

**VIA ELECTRONIC SUBMISSION**

October 31, 2023

Canada Energy Regulator  
Suite 210, 517 Tenth Avenue S.W.  
Calgary, Alberta T2R 0A8

To: Ms. Ramona Sladic, Secretary of the Commission

Dear Ms. Sladic:

**Re: Trans Mountain Pipeline ULC (Trans Mountain)  
Trans Mountain Expansion Project (Project or TMEP)  
Certificate OC-065  
Request for Variance – Pipe Diameter, Coating and Wall Thickness  
Mountain 3 Horizontal Directional Drill  
CER File: OF-Fac-Oil-T260-2013-03 61**

Trans Mountain is filing this application pursuant to section 69(1) of the *Canadian Energy Regulator Act* (CER Act) requesting a variance to Schedule A of Certificate of Public Convenience and Necessity (Certificate) OC-065 with respect to the diameter, wall thickness and coating of pipe in an approximately 2300 m segment in the Black Pines to Burnaby Tank Terminal segment of TMEP from approximately KP 1064.4-1066.7 (Variance). The details of the requested Variance are described below and are shown in Attachment 1, a black-lined version of Schedule A, detailing the requested changes to Schedule A of Certificate OC-065.

Trans Mountain respectfully requests that the Commission of the Canada Energy Regulator (Commission) issue an order pursuant to section 69(1) of the CER Act granting:

1. the Variance, conditional on Trans Mountain providing confirmation to the Commission on or before November 22, 2023 that it intends to proceed with the change in pipe diameter, wall thickness and coating pursuant to section 67(1) of the CER Act; and
2. such further and other relief as Trans Mountain may request, or that the Commission may consider appropriate, pursuant to section 68 of the CER Act.

**Background**

Starting at approximately KP 1064.4, Trans Mountain's Mountain 3 crossing is an approximately 2300 m horizontal directional drill (HDD) in the Fraser Valley between Hope and Chilliwack, BC. This route was approved by the Commission under Order AO-012-OPL-004-2020 issued in March 2022 [[C18157](#)]. Drilling preparation began in May 2022.

The HDD is located wholly within very hard igneous and metamorphic rock, with unconsolidated surficial material at the HDD entry and exit points. Drilling of the HDD pilot hole began June 7, 2022, and 42" reaming is now complete. The current HDD execution plan requires continuation of reaming to the 48" diameter to accommodate pullback of the NPS 36 pipeline.

Construction of the HDD has been very challenging due to the hardness of rock and the complexity of a 2300 m HDD. Construction has been ongoing for approximately 18 months. Progress of the 48" reaming operation is unpredictable, with the risk of tool loss and additional delay, and Mountain 3 is currently on the Project's critical path.

To reduce the risk of delays in the completion of the HDD and overall Project, Trans Mountain developed a contingency option that would, if implemented, involve the installation of NPS 30 pipe within the 42" ream. This would avoid the need to complete the 48" ream pass that is required to accommodate pullback of the NPS 36 pipeline. Implementing the contingency option with the installation of the NPS 30 pipeline can be completed in a time frame that is shorter than the time it will take to complete the 48" ream and install a 36" pipeline, as described in further detail below.

### **NPS 30 Contingency Option**

The 42" reaming operation is now complete. In the event Mountain 3 remains on the Project's critical path and risks delaying the overall Project in-service date, Trans Mountain's contingency option is to install NPS 30 diameter pipe in the Mountain 3 HDD segment, following receipt of all required approvals.

Trans Mountain anticipates the schedule for installation of the NPS 30 pipeline will be shorter than the time required to ream to 48" and install the NPS 36 pipe in the HDD crossing by up to approximately 55-60 days.

Engineering Alignment Sheets that illustrate and provide detail on the NPS 30 installation are provided in Attachment 2. The NPS 30 pipe will be ARO-coated, 15.9 mm wall thickness for the entire length of the crossing, and induction bends will be 19 mm wall thickness. This configuration, determined using a design factor of 0.8 and class location of 1, maintains the current design factor of safety for the Mountain 3 HDD crossing.

A plan and profile of the NPS 30 HDD is provided as Attachment 3. A plan and profile of the NPS 30 HDD pullback is provided as Attachment 4.

The NPS 30 segment of pipeline will maintain the previously designated MAOP of 9,930 kPa. Trans Mountain's Hydraulic Engineering team conducted a simulation of the system using the NPS 30 pipe for this 2300 m segment. The assessment concluded that while the NPS 30 segment results in some additional head loss, there is no overall impact to throughput at the design flow rate under either summer or winter conditions. This is illustrated in the summer and winter hydraulic simulations provided as Attachment 5 and summarized in Table 1 below.

<b>Table 1: Line-2 Throughput Impact Summary (Mountain 3 HDD)</b>		
<b>Mountain 3 Pipe Section</b>	<b>Throughput Comparison</b>	
	<b>Winter Design Condition</b>	<b>Summer Design Condition</b>
	[bbl/day]	[bbl/day]
<b>NPS36 (Design)</b>	568,400	568,400
<b>NPS30 (Contingency)</b>	568,400	568,400
<b>Comparison</b>	NO IMPACT	NO IMPACT

All welding procedures required for the NPS 30 installation are currently on file with the Commission [\[C00700-9\]](#).

Given that this segment remains an HDD with the same profile, no change to factor of safety or MAOP, and with no change in associated third party risk, Trans Mountain has determined that there is no material change to the pipeline risk assessment.

If Trans Mountain proceeds with the contingency option, it will install concentric reducers to transition from NPS 36 to NPS 30, and then to transition from NPS 30 to NPS 36 on either end of the NPS 30 HDD segment. The transitions will be entirely below ground and within the existing easement. Dual-diameter tools and pigs will be required to accommodate the change in pipe size and allow Trans Mountain to conduct the ILI caliper tool runs required for compliance with Condition 143 a) i): Baseline Inspections within six months of commencing operations. In the future, pig traps will be installed on either end of the Mountain 3 NPS 30 HDD segment to support future tool runs.

Concurrent with the filing of this Variance application, Trans Mountain will notify the Indigenous groups listed in Table 2 below of the application and invite questions or comments by November 13, 2023. Trans Mountain will advise the Commission of any concerns regarding this application that are not addressed through usual engagement channels. Trans Mountain believes this approach is appropriate as the Variance is strictly technical in nature and relates only to a change in the pipe size, wall thickness and coating of the pipe to be installed. It does not involve any change to factors that could affect Indigenous rights or title.

**Table 2: Indigenous Groups to be Notified of the Application for Variance**

British Columbia Métis Federation	Penelakut Tribe
Chawathil First Nation	Peters First Nation
Cheam First Nation	Popkum First Nation
Cowichan Tribes	Seabird Island Band
Halalt First Nation	Shxw'ow'hamel First Nation
Kwaw-kwaw-Apilt First Nation	Skawahlook First Nation
Ts'uubaa-asatx First Nation (formerly Lake Cowichan First Nation)	Skwah First Nation
Lyackson First Nation	Stz'uminus First Nation (Chemainus)
Métis Nation British Columbia	Union Bar First Nation
	S'olh Temexw Stewardship Alliance

### **Timing of Decision to Proceed with the Contingency Option**

Trans Mountain confirms that the 42" reaming pass is now complete. In the coming weeks, Trans Mountain will evaluate whether to implement the contingency option and install NPS 30 pipe or continue with the steps required to install the NPS 36 pipe. The decision will be based on the progress on other scopes of work on the Project. Trans Mountain will advise the Commission of its decision on whether to proceed with the contingency option on or before November 22, 2023.

### **Relief Sought**

For these reasons, Trans Mountain respectfully requests the Commission issue an Order pursuant to section 69(1) of the CER Act amending Schedule A of Certificate OC-065 as described above, conditional on Trans Mountain providing confirmation to the Commission on or before November 22, 2023 that it intends to proceed with the contingency option, pursuant to section 67(1) of the CER Act. Other than the Variance described above, there are no other changes to the engineering design details for this 2300 m segment of the Project.

Trans Mountain respectfully requests an expedited decision on this application for Variance by November 30, 2023 to advance the timely completion of the Mountain 3 HDD and the overall TMEP.

Should you have any questions or wish to discuss this matter further, please contact the undersigned at [regulatory@transmountain.com](mailto:regulatory@transmountain.com) or (403) 514-6400.

Yours truly,

*Original signed by*

Dorothy Golosinski  
Vice President, Regulatory  
Trans Mountain Canada Inc.

Enclosures:

- Attachment 1: Certificate OC-065 - Schedule A (Amended)
- Attachment 2: Mountain 3 HDD Engineering Alignment Sheets
- Attachment 3: Mountain 3 HDD Plan and Profile
- Attachment 4: Mountain 3 HDD Pullback Plan and Profile
- Attachment 5: Mountain 3 HDD Summer and Winter Hydraulic Simulations

**Attachment 1**

**Certificate OC-065 - Schedule A (Amended)**

**SCHEDULE A**  
**National Energy Board Certificate OC-065**

Line 2 pipeline specifications

<b>Location</b>	Edmonton, AB to Hinton, AB	Hinton, AB to Hargreaves, B.C.	Hargreaves, B.C. to Blue River, B.C.	Blue River, B.C. to Darfield, B.C.	Darfield, B.C. to Black Pines, B.C.	Black Pines, B.C. to Burnaby Tank Terminal, B.C.
<b>Project Type</b>	New construction	Transfer existing segment	New construction	New construction	Transfer existing segment	New construction
<b>Approximate Length (km)</b>	339	150	121	158	43	368
<b>Wall Thickness (mm)</b>	11.8	11.8	13.8	11.8	11.13	11.8
						<u>Mountain 3 HDD</u> <u>KP~1064.4 to ~1066.7</u> <u>15.8 mm and 19.0 mm</u>
<b>Outside Diameter</b>	914 mm (NPS 36)	914 mm (NPS 36)	1067 mm (NPS 42)	914 mm (NPS 36)	762 mm (NPS 30)	914 mm (NPS 36)
						<u>Mountain 3 HDD</u> <u>KP~1064.4 to ~1066.7</u> <u>762 mm (NPS 30)</u>
<b>Pipe Grade</b>	483 MPa	483 MPa (X70)	483 MPa	483 MPa	359 MPa (X52)	483 MPa
<b>Pipe Material Standard</b>	CSA Z245.1 Category II	API 5L	CSA Z245.1 Category II	CSA Z245.1 Category II	API 5L	CSA Z245.1 Category II
<b>External Coating</b>	Fusion bond epoxy (FBE)	FBE	FBE	FBE	Coal tar enamel	FBE <u>Mountain 3 HDD</u> <u>KP~1064.4 to ~1066.7</u> <u>ARO</u>
<b>Product</b>	Low vapour pressure crude oil					
<b>Maximum Operating Pressure (kPa)</b>	6 000 to 10 000 <sup>(i)</sup>	9 930 and 10 875	6 000 to 10 000 <sup>(i)</sup>	6 000 to 10 000 <sup>(i)</sup>	3 660 to 8 233 <sup>(i)</sup>	6 000 to 10 000 <sup>(i)</sup>

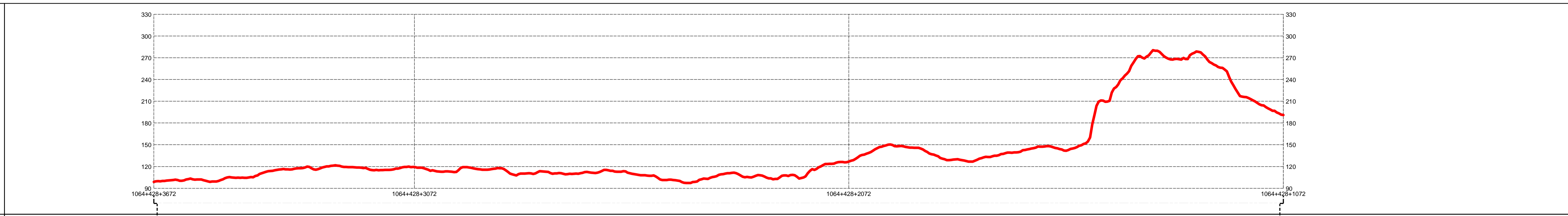
**Attachment 2**

**Mountain 3 HDD  
Engineering Alignment Sheets**





PIPELINE DATA	
OPERATING / TEST PRESSURES / LICENCE PERMITS	
MAX. OPERATING PRESSURE: VARYING, POINT SPECIFIC (NOTE 12)	
DESIGN PRESSURE: 9,930 kPa	
MIN. TEST PRESSURE: VARYING, POINT SPECIFIC (NOTE 12)	
PRODUCT CARRIED: LVP HYDROCARBONS	
OPERATING LICENCE: TBD	
DESIGN CODE: CSA Z662-15	



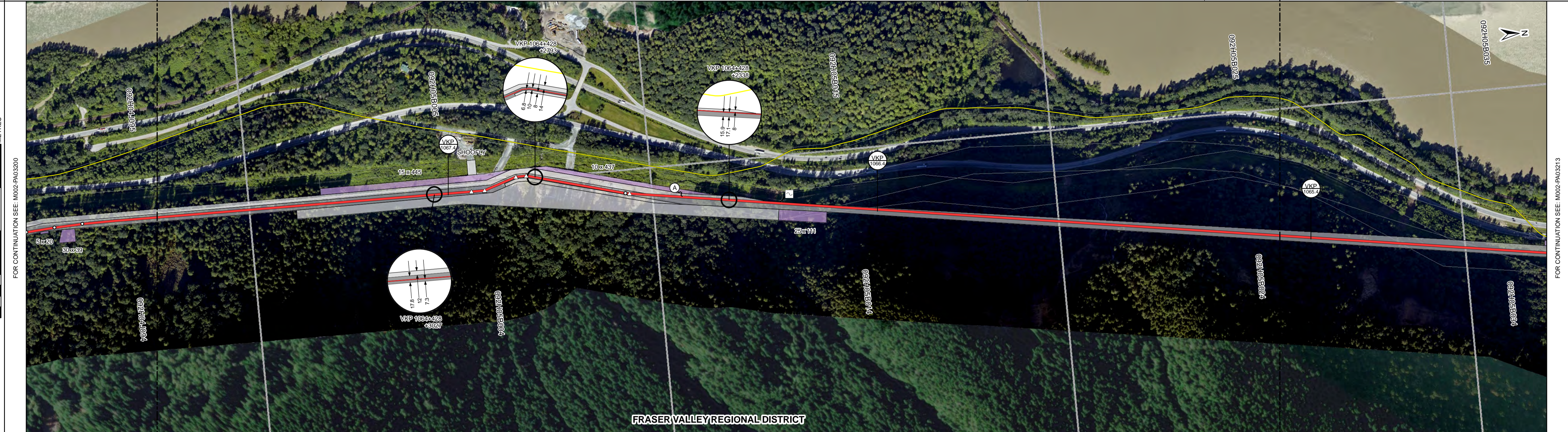
ENVIRONMENTAL	
SOIL HANDLING	TOP SOIL DEPTH (cm)
ENVIRONMENTAL FEATURES	PROCEDURE

REFER TO ENVIRONMENTAL ALIGNMENT SHEETS
REFER TO ENVIRONMENTAL ALIGNMENT SHEETS
SEE ENVIRONMENTAL WORKSHEET 01-13283-M002-PE0150676
SEE ENVIRONMENTAL WORKSHEET 01-13283-M002-PE0150675
SEE ENVIRONMENTAL WORKSHEET 01-13283-M002-PE0150674

TRACT
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PC7072.051	PC7072.06	2136	2135	2132	ADJ149.04
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LEGEND	
	KILOMETRE POST
	FACILITY TIE-IN
	GROUND BED
	MATERIAL BALLOON
	CP TEST STATION
	AC MITIGATION
	RECTIFIER
	FLOW ARROW
	INDUCTION BEND
	BLOCK VALVE
	CHECK VALVE
	TMEP CROSSING BELOW PIPELINE
	TMEP CROSSING BELOW CABLE
	TMEP CROSSING ABOVE PIPELINE
	TMEP CROSSING ABOVE CABLE
	UNKNOWN ROW CROSSING
	WARNING SIGN
	CONCRETE COATED PIPE
	HEAVY WALL PIPE
	AC MITIGATION 2/0 COPPER WIRE
	INFLECTION POINT
	TMEP PIPELINE
	EXISTING TMEP PIPELINE
	EXTRA WORKSPACE
	FACILITIES
	EASEMENT
	TEMPORARY WORKSPACE
	LOG DECK / STORAGE SITE
	RESTRICTED AREA



SURVEY DATA (INFLECTION)	
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1064+28+3672	1064+28+3712	1064+28+3752	1064+28+3792	1064+28+3832	1064+28+3872	1064+28+3912	1064+28+3952	1064+28+3992	1064+28+4032	1064+28+4072
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MIN. COVER (CG)
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1.0m	1.0m	1.0m	1.0m	1.0m	1.0m	1.0m	1.0m	1.0m	1.0m	1.0m
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NOTES	
1. ALL MEASUREMENTS ARE IN METRES UNLESS OTHERWISE SPECIFIED.	
2. ALL CHANGES ARE MEASURED HORIZONTALLY AND ALL ELEVATIONS ARE GEODETIC.	
3. DRAWING SCALE IS CORRECT ONLY WHEN PLOTTED AT FULL (ISO A1) SIZE.	
4. REFER TO ENVIRONMENTAL WORK SHEETS FOR ENVIRONMENTAL DATA.	
5. REFER TO TYPICAL DRAWINGS FOR TEST STATION DETAILS.	
6. REFER TO DRAWING INDEX FOR TITLES AND NUMBERS OF TYPICAL AND SITE SPECIFIC DRAWINGS.	
7. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND RECORD BURIED UTILITIES INCLUDING COVER / DIAMETER / MATERIAL.	
8. LOCATION AND TYPE OF BUOYANCY CONTROL DERIVED FROM DESKTOP STUDIES. EXACT LOCATION AND BUOYANCY CONTROL REQUIREMENT SHALL BE ASSESSED AND CONFIRMED DURING CONSTRUCTION BY THE GEOTECHNICAL ENGINEER. REFER TO 01-13283-SG-M002-PL-RPT0004 FOR BUOYANCY CONTROL DESIGN BASIS.	
9. REFER TO 01-13283-M002-PM02018 FOR GENERAL AND STRESS MITIGATION NOTES.	
10. CLOUDED AREAS INDICATE PIPELINE SECTIONS INSTALLED PRIOR TO DRAWING REVISION AND HAVE NOT BEEN UPDATED TO REFLECT AS-BUILT.	
11. MATERIAL QUANTITIES SHOWN ARE AS DESIGNED, AND MAY DIFFER FROM WHAT WAS INSTALLED.	
12. AS PER 01-13283-SG-M002-PL-DCN-0005, THE PIPELINE WILL BE TESTED AND OPERATED BASED ON POINT-SPECIFIC MAXIMUM OPERATING PRESSURE (BASED ON THE APPROVED FINAL HYDROSTATIC TEST). MINIMUM TEST PRESSURE WILL BE BASED ON ELEVATION PROFILES BETWEEN PUMP STATIONS.	

1064+28+3672	1064+28+3712	1064+28+3752	1064+28+3792	1064+28+3832	1064+28+3872	1064+28+3912	1064+28+3952	1064+28+3992	1064+28+4032	1064+28+4072
1064+28+3672	1064+28+3712	1064+28+3752	1064+28+3792	1064+28+3832	1064+28+3872	1064+28+3912	1064+28+3952	1064+28+3992	1064+28+4032	1064+28+4072

REFERENCE DRAWINGS (SEE NOTE 6)

LIST OF ABBREVIATIONS	
ARO	ABRASION RESISTANT OVERCOAT
FBE	FUSION BONDED EPOXY
LE	LIQUID EPOXY
CCC	CONTINUOUS CONCRETE COATING
CE	CONSTANT ELEVATION
DOC (CG)	DEPTH OF COVER (CONSTRUCTION GRADE)
DOC (FG)	DEPTH OF COVER (FINAL GRADE)

MISC. MATERIALS	
DESCRIPTION	QTY.
TEST LEAD TYPE A (EA)	1
WARNING SIGN (EA)	20

LIST OF MATERIALS					
ITEM	DESCRIPTION	SPECIFICATION	COATING	QTY.	NO.
5	NPS 36 x 14.7mm W.T., GR. 483	CSA Z245.1 CAT. II (M5C)	FBE	286	1
7	NPS 36 x 19.0mm W.T., GR. 483	CSA Z245.1 CAT. II (M5C)	FBE	30	2
8	NPS 36 x 19.0mm W.T., GR. 483	CSA Z245.1 CAT. II (M5C)	ARO	724	3
22	NPS 36 x 14.7mm W.T., INDUCTION BEND	ASME B16.49	LE	3 (EA)	
26	NPS 36 x 19.0mm W.T., INDUCTION BEND	ASME B16.49	LE	1 (EA)	
29	NPS 30 x 15.9mm W.T., INDUCTION BEND	ASME B16.49	LE	1 (EA)	
61	NPS 30 x 15.9mm W.T., GR. 483	CSA Z245.1 CAT. II (M5C)	FBE	22	
62	NPS 30 x 15.9mm W.T., GR. 483	CSA Z245.1 CAT. II (M5C)	ARO	1,516	
65	NPS 36 19.0mm W.T. X NPS 30 15.9mm W.T., GR.483, CONCENTRIC REDUCER	CSA Z245.11 CAT II M5C	LE	1	

REFERENCE DRAWINGS	
TITLE	DRAWING NO.
EXPLORATION BOREHOLE MOUNTAIN CROSSING 3	M002-XD0027101
MTN #3 HDD TO BOULDER FIELD HDD TIE-IN	M002-PM0061301
BOULDER FIELD HDD	M002-XD0027601

CLIENT ACCEPTANCE							
NO.	DESCRIPTION	DATE	ACC				
			66				
REVISIONS							
NO.	DESCRIPTION	DATE	DRN	CKD	ENG	APP	CLI
0	ISSUED FOR INFORMATION, AFE 01-13283	2023/10/11	BVD	DCL	AM	GF	

## TRANS MOUNTAIN PIPELINE

TRANS MOUNTAIN EXPANSION PROJECT

### CONTINGENCY ALIGNMENT SHEET (SPREAD 5B)

VKP 1064+428+1072 TO VKP 1064+428+3672  
092H04J & 092H05B  
**NOT FOR CONSTRUCTION**

ROUTE	PROJECT NUMBER	DRAWING NUMBER	SHT NO.	REV.
005.24.19	01-13283	M002-PA03214	01	0

PERMIT TO PRACTICE  
UPI PROJECTS CANADA LTD.  
PERMIT NUMBER: 1001209  
The Association of Professional Engineers and  
Geoscientists of the Province of British Columbia

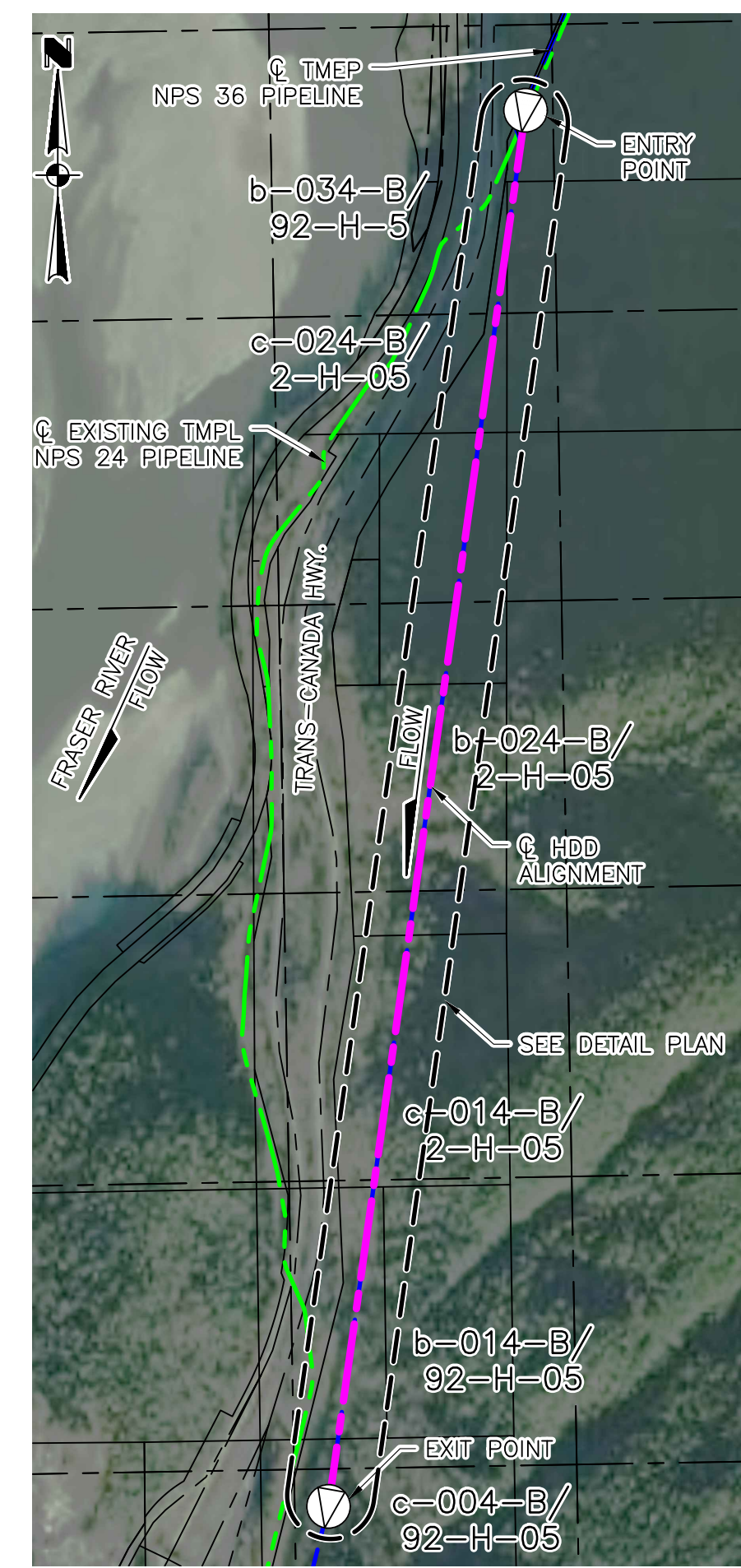
UniversalPegasus  
INTERNATIONAL

UPI DRAWING NUMBER: 19731-510-ALS-03214

FOR CONTINUATION SEE: M002-PA03213

**Attachment 3**

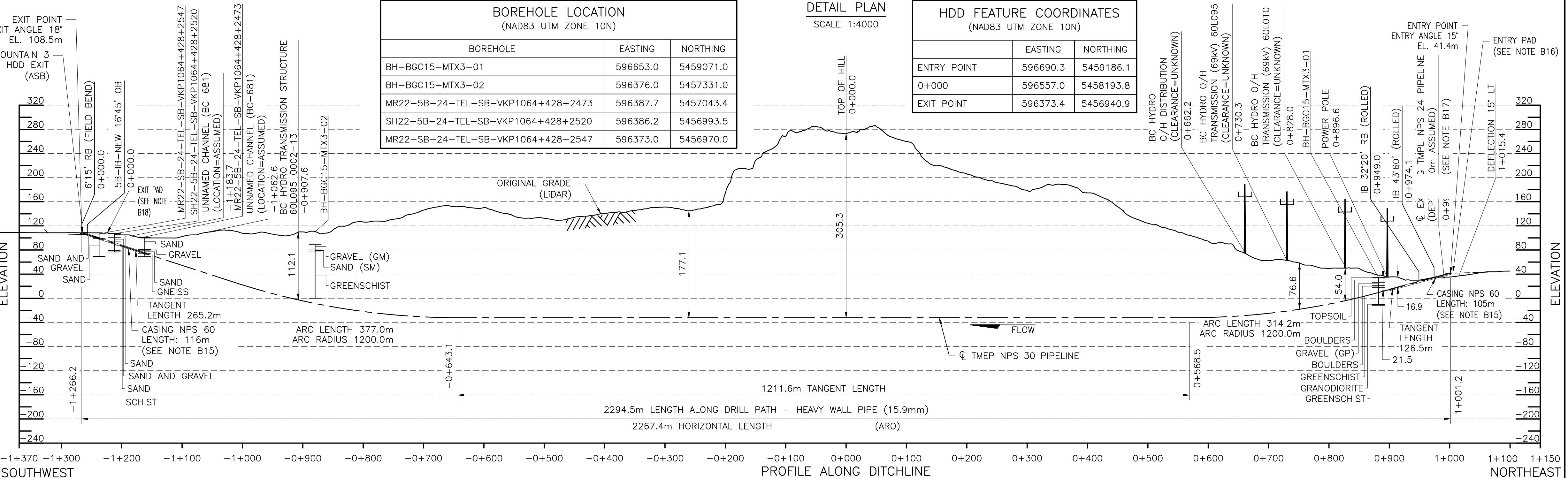
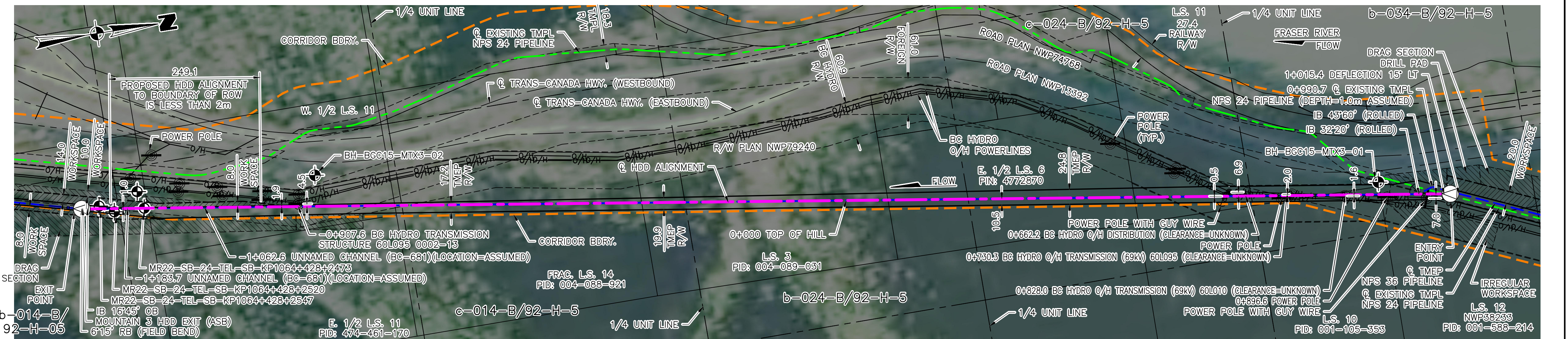
**Mountain 3  
HDD Plan and Profile**



**LOCATION PLAN**  
SCALE 1:10000  
b-034-B/92-H-5  
REGIONAL DISTRICT OF FRASER VALLEY  
NAD83 UTM ZONE 10N  
APPROX. TMEP KP 1065.7

**LEGEND**

- HDD ALIGNMENT
- EXISTING TML NPS 24 PIPELINE
- TMEP NPS 36 PIPELINE
- CORRIDOR BOUNDARY
- BOREHOLE
- ⊙ POWER POLE



**BOREHOLE LOCATION**  
(NAD83 UTM ZONE 10N)

BOREHOLE	EASTING	NORTHING
BH-BGC15-MTX3-01	596653.0	5459071.0
BH-BGC15-MTX3-02	596376.0	5457331.0
MR22-SB-24-TEL-SB-VKP1064+428+2473	596387.7	5457043.4
SH22-SB-24-TEL-SB-VKP1064+428+2520	596386.2	5456993.5
MR22-SB-24-TEL-SB-VKP1064+428+2547	596373.0	5456970.0

**HDD FEATURE COORDINATES**  
(NAD83 UTM ZONE 10N)

	EASTING	NORTHING
ENTRY POINT	596690.3	5459186.1
0+000	596557.0	5458193.8
EXIT POINT	596373.4	5456940.9

**GENERAL NOTES**

- A1. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE SHOWN. ALL ELEVATIONS ARE GEODETIC. ALL CHAINAGES ARE HORIZONTAL.
- A2. DRAWING SCALES ARE ONLY CORRECT WHEN PLOTTED AT FULL SIZE (A1).
- A3. ALL WORK IN CLOSE PROXIMITY TO POWER LINES MAY BE SUBJECT TO ELECTROSTATIC AND ELECTROMAGNETIC INDUCED VOLTAGES. CONTRACTOR SHALL BE RESPONSIBLE FOR MONITORING AND IMPLEMENTING MITIGATION PROCEDURES. CONTRACTOR SHALL IMPLEMENT THESE PRECAUTIONS AS WELL AS THOSE SPECIFIED BY TRANS MOUNTAIN REPRESENTATIVE.
- A4. THE CONTRACTOR SHALL ENSURE ALL UTILITIES ARE PROTECTED AND MAINTAINED THROUGH THE CONSTRUCTION PROCESS.
- A5. THE CONTRACTOR SHALL ENSURE THAT COPIES OF THE CROSSING AGREEMENTS ARE KEPT ON SITE FOR THE FULL DURATION OF THE CONSTRUCTION ACTIVITIES. CONTRACTOR SHALL ADHERE TO ALL REQUIREMENTS OF THE CROSSING AGREEMENTS.
- A6. SURVEYED BASE PLAN IS EXTRACTED FROM SURVEY DRAWING 38290-BASE-92H5B-R18, DATED MARCH 16, 2022, PROVIDED BY WSP SURVEYS (BC) LTD. PARTNERSHIP. THE GROUND PROFILE IS GENERATED FROM LIDAR DATA. THE LIDAR AND THE IMAGERY WERE SUPPLIED BY AERQUEST MAPCON, DATED 2019.
- A7. CONSTRUCTION SHALL BE COMPLETED IN ACCORDANCE WITH CSA Z662 (CURRENT VERSION), AND THE MOST RECENT VERSIONS OF ALL PROVINCIAL AND FEDERAL REGULATIONS, ENVIRONMENTAL PROTECTION PLAN (EPP), CONTRACT DOCUMENTS, AND THE AUTHORITIES HAVING JURISDICTION.
- A8. THE CONTRACTOR SHALL SUPPLY AND ADHERE TO THE CONTRACTOR SUPPLIED AND APPROVED DRILLING EXECUTION PLAN. THIS PLAN IS TO ALSO INCLUDE HOW THE DIFFERENCE IN ELEVATION BETWEEN ENTRY AND EXIT WILL BE HANDLED ALONG WITH THE WATER TABLE IN SAND LAYER ON THE EXIT SIDE.
- A9. AS PER 01-13283-SG-M002-PL-DCN-0005, THE PIPELINE WILL BE TESTED AND OPERATED BASED ON POINT-SPECIFIC MAXIMUM OPERATING PRESSURE (BASED ON THE APPROVED FINAL HYDROSTATIC TEST). MINIMUM TEST PRESSURE WILL BE BASED ON ELEVATION PROFILES BETWEEN PUMP STATIONS.

**CONSTRUCTION NOTES**

- B1. CONSTRUCTION METHOD FOR THIS CROSSING IS THE HORIZONTAL DIRECTIONAL DRILL METHOD (HDD). FOR HDD CONSTRUCTION SPECIFICATIONS REFER TO THE CONTRACT DOCUMENTS.
- B2. THE CONTRACTOR SHALL VERIFY ALL TOPOGRAPHICAL SURVEY INFORMATION AND CONFIRM THE DEPTH AND LOCATION OF ALL BURIED FACILITIES IN THE FIELD PRIOR TO CONSTRUCTION.
- B3. THE CONTRACTOR SHALL SUPPLY A DRILL RIG WITH A MINIMUM OF 1,000,000 LBF (4,448 kN) PUSH/PULL WITH APPROPRIATE ASSOCIATED EQUIPMENT AS OUTLINED IN THE SPECIFICATIONS. THE THEORETICAL PULL FORCE FOR THIS CROSSING IS 890,000 LBF (3,959 kN) WITHOUT BUOYANCY CONTROL AND 450,000 LBF (2,002 kN) WITH 100% BUOYANCY CONTROL.
- B4. THE CONTRACTOR SHALL SUPPLY AN ELECTRONIC DRILLING RECORDER (EDR) TO MONITOR AT A MINIMUM, TANK/PIT VOLUME, FLOW (PUMP AND RETURN), PRESSURE (ANNULAR/STANDPIPE), RATE OF PENETRATION, PUSH/PULL FORCE, ROTARY TORQUE, AND ROTATIONAL SPEED, PROVIDE THIS ELECTRONIC INFORMATION TO TRANS MOUNTAIN REPRESENTATIVE AND ALSO SUBMIT AS A PART OF THE AS-BUILT RECORDS REQUIRED AT THE END OF THE PROJECT.
- B5. THE CONTRACTOR SHALL SUPPLY AND USE AN APPROVED ANNULAR PRESSURE TOOL WITH THE CONTRACTOR SUPPLIED ANNULAR PRESSURE MODEL.
- B6. ALL EQUIPMENT SHALL BE SUPPLIED IN GOOD WORKING ORDER MAINTAINED AND SERVICED. ANY EQUIPMENT NOT OPERATIONAL OR FULFILLING THE REQUIREMENTS OUTLINED IN THE CONTRACT DOCUMENTS SHALL BE REPAIRED OR REPLACED.

**CONSTRUCTION NOTES (CONT'D)**

- B7. THE CONTRACTOR SHALL SUPPLY A CASING PLAN WHICH INCLUDE SIZE OF CASING, INSTALLATION METHOD, CLEANOUT PROCEDURE, REMOVAL PROCEDURE, AND A DESCRIPTION OF THE CENTRALIZING CASING TO BE USED.
- B8. THE PILOT HOLE SHALL BE INSTALLED AS CLOSE AS PRACTICAL TO THE PROPOSED DESIGN DRILL PATH WITH THE DESIGN INFORMATION SHOWN ON THE DRAWING. HORIZONTAL DEVIATION GREATER THAN -3.7 m OR +0.3 m (SEE FROM ENTRY) SHALL BE APPROVED BY TRANS MOUNTAIN REPRESENTATIVE PRIOR TO COMPLETION OF DRILL. DRILL PATH VERTICAL DEVIATION SHALL BE WITHIN ±2.0 m OF THE DESIGN DRILL PATH. UNDER NO CIRCUMSTANCES SHALL THE PIPELINE BE INSTALLED OUTSIDE THE LEGAL PIPELINE EASEMENT.
- B9. MINIMUM DEPTH OF COVER TO BE THE GREATER OF THIS DRAWING OR AS SPECIFIED IN CROSSING AGREEMENTS.
- B10. THE DESIGN RADIUS FOR THE CROSSING IS 1200 m. THE PILOT HOLE SHALL ADHERE TO THE FOLLOWING TOLERANCES:
  - THE SINGLE JOINT RADIUS SHALL NOT BE LESS THAN 550 m.
  - THE THREE JOINTS RADIUS SHALL NOT BE LESS THAN 750 m.
- B11. THE DRAG SECTION WILL BE LIKELY PLACED ON ENTRY SIDE.
- B12. ENSURE THAT THE PRODUCT PIPE SHALL BE ADEQUATELY SUPPORTED AT ALL TIMES DURING THE PIPE PULL BACK SO AS TO PREVENT OVERSTRESSING THE PIPE AND TO PROTECT THE PIPE COATING.
- B13. THE COMPOSITION OF THE DRILLING FLUID USED SHALL BE LIMITED TO BENTONITE, FRESH WATER AND IF REQUIRED, TRANS MOUNTAIN REPRESENTATIVE APPROVED NON-TOXIC ADDITIVES. DURING DRILLING OR PIPE PULL OPERATIONS, NO SUBSTANCE SHALL BE ADDED TO THE DRILLING FLUID WITHOUT THE WRITTEN AUTHORIZATION OF THE TRANS MOUNTAIN REPRESENTATIVE.
- B14. TRENCHLESS PIPELINE CONSTRUCTION MAY CAUSE GROUND MOVEMENTS AND SETTLEMENT. THE DESIGN DOES NOT CONSIDER THE EXTENT OF SETTLEMENT AND SETTLEMENT IMPACTS TO INFRASTRUCTURE AND HOUSES WITHIN CLOSE PROXIMITY TO THE CROSSING. THE TRANS MOUNTAIN REPRESENTATIVE WILL DECIDE ON THE REQUIREMENTS FOR PRECONSTRUCTION SURVEY, AND SETTLEMENT MONITORING DURING AND POST CONSTRUCTION, AS WELL AS TAKING MEASURES TO PROTECT THE INFRASTRUCTURE AND HOUSES FROM DAMAGE.

**ENVIRONMENTAL NOTES**

- C1. DISPOSAL OF DRILLING FLUID AND CUTTINGS WILL BE CONDUCTED IN A MANNER THAT ADHERES TO BRITISH COLUMBIA OIL AND GAS HANDBOOK - DRILLING WASTE MANAGEMENT CHAPTER.
- C2. TO MINIMIZE THE POTENTIAL FOR INADVERTENT FLUID RELEASE TO SURFACE, CONTRACTOR SHALL ENSURE THAT MUD PRESSURE IS KEPT TO THE MINIMUM REQUIREMENT FOR CUTTINGS RETURN ANNULAR PRESSURE MODEL.
- C3. SUITABLE EMERGENCY RESPONSE SPILL KITS ARE REQUIRED TO BE MAINTAINED ON SITE AT ALL TIMES.

**GEOTECHNICAL INFORMATION**

- D1. GEOTECHNICAL BOREHOLE DATA ON THE DRAWING IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY. FOR COMPLETE SOIL INFORMATION, THE CONTRACTOR SHALL REFER TO GEOTECHNICAL REPORT FILE NO. 01-13283-SB-M002-PL-RPT-0071 RD, FOR TRANS MOUNTAIN EXPANSION PROJECT - SPREAD SB - MOUNTAIN 3 SOUTH AND BOULDER FIELD CROSSING ENTRY AND EXIT LOCATIONS, DATED JULY 07, 2022. ALL GEOTECHNICAL INFORMATION PROVIDED BY THURBER ENGINEERING LTD. TMC HAS APPROVED TO CARRY OUT THE HDD CONSTRUCTION.

**PROJECT PIPE SPECIFICATIONS**

PRODUCT	LOW VAPOUR PRESSURE (LVP) LIQUID HYDROCARBONS
CLASS LOCATION DESIGNATION	N/A
DESIGN PRESSURE	9,930 kPa
MAXIMUM OPERATING PRESSURE	VARYING POINT-SPECIFIC PRESSURE (SEE NOTE A9)
MINIMUM TEST PRESSURE	VARYING POINT-SPECIFIC PRESSURE (SEE NOTE A9)
MINIMUM OPERATING TEMPERATURE	5 °C
MAXIMUM OPERATING TEMPERATURE	38 °C
PIPELINE DATA	CARRIER PIPE
	HEAVY WALL PIPE
OUTSIDE DIAMETER OF PIPE (mm)	762.0 (NPS 30)
PIPE WALL THICKNESS (mm)	15.9
MINIMUM YIELD STRENGTH (MPa)	483
PIPE MATERIAL	STEEL, CSA Z245.1 (GRADE 483, CAT II)
COATING	FUSION BOND EPOXY (FBE), ABRASION RESISTANT OVERCOAT (ARO)
CATHODIC PROTECTION	IMPRESSED CURRENT

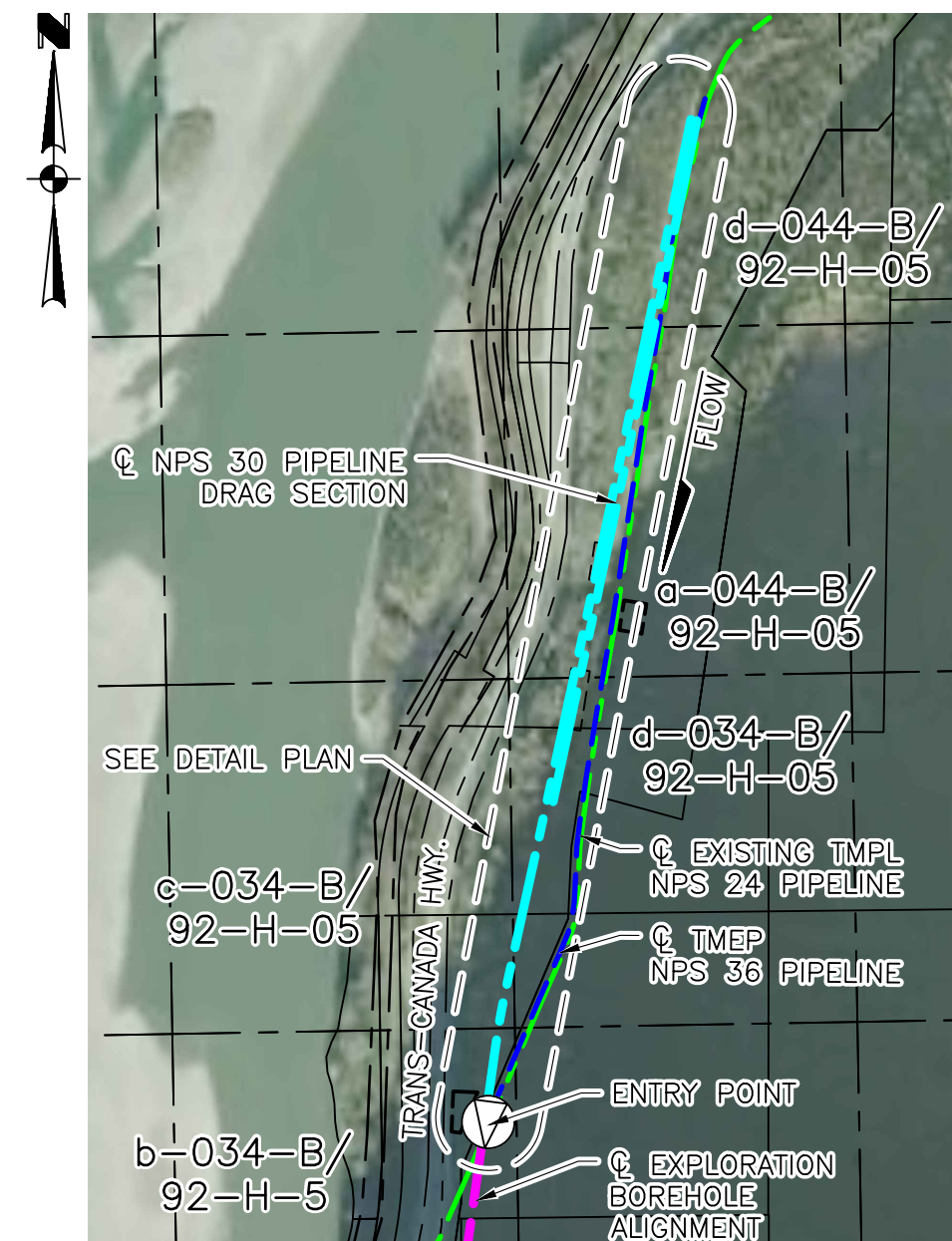
PERMIT TO PRACTICE		CLIENT ACCEPTANCE	
UPI PROJECTS CANADA LTD. PERMIT NUMBER: 1001209 THE ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS OF THE PROVINCE OF BRITISH COLUMBIA		0 23/10/06 ISSUED FOR CONSTRUCTION, AFE 01-13283	
THIS DRAWING IS PREPARED SOLELY FOR THE USE OF TRANS MOUNTAIN PIPELINE ULC. UPI PROJECTS CANADA LTD. ASSUMES NO LIABILITY TO ANY OTHER PARTY FOR ANY REPRESENTATIONS CONTAINED IN THIS DRAWING.		REVISION	
UPI ORG. NO. 19731-505-HDW-00272		NO. DATE	
2 ALIGNMENT SHEET M002-PA0319901		NO. DATE	
1 ALIGNMENT SHEET M002-PA0319801		0 23/10/06 ISSUED FOR CONSTRUCTION, AFE 01-13283	
NO.	REFERENCE DRAWING TITLE	REFERENCE DRAWING NO.	NO. DATE

TRANS MOUNTAIN		SHEET SIZE	
DRAWN BY: BF		A1	
CHECKED BY: RGR		SCALE: AS SHOWN	
APPROVED BY: GF		DATE: 23/09/28	
PROJECT CODING: AFE		DRAWING NUMBER: M002 - XD00272	
FACILITY ID: M002		DOCUMENT NO: 01	
SHT NO: 01		REV: 0	

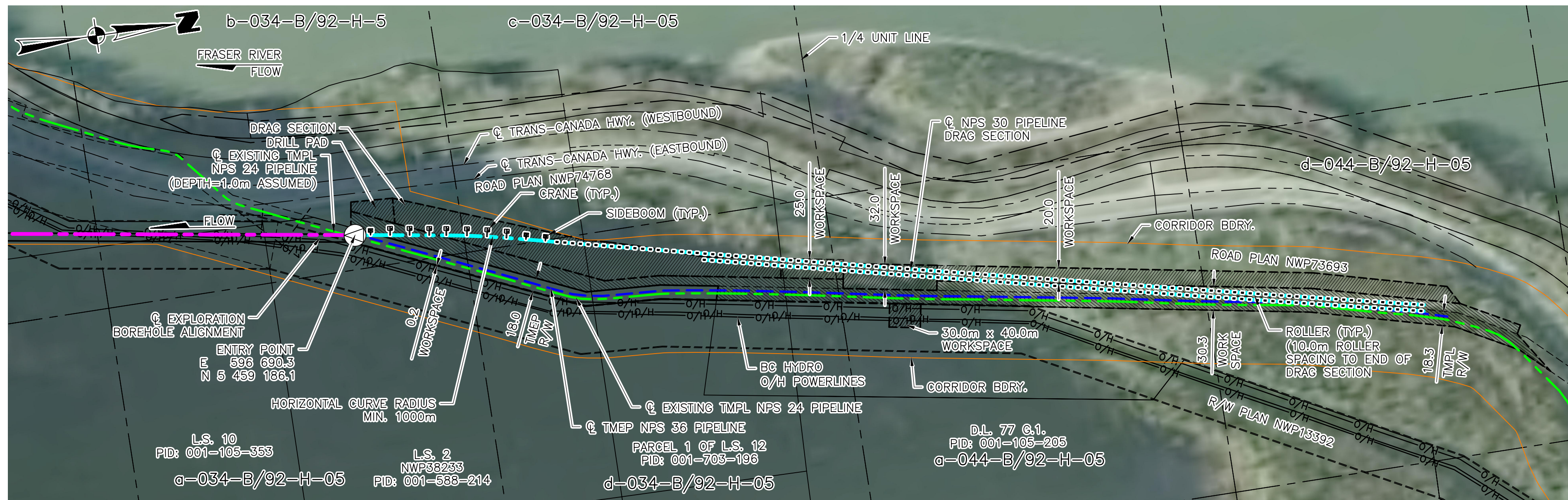
**Attachment 4**

**Mountain 3**

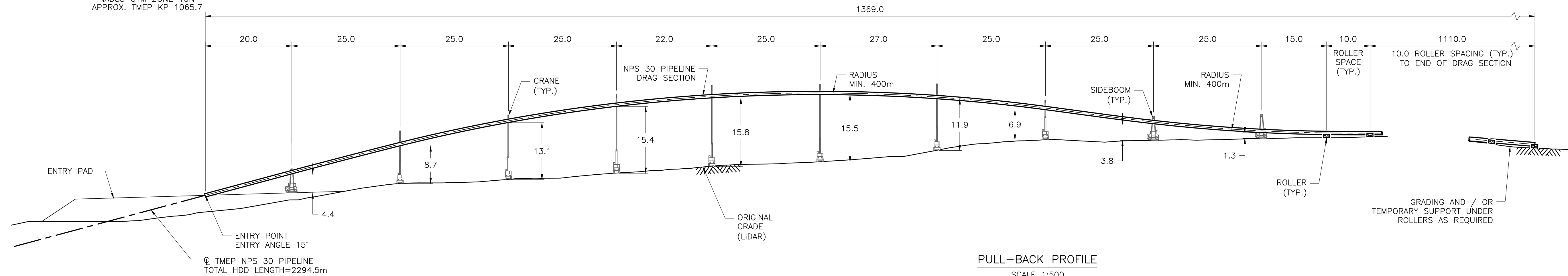
**HDD Pullback Plan and Profile**



**LOCATION PLAN**  
SCALE 1:10000  
b-034-B/92-H-5  
REGIONAL DISTRICT OF FRASER VALLEY  
NAD83 UTM\_ZONE 10N  
APPROX. TMEP KP 1065.7



**DETAIL PLAN**  
SCALE 1:4000



**PULL-BACK PROFILE**  
SCALE 1:500

**GENERAL NOTES**

- A1. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE SHOWN. THE DIMENSIONS SHOWN FOR THE LIFTING HEIGHTS ARE FROM BOTTOM OF PIPE TO GRADE.
- A2. CONSTRUCTION SHALL BE COMPLETED IN ACCORDANCE WITH CSA Z662 (2019 VERSION), AND THE MOST RECENT VERSIONS OF ALL PROVINCIAL AND FEDERAL REGULATIONS, ENVIRONMENTAL PROTECTION PLAN (EPP), CONTRACT DOCUMENTS, AND THE AUTHORITIES HAVING JURISDICTION.
- A3. SURVEYED BASE PLAN IS EXTRACTED FROM SURVEY DRAWING 38290-BASE-92H5B-R14, DATED JULY 29, 2019, PROVIDED BY OPUS STEWART WEIR LTD. (OSW). THE GROUND PROFILE IS GENERATED FROM LIDAR DATA. THE LIDAR AND THE IMAGERY WERE SUPPLIED BY AEROQUEST MAPCON, DATED 2019.
- A4. MAKE-UP SECTION WILL BE PLACED ON THE HDD ENTRY SIDE.
- A5. THIS DRAWING HAS BEEN PREPARED TO ASSIST THE DESIGN AND ALIGNMENT FOR THE CROSSING.
- A6. AS PER 01-13283-SG-M002-PL-DCN-0005, THE PIPELINE WILL BE TESTED AND OPERATED BASED ON POINT-SPECIFIC MAXIMUM OPERATING PRESSURE (BASED ON THE APPROVED FINAL HYDROSTATIC TEST). MINIMUM TEST PRESSURE WILL BE BASED ON ELEVATION PROFILES BETWEEN PUMP STATIONS.

**CONSTRUCTION NOTES**

- B1. MINIMUM ROPING RADIUS, ANTICIPATED LIFTING HEIGHTS AND MAXIMUM SUPPORT SPANS HAVE BEEN SHOWN ON PULL-BACK PLAN AND PROFILE DRAWING AND SERVE AS A GUIDE FOR CONTRACTOR TO CHOOSE MINIMUM TYPE AND SIZE OF EQUIPMENT, AND NOT TO OVERSTRESS THE PULL SECTION DURING PIPE PULL-BACK INSTALLATION PROCESS.
- B2. THE GROUND PROFILE SHOWN ON THE DRAWING MAY NOT MATCH TO ACTUAL FIELD CONDITIONS. CHANGES TO THE PULL-BACK DRAWING DUE TO SITE CONDITIONS (IF ANY) SHALL BE VERIFIED WITH THE ENGINEER.

- B3. CONTRACTOR MAY BE REQUIRED TO BUILD TEMPORARY PIPE SUPPORTS FOR THE PULL-BACK BASED ON SITE CONDITIONS.
- B4. CONTRACTOR SHALL FIELD FIT LIFTING AND SUPPORT EQUIPMENT ON SITE, BASED ON THE GRADE CONDITIONS ENCOUNTERED AS WELL AS MAXIMUM 30 m LIFTING SUPPORT SPACING AND 10 m ROLLER SPACING REQUIREMENTS.
- B5. MAXIMUM LIFTING HEIGHT OF SIDEBOOM UTILIZED IS ASSUMED TO BE 5.8 m (19ft), WHICH IS BASED ON A CAT 583T PIPELAYER WITH A 28 ft BOOM. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CHOOSE SUITABLE EQUIPMENT IN LIGHT OF THE SITE CONDITIONS.
- B6. A 4" HDPE LINE FILLED WITH WATER WITHIN THE ENTIRE LENGTH OF THE PULLBACK SECTION HAS BEEN ASSUMED FOR BUOYANCY CONTROL.
- B7. CONTRACTOR SHALL PROVIDE A BUOYANCY CONTROL PLAN TO TRANS MOUNTAIN REPRESENTATIVE FOR APPROVAL 2 WEEKS PRIOR TO COMMENCEMENT OF PULL-BACK.
- B8. APPROVED CRADLES WITH A SUITABLE SAFETY FACTOR ARE TO BE USED BY SUPPORT AND LIFTING EQUIPMENT DURING PULL-BACK.
- B9. CALCULATED MAXIMUM LOAD AT EACH LIFTING POINT IS APPROXIMATELY 17,000 kg (37,500 lbs) VERTICALLY AND 1,700 kg (3,700 lbs) HORIZONTALLY.
- B10. CALCULATED MAXIMUM LOAD AT EACH ROLLER IS APPROXIMATELY 6,000 kg (13,500 lbs) BASED ON 10 m SPACING.
- B11. FOR PROTECTION, PLACE RAMPS OR RAMP MATS ABOVE EXISTING BURIED PIPELINES WHEN CROSSING WITH HEAVY EQUIPMENT AND MACHINERY, AS REQUIRED BY THE CROSSING AGREEMENT WITH THE OWNER OF FOREIGN PIPELINE.
- B12. CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL APPROPRIATE CROSSING AGREEMENTS ARE IN PLACE PRIOR TO CONSTRUCTION.
- B13. CONTRACTOR SHALL ENSURE THAT TRAILING ENDS OF PULL-BACK SECTION SHALL NOT EXCEED 10 m IN ORDER TO PREVENT OVERSTRESSING THE PIPE AND DAMAGING THE COATING. PULL SECTION NEEDS TO BE PROPERLY SUPPORTED AT ALL TIMES DURING PULL-BACK. ANY DAMAGE TO COATING SHALL BE REPAIRED AS SPECIFIED IN THE CONTRACT DOCUMENTS.

- B14. CONTRACTOR SHALL AVOID HIGH PULLING FORCES AND SPEEDS TO PREVENT DAMAGE TO THE PIPE DURING PULL-BACK.
- B15. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND VERIFYING DEPTHS OF ALL EXISTING UNDERGROUND FACILITIES/UTILITIES IN THE AREA PRIOR TO CONSTRUCTION.
- B16. A PULL-BACK PLAN SHALL BE SUBMITTED BY THE CONTRACTOR TO TRANS MOUNTAIN REPRESENTATIVE, TWO WEEKS PRIOR TO STARTING PULL-BACK.
- B17. WHERE THERE IS ANY CHANGE IN GRADE OVER THE LENGTH OF THE CARRIER PIPE, THE CONTRACTOR SHALL ENSURE THAT THE PIPE IS ADEQUATELY SUPPORTED AT ALL TIMES.
- B18. WHERE THE PIPE IS MADE UP AND PULLED THROUGH A HORIZONTAL CURVE IN THE ALIGNMENT, THE CONTRACTOR IS RESPONSIBLE TO ADEQUATELY SUPPORT THE PIPE IN LIGHT OF ADDED HORIZONTAL LOADS.
- B19. CARE SHALL BE TAKEN WHEN HANDLING THE LEAD AND TAIL END SECTIONS OF THE CARRIER PIPE.
- B20. GRADING AT THE DRAG SECTION AREA SHALL BE CARRIED OUT AS REQUIRED.
- B21. APPROXIMATE TOTAL PULL-BACK LENGTH IS 2300 m. AS PER THE HDD CONSTRUCTION SPECIFICATION TMEP-MP-3123, THE TOTAL PULL-BACK LENGTH OF 2300 m HAS INCLUDED AN ADDITIONAL LENGTH OF 5.0 m.
- B22. THE PULLBACK SECTION MAY BE SPLIT INTO TWO PORTIONS DUE TO LIMITED WORKSPACE. THE TIE-INS BETWEEN PORTIONS SHALL BE DONE IN A TIMELY MANNER TO AVOID STUCK PIPE.
- B23. THE HDD ENTRY PAD SHOWN ON THE DRAWING WAS PROVIDED BY TMC ON MARCH, 2022.

**LEGEND**

- EXPLORATION BOREHOLE ALIGNMENT
- EXISTING TMEP NPS 24 PIPELINE
- TMEP NPS 36 PIPELINE
- NPS 30 PIPELINE DRAG SECTION
- CORRIDOR BDY.

PROJECT PIPE SPECIFICATIONS	
PRODUCT	LOW VAPOUR PRESSURE (LVP) LIQUID HYDROCARBONS
CLASS LOCATION DESIGNATION	N/A
DESIGN PRESSURE	9,930 kPa
MAXIMUM OPERATING PRESSURE	SEE NOTE 6
MINIMUM TEST PRESSURE	SEE NOTE 6
MINIMUM OPERATING TEMPERATURE	5 °C
MAXIMUM OPERATING TEMPERATURE	38 °C
<b>PIPELINE DATA</b>	
<b>CARRIER PIPE</b>	
HEAVY WALL PIPE	
OUTSIDE DIAMETER OF PIPE (mm)	762.0 (NPS 30)
PIPE WALL THICKNESS (mm)	15.9 mm
MINIMUM YIELD STRENGTH (MPa)	483
PIPE MATERIAL	STEEL, CSA Z245.1 (GRADE 483, CAT II)
COATING	FUSION BOND EPOXY (FBE), ABRASION RESISTANT OVERCOAT (ARO)
CATHODIC PROTECTION	IMPRESSED CURRENT

PERMIT TO PRACTICE UPI PROJECTS CANADA LTD. PERMIT NUMBER: 1001209 THE ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS OF THE PROVINCE OF BRITISH COLUMBIA		THIS DRAWING IS PREPARED SOLELY FOR THE USE OF TRANS MOUNTAIN PIPELINE ULC. UPI PROJECTS CANADA LTD. ASSUMES NO LIABILITY TO ANY OTHER PARTY FOR ANY REPRESENTATIONS CONTAINED IN THIS DRAWING.				CLIENT ACCEPTANCE NO. 0 DATE 23/10/06 ISSUED FOR CONSTRUCTION, AFE 01-13283 REVISION ACC. 66							
						DRAWN BY BF		TRANS MOUNTAIN EXPANSION PROJECT PULL-BACK PLANS AND PROFILES				SHEET SIZE A1	
						CHECKED BY XU		MOUNTAIN CROSSING 3 - CONTINGENCY b-034-B/92-H-5				SCALE AS SHOWN	
						APPROVED BY XU		PROJECT CODING AFE M002 - XD00771				DATE 23/10/04	
						NO. 0 DATE 23/10/06 ISSUED FOR CONSTRUCTION, AFE 01-13283 REVISION DRN CHK ENG APPR		PROJECT CODING AFE M002 - XD00771		DRAWING NUMBER DOCUMENT NO. SHT NO. REV		01 01 0	

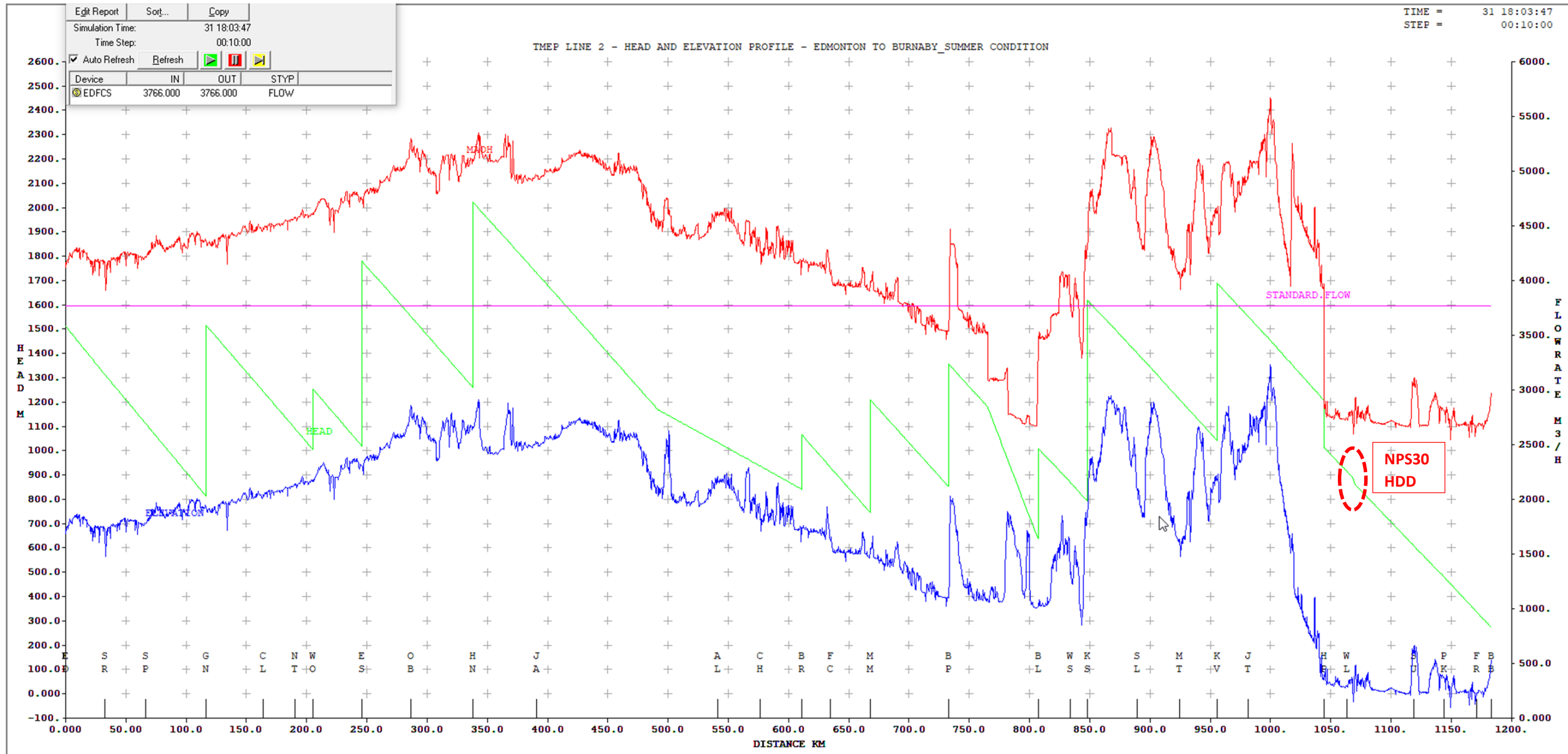
## **Attachment 5**

### **Mountain 3 HDD**

#### **Summer and Winter Hydraulic Simulations**

# Mountain 3 HDD: NPS 30 pipe instead of NPS36 - Summer

No throughput impact, the design flow rate 568,400 bpd (3766m3/hr) can be achieved.



# Mountain 3 HDD: NPS 30 pipe instead of NPS36 - Winter

No throughput impact, the design flow rate 568,400 bpd (3766m3/hr) can be achieved.

