

As Jet Grouting need to be carried out concurrently with the outfall construction, a steel platform need to be erected for the support of the jet grouting rig



Steel platform erected for the support of the jet grouting rig



Jet grouting rig in operation



Jet grouting rig in operation



Test for In-situ Permeability

DC/2007/16
Lai Chi Kok Transfer Scheme
Grout Column Sample Coring at TBM Shaft



DC/2007/16

Lai Chi Kok Transfer Scheme

Grout Column Sample Coring at TBM Shaft



DC/2007/16
Lai Chi Kok Transfer Scheme
Grout Column Sample Coring at TBM Shaft



VIBRO 惠保(香港)有限公司
Vibro (H.K.) Limited

Site : Lai Chi Kok Transfer Scheme – Grout Column Sample Coring at TBM Shaft

Drill Hole : CH04 Depth (m) : 40.30 to 47.00 Job No. : J201114e

Box No. : 2 of 2 Photo Date : 31/3/2011

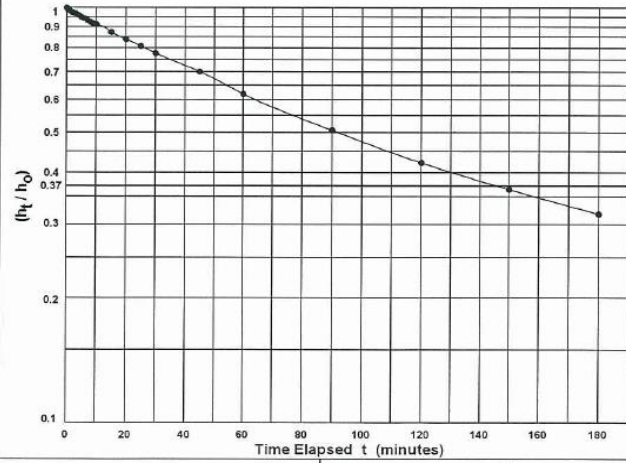
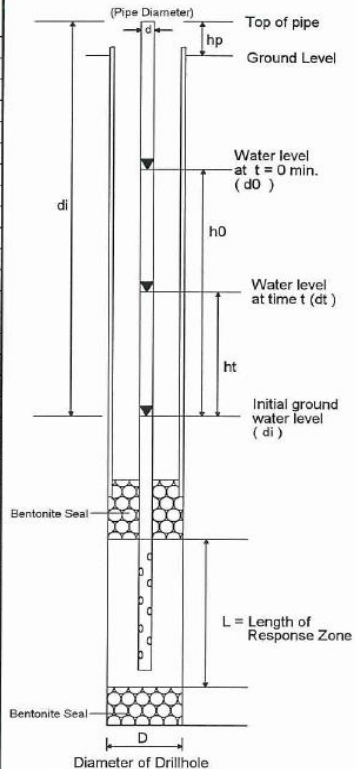


0m 0.5m 1m 1.5m



Contractor : VIBRO (H.K.) LIMITED		Drillhole No. : CH03
Contract No. : J201114e		Date of Test : 16/03/2011
Works Order No. : N/A		Ground Level : + 5.60 mPD
Project : 3 Coring Works at Grount Column at Lai Chi Kok		Test No. : 1-1
		Co-ordinates : E N
Initial Water Level Before Test : 5.88 m below G. L.	Depth of Test : 38.78m to 40.28m	
Tested / Supervised By : C. H. Yeung	Checked By : E. Leung	

Time Elapsed, t (minutes)	Depth of Water from top of pipe dt (m)	ht = di - dt (m)	$\frac{ht}{h_0}$ (h0 = di - d0)
0	0.00	7.55	1.00
0.25	0.03	7.52	1.00
0.5	0.05	7.50	0.99
0.75	0.10	7.45	0.99
1	0.12	7.43	0.98
1.5	0.16	7.39	0.98
2	0.20	7.35	0.97
3	0.24	7.31	0.97
4	0.31	7.24	0.96
5	0.39	7.16	0.95
6	0.44	7.11	0.94
7	0.51	7.04	0.93
8	0.58	6.97	0.92
9	0.64	6.91	0.92
10	0.67	6.88	0.91
15	0.96	6.59	0.87
20	1.22	6.33	0.84
25	1.45	6.10	0.81
30	1.69	5.86	0.78
45	2.26	5.29	0.70
60	2.88	4.67	0.62
90	3.73	3.82	0.51
120	4.36	3.19	0.42
150	4.80	2.75	0.36
180	5.15	2.40	0.32



Note : T is time where ht / h0 = 0.37
T = 8760 sec

Permeability $k = \frac{A}{FT}$
k = 4.10x10⁻⁸ m/sec

- d = 0.038 m
- D = 0.101 m
- L = 1.50 m
- hp = 1.67 m
- di = 7.55 m

Where :
 Area = $A = \frac{d^2 \pi}{4} = 0.0011341$ (in metre²)
 Intake Factor = F (in metres)
 $F = \frac{2.4 \pi L}{\ln \left[1.2 \frac{L}{D} + \sqrt{1 + \left(1.2 \frac{L}{D} \right)^2} \right]} = 3.16$

Material Surrounding Response Zone :
 Filter Material : Sand Filter

DC/2007/16 – Lai Chi Kok Transfer Scheme

Permeability Test Result

Maintenance Chamber



Provision of Jet Grouting Columns at Pier 15

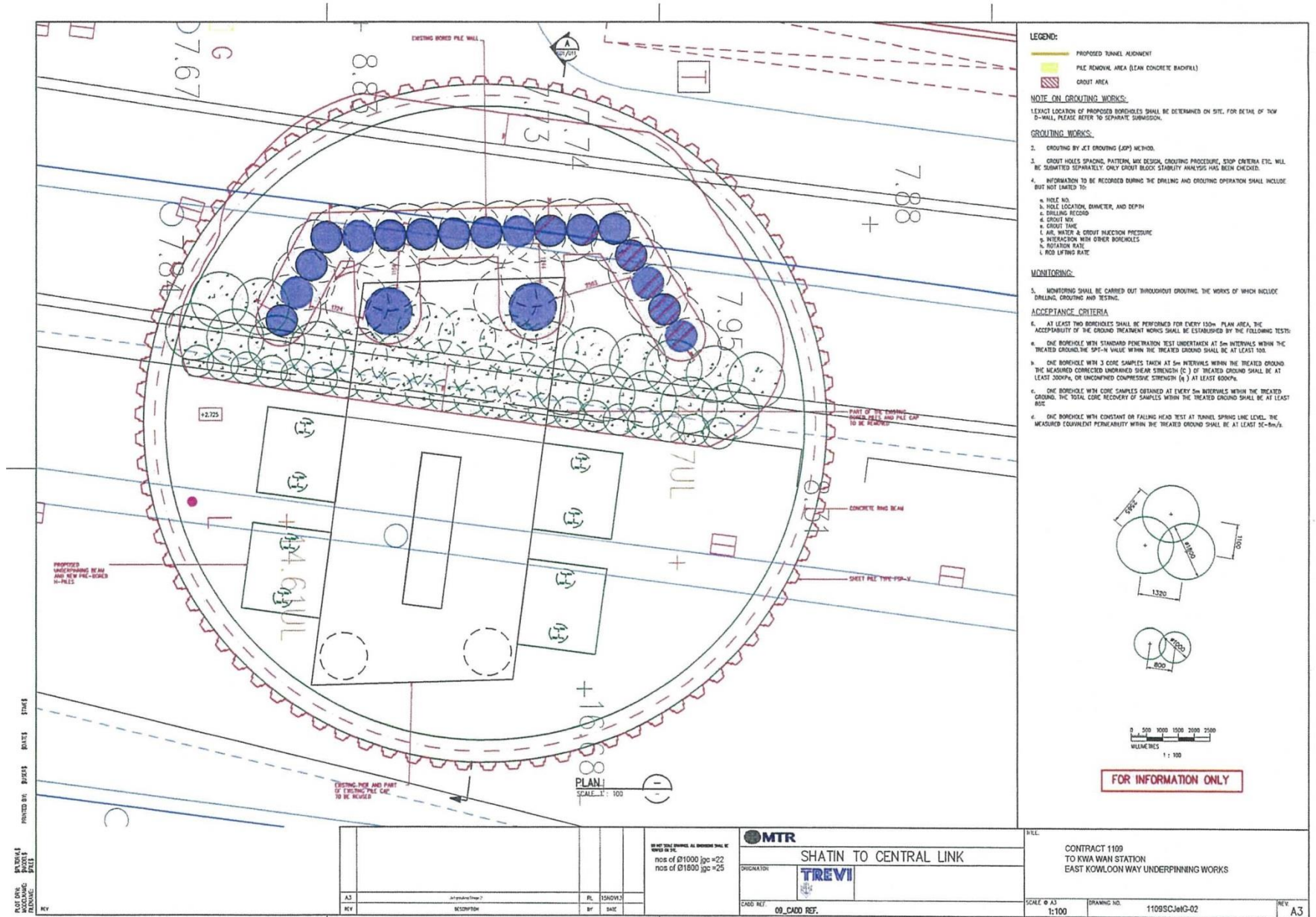
Scope of Work

Provision of jet grout columns (jgc) for Stage 1 only, which consists of 26 number of single fluid jgc of 1000mm theoretical diameter; and 22 number of double fluid jgc of 1800mm theoretical diameter.

The depth of the jgc to form the grout block shall be 3000mm below the future tunnel and 1000 to 1500mm outside the tunnels.

We have assumed drilling to commence at excavated level of +2.30 mPD.

Drawings : Appendix A1, A2, A3



LEGEND:

- PROPOSED TUNNEL ALIGNMENT
- PILE REMOVAL AREA (LEAN CONCRETE BACKFILL)
- ▨ GROUT AREA

NOTE ON GROUTING WORKS:

EXACT LOCATION OF PROPOSED BOREHOLES SHALL BE DETERMINED ON SITE. FOR DETAIL OF TOW D-WALL, PLEASE REFER TO SEPARATE SUBMISSION.

GROUTING WORKS:

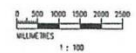
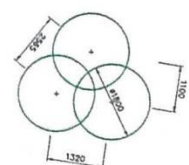
1. GROUTING BY JET GROUTING (LPT) METHOD.
2. GROUT HOLES SPACING, PATTERN, MIX DESIGN, GROUTING PROCEDURE, STOP CRITERIA ETC. WILL BE SUBMITTED SEPARATELY. ONLY GROUT BLOCK STABILITY ANALYSIS HAS BEEN CHECKED.
3. INFORMATION TO BE RECORDED DURING THE DRILLING AND GROUTING OPERATION SHALL INCLUDE BUT NOT LIMITED TO:
 - a. HOLE NO.
 - b. HOLE LOCATION, DIAMETER, AND DEPTH
 - c. DRILLING RECORD
 - d. GROUT MIX
 - e. GROUT TIME
 - f. AIR, WATER & GROUT INJECTION PRESSURE
 - g. INTERACTION WITH OTHER BOREHOLES
 - h. ROTATION RATE
 - i. PILE LIFTING RATE

MONITORING:

5. MONITORING SHALL BE CARRIED OUT THROUGHOUT GROUTING. THE WORKS OF WHICH INCLUDE DRILLING, GROUTING AND TESTING.

ACCEPTANCE CRITERIA

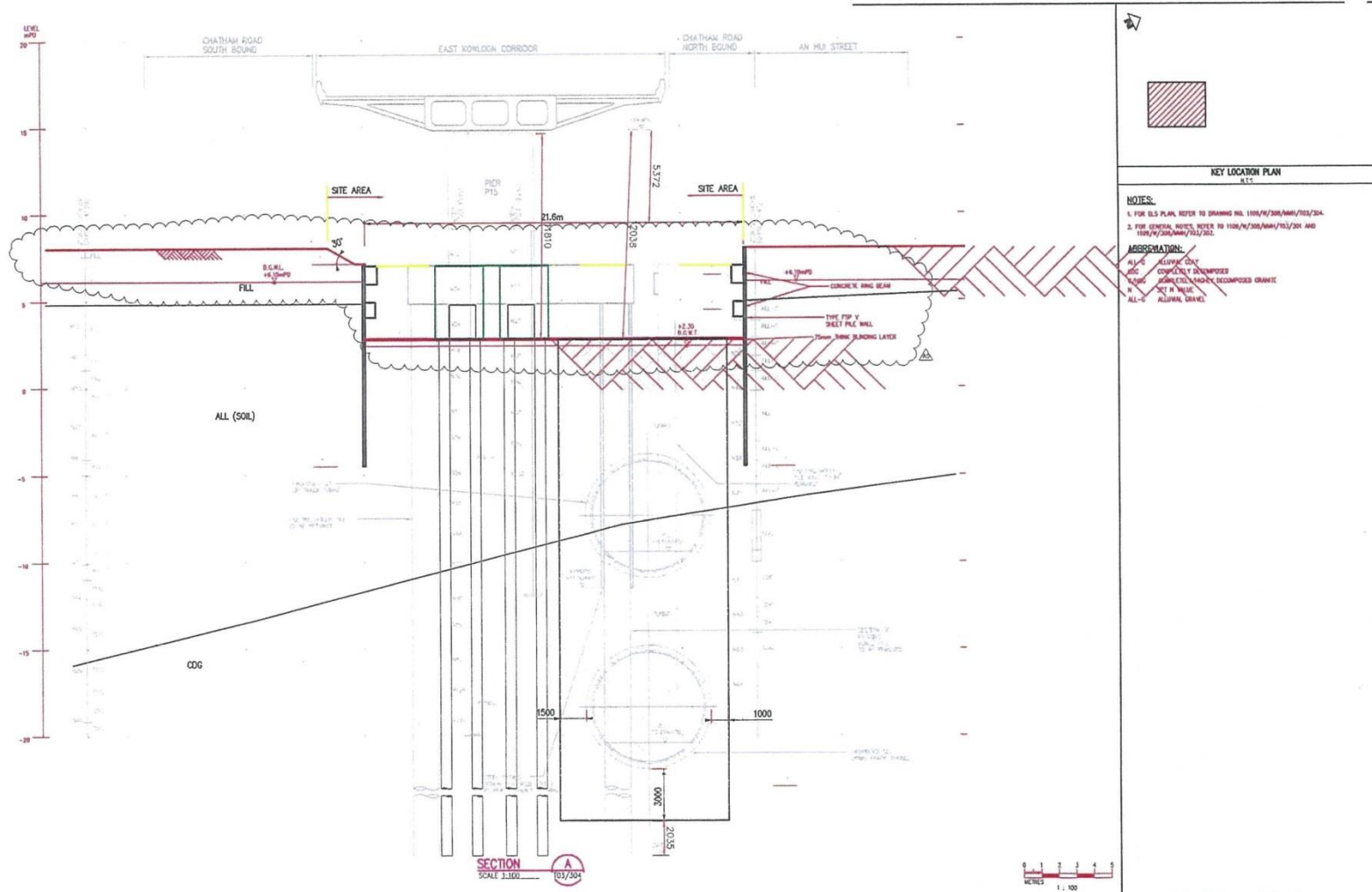
6. AT LEAST TWO BOREHOLES SHALL BE PERFORMED FOR EVERY 120m² PLAN AREA. THE ACCEPTABILITY OF THE GROUND TREATMENT WORKS SHALL BE ESTABLISHED BY THE FOLLOWING TESTS:
 - a. ONE BOREHOLE WITH STANDARD PENETRATION TEST UNDERTAKEN AT 5m INTERVALS WITHIN THE TREATED GROUND. THE SPT-N VALUE WITHIN THE TREATED GROUND SHALL BE AT LEAST 100.
 - b. ONE BOREHOLE WITH 3 CORE SAMPLES TAKEN AT 5m INTERVALS WITHIN THE TREATED GROUND. THE MEASURED CORRECTED UNCONFINED SHEAR STRENGTH (C) OF TREATED GROUND SHALL BE AT LEAST 300kPa, OR UNCONFINED COMPRESSIVE STRENGTH (q_u) AT LEAST 600kPa.
 - c. ONE BOREHOLE WITH CORE SAMPLES OBTAINED AT EVERY 5m INTERVALS WITHIN THE TREATED GROUND. THE TOTAL CORE RECOVERY OF SAMPLES WITHIN THE TREATED GROUND SHALL BE AT LEAST 80%.
 - d. ONE BOREHOLE WITH CONSTANT OR FALLING HEAD TEST AT TUNNEL SPRING LINE LEVEL. THE MEASURED EQUIVALENT PERMEABILITY WITHIN THE TREATED GROUND SHALL BE AT LEAST 5E-06m/s.



FOR INFORMATION ONLY

		SHATIN TO CENTRAL LINK		REV.	
ORIGINATOR:				CONTRACT 1109 TO KWA WAN STATION EAST KOWLOON WAY UNDERPINNING WORKS	
nos of Ø1000 jpc = 22 nos of Ø1800 jpc = 25		CAD REF: 09_CADD REF.		SCALE: AS 1:100	
A3	REVISION	PL (SNOV)	BY DATE	DRAWING NO: 1109SCJA6G-02	REV: A3

PRINTED BY: BUREAU OF METEOROLOGY
 DRAWING NO: 1109SCJA6G-02
 SCALE: AS 1:100



A0	APPROVED BY JVS INSTRUCTION	KL	02AUG13	DH
A4	REVISED DRAWING	KL	09AUG13	DH
A5	REVISED DRAWING	KL	26AUG13	DH
AZ	2nd SUBMISSION	KL	25AUG13	DH
A1	FIRST ISSUE	KL	08MAY13	DH

KL
DL
TC
DH
09/MAY/2013

CONTRACT 1109
SUN AND TKW STATIONS AND TUNNELS
EAST KOWLOON WAY UNDERPINNING WORKS
ELS SECTION A

\$FILE\$

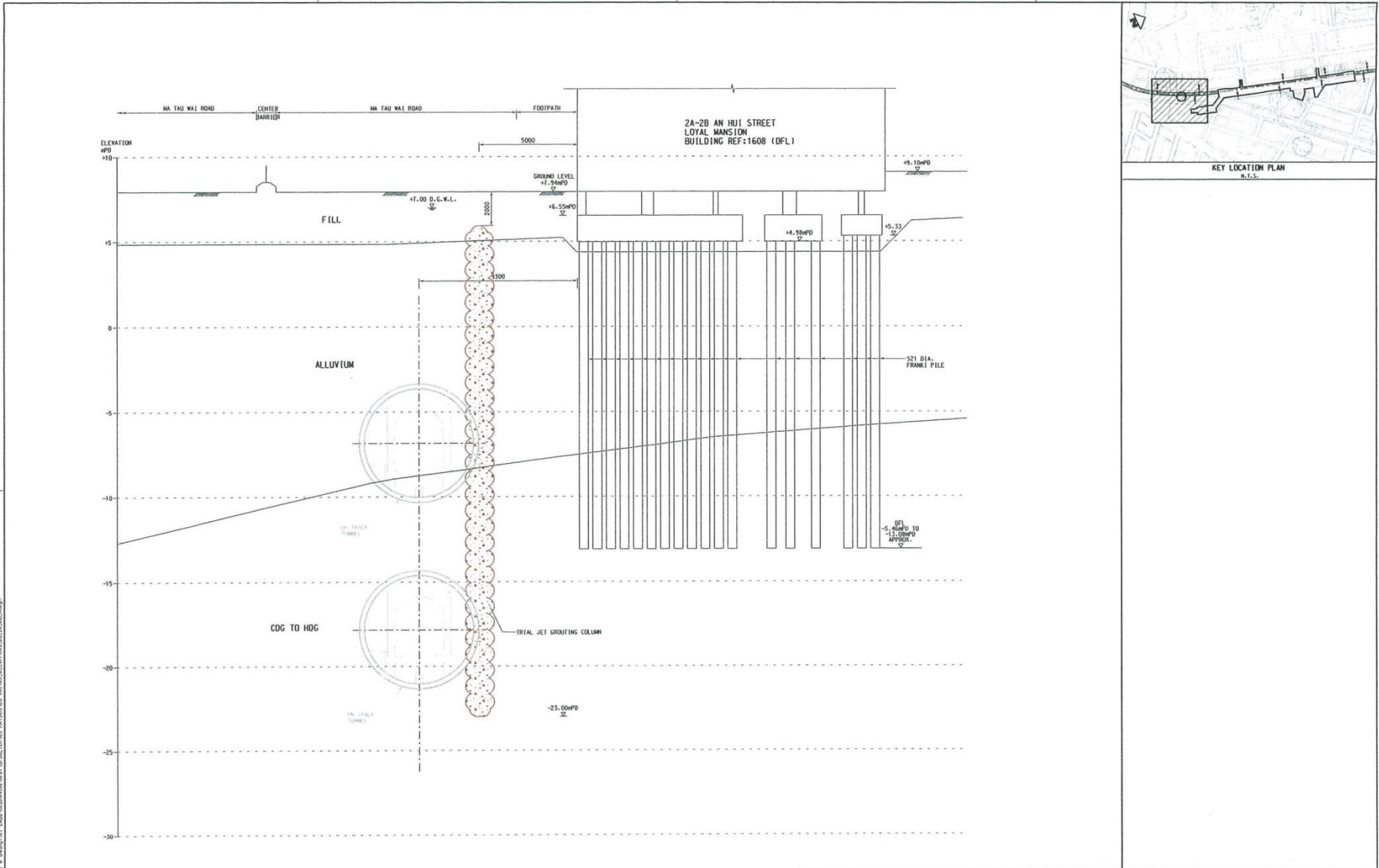
Provision of Jet Grouting Columns at the Western side of To Ka Wan Street

Scope of Work

Execution of about 108 columns of jet grout columns (jgc) single fluid diameter 1 meter with interax. 0.80m to be executed on the western side of To Ka Wan Road starting from the corner with Lok Shan Road for about 90m toward south.

We have assumed the drilling to commence at excavated level of +10mPD. The jet grouting column will start from a about 2 meters below the road surface i.e +8mPD to an elevation -10mPD.

Drawings : Appendix B1, B2, B3



C:\ProgramData\Bentley\MicroStation\B1\SELECT\Map\Map-Spec\Station\Station.dwg
 PLT FILE: C:\ProgramData\Bentley\MicroStation\B1\SELECT\Map\Map-Spec\Station\Station.dwg
 PLOT DATE: 01/20/2013 10:00:00 AM
 PLOT BY: J. H. CHONG
 PLOT DEVICE: HP DesignJet 5000

REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED

DRAWN BY: DESIGNED: CHECKED: APPROVED: DATE: 01/JAN/2013 <small>SEE THE FULL SERIAL AND DRAWING SHEET IN THE PROJECT FOR THE COMPLETE LIST OF THE SHEETS IN THIS DRAWING. APPROVED TO MAKE BY THE ORIGINAL DESIGNER OR HIS DELEGATE. THE APPROVED BY THE SIGNATURE OF THE ORIGINAL DESIGNER OR HIS DELEGATE.</small>	RY -- -- -- 01/JAN/2013	 SHATIN TO CENTRAL LINK Samsung - Hsin Chong Joint Venture	TITLE CONTRACT 1109 SUW AND TKW STATIONS AND TUNNELS PROPOSED TRIAL JET GROUTING SHEET 2 OF 2
SCALE: # 1 1 : 100 (A1)	DRAWING NO. 1109/DS/SK/021	REV. A	

Provision of Jet Grouting Columns at EEP (Pier 17)

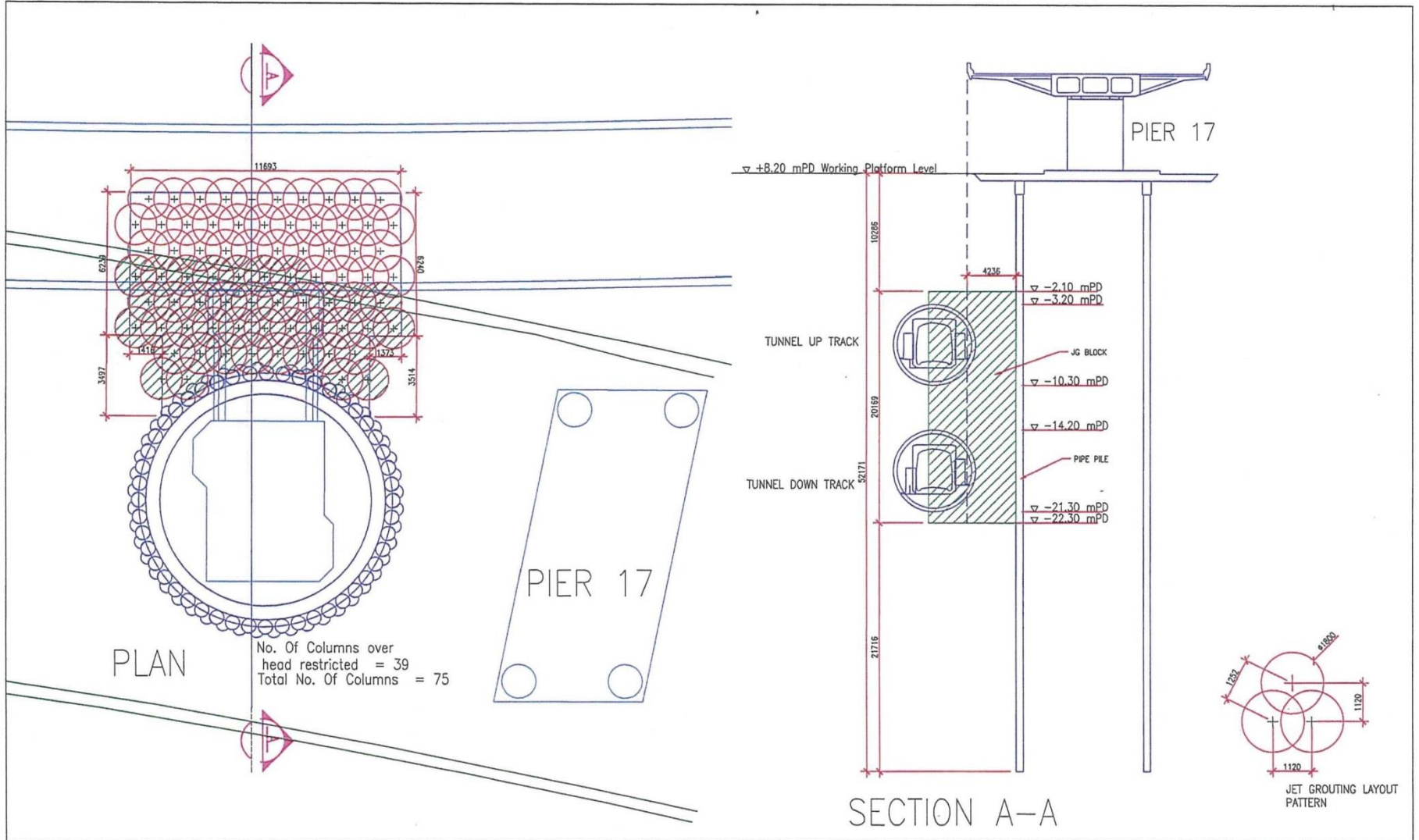
Scope of Work

Provision of 75 nos. 1.8m diameter double-fluid jet grout columns (jgc) and 4 nos. 1.0m diameter mono-fluid jgc. Jet grouting in two stages because of overhead restriction.

The depth of the jgc to form the grout block is between -2.1mPD to -22.3mPD.

We have assumed drilling to commence at road level of +8.20mPD.

Drawing : Appendix C



Note :



Columns that are over head restricted.

REV.	DATE	BY	CHKD	APPD	DESCRIPTION
A	18 Oct 14	TH			First Issue



CONTRACT: MTR CONTRACT 1109

PROJECT TITLE: SUW AND TKW STATIONS AND TUNNELS

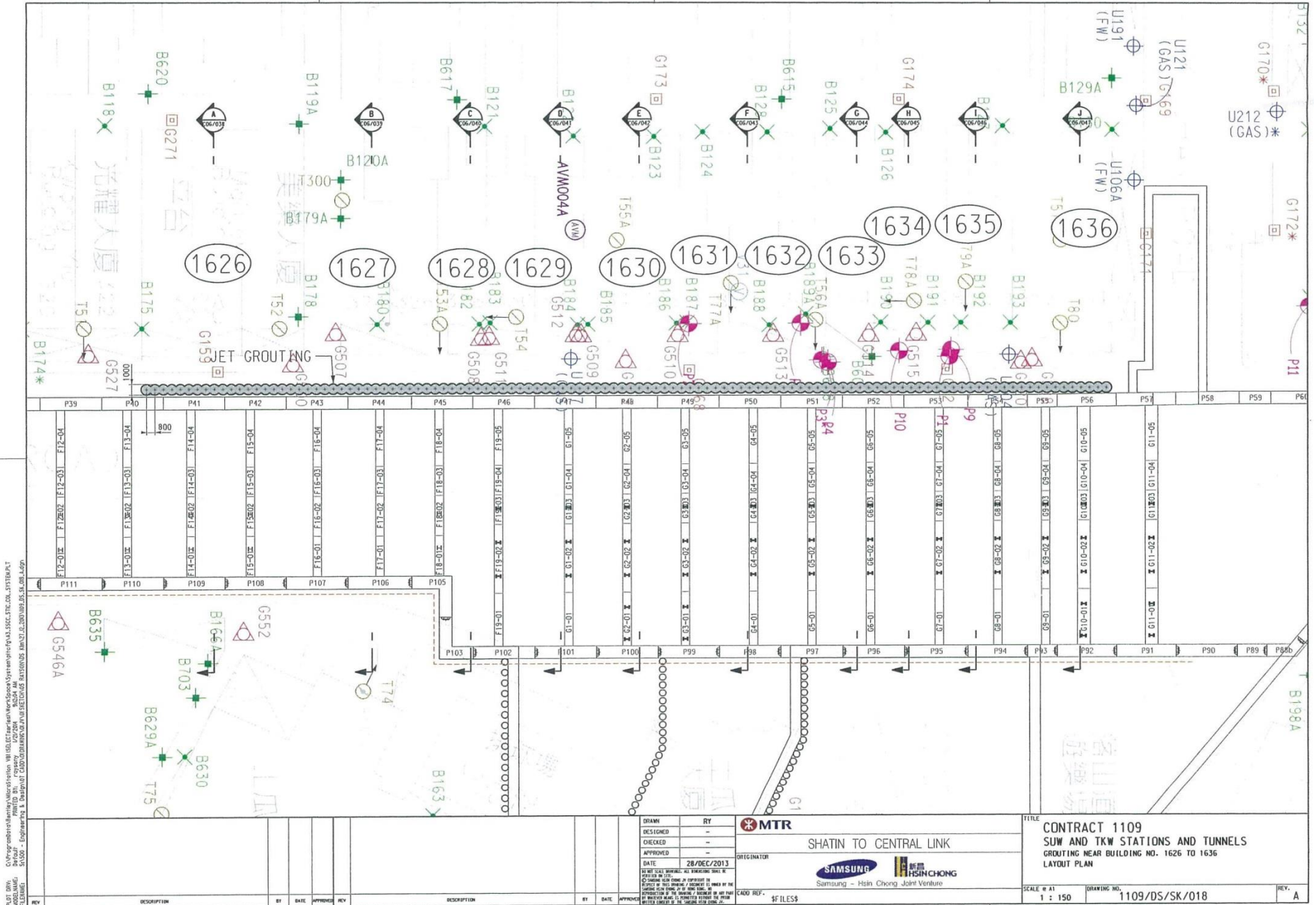
DRAWING TITLE:	
Eep at To Kwa Wan Station Ground Treatment Plan and Section.	
DRAWING NO.:	REV. A
SCALE:	SHEET 1 of 1 A3





MTR 1109 – Stations and Tunnels of Kowloon City Section

Appendix B2



DRAWN	RY	*MTR SHATIN TO CENTRAL LINK ORIGINATOR SAMSUNG HSINCHONG Samsung - Hsin Chong Joint Venture
DESIGNED	RY	
CHECKED	RY	
APPROVED	RY	
DATE	28/DEC/2013	CADD REF.
SKILL\$		\$FILL\$

TITLE	CONTRACT 1109 SUW AND TKW STATIONS AND TUNNELS GROUTING NEAR BUILDING NO. 1626 TO 1636 LAYOUT PLAN
SCALE # A1	1 : 150
DRAWING NO.	1109/DS/SK/018
REV.	A

MTR 1109 – Stations and Tunnels of Kowloon City Section



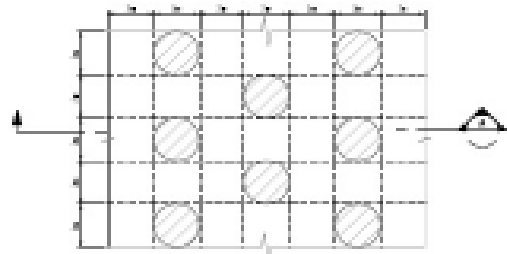


MTR 810A – West Kowloon Terminus Station North

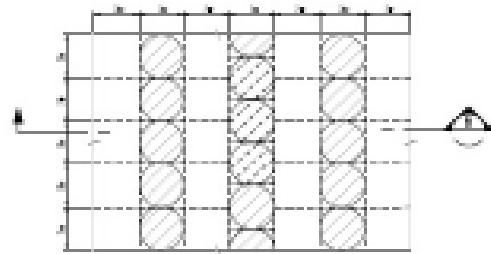


MTR 810A – West Kowloon Terminus Station North

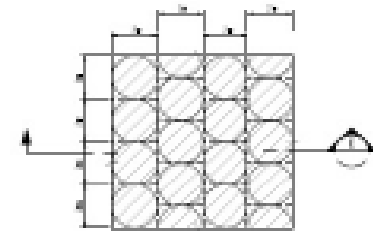




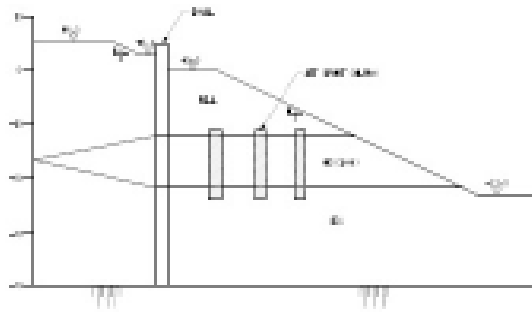
PLAN VIEW
TYPE A – DISCRETE JET GROUT COLUMNS
 N.T.S.



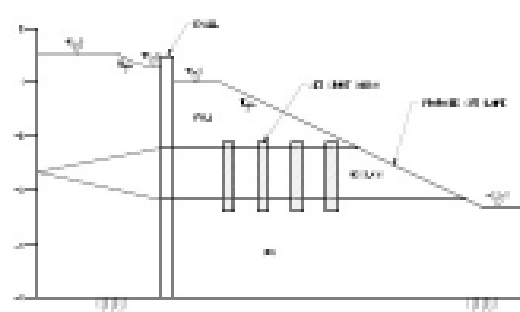
PLAN VIEW
TYPE B – CONTINUOUS JET GROUT COLUMNS
 (FOR LOW SHEAR STRENGTH)
 N.T.S.



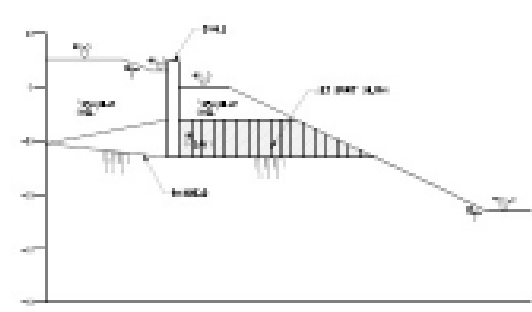
PLAN VIEW
TYPE C – JET GROUT BLOCK
 (FOR LOW SHEAR STRENGTH AND FUNDED ON HIGH ROCKHEAD)
 N.T.S.



SECTION A
TYPE A – DISCRETE JET GROUT COLUMNS
 N.T.S.



SECTION B
TYPE B – CONTINUOUS JET GROUT COLUMNS
 (FOR LOW SHEAR STRENGTH)
 N.T.S.



SECTION C
TYPE C – JET GROUT BLOCK
 (FOR LOW SHEAR STRENGTH AND FUNDED ON HIGH ROCKHEAD)
 N.T.S.

10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM

		EXPRESS RAIL LINK 		CONTRACT 810B WEST KOWLOON TERMINUS STATION NORTH PROPOSED 47' SHIELD DETAILS	
10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM		10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM		10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM	
10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM		10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM		10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM 10/10/2014 10:10:14 AM	











MTR 810A – West Kowloon Terminus Station North

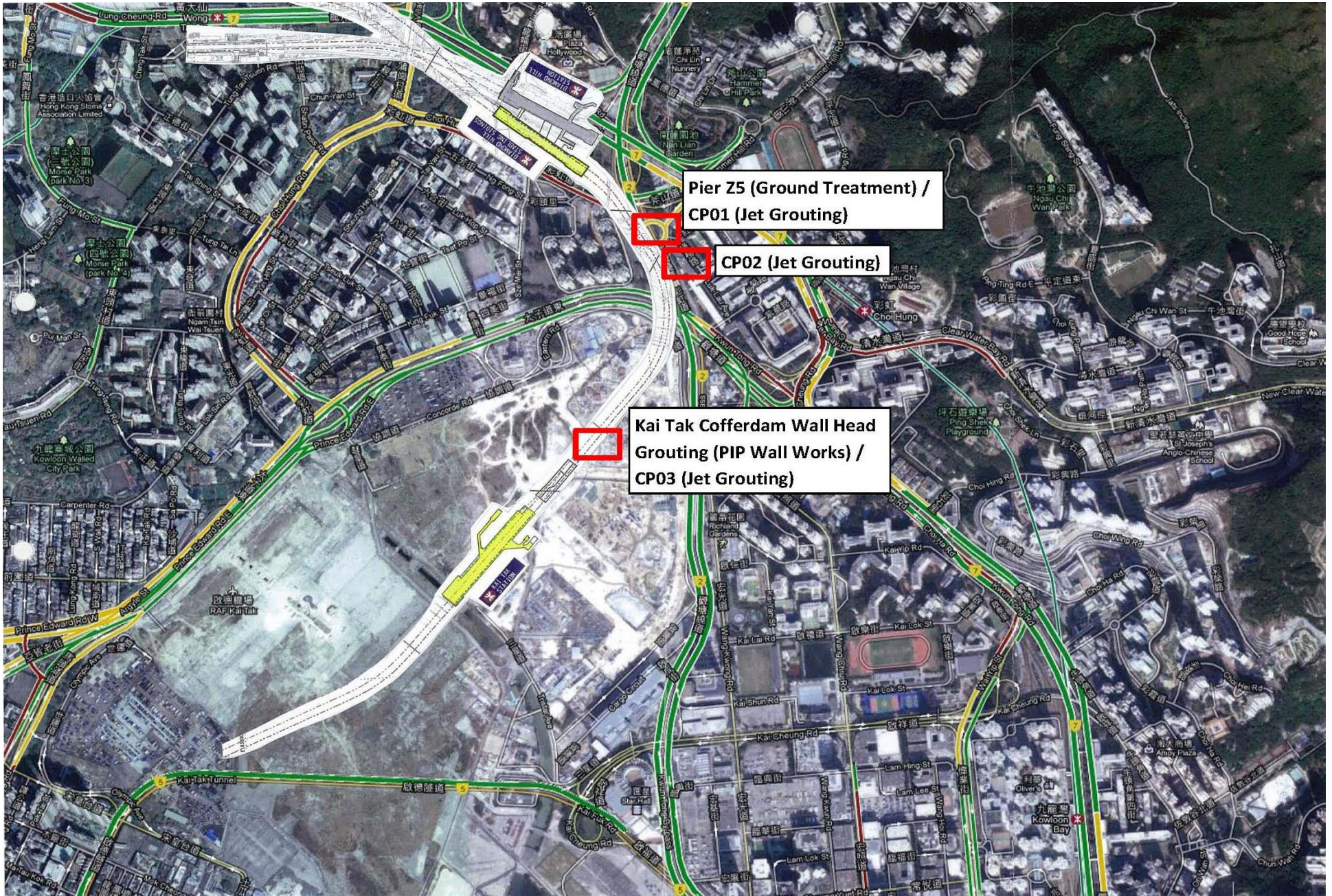


MTR 810A – West Kowloon Terminus Station North



MTR 810A – West Kowloon Terminus Station North

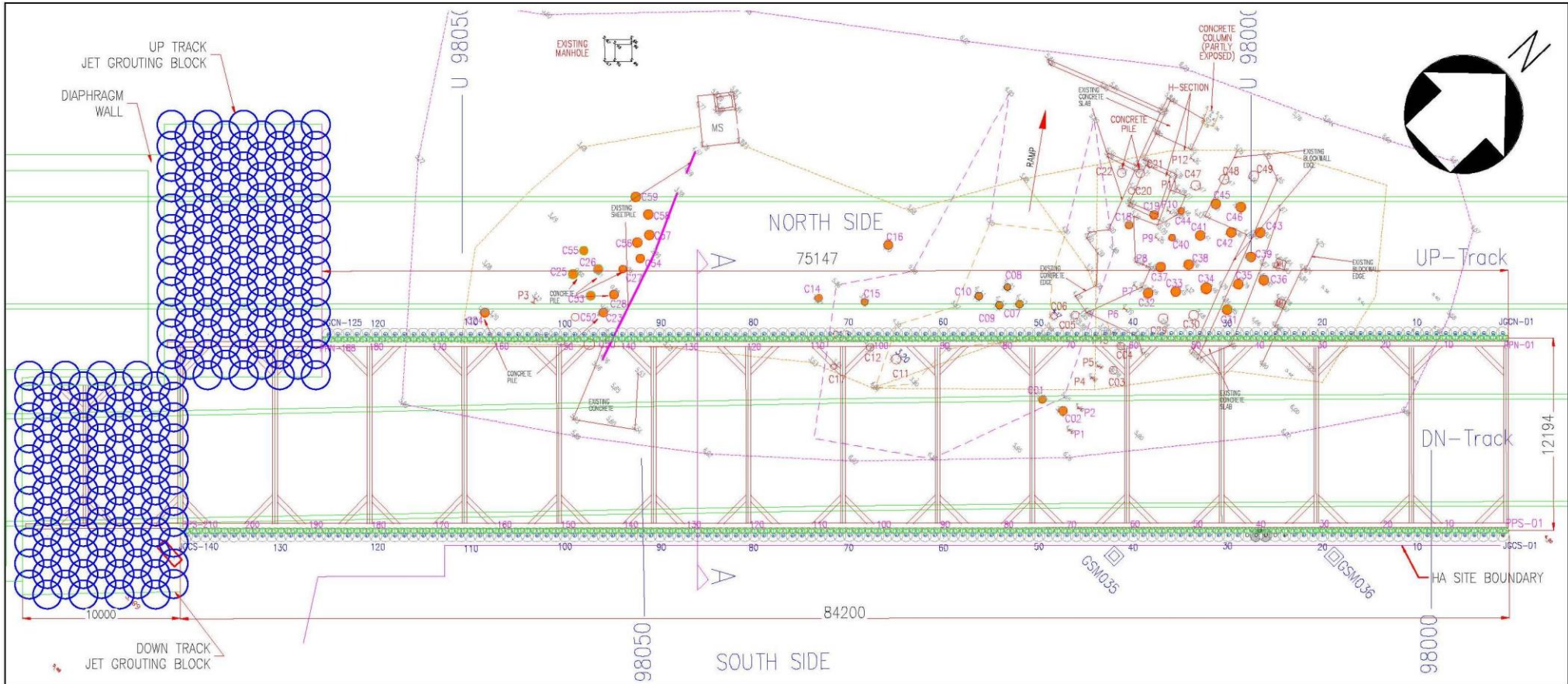




**Pier Z5 (Ground Treatment) /
CP01 (Jet Grouting)**

CP02 (Jet Grouting)

**Kai Tak Cofferdam Wall Head
Grouting (PIP Wall Works) /
CP03 (Jet Grouting)**



SOUTH SIDE :
 NO. OF PIPE PILE WITH UC = 210
 NO. OF JET GROUTING COLUMNS = 140

NORTH SIDE :
 NO. OF PIPE PILE WITH UC = 188
 NO. OF JET GROUTING COLUMNS = 125

TOTAL FOR BOTH SIDES :
 NO. OF PIPE PILE WITH UC = 398
 NO. OF JET GROUTING COLUMNS = 265

NOTES:

ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED.

2 JG COLUMNS AND 1 PIPE PILE CARRIED OUT ON TRIAL.

SECTION A-A SHOWN AT INDICATIVE POSITION.

Contract :



MTRC 1107



Project Title :
 Diamond Hill to Kai Tak Tunnels

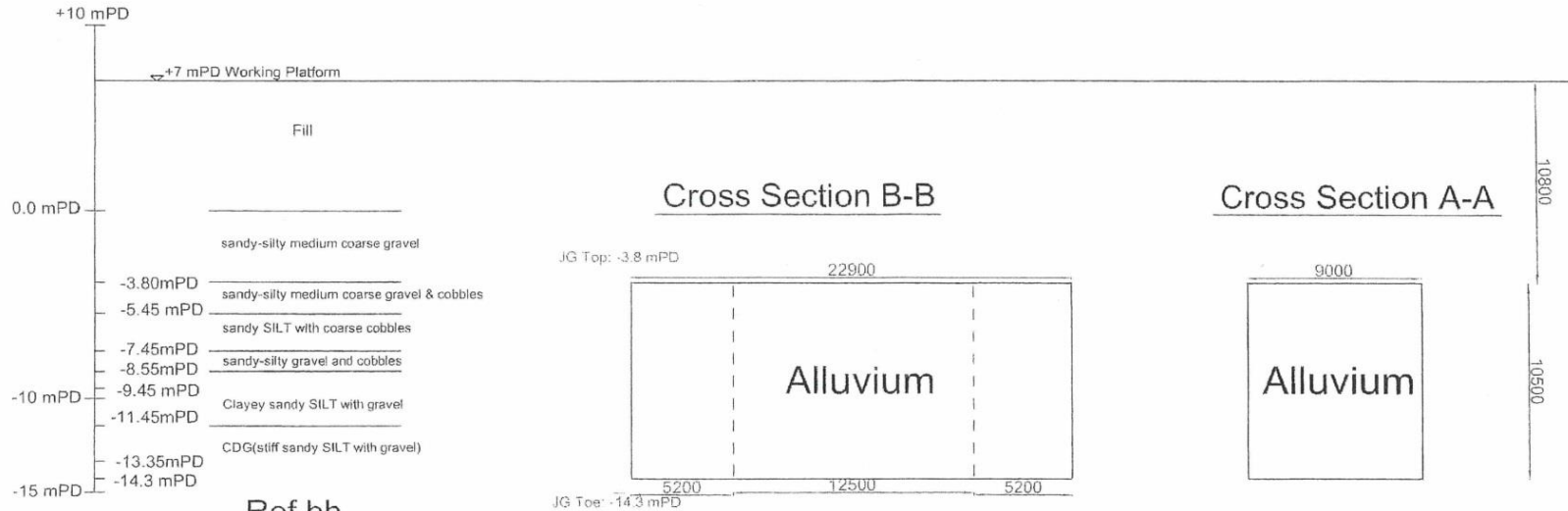
Drawing Title :
 Pipe pile wall - pipe pile & jet grouting column layout.

Designed LRS **Checked** LRS **Approved** LRS

Scale : 1:250 **Drawn** TN **Date :** 18 Nov 13

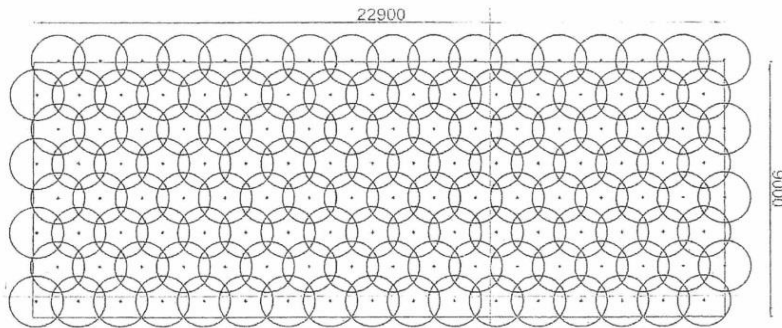
Drawing No. : **Rev. B**

Rev.	Date	Drawn by	Description	Chk'd	App'd	CAD File Name	Sheet 1 of 1	AS
B	18 Nov 13	TN	Revised quantity + numbering	LRS	LRS			
A	9 Oct 13	TN	First issue	LRS	LRS			



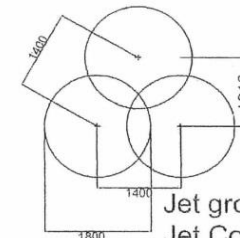
Note:
Do not scale drawing.
Refer to measurements only.

Ref.bh
2209/Sci/EDH268



No of grout holes: 136

Plan View



Jet grouting
Jet Column spacings.



Contract
QANTH MTR 1107

Project Title:
Diamond Hill to Kai Tak Tunnel

Drawing Title:
TBM Tunnels Cross Passage DIH
002 Jet grout

Designed	Checked	Approved
	LRS	
Scale	Drawn	Date
1:100	Tat	09 Oct 12

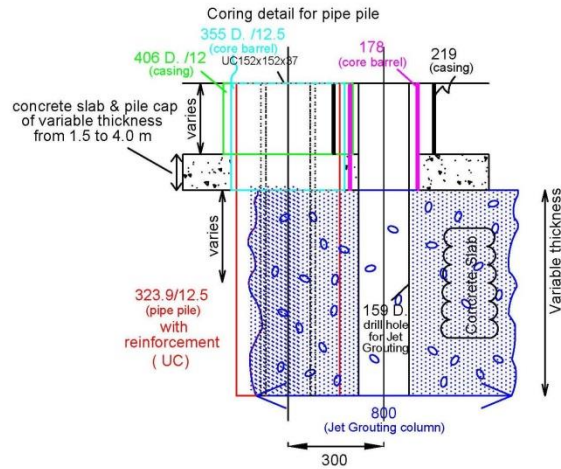
Rev	Date	Sign By	Description	Chk'd	App'd
A	09 Oct 12	Tat	First draft - Chen Wo and SELI	LRS	LRS
CAD File Name: Sheet 1 of 1 A2					

note : pipes, type, length, depth and reinforcement details to be confirmed by engineer

Dimensions are in millimeters

Utilities

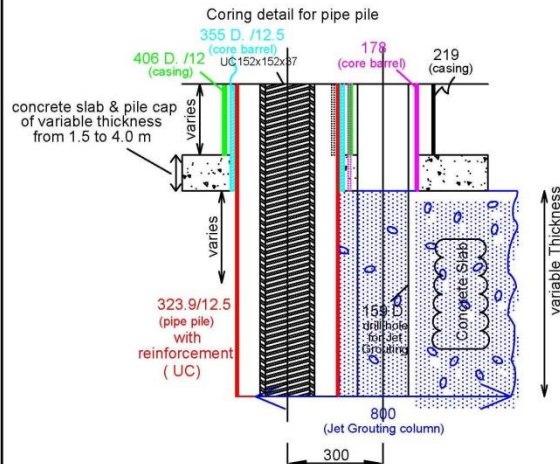
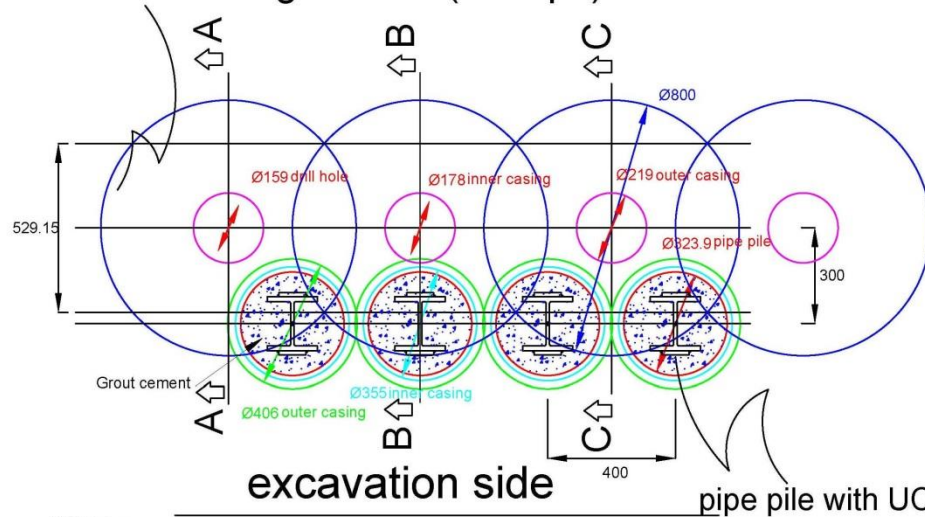
Steel Grade : S275 and S355



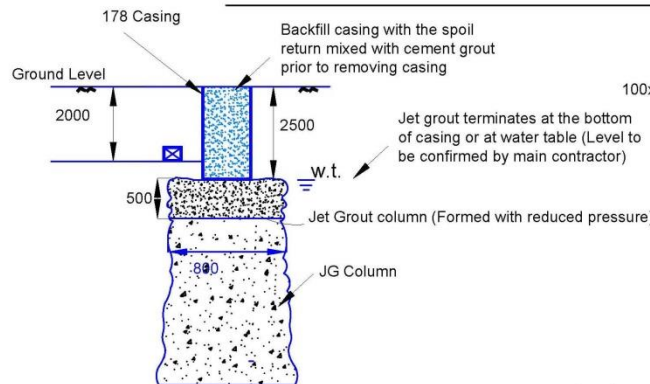
Section A-A

Completed pipe pile wall with grout curtain by Jet Grouting

Jet Grouting column (~3 Mpa)

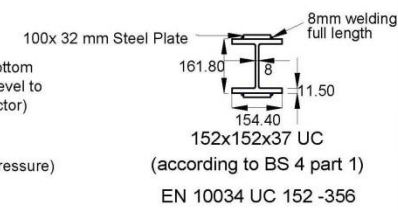


Section B-B



Section C-C

(Where no concrete slab is present)
(Where utilities are present)



Rev.	Date	Drawn By	Description	Chk'd	App'd
C	22.Oct.2013	TN	Revised casing dimension	LRS	LRS
B	24.Sep.2013	TN	Including area with no slab	LRS	LRS
A	30.Jul.2013	TK	First Issue	LRS	LRS

Scale	N.T.S	Date	22.Oct.2013
Designing No. 1	T1107 shoring Trevi 002		
Sheet	1 of 1	Rev.	C

TREVI CONSTRUCTION

contract: MTRC 1107

Project Title : MTRC 1107 Diamond Hill to Kai Tak Tunnels

Drawing Title : Pipe pile wall and Jet grouting Plan and Cross-section

Designed: _____ Checked: _____ Approved: _____



Pipe Pile Wall



CW-SELI JOINT VENTURE

Shatin to Central Link Contract No. 1107
 Diamond Hill to Kai Tak Tunnels
 Ground Settlement Marker Summary
 Monitoring Report

Instrument No. : TGSM01
 As-build coordinate: 821572.741 Northing
 838902.515 Easting
 Date of Initial : 7-Nov-13
 Initial Reading (mPD) : 6.17

Monitoring Frequency: Active
 Response Value : (mm)
 Alert: ±4
 Action: ±7
 Alarm: ±8





Pipe Pile Wall