



**TABLE 1**  
**LIST OF STANDARD SPECIFICATIONS REFERENCED IN REPORT**

<b>DOCUMENT</b>	<b>TITLE</b>
OPSS 120	General Specification for the Use of Explosives
OPSS 422	Construction Specification for Precast Reinforced Concrete Box Culverts and Box Sewers in Open Cut
OPSS 501	Construction Specification for Compacting
OPSS 511	Construction Specification for Rip-Rap, Rock Protection, and Granular Sheeting
OPSS 518	Construction Specification for Control of Water from Dewatering Operations
OPSS 802	Construction Specification for Topsoil
OPSS 803	Construction Specification for Sodding
OPSS 804	Construction Specification for Seed and Cover
OPSS 902	Excavation and Backfilling of Structures
OPSS 1004	Material Specification for Aggregates - Miscellaneous
OPSS 1860	Material Specification for Geotextiles
SP 110S13	Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material
SP 206S03	Construction Specification for Grading
SP 422S01	Construction Specification for Precast Reinforced Concrete Box Culverts and Box Sewers
SP 999S26	Design, Installation and Testing of Pre-Stressed Anchors in Soil and Rock
OPSD 803.010	Backfill and Cover for Concrete Culverts
OPSD-810.010	Rip-Rap Treatment for Sewer and Culvert Outlets
OPSD 3090.101	Foundation Frost Depth for Southern Ontario
OPSD 3121.150	Minimum Granular Backfill Requirements – Retaining Walls
NSSP	Dowels into Concrete
NSSP	Control Blasting/Excavation of Rock



TABLE 2  
ESTIMATED SETTLEMENT OF SOILS UNDER PROPOSED CULVERTS  
AS PER THE "MTO POST-CONSTRUCTION ROCK FILL SETTLEMENT AND GUIDELINES FOR ESTIMATING ROCK FILL QUANTITY" (APRIL 12, 2010)

Culvert	Location	Recommended Swamp Treatment	Cohesive Soil Height (m)	Cohesionless Soil Height (m)	Rockfill Height (m)	Estimated Maximum Settlement (mm)						Remaining Settlement (mm)		Revised Recommendations and Remarks
						Primary Consolidation of Cohesive Soils and Compression of Cohesionless Soils	Rockfill Settlement		Total	During First 6 months	During First 12 months	After 6 months	After 12 months	
							Compacted	Dumped						
C3 (NBL) Sta. 15+632 (Swamp 306)	C3-1	Surcharge embankment for 6 months without removal of compressible clayey soils	3.2	1.5	1	15 <sup>(1)</sup>	0	12	27	15	20	12	7	<u>Culvert Replacement:</u> Install culvert during embankment construction. Do not surcharge embankment between Sta. 15+627 and 15+637
	C3-2		4	1.5	1.1	15 <sup>(1)</sup>	0	13	28	15	18	13	10	
	C3-3		4.9	0.3	1	25 <sup>(1)</sup>	0	12	37	12	16	25	21	
C4 (NBL) Sta. 16+181 (Swamp 305)	C4-1	Surcharge embankment for 6 months without removal of compressible clayey soils	16.0 (Estimated)	2.2	2.6	20 <sup>(1)</sup>	0	35	55	33	38	22	17	<u>Culvert Replacement:</u> Install culvert during embankment construction. Do not surcharge embankment between Sta. 16+176 and 16+186
	C4-2		16.0 (Estimated)	2.2	2.8	5 <sup>(1)</sup>	0	36	41	27	31	14	10	
C4A (NBL) Sta. 16+260 (Swamp 305)	C4A-1	Surcharge embankment for 6 months without removal of compressible clayey soils	0	0	0	0	0	0	0	0	0	0	0	Install culvert during embankment construction. Do not surcharge embankment between Sta. 16+255 to 16+265
	C4A-2		2.4	1.2	1	10 <sup>(1)</sup>	6	0	16	11	14	5	2	
	C4A-3		2.4	0	1	25 <sup>(1)</sup>	6	0	31	20	26	11	5	
C7 (NBL) Sta. 19+100 (Swamp 301)	C7-3	Full excavation of compressible clayey soils and preloading for 6 months	0	0	0	0	0	0	0	0	0	0	0	Culvert may be installed during embankment construction
	301-12		0	0	0	0	0	0	0	0	0	0	0	
	C7-2		0	0	1	0	0	12	12	9	10	3	2	
C7 (SBL) Sta. 19+100 (Swamp 301)	C7-2	Full excavation of compressible clayey soils and preloading for 6 months	0	0	1	0	0	12	12	9	10	3	2	Culvert may be installed during embankment construction - Expansion/intermediate joints may be added to accommodate about 40 mm differential settlement during first 12 months
	301-11		0	0	0.3	0	0	4	4	2	3	2	1	
	C7-1		0	0	4.6	0	0	55	55	40	46	15	9	

Note: (1) Estimated settlements are for clayey soils under culverts without surcharging at the culvert location.



## **APPENDIX A**

### **SLOPE STABILITY ANALYSES DIAGRAMS**

## SLOPE STABILITY ANALYSES DIAGRAMS

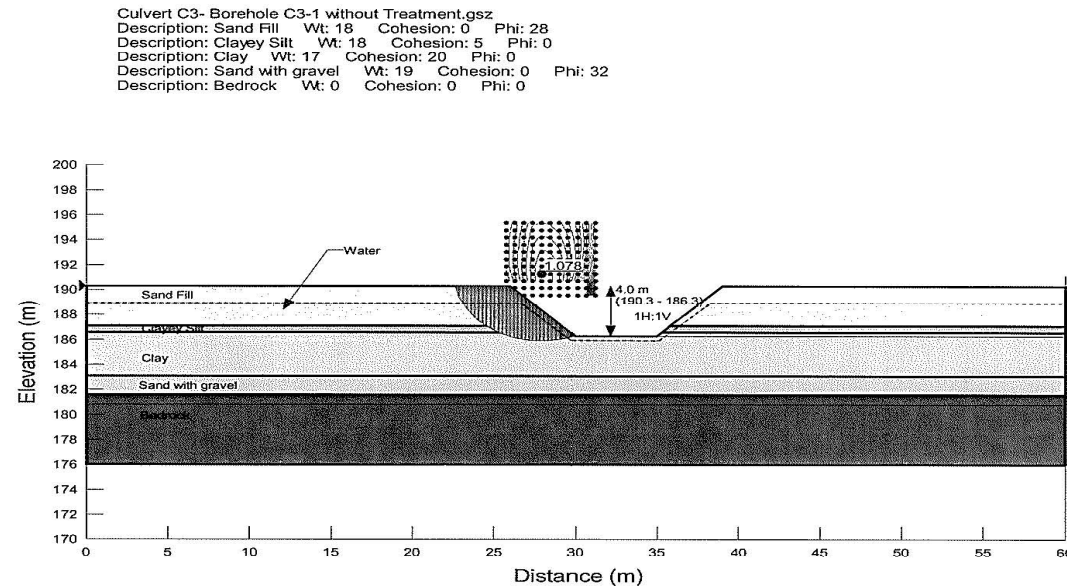


FIGURE C3-1  
 UNCONFIGURED TEMPORARY SLOPE – CULVERT C3



## SLOPE STABILITY ANALYSES DIAGRAMS

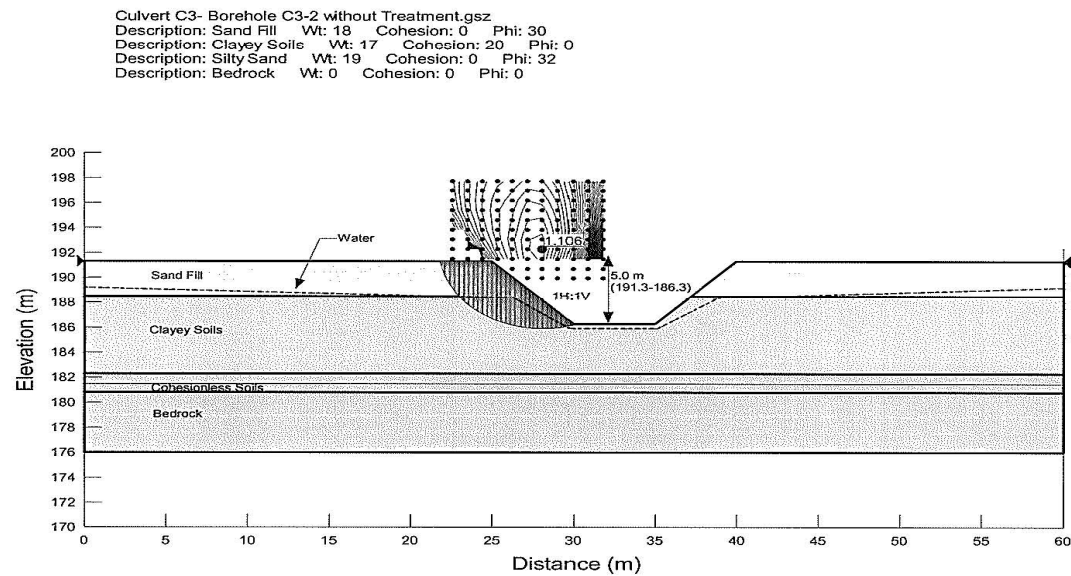


FIGURE C3-2  
UNCONFIGURED TEMPORARY SLOPE – CULVERT C3

## SLOPE STABILITY ANALYSES DIAGRAMS

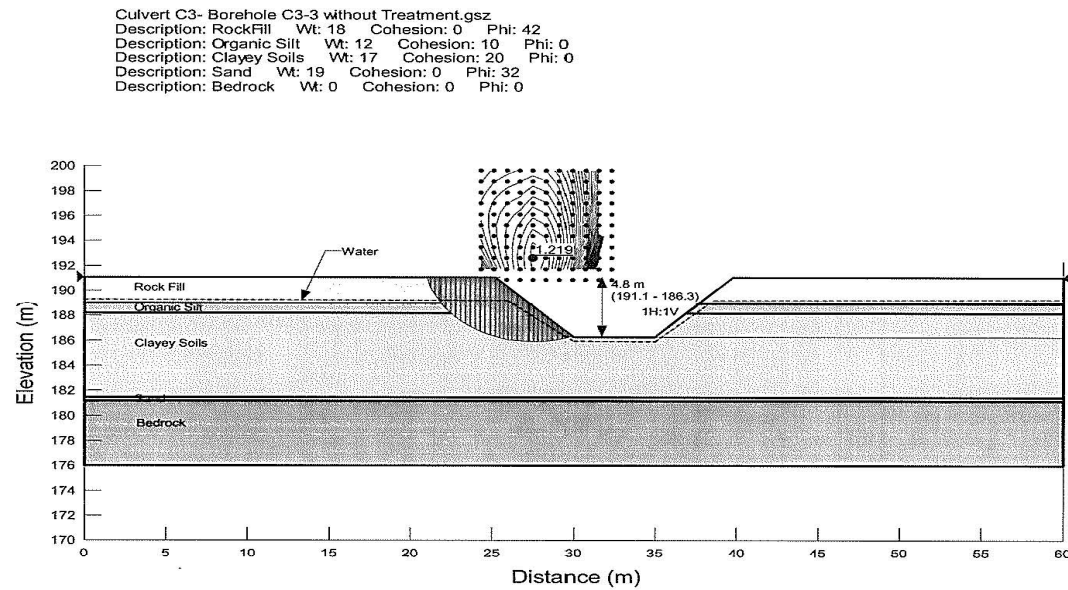


FIGURE C3-3  
 UNCONFIGURED TEMPORARY SLOPE – CULVERT C3

## SLOPE STABILITY ANALYSES DIAGRAMS

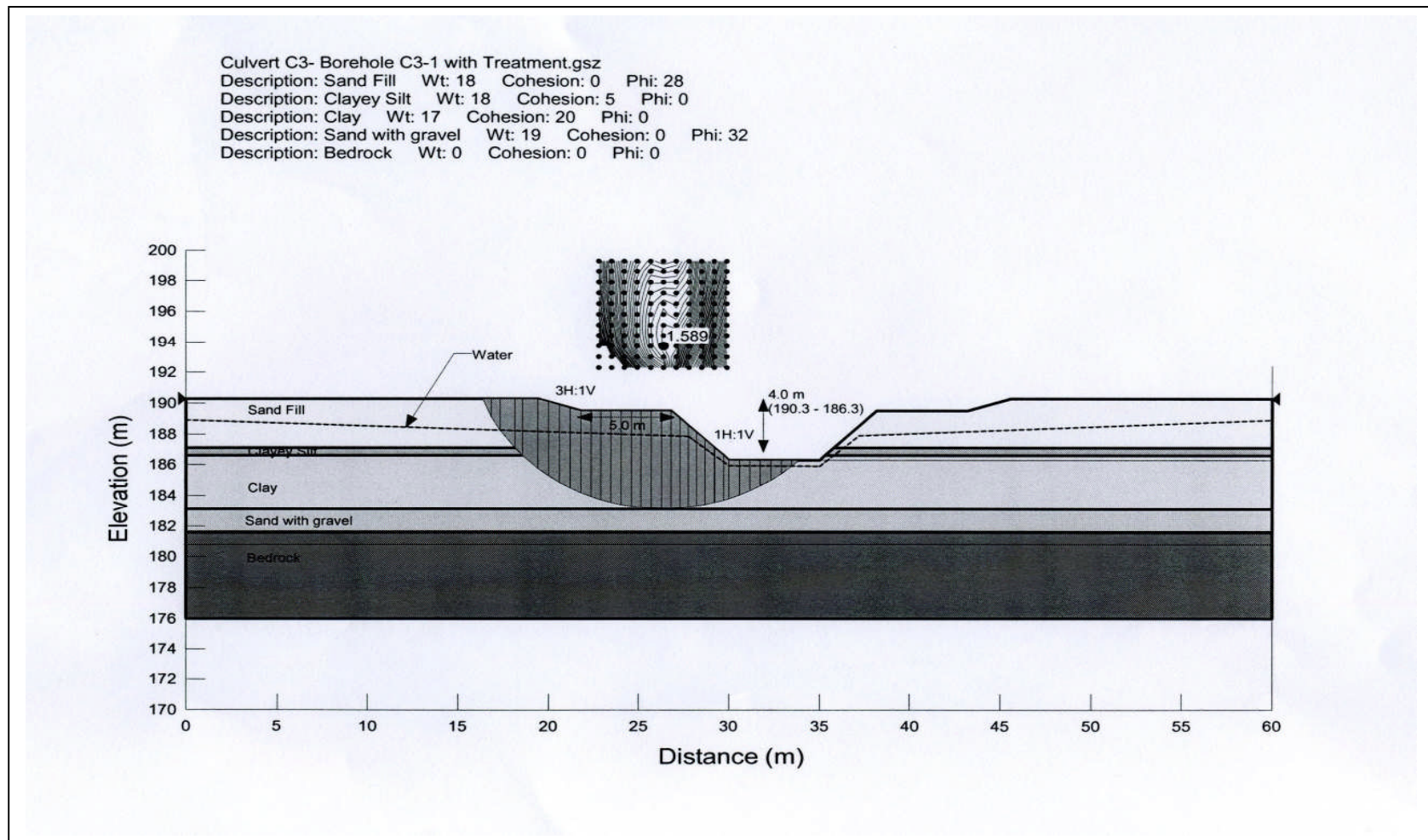


FIGURE C3-1A  
 CONFIGURED TEMPORARY SLOPE – CULVERT C3

## SLOPE STABILITY ANALYSES DIAGRAMS

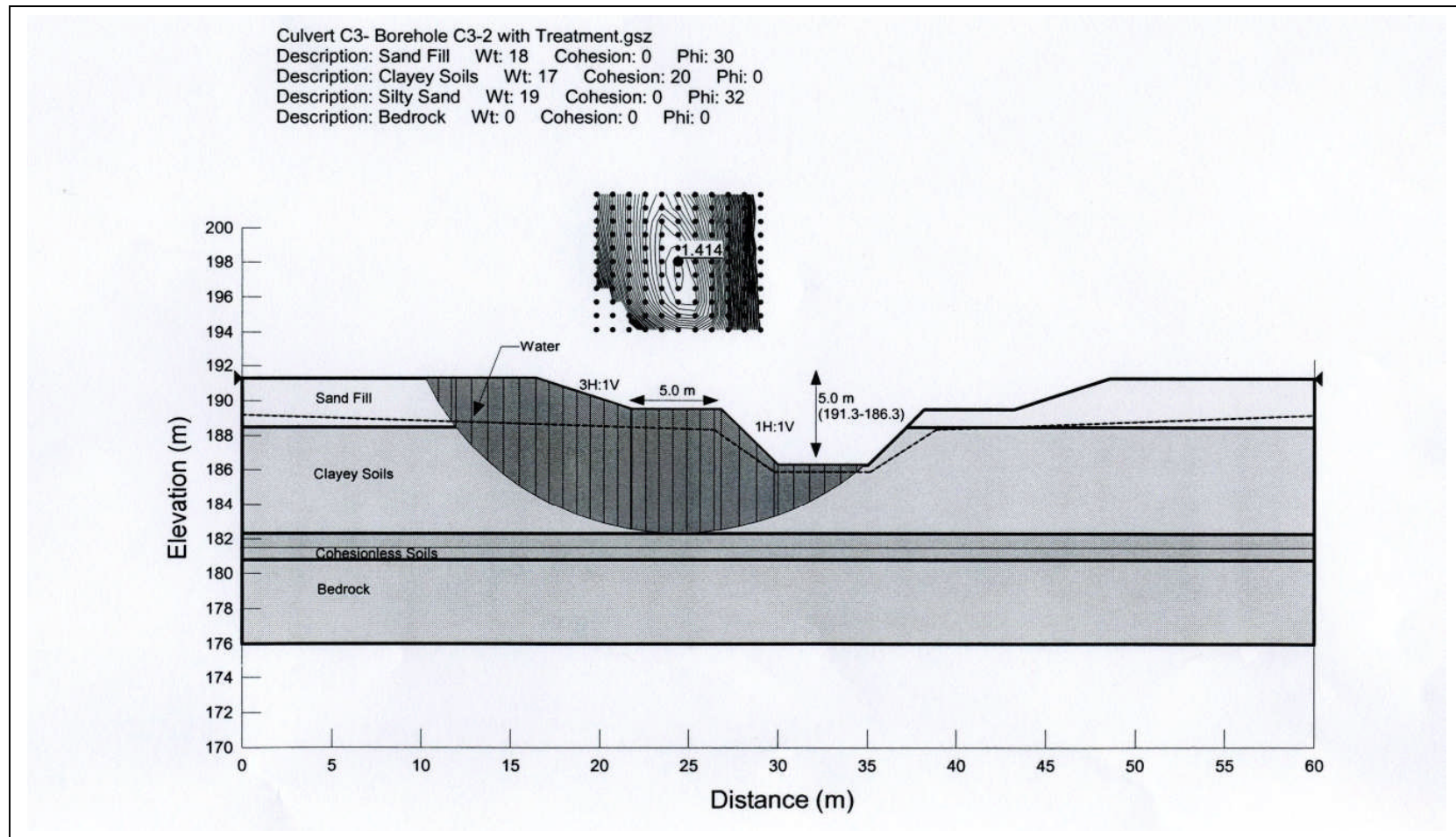


FIGURE C3-2A  
CONFIGURED TEMPORARY SLOPE – CULVERT C3



## SLOPE STABILITY ANALYSES DIAGRAMS

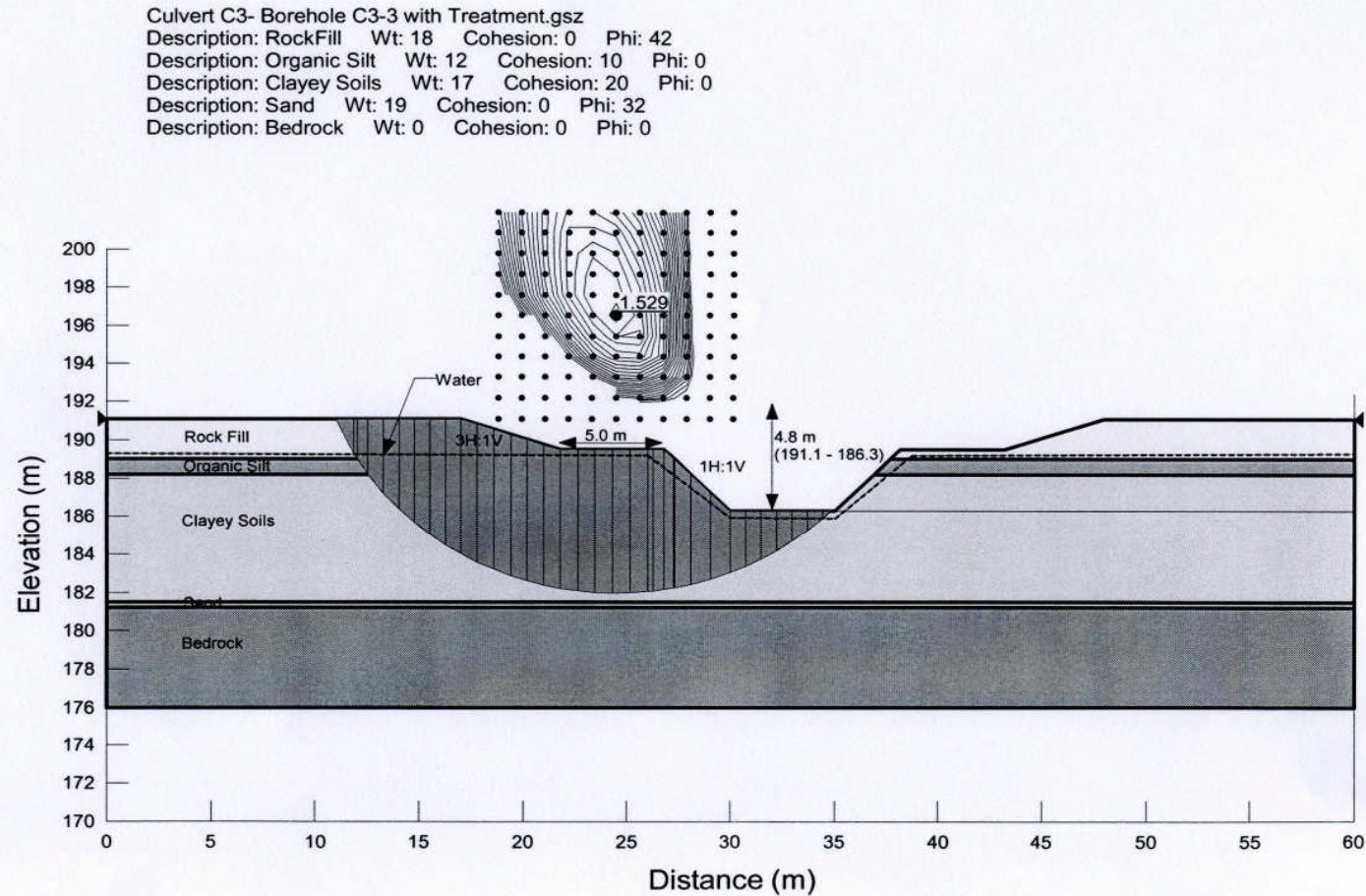


FIGURE C3-3A  
 CONFIGURED TEMPORARY SLOPE – CULVERT C3



## SLOPE STABILITY ANALYSES DIAGRAMS

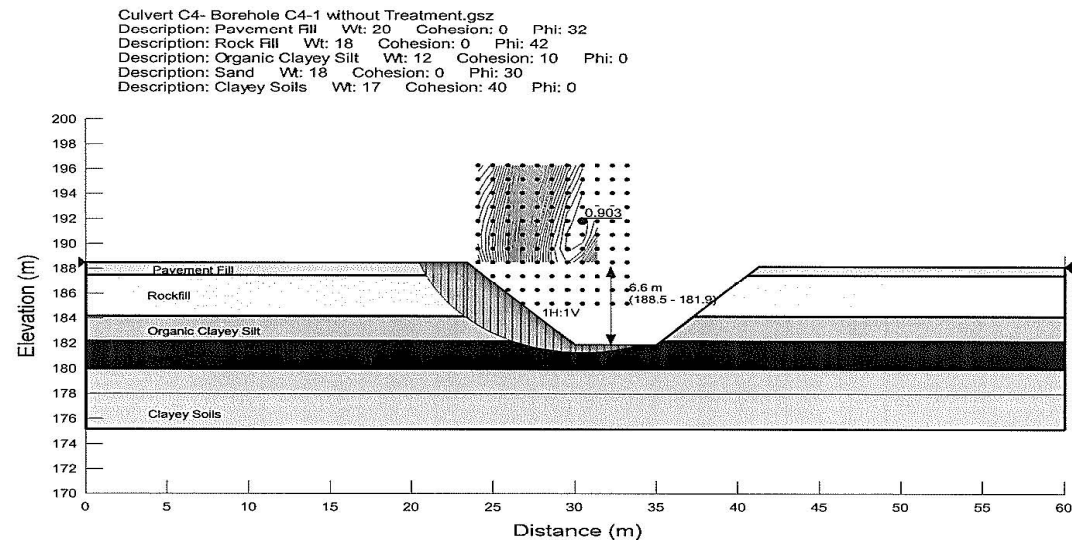


FIGURE C4-1  
 UNCONFIGURED TEMPORARY SLOPE – CULVERT C4

## SLOPE STABILITY ANALYSES DIAGRAMS

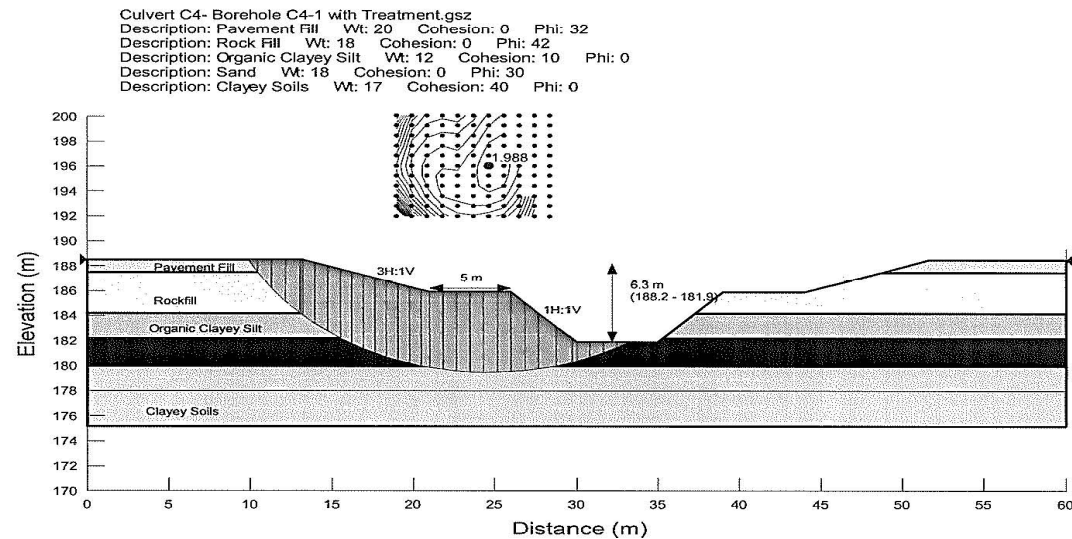


FIGURE C4-1A  
 CONFIGURED TEMPORARY SLOPE – CULVERT C4

## SLOPE STABILITY ANALYSES DIAGRAMS

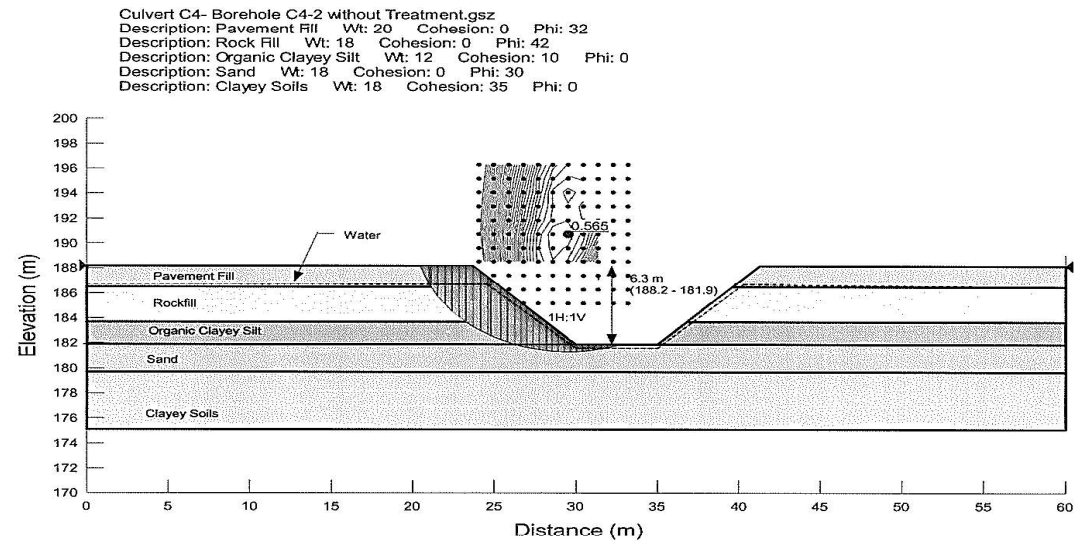


FIGURE C4-2  
 UNCONFIGURED TEMPORARY SLOPE – CULVERT C4

## SLOPE STABILITY ANALYSES DIAGRAMS

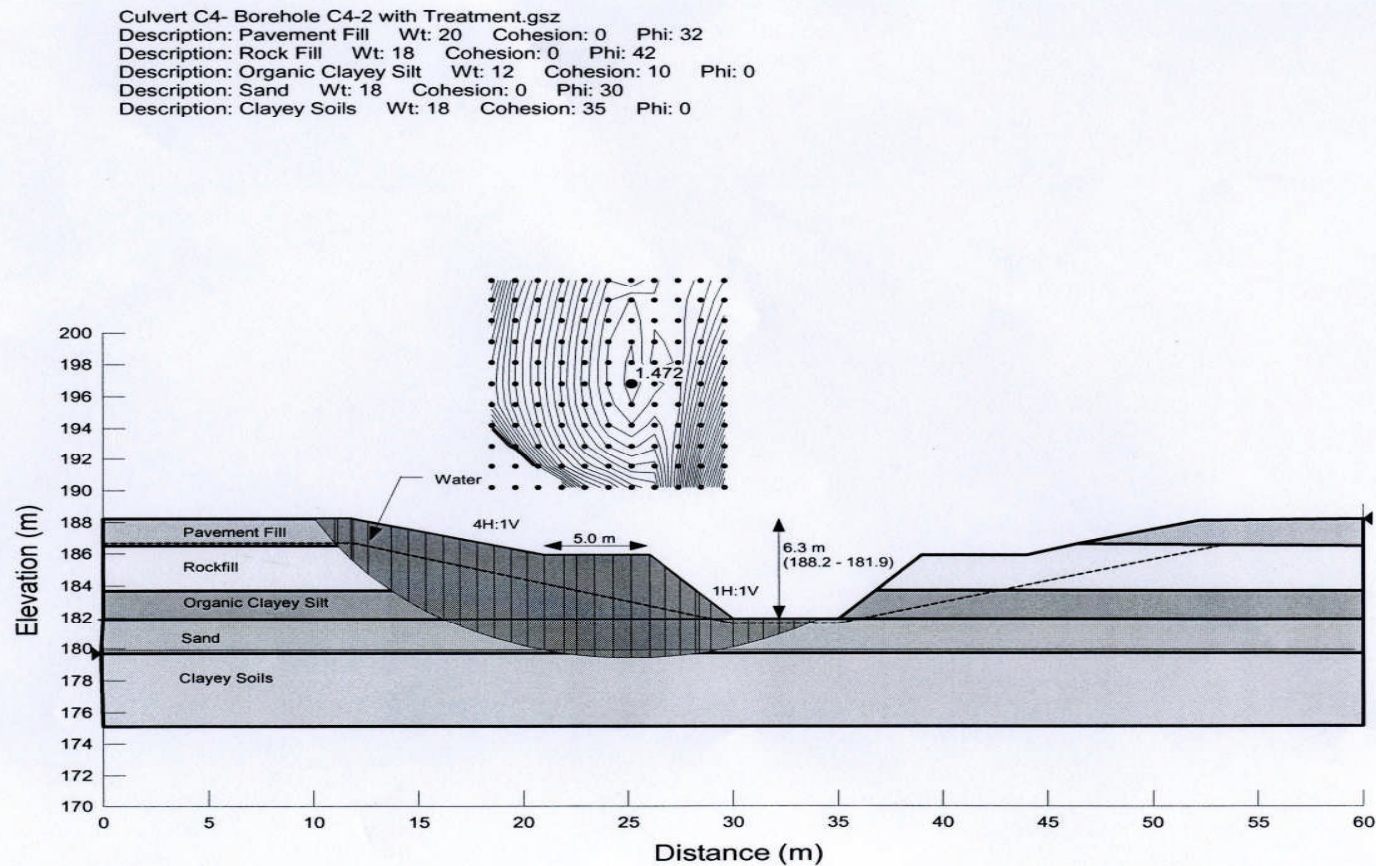


FIGURE C4-2A  
CONFIGURED TEMPORARY SLOPE – CULVERT C4

## SLOPE STABILITY ANALYSES DIAGRAMS

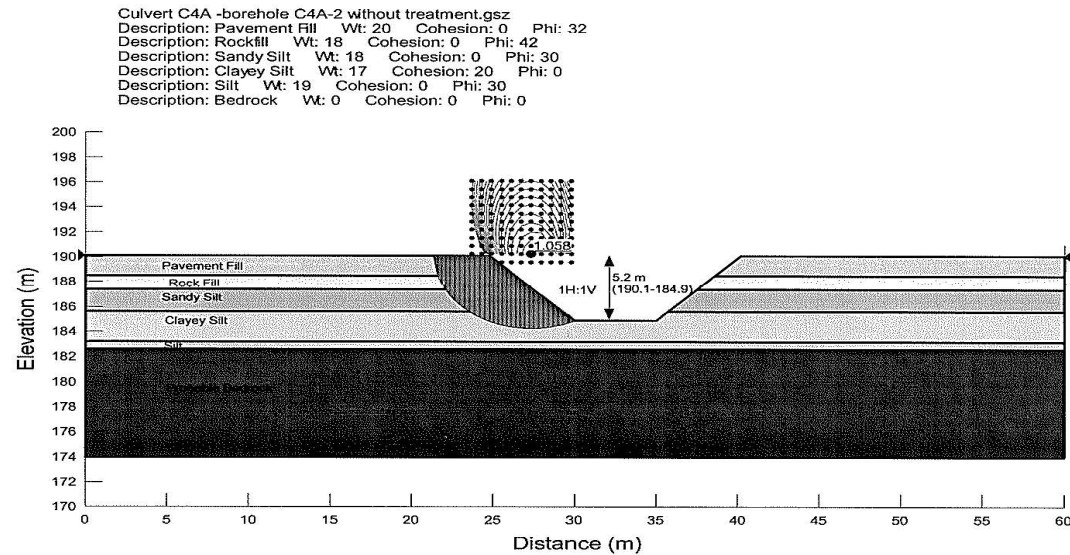


FIGURE C4A-2  
 UNCONFIGURED TEMPORARY SLOPE – CULVERT C4A

## SLOPE STABILITY ANALYSES DIAGRAMS

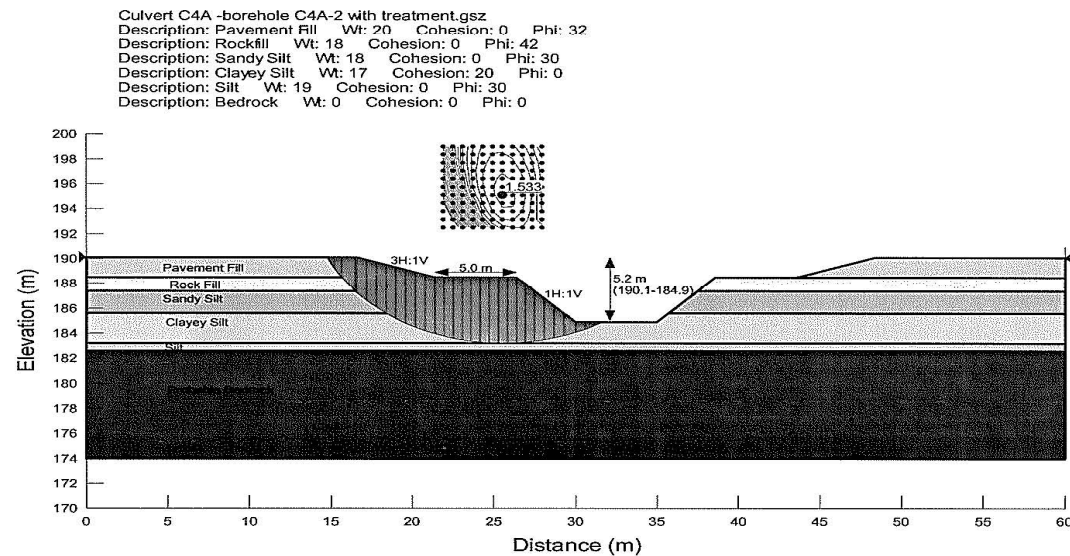


FIGURE C4A-2A  
 CONFIGURED TEMPORARY SLOPE – CULVERT C4A