Appendix 13 B

Use of Explosives

APPENDIX A13B - CONTENTS

1 INTRODUCTON

1.1 BACKGROUND

The MTR Corporation Limited (MTR) is undertaking the design of the Shatin to Central Link (SCL), which when complete will form a strategic rail corridor comprising of two sections: (i) The Tai Wai to Hung Hom Section and (ii) The Cross Harbour Section.

Under Section 5(7) of the Environmental Impact Assessment (EIA) Ordinance (Cap. 499) (EIAO), the Director of Environmental Protection (Director) from the Environmental Protection Department (EPD) has issued a Study Brief No. ESB-199/2008 for this project (EIA Study Brief). *Section 3.4.5* of the EIA Study Brief specifies that a Hazard to Life Assessment should be conducted for the Project.

In *Section 3.4.5.3* of the EIA Study Brief, it is stated that a hazard assessment should be carried out for aspects of the Project that involves the use of explosives for the construction activities and the storage or blasting location which is in close vicinity to populated areas, Potentially Hazardous Installation sites(s) (PHIs), and town gas installations along the Project alignment. For completeness, these requirements are repeated in *Table 1.1*.

Table 1.1 EIA Study Brief – Hazard to Life Requirements

3.4.5	**Hazard to Life**
3.4.5.3	If there is use of explosives for the construction activities and the storage or blasting location is in close vicinity to populated areas, Potentially Hazardous Installation site(s) (e.g. Sha Tin Water Treatment Works and Ma Tau Kok Gas Production Plant and associated facilities) and town gas installations along the Project alignment such as the Beacon Hill North Offtake Station and underground town gas pipes, the Applicant shall carry out hazard assessment as follows: (i) Identify hazardous scenarios associated with the storage, transport and use of explosives; and possible damage scenarios to the gas installations leading to catastrophic and non-catastrophic failures of the gasholder causing gas release; and then determine a set of relevant scenarios to be included in a Quantitative Risk Assessment (QRA); (ii) Execute a QRA of the set of hazardous scenarios determined in (i), expressing population risks in both individual and societal terms; (iii) Compare individual and societal risks with the criteria for evaluating hazard to life stipulated in Annex 4 of the TM. (iv) Identify and assess practicable and cost-effective mitigation measures for reducing individual and societal risks. (e.g. selection of the shortest practicable road transport routes to and from the storage facility, reducing possibility of undue movement, differential settlement, ground instability, distortion, fracture, dislocation, damage and destruction to the town gas facilities.) The methodology to be used in the hazard assessment should be consistent with previous studies having similar issues.

This appendix addresses in detail the EIA Study Brief requirements for the "use" of explosives as well as the impact of blasting activities on PHIs and Towngas installations. The EIA Study Brief requirements related to Storage and Transport of explosives are addressed in detail in *Appendix 13A*.

1.2 SCOPE OF THE STUDY

Drill and blast excavation method will be used during construction of Lion Rock Tunnel and Ho Man Tin Tunnels for the SCL (TAW-HUH) project. This Appendix addresses, in particular, the following:

- Use of Explosives during the Construction of the Tunnels, including:
  - Use of Cartridged Emulsion Explosives;
  - Use of Bulk Emulsion Explosives;
  - Use of blasting accessories including detonators, detonating cords and surface connectors;
- Transport of Explosives from the Delivery Points to the Blast Faces

1.3 GENERAL METHODOLOGY

The approach to assess the risk associated with the use of explosives in this study will be similar to that adopted as part of the West Island Line (WIL) project (ERM, 2008). In addition, this Hazard Assessment addresses the risk due to construction activities near PHIs, towngas facilities and LPG Gas stations. The potential effects considered to pose a risk to the general population include air overpressure, cratering, fireball, debris (blast effects), ground vibration effects, and any secondary effects such as building collapse, slope collapse, gas pipe rupture and subsequent fire etc.

a) The elements of the QRA for the use of explosives include the following steps.

- Hazard identification. Collection and review of relevant literature and data for the use of explosives at the blast face, as well as buildings and vulnerable receptors, such as slopes, retaining walls, PHIs, Towngas installations etc., in the vicinity of the tunnel construction. This formed the basis for identifying the hazardous scenarios for the study;
- Frequency estimation. In accordance with WIL study methodology, the frequencies of scenarios associated with the use of explosives at the blast face were established using fault tree analysis, in conjunction with a human factor assessment to evaluate human error probabilities. The fault trees were modified to suit the particular conditions of the SCL (TAW-HUH) project;

- Consequence assessment: Key sensitive receivers were preliminarily screened based on the threshold limits of Peak Particle Velocity (PPV) = 90 mm/s (for slopes), PPV = 100 mm/s (for buildings) as per WIL methodology (ERM, 2008); and PPV = 13 mm/s (for gas offtake station and LPG Gas station) and PPV = 25 mm/s (for gas pipes) as per the Blasting Assessment Report (MTR 1, 2009). Detailed QRA was then conducted on those selected slopes and buildings following the consequences and frequency models developed as part of the WIL study (ERM, 2008); and

- The results from the risk assessment were compared to the EIAO-TM Criteria. Recommendations have been made where required to ensure compliance with EIAO-TM Criteria, relevant best practice, and to reduce the overall risk levels.

b) The elements of the QRA for the transport of explosives from the delivery points to the blast faces include the following steps.

- Collection and review of relevant data for the proposed shafts/portals, the transport from the delivery points to blast sites, as well as population and vulnerable receptors, such as slopes, retaining walls, gas installations, PHIs etc., in the vicinity of the tunnel, shafts/portals and proposed transport routes;

- Hazard identification: A review of literature and accident databases was undertaken and updated (see the *Data Report*). These formed the basis for identifying all the hazardous scenarios for the QRA study;

- For all identified hazards, the frequency assessment has been documented and the consequences of the event were modelled;

- Frequency estimation: The frequencies, or the likelihood, of the various outcomes that result from the hazards associated with the transport of explosives was taken primarily from *Appendix 13A*;

- The same frequency model was adopted in this study as that of XRL study (ERM, 2009), which has been derived to reflect the current Transport Department statistics, Fire Services Department statistics, specific design features as applicable for the SCL (TAW-HUH) project and current knowledge of explosives;

- The consequence model employed in this study is the ESTC model (ESTC, 2000) developed by the UK Health and Safety Commission (HSC). Although, there have been a number of recent studies suggesting that the ESTC model (ESTC, 2000) models should be reviewed for applicability to explosive stores and transport, these models are still the recommended models in the UK and have been adopted in previous Hong Kong EIAs;

- The consequence and frequency data were subsequently combined using ERM's in-house Explosives Transport GIS Risk Assessment tool (E-TRA),

which has been developed to account for three-dimensional blast effects on buildings and the effect of accidental explosions on elevated roads. This risk assessment tool has been employed in the Express Rail Link (XRL) study (ERM, 2009);

- For modelling of domino effects on gas installations, ERM's in-house RISKPLOT™ tool has been used; and

- Finally, the results from the risk assessment were compared to the EIAO-TM Criteria. Recommendations have been made where required to ensure compliance with EIAO-TM Criteria, relevant best practice, and to reduce the overall risk levels.

The QRA study for the Express Rail Link (ERM, 2009) formed the primary reference for this study for all aspects related to transport of explosives within the site.

The QRA study for the WIL (ERM, 2008) formed the primary reference for this study for all aspects related to the use of explosives as part of the construction of SCL (TAW-HUH) tunnels.

2.1 OVERVIEW

The proposed Tai Wai to Hung Hom Line (TAW-HUH)) of the Shatin to Central Link (SCL) project is an extension of the existing Ma On Shan Line connecting Tai Wai and the new Hung Hom station via Hin Keng, Diamond Hill, Kai Tak, To Kwa Wan, Ma Tau Wai and Ho Man Tin. The SCL is classified as a District Line of the MTR network.

Construction is expected to commence in 2012. Major civil works will be completed by 2016, and all works will be completed in 2018. The Project involves nearly 9 km to be constructed in tunnel. The route will encounter a variety of ground conditions, urban and rural environments, and a number of specific constraints in some localized areas. The majority of the tunneling will be by mechanical methods but there will be blasting required in certain sections. The project details can be found in *Appendix 13A*.

2.2 AREAS OF BLASTING

A significant amount of explosives will be required for the excavation works in the construction of SCL (TAW-HUH) alignment as per the Blasting Assessment Report (MTR 2010). It is envisaged that the following items will require blasting:

- Ho Man Tin (HMT) Tunnels: Twin single track horseshoe shaped tunnels with a length of approximately 480m will run from the Shansi Street Access Shaft toward Ho Man Tin Station. HMT (Uptrack) Tunnel runs from Ch U 101+025.0000 to Ch U 101+490.0000 and HMT (Downtrack) Tunnel runs from Ch D 101+035.0000 to Ch D 101+515.0000; and

- Lion Rock Tunnel (LRT): A twin track tunnel between Ma Chai Hang (MCH) Ventilation Building and Hin Keng Portal, approximately 2,450m long. The LRT runs from Ch 27180 to Ch 29510.

Construction of the Lion Rock Tunnel will proceed from the Hin Keng Portal and the Ma Chai Hang Ventilation Building, and blasting from both ends will meet inside the tunnel at Ch 28350. Blasting of the two Ho Man Tin Tunnels will start from the Shansi Street Shaft. The twin tunnel will be transformed gradually from a stacked arrangement to a side by side configuration before entering Ho Man Tin Station.

The location of blast areas is shown in *Figure 2.1*. The typical blasthole patterns that have been developed for construction of the Ho Man Tin Tunnels and Lion Rock Tunnel are shown in *Figure 2.2*.

Figure 2.1 *Location of Blast Areas for SCL (TAW-HUH) Project*

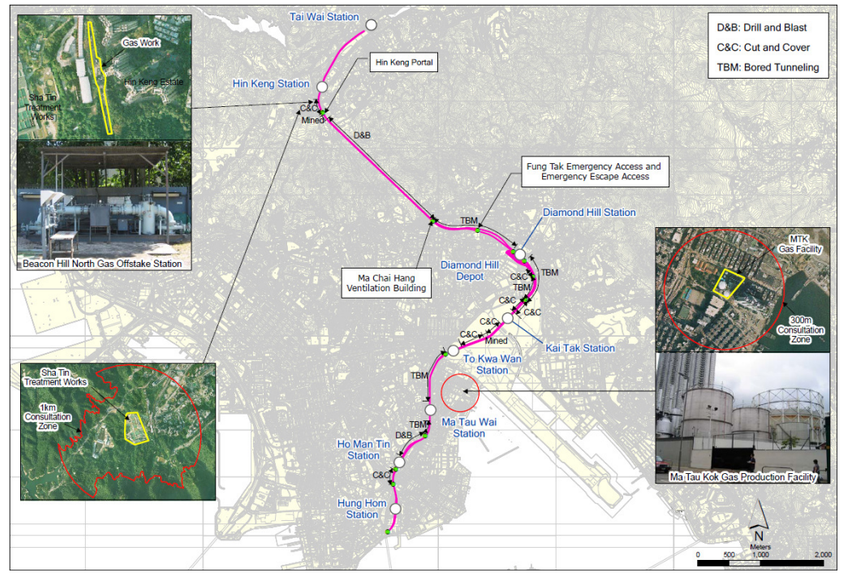
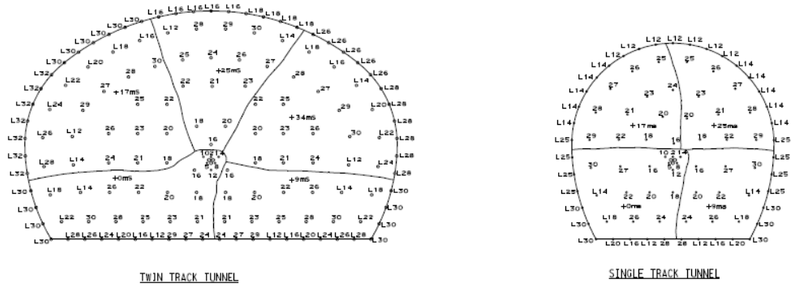


Figure 2.2 *Typical Blast Patterns for SCL (TAW-HUH) Project*



2.3 DELIVERY POINTS AND ACCESS PATHS TO SHAFT/PORTAL

A delivery point is the location where explosives truck enters the worksite. From this point, explosives are delivered via an 'access path' to the portal /shaft and then into the tunnel to the blast face. The access paths to the portal/shaft are shown in *Figure 2.3* to *Figure 2.5*. The access path to Hin Keng Portal of the Lion Rock tunnel is 39 m and that to the Shansi Street Shaft of the Ho Man Tin tunnels is 35 m. There is no access path to Ma Chai Hang Ventilation Building as the explosives are transported directly to the shaft.

Figure 2.3 *Hin Keng Portal and Associated Delivery Point at Hin Tin Street*

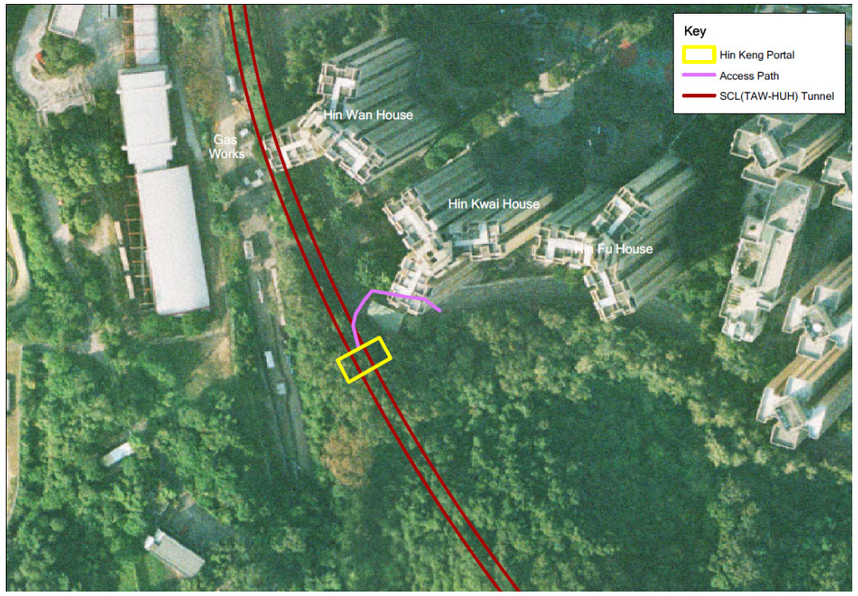


Figure 2.4 *Ma Chai Hang Ventilation Building and Associated Delivery Point at Ma Chai Hang Road*

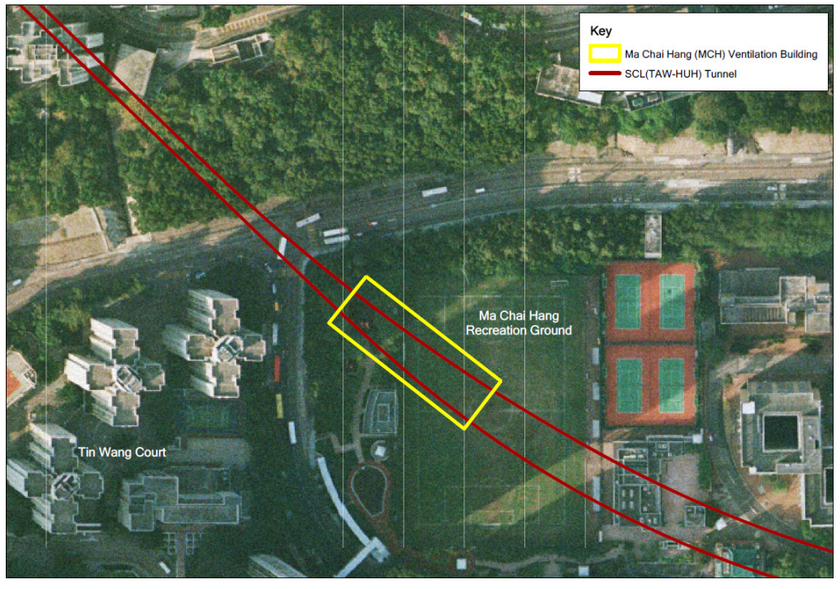
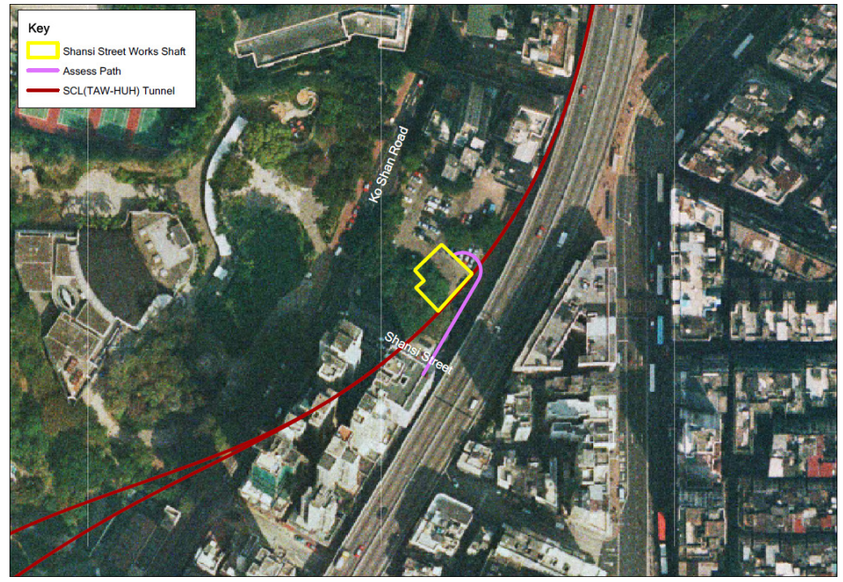


Figure 2.5 *Shansi Street Shaft and Associated Delivery Point at Shansi Street*



2.4 OVERVIEW OF BLASTING

2.4.1 The Blasting Process

Supply of Detonators, Detonating Cord and Cartridged Emulsion Explosives

Detonators are imported into Hong Kong. Destructive product sample tests are conducted by the manufacturer before each order leaves the factory. These tests record the actual delay firing time of each sample detonator and must fall within the manufacturers upper and lower tolerances as dictated by their quality control and quality assurance (QC /QA) system. In the event that the tested sample falls outside of the delay time control, or tolerance limits the batch will be destroyed. The delay time, detonator shock tube length, batch number and date of manufacture are printed on each vacuum bag (inner packaging) and the delay time is printed on the aluminium shell and the coil tag of each detonator, where the detonator shock tube length is also shown. The detonator order will be imported into Hong Kong and stored at the Mines Division Kao Shat Wan (KSW) explosives magazine. Users will then order from Mines Division for delivery to their on-site explosives magazine or to their blasting site.

Cartridged emulsion explosives are imported into Hong Kong and stored at the KSW magazine and delivered to end users by Mines Division on a daily basis.

Blast Design

The design of the blast will consider the quantity and type of explosives needed including MIC (maximum instantaneous charge), number of detonators required, as well as the sensitive receivers at the blasting location. The blast design will be prepared by the Blasting Engineer, in collaboration with the Registered Shotfirer, checked and approved by the Blasting Competent Supervisor, and then submitted to Mines Division for auditing prior to implementation. The blast plan will contain information covering the dimensions of the face to be blasted, MIC, location (chainage) size of blastholes, type and number of delay detonators required, powder factor (kg/m^3), which is defined as the ratio of mass of explosives used to the volume of rock removed by the blast. The blast design will ensure that each detonator will initiate at a different time delay to allow sequential breaking of the rock.

Blast Loading and Execution

Immediately prior to loading, the required and approved amount of explosives, detonating cord and detonators for the blast will be collected by the Chief Shotfirer and delivered to the blasting site by licensed Contractors' vehicles. The collection of the correct quantity of blasting explosives and initiating explosives will be checked by the Registered Shotfirer, a representative from the supervising engineer (i.e. Resident Explosives Supervisor) and a representative from the Contractor.

To ensure that blasting of different sectors of the blast face occurs in the correct sequence and not simultaneously, the shock tubes from the detonators associated with a particular sector may be 'bunched' together and wrapped, or 'looped', with detonating cord. A bunch block is then attached to the detonating cord. A bunch block, containing approximately 0.3 g of explosive, is sufficient to initiate the detonating cord, which in turn ignites the shock tubes around which the cord is wrapped. The shock tube tail of the bunch block is itself ignited by a surface connector.

A surface connector has a smaller mass of explosive (0.11 g) than a bunch block, which whilst it is insufficient to initiate the detonating cord, it is sufficient to ignite shock tubes. A bunch block and detonator cord combination is used to ignite a bundle of shock tubes because a surface connector can only hold up to a maximum of 8 shock tubes. Two surface connectors may be linked in series, with their connected bunch blocks in parallel, to ensure the staggering of the individual detonations across the entire blast face. The bunch block typically has no delay time, as the delay is provided by the surface connector to which its initiating shock tube is connected.

For each blast, generally, 3-5 surface connectors will be used, (each having a delay time of 9 and 17 ms), and 4-6 bunch blocks (0 ms) per blast. A typical blast round usually takes 4 to 5 seconds for completion.

A detailed step-by-step method of blasting set-up and execution is given in the *Data Report*.

2.4.2 *Safe Operating Practices*

Vibration Monitoring

It is a requirement to monitor every blast in Hong Kong to record blast induced ground vibrations. Each blast is influenced by a controlling sensitive receiver which may be a building, slope/ retaining wall or utilities. The controlling sensitive receiver, and its allowable peak particle velocity (PPV) will dictate the MIC that can be used for any blast.

When each and every blast is designed, the first parameters to be established are the controlling sensitive receiver, its allowable PPV, its radial distance from the blast and the allowable MIC calculated.

As the excavation advances on a blast-by-blast basis, the controlling sensitive receiver may change or remain constant. However, the allowable MIC may decrease or increase depending on the radial distance between the blast and the controlling sensitive receiver.

A blasting engineer is responsible for ensuring that the controlling and other nominated sensitive receivers for each blast are monitored to record the PPV in mm/sec. In addition, there may be instances where it is necessary to record air overpressure generated by blasting activities.

Trial Blasts

Trial blasts will be carried out for the first series of blasts for the tunnels and adits and different areas or sectors of the project if required. The trial blasts will be used to determine rock characteristics and to collect data to enable site specific constants to be calculated for future vibration (in terms of Peak Particle Velocity, PPV) prediction, and to ensure the blasting monitoring and control procedures are effective.

Trial blasts are conducted with cartridged emulsion explosives.

Advance Notice of Blasts

As part of the process of issuing a *License to Possess* and a *Permit to Use* dangerous goods, Mines Division will require that highly visible warning notices/signs be posted at several locations to warn the public that blasting will take place. These warning signs will be posted near the intended blasting location, even though all blasts will be conducted underground. The Contractor is required to write the blasting date and time on the notice.

With respect to public complaints, the usual practice is for the Resident Engineer (RE) to brief the District Council on the project and to notify the public via the District Council that there will be blasting and other construction activities during the project. At the same time, the RE will advise

the District Council of the process for lodging and filing complaints. Complaints are usually channelled via the RE.

Public Safeguards

Public safeguards during a construction project take many forms such as:

- Site hoarding
- Security guards
- Warning signage
- District Council Meetings/briefings by the RE
- Public Relations Programmes by the RE

Additionally, various government departments and industry bodies occasionally provide safety training and inspection, for example

- Construction Industry Training Authority (CITA)
- Labour Department

Safety Management System

Contractors are required by Law to have a comprehensive Safety Management System, usually ISO-9000 and this is implemented and supervised by on-site safety teams. Independent third party auditors make annual checks of documentation and safety records.

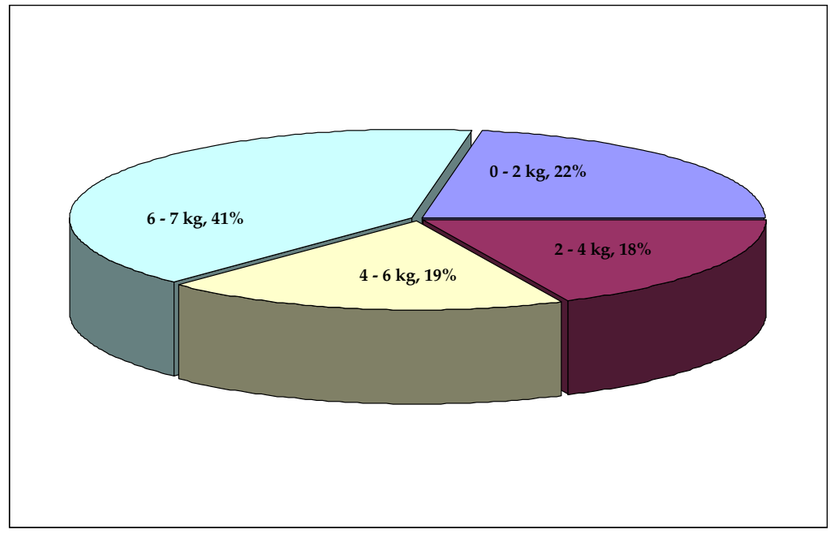
2.4.3 *Typical Rock Blasting for SCL (TAW-HUH) Project*

The tunnel blast face is typically divided into 4 or 5 sectors containing a total of 70 to 175 blastholes. These blastholes comprise 30 to 55 perimeter holes that run along the curved outer edge of the tunnel face, with further blastholes along the base of the tunnel face that are termed lifters. The 40 to 120 production holes are distributed within the sectors on the blast face.

The blast is designed to first cut a central core from the rock face. This is achieved by the centre 'cut', which comprises three relief holes and six loaded 'cut' holes around the lower centre of the blast face. The purpose of this centre 'cut' is to provide a void, or relief, before other production holes are blasted allowing the rock to fall away from the face into the space provided by the centre cut. Each sector is then detonated in a pre-determined sequence based on the detonator time delay and the sector time delay. The order of blasting is that the cut will be detonated and ejected first, followed by the production / lifter holes and finally the perimeter holes will detonate to provide a smooth tunnel profile.

The distribution of design MIC for the construction of Lion Rock Tunnel and Ho Man Tin Tunnels of the SCL (TAW-HUH) alignment is shown in *Figure 2.6*. It can be seen that more than 41% of the design MIC is 6-7 kg.

Figure 2.6 ***Distribution of Design MIC for the SCL (TAW-HUH) Alignment***



A review of the adopted MICs over the length of the entire blasting tunnels of the SCL (TAW-HUH) project indicates approximately 1,533 individual blast rounds will be required for completion.

Depending on the radial distance to the controlling sensitive receiver(s) and the resultant MIC, the maximum blast length would be 4.7 m, while the minimum would be about 0.9 m, for each blast round.

2.5 *PHIs, Towngas Installations and LPG Gas Station near SCL (TAW-HUH) Alignment*

As required by the EIA Study Brief, the hazards to life related to the use of explosives during construction of tunnels on nearby potentially hazardous installations (PHIs) and Towngas installations should be assessed. The PHIs considered are Shatin Water Treatment Works (STWTW) (*Figure 2.7*) and Ma Tau Kok (MTK) Gas Production Plant (*Figure 2.8*). Towngas facilities comprising the Beacon Hill North Gas Offtake Station (*Figure 2.9*) and Towngas pipelines were considered. An LPG Gas station (Figure 2.10), potentially affected by the tunnel construction was also considered in this study.

STWTW is a PHI owing to its use and storage of chlorine in 1 tonne drums. It is located at the head of the valley on Keng Hau Road, to the south-west of Shatin new town. The site is approximately rectangular in shape and measures 400 m north-south and 300 m east-west. It is surrounded on three sides by hills rising to approximately 300 m. The chlorine store is located about 375 m from the Lion Rock tunnel entrance work area.

MTK Gas Production Plant is a PHI due to its storage of towngas, which is a flammable gas, in a quantity exceeding 15 tonnes. The gas plant also comprises naphtha storage, naphtha reforming plant, towngas compressors and ancillary units. The site measures about 130 m north-south and 97 m east-west. The gas holders are located in the corner of San Shan Road and To Kwa Wan Road, of which the distance to the Ho Man Tin tunnel construction area measures approximately 865 m for the closest one.

The existing Beacon Hill North Gas Offtake Station is located opposite Hin Wan House of the Hin Keng Estate. A segment of the underground pipelines will also be relocated aboveground across the top of the tunnel portal before entering the station. The Beacon Hill North Gas Offtake Station is 68 m from Hin Keng portal and 52 m from the nearest delivery route. Due to their close proximity, there is a possibility of SCL (TAW-HUH) tunnel construction impacting these Towngas installations. The following are the gas installations that were identified to be potentially affected by the construction of the SCL (TAW-HUH) tunnels.

- Town Gas main along Fat Kwong Street
- Town Gas main along Yan Fung Street
- Town Gas main along Valley Road
- Town Gas Main J/OShung Yung Road & Fat Kwong Street
- Town Gas main along Shung Yung Road near San Lau Street
- Town Gas main along Kiang His Street
- Town Gas main along Pak Kung Street
- Town Gas main along San Lau Street
- Town Gas main along Chatham Road near Fat Kwong Steet
- Town Gas main along Chatham Road near Kiu Wai Mansion
- Town Gas main J/O Chatham Road & San Wai Street
- Town Gas main along Chatham Road near Shansi Street Works Shaft
- Town Gas main along Ma Tau Wai Road near Wing Kwong Street
- Town Gas main along Ma Tau Wai Road near Ngan Hon Street
- Town Gas main along Ko Shan Road near Ko Shan Theatre
- Town Gas main next to Ko Shan Sub-station
- Gas Governer between Shek Tong Street & Ma Tau Wai Road

An LPG Gas station which is located in Chui Chuk Street in Ma Chai Hang was also identified to be potentially affected by the SCL (TAW-HUH) tunnel construction. The blasting effect on the LPG Gas station was studied further and is documented in subsequent sections of this report.

Figure 2.7 Location of Shatin Water Treatment Works (STWTW) and the SCL (TAW-HUH) Alignment

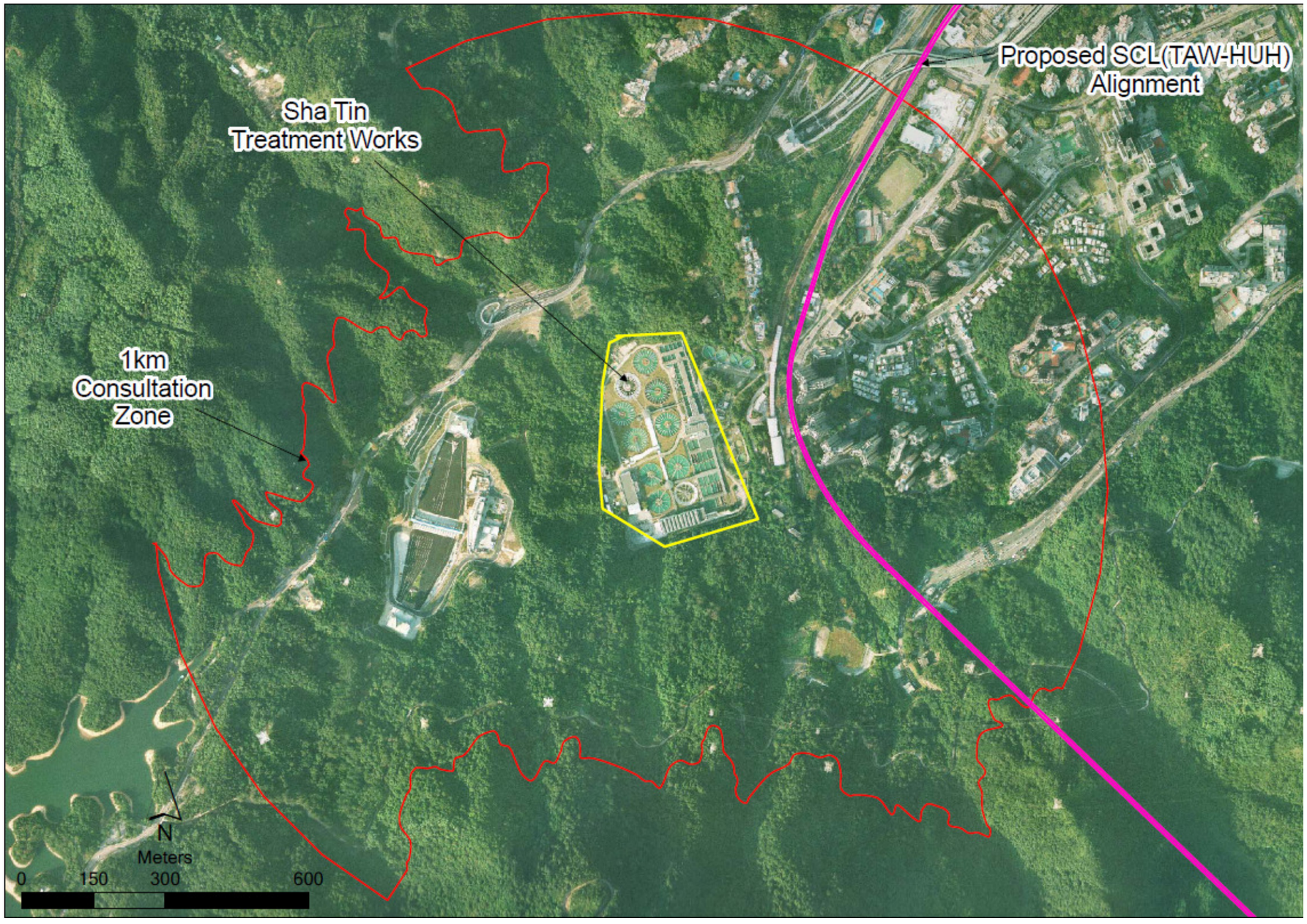


Figure 2.8 Location of Ma Tau Kok (MTK) Gas Production Plant and the SCL (TAW-HUH) Alignment

Figure 2.9 Location of Beacon Hill North Gas Offtake Station and the SCL (TAW-HUH) Alignment

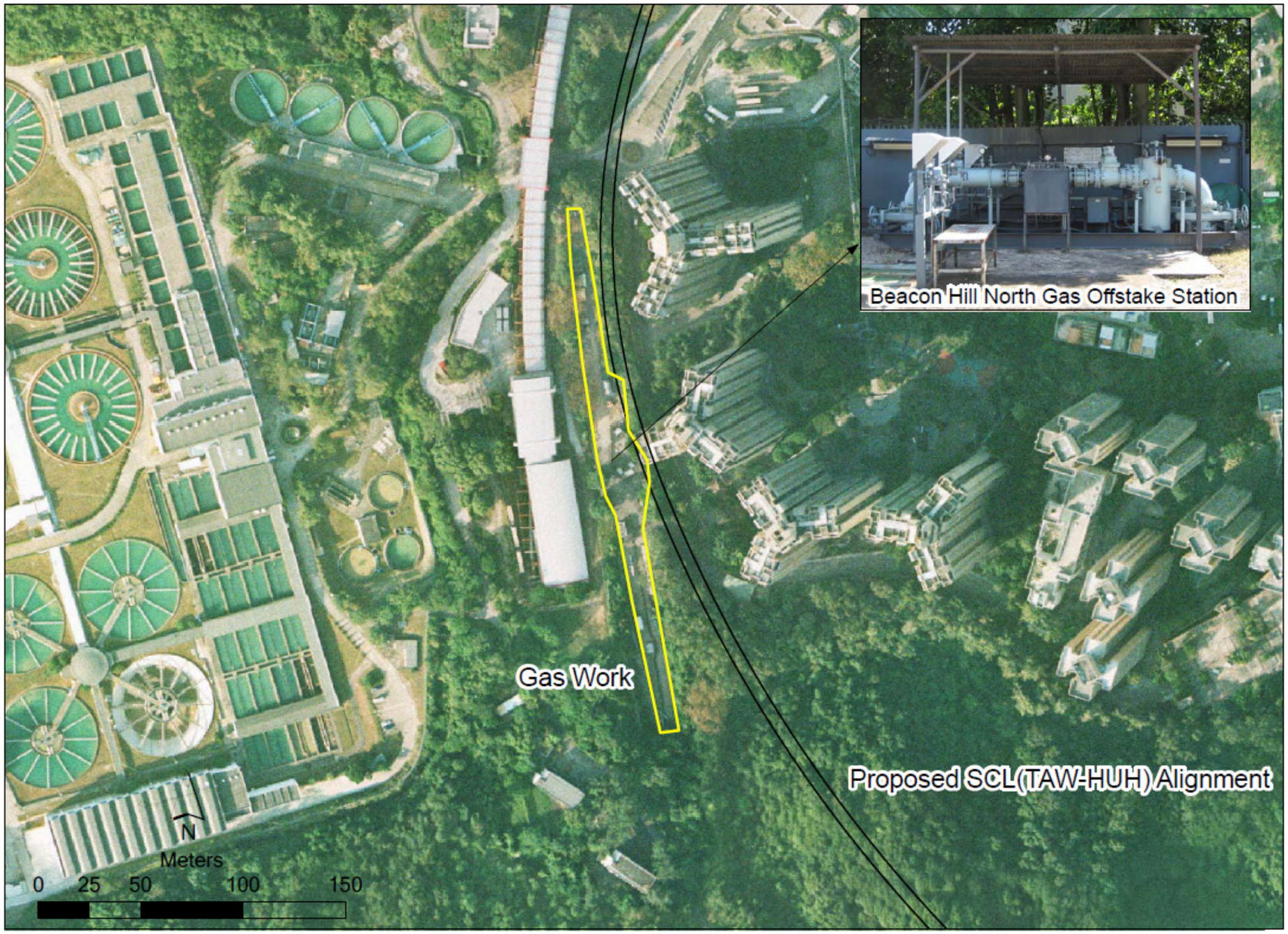
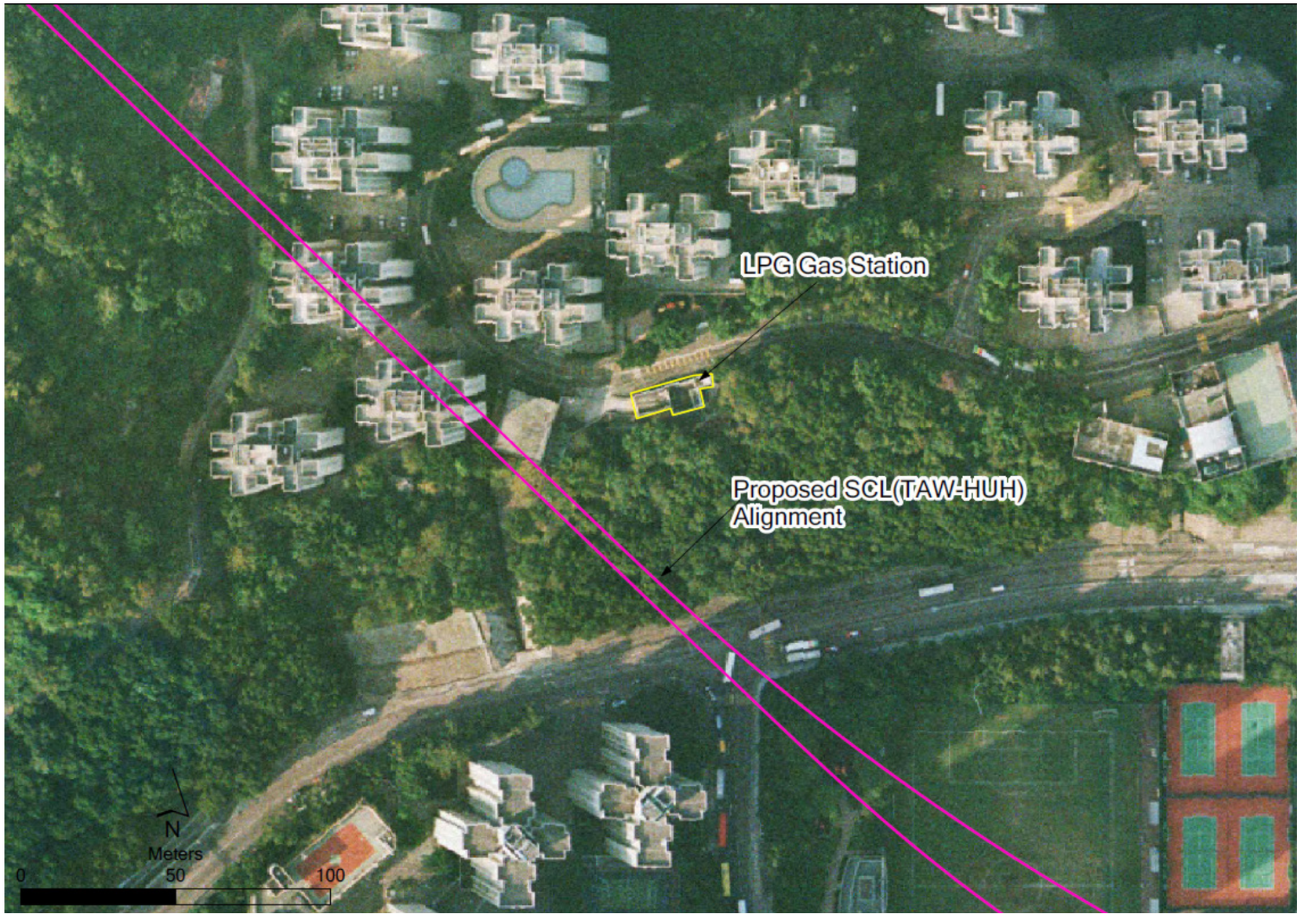


Figure 2.10 Location of LPG Gas Station on Chui Chuk Street, Ma Chai Hang and the SCL (TAW-HUH) Alignment



3.1 REVIEW OF PAST INCIDENTS

A review of reported safety incidents involving use and transport of explosives (in industrial/ commercial applications) has been conducted in the MTR WIL QRA study (ERM, 2008) and XRL QRA study (ERM, 2009).

The *Data Report* provides a summary of relevant incidents for each of the categories.

3.2 FEATURES CONSIDERED IN THE STUDY

All the sensitive receivers, including buildings, slopes/ retaining walls, PHIs, utilities and other structures within a distance of 150 m along the blasting route have been identified in the Blasting Assessment Report. This distance is equivalent to a peak particle velocity value of approximately 5 mm/s based on the blasting design. Local experience suggests that this will generally give a zone of influence approximately 150m around a tunnel alignment (MTR 2010).

The vibration threshold for the cosmetic damage to buildings lies between 25mm/s and 50mm/s depending on its construction. For slopes, this level of PPV will not cause significant slope movement. This is consistent with GEO Guide 4 (CEDD, 1998) *Section 5.7.1* which states "As a general guide, blast vibrations from subsurface works are normally not potentially damaging at a distance of more than 50 m."

Figure 3.1 and *Figure 3.2* provide a three-dimensional view of the blasting chainage and sensitive receivers for the Lion Rock Tunnel and Ho Man Tin Tunnels of the SCL (TAW-HUH) alignment considered in the study. The sensitive receivers are represented by a point or a number of points in the analysis. Those features considered as sensitive receivers are described in *Section 3.2.1*. The alignment for the Lion Rock Tunnel and Ho Man Tin Tunnels are also represented by points at every chainage interval.

The latitude and longitude (i.e. 'Northing' and 'Easting') of every point shown in *Figure 3.1* and *Figure 3.2* are based on the 'Hong Kong 1980 Grid' coordinate system. The plot of 'Northing' (y-axis) and 'Easting' (x-axis) is shown as the horizontal plane in this figure. The level of a point refers to the elevation of the relative receiver with respect to the Principal Datum (the unit is mPD), and is shown as the z-axis in this figure.

Figure 3.1 ***Blasting Chainage and Sensitive Receivers Considered for the Construction of Lion Rock Tunnel***

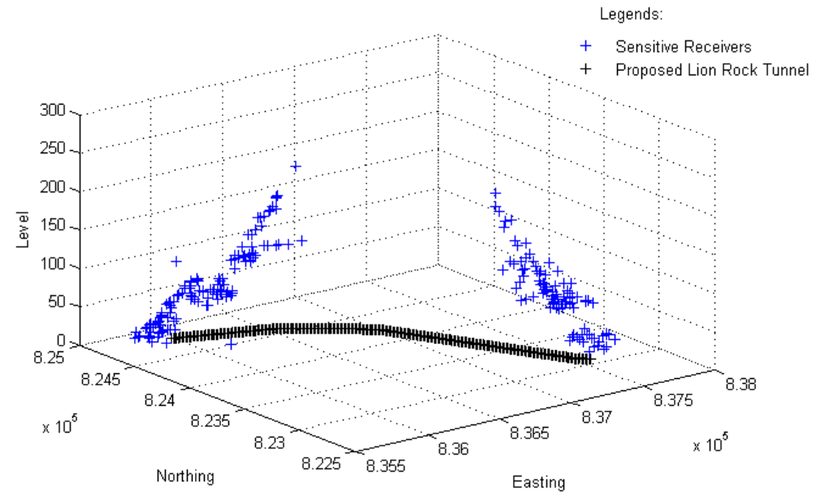
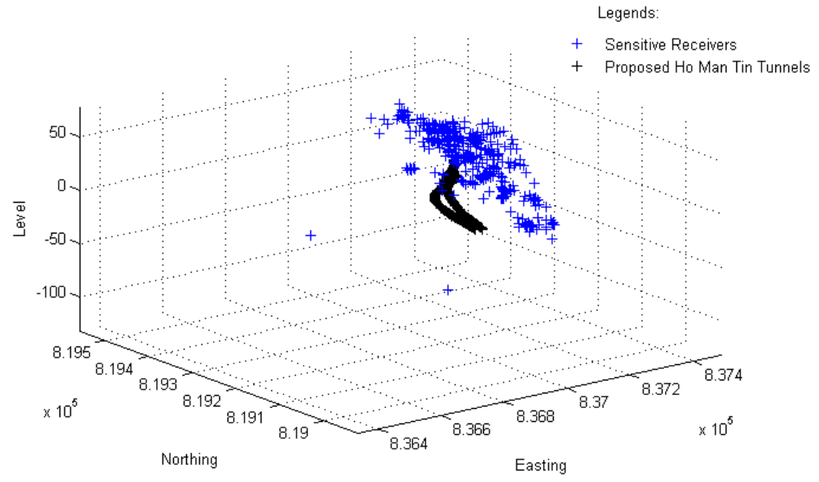


Figure 3.2 ***Blasting Chainage and Sensitive Receivers Considered for the Construction of Ho Man Tin Tunnels***



3.2.1 *Features Considered for the Study*

The following sets of features were considered as sensitive receivers in the Blasting Assessment Report (MTR, 2010):

- Man made slopes and Retaining walls
  These features include cut slopes, fill slopes, retaining walls and a combination of these. The slopes are covered with all types of facing, including shotcrete, chunam, stone facing and vegetation.

- Natural terrain hillside and Boulders
  There are no natural terrain hillsides or pockets of natural terrain within the influence zone of SCL (TAW-HUH) alignment based on Blasting Assessment Report (MTR , 2010). In addition there are no boulders located above the proposed blasting zone.

- Existing buildings and structures
  Since the proposed SCL (TAW-HUH) alignment is along urban areas which have been developed with buildings and structures, all buildings and structures within 150 m from the SCL (TAW-HUH) alignment are considered in this study.

- Utilities
  There are numerous underground utility facilities near the proposed SCL (TAW-HUH) alignment. The facilities include Beacon Hill North Gas Offtake Station, LPG Gas Station in Ma Chai Hang, gas pipes, electricity cables, telephone cables, cable television services, stormwater drains and sewage pipes, and fresh water main.

- PHIs
  Sha Tin Water treatment Works and associated facilities are identified which are in proximity to the SCL (TAW-HUH) alignment. Ma Tau Kok Gas Production Plant which is in the EIA Study Brief is over 800 m from any worksites and falls beyond any hazard distances from the blasting activities and therefore not considered for further analysis.

- Other facilities
  These refer to features other than those listed above but have been included in the Blast Assessment Report (MTR, 2010) as sensitive receivers. These may include sewage tunnel networks etc.

The features were identified by desktop review or site survey as part of the Blast Assessment (MTR , 2010). Every feature was represented by one or more coordinates in a 3-dimensional plane (Northing, Easting, and Elevation) based on data given in the report. More than 500 features were identified for this SCL (TAW-HUH) project.

3.3 SCENARIOS FOR USE OF EXPLOSIVES HAZARD TO LIFE ASSESSMENT

Hazardous scenarios considered for the use of explosives are presented below:

Hazards from the Blasting of a Face

The design of the blast face is determined by the permitted vibration level of the sensitive receivers, and is expected not to cause any damage to the sensitive receivers. However, potential hazards may arise in the event of deviations from the confirmed design, which may lead to higher than expected PPV values.

Similar to a previous study (ERM, 2008), a high-level failure mode analysis was carried out for the blasting lifecycle covering manufacture of detonators and surface connectors, design of the blast, installation of detonators and surface connectors, and loading of explosives. The details are presented in the *Data Report*. The review has investigated all relevant failure scenarios at the blast face, leading to higher than expected ground vibrations.

The effects of overpressure and debris are not considered to have the potential to impact members of the public as a blast door will be provided and closed during the blasting of faces. Blast doors fitted either over vertical shafts or on adits/tunnels are fabricated to withstand a pressure pulse of 2 bar (29 psi / 200 kPa). The doors are vented to relieve explosion overpressure and their design is certified by an Independent Checking Engineer (ICE).

The following possible hazardous scenario arising from blasting was identified for risk assessment:

- Higher than expected vibrations generated at the blast face due to human errors or other reasons such as manufacturing defects causing deviation from the confirmed design.

Hazards from the Transport of Explosives to Blast Faces

Bulk emulsion trucks will contain bulk emulsion precursor which is an oxidising agent and not detonator sensitive. The truck is provided with an automatic shutdown system to ensure a safe shutdown of the precursor pump in case the pump deviates from its operating conditions, such as high pressure or temperature. Furthermore, the bulk emulsion explosive is quite insensitive and will not detonate in the absence of the primer. The precursor and gassing pumps at the truck will not be permitted to operate until all the detonators and primers have gone into the blastholes. The shock tube will not be connected to the exploder (electric detonator initiator) until the face has completed setup and has been checked, all personnel have retreated to a safe location, the truck has left the tunnel and the blast door has been closed.

The cartridge cases and detonating cords delivered to site will be conveyed to the tunnel using an appropriate and certified lifting system (such as man-cage)

through shaft. The lifting system is provided with safety lock to prevent the fall of explosives in case of lifting mechanism failure.

The cartridge cases will be transported by a diesel vehicle within the tunnel.

The following possible scenarios were identified for risk assessment:

- Vibrations due to the detonation of a full load of explosives within the tunnel whilst transferring explosives to the appropriate blast site. As per WIL study (ERM, 2008), vibrations may be generated at the truck location due to an uncoupled explosion.

- Blast effects including debris and overpressure due to the detonation of a full load of explosives within the tunnel. As per WIL study (ERM, 2008) methodology, blast effects are modelled at the shaft/portal ignoring decay factors along the tunnel.

- Blast and vibration effects due to accidental explosion of the full load of explosives while transferring explosives from the delivery points to the shafts/portals.

The amount of full load varies for each tunnel according to the following:

- 321 kg for LRT – Hin Keng Portal;

- 200 kg for LRT – Ma Chai Hang Ventilation Building and HMT South; and

- 203 kg for HMT North.

4 FREQUENCY ASSESSMENT

The frequency assessment for the use of explosives was derived in two parts. The first part determined the occurrence frequency of higher than expected ground vibration generated by 1,533 blasts due to errors in the blasting process. The second part evaluated the occurrence frequency of blast effects and ground shocks during transportation of explosives from the delivery points to the blast sites.

4.1 FREQUENCY OF HIGHER THAN EXPECTED VIBRATION DUE TO ERRORS IN THE BLASTING PROCESS

Amongst all the failure scenarios identified in the high-level failure mode analysis, the most contributing causes are due to human errors during the blasting process. These could be errors in design, manufacturing, installation, checking and recovery.

Fault tree analysis was carried out in accordance with the WIL study methodology (ERM, 2008) to determine the overall occurrence frequencies for the failure scenario(s) detailed in *Section 3.3* as applicable to the SCL (TAW-HUH) project, whilst human factor assessment was carried out to derive the human error probabilities for the base events. The details of the fault tree analysis and human factor assessment are provided in the *Data Report*.

The overall frequencies of failure for scenarios leading to higher than expected vibrations for the SCL (TAW-HUH) project are summarised below. It is noted that the occurrence frequency for simultaneous detonation of 5 and 6 MIC for the construction of the Lion Rock Tunnel and Ho Man Tin Tunnels were conservatively assumed to be equal to the 4 MIC case as per WIL study (ERM, 2008).

Table 4.1 Overall Frequencies for Failure Scenarios leading to Higher than Expected Vibration for the SCL (TAW-HUH) Project

Sections	Blast Linear Length	Occurrence Frequency for multiple MIC detonated at the same time (Occurrence per Project)				
		2MIC	3MIC	4MIC	5MIC	6MIC
SCL (TAW-HUH) Alignment	3.2 km	1.32E-01	3.81E-04	2.19E-06	2.19E-06	2.19E-06

Notes: The Blast Linear Length refers to the total pull length by the drill and blast operation. For the SCL (TAW-HUH) alignment, the blast linear length includes the Lion Rock Tunnel and the Ho Man Tin tunnels

Due to the variation of MIC used for the alignment, the risk assessment for the use of explosives was carried out at every 10 m chainage interval for LRT and 5 m for HMT, which is in line with the interval for the MIC design in the Blast

Assessment Report (MTR, 2010). The frequency of multiple MICs detonated simultaneously on a 10 m section and a 5 m section is summarized in *Table 4.2*.

Table 4.2 ***Overall Frequencies for Failure Scenarios leading to Higher than Expected Vibration per 10 m Section and per 5 m Section***

Sections	Occurrence Frequency for multiple MIC detonated at the same time for 10 m advance (Occurrence per 10m section)				
	2MIC	3MIC	4MIC	5MIC	6MIC
SCL (TAW-HUH) (10 m)	4.13E-04	1.19E-06	6.84E-09	6.84E-09	6.84E-09
SCL (TAW-HUH) (5 m)	2.07E-04	5.95E-07	3.42E-09	3.42E-09	3.42E-09

Based on the derivation given in *Table 4.2,* the calculated frequency for a 10 m section represents the average frequency for an average blast length of 2.5 m (blast linear length of 3.2 km for 1,533 blasts, see the *Data Report*) for SCL (TAW-HUH) alignment. The consequence assessment (see *Section 5*) has identified the relevant sections of the SCL (TAW-HUH) alignment which may pose significant impact on sensitive receivers due to ground vibration and for those sections, the MIC is generally larger than 3 kg (see the *Data Report*) which corresponds to a blast length of about 2 m. Since the average frequency given in *Table 4.2* will be slightly lower than some actual blasting scenarios in which the chargeweight is less than 4 kg, the derived frequency in *Table 4.2* was increased by 25% to cover the worst case scenario which involves the use of a small chargeweight per blast. The revised failure frequency leading to higher than expected vibrations per 10 m and similarly for per 5 m is presented in *Table 4.3*.

Table 4.3 ***Revised Overall Frequencies for Failure Scenarios leading to Higher than Expected Vibrations per 10 m and per 5m section (Considering 25% Increase)***

Sections	Occurrence Frequency for multiple MIC detonated at the same time for 10 m (Occurrence per 10m)				
	2MIC	3MIC	4MIC	5MIC	6MIC
SCL (TAW-HUH) (10 m)	5.16E-04	1.49E-06	8.55E-09	8.55E-09	8.55E-09
SCL (TAW-HUH) (5 m)	2.58E-04	7.44E-07	4.28E-09	4.28E-09	4.28E-09

For the Worst Case scenario, the overall number of blasts is increased by 20% to account for potential deviation from the envisaged construction programme.

4.2 *FREQUENCY OF ACCIDENTAL DETONATION OF EXPLOSIVES BEING DELIVERED TO THE BLAST SITE*

For an accidental explosion of the full load when delivering explosives within the tunnel, a frequency of 7.69×10^{-10} per truck-km was used, as described in the QRA for Explosives Transport and Storage. This approach is consistent with previous studies and the value of the explosion initiation frequency is

considered conservative since speed control will be exercised and traffic within the tunnel is not heavier than public roads. For conservatism, reduction factors were not considered for the probability of fire following a vehicle crash (crash fire) and impact initiation in crash.

An accidental detonation of the full truck load considered every 10 m interval along the access path and at 10 m chainage intervals within the tunnel. Since the transport length within the tunnel will vary as the blasting proceeds, the average transport length was assumed as half the tunnel length for all deliveries in accordance with the WIL study (ERM, 2008). The overall transport length thus comprises the length of the access path combined with half of the tunnel length. The frequency of ground vibration for the two delivery sections is given in *Table 4.4*.

For accidental explosions scenarios occurring within the tunnel (Scenarios D02, D03, D05 and D06), the blast effects have been considered at the tunnel shaft/portal while the vibration effects have been considered at the truck location in accordance with the WIL study (ERM, 2008).

For the Worst Case scenario, the number of trips has been increased by 20% to account for potential deviation from the envisaged construction programme.

Table 4.4 Frequency of Accidental Explosion due to Detonation of Full Load During Delivery to Blast Site

Scenario	Description	Initiation Freq (/yr)	No. of Trips	Road Length (km)	Frequency (/yr)
D01	Initiation of explosives during explosives delivery from delivery point at Hin Tin Street to Hin Keng Portal.	7.69E-10	384	0.04	5.91E-09
D02	Initiation of explosives during explosives delivery from Hin Keng Portal to Lion Rock Tunnel blast site.	7.69E-10	384	0.51	7.53E-08
D03	Initiation of explosives during explosives delivery from Ma Chai Hang Ventilation Building to Lion Rock Tunnel blast site.	7.69E-10	598	1.88	4.33E-07
D04	Initiation of explosives during explosives delivery from delivery point at Shansi Street to Shansi Street Shaft at Ho Man Tin.	7.69E-10	551	0.03	6.36E-09
D05	Initiation of explosives during explosives delivery from Shansi Street Shaft to Ho Man Tin Tunnel (Uptrack) blast site.	7.69E-10	284	0.42	4.59E-08
D06	Initiation of explosives during explosives delivery from Shansi Street Shaft to Ho Man Tin Tunnel (Downtrack) blast site.	7.69E-10	267	0.45	4.62E-08

5.1 GENERAL

The use of blasting to excavate tunnels in rock presents a hazard to both property and people. In this study, three different levels of consequences were assessed. This is consistent with the WIL study (ERM, 2008).

- Primary effects: Ground vibration and blast effects;
- Secondary effects: Effects associated with building/slope collapse or the impact of debris and fragments from damaged features, effects on PHIs (e.g. Sha Tin Water Treatment Works and Ma Tau Kok Gas Production Plant and associated facilities), towngas installations along the Project alignment (e.g. Beacon Hill North Gas Offtake Station and underground towngas pipelines) and LPG Gas Station; and
- Tertiary effects: Landslides, rupture of gas equipment and subsequent fire, etc.

5.2 PRIMARY EFFECT MODELLING

5.2.1 *Ground Shock/Vibrations Generated by Rock Excavation using Explosives or during Transport of Explosives within the Tunnels*

The detonation of solid phase materials liberates energy by a rapid chemical reaction process, which produces and sustains a shock wave in the material. The high temperatures and pressure associated with the shock wave cause almost instantaneous reaction in the material. This reaction produces high pressures and temperatures in the expanding gas. It is this pressure that crushes surrounding rock when the explosive material is placed in a drill hole for blasting.

In areas where the explosive material is less confined the pressure will be reduced due to the increased volume into which the gases can expand. If the degree of confinement is reduced eventually the pressure will cease to crush the rock, but instead will cause rock fractures or cracking. If the level of confinement is reduced further, the pressure will cease to fracture the rock and the energy will propagate through the rock as an elastic wave causing the rock particles to vibrate. The degree of vibration of the rock particles decreases with increasing distance from the blast. However, the vibration of the rock particles can cause damage and structural failure to buildings if sufficiently strong.

The prediction of the Peak Particle Velocity (PPV) follows a propagation law which has the form (CEDD, 1998):

$$V = K Q^{d} R^{-b}$$

Where V is the Peak Particle Velocity, mm/sec
R is the distance (m) between the blasting source and the measuring point
Q is the explosive charge weight (kg) in TNT equivalence per delay
K, d and b are site specific constants, termed the rock constant, charge exponent, and attenuation factor respectively. Both theoretical and empirical methods have been used to estimate values for K, d, and b.

The above equation with values of K = 644 based on the 84% confidence limit, d = 0.5 and b = 1.22 have been used for the blast design of the SCL (TAW-HUH) project, in accordance with the general practice in Hong Kong and as per the guidelines developed by the Mines Division. A limit on PPV of 25 mm/s (for buildings) and similar values (for other receptors) is used as the criteria for the blast design as discussed in the Blasting Assessment Report (MTR 1, 2009).

From a risk perspective, if a 84% confidence level is used for calculation of PPV, there would be a 16% probability that the PPV will exceed the acceptable PPV. Hence, it is necessary to determine a value for the rock constant, K that is appropriate for the hazard assessment.

The value for the rock constant, K, is largely related to the rock type, structure and the confinement of the blast, i.e. K will be larger for an explosive charge placed in a tight fitting blasthole than for explosives stored in a chamber or tunnel. The values of K for granitic and volcanic rocks in Hong Kong are in the range of 1,000 to 1,200 for rock blasting (CEDD, 1998). Geoguide 4 states that the values for the charge and attenuation exponents are from 0.6 to 0.8 and from 1.2 to 1.6 respectively.

Rearranging the above equation yields:-

$$V = K (R / Q^{d/b})^{-b}$$

Where the ratio of the charge to attenuation exponent (i.e. d/b) lies within the limits of 0.5 to 0.66.

In the context of QRA, the equation used in GEO Guide 4 (CEDD, 1998) was considered applicable (ERP, 2008). The parameters used in the QRA are as follow:

K = 1200, upper range selected from GEO Guide 4

This value is conservative as it represents an upper limit for PPV for rock conditions considered applicable for Hong Kong.

d = 0.5 and b = 1.22

This slope is conservative for predicting PPV in far field for which an attenuation exponent of 1.2 to 1.6 could be considered as per GEO Guide 4 (CEDD, 1998).

5.2.2 *Ground Shock/Vibrations during Transport of Explosives within the Tunnels*

In assessing the effect of ground vibrations due to detonation of full load during explosives transfer from the shafts/portals to the blast sites, the methodology as described in Section 5.2.1 has been used, however the value of K was taken as 200 to represent the "decoupling" of explosives during transport within the tunnels (ERM, 2008).

5.2.3 *Ground Shock/Vibrations during the Transport of Explosives outside the Tunnels*

Ground shock outside the tunnel is built into the ESTC model (ESTC, 2000). However, to evaluate the specific effects of vibrations on the nearby gas installations, the Ground Vibration model for uncoupled load described in the previous section has been used.

5.2.4 *Blast Effects including Overpressure and Debris from Accidental Explosion while Transferring Explosives from Shafts/Portals to Blast Faces*

To be consistent with previous studies ((ERM, 2008), (ERM 2009)), the ESTC model (ESTC, 2000) was employed when assessing the likelihood of fatalities due to blast effects.

During the construction of tunnels, an initiation of explosives during transport within the tunnel is considered as an explosion at the tunnel shaft or portal since no decay factor was considered for a blast wave travelling from within the tunnel to the shaft/portal. This approach is consistent with the WIL study (ERM, 2008).

Fatality due to flying fragments or missiles due to above ground explosion is considered in the ESTC model. The ESTC model is also more conservative in estimating hazard distances during the construction of tunnels, as compared to using DoD 6055.9-STD equation C9.7-16. Therefore the consequence distances obtained from the ESTC models have been used to assess the risk of transporting explosives within the tunnel. Details of the ESTC model can be found in the *Appendix 13A*.

To model overpressure effects on towngas installations, the TNT model (Yellow Book) has been used. This model is more conservative than DoD6055.9-STD equation C9.7-16 and C9.7-17.

5.2.5 *Blast Effects including Overpressure and Debris from Accidental Explosion while Transferring Explosives from Delivery Points to Shafts/Portals*

In assessing the blast effects due to detonation of a full load during the transfer of explosives from the delivery points to the shafts/portals (outside the tunnel), the same methodology as described in *Section 5.2.4* has been used.

5.3 *SECONDARY EFFECT MODELLING*

5.3.1 *Effect on buildings*

There are various published international standards that relate to the damage levels that may be apparent from ground vibrations. However, most of these are concerned with the limit of cosmetic damage to buildings. For example, *BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Guide to damage levels from ground borne vibration* (BSI, 1993) states that the probability of damage to buildings tends towards zero at values for the Peak Particle Velocity at 12.5 mm/s or less. In addition for reinforced or framed structures the PPV value at which cosmetic damage will occur is 50 mm/s. This reduces to 20 mm/s for un-reinforced or light buildings at lower frequencies, increasing to 50 mm/s for frequencies above 40 Hz.

In Hong Kong the value for the peak velocity of 25 mm/s has been used for many years, and represents the maximum values normally acceptable for a building, in order to prevent cosmetic damage. However, for the purpose of this study the value of the peak particle velocity that causes significant structural damage such that a fatality or multiple fatalities are possible is required.

In the US Bureau of Mines Bulletin 656 *Blasting vibrations and their effects on structures* (USBoM) provide results obtained from blasting undertaken in Sweden. These results were obtained following blasting where the vibrations were attenuated very little with distance since both the charge location and the buildings were set in rock. In order to improve the economy of the blasting, larger charge weights were used that would result in minor damage. The cost of repair of the buildings was considered preferable to the use of smaller charge weights. Hence, there was a large amount of data obtained on damage to buildings from blasting. The results obtained are shown in Table 5.1.

Table 5.1 Damage Level due to Ground Vibration

Damage level	Peak particle velocity, mm/s (in/s)
No noticeable damage	70 (2.8)
Fine cracking and fall of plaster	110 (4.3)
Cracking	160 (6.3)
Serious cracking	231 (9.1)

Further information on the damage to buildings is provided by the US Department of Defence Standard DoD 6055.9-STD 2004 DOD Ammunition and explosives safety standards (USDoD, 2004). Paragraph C9.7.2.3.1.1 states that for the protection of residential buildings against significant structural damage by ground shock, the maximum particle velocity induced in the ground at the building site shall not exceed 9.0 in/sec or **229 mm/s** for strong rock.

Criteria adopted for building risk assessment were summarized as below:

- **PPV = 229mm/s – Building structural element collapse threshold.**
  It represents significant structural damage to a building. Note that based on expect judgment (ERP, 2008), PPV at this level is not likely to cause any structural element to collapse.

- **PPV = 100mm/s – Object falling threshold.**
  Based on the discussion below, it is assumed to represent a 1% fatality level within a building due to vibration causing object falling, but no major building damage is expected at this level.

A peak particle velocity significantly larger than the assumed threshold limit value of 229 mm/s, would be required to fail a typical building in Hong Kong (ERP, 2008). Hence the above criteria are considered to be conservative.

Building Collapse Models for Explosion/ Earthquake

Estimation of fatalities from falling objects relies on assumptions such as the number of objects with the potential to fall, weight and size of those objects, probability of fatality when a person is hit etc. Although the number of fatalities given an object of a given size can be estimated, the probability of objects falling due to ground vibration particularly at a low threshold value of 100mm/s is uncertain. It would depend on the condition of the building, presence of temporary or unauthorized structures etc.

For the types of buildings considered in the QRA, objects with the potential to fall are assumed to cover an area of 1 m2. Based on the maximum pedestrian population density of 0.5 person/m2 estimated in the QRA, the resulting number of fatalities due to an object falling is one. Even assuming conservatively that one object will fall on each side of a building, the expected number of fatalities will be 2 given a 50% chance of fatality for such an object falling (ERM, 2005).

Since, the assessment of risks due to objects falling due to blast vibrations involves the assessment of unknown factors, the QRA has used building collapse correlations applied to the entire building population (assuming full occupancy) to capture such unknown factors based on the consideration that building collapse will cause more fatalities than objects falling. Building vulnerability models have been well established and extensively used to determine the fatality rate due to damage or collapse of buildings caused by explosion or earthquake.

A review of building damage vulnerability models for partial building collapse / damage was carried in the WIL study (ERM, 2008). The fatality modes caused by partial collapse will be mainly due to the collapse of roofs, ceilings and walls, which may be considered as the most serious concern of objects falling causing fatality (i.e. more than one or two fatalities). The fatality rates calculated from various models for partial collapse of a building vary from 0.01% to 1.5%. A fatality rate of 1% has therefore been conservatively considered for fatalities resulting from objects falling.

For PPV values within the range of 100 mm/s (object falling threshold) and 229 mm/s (building collapse threshold), fatality probabilities have been interpolated.

5.3.2 Effect on slopes

The approach to assess the impact on slopes due to ground vibration effect has been developed in the WIL study (ERM, 2008).

The criteria for the failure of slopes based on the amount of shear displacement or slope movement (ERP, 2008) as appropriate to the study (as per WIL study (ERM, 2008)) are summarized below:

- 20 mm shear displacement or slope movement causes a 0.01% chance of slope failure

- 50 mm shear displacement leading to a 10% chance of slope failure (i.e. displacement is 2.5 times the 0.01% chance of slope failure)

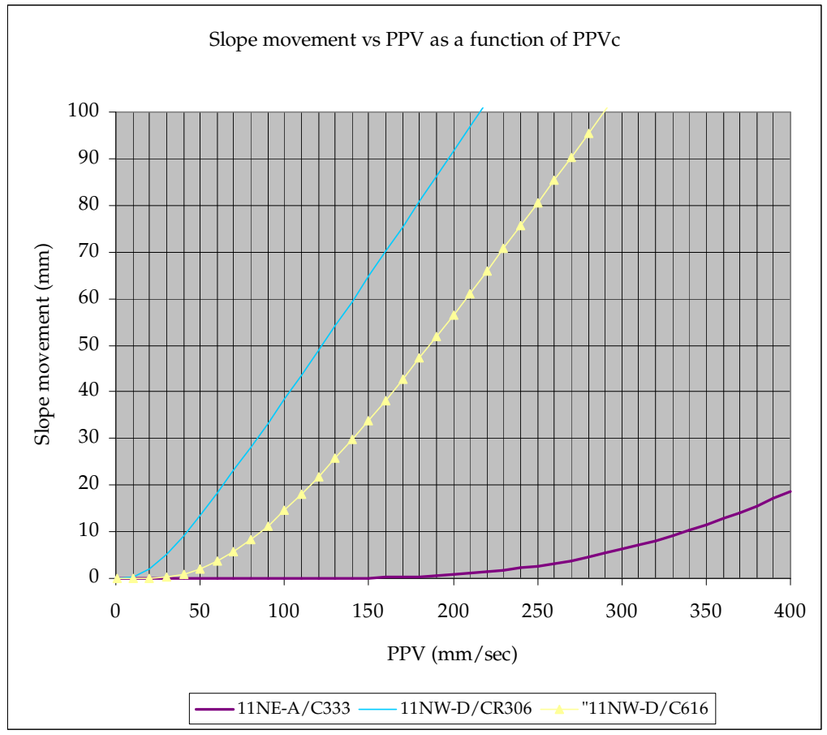
- 100 mm shear displacement leading to a 50% chance of slope failure (i.e. displacement is 5 times the 0.01% chance of slope failure)

- 200 mm shear displacement leading to a 100% chance of slope failure (i.e. displacement is 10 times the 0.01% chance of slope failure)

Therefore, for an estimated PPV value the amount of slope movement can be calculated for a given slope or wall, and hence the probability of its failure estimated. *Figure 5.1* shows the relationship between slope movement and PPV for the slopes under consideration in this study.

In addition, a screening criteria of PPV = 90 mm/s was adopted for the screening of slopes which are potentially at risk during the construction of SCL (TAW-HUH) alignment. This PPV level corresponds to 0.01% chance of a slope failure with a Factor of Safety (FOS) = 1.1. A detailed analysis was then conducted for each of the slopes which exceeded the above criteria.

Figure 5.1 Slope Movement for the Concerned Slopes in SCL (TAW-HUH) Study



5.3.3 Effect on the Beacon Hill North Gas Offtake Station

Damage to piping, valves, flanges and equipment fittings caused by ground vibrations from an explosion poses a significant hazard. A leak from piping or failure of the valve, flange or instrument fitting can lead to a gas release which can ignite. According to the AECOM Blasting Assessment Report, a vibration limit of 13 mm/s should be adopted for gas main offtakes, agreed in consultation with HKCG, and is a tolerable level at which no significant damage is expected. This represents the threshold PPV that is the onset of damage at which there may be some cosmetic damage to the station, possibly resulting in instrument disturbance or other minor issues, but is extremely unlikely to result in gas leakage. The assessment conservatively considers 1% probability of significant damage at the PPV of 13mm/s leading to pipe rupture, leakage of gas and, upon ignition, to fatality. In the absence of further data or appropriate technical guidelines regarding vibration effect on gas installations due to an aboveground explosion, the following conservative criteria were assumed:

- 13 mm/s PPV leads to a 1% probability of significant damage to pipeworks, valves and flanges at the gas station (i.e. damage threshold used in blast design), upon ignition, to fatality.

- 32.5 mm/s PPV leads to a 10% probability of significant damage to pipeworks, valves and flanges at the gas station (i.e. PPV is 2.5 times the 1% chance of damage), upon ignition, to fatality.

- 65 mm/s PPV leads to a 50% probability of significant damage to pipeworks, valves and flanges at the gas station(i.e. PPV is 5 times the 1% chance of damage), upon ignition, to fatality.

- 130 mm/s PPV leads to a 100% probability of significant damage to pipeworks, valves and flanges at the gas station(i.e. PPV is 10 times the 1% chance of damage), upon ignition, to fatality.

The criteria distribution pattern for the offtake station follows that for the slopes, as derived for the approved WIL study (ERM, 2008), based on the findings of the Expert Review Panel (ERP, 2008). Using these criteria, an estimated PPV value for the probability of damage for the installation can be estimated. A consequence analysis was then conducted to determine the population that will be impacted.

Based on petrochemical explosion experience (CCPS, 1999), pipework can withstand a significant overpressure from an explosion. Piping damage may start to occur in the range of 5 to 14 psi (~ 0.3 to 1 bar). It is conservatively considered in this study that a blast wave resulting in 5 psi on the pipe.

Based on the TNT Model (Yellow Book), the distance to 5 psi from an accidental explosion of the full load outside the tunnel is evaluated at 39 m. Any above ground gas pipe located within 39 m of an accidental explosion from the access path has been considered to rupture.

5.3.4 *Effect on Old Beacon Hill Tunnel*

The Old Beacon Hill Tunnel is a heritage structure that has been considered to be a sensitive receptor in this study. Due to its age, a vibration limit of 13 mm/s is used when assessing blast effects on the Old Beacon Hill Tunnel. The following conservative criteria for Old Beacon Hill Tunnel were assumed:

- 13 mm/s PPV leads to a 1% probability of significant damage to tunnel and subsequent damage to the pipeline (i.e. damage threshold used in blast design), upon ignition, to fatality.
- 32.5 mm/s PPV leads to a 10% probability of significant damage to tunnel and subsequent damage to the pipeline (i.e. PPV is 2.5 times the 1% chance of damage), upon ignition, to fatality.
- 65 mm/s PPV leads to a 50% probability of significant damage to damage to tunnel and subsequent damage to the pipeline (i.e. PPV is 5 times the 1% chance of damage), upon ignition, to fatality.
- 130 mm/s PPV leads to a 100% probability of significant damage to damage to tunnel and subsequent damage to the pipeline (i.e. PPV is 10 times the 1% chance of damage), upon ignition, to fatality.

5.3.5 *Effect on Underground and Aboveground Towngas Pipes*

A gas pipeline can potentially leak or rupture if it is subjected to strong vibrations from a nearby explosion. Again referring to the AECOM Blasting Assessment Report, towngas pipelines have a maximum allowable PPV of 25 mm/s, agreed in consultation with HKCG, and is a tolerable level at which no significant damage is expected. This represents the threshold PPV that is the onset of damage at which there may be some cosmetic damage but is extremely unlikely to result in gas leakage. The assessment conservatively considers 1% probability of significant damage at the PPV of 25mm/s leading to pipe rupture, leakage of gas and, upon ignition, to fatality. In the absence of further data or appropriate technical guidelines regarding vibration effect on gas pipelines the following criteria was assumed:

- 25 mm/s PPV leads to a 1% probability of significant damage to pipe (i.e. damage threshold in blast design), upon ignition, to fatality.
- 62.5 mm/s PPV leads to a 10% probability of significant damage to pipe (i.e. PPV is 2.5 times the 1% chance of damage), upon ignition, to fatality.
- 125 mm/s PPV leads to a 50% probability of significant damage to pipe (i.e. PPV is 5 times the 1% chance of damage), upon ignition, to fatality.
- 250 mm/s PPV leads to a 100% probability of significant damage to pipe (i.e. PPV is 10 times the 1% chance of damage), upon ignition, to fatality.

The criteria distribution pattern for the offtake station follows that for the slopes, as derived for the approved WIL study (ERM, 2008), based on the findings of the Expert Review Panel (ERP, 2008). Therefore, for an estimated PPV value the probability of damage for the pipes can be estimated. Taking into account also the ignition probability of the gas released, the resulting frequency of towngas explosion events can be determined, and thus the risk to the public can be assessed.

Aboveground pipelines may also be subject to overpressure effects as described in previous section.

5.3.6 *Effect on Sha Tin Water Treatment Works*

At 375 m distance to the closest facility from Hin Keng construction area, the maximum PPV at Shatin Water Treatment Works assuming full load detonation is 5 mm/s, which is insignificant for a ground vibration effect. Furthermore, overpressure effect is not possible since pressure waves will be screened by the hills surrounding STWTW. Therefore, STWTW will not be impacted by the construction of the SCL railway tunnel and no further analysis was carried out.

5.3.7 *Effect on Ma Tau Kok Gas Production Plant*

The Ma Tau Kok Gas Production Plant is 865 m away from the Ho Man Tin tunnel construction site. This distance is outside the blast effect distance assuming a full load detonation. Also, the maximum PPV at the plant assuming this worst case scenario is 1.8 mm/s. Since the impact of the SCL tunnel construction on the Ma Tau Kok Gas Production Plant is negligible, no further assessment was necessary.

5.3.8 *Effect on LPG Gas Station in Ma Chai Hang*

Damage to LPG storage tanks, piping, valves, flanges and equipment fittings caused by ground vibrations from an explosion poses a significant hazard. A leak from piping or failure of the valve, flange or instrument fitting can lead to a gas release which can ignite. A vibration limit of 13 mm/s which is similar to that of the gas mains offtake station has been adopted for the LPG station. This represents the threshold PPV that can potentially cause cosmetic damage to the station. In the absence of further data regarding vibration effect on gas installations due to an aboveground explosion, the following conservative criteria were assumed:

- 13 mm/s PPV leads to a 1% probability of damage to pipeworks, valves and flanges at the gas station (i.e. damage threshold used in blast design), upon ignition, to fatality.
- 32.5 mm/s PPV leads to a 10% probability of damage to pipeworks, valves and flanges at the gas station (i.e. PPV is 2.5 times the 1% chance of damage), upon ignition, to fatality.

- 65 mm/s PPV leads to a 50% probability of damage to pipeworks, valves and flanges at the gas station (i.e. PPV is 5 times the 1% chance of damage), upon ignition, to fatality.

- 130 mm/s PPV leads to a 100% probability of damage to pipeworks, valves and flanges at the gas station (i.e. PPV is 10 times the 1% chance of damage), upon ignition, to fatality.

Using these criteria, an estimated PPV value for the probability of damage for the installation can be estimated. A consequence analysis was then conducted to determine the population that will be impacted.

5.4 TERTIARY EFFECT MODELLING

5.4.1 Landslide Consequence

A landslide consequence classification system was published in the GEO Report 81 Slope Failures along BRIL Roads: Quantitative Risk Assessment and Ranking (CEDD, 1999) This provides an equation for the estimation of the number of fatalities:

$$N = \frac{\sum WFPEA}{V}$$

Where W is the width of the landslide plus an adjustment for effective stopping distance;
F is the frequency of passing passengers, which may be taken as the product of the Annual Average Daily Traffic (AADT) and the average number of people in a vehicle;
P is the probability of death due to being caught in the landslide;
E is the extent of the landslide equivalent to the number of lanes affected;
A is an adjustment factor for proportion of normal road usage at the time of the landslide; and
V is the speed of vehicles.

The following assumptions have been made in applying this model.

- Average speed of the vehicles is taken to be 30 miles/hr (48 km/h) based on the road conditions at the location of the magazine. It should be noted that the speed of the vehicles is not particularly sensitive to the calculation of N since the effect is largely compensated by the effective stopping distance.

- A stopping distance of approximately 23 m is assumed based on UK Highway Code data for a vehicle speed of 30 miles/hr (48 km/h) (UK Highway Code). This stopping distance includes the reaction time. Higher speeds will require greater stopping distances. However, it is considered that the road conditions at the site of the magazine prohibit excessive vehicle speeds.

- The probability of death, P, due to the landslides given is obtained from the GEO Report 81 (CEDD, 1999). GEO has developed the consequence model and has published papers on this subject (Wong). The past incidents show that for landslides the assumptions are reasonable. This model has been applied for several studies on landslides in Hong Kong.

Table 5.2 Probability of Fatality due to Landslide (CEDD, 1999)

Proximity to Slope	Probability of Death
Lane nearest the slope	0.8
2nd lane away from slope	0.6
3rd lane from slope	0.4

- For the failure of a retaining wall, that causes the collapse of a road, the probability of death is assumed to be 1 for the lanes affected.

- The parameter A can be taken as 0.82 and accounts for the fact that landslides are most likely to occur during heavy rainfall. However, as the possible slope failure is caused by explosives detonating it is assumed that the value for A is unity.

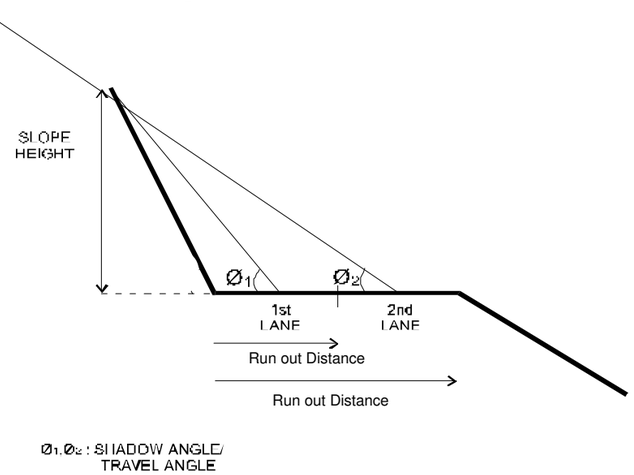
- To allow for the additional risk due to footpaths adjacent to the road, an adjustment factor is applied to the calculated value of N.

- To account for pedestrians, the calculated N value is increased by 10%.

The travel distance of landslide debris is influenced by the mechanism of its failure. For example, it would be expected that a landslide induced by rainfall will travel further than one caused by blasting as the soil and rock may behave in a more liquid manner. Therefore, the travel distance for rainfall induced landslides that involve liquefaction may be based on an apparent angle of friction of 15 to 30º. This apparent angle of friction or travel angle is defined as the inclination. The GEO Report 81 (CEDD, 1999) indicates that a typical rain induced landslide that involves a landslide volume less than 2000 m^3 generally ranges from 30 to 40°. For conservatism, it is assumed that a slope failure caused by detonation of explosives will result is a travel angle of 30°.

The relationship of shadow/travel angle and run out distance is illustrated by the following figure.

Figure 5.2 Influence Zone for Slope Failures



Therefore, the run out distance for the landslide, assuming a triangular volume, can be approximated by the equation:

$$L = \sqrt{\frac{2V}{W \tan(30)}}$$

Where L is the run out distance, m;
V is the slip volume, m^3; and
W is the slip width, m.

5.4.2 *Gas Piping Rupture Consequence*

To assess the risks on population arising from damage of Beacon Hill North Gas Offtake Station and towngas pipelines near Lion Rock Tunnel, the worst case scenario was assumed: A full rupture of 7 barg 600 mm gas pipeline with no isolation, leading to a gas release.

For towngas pipelines near Ho Man Tin Tunnels, a full rupture of 2 kPa 180mm gas pipeline with no isolation leading to a gas release, was assumed as the worst scenario.

Towngas

Towngas is a mixture of hydrogen, methane, carbon dioxide, carbon monoxide and small traces of nitrogen and oxygen. The proportion of gases is given in *Table 5.3.*

Table 5.3 Towngas Composition

Component	Composition (molar %)
Hydrogen	49
Methane	29.5
Carbon Dioxide	18

Component	Composition (molar %)
Carbon Monoxide	2
Nitrogen	1.5

The possible outcomes of a towngas release following ignition are:

- Fireball with subsequent jetfire;
- Flash fire; or
- Toxic dispersion

The frequencies associated with these events are shown in the event trees below. The base frequencies for the event trees were derived based on the fraction of the explosives delivery route that has a potential impact on the pipeline/offtake station. These fractions of the delivery route that represents 1%, 10%, 50% and 100% damage probabilities (refer to *Section 5.3.3* and *Section 5.3.4* for details) were then multiplied by the number of trips per year to get the travel lengths for each case. These travel lengths are interpreted as the distances travelled by the truck each year, along which there is potential damage to the pipeline/offtake station if the truck initiates.

The travel lengths are calculated using the criteria given in *Section 5.3.3* and *Section 5.3.4* for the offtake station and the towngas pipelines respectively. For example, for the offtake station, any transport route sections that lie within 79.5 m (corresponding to 32.5 mm/s PPV or 10% damage probability) from the station will be added up to give the travel length that contributes a 10% damage probability. Similarly, any transport route section that lie between 168 m (corresponding to 13 mm/s PPV or 1% damage probability) and 79.5 m (corresponding to 32.5 mm/s PPV or 10% damage probability) from the station will be added up to give the travel length for 1% damage probability.

The travel lengths, were then multiplied by the truck initiation frequency of 7.69E-10/km and then added up together, give the overall initiation frequency of the delivery route. For example, for the Beacon Hill North Gas Offtake Station, the frequency of initiation causing 1% damage probability is 3.86E-11/yr. No scenarios were observed along the delivery route that presents ≥ 10% damage probability to the station. Therefore, the overall initiation frequency is 3.86E-11/yr.

The probabilities of ignition in the event trees are consistent with previous QRA studies for gas mains not in the immediate vicinity of traffic or residential areas.

Figure 5.3 *Event Tree for a Full Towngas Pipeline Rupture at Hin Keng Portal*

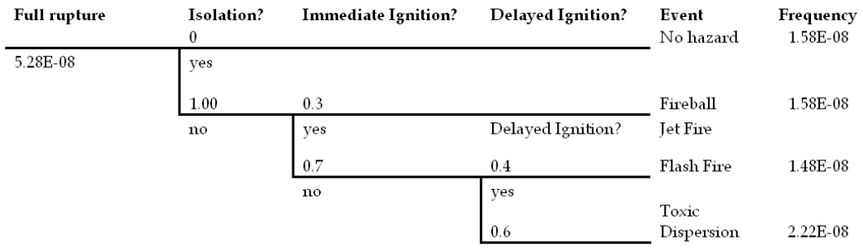
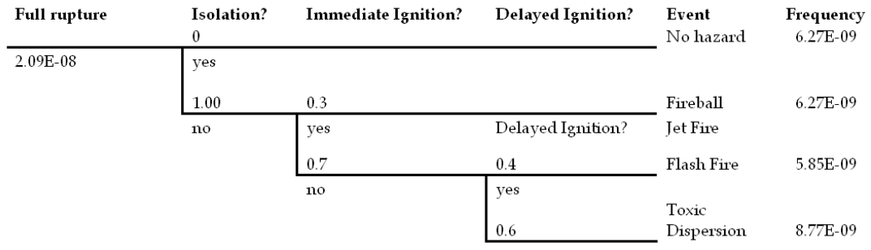


Figure 5.4 *Event Tree for a Full Towngas Pipeline Rupture at Ho Man Tin Tunnel*



Consequence analysis for a full pipe rupture scenario comprises the following:

- Source term modelling which involves determining the release rate variation with time and the thermodynamic properties of the released fluids
- Physical effects modelling, which involves estimating the effect zone of the various hazardous outcomes
- Assessment of the impact of hazardous outcomes on the exposed population using RISKPLOT™

Source Term Modelling

For a towngas release from pipeline rupture, an empirical correlation developed by Bell and modified by Wilson (CCPS, 1996) was adopted, which represents an isothermal pipeline gas release as a 'double exponential' that decreases with time. For such as release, the temperature drop is not expected to be significant and thus a final gas temperature of 24°C has been conservatively assumed.

Fireball was assumed to take place within 10 seconds of gas release. This will be followed by a subsequent jet fire.

Physical Effect Modelling

PHAST was used to model gas dispersion and the subsequent effects of fireball, jet fire, flash fire and toxic dispersion.

Fireball

In this assessment, a fireball has been modelled for immediate ignition of a full bore release from pipeline using PHAST. The mass of gas involved in the fireball has been conservatively assumed to be all the towngas released in a full pipe rupture for 10 s.

The fireball effects following a catastrophic rupture of the gas holder are modelled as follows (Yellow Book, 1997):

Fireball radius R (m) = $3.24\ M^{0.325}$

Duration t (s) = $0.852\ M^{0.26}$

where, M is mass in kg

A surface emissive power of 250kW/m² is assumed. Fatality probabilities have been calculated using a dose approach and for people entrapped in the fireball radius, the fatality is taken as 100%. Thermal radiation from a fireball has been modelled as shown in *Table 5.4* , taking into account its short duration.

Table 5.4 ***Fatality Probabilities for a Fireball***

Consequence Event	Endpoint Criteria(1)	Outdoor Fatality Probability	Indoor Fatality Probability	Fatality Probability In Vehicles
Fireball	Fireball Radius	1	0.1	0.25
	4167 TDU	0.9	0.09	0.225
	2669 TDU	0.5	0.05	0.125
	1038 TDU	0.03	0.003	0.0075

Note:
(1) TDU is the thermal dose unit $t\ I^{4/3}$ expressed in [s $(kW/m^2)^{4/3}$] derived from Lees' Probit (Lees, 1994)

Jet Fire

In this study, a subsequent jet fire following a fireball was assumed. The hazard distances to the 20.9 kW/m², 14.4 kW/m² and 7.3 kW/m² radiation levels were modelled using PHAST Shell correlation.

Flash Fire

Following a hazardous gas release, a large proportion of it will evaporate to form a flammable gas cloud. If the plume contacts an ignition source with concentration within its flammable limits (i.e. above its lower flammability limit (LFL)), the plume may ignite resulting in a flash fire. Using PHAST, the following hazard distances were determined for the flammable gas cloud:

- Maximum downwind distance (d) to the 0.85LFL of the cloud
- Maximum crosswind 0.85LFL distance (c) of the cloud
- Distance to the maximum crosswind 0.85LFL distance (m) of the cloud
- Maximum upwind 0.85LFL distance (s) of the cloud

Toxicity

Town gas contains carbon dioxide and carbon monoxide, which are toxic. Carbon dioxide is usually considered as a simple asphyxiant, although it is also a potent stimulus to respiration and both a depressant and excitant of the central nervous system. Concentrations of 20% to 30% result in unconsciousness and convulsions within one minute of exposure (CHW, 1998).

Carbon monoxide is a chemical asphyxiant. It combines with haemoglobin in the blood, thus displacing oxygen. The IDLH (Immediately Dangerous to Life and Health) value for CO is 1200ppm while for CO_2 it is 4% (USHHS, 1994).

The concentration corresponding to 1% fatality can be derived from probit equation assuming an exposure time to CO of 10 minutes to 30 minutes. The probit equation for CO (CPS, 1989) is

Pr = -37.98 + 3.7ln Ct

The probit value for 1% fatality is 2.67. The concentration corresponding to 1 minute, 3 minutes, 10 minutes and 30 minutes exposure for 1% fatality is given in *Table 5.5*. Since the concentration of CO in the gas is 2%, the equivalent concentration of the gas mixture was also derived.

Table 5.5 CO Concentration Corresponding to 1% Fatality

Exposure Time	Actual Conc. Of CO	Corresponding Conc. Of Gas Mixture
1 min	59070ppm	49%
3 min	19690ppm	16.4%
10 min	5907ppm	4.9%
30 min	1969ppm	1.6%
IDLH	1200ppm	1%

The concentration for 1% fatality corresponding to 10 minutes exposure is similar to the LFL (which is about 6%).

Persons indoors are expected to be offered some protection from the ingress of a toxic cloud in buildings, the fatality probability for indoor persons is therefore assumed to be one tenth of the outdoor fatality probability.

Impact Assessment

Thermal Radiation from Jet Fire

The conservative TNO Green Book equation has been used to determine the thermal impact radiation from jet fires to persons unprotected by clothing.

Y = -36.38 + 2.56 ln (t I 4/3)

where I is the radiant thermal flux (W/m²) and Y is the probit function which is related to the probability of fatality. This equation gives the data points presented in *Table 5.6*, assuming a 30 second exposure time. For areas lying between any two radiation flux contours, the equivalent fatality level is estimated as follows:

- For areas beyond the 50% fatality contour, the equivalent fatality is calculated using a 2/3 weighting towards the lower contour. For example, the equivalent fatality between the 1% and 50% contours is calculated as 2/3 x 1 + 1/3 x 50 = 17%;
- For areas within the 50% contour, the equivalent fatality is calculated with a 2/3 weighting towards the upper contour. For example, the equivalent fatality between the 90% and 50% contours is calculated as 2/3 x 90 + 1/3 x 50 = 77%.

The different approach above and below the 50% fatality contour is due to the sigmoid shape of the probit function.

Table 5.6 Levels of Fatality for 30s Exposure to Heat Fluxes

Incident Thermal Flux (kW/m²)	Fatality Probability for 30s Exposure	Equivalent Fatality Probability for Area between Radiation Flux Contours
7.3	1%	17%
14.4	50%	77%
20.9	90%	97%
35.5	99.9%	

Flash Fire

For a flash fire, a 100% fatality is assumed for any person outdoors within the flash fire envelope. The extent of flash fire is assumed to be the dispersion distance to 85% of the LFL for a conservative evaluation.

Indoor Protection Factor

To simplify the assessment, no protection factor has been assumed for outdoor population. For indoor population, a 90% protection factor has been taken.

Height Protection Factor

A height protection factor is used to factor down the population so that only those exposed (i.e. below the top of the cloud) are considered in the risk summation for a flash fire.

A height protection factor is determined by considering the relative height of each building with respect to the height of the dispersed cloud. The proportion of the building above the top of the cloud is the protection factor. All areas higher than 10 m (or 3 storeys) are assumed to be protected from the flash fire effects. While it is recognized that most dispersed clouds will have a cloud height lower than 10 m, this height is used because it roughly equates to the height of ground floor shops and markets hall. Even if the cloud is less than 10 m high, it will still these ground floor areas.

A jet fire has been assumed to only affect population below a 10 m elevation. This in effect assumes that a jet fire is horizontal or near-horizontal, and therefore reaching its maximum footprint radius. As with a flash fire, only those exposed (i.e. below 10 m elevation) are considered in the risk summation jet fire event, with the rest being excluded by use of a height protection factor.

Weather Data

Data on local meteorology such as wind speed, wind direction, weather stability, ambient temperature and humidity are required for gas dispersion modeling. This data was obtained from Hong Kong Observatory appropriate for both Lion Rock Tunnel and Ho Man Tin Tunnels. The annual average temperature and relative humidity is 24°C and 78% respectively. The weather classes and the probability of each weather state for each direction are shown in *Table 5.7.*

Table 5.7 Wind Speeds and Stability Classes

Wind Direction	Probability of Occurrence							
	Day				Night			
	2F	3D	7D	TOTAL	2F	3D	7D	TOTAL
0°	0.24%	0.56%	3.17%	3.97%	1.52%	0.38%	2.61%	4.51%
30°	0.08%	0.87%	1.82%	2.77%	0.87%	0.54%	2.83%	4.24%
60°	0.08%	1.27%	5.47%	6.82%	1.25%	0.65%	6.25%	8.15%
90°	0.16%	0.71%	29.66%	30.53%	0.87%	0.22%	30.94%	32.03%
120°	0.79%	1.51%	23.79%	26.09%	1.90%	0.60%	24.36%	26.86%
150°	0.63%	2.14%	9.83%	12.60%	2.39%	0.33%	5.11%	7.83%
180°	0.08%	0.32%	0.40%	0.80%	1.47%	0.11%	0.05%	1.63%
210°	0.32%	0.48%	0.63%	1.43%	0.98%	0.05%	0.49%	1.52%
240°	0.32%	0.95%	1.67%	2.94%	0.71%	0.16%	1.14%	2.01%
270°	0.48%	0.56%	0.71%	1.75%	0.87%	0.05%	0.44%	1.36%
300°	0.95%	0.79%	0.95%	2.69%	1.03%	0.44%	1.09%	2.56%
330°	0.24%	1.27%	6.11%	7.62%	1.52%	0.92%	4.84%	7.28%
TOTAL	4.13%	11.43%	84.21%	100%	15.38%	4.45%	80.15%	100%

The Pasquill-Gifford atmosphere stability classes used in *Table 5.7* are defined as follows:

A: Turbulent
B: Very unstable
C: Unstable
D: Neutral
E: Stable; and
F: Very stable.

Wind speed and solar radiation interact to determine the level of atmospheric stability, which in turn suppresses or enhances the vertical element of turbulent motion. The latter is a function of the vertical temperature profile in the atmosphere; the greater the rate of decrease in temperature with height, the greater the level of turbulence. Category D is neutral and neither enhances nor suppresses atmospheric turbulence. Wind directions refer to the angle of the prevailing wind. For example, 0° is refers to a northerly wind, 90° easterly, 180° southerly and 270° westerly.

5.4.3 LPG Gas Station Equipment Rupture Consequence

The main hazard associated with an LPG facility is an uncontrolled release of LPG resulting in a fire or explosion upon ignition. Rupture of vessels may result in fireballs or flash fires while leaks may cause jet fires or flash fires. Boiling Liquid Expanding Vapour Explosion (BLEVE) of the LPG storage tank is not considered possible since the LPG is assumed to be stored in mounded tanks.

Liquified Petroleum Gas (LPG)

LPG is a flammable mixture than contains propane and butane in varying proportions. Composition of LPG used for this study is shown in *Table 5.3.*

Table 5.8 LPG Composition

Component	Composition (molar %)
Propane	30
Butane	70

The possible outcomes of an LPG release following ignition are:

- Fireball; or
- Flash fire

The base frequencies for these scenarios were derived from the vibration modelling. Here, a probability of damage was defined for each scenario where a multiple MIC explosion resulted in a vibration level greater than 13mm/s on the LPG gas station. The criteria used to define the probability of damage are documented in Section 5.3.8. The product of each probability of damage and its corresponding actual frequency of multiple MIC detonation were then summed to arrive at the base frequency.

Based on 0.3 as an ignition probability, the flash fire frequency was found to be 9.48E-07 per year. Since fireballs are basically the worst case scenario resulting from a catastrophic failure of a mounded LPG tank, which is highly unlikely, the fireball frequency was estimated based on 1% of the flash fire frequency and was found to be 9.48E-09 per year.

Consequence analysis for a full pipe rupture scenario comprises the following:

- Source term modelling which involves determining the release rate variation with time and the thermodynamic properties of the released fluids;
- Physical effects modelling, which involves estimating the effect zone of the various hazardous outcomes; and
- Assessment of the impact of hazardous outcomes on the exposed population using RISKPLOT™.

Source Term Modelling

A source term is the information required by gas dispersion, fireball or other consequence models to describe the discharge rate and quantity of hazardous substance to be considered. Standard orifice type calculations are used to determine the rate of discharge, based on conditions of pressure, temperature and phase of material. Duration of discharge is determined from inventory and release rate. LPG in Hong Kong is a mixture of 70% butane and 30% propane. Vessels are conservatively assumed to be full at time of failure; 10 tonnes for the storage vessel.

LPG is stored in liquid form by pressurisation to moderate pressures depending on ambient temperature. Fireball and flash fires were assumed to take place after release.

Physical Effect Modelling

PHAST was used to model gas dispersion and the subsequent effects of fireball and flash fire.

Fireball

Catastrophic failures are characterised by a rapid propagation of a crack leading to a sudden release of the contents inside a pressurised vessel. Immediate ignition results in a fireball, which gives a massive transient dose of thermal radiation. Due to its short duration, large size and high intensity, fireballs are not significantly influenced by weather, wind direction or wind speed. Its size, height, duration and thermal radiation flux are calculated using the HSE model within PHAST. People entrapped inside the fireball radius are seriously injured and the fatality is taken as 100%. Outside the fireball radius, radiation effects were found to be negligible due to the short duration of fireballs for the size of releases encountered in this study

Gas Dispersion and Flash Fires

LPG evaporates rapidly following a release, generating a dispersing vapour cloud if there is no ignition source nearby. The cloud expands and migrates from its release point and may affect offsite locations. The built-in dispersion model in PHAST is used to predict the shape, size, concentration and migration of the vapour cloud.

The principal hazard arising from delayed ignition of an LPG vapour cloud is a flash fire. The flash fire envelope is modelled by calculating the dispersion distance up to the lower flammability limit (LFL).

It is considered that there is no scope for escape for persons within the flammable limits of a flash fire: a fatality probability of 100% is assumed. Flash fires are, however, short duration events with low levels of thermal radiation outside the flash fire. Persons outside the flash fire envelope are therefore assumed to be unaffected by a flash fire.

Impact Assessment

Population in the vicinity of the LPG Gas Station can be potentially affected by the hazardous outcomes depending on the consequence distances. Fireballs from the LPG storage vessels have a radius of up to 75 m and a lift-off height of more than 100m. Due to the lift-off and rise of fireballs, they are assumed to affect the full height of residential blocks facing the LPG Gas Station. Units that are not overlooking the station are assumed to be unaffected by fireballs. For a flash fire, a 100% fatality is assumed for any person outdoors within the flash fire envelope.

The manning level in the LPG Gas Station was conservatively assumed to be 5 persons.

Weather Data

Data on local meteorology such as wind speed, wind direction, weather stability, ambient temperature and humidity are required for gas dispersion modeling. This data was obtained from the Hong Kong Observatory and is appropriate for both Lion Rock Tunnel and Ho Man Tin Tunnels. The weather data used is identical to that used in the gas piping rupture consequence model and is documented in Section 5.4.2.

5.5 RESULTS OF CONSEQUENCE ASSESSMENT

5.5.1 3-D Review of Features

The ground vibration levels at a given receptor will depend on the distance between the receptor and the blasting point. The location of the blast site will move forward every time the proceeding blast completes and the rock spoil is removed. Therefore, the distance between the features and the blasting site will vary for each and every blast.

In order to consider the dynamic characteristic of the blasting work, a 3-dimensional review was carried out to assess the nearest features to the blasting site. The graphical representations for the SCL (TAW-HUH) alignment with the sensitive receivers are shown in *Figure 3.1* and *Figure 3.2.*

5.5.2 Screening of Features for Consequence Assessment

During the review, every feature was represented by one or more coordinates in a 3-dimensional plane (Northing, Easting, and Elevation) based on data given in the Blast Assessment Report (MTR, 2010). Similarly, every chainage interval of the alignment was represented by a single point. The nearest feature for every chainage section was then identified.

The vibration level for the nearest feature for every chainage was assessed for a charge weight equivalent to 2 to 6 times of the base MIC. The charge weight of more than 6 MIC was not considered for a credible case for consequence assessment as the occurrence frequency is much lower than 10^{-9} for the SCL (TAW-HUH) project (see the *Data Report*).

The results show that no building will be subject to failure due to the use of explosives for rock excavation, based on the limit of 229 mm/s required to cause significant structural damage.

However, a vibration level of 100 mm/s will be reached for some buildings or features (excluding slopes and boulders), whereas a vibration limit of 90 mm/s will be reached for some slopes and boulders for a charge weight of 5 and 6 MIC. The 90mm/s for the slopes/ retaining walls and boulders was chosen for screening out the relevant slopes and boulders for further analysis, as mentioned previously. Therefore, each of the concerned slopes and boulders were further assessed to determine if a failure will occur at a charge weight of 5 and 6 MIC.

5.5.3 Consequence Assessment for Specific Features

If a feature is susceptible to a vibration level higher than 90 mm/s (for slopes and boulders) or 100 mm/s (for buildings) from the nearest chainage, it may also be affected by the adjacent chainage. Therefore, the effects from the adjacent chainage were also assessed.

With respect to slopes and boulders, the minimum vibration level that will initiate a slope / boulder failure was assessed for each of them based on their individual characteristics.

With respect to the gas facilities and pipes, the minimum vibration level that will initiate a probability of failure was also assessed based on their individual characteristics.

The hazard footprints in terms of PPV were then established for each particular feature, with respect to a range of chainage that may establish a footprint of 100 mm/s for buildings or that of the specific minimum vibration level for failure for slopes and boulders. The chainage was studied at 10-m intervals and those that can establish a hazard footprint on these criteria were identified.

5.5.4 Consequence Assessment Results for the Construction of Lion Rock Tunnel for SCL (TAW-HUH) Alignment

Ground Vibration Effect on Slopes due to Errors in Blasting Face

One slope feature (for full load detonation) was identified for further assessment based on the screening criteria of PPV = 90 mm/s during construction of Lion Rock Tunnel. The data of the affected slopes are summarized in Table 5.9.

No Slopes were found to exceed a PPV of 90mm/s due to accidental initiation of up to 6MIC during the construction of the Lion Rock Tunnel.

Table 5.9 Analysis of Slopes Exceeding Peak Particle Velocity of 90 mm/s due to full load detonation during the Construction of Lion Rock Tunnel

Mapsheet	Type[1]	No.	Static F.O.S	Slope length (m) [2]	Slope depth (m) [3]	Slope Material	PPVc (mm/s)	Slip Volume (m3) [4]	PPV correspond to 100% slope failure (mm/s)	PPV correspond to 50% slope failure (mm/s)	PPV correspond to 10% slope failure (mm/s)	PPV correspond to 0.01% slope failure (mm/s)
11NE-A	C	333	1.361	270	15.2	Soil	111.5	112815	989 [5]	719 [5]	549 [5]	408[5]

Notes:

(1) C-Cut Slope, F-Fill Slope, CR/FR – Slope & Retaining Wall, R-Retaining Wall

(2) Slope length along its own slope

(3) Slope depth measured as a perpendicular distance below the slope surface

(4) It is assumed that the slope failure width is equal to the length and that the volume = $\pi * length^2 * depth / 6$.

(5) PPV > 400 mm/s which is unachievable based on the assessment

Ground Vibration Effect on Buildings due to Errors in Blasting Face

It was found that the building structural element collapse threshold (PPV = 229 mm/s) considering accidental explosion up to 6MIC is not applicable.

It was found that, however some features along the alignment would reach the object falling threshold (PPV = 100 mm/s, the 1% fatality threshold), the results are summarized below.

Table 5.10 ***Features Affected by Higher than Expected Vibrations Generated by Accidental Initiation during the Construction of Lion Rock Tunnel***

Scenario/ Chainage	Features Affected	Observed PPV (mm/s)
4MIC detonated at the same time		
211-LRT-27190	Shaft D'wall	105
213-LRT-27210	Shaft D'wall	104
5MIC detonated at the same time		
210-LRT-27180	Shaft D'wall	103
211-LRT-27190	Shaft D'wall	121
212-LRT-27200	Shaft D'wall	101
213-LRT-27210	Shaft D'wall	119
6MIC detonated at the same time		
210-LRT-27180	Shaft D'wall	115
211-LRT-27190	Shaft D'wall	135
212-LRT-27200	Shaft D'wall	113
213-LRT-27210	Shaft D'wall	133

Ground Vibration Effects on the Old Beacon Hill Tunnel due to Errors in Blast Face

The following failure scenarios were found to occur based on the maximum allowable PPV of 13 mm/s.

Table 5.11 ***Features (Old Beacon Hill Tunnel) Affected by Higher than Expected Vibrations Generated by Accidental Initiation during the Construction of Lion Rock Tunnel***

Scenario/ Chainage	Features Affected	Observed PPV (mm/s)
2MIC detonated at the same time		
435-LRT-29430	Gas Main Tunnel Nearest to proposed tunnel	14
436-LRT-29440	Gas Main Tunnel Nearest to proposed tunnel	13
437-LRT-29450	Gas Main Tunnel Nearest to proposed tunnel	14
438-LRT-29460	Gas Main Tunnel Nearest to proposed tunnel	15
439-LRT-29470	Gas Main Tunnel Nearest to proposed tunnel	17
440-LRT-29480	Gas Main Tunnel Nearest to proposed tunnel	16
441-LRT-29490	Gas Main Tunnel Nearest to proposed tunnel	15
3MIC detonated at the same time		
433-LRT-29410	Gas Main Tunnel Nearest to proposed tunnel	14
434-LRT-29420	Gas Main Tunnel Nearest to proposed tunnel	15
435-LRT-29430	Gas Main Tunnel Nearest to proposed tunnel	17
436-LRT-29440	Gas Main Tunnel Nearest to proposed tunnel	17
437-LRT-29450	Gas Main Tunnel Nearest to proposed tunnel	18
438-LRT-29460	Gas Main Tunnel Nearest to proposed tunnel	19
439-LRT-29470	Gas Main Tunnel Portal	14
	Gas Main Tunnel Nearest to proposed tunnel	22
440-LRT-29480	Gas Main Tunnel Portal	13
	Gas Main Tunnel Nearest to proposed tunnel	21
441-LRT-29490	Gas Main Tunnel Nearest to proposed tunnel	19
4MIC detonated at the same time		
430-LRT-29380	Gas Main Tunnel Nearest to proposed tunnel	15
431-LRT-29390	Gas Main Tunnel Nearest to proposed tunnel	15
432-LRT-29400	Gas Main Tunnel Nearest to proposed tunnel	15
433-LRT-29410	Gas Main Tunnel Nearest to proposed tunnel	16
434-LRT-29420	Gas Main Tunnel Nearest to proposed tunnel	17
435-LRT-29430	Gas Main Tunnel Nearest to proposed tunnel	21
436-LRT-29440	Gas Main Tunnel Nearest to proposed tunnel	20
437-LRT-29450	Gas Main Tunnel Nearest to proposed tunnel	21
438-LRT-29460	Gas Main Tunnel Nearest to proposed tunnel	22
	Gas Main Tunnel Portal	14
439-LRT-29470	Gas Main Tunnel Nearest to proposed tunnel	27
	Gas Main Tunnel Portal	17
440-LRT-29480	Gas Main Tunnel Portal	16
	Gas Main Tunnel Nearest to proposed tunnel	25
441-LRT-29490	Gas Main Tunnel Portal	15
	Gas Main Tunnel Nearest to proposed tunnel	23
442-LRT-29500	Gas Main Tunnel Nearest to proposed tunnel	15
5MIC detonated at the same time		
428-LRT-29360	Gas Main Tunnel Nearest to proposed tunnel	14
429-LRT-29370	Gas Main Tunnel Nearest to proposed tunnel	15

Scenario/ Chainage	Features Affected	Observed PPV (mm/s)
430-LRT-29380	Gas Main Tunnel Nearest to proposed tunnel	18
431-LRT-29390	Gas Main Tunnel Nearest to proposed tunnel	17
432-LRT-29400	Gas Main Tunnel Nearest to proposed tunnel	18
433-LRT-29410	Gas Main Tunnel Nearest to proposed tunnel	19
434-LRT-29420	Gas Main Tunnel Nearest to proposed tunnel	20
435-LRT-29430	Gas Main Tunnel Nearest to proposed tunnel	24
435-LRT-29430	Gas Main Tunnel Portal	15
436-LRT-29440	Gas Main Tunnel Portal	14
436-LRT-29440	Gas Main Tunnel Nearest to proposed tunnel	23
437-LRT-29450	Gas Main Tunnel Portal	15
437-LRT-29450	Gas Main Tunnel Nearest to proposed tunnel	24
438-LRT-29460	Gas Main Tunnel Portal	16
438-LRT-29460	Gas Main Tunnel Nearest to proposed tunnel	26
439-LRT-29470	Gas Main Tunnel Portal	19
439-LRT-29470	Gas Main Tunnel Nearest to proposed tunnel	30
440-LRT-29480	Gas Main Tunnel Portal	18
440-LRT-29480	Gas Main Tunnel Nearest to proposed tunnel	29
441-LRT-29490	Gas Main Tunnel Portal	17
441-LRT-29490	Gas Main Tunnel Nearest to proposed tunnel	26
442-LRT-29500	Gas Main Tunnel Nearest to proposed tunnel	17
6MIC detonated at the same time		
428-LRT-29360	Gas Main Tunnel Nearest to proposed tunnel	16
429-LRT-29370	Gas Main Tunnel Nearest to proposed tunnel	17
430-LRT-29380	Gas Main Tunnel Nearest to proposed tunnel	20
431-LRT-29390	Gas Main Tunnel Nearest to proposed tunnel	19
432-LRT-29400	Gas Main Tunnel Nearest to proposed tunnel	20
433-LRT-29410	Gas Main Tunnel Nearest to proposed tunnel	21
	Gas Main Tunnel Portal	13
434-LRT-29420	Gas Main Tunnel Portal	14
	Gas Main Tunnel Nearest to proposed tunnel	22
435-LRT-29430	Gas Main Tunnel Portal	16
	Gas Main Tunnel Nearest to proposed tunnel	27
436-LRT-29440	Gas Main Tunnel Portal	16
	Gas Main Tunnel Nearest to proposed tunnel	25
437-LRT-29450	Gas Main Tunnel Portal	17
	Gas Main Tunnel Nearest to proposed tunnel	27

Scenario/ Chainage	Features Affected	Observed PPV (mm/s)
438-LRT-29460	Gas Main Tunnel Portal	18
	Gas Main Tunnel Nearest to proposed tunnel	29
439-LRT-29470	Gas Main Tunnel Portal	21
	Gas Main Tunnel Nearest to proposed tunnel	34
440-LRT-29480	Gas Main Tunnel Portal	21
	Gas Main Tunnel Nearest to proposed tunnel	32
441-LRT-29490	Gas Main Tunnel Portal	19
	Gas Main Tunnel Nearest to proposed tunnel	29
442-LRT-29500	Gas Main Tunnel Portal	14
	Gas Main Tunnel Nearest to proposed tunnel	19

Ground Vibration Effects on the LPG Gas Station due to Errors in Blast Face

The following failure scenarios were found to occur based on the maximum allowable PPV of 13 mm/s.

Table 5.12 Features (LPG Gas Station) Affected by Higher than Expected Vibrations Generated by Accidental Initiation during the Construction of Lion Rock Tunnel

Scenario/ Chainage	Features Affected	Observed PPV (mm/s)
3MIC detonated at the same time		
213-LRT-27210	LPG Gas Station	14
214-LRT-27220	LPG Gas Station	17
215-LRT-27230	LPG Gas Station	17
216-LRT-27240	LPG Gas Station	17
217-LRT-27250	LPG Gas Station	17
218-LRT-27260	LPG Gas Station	17
219-LRT-27270	LPG Gas Station	17
220-LRT-27280	LPG Gas Station	17
221-LRT-27290	LPG Gas Station	17
222-LRT-27300	LPG Gas Station	17
223-LRT-27310	LPG Gas Station	17
224-LRT-27320	LPG Gas Station	17
225-LRT-27330	LPG Gas Station	17
226-LRT-27340	LPG Gas Station	17
227-LRT-27350	LPG Gas Station	17
228-LRT-27360	LPG Gas Station	17
229-LRT-27370	LPG Gas Station	17
230-LRT-27380	LPG Gas Station	17
231-LRT-27390	LPG Gas Station	17
232-LRT-27400	LPG Gas Station	17
233-LRT-27410	LPG Gas Station	15
234-LRT-27420	LPG Gas Station	14
4MIC detonated at the same time		
213-LRT-27210	LPG Gas Station	17
214-LRT-27220	LPG Gas Station	20

Scenario/ Chainage	Features Affected	Observed PPV (mm/s)
215-LRT-27230	LPG Gas Station	20
216-LRT-27240	LPG Gas Station	20
217-LRT-27250	LPG Gas Station	20
218-LRT-27260	LPG Gas Station	20
219-LRT-27270	LPG Gas Station	20
220-LRT-27280	LPG Gas Station	20
221-LRT-27290	LPG Gas Station	20
222-LRT-27300	LPG Gas Station	20
223-LRT-27310	LPG Gas Station	20
224-LRT-27320	LPG Gas Station	20
225-LRT-27330	LPG Gas Station	20
226-LRT-27340	LPG Gas Station	20
227-LRT-27350	LPG Gas Station	20
228-LRT-27360	LPG Gas Station	20
229-LRT-27370	LPG Gas Station	20
230-LRT-27380	LPG Gas Station	20
231-LRT-27390	LPG Gas Station	20
232-LRT-27400	LPG Gas Station	20
233-LRT-27410	LPG Gas Station	18
234-LRT-27420	LPG Gas Station	17
235-LRT-27430	LPG Gas Station	13
5MIC detonated at the same time		
213-LRT-27210	LPG Gas Station	20
214-LRT-27220	LPG Gas Station	23
215-LRT-27230	LPG Gas Station	23
216-LRT-27240	LPG Gas Station	23
217-LRT-27250	LPG Gas Station	23
218-LRT-27260	LPG Gas Station	23
219-LRT-27270	LPG Gas Station	23
220-LRT-27280	LPG Gas Station	23
221-LRT-27290	LPG Gas Station	23
222-LRT-27300	LPG Gas Station	23
223-LRT-27310	LPG Gas Station	23
224-LRT-27320	LPG Gas Station	23
225-LRT-27330	LPG Gas Station	23
226-LRT-27340	LPG Gas Station	23
227-LRT-27350	LPG Gas Station	23
228-LRT-27360	LPG Gas Station	23
229-LRT-27370	LPG Gas Station	23
230-LRT-27380	LPG Gas Station	23
231-LRT-27390	LPG Gas Station	23
232-LRT-27400	LPG Gas Station	23
233-LRT-27410	LPG Gas Station	20
234-LRT-27420	LPG Gas Station	19
235-LRT-27430	LPG Gas Station	15
236-LRT-27440	LPG Gas Station	14
237-LRT-27450	LPG Gas Station	14
6MIC detonated at the same time		
213-LRT-27210	LPG Gas Station	22
214-LRT-27220	LPG Gas Station	25
215-LRT-27230	LPG Gas Station	25
216-LRT-27240	LPG Gas Station	25
217-LRT-27250	LPG Gas Station	25
218-LRT-27260	LPG Gas Station	25
219-LRT-27270	LPG Gas Station	25
220-LRT-27280	LPG Gas Station	25
221-LRT-27290	LPG Gas Station	25
222-LRT-27300	LPG Gas Station	25
223-LRT-27310	LPG Gas Station	25
224-LRT-27320	LPG Gas Station	25
225-LRT-27330	LPG Gas Station	25
226-LRT-27340	LPG Gas Station	25
227-LRT-27350	LPG Gas Station	25
228-LRT-27360	LPG Gas Station	25
229-LRT-27370	LPG Gas Station	25
230-LRT-27380	LPG Gas Station	25
231-LRT-27390	LPG Gas Station	25
232-LRT-27400	LPG Gas Station	25
233-LRT-27410	LPG Gas Station	23
234-LRT-27420	LPG Gas Station	21
235-LRT-27430	LPG Gas Station	17
236-LRT-27440	LPG Gas Station	16
237-LRT-27450	LPG Gas Station	15
238-LRT-27460	LPG Gas Station	14

Further consequence analysis was carried out on the LPG Gas Station to assess the risks on population due to gas leak hazards; see *Section 6*.

Ground Vibration Effect on Towngas Pipelines due to Errors in Blast Face

Ground vibration effect on the Towngas Pipeline was not separately assessed here as it has already been assessed in the previous subsection, damage to the Old Beacon Hill Tunnel and subsequent damage to the pipeline, adopting more stringent criteria.

Ground Vibration Effect on Buildings due to Detonation of Full Load during the Transfer of Explosives from Delivery Point to Blast Site

The effect from ground vibrations caused by the denotation of 321 kg and 200 kg of explosives within the tunnel whilst transferring explosives to the appropriate blast site may cause damage to nearby buildings. The calculation for ground vibrations follows the equation given in *Section 5.2.1* with a value of K = 200.

Table 5.13 gives the results for buildings that are affected by detonation of full load during construction of the tunnels. For conservatism, the PPV given in the table is the highest PPV experienced by the structure and the minimum fatality is assumed to be one.

Table 5.13 Buildings Exceeding Peak Particle Velocity of 100 mm/s due to Full Load Initiation during Construction of Lion Rock Tunnel

Scenario	Feature Affected	Observed PPV (mm/s)

Scenario	Feature Affected	Observed PPV (mm/s)
Full load detonation at LRT Chainage 29160-29200	High Island Water Tunnel	1316
Full load detonation at LRT Chainage 27180-27210	Shaft D'Wall	2330

Ground Vibration Effect on Slopes due to Detonation of Full Load during the Transfer of Explosives from Delivery Point to Blast Site

A screening value of 90 mm/s for PPV was applied for assessing the failure of slopes, below which the probability of slope failure is considered insignificant. The probability of failure follows the criteria given in *Section 5.2.1*. Table 5.16 gives the results for slopes that are affected by detonation of full load during construction of the tunnels. For conservatism, the PPV given in the table is the highest PPV experienced by the slope.

Table 5.14 Slopes Exceeding Peak Particle Velocity of 90 mm/s due to Full Load Initiation during Construction of Lion Rock Tunnel

Scenario	Feature Affected	Observed PPV (mm/s)
Full load detonation at LRT Chainage 27180-27200	11NE-A/C333	588

Blast Effects due to Detonation of Full Load during the Transfer of Explosives from Delivery Point to Blast Site

Blast effects due to the detonation of a full load during the transfer of explosives are summarised in *Table 5.15*.

Table 5.15 Summary of Blast Effect Associated with Transport of Explosives from Delivery Point to Blast Site at Lion Rock Tunnel

Scenario	Description	TNT eqv. (kg)	Freq. (/yr)	*Indoor*		*Outdoor*	
				Fatality Prob.	Impact distance (m)	Fatality Prob.	Impact distance (m)
S01	Initiation of explosives during explosives delivery from delivery point at Hin Tin Street to Hin Keng Portal	321	3.74E-09	90%	21	90%	17
				50%	24	50%	17
				10%	36	10%	19
				3%	48	3%	21
				1%	62	1%	22
S02	Initiation of explosives during explosives delivery from Hin Keng Portal to blast site	321	4.92E-08	90%	21	90%	17
				50%	24	50%	17
				10%	36	10%	19
				3%	48	3%	21
				1%	62	1%	22
S03	Initiation of explosives during explosives delivery from Ma Chai Hang Ventilation Building to blast site	200	4.33E-07	90%	19	90%	15
				50%	22	50%	16
				10%	32	10%	17
				3%	43	3%	19
				1%	57	1%	20

Ground Vibration Effect on Towngas Installations due to Detonation of Full Load during the Transfer of Explosives from Delivery Point to Blast Site

Beacon Hill North Gas Offtake Station

The highest probability of damage to the Beacon Hill North Gas Offtake Station is 1%. This probability of damage was determined based on the calculated vibration level (PPV) on the offtake station from full load detonation (i.e. 321 kg explosives) compared to the conservative criteria as developed in *Section 5.3.3*. It was found that a length of 20 m along the delivery route could cause the vibration (with 13 mm/s ≤ PPV level < 32.5 mm/s) on the gas offtake station up to a 1% probability of damage of its pipeworks, valves and flanges at the station. *Table 5.16* summarizes the results for effect of ground vibration on the offtake station.

Table 5.16 Consequence of Ground Vibration Effect on Beacon Hill North Gas Offtake Station from Full Load Detonation during Construction of Lion Rock Tunnel

Scenario	Frequency (/yr)	Travel Distance along Delivery Route (m)
Full load detonation along delivery route causing 1% damage to the offtake station by vibration effect	3.86E-11	20

Towngas Pipelines

A 2-D analysis was carried out for risk assessment of Towngas pipelines since this gives a conservative result compared to when elevation is considered in the assessment. The probabilities of damage to the pipelines were determined based on the calculated vibration level (PPV) on the pipes from full load detonation (i.e. 321 kg explosives) compared to the conservative criteria as developed in *Section 5.3.4*. *Table 5.17* summarizes the results. Note that in all cases the pipes were modelled as a 7 barg 600 mm gas main for conservatism.

Table 5.17 Consequence of Ground Vibration Effect on Towngas Pipelines from Full Load Detonation during Construction of Lion Rock Tunnel

Scenario	Frequency (/yr)	Travel Distance along Delivery Route (m)
Full load detonation along delivery route causing 1% damage to towngas pipelines around Hin Keng Portal by vibration effect	5.79E-11	30

Blast Effects on Towngas Installations due to Detonation of Full Load during the Transfer of Explosives Along Access Path

Based on the 39 m hazard distance described in *Section 5.3.3*, there is no risk of full pipe rupture at Beacon Hill North Gas Offtake Station caused by blast effects when 321 kg of explosives is detonated along the access path to Hin Keng Portal since the nearest point of the delivery route is 52 m away from the station.

For the aboveground gas mains, the blast effects resulting from a full load detonation is shown in *Table 5.18*.

Table 5.18 Consequence of Blast Effects on Towngas Pipelines from Full Load Detonation during Construction of Lion Rock Tunnel

Scenario	Frequency (/ yr)	Travel Distance along Access Path (m)
Full load detonation along delivery route causing 1% damage to towngas pipelines around Hin Keng Portal by blast effect	5.28E-08	39

Further consequence analysis was carried out on the pipelines to assess the risks on population due to gas leak hazards; see *Section 6*.

5.5.5 Consequence Assessment Results for Construction of Ho Man Tin Tunnels for SCL (TAW-HUH) Alignment

Ground Vibration Effect on Slopes due to Errors in Blasting Face

Two slope features (for full load detonation) have been identified for further assessment based on the screening criteria of PPV = 90 mm/s during construction of Ho Man Tin Tunnels. The data of the affected slopes are summarized in Table 5.19.

No Slopes were found to exceed a PPV of 90mm/s due to accidental initiation of up to 6MIC during the construction of the Ho Man Tin Tunnel.

Table 5.19 Analysis of Slopes Exceeding Peak Particle Velocity of 90 mm/s due to full load detonation during the Construction of Ho Man Tin Tunnels

Mapsheet	Type(1)	No.	Static F.O.S	Slope length (m) (2)	Slope depth (m) (3)	Slope Material	PPVc (mm/s)	Slip Volume (m3) (4)	PPV correspond to 100% slope failure (mm/s)	PPV correspond to 50% slope failure (mm/s)	PPV correspond to 10% slope failure (mm/s)	PPV correspond to 0.01% slope failure (mm/s)
11NW-D	CR	306	1.159	10.5	6.5	Soil	4	375	400	216	122	64
11NW-D	C	616	1.2	-	-	Soil & Rock	15	6	482	289	186	115

Notes:

(1) C-Cut Slope, F-Fill Slope, CR/FR – Slope & Retaining Wall, R-Retaining Wall

(2) Slope length along its own slope

(3) Slope depth measured as a perpendicular distance below the slope surface

(4) It is assumed that the slope failure width is equal to the length and that the volume = $\pi * \text{length}^2 * \text{depth} / 6$.

Ground Vibration Effect on Buildings due to Errors in Blasting Face

1 building was found to exceed a PPV of 100 mm/s. However, no building was found to exceed the building structural element collapse threshold (PPV=229m/s) considering accidental explosions up to 6MIC.

It was also found that, one temporary structure along the alignment would exceed a PPV of 100mm/s.

Table 5.20 ***Features Affected by Higher than Expected Vibrations Generated by Accidental Initiation during the Construction of Ho Man Tin Tunnels***

Scenario/ Chainage	Features Affected	Observed PPV (mm/s)
2MIC detonated at the same time		
1-HMT_U-U 101+025.0000	Temporary retaining structure (Shansi Street works shaft)	142
2-HMT_U-U 101+030.0000	Temporary retaining structure (Shansi Street works shaft)	142
103-HMT_D-D 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	142
104-HMT_D-D 101+040.0000	Temporary retaining structure (Shansi Street works shaft)	128
3MIC detonated at the same time		
1-HMT_U-U 101+025.0000	Temporary retaining structure (Shansi Street works shaft)	182
2-HMT_U-U 101+030.0000	Temporary retaining structure (Shansi Street works shaft)	182
3-HMT_U-U 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	108
103-HMT_D-D 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	182
104-HMT_D-D 101+040.0000	Temporary retaining structure (Shansi Street works shaft)	164
105-HMT_D-D 101+045.0000	Temporary retaining structure (Shansi Street works shaft)	126
4MIC detonated at the same time		
1-HMT_U-U 101+025.0000	Temporary retaining structure (Shansi Street works shaft)	217
2-HMT_U-U 101+030.0000	Temporary retaining structure (Shansi Street works shaft)	217
3-HMT_U-U 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	129
103-HMT_D-D 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	217
104-HMT_D-D 101+040.0000	Temporary retaining structure (Shansi Street works shaft)	195
105-HMT_D-D 101+045.0000	Temporary retaining structure (Shansi Street works shaft)	147
106-HMT_D-D 101+050.0000	Temporary retaining structure (Shansi Street works shaft)	103
5MIC detonated at the same time		
3-HMT_U-U 101+035.0000	Comfort House	106
4-HMT_U-U 101+040.0000	Comfort House	109
5-HMT_U-U 101+045.0000	Comfort House	105
1-HMT_U-U 101+025.0000	Temporary retaining structure (Shansi Street works shaft)	249
2-HMT_U-U 101+030.0000	Temporary retaining structure (Shansi Street works shaft)	249
3-HMT_U-U 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	147
103-HMT_D-D 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	249
104-HMT_D-D 101+040.0000	Temporary retaining structure (Shansi Street works shaft)	223
105-HMT_D-D 101+045.0000	Temporary retaining structure (Shansi Street works shaft)	168
106-HMT_D-D 101+050.0000	Temporary retaining structure (Shansi Street works shaft)	118
6MIC detonated at the same time		
3-HMT_U-U 101+035.0000	Comfort House	118
4-HMT_U-U 101+040.0000	Comfort House	121
5-HMT_U-U 101+045.0000	Comfort House	117
1-HMT_U-U 101+025.0000	Temporary retaining structure (Shansi Street works shaft)	278
2-HMT_U-U 101+030.0000	Temporary retaining structure (Shansi Street works shaft)	278
3-HMT_U-U 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	165
4-HMT_U-U 101+040.0000	Temporary retaining structure (Shansi Street works shaft)	107
103-HMT_D-D 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	278
104-HMT_D-D 101+040.0000	Temporary retaining structure (Shansi Street works shaft)	250
105-HMT_D-D 101+045.0000	Temporary retaining structure (Shansi Street works shaft)	188
106-HMT_D-D 101+050.0000	Temporary retaining structure (Shansi Street works shaft)	132

Ground Vibration Effect on Towngas Pipelines due to Errors in Blast Face

The results for ground vibration effect on towngas pipelines are summarized in *Table 5.21*.

Table 5.21 Gas Mains Affected by Higher than Expected Vibrations Generated by Accidental Initiation during the Construction of Ho Man Tin Tunnels

Scenario/ Chainage	Features Affected(1)	Observed PPV (mm/s)
3MIC Detonated at the same time		
9-HMT_U-U 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	26
99-HMT_U-U 101+475.0000	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	32
98-HMT_U-U 101+470.0000	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	32
97-HMT_U-U 101+465.0000	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	32
96-HMT_U-U 101+460.0000	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (4)	26
94-HMT_U-U 101+457.5436	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (4)	27
93-HMT_U-U 101+455.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (4)	28
92-HMT_U-U 101+450.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	26
	Town Gas main along Fat Kwong Street (4)	30
91-HMT_U-U 101+445.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	31
	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	32
100-HMT_U-U 101+480.0000	Town Gas main along Fat Kwong Street (1)	26
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	32
89-HMT_U-U 101+435.0000	Town Gas main along Fat Kwong Street (2)	26
	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	32
88-HMT_U-U 101+430.0000	Town Gas main along Fat Kwong Street (3)	29
	Town Gas main along Fat Kwong Street (4)	32
87-HMT_U-U 101+425.0000	Town Gas main along Fat Kwong Street (3)	29
	Town Gas main along Fat Kwong Street (4)	32
85-HMT_U-U 101+422.5436	Town Gas main along Fat Kwong Street (3)	29
	Town Gas main along Fat Kwong Street (4)	32
85-HMT_U-U 101+415.0000	Town Gas main along Fat Kwong Street (3)	30
	Town Gas main along Fat Kwong Street (4)	32
84-HMT_U-U 101+420.0000	Town Gas main along Fat Kwong Street (3)	30
	Town Gas main along Fat Kwong Street (4)	32
84-HMT_U-U 101+410.0000	Town Gas main along Fat Kwong Street (3)	30
	Town Gas main along Fat Kwong Street (4)	32
83-HMT_U-U 101+405.0000	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	32
82-HMT_U-U 101+400.0000	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	32
81-HMT_U-U 101+395.0000	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	32
80-HMT_U-U 101+390.0000	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	32
7-HMT_U-U 101+054.6193	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	26

79-HMT_U-U 101+385.0000	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	32
78-HMT_U-U 101+380.0000	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	32
77-HMT_U-U 101+375.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	32
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	26
76-HMT_U-U 101+370.0000	Town Gas main along Fat Kwong Street (3)	30
	Town Gas main along Fat Kwong Street (4)	30
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	26
75-HMT_U-U 101+365.0000	Town Gas main along Fat Kwong Street (3)	27
	Town Gas main along Fat Kwong Street (4)	28
74-HMT_U-U 101+360.0000	Town Gas main along Fat Kwong Street (3)	25
	Town Gas main along Fat Kwong Street (4)	25
70-HMT_U-U 101+340.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	25
6-HMT_U-U 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	26
69-HMT_U-U 101+335.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	25
68-HMT_U-U 101+330.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	26
67-HMT_U-U 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (2)	25
66-HMT_U-U 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (2)	26
65-HMT_U-U 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	27
	Town Gas main along Shung Yung Road near San Lau Street (2)	26
64-HMT_U-U 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	27
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
63-HMT_U-U 101+305.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	27
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
62-HMT_U-U 101+300.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	27
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
61-HMT_U-U 101+295.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	27

	Town Gas main along Shung Yung Road near San Lau Street (2)	28
60-HMT_U-U 101+290.0000	Town Gas main along Shung Yung Road near San Lau Street (2)	26
5-HMT_U-U 101+045.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	26
4-HMT_U-U 101+040.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	28
43-HMT_U-U 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	26
42-HMT_U-U 101+200.0000	Town Gas main next to Ko Shan Sub-station (1)	31
41-HMT_U-U 101+195.0000	Town Gas main next to Ko Shan Sub-station (1)	31
40-HMT_U-U 101+190.0000	Town Gas main next to Ko Shan Sub-station (1)	28
3-HMT_U-U 101+035.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	26
26-HMT_U-U 101+130.0000	Town Gas main along San Lau Street(3)	25
25-HMT_U-U 101+125.0000	Town Gas main along San Lau Street(3)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	26
23-HMT_U-U 101+123.5853	Town Gas main along San Lau Street(2)	26
	Town Gas main along San Lau Street(3)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	28
22-HMT_U-U 101+120.0000	Town Gas main along San Lau Street(1)	25
	Town Gas main along San Lau Street(2)	28
	Town Gas main along San Lau Street(3)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	32
21-HMT_U-U 101+115.0000	Town Gas main along San Lau Street(2)	27
	Town Gas main along San Lau Street(3)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	32
20-HMT_U-U 101+110.0000	Town Gas main along San Lau Street(3)	25
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	32
209-HMT_D-D 101+515.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	31
208-HMT_D-D 101+510.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	31

207-HMT_D-D 101+505.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	31
206-HMT_D-D 101+500.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	30
205-HMT_D-D 101+495.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	30
204-HMT_D-D 101+490.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	29
203-HMT_D-D 101+485.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	29
	Town Gas main along Fat Kwong Street (3)	25
202-HMT_D-D 101+480.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	27
	Town Gas main along Fat Kwong Street (4)	25
201-HMT_D-D 101+475.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	29
	Town Gas main along Fat Kwong Street (4)	27
200-HMT_D-D 101+470.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	29
19-HMT_U-U 101+105.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	31
199-HMT_D-D 101+465.0000	Town Gas main along Fat Kwong Street (1)	30
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	29
198-HMT_D-D 101+460.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	29

197-HMT_D-D 101+455.0000	Town Gas main along Fat Kwong Street (1)	26
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	28
196-HMT_D-D 101+450.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	28
195-HMT_D-D 101+445.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	28
194-HMT_D-D 101+440.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	28
193-HMT_D-D 101+435.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	28
191-HMT_D-D 101+431.3704	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	28
190-HMT_D-D 101+430.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	29
18-HMT_U-U 101+100.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	27
189-HMT_D-D 101+425.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	29
188-HMT_D-D 101+420.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	29
187-HMT_D-D 101+415.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	29
186-HMT_D-D 101+410.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	29
185-HMT_D-D 101+405.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	29
184-HMT_D-D 101+400.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	30
183-HMT_D-D 101+395.0000	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	30
182-HMT_D-D 101+390.0000	Town Gas main along Fat Kwong Street (3)	32

	Town Gas main along Fat Kwong Street (4)	30
181-HMT_D-D 101+385.0000	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	30
17-HMT_U-U 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
179-HMT_D-D 101+381.3704	Town Gas main along Fat Kwong Street (3)	30
	Town Gas main along Fat Kwong Street (4)	28
178-HMT_D-D 101+380.0000	Town Gas main along Fat Kwong Street (3)	29
	Town Gas main along Fat Kwong Street (4)	27
177-HMT_D-D 101+375.0000	Town Gas main along Fat Kwong Street (3)	27
	Town Gas main along Fat Kwong Street (4)	26
16-HMT_U-U 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
15-HMT_U-U 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
14-HMT_U-U 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
13-HMT_U-U 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
12-HMT_U-U 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	31
125-HMT_D-D 101+135.0000	Town Gas main along San Lau Street(3)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	27
124-HMT_D-D 101+130.0000	Town Gas main along San Lau Street(2)	26
	Town Gas main along San Lau Street(3)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	31
123-HMT_D-D 101+125.0000	Town Gas main along San Lau Street(2)	26
	Town Gas main along San Lau Street(3)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	32
122-HMT_D-D 101+120.0000	Town Gas main along San Lau Street(3)	25
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	32
121-HMT_D-D 101+115.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	26

	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	31
120-HMT_D-D 101+110.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	29
11-HMT_U-U 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	29
119-HMT_D-D 101+105.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	26
118-HMT_D-D 101+100.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
117-HMT_D-D 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
115-HMT_D-D 101+093.9891	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
114-HMT_D-D 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
113-HMT_D-D 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
112-HMT_D-D 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	31
111-HMT_D-D 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	30
110-HMT_D-D 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	29
10-HMT_U-U 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	27
109-HMT_D-D 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	28
108-HMT_D-D 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	28

107-HMT_D-D 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	28
106-HMT_D-D 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	27
105-HMT_D-D 101+045.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	27
104-HMT_D-D 101+040.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	25
102-HMT_U-U 101+490.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Yan Fung Street (1)	25
	Town Gas main along Yan Fung Street (2)	28
101-HMT_U-U 101+485.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Yan Fung Street (2)	26
100-HMT_U-U 101+480.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	32

4MIC Detonated at the same time

9-HMT_U-U 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	31
99-HMT_U-U 101+475.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (4)	27
	Town Gas main along Yan Fung Street (1)	25
	Town Gas main along Yan Fung Street (2)	26
98-HMT_U-U 101+470.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (3)	25
	Town Gas main along Fat Kwong Street (4)	28
97-HMT_U-U 101+465.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (3)	26

	Town Gas main along Fat Kwong Street (4)	29
96-HMT_U-U 101+460.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (3)	27
	Town Gas main along Fat Kwong Street (4)	31
94-HMT_U-U 101+457.5436	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	32
93-HMT_U-U 101+455.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (3)	29
	Town Gas main along Fat Kwong Street (4)	33
92-HMT_U-U 101+450.0000	Town Gas main along Fat Kwong Street (1)	34
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	36
91-HMT_U-U 101+445.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	37
	Town Gas main along Fat Kwong Street (3)	33
	Town Gas main along Fat Kwong Street (4)	38
90-HMT_U-U 101+440.0000	Town Gas main along Fat Kwong Street (1)	31
	Town Gas main along Fat Kwong Street (2)	34
	Town Gas main along Fat Kwong Street (3)	33
	Town Gas main along Fat Kwong Street (4)	38
89-HMT_U-U 101+435.0000	Town Gas main along Fat Kwong Street (1)	29
	Town Gas main along Fat Kwong Street (2)	31
	Town Gas main along Fat Kwong Street (3)	34
	Town Gas main along Fat Kwong Street (4)	38
88-HMT_U-U 101+430.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	29
	Town Gas main along Fat Kwong Street (3)	34

	Town Gas main along Fat Kwong Street (4)	38
87-HMT_U-U 101+425.0000	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	35
	Town Gas main along Fat Kwong Street (4)	38
85-HMT_U-U 101+422.5436	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	35
	Town Gas main along Fat Kwong Street (4)	38
85-HMT_U-U 101+415.0000	Town Gas main along Fat Kwong Street (1)	26
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	36
	Town Gas main along Fat Kwong Street (4)	38
84-HMT_U-U 101+420.0000	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	35
	Town Gas main along Fat Kwong Street (4)	38
84-HMT_U-U 101+410.0000	Town Gas main along Fat Kwong Street (1)	26
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	36
	Town Gas main along Fat Kwong Street (4)	38
83-HMT_U-U 101+405.0000	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	37
	Town Gas main along Fat Kwong Street (4)	38
82-HMT_U-U 101+400.0000	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	37
	Town Gas main along Fat Kwong Street (4)	38
81-HMT_U-U 101+395.0000	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	37

	Town Gas main along Fat Kwong Street (4)	38
80-HMT_U-U 101+390.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	37
	Town Gas main along Fat Kwong Street (4)	38
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	26
7-HMT_U-U 101+054.6193	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	31
79-HMT_U-U 101+385.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	37
	Town Gas main along Fat Kwong Street (4)	38
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	28
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	26
78-HMT_U-U 101+380.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	38
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	29
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	28
77-HMT_U-U 101+375.0000	Town Gas main along Fat Kwong Street (1)	29
	Town Gas main along Fat Kwong Street (2)	29
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	38
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	31
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	29
	Town Gas main along Shung Yung Road near San Lau Street (1)	25
76-HMT_U-U 101+370.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	36
	Town Gas main along Fat Kwong Street (4)	36
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	31

	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	29
	Town Gas main along Shung Yung Road near San Lau Street (1)	27
103-HMT_D-D 101+035.0000	Town Gas main along Fat Kwong Street (1)	25
	Town Gas main along Fat Kwong Street (2)	25
	Town Gas main along Fat Kwong Street (3)	33
	Town Gas main along Fat Kwong Street (4)	33
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	29
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	27
	Town Gas main along Shung Yung Road near San Lau Street (1)	27
	Town Gas main along Shung Yung Road near San Lau Street (2)	25
74-HMT_U-U 101+360.0000	Town Gas main along Fat Kwong Street (3)	30
	Town Gas main along Fat Kwong Street (4)	30
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	27
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	26
	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	26
73-HMT_U-U 101+355.0000	Town Gas main along Fat Kwong Street (3)	27
	Town Gas main along Fat Kwong Street (4)	28
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	26
72-HMT_U-U 101+350.0000	Town Gas main along Fat Kwong Street (3)	25
	Town Gas main along Fat Kwong Street (4)	25
	Town Gas main along Shung Yung Road near San Lau Street (1)	29
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
71-HMT_U-U 101+345.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	29
	Town Gas main along Shung Yung Road near San Lau Street (2)	28
70-HMT_U-U 101+340.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	30
	Town Gas main along Shung Yung Road near San Lau Street (2)	28
6-HMT_U-U 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	31
69-HMT_U-U 101+335.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	30

	Town Gas main along Shung Yung Road near San Lau Street (2)	29
68-HMT_U-U 101+330.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	31
	Town Gas main along Shung Yung Road near San Lau Street (2)	29
67-HMT_U-U 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	31
	Town Gas main along Shung Yung Road near San Lau Street (2)	30
66-HMT_U-U 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	31
	Town Gas main along Shung Yung Road near San Lau Street (2)	31
65-HMT_U-U 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	31
64-HMT_U-U 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
63-HMT_U-U 101+305.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
62-HMT_U-U 101+300.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	33
61-HMT_U-U 101+295.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	33
60-HMT_U-U 101+290.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	30
	Town Gas main along Shung Yung Road near San Lau Street (2)	31
5-HMT_U-U 101+045.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	31
59-HMT_U-U 101+285.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	27
	Town Gas main along Shung Yung Road near San Lau Street (2)	29
58-HMT_U-U 101+280.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	25
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
4-HMT_U-U 101+040.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	33
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	27
44-HMT_U-U 101+210.0000	Town Gas main next to Ko Shan Sub-station (1)	26
43-HMT_U-U 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	31
42-HMT_U-U 101+200.0000	Town Gas main next to Ko Shan Sub-station (1)	36
41-HMT_U-U 101+195.0000	Town Gas main next to Ko Shan Sub-station (1)	37
40-HMT_U-U 101+190.0000	Town Gas main next to Ko Shan Sub-station (1)	33

3-HMT_U-U 101+035.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	25
39-HMT_U-U 101+185.0000	Town Gas main next to Ko Shan Sub-station (1)	28
2-HMT_U-U 101+030.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	25
27-HMT_U-U 101+135.0000	Town Gas main along San Lau Street(3)	26
26-HMT_U-U 101+130.0000	Town Gas main along San Lau Street(2)	25
	Town Gas main along San Lau Street(3)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	26
25-HMT_U-U 101+125.0000	Town Gas main along San Lau Street(1)	27
	Town Gas main along San Lau Street(2)	29
	Town Gas main along San Lau Street(3)	34
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	25
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	31
23-HMT_U-U 101+123.5853	Town Gas main along San Lau Street(1)	28
	Town Gas main along San Lau Street(2)	31
	Town Gas main along San Lau Street(3)	35
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	33
22-HMT_U-U 101+120.0000	Town Gas main along San Lau Street(1)	30
	Town Gas main along San Lau Street(2)	34
	Town Gas main along San Lau Street(3)	37
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	38
21-HMT_U-U 101+115.0000	Town Gas main along San Lau Street(1)	27
	Town Gas main along San Lau Street(2)	32
	Town Gas main along San Lau Street(3)	34
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	33
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	38
20-HMT_U-U 101+110.0000	Town Gas main along San Lau Street(2)	29
	Town Gas main along San Lau Street(3)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	27

	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	35
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	38
209-HMT_D-D 101+515.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	37
	Town Gas main along Fat Kwong Street (3)	27
	Town Gas main along Fat Kwong Street (4)	27
	Town Gas main along Yan Fung Street (2)	26
208-HMT_D-D 101+510.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	37
	Town Gas main along Fat Kwong Street (3)	27
	Town Gas main along Fat Kwong Street (4)	27
207-HMT_D-D 101+505.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	36
	Town Gas main along Fat Kwong Street (3)	27
	Town Gas main along Fat Kwong Street (4)	27
206-HMT_D-D 101+500.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	36
	Town Gas main along Fat Kwong Street (3)	27
	Town Gas main along Fat Kwong Street (4)	27
205-HMT_D-D 101+495.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	35
	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	27
204-HMT_D-D 101+490.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	35
	Town Gas main along Fat Kwong Street (3)	29
	Town Gas main along Fat Kwong Street (4)	28
203-HMT_D-D 101+485.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	34
	Town Gas main along Fat Kwong Street (3)	30
	Town Gas main along Fat Kwong Street (4)	29
202-HMT_D-D 101+480.0000	Town Gas main along Fat Kwong Street (1)	38

	Town Gas main along Fat Kwong Street (2)	34
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	30
201-HMT_D-D 101+475.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	34
	Town Gas main along Fat Kwong Street (3)	34
	Town Gas main along Fat Kwong Street (4)	32
200-HMT_D-D 101+470.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	33
	Town Gas main along Fat Kwong Street (3)	37
	Town Gas main along Fat Kwong Street (4)	34
19-HMT_U-U 101+105.0000	Town Gas main along San Lau Street(2)	27
	Town Gas main along San Lau Street(3)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	37
199-HMT_D-D 101+465.0000	Town Gas main along Fat Kwong Street (1)	36
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	34
198-HMT_D-D 101+460.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	29
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	34
197-HMT_D-D 101+455.0000	Town Gas main along Fat Kwong Street (1)	31
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	34
196-HMT_D-D 101+450.0000	Town Gas main along Fat Kwong Street (1)	30
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	34

	Town Gas main along Fat Kwong Street (1)	29
	Town Gas main along Fat Kwong Street (2)	26
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	34
194-HMT_D-D 101+440.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	25
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	34
193-HMT_D-D 101+435.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	25
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	34
191-HMT_D-D 101+431.3704	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	25
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	34
190-HMT_D-D 101+430.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	25
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	34
18-HMT_U-U 101+100.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	32
189-HMT_D-D 101+425.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	26
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	34
188-HMT_D-D 101+420.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	26
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	34
187-HMT_D-D 101+415.0000	Town Gas main along Fat Kwong Street (1)	28

	Town Gas main along Fat Kwong Street (2)	26
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	35
186-HMT_D-D 101+410.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	35
185-HMT_D-D 101+405.0000	Town Gas main along Fat Kwong Street (1)	29
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	35
184-HMT_D-D 101+400.0000	Town Gas main along Fat Kwong Street (1)	29
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	35
183-HMT_D-D 101+395.0000	Town Gas main along Fat Kwong Street (1)	29
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	36
182-HMT_D-D 101+390.0000	Town Gas main along Fat Kwong Street (1)	29
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	36
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	26
181-HMT_D-D 101+385.0000	Town Gas main along Fat Kwong Street (1)	29
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	37
	Town Gas main along Fat Kwong Street (4)	35
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	27
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	25
	Town Gas main along Shung Yung Road near San Lau Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (2)	25

17-HMT_U-U 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	28
179-HMT_D-D 101+381.3704	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	35
	Town Gas main along Fat Kwong Street (4)	33
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (2)	25
178-HMT_D-D 101+380.0000	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	26
	Town Gas main along Fat Kwong Street (3)	35
	Town Gas main along Fat Kwong Street (4)	33
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (1)	27
	Town Gas main along Shung Yung Road near San Lau Street (2)	25
177-HMT_D-D 101+375.0000	Town Gas main along Fat Kwong Street (1)	25
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	30
	Town Gas main along Shung Yung Road near San Lau Street (1)	27
	Town Gas main along Shung Yung Road near San Lau Street (2)	26
176-HMT_D-D 101+370.0000	Town Gas main along Fat Kwong Street (3)	30
	Town Gas main along Fat Kwong Street (4)	28
	Town Gas main along Shung Yung Road near San Lau Street (1)	27
	Town Gas main along Shung Yung Road near San Lau Street (2)	26
175-HMT_D-D 101+365.0000	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	27
	Town Gas main along Shung Yung Road near San Lau Street (1)	27
	Town Gas main along Shung Yung Road near San Lau Street (2)	26
174-HMT_D-D 101+360.0000	Town Gas main along Fat Kwong Street (3)	26
	Town Gas main along Shung Yung Road near San Lau Street (1)	27

	Town Gas main along Shung Yung Road near San Lau Street (2)	27
173-HMT_D-D 101+355.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
172-HMT_D-D 101+350.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
171-HMT_D-D 101+345.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	28
170-HMT_D-D 101+340.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	28
16-HMT_U-U 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
169-HMT_D-D 101+335.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	28
168-HMT_D-D 101+330.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	28
167-HMT_D-D 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	28
166-HMT_D-D 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	27
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
165-HMT_D-D 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (2)	26
164-HMT_D-D 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (2)	25
15-HMT_U-U 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
14-HMT_U-U 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
147-HMT_D-D 101+225.0000	Town Gas main next to Ko Shan Sub-station (1)	25
146-HMT_D-D 101+220.0000	Town Gas main next to Ko Shan Sub-station (1)	27
145-HMT_D-D 101+215.0000	Town Gas main next to Ko Shan Sub-station (1)	27
143-HMT_D-D 101+213.9891	Town Gas main next to Ko Shan Sub-station (1)	27
142-HMT_D-D 101+210.0000	Town Gas main next to Ko Shan Sub-station (1)	27
141-HMT_D-D 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	25

13-HMT_U-U 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	34
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
12-HMT_U-U 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	37
127-HMT_D-D 101+145.0000	Town Gas main along San Lau Street(3)	25
126-HMT_D-D 101+140.0000	Town Gas main along San Lau Street(2)	25
	Town Gas main along San Lau Street(3)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	28
125-HMT_D-D 101+135.0000	Town Gas main along San Lau Street(1)	26
	Town Gas main along San Lau Street(2)	28
	Town Gas main along San Lau Street(3)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	33
124-HMT_D-D 101+130.0000	Town Gas main along San Lau Street(1)	29
	Town Gas main along San Lau Street(2)	31
	Town Gas main along San Lau Street(3)	33
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	37
123-HMT_D-D 101+125.0000	Town Gas main along San Lau Street(1)	27
	Town Gas main along San Lau Street(2)	31
	Town Gas main along San Lau Street(3)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	34
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	38
122-HMT_D-D 101+120.0000	Town Gas main along San Lau Street(1)	26
	Town Gas main along San Lau Street(2)	30
	Town Gas main along San Lau Street(3)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	36
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	38
121-HMT_D-D 101+115.0000	Town Gas main along San Lau Street(2)	28

	Town Gas main along San Lau Street(3)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	37
120-HMT_D-D 101+110.0000	Town Gas main along San Lau Street(2)	25
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	34
11-HMT_U-U 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	34
119-HMT_D-D 101+105.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	31
118-HMT_D-D 101+100.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	29
117-HMT_D-D 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	33
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	27
115-HMT_D-D 101+093.9891	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	34
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	26
114-HMT_D-D 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	35
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	25
113-HMT_D-D 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	37
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
112-HMT_D-D 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	37
111-HMT_D-D 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	36
110-HMT_D-D 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38

	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	35
10-HMT_U-U 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
109-HMT_D-D 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	34
108-HMT_D-D 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	33
107-HMT_D-D 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	33
106-HMT_D-D 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	33
105-HMT_D-D 101+045.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	33
104-HMT_D-D 101+040.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	35
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	30
103-HMT_D-D 101+035.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	26
102-HMT_U-U 101+490.0000	Town Gas main along Fat Kwong Street (1)	34
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (4)	27
	Town Gas main along Yan Fung Street (1)	30
	Town Gas main along Yan Fung Street (2)	33
101-HMT_U-U 101+485.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (4)	27
	Town Gas main along Yan Fung Street (1)	28
	Town Gas main along Yan Fung Street (2)	31
100-HMT_U-U 101+480.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	38

	Town Gas main along Fat Kwong Street (4)	27
	Town Gas main along Yan Fung Street (1)	27
	Town Gas main along Yan Fung Street (2)	28
5MIC Detonated at the same time		
9-HMT_U-U 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	36
99-HMT_U-U 101+475.0000	Town Gas main along Fat Kwong Street (1)	37
	Town Gas main along Fat Kwong Street (2)	44
	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	31
	Town Gas main along Yan Fung Street (1)	29
	Town Gas main along Yan Fung Street (2)	30
98-HMT_U-U 101+470.0000	Town Gas main along Fat Kwong Street (1)	37
	Town Gas main along Fat Kwong Street (2)	44
	Town Gas main along Fat Kwong Street (3)	29
	Town Gas main along Fat Kwong Street (4)	32
	Town Gas main along Yan Fung Street (1)	27
	Town Gas main along Yan Fung Street (2)	28
97-HMT_U-U 101+465.0000	Town Gas main along Fat Kwong Street (1)	37
	Town Gas main along Fat Kwong Street (2)	44
	Town Gas main along Fat Kwong Street (3)	30
	Town Gas main along Fat Kwong Street (4)	33
	Town Gas main along Yan Fung Street (1)	26
	Town Gas main along Yan Fung Street (2)	26
96-HMT_U-U 101+460.0000	Town Gas main along Fat Kwong Street (1)	37
	Town Gas main along Fat Kwong Street (2)	44
	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	35
94-HMT_U-U 101+457.5436	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	44
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	37
93-HMT_U-U 101+455.0000	Town Gas main along Fat Kwong Street (1)	38

	Town Gas main along Fat Kwong Street (2)	44
	Town Gas main along Fat Kwong Street (3)	33
	Town Gas main along Fat Kwong Street (4)	38
92-HMT_U-U 101+450.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	44
	Town Gas main along Fat Kwong Street (3)	36
	Town Gas main along Fat Kwong Street (4)	41
91-HMT_U-U 101+445.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	42
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	44
90-HMT_U-U 101+440.0000	Town Gas main along Fat Kwong Street (1)	35
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	44
89-HMT_U-U 101+435.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	36
	Town Gas main along Fat Kwong Street (3)	39
	Town Gas main along Fat Kwong Street (4)	44
88-HMT_U-U 101+430.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	34
	Town Gas main along Fat Kwong Street (3)	39
	Town Gas main along Fat Kwong Street (4)	44
87-HMT_U-U 101+425.0000	Town Gas main along Fat Kwong Street (1)	31
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	40
	Town Gas main along Fat Kwong Street (4)	44
85-HMT_U-U 101+422.5436	Town Gas main along Fat Kwong Street (1)	31
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	40
	Town Gas main along Fat Kwong Street (4)	44
85-HMT_U-U 101+415.0000	Town Gas main along Fat Kwong Street (1)	30

	Town Gas main along Fat Kwong Street (2)	31
	Town Gas main along Fat Kwong Street (3)	41
	Town Gas main along Fat Kwong Street (4)	43
84-HMT_U-U 101+420.0000	Town Gas main along Fat Kwong Street (1)	30
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	40
	Town Gas main along Fat Kwong Street (4)	44
84-HMT_U-U 101+410.0000	Town Gas main along Fat Kwong Street (1)	30
	Town Gas main along Fat Kwong Street (2)	31
	Town Gas main along Fat Kwong Street (3)	41
	Town Gas main along Fat Kwong Street (4)	44
83-HMT_U-U 101+405.0000	Town Gas main along Fat Kwong Street (1)	30
	Town Gas main along Fat Kwong Street (2)	31
	Town Gas main along Fat Kwong Street (3)	42
	Town Gas main along Fat Kwong Street (4)	44
82-HMT_U-U 101+400.0000	Town Gas main along Fat Kwong Street (1)	31
	Town Gas main along Fat Kwong Street (2)	31
	Town Gas main along Fat Kwong Street (3)	42
	Town Gas main along Fat Kwong Street (4)	44
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	26
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	25
81-HMT_U-U 101+395.0000	Town Gas main along Fat Kwong Street (1)	31
	Town Gas main along Fat Kwong Street (2)	31
	Town Gas main along Fat Kwong Street (3)	42
	Town Gas main along Fat Kwong Street (4)	44
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	28
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	27
80-HMT_U-U 101+390.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	43
	Town Gas main along Fat Kwong Street (4)	44
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	30

	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	28
7-HMT_U-U 101+054.6193	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	36
79-HMT_U-U 101+385.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	43
	Town Gas main along Fat Kwong Street (4)	44
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	32
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	30
78-HMT_U-U 101+380.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	43
	Town Gas main along Fat Kwong Street (4)	44
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	33
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	32
	Town Gas main along Shung Yung Road near San Lau Street (1)	26
77-HMT_U-U 101+375.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	33
	Town Gas main along Fat Kwong Street (3)	43
	Town Gas main along Fat Kwong Street (4)	44
	Town Gas main along Yan Fung Street (1)	25
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	35
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	33
	Town Gas main along Shung Yung Road near San Lau Street (1)	29
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
76-HMT_U-U 101+370.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	41
	Town Gas main along Fat Kwong Street (4)	42
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	35
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	33
	Town Gas main along Shung Yung Road near San Lau Street (1)	31

	Town Gas main along Shung Yung Road near San Lau Street (2)	29
75-HMT_U-U 101+365.0000	Town Gas main along Fat Kwong Street (1)	29
	Town Gas main along Fat Kwong Street (2)	29
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	38
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	33
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	31
	Town Gas main along Shung Yung Road near San Lau Street (1)	31
	Town Gas main along Shung Yung Road near San Lau Street (2)	29
103-HMT_D-D 101+035.0000	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	27
	Town Gas main along Fat Kwong Street (3)	34
	Town Gas main along Fat Kwong Street (4)	35
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	31
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	29
	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	30
73-HMT_U-U 101+355.0000	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	32
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	30
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	28
	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	30
72-HMT_U-U 101+350.0000	Town Gas main along Fat Kwong Street (3)	29
	Town Gas main along Fat Kwong Street (4)	29
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	28
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	26
	Town Gas main along Shung Yung Road near San Lau Street (1)	33
	Town Gas main along Shung Yung Road near San Lau Street (2)	31
71-HMT_U-U 101+345.0000	Town Gas main along Fat Kwong Street (3)	27
	Town Gas main along Fat Kwong Street (4)	27
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	27

	Town Gas main along Shung Yung Road near San Lau Street (1)	34
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
70-HMT_U-U 101+340.0000	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	25
	Town Gas main along Shung Yung Road near San Lau Street (1)	34
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
6-HMT_U-U 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	36
69-HMT_U-U 101+335.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	35
	Town Gas main along Shung Yung Road near San Lau Street (2)	33
68-HMT_U-U 101+330.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	35
	Town Gas main along Shung Yung Road near San Lau Street (2)	34
67-HMT_U-U 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	36
	Town Gas main along Shung Yung Road near San Lau Street (2)	34
66-HMT_U-U 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	36
	Town Gas main along Shung Yung Road near San Lau Street (2)	35
65-HMT_U-U 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	36
	Town Gas main along Shung Yung Road near San Lau Street (2)	36
64-HMT_U-U 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	37
	Town Gas main along Shung Yung Road near San Lau Street (2)	36
	Town Gas main along Pak Kung Street(1)	25
63-HMT_U-U 101+305.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	37
	Town Gas main along Shung Yung Road near San Lau Street (2)	37
	Town Gas main along Pak Kung Street(1)	26
62-HMT_U-U 101+300.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	37
	Town Gas main along Shung Yung Road near San Lau Street (2)	37
	Town Gas main along Pak Kung Street(1)	27
61-HMT_U-U 101+295.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	36
	Town Gas main along Shung Yung Road near San Lau Street (2)	38
	Town Gas main along Pak Kung Street(1)	27
60-HMT_U-U 101+290.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	34
	Town Gas main along Shung Yung Road near San Lau Street (2)	36
	Town Gas main along Pak Kung Street(1)	27

5-HMT_U-U 101+045.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	36
59-HMT_U-U 101+285.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	31
	Town Gas main along Shung Yung Road near San Lau Street (2)	33
	Town Gas main along Pak Kung Street(1)	26
58-HMT_U-U 101+280.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	29
	Town Gas main along Shung Yung Road near San Lau Street (2)	31
57-HMT_U-U 101+275.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (2)	28
56-HMT_U-U 101+270.0000	Town Gas main along Shung Yung Road near San Lau Street (2)	26
4-HMT_U-U 101+040.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	31
45-HMT_U-U 101+215.0000	Town Gas main next to Ko Shan Sub-station (1)	25
44-HMT_U-U 101+210.0000	Town Gas main next to Ko Shan Sub-station (1)	30
43-HMT_U-U 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	35
42-HMT_U-U 101+200.0000	Town Gas main next to Ko Shan Sub-station (1)	42
41-HMT_U-U 101+195.0000	Town Gas main next to Ko Shan Sub-station (1)	42
40-HMT_U-U 101+190.0000	Town Gas main next to Ko Shan Sub-station (1)	38
3-HMT_U-U 101+035.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	35
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	29
39-HMT_U-U 101+185.0000	Town Gas main next to Ko Shan Sub-station (1)	32
38-HMT_U-U 101+180.0000	Town Gas main next to Ko Shan Sub-station (1)	27
2-HMT_U-U 101+030.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	29
28-HMT_U-U 101+140.0000	Town Gas main along San Lau Street(3)	26
27-HMT_U-U 101+135.0000	Town Gas main along San Lau Street(3)	30
26-HMT_U-U 101+130.0000	Town Gas main along San Lau Street(1)	28
	Town Gas main along San Lau Street(2)	29
	Town Gas main along San Lau Street(3)	35
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	29
25-HMT_U-U 101+125.0000	Town Gas main along San Lau Street(1)	31
	Town Gas main along San Lau Street(2)	34
	Town Gas main along San Lau Street(3)	39

	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	36
23-HMT_U-U 101+123.5853	Town Gas main along San Lau Street(1)	32
	Town Gas main along San Lau Street(2)	35
	Town Gas main along San Lau Street(3)	40
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	38
22-HMT_U-U 101+120.0000	Town Gas main along San Lau Street(1)	34
	Town Gas main along San Lau Street(2)	38
	Town Gas main along San Lau Street(3)	43
	Town Gas main along San Lau Street(4)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	36
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	43
21-HMT_U-U 101+115.0000	Town Gas main along San Lau Street(1)	31
	Town Gas main along San Lau Street(2)	36
	Town Gas main along San Lau Street(3)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	44
20-HMT_U-U 101+110.0000	Town Gas main along San Lau Street(1)	29
	Town Gas main along San Lau Street(2)	34
	Town Gas main along San Lau Street(3)	34
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	41
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	44
209-HMT_D-D 101+515.0000	Town Gas main along Fat Kwong Street (1)	44
	Town Gas main along Fat Kwong Street (2)	43
	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	31
	Town Gas main along Yan Fung Street (1)	28
	Town Gas main along Yan Fung Street (2)	30

208-HMT_D-D 101+510.0000	Town Gas main along Fat Kwong Street (1)	44
	Town Gas main along Fat Kwong Street (2)	42
	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	31
	Town Gas main along Yan Fung Street (1)	26
	Town Gas main along Yan Fung Street (2)	28
207-HMT_D-D 101+505.0000	Town Gas main along Fat Kwong Street (1)	44
	Town Gas main along Fat Kwong Street (2)	42
	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	31
	Town Gas main along Yan Fung Street (2)	26
206-HMT_D-D 101+500.0000	Town Gas main along Fat Kwong Street (1)	44
	Town Gas main along Fat Kwong Street (2)	41
	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	31
205-HMT_D-D 101+495.0000	Town Gas main along Fat Kwong Street (1)	44
	Town Gas main along Fat Kwong Street (2)	41
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	31
204-HMT_D-D 101+490.0000	Town Gas main along Fat Kwong Street (1)	44
	Town Gas main along Fat Kwong Street (2)	40
	Town Gas main along Fat Kwong Street (3)	33
	Town Gas main along Fat Kwong Street (4)	32
203-HMT_D-D 101+485.0000	Town Gas main along Fat Kwong Street (1)	44
	Town Gas main along Fat Kwong Street (2)	39
	Town Gas main along Fat Kwong Street (3)	34
	Town Gas main along Fat Kwong Street (4)	33
202-HMT_D-D 101+480.0000	Town Gas main along Fat Kwong Street (1)	44
	Town Gas main along Fat Kwong Street (2)	39
	Town Gas main along Fat Kwong Street (3)	36
	Town Gas main along Fat Kwong Street (4)	34
201-HMT_D-D 101+475.0000	Town Gas main along Fat Kwong Street (1)	44

	Town Gas main along Fat Kwong Street (2)	39
	Town Gas main along Fat Kwong Street (3)	39
	Town Gas main along Fat Kwong Street (4)	37
200-HMT_D-D 101+470.0000	Town Gas main along Fat Kwong Street (1)	44
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (3)	42
	Town Gas main along Fat Kwong Street (4)	39
19-HMT_U-U 101+105.0000	Town Gas main along San Lau Street(1)	25
	Town Gas main along San Lau Street(2)	31
	Town Gas main along San Lau Street(3)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	42
199-HMT_D-D 101+465.0000	Town Gas main along Fat Kwong Street (1)	41
	Town Gas main along Fat Kwong Street (2)	36
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	39
198-HMT_D-D 101+460.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	34
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	39
197-HMT_D-D 101+455.0000	Town Gas main along Fat Kwong Street (1)	36
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	39
196-HMT_D-D 101+450.0000	Town Gas main along Fat Kwong Street (1)	34
	Town Gas main along Fat Kwong Street (2)	30
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	38
195-HMT_D-D 101+445.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	30
	Town Gas main along Fat Kwong Street (3)	44

	Town Gas main along Fat Kwong Street (4)	38
194-HMT_D-D 101+440.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	29
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	39
193-HMT_D-D 101+435.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	29
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	39
191-HMT_D-D 101+431.3704	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	29
	Town Gas main along Fat Kwong Street (3)	43
	Town Gas main along Fat Kwong Street (4)	39
190-HMT_D-D 101+430.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	29
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	39
18-HMT_U-U 101+100.0000	Town Gas main along San Lau Street(2)	25
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	43
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	37
189-HMT_D-D 101+425.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	29
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	39
188-HMT_D-D 101+420.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	30
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	39
187-HMT_D-D 101+415.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	30
	Town Gas main along Fat Kwong Street (3)	44

	Town Gas main along Fat Kwong Street (4)	40
186-HMT_D-D 101+410.0000	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	30
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	40
185-HMT_D-D 101+405.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	31
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	40
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	26
184-HMT_D-D 101+400.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	31
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	41
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	27
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	26
183-HMT_D-D 101+395.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	41
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	28
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	27
	Town Gas main along Shung Yung Road near San Lau Street (1)	25
182-HMT_D-D 101+390.0000	Town Gas main along Fat Kwong Street (1)	34
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	41
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	30
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	28
	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
181-HMT_D-D 101+385.0000	Town Gas main along Fat Kwong Street (1)	33

	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	43
	Town Gas main along Fat Kwong Street (4)	40
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	31
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	29
	Town Gas main along Shung Yung Road near San Lau Street (1)	30
	Town Gas main along Shung Yung Road near San Lau Street (2)	29
17-HMT_U-U 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	32
179-HMT_D-D 101+381.3704	Town Gas main along Fat Kwong Street (1)	32
	Town Gas main along Fat Kwong Street (2)	30
	Town Gas main along Fat Kwong Street (3)	40
	Town Gas main along Fat Kwong Street (4)	38
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	30
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	28
	Town Gas main along Shung Yung Road near San Lau Street (1)	30
	Town Gas main along Shung Yung Road near San Lau Street (2)	29
178-HMT_D-D 101+380.0000	Town Gas main along Fat Kwong Street (1)	31
	Town Gas main along Fat Kwong Street (2)	30
	Town Gas main along Fat Kwong Street (3)	40
	Town Gas main along Fat Kwong Street (4)	38
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	29
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	28
	Town Gas main along Shung Yung Road near San Lau Street (1)	30
	Town Gas main along Shung Yung Road near San Lau Street (2)	29
177-HMT_D-D 101+375.0000	Town Gas main along Fat Kwong Street (1)	29
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	37
	Town Gas main along Fat Kwong Street (4)	35
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	28
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	27

	Town Gas main along Shung Yung Road near San Lau Street (1)	31
	Town Gas main along Shung Yung Road near San Lau Street (2)	29
176-HMT_D-D 101+370.0000	Town Gas main along Fat Kwong Street (1)	27
	Town Gas main along Fat Kwong Street (2)	26
	Town Gas main along Fat Kwong Street (3)	34
	Town Gas main along Fat Kwong Street (4)	33
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	27
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	26
	Town Gas main along Shung Yung Road near San Lau Street (1)	31
	Town Gas main along Shung Yung Road near San Lau Street (2)	30
175-HMT_D-D 101+365.0000	Town Gas main along Fat Kwong Street (1)	26
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	30
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (1)	31
	Town Gas main along Shung Yung Road near San Lau Street (2)	30
174-HMT_D-D 101+360.0000	Town Gas main along Fat Kwong Street (3)	30
	Town Gas main along Fat Kwong Street (4)	29
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	25
	Town Gas main along Shung Yung Road near San Lau Street (1)	31
	Town Gas main along Shung Yung Road near San Lau Street (2)	30
173-HMT_D-D 101+355.0000	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	27
	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	31
172-HMT_D-D 101+350.0000	Town Gas main along Fat Kwong Street (3)	26
	Town Gas main along Fat Kwong Street (4)	25
	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	31
171-HMT_D-D 101+345.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
170-HMT_D-D 101+340.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	32

	Town Gas main along Shung Yung Road near San Lau Street (2)	32
16-HMT_U-U 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	27
169-HMT_D-D 101+335.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
168-HMT_D-D 101+330.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
	Town Gas main along Pak Kung Street(1)	25
167-HMT_D-D 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	33
	Town Gas main along Pak Kung Street(1)	26
166-HMT_D-D 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	31
	Town Gas main along Shung Yung Road near San Lau Street (2)	31
165-HMT_D-D 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	29
	Town Gas main along Shung Yung Road near San Lau Street (2)	30
164-HMT_D-D 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	29
163-HMT_D-D 101+305.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
162-HMT_D-D 101+300.0000	Town Gas main along Shung Yung Road near San Lau Street (2)	26
15-HMT_U-U 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	33
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
14-HMT_U-U 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	35
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
149-HMT_D-D 101+235.0000	Town Gas main next to Ko Shan Sub-station (1)	26
148-HMT_D-D 101+230.0000	Town Gas main next to Ko Shan Sub-station (1)	27
147-HMT_D-D 101+225.0000	Town Gas main next to Ko Shan Sub-station (1)	29
146-HMT_D-D 101+220.0000	Town Gas main next to Ko Shan Sub-station (1)	31
145-HMT_D-D 101+215.0000	Town Gas main next to Ko Shan Sub-station (1)	31
143-HMT_D-D 101+213.9891	Town Gas main next to Ko Shan Sub-station (1)	31
142-HMT_D-D 101+210.0000	Town Gas main next to Ko Shan Sub-station (1)	30

141-HMT_D-D 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	29
140-HMT_D-D 101+200.0000	Town Gas main next to Ko Shan Sub-station (1)	28
13-HMT_U-U 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	39
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
139-HMT_D-D 101+195.0000	Town Gas main next to Ko Shan Sub-station (1)	26
12-HMT_U-U 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	43
128-HMT_D-D 101+150.0000	Town Gas main along San Lau Street(3)	26
127-HMT_D-D 101+145.0000	Town Gas main along San Lau Street(2)	25
	Town Gas main along San Lau Street(3)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	28
126-HMT_D-D 101+140.0000	Town Gas main along San Lau Street(1)	27
	Town Gas main along San Lau Street(2)	29
	Town Gas main along San Lau Street(3)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	32
125-HMT_D-D 101+135.0000	Town Gas main along San Lau Street(1)	30
	Town Gas main along San Lau Street(2)	32
	Town Gas main along San Lau Street(3)	36
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	37
124-HMT_D-D 101+130.0000	Town Gas main along San Lau Street(1)	33
	Town Gas main along San Lau Street(2)	36
	Town Gas main along San Lau Street(3)	38
	Town Gas main along San Lau Street(4)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	36
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	43
123-HMT_D-D 101+125.0000	Town Gas main along San Lau Street(1)	32
	Town Gas main along San Lau Street(2)	35
	Town Gas main along San Lau Street(3)	37

	Town Gas main along San Lau Street(4)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	39
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	44
122-HMT_D-D 101+120.0000	Town Gas main along San Lau Street(1)	30
	Town Gas main along San Lau Street(2)	34
	Town Gas main along San Lau Street(3)	34
	Town Gas main along San Lau Street(4)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	34
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	41
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	44
121-HMT_D-D 101+115.0000	Town Gas main along San Lau Street(1)	28
	Town Gas main along San Lau Street(2)	32
	Town Gas main along San Lau Street(3)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	36
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	43
120-HMT_D-D 101+110.0000	Town Gas main along San Lau Street(2)	29
	Town Gas main along San Lau Street(3)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	36
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	39
11-HMT_U-U 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	40
119-HMT_D-D 101+105.0000	Town Gas main along San Lau Street(2)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	36
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	36
118-HMT_D-D 101+100.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	37
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	33
117-HMT_D-D 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38

	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	31
115-HMT_D-D 101+093.9891	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	39
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	30
114-HMT_D-D 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	40
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	29
113-HMT_D-D 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	42
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	28
112-HMT_D-D 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	43
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	27
111-HMT_D-D 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	41
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	26
110-HMT_D-D 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	40
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	25
10-HMT_U-U 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	43
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	37
109-HMT_D-D 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	39
108-HMT_D-D 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	25
107-HMT_D-D 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	25
106-HMT_D-D 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	37

	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	26
105-HMT_D-D 101+045.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(2)	26
	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	30
	Town Gas main along Chatham Road near Shansi Street Works Shaft(5)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	37
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	27
104-HMT_D-D 101+040.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(2)	28
	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	33
	Town Gas main along Chatham Road near Shansi Street Works Shaft(5)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	40
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	35
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	25
103-HMT_D-D 101+035.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(2)	28
	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	33
	Town Gas main along Chatham Road near Shansi Street Works Shaft(5)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	34
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	29
102-HMT_U-U 101+490.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	44
	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	31
	Town Gas main along Yan Fung Street (1)	35
	Town Gas main along Yan Fung Street (2)	38
101-HMT_U-U 101+485.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	44
	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	31
	Town Gas main along Yan Fung Street (1)	33
	Town Gas main along Yan Fung Street (2)	35
100-HMT_U-U 101+480.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	44

	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	31
	Town Gas main along Yan Fung Street (1)	31
	Town Gas main along Yan Fung Street (2)	33
6MIC Detonated at the same time		
9-HMT_U-U 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	40
99-HMT_U-U 101+475.0000	Town Gas main along Fat Kwong Street (1)	42
	Town Gas main along Fat Kwong Street (2)	49
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	35
	Town Gas main along Yan Fung Street (1)	32
	Town Gas main along Yan Fung Street (2)	34
98-HMT_U-U 101+470.0000	Town Gas main along Fat Kwong Street (1)	42
	Town Gas main along Fat Kwong Street (2)	49
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	36
	Town Gas main along Yan Fung Street (1)	30
	Town Gas main along Yan Fung Street (2)	31
97-HMT_U-U 101+465.0000	Town Gas main along Fat Kwong Street (1)	42
	Town Gas main along Fat Kwong Street (2)	49
	Town Gas main along Fat Kwong Street (3)	33
	Town Gas main along Fat Kwong Street (4)	37
	Town Gas main along Yan Fung Street (1)	29
	Town Gas main along Yan Fung Street (2)	29
96-HMT_U-U 101+460.0000	Town Gas main along Fat Kwong Street (1)	42
	Town Gas main along Fat Kwong Street (2)	49
	Town Gas main along Fat Kwong Street (3)	35
	Town Gas main along Fat Kwong Street (4)	40
	Town Gas main along Yan Fung Street (1)	28
	Town Gas main along Yan Fung Street (2)	27
94-HMT_U-U 101+457.5436	Town Gas main along Fat Kwong Street (1)	42
	Town Gas main along Fat Kwong Street (2)	49

	Town Gas main along Fat Kwong Street (3)	36
	Town Gas main along Fat Kwong Street (4)	41
	Town Gas main along Yan Fung Street (1)	27
	Town Gas main along Yan Fung Street (2)	27
93-HMT_U-U 101+455.0000	Town Gas main along Fat Kwong Street (1)	42
	Town Gas main along Fat Kwong Street (2)	49
	Town Gas main along Fat Kwong Street (3)	37
	Town Gas main along Fat Kwong Street (4)	43
	Town Gas main along Yan Fung Street (1)	27
	Town Gas main along Yan Fung Street (2)	26
92-HMT_U-U 101+450.0000	Town Gas main along Fat Kwong Street (1)	43
	Town Gas main along Fat Kwong Street (2)	49
	Town Gas main along Fat Kwong Street (3)	40
	Town Gas main along Fat Kwong Street (4)	46
	Town Gas main along Yan Fung Street (1)	26
	Town Gas main along Yan Fung Street (2)	25
91-HMT_U-U 101+445.0000	Town Gas main along Fat Kwong Street (1)	42
	Town Gas main along Fat Kwong Street (2)	47
	Town Gas main along Fat Kwong Street (3)	42
	Town Gas main along Fat Kwong Street (4)	49
	Town Gas main along Yan Fung Street (1)	26
90-HMT_U-U 101+440.0000	Town Gas main along Fat Kwong Street (1)	39
	Town Gas main along Fat Kwong Street (2)	43
	Town Gas main along Fat Kwong Street (3)	43
	Town Gas main along Fat Kwong Street (4)	49
89-HMT_U-U 101+435.0000	Town Gas main along Fat Kwong Street (1)	37
	Town Gas main along Fat Kwong Street (2)	40
	Town Gas main along Fat Kwong Street (3)	43
	Town Gas main along Fat Kwong Street (4)	49
88-HMT_U-U 101+430.0000	Town Gas main along Fat Kwong Street (1)	36
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (3)	44

	Town Gas main along Fat Kwong Street (4)	49
87-HMT_U-U 101+425.0000	Town Gas main along Fat Kwong Street (1)	35
	Town Gas main along Fat Kwong Street (2)	36
	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	49
85-HMT_U-U 101+422.5436	Town Gas main along Fat Kwong Street (1)	34
	Town Gas main along Fat Kwong Street (2)	36
	Town Gas main along Fat Kwong Street (3)	45
	Town Gas main along Fat Kwong Street (4)	49
85-HMT_U-U 101+415.0000	Town Gas main along Fat Kwong Street (1)	34
	Town Gas main along Fat Kwong Street (2)	35
	Town Gas main along Fat Kwong Street (3)	46
	Town Gas main along Fat Kwong Street (4)	49
84-HMT_U-U 101+420.0000	Town Gas main along Fat Kwong Street (1)	34
	Town Gas main along Fat Kwong Street (2)	35
	Town Gas main along Fat Kwong Street (3)	45
	Town Gas main along Fat Kwong Street (4)	49
84-HMT_U-U 101+410.0000	Town Gas main along Fat Kwong Street (1)	34
	Town Gas main along Fat Kwong Street (2)	34
	Town Gas main along Fat Kwong Street (3)	46
	Town Gas main along Fat Kwong Street (4)	49
83-HMT_U-U 101+405.0000	Town Gas main along Fat Kwong Street (1)	34
	Town Gas main along Fat Kwong Street (2)	35
	Town Gas main along Fat Kwong Street (3)	47
	Town Gas main along Fat Kwong Street (4)	49
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	27
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	26
82-HMT_U-U 101+400.0000	Town Gas main along Fat Kwong Street (1)	34
	Town Gas main along Fat Kwong Street (2)	35
	Town Gas main along Fat Kwong Street (3)	47
	Town Gas main along Fat Kwong Street (4)	49
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	29

	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	28
81-HMT_U-U 101+395.0000	Town Gas main along Fat Kwong Street (1)	35
	Town Gas main along Fat Kwong Street (2)	35
	Town Gas main along Fat Kwong Street (3)	47
	Town Gas main along Fat Kwong Street (4)	49
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	31
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	30
80-HMT_U-U 101+390.0000	Town Gas main along Fat Kwong Street (1)	35
	Town Gas main along Fat Kwong Street (2)	35
	Town Gas main along Fat Kwong Street (3)	48
	Town Gas main along Fat Kwong Street (4)	49
	Town Gas main along Yan Fung Street (1)	26
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	33
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	32
7-HMT_U-U 101+054.6193	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	40
79-HMT_U-U 101+385.0000	Town Gas main along Fat Kwong Street (1)	36
	Town Gas main along Fat Kwong Street (2)	36
	Town Gas main along Fat Kwong Street (3)	48
	Town Gas main along Fat Kwong Street (4)	49
	Town Gas main along Yan Fung Street (1)	27
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	35
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	34
	Town Gas main along Shung Yung Road near San Lau Street (1)	25
78-HMT_U-U 101+380.0000	Town Gas main along Fat Kwong Street (1)	36
	Town Gas main along Fat Kwong Street (2)	36
	Town Gas main along Fat Kwong Street (3)	48
	Town Gas main along Fat Kwong Street (4)	49
	Town Gas main along Yan Fung Street (1)	27
	Town Gas main along Yan Fung Street (2)	25
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	37
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	35

	Town Gas main along Shung Yung Road near San Lau Street (1)	29
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
77-HMT_U-U 101+375.0000	Town Gas main along Fat Kwong Street (1)	37
	Town Gas main along Fat Kwong Street (2)	37
	Town Gas main along Fat Kwong Street (3)	48
	Town Gas main along Fat Kwong Street (4)	49
	Town Gas main along Yan Fung Street (1)	28
	Town Gas main along Yan Fung Street (2)	26
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	39
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	37
	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	30
76-HMT_U-U 101+370.0000	Town Gas main along Fat Kwong Street (1)	35
	Town Gas main along Fat Kwong Street (2)	35
	Town Gas main along Fat Kwong Street (3)	46
	Town Gas main along Fat Kwong Street (4)	46
	Town Gas main along Yan Fung Street (1)	28
	Town Gas main along Yan Fung Street (2)	26
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	39
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	37
	Town Gas main along Shung Yung Road near San Lau Street (1)	34
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
75-HMT_U-U 101+365.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	33
	Town Gas main along Fat Kwong Street (3)	42
	Town Gas main along Fat Kwong Street (4)	42
	Town Gas main along Yan Fung Street (1)	26
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	37
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	35
	Town Gas main along Shung Yung Road near San Lau Street (1)	35
	Town Gas main along Shung Yung Road near San Lau Street (2)	33
74-HMT_U-U 101+360.0000	Town Gas main along Fat Kwong Street (1)	30

	Town Gas main along Fat Kwong Street (2)	30
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	39
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	35
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	33
	Town Gas main along Shung Yung Road near San Lau Street (1)	36
	Town Gas main along Shung Yung Road near San Lau Street (2)	33
73-HMT_U-U 101+355.0000	Town Gas main along Fat Kwong Street (1)	28
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	35
	Town Gas main along Fat Kwong Street (4)	35
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	33
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	31
	Town Gas main along Shung Yung Road near San Lau Street (1)	36
	Town Gas main along Shung Yung Road near San Lau Street (2)	34
72-HMT_U-U 101+350.0000	Town Gas main along Fat Kwong Street (2)	26
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	32
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	31
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	29
	Town Gas main along Shung Yung Road near San Lau Street (1)	37
	Town Gas main along Shung Yung Road near San Lau Street (2)	35
71-HMT_U-U 101+345.0000	Town Gas main along Fat Kwong Street (3)	30
	Town Gas main along Fat Kwong Street (4)	30
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	30
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	27
	Town Gas main along Shung Yung Road near San Lau Street (1)	38
	Town Gas main along Shung Yung Road near San Lau Street (2)	35
70-HMT_U-U 101+340.0000	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	28
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	28
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	26

	Town Gas main along Shung Yung Road near San Lau Street (1)	38
	Town Gas main along Shung Yung Road near San Lau Street (2)	36
6-HMT_U-U 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	40
69-HMT_U-U 101+335.0000	Town Gas main along Fat Kwong Street (3)	26
	Town Gas main along Fat Kwong Street (4)	26
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	27
	Town Gas main along Shung Yung Road near San Lau Street (1)	39
	Town Gas main along Shung Yung Road near San Lau Street (2)	37
	Town Gas main along Pak Kung Street(1)	25
68-HMT_U-U 101+330.0000	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	25
	Town Gas main along Shung Yung Road near San Lau Street (1)	39
	Town Gas main along Shung Yung Road near San Lau Street (2)	38
	Town Gas main along Pak Kung Street(1)	26
67-HMT_U-U 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	40
	Town Gas main along Shung Yung Road near San Lau Street (2)	38
	Town Gas main along Pak Kung Street(1)	26
66-HMT_U-U 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	40
	Town Gas main along Shung Yung Road near San Lau Street (2)	39
	Town Gas main along Pak Kung Street(1)	27
65-HMT_U-U 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	41
	Town Gas main along Shung Yung Road near San Lau Street (2)	40
	Town Gas main along Pak Kung Street(1)	27
64-HMT_U-U 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	41
	Town Gas main along Shung Yung Road near San Lau Street (2)	41
	Town Gas main along Pak Kung Street(1)	28
	Town Gas main along Pak Kung Street(2)	25
63-HMT_U-U 101+305.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	41
	Town Gas main along Shung Yung Road near San Lau Street (2)	41
	Town Gas main along Pak Kung Street(1)	29
	Town Gas main along Pak Kung Street(2)	26
62-HMT_U-U 101+300.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	41

	Town Gas main along Shung Yung Road near San Lau Street (2)	42
	Town Gas main along Pak Kung Street(1)	30
	Town Gas main along Pak Kung Street(2)	26
61-HMT_U-U 101+295.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	41
	Town Gas main along Shung Yung Road near San Lau Street (2)	42
	Town Gas main along Pak Kung Street(1)	31
	Town Gas main along Pak Kung Street(2)	27
60-HMT_U-U 101+290.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	38
	Town Gas main along Shung Yung Road near San Lau Street (2)	40
	Town Gas main along Pak Kung Street(1)	30
	Town Gas main along Pak Kung Street(2)	26
5-HMT_U-U 101+045.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	40
59-HMT_U-U 101+285.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	35
	Town Gas main along Shung Yung Road near San Lau Street (2)	37
	Town Gas main along Pak Kung Street(1)	29
58-HMT_U-U 101+280.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	32
	Town Gas main along Shung Yung Road near San Lau Street (2)	35
	Town Gas main along Pak Kung Street(1)	27
57-HMT_U-U 101+275.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	29
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
	Town Gas main along Pak Kung Street(1)	26
56-HMT_U-U 101+270.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (2)	29
55-HMT_U-U 101+265.0000	Town Gas main along Shung Yung Road near San Lau Street (2)	26
4-HMT_U-U 101+040.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	43
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	35
46-HMT_U-U 101+220.0000	Town Gas main next to Ko Shan Sub-station (1)	25
45-HMT_U-U 101+215.0000	Town Gas main next to Ko Shan Sub-station (1)	28
44-HMT_U-U 101+210.0000	Town Gas main next to Ko Shan Sub-station (1)	33
43-HMT_U-U 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	39
42-HMT_U-U 101+200.0000	Town Gas main next to Ko Shan Sub-station (1)	47

41-HMT_U-U 101+195.0000	Town Gas main next to Ko Shan Sub-station (1)	47
40-HMT_U-U 101+190.0000	Town Gas main next to Ko Shan Sub-station (1)	42
3-HMT_U-U 101+035.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	39
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
39-HMT_U-U 101+185.0000	Town Gas main next to Ko Shan Sub-station (1)	36
38-HMT_U-U 101+180.0000	Town Gas main next to Ko Shan Sub-station (1)	31
37-HMT_U-U 101+175.0000	Town Gas main next to Ko Shan Sub-station (1)	26
2-HMT_U-U 101+030.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	27
28-HMT_U-U 101+140.0000	Town Gas main along San Lau Street(3)	29
27-HMT_U-U 101+135.0000	Town Gas main along San Lau Street(1)	27
	Town Gas main along San Lau Street(2)	28
	Town Gas main along San Lau Street(3)	34
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	27
26-HMT_U-U 101+130.0000	Town Gas main along San Lau Street(1)	31
	Town Gas main along San Lau Street(2)	33
	Town Gas main along San Lau Street(3)	39
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	33
25-HMT_U-U 101+125.0000	Town Gas main along San Lau Street(1)	35
	Town Gas main along San Lau Street(2)	38
	Town Gas main along San Lau Street(3)	44
	Town Gas main along San Lau Street(4)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	40
23-HMT_U-U 101+123.5853	Town Gas main along San Lau Street(1)	36
	Town Gas main along San Lau Street(2)	39
	Town Gas main along San Lau Street(3)	45
	Town Gas main along San Lau Street(4)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	34

	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	42
22-HMT_U-U 101+120.0000	Town Gas main along San Lau Street(1)	38
	Town Gas main along San Lau Street(2)	43
	Town Gas main along San Lau Street(3)	48
	Town Gas main along San Lau Street(4)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	32
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	40
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	48
21-HMT_U-U 101+115.0000	Town Gas main along San Lau Street(1)	35
	Town Gas main along San Lau Street(2)	40
	Town Gas main along San Lau Street(3)	43
	Town Gas main along San Lau Street(4)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	33
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	42
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	49
20-HMT_U-U 101+110.0000	Town Gas main along San Lau Street(1)	32
	Town Gas main along San Lau Street(2)	38
	Town Gas main along San Lau Street(3)	38
	Town Gas main along San Lau Street(4)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	35
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	45
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	49
209-HMT_D-D 101+515.0000	Town Gas main along Fat Kwong Street (1)	49
	Town Gas main along Fat Kwong Street (2)	48
	Town Gas main along Fat Kwong Street (3)	35
	Town Gas main along Fat Kwong Street (4)	35
	Town Gas main along Yan Fung Street (1)	31
	Town Gas main along Yan Fung Street (2)	34
208-HMT_D-D 101+510.0000	Town Gas main along Fat Kwong Street (1)	49
	Town Gas main along Fat Kwong Street (2)	47
	Town Gas main along Fat Kwong Street (3)	35
	Town Gas main along Fat Kwong Street (4)	35

	Town Gas main along Yan Fung Street (1)	29
	Town Gas main along Yan Fung Street (2)	31
207-HMT_D-D 101+505.0000	Town Gas main along Fat Kwong Street (1)	49
	Town Gas main along Fat Kwong Street (2)	47
	Town Gas main along Fat Kwong Street (3)	35
	Town Gas main along Fat Kwong Street (4)	34
	Town Gas main along Yan Fung Street (1)	27
	Town Gas main along Yan Fung Street (2)	29
206-HMT_D-D 101+500.0000	Town Gas main along Fat Kwong Street (1)	49
	Town Gas main along Fat Kwong Street (2)	46
	Town Gas main along Fat Kwong Street (3)	35
	Town Gas main along Fat Kwong Street (4)	34
	Town Gas main along Yan Fung Street (1)	26
	Town Gas main along Yan Fung Street (2)	27
205-HMT_D-D 101+495.0000	Town Gas main along Fat Kwong Street (1)	49
	Town Gas main along Fat Kwong Street (2)	45
	Town Gas main along Fat Kwong Street (3)	35
	Town Gas main along Fat Kwong Street (4)	35
204-HMT_D-D 101+490.0000	Town Gas main along Fat Kwong Street (1)	49
	Town Gas main along Fat Kwong Street (2)	45
	Town Gas main along Fat Kwong Street (3)	37
	Town Gas main along Fat Kwong Street (4)	36
203-HMT_D-D 101+485.0000	Town Gas main along Fat Kwong Street (1)	49
	Town Gas main along Fat Kwong Street (2)	44
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	37
202-HMT_D-D 101+480.0000	Town Gas main along Fat Kwong Street (1)	49
	Town Gas main along Fat Kwong Street (2)	43
	Town Gas main along Fat Kwong Street (3)	41
	Town Gas main along Fat Kwong Street (4)	38
201-HMT_D-D 101+475.0000	Town Gas main along Fat Kwong Street (1)	49
	Town Gas main along Fat Kwong Street (2)	43

	Town Gas main along Fat Kwong Street (3)	44
	Town Gas main along Fat Kwong Street (4)	41
200-HMT_D-D 101+470.0000	Town Gas main along Fat Kwong Street (1)	49
	Town Gas main along Fat Kwong Street (2)	43
	Town Gas main along Fat Kwong Street (3)	47
	Town Gas main along Fat Kwong Street (4)	44
19-HMT_U-U 101+105.0000	Town Gas main along San Lau Street(1)	28
	Town Gas main along San Lau Street(2)	34
	Town Gas main along San Lau Street(3)	33
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	36
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	47
199-HMT_D-D 101+465.0000	Town Gas main along Fat Kwong Street (1)	46
	Town Gas main along Fat Kwong Street (2)	41
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	44
198-HMT_D-D 101+460.0000	Town Gas main along Fat Kwong Street (1)	43
	Town Gas main along Fat Kwong Street (2)	38
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	44
197-HMT_D-D 101+455.0000	Town Gas main along Fat Kwong Street (1)	40
	Town Gas main along Fat Kwong Street (2)	36
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	43
196-HMT_D-D 101+450.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	34
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	43
195-HMT_D-D 101+445.0000	Town Gas main along Fat Kwong Street (1)	37
	Town Gas main along Fat Kwong Street (2)	33
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	43

194-HMT_D-D 101+440.0000	Town Gas main along Fat Kwong Street (1)	36
	Town Gas main along Fat Kwong Street (2)	33
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	43
193-HMT_D-D 101+435.0000	Town Gas main along Fat Kwong Street (1)	35
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	43
191-HMT_D-D 101+431.3704	Town Gas main along Fat Kwong Street (1)	35
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	43
190-HMT_D-D 101+430.0000	Town Gas main along Fat Kwong Street (1)	35
	Town Gas main along Fat Kwong Street (2)	32
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	44
18-HMT_U-U 101+100.0000	Town Gas main along San Lau Street(2)	28
	Town Gas main along San Lau Street(3)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	35
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	48
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	41
189-HMT_D-D 101+425.0000	Town Gas main along Fat Kwong Street (1)	35
	Town Gas main along Fat Kwong Street (2)	33
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	44
188-HMT_D-D 101+420.0000	Town Gas main along Fat Kwong Street (1)	36
	Town Gas main along Fat Kwong Street (2)	33
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	44
187-HMT_D-D 101+415.0000	Town Gas main along Fat Kwong Street (1)	36
	Town Gas main along Fat Kwong Street (2)	33
	Town Gas main along Fat Kwong Street (3)	49

	Town Gas main along Fat Kwong Street (4)	44
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	25
186-HMT_D-D 101+410.0000	Town Gas main along Fat Kwong Street (1)	36
	Town Gas main along Fat Kwong Street (2)	34
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	45
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	27
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	26
185-HMT_D-D 101+405.0000	Town Gas main along Fat Kwong Street (1)	37
	Town Gas main along Fat Kwong Street (2)	34
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	45
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	29
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	28
184-HMT_D-D 101+400.0000	Town Gas main along Fat Kwong Street (1)	37
	Town Gas main along Fat Kwong Street (2)	35
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	45
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	30
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	29
	Town Gas main along Shung Yung Road near San Lau Street (1)	26
183-HMT_D-D 101+395.0000	Town Gas main along Fat Kwong Street (1)	37
	Town Gas main along Fat Kwong Street (2)	35
	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	46
	Town Gas main along Yan Fung Street (1)	26
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	32
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	30
	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	27
182-HMT_D-D 101+390.0000	Town Gas main along Fat Kwong Street (1)	38
	Town Gas main along Fat Kwong Street (2)	36

	Town Gas main along Fat Kwong Street (3)	49
	Town Gas main along Fat Kwong Street (4)	46
	Town Gas main along Yan Fung Street (1)	27
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	33
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	32
	Town Gas main along Shung Yung Road near San Lau Street (1)	31
	Town Gas main along Shung Yung Road near San Lau Street (2)	30
181-HMT_D-D 101+385.0000	Town Gas main along Fat Kwong Street (1)	37
	Town Gas main along Fat Kwong Street (2)	36
	Town Gas main along Fat Kwong Street (3)	48
	Town Gas main along Fat Kwong Street (4)	45
	Town Gas main along Yan Fung Street (1)	27
	Town Gas main along Yan Fung Street (2)	25
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	34
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	32
	Town Gas main along Shung Yung Road near San Lau Street (1)	34
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
17-HMT_U-U 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	35
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	36
179-HMT_D-D 101+381.3704	Town Gas main along Fat Kwong Street (1)	35
	Town Gas main along Fat Kwong Street (2)	34
	Town Gas main along Fat Kwong Street (3)	45
	Town Gas main along Fat Kwong Street (4)	43
	Town Gas main along Yan Fung Street (1)	26
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	33
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	31
	Town Gas main along Shung Yung Road near San Lau Street (1)	34
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
178-HMT_D-D 101+380.0000	Town Gas main along Fat Kwong Street (1)	35
	Town Gas main along Fat Kwong Street (2)	33
	Town Gas main along Fat Kwong Street (3)	44

	Town Gas main along Fat Kwong Street (4)	42
	Town Gas main along Yan Fung Street (1)	26
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	33
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	31
	Town Gas main along Shung Yung Road near San Lau Street (1)	34
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
177-HMT_D-D 101+375.0000	Town Gas main along Fat Kwong Street (1)	33
	Town Gas main along Fat Kwong Street (2)	31
	Town Gas main along Fat Kwong Street (3)	41
	Town Gas main along Fat Kwong Street (4)	39
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	31
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	30
	Town Gas main along Shung Yung Road near San Lau Street (1)	34
	Town Gas main along Shung Yung Road near San Lau Street (2)	33
176-HMT_D-D 101+370.0000	Town Gas main along Fat Kwong Street (1)	31
	Town Gas main along Fat Kwong Street (2)	29
	Town Gas main along Fat Kwong Street (3)	38
	Town Gas main along Fat Kwong Street (4)	36
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	30
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	29
	Town Gas main along Shung Yung Road near San Lau Street (1)	35
	Town Gas main along Shung Yung Road near San Lau Street (2)	33
175-HMT_D-D 101+365.0000	Town Gas main along Fat Kwong Street (1)	29
	Town Gas main along Fat Kwong Street (2)	28
	Town Gas main along Fat Kwong Street (3)	36
	Town Gas main along Fat Kwong Street (4)	34
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	29
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	27
	Town Gas main along Shung Yung Road near San Lau Street (1)	35
	Town Gas main along Shung Yung Road near San Lau Street (2)	34
	Town Gas main along Pak Kung Street(1)	25
174-HMT_D-D 101+360.0000	Town Gas main along Fat Kwong Street (1)	27

	Town Gas main along Fat Kwong Street (2)	26
	Town Gas main along Fat Kwong Street (3)	33
	Town Gas main along Fat Kwong Street (4)	32
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	28
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	26
	Town Gas main along Shung Yung Road near San Lau Street (1)	35
	Town Gas main along Shung Yung Road near San Lau Street (2)	34
	Town Gas main along Pak Kung Street(1)	26
173-HMT_D-D 101+355.0000	Town Gas main along Fat Kwong Street (1)	26
	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	30
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	27
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	25
	Town Gas main along Shung Yung Road near San Lau Street (1)	35
	Town Gas main along Shung Yung Road near San Lau Street (2)	34
	Town Gas main along Pak Kung Street(1)	26
172-HMT_D-D 101+350.0000	Town Gas main along Fat Kwong Street (3)	29
	Town Gas main along Fat Kwong Street (4)	28
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (1)	36
	Town Gas main along Shung Yung Road near San Lau Street (2)	35
	Town Gas main along Pak Kung Street(1)	26
171-HMT_D-D 101+345.0000	Town Gas main along Fat Kwong Street (3)	28
	Town Gas main along Fat Kwong Street (4)	27
	Town Gas main along Shung Yung Road near San Lau Street (1)	36
	Town Gas main along Shung Yung Road near San Lau Street (2)	35
	Town Gas main along Pak Kung Street(1)	27
170-HMT_D-D 101+340.0000	Town Gas main along Fat Kwong Street (3)	26
	Town Gas main along Fat Kwong Street (4)	25
	Town Gas main along Shung Yung Road near San Lau Street (1)	36
	Town Gas main along Shung Yung Road near San Lau Street (2)	36
	Town Gas main along Pak Kung Street(1)	27

16-HMT_U-U 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	35
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	30
169-HMT_D-D 101+335.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	36
	Town Gas main along Shung Yung Road near San Lau Street (2)	36
	Town Gas main along Pak Kung Street(1)	28
	Town Gas main along Pak Kung Street(2)	25
168-HMT_D-D 101+330.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	36
	Town Gas main along Shung Yung Road near San Lau Street (2)	36
	Town Gas main along Pak Kung Street(1)	28
	Town Gas main along Pak Kung Street(2)	26
167-HMT_D-D 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	36
	Town Gas main along Shung Yung Road near San Lau Street (2)	36
	Town Gas main along Pak Kung Street(1)	29
	Town Gas main along Pak Kung Street(2)	26
	Town Gas main next to Ko Shan Sub-station (1)	25
166-HMT_D-D 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	35
	Town Gas main along Shung Yung Road near San Lau Street (2)	35
	Town Gas main along Pak Kung Street(1)	28
	Town Gas main along Pak Kung Street(2)	25
	Town Gas main next to Ko Shan Sub-station (1)	25
165-HMT_D-D 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	33
	Town Gas main along Shung Yung Road near San Lau Street (2)	34
	Town Gas main along Pak Kung Street(1)	27
	Town Gas main next to Ko Shan Sub-station (1)	25
164-HMT_D-D 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	31
	Town Gas main along Shung Yung Road near San Lau Street (2)	32
	Town Gas main along Pak Kung Street(1)	26
	Town Gas main next to Ko Shan Sub-station (1)	25
163-HMT_D-D 101+305.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	30
	Town Gas main along Shung Yung Road near San Lau Street (2)	31
	Town Gas main along Pak Kung Street(1)	26

162-HMT_D-D 101+300.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	28
	Town Gas main along Shung Yung Road near San Lau Street (2)	29
161-HMT_D-D 101+295.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	26
	Town Gas main along Shung Yung Road near San Lau Street (2)	28
160-HMT_D-D 101+290.0000	Town Gas main along Shung Yung Road near San Lau Street (2)	26
15-HMT_U-U 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	36
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	26
154-HMT_D-D 101+260.0000	Town Gas main next to Ko Shan Sub-station (1)	25
153-HMT_D-D 101+255.0000	Town Gas main next to Ko Shan Sub-station (1)	25
152-HMT_D-D 101+250.0000	Town Gas main next to Ko Shan Sub-station (1)	26
151-HMT_D-D 101+245.0000	Town Gas main next to Ko Shan Sub-station (1)	27
150-HMT_D-D 101+240.0000	Town Gas main next to Ko Shan Sub-station (1)	28
14-HMT_U-U 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	39
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
149-HMT_D-D 101+235.0000	Town Gas main next to Ko Shan Sub-station (1)	29
148-HMT_D-D 101+230.0000	Town Gas main next to Ko Shan Sub-station (1)	31
147-HMT_D-D 101+225.0000	Town Gas main next to Ko Shan Sub-station (1)	33
146-HMT_D-D 101+220.0000	Town Gas main next to Ko Shan Sub-station (1)	35
145-HMT_D-D 101+215.0000	Town Gas main next to Ko Shan Sub-station (1)	35
143-HMT_D-D 101+213.9891	Town Gas main next to Ko Shan Sub-station (1)	35
142-HMT_D-D 101+210.0000	Town Gas main next to Ko Shan Sub-station (1)	34
141-HMT_D-D 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	33
140-HMT_D-D 101+200.0000	Town Gas main next to Ko Shan Sub-station (1)	31
13-HMT_U-U 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
139-HMT_D-D 101+195.0000	Town Gas main next to Ko Shan Sub-station (1)	29
138-HMT_D-D 101+190.0000	Town Gas main next to Ko Shan Sub-station (1)	27
137-HMT_D-D 101+185.0000	Town Gas main next to Ko Shan Sub-station (1)	26
12-HMT_U-U 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	48
129-HMT_D-D 101+155.0000	Town Gas main along San Lau Street(3)	26

128-HMT_D-D 101+150.0000	Town Gas main along San Lau Street(3)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	27
127-HMT_D-D 101+145.0000	Town Gas main along San Lau Street(1)	28
	Town Gas main along San Lau Street(2)	28
	Town Gas main along San Lau Street(3)	33
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	31
126-HMT_D-D 101+140.0000	Town Gas main along San Lau Street(1)	31
	Town Gas main along San Lau Street(2)	32
	Town Gas main along San Lau Street(3)	36
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	36
125-HMT_D-D 101+135.0000	Town Gas main along San Lau Street(1)	34
	Town Gas main along San Lau Street(2)	36
	Town Gas main along San Lau Street(3)	40
	Town Gas main along San Lau Street(4)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	34
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	42
124-HMT_D-D 101+130.0000	Town Gas main along San Lau Street(1)	37
	Town Gas main along San Lau Street(2)	40
	Town Gas main along San Lau Street(3)	43
	Town Gas main along San Lau Street(4)	30
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	34
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	41
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	48
123-HMT_D-D 101+125.0000	Town Gas main along San Lau Street(1)	35
	Town Gas main along San Lau Street(2)	39
	Town Gas main along San Lau Street(3)	41
	Town Gas main along San Lau Street(4)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	36
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	43
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	49

122-HMT_D-D 101+120.0000	Town Gas main along San Lau Street(1)	33
	Town Gas main along San Lau Street(2)	38
	Town Gas main along San Lau Street(3)	38
	Town Gas main along San Lau Street(4)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	46
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	49
121-HMT_D-D 101+115.0000	Town Gas main along San Lau Street(1)	31
	Town Gas main along San Lau Street(2)	36
	Town Gas main along San Lau Street(3)	35
	Town Gas main along San Lau Street(4)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	40
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	48
120-HMT_D-D 101+110.0000	Town Gas main along San Lau Street(1)	28
	Town Gas main along San Lau Street(2)	32
	Town Gas main along San Lau Street(3)	31
	Town Gas main along San Lau Street(4)	25
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	40
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	44
11-HMT_U-U 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
119-HMT_D-D 101+105.0000	Town Gas main along San Lau Street(2)	29
	Town Gas main along San Lau Street(3)	27
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	40
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	40
118-HMT_D-D 101+100.0000	Town Gas main along San Lau Street(2)	26
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	41
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	37

117-HMT_D-D 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	43
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	34
115-HMT_D-D 101+093.9891	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	43
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	34
114-HMT_D-D 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	45
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	32
113-HMT_D-D 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	47
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	31
112-HMT_D-D 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	48
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	30
111-HMT_D-D 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	46
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	29
110-HMT_D-D 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	44
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	28
10-HMT_U-U 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	41
109-HMT_D-D 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	43
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	28
108-HMT_D-D 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	42
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	28
107-HMT_D-D 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	42
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	28

106-HMT_D-D 101+050.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	28
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	42
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	29
105-HMT_D-D 101+045.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(1)	25
	Town Gas main along Chatham Road near Shansi Street Works Shaft(2)	29
	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	33
	Town Gas main along Chatham Road near Shansi Street Works Shaft(5)	29
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	49
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	42
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	30
104-HMT_D-D 101+040.0000	Town Gas main along Kiang His Street(1)	25
	Town Gas main along Chatham Road near Shansi Street Works Shaft(1)	27
	Town Gas main along Chatham Road near Shansi Street Works Shaft(2)	31
	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	37
	Town Gas main along Chatham Road near Shansi Street Works Shaft(5)	32
	Town Gas main along Ma Tau Wai Road near Wing Kwong Street(1)	25
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	45
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	39
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	28
103-HMT_D-D 101+035.0000	Town Gas main along Fat Kwong Street (1)	26
103-HMT_D-D 101+035.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(1)	27
	Town Gas main along Chatham Road near Shansi Street Works Shaft(2)	31
	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	37
	Town Gas main along Chatham Road near Shansi Street Works Shaft(5)	31
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	38

	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	33
102-HMT_U-U 101+490.0000	Town Gas main along Fat Kwong Street (1)	43
	Town Gas main along Fat Kwong Street (2)	49
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	35
	Town Gas main along Yan Fung Street (1)	39
	Town Gas main along Yan Fung Street (2)	42
101-HMT_U-U 101+485.0000	Town Gas main along Fat Kwong Street (1)	43
	Town Gas main along Fat Kwong Street (2)	49
	Town Gas main along Fat Kwong Street (3)	32
	Town Gas main along Fat Kwong Street (4)	34
	Town Gas main along Yan Fung Street (1)	36
	Town Gas main along Yan Fung Street (2)	39
100-HMT_U-U 101+480.0000	Town Gas main along Fat Kwong Street (1)	42
	Town Gas main along Fat Kwong Street (2)	49
	Town Gas main along Fat Kwong Street (3)	31
	Town Gas main along Fat Kwong Street (4)	35
	Town Gas main along Yan Fung Street (1)	34
	Town Gas main along Yan Fung Street (2)	36
104-HMT_D-D 101+040.0000	Town Gas main along Ma Tau Wai Road near Wing Kwong Street(2)	26

Ground Vibration Effect on Buildings due to Detonation of Full Load during the Transfer of Explosives from Delivery Point to Blast Site

The effect from ground vibrations caused by the denotation of 203 kg and 200 kg of explosives within the tunnel whilst transferring explosives to the appropriate blast site may cause damage to nearby buildings and utilities next to Ho Man Tin Tunnels. The results of the analysis are summarized in *Table 5.22* .

Table 5.22 Buildings Exceeding Peak Particle Velocity of 100 mm/s due to Full Load Initiation during Construction of Ho Man Tin Tunnels

Scenario/Chainage	Features Affected	Observed PPV (mm/s)
Full load detonation of HMT_U-U 101+025.0000 to HMT_U-U 101+055.0000	Comfort House	171
Full load detonation of HMT_U-U 101+050.0000 to HMT_U-U 101+075.0000	Fu Bond Building	138
Full load detonation of HMT_U-U 101+145.0000 to HMT_U-U 101+160.0000	Ko Shan Road Substation	117
Full load detonation of HMT_U-U 101+045.0000 to HMT_U-U 101+055.0000	Lee Wing Building	106
Full load detonation of HMT_U-U 101+080.0000 to HMT_U-U 101+105.0000	Lung Wah Court	130
Full load detonation of HMT_U-U 101+025.0000 to HMT_U-U 101+055.0000	Temporary retaining structure (Shansi Street works shaft)	1349
Full load detonation of HMT_U-U 101+060.0000 to HMT_U-U 101+080.0000	The City Culture	120
Full load detonation of HMT_U-U 101+070.0000 to HMT_U-U 101+075.0000	Wealthy Court	101
Full load detonation of HMT_U-U 101+090.0000 to HMT_U-U 101+110.0000	Wing Lam Building	118
Full load detonation of HMT_U-U 101+065.0000 to HMT_U-U 101+085.0000	Wing Wu Building	124

Ground Vibration Effect on Slopes due to Detonation of Full Load during Transferring Explosives from Delivery Point to Blast Site

A screening value of 90 mm/s for PPV was applied for assessing failure of slopes, below which the probability of slope failure is considered insignificant. The probability of failure follows the criteria given in *Section 5.2.1*. The results are presented in the following table.

Table 5.23 ***Slopes Exceeding Peak Particle Velocity of 90 mm/s due to Full Load Initiation during Construction of Ho Man Tin Tunnels***

Scenario	Slope	Observed PPV (mm/s)
Full load detonation of HMT_U-U 101+190.0000 to HMT_U-U 101+200.0000	11NW-D/C616	95
Full load detonation of HMT_U-U 101+170.0000 to HMT_U-U 101+175.0000	11NW-D/CR306	92

Blast Effects due to Detonation of Full Load during the Transfer of Explosives from Delivery Point to Blast Site

Blast effects due to detonation of full load during the transfer of explosives are summarised in *Table 5.24*.

Table 5.24 ***Summary of Blast Effects associated with Transport of Explosives from Delivery Point to Blast Site at Ho Man Tin Tunnels***

Scenario	Description	TNT eqv. (kg)	Freq. (/yr)	*Indoor*		*Outdoor*	
				Fatality Prob.	Impact distance (m)	Fatality Prob.	Impact distance (m)
S01	Initiation of explosives during explosives delivery from delivery point at Shansi Street to Shansi Street Shaft at Ho Man Tin Tunnel (South)	200	4.70E-9	90%	19	90%	15
				50%	22	50%	16
				10%	32	10%	17
				3%	43	3%	19
				1%	56	1%	20
S02	Initiation of explosives during explosives delivery from delivery point at Shansi Street to Shansi Street Shaft at Ho Man Tin Tunnel (North)	203	3.37E-08	90%	19	90%	15
				50%	22	50%	16
				10%	32	10%	17
				3%	44	3%	19
				1%	57	1%	20
S03	Initiation of explosives during explosives delivery from Shansi Street Shaft to blast site at Ho Man Tin Tunnel (South)	200	2.85E-08	90%	19	90%	15
				50%	22	50%	16
				10%	32	10%	17
				3%	43	3%	19
				1%	56	1%	20
S04	Initiation of explosives during explosives delivery from Shansi Street Shaft to blast site at Ho Man Tin Tunnel (North)	203		90%	19	90%	15
				50%	22	50%	16
				10%	32	10%	17
				3%	44	3%	19
				1%	57	1%	20

Ground Vibration Effect on Towngas Gas Pipelines due to Detonation of Full Load during the Transfer of Explosives from Delivery Point to Blast Site

Several gas mains were identified to be potentially affected by the construction of the Ho Man Tin Tunnels. The same approach to risk assessment as for pipelines at Hin Keng Portal was used (see criteria developed in *Section 5.3.4*) and the results are presented in *Table 5.25*. The pipes were modelled as a 0.02 barg 180 mm gas main for conservatism.

Table 5.25 ***Consequence of Ground Vibration Effect Towngas Pipelines from Full Load Detonation during Construction of Ho Man Tin Tunnels***

Scenario	Frequency (/ yr)	Travel Distance along Access Path (m)
Full load detonation along delivery route causing 50% damage to towngas pipelines around Ho Man Tin tunnels by vibration effect	1.61E-09	25
Full load detonation along delivery route causing 10% damage to towngas pipelines around Ho Man Tin tunnels by vibration effect	9.01E-09	64
Full load detonation along delivery route causing 1% damage to towngas pipelines around Ho Man Tin tunnels by vibration effect	3.96E-09	159

Blast Effects on Towngas Pipeline due to Detonation of Full Load during the Transfer of Explosives Along Access Path

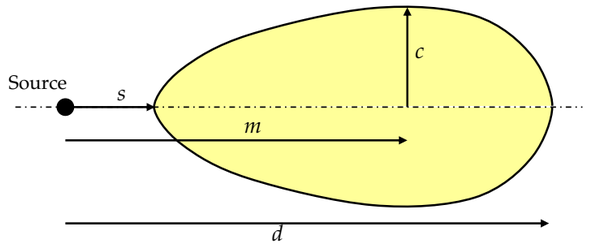
The accidental initiation of 203 kg of explosives was found to cause no pipe ruptures on the Town Gas gas mains based on the distance given in *Section 5.3.3* for pipe rupture since the nearest point of the delivery route is 40 m away from the pipelines.

5.5.6 *Consequence Assessment Results for Rupture of Towngas Installations and LPG Gas Station*

Detailed results of the consequence analysis conducted for Towngas installations and the LPG Gas Station are shown in *Table 5.26* which tabulate the effect zones associated with various end points of the hazardous outcomes considered. Consequence results are presented in terms of:

- d: maximum downwind distance;
- c: maximum half-width;
- s: offset distance between source and effect zone; and
- m: downwind distance at which the maximum width, c, occurs.

Figure 5.5 Presentation of Consequence Results



Weather conditions (2F, 3D and 7D) used in the consequence modelling are described in *Section 5.4.2*.

Table 5.26 Consequence Distance for Events

Scenario / ID Tag	End Point	Fatality Prob.	2F				3D				7D			
			d	c	s	m	d	c	s	m	d	c	s	m
Town Gas Installations														
OFT-RUP-G_FF	0.85LFL	1	175	7	0	106	182	8	0	111	196	7	0	111
OFT-RUP-G_FB	Flame zone	1	40	40	-40	0	40	40	-40	0	40	40	-40	0
	2669 TDU	0.9	41	41	-41	0	41	41	-41	0	41	41	-41	0
	4167 TDU	0.5	48	48	-48	0	48	48	-48	0	48	48	-48	0
	1038 TDU	0.03	67	67	-67	0	67	67	-67	0	67	67	-67	0
OFT-RUP-G_JF	20.9	0.97	81	28	17	49	83	29	18	51	95	30	17	56
	14.4	0.77	87	37	13	51	88	38	14	51	100	38	14	58
	7.3	0.17	105	56	2	55	107	56	4	56	112	56	8	60
OFT-RUP-G_TX	4.90%	0.01	141	6	0	66	149	6	0	71	160	6	0	72
LPG Gas Station														
Fireball	Flame Zone	1	75	75	-75	0	75	75	-75	0	75	75	-75	0
Flash Fire	LFL	1	1	1	0	1	1	1	0	1	1	1	0	1

6.1 RISK RESULTS

Risk Summation of Use of Explosives

Although the blasting operation of whole SCL (TAW-HUH) project will be carried out in 13 months, it was conservatively assumed that all the scenarios leading to failure would occur in the same year.

6.1.1 *Risk Results for Construction of Lion Rock Tunnel for SCL (TAW-HUH) Alignment*

The frequency of occurrence of more than 3 to 6 MIC detonated at the same time has been derived on a per 10-m and a per 5-m basis (see *Table 4.3*). The relevant length of the chainage that impact the feature as identified in the consequence assessment was then used to obtain the frequency of the hazard footprints.

The hazard footprints at each interval of the relevant chainage were then overlaid on each particular feature to estimate the number of fatalities due to falling objects in buildings, or failure of slopes/ boulders.

The resulting risk for every interval of the relevant chainage is summed to determine the overall risk to a particular feature and the risks of all relevant features are summed to give the overall risk due to the blasting operation for the SCL (TAW-HUH) project.

Ground Vibration Effect on Slopes due to Errors in Blasting Face

No Slopes were found to exceed a PPV of 90mm/s due to accidental initiation of up to 6MIC during the construction of the Lion Rock Tunnel.

Ground Vibration Effect on Buildings due to Errors in the Blasting Face

The results of the scenario frequencies and expected fatalities for the affected building features arising from an accidental initiation of explosives in the blasting face are summarized in *Table 6.1* below.

Table 6.1 ***Features Affected by Higher than Expected Vibrations Generated by Accidental Initiation during the Construction of Lion Rock Tunnel***

Scenario/ Chainage	Features Affected	Scenario Frequency (/yr)(1)	Expected Fatality (N)(2)	Remarks
4MIC detonated at the same time				
211-LRT-27190	Shaft D'wall	8.55E-09	-	-
213-LRT-27210	Shaft D'wall	8.55E-09	-	-
5MIC detonated at the same time				
210-LRT-27180	Shaft D'wall	8.55E-09	-	-
211-LRT-27190	Shaft D'wall	8.55E-09	-	-
212-LRT-27200	Shaft D'wall	8.55E-09	-	-
213-LRT-27210	Shaft D'wall	8.55E-09	-	-
6MIC detonated at the same time				
210-LRT-27180	Shaft D'wall	8.55E-09	-	-
211-LRT-27190	Shaft D'wall	8.55E-09	-	-
212-LRT-27200	Shaft D'wall	8.55E-09	-	-
213-LRT-27210	Shaft D'wall	8.55E-09	-	-

Note:
(1) This value is obtained from *Table 4.3*. For the concern section which is less than 10 m, the frequency will be adjusted accordingly.
(2) Expected fatality = Population x Fatality rate. The Fatality rate is interpolated (between 1% and 100%) for PPV between 100 mm/s and 229 mm/s.

Ground Vibration Effect on Old Beacon Hill Tunnel due to Errors in Blast Face

The results of the scenario frequencies and probability of damage to then Old Beacon Hill Tunnel due to ground shocks generated because of errors in the blasting faces are summarized in the following table.

Table 6.2 ***Features (Old Beacon Hill Tunnel) Affected by Higher than Expected Vibrations Generated by Accidental Initiation during the Construction of Lion Rock Tunnel***

Scenario/ Chainage	Features Affected	Scenario Frequency (/yr)	Probability of Damage
2MIC detonated at the same time			
435-LRT-29430	Gas Main Tunnel Nearest to proposed tunnel	5.16E-04	1%
436-LRT-29440	Gas Main Tunnel Nearest to proposed tunnel	5.16E-04	1%
437-LRT-29450	Gas Main Tunnel Nearest to proposed tunnel	5.16E-04	1%
438-LRT-29460	Gas Main Tunnel Nearest to proposed tunnel	5.16E-04	2%
439-LRT-29470	Gas Main Tunnel Nearest to proposed tunnel	5.16E-04	3%

440-LRT-29480	Gas Main Tunnel Nearest to proposed tunnel	5.16E-04	3%
441-LRT-29490	Gas Main Tunnel Nearest to proposed tunnel	5.16E-04	2%
3MIC detonated at the same time			
433-LRT-29410	Gas Main Tunnel Nearest to proposed tunnel	1.49E-06	1%
434-LRT-29420	Gas Main Tunnel Nearest to proposed tunnel	1.49E-06	2%
435-LRT-29430	Gas Main Tunnel Nearest to proposed tunnel	1.49E-06	3%
436-LRT-29440	Gas Main Tunnel Nearest to proposed tunnel	1.49E-06	3%
437-LRT-29450	Gas Main Tunnel Nearest to proposed tunnel	1.49E-06	3%
438-LRT-29460	Gas Main Tunnel Nearest to proposed tunnel	1.49E-06	4%
439-LRT-29470	Gas Main Tunnel Portal	1.49E-06	1%
	Gas Main Tunnel Nearest to proposed tunnel	1.49E-06	5%
440-LRT-29480	Gas Main Tunnel Portal	1.49E-06	1%
	Gas Main Tunnel Nearest to proposed tunnel	1.49E-06	5%
441-LRT-29490	Gas Main Tunnel Nearest to proposed tunnel	1.49E-06	4%
4MIC detonated at the same time			
430-LRT-29380	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	2%
431-LRT-29390	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	2%
432-LRT-29400	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	2%
433-LRT-29410	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	3%
434-LRT-29420	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	3%
435-LRT-29430	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	5%
436-LRT-29440	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	4%
437-LRT-29450	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	5%
438-LRT-29460	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	5%
	Gas Main Tunnel Portal	8.55E-09	1%
439-LRT-29470	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	7%
	Gas Main Tunnel Portal	8.55E-09	3%
440-LRT-29480	Gas Main Tunnel Portal	8.55E-09	2%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	6%
441-LRT-29490	Gas Main Tunnel Portal	8.55E-09	2%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	5%
442-LRT-29500	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	2%
5MIC detonated at the same time			
428-LRT-29360	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	1%
429-LRT-29370	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	2%
430-LRT-29380	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	3%
431-LRT-29390	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	3%
432-LRT-29400	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	3%
433-LRT-29410	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	4%
434-LRT-29420	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	4%
435-LRT-29430	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	6%
	Gas Main Tunnel Portal	8.55E-09	2%
436-LRT-29440	Gas Main Tunnel Portal	8.55E-09	1%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	6%
437-LRT-29450	Gas Main Tunnel Portal	8.55E-09	2%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	6%
438-LRT-29460	Gas Main Tunnel Portal	8.55E-09	2%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	7%
439-LRT-29470	Gas Main Tunnel Portal	8.55E-09	4%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	9%
440-LRT-29480	Gas Main Tunnel Portal	8.55E-09	3%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	8%
441-LRT-29490	Gas Main Tunnel Portal	8.55E-09	3%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	7%
442-LRT-29500	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	3%
6MIC detonated at the same time			
428-LRT-29360	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	2%
429-LRT-29370	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	3%
430-LRT-29380	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	4%
431-LRT-29390	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	4%
432-LRT-29400	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	4%
433-LRT-29410	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	5%
	Gas Main Tunnel Portal	8.55E-09	1%
434-LRT-29420	Gas Main Tunnel Portal	8.55E-09	1%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	5%
435-LRT-29430	Gas Main Tunnel Portal	8.55E-09	3%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	7%
436-LRT-29440	Gas Main Tunnel Portal	8.55E-09	2%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	7%
437-LRT-29450	Gas Main Tunnel Portal	8.55E-09	3%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	8%
438-LRT-29460	Gas Main Tunnel Portal	8.55E-09	3%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	8%

439-LRT-29470	Gas Main Tunnel Portal	8.55E-09	5%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	15%
440-LRT-29480	Gas Main Tunnel Portal	8.55E-09	4%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	10%
441-LRT-29490	Gas Main Tunnel Portal	8.55E-09	4%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	8%
442-LRT-29500	Gas Main Tunnel Portal	8.55E-09	1%
	Gas Main Tunnel Nearest to proposed tunnel	8.55E-09	4%

The associated overall scenario frequency corresponding to the pipe damage probabilities are presented in *Table 6.4*.

Table 6.3 ***Scenario frequencies for Damage of Gas Mains inside the Old Beacon Hill Tunnel***

Gas Main	Probability of Damage	Overall Scenario Frequency (per year) (1)
Gas Main Tunnel	1 – 15%	6.76E-05

(1) This value takes into account the corresponding probability of damage for each Scenario

Taking into account the ignition probability of towngas of 0.07 for major releases (Lees, 1996), which is considered to be an conservative approach, the occurrence frequency for a towngas explosion event for the gas main will be 4.73E-06 per year. A single fatality was conservatively assumed for each of these scenarios based on the consequence modelling.

Ground Vibration Effect on the LPG Gas Station due to Errors in Blast Face

The results of the scenario frequencies and probability of damage to the LPG Gas Station due to ground shocks generated because of errors in the blasting faces are summarized in the following table.

Table 6.4 ***Features (LPG Gas Station) Affected by Higher than Expected Vibrations Generated by Accidental Initiation during the Construction of Lion Rock Tunnel***

Scenario/ Chainage	Features Affected	Scenario Frequency (/yr)	Probability of Damage
3MIC detonated at the same time			
213-LRT-27210	LPG Gas Station	1.49E-06	2%
214-LRT-27220	LPG Gas Station	1.49E-06	3%
215-LRT-27230	LPG Gas Station	1.49E-06	3%
216-LRT-27240	LPG Gas Station	1.49E-06	3%
217-LRT-27250	LPG Gas Station	1.49E-06	3%
218-LRT-27260	LPG Gas Station	1.49E-06	3%
219-LRT-27270	LPG Gas Station	1.49E-06	3%

220-LRT-27280	LPG Gas Station	1.49E-06	3%
221-LRT-27290	LPG Gas Station	1.49E-06	3%
222-LRT-27300	LPG Gas Station	1.49E-06	3%
223-LRT-27310	LPG Gas Station	1.49E-06	3%
224-LRT-27320	LPG Gas Station	1.49E-06	3%
225-LRT-27330	LPG Gas Station	1.49E-06	3%
226-LRT-27340	LPG Gas Station	1.49E-06	3%
227-LRT-27350	LPG Gas Station	1.49E-06	3%
228-LRT-27360	LPG Gas Station	1.49E-06	3%
229-LRT-27370	LPG Gas Station	1.49E-06	3%
230-LRT-27380	LPG Gas Station	1.49E-06	3%
231-LRT-27390	LPG Gas Station	1.49E-06	3%
232-LRT-27400	LPG Gas Station	1.49E-06	3%
233-LRT-27410	LPG Gas Station	1.49E-06	2%
234-LRT-27420	LPG Gas Station	1.49E-06	1%
4MIC detonated at the same time			
213-LRT-27210	LPG Gas Station	8.55E-09	3%
214-LRT-27220	LPG Gas Station	8.55E-09	4%
215-LRT-27230	LPG Gas Station	8.55E-09	4%
216-LRT-27240	LPG Gas Station	8.55E-09	4%
217-LRT-27250	LPG Gas Station	8.55E-09	4%
218-LRT-27260	LPG Gas Station	8.55E-09	4%
219-LRT-27270	LPG Gas Station	8.55E-09	4%
220-LRT-27280	LPG Gas Station	8.55E-09	4%
221-LRT-27290	LPG Gas Station	8.55E-09	4%
222-LRT-27300	LPG Gas Station	8.55E-09	4%
223-LRT-27310	LPG Gas Station	8.55E-09	4%
224-LRT-27320	LPG Gas Station	8.55E-09	4%
225-LRT-27330	LPG Gas Station	8.55E-09	4%
226-LRT-27340	LPG Gas Station	8.55E-09	4%
227-LRT-27350	LPG Gas Station	8.55E-09	4%
228-LRT-27360	LPG Gas Station	8.55E-09	4%
229-LRT-27370	LPG Gas Station	8.55E-09	4%
230-LRT-27380	LPG Gas Station	8.55E-09	4%
231-LRT-27390	LPG Gas Station	8.55E-09	4%
232-LRT-27400	LPG Gas Station	8.55E-09	4%
233-LRT-27410	LPG Gas Station	8.55E-09	3%
234-LRT-27420	LPG Gas Station	8.55E-09	3%
235-LRT-27430	LPG Gas Station	8.55E-09	1%
5MIC detonated at the same time			
213-LRT-27210	LPG Gas Station	8.55E-09	4%
214-LRT-27220	LPG Gas Station	8.55E-09	5%
215-LRT-27230	LPG Gas Station	8.55E-09	5%
216-LRT-27240	LPG Gas Station	8.55E-09	5%
217-LRT-27250	LPG Gas Station	8.55E-09	5%
218-LRT-27260	LPG Gas Station	8.55E-09	5%
219-LRT-27270	LPG Gas Station	8.55E-09	5%
220-LRT-27280	LPG Gas Station	8.55E-09	5%
221-LRT-27290	LPG Gas Station	8.55E-09	5%
222-LRT-27300	LPG Gas Station	8.55E-09	5%
223-LRT-27310	LPG Gas Station	8.55E-09	5%
224-LRT-27320	LPG Gas Station	8.55E-09	5%
225-LRT-27330	LPG Gas Station	8.55E-09	5%
226-LRT-27340	LPG Gas Station	8.55E-09	5%
227-LRT-27350	LPG Gas Station	8.55E-09	5%
228-LRT-27360	LPG Gas Station	8.55E-09	5%

229-LRT-27370	LPG Gas Station	8.55E-09	5%
230-LRT-27380	LPG Gas Station	8.55E-09	5%
231-LRT-27390	LPG Gas Station	8.55E-09	5%
232-LRT-27400	LPG Gas Station	8.55E-09	5%
233-LRT-27410	LPG Gas Station	8.55E-09	4%
234-LRT-27420	LPG Gas Station	8.55E-09	4%
235-LRT-27430	LPG Gas Station	8.55E-09	2%
236-LRT-27440	LPG Gas Station	8.55E-09	2%
237-LRT-27450	LPG Gas Station	8.55E-09	1%
6MIC detonated at the same time			
213-LRT-27210	LPG Gas Station	8.55E-09	5%
214-LRT-27220	LPG Gas Station	8.55E-09	7%
215-LRT-27230	LPG Gas Station	8.55E-09	7%
216-LRT-27240	LPG Gas Station	8.55E-09	7%
217-LRT-27250	LPG Gas Station	8.55E-09	7%
218-LRT-27260	LPG Gas Station	8.55E-09	7%
219-LRT-27270	LPG Gas Station	8.55E-09	7%
220-LRT-27280	LPG Gas Station	8.55E-09	7%
221-LRT-27290	LPG Gas Station	8.55E-09	7%
222-LRT-27300	LPG Gas Station	8.55E-09	7%
223-LRT-27310	LPG Gas Station	8.55E-09	7%
224-LRT-27320	LPG Gas Station	8.55E-09	7%
225-LRT-27330	LPG Gas Station	8.55E-09	7%
226-LRT-27340	LPG Gas Station	8.55E-09	7%
227-LRT-27350	LPG Gas Station	8.55E-09	7%
228-LRT-27360	LPG Gas Station	8.55E-09	7%
229-LRT-27370	LPG Gas Station	8.55E-09	7%
230-LRT-27380	LPG Gas Station	8.55E-09	7%
231-LRT-27390	LPG Gas Station	8.55E-09	7%
232-LRT-27400	LPG Gas Station	8.55E-09	7%
233-LRT-27410	LPG Gas Station	8.55E-09	5%
234-LRT-27420	LPG Gas Station	8.55E-09	5%
235-LRT-27430	LPG Gas Station	8.55E-09	3%
236-LRT-27440	LPG Gas Station	8.55E-09	2%
237-LRT-27450	LPG Gas Station	8.55E-09	2%
238-LRT-27460	LPG Gas Station	8.55E-09	2%

Ground Vibration Effect on Towngas Pipelines due to Errors in Blast Face

Ground vibration effect on the Towngas Pipeline was not separately assessed here as it has already been assessed in the previous subsection, damage to tunnel and subsequent damage to the pipeline, adopting more stringent criteria.

Ground Vibration Effect on Buildings due to Detonation of Full Load during the Transfer of Explosives from Delivery Point to Blast Site

Table 6.5 gives the results for buildings that are affected by the detonation of a full load during construction of the tunnels and the expected fatalities.

Table 6.5 ***Buildings Exceeding Peak Particle Velocity of 100mm/s due to Full Load Initiation during Construction of Lion Rock Tunnel***

Scenario/Chainage	Feature Affected	Scenario Frequency (/yr)	Expected Fatality (N) (1)	Remark
Full load detonation at LRT Chainage 29160-29200	High Island Water Tunnel	8.62E-09	1	(1)
Full load detonation at LRT Chainage 27180-27210	Shaft D'Wall	6.50E-09	-	

(1) Minimum of a single fatality is assumed for values of less than 1.

Ground Vibration Effect on Slopes due to Detonation of Full Load during the Transfer of Explosives from Delivery Point to Blast Site

Table 6.7 gives the results for slopes that are affected by the detonation of a full load during construction of the tunnels and the expected fatalities.

Table 6.6 ***Slopes Exceeding Peak Particle Velocity of 90 mm/s due to Full Load Initiation during the Construction of Lion Rock Tunnel***

Scenario/Chainage	Features Affected	Scenario Frequency (/yr) (1)	Expected Fatality (N)	Remark
Full load detonation at LRT Chainage 27180-27200	11NE-A/C333	5.09E-09	1	(2)

Note:

(1) This value is obtained using the equation for landslide consequence from Report 81 Slope Failures along BRIL Roads (CEDD, 1999).

(2) Minimum of a single fatality is assumed for values of less than 1.

Effect of Damage to Beacon Hill North Gas Offtake Station on Population

The frequency of a full piping rupture at Beacon Hill Offtake Station is 3.86E-11 which is much less that 1E-09, therefore was not considered further. The results are presented in *Table 6.7*.

Table 6.7 ***Maximum Fatality Caused by Rupture of Piping at Beacon Hill North Gas Offtake Station***

Scenario	Frequency (/yr)	Max. Fatality (N)
Rupture of piping at Beacon Hill North Gas Offtake Station	3.86E-11	-

Effect of Damage to Towngas Pipeline on Population

The effect of a full towngas pipeline rupture on the population was modelled using RISKPLOT™ and the following table shows the results.

Table 6.8 Maximum Fatality Caused by Rupture of Towngas Pipeline at Hin Keng Portal

Scenario	Frequency (/yr)	Max. Fatality (N)
Rupture of Towngas pipeline near Hin Keng Portal	5.28E-08	39

6.1.2 Risk Results for Construction of Ho Man Tin Tunnels for SCL (TAW-HUH) Alignment

Ground Vibration Effect on Slopes due to Errors in Blasting Face

No slopes were found to be affected by the accidental initiation of up to 6 MIC during the construction of Ho Man Tin Tunnels.

Ground Vibration Effect on Buildings due to Errors in Blasting Face

The results of the scenario frequencies and expected fatalities for the affected building features due to ground shock generated because of errors in the blasting face are summarized in *Table 6.9* below.

Table 6.9 Features Affected by Higher than Expected Vibrations Generated by Accidental Initiation during the Construction of Ho Man Tin Tunnels

Scenario/ Chainage	Features Affected	Scenario Frequency (yr)(1)	Expected Fatality (N)(2)
2MIC detonated at the same time			
1-HMT_U-U 101+025.0000	Temporary retaining structure (Shansi Street works shaft)	2.58E-04	-
2-HMT_U-U 101+030.0000	Temporary retaining structure (Shansi Street works shaft)	2.58E-04	-
103-HMT_D-D 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	2.58E-04	-
104-HMT_D-D 101+040.0000	Temporary retaining structure (Shansi Street works shaft)	2.58E-04	-
3MIC detonated at the same time			
1-HMT_U-U 101+025.0000	Temporary retaining structure (Shansi Street works shaft)	7.44E-07	-
2-HMT_U-U 101+030.0000	Temporary retaining structure (Shansi Street works shaft)	7.44E-07	-
3-HMT_U-U 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	7.44E-07	-
103-HMT_D-D 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	7.44E-07	-
104-HMT_D-D 101+040.0000	Temporary retaining structure (Shansi Street works shaft)	7.44E-07	-
105-HMT_D-D 101+045.0000	Temporary retaining structure (Shansi Street works shaft)	7.44E-07	-
4MIC detonated at the same time			
1-HMT_U-U 101+025.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
2-HMT_U-U 101+030.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
3-HMT_U-U 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
103-HMT_D-D 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
104-HMT_D-D 101+040.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
105-HMT_D-D 101+045.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
106-HMT_D-D 101+050.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
5MIC detonated at the same time			
3-HMT_U-U 101+035.0000	Building 1	4.28E-09	12
4-HMT_U-U 101+040.0000	Building 1	4.28E-09	19
5-HMT_U-U 101+045.0000	Building 1	4.28E-09	12
1-HMT_U-U 101+025.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
2-HMT_U-U 101+030.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
3-HMT_U-U 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
103-HMT_D-D 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
104-HMT_D-D 101+040.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
105-HMT_D-D 101+045.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
106-HMT_D-D 101+050.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
6MIC detonated at the same time			
3-HMT_U-U 101+035.0000	Building 1	4.28E-09	36
4-HMT_U-U 101+040.0000	Building 1	4.28E-09	41
5-HMT_U-U 101+045.0000	Building 1	4.28E-09	33
1-HMT_U-U 101+025.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
2-HMT_U-U 101+030.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
3-HMT_U-U 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
4-HMT_U-U 101+040.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-

103-HMT_D-D 101+035.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
104-HMT_D-D 101+040.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
105-HMT_D-D 101+045.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-
106-HMT_D-D 101+050.0000	Temporary retaining structure (Shansi Street works shaft)	4.28E-09	-

Note:
(1) This value is obtained from *Table 4.3*. For the concerned section which is less than 5 m, the frequency will be adjusted accordingly
(2) Expected fatality = Population x Fatality rate

Ground Vibration Effect on Towngas Pipelines due to Errors in Blast Face

Scenario frequencies and probability of pipe damage for the affected town gas pipelines due to ground shock generated because of errors in the blasting faces are summarized in the following table.

Table 6.10 Gas Mains Affected by Higher than Expected Vibrations Generated by Accidental Initiation during the Construction of Ho Man Tin Tunnels

Scenario/ Chainage	Features Affected(1)	Scenario Frequency (/yr)(1)	Probability of Damage(2)
3MIC Detonated at the same time			
9-HMT_U-U 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	1%
99-HMT_U-U 101+475.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	3%
98-HMT_U-U 101+470.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	3%
97-HMT_U-U 101+465.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	3%
96-HMT_U-U 101+460.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	1%
94-HMT_U-U 101+457.5436	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	1%
93-HMT_U-U 101+455.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
92-HMT_U-U 101+450.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (3)	7.44E-07	1%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
91-HMT_U-U 101+445.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
100-HMT_U-U 101+480.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	1%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
89-HMT_U-U 101+435.0000	Town Gas main along Fat Kwong Street (2)	7.44E-07	1%
	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
88-HMT_U-U 101+430.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
87-HMT_U-U 101+425.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
85-HMT_U-U 101+422.5436	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
85-HMT_U-U 101+415.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
84-HMT_U-U 101+420.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
84-HMT_U-U 101+410.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%

83-HMT_U-U 101+405.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
82-HMT_U-U 101+400.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
81-HMT_U-U 101+395.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
80-HMT_U-U 101+390.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
7-HMT_U-U 101+054.6193	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	1%
79-HMT_U-U 101+385.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
78-HMT_U-U 101+380.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
77-HMT_U-U 101+375.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	7.44E-07	1%
76-HMT_U-U 101+370.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	7.44E-07	1%
75-HMT_U-U 101+365.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
74-HMT_U-U 101+360.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	1%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	1%
70-HMT_U-U 101+340.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	7.44E-07	1%
6-HMT_U-U 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	1%

69-HMT_U-U 101+335.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	7.44E-07	1%
68-HMT_U-U 101+330.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	7.44E-07	1%
67-HMT_U-U 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	7.44E-07	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	7.44E-07	1%
66-HMT_U-U 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	7.44E-07	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	7.44E-07	1%
65-HMT_U-U 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	7.44E-07	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	7.44E-07	1%
64-HMT_U-U 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	7.44E-07	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	7.44E-07	1%
63-HMT_U-U 101+305.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	7.44E-07	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	7.44E-07	1%
62-HMT_U-U 101+300.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	7.44E-07	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	7.44E-07	2%
61-HMT_U-U 101+295.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	7.44E-07	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	7.44E-07	2%
60-HMT_U-U 101+290.0000	Town Gas main along Shung Yung Road near San Lau Street (2)	7.44E-07	1%
5-HMT_U-U 101+045.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	1%
4-HMT_U-U 101+040.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	2%
43-HMT_U-U 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	7.44E-07	1%
42-HMT_U-U 101+200.0000	Town Gas main next to Ko Shan Sub-station (1)	7.44E-07	2%

41-HMT_U-U 101+195.0000	Town Gas main next to Ko Shan Sub-station (1)	7.44E-07	2%
40-HMT_U-U 101+190.0000	Town Gas main next to Ko Shan Sub-station (1)	7.44E-07	2%
3-HMT_U-U 101+035.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	1%
26-HMT_U-U 101+130.0000	Town Gas main along San Lau Street(3)	7.44E-07	1%
25-HMT_U-U 101+125.0000	Town Gas main along San Lau Street(3)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	1%
23-HMT_U-U 101+123.5853	Town Gas main along San Lau Street(2)	7.44E-07	1%
	Town Gas main along San Lau Street(3)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	2%
22-HMT_U-U 101+120.0000	Town Gas main along San Lau Street(1)	7.44E-07	1%
	Town Gas main along San Lau Street(2)	7.44E-07	2%
	Town Gas main along San Lau Street(3)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	3%
21-HMT_U-U 101+115.0000	Town Gas main along San Lau Street(2)	7.44E-07	1%
	Town Gas main along San Lau Street(3)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	3%
20-HMT_U-U 101+110.0000	Town Gas main along San Lau Street(3)	7.44E-07	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	3%
209-HMT_D-D 101+515.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	3%
208-HMT_D-D 101+510.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	2%
207-HMT_D-D 101+505.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	3%

	Town Gas main along Fat Kwong Street (2)	7.44E-07	2%
206-HMT_D-D 101+500.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	2%
205-HMT_D-D 101+495.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	2%
204-HMT_D-D 101+490.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	2%
203-HMT_D-D 101+485.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (3)	7.44E-07	1%
202-HMT_D-D 101+480.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (3)	7.44E-07	1%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	1%
201-HMT_D-D 101+475.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	1%
200-HMT_D-D 101+470.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
19-HMT_U-U 101+105.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	2%
199-HMT_D-D 101+465.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	1%
	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
198-HMT_D-D 101+460.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%

	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
197-HMT_D-D 101+455.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	1%
	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
196-HMT_D-D 101+450.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
195-HMT_D-D 101+445.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
194-HMT_D-D 101+440.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
193-HMT_D-D 101+435.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
191-HMT_D-D 101+431.3704	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
190-HMT_D-D 101+430.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
18-HMT_U-U 101+100.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	2%
189-HMT_D-D 101+425.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
188-HMT_D-D 101+420.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
187-HMT_D-D 101+415.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
186-HMT_D-D 101+410.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
185-HMT_D-D 101+405.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%

184-HMT_D-D 101+400.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
183-HMT_D-D 101+395.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
182-HMT_D-D 101+390.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
181-HMT_D-D 101+385.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	3%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
17-HMT_U-U 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
179-HMT_D-D 101+381.3704	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
178-HMT_D-D 101+380.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	2%
177-HMT_D-D 101+375.0000	Town Gas main along Fat Kwong Street (3)	7.44E-07	1%
	Town Gas main along Fat Kwong Street (4)	7.44E-07	1%
16-HMT_U-U 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
15-HMT_U-U 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
14-HMT_U-U 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
13-HMT_U-U 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
12-HMT_U-U 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
125-HMT_D-D 101+135.0000	Town Gas main along San Lau Street(3)	7.44E-07	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	2%
124-HMT_D-D 101+130.0000	Town Gas main along San Lau Street(2)	7.44E-07	1%

	Town Gas main along San Lau Street(3)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	3%
123-HMT_D-D 101+125.0000	Town Gas main along San Lau Street(2)	7.44E-07	1%
	Town Gas main along San Lau Street(3)	7.44E-07	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	3%
122-HMT_D-D 101+120.0000	Town Gas main along San Lau Street(3)	7.44E-07	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	3%
121-HMT_D-D 101+115.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	3%
120-HMT_D-D 101+110.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	2%
11-HMT_U-U 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	2%
119-HMT_D-D 101+105.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	7.44E-07	1%
118-HMT_D-D 101+100.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan	7.44E-07	3%

	Theatre(2)		
117-HMT_D-D 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
115-HMT_D-D 101+093.9891	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
114-HMT_D-D 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
113-HMT_D-D 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
112-HMT_D-D 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	3%
111-HMT_D-D 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	2%
110-HMT_D-D 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	2%
10-HMT_U-U 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	1%
109-HMT_D-D 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	2%
108-HMT_D-D 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	2%
107-HMT_D-D 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%

	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	2%
106-HMT_D-D 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	2%
105-HMT_D-D 101+045.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	2%
104-HMT_D-D 101+040.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	7.44E-07	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	7.44E-07	1%
102-HMT_U-U 101+490.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	3%
	Town Gas main along Yan Fung Street (1)	7.44E-07	1%
	Town Gas main along Yan Fung Street (2)	7.44E-07	2%
101-HMT_U-U 101+485.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	3%
	Town Gas main along Yan Fung Street (2)	7.44E-07	1%
100-HMT_U-U 101+480.0000	Town Gas main along Fat Kwong Street (1)	7.44E-07	2%
	Town Gas main along Fat Kwong Street (2)	7.44E-07	3%
4MIC Detonated at the same time			
9-HMT_U-U 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
99-HMT_U-U 101+475.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas main along Yan Fung Street (2)	4.28E-09	1%
98-HMT_U-U 101+470.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%

	Town Gas main along Fat Kwong Street (3)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
97-HMT_U-U 101+465.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
96-HMT_U-U 101+460.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
94-HMT_U-U 101+457.5436	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
93-HMT_U-U 101+455.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
92-HMT_U-U 101+450.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
91-HMT_U-U 101+445.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
90-HMT_U-U 101+440.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%

	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
89-HMT_U-U 101+435.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
88-HMT_U-U 101+430.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
87-HMT_U-U 101+425.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
85-HMT_U-U 101+422.5436	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
85-HMT_U-U 101+415.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
84-HMT_U-U 101+420.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	0.0413571
84-HMT_U-U 101+410.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%

83-HMT_U-U 101+405.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
82-HMT_U-U 101+400.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
81-HMT_U-U 101+395.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
80-HMT_U-U 101+390.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
7-HMT_U-U 101+054.6193	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
79-HMT_U-U 101+385.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
78-HMT_U-U 101+380.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%

	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
77-HMT_U-U 101+375.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
76-HMT_U-U 101+370.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
103-HMT_D-D 101+035.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%

74-HMT_U-U 101+360.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
73-HMT_U-U 101+355.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
72-HMT_U-U 101+350.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
71-HMT_U-U 101+345.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
70-HMT_U-U 101+340.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
6-HMT_U-U 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	2%
69-HMT_U-U 101+335.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%

68-HMT_U-U 101+330.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
67-HMT_U-U 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
66-HMT_U-U 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
65-HMT_U-U 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
64-HMT_U-U 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
63-HMT_U-U 101+305.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
62-HMT_U-U 101+300.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
61-HMT_U-U 101+295.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
60-HMT_U-U 101+290.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
5-HMT_U-U 101+045.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	2%
59-HMT_U-U 101+285.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San	4.28E-09	2%

	Lau Street (2)		
58-HMT_U-U 101+280.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
4-HMT_U-U 101+040.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	2%
44-HMT_U-U 101+210.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
43-HMT_U-U 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
42-HMT_U-U 101+200.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	4%
41-HMT_U-U 101+195.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	4%
40-HMT_U-U 101+190.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	3%
3-HMT_U-U 101+035.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	1%
39-HMT_U-U 101+185.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
2-HMT_U-U 101+030.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	1%
27-HMT_U-U 101+135.0000	Town Gas main along San Lau Street(3)	4.28E-09	1%
26-HMT_U-U 101+130.0000	Town Gas main along San Lau Street(2)	4.28E-09	1%
	Town Gas main along San Lau Street(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
25-HMT_U-U 101+125.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
23-HMT_U-U 101+123.5853	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	3%

	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	3%
22-HMT_U-U 101+120.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
21-HMT_U-U 101+115.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
20-HMT_U-U 101+110.0000	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
209-HMT_D-D 101+515.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	1%
208-HMT_D-D 101+510.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	1%

	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
207-HMT_D-D 101+505.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
206-HMT_D-D 101+500.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
205-HMT_D-D 101+495.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
204-HMT_D-D 101+490.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
203-HMT_D-D 101+485.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
202-HMT_D-D 101+480.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
201-HMT_D-D 101+475.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%

200-HMT_D-D 101+470.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
19-HMT_U-U 101+105.0000	Town Gas main along San Lau Street(2)	4.28E-09	1%
	Town Gas main along San Lau Street(3)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
199-HMT_D-D 101+465.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
198-HMT_D-D 101+460.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
197-HMT_D-D 101+455.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
196-HMT_D-D 101+450.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
195-HMT_D-D 101+445.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%

	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
194-HMT_D-D 101+440.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
193-HMT_D-D 101+435.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
191-HMT_D-D 101+431.3704	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
190-HMT_D-D 101+430.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
18-HMT_U-U 101+100.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	3%
189-HMT_D-D 101+425.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
188-HMT_D-D 101+420.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%

187-HMT_D-D 101+415.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
186-HMT_D-D 101+410.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
185-HMT_D-D 101+405.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
184-HMT_D-D 101+400.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
183-HMT_D-D 101+395.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
182-HMT_D-D 101+390.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
181-HMT_D-D 101+385.0000	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%

	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
17-HMT_U-U 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
179-HMT_D-D 101+381.3704	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
178-HMT_D-D 101+380.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
177-HMT_D-D 101+375.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San	4.28E-09	1%

	Lau Street (1)		
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
176-HMT_D-D 101+370.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
175-HMT_D-D 101+365.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
174-HMT_D-D 101+360.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
173-HMT_D-D 101+355.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
172-HMT_D-D 101+350.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
171-HMT_D-D 101+345.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
170-HMT_D-D 101+340.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
16-HMT_U-U 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%

169-HMT_D-D 101+335.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
168-HMT_D-D 101+330.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
167-HMT_D-D 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
166-HMT_D-D 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
165-HMT_D-D 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
164-HMT_D-D 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
15-HMT_U-U 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
14-HMT_U-U 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
147-HMT_D-D 101+225.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
146-HMT_D-D 101+220.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
145-HMT_D-D 101+215.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
143-HMT_D-D 101+213.9891	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
142-HMT_D-D 101+210.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
141-HMT_D-D 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
13-HMT_U-U 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%

12-HMT_U-U 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
127-HMT_D-D 101+145.0000	Town Gas main along San Lau Street(3)	4.28E-09	1%
126-HMT_D-D 101+140.0000	Town Gas main along San Lau Street(2)	4.28E-09	1%
	Town Gas main along San Lau Street(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
125-HMT_D-D 101+135.0000	Town Gas main along San Lau Street(1)	4.28E-09	1%
	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	3%
124-HMT_D-D 101+130.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
123-HMT_D-D 101+125.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
122-HMT_D-D 101+120.0000	Town Gas main along San Lau Street(1)	4.28E-09	1%
	Town Gas main along San Lau Street(2)	4.28E-09	2%

	Town Gas main along San Lau Street(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
121-HMT_D-D 101+115.0000	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
120-HMT_D-D 101+110.0000	Town Gas main along San Lau Street(2)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	3%
11-HMT_U-U 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
119-HMT_D-D 101+105.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	3%
118-HMT_D-D 101+100.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
117-HMT_D-D 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan	4.28E-09	4%

	Theatre(2)		
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
115-HMT_D-D 101+093.9891	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
114-HMT_D-D 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
113-HMT_D-D 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
112-HMT_D-D 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
111-HMT_D-D 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
110-HMT_D-D 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
10-HMT_U-U 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
109-HMT_D-D 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
108-HMT_D-D 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%

107-HMT_D-D 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
106-HMT_D-D 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
105-HMT_D-D 101+045.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
104-HMT_D-D 101+040.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	2%
103-HMT_D-D 101+035.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	1%
102-HMT_U-U 101+490.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	3%
101-HMT_U-U 101+485.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	2%
100-HMT_U-U 101+480.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%

	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas main along Yan Fung Street (2)	4.28E-09	2%
5MIC Detonated at the same time			
9-HMT_U-U 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
99-HMT_U-U 101+475.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	2%
98-HMT_U-U 101+470.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	2%
97-HMT_U-U 101+465.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas main along Yan Fung Street (2)	4.28E-09	1%
96-HMT_U-U 101+460.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
94-HMT_U-U 101+457.5436	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%

	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
93-HMT_U-U 101+455.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
92-HMT_U-U 101+450.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
91-HMT_U-U 101+445.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
90-HMT_U-U 101+440.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
89-HMT_U-U 101+435.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
88-HMT_U-U 101+430.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
87-HMT_U-U 101+425.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%

	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
85-HMT_U-U 101+422.5436	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
85-HMT_U-U 101+415.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
84-HMT_U-U 101+420.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
84-HMT_U-U 101+410.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
83-HMT_U-U 101+405.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
82-HMT_U-U 101+400.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
81-HMT_U-U 101+395.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%

	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
80-HMT_U-U 101+390.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
7-HMT_U-U 101+054.6193	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
79-HMT_U-U 101+385.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
78-HMT_U-U 101+380.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San	4.28E-09	1%

	Lau Street (1)		
77-HMT_U-U 101+375.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
76-HMT_U-U 101+370.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
75-HMT_U-U 101+365.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San	4.28E-09	2%

	Lau Street (2)		
103-HMT_D-D 101+035.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
73-HMT_U-U 101+355.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
72-HMT_U-U 101+350.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
71-HMT_U-U 101+345.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%

	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
70-HMT_U-U 101+340.0000	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
6-HMT_U-U 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
69-HMT_U-U 101+335.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
68-HMT_U-U 101+330.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
67-HMT_U-U 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
66-HMT_U-U 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
65-HMT_U-U 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
64-HMT_U-U 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
63-HMT_U-U 101+305.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%

62-HMT_U-U 101+300.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
61-HMT_U-U 101+295.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
60-HMT_U-U 101+290.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
5-HMT_U-U 101+045.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
59-HMT_U-U 101+285.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
58-HMT_U-U 101+280.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
57-HMT_U-U 101+275.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
56-HMT_U-U 101+270.0000	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
4-HMT_U-U 101+040.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	2%
45-HMT_U-U 101+215.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
44-HMT_U-U 101+210.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%

43-HMT_U-U 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	3%
42-HMT_U-U 101+200.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	5%
41-HMT_U-U 101+195.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	5%
40-HMT_U-U 101+190.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	4%
3-HMT_U-U 101+035.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	2%
39-HMT_U-U 101+185.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	3%
38-HMT_U-U 101+180.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
2-HMT_U-U 101+030.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
28-HMT_U-U 101+140.0000	Town Gas main along San Lau Street(3)	4.28E-09	1%
27-HMT_U-U 101+135.0000	Town Gas main along San Lau Street(3)	4.28E-09	2%
26-HMT_U-U 101+130.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
25-HMT_U-U 101+125.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
23-HMT_U-U 101+123.5853	Town Gas main along San Lau Street(1)	4.28E-09	3%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
22-HMT_U-U 101+120.0000	Town Gas main along San Lau Street(1)	4.28E-09	3%

	Town Gas main along San Lau Street(2)	4.28E-09	4%
	Town Gas main along San Lau Street(3)	4.28E-09	5%
	Town Gas main along San Lau Street(4)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
21-HMT_U-U 101+115.0000	Town Gas main along San Lau Street(1)	4.28E-09	3%
	Town Gas main along San Lau Street(2)	4.28E-09	4%
	Town Gas main along San Lau Street(3)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
20-HMT_U-U 101+110.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
209-HMT_D-D 101+515.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	2%
208-HMT_D-D 101+510.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%

	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas main along Yan Fung Street (2)	4.28E-09	2%
207-HMT_D-D 101+505.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	1%
206-HMT_D-D 101+500.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
205-HMT_D-D 101+495.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
204-HMT_D-D 101+490.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
203-HMT_D-D 101+485.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
202-HMT_D-D 101+480.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%

201-HMT_D-D 101+475.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
200-HMT_D-D 101+470.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
19-HMT_U-U 101+105.0000	Town Gas main along San Lau Street(1)	4.28E-09	1%
	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
199-HMT_D-D 101+465.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
198-HMT_D-D 101+460.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
197-HMT_D-D 101+455.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
196-HMT_D-D 101+450.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%

	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
195-HMT_D-D 101+445.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
194-HMT_D-D 101+440.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
193-HMT_D-D 101+435.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
191-HMT_D-D 101+431.3704	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
190-HMT_D-D 101+430.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
18-HMT_U-U 101+100.0000	Town Gas main along San Lau Street(2)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
189-HMT_D-D 101+425.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%

	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
188-HMT_D-D 101+420.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
187-HMT_D-D 101+415.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
186-HMT_D-D 101+410.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
185-HMT_D-D 101+405.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
184-HMT_D-D 101+400.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
183-HMT_D-D 101+395.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%

	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
182-HMT_D-D 101+390.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
181-HMT_D-D 101+385.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
17-HMT_U-U 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	3%
179-HMT_D-D 101+381.3704	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%

	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
178-HMT_D-D 101+380.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
177-HMT_D-D 101+375.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
176-HMT_D-D 101+370.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%

	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
175-HMT_D-D 101+365.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
174-HMT_D-D 101+360.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
173-HMT_D-D 101+355.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
172-HMT_D-D 101+350.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San	4.28E-09	2%

	Lau Street (2)		
171-HMT_D-D 101+345.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
170-HMT_D-D 101+340.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
16-HMT_U-U 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
169-HMT_D-D 101+335.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
168-HMT_D-D 101+330.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
167-HMT_D-D 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
166-HMT_D-D 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
165-HMT_D-D 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
164-HMT_D-D 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
163-HMT_D-D 101+305.0000	Town Gas main along Shung Yung Road near San	4.28E-09	1%

	Lau Street (1)		
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
162-HMT_D-D 101+300.0000	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
15-HMT_U-U 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
14-HMT_U-U 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
149-HMT_D-D 101+235.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
148-HMT_D-D 101+230.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
147-HMT_D-D 101+225.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
146-HMT_D-D 101+220.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
145-HMT_D-D 101+215.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	3%
143-HMT_D-D 101+213.9891	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	3%
142-HMT_D-D 101+210.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
141-HMT_D-D 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
140-HMT_D-D 101+200.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
13-HMT_U-U 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
139-HMT_D-D 101+195.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
12-HMT_U-U 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
128-HMT_D-D 101+150.0000	Town Gas main along San Lau Street(3)	4.28E-09	1%
127-HMT_D-D 101+145.0000	Town Gas main along San Lau Street(2)	4.28E-09	1%
	Town Gas main along San Lau Street(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
126-HMT_D-D 101+140.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%

	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	3%
125-HMT_D-D 101+135.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
124-HMT_D-D 101+130.0000	Town Gas main along San Lau Street(1)	4.28E-09	3%
	Town Gas main along San Lau Street(2)	4.28E-09	4%
	Town Gas main along San Lau Street(3)	4.28E-09	4%
	Town Gas main along San Lau Street(4)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
123-HMT_D-D 101+125.0000	Town Gas main along San Lau Street(1)	4.28E-09	3%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	4%
	Town Gas main along San Lau Street(4)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
122-HMT_D-D 101+120.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%

	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	3%
	Town Gas main along San Lau Street(4)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
121-HMT_D-D 101+115.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
120-HMT_D-D 101+110.0000	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
11-HMT_U-U 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	6%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
119-HMT_D-D 101+105.0000	Town Gas main along San Lau Street(2)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
118-HMT_D-D 101+100.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%

	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	3%
117-HMT_D-D 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
115-HMT_D-D 101+093.9891	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
114-HMT_D-D 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
113-HMT_D-D 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
112-HMT_D-D 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
111-HMT_D-D 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
110-HMT_D-D 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan	4.28E-09	4%

	Theatre(2)		
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
10-HMT_U-U 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
109-HMT_D-D 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
108-HMT_D-D 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
107-HMT_D-D 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
106-HMT_D-D 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
105-HMT_D-D 101+045.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(2)	4.28E-09	1%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	4.28E-09	2%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(5)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
104-HMT_D-D 101+040.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(2)	4.28E-09	2%

	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	4.28E-09	3%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(5)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
103-HMT_D-D 101+035.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(2)	4.28E-09	2%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	4.28E-09	3%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(5)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	2%
102-HMT_U-U 101+490.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas main along Yan Fung Street (1)	4.28E-09	3%
	Town Gas main along Yan Fung Street (2)	4.28E-09	4%
101-HMT_U-U 101+485.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas main along Yan Fung Street (1)	4.28E-09	3%
	Town Gas main along Yan Fung Street (2)	4.28E-09	3%
100-HMT_U-U 101+480.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%

	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	3%
6MIC Detonated at the same time			
9-HMT_U-U 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
99-HMT_U-U 101+475.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas main along Yan Fung Street (1)	4.28E-09	3%
	Town Gas main along Yan Fung Street (2)	4.28E-09	3%
98-HMT_U-U 101+470.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	2%
97-HMT_U-U 101+465.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	2%
96-HMT_U-U 101+460.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	2%
94-HMT_U-U 101+457.5436	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	7%
	Town Gas main along	4.28E-09	4%

	Fat Kwong Street (3)		
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	1%
93-HMT_U-U 101+455.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas main along Yan Fung Street (2)	4.28E-09	1%
92-HMT_U-U 101+450.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	6%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas main along Yan Fung Street (2)	4.28E-09	1%
91-HMT_U-U 101+445.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
90-HMT_U-U 101+440.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
89-HMT_U-U 101+435.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
88-HMT_U-U 101+430.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along	4.28E-09	7%

	Fat Kwong Street (4)		
87-HMT_U-U 101+425.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
85-HMT_U-U 101+422.5436	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
85-HMT_U-U 101+415.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
84-HMT_U-U 101+420.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
84-HMT_U-U 101+410.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
83-HMT_U-U 101+405.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
82-HMT_U-U 101+400.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
	Town Gas Main	4.28E-09	2%

	J/OShung Yung Road & Fat Kwong Street (1)		
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
81-HMT_U-U 101+395.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
80-HMT_U-U 101+390.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	3%
7-HMT_U-U 101+054.6193	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
79-HMT_U-U 101+385.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	3%
78-HMT_U-U 101+380.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%

	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
77-HMT_U-U 101+375.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	7%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
76-HMT_U-U 101+370.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	6%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%

	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
75-HMT_U-U 101+365.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
74-HMT_U-U 101+360.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
73-HMT_U-U 101+355.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%

72-HMT_U-U 101+350.0000	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
71-HMT_U-U 101+345.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
70-HMT_U-U 101+340.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
6-HMT_U-U 101+050.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
69-HMT_U-U 101+335.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near	4.28E-09	4%

	San Lau Street (1)		
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
68-HMT_U-U 101+330.0000	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
67-HMT_U-U 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	5%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
66-HMT_U-U 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	0.0467614
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
65-HMT_U-U 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	5%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	5%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
64-HMT_U-U 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	5%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	5%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
63-HMT_U-U 101+305.0000	Town Gas main along Pak Kung Street(2)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	5%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	5%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
	Town Gas main along Pak Kung Street(2)	4.28E-09	1%
62-HMT_U-U 101+300.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	5%

	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	5%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
	Town Gas main along Pak Kung Street(2)	4.28E-09	1%
61-HMT_U-U 101+295.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	5%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	5%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
	Town Gas main along Pak Kung Street(2)	4.28E-09	1%
60-HMT_U-U 101+290.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	5%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
	Town Gas main along Pak Kung Street(2)	4.28E-09	1%
5-HMT_U-U 101+045.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
59-HMT_U-U 101+285.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
58-HMT_U-U 101+280.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
57-HMT_U-U 101+275.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
56-HMT_U-U 101+270.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
55-HMT_U-U 101+265.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%

	San Lau Street (2)		
4-HMT_U-U 101+040.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
46-HMT_U-U 101+220.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
45-HMT_U-U 101+215.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
44-HMT_U-U 101+210.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	3%
43-HMT_U-U 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	4%
42-HMT_U-U 101+200.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	6%
41-HMT_U-U 101+195.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	6%
40-HMT_U-U 101+190.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	5%
3-HMT_U-U 101+035.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
39-HMT_U-U 101+185.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	4%
38-HMT_U-U 101+180.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
37-HMT_U-U 101+175.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
2-HMT_U-U 101+030.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	1%
28-HMT_U-U 101+140.0000	Town Gas main along San Lau Street(3)	4.28E-09	2%
27-HMT_U-U 101+135.0000	Town Gas main along San Lau Street(1)	4.28E-09	1%
	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
26-HMT_U-U 101+130.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	3%
25-HMT_U-U 101+125.0000	Town Gas main along San Lau Street(1)	4.28E-09	3%

	Town Gas main along San Lau Street(2)	4.28E-09	4%
	Town Gas main along San Lau Street(3)	4.28E-09	5%
	Town Gas main along San Lau Street(4)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
23-HMT_U-U 101+123.5853	Town Gas main along San Lau Street(1)	4.28E-09	4%
	Town Gas main along San Lau Street(2)	4.28E-09	4%
	Town Gas main along San Lau Street(3)	4.28E-09	6%
	Town Gas main along San Lau Street(4)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
22-HMT_U-U 101+120.0000	Town Gas main along San Lau Street(1)	4.28E-09	4%
	Town Gas main along San Lau Street(2)	4.28E-09	5%
	Town Gas main along San Lau Street(3)	4.28E-09	6%
	Town Gas main along San Lau Street(4)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	7%
21-HMT_U-U 101+115.0000	Town Gas main along San Lau Street(1)	4.28E-09	3%
	Town Gas main along San Lau Street(2)	4.28E-09	5%
	Town Gas main along San Lau Street(3)	4.28E-09	5%
	Town Gas main along San Lau Street(4)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko	4.28E-09	7%

	Shan Theatre(3)		
20-HMT_U-U 101+110.0000	Town Gas main along San Lau Street(1)	4.28E-09	3%
	Town Gas main along San Lau Street(2)	4.28E-09	4%
	Town Gas main along San Lau Street(3)	4.28E-09	4%
	Town Gas main along San Lau Street(4)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	6%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	7%
209-HMT_D-D 101+515.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas main along Yan Fung Street (1)	4.28E-09	3%
	Town Gas main along Yan Fung Street (2)	4.28E-09	3%
208-HMT_D-D 101+510.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	3%
207-HMT_D-D 101+505.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas main along Yan Fung Street (1)	4.28E-09	2%
	Town Gas main along Yan Fung Street (2)	4.28E-09	2%
206-HMT_D-D 101+500.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%

	Town Gas main along Yan Fung Street (2)	4.28E-09	1%
205-HMT_D-D 101+495.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
204-HMT_D-D 101+490.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
203-HMT_D-D 101+485.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
202-HMT_D-D 101+480.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
201-HMT_D-D 101+475.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
200-HMT_D-D 101+470.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
19-HMT_U-U 101+105.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	6%

199-HMT_D-D 101+465.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	6%
198-HMT_D-D 101+460.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
197-HMT_D-D 101+455.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
196-HMT_D-D 101+450.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
195-HMT_D-D 101+445.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
194-HMT_D-D 101+440.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
193-HMT_D-D 101+435.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
191-HMT_D-D 101+431.3704	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%

190-HMT_D-D 101+430.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
18-HMT_U-U 101+100.0000	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
189-HMT_D-D 101+425.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	6%
188-HMT_D-D 101+420.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	6%
187-HMT_D-D 101+415.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	6%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
186-HMT_D-D 101+410.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	6%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
185-HMT_D-D 101+405.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%

	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	6%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
184-HMT_D-D 101+400.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	6%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
183-HMT_D-D 101+395.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	6%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
182-HMT_D-D 101+390.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	6%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%

	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
181-HMT_D-D 101+385.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	6%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas main along Yan Fung Street (2)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
17-HMT_U-U 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
179-HMT_D-D 101+381.3704	Town Gas main along Fat Kwong Street (1)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%

178-HMT_D-D 101+380.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	6%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	5%
	Town Gas main along Yan Fung Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
177-HMT_D-D 101+375.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
176-HMT_D-D 101+370.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	4%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
175-HMT_D-D 101+365.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	2%

	Town Gas main along Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	4%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
174-HMT_D-D 101+360.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
173-HMT_D-D 101+355.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (2)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
172-HMT_D-D 101+350.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%

	Town Gas main along Fat Kwong Street (4)	4.28E-09	2%
	Town Gas Main J/OShung Yung Road & Fat Kwong Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
171-HMT_D-D 101+345.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	2%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
170-HMT_D-D 101+340.0000	Town Gas main along Fat Kwong Street (3)	4.28E-09	1%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
16-HMT_U-U 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
169-HMT_D-D 101+335.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
168-HMT_D-D 101+330.0000	Town Gas main along Pak Kung Street(2)	4.28E-09	1%
	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%

	Town Gas main along Pak Kung Street(2)	4.28E-09	1%
167-HMT_D-D 101+325.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	4%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	4%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
	Town Gas main along Pak Kung Street(2)	4.28E-09	1%
	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
166-HMT_D-D 101+320.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
	Town Gas main along Pak Kung Street(2)	4.28E-09	1%
	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
165-HMT_D-D 101+315.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	2%
	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
164-HMT_D-D 101+310.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	3%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	3%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
163-HMT_D-D 101+305.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
	Town Gas main along Pak Kung Street(1)	4.28E-09	1%
162-HMT_D-D 101+300.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	2%
	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	2%
161-HMT_D-D 101+295.0000	Town Gas main along Shung Yung Road near San Lau Street (1)	4.28E-09	1%
	Town Gas main along Shung Yung Road near	4.28E-09	2%

	San Lau Street (2)		
160-HMT_D-D 101+290.0000	Town Gas main along Shung Yung Road near San Lau Street (2)	4.28E-09	1%
15-HMT_U-U 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
154-HMT_D-D 101+260.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
153-HMT_D-D 101+255.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
152-HMT_D-D 101+250.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
151-HMT_D-D 101+245.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
150-HMT_D-D 101+240.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
14-HMT_U-U 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
149-HMT_D-D 101+235.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
148-HMT_D-D 101+230.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
147-HMT_D-D 101+225.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	3%
146-HMT_D-D 101+220.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	3%
145-HMT_D-D 101+215.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	3%
143-HMT_D-D 101+213.9891	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	3%
142-HMT_D-D 101+210.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	3%
141-HMT_D-D 101+205.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	3%
140-HMT_D-D 101+200.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
13-HMT_U-U 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	6%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
139-HMT_D-D 101+195.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
138-HMT_D-D 101+190.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	2%
137-HMT_D-D 101+185.0000	Town Gas main next to Ko Shan Sub-station (1)	4.28E-09	1%
12-HMT_U-U 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko	4.28E-09	7%

	Shan Theatre(2)		
129-HMT_D-D 101+155.0000	Town Gas main along San Lau Street(3)	4.28E-09	1%
128-HMT_D-D 101+150.0000	Town Gas main along San Lau Street(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	1%
127-HMT_D-D 101+145.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
126-HMT_D-D 101+140.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
125-HMT_D-D 101+135.0000	Town Gas main along San Lau Street(1)	4.28E-09	3%
	Town Gas main along San Lau Street(2)	4.28E-09	4%
	Town Gas main along San Lau Street(3)	4.28E-09	5%
	Town Gas main along San Lau Street(4)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
124-HMT_D-D 101+130.0000	Town Gas main along San Lau Street(1)	4.28E-09	4%
	Town Gas main along San Lau Street(2)	4.28E-09	5%
	Town Gas main along San Lau Street(3)	4.28E-09	5%
	Town Gas main along San Lau Street(4)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	6%
123-HMT_D-D 101+125.0000	Town Gas main along	4.28E-09	3%

	San Lau Street(1)		
	Town Gas main along San Lau Street(2)	4.28E-09	4%
	Town Gas main along San Lau Street(3)	4.28E-09	5%
	Town Gas main along San Lau Street(4)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	7%
122-HMT_D-D 101+120.0000	Town Gas main along San Lau Street(1)	4.28E-09	3%
	Town Gas main along San Lau Street(2)	4.28E-09	4%
	Town Gas main along San Lau Street(3)	4.28E-09	4%
	Town Gas main along San Lau Street(4)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	6%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	7%
121-HMT_D-D 101+115.0000	Town Gas main along San Lau Street(1)	4.28E-09	3%
	Town Gas main along San Lau Street(2)	4.28E-09	4%
	Town Gas main along San Lau Street(3)	4.28E-09	4%
	Town Gas main along San Lau Street(4)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	7%
120-HMT_D-D 101+110.0000	Town Gas main along San Lau Street(1)	4.28E-09	2%
	Town Gas main along San Lau Street(2)	4.28E-09	3%
	Town Gas main along San Lau Street(3)	4.28E-09	2%
	Town Gas main along San Lau Street(4)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%

	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	6%
11-HMT_U-U 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	6%
119-HMT_D-D 101+105.0000	Town Gas main along San Lau Street(2)	4.28E-09	2%
	Town Gas main along San Lau Street(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	5%
118-HMT_D-D 101+100.0000	Town Gas main along San Lau Street(2)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	4%
117-HMT_D-D 101+095.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	3%
115-HMT_D-D 101+093.9891	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	3%
114-HMT_D-D 101+090.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	6%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	3%
113-HMT_D-D 101+085.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	6%
	Town Gas main along Ko Shan Road near Ko	4.28E-09	7%

	Shan Theatre(2)		
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
112-HMT_D-D 101+080.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	6%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
111-HMT_D-D 101+075.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	6%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
110-HMT_D-D 101+070.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	6%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
10-HMT_U-U 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
109-HMT_D-D 101+065.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
108-HMT_D-D 101+060.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
107-HMT_D-D 101+055.0000	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%

106-HMT_D-D 101+050.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
105-HMT_D-D 101+045.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(1)	4.28E-09	1%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(2)	4.28E-09	2%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	4.28E-09	3%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(5)	4.28E-09	2%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	7%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	5%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
104-HMT_D-D 101+040.0000	Town Gas main along Kiang His Street(1)	4.28E-09	1%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(1)	4.28E-09	2%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(2)	4.28E-09	3%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	4.28E-09	4%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(5)	4.28E-09	3%
	Town Gas main along Ma Tau Wai Road near Wing Kwong Street(1)	4.28E-09	1%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	6%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	4%

	Town Gas main along Ko Shan Road near Ko Shan Theatre(3)	4.28E-09	2%
103-HMT_D-D 101+035.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	1%
103-HMT_D-D 101+035.0000	Town Gas main along Chatham Road near Shansi Street Works Shaft(1)	4.28E-09	1%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(2)	4.28E-09	3%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(3)	4.28E-09	4%
	Town Gas main along Chatham Road near Shansi Street Works Shaft(5)	4.28E-09	3%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(1)	4.28E-09	4%
	Town Gas main along Ko Shan Road near Ko Shan Theatre(2)	4.28E-09	3%
102-HMT_U-U 101+490.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas main along Yan Fung Street (1)	4.28E-09	4%
	Town Gas main along Yan Fung Street (2)	4.28E-09	5%
101-HMT_U-U 101+485.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas main along Yan Fung Street (1)	4.28E-09	4%
	Town Gas main along Yan Fung Street (2)	4.28E-09	4%
100-HMT_U-U 101+480.0000	Town Gas main along Fat Kwong Street (1)	4.28E-09	5%
	Town Gas main along Fat Kwong Street (2)	4.28E-09	7%
	Town Gas main along Fat Kwong Street (3)	4.28E-09	3%
	Town Gas main along Fat Kwong Street (4)	4.28E-09	3%
	Town Gas main along Yan Fung Street (1)	4.28E-09	3%
	Town Gas main along Yan Fung Street (2)	4.28E-09	4%
104-HMT_D-D 101+040.0000	Town Gas main along Ma Tau Wai Road near	4.28E-09	1%

Note:
(1) This value is obtained from *Table 4.3*. For the concerned section which is less than 5 m, the frequency will be adjusted accordingly.
(2) In each scenario, the highest probability of pipe damage (for any particular Town Gas main) was selected for risk summation.

The associated overall scenario frequency corresponding to the pipe damage probabilities are presented in the following table.

Table 6.11 Scenario frequencies for Pipeline Damage of Gas Mains Near Ho Man Tin Tunnels

Gas Main	Probability of Damage	Overall Scenario Frequency (per year)
Town Gas main along Fat Kwong Street	1%	4.55E-07
Town Gas main along Yan Fung Street	1%	0.00E+00
Town Gas main along Valley Road	1%	0.00E+00
Town Gas Main J/OShung Yung Road & Fat Kwong Street	1%	8.56E-11
Town Gas main along Shung Yung Road near San Lau Street	1%	8.49E-08
Town Gas main along Kiang His Street	1%	4.28E-11
Town Gas main along Pak Kung Street	1%	0.00E+00
Town Gas main along San Lau Street	1%	7.69E-08
Town Gas main along Chatham Road near Fat Kwong Steet	1%	0.00E+00
Town Gas main along Chatham Road near Kiu Wai Mansion	1%	0.00E+00
Town Gas main J/O Chatham Road & San Wai Street	1%	0.00E+00
Town Gas main along Chatham Road near Shansi Street Works Shaft	1%	3.85E-10
Town Gas main along Ma Tau Wai Road near Wing Kwong Street	1%	4.28E-11
Town Gas main along Ma Tau Wai Road near Ngan Hon Street	1%	0.00E+00
Town Gas main along Ko Shan Road near Ko Shan Theatre	1%	2.49E-07
Town Gas main next to Ko Shan Sub-station	1%	3.22E-08
Gas Governer between Shek Tong Street & Ma Tau Wai Road	1%	0.00E+00

Taking into account the pipe damage probability and an ignition probability for towngas of 0.01 for small release (Lees, 1996), which is considered to be a conservative approach, the overall occurrence frequency for a towngas explosion event for the gas mains was found to be 8.99E-09 per year.

From a review of Town Gas main explosions in Hong Kong and based on the gas main locations (in highly populated areas), five fatalities were conservatively assumed for each of the gas main explosion scenarios.

Ground Vibration Effect on Buildings due to Detonation of Full Load during the Transfer of Explosives within Ho Man Tin Tunnels to Blast Site

The effect from ground vibration caused by the denotation of 203 kg and 200 kg of explosives within the tunnels whilst transferring explosives to the appropriate blast site may cause damage to nearby buildings and utilities in the vicinity of Ho Man Tin Tunnels. The results of the analysis are summarized in *Table 6.12*.

Table 6.12 Buildings Exceeding Peak Particle Velocity of 100 mm/s due to Full Load Initiation during the Construction of Ho Man Tin Tunnels

Scenario/Chainage	Features Affected	Scenario Frequency (/yr) (1)	Expected Fatality (N) (2)	Remark
Full load detonation of HMT_U-U 101+025.0000 to HMT_U-U 101+055.0000	Building 1	4.87E-09	134	(3)
Full load detonation of HMT_U-U 101+050.0000 to HMT_U-U 101+075.0000	Building 2	4.06E-09	50	(3)
Full load detonation of HMT_U-U 101+070.0000 to HMT_U-U 101+075.0000	Building 3	8.11E-10	2	(3)
Full load detonation of HMT_U-U 101+045.0000 to HMT_U-U 101+055.0000	Building 4	1.62E-09	17	(3)
Full load detonation of HMT_U-U 101+060.0000 to HMT_U-U 101+080.0000	Building 5	3.25E-09	11	(3)
Full load detonation of HMT_U-U 101+065.0000 to HMT_U-U 101+085.0000	Building 6	3.25E-09	51	(3)
Full load detonation of HMT_U-U 101+080.0000 to HMT_U-U 101+105.0000	Building 7	4.06E-09	17	(3)
Full load detonation of HMT_U-U 101+090.0000 to HMT_U-U 101+110.0000	Building 8	3.25E-09	44	(3)
Full load detonation of HMT_U-U 101+145.0000 to HMT_U-U 101+160.0000	Building 9	2.43E-09	8	(3)

Note:
(1) This value is obtained using the delivery distance along chainages that result in a PPV of more than 100 mm/s for the feature.
(2) Expected fatality = Population x Fatality rate. The Fatality rate is interpolated (between 1% and 100%) for PPV between 100 mm/s and 229 mm/s.
(3) Building population is estimated based on *Table 4.6* of QRA for Explosives Transport and Storage and a population growth factor of 1% per year is assumed.

Ground Vibration Effect on Slopes due to Detonation of Full Load during the Transfer of Explosives within Ho Man Tin Tunnels to Blast Site

The results of analysis for the ground shock on slopes are presented in the following table.

Table 6.13 Slopes Exceeding Peak Particle Velocity of 90 mm/s due to Full Load Initiation during the Construction of Ho Man Tin Tunnels

Scenario/Chainage	Features Affected	Scenario Frequency (/yr) (1)	Expected Fatality (N)	Remark
Full load detonation of HMT_U-U 101+190.0000 to HMT_U-U 101+200.0000	11NW-D/C616	1.94E-09	1	(2)

Scenario/Chainage	Features Affected	Scenario Frequency (/yr) (1)	Expected Fatality (N)	Remark
Full load detonation of HMT_U-U 101+170.0000 to HMT_U-U 101+175.0000	11NW-D/CR306	5.09E-09	1	(2)

Note:
(1) This value is obtained using the equation for landslide consequence from Report 81 Slope Failures along BRIL Roads (CEDD, 1999).
(2) Minimum of a single fatality is assumed for values of less than 1.

Effect of Damage to Towngas Pipeline on Population

Similar to the towngas pipelines at Hin Keng Portal, the effect of a full towngas pipeline rupture on the population around Ho Man Tin Tunnels was modelled using RISKPLOT™, giving the following results.

Table 6.14 Maximum Fatality Caused by Rupture of Towngas Pipeline Near Ho Man Tin Tunnels

Scenario	Frequency (/yr)	Max. Fatality (N)
Rupture of Towngas pipeline near Ho Man Tin tunnels	2.08857E-08	28

6.2 RISK SUMMATION

Risk summation combines the estimates of the consequences of an event with the event frequencies to give an estimate of the resulting risk of fatalities.

The two types of risk measures considered are societal and individual risks.

6.2.1 *Societal Risk*

Societal risk is defined as the risk to a group of people due to all hazards arising from a hazardous installation or activity. The simplest measure of societal risk is the Rate of Death or Potential Loss of Life (PLL), which represents the predicted equivalent fatalities per year.

The frequency (f) and fatalities (N) associated with each outcome event are derived as described in earlier sections. Based on this, the Potential Loss of Life is calculated as follows:

$PLL = f_1N_1 + f_2N_2 + f_3N_3 + + f_nN_n$

Societal risk can also be expressed in the form of an F-N curve, which represents the cumulative frequency (F) of all event outcomes leading to N or more fatalities. This representation of societal risk highlights the potential for accidents involving large numbers of fatalities.

6.2.2 *Individual Risk*

Individual risk may be defined as the frequency of fatality per individual per year due to the realisation of specified hazards. Individual Risk may be derived for a hypothetical individual present at a location 100% of time or a named individual considering the probability of his presence etc. (the latter case is known as Personal Individual Risk).

6.3 SOCIETAL RISK

6.3.1 *Potential Loss of Life*

Table 6.15 and *Table 6.16* below show the overall Potential Loss of Life (PLL) values for the use of explosives assessment. The Base Case represents the risks associated with the expected blasting programme, whereas the Worst Case has considered a 20% increase in the number of blasts for both tunnels.

It can be seen that the ground shock generated by rock excavation of Lion Rock Tunnel accounts for about 62% of the overall risk, this can be explained by the risk associated with the long blast length (~ 2.4 km). The presence of the population in a number of buildings (Building 1, Building 2, Building 3, Building 4, Building 5, Building 6, Building 9) also makes a considerable contribution towards the risk (about 17% of the total) when delivering a full load from the delivery point to the blast face for the construction of Ho Man Tin Tunnels.

Table 6.15 ***PLL for Use of Explosives in the SCL (TAW-HUH) Project (Base Case)***

Case	PLL (/ year)	Percentage Contribution (%)
Construction of Lion Rock Tunnel (Ground shock from blast face)	4.73E-06	62.48%
Construction of Ho Man Tin Tunnels (Ground shock from blast face)	6.99E-07	9.23%
Full load detonation of explosives during transport to blast faces for Lion Rock Tunnel (Blast effect)	3.41E-07	4.50%
Full load detonation of explosives during transport to blast faces for Lion Rock Tunnel (Ground shock)	8.62E-09	0.11%
Full load detonation of explosives during transport to blast faces for Ho Man Tin Tunnels (Blast effect)	2.12E-07	2.80%
Full load detonation of explosives during transport to blast faces for Ho Man Tin Tunnels (Ground shock)	1.32E-06	17.39%
Gas piping rupture due to Ground shock and Blast effect (Tertiary Effect)	1.58E-07	2.09%
LPG Gas Station Failure (Tertiary Effect)	1.07E-07	1.41%
Total	7.57E-06	100.00%

Table 6.16 ***PLL for Use of Explosives in the SCL (TAW-HUH) Project (Worst Case)***

Case	PLL (/ year)	Percentage Contribution (%)
Construction of Lion Rock Tunnel (Ground shock from blast face)	5.68E-06	62.48%
Construction of Ho Man Tin Tunnels (Ground shock from blast face)	8.38E-07	9.23%
Full load detonation of explosives during transport to blast faces for Lion Rock Tunnel (Blast effect)	4.09E-07	4.50%
Full load detonation of explosives during transport to blast faces for Lion Rock Tunnel (Ground shock)	1.03E-08	0.11%
Full load detonation of explosives during transport to blast faces for Ho Man Tin Tunnels (Blast effect)	2.54E-07	2.80%
Full load detonation of explosives during transport to blast faces for Ho Man Tin Tunnels (Ground shock)	1.58E-06	17.39%
Gas piping rupture due to Ground shock and Blast effect (Tertiary Effect)	1.90E-07	2.09%
LPG Gas Station Failure (Tertiary Effect)	1.28E-07	1.41%
Total	9.09E-06	100.00%

6.3.2 F-N Curves

Figure 6.1 shows the F-N curves for the use of explosives assessment in SCL (TAW-HUH) Project. The results represent the risks associated with the blast effects and the ground shock generated from accidental explosions while transferring explosives to the blast faces, and the ground shock generated by rock excavation using explosives.

It can be seen that for both cases the risks lie in the acceptable region.

Figure 6.1 ***F-N Curve for Use of Explosives***

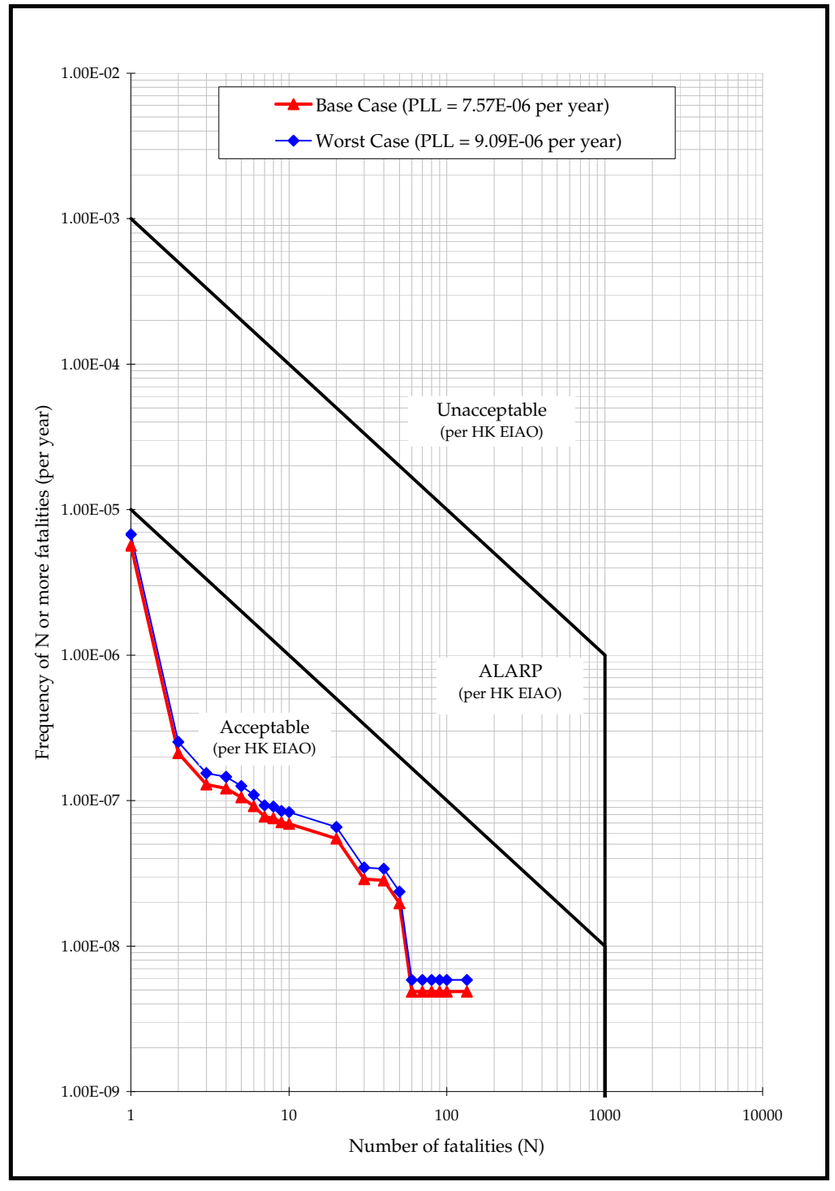
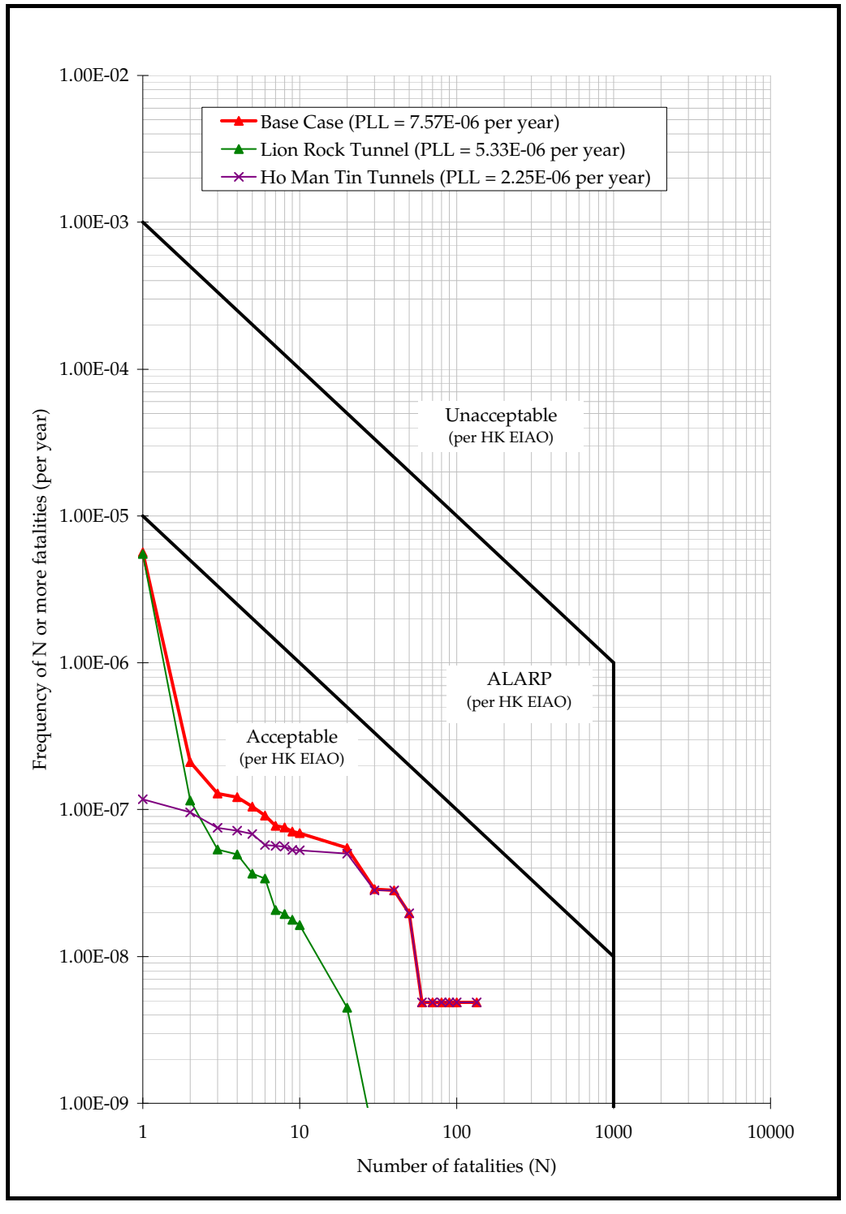


Figure 6.2 shows the F-N curve for the Base Case with a breakdown by Lion Rock Tunnel and Ho Man Tin Tunnels. It can be seen that the construction of Ho Man Tin Tunnels contributes a larger proportion of the risk for higher N values. This can be explained by the location of the Ho Man Tin Tunnels, being closer to populated areas as compared to the Lion Rock Tunnel. Also, the number of Town Gas Mains potentially affected by the construction of the Ho Man Tin Tunnels was significantly higher than that of the Lion Rock Tunnel.

Figure 6.2 ***F-N Curve for Base Case with Breakdown by Lion Rock Tunnel and Ho Man Tin Tunnels***



6.4 INDIVIDUAL RISK

For rock excavation using explosives, features at risk due to ground shock were identified and the maximum risk of fatality to any individual is estimated as 4.73E-06 per year (see *Table 6.17*). This is lower than the Individual Risk Criterion of 10^{-5} per year from the EIAO-TM Annex 4.

Table 6.17 ***Individual Risk for Ground Vibrations Generated by Rock Excavation Using Explosives***

Features	Individual Risk (per year)
Building 1	2.74E-09
Building 10	8.99E-09
Building 11	4.73E-06

For detonation of full load, features at risk due to ground shock were identified and the maximum risk of fatality to any individual is estimated as 2.73E-09 per year (see *Table 6.18*). This is much lower than the Individual Risk Criterion of 10^{-5} per year from the EIAO-TM Annex 4.

Table 6.18 ***Individual Risk for Ground Vibrations Generated from Full Load Detonation during Delivery to Blast Site***

Features	Individual Risk (per year)
Building 1	2.73E-09
Building 2	1.26E-09
Building 3	1.62E-11
Building 4	9.74E-11
Building 5	5.52E-10
Building 6	6.17E-10
Building 7	9.74E-10
Building 8	4.87E-10
Building 9	3.41E-10
Building 12	1.08E-09

For detonation of full load, the IR of all transport routes from delivery point to the blast sites are shown in *Table 6.19*. The maximum IR for the transport routes is 6.47E-07 per year. This is much lower than the Individual Risk Criterion of 10^{-5} per year from the EIAO-TM Annex 4.

Table 6.19 ***Individual Risk for Blast Effects due to Full Load Detonation during Delivery to Blast Site***

Transport Route	Individual Risk (per year)
Lion Rock Tunnel - Hin Keng Portal	8.62E-08
Lion Rock Tunnel - Ma Chai Hang Ventilation Building	6.47E-07

Ho Man Tin Tunnel (South)	2.59E-08
Ho Man Tin Tunnel (North)	2.59E-08

For gas pipe rupture scenario due to ground vibration, the IR values are shown in *Table 6.20*. The maximum IR is 8.44E-09 per year, which is much lower than the Individual Risk Criterion of 10^{-5} per year from the EIAO-TM Annex 4.

Table 6.20 Individual Risk for Gas Pipe Rupture Scenario

Scenario	Individual Risk (per year)
Pipe Rupture at Beacon Hill Offtake Station	<1.0E-10
Towngas Pipe Rupture at Hin Keng Portal	8.44E-09
Towngas Pipe Rupture at Ho Man Tin	1.50E-09

6.5 UNCERTAINTY ANALYSIS AND SENSITIVITY TESTS

The study is based on a number of assumptions as previously highlighted in various sections of this report.

A discussion on the uncertainties and sensitivity of the results specifically to the use of explosives assessment is given below.

Transport of Explosives

Accident Frequency for Underground Tunnel Transport

Initiation of explosives during transport includes initiation due to crash fire, non-crash fire and crash impact. It is should be noted that the crash frequency used for road transport was derived based on data on public roads, and the same has been applied for transport within the underground access tunnel, i.e. access tunnel to the blast face. The crash frequency for transport within the tunnel is however, expected to be much lower due to speed restrictions inside the tunnel and the absence of other vehicle movements.

Use of Explosives

Ground Vibration Model

In the study, it has been assumed that when more than one blasthole charge is detonated at the same time, the vibration effect will be equivalent to the summation of all charge weight detonated at the same time (i.e. the effect will be additive). However, due to delay scatter within the realms of manufacturing tolerance, direct summation of charge weight would lead to significant overestimation of the predicted vibration. Based on experience, this could lead to an over-prediction of 30% for long time delay detonator and 70% for short time delay detonator. However, the consequence assessment has considered the effects to be additive which is conservative.

Impact on Buildings and other Features due to Ground Vibrations

It has been conservatively assumed that any building subject to vibrations of more than 100 mm/s PPV will experience some damage to non-structural elements such as brick walls or lead to objects falling off the building including advertisement signboards, any unauthorised features etc leading to a fatality. A fatality level of about 1% of the total population inside the building has been assumed. This assumption of 1% fatality level for vibration effects of more than 100mm/s PPV is also expected to account for any impacts on other minor features along the tunnel alignment including advertising signs, scaffolding etc.

During the analysis, it was noted that the PPV levels for the majority of buildings and slopes along the alignment are much less than 100 mm/s. This is because the design charge weight (MIC) determined for blasting along the route may be governed by other sensitive features, for example, historical buildings have a limit of 5 mm/s, some cables have a limit of 13 mm/s etc. These limits are lower than 25mm/s for buildings and hence the design provides some implicit safety margin for the buildings on account of other factors.

Frequency of Blast involving more than one MIC

The frequency of blasts involving more than one MIC has been estimated from failure mode analysis, fault trees, expert judgement and human error analysis.

The frequency of 5MIC and 6MIC detonation occurring simultaneously has been conservatively assumed to be the same as 4 MIC. Hence the FN curve for 'use' does not extend below a frequency of 9E-8 per year. The frequency of more than 6MIC is negligible, i.e. below 1E-9 per year.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

A QRA has been carried out to assess the hazard to life issues arising from the use of explosives during construction for the SCL (TAW-HUH) Project.

The criterion of Annex 4 of the EIAO-TM for Individual Risk is met. The assessment results showed that the individual and societal risk is within the acceptable limit of the Risk Guidelines specified in EIAO-TM Criteria.

Nevertheless some recommendations specific to the use of explosives during construction of SCL (TAW-HUH) have been made to minimise risks further and in accordance with best practices (see *Section 7.2*).

7.2 RECOMMENDATIONS

The following recommendations should be considered for the safe use of explosives.

1. Blast charge weight (MIC) should be within the maximum MIC as specified for the given section.

2. Temporary mitigation measures such as blast doors or heavy duty blast curtains should be installed at the access adits, shafts/ portals and at suitable locations underground to prevent flyrock and control the air overpressure.

3. Blasting from multiple faces as well as different locations will be carried out for this project. Good communication and control will need to be adopted in ensuring that the works are carried out safely.

4. It is intended that complete evacuation of the underground tunnels need not be carried out and secure refuge areas should be identified to workers in the area.

5. A Chief Shotfirer and a Blasting Engineer shall be employed in addition to the normal blasting personnel to ensure that the works are safe and coordinated between blasting areas and between adjacent contracts.

6. Shotfirer to be provided with a lightning detector, and appropriate control measures should be in place.

7. A speed limit for the diesel vehicle truck and bulk emulsion truck in the tunnel should be enforced. The truck may be escorted while underground to ensure route is clear from hazards and obstructions.

8. Hot work should be suspended during passage of the diesel vehicle truck and bulk emulsion truck in the tunnel.

9. For any construction works related to use of explosives near gas facilities and gas pipes, the requirements of the Code of Practice on Avoiding Danger from Gas Pipes must be respected, in particular, to ensure liaison/coordination with HKCG with sufficient notice of planned works and to follow prescribed emergency procedures in case of leaks.

10. A detailed liaison between the contractor and HKCG should be established. HKCG should be notified about the blasting schedule in written format within a reasonable period of time prior to blasting in order to ensure the gas safety during the construction period. Also, liaison should be made with HKCG to develop an emergency plan.

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