

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 31L-65

DIST. 54 REGION

W.P. No. 25-84-01

CONT. No. 95-215

W. O. No.

STR. SITE No.

HWY. No. 11

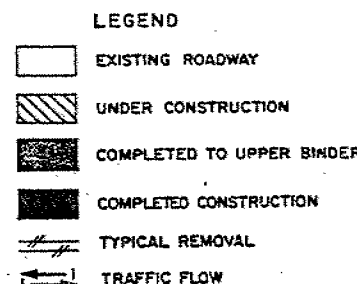
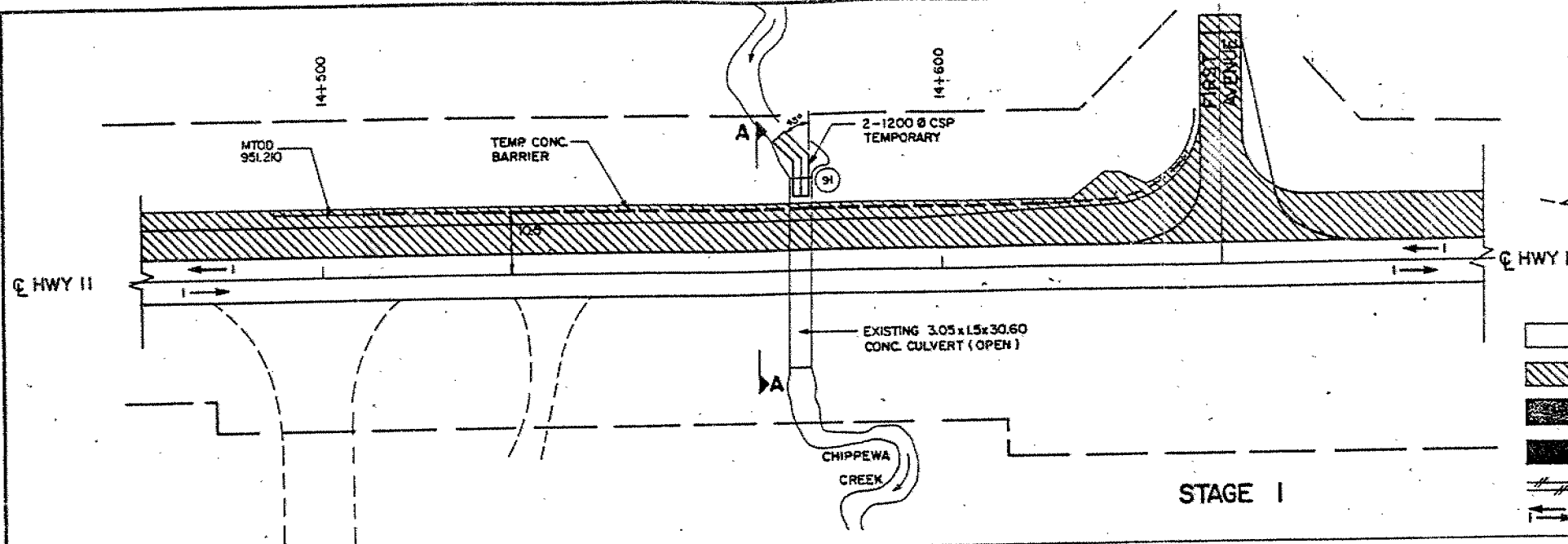
LOCATION Chippewa Culvert
Replacement

No of PAGES -

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

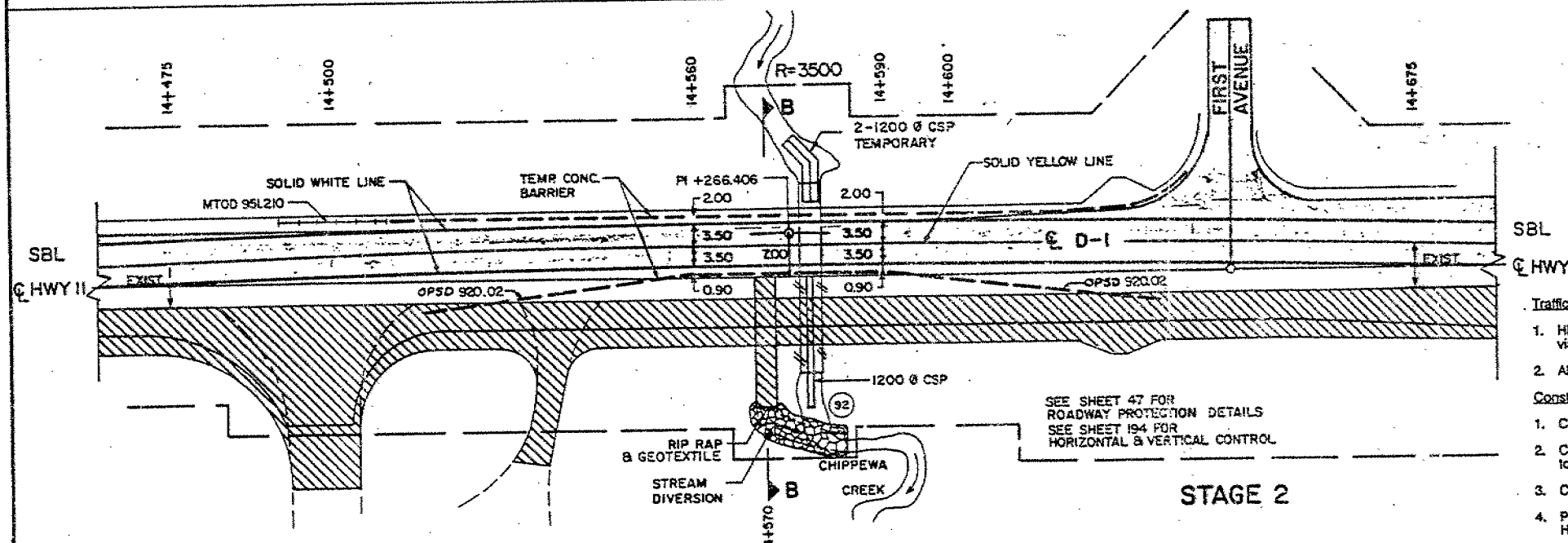


Traffic Flow During Stage

- Traffic will remain on existing roadways.

Construction Sequence

- Place two temporary 1200a CSP at west (left) end of the existing Concrete Culvert at Sta 14+577.
- Construct west side of Highway 11 widening from Sta ±14+200 to 14+900 and First Avenue to Upper Binder Course.
- Place Temporary Concrete Barriers as shown.
- Layout and construct temporary pavement markings for detour D-1

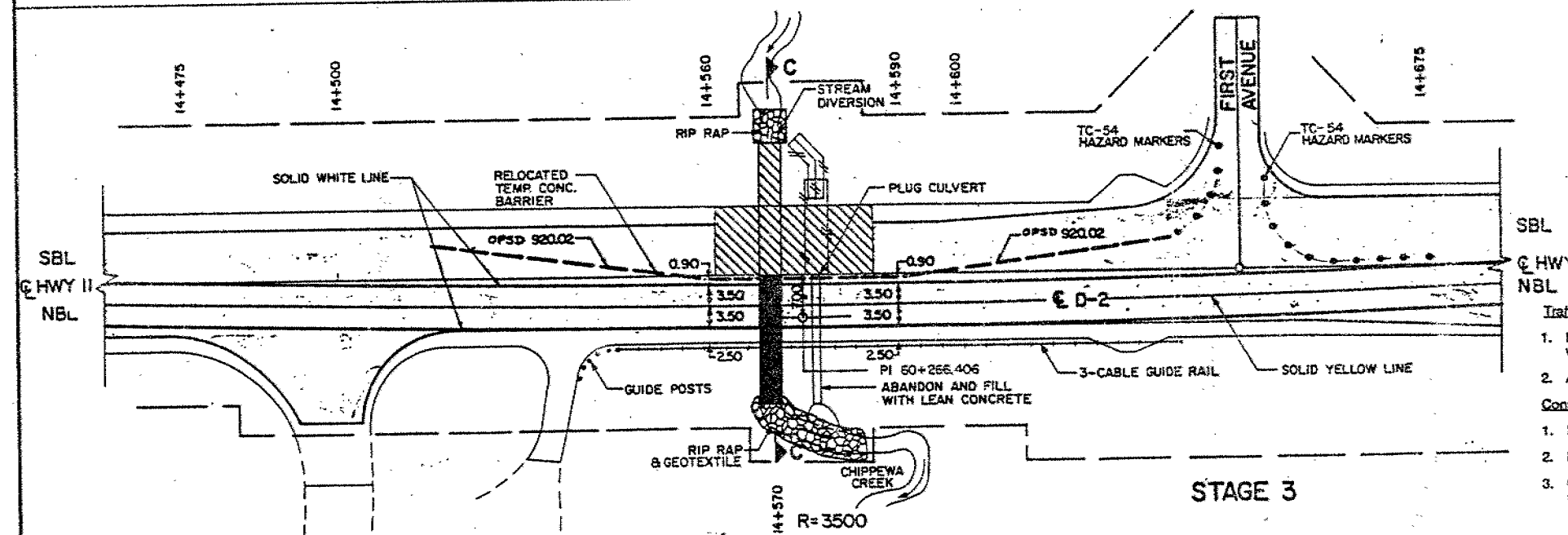


Traffic Flow During Stage

- Highway 11 northbound and southbound traffic will be diverted to the west via Detour D-1 between Sta 14+300 and Sta 14+840
- All other traffic will remain unchanged.

Construction Sequence

- Construct shoring (Roadway Protection).
- Construct new 3.0 x 1.5 concrete culvert from Highway 11 centreline to the east (right) limit.
- Construct east side (downstream) stream diversion.
- Place 1200a CSP inside existing concrete culvert at Sta 14+577 from Highway 11 centreline to 21 metres right.
- Remove existing 3.05 x 1.5 concrete culvert from Highway 11 centreline to east limits.
- Construct east side of Highway 11 widening from Sta ±14+200 to 14+900 and side entrances to Upper Binder Course.
- Layout and construct temporary pavement markings for detour D-2

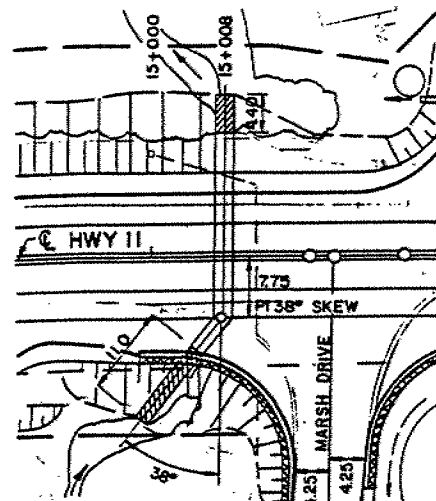


Traffic Flow During Stage

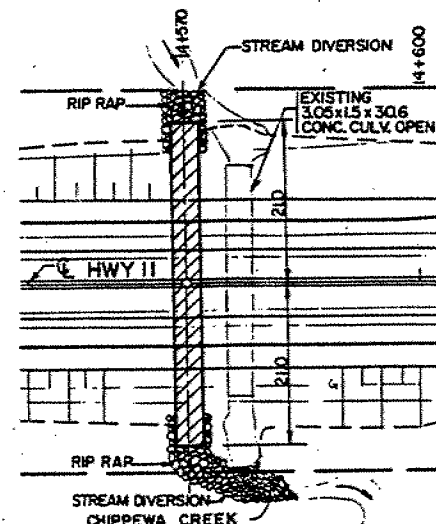
- Highway 11 northbound and southbound traffic will be diverted to the east via Detour D-2 between Sta 14+300 and 14+900
- All other traffic will remain unchanged.

Construction Sequence

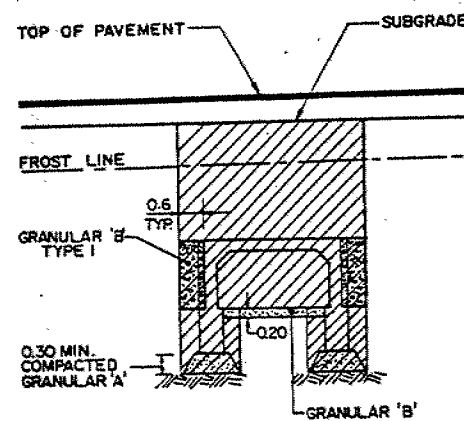
- Relocate Temporary Concrete Barrier to east side of shoring.
- Excavate for and construct west of 3.0 x 1.5 concrete culvert.
- Construct west side (upstream) of stream diversion and divert stream flow through new concrete culvert.
- Remove two temporary 1200a CSP culverts and remainder of existing concrete culvert at Sta 14+577.
- Remove shoring and complete paving and shoulder construction.



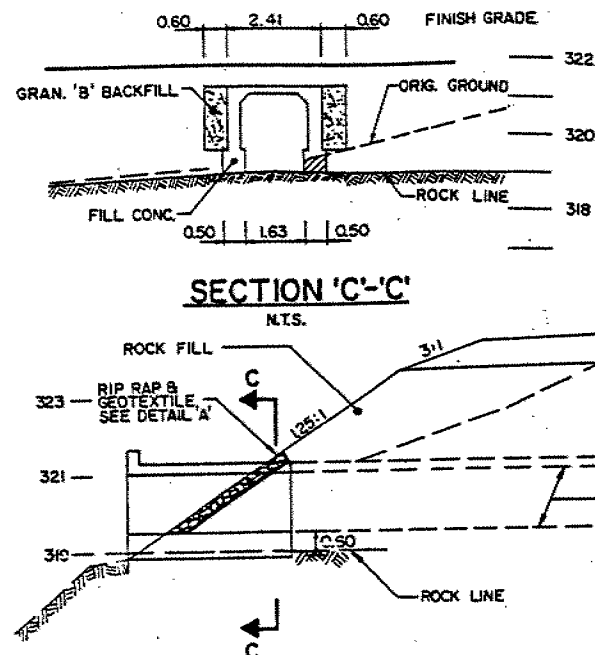
PLAN OF SITE
N.T.S.



PLAN OF SITE
N.T.S.

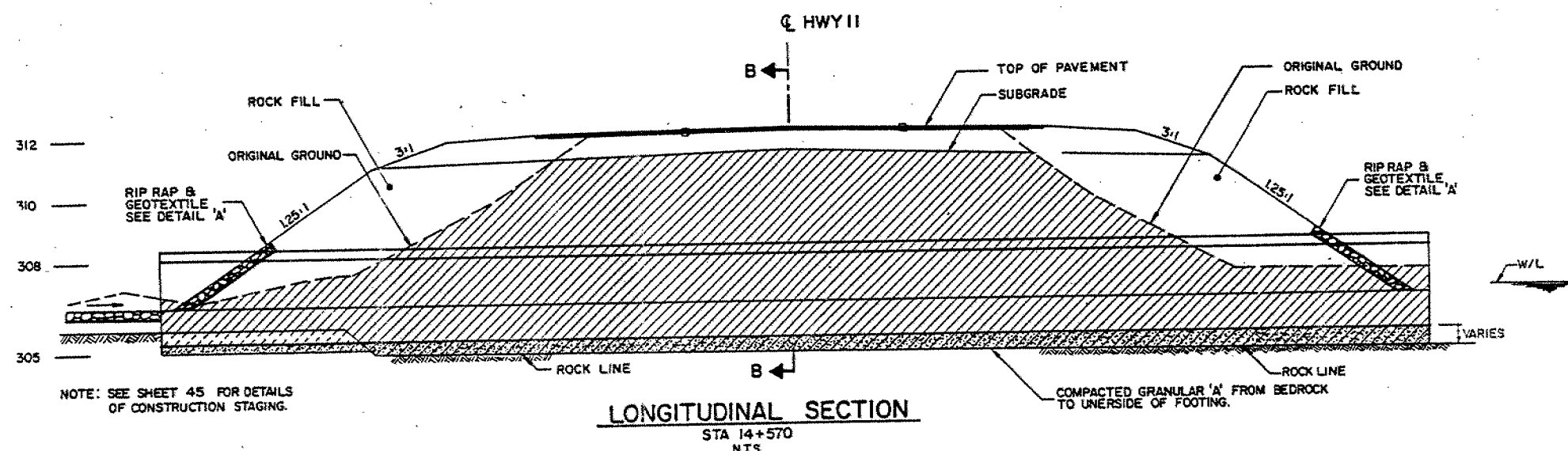


SECTION 'B'-'B'
N.T.S.

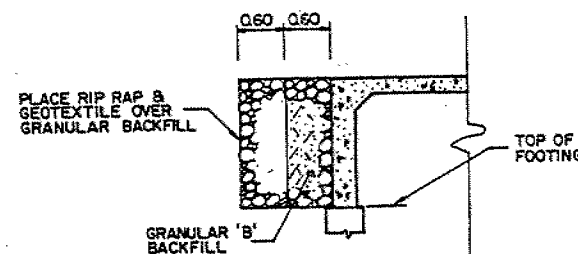


SECTION 'C'-'C'
N.T.S.

LONGITUDINAL SECTION
STA 15+008
N.T.S.



LONGITUDINAL SECTION
STA 14+570
N.T.S.



DETAIL 'A'

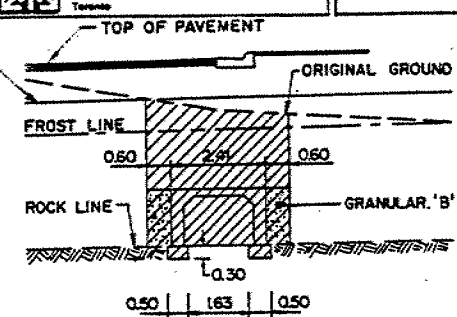
- LEGEND
- EARTH EXCAVATION FOR STRUCTURE
 - ROCK EXCAVATION FOR STRUCTURE
 - GRANULAR BACKFILL
 - GRANULAR BEDDING

CONT No 95-215
WP No 25-84-01

EXCAVATION DETAILS
FOR CONCRETE CULVERTS
AT STA'S 14+570 & 15+008

SHEET
46

Prector & Redfern Limited
Consulting Engineers and Architects
Toronto



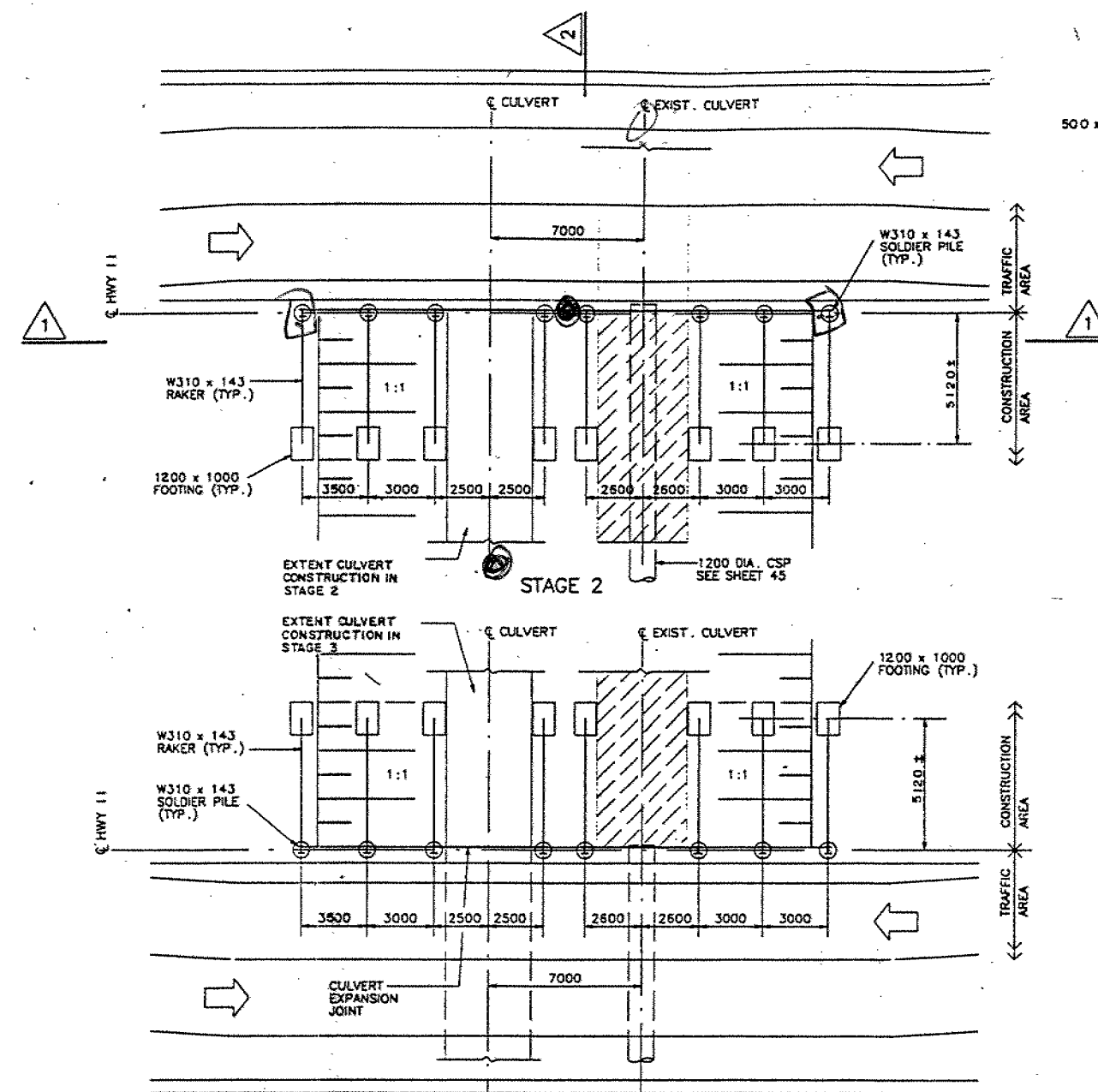
SECTION 'D'-'D'
N.T.S.

GENERAL NOTES :

1. STEEL SHALL CONFORM TO CSA G40.21M GRADE 350W.
2. IF NECESSARY, ALL WELDING SHALL BE PERFORMED IN ACCORDANCE WITH CURRENT CSA SPEC. W59 BY QUALIFIED WELDERS IN ACCORDANCE WITH CSA W47.1.
3. LAGGING SHALL BE DOUGLAS FIR GRADE No. 1 OR BETTER AND SHALL CONFORM TO CANJ-086-1-M84.
4. REINFORCING STEEL SHALL BE GRADE 400.

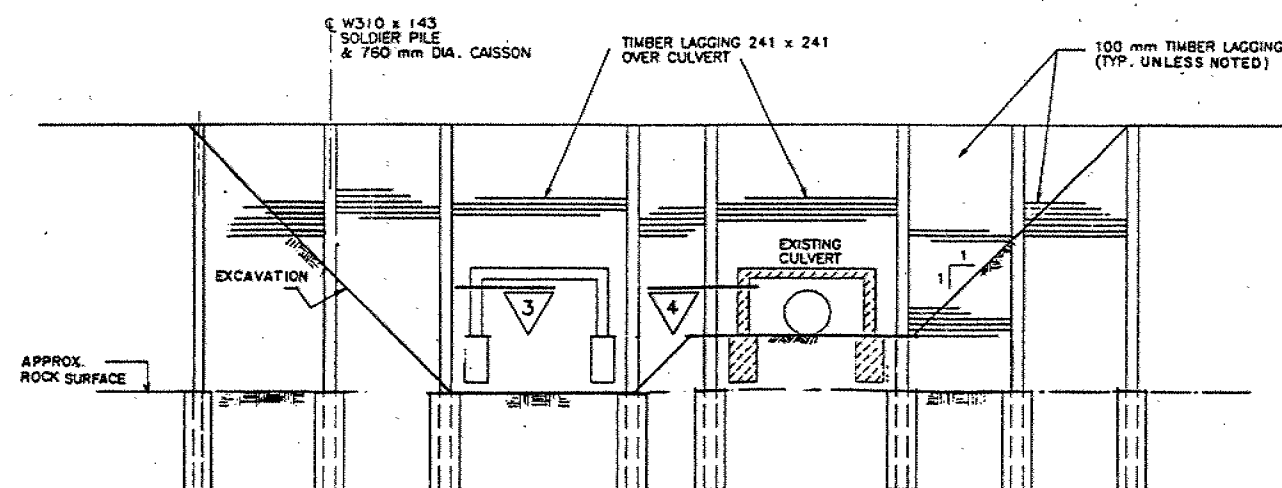
CONSTRUCTION SEQUENCE (TO BE READ IN CONJUNCTION
WITH CONSTRUCTION STAGE
DWG. SHEET 45)

1. SEE DWG. SHEET No. 45 FOR CONSTRUCTION SEQUENCE OF TRAFFIC STAGING AND STREAM DIVERSION.
2. AUGER HOLES FOR THE SOLDIER PILES TO THE REQUIRED DEPTHS.
3. INSTALL SOLDIER PILES IMMEDIATELY AFTER AUGERING EACH HOLE AND FILL THE AUGERED HOLE TO THE TOP OF SOUND ROCK LEVEL WITH 20 MPa CONCRETE.
4. EXCAVATE LOCALLY AT EACH RAKER LOCATION. CONSTRUCT CONCRETE FOOTINGS AND INSTALL RAKER SYSTEMS IN STAGE 2 CONSTRUCTION AREA.
5. AFTER THE INSTALLATION OF SOLDIER PILES AND RAKERS IS COMPLETED, PROGRESSIVELY EXCAVATE AND PLACE LAGGING.
6. CONSTRUCT BOX CULVERT IN STAGE 2 CONSTRUCTION AREA.
7. REMOVE EXISTING CONCRETE CULVERT IN STAGE 2 CONSTRUCTION AREA EXCEPT AS NOTED IN SECTION 4.
8. INSTALL STEEL ANGLE AND TIMBER LAGGING AS SHOWN ON SECTION 3 & 4.
9. BACKFILL STAGE 2 CONSTRUCTION AREA AND MOVE TRAFFIC TO EAST SIDE.
10. EXCAVATE LOCALLY AT EACH RAKER LOCATION IN STAGE 3 CONSTRUCTION AREA. CONSTRUCT CONCRETE FOOTINGS AND INSTALL RAKER SYSTEM.
11. AFTER THE INSTALLATION OF RAKERS IS COMPLETED, EXCAVATE STAGE 3 CONSTRUCTION AREA.
12. CONSTRUCT THE REMAINDER OF NEW BOX CULVERT.
13. REMOVE REMAINDER OF EXISTING CONCRETE CULVERT.
14. BACKFILL STAGE 3 CONSTRUCTION AREA AND REMOVE TOP 800 mm OF TIMBER LAGGING & SOLDIER PILES.

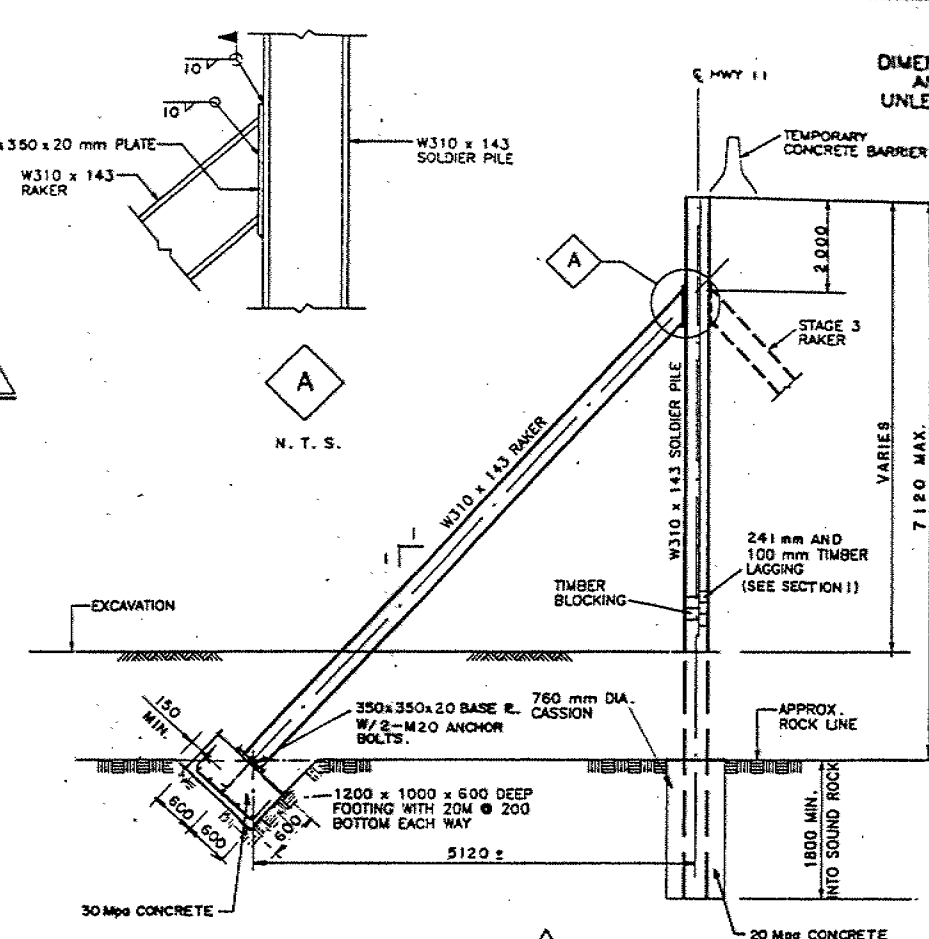


STAGE 3
P L A N

1 : 150

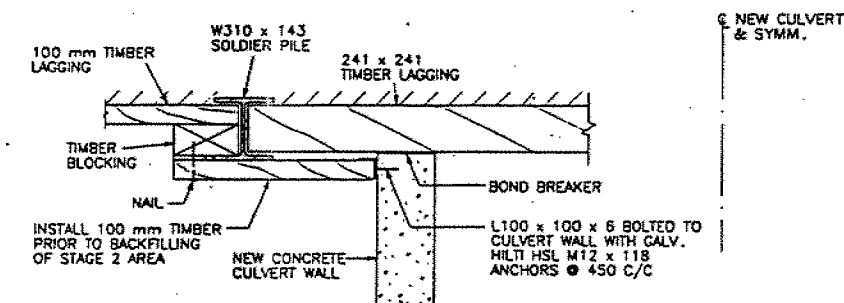


1 : 100



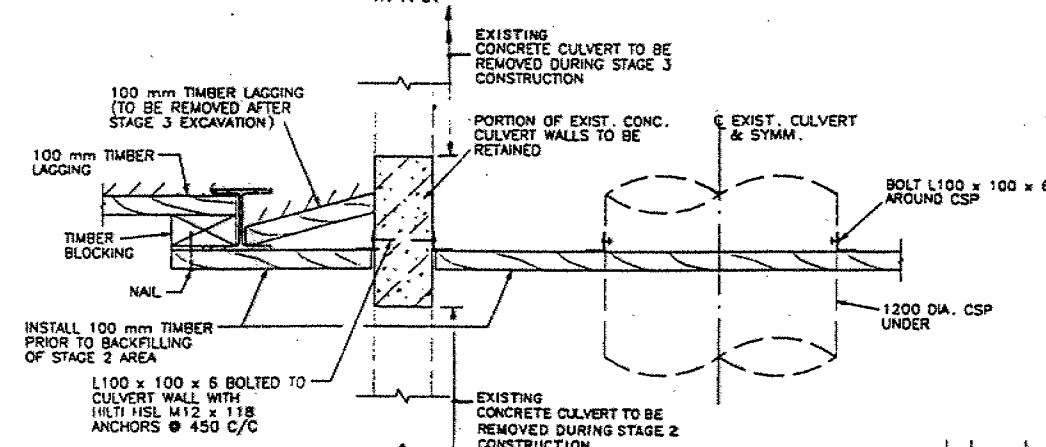
2

1 - 54



3

11. 7. 2001

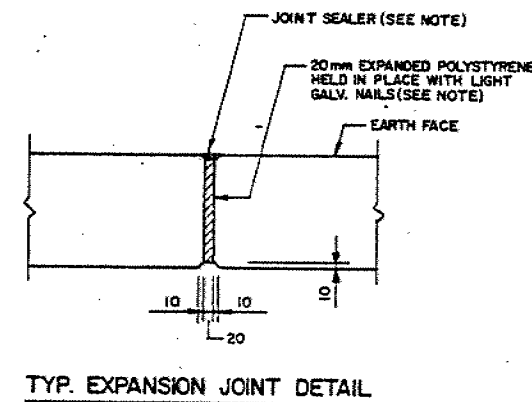
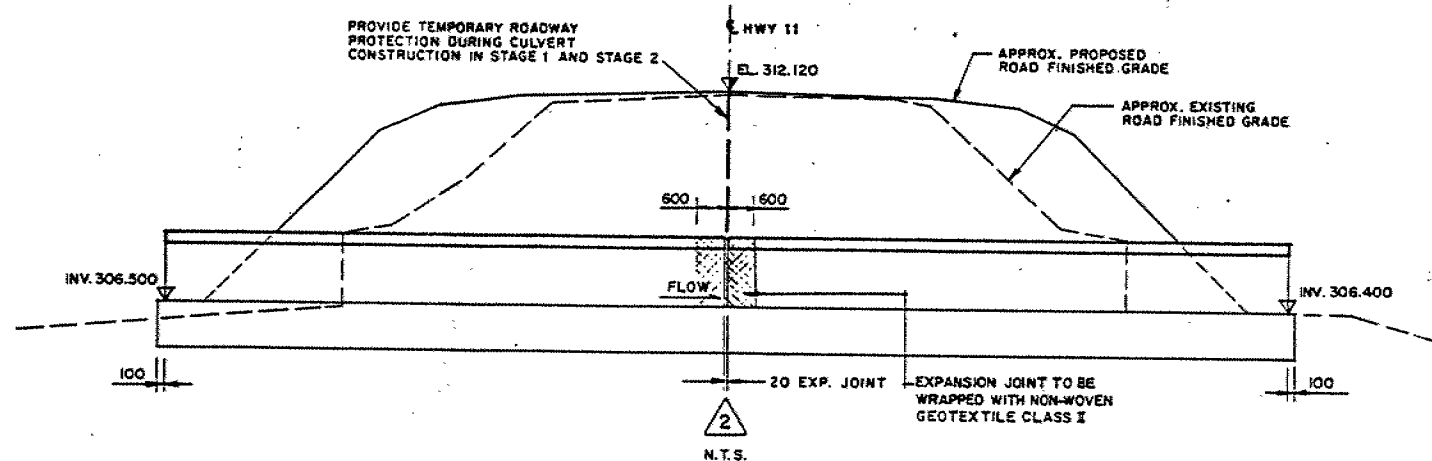
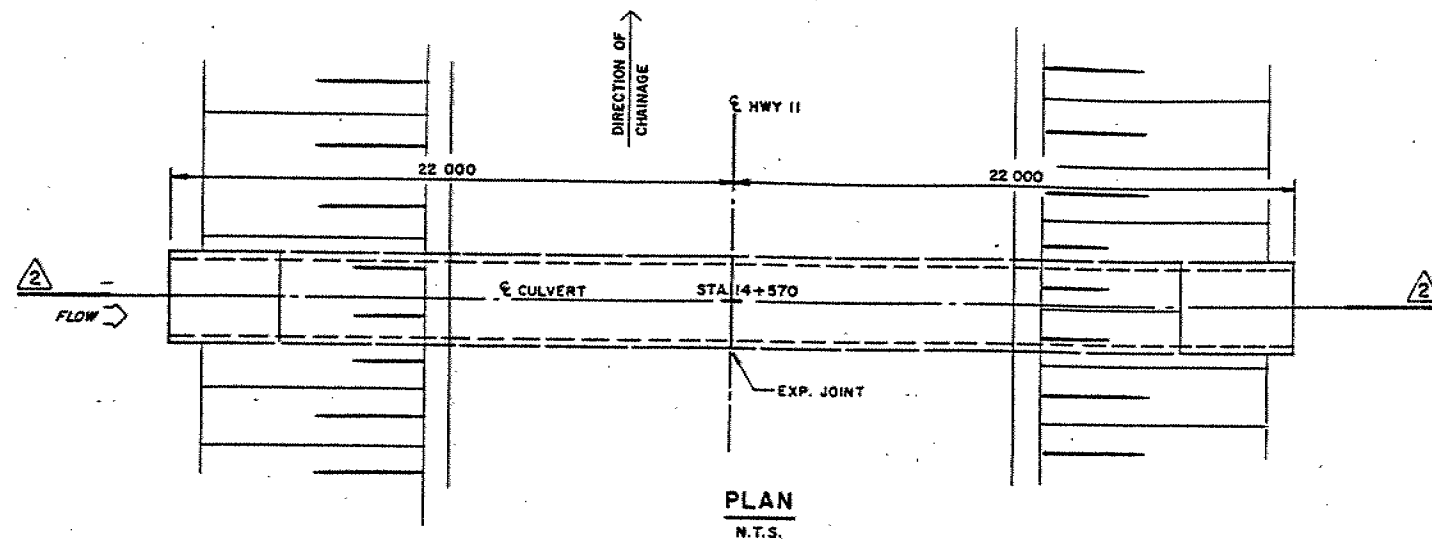


4
N. T. S.

N. T. S.

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

[illegible]

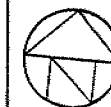


NOTE: EXPANDED POLYSTYRENE AND JOINT SEALER (RUBBER ASPHALT, COLD APPLIED, VERTICAL) SHALL CONFORM TO SPSS 920.

METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No 95-215
WP No 25-84-01



HWY 11 CULVERT
STA. 14 + 570

SHEET
48



Proctor & Redfern Limited
Consulting Engineer and Architect
Toronto

E.O. 90204

GENERAL NOTES
CLASS OF CONCRETE
30 MPa

CLEAR COVER TO REINFORCING STEEL
BOTTOM OF TOP SLAB 40 ± 10
BOTTOM OF FOOTINGS 100 ± 25
REMAINDER 70 ± 20 UNLESS OTHERWISE NOTED

REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED. BARS MARKED WITH SUFFIX C DENOTE COATED BARS.

ALT DENOTES ALTERNATE
IF DENOTES INSIDE FACE
OF DENOTES OUTSIDE FACE
EF DENOTES EACH FACE

CONSTRUCTION NOTES

- BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH SIDES OF CULVERT KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.
- SIDES OF FOOTING TO BE CAST AGAINST UNDISTURBED SOIL
- NO CONCRETE SHALL BE PLACED FOR ANY FOOTINGS UNTIL THE DEPTH OF THE EXCAVATION AND THE CHARACTER OF THE FOUNDATION HAVE BEEN APPROVED BY THE ENGINEER.

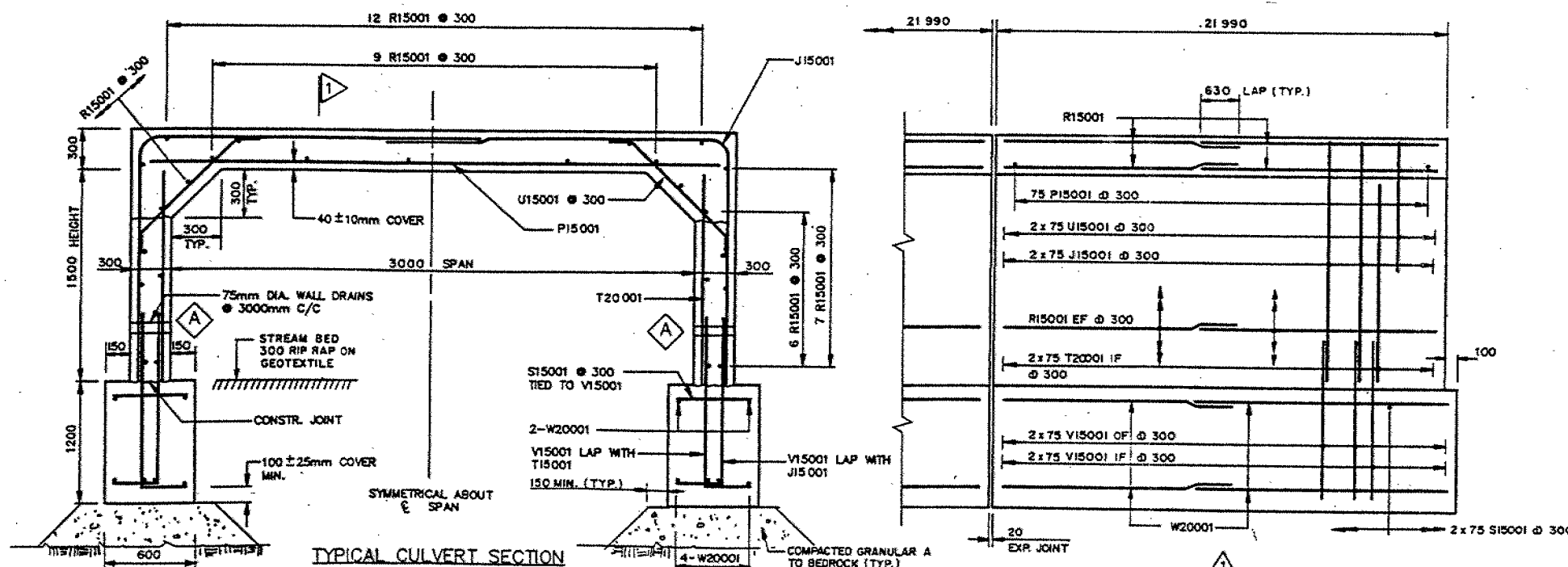
QUANTITIES				
ITEM	WALLS & SLAB	FOOTINGS	RETAINING WALL	TOTAL
MASS OF REINF. STL tonnes	7.4	2.9	—	10.3
VOL. OF CONCRETE cubic metres	91.2	63.4	—	154.6

MARK	NO. REQ'D	C/C	LENGTH	DETAILS	REMARKS
J15001	300	300	3610		
P15001	150	300	3300	STRAIGHT	BOTTOM OF TOP SLAB
R15001	188	300	11560	STRAIGHT 4 SETS @ 47 PER SET	LONGITUDINAL
S15001	300	300	400	STRAIGHT	TOP OF FOOTING
T20001	300	300	1500	STRAIGHT	INSIDE FACE OF WALLS
U15001	300	300	1300		HAUNCH
V15001	600	300	2000		FOOTING DOWELS
W20001	48	—	11610	STRAIGHT 4 SETS @ 12 PER SET	LONGITUDINAL IN FOOTING

NOTE: — All dimensions shown to centre line of bar
— * represents vertical dimension
— ** c/c spacing given at midspan

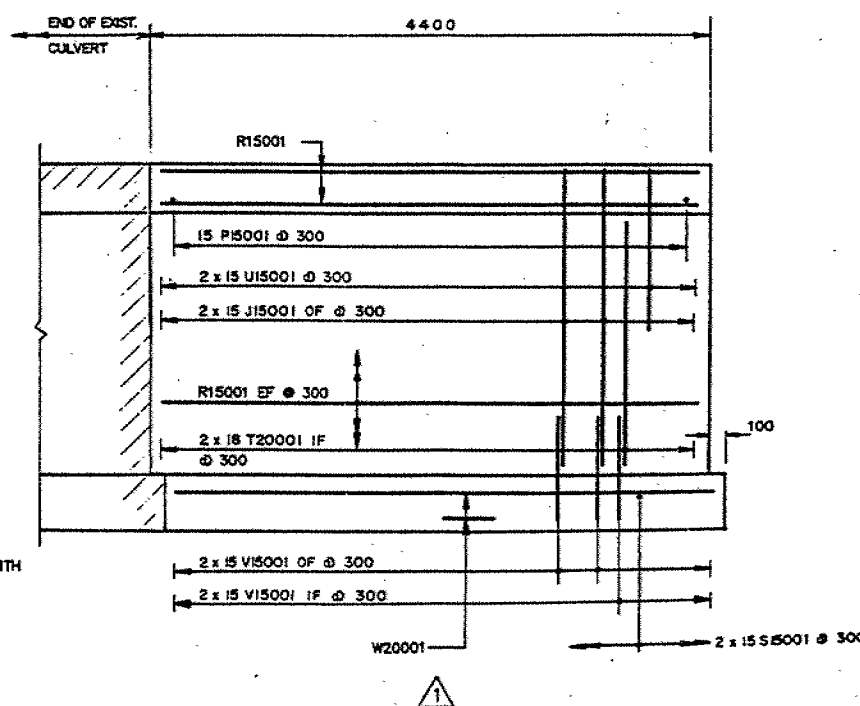
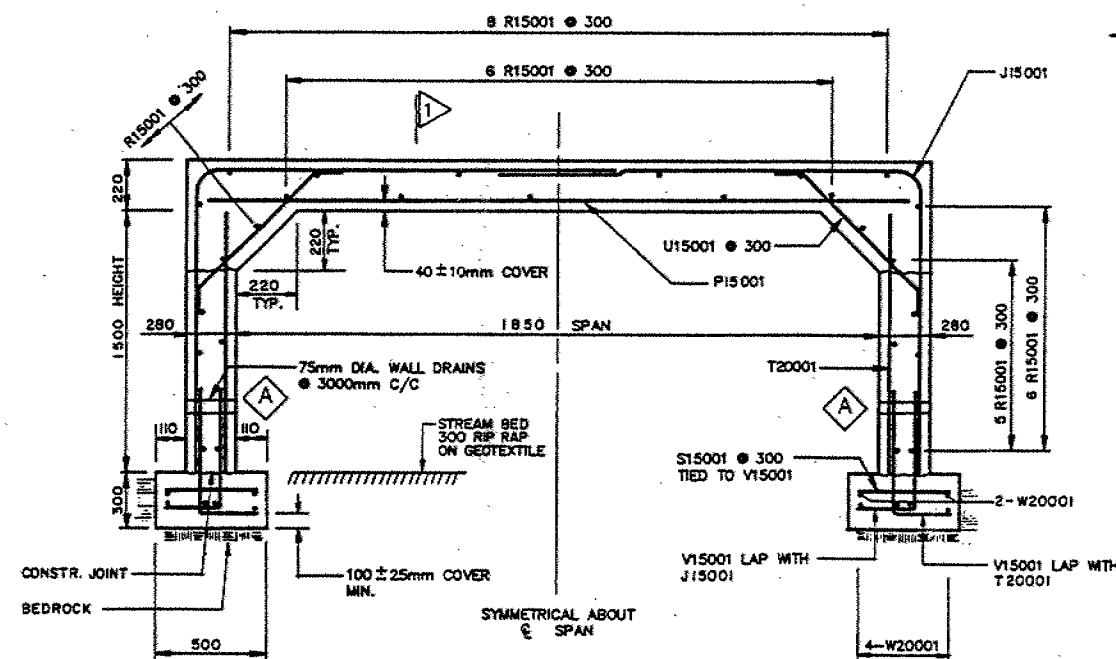
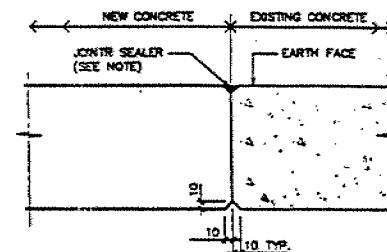
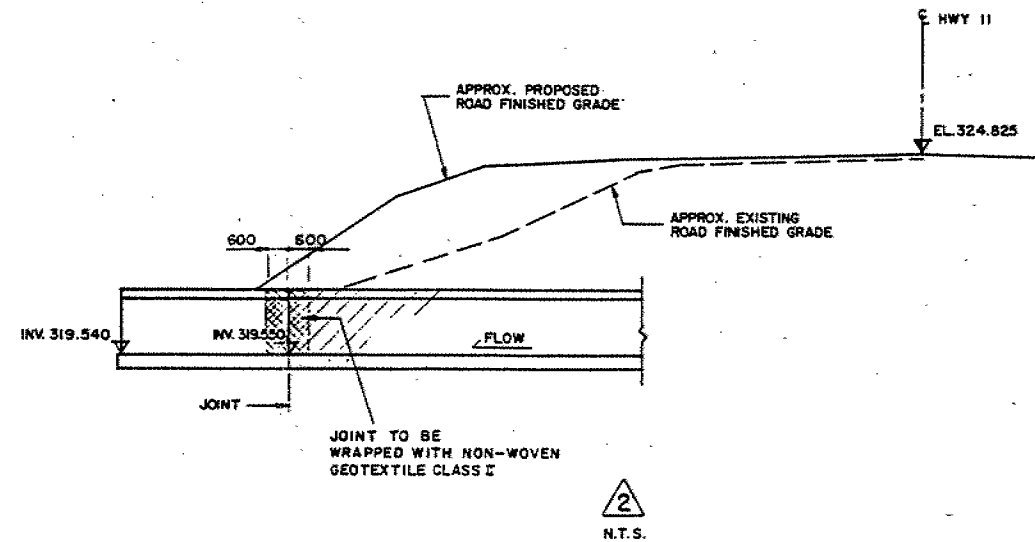
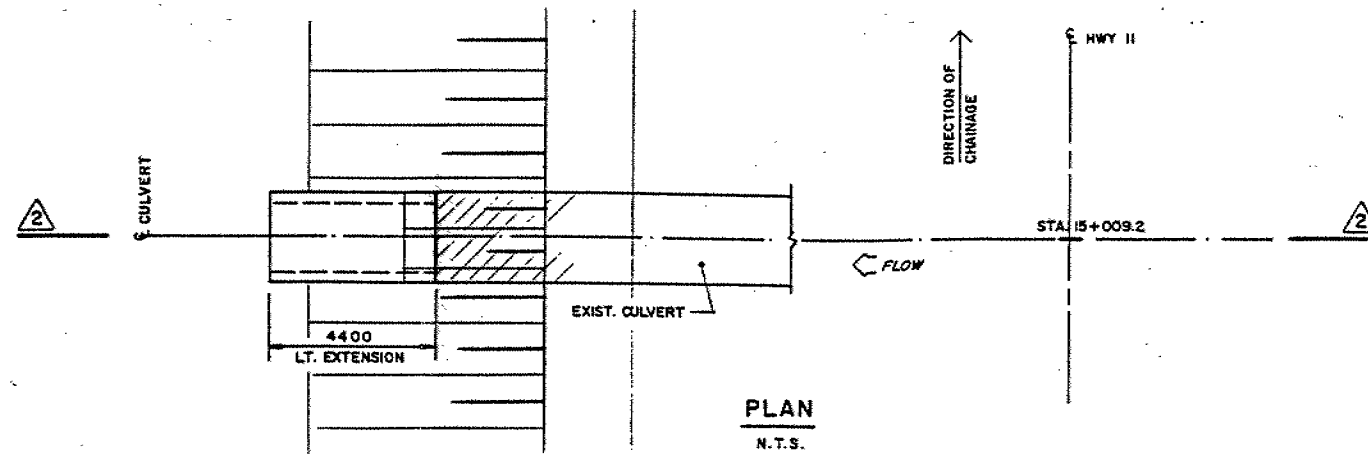
STANDARD DRAWING
DECEMBER 1988
RIGID FRAME OPEN FOOTING CULVERT

SS114 - 1



DRAWING NOT TO BE SCALED

REVISIONS	DATE	BY	DESCRIPTION



METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No 95-215
WP No 25-84-01

HWY 11 CULVERT LT. EXTENSION
STA. 15 + 009.2

SHEET
49

Proctor & Redfern Limited
Consulting Engineer and Architect
Toronto

E.O. 90204

GENERAL NOTES
CLASS OF CONCRETE
30 MPa

CLEAR COVER TO REINFORCING STEEL
BOTTOM OF TOP SLAB 40 ± 10
BOTTOM OF FOOTINGS 100 ± 25
REMAINDER 70 ± 20 UNLESS OTHERWISE NOTED
REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED. BARS MARKED WITH SUFFIX C DENOTE COATED BARS.
ALT DENOTES ALTERNATE
IF DENOTES INSIDE FACE
OF DENOTES OUTSIDE FACE
EF DENOTES EACH FACE

CONSTRUCTION NOTES

- BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH SIDES OF CULVERT KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.
- SIDES OF FOOTING TO BE CAST AGAINST UNDISTURBED SOIL
- NO CONCRETE SHALL BE PLACED FOR ANY FOOTINGS UNTIL THE DEPTH OF THE EXCAVATION AND THE CHARACTER OF THE FOUNDATION HAVE BEEN APPROVED BY THE ENGINEER.

ITEM	QUANTITIES			
	WALLS & SLAB	FOOTINGS	RETAINING WALL	TOTAL
MASS OF REINF. STL tonnes	0.6	0.3	—	0.9
VOL. OF CONCRETE cubic metres	6.3	1.3	—	7.6

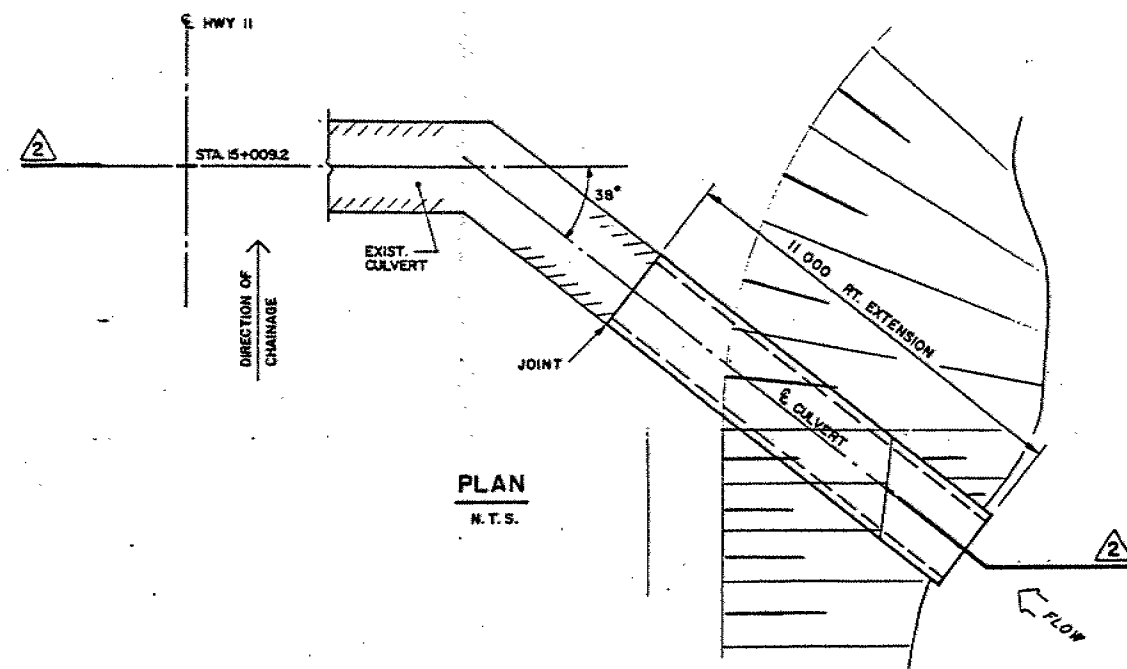
MARK	NO. REQ'D	C/C	LENGTH	DETAILS	REMARKS
J15001	30	300	3020		
P15001	15	300	2270	STRAIGHT	BOTTOM OF TOP SLAB
R15001	36	300	4240	STRAIGHT	LONGITUDINAL
S15001	30	300	300	STRAIGHT	TOP OF FOOTING
T20001	36	250	1500	STRAIGHT	INSIDE FACE OF WALLS
U15001	30	300	1040		HAUNCH
V15001	60	300	1040		FOOTING DOWELS
W20001	12	—	4260	STRAIGHT	LONGITUDINAL IN FOOTING

NOTE: — All dimensions shown to centre line of bar
• represents vertical dimension
— c/c spacing given at midspan

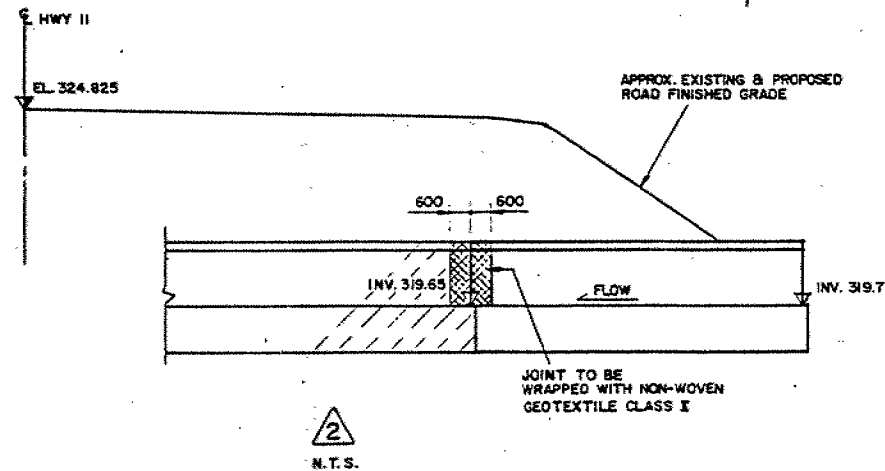
STANDARD DRAWING
DECEMBER 1988
SS114 - 1
RIGID FRAME OPEN FOOTING CULVERT

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	C.C.	CHK T.W.	CODE OHDC-83 (LOAD CLASS A) (DATE MAY 1988)
DRAWN	CHK C.C.	SITE	STRUCT
			SCHEME

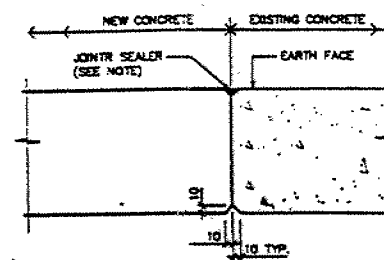
DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING



PLAN
N.T.S.

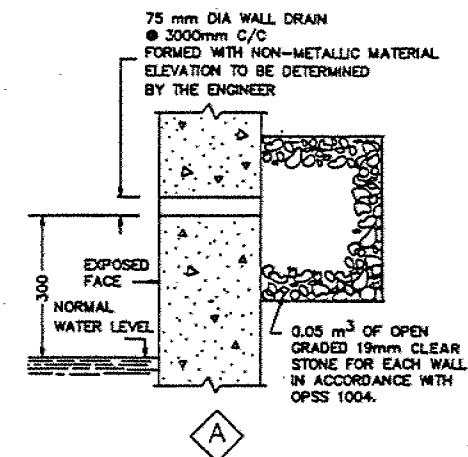


N.T.S.



TYPICAL JOINT DETAIL
N.T.S.

NOTE: JOINT SEALER (RUBBER ASPHALT, COLD APPLIED, VERTICAL) SHALL CONFORM TO OPSS 920.



A

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No 95-215
WP No 25-84-01



HWY 11 CULVERT RT. EXTENSION
STA. 15 + 009.2

SHEET
50

Proctor & Redfern Limited
Consulting Engineer and Architect
Toronto

E.O. 90204

GENERAL NOTES
CLASS OF CONCRETE
30 MPa

CLEAR COVER TO REINFORCING STEEL:
BOTTOM OF TOP SLAB 40 ± 10
BOTTOM OF FOOTINGS 100 ± 25
REMAINDER 70 ± 20 UNLESS OTHERWISE NOTED
REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED. BARS MARKED WITH SUFFIX C DENOTE COATED BARS.
ALT DENOTES ALTERNATE
IF DENOTES INSIDE FACE
OF DENOTES OUTSIDE FACE
EF DENOTES EACH FACE

CONSTRUCTION NOTES

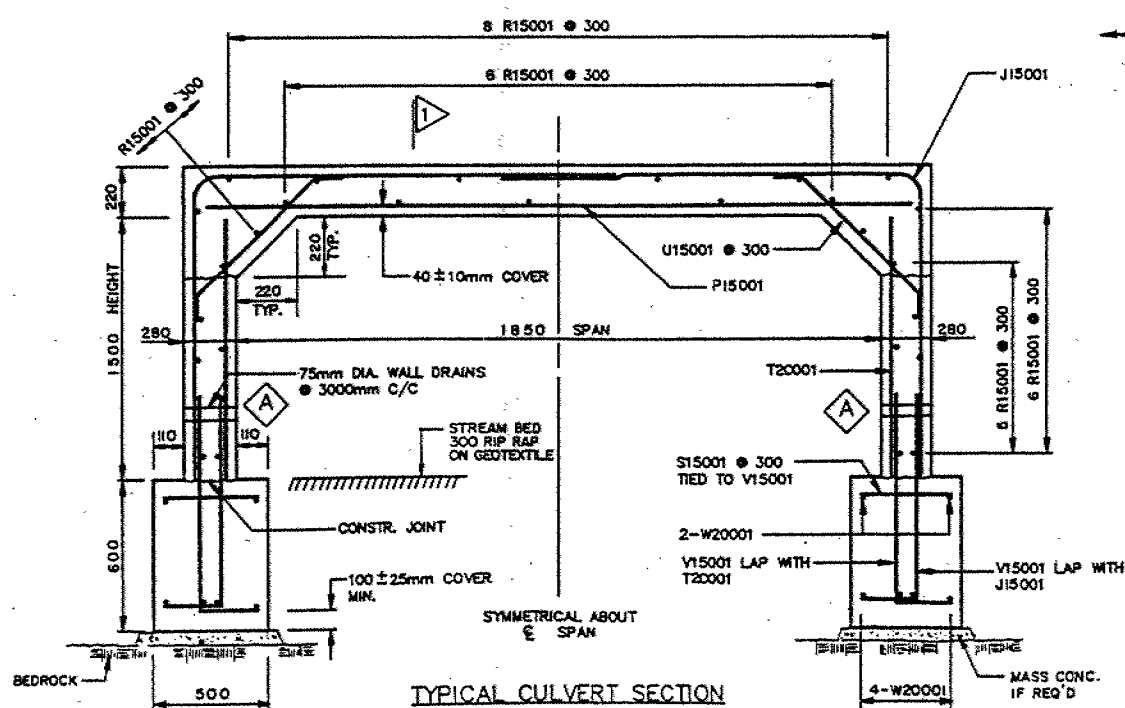
1. BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH SIDES OF CULVERT KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.
2. SIDES OF FOOTING TO BE CAST AGAINST UNDISTURBED SOIL.
3. NO CONCRETE SHALL BE PLACED FOR ANY FOOTINGS UNTIL THE DEPTH OF THE EXCAVATION AND THE CHARACTER OF THE FOUNDATION HAVE BEEN APPROVED BY THE ENGINEER.

ITEM	QUANTITIES			
	WALLS & SLAB	FOOTINGS	RETAINING WALL	TOTAL
MASS OF REINF. STL tonnes	1.5	0.7	—	2.2
VOL. OF CONCRETE cubic metres	15.7	6.6	—	22.3

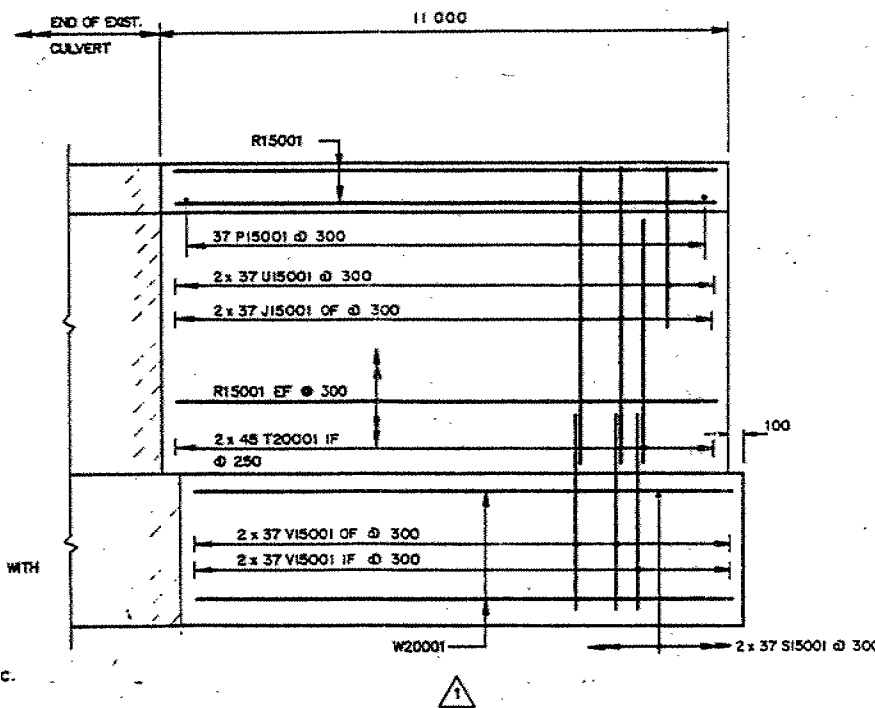
MARK	NO. REQ'D	C/C	LENGTH	DETAILS	REMARKS
J15001	74	300	3020		
P15001	37	300	2270	STRAIGHT	BOTTOM OF TOP SLAB
R15001	36	300	10840	STRAIGHT	LONGITUDINAL
S15001	74	300	300	STRAIGHT	TOP OF FOOTING
T20001	90	250	1500	STRAIGHT	INSIDE FACE OF WALLS
U15001	74	300	1040		HAUNCH
V15001	148	300	1340		FOOTING DOWELS
W20001	12	—	10840	STRAIGHT	LONGITUDINAL IN FOOTING

NOTE: — All dimensions shown to centre line of bar
— * represents vertical dimension
— c/c spacing given at midspan

STANDARD DRAWING
DECEMBER 1988
SS114 - 1
RIGID FRAME OPEN FOOTING CULVERT



TYPICAL CULVERT SECTION



DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

DATE	BY	DESCRIPTION
DESIGN C.C.	CHK T.W.	CODE CHOC-83
DRAWN	CHK C.C.	SITE

LOAD CLASS A DATE MAY 1991
STRUCT ISCHÉME DWG



Ministry
of
Transportation

FILE COPY

GEOCRES No 31L-65
Cont No 95-215

FOUNDATION DESIGN SECTION

**foundation
investigation and
design report**



MEMORANDUM

Engineering Materials Office
Room 313, Central Building, Downsview
Tel. (416) 235-3732 Fax. (416) 235-5240

To: J. McDougall, Head
Geotechnical Section - Northern Region

July 4, 1996

From: Foundation Design Section
Rm. 315, Central Building

GEOCRES 31L-65

Re: WP 25-84-01, Chippewa Culvert Replacement
Hwy. 11, District 54, North Bay

This memorandum summarizes the results of a Foundation Investigation conducted at the aforementioned site and provides preliminary comments pertaining to structure foundations and related earthworks. These comments have been submitted in advance of the final report to assist in expediting the design so that conformance to project scheduling can be met.

Proposed Structure

In conjunction with the widening of Hwy. 11 at this location it is proposed to replace the existing 3 m x 1.5 m x 30 m culvert with a new one placed approximately 7.0 m south (Centre to centre). Approach fills in the order of magnitude of approximately 6 metres will be required. The foundation investigation consisted of three boreholes (BH 1 through BH 3) along the length of the proposed culvert location, with one (BH 1) at the toe of the embankment on the east side and two on the highway grade. One (BH 2) placed on the centreline of the embankment and the second (BH 3) at the crest on the west side. Four additional cone penetration tests were placed at points along the culverts width in order to determine bedrock surface. Hollow stem augers were utilized with split spoon samples retrieved. Boreholes were penetrated to a maximum depth of 15 metres.

Subsoil Conditions

The ground surface of the highway is approximately 311 - 312 m whilst the water table elevation is approximately 306.5 m.

From the highway surface the subsoil stratigraphy at the site consisted of approximately 5 m of fill composed of a mixture of sand and silt, trace gravel. This layer underlying the pavement also contained a trace of organic. The fill deposit is underlain by a organic sand layer having a thickness of 1.5 - 2 m. Wood particles were observed in this deposit. This layer had a very loose state of denseness. Beneath the organic layer was a 3.0 - 5.5 m thick layer of silty sand. Due to the high water level in this region and the non-cohesive

nature of this material blow up conditions within the augers were encountered, making the 'N' values somewhat questionable due to disturbance. Encountered only in the boreholes conducted on highway grade the silty sand layer was underlain by a silty sand till, trace gravel which was 1.5 - 3.0 m thick. This layer has a dense state, in particular when approaching the bedrock surface. The overburden is underlain by bedrock found at an elevation of 300.5 - 298.5 m, at a depth of 8 m below natural ground and 11.2 - 13.3 m below the highway grade. Subsurface conditions encountered during the course of the investigation are shown on the record of borehole sheets appended to this memo. Upon completion of the lab test results and bedrock descriptions this memo will be reissued with these details.

Ground water levels obtained at the time of the investigation revealed that the ground water table is at a depth of about 5 m below the highway surface, placing it approximately at the depth of the creek.

Discussion and Recommendations

Inspection of the existing culvert indicated that it performed adequately with no sign of settlement or distress. Some cracking was observed along the walls on the west end. Extensions on either side of the existing culvert were added to accommodate the widening of the highway. Due to its relatively acceptable performance the rehabilitation of the existing culvert could be considered. One option would be to jack a precast concrete pipe into the existing structure and grout the outside. The relative merits of rehabilitation would have to be weighed with the recommendations below for an entirely new structure being constructed.

Structure Foundations

The proposed 305.5 m founding elevation of the culvert would place it approximately 5 - 6 m above the bedrock, within the non-cohesive silty sand deposit. Due to concerns of the probability of differential settlement between the culvert and its approaches and for economical reasons, deep foundation units in the form of steel H-piles would not be recommended. As the denseness ('N' values) was found to be relatively low in this material it is recommended that shallow foundations be considered with a minimum 300 mm granular base.

Greater capacities can be recommended with the utilization of a Granular 'A' pad of varying thickness in order to distribute the load.

Culvert Shallow Foundations

Pad Thickness (m)	.3 m	1 m	2 m
Geotechnical Bearing Capacity at SLS (kPa)	85	110	150
Factored Geotechnical Capacity at ULS (kPa)	125	165	225

The capacities were calculated assuming a 3 m wide rectangular footing. While the proposed culvert is of an open design, a rigid frame box culvert would be more suitable to distribute loads and provide greater protection against the erosion effects of the creek. Some differential settlement along the length of the culvert should be expected as part of it will be placed beneath the proposed widened portion of the highway. To compensate for the anticipated settlement the culvert should be constructed with appropriate camber utilizing articulated joints.

To achieve the profile grade of Hwy. 11 a fill height of 5 m will be required from the toe of the culvert. Prior to placement of the fill, all surficial organic or loose material should be removed under the plan limits of the embankment and culvert. No stability problems are anticipated provided that 2H:1V slopes are maintained for earth fill or 1.25H:1V slopes for rockfill.

In order to construct the culvert and maintain traffic along the highway a temporary shoring scheme will be required. This would be accomplished utilizing sheet piles which would be required at the centreline of the highway (for the staged construction) and along the length of the existing culvert in order to prevent its disturbance and control the flow in the creek.

The design of the shoring system shall include the appropriate earth pressures computed in accordance with section 6-7 of the O.H.B.D.C. The loadings induced by any construction surcharge traffic shall be incorporated in the design in accordance with Section 6-7.5 of the code. Lateral earth pressures can be computed using the soil design parameters tabulated below. Active earth pressure coefficients can be used and the shoring wall shall be designed to resist lateral earth pressure using an appropriate rectangular or trapezoidal stress envelope.

Shoring Design Parameters

<u>Soil</u>	<u>Elevation</u>	<u>Unfactored Angle of Internal Friction (θ)</u>	<u>Bulk Unit Weight</u>	<u>Coefficient of Active Earth Pressure</u>
Mixture of Sand and Silt, trace Gravel	312-307 m	31°	19.5 kN/m ³	0.31
Silty Sand (organic sands)	307 - 299.5 m	30°	19.0 kN/m ³	0.27
Silty Sand [TILL]	299.5-298.5 m	32°	21 kN/m ³	0.33

As the excavation goes 1 - 2 m below the depth of the water table within sands, care

should be taken to prevent blow up of the base as there is some concern that this may occur. An advanced dewatering scheme should be incorporated to maintain the water level a minimum of 0.5 m below the base of the excavation, especially during the placement and compaction of granular bedding and granular backfills.

Footings should be protected against any potential for undermining caused by erosion with scour protection measures. Due to the potential for flooding in the area these protection measures should be considered. Rip rap should be placed along the creek bed and along the forward slopes.

For backfill requirements, it is recommended to use free draining material such as Granular 'A' to prevent hydrostatic pressure build-up. Design parameters of the soil are given below for purposes of the O.H.B.D.C..

	<u>Granular 'A'</u>	<u>Granular 'B'</u>
Angle of Internal Friction	35°	30°
Unit Weight (kN/m ³)	22.8	21.2

Any footings or pile caps should have a minimum of 2.1 m earth cover to protect against frost protection. Only relatively free draining granular material should be used below the water level.

Any backfill should be placed simultaneously on both sides of the culvert such that the maximum difference in backfill heights does not exceed 300mm. In addition, the backfill should be placed in lifts not exceeding 300 mm in thickness.

We expect this memorandum meets with your requirements at this time. A final report will be forthcoming upon completion of laboratory testing. If there are any question please contact this office.



M. Michalek, P. Eng.
Jr. Foundation Engineer
For:
T. C. Kim, P. Eng.

cc: P. Furst, Structural - Northern Region
R. Auger, Proctor and Redfern

RECORD OF BOREHOLE No 1

1 OF 1

METRIC

W.P. 25-84-01 LOCATION Sta. 14+570 o/s 26.7m RT of Centreline Hwy. 11 ORIGINATED BY L.V.
 DIST 54 HWY 11 BOREHOLE TYPE H.S. Auger, Rock Coring COMPILED BY L.V.
 DATUM Geodetic DATE 1995 06 27 CHECKED BY T.K.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
307.3	Natural Ground Surface													
0.0	Organic Sand Wood Particles		1	SS	2		307							
			2	SS	2		306							
305.0							305							
2.3	Silty Sand Very Loose		3	SS	2		304							
			4	SS	3		303							
			5	SS	6		302							
			6	SS	2		301							
			7	SS	3		300							
299.1			8	SS	54		299							
8.2	Bedrock		9	RC	REC 95%		298							RQD 85%
			10	RC	REC 94%		297							RQD 94%
295.8							296							
11.5	End of Borehole													
	*NOTE: BLOW UP CONDITIONS WERE ENCOUNTERED WITHIN THE SILTY SAND DEPOSIT 'N' VALUES MAY BE DISTURBED													

RECORD OF BOREHOLE No 1A

1 OF 1

METRIC

W.P. 25-84-01 LOCATION Sta. 14+567 o/s 26.7m RT of Centreline Hwy.11 ORIGINATED BY L.V.
 DIST 54 HWY 11 BOREHOLE TYPE HS Auger, Rock Coring COMPILED BY L.V.
 DATUM Geodetic DATE 1996 06 25 CHECKED BY T.K.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100	W _p	W	W _L		
307.3	Natural Ground Surface																
0.0	Probable Organic Sand Wood Particles						307										
305.0							306										
2.3	Probable Silty Sand						305										
							304										
							303										
							302										
							301										
299.7	*Probable Bedrock						300										
7.6	End of Cone Test																

RECORD OF BOREHOLE No 2

1 OF 1

METRIC

W.P. 25-84-01 LOCATION Sta. 14+567 o/s 3m RT. of Centreline Hwy. 11 ORIGINATED BY L.V.
 DIST 54 HWY 11 BOREHOLE TYPE HS Auger, Rock Coring COMPILED BY L.V.
 DATUM Geodetic DATE 1996 06 26 CHECKED BY T.K.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
311.8														
0.0	Mixture of Sand and Silt Trace Gravel Trace Organics [Fill]		1	SS	29		311							
			2	SS	120		310							
			3	SS	12		308							
			4	SS	4		308							
			5	SS	5		307							
307.0			6	SS	5		306							
4.9	Organic Sand Wood Particles		7	SS	8		305							
305.7			8	SS	4		304							
6.2	Silty Sand Very Loose to Compact		9	SS	13		303							
			10	SS	2		302							
301.0			11	SS	19		301							
10.8	Silty Sand Trace Gravel [Fill] Very Dense		12	SS	57		300							
298.6			13	RC	REC 85%		299							
13.3	Bedrock						298							
296.9							297							
14.9	End of Borehole													

+3, x5: Numbers refer to
Sensitivity

20
15-25 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 2A

1 OF 1

METRIC

W.P. 25-84-01 LOCATION Sta. 14+570 o/s 6m RT. of Centreline on Hwy. 11 ORIGINATED BY L.V.
 DIST 54 HWY 11 BOREHOLE TYPE HS Auger, Rock Coring COMPILED BY L.V.
 DATUM Geodetic DATE 1996 06 26 CHECKED BY T.K.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		NATURAL MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100	W _p	W	W _L		
311.8														
0.0	Probable Mixture of Sand and Silt Trace Gravel Trace Organics [Fill]													
306.9														
4.9	Probable Organic Sand Wood Particles													
305.6														
6.2	Probable Silty Sand													
301.0														
10.8	Probable Silty Sand Trace Gravel [Till]													
299.3	*REFUSAL Probable Bedrock													
12.5	End of Cone Test													

RECORD OF BOREHOLE No 3

1 OF 1

METRIC

W.P. 25-84-01 LOCATION Sta. 14+567 o/s 11.1m LT. of Centreline Hwy. 11 ORIGINATED BY L.V.
DIST 54 HWY 11 BOREHOLE TYPE HS Auger, Rock Coring COMPILED BY L.V.
DATUM Geodetic DATE 1996 06 26 CHECKED BY T.K.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)
								20 40 60 80 100										
311.6	Highway Grade																	
0.0	Mixture of Sand and Silt Trace Gravel Trace Organics [Fill]		1	SS	19		311											
			2	SS	42		310											
			3	SS	18		309											
			4	SS	7		308											
			5	SS	7		307											
306.9			6	SS	2		306											
4.7	Organic Sand Wood Particles		7	SS	4		305											
305.5			8	SS	6		304											
6.1	Silty Sand Loose		9	SS	5		303											
302.5							302											
9.1	Silty sand Trace Gravel [Fill] Compact to Very Dense		10	SS	6		301											
	•REFUSAL Probable Bedrock Surface		11	SS	120													
300.4																		
11.2	End of Borehole																	

RECORD OF BOREHOLE No 3A

1 OF 1

METRIC

W.P. 25-84-01 LOCATION Sta. 14+570 o/s 11.1m LT of Centreline Hwy.11 ORIGINATED BY L.V.
 DIST 54 HWY 11 BOREHOLE TYPE HS Auger, Rock Coring COMPILED BY L.V.
 DATUM Geodetic DATE 1996 06 27 CHECKED BY T.K.

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20					
311.6	Highway Grade												
0.0	Probable Mixture of Sand and Silt Trace Gravel Trace Organics [Fill]												
306.9													
4.7	Probable Organic Sand Wood Particles												
305.5													
6.1	Probable Silty Sand												
302.5													
9.1	Probable Silty Sand Trace Gravel [Fill]												
300.6	REFUSAL Probable Bedrock												
11.0	End of Cone Test												

ROCK CORE DESCRIPTION **WP 25-84-01**

Page 1 of 1

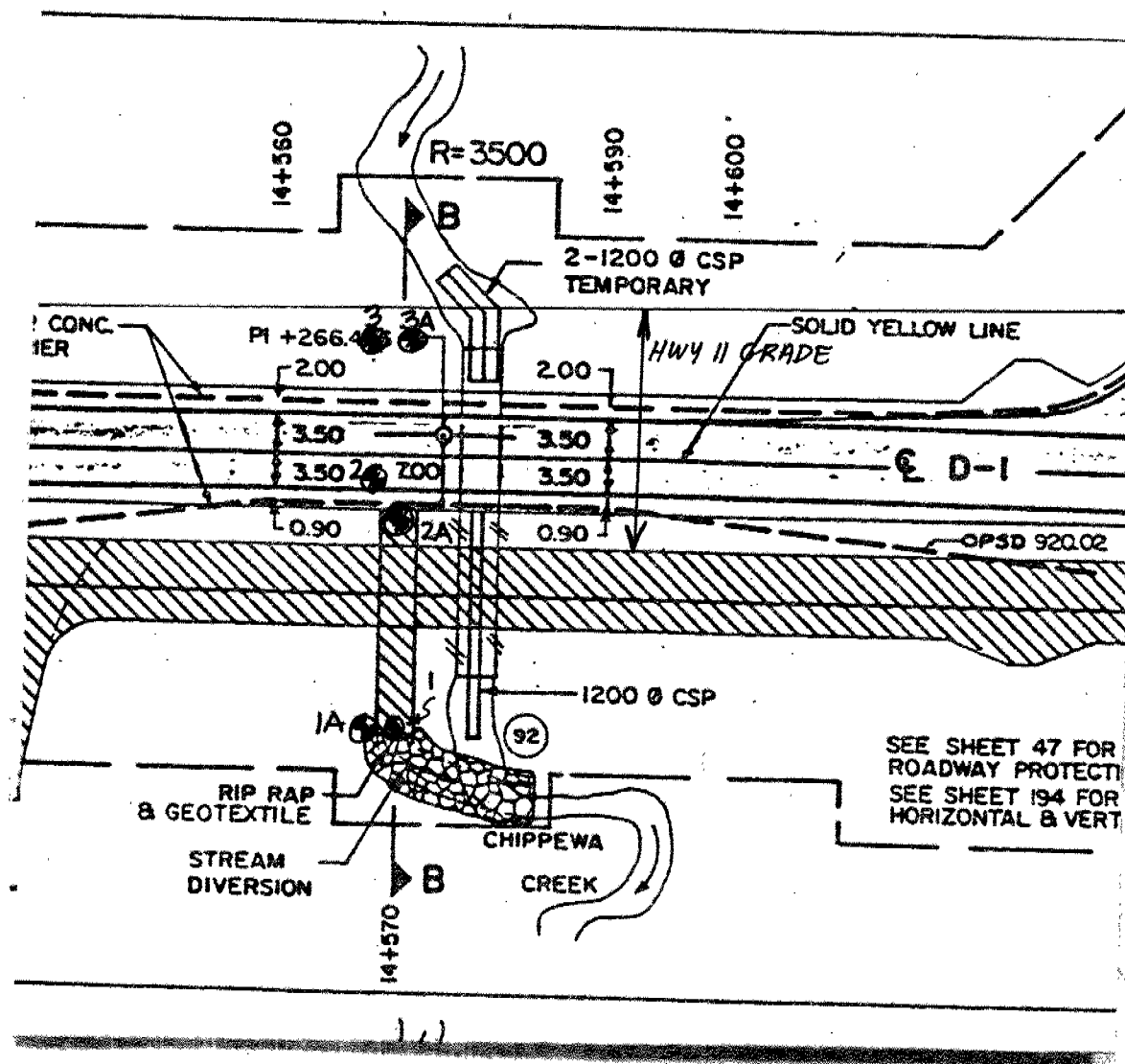
CORE RECOVERY					CORE DESCRIPTION	
BH#	RC#	DEPTH (m)	% CR*	% RQD*	DEPTH (m)	DESCRIPTION
1	9	8.18-9.85	95	85	8.18-11.48	BIOTITE GNEISS, greyish orange pink to greyish red to dark grey; medium to coarse grained; strong; unweathered to slightly weathered; fractures wide to close spaced, flat to near vertical, undulating to planar, smooth to rough.
	10	9.85-11.48	94	94		
2	13	13.28-14.91	89	25	13.28-14.91	BIOTITE GNEISS, greyish orange pink to greyish red to dark grey; medium to coarse grained; strong; unweathered to slightly weathered; fractures moderate to very close spaced, flat, planar to undulating, smooth to rough.

*CR = CORE RECOVERY

*RQD = ROCK QUALITY DESIGNATION

Note: Depths are approximated where core recovery is less than 100%

Logged by: DAW, Soils and Aggregates Section



WP 25-84-01