

FEASIBILITY STUDY

Nanaimo River Pedestrian Crossing at Morden Colliery Regional Trail

Prepared for:

Regional District of Nanaimo

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Project No. 0837-089





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1 PROJECT SUMMARY

Herold Engineering Limited (Herold Engineering) has completed a feasibility study and site review of the proposed new bridge crossing over the Nanaimo River for the Regional District of Nanaimo (RDN). The proposed crossing is located near the community of Cedar, BC, it is to form the main conduit along the Morden Colliery Regional (MCR) Trail, connecting Morden Colliery Historic Provincial Park with Hemer Provincial.

It is our understanding that this review is to form part of a preliminary planning and development study to improve access to users and provide access across Nanaimo River. Currently there is no crossing and the MCR trail terminates at Morden Colliery Historic Provincial Park. It is unknown when the RDN intends to construct the new bridge as well as the connecting trails as it is contingent on securing funding for the project.

A feasibility study was completed by Herold Engineering in 2014 that included two bridge crossing and costed options. The intent of this study is to review the 2014 feasibility study considering the most recent topographic survey of the trail and proposed bridge location within RDN's right-of-way. Additionally, Northwest Hydraulics Consultants Ltd. was retained to complete a preliminary hydrotechnical and hydrology of the proposed bridge location and Lewkowich Geotechnical Engineering was consulted to review the geotechnical parameter of the project and updated geotechnical memo, highlighting the foundation options. The project site was visited with a representative from Aquaparian Environmental Consulting Ltd. to review the project site and provide comments on the environmental footprint of the project.

This report provides a summary result of the feasibility study and provides an updated design concept of the two viable superstructure options for the bridge crossing. An order of magnitude cost estimates as well as discussion on the constructability of the new bridge structure are also discussed in this report.

2 SCOPE OF REVIEW

The site review was limited to surficial measurements and observation only. This included a walkthrough assessment of the approaching trail to the east of the proposed bridge location and to the west along RDN trail right-of-way. The assessment included observation of the channel characteristics downstream and upstream of the proposed bridge location and a recorded review of channel composition, historic highwater evidence, site conditions, and constrains for construction.

No topographic survey was completed by Herold Engineering and topographic survey information was made available by the RDN for this assignment. Options for the bridge crossing presented in this report are based on topographic modeling using LiDAR information obtained through LiDAR BC – Open LiDAR Data Portal, presented and managed by BC provincial government and the most recent topographic survey provided by the RDN. Herold Engineering does not assume responsibility for the accuracy of this data.

The following list of items does not form part of the scope of this investigation, but is recommended to refine the result of the assessment as presented in this report:

- Detailed topographic survey of the final bridge location to determine site geometry and bridge alignment.



- Detailed geotechnical investigation to verify the suitability of the proposed foundations.
- Environmental assessment to fulfill the permitting requirements and provide mitigation plans during and post construction; and
- Construction Planning Study to ensure effective execution of the construction of the bridge, considering the remote location and limited access to the project area.

3 DESIGN OBJECTIVES & GUIDELINES

All analyses for this study were completed in accordance with the following design objectives, guidelines, and scope:

- Design to satisfy the requirements of the Canadian Highway Bridge Design Code (CAN/CSA S6-19)
- Intended use for pedestrians, cyclist, equestrian traffic (no service vehicles);
- Structure hydraulically designed to meet a 200-year return peak flow event. (i.e. Q_{200})
- Multi-span construction with foundations outside the wetted perimeter of Nanaimo River;
- Structure with a preferred clear minimum deck width of 2.05m;
- Hydrotechnical scope shall include the update to design flow for Q_{200} event including the impact of climate change; and scour assessment
- Geotechnical scope shall include desktop study of geotechnical site condition and the viability of deep pile foundation;
- Environmental scope shall include, site assessment, Environmental Impact Assessment (EIA), Environmental Management Plan (EMP), design review and list of required environmental permitting;
- Relatively low maintenance structure with low maintenance costs in the long run; and
- The new structure to be located within RDN's right-of-way.

4 Site Description and History

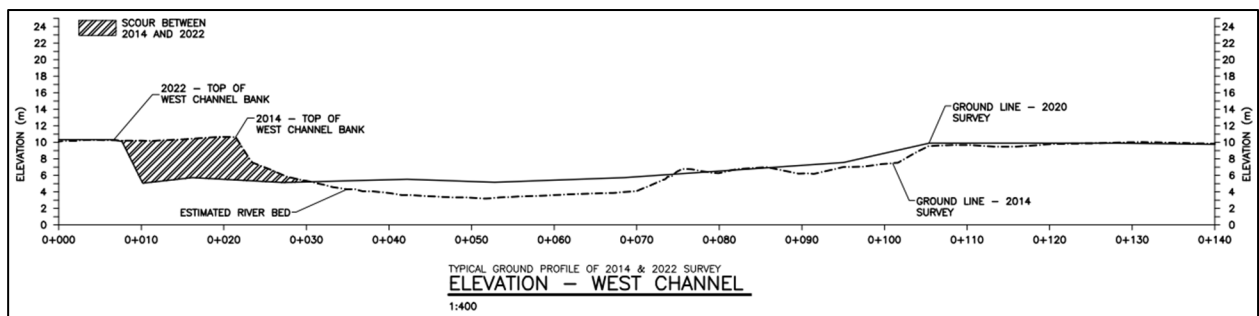
4.1 Current Site Condition & Bridge Alignment

It is our understanding that the new bridge location and the corresponding connecting trail shall be within the RDN's right-of-way. In Appendix A, the satellite image and project location map illustrates an overview of the project area and the location of the proposed bridge location.

As discussed in the NHC hydrology report, the proposed bridge located approximately 4.7 km upstream of Nanaimo River estuary tidal flats and is beyond the limit of tidal influence during large flooding. Nanaimo River is generally a meandering, gravel-bed channel, with occasional divide and splits around vegetated river islands. The stream flow at the proposed bridge location is diverted around a large river island, with main flow diverted to two distinct East and West channels. The east channel could be considered a secondary, overflow channel as review of the historic air photos indicates the main flow of Nanaimo River is through the west channel. The river island appears to be comprised of mature trees and fluvial deposit of fines, gravel and boulders. It is our understanding that the proposed bridge site was used previously as a rail bridge crossing in order to carry coal from the Morden site to waterfront barges in Boat Harbour. Signs of coal deposits are evident in the center bank of the river crossing and previous abutments are still partially visible.

Review of the historic air photos completed by NHC dating back to 1968 and comparison made in channel alignment photos from 1968 to 1982, 2010 and 2020 photos, indicates that while the single channel of the upstream and downstream of the proposed bridge crossing remained relatively stable over the last 52 years, the west bank channel has eroded significantly. NHC report notes that this is due in part to the formation and establishment of a river island upstream of the proposed bridge crossing that is reducing the proportion of the flow directed through the east channel. This consequently has increased flow through the west channel and promoted bank erosion near the proposed bridge location. It is important to note that with continued accumulation of gravel and woody debris, flows could be forced back through the east channel, which would promote erosion of the east bank.

Herold Engineering review of the site has noted significant scour of the west side of the proposed crossing with river banks nearly vertical. Figure 1, illustrates the level of bank scour and erosion along the west bank of Nanaimo River between when considering the 2014 topographic survey and the most recent (2022) topographic survey. The rate and level of bank erosion is significant and will impact the span length and location of the abutments.



Generally, the proposed bridge location at the RDN right-of-way as identified in the NHC report has several hydrotechnical challenges and final bridge location and location of the foundation should carefully consider in the detailed design phase if the project is to move forward. Furthermore, a single span across Nanaimo River at the RDN right-of-way is not feasible and two distinct spans as indicated in the 2014 feasibility study will be required.

It is important to note that the alternative crossing location downstream of the RDN right-of-way may prove more cost effective and may not have the same hydrotechnical challenges. At this location, Nanaimo River is more incised and narrower and does not appear more stable. A single span bridge may provide access across the Nanaimo River, however, further study, acquisition or transfer of additional land and construction of a new trail in Morden Colliery Historic Provincial Park will be required.

4.2 2014 Feasibility Study

The 2014 bridge feasibility study prepared by Herold Engineering indicated that either a steel truss bridge or steel suspension bridge with a semi-rigid deck and steel towers would be feasible alternatives for a pedestrian bridge crossing. Two distinct spans of 90m at West channel and 84m at the East channel would provide access across Nanaimo River.

Considering the most recent survey and the hydrotechnical challenges in regards to stream bank erosion along the West channel and potential long-term erosion along the East channel,



longer spans for both channel crossings is anticipated. For the purpose of the feasibility study, it could be assumed based on the most recent survey and hydrotechnical information, it is anticipated that a 110m span would be required for the West channel and 100m span would be required on the secondary East channel.

5 PRELIMINARY HYDROTECHNICAL ASSESSMENT

5.1 Flood Elevation Data & Analysis

In 2014, NHC was retained to complete a hydrotechnical review of the project. As a part of the current feasibility study, NHC was again retained to update the 2014 study with additional data with most recent Water Survey Canada information. A similar methodology as the 2014 has been employed to determine the hydrotechnical parameters of the proposed project. Additionally, a 20% increase in flow quantities has been applied to the model to account for climate change impact. This is based on the current projections for Vancouver Island as recommended by Engineers and Geoscientists BC.

The results of the NHC's preliminary hydrotechnical study are given in Table 1.

Table 1: Preliminary Hydrotechnical Results

	200-year Return Period with Allowance for Climate Change
Percentage of Flow in the Floodplain	15 to 40%
Design Discharge	1930 m ³ /s
Mean Channel Velocity	3.9 m/s
Water Surface Elevation	11.2 m
Minimum Free Board	1.5 m
Mean Bridge Soffit Elevation	12.7 m
Minimum Scour Elevation	1.7 m

The following notes summarize the result of the preliminary hydrotechnical assessment:

- The result of the hydrotechnical study is based on a 200-year return period (Q_{200}) with a 0.5% annual exceedance probability.
- With the potential of up to 40% of the flow in the floodplain, the trail approaches to the bridge will be subject to washouts in a large flood event and trail maintenance plans should take this into consideration.
- A minimum free board of 1.5m above the flood elevation is recommended.
- The minimum bridge soffit elevation has increased from 12.2m in the 2014 study to 12.7m elevation. This is mainly due to the inclusion of climate change allowance.
- Significant amount of fill on the approaches trail to the bridge will be required and for this reason the final designs would incorporate a significant camber to minimize approach fills.
- At estimated scour elevation of 1.7m, a spread footing foundation is not recommended, and deep pile foundation are proposed for this site.

5.2 Potential Hydrotechnical Constrains

As part of the detailed bridge design process, hydrotechnical input will be required to assess key components such as the channel reach stability, localized bank stability and scour risk, construction levels above the design flood, as well as provide input to the bridge design (e.g. abutment locations, flood proofing, riprap design). In addition, the proposed crossing which is located on an island significantly increases the complexity of the hydrotechnical engineering. Issues include longer bridge segments, increased protection works to maintain flows in two separate channels, stability concerns at the island and the flow morphology in the West and East channel are difficult to predict. Deep pilings set back from the current channel banks will reduce the hydrotechnical risks at the site to some degree. Short, localized bank protection is not likely to be effective. Extensive bank protection upstream is not likely to be cost effective and protection should consist of setbacks bridge foundation and riprap protection capable of withstanding large flood events.

As recommended by NHC, the future hydrotechnical study in the detailed design stage should include:

- A more comprehensive river survey around the bridge location and update to the hydraulic model to include the most recent channel bathymetry.
- Conduct a more thorough geomorphology investigation to predict the potential channel changes.
- Complete a detailed waterway design, including flood level, scour, and debris assessment.

6 PRELIMINARY GEOTECHNICAL ASSESSMENT

6.1 Bridge Foundation Feasibility

Based on the site review and desktop study completed by Lewkowich Geotechnical, it is expected that the most cost-effective and practical means to support the bridge structures would be driven piles. Given the presence of fill materials within the abandoned railway berm and the scour potential during a large event, the typical spread footings are not recommended.

It is anticipated that the naturally deposited subgrade conditions will be favorable and will provide competent bearing conditions at relatively shallow depths. It is also anticipated that the subgrade will consist of a layer of coarse, dense, sand, gravel, and cobbles overlying bedrock. The depth to bedrock could be determined through a series of bore holes, if required during the detailed design phase.

7 DESIGN OPTIONS

There are several options available for material and structure types for an approximately 90 to 110m, single-span crossing. For the purpose of this feasibility study, considering the key design elements of cost, constructability, user requirements and maintenance implication, two bridge types as follows were considered for discussion:

1. Steel Truss Bridge
2. Steel cable suspension bridge with a semi-rigid deck and steel towers

~A conceptual sketch of the bridge options is presented in **Appendix C**.

7.1 **OPTION 1: Steel Truss Bridge**

Steel truss bridges have been in service and utilized by many municipalities, provincial transportation authorities and developers for many decades. They are fabricated in a controlled setting which allows for optimal quality control and assurance, before being segmented and shipped to the site.

These structures are common and would generally consist of half-through or “pony truss” constructed of hollow steel tubing or build-up steel sections (typically weathering steel). They can be fabricated by experienced bridge manufacturers throughout Canada and be installed relatively quickly, using local crews and with little or no specialized equipment.

The bridge deck options consist of cast-in-place concrete utilizing “stay-in-place” steel forms, galvanized steel or aluminum grading planks anchored to bottom truss cords, or dimensional treated timber. Pedestrian barriers can be fabricated using steel tubing attached to the truss on each side of the bridge.

The structure can be supported on either cast-in-place or precast concrete footings. The use of treated timber footing is acceptable but is not recommended due to rapid decay and the limited service life. The footings can be cast on placed on a constructed pad or anchored directly to competent bedrock.

The main benefits of this type of structure are the higher soffit elevations that are achieved due to the low profile of the structure below the deck, speed of erection and the availability of relatively common material and member components. From the serviceability and user perspective, due to the overall depth of the truss, these structures have relatively low deflection and vibration levels.

The disadvantage to this structure may include the natural red-orange patina of aged weathering steel which not all users find attractive as well as the general truss geometry of the bridge. While appearance and aesthetics are somewhat subjective, truss structures and weathering steel can be “Industrial” in appearance and may or may not fit into a park setting. A compromise can be made by incorporating timber elements to the structure. Timber decks and handrails are generally well accepted in a park environment but may require additional maintenance compared to other options presented.

7.2 **OPTION 2: A steel cable suspension bridge with a semi-rigid deck and steel towers**

Suspension cable-type bridges are one of the more common structures utilized in park settings. Due to the inherent nature of these structures, they can be used to span long crossings in remote settings where access to the site can be difficult.

They generally consist of steel cables attached to steel HSS towers at each side of the bridge approach. The towers are then attached to concrete anchor blocks or rock anchors embedded in competent bedrock. Since the structure is primarily supported by anchorage blocks or rock anchors, the geotechnical properties of the bridge location will determine the feasibility of the structure.

For semi-flexible deck-type structures, galvanized steel decking anchored to bottom cables provides access to users. Steel brackets attached to cables provide bridge posts and Chain Link fence provides a barrier to users.

The main advantage of suspension bridge-type structures is that they are relatively affordable to construct and have low maintenance requirements. A minimum amount of supplies is needed to construct the superstructure and no specialized fabrication is required. A more advanced construction crew may be required to successfully and safely install these structures.

The critical element for the construction of these structures is a suitable geotechnical condition to construct the bridge foundation. Poor soft soil or incompetent bedrock will increase the cost of these structures as considerable effort is required to improve the site conditions to support the bridge. A comprehensive geotechnical investigation should be completed to ensure the structure is economically suitable relative to other alternatives.

Typically, suspension bridge types are acceptable in a park setting and tend to attract visitors and become a focal point of the area, a landmark for the community that attracts tourists. They are aesthetically pleasing and the use of a timber deck may allow a better fit in a natural environment.

The main disadvantage to these structures is from a serviceability perspective as they can be quite lively under load and vibrate excessively. This often is acceptable to some users in a park setting but others may find it unacceptable as the excessive vibration may not be comfortable.

These structures also have a limited capacity to carry heavy or concentrated loads. As such their use is limited to pedestrians only. Considerable effort will be required to stiffen the deck so a concentrated load can be carried over the bridge. Although the intent of this report is for pedestrian use only, it's important to highlight this drawback. This structure type would not be acceptable for equestrian use.

8 **COST ESTIMATE**

Class "D" Cost Estimates have been prepared and are summarized in the table below:

Description	Type "D" Cost Estimate
1. Steel Truss Bridge – 110m + 90 m span	\$ 3,722,280.00
2. Suspension Cable Type Bridge with flexible deck – 110 m + 90 m span	\$ 2,471,888.00

The cost estimates provided in this study are intended to be an order of magnitude only and are based on preliminary design and site data. Any project planning, budgeting or funding requests that are undertaken based upon this report should carry adequate contingencies to allow for unforeseen circumstances that may occur as the project proceeds. Based on the preliminary data and site conditions, it is recommended that at a minimum a 30% project contingency at this stage, which could be reviewed if and when the detailed design proceeds.

9 **CONCLUSIONS & RECOMMENDATIONS**

Based on the findings and constraints noted above, the following comments and recommendations are given:



- The decision for the structure should be discussed further with RDN to confirm the design values prior to making a structure recommendation.
- It should be understood that the river bank is very dynamic and is expected to continue to move in the future which could require additional efforts in the future to maintain trail connection to the proposed bridge if the river moves in either direction.
- A topographic survey, geotechnical, hydrotechnical, environmental assessment and detailed structural design will be required to complete the design of the new structure.
- Access to the site for construction equipment should be reviewed.

This report has been prepared for the sole and exclusive use of the Regional District of Nanaimo. The report has been prepared in accordance with generally accepted engineering practice for the design of a new bridge structure. The use of or reliance upon this report by third parties is neither authorized nor warranted.

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Respectfully submitted,

HEROLD ENGINEERING LIMITED

Prepared by:

Craig Work, P.Eng., FEC
Principal, Sr. Bridge Engineer

APPENDIX A – COST ESTIMATES

Project Name: MODERN COLLIERY TRAIL BRIDGES - TRUSS OPTION

BRIDGE ORDER OF MAGNITUDE COST ESTIMATE (110m + 90m Spans)					
Item#	Description of Work	Unit of Measure	Approx. Quantity	Unit Price	Extended Amount
02.	SECTION 2 - BRIDGE				
02.01	Mobilization	L.S.	1	\$336,000.00	\$336,000.00
02.02	Foundation Excavation				
02.02.01		L.S.	1	\$24,000.00	\$24,000.00
02.03	Backfill				
02.03.01	Bridge End Fill	Cubic Meter	40	\$80.00	\$3,200.00
02.04	Steel Pipe Piling				
02.03.01	Mobilization	L.S.	1	\$120,000.00	\$120,000.00
02.03.02	Material Supply	Metre	132	\$700.00	\$92,400.00
02.03.03	Driving	Metre	120	\$650.00	\$78,000.00
02.03.04	Socketing	Metre	12	\$5,000.00	\$60,000.00
02.05	Reinforcing Steel				
02.05.01	Uncoated - Pile caps	Kilogram	1000	\$6.00	\$6,000.00
02.05.03	Ballast walls	Kilogram	600	\$6.00	\$3,600.00
02.06	Concrete				
02.06.01	Cast-in-Place Concrete				
02.06.01.01	Pile caps	Cubic Meter	4	\$1,800.00	\$7,200.00
02.06.02	Precast Concrete				
02.06.02.01	Ballast walls	Cubic Meter	2	\$1,800.00	\$3,600.00
02.06.02.02	Shipping and Erection	Each	4	\$1,500.00	\$6,000.00
02.07	Steel				
02.07.01	Structural Steel				
02.07.01.01	Supply and Fabrication	Tonne	205	\$ 6,500.00	\$1,332,500.00
02.07.01.02	Shipping and Erection	Tonne	205	\$800.00	\$164,000.00

Item#	Description of Work	Unit of Measure	Approx. Quantity	Unit Price	Extended Amount
02.09	Miscellaneous Metalwork				
02.09.01	Supply and Install Guard Railings	Meter	350	\$250.00	\$87,500.00
02.10	Structural Bearings and Anchor bolts				
02.10.01	Supply and Install (Includes Testing)	L.S.	1	\$15,000.00	\$15,000.00
02.12	Timber Decking				
02.12.01	Supply & Install	Meter	1580	\$150.00	\$237,000.00
Part A	TENDER COST ESTIMATE				\$2,576,000.00
	Detailed Engineering				\$283,360.00
	Geotechnical Drilling				\$85,000.00
	Tender and Contract Management				\$437,920.00
	Contingencies (30%)	L.S.			\$ 340,000.00
901.00	TOTAL TENDER, SITE OCCUPANCY (if applicable) AND ASSOCIATED COST ESTIMATES				\$3,722,280.00

Project Name: MODERN COLLIERY TRAIL BRIDGES - SUSPENSION BRIDGE OPTION

BRIDGE ORDER OF MAGNITUDE COST ESTIMATE					
Item#	Description of Work	Unit of Measure	Approx. Quantity	Unit Price	Extended Amount
02.	SECTION 2 - BRIDGE				
02.01	Mobilization	L.S.	1	\$217,000.00	\$217,000.00
02.02	Foundation Excavation				
02.02.01		L.S.	1	\$24,000.00	\$24,000.00
02.03	Steel Pipe Piling				
02.03.01	Mobilization	L.S.	1	\$120,000.00	\$120,000.00
02.03.02	Material Supply	Metre	240	\$915.00	\$219,600.00
02.03.03	Driving	Metre	216	\$750.00	\$162,000.00
02.03.04	Socketing	Metre	24	\$7,000.00	\$168,000.00
02.04	Reinforcing Steel				
02.04.01	Uncoated - Pile caps	Kilogram	4000	\$6.00	\$24,000.00
02.05	Concrete				
02.05.01	Cast-in-Place Concrete				
02.05.01.01	Pile caps	Cubic Meter	20	\$1,800.00	\$36,000.00
02.06	Cable				
02.06.01	Supply and Installation (50.8mm diameter)	Meter	800	\$ 200.00	\$160,000.00
02.06.02	Supply and Installation(12mm diameter)	Meter	1780	\$ 50.00	\$89,000.00
02.07	Steel				
02.07.01	Structural Steel				
02.07.01.01	Supply and Fabrication	Tonne	25	\$ 6,500.00	\$162,500.00
02.07.01.02	Shipping and Erection	Tonne	25	\$1,200.00	\$30,000.00
02.08	Hanger and Sway cable connections				
02.08.01	Supply and Installation	L.S.	1	\$100,000.00	\$100,000.00
02.09	Guard				
02.09.01	Supply and Installation of handrail cable	Meter	350	\$100.00	\$35,000.00
	Fencing	Square Meter	425	\$75.00	\$31,875.00

Item#	Description of Work	Unit of Measure	Approx. Quantity	Unit Price	Extended Amount
02.10	Timber Decking				
02.10.01	Supply & Install	<i>Meter</i>	<i>1575</i>	<i>\$50.00</i>	<i>\$78,750.00</i>
Part A	TENDER COST ESTIMATE				\$1,657,725.00
	Detailed Engineering				\$182,349.75
	Geotechnical Drilling				\$85,000.00
	Tender and Contract Management				\$281,813.25
	Contingencies (30%)	<i>L.S.</i>			\$ 265,000.00
901.00	TOTAL TENDER, SITE OCCUPANCY (if applicable) AND ASSOCIATED COST ESTIMATES				\$2,471,888.00

APPENDIX B – MAP



End of Morden Colliery Trail

Proposed Bridge Location
Span B

Proposed Bridge Location
Span A

Thatcher Creek Crossings

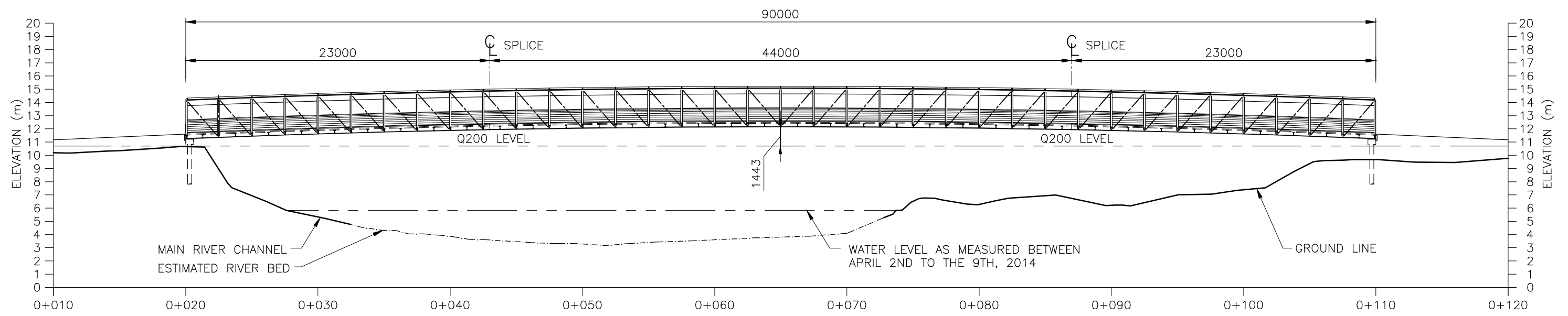
Estimated Location of RDN trail Corridor

Existing Trail

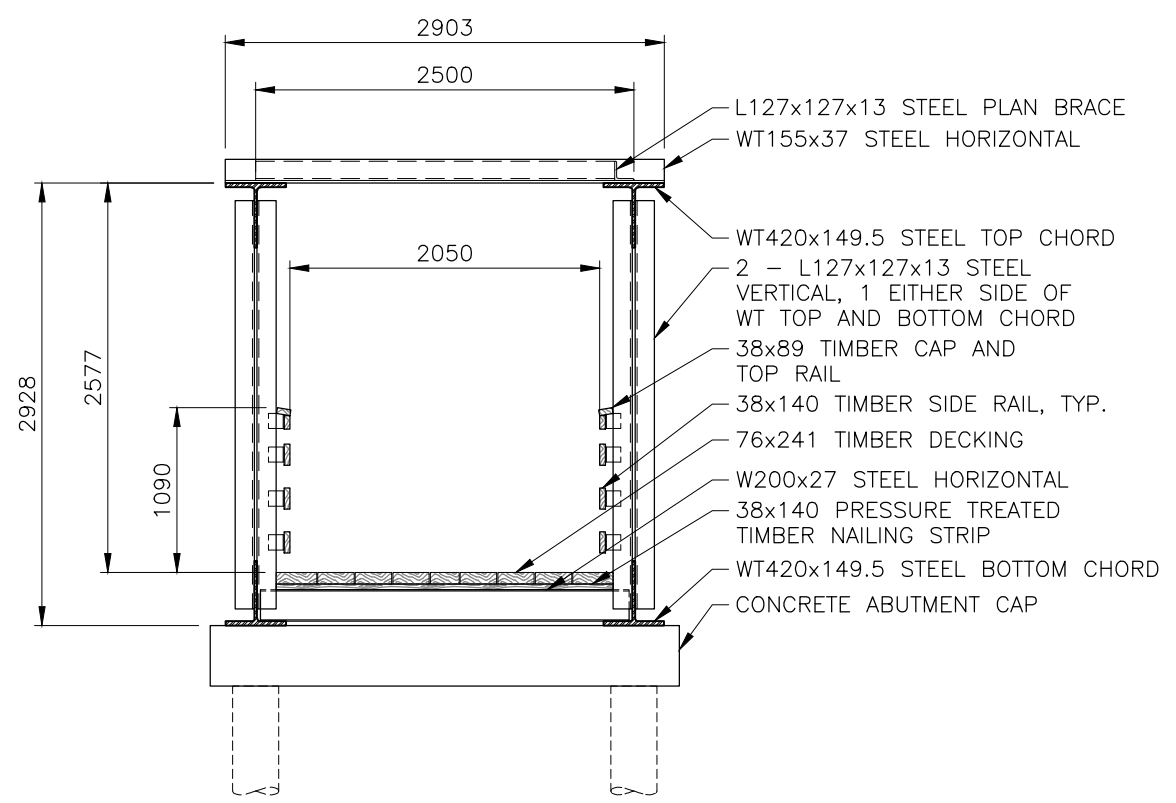
New Trail to be Designed

APPENDIX C – CONCEPTUAL DRAWINGS

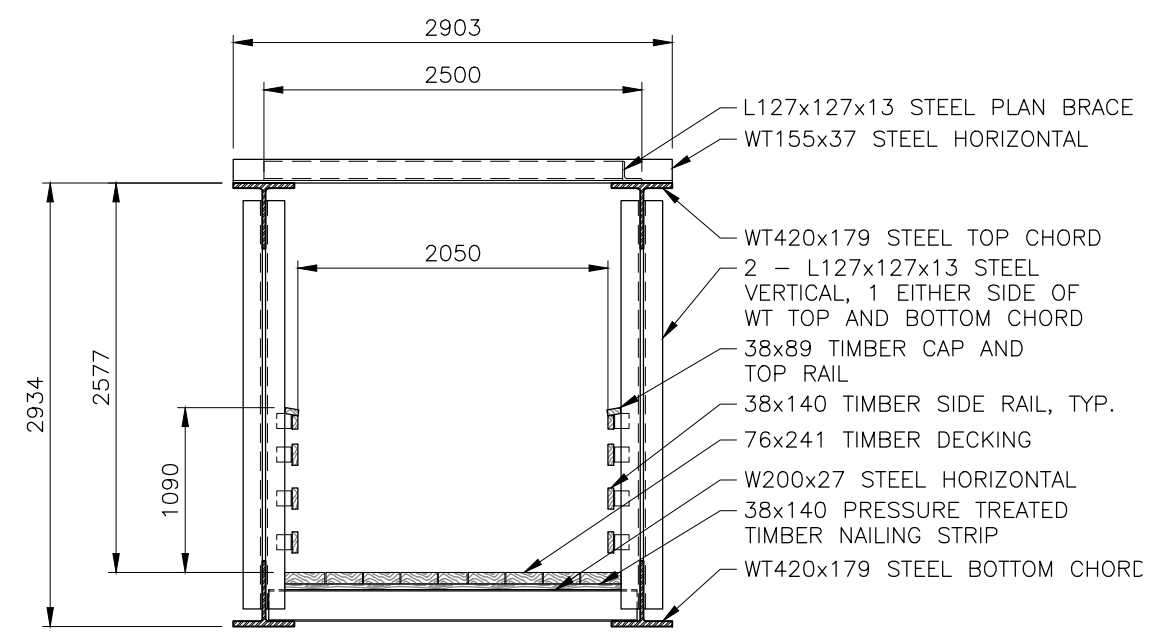
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 © Copyright reserved. This drawing remains the exclusive property of Herold Engineering Limited and may not be reused or reproduced without written consent of Herold Engineering Limited.



ARCHED TRUSS DESIGN
ELEVATION – WEST CHANNEL BRIDGE
 1:300



AT ENDS (BALLAST WALL NOT SHOWN FOR CLARITY)
TYPICAL SECTION
 1:50




AT MIDSPAN
TYPICAL SECTION
 1:50

FEASIBILITY
 STUDY

NOT FOR
 CONSTRUCTION

ISSUES		
No.	DATE	ISSUED FOR
A	2014.06.13	FEASIBILITY STUDY
B	2014.08.22	REVISED
C	2014.09.12	REVISED



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**MORDEN COLLIERY
 TRAIL AND BRIDGES
 CONCEPT OPTION 1
 ARCHED TRUSS
 BRIDGE 1 90m SPAN**

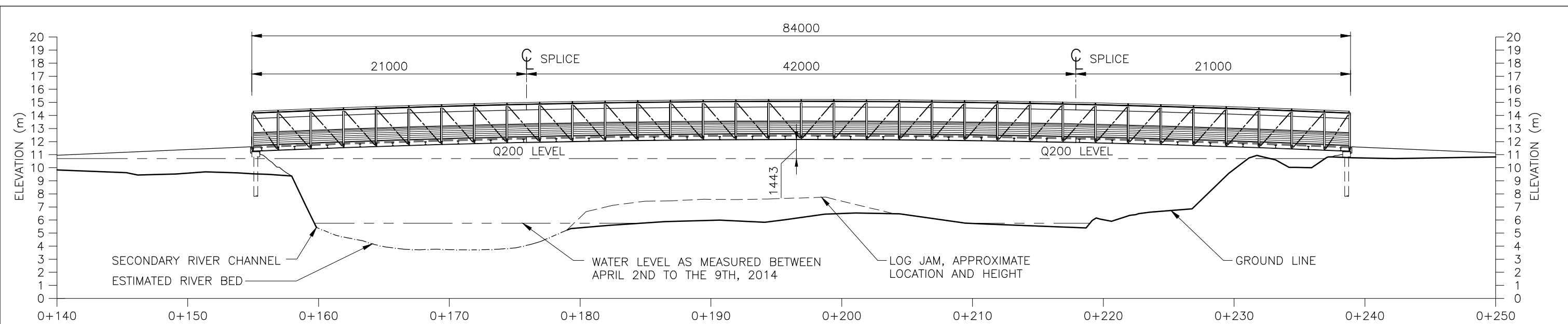
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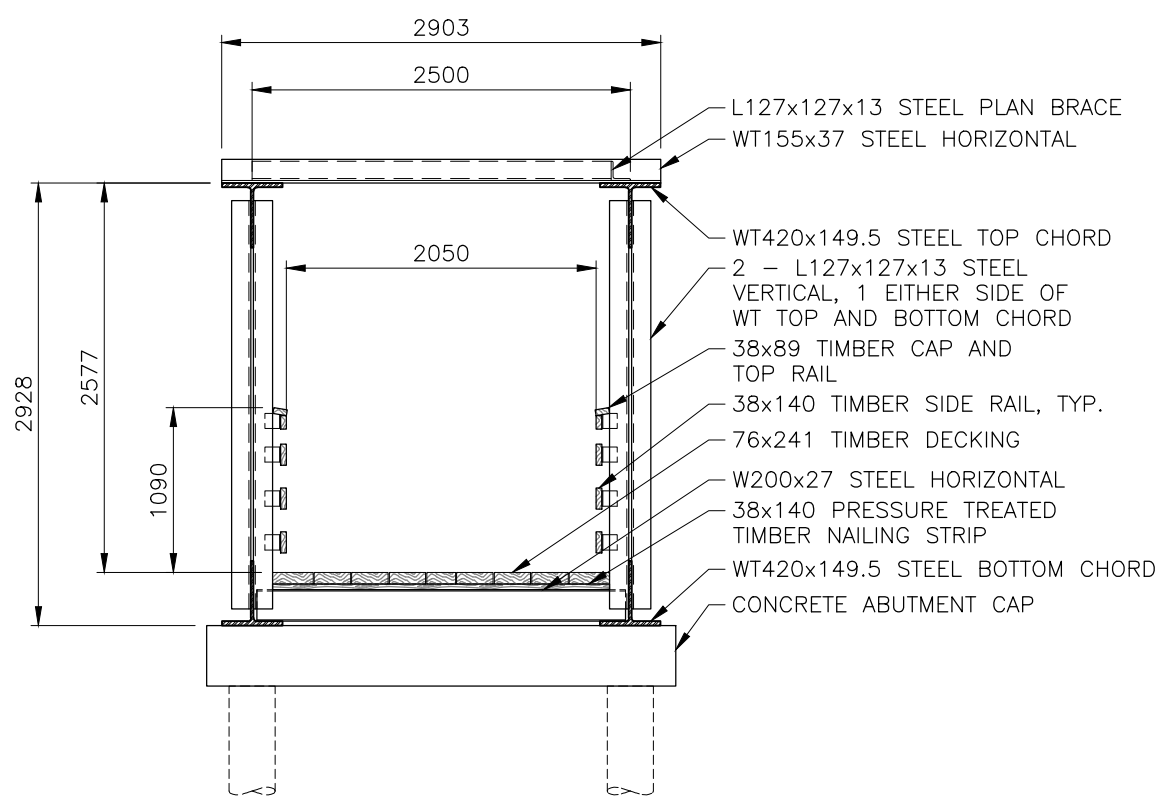
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DESTROY ALL DRAWINGS SHOWING PREVIOUS REVISION

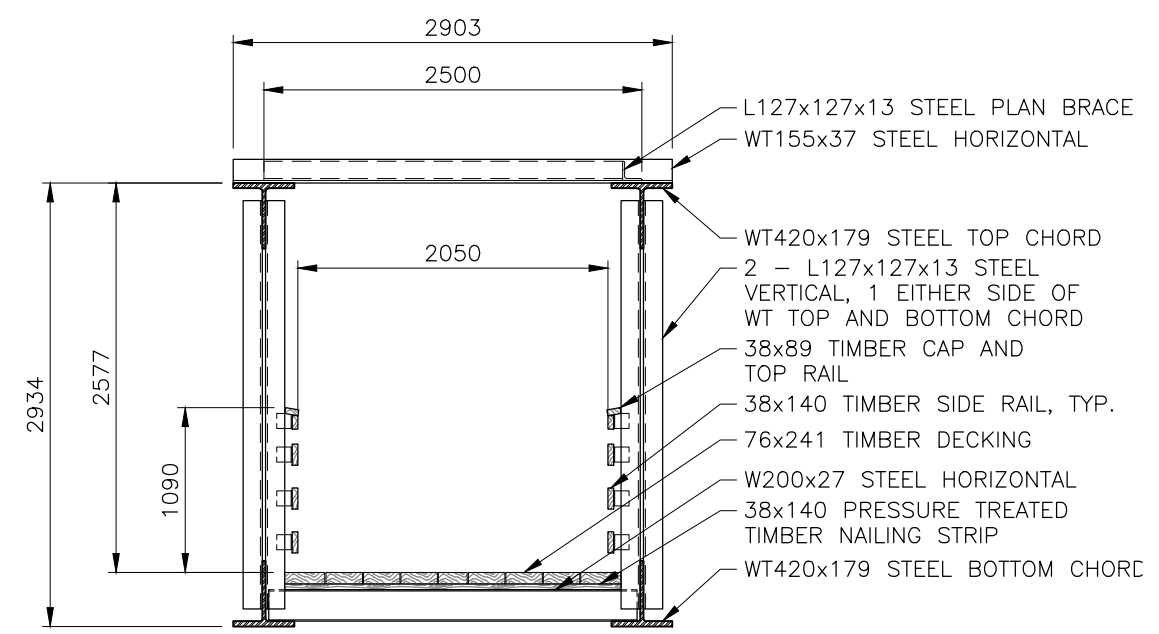
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ARCHED TRUSS DESIGN
ELEVATION – EAST CHANNEL BRIDGE
 1:300



AT ENDS (BALLAST WALL NOT SHOWN FOR CLARITY)
TYPICAL SECTION
 1:50



AT MIDSPAN
TYPICAL SECTION
 1:50

FEASIBILITY
 STUDY

NOT FOR
 CONSTRUCTION

ISSUES		
No.	DATE	ISSUED FOR
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B	2014.08.22	REVISED
C	2014.09.12	REVISED

HEROLD
ENGINEERING

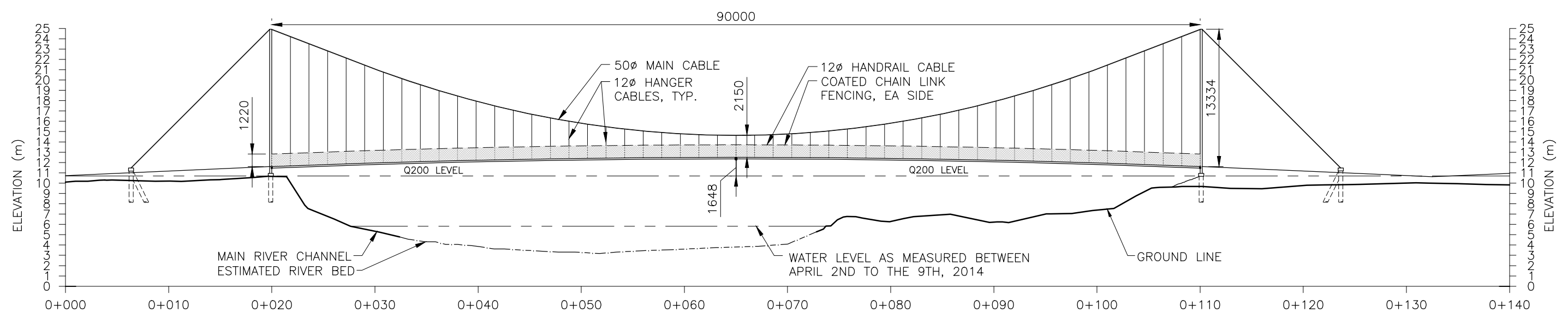
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**MORDEN COLLIERY
 TRAIL AND BRIDGES
 CONCEPT OPTION 1
 ARCHED TRUSS
 BRIDGE 2 84m SPAN**

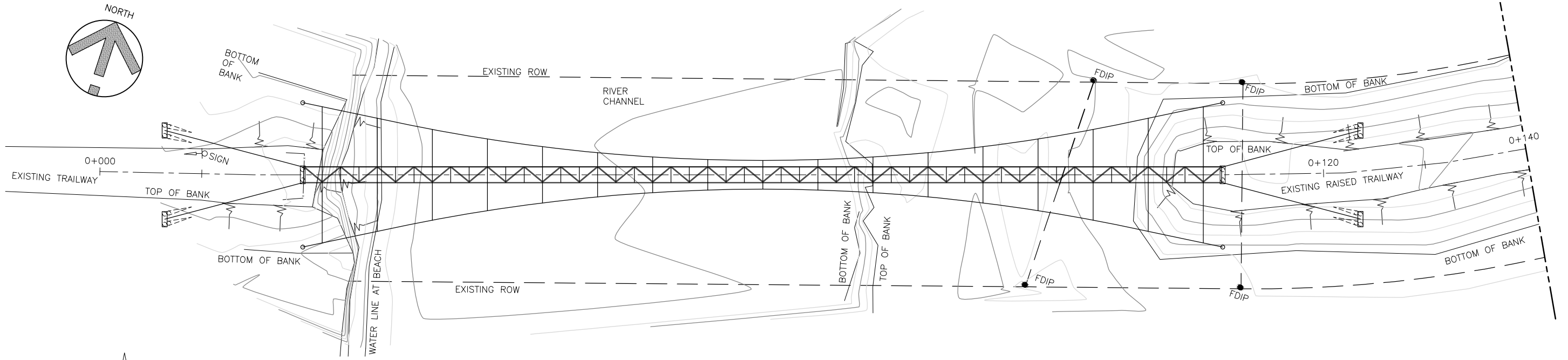
DRAFTED PHU	SCALE AS SHOWN	PROJECT No. 0837-029	HEL DRAWING No. SK2B	REVISION C
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DESTROY ALL DRAWINGS SHOWING PREVIOUS REVISION

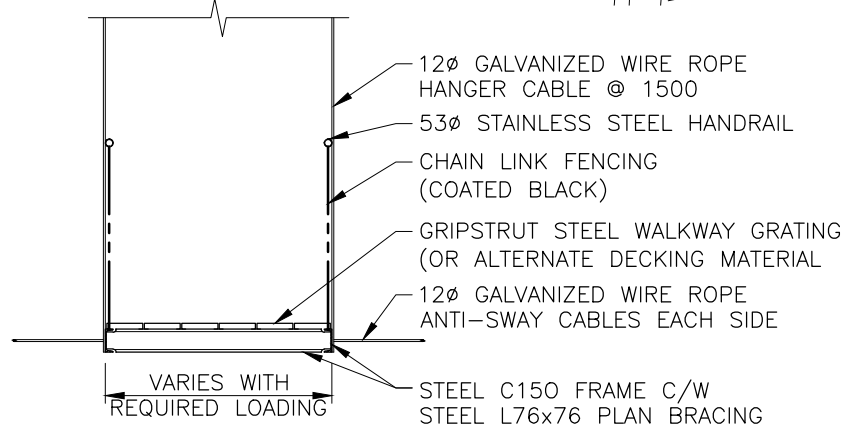
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ARCHED SUSPENSION DESIGN
ELEVATION – WEST CHANNEL BRIDGE
 1:400



PLAN – WEST CHANNEL BRIDGE
 1:400



FEASIBILITY STUDY
 NOT FOR CONSTRUCTION

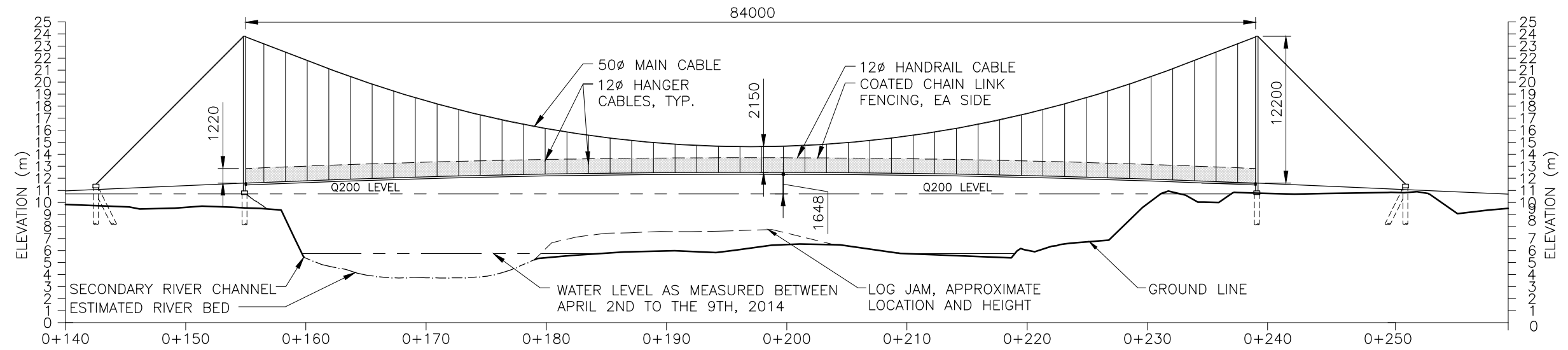
ISSUES		
No.	DATE	ISSUED FOR
A	2014.06.13	FEASIBILITY STUDY
B	2014.08.22	REVISED
C	2014.09.12	REVISED

HEROLD ENGINEERING
 3701 Shenton Rd, Nanaimo, BC V9T 2H1
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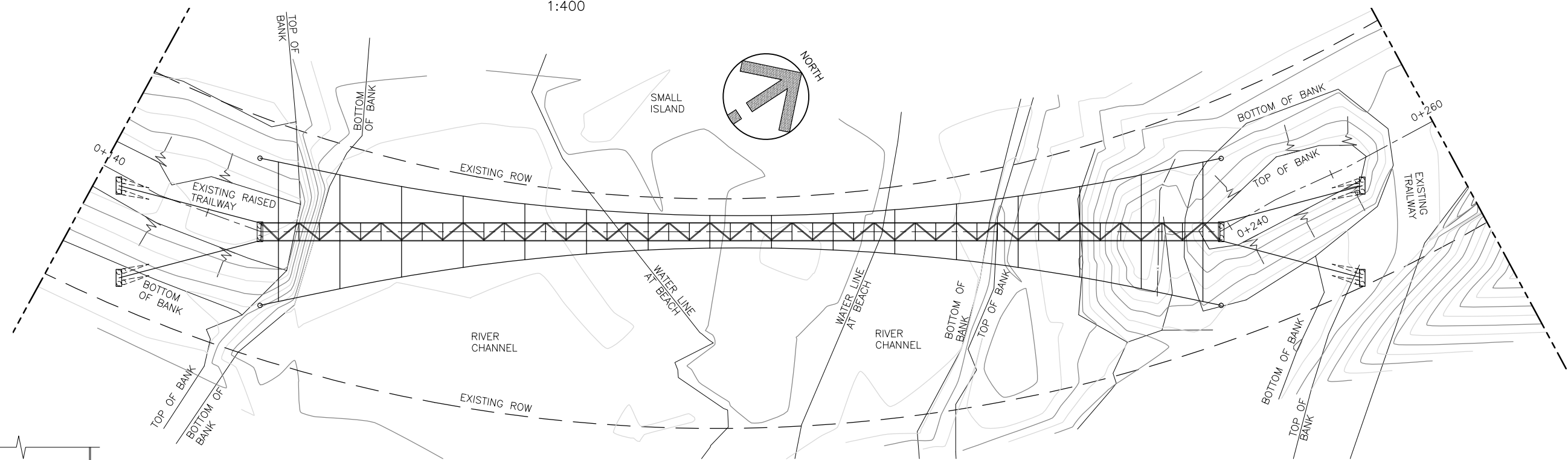
MORDEN COLLIERY TRAIL AND BRIDGES
 CONCEPT OPTION 2
ARCHED SUSPENSION BRIDGE 1 90m SPAN
 PROJECT No. 0837-029
 HEL DRAWING No. **SK3B**
 REVISION C

DESTROY ALL DRAWINGS SHOWING PREVIOUS REVISION

File: H:\Projects\0837-029 Morden Colliery Trail And Bridges\045 Drawings\Active\Preliminary\0837-029 BRIDGE 2.dwg Plot Time: Sep. 12. 14 9:52 AM User: Peter Ungby
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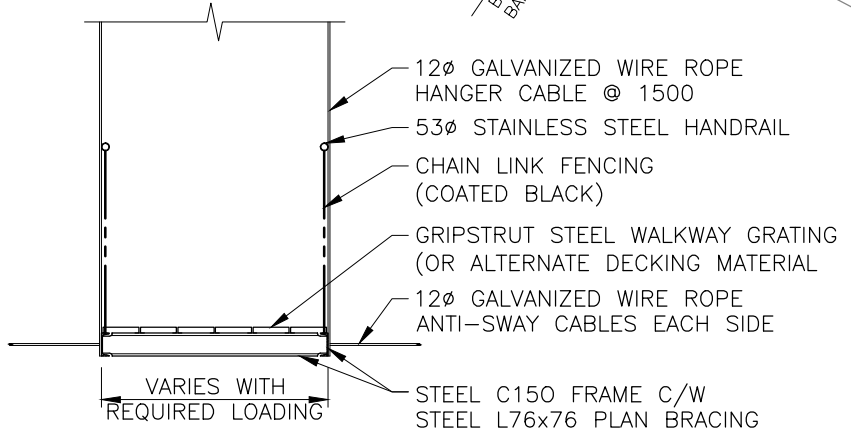


ARCHED SUSPENSION DESIGN
ELEVATION – EAST CHANNEL BRIDGE
 1:400



PLAN – EAST CHANNEL BRIDGE

1:400



TYPICAL SECTION

1:50

FEASIBILITY STUDY

NOT FOR CONSTRUCTION

ISSUES		
No.	DATE	ISSUED FOR
A	2014.06.13	FEASIBILITY STUDY
B	2014.08.22	REVISED
C	2014.09.12	REVISED

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MORDEN COLLIERY TRAIL AND BRIDGES
 CONCEPT OPTION 2
 BRIDGE 2 84m SPAN

DRAFTED PHU	SCALE AS SHOWN	PROJECT No. 0837-029	HEL DRAWING No. SK4B	REVISION C
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