

ATTACHMENT 8

WATERCOURSE CROSSINGS LIST AND ENGINEERING DRAWINGS

- 8.1 North Railway Crossing List
- 8.2 Tote Road Crossing List
- 8.3 North Railway Bridge Drawings

ATTACHMENT 8.1

NORTH RAILWAY CROSSING LIST

Table 8.1 North Railway Culvert Crossings, Bridges, Cuts, Diversions, and Encroachments on Waterbodies and Fish Habitat

Site ID	Description	Waterbody Type ¹	Diversion to	Receives Diversion From	Rail Chainage (m)	UTM Coordinates ²		Arctic Char		Ninespine Stickleback		Habitat Quality	No. Barrels	Culvert Length (m)	Culvert Diameter (mm)	Stream Order		Culvert Footprint in Arctic Char Habitat			Catchment Areas (m ²)	Mean Annual Flow		Ranges of results			
						Easting	Northing	Fish Bearing	Classification Uncertainty	Fish Bearing	Classification Uncertainty					Stream Order at Crossing	Ave. Bank-full Habitat Width (est.) ⁷	Area Without Apron (m ²)	Apron Area (m ²)	Total Area (m ²)		Low Flow Scenario (L/s)	High Flow Scenario (L/s)	Min velocity (m/s)	Max Velocity (m/s)	Min Depth (m)	Max Depth (m)
CV-0-1	Culvert	S	CV-0-1	CV-0-2	275	504289	7975593	No	N/A	No	N/A	None	1	6.0	900	n/a	n/a			11703	0.1	0.1	0.00	0.00	0.00	0.00	
CV-0-2	Cut	S		328	504234	7975572	No	N/A	No	N/A	None	NA	NA	NA	n/a	n/a			143614	1.0	1.6	0.00	0.00	0.00	0.00		
CV-0-3	Culvert	S		888	503796	7975281	No	N/A	No	N/A	None	TBD	TBD	TBD	n/a	n/a											
CV-1-1	Culvert	S			1122	503802	7975052	No	N/A	No	N/A	None	TBD	TBD	TBD	n/a	n/a										
CV-1-2	Culvert	S			1266	503830	7974912	No	N/A	No	N/A	None	TBD	TBD	TBD	n/a	n/a										
CV-1-3	Culvert	S/P			1350	503820	7974824	No	N/A	No	N/A	None	TBD	TBD	TBD	n/a	n/a										
CV-1-4	Culvert	LP			1780	503877	7974421	No	N/A	No	N/A	None	TBD	TBD	TBD	n/a	n/a										
CV-1-5	Culvert	LP			1896	503938	7974333	No	N/A	No	N/A	None	TBD	TBD	TBD	n/a	n/a										
CV-1-6	Culvert	S			2345	504292	7974064	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			60907	0.4	0.7	0.00	0.00	0.00	0.00	
CV-1-7	Culvert	S			2895	504662	7973667	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			24266	0.2	0.3	0.00	0.00	0.00	0.00	
CV-1-8	Culvert	S			3225	504895	7973426	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			54475	0.4	0.6	0.00	0.00	0.00	0.00	
CV-1-9	Culvert	S			3283	504924	7973381	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			38355	0.3	0.4	0.00	0.00	0.00	0.00	
CV-2-1	Culvert	S			3625	505154	7973121	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			328690	2.4	3.6	0.00	0.00	0.00	0.00	
CV-2-2	Culvert	S			3720	505217	7973067	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			11440	0.1	0.1	0.00	0.00	0.00	0.00	
CV-3-1	Culvert	S			3940	505388	7972906	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-3-2	Culvert	S			3955	505396	7972893	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			17518	0.1	0.2	0.00	0.00	0.00	0.00	
CV-4-1	Culvert	S			4395	505666	7972585	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			38452	0.3	0.4	0.00	0.00	0.00	0.00	
CV-4-2	Culvert	S			4520	505774	7972512	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			8996	0.1	0.1	0.00	0.00	0.00	0.00	
CV-4-3	Culvert	S			4620	505836	7972435	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			12408	0.1	0.1	0.00	0.00	0.00	0.00	
CV-4-4	Culvert	S			4665	505862	7972397	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			10441	0.1	0.1	0.00	0.00	0.00	0.00	
CV-4-5	Culvert	S			4950	506070	7972201	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			53676	0.4	0.6	0.00	0.00	0.00	0.00	
CV-5-1	Culvert	S			5130	506158	7972031	No	N/A	No	N/A	None	1	10.0	900	n/a	n/a			454159	3.3	5.0	0.00	0.00	0.00	0.00	
CV-5-2	Culvert	S			5165	506172	7971999	No	N/A	No	N/A	None	1	10.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-5-3	Culvert	S			5421	506297	7971792	No	N/A	No	N/A	None	1	10.0	900	n/a	n/a			1086870	7.9	12.0	0.00	0.00	0.00	0.00	
CV-5-4	Culvert	S			5700	506540	7971622	No	N/A	No	N/A	None	1	10.0	900	n/a	n/a			3288	0.0	0.0	0.00	0.00	0.00	0.00	
CV-5-5	Culvert	S			5838	506643	7971540	No	N/A	No	N/A	None	1	10.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-5-6	Culvert	S			5861	506661	7971526	No	N/A	No	N/A	None	1	10.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-5-7	Culvert	S			6030	506781	7971420	No	N/A	No	N/A	None	1	10.0	900	n/a	n/a			71246	0.5	0.8	0.00	0.00	0.00	0.00	
CV-6-1	Culvert	S			6240	506927	7971257	No	N/A	No	N/A	None	2	24.0	1200	n/a	n/a			32214	0.2	0.4	0.00	0.00	0.00	0.00	
CV-6-2	Culvert	S			6557	507170	7971061	No	N/A	No	N/A	None	1	10.0	900	n/a	n/a			206389	1.5	2.3	0.00	0.00	0.00	0.00	
CV-6-3	Culvert	S			6852	507417	7970910	No	N/A	No	N/A	None	1	10.0	900	n/a	n/a			656037	4.8	7.2	0.00	0.00	0.00	0.00	
CV-6-4	Culvert	S			6945	507476	7970841	No	N/A	No	N/A	None	1	10.0	900	n/a	n/a			506312	3.7	5.6	0.00	0.00	0.00	0.00	
CV-7-1	Culvert	LP			7350	507732	7970526	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-7-2	Culvert	LP			7593	507884	7970336	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-7-3	Culvert	LP			7700	507953	7970255	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-7-4	Culvert	LP			7838	508038	7970146	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-7-5	Culvert	LP			7875	508060	7970116	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-7-6	Culvert	LP			7930	508094	7970073	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-7-7	Culvert	LP			7935	508097	7970069	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-8-0	Cut	S																									

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Site ID	Description	Waterbody Type ¹	Diversion to	Receives Diversion From	Rail Chainage (m)	UTM Coordinates ²		Arctic Char		Ninespine Stickleback		Habitat Quality	No. Barrels	Culvert Length (m)	Culvert Diameter (mm)	Stream Order		Culvert Footprint in Arctic Char Habitat			Catchment Areas (m ²)	Mean Annual Flow		Ranges of results			
						Easting	Northing	Fish Bearing	Classification Uncertainty	Fish Bearing	Classification Uncertainty					Stream Order at Crossing	Ave. Bank-full Habitat Width (est.) ⁷	Area Without Apron (m ²)	Apron Area (m ²)	Total Area (m ²)		Low Flow Scenario (L/s)	High Flow Scenario (L/s)	Min velocity (m/s)	Max Velocity (m/s)	Min Depth (m)	Max Depth (m)
CV-14-2	Culvert	P			14821	513436	7966375	No	N/A	No	N/A	None	1	12.0	1200	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-14-3	Culvert	P			14926	513532	7966333	No	N/A	No	N/A	None	1	12.0	1200	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-15-1	Culvert	LP			15026	513624	7966294	No	N/A	No	N/A	None	1	12.0	1200	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-15-2	Culvert/encroachment	S/P			15216	513781	7966188	Yes	N/A	Yes	N/A	Marginal(ARCH) Important (NNST)	1	24.0	1400	3	36			1038020	7.6	11.4	0.42	0.76	0.04	0.06	
CV-15-3	Culvert/encroachment	S/P			15407	513892	7966034	Yes	N/A	Yes	N/A	Marginal - Important	2	17.5	900	2	27.3			331285	2.4	3.6	0.25	0.47	0.02	0.03	
CV-15-4	Culvert	P			15806	514123	7965711	No	Low	No	Low	None	1	15.0	1200	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-15-5	Bridge	S			15950	514239	7965626	Yes	N/A	Yes	N/A	Important	N/A	N/A	N/A	3+	Bridge			538280000	3929.4	5921.1	0.00	0.00	0.00	0.00	
CV-16-1	Culvert	LP			16055	514325	7965565	No	N/A	No	N/A	None	4	15.0	1200	n/a	n/a			538280000	3929.4	5921.1	0.00	0.00	0.00	0.00	
CV-16-2	Culvert/encroachment	S/P			16722	514768	7965089	No	N/A	No	N/A	None	4	12.5	1200	n/a	n/a			117686	0.9	1.3	0.14	0.26	0.01	0.01	
CV-16-3	Culvert	S			16961	514811	7964916	No	Low	Potential	High	Marginal	1	12.0	900	n/a	n/a			117686	0.9	1.3	0.23	0.42	0.02	0.03	
CV-17-1	Culvert	P			17903	515261	7964025	No	N/A	No	Low	None	1	17.5	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-18-1	Encroachment	P			18095	515331	7963846	No	N/A	Unlikely	Moderate	None - Marginal	1	30.0	900	1	2.8			1094950	8.0	12.0	0.45	0.83	0.04	0.07	
CV-18-2	Culvert	S			18266	515405	7963693	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			42825	0.3	0.5	0.00	0.00	0.00	0.00	
CV-18-3	Culvert	S			18633	515607	7963389	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-18-4	Culvert	S			18729	515682	7963328	No	N/A	No	N/A	None	1	15.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-19-1	Culvert	S			19018	515927	7963175	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			56868	0.4	0.6	0.00	0.00	0.00	0.00	
CV-19-2	Culvert	P			19293	516161	7963031	No	N/A	No	Low	None	1	30.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-19-3	Culvert	S			19940	516613	7962587	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			44195	0.3	0.5	0.00	0.00	0.00	0.00	
CV-20-1	Culvert	LP		CV-20-2	20498	517040	7962255	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			29676	0.2	0.3	0.00	0.00	0.00	0.00	
CV-20-2	Cut	S	CV-20-1		20818	517267	7962029	No	N/A	No	N/A	None	0	NA	NA	n/a	n/a			28804	0.2	0.3	0.00	0.00	0.00	0.00	
CV-21-1	Culvert	LP			21008	517391	7961887	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-21-2	Culvert	LP			21336	517607	7961640	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-21-3	Culvert	LP			21798	517928	7961308	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-21-4	Culvert	LP			21955	518010	7961196	No	N/A	No	N/A	None	0	18.0	0	n/a	n/a			254847	1.9	2.8	0.00	0.00	0.00	0.00	
CV-22-1	Pond Infilling	P			22209	518123	7960950	No	N/A	Unlikely	Moderate	None - Marginal	1	12.0	900	n/a (LE)	n/a			-	-	-	0.03	0.04	0.00	0.00	
CV-22-2	Encroachment	P			22680	518232	7960617	No	N/A	Unlikely	Moderate	None - Marginal	1	12.0	900	n/a (LE)	n/a			-	-	-	0.03	0.04	0.00	0.00	
CV-22-3	Culvert	LP			22759	518295	7960427	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-22-4	Encroachment	P			23000	518370	7960198	No	N/A	Unlikely	Moderate	None - Marginal	does not require modeling			n/a (LE)	n/a			Encroachment							
CV-23-1	Culvert	S			23200	518441	7959981	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			198672	1.5	2.2	0.00	0.00	0.00	0.00	
CV-23-2	Culvert	S			23421	518501	7959798	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			105039	0.8	1.2	0.00	0.00	0.00	0.00	
CV-23-3	Culvert	LP			23844	518695	7959425	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-23-4	Culvert	S			23952	518754	7959335	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			59007	0.4	0.6	0.00	0.00	0.00	0.00	
CV-24-1	Culvert	S			24407	518988	7958946	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			177168	1.3	1.9	0.00	0.00	0.00	0.00	
CV-24-2	Culvert	S			24689	519081	7958667	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			3029	0.0	0.0	0.00	0.00	0.00	0.00	
CV-24-3	Culvert	S			24863	519153	7958481	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			1240640	9.1	13.6	0.00	0.00	0.00	0.00	
CV-25-1	Culvert	S			25162	519225	7958229	No	N/A	No	N/A	None	2	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-25-2	Culvert	S			25250	519507	7958144	Probable	Moderate	Probable	Moderate	Marginal - Important	1	13.6	900	1	2.8	38	20	58							
CV-25-3	Culvert	S			25690	519661	7958016	Potential	High	Potential	High	Marg															

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						Easting	Northing	Fish Bearing	Classification Uncertainty	Fish Bearing	Classification Uncertainty					Stream Order at Crossing	Ave. Bank-full Habitat Width (est.) ⁷	Area Without Apron (m ²)	Apron Area (m ²)	Total Area (m ²)		Low Flow Scenario (L/s)	High Flow Scenario (L/s)	Min velocity (m/s)	Max Velocity (m/s)	Min Depth (m)	Max Depth (m)
CV-30-7	Pond Infilling	S/P			30921	521712	7953143	No	N/A	Unlikely	Moderate	None - Marginal	1	12.5	900	n/a (LE)	n/a			-	-	-	0.03	0.04	0.00	0.00	
CV-31-1	Culvert	S			31278	521748	7952788	Yes	N/A	Yes	N/A	Important	1	20.0	1200	3	16.3	326	156	482	4378030	32.0	48.2	0.66	1.21	0.08	0.13
CV-31-2	Culvert	S			31290	521749	7952776	Yes	N/A	Yes	N/A	Important	1	20.0	1200	3	16.3	326	156	482	4378030	32.0	48.2	0.66	1.21	0.08	0.13
CV-31-3	Culvert	LP			31720	521763	7952346	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			362829	2.6	4.0	0.00	0.00	0.00	0.00	
CV-31-4	Culvert	LP			31789	521772	7952278	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			362829	2.6	4.0	0.00	0.00	0.00	0.00	
CV-32-1	Culvert	LP			32008	521827	7952066	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			362829	2.6	4.0	0.00	0.00	0.00	0.00	
CV-32-2	Culvert	LP			32220	521882	7951861	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			362829	2.6	4.0	0.00	0.00	0.00	0.00	
CV-32-3	Culvert	LP			32470	521946	7951620	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			362829	2.6	4.0	0.00	0.00	0.00	0.00	
CV-32-4	Culvert	S			32580	521983	7951453	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			336611	2.5	3.7	0.00	0.00	0.00	0.00	
CV-33-1	Culvert	LP			33083	521990	7951011	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			163261	1.2	1.8	0.00	0.00	0.00	0.00	
CV-33-2	Culvert	LP			33183	521991	7950911	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-33-3	Culvert	LP			33255	521990	7950839	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-33-4	Culvert	S			33362	521976	7950733	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-33-5	Culvert	S			33434	521964	7950662	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			2059530	15.0	22.7	0.00	0.00	0.00	0.00	
CV-33-6	Culvert	S			33530	521947	7950568	Yes	N/A	Yes	N/A	Important	4	18.0	1200	3	16.3	293	156	450	1772810	12.9	19.5	0.33	0.60	0.03	0.04
CV-33-7	Culvert	P			33888	521885	7950215	No	N/A	No	N/A	None	1	10.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-34-1	Culvert	S			34439	521789	7949673	No	N/A	No	N/A	None	1	24.0	1200	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-34-2	Culvert	S			34963	521801	7949153	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-35-2	Culvert	S			35331	521947	7948828	Yes	N/A	Yes	N/A	Important	5	22.5	1400	3+	14.1	317	158	475	34732700	253.5	382.1	0.74	1.36	0.09	0.15
CV-35-4	Culvert	S		CV-35-5	35959	522249	7948287	No	N/A	No	N/A	None	4	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-35-5	Cut	LP	CV-35-4		36070	522298	7948170	No	N/A	No	N/A	None	0	NA	NA	n/a	n/a			2757860	20.1	30.3	0.00	0.00	0.00	0.00	
CV-37-1	Culvert	LP			37897	522533	7946398	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-38-1	Culvert	S			38297	522570	7946000	No	N/A	No	N/A	None	1	30.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-38-2	Culvert	S			38509	522646	7945802	No	N/A	No	N/A	None	1	36.0	900	n/a	n/a			180963	1.3	2.0	0.00	0.00	0.00	0.00	
CV-38-3	Culvert	S			38970	522846	7945387	No	N/A	No	N/A	None	3	30.0	1400	n/a	n/a			6203670	45.3	68.2	0.00	0.00	0.00	0.00	
CV-39-1	Culvert	S			39513	523125	7944922	No	N/A	No	N/A	None	1	36.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-40-1	Culvert	LP			40160	523148	7944309	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-40-2	Culvert	S			40320	523147	7944150	No	N/A	No	N/A	None	2	18.0	1200	n/a	n/a			3211670	23.4	35.3	0.00	0.00	0.00	0.00	
CV-40-3	Culvert	LP			40586	523231	7943898	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-40-4	Culvert	LP			40830	523301	7943665	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-41-1	Culvert	S			41100	523332	7943397	No	N/A	No	N/A	None	1	12.5	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-41-2	Culvert	S			41186	523342	7943311	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-41-3	Culvert	LP			41346	523359	7943152	No	N/A	No	N/A	None	1	12.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-41-4	Culvert	LP			41536	523351	7942963	No	N/A	No	N/A	None	1	24.0	900	n/a	n/a			-	-	-	0.00	0.00	0.00	0.00	
CV-42-1	Culvert	S			42225	523423	7942323	No	N/A	No	N/A	None	1	24.0	1200	n/a	n/a			1453950	10.6	16.0	0.00	0.00	0.00	0.00	
CV-42-2	Culvert	S			42954	523475	7941603	No	N/A	No	N/A	None	1	22.5	900	n/a	n/a			321511	2.3	3.5	0.00	0.00	0.00	0.00	
CV-43-1	Culvert	S			43331	523647	7941268	No	N/A	No	N/A	None	1	18.0	900	n/a	n/a			3951760	28.8	43.5	0.00	0.00			

Table 8.1 North Railway Culvert Crossings, Bridges, Cuts, Diversions, and Encroachments on Waterbodies and Fish Habitat

Site ID	Description	Waterbody Type ¹	Diversion to	Receives Diversion From	Rail Chainage (m)	UTM Coordinates ²		Arctic Char		Ninespine Stickleback		Habitat Quality	No. Barrels	Culvert Length (m)	Culvert Diameter (mm)	Stream Order		Culvert Footprint in Arctic Char Habitat			Catchment Areas (m ²)	Mean Annual Flow		Ranges of results			
						Easting	Northing	Fish Bearing	Classification Uncertainty	Fish Bearing	Classification Uncertainty					Stream Order at Crossing	Ave. Bank-full Habitat Width (est.) ⁷	Area Without Apron (m ²)	Apron Area (m ²)	Total Area (m ²)		Low Flow Scenario (L/s)	High Flow Scenario (L/s)	Min velocity (m/s)	Max Velocity (m/s)	Min Depth (m)	Max Depth (m)
CV-50-4a	Culvert	LP			50820	526876	7934875	No	N/A	No	N/A	None	TBD	TBD	TBD												
CV-50-4b	Culvert	LP			50920	526888	7934776	No	N/A	No	N/A	None	TBD	TBD	TBD												
CV-50-5	Culvert	S			50945	526924	7934630	Yes	Low	Yes	Low	Marginal	2	30	1200	3	16.3	489	156	645	7949400	58.0	87.4	0.64	1.18	0.07	0.12
CV-50-6	Culvert	S			50955	526926	7934620	Yes	N/A	Yes	N/A	Important	2	30	1200	3	16.3	489	156	645	7949400	58.0	87.4	0.64	1.18	0.07	0.12
CV-51-1	Culvert	LP			51255	527006	7934331	No	N/A	No	N/A	None	1	24	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-51-2	Culvert	LP			51964	527054	7933628	No	N/A	No	N/A	None	1	30	1200	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-52-1	Culvert	S			52599	527080	7932998	No	N/A	No	N/A	None	1	12	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-52-2	Culvert	S			52817	527132	7932787	No	N/A	No	N/A	None	1	18	900	n/a	n/a				541062	3.9	6.0	0.00	0.00	0.00	0.00
CV-52-3	Culvert	LP			52918	527180	7932698	No	N/A	No	N/A	None	1	12	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-53-1	Culvert	LP			53208	527366	7932476	No	N/A	No	N/A	None	1	12	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-53-2	Culvert	P			53737	527274	7932000	No	N/A	No	Low	None	1	36	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-54-1	Culvert	S			54398	527333	7931375	No	N/A	No	N/A	None	1	24	1200	n/a	n/a				1597470	11.7	17.6	0.00	0.00	0.00	0.00
CV-54-2	Culvert	S			54940	527529	7930869	No	N/A	No	N/A	None	2	12.5	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-55-1	Culvert	LP			55163	527583	7930653	No	N/A	No	Low	None	1	18	1200	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-55-2	Culvert	LP			55400	527632	7930421	No	N/A	No	Low	None	1	12	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-55-3	Culvert	S			55484	527650	7930339	Yes	N/A	Yes	N/A	Important	5	12.5	900	3	16.3	204	117	321	2783990	20.3	30.6	0.37	0.68	0.03	0.05
CV-56-1	Culvert	S			56580	528085	7929337	Yes	N/A	Yes	N/A	Marginal	2	12.2	1200	3	16.3	199	156	355	2731000	19.9	30.0	0.46	0.85	0.04	0.07
CV-57-1	Culvert	S			57125	528309	7928841	Yes	N/A	Yes	N/A	Marginal	1	12.2	900	2	6.8	83	49	132	1613800	11.8	17.8	0.51	0.93	0.05	0.09
CV-57-2	Culvert	S			57287	528345	7928683	Yes	N/A	Yes	N/A	Marginal	1	12.2	900	2	6.8	83	49	132	886436	6.5	9.8	0.42	0.78	0.04	0.06
CV-58-1	Culvert	S			58017	528241	7927966	Probable	Moderate	Probable	Moderate	Marginal	2	9.76	900	1	2.8	27	20	47	94000	0.7	1.0	0.17	0.32	0.01	0.02
CV-58-2	Culvert	S			58192	528168	7927807	Yes	Low	Yes	Low	Marginal - Important	1	9.76	900	1	2.8	27	20	47	115501	0.8	1.3	0.23	0.42	0.01	0.02
CV-58-3	Culvert	S			58301	528109	7927716	Potential	High	Potential	High	Marginal	1	9.76	900	1	2.8	27	20	47	7281	0.1	0.1	0.10	0.18	0.00	0.01
CV-58-4	Culvert	S			58377	528062	7927656	Yes	Low	Yes	Low	Marginal - Important	1	12.2	900	2	6.8	83	49	132	192771	1.4	2.1	0.27	0.49	0.02	0.03
CV-58-4a	Culvert	S			58540	527931	7927527	Yes	Low	Yes	Low	Marginal - Important	1	12.2	900	1	2.8	34	20	54	64172	0.5	0.7	0.19	0.35	0.01	0.02
CV-58-5	Culvert	S			58795	527751	7927378	Probable	Moderate	Probable	Moderate	Marginal - Important	1	12.2	900	2	6.8	83	49	132	18710	0.1	0.2	0.13	0.24	0.01	0.01
CV-58-6	Culvert	S			58887	527681	7927318	Probable	Moderate	Probable	Moderate	Marginal - Important	1	12.2	900	1	2.8	34	20	54	417954	3.1	4.6	0.34	0.62	0.03	0.05
CV-58-7	Cut	S	CV-59-1		58940	527650	7927282	Unlikely	Moderate	Unlikely	Moderate	None - Marginal	NA	NA	NA	1	2.8				417954	3.1	4.6	0.00	0.00	0.00	0.00
CV-58-8	Cut	S	CV-59-1		58960	527613	7927217	Potential	High	Potential	High	None - Marginal	NA	NA	NA	1	2.8				304042	2.2	3.3	0.00	0.00	0.00	0.00
CV-59-1	Culvert	S		CV-58-7 and CV-58-6	59062	527590	7927169	Probable	Moderate	Probable	Moderate	Marginal - Important	1	9.76	900	2	6.8	66	49	115	93947	0.7	1.0	0.21	0.39	0.01	0.02
CV-59-2	Culvert	S			59186	527553	7927052	Potential	High	Potential	High	Marginal	1	14.64	900	1	2.8	41	20	61	49972	0.4	0.5	0.18	0.32	0.01	0.02
CV-59-3	Culvert	S			59323	527529	7926917	Potential	High	Potential	High	None - Marginal	1	9.76	900	1	2.8	27	20	47	38859	0.3	0.4	0.16	0.30	0.01	0.02
CV-59-4b	Cut	LP	CV-59-4		59442	527467	7926817	No	N/A	No	N/A	None	0		0	n/a	n/a				4768110	34.8	52.4	0.00	0.00	0.00	0.00
CV-59-4a	Culvert	S		CV-59-4a & b	59552	527395	7926734	Yes	Low	Yes	Low	Important	3	21.96	1200	2	6.8	149	65	215	4768110	34.8	52.4	0.49	0.89	0.05	0.08
CV-59-4a	Cut	S	CV-59-4		59706	527329	7926595	No	Low	No	Low	None	0	NA	NA	n/a	n/a				4768110	34.8	52.4	0.00	0.00	0.00	0.00
CV-59-5	Culvert	S			59855	527272	7926457	No	Low	No	Low	None	1	12.2	900	n/a	n/a				435215	3.2	4.8	0.00	0.00	0.00	0.00
CV-60-1	Culvert	S			6007																						

Table 8.1 North Railway Culvert Crossings, Bridges, Cuts, Diversions, and Encroachments on Waterbodies and Fish Habitat

Site ID	Description	Waterbody Type ¹	Diversion to	Receives Diversion From	Rail Chainage (m)	UTM Coordinates ²		Arctic Char		Ninespine Stickleback		Habitat Quality	No. Barrels	Culvert Length (m)	Culvert Diameter (mm)	Stream Order		Culvert Footprint in Arctic Char Habitat			Catchment Areas (m ²)	Mean Annual Flow		Ranges of results			
						Easting	Northing	Fish Bearing	Classification Uncertainty	Fish Bearing	Classification Uncertainty					Stream Order at Crossing	Ave. Bank-full Habitat Width (est.) ⁷	Area Without Apron (m ²)	Apron Area (m ²)	Total Area (m ²)		Low Flow Scenario (L/s)	High Flow Scenario (L/s)	Min velocity (m/s)	Max Velocity (m/s)	Min Depth (m)	Max Depth (m)
CV-64-6	Culvert	S			65000	527757	7921691	No	Low	No	Moderate	None	1	12.2	900	n/a	n/a				140599	1.0	1.5	0.00	0.00	0.00	0.00
CV-65-1	Culvert	S			65285	527793	7921396	Probable	Moderate	Probable	High	Marginal - Important	1	17.08	900	3	16.3	278	117	396	612555	4.5	6.7	0.38	0.70	0.03	0.05
CV-65-2a	Cut	LP	CV-65-2		65541	527803	7921140	Unlikely	Low	No	Low	None - Marginal	0	NA	NA	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-65-2	Pond Infilling/Culvert	P		CV-65-2a	65750	527828	7920934	Potential	High	Potential	Low	None - Important	1	21.96	900	1	25				129361	0.9	1.4	0.24	0.43	0.02	0.03
CV-66-1	Culvert	S			66086	527959	7920627	Unlikely	Low	Unlikely	Low	None - Marginal	1	12.2	900	2	6.8	83	49	132	329312	2.4	3.6	0.31	0.58	0.02	0.04
CV-66-2a	Cut	LP	CV-66-2		66164	528013	7920571	No	Low	No	Low	None	0	NA	NA	n/a	n/a				-			0.00	0.00	0.00	0.00
CV-66-2	Culvert	S		CV-66-2a	66228	528063	7920532	No	Low	No	Moderate	None	1	14.64	900	n/a	n/a				602401	4.4	6.6	0.00	0.00	0.00	0.00
CV-66-3	Culvert	S			66555	528328	7920342	Probable	Moderate	Probable	Low	Marginal - Important	1	19.52	900	1	2.8	55	20	75	182193	1.3	2.0	0.26	0.48	0.02	0.03
CV-66-4	Culvert	S			66615	528359	7920292	No	Low	No	Low	None	1	12.2	900	n/a	n/a				182193	1.3	2.0	0.00	0.00	0.00	0.00
CV-66-5	Culvert	S			66724	528389	7920187	No	Low	No	Low	None	1	14.64	900	n/a	n/a				84029	0.6	0.9	0.00	0.00	0.00	0.00
CV-66-6	Culvert	S			66750	528390	7920161	No	Low	No	Low	None	1	9.76	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-66-7	Culvert	S			66898	528378	7920014	No	Low	No	Moderate	None	1	9.76	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-66-8	Culvert	S			66925	528376	7919987	Probable	Moderate	Probable	Moderate	Marginal - Important	1	9.76	900	1	2.8	27	20	47	36437	0.3	0.4	0.16	0.29	0.01	0.01
CV-67-1	Culvert	S			67182	528299	7919743	Probable	Moderate	Probable	Low	Marginal - Important	1	14.64	900	1	2.8	41	20	61	331786	2.4	3.6	0.31	0.58	0.02	0.04
CV-67-2	Culvert	S			68020	528226	7918995	No	Low	No	Low	None	1	9.76	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-68-1a	Culvert	S			68080	528200	7918864	Yes	Low	Yes	Low	Marginal - Important	1	14.64	33 900	2	6.8	224	49	273	3551025	25.9	39.1	0.65	1.18	0.07	0.13
CV-68-1	Culvert	S			68107	528199	7918838	Yes	Low	Yes	Low	Important	3	31.72	1400	2	6.8	216	76	292	3551025	25.9	39.1	0.43	0.80	0.04	0.07
CV-68-2	Culvert	S			68177	528194	7918768	No	Low	No	Moderate	None	1	21.96	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-68-3	Culvert	S			68484	528059	7918496	Probable	Moderate	Probable	Low	Marginal - Important	1	21.96	1200	2	6.8	149	65	215	1076140	7.9	11.8	0.43	0.79	0.04	0.07
CV-68-4	Culvert	S			68519	528055	7918461	No	Low	No	High	None	1	12.2	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-68-5	Culvert	S			68650	528081	7918334	Potential	High	Potential	Low	Marginal - Important	1	26.84	900	2	6.8	183	49	231	587722	4.3	6.5	0.37	0.69	0.03	0.05
CV-69-1	Culvert	S			69190	528322	7917862	No	Low	No	Low	None	1	12.2	900	n/a	n/a				214538	1.6	2.4	0.00	0.00	0.00	0.00
CV-69-2	Culvert	S			69552	528438	7917517	Yes	Low	Yes	Low	Marginal - Important	1	14.64	900	2	6.8	100	49	149	469963	3.4	5.2	0.35	0.64	0.03	0.05
CV-69-3	Culvert	S			69616	528458	7917456	Yes	Low	Yes	High	Marginal - Important	1	14.64	900	1	2.8	41	20	61	83120	0.6	0.9	0.21	0.38	0.01	0.02
CV-69-4	Culvert	S			69668	528474	7917407	Potential	High	Potential	Moderate	Marginal - Important	1	12.2	900	1	2.8	34	20	54	-	-	-	0.03	0.04	0.00	0.00
CV-70-1	Encroachment	P			70201	528704	7916939	No	N/A	Unlikely	Moderate	None - Marginal	1	12.2	900	n/a (LE)					-	-	-	0.03	0.04	0.00	0.00
CV-70-2	Culvert	S			70580	529030	7916745	Yes	N/A	Yes	N/A	Important	1	17.08	900	2	6.8	116	49	165	-	-	-	0.03	0.04	0.00	0.00
CV-70-3	Bridge	S			70684	529120	7916693	Yes	N/A	Yes	Low	Important	0	NA	NA	3+	Bridge				-	-	-	0.00	0.00	0.00	0.00
CV-71-1	Pond Infilling	S/P			71053	529451	7916535	Yes	Low	Yes	Low	Important	4	17.08	1800	3	74.9				2962380	21.6	32.6	0.36	0.66	0.03	0.05
CV-71-2a	Encroachment	S/P			71315	529708	7916558	Probable	Moderate	Probable	Moderate	Marginal	NA	NA	NA	1	8.7				Encroachment						
CV-71-3	Culvert	S			71860	529965	7916706	No	Low	Unlikely	Moderate	None - Marginal	1	12.2	900	1	2.8				-	-	-	0.03	0.04	0.00	0.00
CV-71-4	Culvert	S			71905	530214	7916862	No	Low	Unlikely	Moderate	None - Marginal	1	9.76	900	1	2.8				11370	0.1	0.1	0.11	0.21	0.01	0.01
CV-72-1	Culvert	S			72085	530370	7916951	No	Low	Unlikely	Moderate	None - Marginal	1	17.08	1200	3	16.3				332965	2.4	3.7	0.30	0.55	0.02	0.04
CV-72-1a	Culvert	S			72320	530587	7917015	No	Low	Unlikely	Moderate	None - Marginal	1	12.2	1200	1	2.8				128088	0.9	1.4	0.22	0.41	0.01	0.02
CV-72-2	Culvert	S			72515	530784	7917069	No	Low	Unlikely	High	None - Marginal	1	12.2	900	1	2.8				189785	1.4	2.1	0.26	0.49		

Table 8.1 North Railway Culvert Crossings, Bridges, Cuts, Diversions, and Encroachments on Waterbodies and Fish Habitat

Site ID	Description	Waterbody Type ¹	Diversion to	Receives Diversion From	Rail Chainage (m)	UTM Coordinates ²		Arctic Char		Ninespine Stickleback		Habitat Quality	No. Barrels	Culvert Length (m)	Culvert Diameter (mm)	Stream Order		Culvert Footprint in Arctic Char Habitat			Catchment Areas (m ²)	Mean Annual Flow		Ranges of results			
						Easting	Northing	Fish Bearing	Classification Uncertainty	Fish Bearing	Classification Uncertainty					Stream Order at Crossing	Ave. Bank-full Habitat Width (est.) ⁷	Area Without Apron (m ²)	Apron Area (m ²)	Total Area (m ²)		Low Flow Scenario (L/s)	High Flow Scenario (L/s)	Min velocity (m/s)	Max Velocity (m/s)	Min Depth (m)	Max Depth (m)
CV-80-1a	Culvert	S			80039	537487	7919182	Unlikely	Moderate	Unlikely	Moderate	None - Marginal	1	12.2	1200	1	2.8	34	27	61	94000	0.7	1.0	0.20	0.37	0.01	0.02
CV-80-2	Culvert	S			81003	538320	7919565	Unlikely	Moderate	Unlikely	Moderate	None - Marginal	1	10	900	1	2.8	28	20	48	2415	0.0	0.0	0.07	0.13	0.00	0.00
CV-80-2a	Culvert	S			81019	538307	7919556	Unlikely	Moderate	Unlikely	Moderate	None - Marginal	1	10	900	1	2.8	28	20	48	26262	0.2	0.3	0.14	0.26	0.01	0.01
CV-80-2b	Culvert	S			81034	538334	7919573	Unlikely	Moderate	Unlikely	Moderate	None - Marginal	1	10	900	2	6.8	68	49	117	161892	1.2	1.8	0.25	0.46	0.02	0.03
CV-80-3	Culvert	S			81171	538453	7919642	Unlikely	Moderate	Unlikely	Moderate	None - Marginal	1	10	900	1	2.8	28	20	48	74433	0.5	0.8	0.20	0.36	0.01	0.02
CV-80-4	Culvert	S			81236	538510	7919675	Unlikely	Moderate	Unlikely	Moderate	None - Marginal	1	10	900	1	2.8	28	20	48	47083	0.3	0.5	0.17	0.32	0.01	0.02
CV-80-5	Culvert	S			81347	538604	7919729	Unlikely	Moderate	Unlikely	Low	None - Marginal	1	10	900	2	6.8	68	49	117	38715	0.3	0.4	0.16	0.30	0.01	0.01
CV-81-1	Culvert	S			81447	538691	7919779	No	Low	No	Moderate	None	2	9.76	900	n/a	n/a				31756	0.2	0.3	0.00	0.00	0.00	0.00
CV-81-2	Culvert	S			81687	538879	7919924	Probable	Moderate	Probable	Moderate	Marginal - Important	1	12.2	900	1	2.8	34	20	54	145625	1.1	1.6	0.24	0.45	0.02	0.03
CV-81-3	Culvert	S			81788	538942	7920004	Probable	Moderate	Probable	Moderate	Marginal - Important	1	12.2	900	2	6.8	83	49	132	263562	1.9	2.9	0.29	0.54	0.02	0.04
CV-81-4	Culvert	S			82000	539077	7920175	Unlikely	Moderate	Unlikely	Moderate	None - Marginal	1	12.2	900	1	2.8	34	20	54	149049	1.1	1.6	0.25	0.45	0.02	0.03
CV-82-1	Culvert	S		CV-82-1a	82060	539131	7920244	Unlikely	Moderate	Unlikely	Moderate	None - Marginal	2	12.2	900	2	6.8	83	49	132	2043550	14.9	22.5	0.44	0.81	0.04	0.07
CV-82-1a	Cut	LP	CV-82-1		82266	539242	7920376	No	Low	No	Low	None	0	NA	NA	n/a (cut)					-	-	-	0.00	0.00	0.00	0.00
CV-82-2	Culvert	S			82442	539376	7920489	Unlikely	Moderate	Unlikely	Moderate	None - Marginal	1	9.76	900	1	2.8	27	20	47		-	-	-	0.03	0.04	0.00
CV-82-3	Culvert	S			82614	539508	7920599	Unlikely	Moderate	Unlikely	Moderate	None - Marginal	1	12.2	900	1	2.8	34	20	54	110862	0.8	1.2	0.22	0.41	0.01	0.02
CV-82-4	Culvert	S			82901	539729	7920783	Probable	Moderate	Probable	Moderate	Marginal - Important	1	13.2	1200	1	2.8	37	27	64	69358	0.5	0.8	0.19	0.34	0.01	0.02
CV-83-1	Culvert	S			83039	539835	7920871	Probable	Moderate	Probable	High	Marginal - Important	1	12.2	1200	2	6.8	83	65	148	1235590	9.0	13.6	0.45	0.83	0.04	0.07
CV-83-1a	Culvert	S			83105	539887	7920915	Potential	High	Potential	N/A	Marginal - Important	1	12.2	1200	1	2.8	34	27	61	92203	0.7	1.0	TBD	TBD	TBD	TBD
CV-83-2	Culvert	S			83459	540162	7921134	Yes	N/A	Yes	N/A	Marginal	4	12.2	1800	3	16.3	199	235	434	3235620	23.6	35.6	0.37	0.68	0.03	0.05
CV-84-1	Culvert	S			84236	540842	7921510	Yes	N/A	Yes	Moderate	Important	1	17.08	1200	3+	5.6	96	54	149	11469400	83.7	126.2	0.88	1.62	0.12	0.20
CV-84-2	Culvert	S			84467	541030	7921642	Unlikely	Moderate	Unlikely	N/A	None - Marginal	1	12.2	900	2	6.8	83	49	132	473522	3.5	5.2	0.35	0.64	0.03	0.05
CV-84-3	Culvert	S			84873	541294	7921948	No	N/A	No	N/A	None	1	14.64	1200	n/a	n/a				536112	3.9	5.9	0.00	0.00	0.00	0.00
CV-85-1	Culvert	S			85117	541514	7922054	No	N/A	No	N/A	None	1	12.2	900	n/a	n/a				75263	0.5	0.8	0.00	0.00	0.00	0.00
CV-85-2	Culvert	S			85563	541921	7922236	No	N/A	No	N/A	None	2	17.08	1800	n/a	n/a				762696	5.6	8.4	0.00	0.00	0.00	0.00
CV-85-3	Bridge	S			85868	542213	7922215	Yes	N/A	Yes	N/A	Important		NA	NA	3+	Bridge				-	-	-	0.00	0.00	0.00	0.00
CV-85-4	Culvert	S			85964	542288	7922156	Yes	N/A	Yes	High	Important	1	17.08	1800	3+	25	427	360	787	-	-	-	0.02	0.03	0.00	0.00
CV-86-1	Encroachment	P			86502	542671	7921780	No	N/A	Potential	High	None - Marginal	6	9.76	900	n/a (LE)					-	-	-	0.03	0.04	0.00	0.00
CV-86-2	Culvert	S			86611	542753	7921708	Yes	N/A	Yes	Low	Marginal	2	19.52	1800	3	60	1171	864	2035	24812000	181.1	272.9	0.86	1.57	0.11	0.19
CV-87-1	Culvert	LP			87012	543078	7921473	No	Low	No	Low	None	1	9.76	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-87-2	Culvert	LP			87399	543392	7921247	No	Low	No	Low	None	1	12.2	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-87-3	Culvert	LP			87559	543532	7921170	No	Low	No	N/A	None	1	9.76	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-87-4	Culvert	S			87735	543736	7921141	Yes	N/A	Yes	Low	Marginal	1	9.76	900	2	6.8	66	49	115	481790	3.5	5.3	0.35	0.65	0.03	0.05
CV-88-1	Culvert	LP			88015	543976	7921204	No	Low	No	Low	None	1	9.76	900	n/a	n/a				193563	1.4	2.1	0.00	0.00	0.00	0.00
CV-88-2	Culvert	S			88261	544209	7921282	Yes	Low	Yes	Low	Marginal	1	14.64	900	2	6.8	100	49	149	154608	1.1	1.7	0.25	0.46	0.02	0.03
CV-88-3	Culvert	S			88314	5444																					

Table 8.1 North Railway Culvert Crossings, Bridges, Cuts, Diversions, and Encroachments on Waterbodies and Fish Habitat

Site ID	Description	Waterbody Type ¹	Diversion to	Receives Diversion From	Rail Chainage (m)	UTM Coordinates ²		Arctic Char		Ninespine Stickleback		Habitat Quality	No. Barrels	Culvert Length (m)	Culvert Diameter (mm)	Stream Order		Culvert Footprint in Arctic Char Habitat			Catchment Areas (m ²)	Mean Annual Flow		Ranges of results			
						Easting	Northing	Fish Bearing	Classification Uncertainty	Fish Bearing	Classification Uncertainty					Stream Order at Crossing	Ave. Bank-full Habitat Width (est.) ⁷	Area Without Apron (m ²)	Apron Area (m ²)	Total Area (m ²)		Low Flow Scenario (L/s)	High Flow Scenario (L/s)	Min velocity (m/s)	Max Velocity (m/s)	Min Depth (m)	Max Depth (m)
CV-95-3	Culvert	S			96108	550483	7917613	Probable	Moderate	Probable	Moderate	Marginal - Important	1	12.2	900	1	2.8	34	20	54	49194	0.4	0.5	0.18	0.32	0.01	0.02
CV-95-4	Culvert	S			96307	550630	7917484	Probable	Moderate	Probable	Low	Marginal	1	12.2	900	1	2.8	34	20	54	30074	0.2	0.3	0.15	0.28	0.01	0.01
CV-95-5	Culvert	S			96403	550708	7917426	No	Low	No	Low	None	1	12.2	900	n/a	n/a				726430	5.3	8.0	0.00	0.00	0.00	0.00
CV-95-5a	Culvert	S			96500	550781	7917371	No	N/A	No	N/A	None	1	12.2	900	n/a	n/a				9173	0.1	0.1	0.00	0.00	0.00	0.00
CV-95-6	Culvert	S			96556	550832	7917333	No	Low	No	Low	None	1	12.2	900	n/a	n/a				30505	0.2	0.3	0.00	0.00	0.00	0.00
CV-95-7	Culvert	S			95620	550885	7917294	No	Low	No	N/A	None	1	12.2	900	n/a	n/a				7970	0.1	0.1	0.00	0.00	0.00	0.00
CV-96-1	Culvert	S			96672	550924	7917265	Yes	N/A	Yes	N/A	Important	1	26.84	900	3	5.3	142	38	180	16427000	119.9	180.7	1.02	1.87	0.15	0.27
CV-96-2	Culvert	S			96722	550964	7917235	No	N/A	No	N/A	None	1	26.84	900	n/a	n/a				114204	0.8	1.3	0.00	0.00	0.00	0.00
CV-96-3	Culvert	LP			96940	551117	7917101	No	N/A	No	N/A	None	1	26.84	900	n/a	n/a				33258	0.2	0.4	0.00	0.00	0.00	0.00
CV-97-1	Culvert	LP			97041	551191	7917013	No	N/A	No	N/A	None	1	12.2	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-97-2	Culvert	S			97095	551226	7916972	No	N/A	No	N/A	None	1	21.96	900	n/a	n/a				105572	0.8	1.2	0.00	0.00	0.00	0.00
CV-97-3	Culvert	S			97137	551254	7916940	No	N/A	No	N/A	None	1	9.76	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-97-4	Culvert	S			97194	551292	7916898	No	N/A	No	N/A	None	1	19.52	900	n/a	n/a				102526	0.7	1.1	0.00	0.00	0.00	0.00
CV-97-5	Culvert	S		CV-97-6	97286	551351	7916843	No	N/A	No	N/A	None	1	12.2	900	n/a	n/a				102526	0.7	1.1	0.00	0.00	0.00	0.00
CV-97-5b	Culvert	S			97241	551326	7916865	No	N/A	No	N/A	None	1	12.2	900	n/a	n/a				102526	0.7	1.1	0.00	0.00	0.00	0.00
CV-97-6	Cut	LP	CV-97-5		97425	551457	7916754	No	N/A	No	N/A	None		NA	NA	n/a	n/a				22328	0.2	0.2	0.00	0.00	0.00	0.00
CV-97-7	Culvert	S			97562	551576	7916658	No	N/A	No	N/A	None	1	12	900	n/a	n/a				61508	0.4	0.7	0.00	0.00	0.00	0.00
CV-97-7a	Culvert	S			97550	551560	7916671	No	N/A	No	N/A	None	1	12.2	900	n/a	n/a				61508	0.4	0.7	0.00	0.00	0.00	0.00
CV-97-9	Culvert	S			97635	551629	7916614	No	N/A	No	N/A	None	1	19.52	900	n/a	n/a				61508	0.4	0.7	0.00	0.00	0.00	0.00
CV-97-10	Culvert	S			97841	551781	7916475	No	N/A	No	N/A	None	1	19.52	900	n/a	n/a				30153	0.2	0.3	0.00	0.00	0.00	0.00
CV-97-11	Culvert	LP			97900	551823	7916434	No	N/A	No	N/A	None	1	12.2	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-97-12	Culvert	LP			97993	551891	7916370	No	N/A	No	N/A	None	1	14.64	900	n/a	n/a				20951	0.2	0.2	0.00	0.00	0.00	0.00
CV-98-0	Culvert	LP			98130	552001	7916266	No	N/A	No	N/A	None	1	19.52	900	n/a	n/a				24482	0.2	0.3	0.00	0.00	0.00	0.00
CV-98-1	Culvert	LP			98203	552043	7916226	No	N/A	No	High	None	1	19.52	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-99-1	Culvert/ encroachment	S/P			98720	552464	7915930	No	N/A	Potential	High	None - Marginal	1	12.2	900	1	2.8				20380	0.1	0.2	0.13	0.25	0.01	0.01
CV-99-2	Culvert	S			99370	552958	7915502	No	N/A	Potential	Low	None - Marginal	5	12.2	900	1	2.8				-	-	-	0.03	0.04	0.00	0.00
CV-99-3	Culvert	S			99687	553253	7915414	Yes	Low	Yes	N/A	Marginal - Important	5	12.2	900	3	16.3	199	117	316	6936290	50.6	76.3	0.49	0.89	0.05	0.08
CV-100-1	Culvert	LP			100026	553579	7915319	No	N/A	No	N/A	None	5	7.32	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-100-2	Culvert	LP			100315	553862	7915292	No	N/A	No	High	None	1	9.76	900	n/a	n/a				-	-	-	0.00	0.00	0.00	0.00
CV-100-3	Culvert	LP			100523	554050	7915379	No	N/A	No	N/A	None	1	9.76	900	1	2.8				783746	-	-	0.03	0.04	0.00	0.00
CV-100-4	Culvert	S			100673	554185	7915443	Probable	Moderate	Probable	Moderate	Marginal	2	12.2	1200	3	16.3	199	156	355	783746	5.7	8.6	0.32	0.58	0.02	0.04
CV-101-1	Culvert	S		CV-101-1a and CV-101-1b	101153	554664	7915456	Probable	Moderate	Probable	Moderate	Marginal	1	9.76	900	3	16.3	159	117	276	783746	5.7	8.6	0.41	0.75	0.04	0.06
CV-101-1a	Cut	S	CV-101-1		101280	554772	7915455	No	N/A	No	N/A	None		NA	NA	2	6.8				783746	5.7	8.6	0.00	0.00	0.00	0.00
CV-101-1b	Cut	S	CV-101-1		101380	554885	7915454	No	N/A	No	N/A	None		NA	NA	2	6.8				783746	5.7	8.6	0.00	0.00	0.00	0.00
CV-101-2	Culvert	S			101690	555200	7915449	No	N/A	Unlikely	N/A	None - Marginal	5	9.76	1400	1	2.8				123606	0.9	1.4	0.13	0.24	0.01	0.01
CV-102-1	Bridge	S			102218	555728	7915442	Yes	N/A	Yes																	

Table 8.1 North Railway Culvert Crossings, Bridges, Cuts, Diversions, and Encroachments on Waterbodies and Fish Habitat

Site ID	Description	Waterbody Type ¹	Diversion to	Receives Diversion From	Rail Chainage (m)	UTM Coordinates ²		Arctic Char		Ninespine Stickleback		Habitat Quality	No. Barrels	Culvert Length (m)	Culvert Diameter (mm)	Stream Order		Culvert Footprint in Arctic Char Habitat			Catchment Areas	Mean Annual Flow		Ranges of results			
						Easting	Northing	Fish Bearing	Classification Uncertainty	Fish Bearing	Classification Uncertainty					Stream Order at Crossing	Ave. Bank-full Habitat Width (est.) ⁷	Area Without Apron (m ²)	Apron Area (m ²)	Total Area (m ²)		(m ²)	Low Flow Scenario (L/s)	High Flow Scenario (L/s)	Min velocity (m/s)	Max Velocity (m/s)	Min Depth (m)
CV-110-2	Culvert/encroachment	P			MS Rail Loop	561266	7912241	No	N/A	No	N/A	None	TBD	TBD	TBD												
CV-110-3	Pond Infilling	P			MS Rail Loop	561445	7912240	No	N/A	No	N/A	None	TBD	TBD	TBD												
CV-110-4	Culvert	S			MS Rail Loop	561546	7912425	No	N/A	No	N/A	None	TBD	TBD	TBD												
NOTES:																		20,316.8	10,304.5	30,621.4							

NOTES:
1. Waterbody Types: S = stream; P = pond; LP = Low point; L = Lake
2. UTM Coordinates in NAD83, Zone 17

ATTACHMENT 8.2

TOTE ROAD CROSSING LIST

Table 8.2 Tote Road Crossing List

Road Section	Culvert Name		Feature	Road Chainage Reference	UTM Coordinates		Fish Bearing
				(m)	Easting	Northing	
Temporary Haul Road	CV-059-1	New	New Culvert	60500	528033	7929251	Potential
Temporary Haul Road	CV-060-1	New	New Culvert	55445	527517	7930366	Fish Bearing
Tote Road Realignment 12-530	CV-131-1	New	New Culvert	12530	511333	7967096	No
Tote Road Realignment 55-445	CV-060-2	New	New Culvert	55445	527756	7930278	Fish Bearing
Tote Road Realignment 84-500	CV-214-1	Relocate	Relocation of existing tote road culvert CV-214	84500	541273	7921956	No
Tote Road Realignment 84-500	CV-214-2	New	New culvert; no recorded culvert along existing road in the same drainage). Near rail culvert CV-85-1	84500	541507	7922071	No
Tote Road Realignment 84-500	CV-215-1		Relocation of existing tote road culvert CV-215	84500	541909	7922250	Potential
Tote Road Realignment 87+345	CV-216-1	New	New culvert; no recorded culvert along existing road in the same drainage). Near rail culvert CV-87-2	87345	543381	7921181	No
Tote Road Realignment 87+345	CV-216-2	New	New culvert; no recorded culvert along existing road in the same drainage). Near rail culvert CV-87-3	87345	543524	7921151	No
Tote Road Realignment 91-750	CV-020-1	New	New culvert in stream that runs parallel to road and eventually drains into nearby pond at existing tote road culvert CV-021. Near rail culvert CV-91-2.	91750	547094	7919813	No
Tote Road Realignment 91-750	CV-020-2	New	Same as CV020-1 above. Near rail culvert CV-91-0 and CV-91-0.	91750	546893	7919846	No
Tote Road Realignment 9-450	CV-146-1	Relocate	Relocation of existing tote road culvert CV-146	9450	508928	7968816	No
Tote Road Realignment 9-450	CV-146-2	Relocate	Relocation of existing tote road culvert CV-146	9450	508728	7968856	
Tote Road Realignment 9-450	CV-146-3	Relocate	Relocation of existing tote road culvert CV-146	9450	508720	7968885	
Tote Road Realignment 96-585	BG-13-1	New	New culvert near existing CV-007 but in a different watercourse that runs parallel to the existing road.	96585	551001	7917116	No
Tote Road Realignment 96-585	BG-14-1	New	New culvert near existing BG-14 but in a different watercourse that runs parallel to the existing road.	96585	550839	7917414	No
Laydown LD-4 off Tote Road 5-500	CV-169-1	New	New Culvert	5500	505149	7972688	Potential

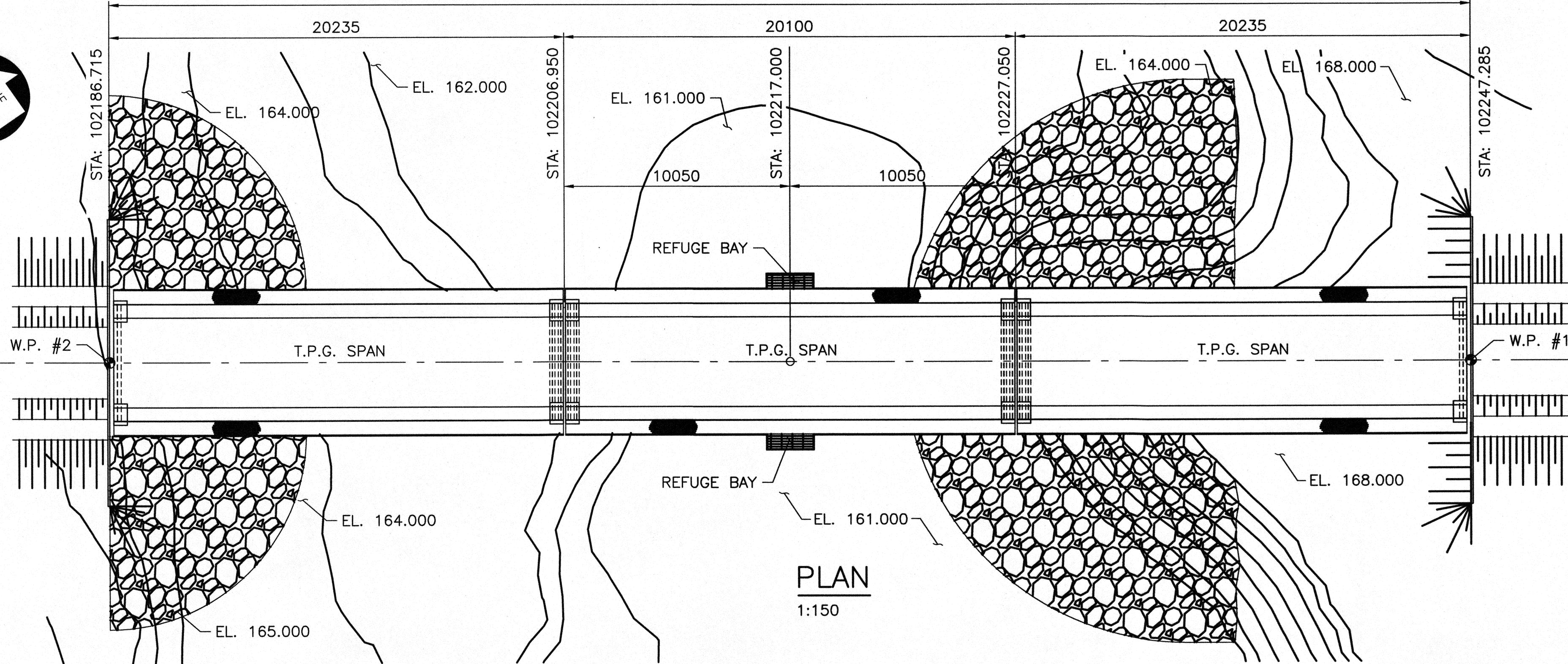
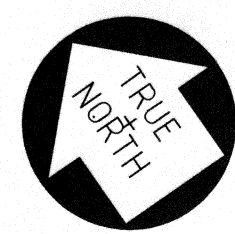
ATTACHMENT 8.3

NORTH RAILWAY BRIDGE DRAWINGS

H353004-35000-224-270-0004-0001

TRACK & BRIDGE

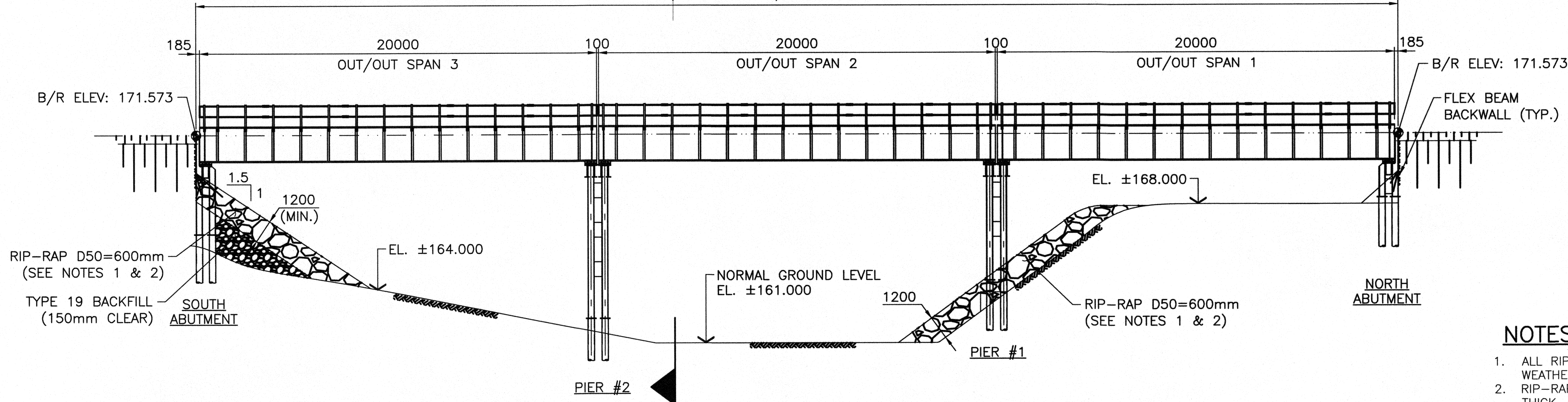
60570 F/F BACKWALLS



PLAN
1:150

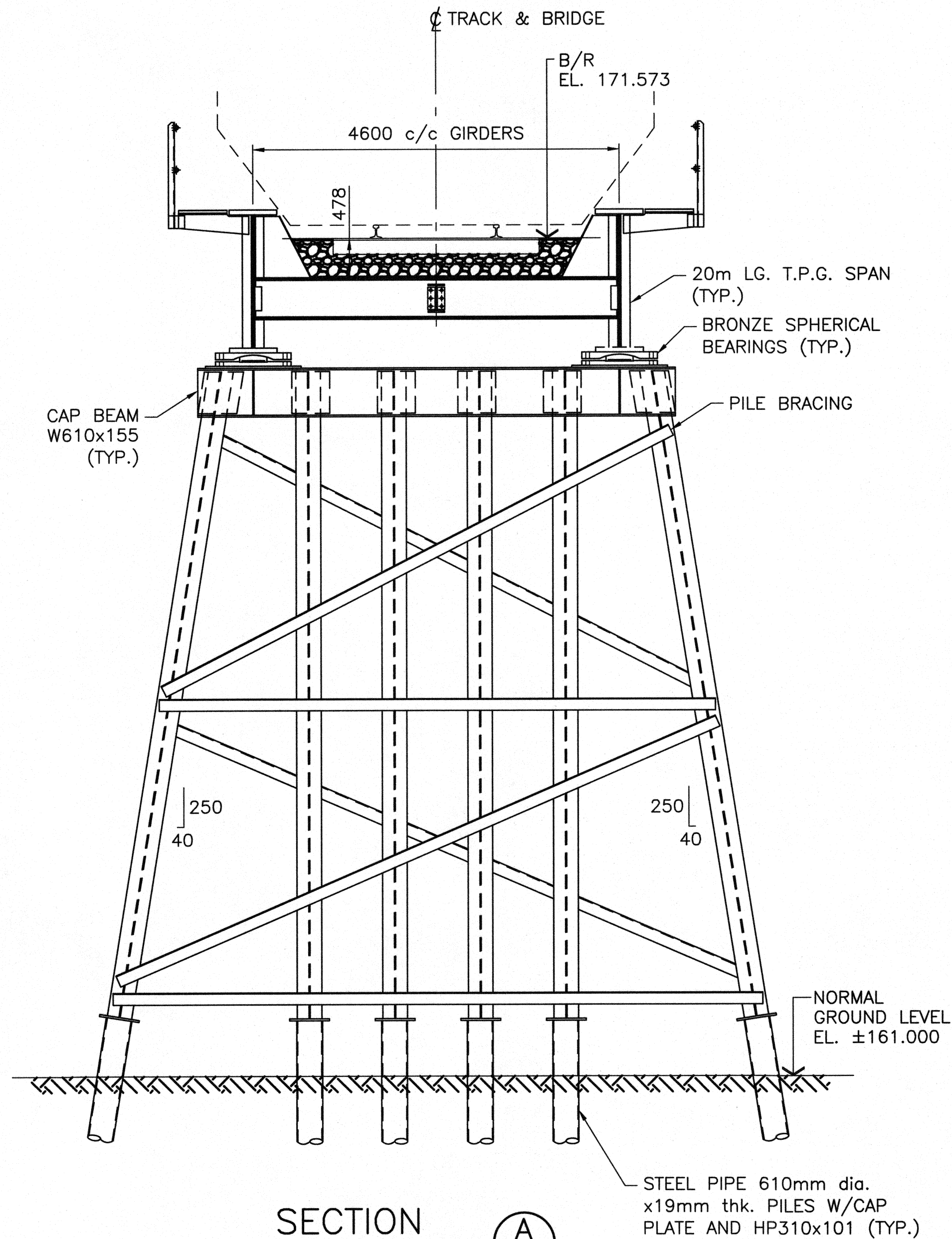
ALIGNMENT: TANGENT
GRADIENT: +0.0%

60570 F/F BACKWALLS



ELEVATION
1:150

WORKING POINT COORDINATES		
	E	N
WP #1	555757.921	7915441.329
WP #2	555697.356	7915442.128



SECTION
1:50

ESTIMATED QUANTITIES:

DESCRIPTION	QUANTITIES
HP310x101 PILES (QTY=48)	234 l.m.
610mm dia.x19mm thk. STEEL PIPE PILES (QTY=48)	LENGTHS T.B.D.
W610x155 CAP BEAMS (QTY=12)	72 l.m.
FLEXBEAM BACKWALL (QTY=2)	78 m ²
BRONZE BEARINGS (QTY=12)	8,790 Kg
20m T.P.G. SPANS (QTY=3)	156,000 Kg
WALKWAY HANDRAIL	121 l.m. (1,015 Kg)
WALKWAY GRATING	74 m ²
WALKWAY BRACKETS/POSTS (QTY=96)	3,840 Kg
TYPE 19 BACKFILL (150mm CLEAR)	180 m ³
RIP-RAP D50 (600mm)	570 m ³

NOTES:

- ALL RIP-RAP MATERIAL SHALL BE RESISTANT TO WEATHERING AND WATER ACTION.
- RIP-RAP PROTECTION IS TO BE MINIMUM 1.2m THICK. THE GRADATION SHALL BE SUCH THAT 50 PERCENT OF THE RIP RAP CONSISTS OF MATERIAL HAVING A MINIMUM DIMENSION OF 600mm (D50).
- THIS DRAWING WAS PREVIOUSLY ISSUED AS: H353004-35000-224-270-0004-0001
- ALL DIMENSIONS IN mm UNLESS INDICATED OTHERWISE.

NOT FOR CONSTRUCTION

THIS DRAWING WAS PREPARED BY HATCH LTD. ("HATCH") FOR THE EXCLUSIVE USE OF BAFFINLAND IRON MINES LP ("CLIENT") AND ITS USE IS SUBJECT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN HATCH AND THE CLIENT. INCLUDING ANY LIMITATIONS ON LIABILITY CONTAINED THEREIN. THIS DRAWING AND ITS CONTENTS REMAIN THE INTELLECTUAL PROPERTY OF HATCH SUBJECT TO CLIENTS ROYALTY-FREE, REVOCABLE, PERPETUAL, AND NON-EXCLUSIVE LICENSE TO USE AND REPRODUCE THE DRAWING FOR PURPOSES CONNECTED WITH THE PROJECT, INCLUDING THE CONSTRUCTION, COMPLETION, MAINTENANCE, EXTENSION, REINSTATEMENT AND REPAIR OF THE PROJECT. THIS DRAWING AND THE INFORMATION CONTAINED HEREIN, SHALL BE TREATED AS CONFIDENTIAL FOR ALL OTHER PURPOSES AND SHALL NOT BE MODIFIED WITHOUT THE WRITTEN CONSENT OF HATCH.

HATCH

Baffinland

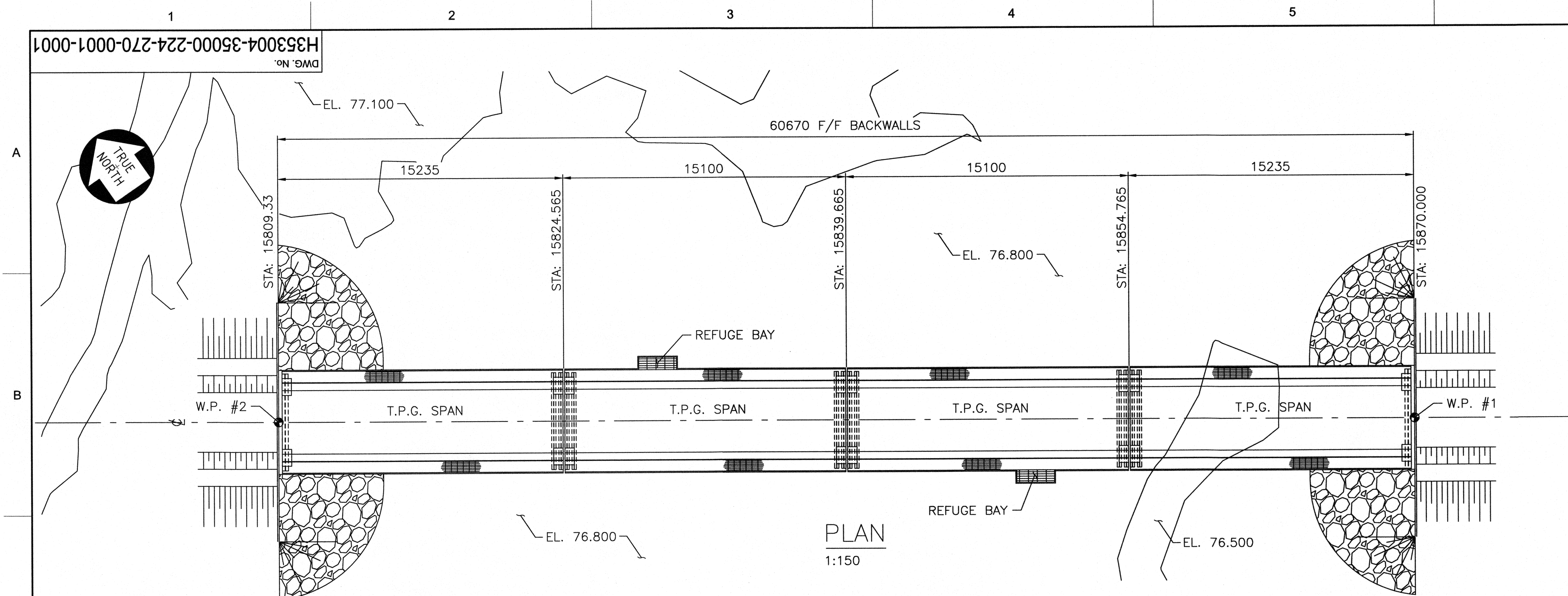
BAFFINLAND IRON MINES LP
MARY RIVER PROJECT

RAIL SITE
BRIDGE GENERAL LAYOUT
BR-102-1

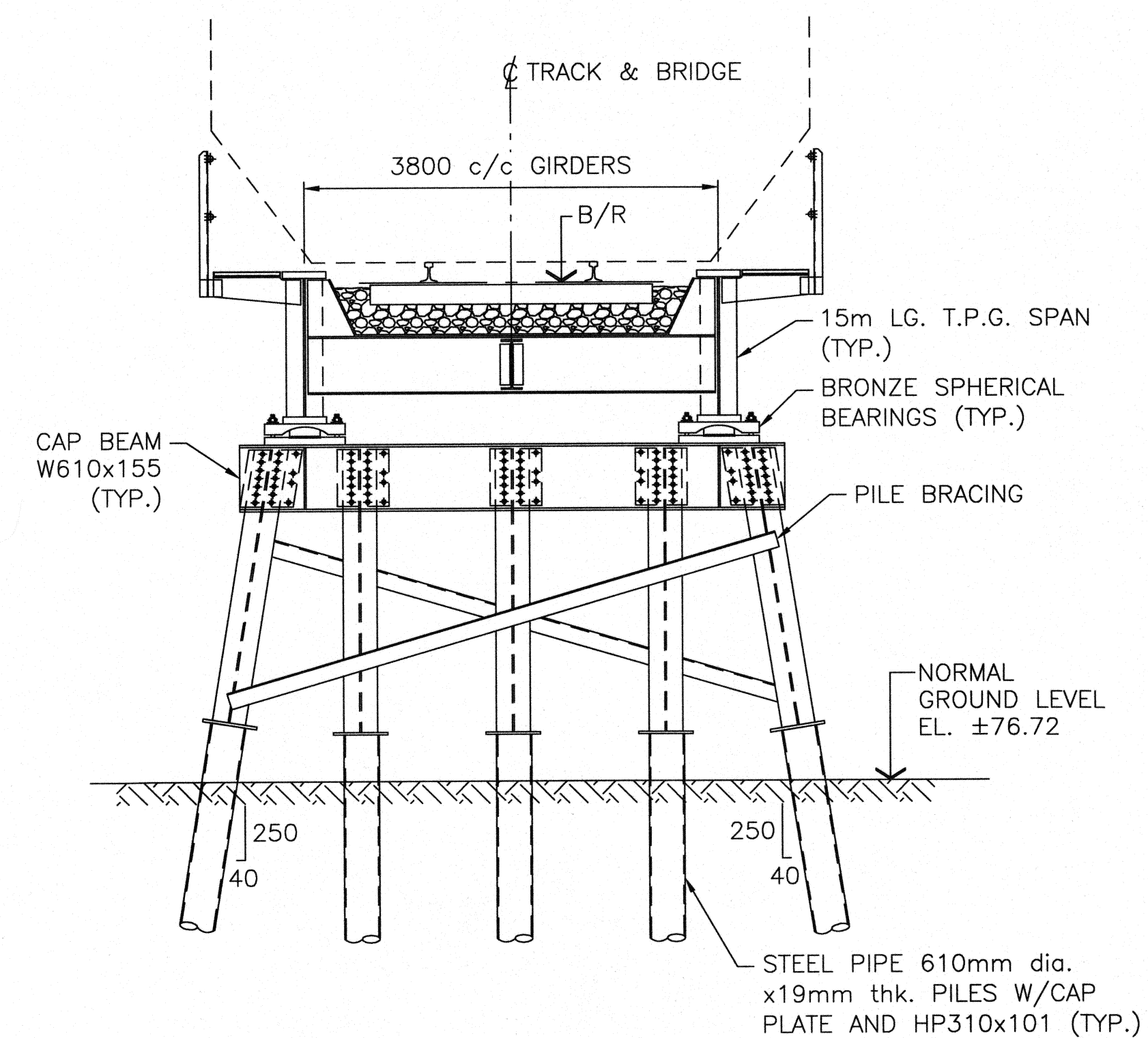
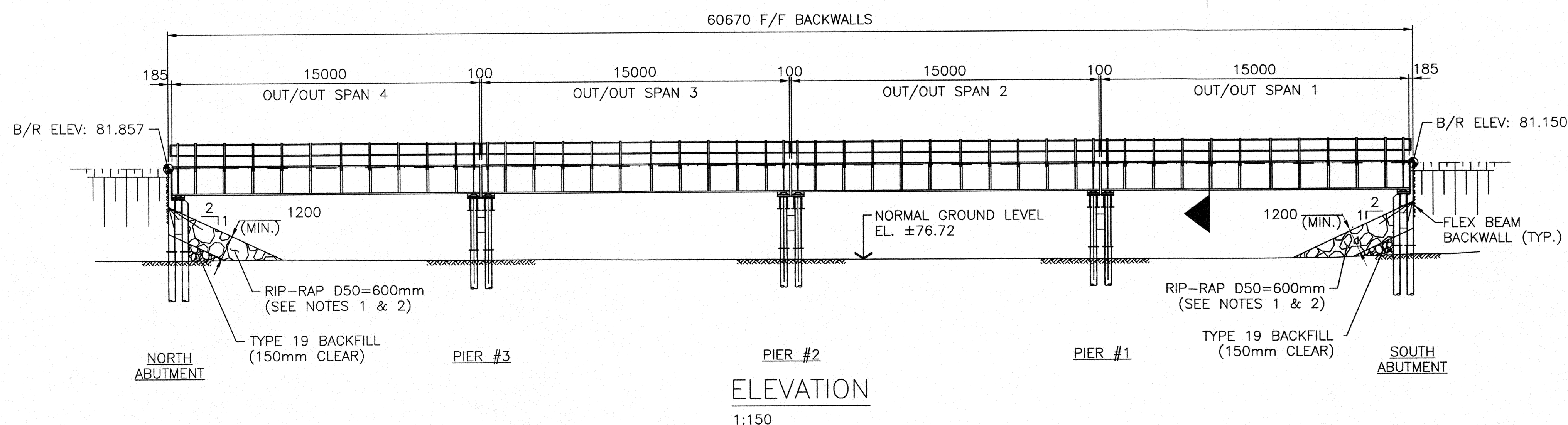
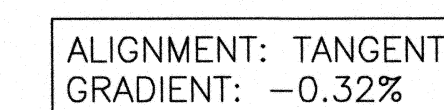
DRAFTSPERSON	J ESTRIDE	NR	2016/09/06
DESIGNER	J ESTRIDE	NR	
CHECKER	A MIDDLETON		
DESIGN COORD.	A AQUIL		2016/09/23
RESP. ENG.	A MIDDLETON		
LEAD DISC. ENG.	F VAN BILJON		2016/09/27
AREA LEAD	F VAN BILJON		2016/09/27
ENG. MANAGER	D STANGER		2016/09/29
CLIENT	F PITTMAN		
ROLE	NAME	SIGNATURE	DATE
DRAWING APPROVAL STATUS:		APPROVED FOR USE	

SCALE	DWG. No.	REV
OR AS NOTED	H353004-35000-224-270-0004-0001	0

SHEET SIZE: D



WORKING POINT COORDINATES		
	E	N
WP #1	514260.2440	7965610.4080
WP #2	514210.6739	7965645.3887



SECTION

1:50

NOTES:

1. ALL RIP-RAP MATERIAL SHALL BE RESISTANT TO WEATHERING AND WATER ACTION.
2. RIP-RAP PROTECTION IS TO BE MINIMUM 1.2m THICK. THE GRADATION SHALL BE SUCH THAT 50 PERCENT OF THE RIP RAP CONSISTS OF MATERIAL HAVING A MINIMUM DIMENSION OF 600mm (D50).
3. PRE-FABRICATED BRIDGE SPANS TO BE USED FOR THIS PROJECT.
4. THIS DRAWING WAS PREVIOUSLY ISSUED AS:
H353004-4 3330-230-270-0001-0001
5. ALL DIMENSIONS IN mm UNLESS INDICATED OTHERWISE.

ESTIMATED QUANTITIES:

DESCRIPTION	QUANTITIES
HP310x101 PILES (QTY-50)	145 l.m.
ø610mm x19mm thk. STEEL PIPE PILES (QTY-50)	LENGTHS T.B.D.
W610x155 CAP BEAMS (QTY-16)	80 l.m.
FLEXBEAM BACKWALL (QTY-2)	78 m ²
BRONZE BEARINGS (QTY-16)	10,675 Kg
15m T.P.G. SPANS (QTY-4)	148,320 Kg
WALKWAY HANDRAIL	121 l.m. (1,015 Kg)
WALKWAY GRATING	74 m ²
WALKWAY BRACKETS/POSTS (QTY-96)	3,840 Kg
TYPE 19 BACKFILL (150mm CLEAR)	55 m ³
RIP-RAP D50 (600mm)	180 m ³

NOT FOR CONSTRUCTION

THIS DRAWING WAS PREPARED BY HATCH LTD. ("HATCH") FOR THE EXCLUSIVE USE OF BAFFINLAND IRON MINES LP ("CLIENT") AND ITS USE IS SUBJECT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN HATCH AND THE CLIENT. INCLUDING ANY LIMITATIONS ON LIABILITY CONTAINED THEREIN. THIS DRAWING AND ITS CONTENTS REMAIN THE INTELLECTUAL PROPERTY OF HATCH AND ARE HEREBY GRANTED TO CLIENT ON A NON-EXCLUSIVE, NON-TRANSFERABLE, NON-ASSIGNABLE, NON-REPROducible, NON-REVOCABLE, IRREVOCABLE, PERPETUAL AND NON-EXCLUSIVE LICENSE TO USE AND REPRODUCE THE DRAWING FOR PURPOSES CONNECTED WITH THE PROJECT, INCLUDING THE CONSTRUCTION, COMPLETION, MAINTENANCE, EXTENSION, REINSTATEMENT AND REPAIR OF THE PROJECT. THIS DRAWING, AND THE INFORMATION CONTAINED HEREIN, SHALL BE TREATED AS CONFIDENTIAL FOR ALL OTHER PURPOSES AND SHALL NOT BE MODIFIED WITHOUT THE WRITTEN CONSENT OF HATCH.

HATCH



Baffinland

**BAFFINLAND IRON MINES LP
MARY RIVER PROJECT**

RAIL SITE
BRIDGE GENERAL LAYOUT
BR-15-1

DRAFTSPERSON	J ESTRADE		NR	2016/09/06
DESIGNER	J ESTRADE		NR	
CHECKER	A MIDDLETON	arthur.middleton@phobos.mn.ca		
RESP. COORD.	A AQUIL	www.aquilinc.com/phobos.mn.ca		2018/04/27
RESP. ENG.	A MIDDLETON			
LEAD DISC. ENG.	F VAN BIJLO			2018/04/27
AREA LEAD	F VAN BIJLO			2018/04/27
ENG. MANAGER	D STANGER			2018/04/27
CLIENT	F PITTMAN			2018/04/24

SCALE	DWG. No.
OR AS NOTED	H353004-35000-224-270-0001-0001

H353004-30000-224-271-0007	LAYOUT AND LONGITUDINAL SECTION CH. 14+100 TO CH. 18+720
DRAWING No.	DRAWING TITLE

DRAWING NO.	DATE
REFERENCE DRAWINGS	

REG. PROFESSIONAL

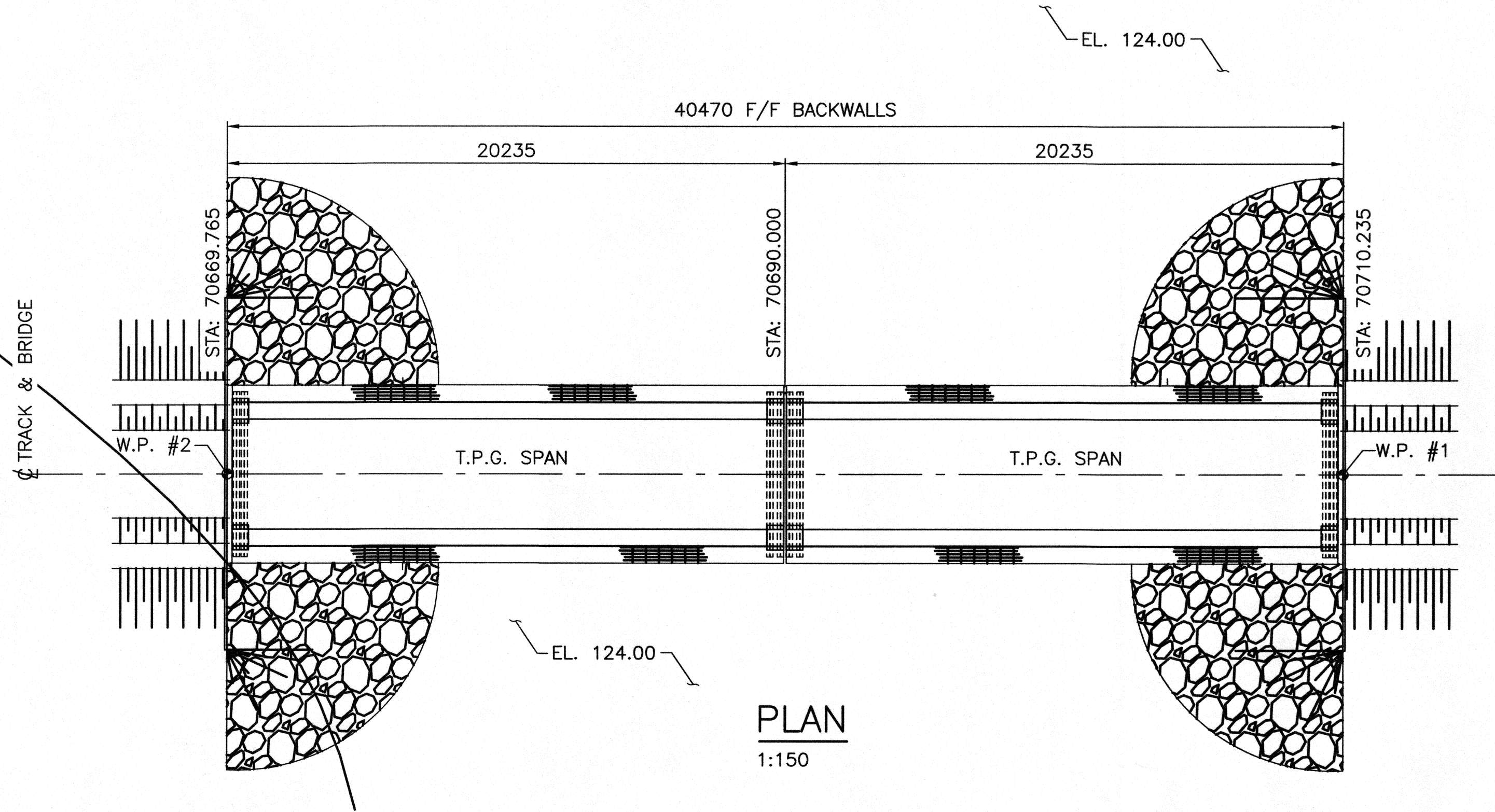
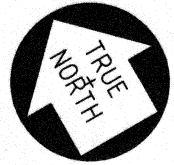
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No.	DESCRIPTION	BY	CHK'D	DATE
REVISIONS				

DRAWING APPROVAL STATUS: APPROVED FOR USE

OR AS NOTED H353004-35000-224-270-0001-0001

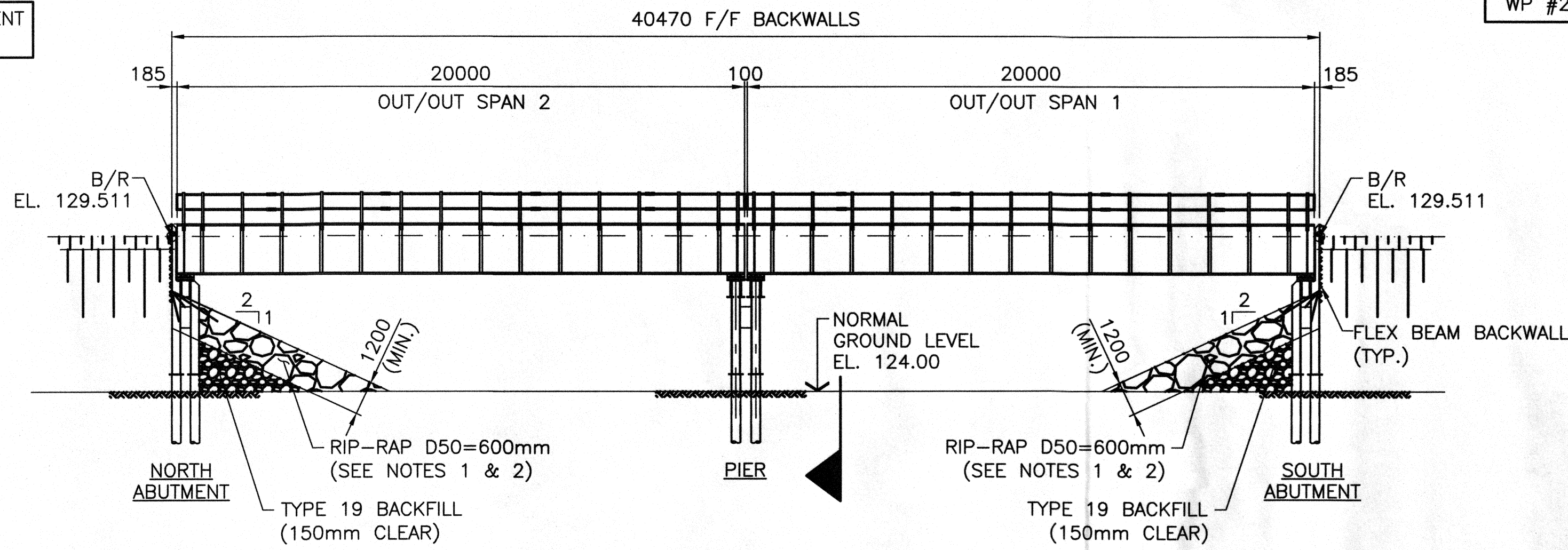
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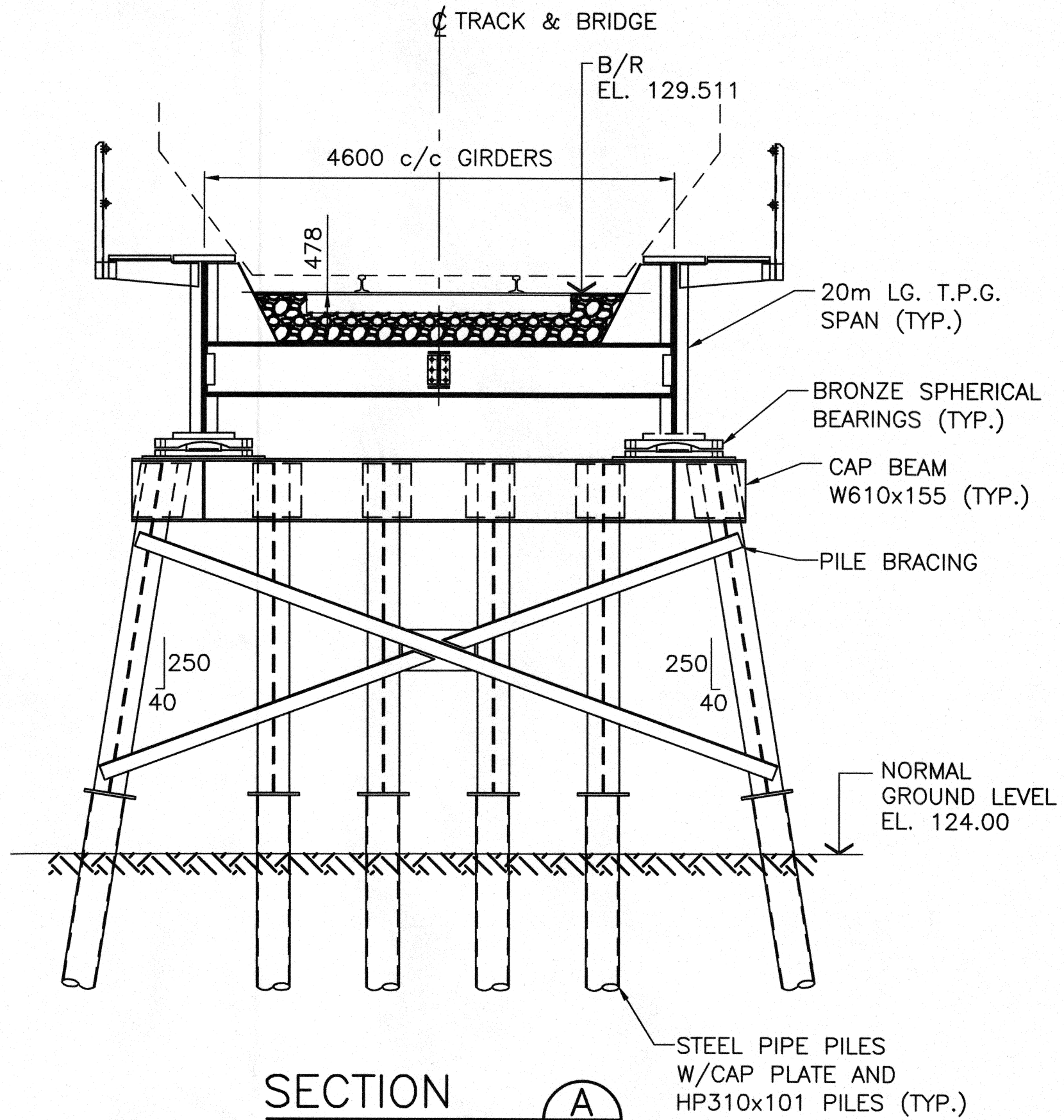
PLAN
1:150

ALIGNMENT: TANGENT
GRADIENT: +0.0%



ELEVATION

WORKING POINT COORDINATES		
	E	N
WP #1	529,142.297	7,916,679.156
WP #2	529,107.458	7,916,699.747



SECTION
1:50

NOTES:

- ALL RIP-RAP MATERIAL SHALL BE RESISTANT TO WEATHERING AND WATER ACTION.
- RIP-RAP PROTECTION IS TO BE MINIMUM 1.2m THICK. THE GRADATION SHALL BE SUCH THAT 50 PERCENT OF THE RIP RAP CONSISTS OF MATERIAL HAVING A MINIMUM DIMENSION OF 600mm (D50).
- THIS DRAWING WAS PREVIOUSLY ISSUED AS:
H353004-3330-230-270-0002-0001
- ALL DIMENSIONS IN mm UNLESS INDICATED OTHERWISE.

ESTIMATED QUANTITIES:	
DESCRIPTION	QUANTITIES
HP310x101 PILES (QTY-36)	143 l.m.
610mm dia.x19mm thk. STEEL PIPE PILES (QTY-36)	LENGTHS T.B.D.
W610x155 CAP BEAMS (QTY-8)	48 l.m.
FLEXBEAM BACKWALL (QTY-2)	78 m ²
BRONZE BEARINGS (QTY-8)	5,860 Kg
20m T.P.G. SPANS (QTY-2)	104,000 Kg
WALKWAY HANDRAIL	80 l.m. (680 Kg)
WALKWAY GRATING	49 m ²
WALKWAY BRACKETS/POSTS (QTY-64)	2,495 Kg
TYPE 19 BACKFILL (150mm CLEAR)	310 m ³
RIP-RAP D50 (600mm)	340 m ³

NOT FOR CONSTRUCTION

THIS DRAWING WAS PREPARED BY HATCH LTD. ("HATCH") FOR THE EXCLUSIVE USE OF BAFFINLAND IRON MINES LP ("CLIENT") AND ITS USE IS SUBJECT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN HATCH AND THE CLIENT. INCLUDING ANY LIMITATIONS ON LIABILITY CONTAINED THEREIN. THIS DRAWING AND ITS CONTENTS REMAIN THE INTELLECTUAL PROPERTY OF HATCH SUBJECT TO CLIENT'S ROYALTY-FREE, REVOCABLE, PERPETUAL, AND NON-EXCLUSIVE LICENSE TO USE AND REPRODUCE THE DRAWING FOR PURPOSES CONNECTED WITH THE PROJECT, INCLUDING THE CONSTRUCTION, COMPLETION, MAINTENANCE, EXTENSION, REINSTATEMENT AND REPAIR OF THE PROJECT. THIS DRAWING AND THE INFORMATION CONTAINED HEREIN, SHALL BE TREATED AS CONFIDENTIAL FOR ALL OTHER PURPOSES AND SHALL NOT BE MODIFIED WITHOUT THE WRITTEN CONSENT OF HATCH.

HATCH

Baffinland

BAFFINLAND IRON MINES LP
MARY RIVER PROJECT

RAIL SITE
BRIDGE GENERAL LAYOUT
BR-70-1

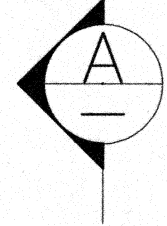
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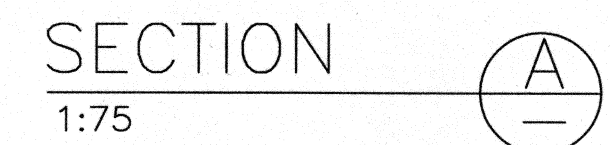
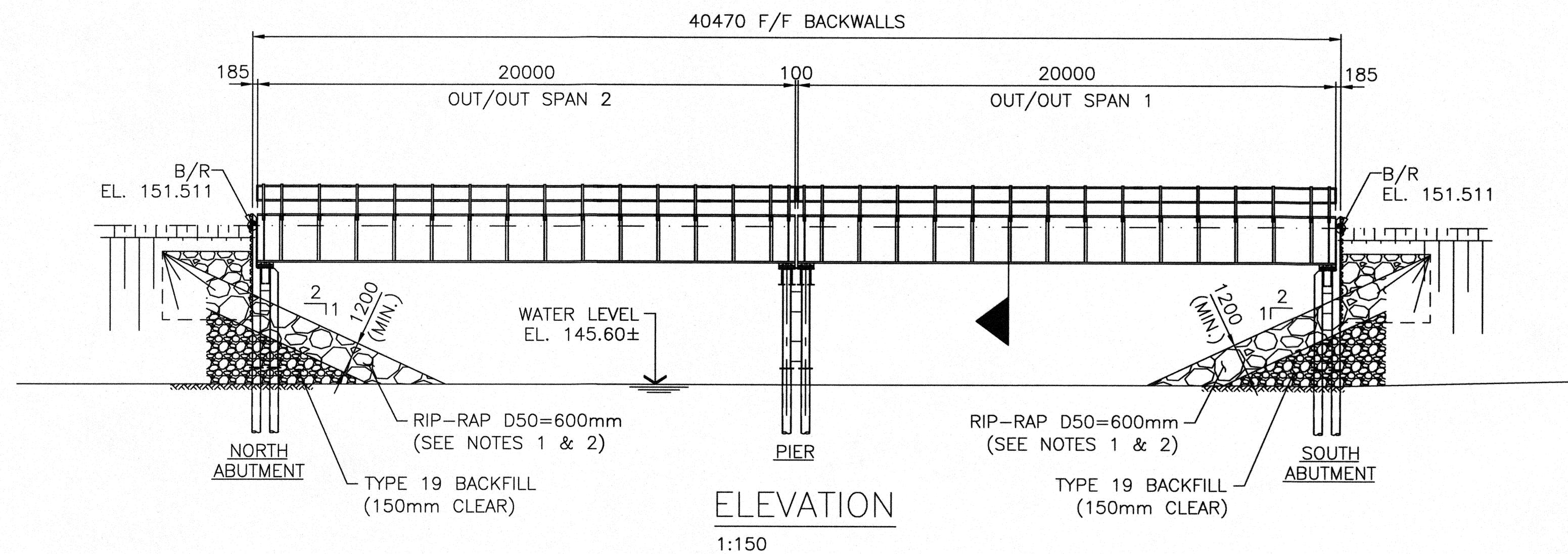
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DRAFTSPERSON		S HANDY		NR		2016/09/06	
DESIGNER	S HANDY	CHECKER	A MIDDLETON	DESIGN COORD.	A AQUIL	RESP. ENG.	A MIDDLETON
LEAD DISC. ENG.	F VAN BILJON	AREA LEAD	F VAN BILJON	ENG. MANAGER	D STANGER	CLIENT	F PITTMAN
ROLE	NAME	SIGNATURE	DATE	SCALE	DWG. No.	REV	0
DRAWING APPROVAL STATUS:	APPROVED FOR USE	OR AS NOTED	H353004-35000-224-270-0002-0001	0			

BAFFINLAND IRON MINES LP MARY RIVER PROJECT	RAIL SITE BRIDGE GENERAL LAYOUT BR-70-1	SCALE	DWG. No.	REV	0
H353004-35000-224-270-0002-0001	0				



ALIGNMENT: TANGENT
GRADIENT: +0.0%



1. ALL RIP-RAP MATERIAL SHALL BE RESISTANT TO WEATHERING AND WATER ACTION.
2. RIP-RAP PROTECTION IS TO BE MINIMUM 1.2m THICK. THE GRADATION SHALL BE SUCH THAT 50 PERCENT OF THE RIP RAP CONSISTS OF MATERIAL HAVING A MINIMUM DIMENSION OF 600mm (D50).
3. PRE-FABRICATED BRIDGE SPANS TO BE USED FOR THIS PROJECT.
4. THIS DRAWING WAS PREVIOUSLY ISSUED AS:
H353004-3330-230-270-0003-0001
5. ALL DIMENSIONS IN mm UNLESS INDICATED OTHERWISE.

ESTIMATED QUANTITIES:	
DESCRIPTION	QUANTITIES
HP310x101 PILES (QTY-36)	160 l.m.
610mm dia.x19mm thk. STEEL PIPE PILES (QTY-36)	LENGTHS T.B.D.
W610x155 CAP BEAMS (QTY-8)	48 l.m.
FLEXBEAM BACKWALL (QTY-2)	104 m ²
BRONZE BEARINGS (QTY-8)	5,860 Kg
20m T.P.G. SPANS (QTY-2)	104,000 Kg
WALKWAY HANDRAIL	80 l.m. (670 Kg)
WALKWAY GRATING	49 m ²
WALKWAY BRACKETS/POSTS (QTY-64)	2,497 Kg
GABION WALL (QTY-4)	60 m ²
TYPE 19 BACKFILL (150mm CLEAR)	300 m ³
RIP-RAP D50 (600mm)	260 m ³

NOT FOR CONSTRUCTION

THIS DRAWING WAS PREPARED BY HATCH LTD. (HATCH) FOR THE EXCLUSIVE USE OF BAFFINLAND IRON MINES LP ("CLIENT") AND ITS USE IS SUBJECT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN HATCH AND THE CLIENT, INCLUDING ANY LIMITATIONS ON LIABILITY CONTAINED THEREIN. THIS DRAWING AND ITS CONTENTS REMAIN THE INTELLECTUAL PROPERTY OF HATCH SUBJECT TO CLIENT'S ROYALTY-FEE, IRREVOCABLE, PERPETUAL, AND NON-EXCLUSIVE LICENSE TO USE AND REPRODUCE THE DRAWING FOR PURPOSES CONNECTED WITH THE PROJECT, INCLUDING THE CONSTRUCTION, COMPLETION, MAINTENANCE, EXTENSION, REINSTATEMENT AND REPAIR OF THE PROJECT. THIS DRAWING, AND THE INFORMATION CONTAINED HEREIN, SHALL BE TREATED AS CONFIDENTIAL FOR ALL OTHER PURPOSES AND SHALL NOT BE MODIFIED WITHOUT THE WRITTEN CONSENT OF HATCH.

HATCH



Baffinland

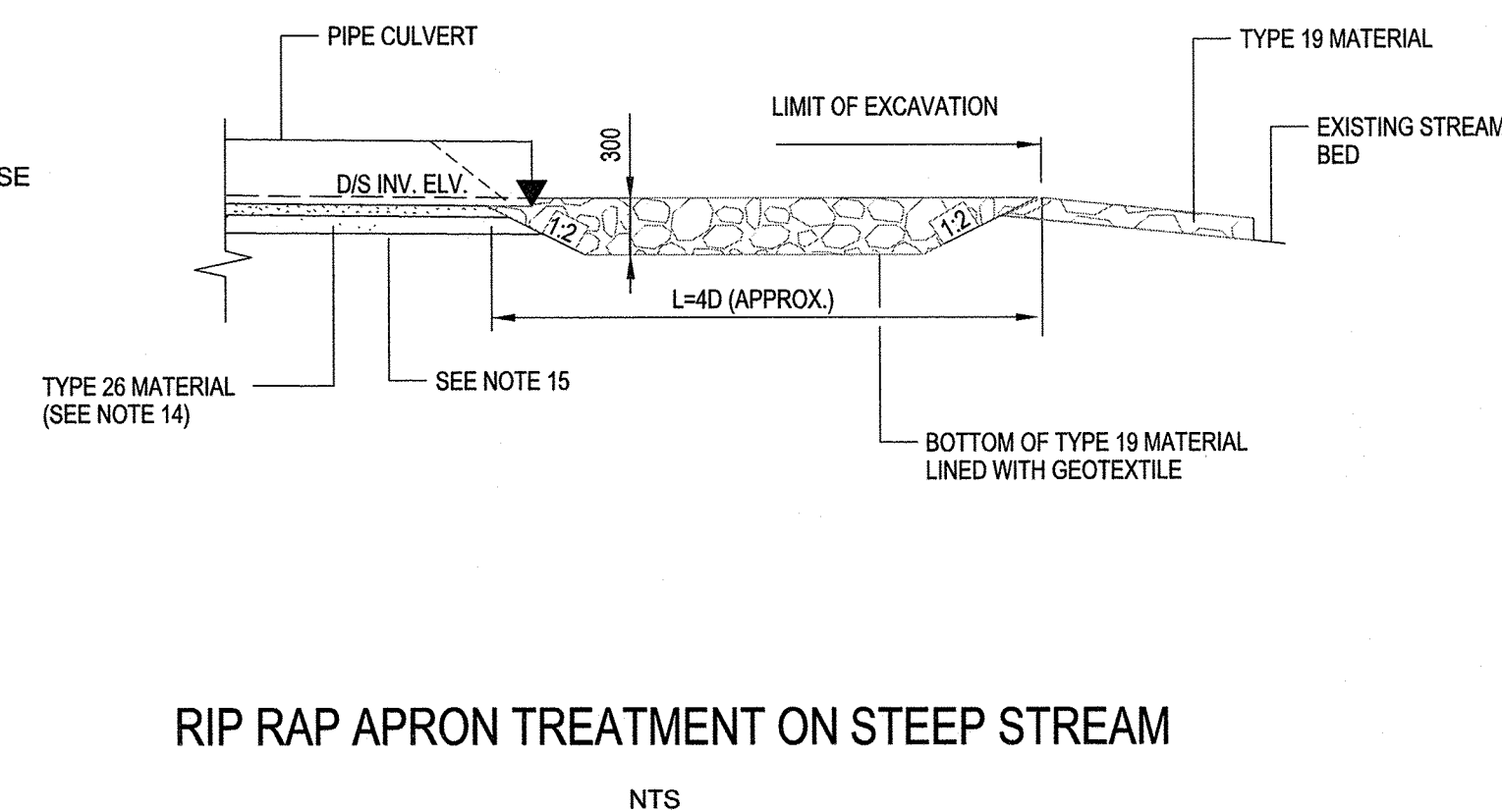
BAFFINLAND IRON MINES LP
MARY RIVER PROJECT

RAIL SITE
BRIDGE GENERAL LAYOUT
BR-86-1

SCALE	DWG. No.	R
OR AS NOTED	H353004-35000-224-270-0003-0001	(

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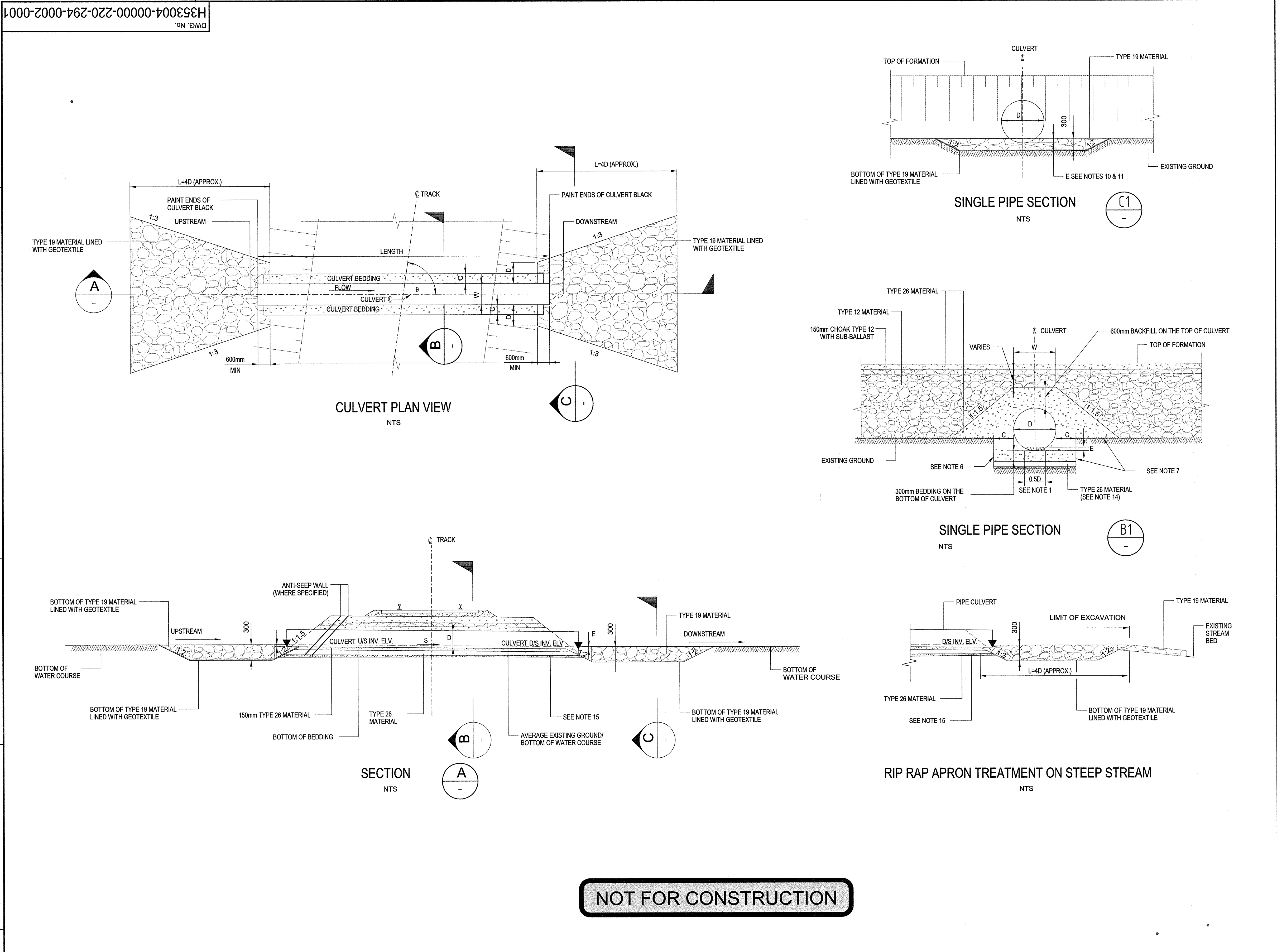


SHEET SIZE: A

		NAME		Reserved space for Issue Reason stamp applied by Document Control		THIS DRAWING WAS PREPARED FOR THE EXCLUSIVE USE OF BAFFINLAND IRON CORPORATION ("CLIENT") AND IS ISSUED PURSUANT TO THE AGREEMENT BETWEEN CLIENT AND HATCH LTD. ("HATCH"). UNLESS OTHERWISE AGREED IN WRITING WITH CLIENT OR SPECIFIED ON THIS DRAWING, (A) HATCH DOES NOT ACCEPT AND DISCLAIMS ANY AND ALL LIABILITY OR RESPONSIBILITY ARISING FROM ANY USE OF OR RELIANCE ON THIS DRAWING BY ANY THIRD PARTY OR ANY MODIFICATION OR MISUSE OF THIS DRAWING BY CLIENT, AND (B) THIS DRAWING IS CONFIDENTIAL AND ALL INTELLECTUAL PROPERTY RIGHTS EMBODIED OR REFERENCED IN THIS DRAWING REMAIN THE PROPERTY OF HATCH.		 			
		SIGNATURE						DRAFTSPERSON S ATKINSON DESIGNER CHECKER R MEISERS DESIGN COORD. RESP. ENG. LEAD DISC. ENG. ENG. MANAGER PROJ. MANAGER		2016/12/07 NR 2nd/12/15 2nd/12/15 2nd/12/15 2nd/12/15	
		ENG REG NUMBER								TYPICAL CROSS SECTION- MULTIPLE BARREL PIPE CULVERT	
		REVISION DATE								SCALE NTS OR AS NOTED	
		ORIGINAL DATE		0 APPROVED FOR BID		SPA BY CHKD DATE 2016/12/07		ROLE NAME SIGNATURE DATE		DWG. No. H353004-00000-220-294-0001-0001	

A
B
C
D
E
F

A
B
C
D
E
F



LEGEND

D	CULVERT DIAMETER
E	EMBEDMENT DEPTH
C	CULVERT SPACING AND BEDDING CLEARANCE C=600 WHILE D>900mm C=300 WHILE D<=900mm
W	CULVERT BACKFILL TOP WIDTH W=n*D+(n-1)*C
U/S INV. ELV.	CULVERT UPSTREAM INVERT ELEVATION
D/S INV. ELV.	CULVERT DOWNSTREAM INVERT ELEVATION
L	RIPRAP APRON LENGTH L=4*D (APPROX.)
S	CULVERT SLOPE
LENGTH	CULVERT LENGTH
INV	INVERT
θ	ANGLE OF SKEW

NOTES:

- THE PIPE BED SHALL BE SHAPED TO RECEIVE THE BOTTOM OF THE PIPE.
- GRANULAR MATERIAL PLACED UNDER THE HAUNCH MUST BE COMPACTED.
- BEDDING AND BACKFILL MATERIAL SHALL BE HOMOGENEOUS GRANULAR MATERIAL, AND SHALL BE PLACED AND COMPACTED UNIFORMLY AROUND THE PIPE.
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE
- ALL ELEVATIONS ARE IN METERS UNLESS NOTED OTHERWISE.
- WHERE VERTICAL EXCAVATION IS NOT POSSIBLE, MODIFY EXCAVATION SLOPE TO MIN. 1.5H: 1V.
- PROVIDE 300mm TYPE 8 (150mm MINUS) AROUND BEDDING AND BACK FILL MATERIAL ONLY WHEN ROCKFILL IS PRESENT.
- ADJUST CULVERT START AND END COORDINATES AND INVERT ELEVATIONS IN THE FIELD AS APPROVED BY COMPANY'S REPRESENTATIVE.
- FLOW DIRECTION MUST BE FROM UPSTREAM TO DOWNSTREAM. PROVIDE AVERAGE STREAM SLOPE ALONG THE CULVERT AS CULVERT SLOPE BASED ON ACTUAL FIELD CONDITION.
- FOR FISH BEARING CULVERT, E=0.1D-0.25D
FOR NON-FISH BEARING CULVERT, E=0
- FOR FISH BEARING CULVERT WITH MULTIPLE PIPES, ONLY ONE PIPE SHALL BE EMBEDDED BY "E" (APPROXIMATELY 0.1D-0.25D) ALL OTHER PIPES SHALL BE PLACED ON GROUND/BOTTOM OF WATER COURSE.
- COMPACTED ROCK-FILL (TYPE 8) MATERIAL TO BE PLACED ON THE NATURAL GROUND OR RAISED GRADE. DEPTH OF ROCK-FILL VARIES BETWEEN 1m AND 1.5m
- ADDITIONAL FILL OF RUN OF QUARRY (TYPE 12) OR ROCK-FILL (TYPE 8)