



SECRETARIA DE
ESTADO DE
TRANSPORTES



GOVERNO DO
PARÁ

CÓDIGO	REV.
MC-SETRAN-01-Q09/101	00
EMIÇÃO	FOLHA
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EMPREENHIMENTO

PROJETO EXECUTIVO DA DUPLICAÇÃO DA BR-222

TRECHO

ROTATÓRIA BR-155 / PONTE DOM ELISEU

TÍTULO

MEMÓRIA DE CÁLCULO DE VOLUMES

ELABORAÇÃO	RESP. TÉCNICO	VERIFICAÇÃO	LIBERAÇÃO	APROVAÇÃO
Engº. Alfredo Queiroz	Engº. Ettore J. Bottura	Engº. Alfredo Queiroz		

DOCUMENTOS DE REFERÊNCIA

DE-SETRAN-01-F07/001 A 007 – Traçado em Planta e Perfil

DOCUMENTOS RESULTANTES

OBSERVAÇÕES

REVISÃO	DATA	RESP. TÉCNICO	VERIFICAÇÃO	LIBERAÇÃO	APROVAÇÃO
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1 INTRODUÇÃO

A SYSTRA apresenta à SETRAN - Secretaria de Estado de Transportes do Estado do Pará, as Planilhas de Cálculo de Volumes referente ao Projeto Executivo da Duplicação da BR-222.

2 CONSIDERAÇÕES GERAIS

O projeto de terraplenagem fez as seguintes considerações:

- Fator de correção do solo aplicado ao volume de aterro = 1,15%;
- Distância média de transporte para compensação lateral DMT= 0,01 km;
- Para empréstimo, foi considerada a Jazida Loirão, localizada na Estrada Muru-Muru, Morada Nova, localizada a 21,9 km do local do empreendimento para material de corpo de aterro.



Figura 1 – Jazida Loirão



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3 PLANILHAS DE CÁLCULO DE VOLUMES

3.1 Eixo BR-222

Planilha de Cálculo de Volumes															
ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m ³)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOÇÃO		ATERRO EMPOLADO Fc= 1,15	CORTE			REMOÇÃO			
			1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO		1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO GEOMET.		
0+0,000		8,49	0,06												
	10,00							241,0	12,0					12,0	
1+0,000		12,44	1,17											-229	
	10,00							266,0	48,0					48,0	
2+0,000		10,7	3,59											-447	
	10,00							268,0	117,0					117,0	
3+0,000		12,6	8,08											-598	
	10,00							332,0	262,0					262,0	
4+0,000		16,3	18,15											-668	
	10,00							388,0	343,0					343,0	
5+0,000		17,4	16,14											-713	
	10,00							472,0	393,0					393,0	
6+0,000		23,66	23,12											-792	
	10,00							555,0	543,0					543,0	



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Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m ³)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOÇÃO		ATERRO EMPOLADO Fc= 1,15	CORTE			REMOÇÃO			
			1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO		1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO GEOMET.		
16+15,719		1,87	5,15												3.096
	2,14							10,0	20,0					10,0	
17+0,000		2,26	4,34												3.106
	5,00							25,0	37,0					25,0	
17+10,000		2,11	3,15												3.118
	2,46							11,0	14,0					11,0	
17+14,914		1,67	2,66												3.121
	2,54							9,0	15,0					9,0	
18+0,000		1,55	3,2												3.127
	5,00							25,0	24,0					24,0	
18+10,000		2,88	1,57												3.126
	2,05							22,0	7,0					7,0	
18+14,109		6,43	1,62												3.111
	2,95							51,0	5,0					5,0	
19+0,000		8,54	0,01												3.065
	10,00							193,0							
20+0,000		8,2													2.872
	10,00							211,0	1,0					1,0	
21+0,000		10,16	0,06												2.662
	10,00							277,0	1,0					1,0	



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ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOCAO SOLO MOLE	REATERRO	ATERRO EMPOLADO Fc= 1,15	CORTE			REMOCAO SOLO MOLE	REATERRO GEOMET.		
			1a.Cat	2a.Cat	3a.Cat				1a.Cat	2a.Cat	3a.Cat				
22+0,000		13,95													2.386
	10,00							267,0	1,0					1,0	
23+0,000		9,27	0,09												2.120
	10,00							215,0	1,0					1,0	
24+0,000		9,45													1.906
	10,00							151,0	4,0					4,0	
25+0,000		3,72	0,35												1.759
	1,23							7,0	1,0					1,0	
25+2,465		1,35	0,4												1.753
	3,77							29,0	2,0					2,0	
25+10,000		5,31													1.726
	5,00							60,0							
26+0,000		5,04													1.666
	2,40							26,0							
26+4,801		4,33													1.640
	2,60							24,0							
26+10,000		3,57													1.616
	5,00							40,0							
27+0,000		3,46													1.576
	3,57							26,0							



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Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOÇÃO		ATERRO EMPOLADO Fc= 1,15	CORTE			REMOÇÃO			
			1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO		1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO GEOMET.		
27+7,137		2,82	0,03												1.550
	6,43							56,0							
28+0,000		4,81													1.494
	10,00							76,0							
29+0,000		1,76	0,01												1.418
	10,00							21,0	30,0					21,0	
30+0,000		0,09	2,94												1.427
	10,00							23,0	67,0					23,0	
31+0,000		1,94	3,77												1.471
	10,00							48,0	46,0					46,0	
32+0,000		2,23	0,87												1.469
	10,00							40,0	61,0					40,0	
33+0,000		1,23	5,22												1.490
	10,00							97,0	73,0					73,0	
34+0,000		7,17	2,06												1.466
	10,00							154,0	43,0					43,0	
35+0,000		6,26	2,28												1.355
	10,00							167,0	45,0					45,0	
36+0,000		8,27	2,21												1.233
	10,00							242,0	37,0					37,0	



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ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+)corte
		ATERRO	CORTE			REMOCAO SOLO MOLE	REATERRO	ATERRO EMPOLADO Fc= 1,15	CORTE			REMOCAO SOLO MOLE	REATERRO GEOMET.		
			1a.Cat	2a.Cat	3a.Cat				1a.Cat	2a.Cat	3a.Cat				
43+0,000															-138
	1,41														
43+2,818															-138
	8,59														
44+0,000															-138
	10,00														
45+0,000															-138
	10,00														
46+0,000															-138
	10,00							398,0							
47+0,000		34,6													-536
	10,00							632,0							
48+0,000		20,32													-1.168
	10,00							312,0							
49+0,000		6,79	0,03												-1.480
	10,00							115,0	58,0					58,0	
50+0,000		3,25	5,74												-1.537
	10,00							46,0	99,0					46,0	
51+0,000		0,78	4,13												-1.484
	10,00							187,0	70,0					70,0	



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Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOCAO SOLO MOLE	REATERRO	ATERRO EMPOLADO Fc= 1,15	CORTE			REMOCAO SOLO MOLE	REATERRO GEOMET.		
			1a.Cat	2a.Cat	3a.Cat				1a.Cat	2a.Cat	3a.Cat				
52+0,000		15,5	2,83												-1.601
	10,00						181,0	66,0						66,0	
53+0,000		0,25	3,77												-1.716
	10,00						85,0	71,0						71,0	
54+0,000		7,17	3,28												-1.730
	10,00						179,0	60,0						60,0	
55+0,000		8,37	2,74												-1.849
	10,00						99,0	98,0						98,0	
56+0,000		0,22	7,1												-1.850
	10,00						153,0	97,0						97,0	
57+0,000		13,05	2,61												-1.906
	10,00						164,0	72,0						72,0	
58+0,000		1,21	4,59												-1.998
	1,15						2,0	13,0						2,0	
58+2,310		0,55	6,39												-1.987
	3,85						2,0	71,0						2,0	
58+10,000			12,03												-1.918
	5,00							124,0							
59+0,000		0,02	12,78												-1.794
	2,80							68,0							



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ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+)corte	
		ATERRO	CORTE			REMOCAO		ATERRO EMPOLADO Fc= 1,15	CORTE			REMOCAO				
			1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO		1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO GEOMET.			
59+5,604		0,1	11,64													-1.726
	2,20								53,0							
59+10,000			12,45													-1.673
	5,00								130,0							
60+0,000			13,62													-1.543
	4,45								117,0							
60+8,899			12,66													-1.426
	5,55							4,0	121,0					4,0		
61+0,000		0,63	9,11													-1.309
	10,00							23,0	198,0					23,0		
62+0,000		1,35	10,65													-1.134
	10,00							23,0	215,0					23,0		
63+0,000		0,61	10,81													-942
	10,00							8,0	186,0					8,0		
64+0,000		0,06	7,75													-764
	10,00							5,0	113,0					5,0		
65+0,000		0,36	3,52													-656
	10,00							23,0	81,0					23,0		
66+0,000		1,63	4,62													-598
	10,00							73,0	65,0					65,0		



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ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOCAO SOLO MOLE	REATERRO	ATERRO EMPOLADO Fc= 1,15	CORTE			REMOCAO SOLO MOLE	REATERRO GEOMET.		
			1a.Cat	2a.Cat	3a.Cat				1a.Cat	2a.Cat	3a.Cat				
67+0,000		4,75	1,87												-606
	10,00							87,0	38,0					38,0	
68+0,000		2,81	1,91												-655
	10,00							72,0	60,0					60,0	
69+0,000		3,42	4,06												-667
	10,00							155,0	49,0					49,0	
70+0,000		10,1	0,81												-773
	10,00							263,0	13,0					13,0	
71+0,000		12,73	0,45												-1.023
	10,00							454,0	7,0					7,0	
72+0,000		26,74	0,23												-1.470
	10,00							389,0	3,0					3,0	
73+0,000		7,05	0,09												-1.856
	10,00							154,0	5,0					5,0	
74+0,000		6,35	0,44												-2.005
	10,00							123,0	20,0					20,0	
75+0,000		4,31	1,53												-2.108
	10,00							75,0	23,0					23,0	
76+0,000		2,24	0,79												-2.160
	10,00							73,0	17,0					17,0	



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ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOCAO SOLO MOLE	REATERRO	ATERRO EMPOLADO Fc= 1,15	CORTE			REMOCAO SOLO MOLE	REATERRO GEOMET.		
			1a.Cat	2a.Cat	3a.Cat				1a.Cat	2a.Cat	3a.Cat				
77+0,000		4,1	0,89												-2.216
	10,00							90,0	27,0					27,0	
78+0,000		3,71	1,84												-2.279
	10,00							80,0	62,0					62,0	
79+0,000		3,24	4,37												-2.297
	10,00							87,0	63,0					63,0	
80+0,000		4,33	1,89												-2.321
	10,00							70,0	75,0					70,0	
81+0,000		1,73	5,57												-2.316
	10,00							38,0	131,0					38,0	
82+0,000		1,6	7,54												-2.223
	1,20							4,0	19,0					4,0	
82+2,405		1,55	8,13												-2.208
	3,80							16,0	62,0					16,0	
82+10,000		2,11	8,2												-2.162
	5,00							24,0	95,0					24,0	
83+0,000		2,09	10,83												-2.091
	1,49							7,0	34,0					7,0	
83+2,977		1,87	11,84												-2.064
	3,51							11,0	77,0					11,0	



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ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+) corte	
		ATERRO	CORTE			REMOCAO		ATERRO EMPOLADO Fc= 1,15	CORTE			REMOCAO				
			1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO		1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO GEOMET.			
92+0,000		1,15	3,73													-683
	10,00							134,0	53,0						53,0	
93+0,000		10,5	1,54													-764
	10,00							799,0	33,0						33,0	
94+0,000		59,01	1,73													-1.530
	7,07							783,0	30,0						30,0	
94+14,135		37,31	2,47													-2.283
	2,93							225,0	15,0						15,0	
95+0,000		29,58	2,48													-2.493
	5,00							292,0	26,0						26,0	
95+10,000		21,18	2,72													-2.759
	5,00							224,0	27,0						27,0	
96+0,000		17,71	2,7													-2.956
	5,00							263,0	24,0						24,0	
96+10,000		27,97	2,16													-3.195
	5,00							344,0	21,0						21,0	
97+0,000		31,88	1,97													-3.518
	5,00							368,0	15,0						15,0	
97+10,000		32,11	0,97													-3.871
	5,00							359,0	7,0						7,0	



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ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m ³)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOÇÃO		ATERRO EMPOLADO Fc= 1,15	CORTE			REMOÇÃO			
			1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO		1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO GEOMET.		
98+0,000		30,3	0,49												-4.223
	5,00							334,0	2,0					2,0	
98+10,000		27,74													-4.555
	5,00							389,0							
99+0,000		39,85													-4.944
	5,00							477,0							
99+10,000		43,19													-5.421
	5,00							516,0							
100+0,000		46,57													-5.937
	5,00							518,0							
100+10,000		43,5													-6.455
	4,18							396,0							
100+18,363		38,96	0,02												-6.851
	0,82							74,0							
101+0,000		40													-6.925
	5,00							384,0							
101+10,000		26,76													-7.309
	5,00							280,0							
102+0,000		21,86													-7.589
	5,00							269,0							



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ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+)corte
		ATERRO	CORTE			REMOCAO SOLO MOLE	REATERRO	ATERRO EMPOLADO Fc= 1,15	CORTE			REMOCAO SOLO MOLE	REATERRO GEOMET.		
			1a.Cat	2a.Cat	3a.Cat				1a.Cat	2a.Cat	3a.Cat				
102+10,000		24,93													-7.858
	5,00							324,0							
103+0,000		31,37													-8.182
	5,00							364,0							
103+10,000		31,89													-8.546
	5,00							352,0							
104+0,000		29,27													-8.898
	5,00							299,0							
104+10,000		22,75													-9.197
	5,00							242,0							
105+0,000		19,42													-9.439
	5,00							217,0							
105+10,000		18,31	0,03												-9.656
	5,00							205,0							
106+0,000		17,3													-9.861
	5,00							186,0							
106+10,000		15,01													-10.047
	5,00							160,0							
107+0,000		12,73													-10.207
	1,30							38,0							



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ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOÇÃO SOLO MOLE	REATERRO	ATERRO EMPOLADO Fc= 1,15	CORTE			REMOÇÃO SOLO MOLE	REATERRO GEOMET.		
			1a.Cat	2a.Cat	3a.Cat				1a.Cat	2a.Cat	3a.Cat				
107+2,590		12,36													-10.245
	8,70							221,0							
108+0,000		9,76													-10.466
	10,00							180,0							
109+0,000		5,93	0,01												-10.646
	10,00							128,0	6,0					6,0	
110+0,000		5,21	0,57												-10.768
	10,00							112,0	18,0					18,0	
111+0,000		4,51	1,27												-10.862
	10,00							88,0	18,0					18,0	
112+0,000		3,17	0,51												-10.932
	10,00							68,0	16,0					16,0	
113+0,000		2,7	1,08												-10.984
	10,00							45,0	33,0					33,0	
114+0,000		1,18	2,21												-10.996
	10,00							44,0	39,0					39,0	
115+0,000		2,63	1,64												-11.001
	10,00							59,0	22,0					22,0	
116+0,000		2,5	0,52												-11.038
	10,00							62,0	25,0					25,0	



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Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m ³)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOÇÃO		ATERRO EMPOLADO Fc= 1,15	CORTE			REMOÇÃO			
			1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO		1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO GEOMET.		
117+0,000		2,93	2												-11.075
	10,00							98,0	30,0					30,0	
118+0,000		5,57	0,97												-11.143
	10,00							207,0	20,0					20,0	
119+0,000		12,47	1												-11.330
	10,00							355,0	19,0					19,0	
120+0,000		18,36	0,93												-11.666
	10,00							368,0	19,0					19,0	
121+0,000		13,65	0,99												-12.015
	10,00							556,0	20,0					20,0	
122+0,000		34,68	1,05												-12.551
	10,00							863,0	19,0					19,0	
123+0,000		40,35	0,84												-13.395
	10,00							977,0	19,0					19,0	
124+0,000		44,57	1,08												-14.353
	10,00							905,0	28,0					28,0	
125+0,000		34,11	1,7												-15.230
	10,00							633,0	36,0					36,0	
126+0,000		20,95	1,9												-15.827
	10,00							412,0	47,0					47,0	



DOCUMENTO TÉCNICO

Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m ³)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOÇÃO SOLO MOLE	REATERRO	ATERRO EMPOLADO Fc= 1,15	CORTE			REMOÇÃO SOLO MOLE	REATERRO GEOMET.		
			1a.Cat	2a.Cat	3a.Cat				1a.Cat	2a.Cat	3a.Cat				
127+0,000		14,86	2,84												-16.192
	10,00							323,0	60,0					60,0	
128+0,000		13,26	3,19												-16.455
	10,00							342,0	101,0					101,0	
129+0,000		16,51	6,93												-16.696
	10,00							383,0	112,0					112,0	
130+0,000		16,77	4,29												-16.967
	10,00							425,0	89,0					89,0	
131+0,000		20,19	4,61												-17.303
	10,00							546,0	78,0					78,0	
132+0,000		27,26	3,2												-17.771
	10,00							602,0	76,0					76,0	
133+0,000		25,08	4,43												-18.297
	10,00							584,0	83,0					83,0	
134+0,000		25,7	3,86												-18.798
	10,00							445,0	70,0					70,0	
135+0,000		12,98	3,11												-19.173
	10,00							258,0	52,0					52,0	
136+0,000		9,44	2,12												-19.379
	10,00							170,0	40,0					40,0	



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Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOCAO SOLO MOLE	REATERRO	ATERRO EMPOLADO Fc= 1,15	CORTE			REMOCAO SOLO MOLE	REATERRO GEOMET.		
			1a.Cat	2a.Cat	3a.Cat				1a.Cat	2a.Cat	3a.Cat				
137+0,000		5,3	1,9												-19.509
	10,00							132,0	28,0					28,0	
138+0,000		6,14	0,9												-19.613
	10,00							201,0	30,0					30,0	
139+0,000		11,3	2,1												-19.784
	10,00							355,0	66,0					66,0	
140+0,000		19,53	4,54												-20.073
	10,00							336,0	130,0					130,0	
141+0,000		9,65	8,5												-20.279
	10,00							281,0	169,0					169,0	
142+0,000		14,77	8,4												-20.391
	10,00							394,0	191,0					191,0	
143+0,000		19,53	10,74												-20.594
	10,00							643,0	196,0					196,0	
144+0,000		36,37	8,83												-21.041
	10,00							692,0	185,0					185,0	
145+0,000		23,84	9,67												-21.548
	10,00							474,0	150,0					150,0	
146+0,000		17,42	5,35												-21.872
	2,06							85,0	20,0					20,0	



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Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+)corte
		ATERRO	CORTE			REMOCAO SOLO MOLE	REATERRO	ATERRO EMPOLADO Fc= 1,15	CORTE			REMOCAO SOLO MOLE	REATERRO GEOMET.		
			1a.Cat	2a.Cat	3a.Cat				1a.Cat	2a.Cat	3a.Cat				
151+0,000		32,54													-25.502
	5,00							359,0							
151+10,000		29,91													-25.861
	5,00							328,0							
152+0,000		27,1													-26.189
	5,00							342,0							
152+10,000		32,45													-26.531
	2,47							175,0							
152+14,939		29,07													-26.706
	2,53							104,0							
153+0,000		6,53													-26.810
	5,00							51,0	6,0					6,0	
153+10,000		2,29	1,15												-26.855
	5,00							49,0	13,0					13,0	
154+0,000		6,15	1,37												-26.891
	5,00							128,0	14,0					14,0	
154+10,000		16,13	1,41												-27.005
	5,00							139,0	19,0					19,0	
155+0,000		8,12	2,35												-27.125
	5,00							105,0	27,0					27,0	



DOCUMENTO TÉCNICO

Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOCAO SOLO MOLE	REATERRO	ATERRO EMPOLADO Fc= 1,15	CORTE			REMOCAO SOLO MOLE	REATERRO GEOMET.		
			1a.Cat	2a.Cat	3a.Cat				1a.Cat	2a.Cat	3a.Cat				
160+0,000		2,91	4,49												-28.091
	5,00						42,0	33,0						33,0	
160+10,000		4,44	2,13												-28.100
	5,00						57,0	23,0						23,0	
161+0,000		5,55	2,46												-28.134
	5,00						69,0	36,0						36,0	
161+10,000		6,49	4,75												-28.167
	5,00						77,0	41,0						41,0	
162+0,000		6,97	3,53												-28.203
	5,00						77,0	28,0						28,0	
162+10,000		6,49	2,08												-28.252
	5,00						65,0	24,0						24,0	
163+0,000		4,84	2,63												-28.293
	5,00						48,0	20,0						20,0	
163+10,000		3,46	1,37												-28.321
	5,00						33,0	12,0						12,0	
164+0,000		2,21	1,09												-28.342
	5,00						21,0	13,0						13,0	
164+10,000		1,4	1,47												-28.350
	1,01						3,0	3,0						3,0	



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Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+) corte	
		ATERRO	CORTE			REMOÇÃO		ATERRO EMPOLADO Fc= 1,15	CORTE			REMOÇÃO				
			1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO		1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO GEOMET.			
164+12,010		1,31	1,36													-28.350
	3,99							11,0	10,0						10,0	
165+0,000		1,15	1,12													-28.351
	5,00							12,0	14,0						12,0	
165+10,000		0,88	1,76													-28.349
	5,00							10,0	19,0						10,0	
166+0,000		0,9	2,12													-28.340
	5,00							10,0	23,0						10,0	
166+10,000		0,77	2,38													-28.327
	5,00							8,0	28,0						8,0	
167+0,000		0,65	3,3													-28.307
	5,00							5,0	45,0						5,0	
167+10,000		0,19	5,6													-28.267
	5,00							3,0	62,0						3,0	
168+0,000		0,37	6,73													-28.208
	5,00							6,0	79,0						6,0	
168+10,000		0,7	9,01													-28.135
	5,00							6,0	101,0						6,0	
169+0,000		0,31	11,28													-28.040
	5,00							7,0	107,0						7,0	



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Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m ³)	ORDENADAS DE MASSAS (-) aterro (+) corte	
		ATERRO	CORTE			REMOÇÃO		ATERRO EMPOLADO Fc= 1,15	CORTE			REMOÇÃO				
			1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO		1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO GEOMET.			
169+10,000		0,92	10,21													-27.940
	4,13							12,0	84,0						12,0	
169+18,251		1,67	10,03													-27.868
	0,87							3,0	18,0						3,0	
170+0,000		1,69	10,45													-27.853
	10,00							38,0	258,0						38,0	
171+0,000		1,64	15,31													-27.633
	3,57							19,0	115,0						19,0	
171+7,135		2,87	16,8													-27.537
	1,43							11,0	48,0						11,0	
171+10,000		3,86	16,99													-27.500
	5,00							92,0	178,0						92,0	
172+0,000		12,16	18,52													-27.414
	5,00							146,0	258,0						146,0	
172+10,000		13,28	33,13													-27.302
	5,00							152,0	335,0						152,0	
173+0,000		13,22	33,95													-27.119
	5,00							138,0	351,0						138,0	
173+10,000		10,74	36,25													-26.906
	5,00							129,0	383,0						129,0	



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Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+) corte
		ATERRO	CORTE			REMOÇÃO		ATERRO EMPOLADO Fc= 1,15	CORTE			REMOÇÃO			
			1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO		1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO GEOMET.		
177+10,000		7,75	27,45												-25.263
	5,00							59,0	293,0					59,0	
178+0,000		2,46	31,1												-25.029
	0,75							4,0	47,0					4,0	
178+1,497		2,39	31,33												-24.986
	9,25							49,0	592,0					49,0	
179+0,000		2,21	32,69												-24.443
	10,00							51,0	638,0					51,0	
180+0,000		2,25	31,06												-23.856
	10,00							58,0	362,0					58,0	
181+0,000		2,76	5,18												-23.552
	10,00							33,0	110,0					33,0	
182+0,000		0,08	5,77												-23.475
	10,00							1,0	129,0					1,0	
183+0,000			7,16												-23.347
	10,00								157,0						
184+0,000			8,52												-23.190
	10,00								146,0						
185+0,000			6,03												-23.044
	10,00								125,0						



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Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m ³)	ORDENADAS DE MASSAS (-) aterro (+) corte	
		ATERRO	CORTE			REMOÇÃO		ATERRO EMPOLADO Fc= 1,15	CORTE			REMOÇÃO				
			1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO		1a.Cat	2a.Cat	3a.Cat	SOLO MOLE	REATERRO GEOMET.			
186+0,000			6,44													-22.919
	10,00							43,0	111,0						43,0	
187+0,000		3,78	4,69													-22.851
	10,00							68,0	93,0						68,0	
188+0,000		2,17	4,6													-22.826
	0,56							3,0	5,0						3,0	
188+1,117		1,91	4,32													-22.824
	4,44							14,0	29,0						14,0	
188+10,000		0,91	2,17													-22.809
	5,00							14,0	16,0						14,0	
189+0,000		1,51	0,94													-22.807
	5,00							23,0	9,0						9,0	
189+10,000		2,41	0,93													-22.821
	3,06							18,0	6,0						6,0	
189+16,117		2,57	1,05													-22.833
	1,94							11,0	4,0						4,0	
190+0,000		2,27	1,19													-22.840
	5,00							20,0	15,0						15,0	
190+10,000		1,14	1,9													-22.845
	3,13							10,0	8,0						8,0	



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SYSTRA

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Planilha de Cálculo de Volumes

ESTACAS	Dist. Media (m)	ÁREAS (m ²)						VOLUMES (m ³)						VOLUME COMPENS. LATERAL (m3)	ORDENADAS DE MASSAS (-) aterro (+)corte	
		ATERRO	CORTE			REMOCAO SOLO MOLE	REATERRO	ATERRO EMPOLADO Fc= 1,15	CORTE			REMOCAO SOLO MOLE	REATERRO GEOMET.			
			1a.Cat	2a.Cat	3a.Cat				1a.Cat	2a.Cat	3a.Cat					
195+0,000		1,64	1,99													-22.963
	10,00							24,0	31,0						24,0	
196+0,000		0,44	1,09													-22.956
	10,00							6,0	45,0						6,0	
197+0,000		0,04	3,42													-22.917
	10,00								93,0							
198+0,000			5,86													-22.824
	10,00								125,0							
199+0,000		0,04	6,63													-22.699
	10,00							1,0	140,0						1,0	
200+0,000		0,04	7,37													-22.560
	10,00								98,0							
201+0,000			2,4													-22.462
TOTAL								45.500	23.038					9.876		