

GUIDE FOR IMPLEMENTING 9-AXLE B-TRAINS FOR LOG HAULING IN B.C.

STEPS TO ACHIEVE AUTHORIZATION ON DESIGNATED PROVINCIAL HIGHWAYS AND FOREST SERVICE ROADS

Version 1.2

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This document summarizes the steps that industry proponents must take to obtain authorization to use 9-axle log B-trains on new routes in B.C. The goal of this document is to ensure that industry proponents are aware of all the necessary requirements and know where to look for the needed information.

The process outlined in this document is for travel on provincial highways and Forest Service Roads (FSRs) tributary to designated provincial highways.

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1 INTRODUCTION

The B.C. Forest industry can realize substantial benefits by implementing new 9-axle log-hauling configurations. Benefits of these configurations include improved transportation productivity and more economically accessible timber, improved vehicle safety, less traffic congestion, reduced road impacts, and a reduction in fuel consumption and GHG emissions. Two configurations of 9-axle log hauling B-trains, known as tandem-drive and tridem-drive versions, have been developed for use.

The B.C. Ministry of Transportation and Infrastructure (TRAN) and the B.C. Ministry of Forests, Lands, and Natural Resource Operations and Rural Development (FLNR) may authorize the use of 9-axle B-trains for log hauling on designated provincial highways and forest service roads. This document summarizes the steps that industry proponents must take to obtain authorization to use 9-axle log B-trains on new routes in B.C. Other steps, laid out in specific TRAN policy, are referred to but not detailed here.

The goal of this document is to ensure that industry proponents are aware of all the necessary requirements and know where to look for the needed information.

The process outlined in this document is for travel on provincial highways and Forest Service Roads (FSRs) tributary to designated provincial highways. Authorization to use 9-axle log trucks on these roads requires proponents to engage with TRAN and FLNR in two separate processes. When granting authorizations to use public highways TRAN requires proponents first to demonstrate that they have gained approval to use that part of the proposed route in the adjacent jurisdiction(s) (excluding FSRs).

Roads in other jurisdictions, including those in municipalities, national or provincial parks, First Nation reserves, Department of Defense lands, and privately-owned lands, may have different approval requirements. To-date, only studies of bridge capacity and off-tracking through tight curves or intersections have been required to obtain route approvals in these other jurisdictions.

2 BACKGROUND

The approval of 9-axle B-trains on designated haul routes and public highways was the result of a multi-year collaboration between the B.C. forest industry, TRAN, FLNR, FPInnovations, trailer manufacturers, BC Forest Safety Council, and other stakeholders. To-date, over 50 segments of provincial highways have been evaluated and approved for use with 9-axle log B-trains.

Numerous engineering studies were undertaken by FPInnovations to demonstrate the 9-axle B-trains' suitability in terms of road safety, dynamic performance, road geometry, bridge capacity, and road impacts.

The 9-axle log hauling B-trains feature highway legal axle loads and this helps to reduce their impacts on both roads and bridges. The weights and dimensions of these new log hauling configurations are shown in Figure 1. Dimensional tolerances for use by trailer manufacturers, that also ensure the 9-axle B-trains retain their required dynamic performance, are provided in Table 1.

2.1 Vehicle Descriptions

Any vehicles that are being proposed through this process must meet the following weights and dimensions.

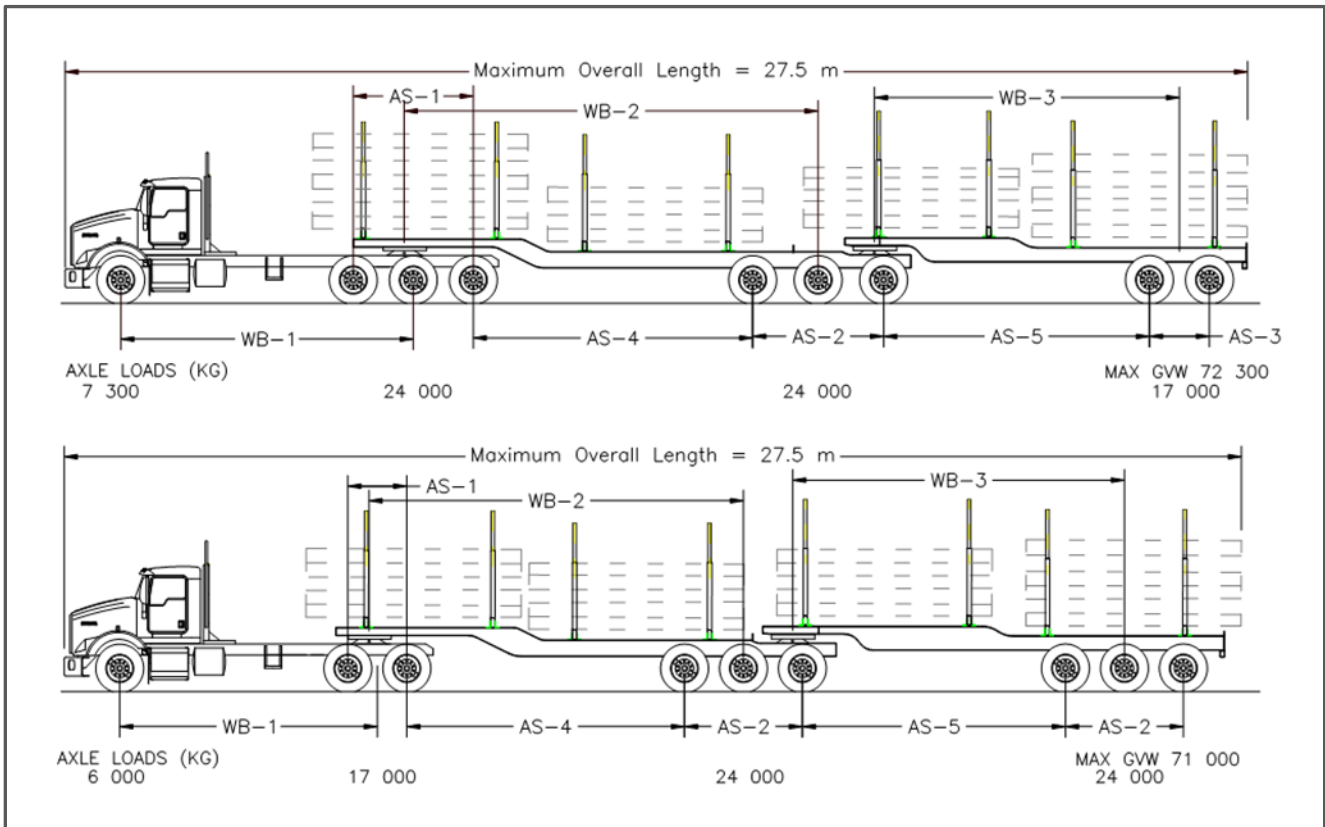


Figure 1. Tridem-drive and tandem-drive 9-axle log hauling B-train configurations for B.C.

Table 1.. Allowable dimensions for tridem-drive and tandem-drive 9-axle log B-trains

Allowable dimensions (m)	Tridem-drive	Tandem-drive
Tractor wheelbase (WB-1)	6.60 – 6.80	5.70 – 6.20
Lead trailer wheelbase (WB-2)	9.48 – 9.78	8.62 – 8.92
Rear trailer wheelbase (WB-3)	6.79 – 7.39	7.24 – 7.84
Drive group spread (AS-1)	2.40 – 2.80	1.30 – 1.55
Trailer tridem group spread (AS-2)	2.70 – 3.10	2.70 – 3.10
Trailer tandem group spread (AS-3)	1.30 – 1.60	n.a.
Axle spacing: drives to lead trailer (AS-4)	6.00 – 6.50	6.20 – 6.80
Axle spacing: lead to rear trailer (AS-5)	6.00 – 6.60	6.00 – 6.50

Notes:

- Maximum trailer axle width should not exceed 2.6 m (8.5 feet).
- Maximum log bunk width should not exceed 2.9 m (9.5 feet).
- Tridem-drive 9-axle log B-train steering axle weight was increased from 6,900 kg to 7,300 kg and GVW increased to 72,300 kg.

3 STEPS FOR TRAN AUTHORIZATION TO USE 9-AXLE B-TRAINS ON A DESIGNATED PROVINCIAL HIGHWAY

TRAN's Commercial Vehicle Safety and Enforcement Branch (CVSE) in Victoria is the main point of contact to request authorization for 9-axle log hauling B-trains. These requests are evaluated on a case-by-case basis and must meet the criteria laid out in TRAN's Reducible Load Overweight Policy (RLOP).¹

Part of the process to authorize a new configuration under the RLOP is to carry out: a) the requisite vehicle dynamics studies to ensure vehicle stability and safety, and b) road impact studies based on Equivalent Single Axle Load (ESAL) calculations. These studies have been completed and approved by TRAN for the two 9-axle B-train configurations specified in this document.

Proponents are responsible for any costs associated with engineering studies and infrastructure upgrades to meet the requirement as stipulated in the RLOP. Note that evaluating road infrastructure is a two-step process that must be undertaken in the following order:

- A route analysis is conducted by TRAN to ensure that road geometry is acceptable and any 'road fit' issues have been addressed; and,
- A bridge analysis is completed on the proposed route to ensure that bridges have the required capacity for the new configurations.

To initiate the approval process for a new route, industrial proponents (also known as 'shippers') must submit maps of the provincial highways that are part of the proposed haul routes for the 9-axle B-train to the CVSE. The maps of the proposed routes must be supplemented with written descriptions of the route, for example, turn-by-turn descriptions for secondary highways leading from a numbered highway to a mill, start and end points, and direction of travel. In addition to the main highway routes, the location of any secondary highways leading to a mill or log dump must be clearly highlighted and should be included as map insets. See Appendix 1 for an example map submission.

The CVSE's point of contact for map submission is:

Christopher Rabbitt, P.Eng., Vehicle Engineer
Commercial Vehicle Safety and Enforcement
B.C. Ministry of Transportation and Infrastructure
Tel.: 250-953-4017
Email: Christopher.Rabbitt@gov.bc.ca

¹ The RLOP is found in Section 6.5 of the Commercial Transport Procedures Manual: (http://www.th.gov.bc.ca/cvse/ctpm/Chapter_6.pdf)

CVSE will in turn submit the maps to TRAN's Bridge Engineering Section for an initial review of bridge capacity on the proposed routes. Proponents will be advised by CVSE as to the outcome of the initial bridge review. If any potential bridges of concern are identified, the haul proponent is responsible for all studies that may be required to confirm bridge capacities, as well as paying for any costs associated with upgrading infrastructure to accommodate the haul. Similarly, any required improvements to route infrastructure (e.g., shoulder widening) also are to be funded by the proponent.

When the review of bridges has been completed and the proposed highway routes are deemed acceptable for 9-axle B-trains, a Letter of Authorization (LOA) must be obtained from CVSE by the fleet owner. All approved fleet owners must be carriers with a Satisfactory or better carrier safety rating. To obtain the LOA, the fleet owner must submit a complete list of Vehicle Identification Numbers (VIN), Make, and Year for all truck tractors and trailers that will be used on the routes. The power units and trailers must be properly licensed, insured, and operated within all applicable rules and regulations in the province of British Columbia, and adhere to all applicable requirements as stated in the British Columbia Transport Regulations.

The required information includes:

- Tractor manufacturer and year of manufacture: _____
- Tractor VIN: _____

- Trailer manufacturer and year of manufacture: _____
- Lead trailer VIN: _____
- Rear trailer VIN: _____

If a LOA is granted, the fleet owner must purchase British Columbia Transport Permits for each prescribed vehicle combination prior to their operation on British Columbia's highways.

Other points to note:

- Additional trucks, owned by the same fleet owner, can be added to a LOA.
- Authorized 9-axle routes in BC are listed, and shown on maps, in the CVSE106 – 9-axle Logging Truck Routes form (see <http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1462> for the most up-to-date version).
- A new fleet owner requires a separate LOA.
- Axle group weight tolerances as specified in Section 7.26 of B.C.'s Commercial Transport Regulations do not apply to the 9-axle B-train configurations operating under a TRAN LOA.

4 STEPS FOR FLNR AUTHORIZATION TO USE 9-AXLE B-TRAINS ON A DESIGNATED FOREST SERVICE ROAD

The proponent must evaluate the suitability of the Forest Service Roads proposed for 9-axle B-train use. The key road parameters to evaluate are bridge capacity and horizontal and vertical alignment. The gradeability of the new configurations relative to the FSR's vertical alignment should also be considered.

4.1 Principles

- Process only applies to specific vehicle configurations (and associated dimensional tolerances) that have received TRAN approval.
- Applicable to all On-Highway use Forest Service Roads (FSRs).
- Road and bridge assessments must be done to ensure adequate geometry and capacity for the proposed 9-axle vehicle configurations; the assessments will be consistent with demonstrated professional reliance; evaluations for FSR segments will only be required to be completed once.
- Off-highway use FSRs with L-75 bridges must have the bridges assessed; L-90 or greater off-highway use FSRs will not require bridge assessments.
- FPIinnovations' technical evaluation of forest bridge and resource road geometric requirements for 9-axle B-trains may be used for guidance: Bradley, A. 2020. 9-axle B-trains for log hauling on B.C. resource roads. Technical Report No. 11, Version 2.1, Vancouver, B.C.: FPIinnovations.
- Field assessments shall be completed by a qualified professional.
- Road Use Permits (RUPs) will be issued or amended to provide for assessed vehicle configurations when considered appropriate by the District Manager.
- FLNR will continue to seek efficiencies and acceleration of opportunities for implementation of 9-axle configurations.

4.2 Process

Proponents will:

- Determine if an existing RUP requires amendment or a new RUP is required to authorize the use of the proposed vehicle configurations.
- Identify and prioritize FSRs and any associated RUP's. Provide map(s) clearly denoting where they wish to operate 9-axle B-trains.
- Engage a qualified professional to conduct field assessments and office analyses of the FSRs to determine if the roads and bridges are in acceptable condition for operating the proposed 9-axle vehicle, and to liaise with the FLNR District for clarifying requirements and obtaining road and bridge information.
- Have the qualified professional conduct assessment of proposed routes and prepare a report to summarize the data and results from the field assessments and office analyses.

- Have the qualified professional provide an assurance statement in the report to the effect of *'I give my assurance, that in my professional opinion, and based on the results of field review and analysis to assess key road geometry and bridge sufficiency for operation of the 9-axle B-train configurations, the road and bridges for the specified FSRs are within acceptable operating conditions'*.
- Submit a RUP application or request a RUP amendment. The application must include map(s) and the associated assessment report with assurance statement.

More information about the application process and about the specific information required by FLNR is detailed in Appendix 2 and Appendix 3, respectively.

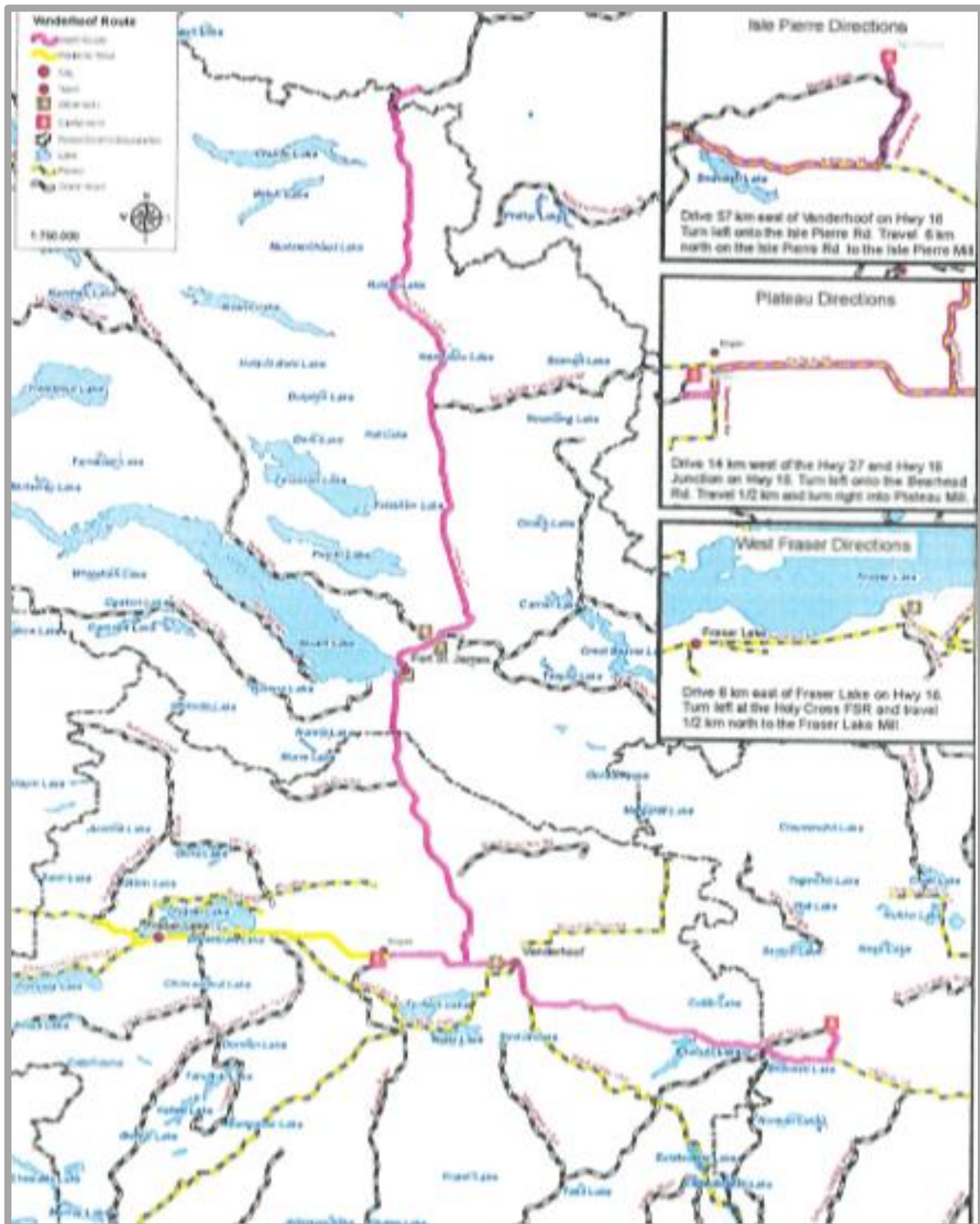
FLNR will:

- Determine whether professional assessments have already been completed and, therefore, an additional assessment is not required.
- Conduct an office review to assess bridge structures for appropriate load ratings and provide results to the proponent and District Manager; alternatively, provide information to the proponent's professional engineer to carry out bridge assessments.
- Specifically identify to the proponent any bridges that are found to be inadequate, for discussion on potential remediation.

District Manager:

- Will authorize through a RUP to the applicant, if all the requirements are met, the use of the FSR(s) identified in the application. These requirements include the qualified professional assurance statement, and the bridge assessments, indicating that the use of the approved 9-axle vehicle is within safe operating conditions and will not adversely affect other authorized road users or compromise a forest stewardship or development plan.
- May include, in the issued permit/ amendment, a requirement that the permit holder erect signage depicting the 9-axle configurations approved and marking the approved route(s) for use on the given FSRs.

APPENDIX 1: EXAMPLE OF ROUTE MAP



APPENDIX 2: EXAMPLE OF FLNR DISTRICT APPROVAL PROCESS

It is recommended that proponents consult with the Resource District to confirm their specific requirements, and any potential deviation from the following process for obtaining 9-axle authorization for use on Forest Service Roads.

The following is the step-by-step approval process for FSRs:

1. Licensee proponent contacts District and provides a list and map depicting proposed FSRs, project numbers, branches, and RUP numbers (or new) for 9-axle log haul vehicle use.
2. Licensee proponent and District clarify the appropriate party to receive the 9-axle RUP authorization.
3. District reviews the list and map to ensure roads are FSRs and the proposed route includes all the needed FSRs.
4. District reviews the Corporate Bridge Register (CBR) to identify any noted bridge issues that may impact their use by the 9-axle B-trains.
5. District contacts appropriate FLNR Bridge Engineer to provide list of structures reviewed and any identified concerns of the District. Any identified structural, safety, or other issues impacting industrial use of any reviewed bridges is to be brought to the attention of the District. They will provide any known hazard information to the Licensee.
6. District reviews applicant licensee RUPs to see if any permits need to be amended to include the required FSRs.
7. District contacts applicant licensee by email to:
 - list any known concerns that have surfaced on the road or structures.
 - list other RUP holders (including primaries) as well as details on sections of road that the applicant will need to apply to have included under the RUP.
 - suggest, if appropriate, that the applicant licensee should take over primary responsibility for the FSR. This may not be necessary if the current primary gives the applicant a letter saying that they agree with 9-axle B-train access to the FSR.
8. District provides access to or sends copies of latest 'approved' routine structure inspections to licensee for FSR bridges that have been identified for proposed routes.
9. The Licensee is fully responsible for field assessment and has a qualified professional (B.C.-registered R.P.F., R.F.T., or P.Eng.) assess the FSR(s) to check:
 - suitability and condition of bridge structures.
 - suitability of FSR geometry.
 - identify any hazards for industrial use.
10. Any identified hazards must be addressed by the Licensee before the road can be used.
11. Licensee formally applies to the District for a new RUP or an amendment of an existing RUP to add required sections. The submission must include:

- Detailed listing of Forest Service Road sections, project numbers, branches, and RUP numbers, as applicable.
 - Map showing the proposed roads.
 - Specification of the TRAN-approved 9-axle B-train configuration proposed for use.
 - Identification of any known hazards and proposed plans to mitigate the hazards prior to industrial use.
 - FSR assessment report, signed and sealed by the qualified professional responsible, and including summaries of bridge assets and key FSR geometric attributes with reasoning for the judgment that the FSR is suitable for 9-axle B-trains, and an assurance statement.
12. If satisfied with the information and completed assessment, the District prepares a RUP including:
- clauses about the 9-axle B-train configuration and drawing of the approved configuration.
 - requirement of the Licensee to post the approved loading signs at the start of the FSR.
 - posting of 9-axle route signs along the authorized route(s).
13. District sends completed RUP document to Licensee.

APPENDIX 3: FLNR-SUGGESTED SUBMISSION INFORMATION

Proponents wishing to obtain authorization for use of 9-axle tridem-drive and (or) tandem-drive B-train log hauling configurations (that have been approved for use on designated provincial highways in B.C.) on Forest Service Roads shall provide an FSR assessment report, signed and sealed (as appropriate) by the qualified professional responsible, to the Ministry.

The FSR assessment report should include:

- a listing of FSR sections that were assessed (see sample in Table 2).
- a map clearly showing the proposed FSR sections and connectivity to the public road network (see sample in Appendix 1).
- which TRAN-approved 9-axle B-Train configuration was evaluated (e.g., tandem or tridem-drive).
- a summary of bridge assets arranged in a table (see sample in Table 3) with a description of the methodology used to complete the assessment. If used, reference should be made to the appropriate aspects of FPInnovations' technical guidance - *9-axle B-trains for log hauling on B.C. forest roads*. Technical Report No. 11, Version 2.1, Vancouver, B.C., FPInnovations, December 2020. This section should include reasoning for the judgment that the FSR is suitable for 9-axle B-trains (see sample in Table 4).
- identification of any notable risks that should be monitored.
- any concerns that require addressing in advance of 9-axle B-Train use.
- identification of any limitations to the findings.
- a signed and sealed (as appropriate) assurance statement.

The assurance statement in the report should include:

- what the assessing professional's designation is and who they are registered with:
 - R.P.F. or R.F.T. registered with ABCFP, or a P.Eng. registered with EGBC.
- that they are responsible for the work in conducting the assessment of the noted Forest Service Roads for acceptability of use of 9-axle B-train log haul vehicles
- that they are providing their assurance that for the assessment, they have:
 - directed activities with sufficient oversight and supervision,
 - produced, or reviewed, and accepted, all the relevant documentation
 - determined that the resource road(s) and its bridge infrastructure, that were analysed and are identified within their report, are within acceptable operating conditions for 9-axle B-train log haul use
 - that they completed the assessment to an acceptable standard as required under the Legislation for my profession and by good practice
- Signature and seal (as appropriate).

(A sample of an assurance statement from a qualified professional is provided below.)

Date completed: _____

Submitted by: _____ Phone : _____ Email: _____

Table 2. Sample table of FSR sections that were assessed for use by 9-axle B-trains

Route priority	Forest Licensee (RUP holder)		Resource District name	FSR name	FSR project number	FSR branch number(s)	Current Road Use Permit number(s)	FSR sections to be used	Approved 9-axle vehicle configuration (tandem-drive or tridem-drive or both)
	Company name	Contact name, phone, email							
1				FSR a				Km to Km	
1				FSR a				Km to Km	
2				FSR b				Km to Km	

Table 3. Sample table of bridge assets and reasoning for judgment that bridges are suitable for use by 9-axle B-trains

Structure number	Location	Bridge type	Superstructure type	Span length (m)	Original bridge design vehicle	Load rating / field condition ^a	Applicable bridge length limit (m)	Meets 9-axle B-train criteria?
CR-1488	5 km on Green Lake FSR	Simple, one lane, one span	Concrete panels on two steel girders	23.4	BCL-625	63 tonnes/ good condition	37.5	YES
CR-1403	16 km on Green Lake FSR	Simple, one lane, one span	Concrete slab	8.0	L-75	68 tonnes/ good condition	80	YES
CR-2204	35 km on Green Lake FSR	Continuous, one lane, two spans	Concrete panels on two steel girders	48.4 (24.2, 24.2)	L-75	68 tonnes/ good condition	60 (30, 30)	YES

Notes:

1. Original bridge design vehicle and load rating obtained from FLNR
2. Adequacy to support 9-axle B-Trains determined use tables 1, 2, 3 in FPInnovations’ 9-axle B-trains for log hauling on B.C. resource roads. Technical Report No. 11, Version 2.1
3. Structures were field reviewed to confirm adequate field condition of key structural elements.

Table 4. Sample table to summarize key FSR geometry and reasoning for judgment that road is suitable for use by 9-axle B-trains

	Max grade over 200 m long	Horizontal curve design standard	Vertical curve design standard	Current truck configurations	Reasoning for judgment that road is suitable for 9-axle B-trains
Green Lake FSR	7.50%	FLNR (2018)	unknown	8-axle B-trains, 7-axle tridem-drive hayracks	<ol style="list-style-type: none"> 1. 9-axle B-trains OK for FLNR standard. Some widening of tight curves was done after construction. 2. 8-axle B-trains use bridges without issue, so 9-axle B-trains will too. 3. Observed grades are less than 9-axle B-train limits.

Notes:

1. Adequacy for road geometry to support 9-axle B-Trains determined use tables 4, 5, 6 in FPIinnovations’ 9-axle B-trains for log hauling on B.C. resource roads. Technical Report No. 11, Version 2.1.
2. Ability for 9-axle B-train to traverse grades over 200 m drawn from table 8 in FPIinnovations’ 9-axle B-trains for log hauling on B.C. resource roads. Technical Report No. 11, Version 2.1.

SAMPLE QUALIFIED PROFESSIONAL ASSURANCE STATEMENT

9-AXLE B-TRAIN LOG HAUL - RESOURCE ROAD SUITABILITY ASSESSMENT

Description of Project Covered by this Statement		
9-axle drive axle configuration analyzed :	<input type="checkbox"/> Tridem-drive	<input type="checkbox"/> Tandem-drive

This is to advise that I am a:

- Professional Engineer (P.Eng.), registered with Engineers & Geoscientists British Columbia (EGBC)
- Forest Professional (R.P.F. or R.F.T.), registered with the Association of British Columbia Forest Professionals (ABCFP)

I am responsible for the work in conducting the assessment of the noted Forest Service Roads for acceptability of use of 9-axle B-train log haul vehicles.

I give my assurance**, that for this assessment, I have:

- directed activities with sufficient oversight and supervision.
- produced or reviewed, and accepted, all the relevant documentation.
- determined that the resource road(s) and associated bridge infrastructure, that have been analysed and are identified within my report, are within acceptable operating conditions for 9-axle B-train log haul use.

I have completed my assessment to an acceptable standard as required under the Legislation for my profession and by good practice.

Name and Title of Qualified Professional <i>(please print)</i>		<i>(please affix professional seal, signature and date here)</i>
Company Name and Address <i>(please print)</i>		
Phone Number	Email Address	

**Assurance” means that a P.Eng. or R.P.F. or R.F.T., has undertaken the analysis and field reviews that, in his/her professional judgment, are considered necessary to ascertain whether the resource road(s) and associated bridge infrastructure are within acceptable operating conditions for 9-axle B-train log haul use.

FOR MORE INFORMATION

Published guidance about bridge and road geometry requirements of 9-axle log B-train is contained in:

Bradley, A. 2020. *9-axle B-trains for log hauling on B.C. resource roads*. Technical Report No. 11, Version 2.1, Vancouver, B.C.: FPInnovations. December 2020

General guidance about conducting assessments of resource roads is contained in:

Bradley, A. 2020. *Resource road assessments for implementation of 9-axle log B-trains*. Research Report, Vancouver, B.C.: FPInnovations. December 2020.

For more information, please contact:

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