

MTR Corporation Limited

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

Groundwater Drawdown Contingency Plan for
Ngau Tam Mei to Tai Kong Po Tunnels (Rev A)

Verified by:



Position:

Independent Environmental Checker

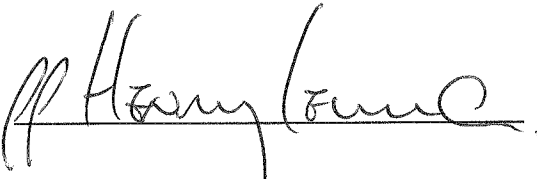
Date:

16 March 2012

MTR Corporation Limited

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SHENZHEN - HONG KONG EXPRESS RAIL LINK
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Groundwater Drawdown Contingency Plan for
Ngau Tam Mei to Tai Kong Po Tunnels (Rev A)

Certified by: 
Position: Environmental Team Leader
Date: 14 MAR 2012

Groundwater Drawdown Contingency Plan

CONTENT

1	Construction Works Description	3
2	Ground Water Level Monitoring	4
3	Alert, Action and Alarm Level (AAA) and Emergency Response.....	4
4	Mitigation Measures.....	6
5	Conclusions	7
APPENDIX A – DRAWINGS LIST REFERENCE		8
APPENDIX B – ORGANISATION CHART		9

Groundwater Drawdown Contingency Plan

1 Construction Works Description

1.1 Background

- This contingency plan is prepared in compliance with the Part C conditions 2.11 of the Environmental Permit No. EP-349/2009/E dated 03 February, 2012.
- The soil excavation works which might affect the ground water level or/and involves groundwater drawdown are as follows:
 - Excavation of the Plant Building at Area 3.8, Tai Kong Po;
 - Excavation of the Ventilation Building at Ngau Tam Mei;
 - Tunnel between Ngau Tam Mei and Tai Kong Po.

1.2 Potential risk associated with groundwater drawdown

At Tai Kong Po (TKP) the excavation of the shaft involves excavating approx 20m in soft overburden material followed by 20m of rock excavation from Grade IV to II. The shaft excavation will be supported by a pipe pile wall in the soft material. The rock section of the excavation will be shotcrete lined and rock bolted. The shaft shall be made water tight prior to excavation by the installation of a grout curtain behind the pipe piles and grouting in the rock section of the shaft. A 2 stage pumping test shall be carried out in the soft material prior to excavation to verify the effectiveness of the grout curtain.

At Ngau Tam Mei (NTM) the shaft is 90m deep with approx the top 35m being soft material and the remaining 55m being rock. The soft material is supported by a Secant Pile wall design, and the rock is supported by shotcrete lining and rock bolts. The secant piling will form an effective water barrier and ground investigation in the rock section of the shaft will determine if grouting of the rock section is required to control any water inflow.

The tunnels are a drained design shall be temporarily lined during excavation to support the rock mass. The permanent tunnel lining will incorporate a water proofing system which will prevent water from seeping into the tunnels. All tunnel discharge water will be treated prior to discharge in accordance with section 11 of the EIA report.

Monitoring of the ground water levels will be carried out at both shafts in accordance with the contract drawings. Treatment of ground water prior to discharge to the local Nullah's shall be in accordance with section 11 of the approved EIA report and the discharge licenses obtained from EPD. Contingency plans will be put in place for excessive ground water drawdown as recommended by the EIA and HIA reports.

Groundwater Drawdown Contingency Plan

1.3 Groundwater drawdown contingency plan

The ground water levels around NTM and TKP shall be monitored by an independent body as required under the contract. A weekly monitoring report shall be submitted to MTRC detailing the current site activities and the current state of the ground water table within and outside the works area.

In addition a General Plan of Action shall be submitted to MTRC detailing the actions to be taken if the instruments on site reach their associated AAA levels. The reaching of the AAA values will trigger the production of Detailed Plans of Action or Emergency Plans of Action. These reports will detail the measures to be taken to deal with the ground water drawdown to maintain the ground water level within the specified design requirements.

2 Ground Water Level Monitoring

Monitoring of the ground water level will be carried out along the length of the tunnel sections and at NTM and TKP. The ground water levels shall be monitored in accordance with Alert, Action, Alarm, (AAA) values. the AAA values shall be as per the table below::

Monitoring Point	ALERT	ACTION	ALARM
Ground Water Drawdown	500mm within the lowest historical groundwater level	800mm within the lowest historical groundwater level	1000mm within the lowest historical groundwater level

The monitoring will be conducted in accordance with the requirement stipulated in App. N of the Particular Specification issued by the Engineer. In General the instruments are monitored on a daily basis whilst construction works are on going.

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

With reference to the ground water drawdown limits the following responses shall be made to exceedances of the AAA values:

3.1 Alert Level Exceedance

- a) KKOJV shall inform the Engineer (MTRC) immediately;

Groundwater Drawdown Contingency Plan

- b) KKOJV shall immediately submit a DPA (detailed plan of action) to MTRC before the Action level is reached. The report shall detail what actions shall be taken for reaching the alert level and what action shall be taken for reaching the action level.
- c) KKOJV shall implement the response actions detailed in the DPA for reaching the Alert Level.

3.2 Action Level Exceedance

- a) KKOJV shall inform the Engineer (MTRC) immediately;
- b) KKOJV shall immediately implement the response actions detailed in the DPA as submitted for the Alert level exceedance;
- c) KKOJV shall take all necessary action to try to ensure that the Alarm level is not reached;
- d) Works may only proceed if the response Actions have been implemented and are effective in the opinion of the Engineer (MTRC);
- e) KKOJV may need to carry out additional response actions than those required by the DPA of the Engineer deems it necessary.

3.3 Alarm Level Exceedance

- a) KKOJV shall inform the Engineer (MTRC) immediately;
- b) KKOJV shall prepare and submit a EPA (Emergency Plan of Action) immediately and submit to MTRC for review and approval;
- c) The action required in the EPA shall be implemented immediately by KKOJV to prevent any further movement of the ground or lowering of the ground water level;
- d) Works shall not resume on the site until such time that the ground water level and settlement is stable in the opinion of the Engineer (MTRC);

The contact persons for KKOJV for issues with the monitoring ground water levels and ground settlement are as follows:

Name	Position	Contact No.
Russell Lang	Project Director	6507 6583
Lau Chi Woon	Deputy Project Director	9483 6529
Pedro Gutierrez	Tunnel Manager	9665 2039
David Leaver	TKP Section Manager	9815 7670
Ben Bearcroft	NTM Section Manager	9828 2672

Groundwater Drawdown Contingency Plan

Mok Wah Moon	Chief Superintendant	9120 8798
Patrick Sin	Environmental Officer	6022 8646

The Tunnel Manager and Section managers will be responsible for ensuring that the reports stated above are produced and the response actions are completed. The environmental officer shall ensure that the managers carry out their tasks and that the details are passed on to the project director.

4 Mitigation Measures

As per section 11 of the EIA report and section 5 and 7 of the HIA report, mitigation measures to be carried out are summarised as below:

Shaft Excavation

- Further grouting of the grout curtain wall at TKP may be carried out to further improve the quality and effectiveness of the hydrological water barrier;
- Grouting of the Rock at both shafts may be carried out to further reduce the permeability of the rock and hence reduce the water inflow;
- Recharge wells may be installed to control the drawdown of the water table outside the shafts;
- Prior to any excavation works at either shaft, multiple stage pumping tests shall be carried out to verify the effectiveness of the water cut off of the ELS systems at both shafts.

Tunnel Excavation

- Probe holes shall be drilled ahead of the tunnel works as required under the contract to measure the volume of water inflow. Grouting of the rock may be required ahead of the blasting works if unmanageable levels of water are recorded;
- The tunnel sections shall be shotcreted and rock bolted as soon as possible after clearing the blasted material to provide stability to the rock mass and to reduce the water inflow through the rock;
- Where fault zones are detected then canopy tubes will be installed with steel arch support. The canopy can then be grouted to control the water inflow into the tunnel

Groundwater Drawdown Contingency Plan

sections.

5 Conclusions

Both groundwater monitoring and ground settlement at TKP and NTV will be closely monitored in compliance with the contract documents. Contingency actions as mentioned above will be carried out if there is any exceedance.

Groundwater Drawdown Contingency Plan

APPENDIX A – DRAWINGS LIST REFERENCE

Area 3.8 Tai Kong Po

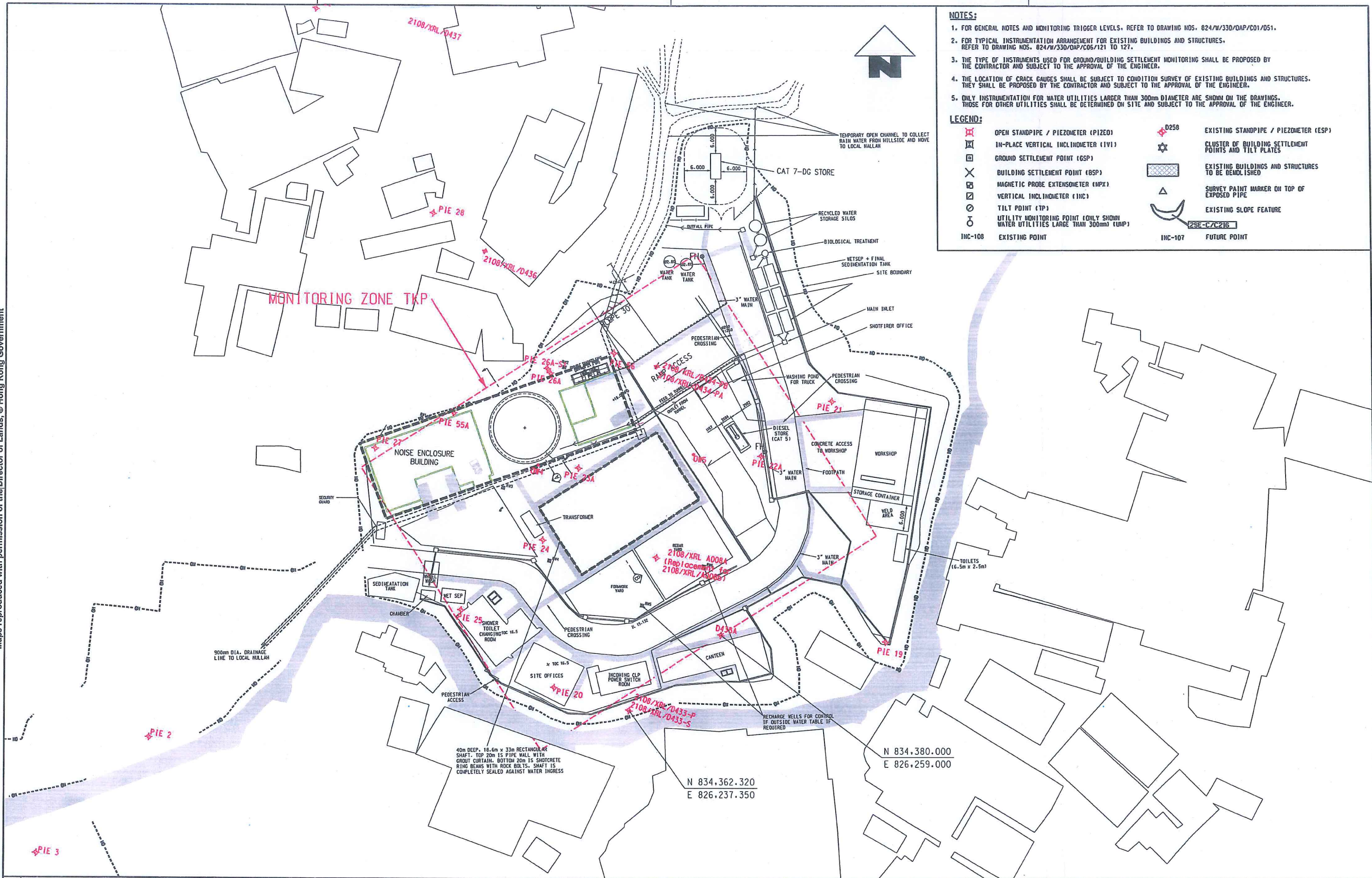
- 824/C/331/KKO/C01/001 Rev G1

Ngau Tam Mei Ventilation Building

- 824/C/NTV/KKO/C06/001 Rev -

Ngau Tam Mei to Tai Kong Po Tunnels

- 824/C/331/KKO/C06/001 Rev –
- 824/C/331/KKO/C06/002 Rev –
- 824/C/331/KKO/C06/003 Rev –
- 824/C/331/KKO/C06/004 Rev –



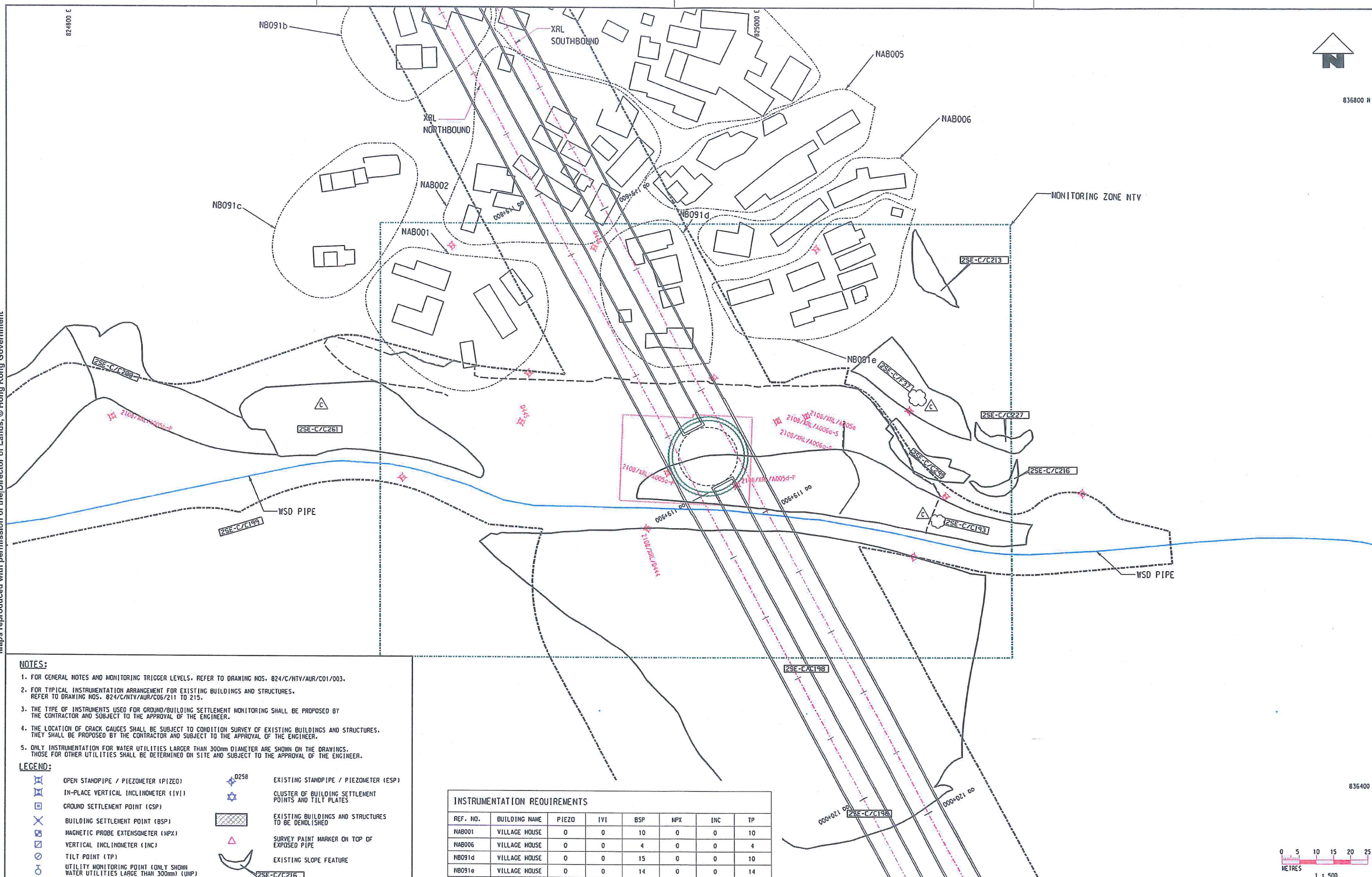
NOTES:

- FOR GENERAL NOTES AND MONITORING TRIGGER LEVELS, REFER TO DRAWING NOS. 824/W/330/DAP/C01/D51.
- FOR TYPICAL INSTRUMENTATION ARRANGEMENT FOR EXISTING BUILDINGS AND STRUCTURES, REFER TO DRAWING NOS. 824/W/330/DAP/C05/121 TO 127.
- THE TYPE OF INSTRUMENTS USED FOR GROUND/BUILDING SETTLEMENT MONITORING SHALL BE PROPOSED BY THE CONTRACTOR AND SUBJECT TO THE APPROVAL OF THE ENGINEER.
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- ONLY INSTRUMENTATION FOR WATER UTILITIES LARGER THAN 300mm DIAMETER ARE SHOWN ON THE DRAWINGS. THOSE FOR OTHER UTILITIES SHALL BE DETERMINED ON SITE AND SUBJECT TO THE APPROVAL OF THE ENGINEER.

LEGEND:

OPEN STANDPIPE / PIEZOMETER (PIZO)	EXISTING STANDPIPE / PIEZOMETER (ESP)
IN-PLACE VERTICAL INCLINOMETER (IVI)	CLUSTER OF BUILDING SETTLEMENT POINTS AND TILT PLATES
GROUND SETTLEMENT POINT (GSP)	EXISTING BUILDINGS AND STRUCTURES TO BE DEMOLISHED
BUILDING SETTLEMENT POINT (BSP)	SURVEY POINT MARKER ON TOP OF EXPOSED PIPE
MAGNETIC PROBE EXTENSOMETER (MPX)	EXISTING SLOPE FEATURE
VERTICAL INCLINOMETER (INC)	25E-C/C216
TILT POINT (TP)	
UTILITY MONITORING POINT (ONLY SHOWN WATER UTILITIES LARGER THAN 300mm) (UMP)	
INC-108 EXISTING POINT	INC-107 FUTURE POINT

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DESIGNED								CONTRACT 824			
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APPROVED								TAI KONG PO PLANT BUILDING TKP			
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NOTES:

1. FOR GENERAL NOTES AND MONITORING TRIGGER LEVELS, REFER TO DRAWING NOS. 824/C/NTV/AUR/C01/003.
2. FOR TYPICAL INSTRUMENTATION ARRANGEMENT FOR EXISTING BUILDINGS AND STRUCTURES, REFER TO DRAWING NOS. 824/C/NTV/AUR/C06/211 TO 215.
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	VERTICAL INCLINOMETER (INC)		
	TILT POINT (TP)		
	UTILITY MONITORING POINT (ONLY SHOWN WATER UTILITIES LARGER THAN 300mm) (UMP)		

INSTRUMENTATION REQUIREMENTS

REF. NO.	BUILDING NAME	PIEZO	IVI	BSP	MPX	INC	TP
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NAB006	VILLAGE HOUSE	0	0	4	0	0	4
NB091d	VILLAGE HOUSE	0	0	15	0	0	10
NB091e	VILLAGE HOUSE	0	0	14	0	0	14

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DATE

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TITLE

CONTRACT 824
NGAU TAM MEI TO TAI KONG PO TUNNELS
NGAU TAM MEI VENTILATION BUILDING
GEOTECHNICAL INSTRUMENTATION LAYOUT PLAN
(PIEZOMETER)

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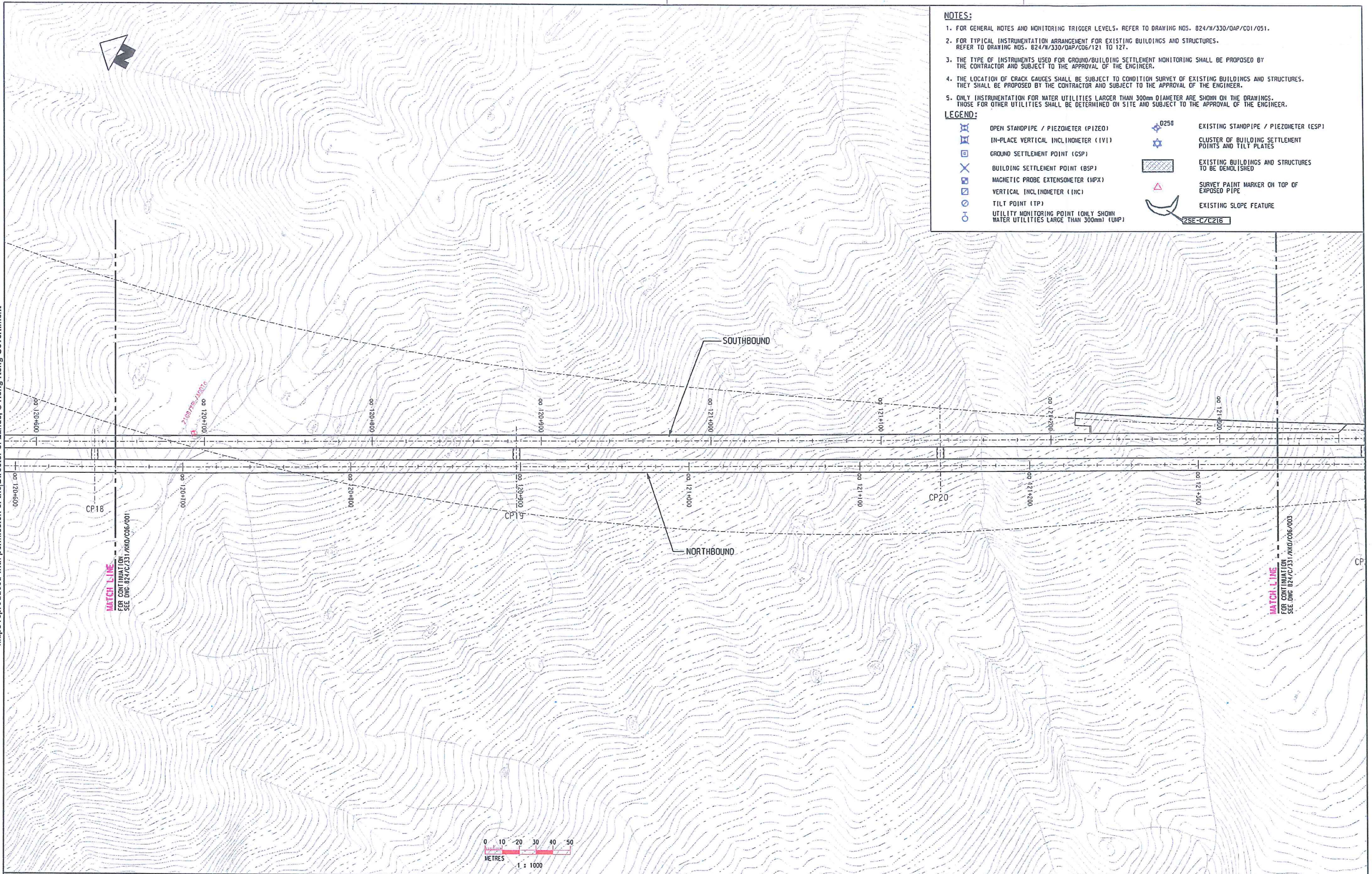
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| | VERTICAL INCLINOMETER (INC) | | |
| | TILT POINT (TP) | | |
| | UTILITY MONITORING POINT (ONLY SHOWN WATER UTILITIES LARGER THAN 300mm) (UMP) | | |

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ORIGINATOR

Kier Kaden OSSA JV KIER-KADEN-OSSA JOINT VENTURE

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TITLE

CONTRACT 824
NGAU TAM MEI TO TAI KONG PO
GEOTECHNICAL INSTRUMENTATION
LAYOUT PLAN
SHEET 2 OF 4

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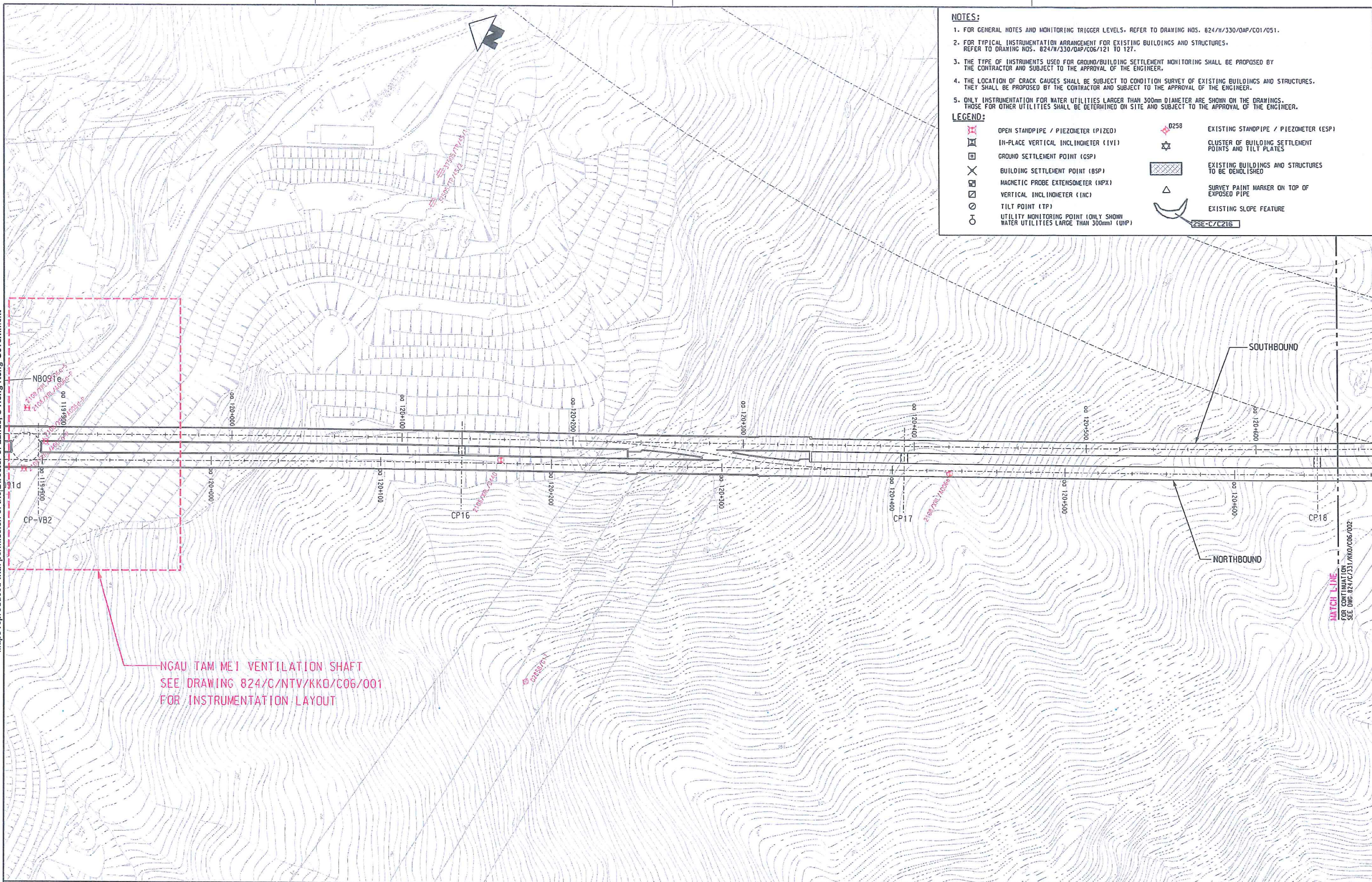
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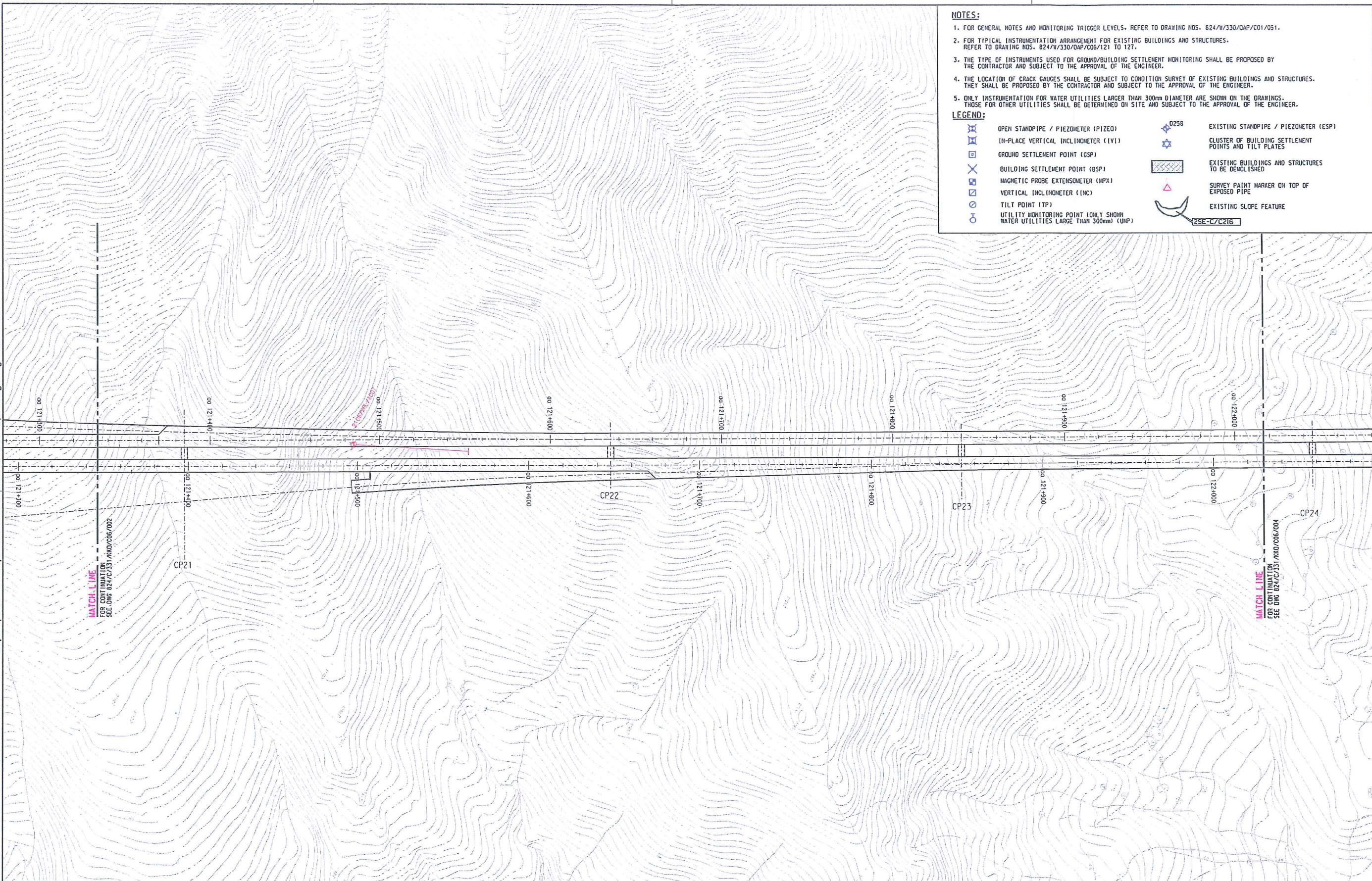
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| | TILT POINT (TP) | | |
| | UTILITY MONITORING POINT (ONLY SHOWN WATER UTILITIES LARGER THAN 300mm) (UMP) | | |

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TITLE

CONTRACT 824
NGAU TAM MEI TO TAI KONG PO
GEOTECHNICAL INSTRUMENTATION
LAYOUT PLAN
SHEET 3 OF 4

SCALE 1: 1000 (A1)

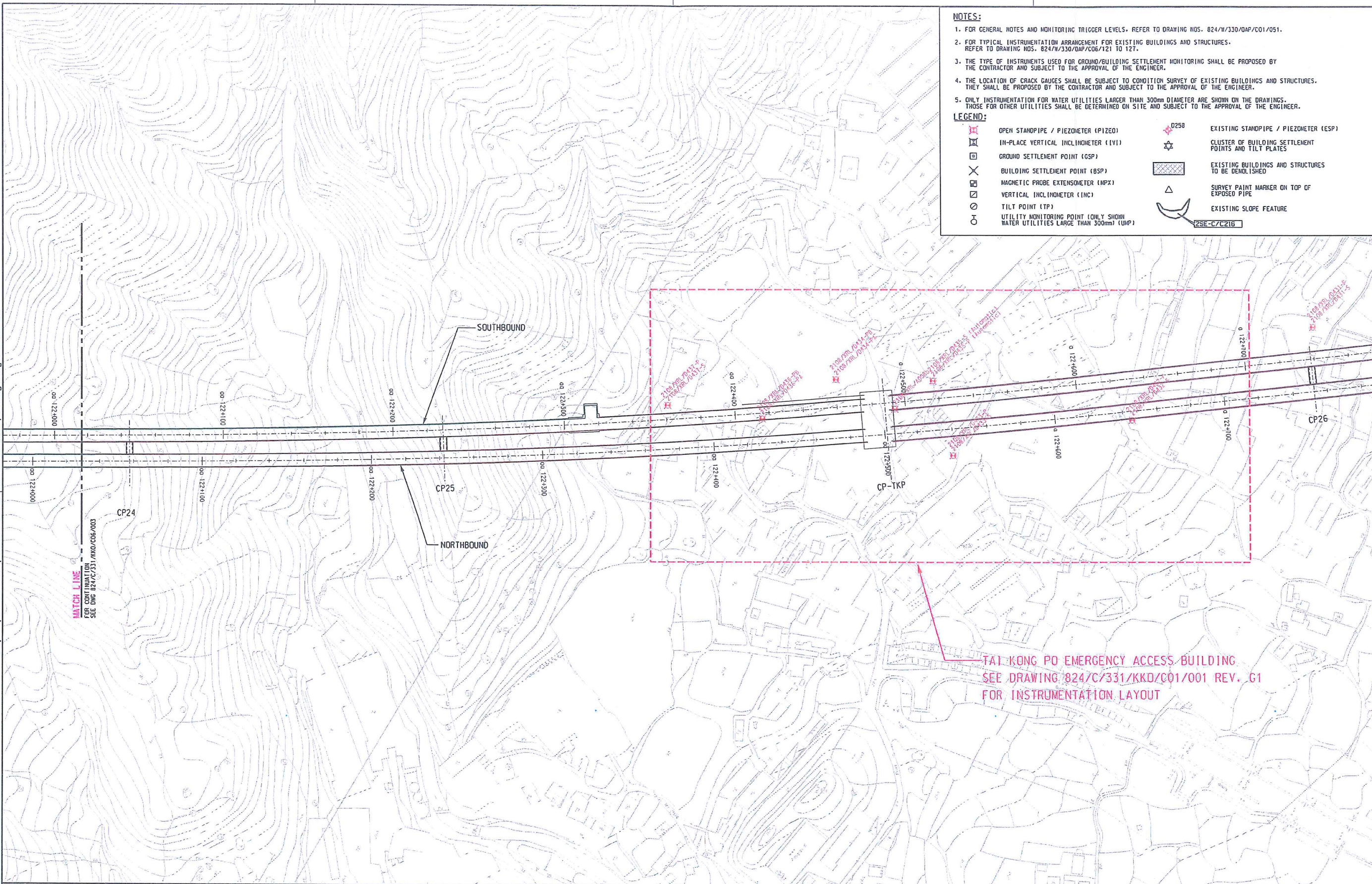
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| | UTILITY MONITORING POINT (ONLY SHOWN WATER UTILITIES LARGER THAN 300mm) (UMP) | | |

TAI KONG PO EMERGENCY ACCESS BUILDING
SEE DRAWING 824/C/331/KK0/C01/001 REV. G1
FOR INSTRUMENTATION LAYOUT

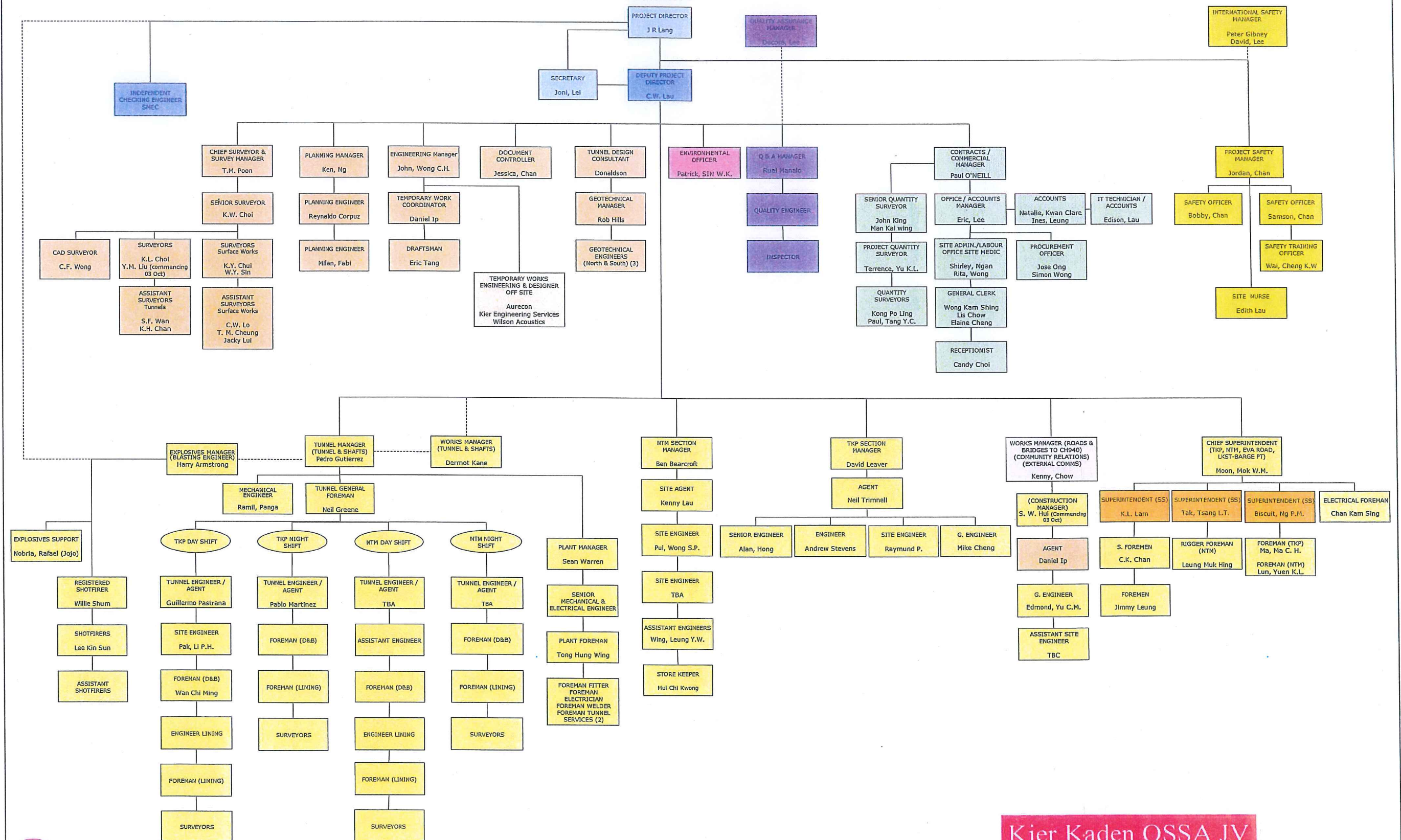
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TITLE	
CONTRACT 824	
NGAU TAM MEI TO TAI KONG PO	
GEOTECHNICAL INSTRUMENTATION	
LAYOUT PLAN	
SHEET 4 OF 4	
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APPENDIX B – ORGANISATION CHART

MTRC EXPRESS RAIL LINK
Contract 824 - New Tam Mei to Tai Koo Po Tunnels
Organization Chart



Kier Kaden OSSA JV

