

ANEXO A

Documento 03-02-00-00-4C3-0001-01-PDF, DE-03-02-00-00-4C3-0001												
Trecho	Sion - Savassi - Estaca 202+00 a Estaca 225+00											
Furo	SM-01	SM-02	SM-03	SM-07	SM-08	SM-09	SM-11	SM-12	SM-13	SM-14	SM-05	SM-10
Cota da boca do furo	919,146	917,298	916,581	914,143	912,12	910,19	908,053	907,604	905,995	903,45	914,162	909,965
Topo de rocha decomposta (TD)	51,06	34,13	25,3	51,06	50,02	49,11	45,05	45,05	43,09	42	50,08	47,08
Topo de rocha sã (TS)	58	55	53	-	-	-	-	-	-	-	51	-
Nível d'água (NA)	14,81	10,17	16,5	8,19	7,8	7,62	18,49	14,82	13,86	16,4	-	-
Litologia	Filito	Filito	Filito	Filito	Filito	Filito	Filito	Filito	Filito	Filito	Filito	Filito

Documento 03-04-00-00-4C3-0001-01-PDF, DE-03-04-00-00-4C3-0001														
Trecho	Savassi - Tiradentes - Estaca 180+00 a Estaca 202+00													
Furo	SM-16A	SM-18	SM-19	SM-20	SM-22	SM-24	SM-26	SM-27	SM-28	SM-29	SM-21	SM-23	SM-25	SM-30
Cota da boca do furo	899,031	899,004	898,658	897,701	896,922	894,756	892,199	891,171	890,599	888,925	898,863	896,726	894,746	887,376
Topo de rocha decomposta (TD)	41	38	36	36	36	34	33	31	31,18	28,05	36	34,05	33,12	28,05
Topo de rocha sã (TS)	-	-	-	-	-	-	-	-		32,05	-	-	-	32
Nível d'água (NA)	15,1	15,9	9,05	8,45	8,3	14,1	8	-	12,15	5,37	-	-	-	-
Litologia	Filito / Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse

Documento 03-04-00-00-4C3-0002-01-PDF, DE-03-04-00-00-4C3-0002														
Trecho	Savassi - Tiradentes - Estaca 160+00 a Estaca 180+00													
Furo	SM-30	SM-31	SM-33	SM-32	SM-36	SM-37	SM-38	SM-39	SM-40	SM-43	SM-41	SM-29	SM-42	SM-44
Cota da boca do furo	887,376	886,785	885,91	884,927	884,136	882,843	881,77	880,014	878,514	877,293	875,435	888,925	876,328	874,609
Topo de rocha decomposta (TD)	28,05	32	33	28,2	33	19,25	33	28,6	22	26,8	24,19	28,05	23,04	24
Topo de rocha sã (TS)	32	-	-	33,28	-	33,03	-	30,45	22,54	30,62	31	32,05	23,5	30
Nível d'água (NA)	10,36	11,67	12,55	6,55	16	7,4	10,19	8,84	14,17	6,12	6,92	-	-	-
Litologia	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse

Documento 03-06-00-00-4C3-0001-01-PDF, DE-03-06-00-00-4C3-0001																	
Trecho	Tiradentes - Palácio das Artes - Estaca 140+00 a Estaca 160+00																
Furo	SM-41	SM-44	SM-45	SM-46	SM-47	SM-48	SM-49	SM-50	SM-51	SM-58	SM-57	SM-42	SM-55A	SM-54B	SM-53	SM-56	SM-59

Cota da boca do furo	875,435	874,609	872,674	871,215	869,529	867,759	866,228	864,893	864,044	863,655	862,647	876,328	863,889	863,81	863,297	863,997	861,011
Topo de rocha decomposta (TD)	24,19	24	24,06	24,03	23,04	27,05	29,08	31	19	23,81	24,1	23,04	24,1	21,19	22,45	26,25	22,1
Topo de rocha sã (TS)	31	30	25,6	24,3	-	35	31	-	-	-	-	23,5	-	21,55	-	27,5	-
Nível d'água (NA)	6,92	6,12	6,3	7,8	4,43	5,68	5,48	4,54	4,34	6,62	11,38	-	-	-	-	-	-
Litologia	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse

Documento 03-06-00-00-4C3-0002-01-PDF, DE-03-06-00-00-4C3-0002									
Trecho	Tiradentes - Palácio das Artes - Estaca 120+00 a Estaca 140+00								
Furo	SM-59	SM-60	SM-62	SM-65	SM-68	SM-69	SM-70	SM-58	SM-57
Cota da boca do furo	861,011	859,593	857,143	855,334	850,758	849,963	849,289	863,655	862,647
Topo de rocha decomposta (TD)	22,1	19,1	29,54	20,15	27,56	30	32	23,81	24,1
Topo de rocha sã (TS)	-	23,2	-	31	30,11	-	-	-	-
Nível d'água (NA)	6,45	6,09	10,34	7,25	8,85	5,15	3,26	6,62	11,38
Litologia	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse

Documento 03-08-00-00-4C3-0001-01-PDF, DE-03-08-00-00-4C3-0001																
Trecho	Palácio das Artes - Praça Sete - Estaca 100+00 a Estaca 120+00															
Furo	SM-70	SM-71	SM-73	SM-75	SM-78	SM-80	SM-81	SM-82	SM-83	SM-84	SM-69	SM-74	SM-72	SM-76	SM-77	SM-85
Cota da boca do furo	849,289	850,034	849,993	849,958	849,992	850,025	850,046	850,174	850,238	850,301	849,963	849,491	849,302	849,449	849,487	850,217
Topo de rocha decomposta (TD)	32	32,05	37	24	18,36	17,27	16,12	28	28,6	32,28	30	25	28	18	18,71	32
Topo de rocha sã (TS)	-	-	40	27	29,6	27	-	-	31	-	-	32,1	32,12	26,2	24,41	-
Nível d'água (NA)	3,26	6,16	4,73	9,15	6,59	3,89	7,75	6,13	1,52	2,25	-	-	-	-	-	-
Litologia	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse

Documento 03-08-00-00-4C3-0002-01-PDF, DE-03-08-00-00-4C3-0002													
Trecho	Palácio das Artes - Praça Sete - Estaca 80+00 a Estaca 100+00												
Furo	SM-85	SM-86	SM-87	SM-89	SM-90	SM-93	SM-94	SM-95A	SM-97	SM-84	SM-92	SM-88A	SM-96B
Cota da boca do furo	850,217	850,223	850,19	849,471	849,403	849,382	849,513	850,23	850,23	850,301	841,309	850,77	849,629
Topo de rocha decomposta (TD)	32	32,45	40	32,15	26,09	31,4	26	30,45	23,9	32,28	21	31,18	23,15

Topo de rocha sã (TS)	-	-	-	-	32,25	32	32	32	31,8	-	32,1	32	31
Nível d'água (NA)	10,35	6,53	2,3	6,04	12,06	6,8	6,45	2,1	11,5	-	-	-	-
Litologia	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss

Documento 03-10-00-00-4C3-0001-01-PDF, DE-03-10-00-00-4C3-0001																
Trecho	Palácio das Artes - Praça Sete - Estaca 60+00 a Estaca 80+00															
Furo	SM-98	SM-101	SM-103	SM-102	SM-105	SM-109	SM-110	SM-111	SM-112	SM-97	SM-99H	SM-100	SM-102	SM-107	SM-106	SM-108
Cota da boca do furo	850,23	853,617	852,413	853,529	853,579	853,552	853,365	853,061	852,137	850,23	850,23	853,082	853,529	852,808	853,1	852,697
Topo de rocha decomposta (TD)	23,15	27	28	31,15	24	28	30	34,01	30	23,9	29,19	27	31,15	23,35	23,5	33,03
Topo de rocha sã (TS)	32,02	40,24	40,05	36,9	40	33	34,22	-	36,05	31,8	33	38	36,9	40	40	-
Nível d'água (NA)	7,39	5,8	10,58	8,9	7,56	7,96	5,8	7,17	5,05	11,5	-	-	-	-	-	-
Litologia	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss	Gnaiss

Documento 03-10-00-00-4C3-0002-01-PDF, DE-03-10-00-00-4C3-0002														
Trecho	Praça Sete - Rio Branco - Estaca 40+00 a Estaca 60+00													
Furo	SM-113	SM-114	SM-115	SM-118	SM-120	SM-121	SM-122	SM-123	SM-126	SM-119	SM-124	SM-127A	SM-129	SM-128
Cota da boca do furo	852,175	851,481	850,656	850,767	849,078	848,628	846,161	846,161	840,052	848,154	845,62	840,054	840,092	840,092
Topo de rocha decomposta (TD)	36,7	33,07	32,45	33	20	28,66	23	31,25	25,75	24,18	27,7	25,8	28,35	31
Topo de rocha sã (TS)	40,07	40	40,05	41,2	40	40,08	40	40,1	-	40,25	40		31,2	40
Nível d'água (NA)	4,05	6,8	7,03	2,15	6,8	4,85	7,81	8,55	1,39	-	-	-	-	-
Litologia	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse	Gnaisse

Documento 03-12-00-00-4C3-0001-01-PDF, DE-03-12-00-00-4C3-0001								
Trecho	Rio Branco - SENAI - Estaca 20+00 a Estaca 40+00							
Furo	SM-129	SM-130	SM-131	SM-132	SM-133	SM-134	SM-136	SM-128
Cota da boca do furo	840,092	840,037	839,572	839,948	839,891	842,248	848,844	840,092
Topo de rocha decomposta (TD)	28,35	23,1	35	38	27,3	23,78	28	31
Topo de rocha sã (TS)	31,2	-	-	-	31,8	25,88	38,15	40

ANEXO B



PFC_V2_3

Project1

Date Created: 04/02/2026, 18:54:05

Software Version: 11.026

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PFC_V2_3

RS2 Analysis Information

Project Summary

File Name:	PFC_V2_3
Last saved with RS2 version:	11.026
Project Title:	Project1

General Settings

Single stage model

Analysis Type:

Solver Type:

Units:

Permeability Units:

Time Units:

Plane Strain

Gaussian Elimination

Metric, stress as MPa

meters/second

seconds

Analysis Options

Maximum Number of Iterations:	500
Tolerance:	0.001
Number of Load Steps:	Automatic
Convergence Type:	Comprehensive
Tensile Failure:	Reduces Shear Strength
Joint tension reduces joint stiffness by a factor of 0.01	

Groundwater Analysis

Method:

Static

Pore Fluid Unit Weight:

0.00981 MN/m³

Grid Interpolation:

Modified Chugh

Probability Analysis

Analysis Type:

Monte-Carlo

Number of Samples:

1000

Statistical Variables

Number of Statistical Variables Used: 0

Field Stress

Field stress:	Gravity
Using actual ground surface	
Effective stress ratio (horizontal/vertical in-plane):	1
Effective stress ratio (horizontal/vertical out-of-plane):	1
Locked-in horizontal stress (in-plane):	0
Locked-in horizontal stress (out-of-plane):	0

Mesh

Mesh type:	Graded
Element type:	6 Noded triangles
Number of elements:	6631
Number of nodes:	13611

Mesh Quality

All elements are of good quality

Poor quality elements defined as:

Side length ratio (maximum / minimum) > 30.00

Minimum interior angle < 2.0 degrees

Maximum interior angle > 175.0 degrees

Material Properties

Material 1

Material Color	
Initial Element Loading	Field Stress and Body Force
Account for Moisture Content in Unit Weight	No
Unit Weight	0.026 MN/m ³
Porosity Value	0.5
Elastic Type	Isotropic
Poisson's Ratio	0.2
Young's Modulus	40000 MPa
Failure Criterion	Hoek-Brown
Material Type	Elastic
Compressive Strength	160 MPa
mb Parameter	3.376
s Parameter	0.001
Unsaturated Behavior	None
Material Behaviour	Drained
Fluid Bulk Modulus	2200 MPa
Use Biot's Coefficient for calculating Effective Stress	No
Static Water Mode	Piezometric Lines
Piezo to Use	1
Hu Value	1

Material 2

Material Color	
Initial Element Loading	Field Stress and Body Force
Account for Moisture Content in Unit Weight	No
Unit Weight	0.026 MN/m ³
Porosity Value	0.5
Elastic Type	Isotropic
Poisson's Ratio	0.2
Young's Modulus	40000 MPa
Failure Criterion	Mohr-Coulomb
Material Type	Elastic
Peak Tensile Strength	1.66 MPa
Peak Friction Angle	32.8 degrees
Peak Cohesion	0.0171 MPa
Unsaturated Behavior	None
Material Behaviour	Drained
Fluid Bulk Modulus	2200 MPa
Use Biot's Coefficient for calculating Effective Stress	No
Static Water Mode	Piezometric Lines
Piezo to Use	1
Hu Value	1

Joint Properties

Joint 1

Joint Color	
Slip Criterion	None
Normal Stiffness	100000 MPa/m
Shear Stiffness	10000 MPa/m
Initial Deformation	Yes
Apply Pore Pressure	Yes
Apply Additional Pressure inside Joint	No
Apply Pressure to Liner Side Only	No
Apply Stage Factors	No

Liner Properties

Liner: Liner 1

Color	
Liner Type	Standard Beam
Formulation	Timoshenko
Thickness	0.1 m
Elastic Properties	
Young's modulus	30000 MPa
Poisson's ratio	0.2
Axial Strain (+Expansion)	0

List of All Coordinates

Excavation boundary

X	Y
93.5855	64.0682
93.6316	63.6783
93.7082	63.2933
93.8148	62.9154
93.9506	62.5471
94.115	62.1906
94.3068	61.848
94.525	61.5216
94.768	61.2133
95.0345	60.925
95.3228	60.6585
95.6311	60.4154
95.9575	60.1973
96.3001	60.0055
96.6566	59.8411
97.025	59.7052
97.4028	59.5987
97.7879	59.5221
98.1777	59.4759
98.57	59.4605
98.9623	59.4759
99.3522	59.5221
99.7373	59.5987
100.115	59.7052
100.483	59.8411
100.84	60.0055
101.183	60.1973
101.509	60.4154
101.817	60.6585
102.106	60.925
102.372	61.2133
102.615	61.5216
102.833	61.848
103.025	62.1906
103.189	62.5471
103.325	62.9154
103.432	63.2933
103.508	63.6783
103.555	64.0682
103.57	64.4605
103.555	64.8528
103.508	65.2427
103.432	65.6277
103.325	66.0056
103.189	66.3739

103.025	66.7305
102.833	67.073
102.615	67.3994
102.372	67.7078
102.106	67.9961
101.817	68.2625
101.509	68.5056
101.183	68.7237
100.84	68.9156
100.483	69.0799
100.115	69.2158
99.7373	69.3224
99.3522	69.399
98.9623	69.4451
98.57	69.4605
98.1777	69.4451
97.7879	69.399
97.4028	69.3224
97.025	69.2158
96.6566	69.0799
96.3001	68.9156
95.9575	68.7237
95.6311	68.5056
95.3228	68.2625
95.0345	67.9961
94.768	67.7078
94.525	67.3994
94.3068	67.073
94.115	66.7305
93.9506	66.3739
93.8148	66.0056
93.7082	65.6277
93.6316	65.2427
93.5855	64.8528
93.57	64.4605

External boundary

X	Y
185.535	2.18375
185.535	85.927
185.535	117.063
10.7434	117.063
10.7434	85.927
10.7434	2.18375
13.1792	2.18375
183.068	2.18375

Material boundary

X	Y
10.7434	85.927
92.7616	85.927
102.762	85.927
185.535	85.927

Piezometric line

X	Y
10.7434	108.299
185.535	108.299