MEMO

TO:	Scott Cosman. P ENG.
COMPANY:	BC MOTI
FROM:	Bob Forsyth
DATE:	17 November 2022
CC:	Wayne Byczek, P Eng, Johnathan Tillie, Michael Carreira, P Eng.
PROJECT NO.:	VG07794.312
SUBJECT:	Silver Skagit Road, South of Hope, BC Road and Culvert Repair at km 36.7 Project Number: 14122, Site ID: SA07-150-24

As requested, we herein provide geotechnical comment regarding proposed repairs (RF Binnie & Associates Ltd. Drawings R1-1049-000 to 301) to the creek crossing at km 36.7 of the Silver Skagit Road. During the flood event of November 2021, the culvert inlet on the upstream side of the road was completely buried and the culvert outlet on the downstream side of the road was partially buried with sand and gravel. It is understood that flood waters flowed across the road and deposited sand and gravel on the road and in the creek channel both upstream and downstream of the road. After access had been restored at km 18.6, the road was re-established by grading the road in the vicinity of the creek crossing. The buried culvert was in place and had not yet been excavated, repaired or replaced as observed during our visits of September 14 and 21, 2022. The creek bed was observed to be dry at the time of those visits.

On November 9, 2022, we visited the site and observed the status of construction. The channel had been cleaned both upstream and downstream of the road and the culvert was in place and being backfilled.

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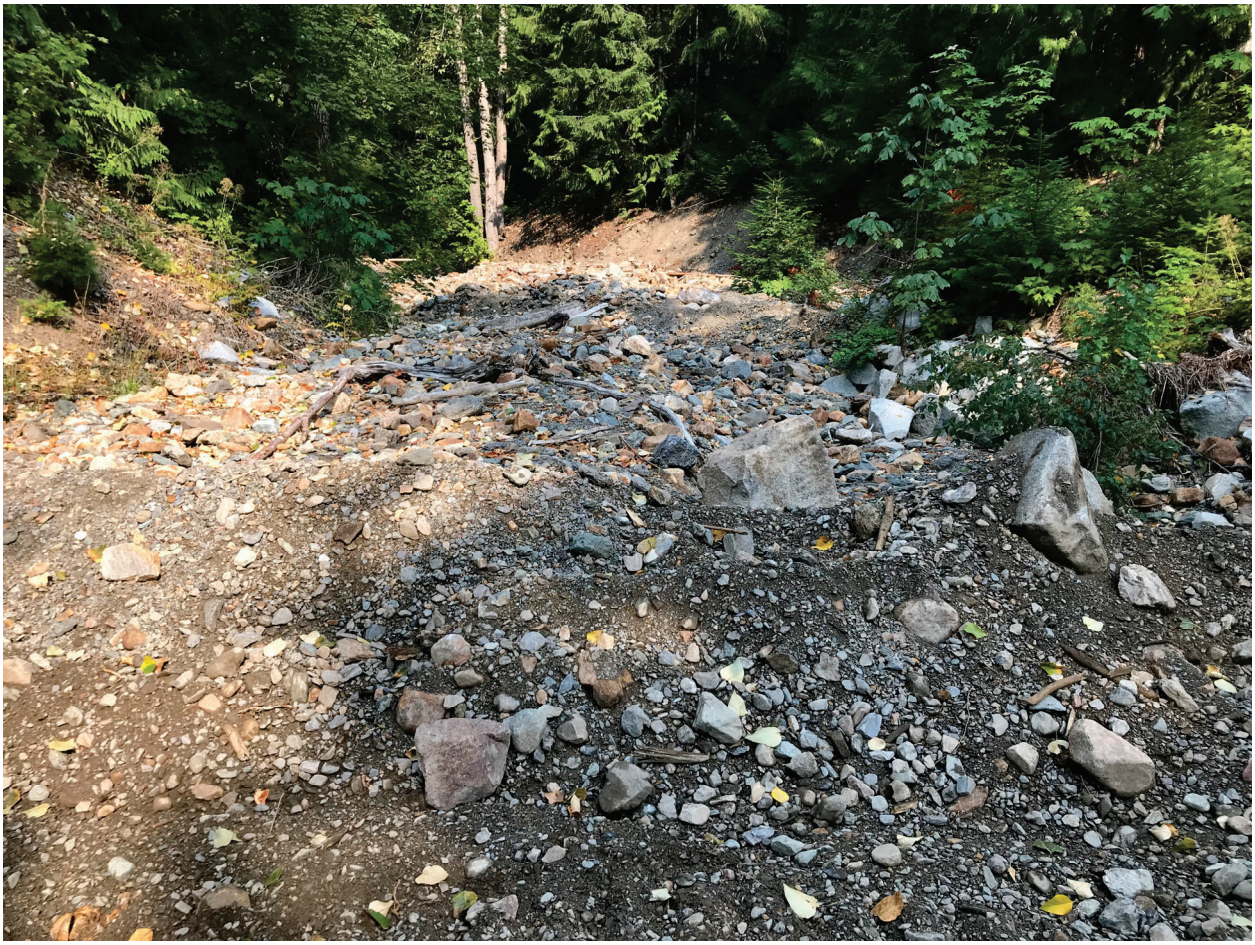

Photo 1: September 14, 2022. Looking upstream from the road.

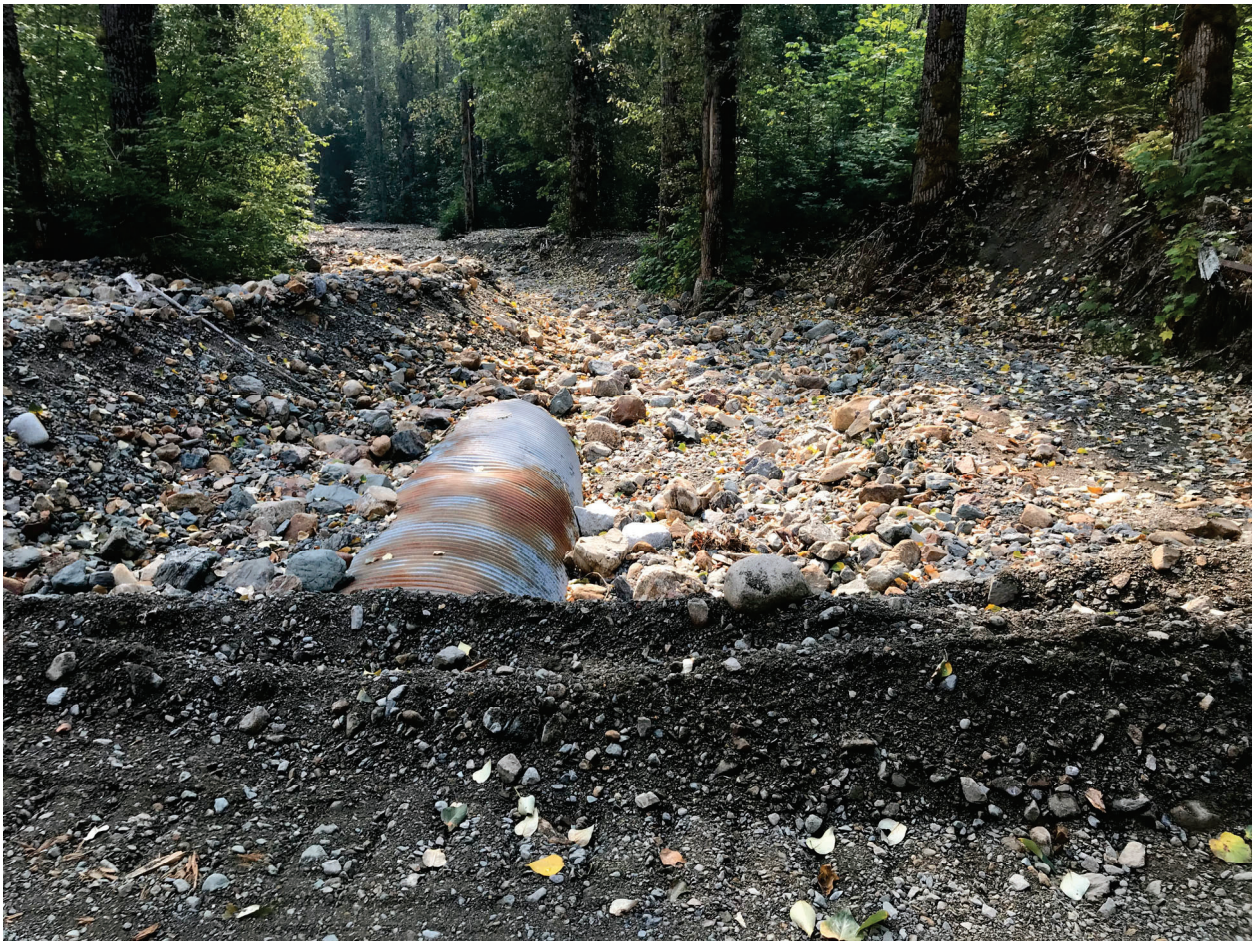

Photo 2: September 14, 2022. Looking downstream from the road.

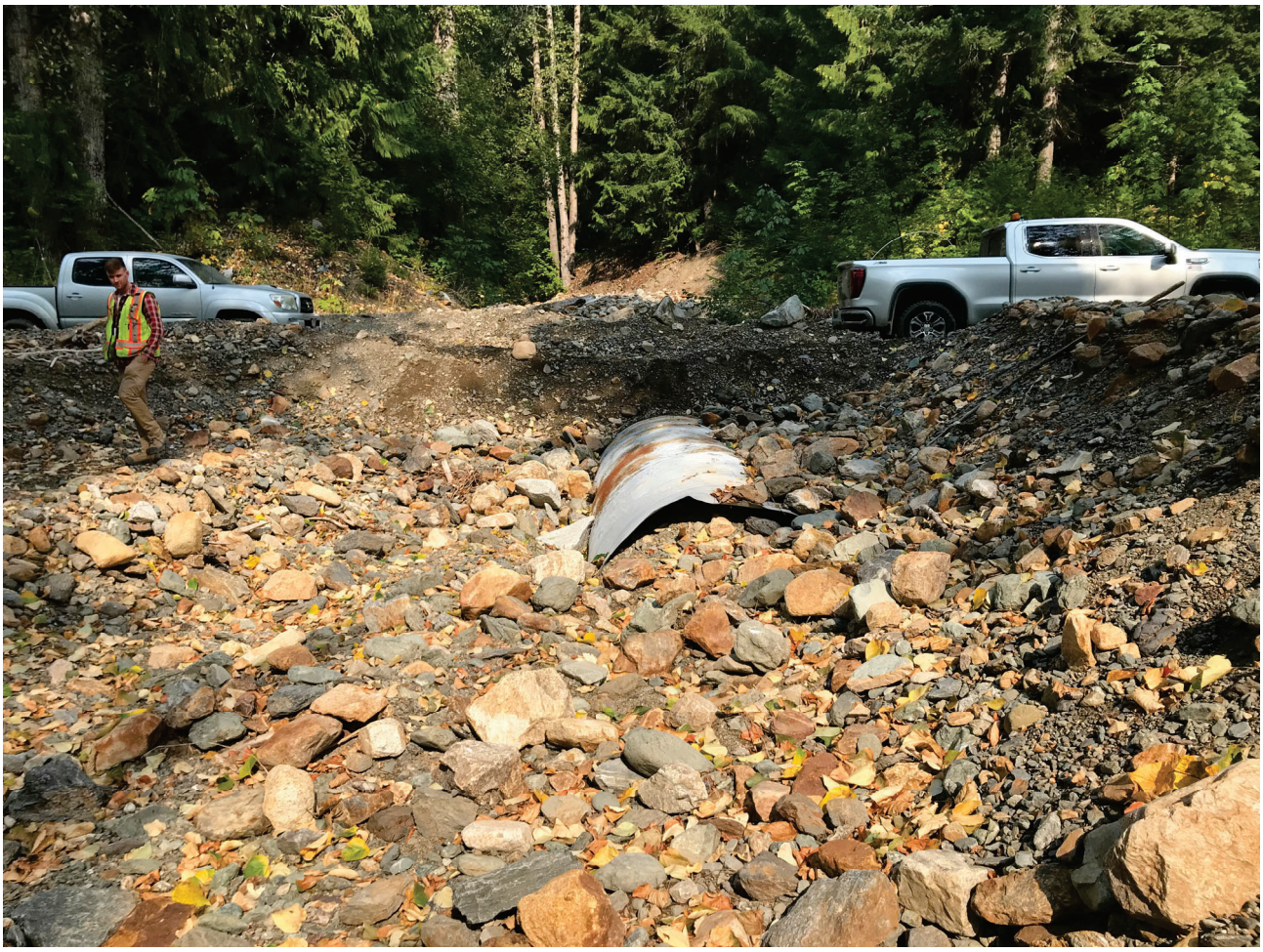

Photo 3: September 14, 2022. Looking upstream at the existing culvert outlet.

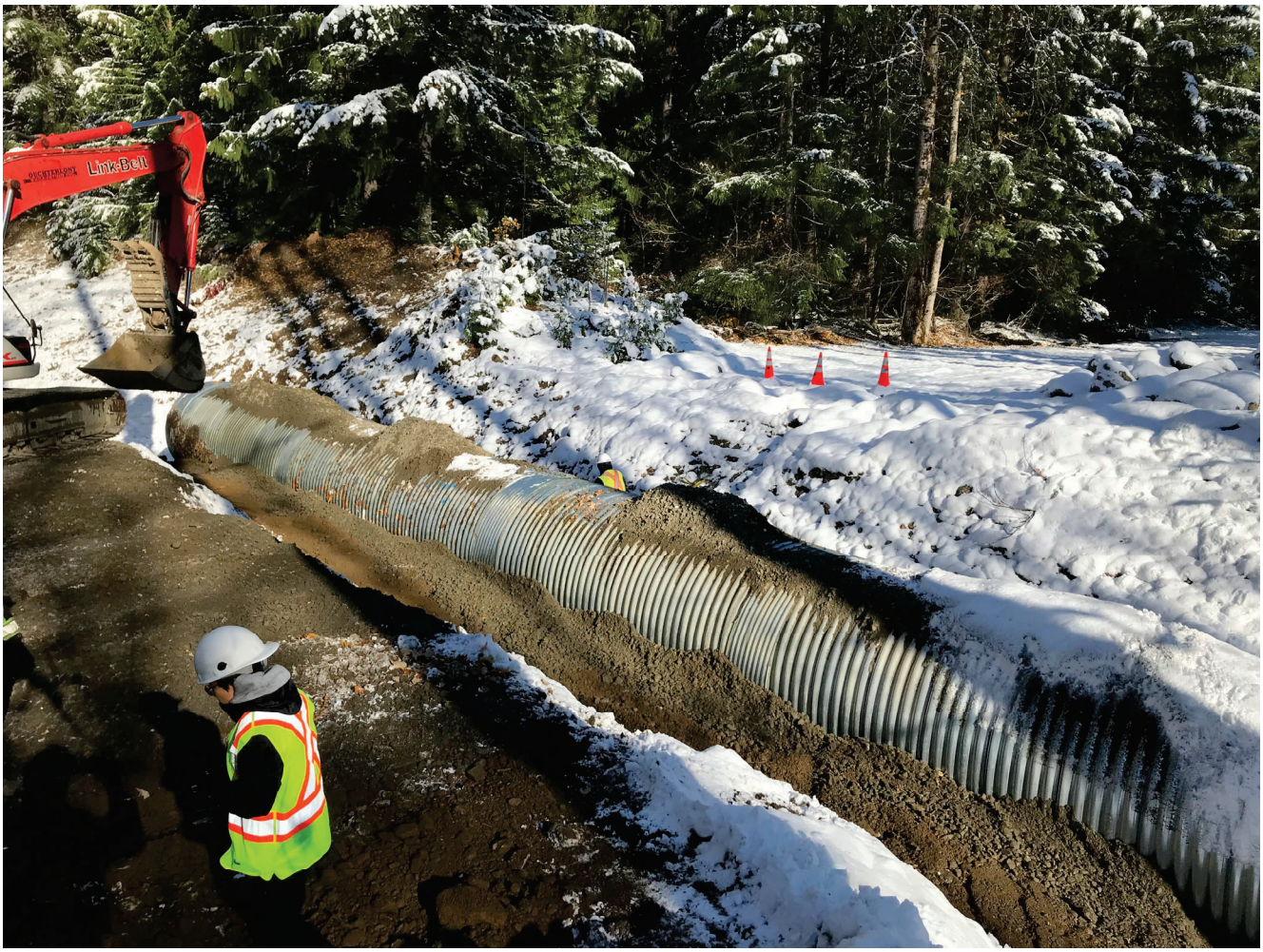

Photo 4: November 9, 2022; Culvert installation is in progress

The repair design includes:

- The culvert of the main channel will be removed and replaced with a new 2.4 m diameter culvert. We understand that the culvert has been sized by the hydrotechnical engineer.
- The creek channel will be cleaned and deepened for a distance of about 60 m upstream of the road and 100 m downstream of the road. The channel bottom will have a minimum 2% downstream gradient.
- The ground adjacent to the culvert inlet and outlet will be protected with riprap.
- The road pavement structure will consist of High Fines Surfacing Aggregate (HFSA), underlain by Well Graded Base Course (WGB) then Select Granular Subbase (SGSB). BC MOTI specifications for the pavement structure materials are shown below.

Course	In Cut	In Fill
HFSA	100	100
25 mm WGB	225	225
SGSB	300*	150**

Notes: * assumes fine grained subgrade ML/CL/OL/MH/CH/OH. Can be reduced if it is coarse grained.
** assumes coarse grained subgrade GW/GP/GM/GC/SW/SP/SM/SC

The subbase can be omitted where the underlying subgrade material meets SGSB requirements. We expect that Type D compacted subgrade material, where required by site grades, will consist of locally sourced granular fill. The material removed from the creek bed is expected to be suitable for this purpose.

The new culvert should be bedded and backfilled with WGB material.

Fill materials should be compacted in lifts, of maximum 300 mm loose thickness, using vibratory equipment. Water should be added as required so that the fill is close to optimum moisture content during compaction. We understand that compaction of fills will be witnessed by the project civil inspector.

Considering the above, it is our opinion that the repair plan is reasonable from a geotechnical perspective.

Comments and recommendations presented herein are based on a geotechnical evaluation of the available information as noted. If conditions other than those reported are noted in subsequent phases of the project, WSP E&I Canada Limited should be notified and be given the opportunity to review and revise the current comments and recommendations if necessary. Recommendations presented herein may not be valid if an adequate level of review or inspection is not provided during construction.

This memo has been prepared for the exclusive use of BC MOTI and their appointed agents for specific application to the area covered within this memo. Any use which a third party makes of this memo or any reliance on or decisions made based on it are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this memo. It has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

Effective September 21, 2022, Wood Environment & Infrastructure Solutions Canada Limited is now operating as WSP E&I Canada Limited. No other aspects of our legal entity, contractual terms or capabilities have changed in relation to this memo submission.

Yours sincerely,

WSP E&I Canada Limited

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2022-11-17

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