

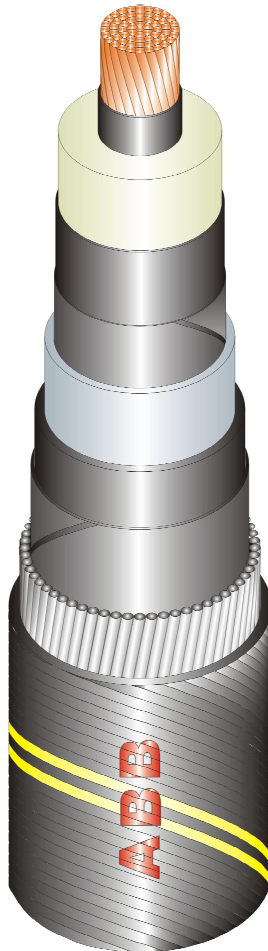
ATTACHMENT H

Revised Attachment H: Cross Section Diagrams

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2.2 Cable Design Sheet



Rated DC Voltage	±320 kV	
Conductor		
Type / material	profiled strands / copper	
Cross-section	2,200 mm ²	
Water blocking compound		
Diameter	2.15 inches	(54.6 mm)
Conductor binder		
Material	semi-conductive swelling tape	
Thickness	24 mils	(0.6 mm)
Conductor shield		
Material	semi-conductive polymer	
Thickness	59 mils	(1.5 mm)
Insulation		
Material	cross-linked DC polymer	
Thickness	787 mils	(20 mm)
Insulation shield		
Material	semi-conductive polymer	
Thickness	55 mils	(1.4 mm)
Longitudinal water barrier		
Material	semi-conducting swell-able tape	
Thickness	24 mils	(0.6 mm)
Metallic sheath		
Type / material	extruded / lead alloy	
Thickness	130 mils	(3.3 mm)
Inner sheath		
Material	high-density polyethylene	
Thickness	118 mils	(3.0 mm)
Tensile armour		
Type / material	wire / steel	
Thickness	197 mils	(5 mm)
Outer serving		
Material	polypropylene yarn, 2 layers	
Thickness	157 mils	(4 mm)
Complete cable		
Diameter	5.24 inches	(133 mm)
Weight in air	34.9 lbs./ft.	(51 kg/m)
Weight in water	26.2 lbs./ft.	(39 kg/m)

Note: All data shall be considered nominal

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



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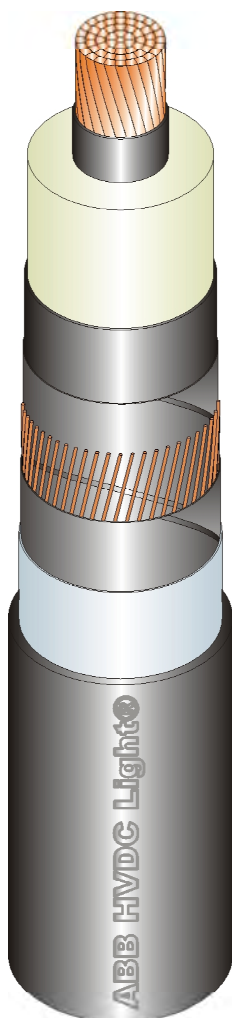
Champlain Hudson Power Express Inc.

HVDC MARINE CABLE

176764-CD-02

Prepared by: **HDR** **DTA** & **CTRC** xx/xx2011

3.2 Cable Design Sheet



Rated DC Voltage	±320 kV
Conductor	
Type / material	profiled strands / copper
Cross-section	2,300 mm ²
Water blocking	compound or swelling tape
Diameter	2.19 inches (56.0 mm)
Conductor binder	
Material	semi-conductive swelling tape
Thickness	24 mils (0.6 mm)
Conductor shield	
Material	semi-conductive polymer
Thickness	59 mils (1.5 mm)
Insulation	
Material	cross-linked DC polymer
Thickness	787 mils (20 mm)
Insulation shield	
Material	semi-conductive polymer
Thickness	55 mils (1.4 mm)
Longitudinal water barrier	
Material	semi-conducting swell-able tape
Thickness	24 mils (0.6 mm)
Metallic screen	
Type / material	round wires / copper
Thickness	43 mils (1.3 mm)
Total cross-section	75 mm ²
Longitudinal water barrier	
Material	semi-conducting swell-able tape
Thickness	24 mils (0.6 mm)
Radial moisture/water barrier	
Type / material	longitudinal applied foil / Aluminum
Thickness	7.9 mils (0.2 mm)
Outer jacket	
Material	high-density polyethylene
Thickness	189 mils (4.8 mm)
Complete cable	
Diameter	4.6 inches (117 mm)
Weight	19.5 lbs./ft. (29 kg/m)

Note: All data shall be considered nominal

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



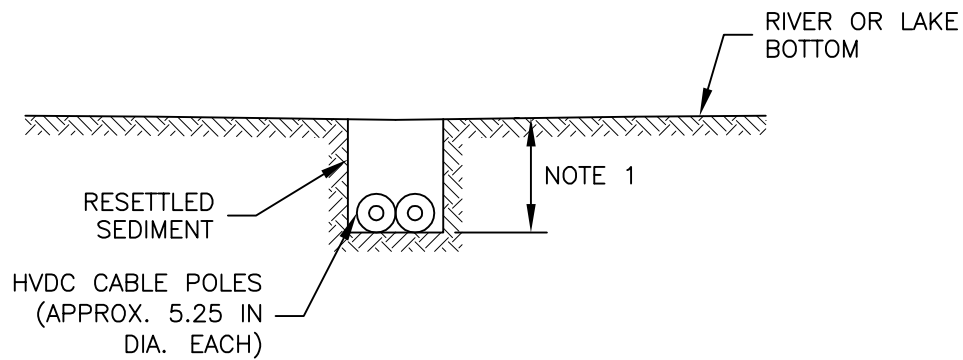
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

HVDC TERRESTRIAL CABLE

176764-CD-03

Prepared by: HDR | DTA & CTRC xx/xx2011




NOTE:

1. BURIAL DEPTH SHALL BE 15'-0" MIN. WITHIN MAINTAINED NAVIGATION CHANNELS. BURIAL DEPTH IS EXPECTED TO BE 6'-0" IN THE HUDSON, HARLEM AND EAST RIVERS, AND NOT LESS THAN 3'-0" WHEN THE CABLES ARE BURIED IN LAKE CHAMPLAIN.

FORMERLY DRAWING 176764-ACOE-E04

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
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1	BURIAL DEPTH PER SETTLEMENT PARTIES	4/28/11	TRC	TRC	.	.
2	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



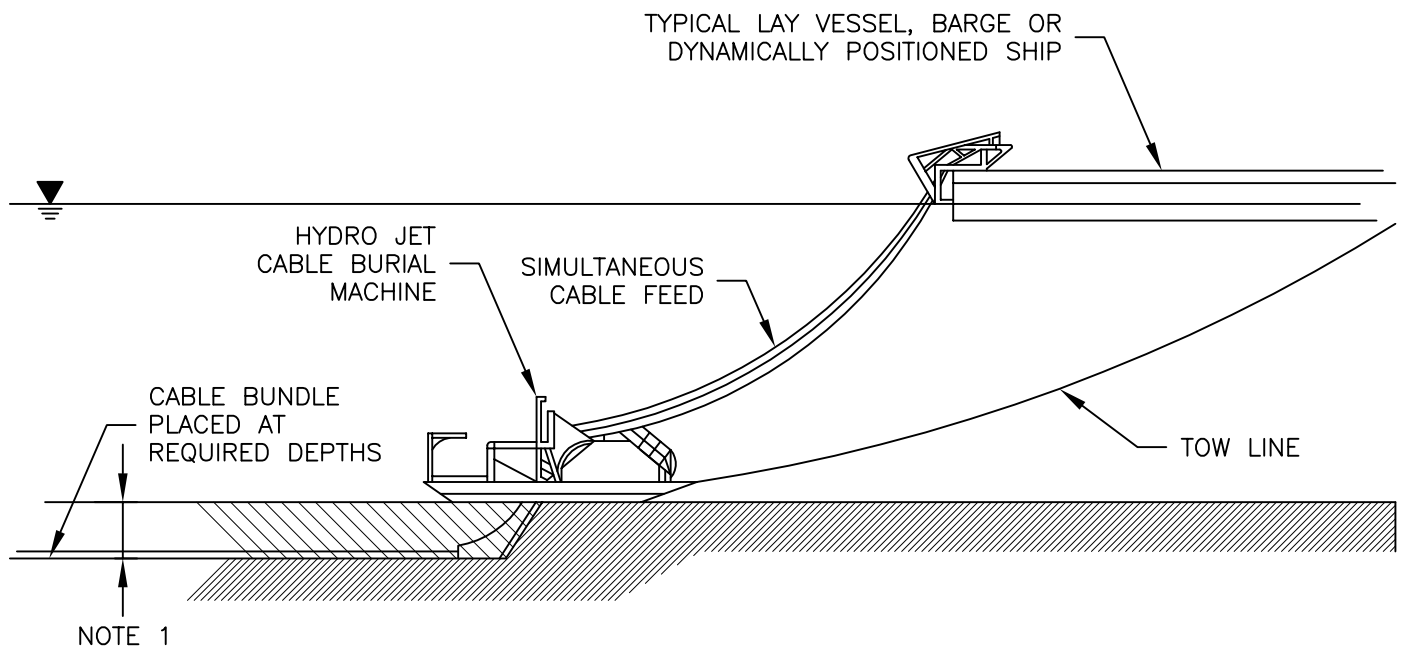
Transmission
Developers Inc.

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

TYPICAL HVDC TRENCH SECTION

176764-E30

Prepared by: **HR** | **DTA** & **CTRC** 10/04/2010




NOTES:

1. BURIAL DEPTH SHALL BE 15'-0" MIN. WITHIN MAINTAINED NAVIGATION CHANNELS. BURIAL DEPTH IS EXPECTED TO BE 6'-0" IN THE HUDSON, HARLEM AND EAST RIVERS, AND NOT LESS THAN 3'-0" WHEN THE CABLES ARE BURIED IN LAKE CHAMPLAIN.
2. HYDROFLOW IS TYPICAL OF EQUIPMENT THAT MAY BE EMPLOYED. ACTUAL EQUIPMENT WILL BE DETERMINED BY THE EPC CONTRACTOR.
3. HYDROJET SHOWN, SHEAR PLOW OPERATION SIMILAR.
4. HYDROFLOW MAY BE OPERATED WITH OR WITHOUT HYDROJET OPERATION (OPERATING AS A SHEAR PLOW) DEPENDING ON BOTTOM SEDIMENT CONDITIONS.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
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1	ART. VII SUBMISSION	2/3/12	TRC	TRC	.	.
2	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



Transmission
Development Inc.

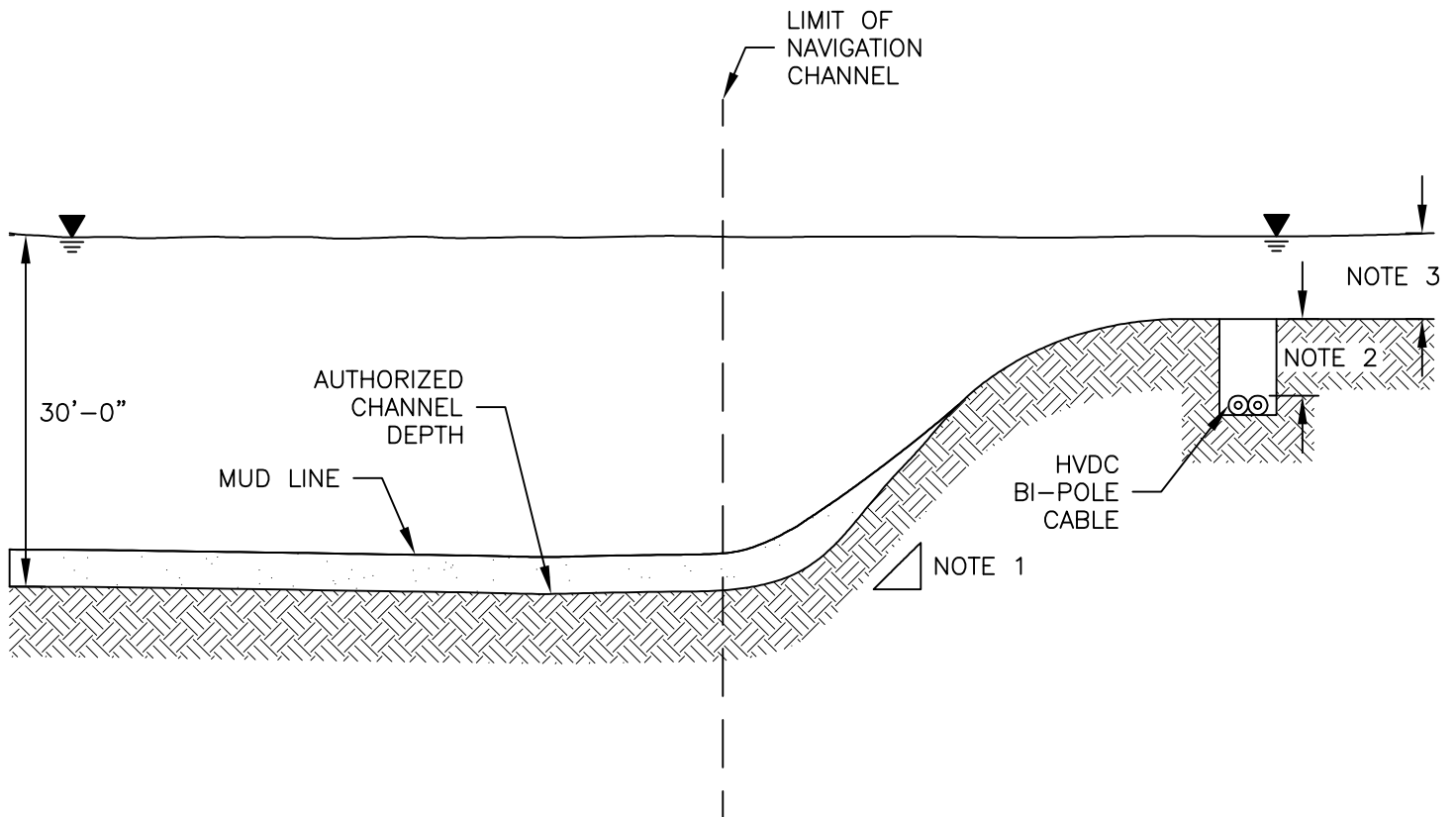
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

**HYDRO FLOW OR
JET FLOW**

176764-SM-01

Prepared by: **HDR** **UTA** & **CTRC** 12/06/2010




NOTE:

1. SIDE SLOPE VARIES.
2. BURIAL DEPTH SHALL BE 15'-0" MIN. WITHIN MAINTAINED NAVIGATION CHANNELS. BURIAL DEPTH IS EXPECTED TO BE 6'-0" IN THE HUDSON, HARLEM AND EAST RIVERS, AND NOT LESS THAN 3'-0" WHEN THE CABLES ARE BURIED IN LAKE CHAMPLAIN.
3. DEPTH OF SHALLOW AREA OUTSIDE CHANNEL VARIES.

Designed	A WIRONEN
Drawn	JRP/TRC
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Approved	.
Scale	NONE

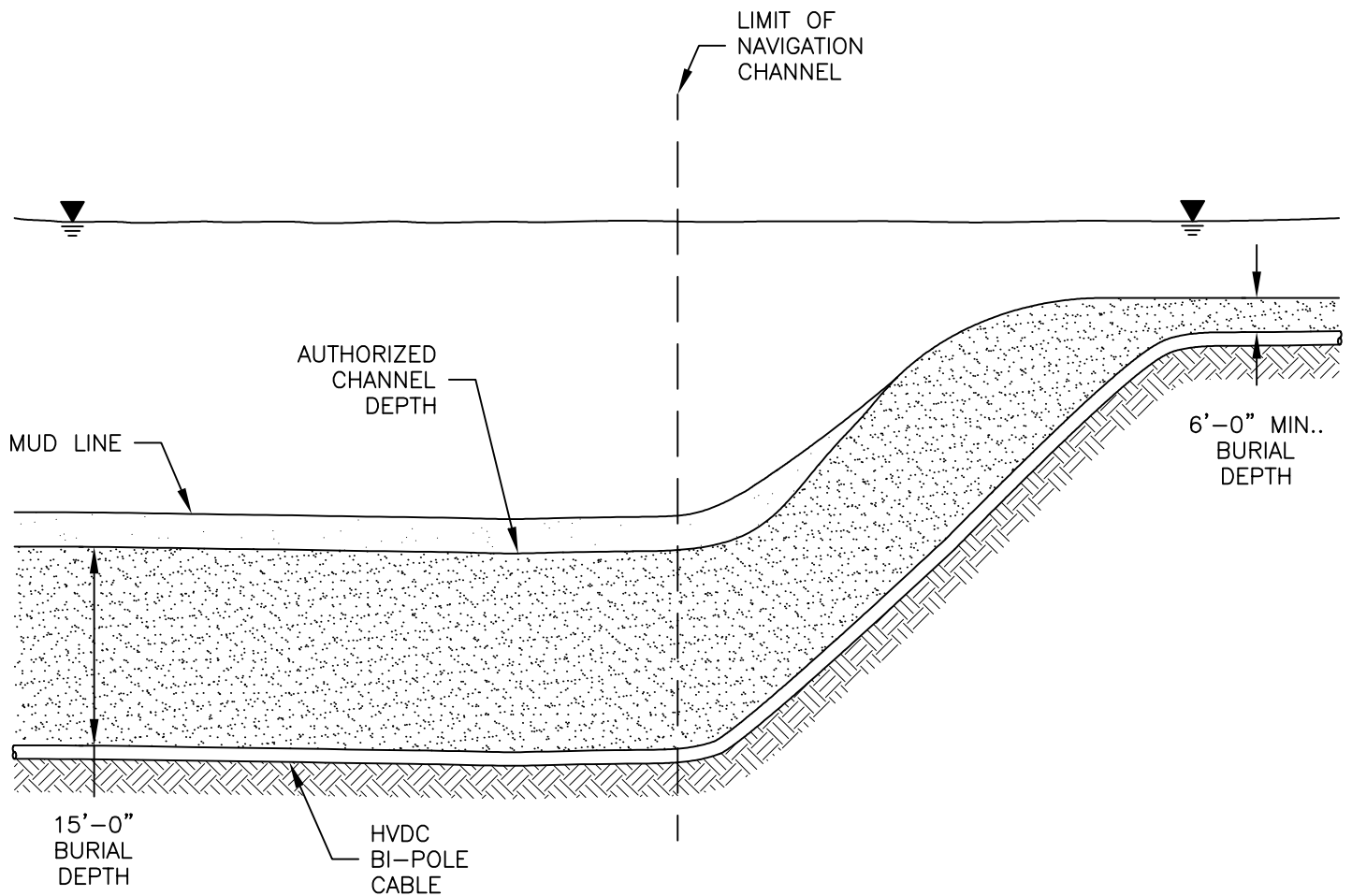
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1	ART. VII SUBMISSION	2/3/12	TRC	TRC	.	.
2	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



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Champlain Hudson Power Express Inc.

**TYPICAL HVDC CABLE
INSTALLATION (SUBMARINE)**
176764-SM-04

Prepared by: **HDR** **UTA** & **CTRC** 12/06/2010



NOTE:

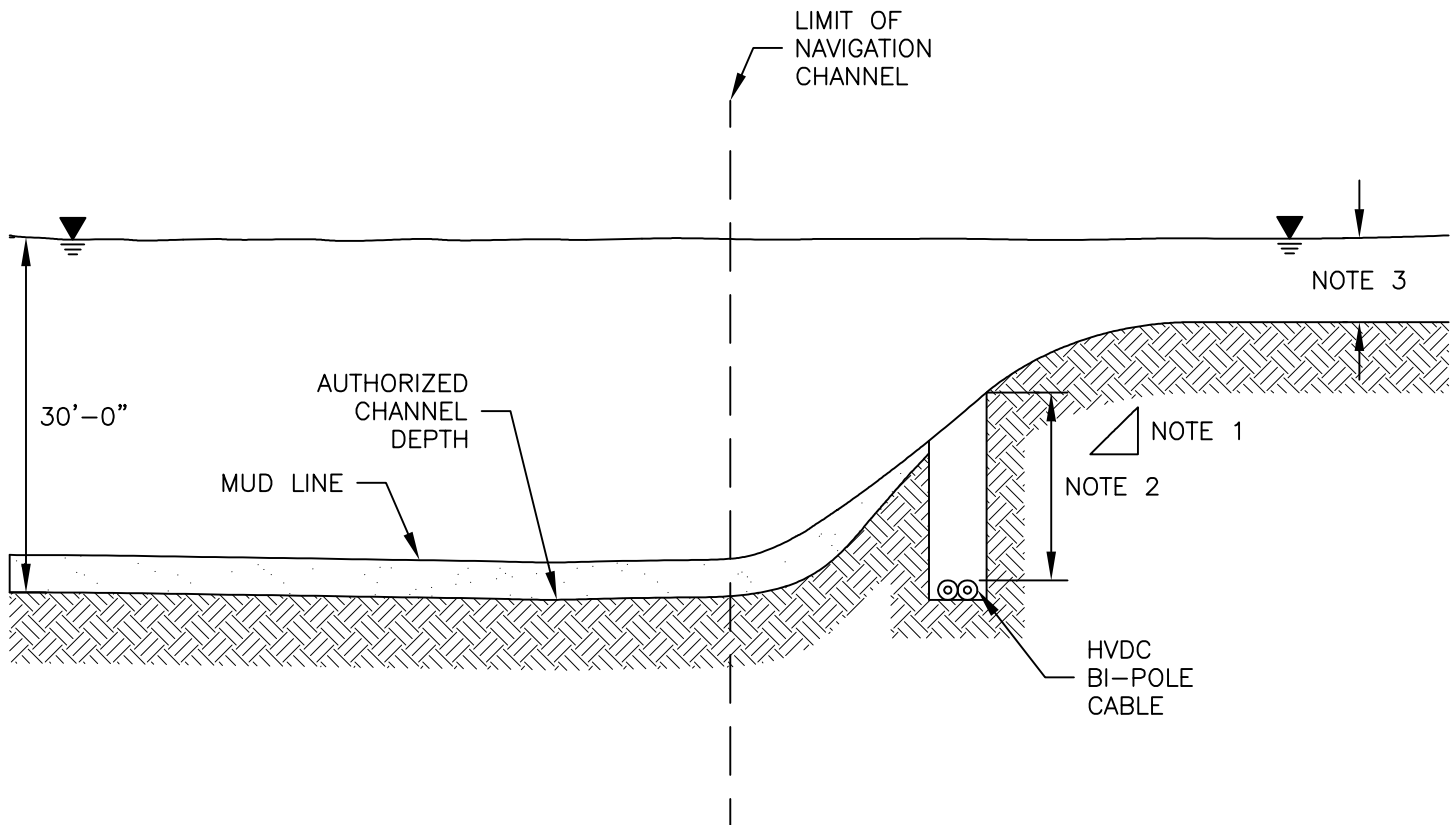
1. BURIAL DEPTH SHALL BE 15'-0" MIN. WITHIN MAINTAINED NAVIGATION CHANNELS. BURIAL DEPTH IS EXPECTED TO BE 6'-0" IN THE HUDSON, HARLEM AND EAST RIVERS, AND NOT LESS THAN 3'-0" WHEN THE CABLES ARE BURIED IN LAKE CHAMPLAIN.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
1	ART. VII SUBMISSION	2/3/12	TRC	TRC	.	.
2	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.


Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.
TYPICAL NAVIGATION CHANNEL SECTION
176764-SM-02

Prepared by: **HR** & **CTRC** 12/06/2010




NOTE:

1. SIDE SLOPE VARIES, DEPTH OF BURIAL IN SIDE SLOPE VARIES FROM 15'-0" TO 6'-0" IN THE HUDSON, HARLEM AND EAST RIVERS, AND NOT LESS THAN 3'-0" WHEN THE CABLES ARE BURIED IN LAKE CHAMPLAIN.
2. DEPTH OF SHALLOW AREA OUTSIDE CHANNEL VARIES.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
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2	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.

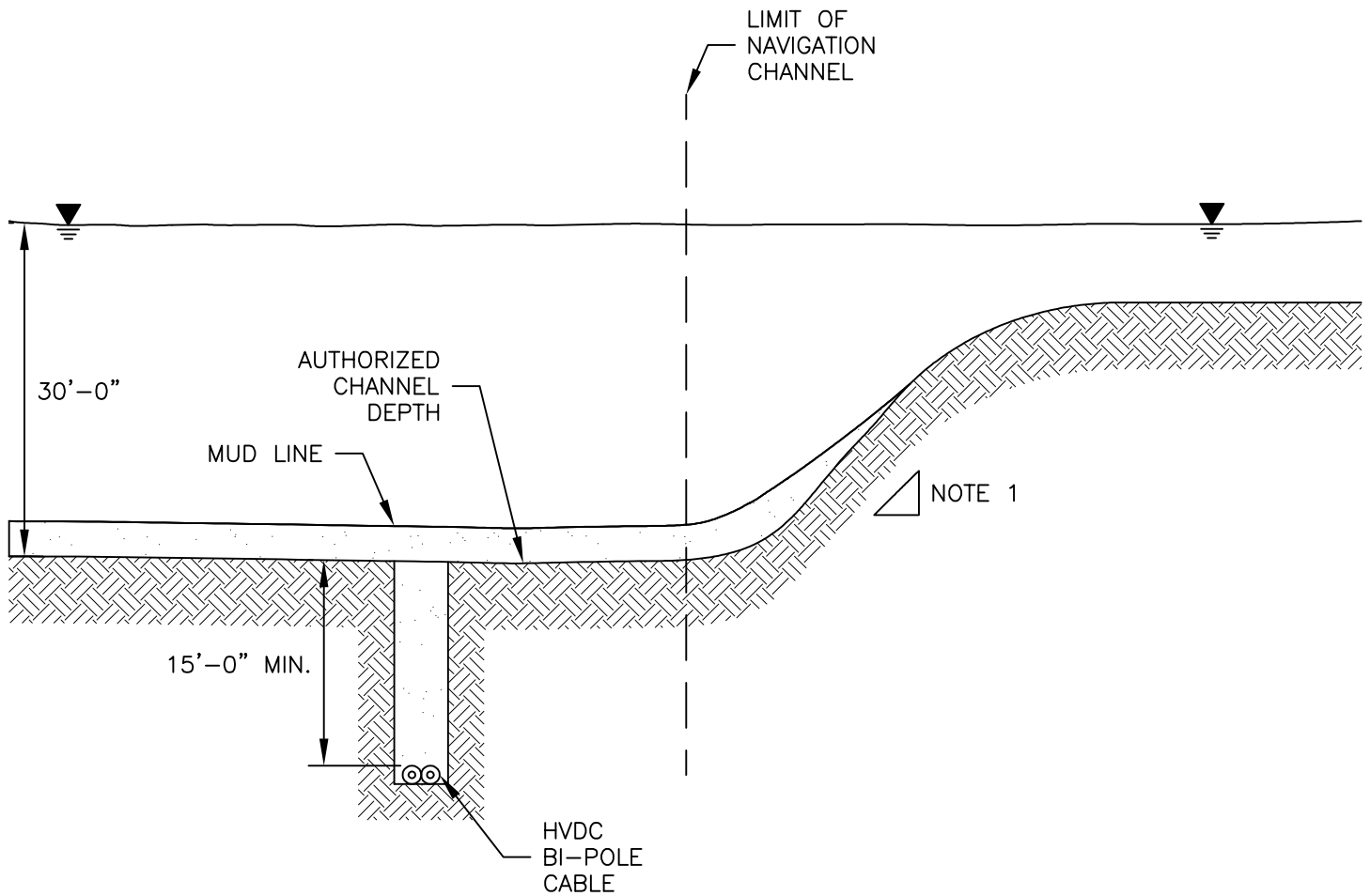


Transmission
Development Inc.

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**HVDC CABLE INSTALLATION
(CHANNEL SIDE SLOPE)**
176764-SM-06

Prepared by: **HDR** **UTA** & **CTRC** 12/06/2010



NOTE:
1. CHANNEL SIDE SLOPE VARIES.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
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1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



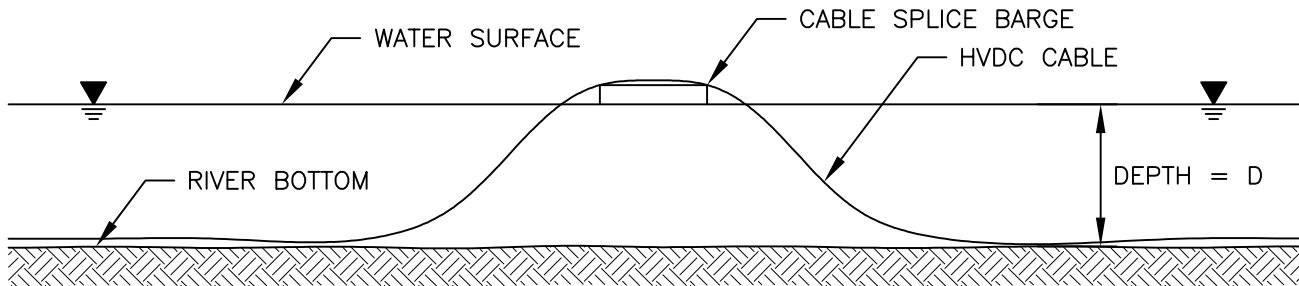
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

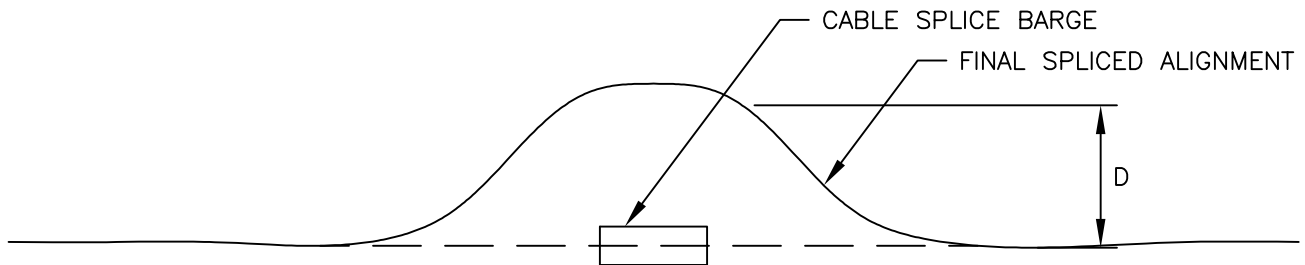
**HVDC CABLE INSTALLATION
(NAVIGATION CHANNEL)**

176764-SM-07

Prepared by: **HDR** **UTA** & **CTRC** 12/06/2010



PROFILE VIEW



PLAN VIEW

NOTE:
CABLE SHOWN SURFACE LAID FOR ILLUSTRATIVE PURPOSES ONLY.
CONSTRUCTION WILL BE DETERMINED BASED UPON BOTTOM
CONDITIONS, AND OTHER FACTORS.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



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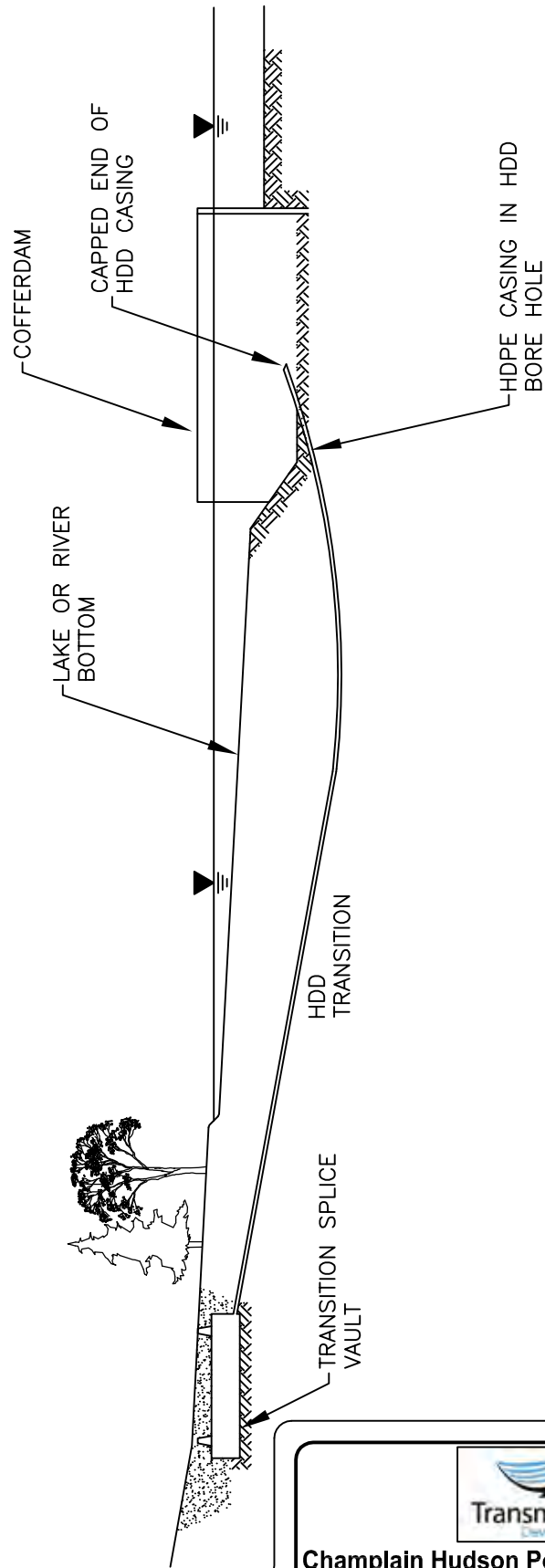
CABLE SPLICE

176764-SM-16

Prepared by: **HDR** **UTA** & **CTRC** 12/06/2010

NOTES:

1. COFFERDAM TO BE UTILIZED WHERE NECESSARY TO STABILIZE BOTTOM SEDIMENT AT HDD TERMINUS. OTHER ALTERNATIVES PROVIDING EQUIVALENT ENVIRONMENTAL PROTECTION MAY BE EMPLOYED WHERE BOTTOM CONDITIONS DO NOT PERMIT DRIVEN PILES.
2. PILES SHALL BE REMOVED OR CUT BELOW THE MUD LINE. AT COMPLETION OF CABLE INSTALLATION IN COORDINATION WITH THE BMP REQUIREMENTS.
3. COFFERDAM WILL EXTEND ABOVE THE WATERLINE IN SHALLOW WATER. EXPOSED STRUCTURE WILL BE MARKED BY BUOYS AND OTHER NAVIGATION AIDS. A NOTICE TO MARINERS WILL BE ISSUED WHEN APPROPRIATE.
4. COFFERDAMS IN DEEP WATER NOT BE EXTENDED TO THE WATER SURFACE. EACH INSTALLATION WILL BE MARKED BY BUOYS AND OTHER NAVIGATION AIDS. A NOTICE TO MARINERS WILL BE ISSUED WHERE APPROPRIATE.



Designed	A WIRONEN
Drawn	KLB/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
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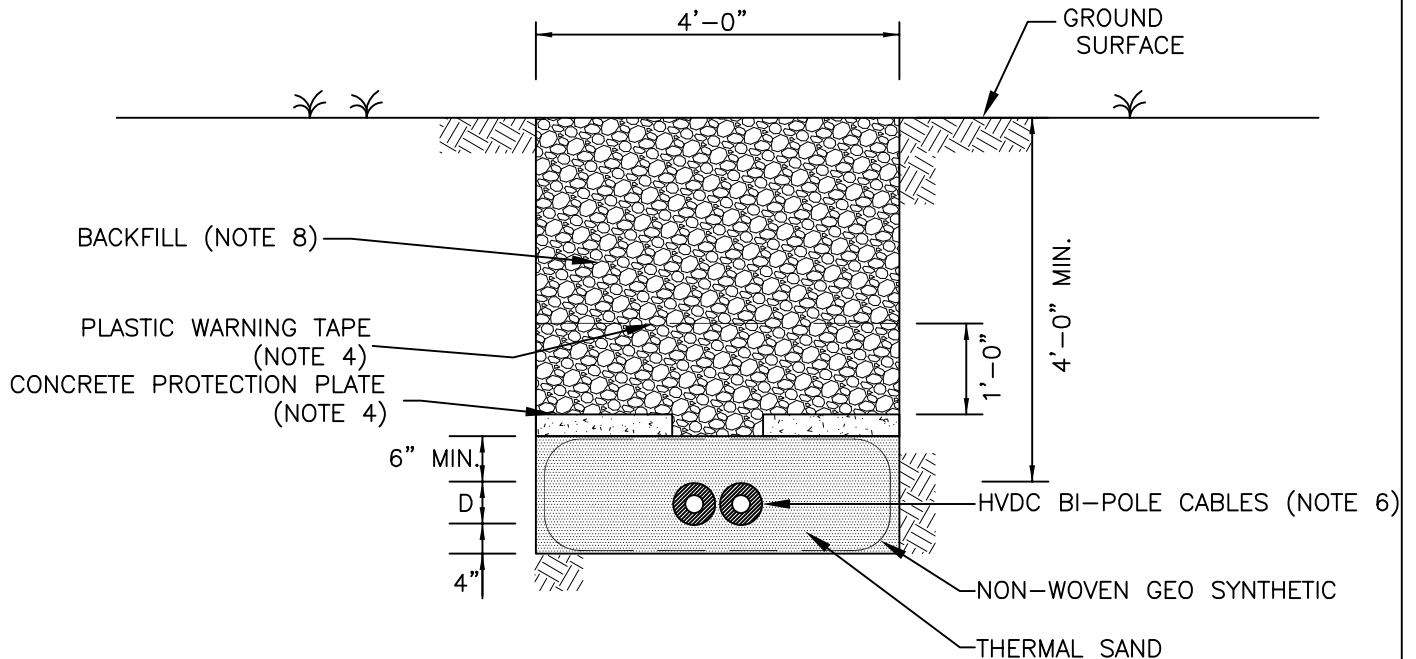


Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

TYPICAL - TERRESTRIAL TRANSITION

176764-UM-41

Prepared by: & 01/13/2012



D= CABLE DIAMETER = 5 1/2"

NOTES:

1. CABLE SPACING MAY VARY BASED UPON CONTRACTOR INSTALLATION PREFERENCE AND LOCATION.
2. CABLES WILL BE BEDDED IN SCREENED SAND OR NATIVE SOIL. THERMAL SAND WILL BE USED WHERE REQUIRED. DEPTH OF THERMAL SAND OVER CABLE WILL BE FIELD DETERMINED FOLLOWING TESTING OF NATIVE SOILS.
3. GEOSYNTHETIC BLANKET WILL BE PROVIDED AROUND SAND BEDDING OVER THERMAL FILL WHEN INSTALLATION IS WITHIN FINE-GRADED SOILS.
4. CONCRETE PROTECTIVE PLATES WILL BE PROVIDED OVER EACH CABLE. AT CONTRACTORS OPTION, STORKBOARD OR APPROVED EQUAL UTILITY DIG-IN PROTECTION MAYBE USED IN LIEU OF CONCRETE PLATES AND WARNING TAPE.
5. EXCAVATION MAY BE VERTICAL SHORED OR LAYED BACK PER OSHA REQUIREMENTS WHERE NECESSARY.
6. INTENTION IS TO BURY CABLE IN A COMMON TRENCH IN CONTACT OR CLOSE PROXIMITY. INSTALLED SEPARATION DISTANCE MAY VARY WITH TRENCH CONDITIONS AND INSTALLATION TECHNIQUES.
7. PRIOR TO EXCAVATION PROVIDE EROSION AND SEDIMENT CONTROLS AS REQUIRED.
8. WHERE THERMAL PROPERTIES OF NATIVE SOIL PERMITS, THE NATIVE SOIL WILL BE USED AS BACKFILL, THEREBY ENHANCING RESTORATION OF THE NATURAL ENVIRONMENT.
9. ABOVE SKETCH IS TO PRESENT CONCEPTS. MORE RESTRICTIVE REQUIREMENTS OF THE RAILROAD, STATE OR OTHER AUTHORITY WILL BE REFLECTED IN THE DETAILED DESIGN REQUIREMENTS OF THE EM & CP DOCUMENTS.

Designed	WJL
Drawn	WJL
Checked	CRP
Approved	LEP
Scale	NTS

No.	Revision	Date	By	Ck	PE	PE #
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1	ISSUED FOR PERMIT	02/20/12	TRC	TRC		



Transmission
Engineering Inc.

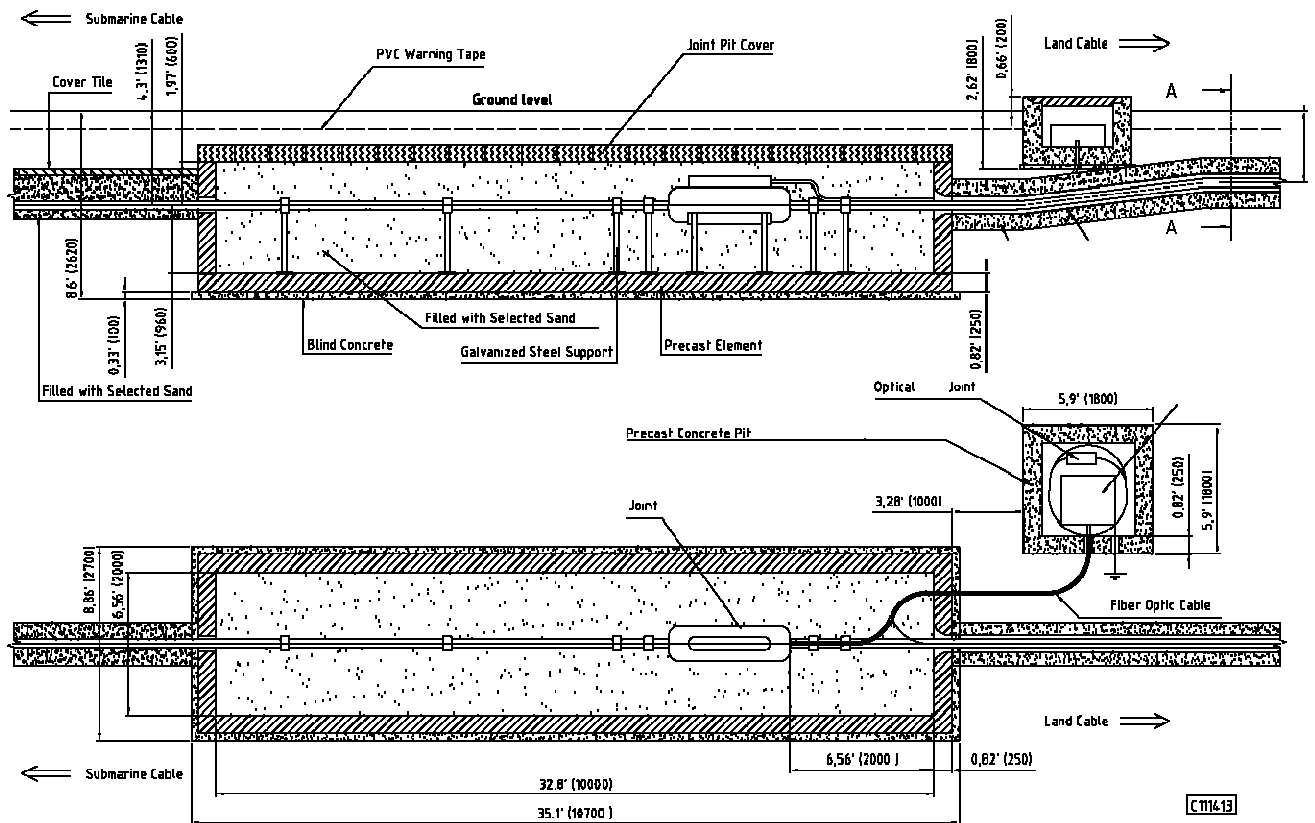
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

**TYPICAL TRENCH
CROSS-SECTION**

176764-UM-08

Prepared by: **HR** & **CTRC** 12/06/2010



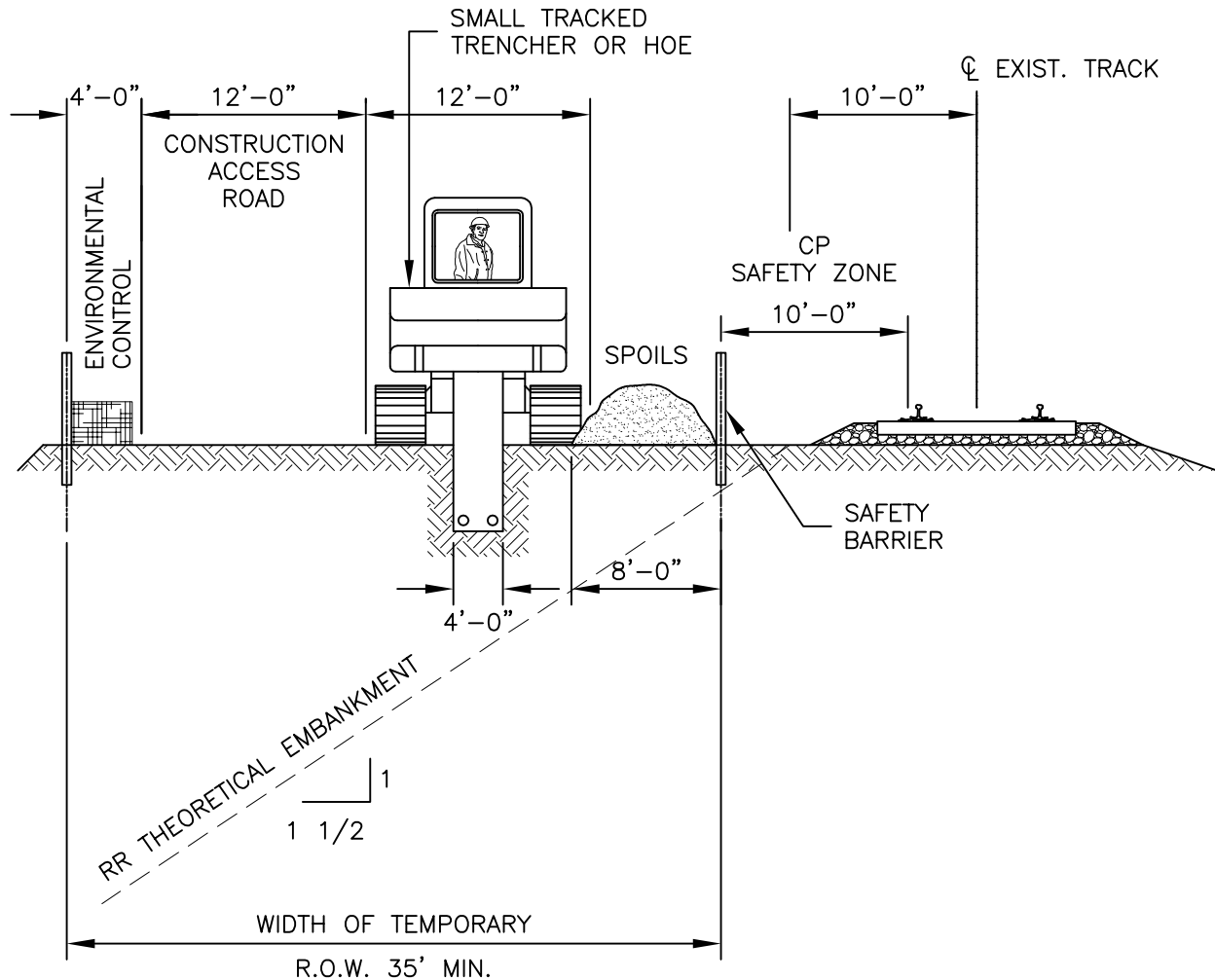
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Drawn	DFW/TRC
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Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
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1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.


Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

TYPICAL SPLICE VAULT
 176764-UM-35

Prepared by:   &  12/19/2011



NOTE:

1. EXCAVATION SHALL BE SHORED OR SLOPED AS REQUIRED FOR OSHA COMPLIANCE. SLOPED EXCAVATION WILL REQUIRE INCREASED ROW.
2. CONTRACT STAGING AREAS WILL BE REQUIRED APPROXIMATELY EVERY 5 MILES. STAGING AREA SIZE IS ESTIMATED TO BE APPROXIMATELY 5 ACRES EACH.
3. WHERE ADEQUATE SPACE IS NOT AVAILABLE ALONG THE RR, THE CONTRACTOR WILL BE REQUIRED TO CAREFULLY PLAN HIS CONSTRUCTION OPERATIONS TO ENSURE ENVIRONMENTAL IMPACTS ARE MINIMIZED AND ALL WORK IS CONTAINED WITHIN THE APPROVED ROW.
4. SHORE ALL EXCAVATIONS WITHIN RR THEORICAL EMBANKMENT.
5. ABOVE SKETCH DEPICTS MINIMUM R.O.W. REQUIRED FOR CONVENTIONAL EXCAVATING AND TRENCHING PROCEDURES.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



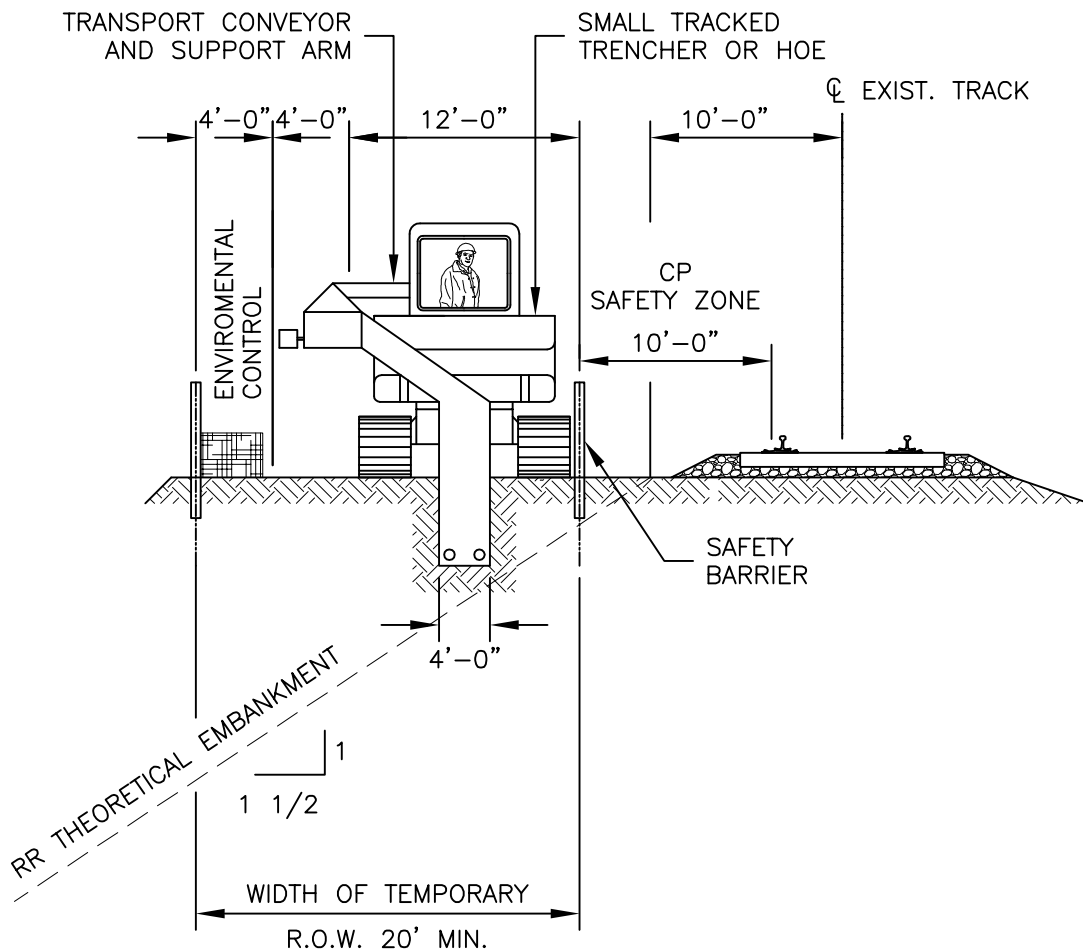
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

**CP TEMPORARY
CONSTRUCTION ROW**

176764-UM-01

Prepared by: **HDR** **UTA** & **CTRC** 12/06/2010



NOTE:

1. EXCAVATION SHALL BE SHORED OR SLOPED AS REQUIRED FOR OSHA COMPLIANCE. SLOPED EXCAVATION WILL REQUIRE INCREASED ROW.
2. CONTRACT STAGING AREAS WILL BE REQUIRED APPROXIMATELY EVERY 5 MILES. STAGING AREA SIZE IS ESTIMATED TO BE APPROXIMATELY 5 ACRES EACH.
3. WHERE ADEQUATE SPACE IS NOT AVAILABLE ALONG THE RR, THE CONTRACTOR WILL BE REQUIRED TO CAREFULLY PLAN HIS CONSTRUCTION OPERATIONS TO ENSURE ENVIRONMENTAL IMPACTS ARE MINIMIZED AND ALL WORK IS CONTAINED WITHIN THE APPROVED ROW.
4. SHORE ALL EXCAVATIONS WITHIN RR THEORETICAL EMBANKMENT.
5. ABOVE SKETCH DEPICTS MINIMUM R.O.W. REQUIRED FOR EMPLOYMENT OF IN-LINE TRENCHING OPERATIONS. THIS METHOD WILL ONLY BE UTILIZED ON A VERY LIMITED BASIS.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
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1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



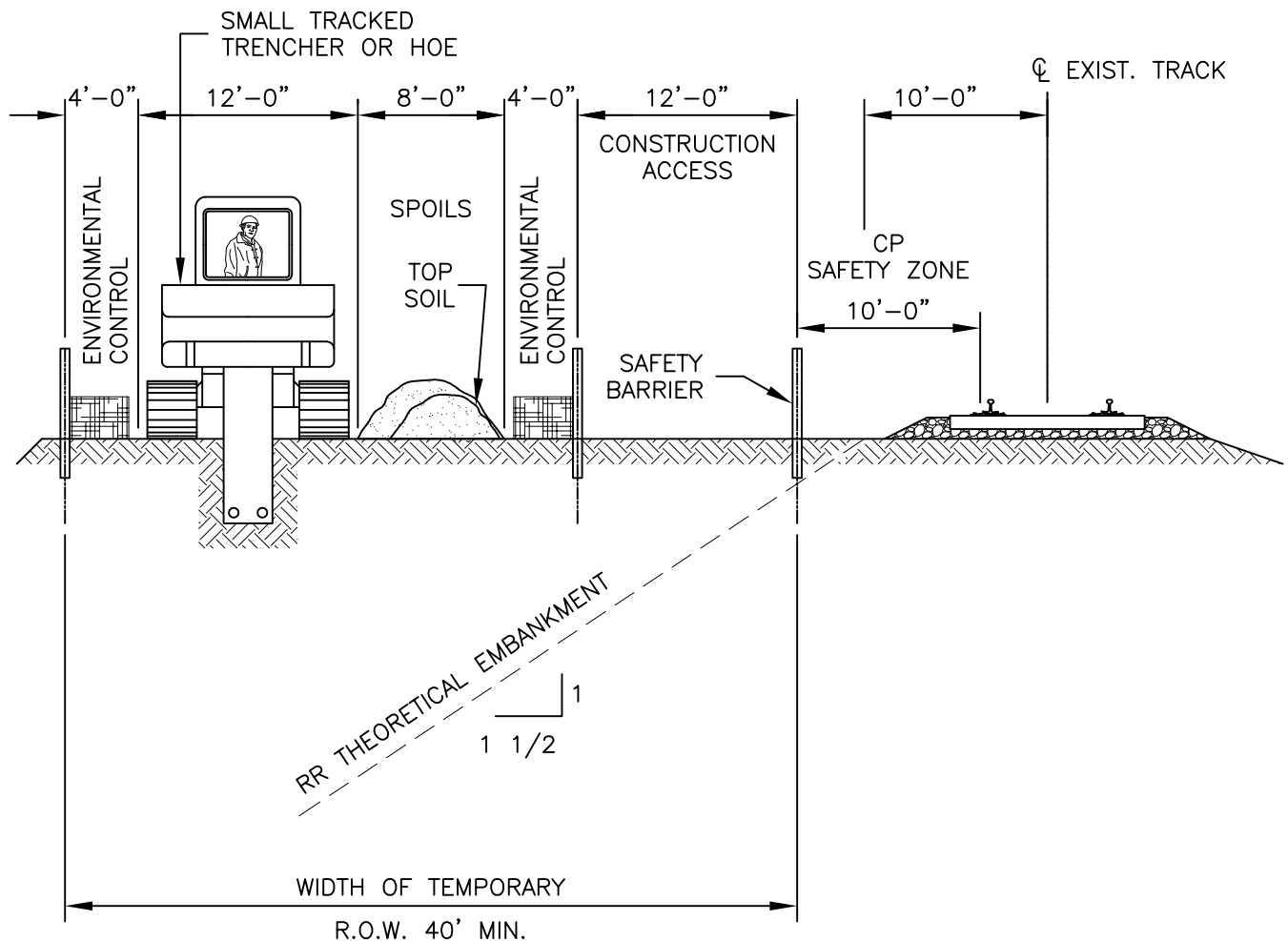
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

**CP IN-LINE TRENCHER
RIGHT OF WAY**

176764-UM-02

Prepared by: HDR UTA & CTRC 12/06/2010




NOTE:

1. EXCAVATION SHALL BE SHORED OR SLOPED AS REQUIRED FOR OSHA COMPLIANCE. SLOPED EXCAVATION WILL REQUIRE INCREASED ROW.
2. CONTRACT STAGING AREAS WILL BE REQUIRED APPROXIMATELY EVERY 5 MILES. STAGING AREA SIZE IS ESTIMATED TO BE APPROXIMATELY 5 ACRES EACH.
3. WHERE ADEQUATE SPACE IS NOT AVAILABLE ALONG THE RR, THE CONTRACTOR WILL BE REQUIRED TO CAREFULLY PLAN HIS CONSTRUCTION OPERATIONS TO ENSURE ENVIRONMENTAL IMPACTS ARE MINIMIZED AND ALL WORK IS CONTAINED WITHIN THE APPROVED ROW.
4. SHORE ALL EXCAVATIONS WITHIN RR THEORETICAL EMBANKMENT.
5. ABOVE SKETCH DEPICTS MINIMUM R.O.W. REQUIRED FOR CONVENTIONAL EXCAVATING AND TRENCHING PROCEDURES.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
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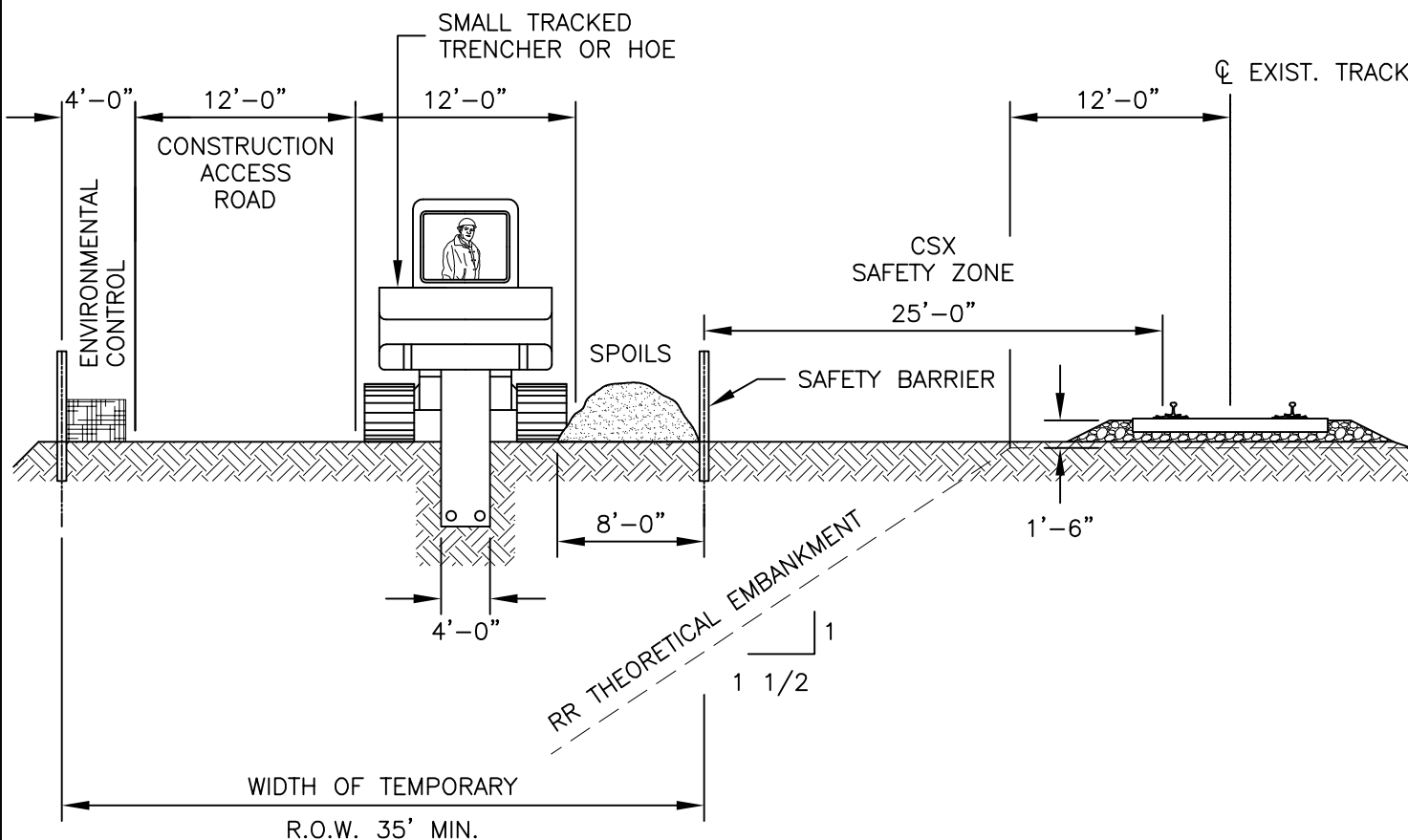


Transmission
Development Inc.

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**CP WIDE
RIGHT OF WAY**
176764-UM-03

Prepared by: **HDR** **DTA** & **CTRC** 12/06/2010



NOTE:

1. EXCAVATION SHALL BE SHORED OR SLOPED AS REQUIRED FOR OSHA COMPLIANCE. SLOPED EXCAVATION WILL REQUIRE INCREASED ROW.
2. CONTRACT STAGING AREAS WILL BE REQUIRED APPROXIMATELY EVERY 5 MILES. STAGING AREA SIZE IS ESTIMATED TO BE APPROXIMATELY 5 ACRES EACH.
3. WHERE ADEQUATE SPACE IS NOT AVAILABLE ALONG THE RR, THE CONTRACTOR WILL BE REQUIRED TO CAREFULLY PLAN HIS CONSTRUCTION OPERATIONS TO ENSURE ENVIRONMENTAL IMPACTS ARE MINIMIZED AND ALL WORK IS CONTAINED WITHIN THE APPROVED ROW.
4. SHORE ALL EXCAVATIONS WITHIN RR THEORICAL EMBANKMENT.
5. ABOVE SKETCH DEPICTS MINIMUM R.O.W. REQUIRED FOR CONVENTIONAL EXCAVATING AND TRENCHING PROCEDURES.

Designed	A WIRONEN
Drawn	DFW/TRC
Checked	.
Approved	.
Scale	NONE

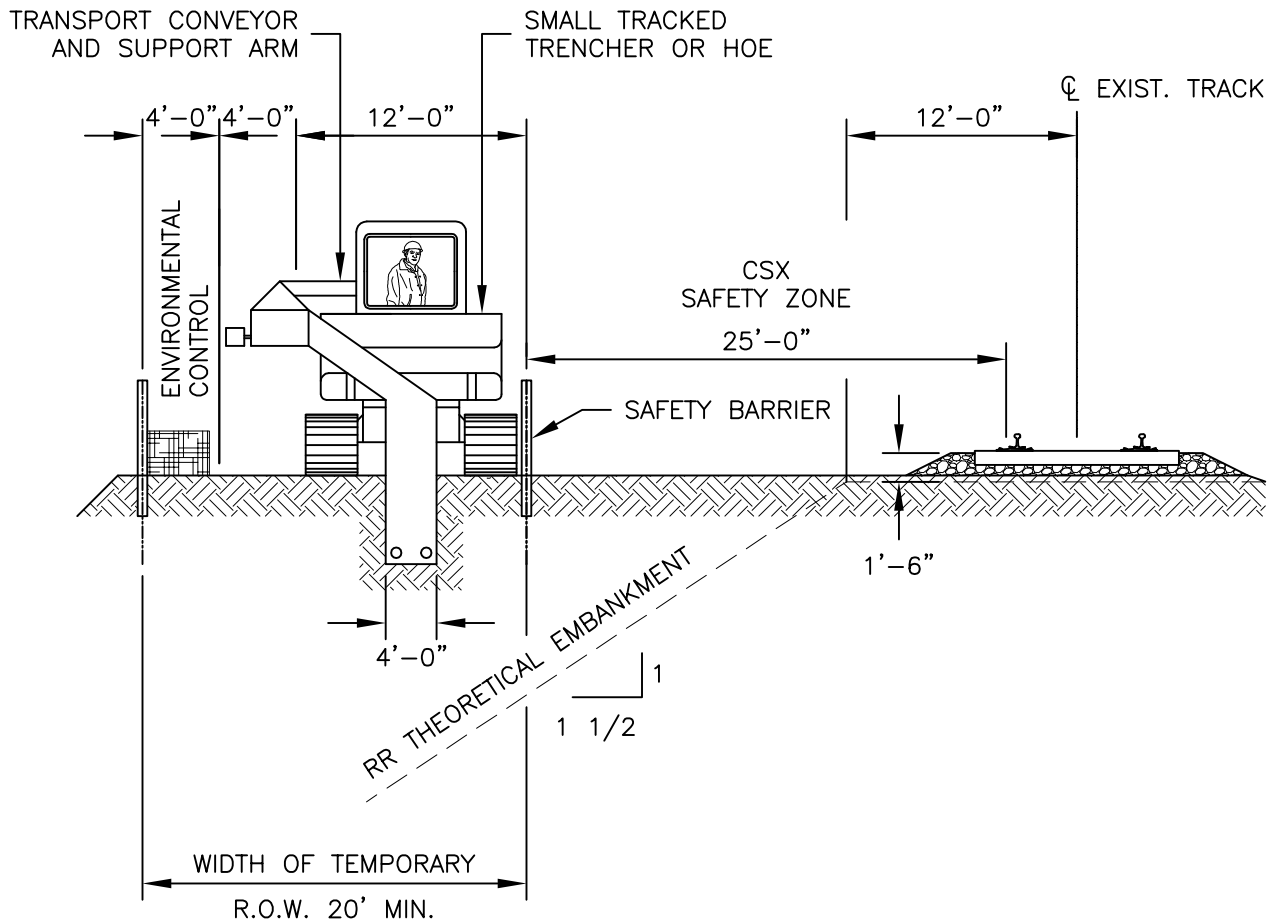
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0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**CSX TEMPORARY
CONSTRUCTION ROW**
176764-UM-04

Prepared by: **HDR** **DTA** & **CTRC** 12/06/2010



NOTE:

1. EXCAVATION SHALL BE SHORED OR SLOPED AS REQUIRED FOR OSHA COMPLIANCE. SLOPED EXCAVATION WILL REQUIRE INCREASED ROW.
2. CONTRACT STAGING AREAS WILL BE REQUIRED APPROXIMATELY EVERY 5 MILES. STAGING AREA SIZE IS ESTIMATED TO BE APPROXIMATELY 5 ACRES EACH.
3. WHERE ADEQUATE SPACE IS NOT AVAILABLE ALONG THE RR, THE CONTRACTOR WILL BE REQUIRED TO CAREFULLY PLAN HIS CONSTRUCTION OPERATIONS TO ENSURE ENVIRONMENTAL IMPACTS ARE MINIMIZED AND ALL WORK IS CONTAINED WITHIN THE APPROVED ROW.
4. SHORE ALL EXCAVATIONS WITHIN RR THEORETICAL EMBANKMENT.
5. ABOVE SKETCH DEPICTS MINIMUM R.O.W. REQUIRED FOR EMPLOYMENT OF IN-LINE TRENCHING OPERATIONS. THIS METHOD WILL ONLY BE UTILIZED ON A VERY LIMITED BASIS.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



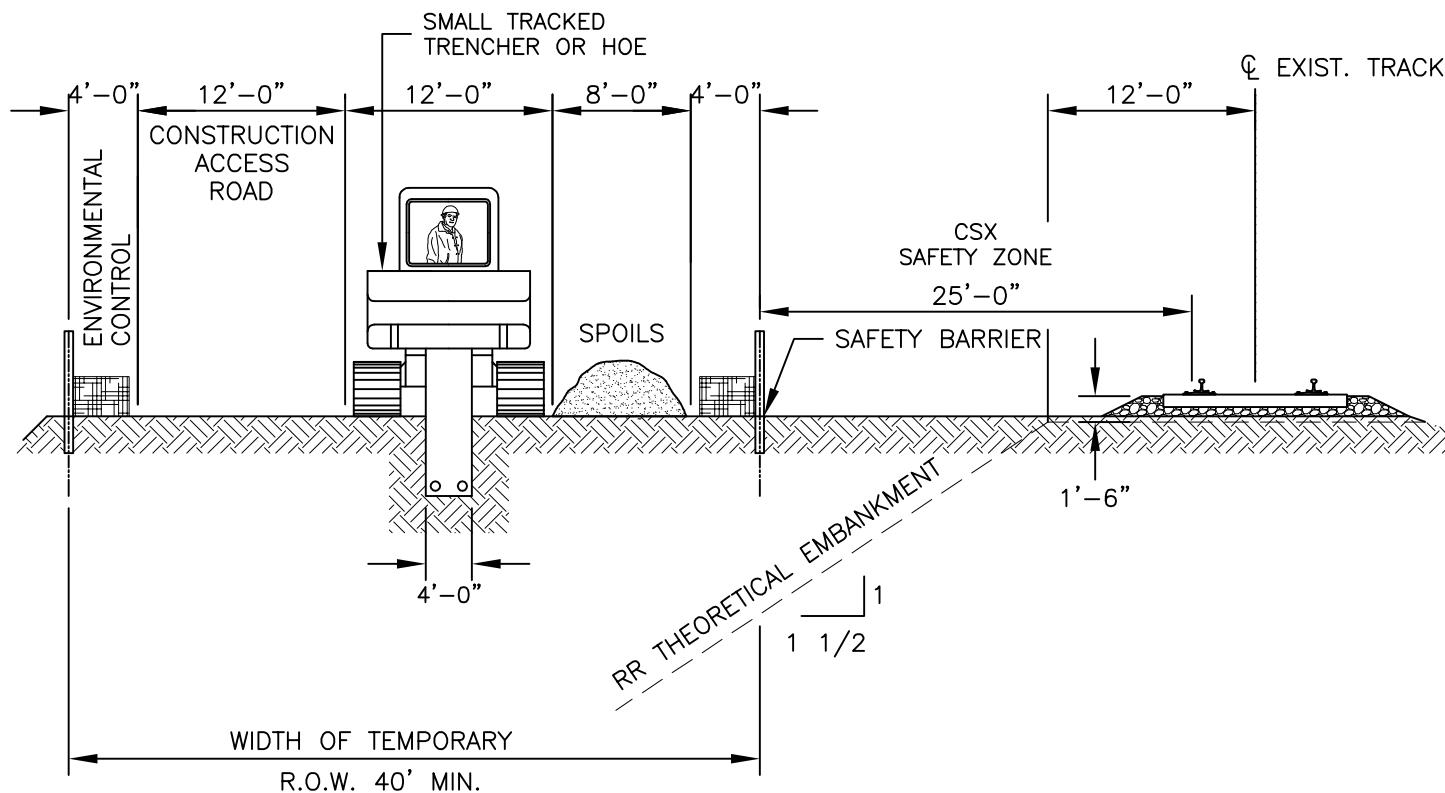
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

**CSX IN-LINE TRENCHER
RIGHT OF WAY**

176764-UM-05

Prepared by: **HDR** **DTA** & **CTRC** 12/06/2010



NOTE:

1. EXCAVATION SHALL BE SHORED OR SLOPED AS REQUIRED FOR OSHA COMPLIANCE. SLOPED EXCAVATION WILL REQUIRE INCREASED ROW.
2. CONTRACT STAGING AREAS WILL BE REQUIRED APPROXIMATELY EVERY 5 MILES. STAGING AREA SIZE IS ESTIMATED TO BE APPROXIMATELY 5 ACRES EACH.
3. WHERE ADEQUATE SPACE IS NOT AVAILABLE ALONG THE RR, THE CONTRACTOR WILL BE REQUIRED TO CAREFULLY PLAN HIS CONSTRUCTION OPERATIONS TO ENSURE ENVIRONMENTAL IMPACTS ARE MINIMIZED AND ALL WORK IS CONTAINED WITHIN THE APPROVED ROW.
4. SHORE ALL EXCAVATIONS WITHIN RR THEORICAL EMBANKMENT.
5. ABOVE SKETCH DEPICTS MINIMUM R.O.W. REQUIRED FOR CONVENTIONAL EXCAVATING AND TRENCHING PROCEDURES.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.

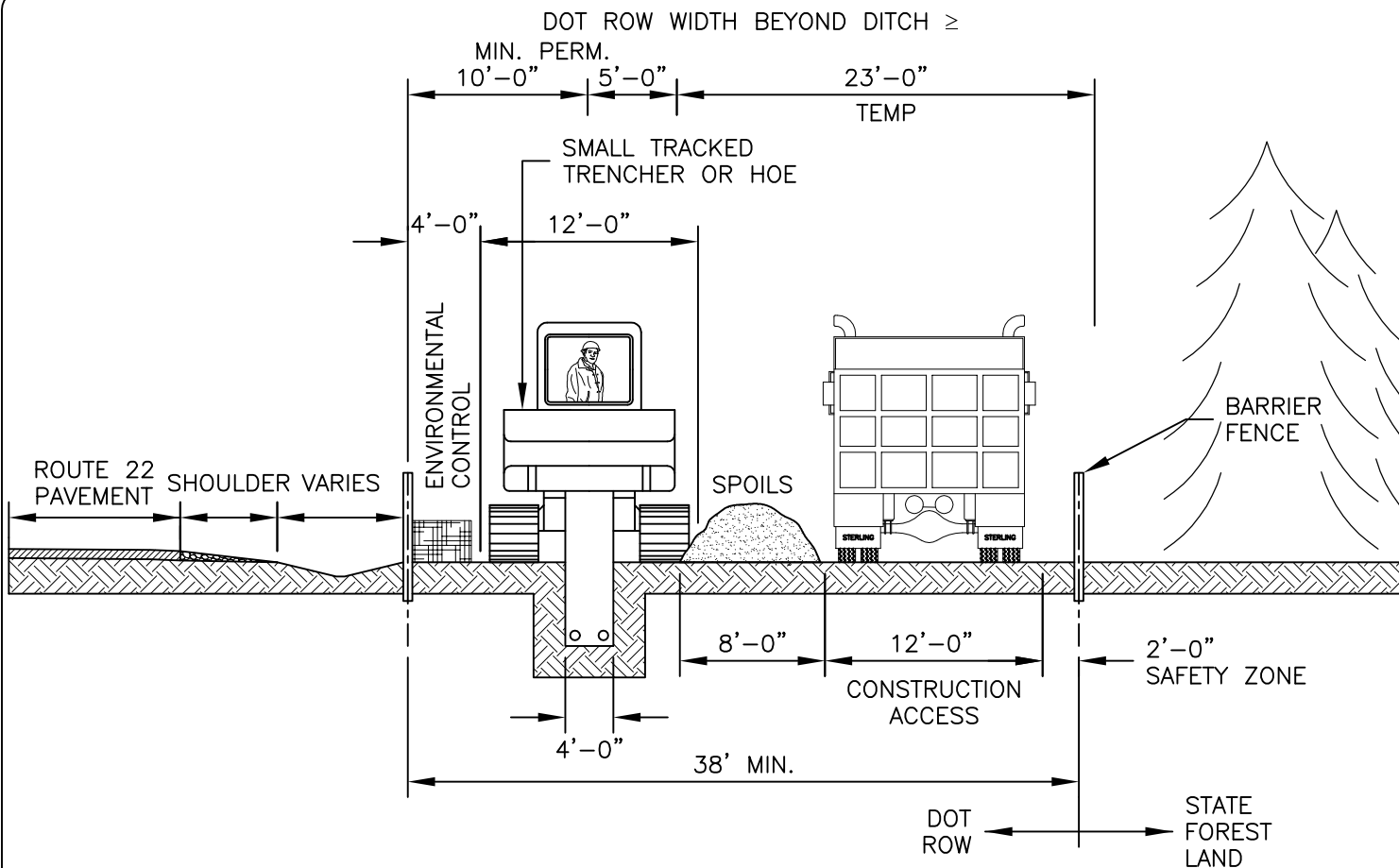


Transmission
Development Inc.

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**CSX WIDE
RIGHT OF WAY**
176764-UM-06

Prepared by: **HDR** **DTA** & **CTRC** 12/06/2010



NOTES:

1. SKETCH DEPICTS MIN R.O.W WIDTH REQUIRED WHERE USE OF STATE ROAD FOR CONSTRUCTION ACCESS AND MATERIAL STAGING IS NOT PERMITTED.
2. CONVENTIONAL TRENCHING OPERATION USING TRACKED HOE OR TRENCHER IS DEPICTED.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR REVIEW	02/22/11	TRC	TRC	.	.
1	ISSUED FOR REVIEW	02/16/12	TRC	TRC	.	.
2	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.

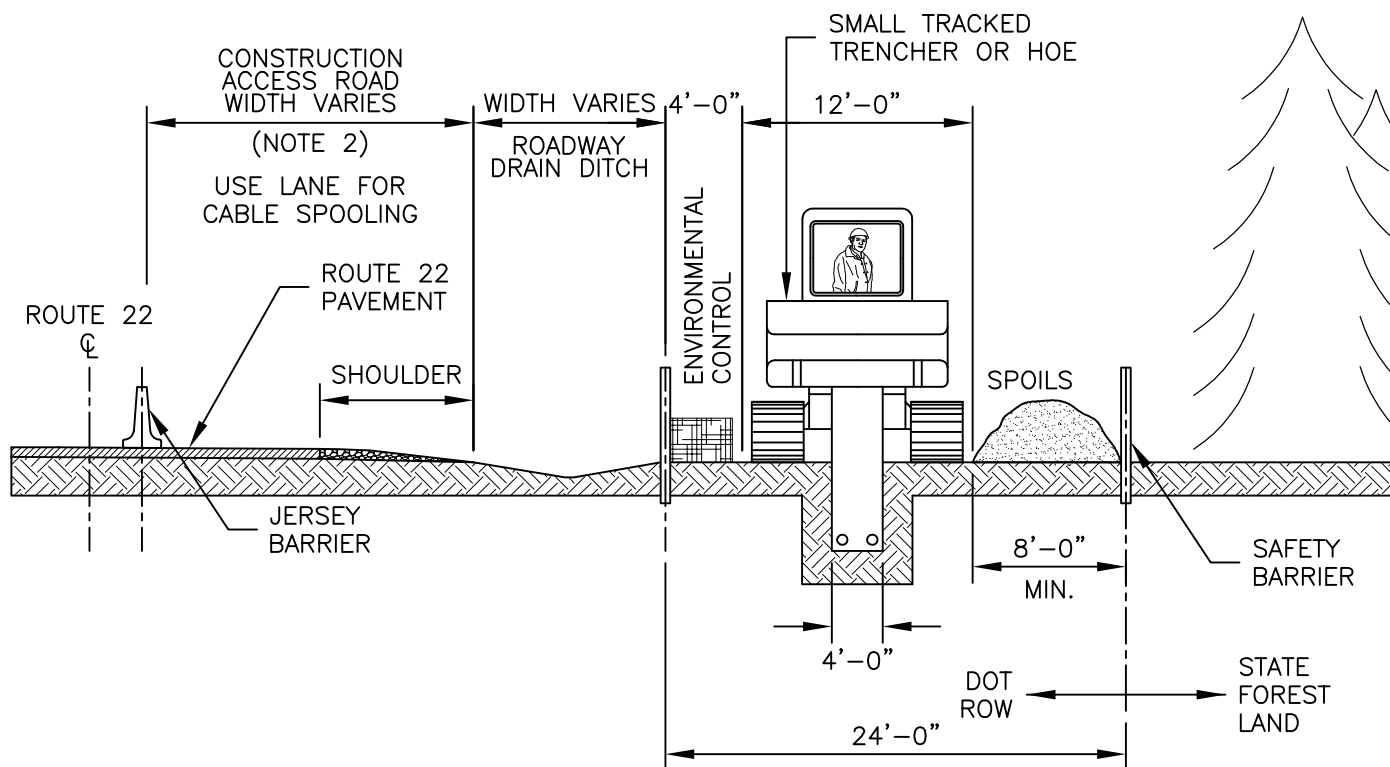


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Developers Inc.

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

RT 22
OPEN TRAVEL LANE
176764-RT22-01A

Prepared by: **HDR** **DTA** & **CTRC** 02/03/2011



NOTES:

1. CROSS SECTION ASSUMES SUFFICIENT DOT ROW WIDTH TO PERMIT HVDC CABLE INSTALLATION OUTSIDE OF ROAD DITCH LINE.
2. MIN. CONSTRUCTION ACCESS ROAD WIDTH OF 12 FT. REQUIRED.
3. CROSS SECTION ASSUMES CONSTRUCTION VEHICLES PERMITTED TO UTILIZE ONE LANE OF ROUTE 22 FOR WORK SITE ACCESS AND MATERIAL STORAGE.
4. ABOVE SKETCH DEPICTS CONVENTIONAL TRENCHING OPERATION WHERE USE OF STATE ROAD IS PERMITTED FOR CONSTRUCTION ACCESS AND STAGING.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR REVIEW	02/22/11	TRC	TRC	.	.
1	ISSUED FOR REVIEW	02/16/12	TRC	TRC	.	.
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Transmission
Development Inc.

Champlain Hudson Power Express Project

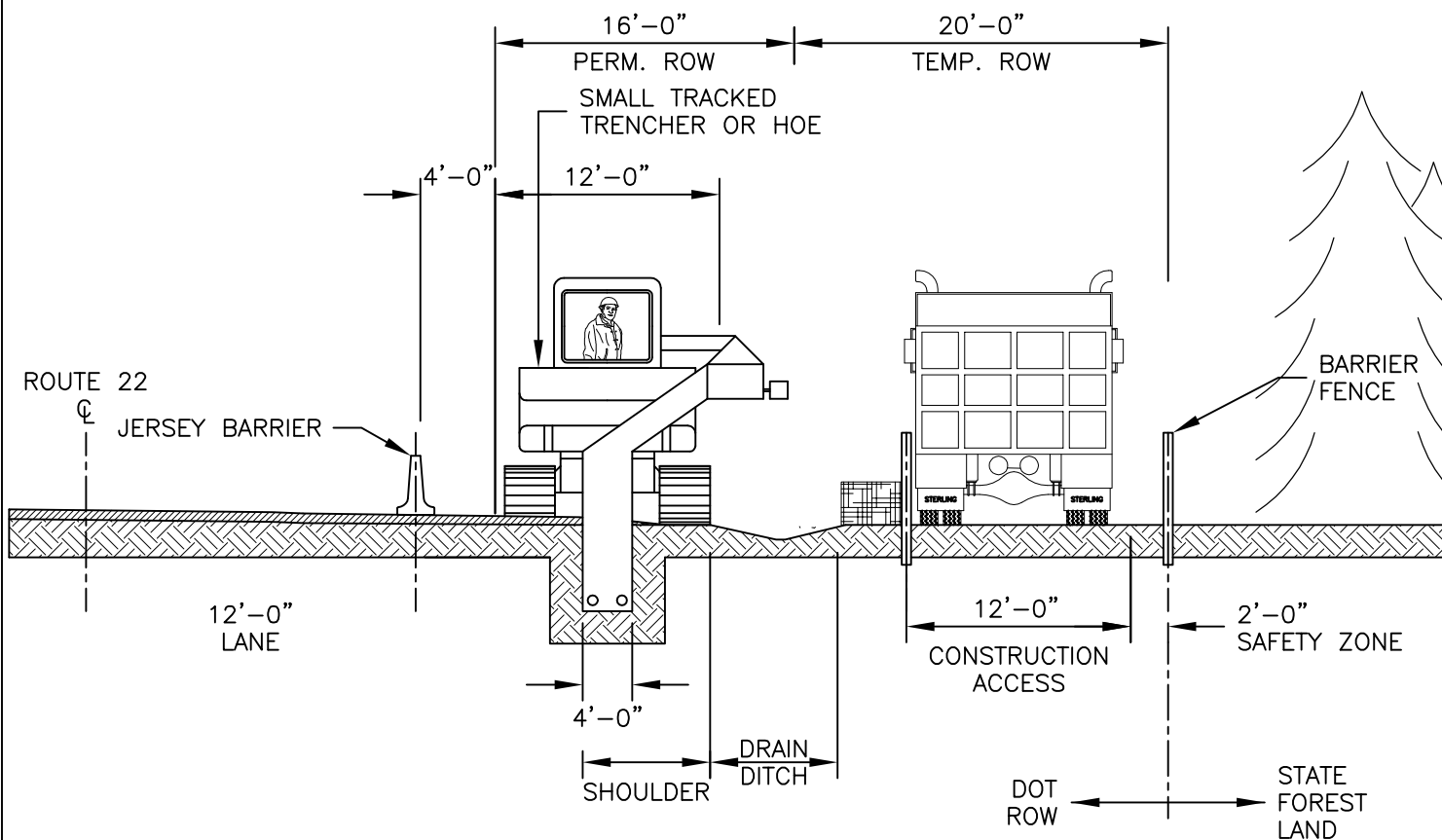
Champlain Hudson Power Express Inc.

RT 22

CLOSED TRAVEL LANE

176764-RT22-01C

Prepared by: **HDR** **DTA** & **CTRC** 02/03/2011



NOTES:

1. ABOVE SCENARIO CAN ONLY BE EMPLOYED WHERE ROAD DRAINAGE DITCH IS SHALLOW OR NON-EXISTENT.
2. ABOVE SKETCH DEPICTS IN-LINE TRENCHING METHODS WHICH CAN ONLY BE USED OVER SHORT DISTANCES WITH LIMITED ACCESS.
3. ABOVE SKETCH DEPICTS MINIMUM CONSTRUCTION ROW REQUIRED FOR IN-LINE CONSTRUCTION WHERE NO USE OF STATE ROADWAY, IS PERMITTED BUT ROW IS SUFFICIENT FOR CONSTRUCTION ACCESS.
4. PROVIDE EROSION CONTROLS AND BARRIERS WITHIN DRAINAGE DITCH AS REQUIRED TO MANAGE RUNOFF.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR REVIEW	02/22/11	TRC	TRC	.	.
1	ISSUED FOR REVIEW	02/16/12	TRC	TRC	.	.
2	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



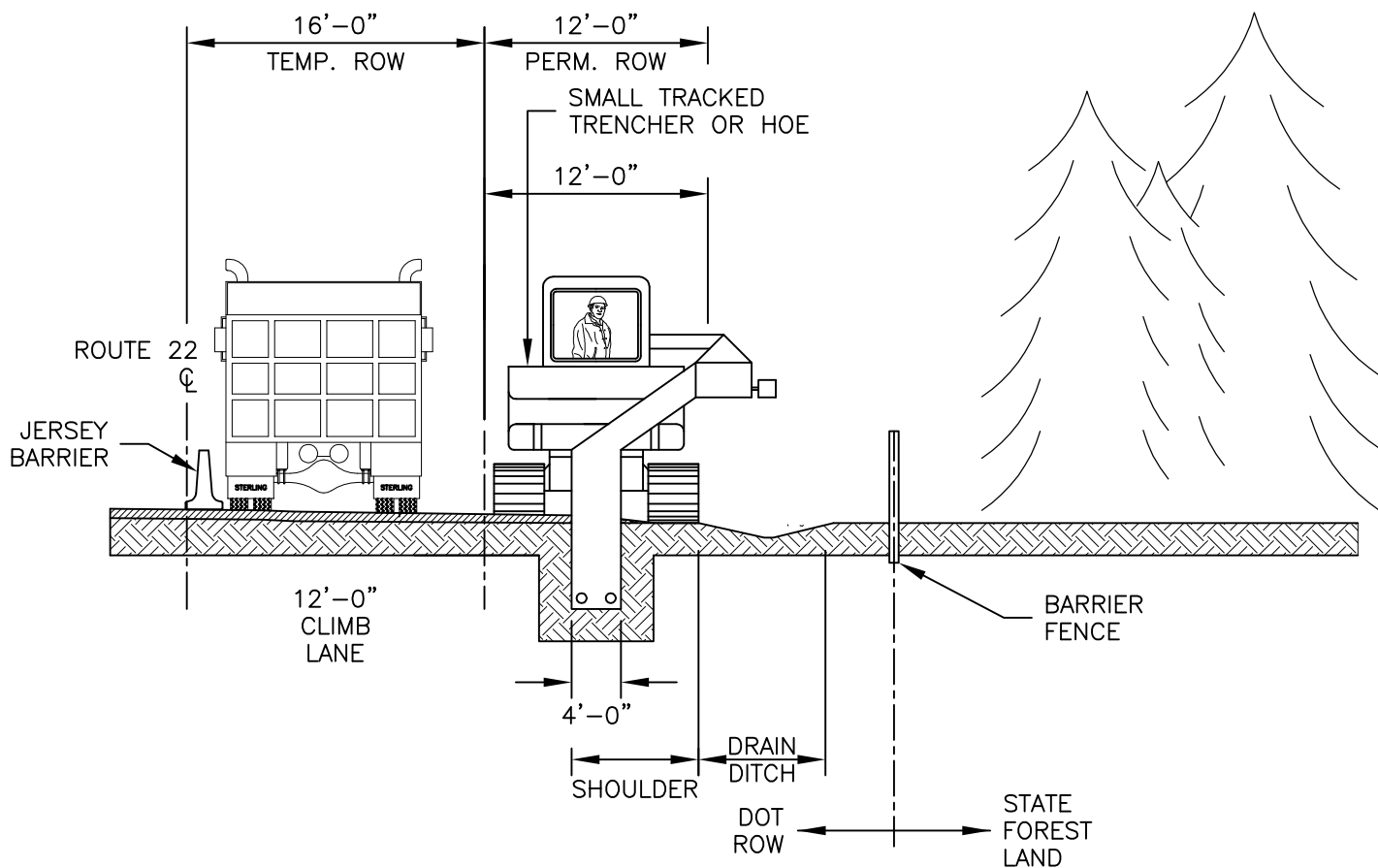
Transmission
Development Inc.

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**RT 22 IN-LINE TRENCHING
IN SHOULDER**

176764-RT22-01D

Prepared by: **FDR** & **CTRC** 02/21/2011



NOTES:

1. ABOVE SCENARIO CAN ONLY BE EMPLOYED WHERE ROAD DRAINAGE DITCH IS SHALLOW OR NON-EXISTENT.
2. ABOVE SKETCH DEPICTS IN-LINE TRENCHING METHODS WHICH CAN ONLY BE USED OVER SHORT DISTANCES WITH LIMITED ACCESS.
3. ABOVE SKETCH DEPICTS MINIMUM CONSTRUCTION ROW REQUIRED FOR IN-LINE CONSTRUCTION AT LOCATIONS WITH LIMITED DOT ROW, BUT USE OF STATE ROADWAY IS PERMITTED.
4. PROVIDE EROSION CONTROLS AND BARRIERS WITHIN DRAINAGE DITCH AS REQUIRED TO MANAGE RUNOFF.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR REVIEW	02/22/11	TRC	TRC	.	.
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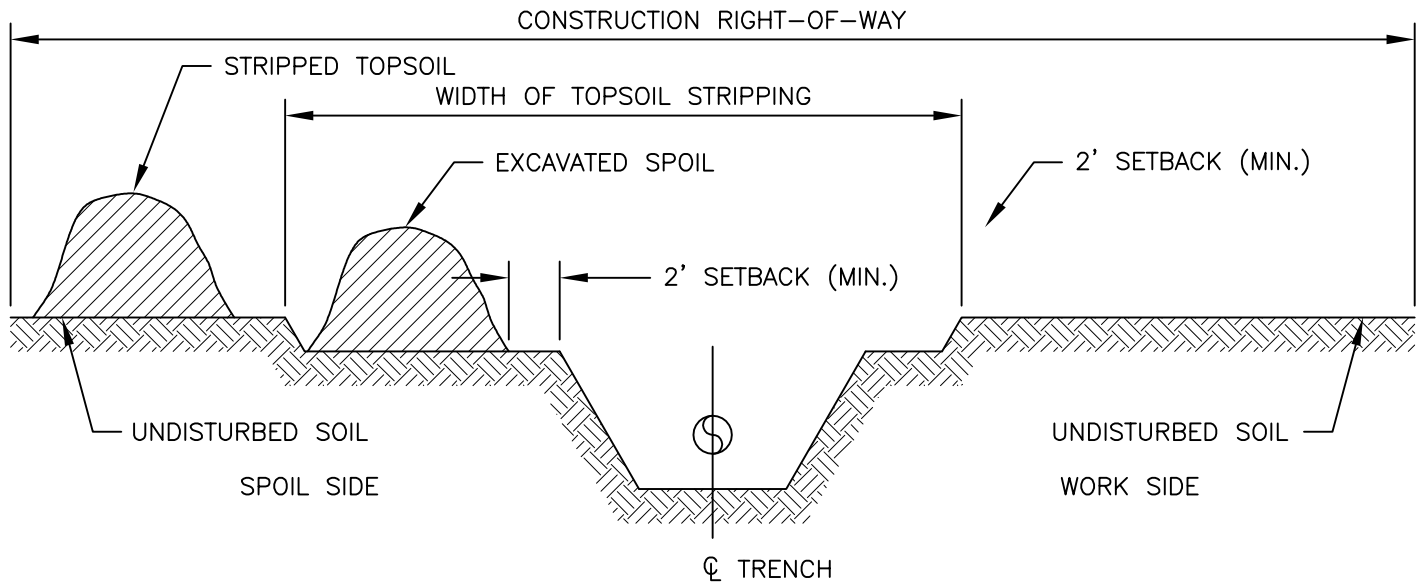
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

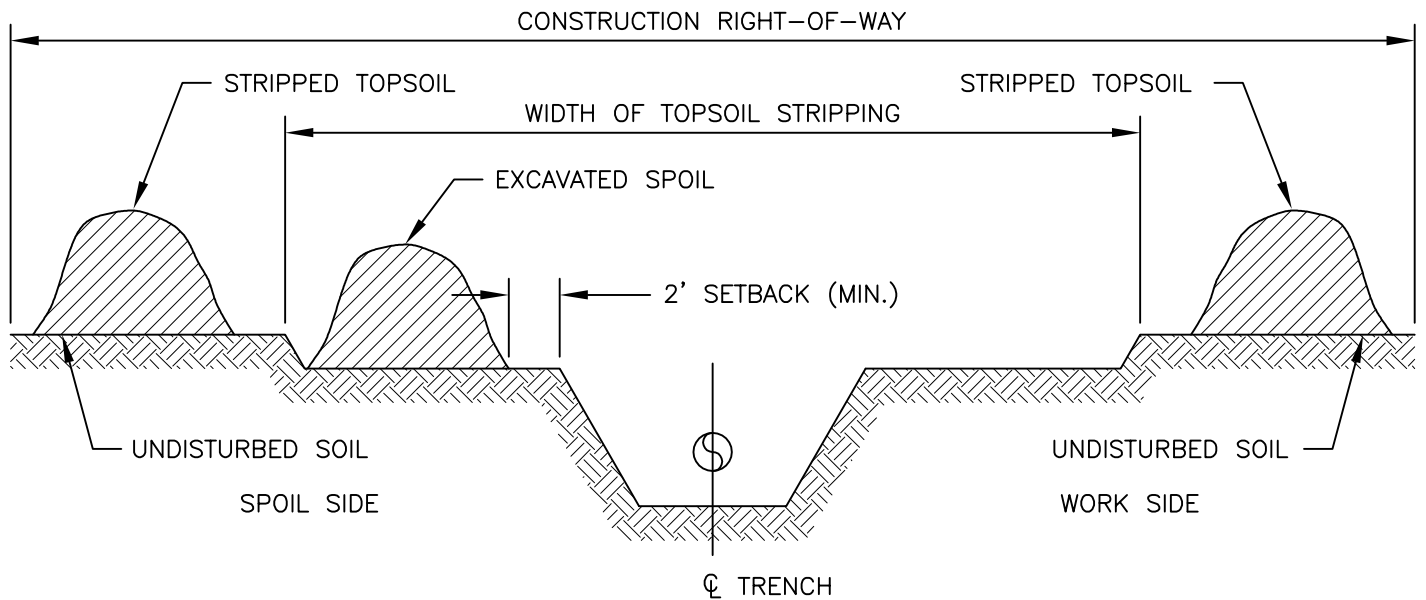
**RT 22 IN-LINE TRENCHING
IN SHOULDER CLIMBING LN.**

176764-RT22-01E

Prepared by: HDR DTA & CTRC 02/21/2011



DITCH PLUS SPOILSIDE TOPSOIL SEGREGATION




FULL RIGHT-OF-WAY TOPSOIL STRIPPING

NOTES:

1. TOPSOIL MAY BE STORED IN LOCATIONS AS SHOWN ABOVE, OR AT OTHER COMPANY APPROVED LOCATIONS WITHIN THE CONSTRUCTION R.O.W.
2. LEAVE GAPS IN SPOIL PILES FOR WATER RUN-OFF.
3. CONSTRUCTION R.O.W. MAY BE EXPANDED UP TO FULL R.O.W. WIDTH IN NON WETLAND AREAS, FOR TOPSOIL SALVAGE.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
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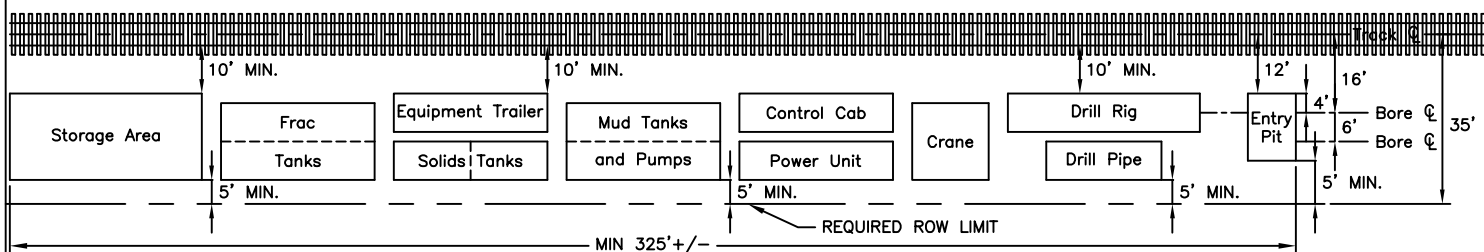


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Developers Inc.

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**ROW TOPSOIL
SEGREGATION TECHNIQUES**
176764-UM-07

Prepared by: **HR** & **CTRC** 12/06/2010



TYPICAL HDD LAYOUT ON CP ROW BI-POLE (2 CABLES) ONE SIDE OF TRACK

Designed	WJL
Drawn	WJL
Checked	CRP
Approved	LEP
Scale	NTS

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC		
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC		



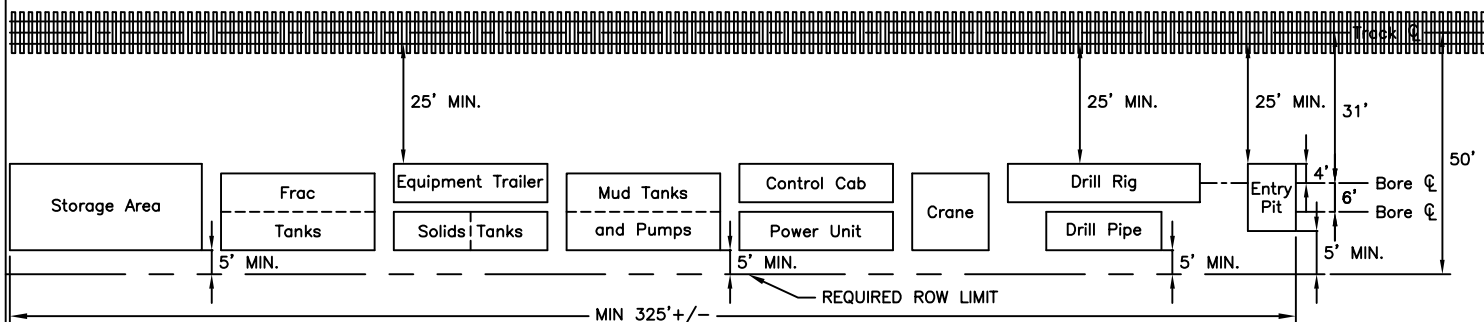
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

HDD LAYOUT CP RIGHT OF WAY

176764-HDDM-01

Prepared by: **HDR** | **DTA** & **CTRC** 12/06/2010



TYPICAL HDD LAYOUT ON CSX ROW BI-POLE (2 CABLES) ONE SIDE OF TRACK

Designed	WJL
Drawn	WJL
Checked	CRP
Approved	LEP
Scale	NTS

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC		
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC		



Transmission
Developers Inc.

Champlain Hudson Power Express Project

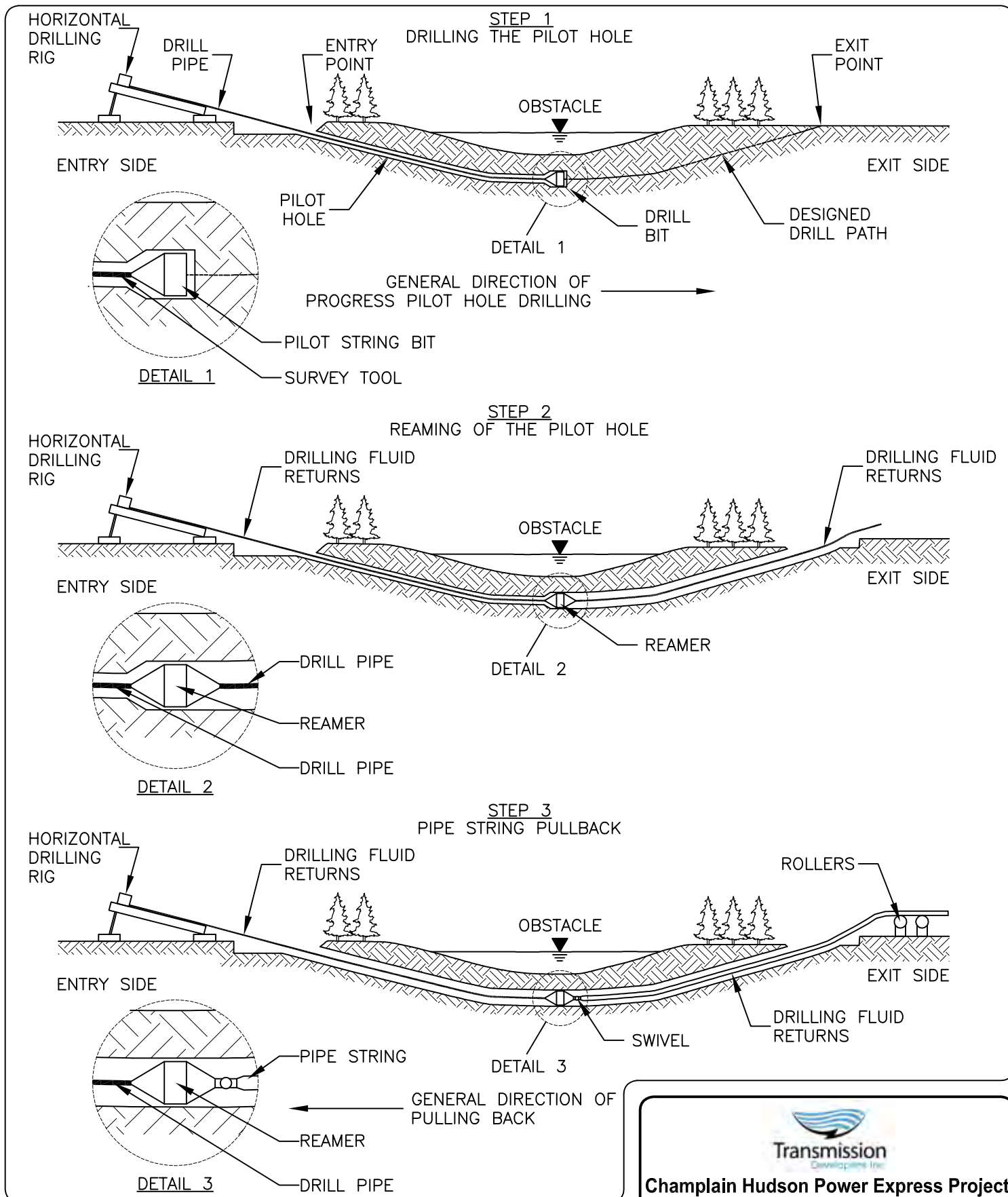
Champlain Hudson Power Express Inc.

HDD LAYOUT CSX

RIGHT OF WAY


176764-HDDM-02

Prepared by: **HDR** | **DTA** & **CTRC** 12/06/2010



Designed	A WIRONEN
Drawn	JJD/TRC
Checked	.
Approved	.
Scale	NONE

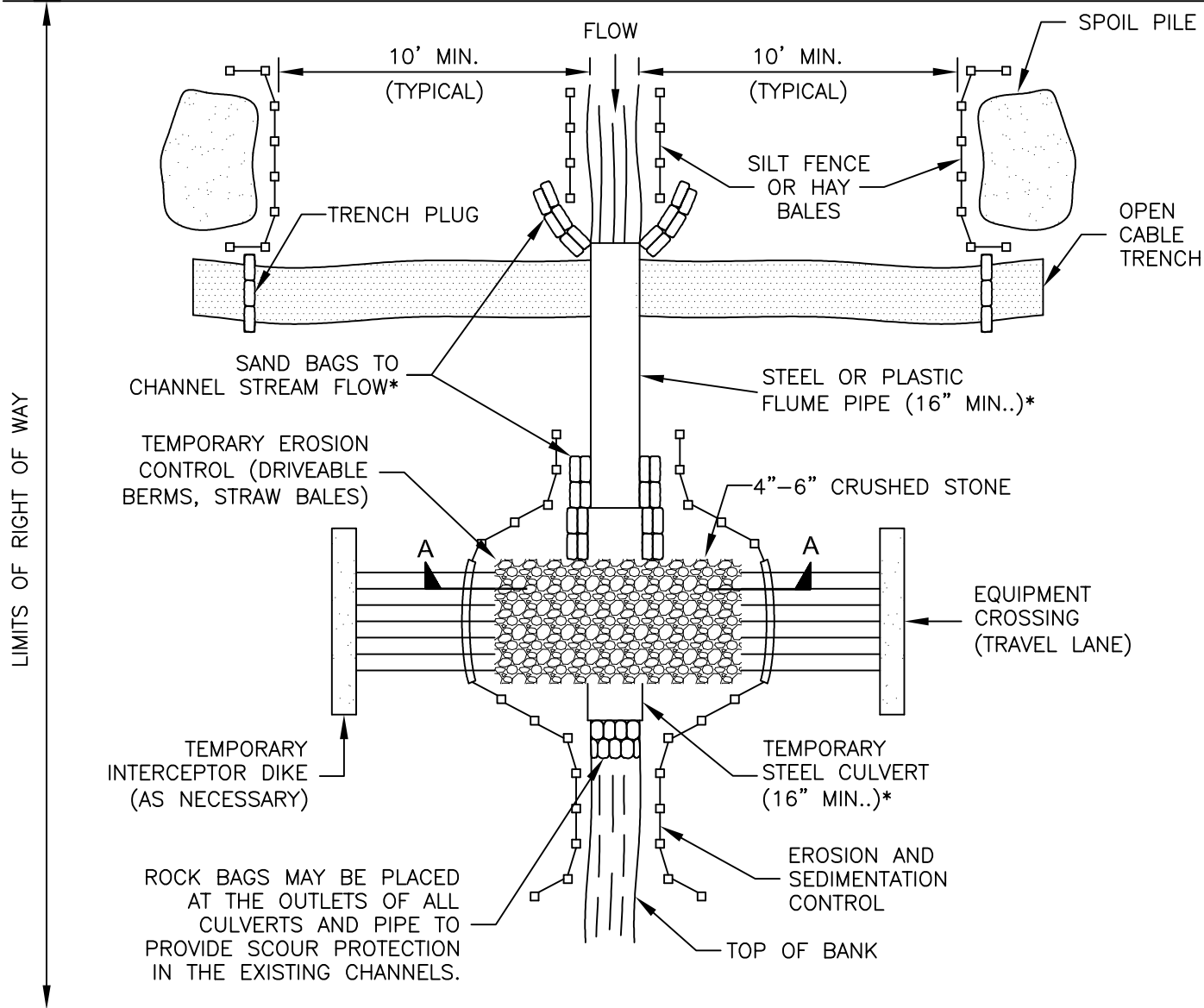
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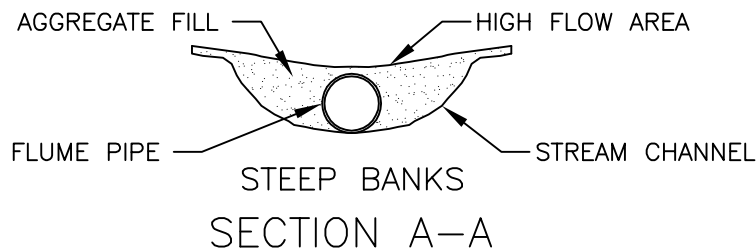
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

HDD
MULTI-STAGE PROCESS
176764-HDDM-03

Prepared by: **HDR** **UTA** & **CTRC** 12/06/2010



PLAN VIEW



* IF WELDED PIPE IS USED SAND BAGS AT JOINTS NOT REQUIRED. ACTUAL NUMBERS OF FLUMES AND CULVERT PIPE REQUIRED TO BE DETERMINED BY STREAM WIDTH.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
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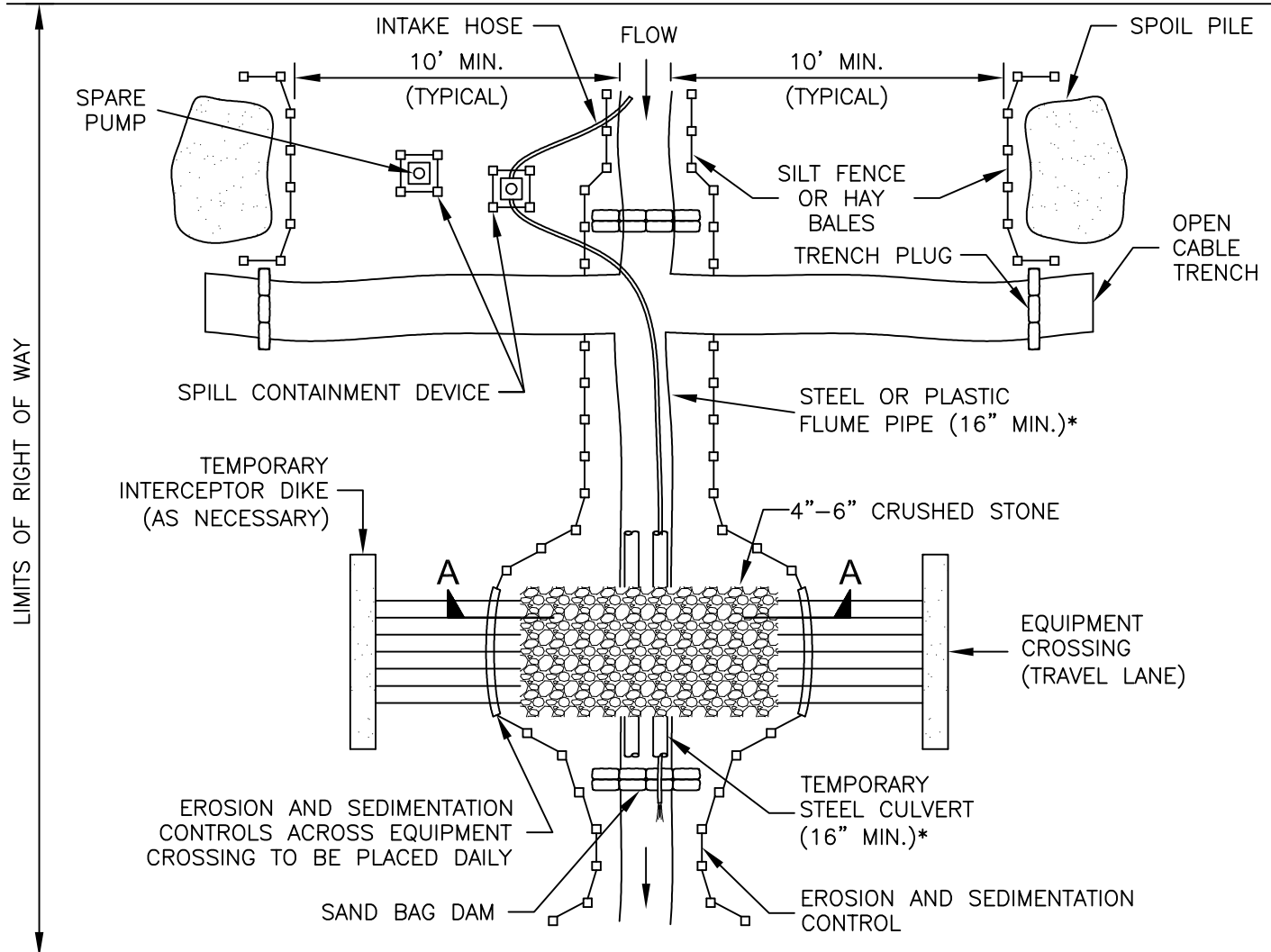
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

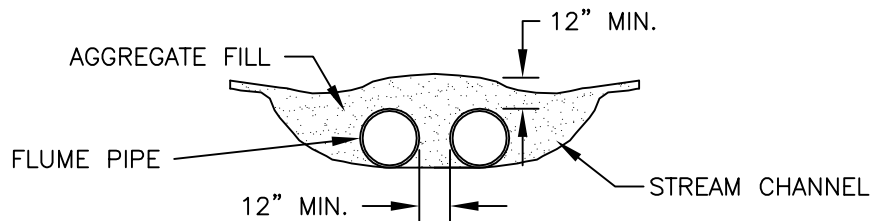
TYPICAL FLUMED CROSSING

176764-UM-13

Prepared by: HDR DTA & CTRC 12/06/2010



PLAN VIEW



SECTION A-A

NOTES:

1. EXCAVATE ACROSS STREAM CHANNEL FOLLOWING WATER RE-ROUTING.
2. LOWER PIPE UNDER HOSE AND BACKFILL.
3. MONITOR PUMPS AT ALL TIMES DURING STREAM CROSSING PROCEDURE.
4. REMOVE SILT FENCE/HAY BALES ACROSS EQUIPMENT CROSSING AS NEEDED FOR ACCESS, AND REPLACE AT THE END OF EACH DAY.
5. NUMBER OF FLUME PIPES WILL VARY DEPENDING ON SITE CONDITIONS.


Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

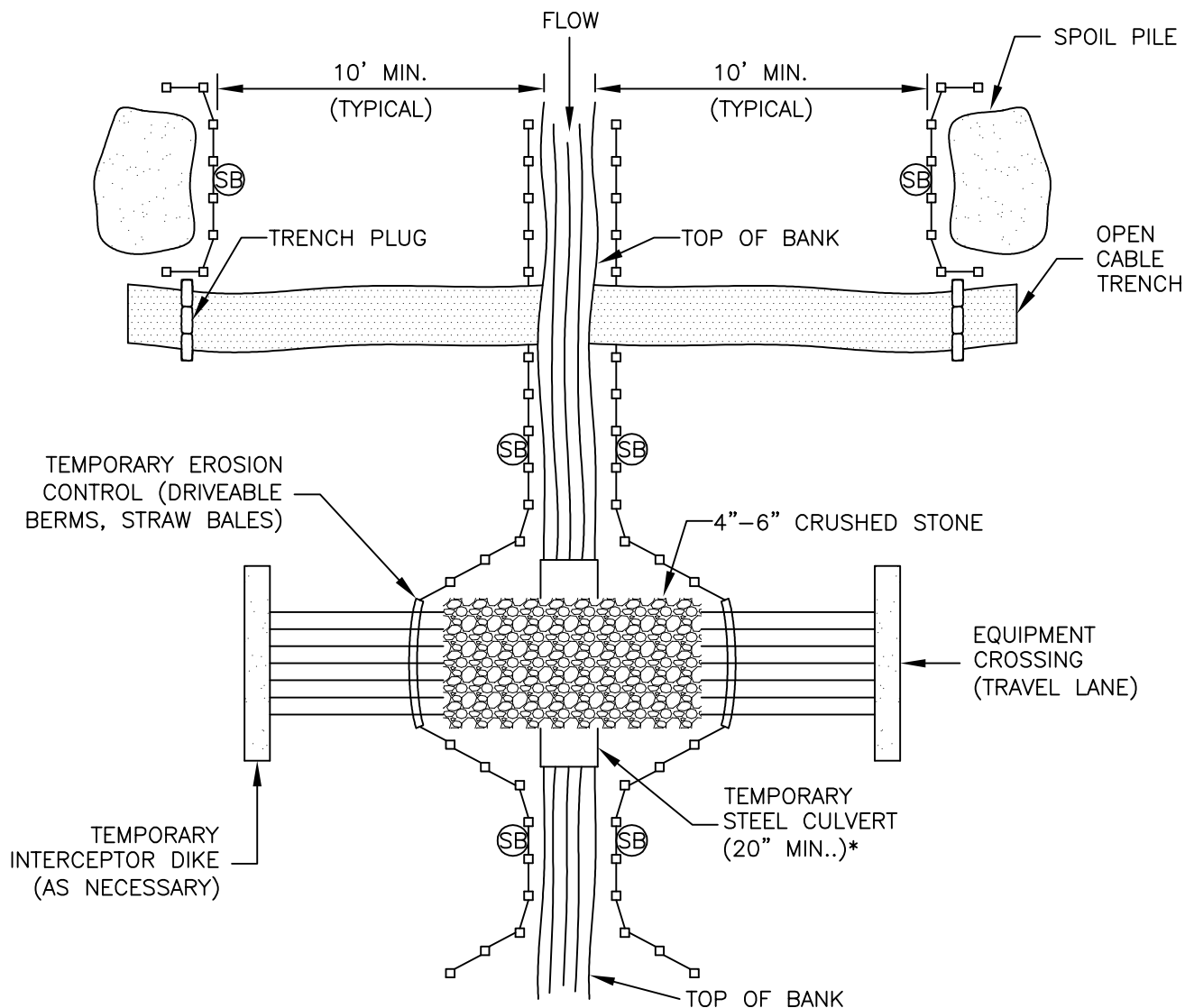
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1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.


Transmission
 Developers Inc.

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**TYPICAL DAM AND PUMP
STREAM CROSSING**
 176764-UM-14

Prepared by:   &  12/06/2010



NOTES:

1. (SB) TEMPORARY SEDIMENT BARRIER OF SILT FENCE AND/OR STRAW BALES, OR APPROPRIATE MATERIALS.
2. FOR MINOR WATERBODIES, COMPLETE TRENCHING AND BACKFILL IN THE WATERBODY (NOT INCLUDING BLASTING OR OTHER ROCK BREAKING MEASURES) WITHIN 24 CONTINUOUS HOURS. IF A FLUME IS INSTALLED WITHIN THE WATERBODY DURING MAINLINE ACTIVITIES, IT CAN BE REMOVED JUST PRIOR TO LOWERING IN THE CABLE OR CONDUIT. THE 24-HOUR TIMEFRAME STARTS AS SOON AS THE FLUME IS REMOVED.
3. FOR INTERMEDIATE WATERBODIES, COMPLETE TRENCHING AND BACKFILLING IN THE WATERBODY (NOT INCLUDING BLASTING OR OTHER ROCK BREAKING MEASURES) WITHIN 48 CONTINUOUS HOURS, IF FEASIBLE.

* ACTUAL NUMBERS OF FLUMES AND CULVERT PIPE REQUIRED TO BE DETERMINED BY STREAM WIDTH.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
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Transmission
Developers Inc.

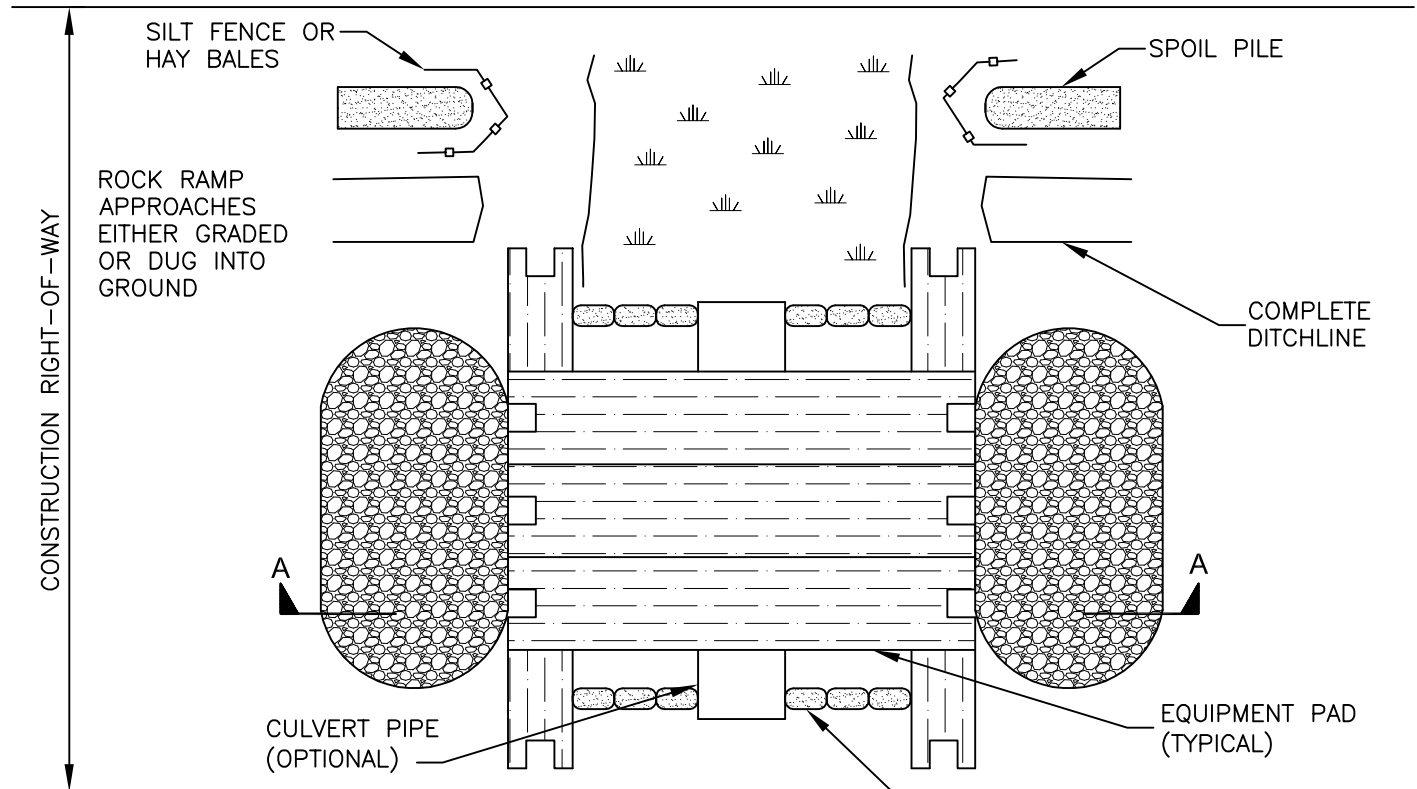
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

**TYP. OPEN CUT
STREAM CROSSING**

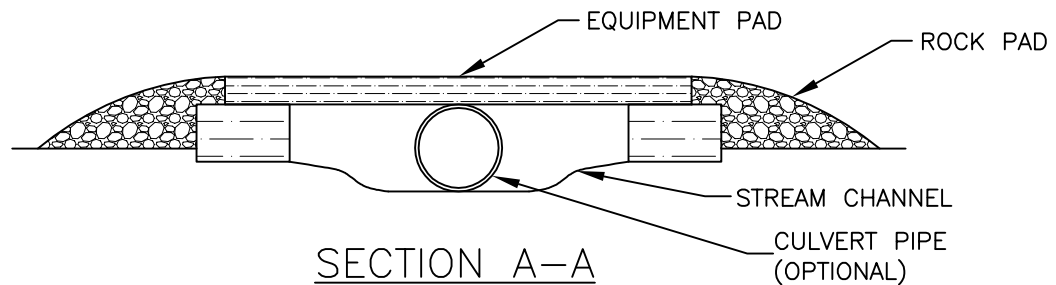
176764-UM-15

Prepared by: **HR** & **CTRC** 12/06/2010



PLAN VIEW

TYPICAL PAD SECTION DIMENSIONS
3' WIDE, 1' THICK, 20' LONG



SECTION A-A

NOTES:

1. CULVERT PIPE UTILIZED IF ADDITIONAL SUPPORT IS REQUIRED.
2. ADDITIONAL PADS CAN BE PUT SIDE BY SIDE IF EXTRA WIDTH IS REQUIRED
3. EQUIPMENT PAD TYPICALLY CONSTRUCTED OF HARDWOOD; MUST ACCOMMODATE THE LARGEST EQUIPMENT USED.
4. ROCK PADS OR CRUSHED STONE SHALL BE USED AT ENTRANCE TO THE EQUIPMENT PADS (IF NECESSARY).

Designed	A WIRONEN
Drawn	DFW/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



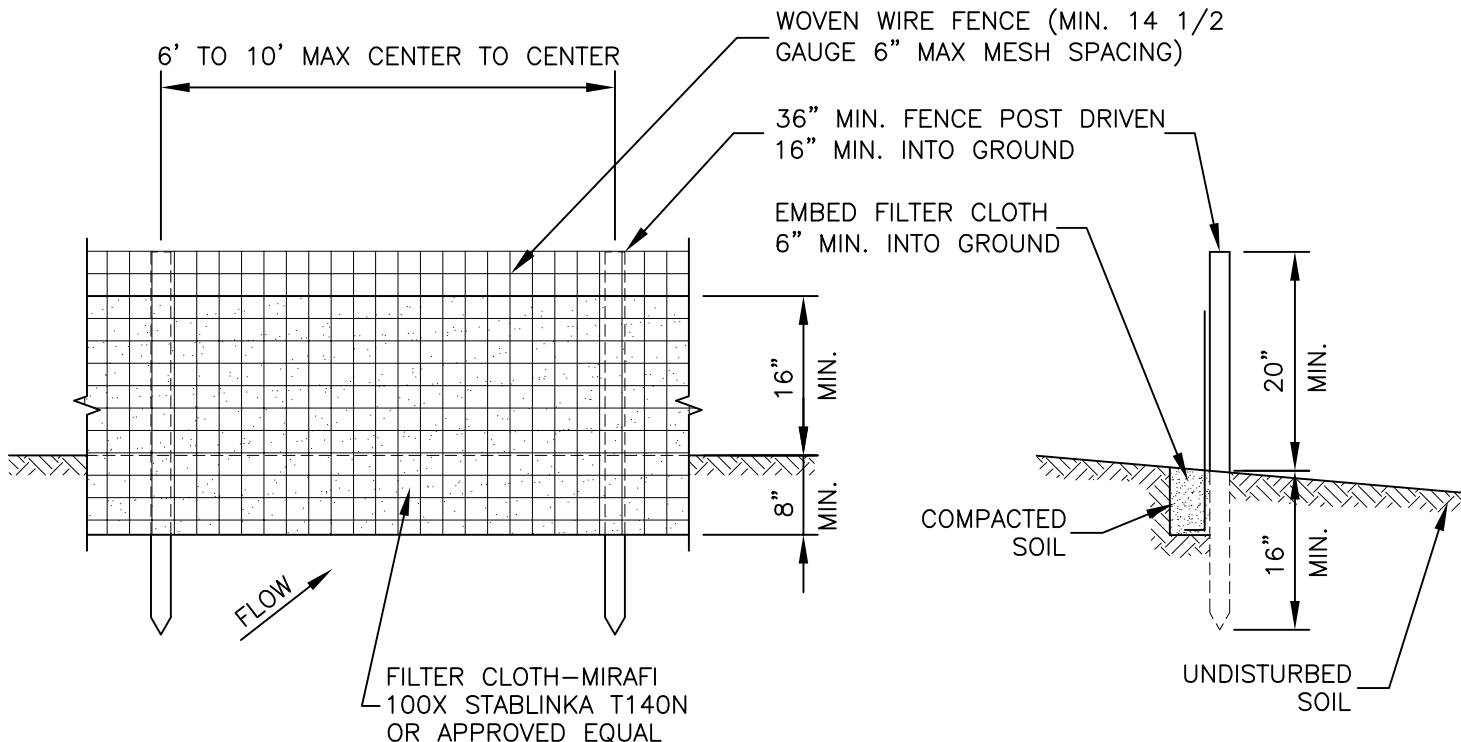
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

**TEMP. EQUIPMENT
BRIDGE (WOODEN MAT)**

176764-UM-17

Prepared by: **HR** **DTA** & **CTRC** 12/06/2010



ELEVATION

SECTION

NOTES:

1. WOVEN WIRE FENCE TO BE FASTENED TO FENCE POSTS WITH WIRE TIES OR STAPLES.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY 6" AND FOLDED.
4. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

POSTS:

STEEL "T" OR "U" TYPE OR 2" HARDWOOD.

FENCE:

WOVEN WIRE. 14 1.2 GA. 6" MAX MESH OPENING.

FILTER CLOTH:

FILTER X, MIRAFI 100X. STABLINKA T140N OR APPROVED EQUAL.


PREFABRICATED UNIT:

ENVIROFENCE OR APPROVED EQUAL.

SILT FENCE DETAIL

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.


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 Development Inc.

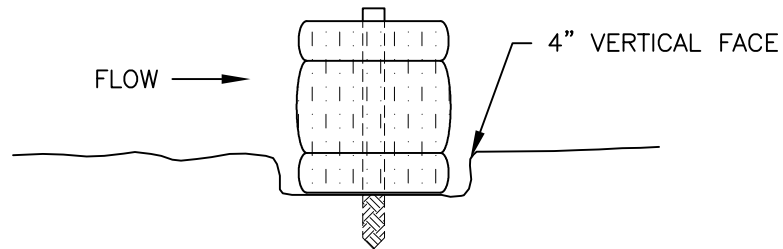
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

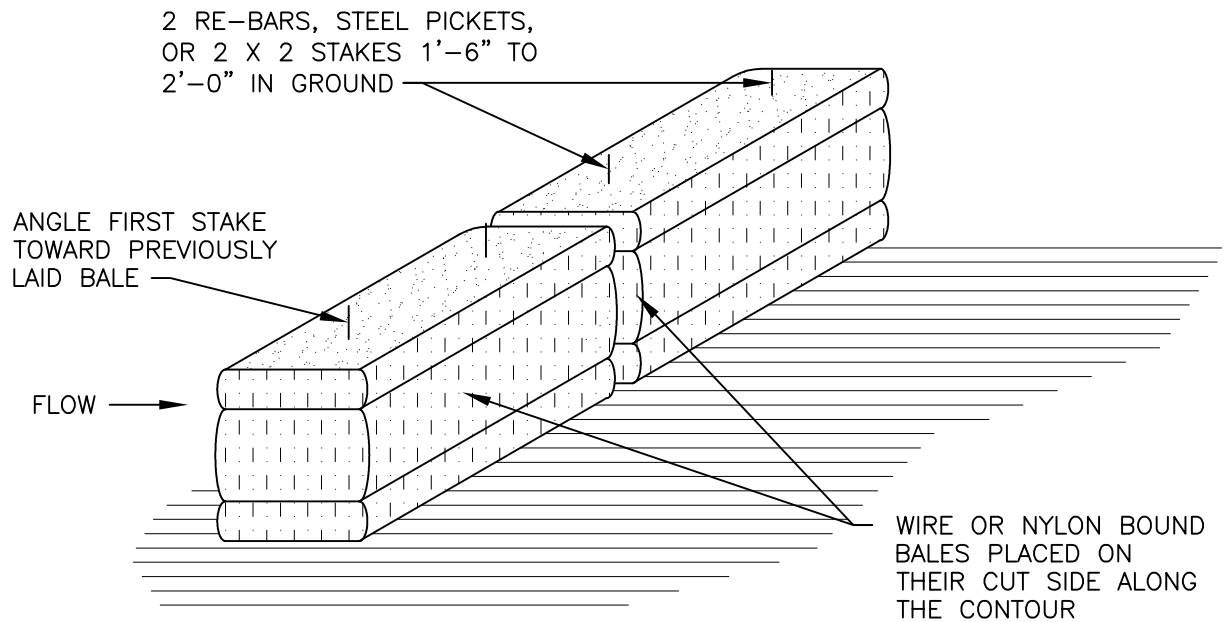
SILT FENCE

176764-UM-21

Prepared by: **HDR** **UTA** & **CTRC** 12/06/2010



EMBEDDING DETAIL



ANCHORING DETAIL

STRAW BALE DIKE DETAIL

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



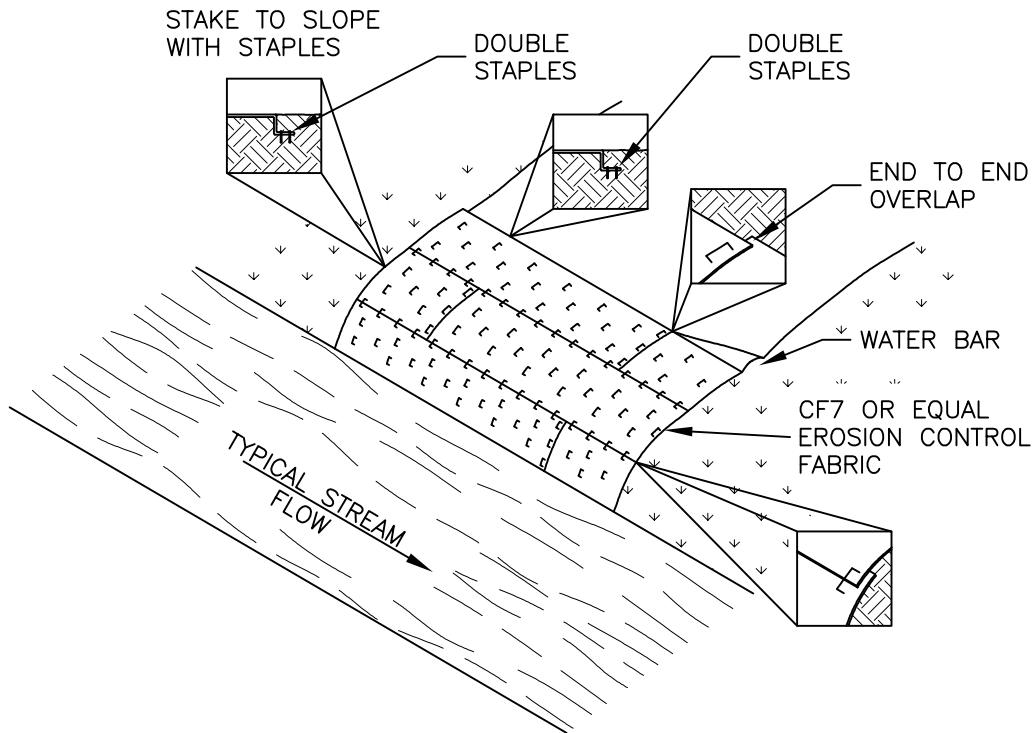
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

STRAW BALE DIKE

176764-UM-22

Prepared by: **HDR** **UTA** & **CTRC** 12/06/2010



NOTES:

1. EROSION CONTROL MATTING SHALL BE PLACED ON THE BANKS OF FLOWING STREAMS WHERE VEGETATION HAS BEEN REMOVED OR AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
2. THE EROSION CONTROL MATTING SHALL MEET THE REQUIREMENTS SPECIFIED IN THE SOIL EROSION AND SEDIMENTATION CONTROL GUIDELINES AND/OR AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
3. STAPLES SHALL BE MADE OF 11 GAUGE WIRE, U-SHAPED WITH 6" LEGS AND A 1" CROWN. STAPLES SHALL BE DRIVEN INTO THE GROUND FOR THE FULL LENGTH OF THE STAPLE LEGS. ALTERNATELY 1" WOODEN PEGS 6" LONG AND BEVELED TO SECURE MATTING.
4. MATTING SHALL BE INSTALLED ACCORDING TO MANUFACTURER SPECIFICATIONS OR AS STATED BELOW:
 - *THE TOP OF THE BLANKET SHALL EXTEND 2' PAST THE UPPER EDGE OF THE HIGH WATER MARK. IF A WATERBED IS PRESENT ON THE APPROACH SLOPE, THE BLANKET SHALL BEGIN ON THE UPHILL SIDE OF THE WATERBED.
 - *INSTALL BLANKET(S) ACROSS THE SLOPE IN THE DIRECTION OF WATER FLOW.
 - *ANCHOR ("KEY") THE UPSTREAM EDGE OF THE BLANKET(S) INTO THE SLOPE USING A 6" WIDE BY 6" DEEP TRENCH. DOUBLE STAPLE EVERY 12" BEFORE BACK FILLING AND COMPACTING TRENCH.
 - *ANCHOR ("KEY") THE UPPER EDGE OF THE BLANKET INTO THE SLOPE USING A 6" WIDE BY 6" DEEP TRENCH. DOUBLE STAPLE EVERY 12" BEFORE BACK FILLING AND COMPACTING TRENCH.
 - *THE EDGES OF PARALLEL BLANKETS SHALL BE OVERLAPPED A MINIMUM OF 6". THE UPPER BLANKET SHALL BE PLACED OVER THE LOWER BLANKET (SHINGLE STYLE) AND STAPLED EVERY 12" ALONG THE LENGTH OF THE EDGE.
 - *WHEN BLANKET ENDS ARE TO ADJOINING BLANKETS, THE UPSTREAM BLANKET SHALL BE PLACED OVER THE DOWNSTREAM BLANKET (SHINGLE STYLE) WITH APPROXIMATELY 6" OF OVERLAP, STAPLE THROUGH THE OVERLAP AREA EVERY 12".
 - *STAPLE DOWN THE CENTER OF THE BLANKET(S), THREE STAPLES IN EVERY SQUARE YARD.
5. IN LIVESTOCK AREAS WHERE EROSION CONTROL MATTING IS APPLIED TO STREAM BANKS, FENCING WILL BE USED IF NECESSARY TO EXCLUDE LIVESTOCK, WITH PERMISSION OF THE LANDOWNER.
6. MONITOR FOR WASHOUTS, STAPLE INTEGRITY OR MAT MOVEMENT. REPLACE OR REPAIR AS NECESSARY.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



Transmission
Developers Inc.

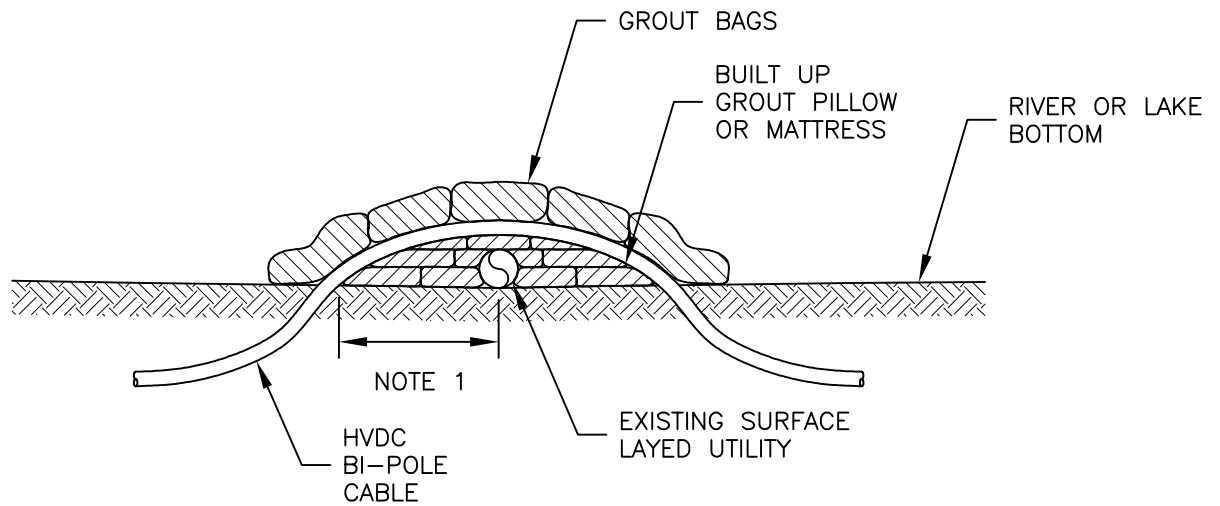
Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

**TYPICAL MATTING
STREAMBANKS**

176764-UM-24

Prepared by: **HR** & **CTRC** 12/06/2010



NOTES:

1. VARIES BASED ON EXISTING UTILITY DIAMETER/EXPOSURE AND MINIMUM BEND RADIUS OF CABLE.
2. ADDITIONAL SUPPORT MAY BE PROVIDED WHERE EXISTING UTILITY IS ON UNSTABLE SEDIMENT. SUPPORT MAY INCLUDE, GROUT BAG STABILIZATION, RIP-RAP, PILES OR OTHER.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.

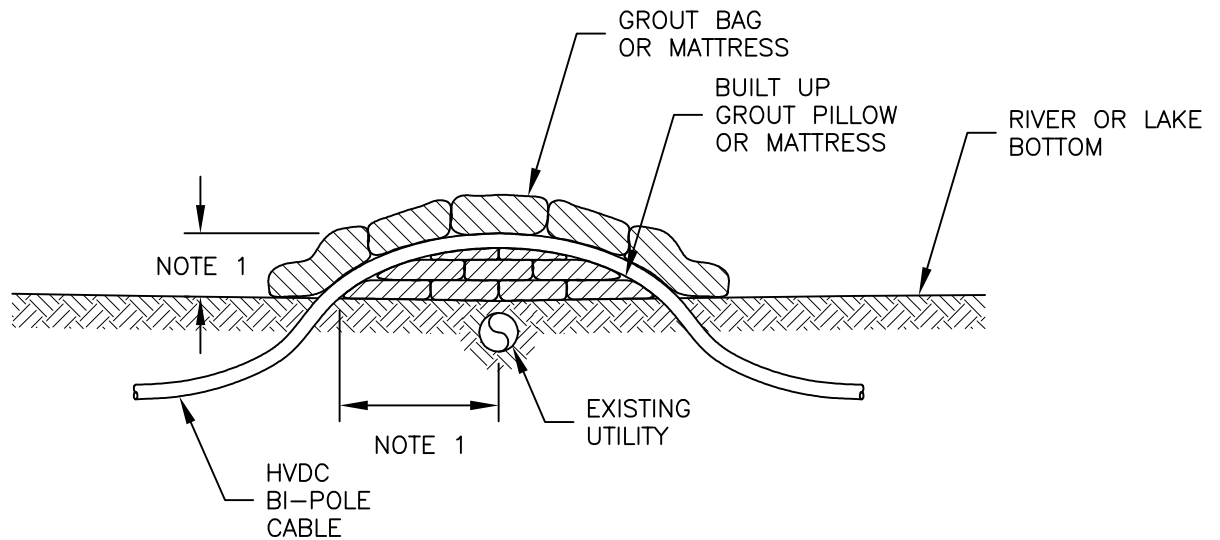


Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**GROUT FILLED MATTRESS UTILITY
CROSSING SURFACE LAID**

176764-SM-10

Prepared by: **HR** & **CTRC** 12/06/2010



NOTE:

1. VARIES BASED ON STABILITY OF EXISTING BOTTOM SEDIMENT, UTILITY DIAMETER AND BEND RADIUS OF CABLE.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PERMIT	12/06/10	TRC	TRC	.	.
1	ISSUED FOR PERMIT	02/20/12	TRC	TRC	.	.



Champlain Hudson Power Express Project

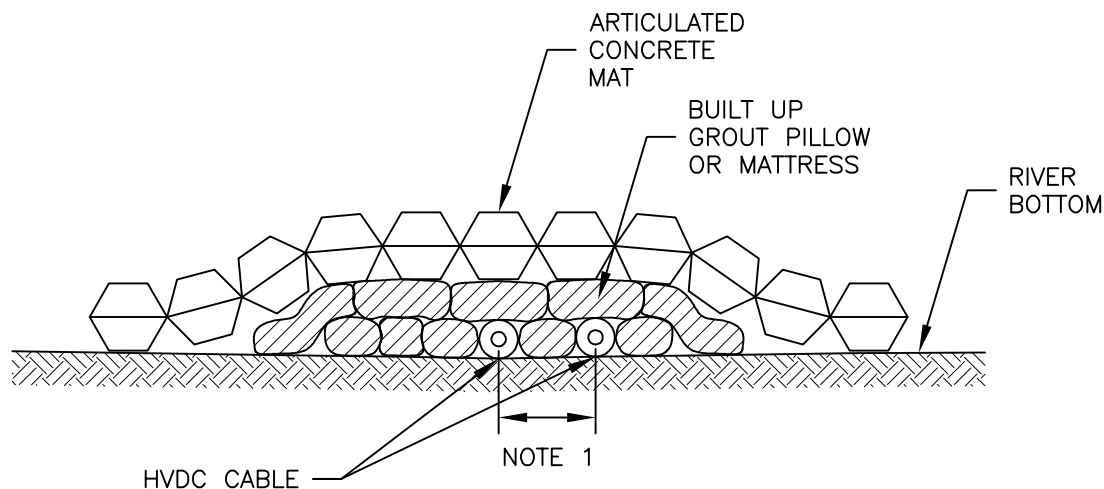
Champlain Hudson Power Express Inc.

GROUT FILLED MATTRESS UTILITY CROSSING NEAR SURFACE LAID

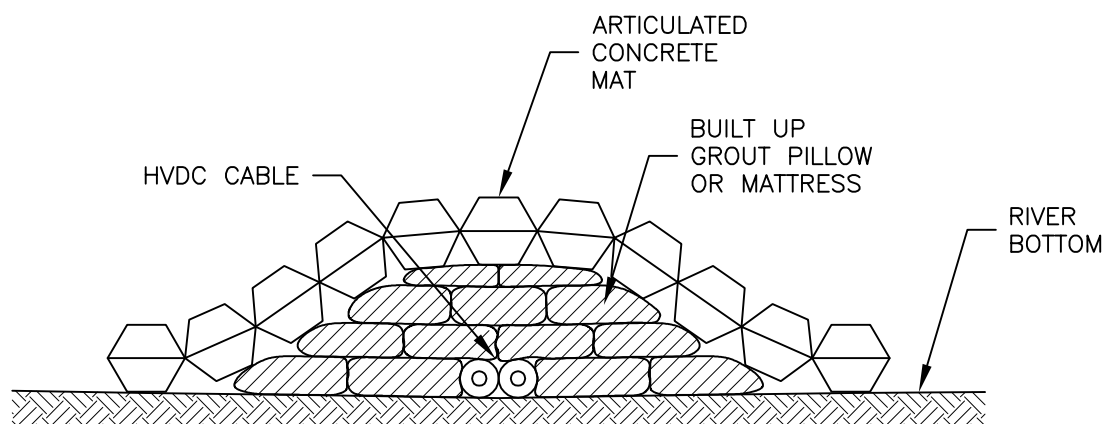
176764-SM-11

Prepared by: HDR | DTA & CTRC 12/06/2010

NON-BURIAL HVDC CABLE INSTALLATION USING ARTICULATED CONCRETE MAT PROTECTIVE COVERING



SEPARATED BI-POLE CONDUCTORS




BUNDLED BI-POLE CONDUCTORS

NOTES:

1. SPACE BI-POLE CONDUCTORS AS REQUIRED TO ENSURE PROPER SUPPORT OF GROUT PILLOWS WITHOUT UNDUE STRESS ON CABLE CASING. CABLE BI-POLES MAY BE IN DIRECT CONTACT.
2. BUILD UP PILLOWS AND MATTRESS WITH OVERLAPPING JOINTS (RUNNING BOND) AS NECESSARY TO BRIDGE OVER BUNDLED CONDUCTORS WITHOUT APPLYING UNDUE STRESS ON CONDUCTORS.
3. ARTICULATED CONCRETE MATS SHALL BE SUBMAT AS MANUFACTURED BY SLP PRE CAST, OR EQUAL.

Designed	A WIRONEN
Drawn	JRP/TRC
Checked	.
Approved	.
Scale	NONE

No.	Revision	Date	By	Ck	PE	PE #
0	ISSUED FOR PREMIT	12/06/10	TRC	TRC	.	.
1	ISSUED FOR PREMIT	02/20/12	TRC	TRC	.	.



**Transmission
Developers Inc.**

Champlain Hudson Power Express Project

Champlain Hudson Power Express Inc.

**ARTICULATED CONCRETE
MAT PROTECTIVE COVERING**

176764-SM-14

Prepared by: **HR** & **CTRC** 12/06/2010