

MTR Corporation Limited

HONG KONG SECTION OF GUANGZHOU –
SHENZHEN – HONG KONG EXPRESS RAIL LINK
(No. EP-349/2009/F)

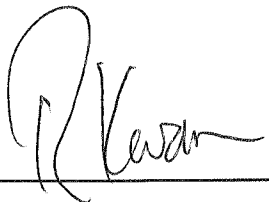
Groundwater Drawdown Contingency Plan for
Tai Kong Po to Tse Uk Tsuen Tunnels (Rev B)

Verified by: 
Position: Independent Environmental Checker
Date: 23 May 2012

MTR Corporation Limited

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SHENZHEN - HONG KONG EXPRESS RAIL LINK
(No. EP-349/2009/F)

Groundwater Drawdown Contingency Plan for
Tai Kong Po to Tse Uk Tsuen Tunnels (Rev B)

Certified by: _____

Position: Environmental Team Leader

Date: 21 MAY 2012



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GROUNDWATER DRAWDOWN CONTINGENCY PLAN

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1.0 Introduction

Maeda – China State Joint Venture (MCJV) was commissioned by MTR Corporation Ltd (MTRCL) as the appointed contractor for one of the XRL contracts.

Contract No.	823A
Title	Tai Kong Po to Tse Uk Tsuen Tunnels
Client	MTRC
Engineer	MTRC
Commencement Date	19 July 2010
Location	Between Tai Kong Po and Tse Uk Tsuen in the New Territories with a Barging Facility in Siu Lam

Pursuant to the requirement of EP 2.11, a groundwater monitoring and contingency plan shall be submitted within 45 days from the date of commencement or 14 days before commencement of tunnelling or excavation works, whichever dates comes first.

The Groundwater Drawdown Contingency Plan (GDGP) is based on the Final Hydrological Impact Assessment Report (Rev.A) as on May 2009 and necessary actions need shall be taken to ensure that the works will not adversely affect the groundwater level.

2.0 Description of Works

The project requirements are to provide for, but not necessarily be limited to, the following. The exact scope of work to be carried out under the Contract should be ascertained from review of other documents forming the Contract.

The works generally include the following:

- (a) A section of twin tunnels to the north of the ERS of approximate length 1050m, with cross passages between the two tunnels ("the North Tunnels");
- (b) A section of twin tunnels to the south of the ERS of approximate length 590m, with cross passages between the two tunnels (the South Tunnels");
- (c) A temporary shaft at Tse Uk Tsuen; and
- (d) A temporary barging facility at Siu Lam ("the Barging Facility").

A hydrogeological impact assessment had been carried out during EIA study to identify and assess the potential impact of the tunnel works on the surface water and groundwater and its major concern is the potential drawdown in any soil and aquifer layers.

2.1 General Requirements

- All necessary actions shall be taken that the works will not adversely affect the utilities in the close proximity of the site;



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- Prior to the commencement of construction works, base readings of all monitoring instruments shall be established and agreed with MTRCL. A set of initial readings of all monitoring instruments shall be submitted to MTRCL for record purpose;
- During the construction works, the piezometers and standpipe shall be monitored daily or more frequently as required by MTRCL;
- Whenever a significant difference between successive readings is observed / recorded, MTRCL will be informed;
- AFCD need to be informed the exact date of TBM excavation;

Table of estimated period of TBM excavation (subject to change):

	Start	Finish	Total
Tsat Sing Kong	Sep 2012	Aug 2013	12 months
Tse Uk Tsuen	Dec 2012	Jul 2013	8 months

2.2 Project Organisation

The Organisation for environmental management depicting the functional inter-relationship of personnel is shown in the **Appendix 1**. The purpose of this being to clearly indicate the managerial control, the reporting structure and the interface relationship between all parties involved in the groundwater drawdown issue.

Company	Contact Person	Title / Address	Tel. No.	Fax No.
MCJV	Mr. Austen Hankinson	Project Manager	2498-2033	2498-0021
	Mr. Toshiyuki Maeda	Deputy Project Manager	2498-2033	2498-0021
	Mr. Jacky Choi	Construction Manager	2498-2033	2498-0021
	Mr. Steven Yu	Senior Engineer	2498-2033	2498-0021
	Mr. Stephen Lee	Supervisor	2498-2033	2498-0021
	Mr. Erwin Regalado	QA & Environmental Manager	2498-2033	2498-0021
Regional Office (North), EPD	Ms. Wendy Ng	Environmental Officer		
	Mr. Jack Kan	10/F, Sha Tin Government Offices,	2158-5823	2650-6033
	Mr. Alan Yim	1 Sheung Wo Che Road, Sha Tin, N.T.	2158-5851	2650-6033

2.3 Duties and Responsibilities

The environmental roles and responsibilities is summarised in the following table:

Title	Responsibilities
Project Manager	• Ultimately responsible for the company's environmental performance on site; • Perform required inspection and monitoring; and • Task allocation to all staff.



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Deputy Project Manager	• Overall superintendence and control of all site matters; • Arrange sufficient resources for the execution of this GDCP and the respective mitigation measures; and • Ensure that all site staff and sub-contractor's staff and labour comply with legislation and the requirement as stated in this GDCP.
Quality & Environmental Manager	• Co-ordinate, monitor and oversee the performance and implementation of this GDCP; • Supervise and monitor the implementation of statutory and contractual requirements relating to groundwater; • Perform monitoring, site inspection, audit and highlighting any deficiencies for the management to take proper follow up action; and • Ensure that each sub-contractor has been made aware of their obligations via sub-contract kick-off meeting.
Environmental Officer	• Develop and future update of this GDCP; • Liaise and co-ordinate with all site personnel, sub-contractors, the Engineer and Environmental Protection Department (EPD); • Undertake the required training or briefing for the implementation of this GDCP; and • Maintain the monitoring record.
Construction Site Engineers and Supervisors	• Follow and implement this GDCP and ensure full compliance during tunnelling works; • Monitor the mitigation measures on a regular basis; • Carry out regular site inspection; • Analysis the monitoring data and review the monitoring programme; • Provide monthly record to MTRCL; and • Review actions proposal in case of exceedance of AAA Levels

2.4 Tunnels Construction Works

Two major tunnelling construction works will be used for Tai Kong Po to Tse UK Tsuen Tunnel, Bored Tunnelling and Cut & Cover Tunnel.

2.4.1 Hydrogeological Impact

Refer to EIA report section 11.103, the bored tunnelling works, the effects on the external groundwater regime are expected to be small both during construction and in the long term due to the method of construction and the use of undrained linings.

2.5 Methodology of Monitoring

The methodology of groundwater level monitoring shall follow M&W Clause 23.19.03:



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- A formal initial reading of an open standpipe piezometer shall consist of the average of three readings with the water level indicator. The indicator shall be removed from the riser pipe between these three readings.
- Each reading other than the formal initial reading shall be a single reading with the water level indicator.
- Reading accuracy shall be $\pm 10\text{mm}$ and shall be referenced to the top of the riser pipe.
- Field calibration of water level indicators shall consist of checking the graduated tape against a standard traceable to a national standards agency approved by the Engineer, to an accuracy of $\pm 5\text{mm}$.

Monitoring will be undertaken by recording the water level in existing piezometers and those installed by the Contractor.

The reporting of the groundwater level monitoring results shall follow M&W Clause 23.19.04:

- Plots of open standpipe piezometer data shall show groundwater elevation versus time.
- For standpipe piezometers in areas influenced by tidal variation, the plots of piezometer data shall also show the tide level plotted against time on the same axis.

3.0 Programme of Monitoring

Groundwater monitoring locations will be determined on site with reference to drawings as shown in Appendix 2. The groundwater monitoring will be conducted by the following phases:

- Background monitoring:
Conducted at initial phase to establish the existing ground water level conditions and it should be conducted for at least one year
- Active monitoring:
Conducted during active construction works within 50m of instrument; and
- Standard monitoring:
Conducted during times when background and active monitoring are not required, or when works are considered minor that will unlikely caused changed to conditions of groundwater by the Engineer

3.1 Monitoring Locations

Locations for the standpipes / piezometers were provided in Drawing No. 823A/K/340/MCJ/T02/001, 823A/K/340/MCJ/T02/012, 823A/K/340/MCJ/T02/003, 823A/K/340/MCJ/T02/004, 823A/K/340/MCJ/T02/005, 823A/K/340/MCJ/T02/006 and 823A/K/340/MCJ/T02/007. GW monitoring would be conducted surrounding the bored tunnel for monitoring of the GW drawdown.

Summary of current standpipes / piezometers in monitoring are:

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Table 3.1

No.	Hole No.	No.	Hole No.
1	C823A_122500_P501	21	C823A_SLS_ERSC_P104
2	C823A_122500_P502	22	C823A_SLS_ERSC_S104
3	C823A_122700_P503	23	C823A_SLS_ERSC_P105
4	C823A_122800_P504	24	C823A_SLS_ERSC_S105
5	C823A_125100_P505	25	C823A_SLS_ERSD_P106
6	C823A_125200_P506	26	C823A_SLS_ERSD_P107
7	C823A_NLS_ERSA_P1A	27	C823A_SLS_ERSF_P108
8	C823A_NLS_ERSA_S2A	28	C823A_SLS_ERSF_S108
9	C823A_NLS_ERSA_S3A	29	C823A_SLS_ERSF_P109
10	C823A_NLS_ERSA_P3A	30	C823A_SLS_ERSF_S109
11	C823A_NLS_ERSA_S4	31	C823A_TUT_P401
12	C823A_NLS_ERSA_P4	32	C823A_TUT_P402
13	C823A_NLS_ERSB_P6	33	C823A_TUT_P403
14	C823A_NLS_ERSB_P7	34	C823A_TUT_S403
15	C823A_NLS_ERSB_P8	35	C823A_TUT_P404
16	C823A_NLS_ERSB_P10	36	C823A_TUT_S404
17	C823A_SLS_ERSC_P101	37	C823A_TUT_P405
18	C823A_SLS_ERSC_P102	38	C823A_TUT_P406
19	C823A_SLS_ERSC_P103	39	C823A_TUT_S406
20	C823A_SLS_ERSC_S103		

3.2 Frequency of Monitoring

The groundwater monitoring program will be conducted by the frequencies specified in the following table.

Table 3.1a Groundwater Monitoring Plan along Regular Works Area

Instrument Type	Depth	Proposed Monitoring Frequency		
		Background Monitoring	Standard Monitoring	Active Monitoring
Open Standpipe Piezometer	Existing Standpipe Tip Depth	Weekly	Weekly	Daily

Table 3.2b Groundwater Monitoring Plan for Shaft

Instrument Type	Depth	Proposed Monitoring Frequency		
		During Wall Installation	During Excavation	Prior to Backfilling to Ground Level
Open Standpipe Piezometer	Temporary Retaining Wall Toe Level	Weekly	Daily	Twice a week

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3.3 Trigger Levels

Groundwater monitoring will be carried out in accordance with the monitoring plan and “Alert”, “Action” and “Alarm” response values as tabulated in Table 3.3.

Table 3.3 Monitoring Trigger Levels

Monitoring Zone	Alert	Action	Alarm
Outside ERS & TUT Within TUT	500mm below the lowest historical groundwater level	800mm below the lowest historical groundwater level	1000mm below the lowest historical groundwater level
Within ERS	1000mm below the lowest historical groundwater level	1600mm below the lowest historical groundwater level	2000mm below the lowest historical groundwater level

4.0 Alert, Action and Alarm Level (AAA) and Emergency Response

MCJV shall review the existing standpipes/piezometers, propose and install new standpipes/piezometers and other relevant instrument at new areas upon agreement with Employer.

MCJV will adopt the following framework for the actions to be taken in order to minimize the accidentally excessive drawdown of groundwater.

Table 4.1 Action Plan

Item	Action Taken	Action Party
Alert Level	- Notify MTRCL; - Review any abnormal readings on other; and instrumentation monitoring points	MCJV MCJV
Action Level	- Notify MTRCL; - Review any abnormal readings on other instrumentation monitoring points by MCJV; - Investigate any physical impact on existing building structure; - Increase the frequency of monitoring; - Propose mitigation measures for MTRCL to consider if necessary; - Implement the mitigation measures once agreed	MCJV MCJV MCJV MCJV & MTRCL MCJV
Alarm Level	- Notify MTRCL and MTRCL will inform AFCD; - Review any abnormal readings on other instrumentation monitoring points by MCJV;	MCJV & MTRCL MCJV



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	• Investigate any physical impact on existing building structure;	MCJV
	• Carry out comprehensive condition survey and assessment;	MCJV
	• Cease the work adjacent any existing building structure under significant influence if considered necessary or once ordered by MTRCL;	MCJV
	• Propose mitigation measures for MTRCL to consider;	MCJV & MTRCL
	• Implement the mitigation measures as soon as possible or once agreed	MCJV
	• MTRCL will notify AFCD if exceedance is confirmed to be valid and project-related	MTRCL

4.1 Monitoring and Reporting Team

The Deputy Project Manager (DPM) will be the key contact person in relation to groundwater issues during tunnelling works. The Environmental Officer (EO) will be responsible to oversee that the Site Engineer (SE) implement the monitoring programme and check the compliance with the project's environmental requirements during construction.

4.2 Mitigation Measures

In case of AAA levels exceedance during construction of shaft or tunnelling, the contractor shall inform MTRCL and submit plan of actions to limit further groundwater level drawdown.

Local practice often be used to limit excessive groundwater drawdown include groundwater recharge, application of hydraulic cut-off measures and detailed review of construction sequence and/or works design if found necessary.

In addition, as per Section 6 and 7 of the updated HIA report, the bored tunnels should be constructed using a closed face tunnel boring machine to limit water inflow into the excavation face. The cutter head for the machine will be sealed

END OF TEXT



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Appendix 1

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Organization Chart For Implementation of Groundwater Contingency Plan

MTRC
Review and Check
MCJV's Submission



Design Team of MCJV
Review Monitoring
Data, Propose Actions
When AAA Levels are
Trigger)



Monitoring Team of
MCJV
Undertake Regular
Monitoring



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Appendix 2

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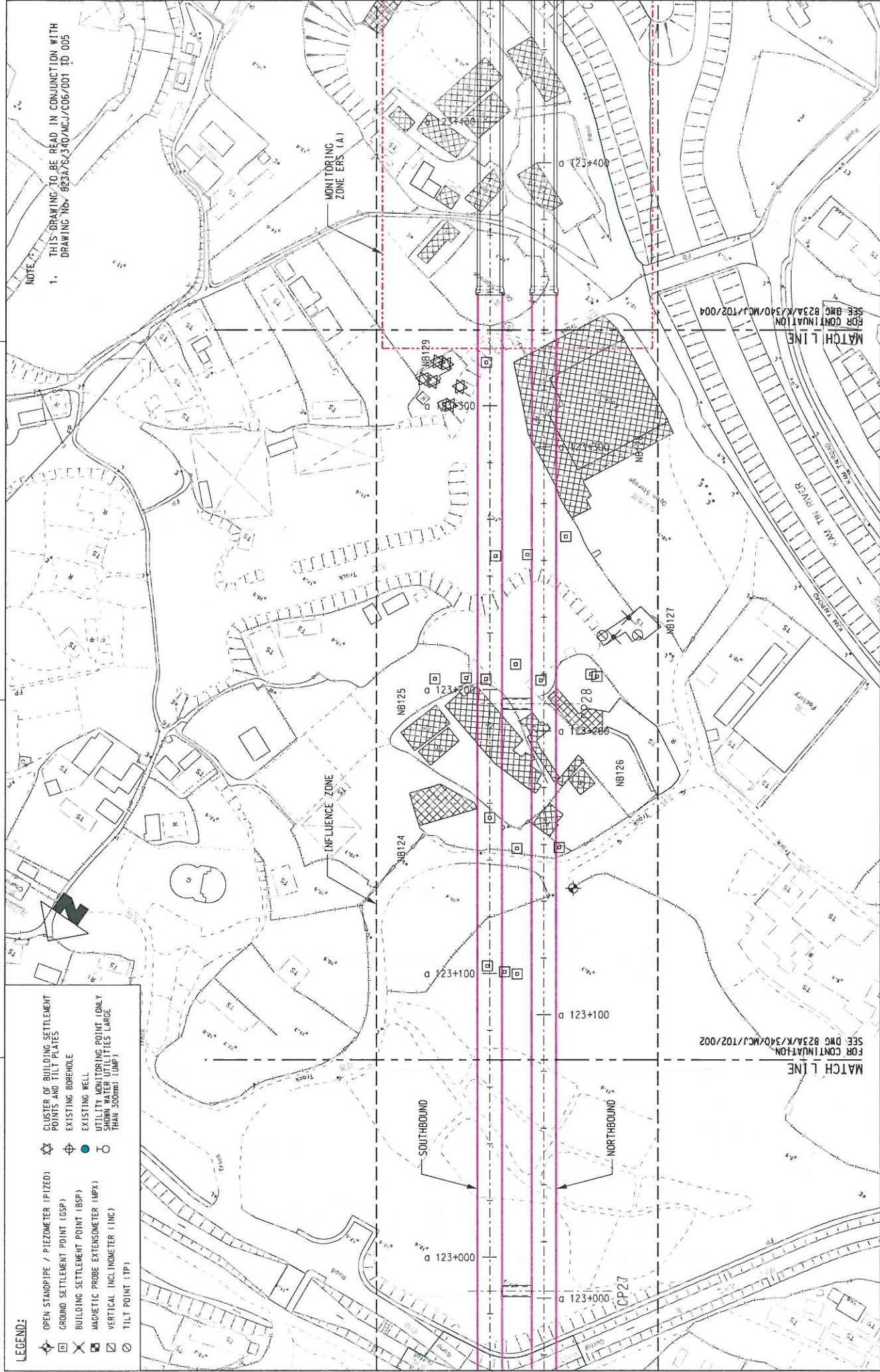
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Monitoring Locations of Groundwater

LEGEND:

- OPEN STANDPIPE / PIEZOMETER (IPZED)
- GROUND SETTLEMENT POINT (GSP)
- BUILDING SETTLEMENT POINT (BSP)
- MAGNETIC PROBE EXTENSOMETER (MPX)
- VERTICAL INCLINOMETER (INC)
- TILT POINT (TP)
- CLUSTER OF BUILDING SETTLEMENT POINTS AND TILT PLATES
- EXISTING BOREHOLE
- EXISTING WELL
- UTILITY MONITORING POINT (ONLY SHOWN WATER UTILITIES LARGE THAN 300mm (IMP))

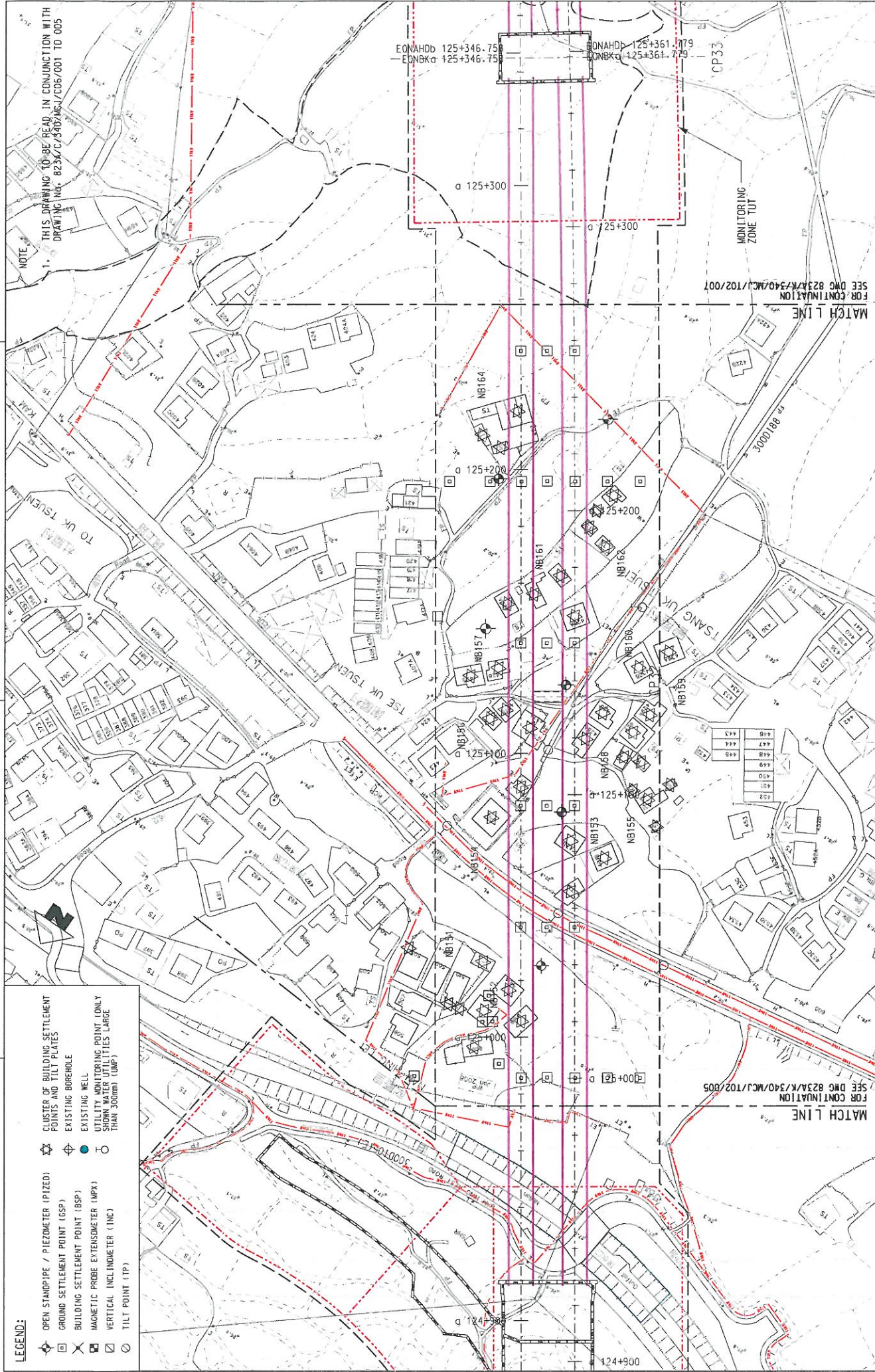
NOTE:
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH DRAWING NO. 823A/K/340/MCJ/CD6/001 TO 005



CONTRACT 823A TAI KONG PO TO TSE UK TSUEN MONITORING STATION LOCATION PLAN SHEET 5		SCALE 1 : 600 (A1)		DRAWING NO. 823A/K/340/MCJ/T02/003		REV.	
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DESIGNED		CHECKED		APPROVED		DATE	
CCH		CCH		CCH		CCH	
25/01/12		22/07/11		22/07/11		22/07/11	
AS PER EMD'S COMMENTS		FIRST ISSUE FOR SUBMISSION		DESCRIPTION		REV	
A2		A1		A2		A2	

LEGEND:

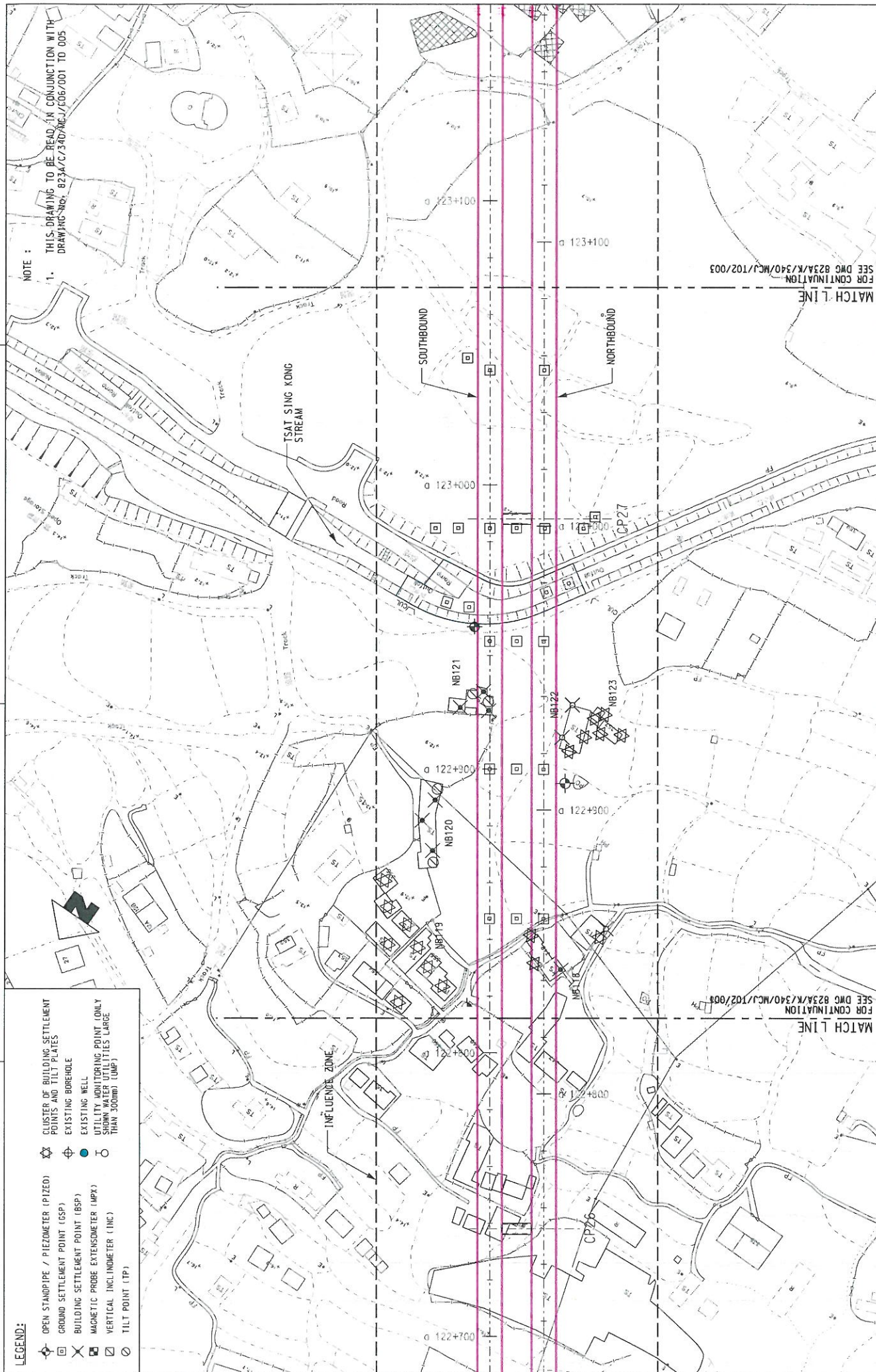
- OPEN STANDPIPE / PIEZOMETER (PIZED)
- GROUND SETTLEMENT POINT (GSP)
- BUILDING SETTLEMENT POINT (BSP)
- MAGNETIC PROBE EXTENSOMETER (MPX)
- VERTICAL INCLINOMETER (INC)
- TILT POINT (TP)
- CLUSTER OF BUILDING SETTLEMENT POINTS AND TILT PLATES
- EXISTING BOREHOLE
- EXISTING WELL
- UTILITY MONITORING POINT (ONLY SHOWN WATER UTILITIES LARGER THAN 300mm) (UMP)



CONTRACT 823A TAI KONG PO TO TSE UK TSUEN MONITORING STATION LOCATION PLAN SHEET 6		SCALE 1 : 600 (A1) 823A/K/340/MCJ/102/006 REV. A2	
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CCN	CCN	CCN	CCN
DESIGNED	DESIGNED	DESIGNED	DESIGNED
CHECKED	CHECKED	CHECKED	CHECKED
APPROVED	APPROVED	APPROVED	APPROVED
BY	BY	BY	BY
DATE	DATE	DATE	DATE
DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION

LEGEND:

- OPEN STANDPIPE / PIEZOMETER (PIZO)
- GROUND SETTLEMENT POINT (GSP)
- BUILDING SETTLEMENT POINT (BSP)
- MAGNETIC PROBE EXTENSOMETER (MPX)
- VERTICAL INCLINOMETER (VINC)
- TILT POINT (TP)
- CLUSTER OF BUILDING SETTLEMENT POINTS AND TILT PLATES
- EXISTING BOREHOLE
- EXISTING WELL
- UTILITY MONITORING POINT (ONLY SHOWN WATER UTILITIES LARGE THAN 300MM) (UMP)



NOTE :
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH DRAWING NO. 823A/C/340/MCJ/006/001 TO 005

FOR CONTINUATION
SEE DWG 823A/K/340/MCJ/102/003

FOR CONTINUATION
SEE DWG 823A/K/340/MCJ/102/003

CONTRACT 823A TAI KONG PD TO TSE UK TSUEN MONITORING STATION LOCATION PLAN SHEET 2		SCALE 1 : 600 (A1) 823A/C/340/MCJ/006/012 REV. A2
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MTR		
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CM 27/01/12 CM 22ND/11 CM 22ND/11	CM 27/01/12 CM 22ND/11 CM 22ND/11	BY DATE RECEIVED REVISION
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