

TECHNICAL MEMO

To

Charlie Gore, Senior Manager of Capital Projects Delivery
Comox Valley Regional District

From

Pieter Poel, PEng
2211 / Civil

Re

CVRD Water and Sewer South Servicing Alignment Options

Date

January 09, 2026

1. Project Background and Objectives

The CVRD retained McElhanney to complete a limited analysis of cost efficiencies for the proposed Water South and Sewer South projects, which are intended to provide potable water and sanitary sewer servicing to various areas south of Courtenay, BC. The purpose of the analysis was to reevaluate the proposed alignments of each project and assess whether combining or partially combining these projects could result in cost savings.

2. Combined Trench Review

CVRD asked McElhanney to explore the feasibility of installing the water and sewer forcemain pipes in a joint trench. A preliminary trench section was provided to Island Health for their input on whether this configuration would be accepted. Island Health advised that, despite mitigation measures such as fused HDPE and leak detection technology, Island Health would not consider the joint trench arrangement permissible, and the pipes would need to be designed in accordance with Design Guidelines for Drinking Water Systems in British Columbia (2023), which indicates a typical pipe separation of 3m, and not less than 1m.

We assume this separation restriction would not apply for a potential pipe bridge installation across the Trent River, i.e. both pipes could be installed on the same bridge.

3. City of Courtenay Sewer Integration

CVRD and McElhanney met with the City of Courtenay on November 18, 2025, to evaluate potential integrations of the CVRD South Sewer project with the City's proposed Cliffe Avenue sewer trunk project.

If a single forcemain was constructed, it would need to be operated by CVRD; however, the City noted that SCADA for the City's sewer lift stations would not be linked to CVRD, and CVRD indicated they do not wish to assume ownership of City lift stations. Furthermore, CVRD's Sewer South concept design relies on a daisy-chain configuration, which would require extensive redesign to accommodate integration of the City's lift stations. These factors suggest that use of CVRD's proposed forcemain by the City's existing pump stations is unlikely to be viable. However, an anticipated future pump station in the vicinity of Christie Parkway, receiving flows from future City development, could be CVRD-operated (pending further discussion between the jurisdictions).

The City indicated that they intend to proceed to detailed design for a gravity section of their project (from the Comox River siphon to 26th Street) in the near future. There may be options for partnering with CVRD to some extent, e.g. as a latecomer's agreement if CVRD connected to it in the future. The CVRD and the City agreed to coordinate separately for future project collaboration opportunities outside of McElhanney's scope. Refer to the meeting minutes circulated separately for additional information.

4. Alignment Options

The alignments of each project were split at Royston Road into north and south sections to allow for independent analysis of each section. Sketches of each alignment option are provided in **Appendix A**.

4.1. NORTH SECTION OPTIONS

North Option 1

- Sewer follows the preliminary design alignment along Cliffe Avenue and Highway 19A.
- Water follows the preliminary design alignment along Arden Road, Comox Logging Road, and Livingstone Road.

North Option 2

- Sewer diverges from Option 1 at 26th Street, instead following the railway south of 26th Street.
- Water is the same as Option 1, following the preliminary design alignment along Arden Road, Comox Logging Road, and Livingstone Road

4.2. SOUTH SECTION OPTIONS

South Option 1

- Sewer follows the preliminary design alignment along Highway 19A.
- Water follows the preliminary design alignment along Highway 19A, Briardale Road, and the railway.

South Option 2

- Both Sewer and Water follow the Water preliminary design alignment along Highway 19A, Briardale Road, and the railway.



South Option 3

- Both Sewer and Water follow the railway.

5. Trent River Crossing Options

The major factor in the south section alignment options is the location and manner of crossing the Trent River, a major watercourse with significant fish presence. Crossing the river adjacent to Highway 19A is assumed to be much more straightforward due to a comparatively narrow and shallow channel, however following the highway route is associated with high surface restoration and traffic control costs, and is also substantially longer for the watermain routing. The river channel at the railway is significantly more complex but could lead to substantial savings elsewhere from routing efficiency.

5.1. REJECTED OPTIONS**Directional Drill (Highway)**

McElhanney reviewed the potential for a directional drill installation adjacent to Highway 19A during preliminary Water design, and determined that it would be more expensive than other options, while also carrying a high risk of failure or cost increases due to variable geological conditions. The same is assumed to be true for a sewer pipe.

Directional Drill (Railway)

McElhanney reviewed the potential for a directional drill installation at the railway corridor during preliminary Water design, and determined that it would be cost prohibitive due to the extremely long pull distance required.

Existing Highway Bridge

McElhanney reviewed the potential for attachment to the existing highway bridge during preliminary Water design. It was determined that, due to the bridge's expected replacement in the next 10-15 years, this would be unadvisable as it would require a costly temporary bypass or support, plus additional costs to refix the pipe to the new bridge.

Existing Railway Trestle

McElhanney completed a desktop review of publicly available documentation to consider the feasibility of attaching to the existing railway trestle over the Trent River. The trestle was built in 1914, with partial reconstruction in 1925. Essential repairs were recommended in 2012 but not implemented; a 2019 inspection noted further deterioration, and it is likely to have deteriorated further since 2019. Even following the recommended repairs, the 2019 report noted that it may still require replacement in 2040-2045, although it may last up to 2070 with proper maintenance and rehabilitation. We anticipate that significant investment would be required to extend reliable service life past 2040.



Even if the bridge was rehabilitated, it is unlikely that the bridge would provide any seismic capacity for reliable post-disaster service in the event of an earthquake. Accordingly, McElhanney and CVRD agreed against further consideration of attachment to the existing railway trestle.

5.2. PIPE BRIDGE OPTIONS

McElhanney completed a preliminary desktop screening to review both the Highway 19A and railway crossings of the Trent River. For both crossings, we anticipate a space truss consisting of steel hollow structural sections (HSS) members to be an economical structure. The space truss could be designed exclusively to support a single pipe (as per the Water preliminary design), two pipes, or two pipes with a pedestrian walkway. Preliminary sections of each crossing option are shown in *Figure 1* below.

We also understand that if the highway routing is chosen, CVRD anticipate adding a third pipe to the crossing to accommodate replacement of the existing water distribution main crossing Trent River, which is exposed in the riverbed. This third pipe is not included in the costing analysis.

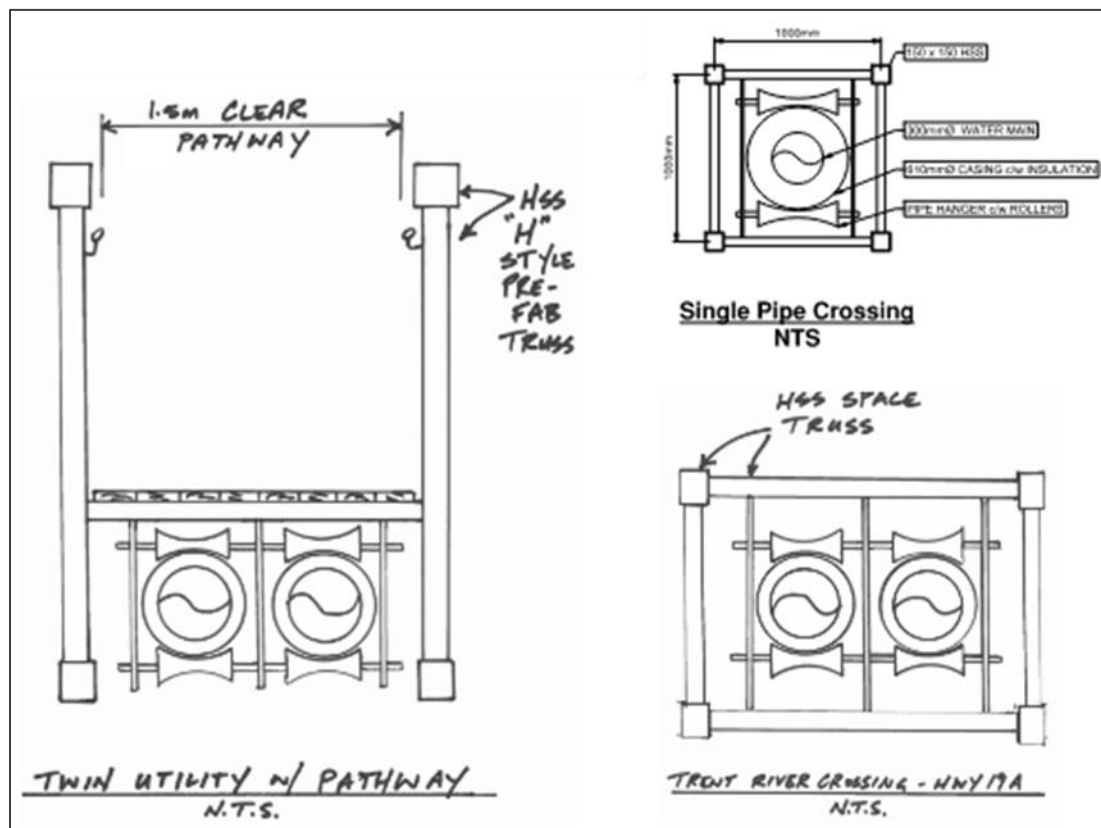


Figure 1 – Bridge Crossing Section Options

Highway Alignment River Crossing

A single clear span of approximately 44m is expected, supported on reinforced concrete abutments. Foundation options for the concrete abutments would be determined during detailed design and may

require deep foundations consisting of steel pipe piles or micro-piles. No pedestrian access is included for this concept, as it is assumed that maintenance access would be provided via bucket truck from the existing adjacent highway bridge or either abutment. Environmental impact is expected to be relatively low.

Railway Alignment River Crossing

For the railway alignment, we note that the existing railway has an approximately 18m high, 130m long embankment constructed out into the river channel, and that this embankment would not be suitable for a new bridge abutment, nor for trenching a watermain through. Accordingly, we anticipate that a new bridge structure would require a much longer span than the existing trestle.

Based on our high-level desktop review, an overall bridge length of approximately 240m is anticipated, consisting of a 6-span crossing with five high level piers constructed in the river channel, as shown in *Figure 2* and SK-04 in **Appendix C**. Foundations for the concrete abutments and piers would be determined during detailed design and would require deep foundations consisting of steel pipe piles or micro-piles. Extensive environmental permitting and mitigation efforts would be required.

Due to the size of the channel, maintenance access to the pipes would not be available from any location outside of the bridge itself, so the bridge concept includes a 1.5m pedestrian access above.

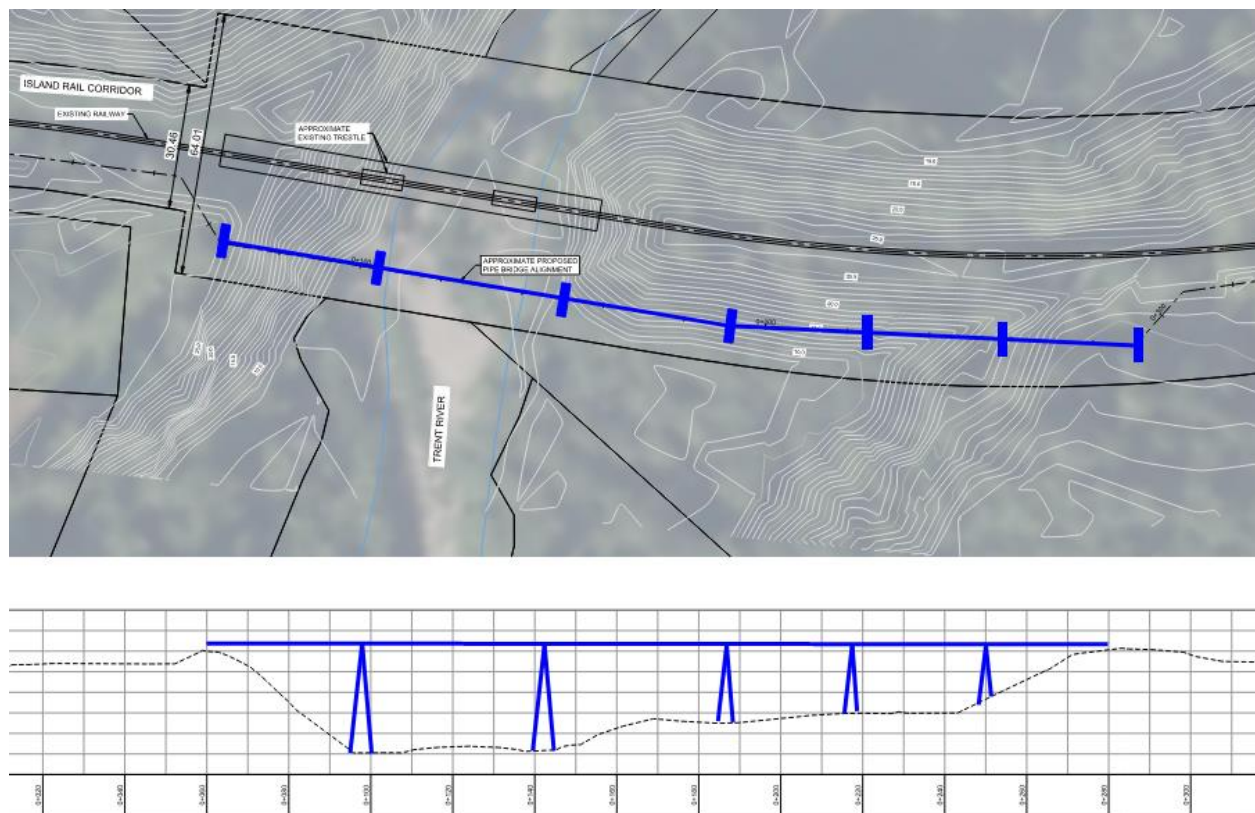


Figure 2 – Railway Corridor Bridge Crossing (excerpt from SK-04)



6. Cost Estimate

McElhanney has compiled comparative cost estimates for the alignment options outlined above. We note the following:

- Costs are provided for comparison between options and may exclude costs common to multiple options. The provided costs should not be used for project budgeting.
- Water costs are not provided for the north section, which only has one alignment under consideration.
- The analysis assumes the Water project is constructed first in 2027, and the Sewer project is constructed in 2030.
- Blowdown and air valve quantities for each alignment were based on a high-level profile review only. Spacing and exact quantities of these items would be subject to proper analysis during detailed design.
- These cost estimates do not account for higher pumping heads on the sewer forcemain, which would likely be a factor especially for North Option 2. The alignment options are not anticipated to have any pressure head effects on the Water project, which has excess head at source.
- The costs of highway alignments are noted to be highly sensitive to asphalt restoration costs and the assumption of a 3.7m wide, 150mm thick asphalt restoration requirement. The conceptual sewer alignment is fully within the travel lane for the entire length, while the watermain alignment is currently approximately 15% travel lane, 20% paved shoulder and 65% unpaved areas.
- The pipe bridge cost for the highway alignment Trent River crossing is supported by a supplier quote received in December 2025 for the cost of a prefabricated truss based on the crossing geometry.
- The railway alignment would also require an extension to the Roy Creek culvert (estimated at approximately 12m to account for an embankment extension at 2H:1V). An extension on the south side would encroach on private property and impact a private driveway access bridge, as shown on SK-05B in **Appendix C**. Extension on the north side would also encroach on private property and require two additional railway crossings. Either would involve high environmental permitting and land acquisition costs, while a bridge option for this crossing was rejected due to the need to provide maintenance vehicle access (3.0m clear width) and an estimated span of 50m, making it cost prohibitive.

Sewer North Options

Table 1 presents the indicative comparative costs for each north sewer option, including professional services (engineering, environmental and archaeological consultancy; land costs; legal costs; CVRD internal staff costs), contingency, and escalation, but excluding taxes. Refer to **Appendix B** for detailed breakdowns of these costs.



Table 1 – Sewer North Section Option Comparative Costs

	Option 1		Option 2	
Sewer Cost	\$	13,757,000	\$	9,874,000

Sewer North Option 2 (along the railway corridor) displays a substantial cost saving over Sewer North Option 1 (the preliminary design alignment).

South Options

Table 2 presents the indicative comparative costs for each south option, including professional services (engineering, environmental and archaeological consultancy; land costs; legal costs; CVRD internal staff costs), contingency, and escalation, but excluding taxes. Refer to **Appendix B** for detailed breakdowns of these costs.

Table 2 – Water and Sewer South Section Option Comparative Costs

	Option 1		Option 2		Option 3	
Water cost	\$	8,238,000	\$	8,278,000	\$	7,342,000
Sewer cost	\$	12,380,000	\$	9,250,000	\$	4,901,000
Trent River bridge cost	\$	1,255,000	\$	1,255,000	\$	11,240,000
Total	\$	21,873,000	\$	18,738,000	\$	23,483,000

As seen above, South Option 2 (Sewer shifted to follow Water) appears to have a substantial cost savings over both South Option 1 (preliminary design alignments) and South Option 3 (railway corridor).



7. Evaluation

Each option was also analysed on a qualitative methodology of non-cost related factors. **Tables 3 and 4** below present evaluation criteria and commentary on each option. Cells are colour-coded depending on perceived impact to the project – green (favourable), yellow (neutral), or red (unfavourable).

Table 3 – Sewer North Section Option Non-Cost Factors

Criteria	North Sewer Option 1	North Sewer Option 2
Construction considerations	More existing utilities present. Higher chance of unknown conditions.	Fewer existing utilities present within rail corridor. Somewhat limited construction access.
Public disruption	Construction near businesses and homes for majority of route. Significant traffic delays on major arterial road with limited detour opportunities.	Construction further away from businesses and homes for substantial portion of route.
Geotechnical considerations	Alignment within previously disturbed ground. Lower likelihood of unsuitable ground conditions.	Portion of alignment within undisturbed area. High potential for unsuitable ground conditions, especially in areas of tree removals.
Environmental considerations and permitting	One major creek crossing at Millard Creek. Mostly within already disturbed corridors.	One major creek crossing at Millard Creek. Anticipate higher number of tree removals.
Archaeological considerations	Majority of alignment within KFN Area of Potential, but no registered sites.	KFN Area of Potential present at Cliffe Ave and Millard Creek. Alignment otherwise outside of KFN Area of Potential.
Operating and maintenance considerations	Highly accessible on public roads. Higher cost of repairs.	Highly accessible on public roads or new access track. Fewer appurtenances due to smoother profile, but higher pumping head due to higher elevation and longer length.
Other	Higher likelihood of collaboration with City trunk sewer project (e.g. separately owned forcemains in joint trench).	Cost advantage is reduced if South Option 1 or 2 is chosen, however may be able to shift Water South to railway ROW and share maintenance access for first 500m north of Royston Road.

Table 4 – Water and Sewer South Section Option Non-Cost Factors

Criteria	South Option 1	South Option 2	South Option 3
Construction considerations	More existing utilities present. Higher chance of unknown conditions.	More existing utilities along highway portion. Moderate chance of unknown conditions.	No known existing utilities. Restricted construction access.
Public disruption	Construction near homes for significant portion of route. Significant traffic delays on major arterial road with limited detour opportunities. Residents disturbed twice in quick succession.	Construction near homes for significant portion of route. Significant traffic delays on major arterial road with limited detour opportunities. Residents disturbed twice in quick succession.	Construction further away from homes and businesses.
Geotechnical considerations	Portion of alignment within undisturbed area. High potential for unsuitable ground conditions, especially in areas of tree removals.	Portion of alignment within undisturbed area. High potential for unsuitable ground conditions, especially in areas of tree removals.	Entire alignment within undisturbed area. High potential for unsuitable ground conditions, especially in areas of tree removals. Major works required for east abutment at Trent River crossing.
Environmental considerations and permitting	Major watercourse crossings at Roy Creek and Trent River. Mostly within already disturbed corridors but some tree removals at south end for Water.	Major watercourse crossings at Roy Creek and Trent River. Mostly within already disturbed corridors but some tree removals at south end.	Major watercourse crossings at Roy Creek and Trent River. Significant tree removals. Higher potential for wetland impacts. Higher ESC measures.
Archaeological considerations	Majority of alignment within KFN Area of Potential, but no registered sites.	Half of alignment within KFN Area of Potential, but no registered sites.	KFN Area of Potential present at Trent River. Alignment otherwise outside of KFN Area of Potential.
Operating and maintenance considerations	Highly accessible on public roads or new access track. Higher cost of repairs for highway portions.	Highly accessible on public roads or new access track. Higher cost of repairs for highway portions.	Accessible on new access track. Repairs to bridge crossing would be complex. Fewer appurtenances due to smoother profile.
Other	Reduced Island Corridor engagement. Opportunity to replace existing Trent River distribution main crossing at the same time (costs not included in this analysis).	Reduced Island Corridor engagement. Opportunity to replace existing Trent River distribution main crossing at the same time (costs not included in this analysis).	Opportunity to complete off-road trail from Courtenay to KFN Southlands. Minimal MoTT engagement required, but increased engagement with Island Corridor.

8. Conclusion and Recommendations

North Section

For the north section of the sewer alignment, from the north tie-ins to Royston Rd, Option 2 (along the railway corridor) displays a substantial cost saving over Option 1 (the preliminary design alignment). Although there are some other non-cost advantages to Option 1, these do not appear to be significant enough to counteract the potential cost savings.

Accordingly, McElhanney recommends that the railway alignment is reconsidered for the portion of the Sewer South project that is north of Royston Road. McElhanney also recommends consideration is made to relocate approximately 500m of the Water South alignment from Livingstone Road to the railway ROW (where they are parallel).

South Section

For the south section of the project, Option 2 (Sewer shifted to follow Water) is the least expensive option over both Option 1 (preliminary design alignments) and Option 3 (railway corridor). The required pipe bridge at the railway corridor significantly increases the project cost, inhibiting the feasibility of the railway corridor option south of Royston Road.

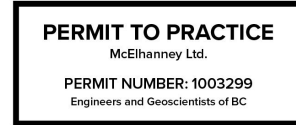
Accordingly, McElhanney recommends that the preliminary design alignment is retained for the Water South detailed design phase, and that the Trent River pipe bridge crossing includes future accommodation for a sewer forcemain to be added. McElhanney further recommends that the Sewer South alignment is reconsidered south of Gartley Point Road, to follow the Water South alignment along Briardale Road and the railway.



Closing

We trust this information will meet the CVRD's needs at this time. Please do not hesitate to contact the undersigned should any questions arise.

Sincerely,
McElhanney Ltd



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APPENDIX A

Alignment Drawings

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CLIENT

COMOX VALLEY REGIONAL DISTRICT

ADDRESS / CONTACT INFO.

770 HARMSTON AVE, COURTENAY BC

PROJECT NAME

CVRD SOUTH SERVICING OPTIONS

DESCRIPTION

ISSUED FOR OPTIONS
ANALYSIS

McELHANNEY PROJECT

2211-47855-00



McElhanney

1211 Ryan Road,
Courtenay BC V9N 3R6
Tel. 250 338 5495

DRAWING LIST								
SHEET #	SHEET TITLE	REVISIONS						
		PA	PB	PC	0	1	2	3
001	KEY PLAN							
101	NORTH OPTION 1							
102	NORTH OPTION 2							
201	SOUTH OPTION 1							
202	SOUTH OPTION 2							
203	SOUTH OPTION 3							



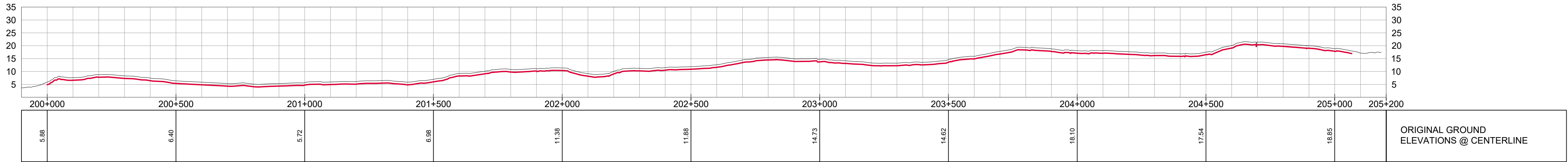
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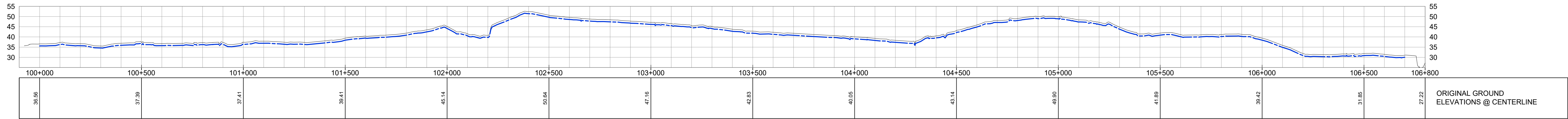
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PLAN VIEW
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PROFILE - SEWER
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PROFILE - WATER
SCALE H 1:10,000
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CVRD SOUTH SERVICING OPTIONS
NORTH OPTION 1

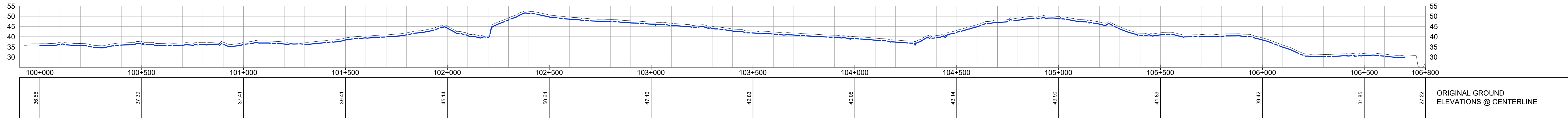
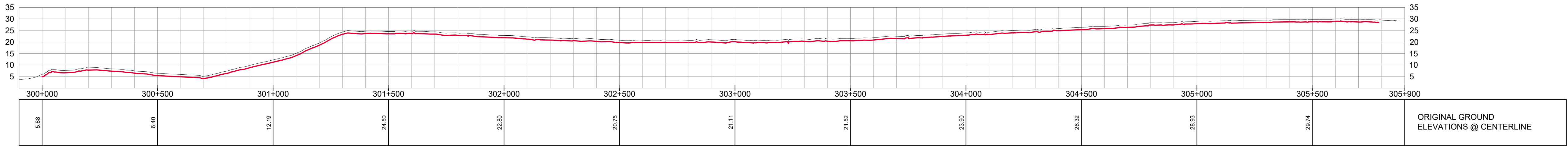
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CVRD SOUTH SERVICING OPTIONS
NORTH OPTION 2

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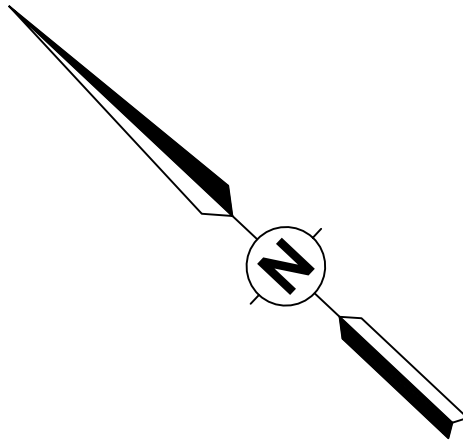
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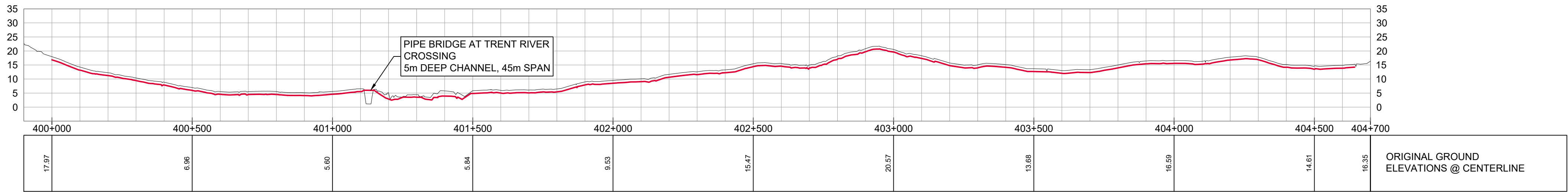
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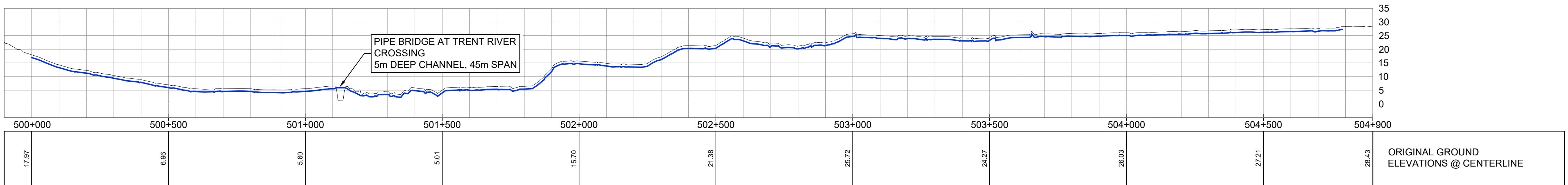
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PLAN VIEW
SCALE 1:10,000



PROFILE - SEWER
SCALE H 1:10,000
V 1:1,000



PROFILE - WATER
SCALE H 1:10,000
V 1:1,000

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PB	2026-01-08	ISSUED FOR OPTIONS ANALYSIS	ER	ER	PP
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BENCHMARK
ALL ELEVATION REFER TO CONTROL MONUMENT: -
LOCATED AT: -
ELEVATION: -

ORIGINAL DWG SIZE: ANSI D (22" x 34")

1211 Ryan Road,
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Tel. 250 338 5495

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COMOX VALLEY REGIONAL DISTRICT
770 HARMSTON AVE., COURTENAY BC

CVRD SOUTH SERVICING OPTIONS
SOUTH OPTION 1

Drawing No.

201

Project Number

2211-47855-00

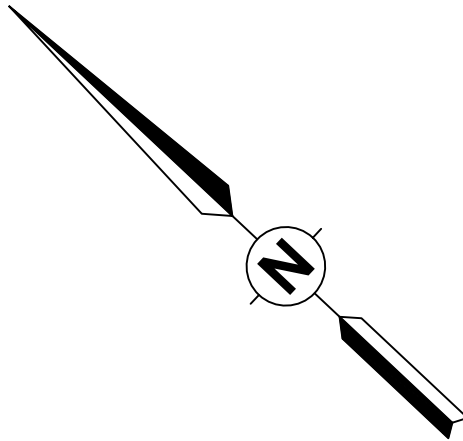
Rev.

PB

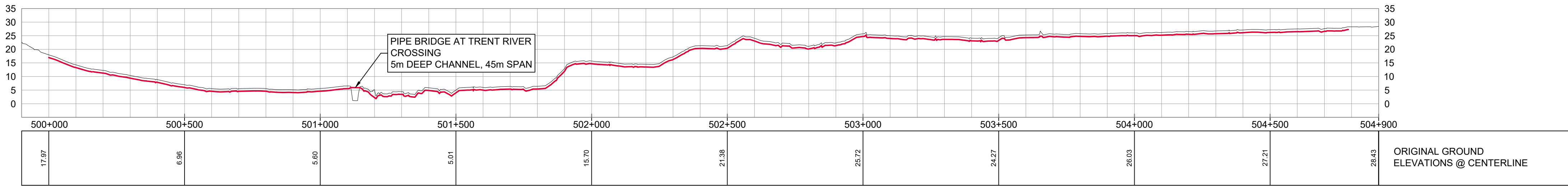
DESTROY ALL PRINTS BEARING PREVIOUS REVISION

McElhanney ANS D - 2025-11-14

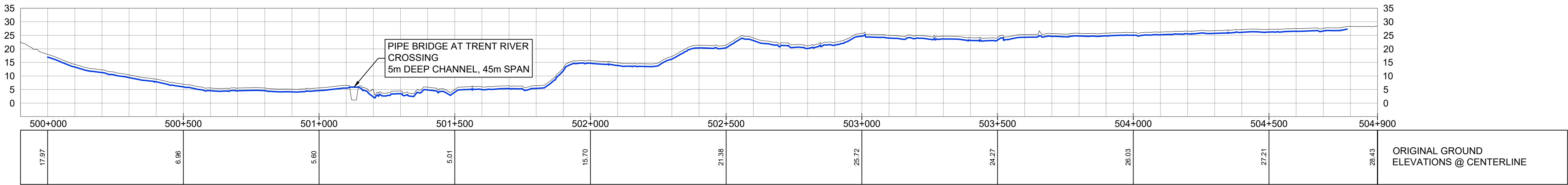
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PLAN VIEW
SCALE 1:10,000



PROFILE - SEWER
SCALE H 1:10,000
V 1:1,000



PROFILE - WATER
SCALE H 1:10,000
V 1:1,000

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PB	2025-01-08	ISSUED FOR OPTIONS ANALYSIS	ER	ER	PP	INFORMATION ON EXISTING UNDERGROUND FACILITIES MAY NOT BE COMPLETE OR ACCURATE. McELHANNEY, ITS EMPLOYEES AND DIRECTORS ARE NOT RESPONSIBLE NOR LIABLE FOR THE LOCATION OF ANY UNDERGROUND CONDUITS, PIPES, CABLES OR OTHER FACILITIES WHETHER SHOWN OR OMITTED FROM THIS PLAN. PRIOR TO CONSTRUCTION CONTRACTOR SHALL EXPOSE LOCATIONS OF ALL EXISTING FACILITIES BY HAND DIGGING OR HYDROVAC AND ADVISE THE ENGINEER OF POTENTIAL CONFLICTS.
PA	2025-12-12	ISSUED FOR REVIEW	ER	ER	PP	
Rev	Date	Description	Drawn	Design	App'd	

BENCHMARK
ALL ELEVATION REFER TO CONTROL MONUMENT: -
LOCATED AT: -
ELEVATION: -

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ORIGINAL DWG SIZE: ANSI D (22" x 34")

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COMOX VALLEY REGIONAL DISTRICT
770 HARMSTON AVE., COURTENAY BC

CVRD SOUTH SERVICING OPTIONS
SOUTH OPTION 2

Drawing No.

202

Project Number

2211-47855-00

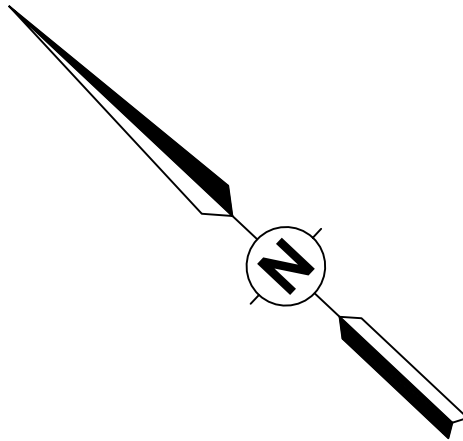
Rev.

PB

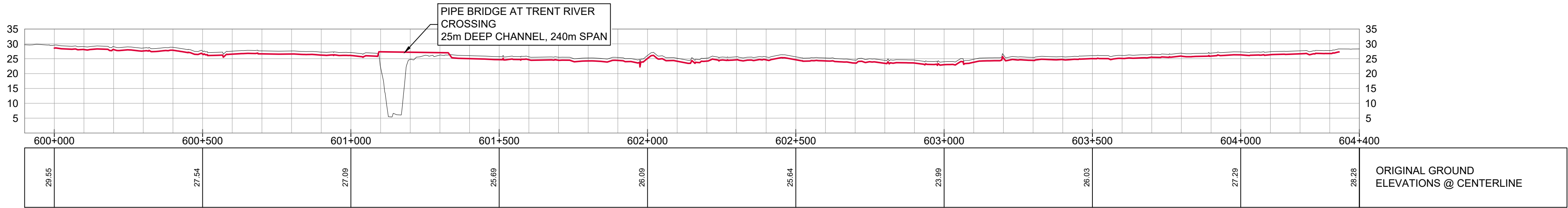
DESTROY ALL PRINTS BEARING PREVIOUS REVISION

McElhanney ANS D - 2025-11-14

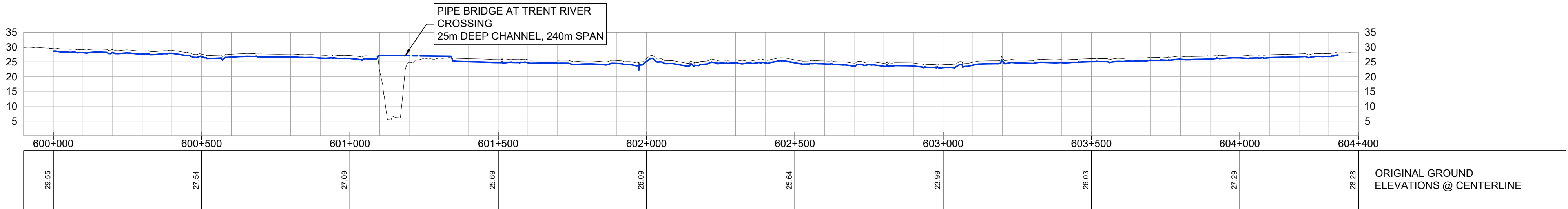
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PLAN VIEW
SCALE 1:10,000



PROFILE - SEWER
SCALE H 1:10,000
V 1:1,000



PROFILE - WATER
SCALE H 1:10,000
V 1:1,000

-	-	-	-	-	-	THIS DRAWING AND DESIGN IS THE PROPERTY OF McELHANNEY AND SHALL NOT BE USED, REUSED OR REPRODUCED WITHOUT THE CONSENT OF McELHANNEY. McELHANNEY WILL NOT BE HELD RESPONSIBLE FOR THE IMPROPER OR UNAUTHORIZED USE OF THIS DRAWING AND DESIGN.
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PA	2025-12-12	ISSUED FOR REVIEW	ER	ER	PP	
Rev	Date	Description	Drawn	Design	App'd	

BENCHMARK
ALL ELEVATION REFER TO CONTROL MONUMENT: -
LOCATED AT: -
ELEVATION: -

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ORIGINAL DWG SIZE: ANSI D (22" x 34")

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CVRD SOUTH SERVICING OPTIONS
SOUTH OPTION 3

Drawing No.
203

Project Number
2211-47855-00

Rev.
PB

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

APPENDIX B

Cost Estimates

- Notes:**
- 1) Class D cost estimate per ACEC-BC guidelines. Rounding has been applied. Prices based on recent tenders within the Comox Valley.
 - 2) Pipe costs include removals, excavation, pipe, backfill, and decribed surface restoration.
 - 3) Professional services costs include engineering, environmental monitoring, legal, land, staff, etc.
 - 4) Costs exclude replacement of other utilities, managing unforeseen utility conflicts, archaeological mitigation works, taxes and fees, permits, maintenance costs.
 - 5) Market volatility (e.g. due to tariffs or other unforeseen trade impacts) is not accounted for.

SEWER FORCEMAIN			NORTH OPTION 1		
Description	Unit	Unit Price	Quantity	Sub total	
REMOVALS AND MISCELLANEOUS					
Tree Removal & Vegetation Trimming	l.s.	l.s.	1	\$	-
Management of Invasive Species (Scotch Broom, etc.)	l.s.	l.s.	1	\$	-
Sediment & Erosion Control / Environmental Protection	l.s.	l.s.	1	\$	50,000
Traffic Control and Management	l.s.	l.s.	1	\$	200,000
		Subtotal		\$	250,000
SEWER FORCEMAIN - 250mm HDPE DR 17		Total Pipe Length:	5066		
Within Highway travel lane (3.7m) - 150mm asphalt	l.m.	\$ 1,090	5066	\$	5,521,940
Within Highway shoulder (1.4m) - 50mm asphalt	l.m.	\$ 435		\$	-
Within Local road lane (3.3m) - 100mm asphalt	l.m.	\$ 680		\$	-
Within Boulevard	l.m.	\$ 415		\$	-
Within Undeveloped land - new access road structure including ditches and culverts	l.m.	\$ 530		\$	-
Within Undeveloped land - reinstate existing access road structure (built during watermain)	l.m.	\$ 410		\$	-
Supported by 5m tall pipe bridge	l.m.	\$ 240		\$	-
Supported by 25m tall pipe bridge	l.m.	\$ 240		\$	-
Air Release Valve Assembly (shallow roadside chamber)	each	\$ 75,000	7	\$	525,000
Blow-Down Assembly	each	\$ 30,000	5	\$	150,000
Major Crossing (Railway, Roy Creek, Millard Creek, Major Intersection)	each	\$ 60,000	4	\$	240,000
		Subtotal		\$	6,436,940
Sewer Construction Subtotal [A]				\$	6,687,000
Professional Services [B] = X * [A]			30%	\$	2,010,000
Contingency [C] = Y * ([A]+[B])			30%	\$	2,610,000
Project Estimate (2025) [D] = [A] + [B] + [C]				\$	11,307,000
Annual Escalation to midpoint of construction @ 4% [E] = [D] * (1.04^Z - 1)			5	\$	2,450,000
Project Estimate (2030) [F] = [D] + [E]				\$	13,757,000

- Notes:**
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 - 3) Professional services costs include engineering, environmental monitoring, legal, land, staff, etc.
 - 4) Costs exclude replacement of other utilities, managing unforeseen utility conflicts, archaeological mitigation works, taxes and fees, permits, maintenance costs.
 - 5) Market volatility (e.g. due to tariffs or other unforeseen trade impacts) is not accounted for.

SEWER FORCEMAIN			NORTH OPTION 2		
Description	Unit	Unit Price	Quantity	Sub total	
REMOVALS AND MISCELLANEOUS					
Tree Removal & Vegetation Trimming	l.s.	l.s.	1	\$	15,000
Management of Invasive Species (Scotch Broom, etc.)	l.s.	l.s.	1	\$	7,500
Sediment & Erosion Control / Environmental Protection	l.s.	l.s.	1	\$	50,000
Traffic Control and Management	l.s.	l.s.	1	\$	90,000
Subtotal				\$	162,500
SEWER FORCEMAIN - 250mm HDPE DR 17		Total Pipe Length:		5787	
Within Highway travel lane (3.7m) - 150mm asphalt	l.m.	\$	1,090	1320	\$ 1,438,800
Within Highway shoulder (1.4m) - 50mm asphalt	l.m.	\$	435		\$ -
Within Local road lane (3.3m) - 100mm asphalt	l.m.	\$	680		\$ -
Within Boulevard	l.m.	\$	415		\$ -
Within Undeveloped land - new access road structure including ditches and culverts	l.m.	\$	530	4467	\$ 2,367,510
Within Undeveloped land - reinstate existing access road structure (built during watermain)	l.m.	\$	410		\$ -
Supported by 5m tall pipe bridge	l.m.	\$	240		\$ -
Supported by 25m tall pipe bridge	l.m.	\$	240		\$ -
Air Release Valve Assembly (shallow roadside chamber)	each	\$	75,000	7	\$ 525,000
Blow-Down Assembly	each	\$	30,000	2	\$ 60,000
Major Crossing (Railway, Roy Creek, Millard Creek, Major Intersection)	each	\$	60,000	4	\$ 240,000
Subtotal				\$	4,631,310
Sewer Construction Subtotal [A]				\$	4,794,000
Professional Services [B] = X * [A]			30%	\$	1,440,000
Contingency [C] = Y * ([A]+[B])			30%	\$	1,880,000
Project Estimate (2025) [D] = [A] + [B] + [C]				\$	8,114,000
Annual Escalation to midpoint of construction @ 4% [E] = [D] * (1.04^Z - 1)			5	\$	1,760,000
Project Estimate (2030) [F] = [D] + [E]				\$	9,874,000

- Notes:**
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WATER MAIN		SOUTH OPTION 1			
Description	Unit	Unit Price	Quantity	Sub total	
REMOVALS AND MISCELLANEOUS					
Tree Removal & Vegetation Trimming	l.s.	l.s.	1	\$ 30,000	
Management of Invasive Species (Scotch Broom, etc.)	l.s.	l.s.	1	\$ 12,500	
Sediment & Erosion Control / Environmental Protection	l.s.	l.s.	1	\$ 100,000	
Traffic Control and Management	l.s.	l.s.	1	\$ 125,000	
		Subtotal		\$ 267,500	
WATER MAIN - 350mm HDPE DR9		Total Pipe Length:	4988		
Within Highway travel lane (3.7m) - 150mm asphalt	l.m.	\$ 1,300	535	\$ 695,500	
Within Highway shoulder (1.4m) - 50mm asphalt	l.m.	\$ 645	1110	\$ 715,950	
Within Local road lane (3.3m) - 100mm asphalt	l.m.	\$ 890	200	\$ 178,000	
Within Boulevard	l.m.	\$ 625	1310	\$ 818,750	
Within Undeveloped land - new access road structure including ditches and culverts	l.m.	\$ 740	1488	\$ 1,101,120	
Within Undeveloped land - reinstate existing Herondale Reservoir access	l.m.	\$ 620	300	\$ 186,000	
Supported by 5m tall pipe bridge	l.m.	\$ 450	45	\$ 20,250	
Supported by 25m tall pipe bridge	l.m.	\$ 450		\$ -	
Air Release Valve Assembly (shallow roadside chamber)	each	\$ 75,000	7	\$ 525,000	
Blow-Down Assembly	each	\$ 30,000	4	\$ 120,000	
Major Crossing (Railway, Roy Creek, Millard Creek, Major Intersection)	each	\$ 60,000	4	\$ 240,000	
Roy Creek Railway Culvert Extension	each	\$ 500,000			
		Subtotal		\$ 4,600,570	
Water Construction Subtotal [A]				\$ 4,868,000	
Professional Services [B] = X * [A]			30%	\$ 980,000	
Contingency [C] = Y * ([A]+[B])			30%	\$ 1,760,000	
Project Estimate (2025) [D] = [A] + [B] + [C]				\$ 7,608,000	
Annual Escalation to midpoint of construction @ 4% [E] = [D] * (1.04^Z - 1)			2	\$ 630,000	
Project Estimate (2027) [F] = [D] + [E]				\$ 8,238,000	

- Notes:**
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 - 3) Professional services costs include engineering, environmental monitoring, legal, land, staff, etc.
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 - 5) Market volatility (e.g. due to tariffs or other unforeseen trade impacts) is not accounted for.

SEWER FORCEMAIN		SOUTH OPTION 1			
Description		Unit	Unit Price	Quantity	Sub total
REMOVALS AND MISCELLANEOUS					
Tree Removal & Vegetation Trimming		l.s.	l.s.	1	\$ 5,000
Management of Invasive Species (Scotch Broom, etc.)		l.s.	l.s.	1	\$ 1,000
Sediment & Erosion Control / Environmental Protection		l.s.	l.s.	1	\$ 70,000
Traffic Control and Management		l.s.	l.s.	1	\$ 175,000
Subtotal				\$	251,000
SEWER FORCEMAIN - 250mm HDPE DR 17			Total Pipe Length:	4644	
Within Highway travel lane (3.7m) - 150mm asphalt		l.m.	\$ 1,090	4599	\$ 5,012,910
Within Highway shoulder (1.4m) - 50mm asphalt		l.m.	\$ 435		\$ -
Within Local road lane (3.3m) - 100mm asphalt		l.m.	\$ 680		\$ -
Within Boulevard		l.m.	\$ 415		\$ -
Within Undeveloped land - new access road structure including ditches and culverts		l.m.	\$ 530		\$ -
Within Undeveloped land - reinstate existing access road structure (built during watermain)		l.m.	\$ 410		\$ -
Supported by 5m tall pipe bridge		l.m.	\$ 240	45	\$ 10,800
Supported by 25m tall pipe bridge		l.m.	\$ 240		\$ -
Air Release Valve Assembly (shallow roadside chamber)		each	\$ 75,000	7	\$ 525,000
Blow-Down Assembly		each	\$ 30,000	5	\$ 150,000
Major Crossing (Railway, Roy Creek, Millard Creek, Major Intersection)		each	\$ 60,000	1	\$ 60,000
Subtotal				\$	5,758,710
Sewer Construction Subtotal [A]				\$	6,010,000
Professional Services [B] = X * [A]				30%	\$ 1,810,000
Contingency [C] = Y * ([A]+[B])				30%	\$ 2,350,000
Project Estimate (2025) [D] = [A] + [B] + [C]				\$	10,170,000
Annual Escalation to midpoint of construction @ 4% [E] = [D] * (1.04^Z - 1)				5	\$ 2,210,000
Project Estimate (2030) [F] = [D] + [E]				\$	12,380,000

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 - 3) Professional services costs include engineering, environmental monitoring, legal, land, staff, etc.
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PIPE BRIDGE			SOUTH OPTION 1		
	Description	Unit	Unit Price	Quantity	Sub total
PIPE BRIDGE					
	Pipe Bridge at Hwy 19A - Double Pipe	I.s.	\$ 675,000	1	\$ 675,000
	Pipe Bridge at Rail Corridor - Double Pipe with Pedestrian Crossing	I.s.	\$ 6,140,000		\$ -
	Bridge Construction Subtotal [A]				\$ 675,000
	Professional Services [B] = X * [A]			30%	\$ 210,000
	Contingency [C] = Y * ([A]+[B])			30%	\$ 270,000
	Project Estimate (2025) [D] = [A] + [B] + [C]				\$ 1,155,000
	Annual Escalation to midpoint of construction @ 4% [E] = [D] * (1.04^Z - 1)			2	\$ 100,000
	Project Estimate (2027) [F] = [D] + [E]				\$ 1,255,000

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WATER MAIN		SOUTH OPTION 2			
Description		Unit	Unit Price	Quantity	Sub total
REMOVALS AND MISCELLANEOUS					
Tree Removal & Vegetation Trimming		l.s.	l.s.	1	\$ 30,000
Management of Invasive Species (Scotch Broom, etc.)		l.s.	l.s.	1	\$ 12,500
Sediment & Erosion Control / Environmental Protection		l.s.	l.s.	1	\$ 100,000
Traffic Control and Management		l.s.	l.s.	1	\$ 125,000
Subtotal				\$	267,500
WATER MAIN - 350mm HDPE DR9			Total Pipe Length:	4988	
Within Highway travel lane (3.7m) - 150mm asphalt		l.m.	\$ 1,300	535	\$ 695,500
Within Highway shoulder (1.4m) - 50mm asphalt		l.m.	\$ 645	1110	\$ 715,950
Within Local road lane (3.3m) - 100mm asphalt		l.m.	\$ 890	200	\$ 178,000
Within Boulevard		l.m.	\$ 625	1310	\$ 818,750
Within Undeveloped land - new access road structure including ditches and culverts		l.m.	\$ 740	1488	\$ 1,101,120
Within Undeveloped land - reinstate existing Herondale Reservoir access		l.m.	\$ 620	300	\$ 186,000
Supported by 5m tall pipe bridge		l.m.	\$ 450	45	\$ 20,250
Supported by 25m tall pipe bridge		l.m.	\$ 450		\$ -
Air Release Valve Assembly (shallow roadside chamber)		each	\$ 75,000	7	\$ 525,000
Blow-Down Assembly		each	\$ 30,000	5	\$ 150,000
Major Crossing (Railway, Roy Creek, Millard Creek, Major Intersection)		each	\$ 60,000	4	\$ 240,000
Roy Creek Railway Culvert Extension		each	\$ 500,000		
Subtotal				\$	4,630,570
Water Construction Subtotal [A]				\$	4,898,000
Professional Services [B] = X * [A]				30%	\$ 980,000
Contingency [C] = Y * ([A]+[B])				30%	\$ 1,770,000
Project Estimate (2025) [D] = [A] + [B] + [C]				\$	7,648,000
Annual Escalation to midpoint of construction @ 4% [E] = [D] * (1.04^Z - 1)				2	\$ 630,000
Project Estimate (2027) [F] = [D] + [E]				\$	8,278,000

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SEWER FORCEMAIN		SOUTH OPTION 2		
Description	Unit	Unit Price	Quantity	Sub total
REMOVALS AND MISCELLANEOUS				
Tree Removal & Vegetation Trimming	l.s.	l.s.	1	\$ -
Management of Invasive Species (Scotch Broom, etc.)	l.s.	l.s.	1	\$ 1,000
Sediment & Erosion Control / Environmental Protection	l.s.	l.s.	1	\$ 70,000
Traffic Control and Management	l.s.	l.s.	1	\$ 125,000
		Subtotal		\$ 196,000
SEWER FORCEMAIN - 250mm HDPE DR 17		Total Pipe Length:	4798	
Within Highway travel lane (3.7m) - 150mm asphalt	l.m.	\$ 1,090	1655	\$ 1,803,950
Within Highway shoulder (1.4m) - 50mm asphalt	l.m.	\$ 435		\$ -
Within Local road lane (3.3m) - 100mm asphalt	l.m.	\$ 680	1310	\$ 890,800
Within Boulevard	l.m.	\$ 415		\$ -
Within Undeveloped land - new access road structure including ditches and culverts	l.m.	\$ 530		\$ -
Within Undeveloped land - reinstate existing access road structure (built during watermain)	l.m.	\$ 410	1788	\$ 733,080
Supported by 5m tall pipe bridge	l.m.	\$ 240	45	\$ 10,800
Supported by 25m tall pipe bridge	l.m.	\$ 240		\$ -
Air Release Valve Assembly (shallow roadside chamber)	each	\$ 75,000	7	\$ 525,000
Blow-Down Assembly	each	\$ 30,000	5	\$ 150,000
Major Crossing (Railway, Roy Creek, Millard Creek, Major Intersection)	each	\$ 60,000	3	\$ 180,000
		Subtotal		\$ 4,293,630
Sewer Construction Subtotal [A]				\$ 4,490,000
Professional Services [B] = X * [A]			30%	\$ 1,350,000
Contingency [C] = Y * ([A]+[B])			30%	\$ 1,760,000
Project Estimate (2025) [D] = [A] + [B] + [C]				\$ 7,600,000
Annual Escalation to midpoint of construction @ 4% [E] = [D] * (1.04^Z - 1)			5	\$ 1,650,000
Project Estimate (2030) [F] = [D] + [E]				\$ 9,250,000

- Notes:**
- 1) Class D cost estimate per ACEC-BC guidelines. Rounding has been applied. Prices based on recent tenders within the Comox Valley.
 - 2) Pipe costs include removals, excavation, pipe, backfill, and decribed surface restoration.
 - 3) Professional services costs include engineering, environmental monitoring, legal, land, staff, etc.
 - 4) Costs exclude replacement of other utilities, managing unforeseen utility conflicts, archaeological mitigation works, taxes and fees, permits, maintenance costs.
 - 5) Market volatility (e.g. due to tariffs or other unforeseen trade impacts) is not accounted for.

PIPE BRIDGE			SOUTH OPTION 2		
	Description	Unit	Unit Price	Quantity	Sub total
PIPE BRIDGE					
	Pipe Bridge at Hwy 19A - Double Pipe	I.s.	\$ 675,000	1	\$ 675,000
	Pipe Bridge at Rail Corridor - Double Pipe with Pedestrian Crossing	I.s.	\$ 6,140,000		\$ -
	Bridge Construction Subtotal [A]				\$ 675,000
	Professional Services [B] = X * [A]			30%	\$ 210,000
	Contingency [C] = Y * ([A]+[B])			30%	\$ 270,000
	Project Estimate (2025) [D] = [A] + [B] + [C]				\$ 1,155,000
	Annual Escalation to midpoint of construction @ 4% [E] = [D] * (1.04^Z - 1)			2	\$ 100,000
	Project Estimate (2027) [F] = [D] + [E]				\$ 1,255,000

- Notes:**
- 1) Class D cost estimate per ACEC-BC guidelines. Rounding has been applied. Prices based on recent tenders within the Comox Valley.
 - 2) Pipe costs include removals, excavation, pipe, backfill, and decribed surface restoration.
 - 3) Professional services costs include engineering, environmental monitoring, legal, land, staff, etc.
 - 4) Costs exclude replacement of other utilities, managing unforeseen utility conflicts, archaeological mitigation works, taxes and fees, permits, maintenance costs.
 - 5) Market volatility (e.g. due to tariffs or other unforeseen trade impacts) is not accounted for.

WATER MAIN		SOUTH OPTION 3		
Description	Unit	Unit Price	Quantity	Sub total
REMOVALS AND MISCELLANEOUS				
Tree Removal & Vegetation Trimming	l.s.	l.s.	1	\$ 60,000
Management of Invasive Species (Scotch Broom, etc.)	l.s.	l.s.	1	\$ 20,000
Sediment & Erosion Control / Environmental Protection	l.s.	l.s.	1	\$ 200,000
Traffic Control and Management	l.s.	l.s.	1	\$ 25,000
		Subtotal		\$ 305,000
WATER MAIN - 350mm HDPE DR9		Total Pipe Length:	4331	
Within Highway travel lane (3.7m) - 150mm asphalt	l.m.	\$ 1,300		\$ -
Within Highway shoulder (1.4m) - 50mm asphalt	l.m.	\$ 645		\$ -
Within Local road lane (3.3m) - 100mm asphalt	l.m.	\$ 890		\$ -
Within Boulevard	l.m.	\$ 625		\$ -
Within Undeveloped land - new access road structure including ditches and culverts	l.m.	\$ 740	3811	\$ 2,820,140
Within Undeveloped land - reinstate existing Herondale Reservoir access	l.m.	\$ 620	280	\$ 173,600
Supported by 5m tall pipe bridge	l.m.	\$ 450		\$ -
Supported by 25m tall pipe bridge	l.m.	\$ 450	240	\$ 108,000
Air Release Valve Assembly (shallow roadside chamber)	each	\$ 75,000	5	\$ 375,000
Blow-Down Assembly	each	\$ 30,000	2	\$ 60,000
Major Crossing (Railway, Roy Creek, Millard Creek, Major Intersection)	each	\$ 60,000		\$ -
Roy Creek Railway Culvert Extension	each	\$ 500,000	1	\$ 500,000
		Subtotal		\$ 4,036,740
Water Construction Subtotal [A]				\$ 4,342,000
Professional Services [B] = X * [A]			30%	\$ 870,000
Contingency [C] = Y * ([A]+[B])			30%	\$ 1,570,000
Project Estimate (2025) [D] = [A] + [B] + [C]				\$ 6,782,000
Annual Escalation to midpoint of construction @ 4% [E] = [D] * (1.04^Z - 1)			2	\$ 560,000
Project Estimate (2027) [F] = [D] + [E]				\$ 7,342,000

- Notes:**
- 1) Class D cost estimate per ACEC-BC guidelines. Rounding has been applied. Prices based on recent tenders within the Comox Valley.
 - 2) Pipe costs include removals, excavation, pipe, backfill, and decribed surface restoration.
 - 3) Professional services costs include engineering, environmental monitoring, legal, land, staff, etc.
 - 4) Costs exclude replacement of other utilities, managing unforeseen utility conflicts, archaeological mitigation works, taxes and fees, permits, maintenance costs.
 - 5) Market volatility (e.g. due to tariffs or other unforeseen trade impacts) is not accounted for.

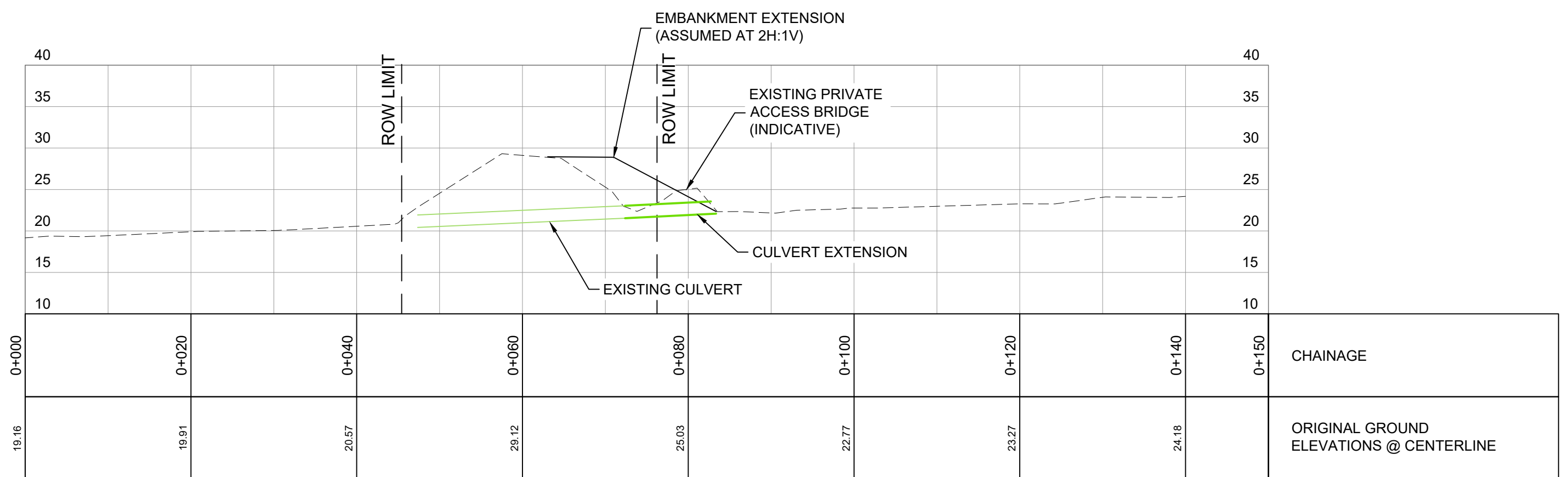
SEWER FORCEMAIN		SOUTH OPTION 3			
Description		Unit	Unit Price	Quantity	Sub total
REMOVALS AND MISCELLANEOUS					
Tree Removal & Vegetation Trimming		l.s.	l.s.	1	\$ -
Management of Invasive Species (Scotch Broom, etc.)		l.s.	l.s.	1	\$ 1,000
Sediment & Erosion Control / Environmental Protection		l.s.	l.s.	1	\$ 100,000
Traffic Control and Management		l.s.	l.s.	1	\$ 25,000
Subtotal				\$	126,000
SEWER FORCEMAIN - 250mm HDPE DR 17			Total Pipe Length:	4331	
Within Highway travel lane (3.7m) - 150mm asphalt		l.m.	\$ 1,090		\$ -
Within Highway shoulder (1.4m) - 50mm asphalt		l.m.	\$ 435		\$ -
Within Local road lane (3.3m) - 100mm asphalt		l.m.	\$ 680		\$ -
Within Boulevard		l.m.	\$ 415		\$ -
Within Undeveloped land - new access road structure including ditches and culverts		l.m.	\$ 530		\$ -
Within Undeveloped land - reinstate existing access road structure (built during watermain)		l.m.	\$ 410	4091	\$ 1,677,310
Supported by 5m tall pipe bridge		l.m.	\$ 240		\$ -
Supported by 25m tall pipe bridge		l.m.	\$ 240	240	\$ 57,600
Air Release Valve Assembly (shallow roadside chamber)		each	\$ 75,000	6	\$ 450,000
Blow-Down Assembly		each	\$ 30,000	2	\$ 60,000
Major Crossing (Railway, Roy Creek, Millard Creek, Major Intersection)		each	\$ 60,000		\$ -
Subtotal				\$	2,244,910
Sewer Construction Subtotal [A]				\$	2,371,000
Professional Services [B] = X * [A]				30%	\$ 720,000
Contingency [C] = Y * ([A]+[B])				30%	\$ 930,000
Project Estimate (2025) [D] = [A] + [B] + [C]				\$	4,021,000
Annual Escalation to midpoint of construction @ 4% [E] = [D] * (1.04^Z - 1)				5	\$ 880,000
Project Estimate (2030) [F] = [D] + [E]				\$	4,901,000

- Notes:**
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 - 3) Professional services costs include engineering, environmental monitoring, legal, land, staff, etc.
 - 4) Costs exclude replacement of other utilities, managing unforeseen utility conflicts, archaeological mitigation works, taxes and fees, permits, maintenance costs.
 - 5) Market volatility (e.g. due to tariffs or other unforeseen trade impacts) is not accounted for.

PIPE BRIDGE			SOUTH OPTION 3		
	Description	Unit	Unit Price	Quantity	Sub total
PIPE BRIDGE					
	Pipe Bridge at Hwy 19A - Double Pipe	I.s.	\$ 675,000		\$ -
	Pipe Bridge at Rail Corridor - Double Pipe with Pedestrian Crossing	I.s.	\$ 6,140,000	1	\$ 6,140,000
	Bridge Construction Subtotal [A]				\$ 6,140,000
	Professional Services [B] = X * [A]			30%	\$ 1,850,000
	Contingency [C] = Y * ([A]+[B])			30%	\$ 2,400,000
	Project Estimate (2025) [D] = [A] + [B] + [C]				\$ 10,390,000
	Annual Escalation to midpoint of construction @ 4% [E] = [D] * (1.04^Z - 1)			2	\$ 850,000
	Project Estimate (2027) [F] = [D] + [E]				\$ 11,240,000

APPENDIX C

Watercourse Crossing Sketches



	#	#		#	#	#	THIS DRAWING AND DESIGN IS THE PROPERTY OF MCELHANEY AND SHALL NOT BE USED, REUSED OR REPRODUCED WITHOUT THE CONSENT OF MCELHANEY. MCELHANEY WILL NOT BE HELD RESPONSIBLE FOR THE IMPROPER OR UNAUTHORIZED USE OF THIS DRAWING AND DESIGN. THIS DRAWING AND DESIGN HAS BEEN PREPARED FOR THE CLIENT IDENTIFIED, TO MEET THE STANDARDS AND REQUIREMENTS OF THE APPLICABLE SPECIFICATIONS AND AGENCIES' PREPARATION. MCELHANEY, ITS EMPLOYEES, SUBCONSULTANTS AND AGENTS WILL NOT BE LIABLE FOR ANY LOSSES OR OTHER CONSEQUENCES RESULTING FROM THE USE OR RELIANCE UPON OR ANY CHANGES MADE TO THIS DRAWING, BY ANY PARTY, INCLUDING THE CLIENT, CONTRACTORS, SUPPLIERS, CONSULTANTS AND STAKEHOLDERS, OR THEIR EMPLOYEES OR AGENTS, WITHOUT MCELHANEY'S PRIOR WRITTEN CONSENT. INFORMATION ON EXISTING UNDERGROUND FACILITIES MAY NOT BE COMPLETE OR ACCURATE. MCELHANEY, ITS EMPLOYEES AND DIRECTORS ARE NOT RESPONSIBLE NOR LIABLE FOR THE LOCATION OF ANY UNDERGROUND CONDUITS, PIPES, CABLES OR OTHER FACILITIES WHETHER SHOWN OR OMITTED FROM THIS PLAN. PRIOR TO CONSTRUCTION CONTRACTOR SHALL EXPOSE LOCATIONS OF ALL EXISTING FACILITIES BY HAND DIGGING OR HYDRO-CUTTING AND ADVISE THE ENGINEER OF POTENTIAL CONFLICTS.
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DATE: 06-01-2020	0	06-01-06	ISSUED FOR INFORMATION	ER	-		
Rev	Date	Description	Drawn	Design	App'd		

BENCHMARK
ALL ELEVATION REF TO CONTROL MONUMENT: -
LOCATED AT: -
ELEVATION: -

0 1:500 25

ORIGINAL DWG SIZE: ANSI D (22" x 34")



McElhanney

1211 Ryan Road,
Courtenay BC V9N 3R6
Tel. 250 338 5495

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PRELIMINARY
NOT FOR
CONSTRUCTION

THIS DRAWING HAS NOT BEEN
APPROVED AND MAY CONTAIN
ERRORS AND OMISSIONS

CVRD
-
CVRD SOUTH OPTIONS
ROY CREEK AT RAILWAY
CREEK PROFILE
-

Drawing No.	
SK05-B	
Project Number	Rev.
2211-47855-00	0