not required for land use permits. Many authorizations require a Global Positioning System (GPS) to determine the location of the project. If we determine a survey is required, we will contact you.

ONLY COMPLETE APPLICATIONS WILL BE ACCEPTED

STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES
Division of Mining, Land and Water

LAND USE PERMIT APPLICATION
AS 38.05.850

Applicants must complete all sections of this application. In addition, applicants proposing:

- the use of the uplands must also complete the Supplemental Questionnaire for Use of State-Owned Uplands accompanying this application;
- off-road travel must also complete the Supplemental Questionnaire for Off-Road Travel accompanying this application; and/or
- the use of shorelands, tidelands, and submerged lands must also complete the Supplemental Questionnaire for Use of State-Owned Waters accompanying this application.

Other items that must accompany the completed application are:

- a (non-refundable) application fee; see current Director's Fee Order or contact your regional office for applicable fees;
- a topographic map or aerial photo showing the location of the proposed activity;
- additional items identified and required in any supplemental questionnaire(s) to this application; and
- additional pages if more space is necessary to answer the questions completely.

Completed Land Use Permit Applications should be submitted electronically or mailed to one of the following offices:

Northern Region Land Office
3700 Airport Way
Fairbanks, AK 99709-4699
(907) 451-2740
nro.lands@alaska.gov

Southcentral Region Land Office
550 West 7th Ave, Suite 900C
Anchorage, AK 99501-3577
(907) 269-8503
dnr.scro.permitting@alaska.gov

Southeast Region Land Office
P. O. Box 111020
Juneau, AK 99811-1020
(907) 465-3400
sero@alaska.gov

Statewide TTY – 771 for Alaska Relay or 1-800-770-8973

LAS # _____
(Applicant please provide if known)

Applicant Information:

Name: State of Alaska DOT&PF

Doing Business As: _____

Mailing Address: 2301 Peger Road
Fairbanks, AK 99709

Email Address: katie.mccarthy@alaska.gov

Date of Birth: _____

Business License #: _____

EIN: _____

Contact Person: Katie McCarthy

Home Phone: _____

Work Phone: (907)451-5483

Cell Phone: _____

Fax: _____

If you are applying for a corporation, give the following information:

Name, address and place of incorporation:

N/A

Is the corporation qualified to do business in Alaska? Yes ☐ No ☐

If yes, provide name, address and phone number of the resident agent:

N/A

Type of User (Select One): ☐ Private non-commercial (personal use) ☐ Commercial Recreation or Tourism

☒ Public Non-profit including Federal, State, Municipal Government Agency ☐ Other commercial or industrial

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Duration of Project: The proposed activity will require the use of state land for: **(Check one)**

☐ A single term of less than one year. **Beginning month:** _____ **Ending month:** _____

☒ A multi year term for up to 5 years. **Beginning year:** 2026 **Ending year:** 2031

If multi year and seasonal, mark months of use in each year.

☐ Jan, ☐ Feb, ☐ Mar, ☒ Apr, ☒ May, ☒ Jun, ☒ Jul, ☒ Aug, ☒ Sept, ☒ Oct, ☐ Nov, ☐ Dec

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Project Location:

Latitude/Longitude or UTM: Lat/Long 67.7554 N. 149.7640 W. degrees or

Section: 23 **Township:** 34N **Range:** 10W **Meridian:** Fairbanks Meridian

Section: _____ **Township:** _____ **Range:** _____ **Meridian:** _____

Proposed project will require the use of up to See project description acres.

(Please add additional sheets for this section as necessary)

Project Description: Describe in detail your intended use of state land. (State land also includes all tide and submerged lands beneath coastal waters and all shorelands beneath other navigable waterbodies of the state.) Discuss development and activities. (Attach additional pages as necessary.)

The purpose of the work is to redirect an unnamed stream back into an abandoned channel where there are sufficiently sized culverts to convey water across the Dalton Highway. Work entails constructing a diversion dike to redirect water back into an abandon stream channel. The dike would be approximately 100-feet long, 4-feet high and 20-feet wide. The dike would be constructed such that footer boulders are keyed in to at least 3 feet below the elevation of the stream channel. This will help prevent undercutting and therefore failure of the dike. All stones will be excavated from the floodplains and dry areas, and not from the existing active channel bed. The work area to collect appropriate sized rocks and construct dike is approximately 1/2 acre from where the dike will be constructed, to no more than 500-feet upstream of the dike.
The need is to divert stream waters back into abandon channel where there are an adequate number and appropriately sized culverts to convey water across the Dalton Highway. This project would reduce present maintenance costs, and allow limited public highway funds to go to other needs along the Dalton Highway. Work will occur as soon as permit is received, water levels are low, and equipment is available. Construction time is estimated to take 1 to 3 days. Although construction is expected to be fairly quick, we are requesting a 5 year Land Use Permit so DOT&PF Maintenance & Operations personnel can continue to inspect and maintain the channel and dike as needed to ensure water continues to flow through the proper channel.

Should a portion of the permitted area be closed to the general public? **Yes** ☒ **No** ☐ .

If yes, explain which portion and provide justification for exclusive use.

In the interest of public safety, the permitted area will need to remain closed to untrained personnel while the diversion dike is being constructed.

Site Description: Briefly describe the current condition of the proposed site of use, noting any trash, garbage, debris or signs of possible site contamination. (If significant, we recommend you provide pictures to establish initial conditions.)

The proposed permitted area contains an abandoned historic stream channel, rocky terrain and tundra with some shrubbery, small trees and natural vegitation. There are no apparent signs of contamination within the proposed permitted area.

Are there improvements or materials on the site now? **Yes** ☐ **No** ☐ **If yes**, briefly describe the improvements, their approximate value, and who owns them. (We recommend you provide pictures of improvements.)

N/A

Describe the natural vegetation – ground cover, trees, shrubs – and any proposed changes. Describe the location of any estuarine, riparian, or wetlands and any noticeable animal use of area.

The proposed permitted area contains an abandoned historic stream channel, rocky terrain and tundra with some shrubbery, small trees and natural vegitation. There are no T&E species present. The unnamed stream most likely does not support fish as the stream goes under ground for several hundred feet. Vegetation will be impacted with small excavator walking vegetation down to access site, with minor vegetation removal in area of dike construction. Work is temporary and not anticipated to impact hunting/wildlife.

Site Access: Describe how you plan to access the site, and your mode of transportation.

Access to the dike location will be achieved by driving equipment up the abandoned channel, and/or rocky areas adjacent to abandoned channel. Access to site is approximately 2000 feet from DOT&PF Dalton Highway ROW to where the dike would be constructed.

If your access is by aircraft, specify the type and size of aircraft:

N/A

To access the site, the aircraft is equipped with **floats** ☐ **wheels** ☐ **skis** ☐ .

Number of people:

1. Indicate the number of employees and supervisors who will be working on the site. varying
2. Indicate the number of customers who will be using the site per year or season. None
3. Indicate the number of days the site will be used per year or season. varying

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Environmental Risk / Hazardous Substances: In the course of your proposed activity will you generate, use, store, transport, dispose of, or otherwise come in contact with toxic and/or hazardous materials, and/or hydrocarbons?

Yes ☒ **No** ☐ . **If yes**, please describe:

The project will involve use of gas and diesel powered equipment. Most equipment will also use hydraulic fluid.

The types and volumes of fuel or other hazardous substances present or proposed:

Gas, diesel, and hydraulic fluid as needed for equipment. Quantities will vary.

The specific storage location(s):

In equipment, as needed to run equipment. Any containers for refueling purposes will likely be stored within the DOT&PF Right of Way.

The spill plan and prevention methods:

- Fueling of land-based vehicles and equipment shall take place in the DOT&PF Right of Way.
- Personnel shall complete daily pre-work inspections of equipment and vessels for cleanliness and leaks. If a piece of equipment or vessel is determined to have a leak, then that piece of equipment or vessel is to be taken out of service until it is repaired and cleaned. Oil absorbent pads (aka diapers) and drip pans need to be utilized to contain the leaking fluid until the repair has been completed.
- Personnel will have a sufficient number of spill kits located on the project site, and be readily accessible, in order to contain and clean any potential spills that may inadvertently occur.

If you plan to use either above or below ground storage containers (like tanks, drums, or other containers) for hazardous material storage, answer the following questions for each container:

Where will the container be located?

N/A no storage containers with hazardous materials will be stored within the requested permitted area.

What will be stored in the container?

N/A

What will be the container's size in gallons? N/A

Give a description of any secondary containment structure, including volume in gallons, the type of lining material, and configuration:

N/A

Will the container be tested for leaks? **Yes** ☐ **No** ☐ .

Will the container be equipped with leak detection devices? **Yes** ☐ **No** ☐ . **If no**, describe:

N/A

Do you have any reason to suspect, or do you know if the site may have been previously contaminated?

Yes ☐ **No** ☒ . **If yes**, please explain:

There are no apparent signs of contamination within the proposed permitted area.

Katie McCarthy	ROW Agent III	05/21/2026
Signature of Applicant or Authorized Representative	Title	Date

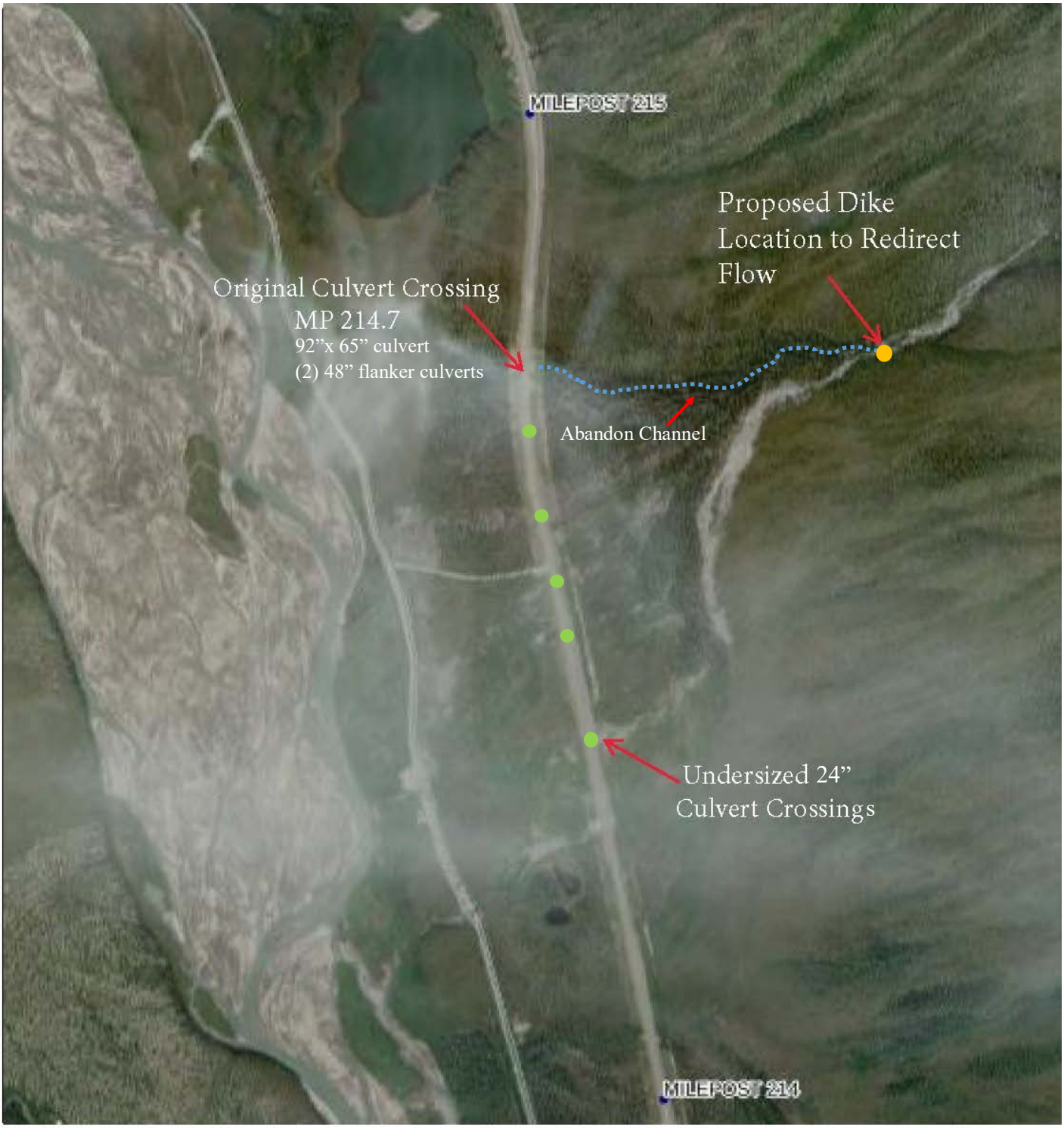
This form must be filled out completely and submitted with the applicable fees. Failure to do so will result in a delay in processing your permit. AS 38.05.035(a) authorizes the director to decide what information is needed to process an application for the sale or use of state land and resources. This information is made a part of the state public land records and becomes public information under AS 40.25.110 and 40.25.120 (unless the information qualifies for confidentiality under AS 38.05.035(a)(8) and confidentiality is requested, AS 43.05.230, or AS 45.48). Public information is open to inspection by you or any member of the public. A person who is the subject of the information may challenge its accuracy or completeness under AS 44.99.310, by giving a written description of the challenged information, the changes needed to correct it, and a name and address where the person can be reached. False statements made in an application for a benefit are punishable under AS 11.56.210.

In submitting this form, the applicant certifies that he or she has not changed the original text of the form or any attached documents provided by the Division. In submitting this form, the applicant agrees with the Department to use "electronic" means to conduct "transactions" (as those terms are used in the Uniform Electronic Transactions Act, AS 09.80.010 – AS 09.80.195) that relate to this form and that the Department need not retain the original paper form of this record: the department may retain this record as an electronic record and destroy the original.

For Department Use Only
Application received date stamp

Receipt Type: ☐ **7A** ☐ **RR** ☐ **FF**

LAS #: _____



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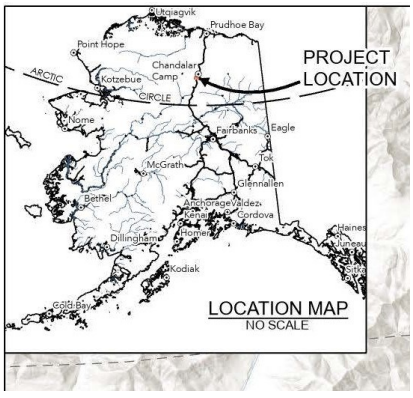

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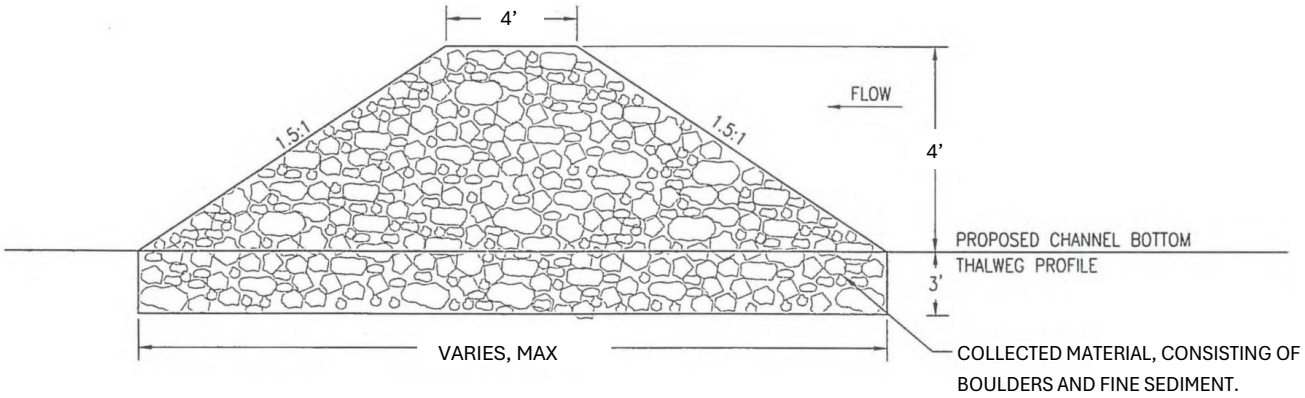
STATE OF ALSKA DEPRTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

- 24" Culverts
- Diversion Dike

Dalton Highway MP 214.7 Diversion Dike Project

Location Map

Date : 2/2026 Figure 1



Dike Cross-Section.

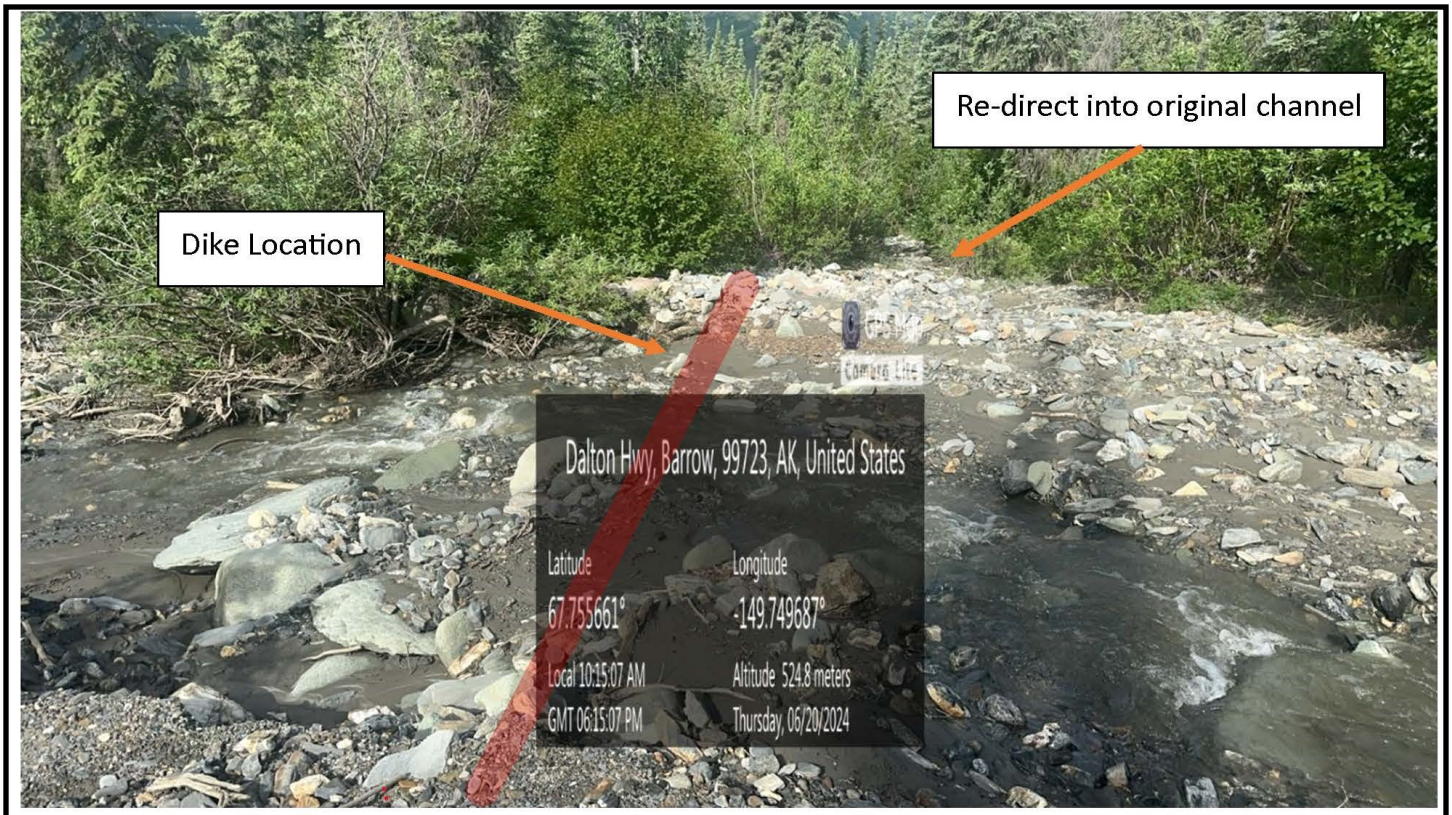
Dike Layout – spanning the dike across the entire channel will capture any flow that enters the secondary channel.

STATE OF ALSKA DEPRTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

Dalton Highway MP 214.7 Diversion Dike Project

Dike Cross-Section & Layout

Date : 9/2025 Figure 2



note: original channel is also referenced as abandon channel

Top photo—Dike location

Lower photo—original channel for water diversion

STATE OF ALSKA DEPRTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

Dalton Highway MP 214.7 Diversion Dike Project

Dike location and Diversion Channel Photos

Date : 2/2025 Figure 3

MEMORANDUM

State of Alaska
Department of Transportation and Public Facilities
Northern Region Materials

TO:	Melissa Riordan Environmental Impact Analyst Northern Region	**DATE:**	September 25, 2025
		TELEPHONE NO:	907-451-2211
FROM:	Elizabeth Thompson Hydraulics Engineer Northern Region Jeff Stutzke, P.E. Regional Hydraulics Engineer Northern Region	**SUBJECT:**	Dalton MP 214.7 Diversion Dike Hydraulic Summary Report

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Introduction

The following report provides a summary of existing conditions and recommended alternatives for the Dalton Highway MP 214.7 ("Dunder's Dribble"/ "Numbers Lake") and the surrounding area along the Dalton Highway. At this location, several culverts along a half mile of the Dalton Highway handle flow from a drainage east of the highway. This drainage has headwaters in a portion of the Brooks Range, with the drainage gradually losing slope and widening as it approaches the Dalton Highway. The Dalton Highway crosses the existing alluvial fan that has formed just upstream of the confluence with the Dietrich River. Under existing conditions, the highway has been difficult to upkeep in this area due to sedimentation, aufeis formation, and culvert jacking. Recommendations have been made based on field visits, aerial imagery and videos, As-Built plans, and reports of existing maintenance difficulties from AK DOT&PF staff.

Project Description

AK DOT&PF hydraulic engineers, maintenance equipment operators and environmental impact analyst met on site with BLM hydrologists to review existing conditions and discuss potential alternatives for preventing sedimentation issues along a 1-mile section of the Dalton Highway. Based on this visit and review of existing information, we recommend that both short term and long term solutions are considered. The short term solution will consist of building a dike along the south side of the existing channel to re-direct flow into the abandoned historic channel. The long term solution focuses on adding and upsizing culverts along the affected portion of the Dalton Highway to allow increased sediment movement and prevent backup of water along the east side of the highway. This longer term solution would be highly beneficial in the event that flow ever circumvents the constructed dike, and to add additional capacity if the structure at MP 214.7 becomes overwhelmed during spring runoff or another high flow event.

Figure 1. Location Map of Dalton Highway MP 214.7 Drainage Issues

Existing Conditions

Watershed Conditions

The drainage to this area along the Dalton Highway is moderately steep and narrow, which typically results in high peak flows due to the lack of attenuation. Historically, the flow path followed the ravine out of the mountains, then widened slightly and decreased in slope, and continued out to the Dalton Highway at approximately MP 214.7. Though this flow path is still visible both in aerial imagery and in field investigations, it is now abandoned (see Figures 1, 2).

Figure 2. Upstream channel with abandoned historic channel.

The flow path now departs from the abandoned channel approximately 2000 upstream of the Dalton Highway and begins traveling south. Over time the flow has thawed a new drainage path into the existing tundra, causing the stream to now go subsurface for several hundred feet before resurfacing into a very low slope zone.

Figure 3. Upstream channel and entrance to subsurface flow channel.

It also appears that in recent years, a frozen debris lobe has begun thawing in the headwaters of the drainage, likely contributing larger volumes of sediment to the stream flows. It is anticipated that this thawing will continue, and for the foreseeable future will add a significant sediment load to flows from this drainage. This flow path is currently continually changing as new sections of tundra and permafrost are thawed subsurface. Currently the majority of flow is slowly making its way further south along the Dalton Highway. It is anticipated that the flow path will eventually reach a limit of movement south at approximately MP 214, before elevation begins to increase heading south.

Highway Conditions

The continual change of this flow path along with increased sedimentation has caused maintenance difficulties along this section of the Dalton Highway for the last several years, despite new pipes being installed in 2018. This section of road experiences both consistent icing conditions in the winter and sedimentation in the summer. Both of these issues result in clogged culverts, and therefore aufeis formation on road shoulders in the cold season and road overflow during the warm season, including rill erosion on the shoulders. We believe that the continual issues with the roadway are due to both the abandonment of the historic channel and undersized crossings for the volume of sediment. Flow no longer crosses the roadway at locations identified as part of the rehabilitation project constructed in 2018. Additionally, this section of the Dalton Highway does not have ditching, and has a very low embankment height ranging from 3 to 6 feet.

Figure 4. Sediment deposition on east shoulder of Dalton Highway results in clogged culverts and road overflow.

Surface Water Hydrology

This drainage has an area of approximately 3.7 square miles. The existing channel has an approximate slope of 8% at the proposed location of the constructed dike and channel reroute. As the channel approaches the road, the slope decreases to 3-4%, which results in the deposition of activated sediment. Based on conditions in the field, it is estimated that material with a long axis up to 24 to 36 inches could be activated during large storm events. Velocities during these events are likely 10+ fps.

The flood frequency estimates for this crossing were developed using equations from the “2016 Estimating Flood Magnitude and Frequency at Gaged and Ungaged Sites on Streams in Alaska and Conterminous Basins in Canada, Based on Data through Water Year 2012” by Janet H. Curran, Nancy A. Barth, Andrea G. Veilleux, and Robert T. Ourso:

Table 1 – Estimated Peak Flows Using USGS 2016 Regression Equations

Percent Chance Exceedance*	Percent Chance Exceedance Flow (cfs)
50	50.7
10	127
2	215
1	257
0.2	364

* Percent Chance Exceedance refers to the probability that the noted flow in cfs will be exceeded in a given year.

Basin characteristic information used in the USGS regression for streamflow analysis is basin area and mean annual precipitation. Drainage areas were obtained by planimetric techniques in ArcGIS utilizing USGS National Elevation Dataset 1/3 arc-second contours obtained from The National Map Download v2.0. 1:63,360 quad maps in ArcGIS. Mean annual precipitation was interpolated from the Gibson (2009a) PRISM dataset.

Hydraulic Recommendations

Recommendations have been developed for both storm-term and long-term timeframes. Due to the ongoing issues of icing and overflow, it is necessary that steps be taken to mitigate these issues as soon as possible. A full rehabilitation project will take years to design and construct, and have a cost of at least an order of magnitude higher than constructing a dike and completing associated drainage work. Therefore, it is reasonable to consider a lower cost and quicker solution that can be performed by maintenance and operations personnel that will provide some mitigation of existing maintenance issues in the short term.

After the dike is constructed, it is recommended to consider a more permanent solution to implement if/when the short-term solution is no longer viable. Recommendations for a full rehabilitation project include a grade raise and culvert replacements for this section of the Dalton Highway, to increase the overall resiliency of the roadway.

Short-Term

The short-term solution for this site is to build a channel-spanning dike and redirect the existing flow into the abandoned channel (noted in Figures 1, 2), using material from on site. It has been determined that the State Maintenance and Operations station has the necessary equipment to construct this dike. Large boulders will need to be excavated from the surrounding dry areas, and keyed into the ground surface in order to prevent undercutting of the dike. It has been confirmed based on the surface water hydrology data included above that the existing structure at MP 214.7 is adequate to carry the flows from this drainage. It is anticipated that with construction of this dike, a high volume of sediment may now deposit upstream of this crossing, however, sediment volume will likely be slightly reduced due to preventing flow from traveling subsurface where it activates finer sediment.

Due to the steep grade, high velocities, and increased sediment load, it is highly likely that construction of this dike will not be a permanent solution. This project has the potential to reduce required road maintenance for some time, but consistent deposition of sediment results in a constantly changing channel, which may cause flow to circumvent the constructed dike in the future. Therefore, a long-term solution is recommended for further design in the future.

Long Term

Due to the unpredictable nature of sediment deposition and channel movement in this drainage, it is expected that though the construction of a dike will likely help the existing issues in the short term, it is also likely that the dike will fail or become obsolete at some point in the future due to changing conditions. Therefore it is necessary to consider other more permanent ways of increasing the resiliency of the roadway.

The recommended long-term solution for this site consists of raising road grade from MP 213.6 to MP 214.9 in order to install larger culverts at set intervals along the corridor in the area of the alluvial fan. All existing culverts through this section would be replaced with larger culverts with thaw pipes, and additional culverts would be added as is deemed necessary. The goal with these culvert replacements would not be to try to guide all water to cross the roadway at a specific location, but rather to give plenty of capacity for passage of water and sediment along the entire alluvial fan, and therefore no longer chase the flow path as it moves over time. This recommendation would require a full design in the future, and is therefore not a viable option for immediate implementation.

Design Recommendations

Design recommendations are provided for the construction of the dike only, as a full rehabilitation and culvert replacement project requires a more in-depth design.

Stone Sizing

Excavated stones for dike construction should have a long axis dimension of 3 feet or longer (similar to Riprap, Class III), and be as angular as possible (given the limitations on the site). These stones should NOT be taken from the existing active channel bed, as they add important roughness and armoring to the existing channel bed that is necessary to prevent downcutting and erosion. All stones should be excavated from the floodplains and dry areas. Smaller grained material shall be used to fill all voids between larger stones to prevent water flow through voids.

Dike Construction Methods

Access to the dike location will be achieved by driving equipment up the abandoned channel, and/or rocky areas adjacent to abandoned channel. It is anticipated that vegetation removal will be required to gain access, with additional minor vegetation removal in the area of the dike construction. The dike shall be constructed such that footer boulders are keyed in to at least 3 feet below the elevation of the channel thalweg. This will help prevent undercutting and therefore failure of the dike. See Figure 5 for more detail. The toe of dike should not encroach on proposed channel area. The dike shall be constructed such that the crest is a height of at least 4 feet above the channel thalweg. The crest width of the dike shall be 4 feet, with no steeper than 1.5:1 slopes. It is estimated that the dike will have a length of approximately 100 feet, resulting in a total volume of 1,000 CY of material required for the dike (consisting of both large boulders and smaller void filling material). It is recommended that as the subsurface area is excavated for placement of boulders, excavated smaller material is stockpiled for later use. See Figure 6 for recommended layout of the dike.

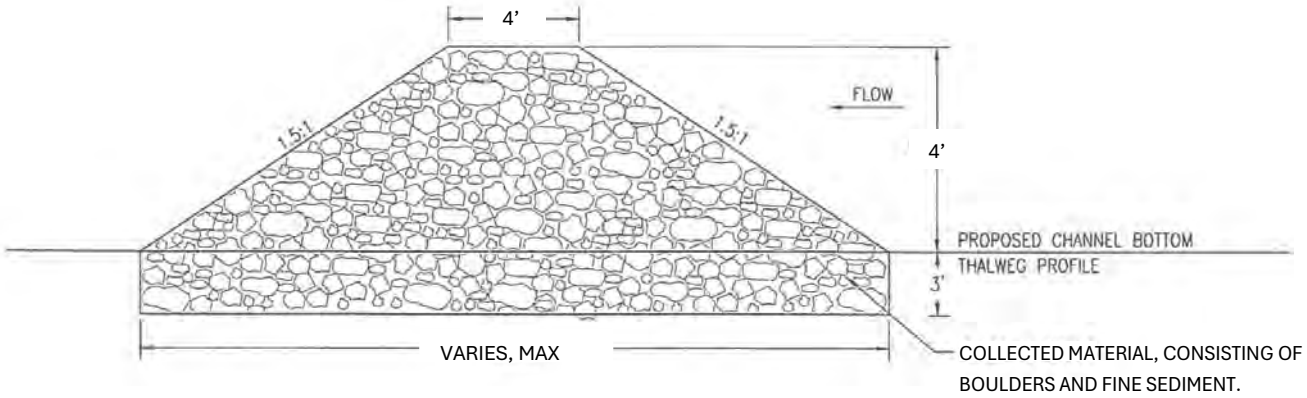

Figure 5. Recommended Dike Cross-Section.

Figure 6. Recommended Dike Layout – spanning the dike across the entire channel will capture any flow that enters the secondary channel.

On the upstream end of the dike, ensure that the embankment is tied into the natural banks to prevent high flow events from outflanking the dike.

Ditching and Channel Formation

Under existing conditions, there is a berm in front of the MP 214.7 structure which significantly prevents inflow to this structure (Figure 7). Previously, the abandoned channel flowed to a structure at this location. The location of the historic channel can be identified by vegetation type approaching the highway. It is assumed that after the structure was replaced and berm formed, the channel naturally moved north around the berm (visible from sediment accumulation between the tree line and road shoulder in Figure 8).

As part of this work, it is recommended that the existing berm be removed, the channel reformed, and ditching performed to direct flow back into this structure. A simple trapezoidal channel may be formed in the area of the removed berm, matching the dimensions of the abandoned channel upstream of the road crossing. Match into existing channel elevation and structure elevation with consistent slope between these two points. Any material removed from the existing berm may be used to form smaller berms on either side of the structure to guide spread flow into the structure (Figure 8). Ensure localized area all drains toward crossing. Retain all existing armoring upstream of crossing to provide a hard surface against which to remove accumulated sediment when necessary. This channel formation work may also require work outside State right-of-way.

Figure 7. Looking upstream from MP 214.7 structure – existing berm is preventing flow into crossing. Historic channel appears to have migrated north, likely due to this berm.

Figure 8. Recommended location of guide berms using removed material from berm blocking abandoned channel.

Figure 9. Historic channel alignment to structure at MP 214.7.

It is important to note that based on the topography of the area, it is likely that overflow from the historic channel could find a path further north toward MP 215 and the Numbers Lake crossing. This crossing is sufficiently sized such that overflow should not cause issues for road maintenance.

Conclusions

Due to the necessity of finding a temporary solution to prevent ongoing maintenance issues along the Dalton Highway from approximately MP 214 to MP 215, it is recommended that a dike be constructed upstream of the MP 214.7 crossing to redirect flow into the previously abandoned channel. Additional drainage work will be necessary to ensure proper functionality of this temporary fix. Design recommendations for this alternative have been provided. It is recommended that this dike is semi-regularly inspected to confirm performance and monitor condition. Due to the constantly changing nature of this drainage and its flow paths, it is also recommended that the State pursue a full design of a rehabilitation along this stretch of roadway to provide greater resiliency in the future by increasing capacity for movement of flow and sediment. The full design would provide a more permanent solution for the maintenance issues of aufeis, sediment accumulation and overflow.

Please reach out if you have any questions.

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