

Report

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| Date | June 19, 2024 | File: |
| Subject | Genoa Bay Road Slope Stabilization and Road Remediation Project – Request to Increase Budget | |

PURPOSE

To provide an update on the Genoa Bay Road Slope Stabilization and Roadway Rehabilitation Project and request an increase to the budget from \$1,500,000 to \$3,000,000.

BACKGROUND

A 110 m section of pavement in the northbound lane of Genoa Bay Road near Genoa Bay Village has been settling, and the pavement has been cracking for many years (approximate location shown in Figure 1). Genoa Bay Road was constructed along the side of a mountain and is the only means of ingress/egress for about 20 homes at the end of Genoa Bay Road. Engineering staff have been monitoring the settlement rate for over eight years. During the November 2021 rainfall event, cracks in the asphalt appeared to be more significant than usual (see Figures 2 and 3). This was confirmed by the settlement monitoring data, which showed an accelerated settlement rate at one of the monitoring stations.

Out of concerns for public safety, the northbound lane was closed and remains closed to this day. Engineering staff immediately commissioned Ryzuk Geotechnical to undertake a geotechnical assessment of the roadbed and slope. The assessment confirmed that the lane closure was warranted. Staff also temporarily relocated a water main serving Genoa Bay Village residents due to concerns that should the water main leak, the water could increase the chance of, or cause, a slope failure, resulting in a loss of both the road and the water service to Genoa Bay Village.

Due to the challenges, complexities, and costs of addressing a problem of this nature (a failing road on the side of a mountain), Engineering staff commissioned an options study with SNC Lavalin to determine the options and costs for resolving the problem. Nine options were developed, ranging from \$2.5 million to \$3.5 million. Six of the nine options necessitated a full road closure for an extended period, which is problematic given that Genoa Bay Road is the only means of ingress/egress for residents and businesses in Genoa Bay Village.

Soon after the SNC Lavalin report was finalized, North Cowichan established a Standing Offer Agreement with three engineering firms for engineering services. North Cowichan retained one of the three engineering firms, WSP, to move forward with the findings from the SNC Lavalin report. Upon reviewing the SNC Lavalin report findings, WSP developed some additional solutions that built upon those proposed by SNC Lavalin. WSP also undertook a further geotechnical investigation, which revealed that an adjacent section of the road also needed to be remediated, increasing the area of concern by about 50%.

The Engineering department has been working with these consultants to achieve two key goals:

1. to try to preserve two lanes for normal traffic flow; and,
2. to keep the costs as low as possible.

DISCUSSION

The report prepared by WSP proposed two viable options. Each option was taken to a 50% design level to provide a more reliable cost estimate before determining which option would best suit North Cowichan.

The two options generally consist of the following work:

1. Stabilization of the slope using a product called Tecco Mesh. Tecco Mesh is like a fencing material made of a high tensile galvanized steel wire anchored to a slope with steel rods drilled into a mountain face (Figure 4). This is a proven technique used by the Ministry of Transportation and Infrastructure (MOTI) to stabilize slopes throughout BC.
2. Permanent replacement and relocation of the Genoa Bay water main from the unstable road area to a new location within the proposed stabilized roadway.
3. Remediation of the road base structure using a technique called Geosynthetic Reinforced Soil (GRS) (Option 1 only) (Figure 5). GRS is a ground reinforcement technique that uses soil reinforced with geotextile to add both horizontal and vertical strength to the soil. The GRS will significantly mitigate settlement of the road base and the overlying asphalt between the steel anchor rods, improving the road's drivability and reducing the chance that a vehicle will lose control due to unexpected dips in the road.
4. Installation of magnetic extensometer devices under the road to monitor any potential settlement.
5. Installation of a road-side barrier due to excessively steep slopes at the edge of the driving lane. This will protect drivers from a lane departure that, without the barrier, could result in a vehicle falling down the slope to the ocean.
6. Installation of traffic control lights (only required if Council chooses the single-lane option; Option 2). While traffic volumes are generally low, the closure is relatively long, and from time to time, heavy rainfall and/or fog can reduce visibility.

OPTIONS

Option 1 - Recommended Option (Two Driving Lanes, Road-Side Barrier)

That Council:

- 1) Approve Option 1 (Two Driving Lanes, Road-Side Barrier) of the Genoa Bay Road Slope Stabilization and Road Remediation Project, as outlined in the June 19, 2024, report from the Manager, Infrastructure.
- 2) Approve increasing the Genoa Bay Road Slope Stabilization and Road Remediation Project budget from \$1,500,000 to \$3,000,000.
- 3) Approve the transfer of \$1,500,000 of funds to the Genoa Bay Road Slope Stabilization and Road Remediation Project as follows:
 - a) \$1,000,000 from the Herd Road Bridge Repair Project;
 - b) \$350,000 from the Kingsview Culverts (Phase 1 and 2) Project;
 - c) \$50,000 from the Seine Road Culvert Replacement Project; and,
 - d) \$100,000 from the Unallocated Roads Fund.

Features:

1. Two 3.2 m wide driving lanes: one northbound and one southbound lane.
2. Tecco Mesh and anchor rods.

3. GRS and a segmented block wall facing for road widening and road base stabilization.
4. Extensometer instrumentation.
5. Water main replacement.
6. New asphalt overlay.
7. Concrete no-post roadside barriers.

Pros:

1. Provides two safe driving lanes: one northbound and one southbound.
2. Provides a stable road base with minimal maintenance.
3. Provides for a stable embankment with minimal maintenance.

Cons:

1. Engineering staff must periodically monitor the roadway and slope movement for several years.
2. It will be necessary to check the torque on the anchor bolts after two years and then every five years after that.
3. This option is approximately \$500,000 more expensive than Option 2.

Cost Estimate:

\$3,000,000 (including engineering fees and 20% contingency)

Option 2 - (One Shared Driving Lane, Road-Side Barrier, Permanent Traffic Control Signals)

That Council:

- 1) Approve Option 2 (One Shared Driving Lane, Road-Side Barrier, Permanent Traffic Control Signals) of the Genoa Bay Road Slope Stabilization and Road Remediation Project, as outlined in the June 19, 2024, report from the Manager, Infrastructure.
- 2) Approve increasing the Genoa Bay Road Slope Stabilization and Road Remediation Project budget from \$1,500,000 to \$2,500,000.
- 3) Approve the transfer of \$1,000,000 of funds to the Genoa Bay Road Slope Stabilization and Road Remediation Project as follows:
 - a) \$1,000,000 from the Herd Road Bridge Repair Project.

Features:

1. One shared driving lane (3.5 m wide) shared by both northbound and southbound traffic.
2. Tecco Mesh and anchor rods.
3. Road asphalt stripped, underlying soils recompactd (no GRS).
4. Extensometer instrumentation.
5. Water main replacement.
6. New asphalt overlay.
7. Concrete no-post roadside barriers.
8. Permanent traffic control signals.

Pros:

1. Provides a single alternating, moderately safe driving lane with road-side barriers and traffic control signals.
2. Provides for a stable embankment with minimal maintenance.
3. Approximately \$500,000 less expensive than Option 1.

Cons:

1. There is some risk of isolated road base settlement that could result in some risk to public safety.
2. Monitoring localized settlement of the road structure and the development of potholes more frequently than for a typical road will be necessary.
3. Engineering staff will have to monitor roadway and slope movement for several years periodically.
4. It will be necessary to check the torque on the anchor bolts after two years and then every five years after that.
5. Single-lane alternating operation is more challenging for snowplows.
6. Traffic control signals require maintenance and do not operate in power failures.
7. Overall higher cost of road maintenance in the long term.
8. This option should be considered a temporary solution.

Cost Estimate:

\$2,500,000 (including engineering fees and 20% contingency):

With respect to the costs, it is notable that this project is similar to the recently completed Goldstream slope stabilization and road repair project completed by MOTI, which cost approximately \$24,000,000. While the Goldstream project is a larger project involving a much more significant road cross-section (4 lanes), the fact that the road corridor is much wider made undertaking the work much more straightforward because the construction crews had room to manage the repairs while keeping the road open. To keep Genoa Bay Road open, which staff deem necessary due to the lack of another means of ingress/egress, implementing stability improvements and repairs to Genoa Bay Road are more complex and hence costly.

IMPLICATIONS

While Option 2 has the potential to save approximately \$500,000 over Option 1, WSP recommends that it not be implemented as a permanent solution as there remains some elevated risk to the public in relation to the signalization. Option 2 also requires more frequent and ongoing maintenance than Option 1. It is possible to follow through with upgrading Option 2 to Option 1 at a later time, but staff do not recommend that approach for the following reasons:

1. The total cost would exceed the cost of Option 1.
2. Proceeding in a phased manner would consume limited internal engineering resources by having to administer another phase of construction at some future date.
3. There would be a second disruption to the community that would not be desirable.

For the reasons stated, Engineering is recommending Option 1.

The current budget of \$1,500,000 set out in early 2022 was based on limited information at the time. Further, it was based on approximately 65 m of the road needing repair. Still, based on additional geotechnical investigations, WSP recommends an extra 45 m of the road be repaired and the associated slope stabilized. This will necessitate an increase of \$1,500,000 to bring the total budget to \$3,000,000. Referring to Table 1, the additional funds needed would be reallocated from projects currently funded in the 2024 budget by deferring the said projects described below in Table 1. The new roads and drainage funds provided in 2025 are expected to be adequate to fund the deferred projects.

Table 1 – Proposed project deferrals and budget transfers.

| Item | Project Name | Current Budget | Expropriate & reallocate Funds | Rationale/Reason |
|--|------------------------------------|----------------|--------------------------------|---|
| 1 | Herd Road Bridge Repair | \$2,200,000 | \$1,000,000 ^[1] | Design in 2023 but defer construction to 2025. |
| 2 | Kingsview Culverts (Phase 1 and 2) | \$445,000 | \$350,000 ^[1] | Design in 2023 but defer construction to 2025. Project is behind schedule |
| 3 | Seine Road Culvert Replacement | \$50,000 | \$50,000 ^[1] | Defer design and construction to 2025. |
| 4 | Unallocated Roads Fund | \$417,000 | \$100,000 | Funds budgeted by Engineering that are to used for sudden/unexpected and urgent work that may arise within a calendar year. |
| Total Funds to be Transferred | | | \$1,500,000 | |
| Current 2024 Genoa Bay Rd Project fund | | | \$1,500,000 | |
| Total Proposed Funding | | | \$3,000,000 | |

Table notes:

(1) It is possible that the Union of BC Municipalities Gas Tax funding may be made available to local governments within this fiscal year. Should such funding be provided, funding could be restored to the deferred projects without consuming the 2025 road budget.

RECOMMENDATION

That Council:

- 1) Approve Option 1 (Two Driving Lanes, Road-Side Barrier) of the Genoa Bay Road Slope Stabilization and Road Remediation Project, as outlined in the June 19, 2024 report from the Manager, Infrastructure.
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 - a) \$1,000,000 from the Herd Road Bridge Repair Project;
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 - c) \$50,000 from the Seine Road Culvert Replacement Project; and,
 - d) \$100,000 from the Unallocated Roads Fund.

Report prepared by:

John Dehoop

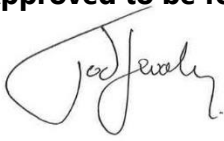
John Dehoop
 Manager, Infrastructure

Report reviewed by:



Clay Reitsma
 Director, Engineering

Approved to be forwarded to Council:



Ted Swabey
Chief Administrative Officer

Attachment:

- (1) WSP – Genoa Bay Road Slope Stabilization – Options Report



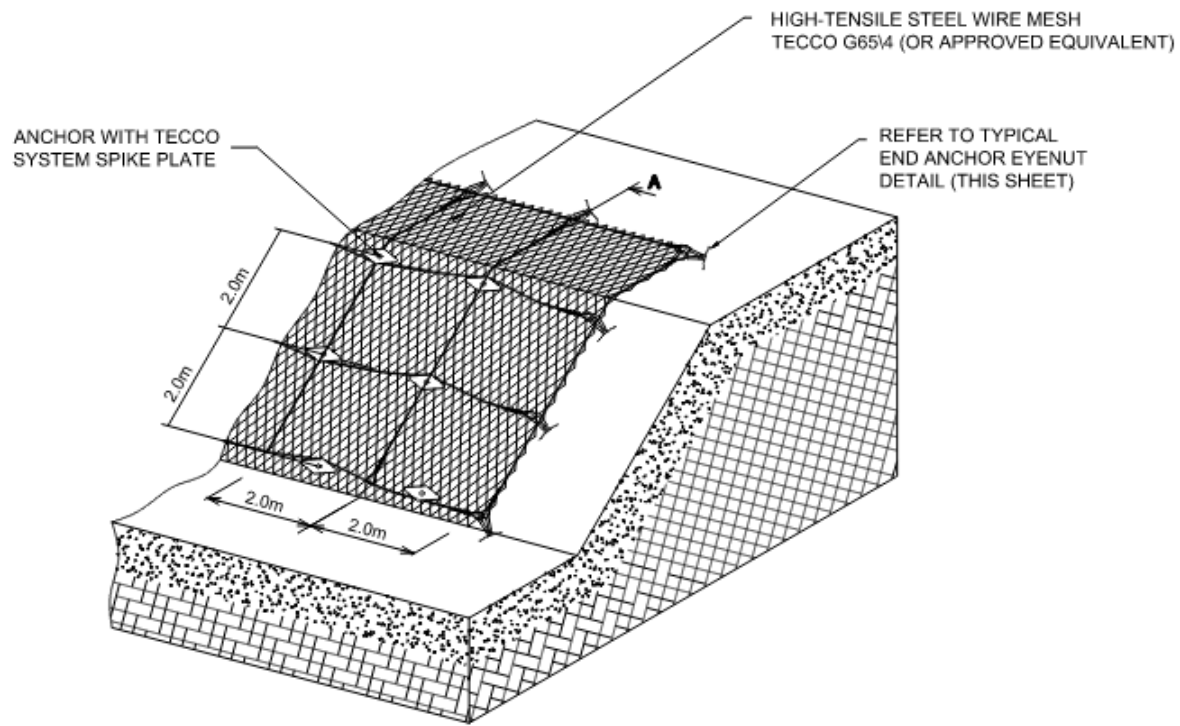
Figure 1 – Site Location (300 m north of the Genoa Bay Village).



Figure 2 – Genoa Bay Road looking north (right) and south (left) through an unstable road section with the water main temporarily relocated on top of the road (steep slope next to the water main).



Figure 3 – Large settlement cracks looking south through an unstable road section (steep slope to the left).



TECCO® system correctly installed and pretensioned

Figure 4 – Examples of Tecco Mesh stabilization.

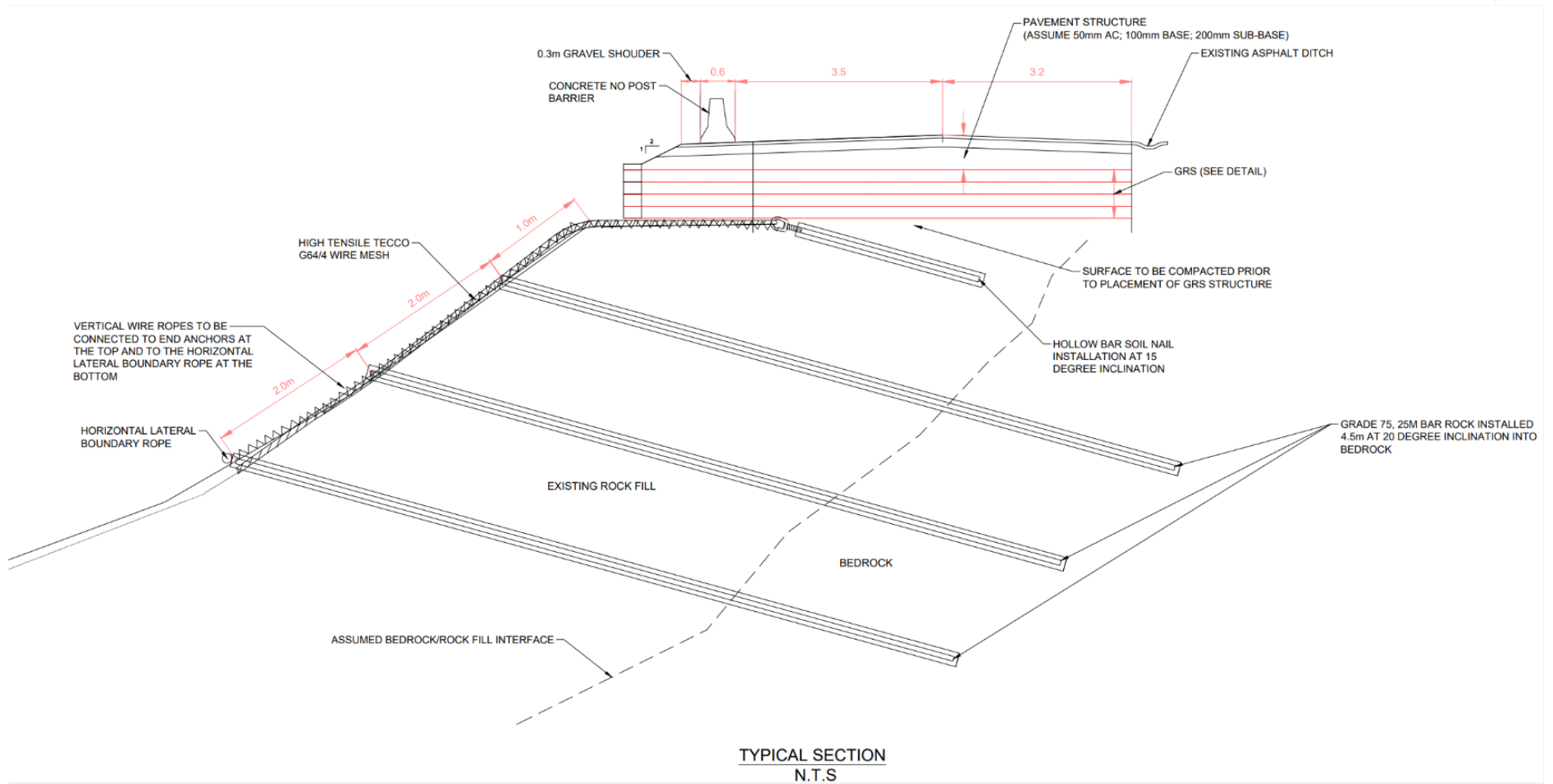


Figure 5 – Example of Geotechnical Reinforced Soil (GRS) (section shown as red lines).