Standard and Specifications for Utility Survey in Singapore

Version 1.3

Oct 2025

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Revision History

Revision	
Version 1.0	Aug 2017
Version 1.1	Mar 2021: - Section 2 amended. - Section 2.1 created and amended for "As-Built Survey for Newly Installed Utility". - Section 2.2 added for "Trial Trench Utility Survey". - Section 5 amended. - Section 5.1 amended. - Section 5.2 amended. - Section 5.3 amended. - Section 5.4.1 created for "New As-Built Utility Survey". - Section 5.4.2 added for "Trial Trench Utility Survey". - Section 6 amended. - Section 6.1 amended. - Section 6.2 amended. - Appendix amended, 7a., 7b. added.
Version 1.2	Apr 2023: - Appendix amended, 8a. added - Link to SHD updated - Requirement of RS Name and RS ID added - Minor errors fixed and standardized
Version 1.3	Oct 2025: - Section 2.2 amended. - Section 4.3 amended. - Section 4.4 added for "Close Range Photogrammetry". - Section 5.1 amended. - Section 5.4.2 amended. - Section 6.1 amended. - Section 6.2 amended. - List of References added. - Appendix amended, 9a., 9b., 9c., 10a., 11a., 11b. added, 2f., 2g., 2h., 2i., 4c., 4d., 4e. removed - Reference to prevailing LSB directives updated. - Reference to prevailing SLA's *Specifications for GNSS Surveys of ISN Markers* updated.

Contents

1.   Introduction

Executive Summary

This document establishes the standard and specifications for the procedure and practice to conduct utility surveying in Singapore. It is not intended to replace the technical specifications stipulated by the clients of surveyors. In the event of a dispute, this document shall not take precedence over any contractual agreement on specifications entered upon between the surveyor and his client.

This document provides detailed procedures from acquisition to production of utility information/data. It covers the two major elements of utility survey process, that is, the data capturing and the data presentation (output).

For data capturing, to embrace and respond to rapid evolution of technologies, Global Navigation Satellite Systems (GNSS), 3D Laser Scanning and Close Range Photogrammetry are covered in the document as a tool to capture high quality data output to produce 3D models with well-defined absolute and relative accuracy. Surveyors shall determine the appropriate equipment and efficiency to satisfy user's requirements.

Objectives

- To create a common understanding on the acquisition and production of utility information.
- To ensure standardised and consistent quality of output using best practices standard and survey techniques.
- To reduce double handling of data.
- To provide documented processes to survey contractors.
- To illustrate all digital information requirements with relevant examples, independently of processing software used.
- To establish a platform where utility information can be easily shared, reused, fused and translated into multiple formats.
- To increase the value of utility survey as a long-term digital asset.

Intended Audience

The document is designed and intended to be of benefit to any party who procures, specifies, or carries out utility surveys. This includes, among others, local utility agencies, utility owners, registered surveyors, engineering consultants, survey companies, and professional institutes involved in utility surveying.

Future Additions to the Specifications

The document is crafted in consultation with professionals on their current practices and government agencies on their needs and priorities. In view of future technology advancements and industry feedback, the specifications will be regularly reviewed for new practices and procedure or changes to existing ones.

Compliance with Land Surveyors Board (LSB) Survey Directives

When executing a utility survey, surveyors are required to, in relation to this document, read and comply with prevailing directives on Surveying Practices, Control Survey and As-built/Topographical Survey stipulated in the *LSB Directives on Land Survey and Geomatics Practices.*

2.   Types of Utility Surveys

Different stages of project life cycle require different type of survey for utility services. This document gives priority to recording accurate three-dimension (3D) location and attributes of newly-laid utility services and existing services within the excavated trial holes. Such as-built and trial trench utility surveys shall be performed before backfilling is carried out.

2.1   As-Built Survey for Newly Installed Utility

Henceforth shall be referred as "New As-Built Utility Survey" or "New As-Built Survey". New utility services are laid on ground or underground (excavated) according to the design plan. All required attributes and details of the target utility shall be surveyed by deploying survey techniques (see section 4) which are deemed appropriate by Registered Surveyors. All surveys shall be done in reference to a framework of survey control (see section 3) established earlier to meet the required survey accuracy (see section 5.2).

2.2   Trial Trench Utility Survey

A trial trench is an observation of a small section of underground space at a particular point in time, created by opening the ground surface and removing the soil down to a certain depth in order to enable visual inspection. It is typically used to verify the presence and location of existing underground utilities that were previously installed prior to conducting any underground works and to confirm the availability of sufficient space for the installation of new underground utilities. The location of trial trench and the utilities exposed within the trench shall be surveyed by Registered Surveyors using survey techniques (see section 4) which are deemed appropriate. Again, all surveys shall be done in accordance to the survey control framework (see section 3) established so as to meet the required survey accuracy (see section 5.2).

3.   Survey Control Accuracy Standards

For the establishment of both horizontal and vertical controls, the local national grid SVY21 coordinate system shall be in reference for horizontal (easting, northing) components and Singapore Height Datum (SHD) for vertical (elevation) component. This is in accordance with the *LSB Directives on Land Survey and Geomatics Practices*.

3.1   Horizontal Control

The *LSB Directives on Land Survey and Geomatics Practices* requires the use of at least four (4) ISN markers to establish the horizontal datum for every survey. The ISN markers shall as far as possible, encompass the site under survey, and should be used only if the residuals in Northing and Easting co-ordinates are within 0.020 m of the recorded ISN values for GNSS surveys by taking reference from the Singapore Satellite Positioning Reference Network (SiReNT). A GNSS survey would also be required if there are less than four (4) stable or intact ISN markers. For further details on establishment of ISN markers, please refer to the *Specifications for GNSS Surveys of ISN Markers* published by SLA.

When a traverse is created, the minimum closure standard for horizontal control is 1:20,000 with angular closure of $5\sqrt{N}$, where N is the number of angle stations. Summary as below:

Minimum Closure Standard	1:20,000
Angular Closure	$5\sqrt{N}$

3.2   Vertical Control

The vertical datum shall be derived from at least one reliable Vertical Control Points (VCP), verified with at least two witness marks established by SLA. All levelling shall be executed by standard precise levelling procedures.

Where a local vertical control is to be established for allowable height accuracy of 5 cm, the geometric geoid model, SGeoid09, established by SLA shall be adopted to convert ellipsoidal heights, obtained in accordance to the recommended procedure

published by SLA, to heights in reference to SHD ([SiReNT - Singapore Satellite Positioning Reference Network - Singapore Geoid Model 2009 (SGEOID09)](#)).

The minimum closure standard for vertical control is 6√k, where k is the distance in kilometres between the two points being considered. Summary as below:

Minimum Closure Standard	6√k

3.3   Singapore Satellite Positioning Reference Network (SiReNT)

GNSS RTK survey (see section 4.2) supplied with real time correction from Continuously Operating Reference Station (CORS) is accepted for establishment of temporary reference marks for both horizontal and vertical components. SiReNT is the only accepted and official CORS network in Singapore. The LSB Directive stipulates the best practices for field survey (see section 4.2) and the following specifications and parameters are to be adopted and documented together with the surveyed coordinates for ensuring the reliability and accuracy of the surveyed outcomes:

(a)   Minimum number of 5 satellites are observed during observation;

(b)   Mask angle of 15 degrees;

(c)   PDOP of less than 4;

(d)   Positioning Standard Deviation (quality indicator) of less than 0.03 meter for horizontal and 0.06 meter for vertical;

(e)   Minimum observation of 5 epochs shall be used for each point measurement.

4.   Specifications for As-Built Utility Survey Techniques

As-built surveys shall be performed using survey techniques as follows:

4.1   Total Station

(a)   Standard operating procedures

Control points must be measured and noted immediately on the data collector and/or in the field book after the instrument has been set up and levelled. When making observations for an extended period of time at a particular instrument location, the control points should be re-observed from time to time, and also before the instrument is relocated.

(b)   Positioning Utility Features with Total Station

Utility features are usually observed by multiple radial sideshots from primary project control points. This is usually a straightforward process: the remote point is occupied with the prism pole, the height of reflector and feature code recorded, and the angle and slope distance observed and recorded. If necessary, supplemental feature attributes may be added. The process is similar when using a reflectorless total station or robotic total station where the data collector is at the prism pole.

Where objects cannot be directly occupied with a prism pole or targeted with a reflectorless total station, off-centre (or eccentric) corrections are automatically available in most data collectors. Offset cases include circular pipes or tanks where only direction to the centre of the circular object can be sighted; or a distance to the circumference and a direction to the centre of the circular object.

4.2   GNSS Real Time Kinematic (RTK)

Real-time Kinematic surveying is a GNSS carrier phase surveying technique that allows the user to rapidly and accurately measure baselines while moving from one point to the next, stopping only briefly at the unknown points, or in dynamic motion such as in a survey boat or aircraft. By taking reference to SiReNT stations, a remote, or rover, receiver traverses between the unknown points to be positioned. The data is

collected and processed real-time to obtain accurate positions to the centimeter level. Real-time phase are referred to as "real-time kinematic" (RTK) surveys. RTK survey techniques require some form of initialization to resolve the carrier phase ambiguities. This is done in real-time using "On-the-Fly" (OTF) processing techniques. Periodic loss of satellite lock can be tolerated, and no static initialization is required to regain the integers. This differs from other GNSS techniques that require static initialization while the user is stationary. A communication link between the reference and rover receivers is required to maintain a real-time solution. In terms of best practices, the survey pole shall be held vertically all the time during observation by reference to a plate bubble attached to the pole. Direct RTK measurement to target features without survey control is acceptable given that the specific conditions are satisfied (see section 3.3). For further details on RTK Survey, please refer to the section on GNSS RTK Survey in the *LSB Directives on Land Survey and Geomatics Practices*.

Figure 1: Surveyor recording GNSS observation on a gas main
(Michigan Department of Transportation, 2015)

4.3   3D Laser Scanning

Laser scanning technology has been prevalent in recent years and is quickly becoming the new industry standard for accurate three-dimensional (3D) measurements in complex environments. A widely adopted method in the industry is Static Terrestrial Laser Scanning (TLS). For further details on TLS, please refer to the *LSB Directives on Land Survey and Geomatics Practices* and *Standard and Specifications for 3D Topographic Surveying (Mapping) in Singapore* published by SLA.

An additional type of laser scanning increasingly adopted for utility survey is Handheld Laser Scanning, especially in restricted or targeted environments. While not intended as a replacement for TLS, Handheld Laser Scanning provides a portable, flexible, rapid and practical method for capturing 3D measurements, particularly within utility corridors, excavated trenches, and underground structures where conventional techniques may be difficult to deploy.

(a)   Scanning procedures

Utilities shall be clearly visible before scanning. Surveyor shall follow a controlled scan path, maintaining consistent motion around the trench location to minimise drift in the captured data. Special care shall be taken to ensure complete coverage around the trench or targeted utilities.

(b)   Ground control points (GCPs)

Where possible, direct use of GNSS RTK measurements with an antenna integrated or mounted to the handheld laser scanner is acceptable. However, in areas with poor GNSS signal reception, GCPs shall be established in accordance with the survey control framework (see section 3) and shall be placed consistently around the open trench location. These GCPs shall be surveyed by Registered Surveyors and shall be captured during the scanning process in order to facilitate point cloud registration for geo-referencing.

(c)   Post processing and submission format

The captured point cloud data should be geo-referenced and further post-processed into 3D GIS format for submission (see section 6.2). These geo-referenced point cloud data in LAS or LAZ format may also be submitted if requested in the contractual requirements by the client. For further details on LAS format, please refer to *LAS Specification* published by the American Society for Photogrammetry and Remote Sensing.

4.4   Close Range Photogrammetry

Close Range Photogrammetry is an image-based technique for 3D measurement using calibrated digital cameras. It is increasingly adopted for utility survey in confined or excavated environments where other techniques may not be deployed effectively.

Photogrammetry enables the generation of realistic 3D models and reconstruction of point cloud data for the exposed utility features through systematic photographic capture and photogrammetric processing. Handheld photogrammetry is one common form of Close Range Photogrammetry. It is especially suited for small scale utility survey.

(a)   Photographic procedures

Utilities shall be clearly visible prior to capturing. Surveyor shall capture images from multiple viewpoints, moving systematically around the utility feature, while maintaining consistent movement and alignment. A minimum image overlap of 80% shall be maintained between successive images (Hong Kong Lands Department, 2024). Sudden variations in camera angle shall be avoided to preserve geometric consistency and for accurate 3D models reconstruction. Adequate care shall also be taken to ensure sufficient and consistent lighting, and all captured images shall be reviewed on-site to confirm full coverage and image clarity of the utility features.

(b)   Ground control points (GCPs)

GCPs shall be established in accordance with the survey control framework outlined in section 3. A minimum of four GCPs shall be positioned evenly around the trench or utilities (Hong Kong Lands Department, 2024), and all GCPs shall be visible in the captured images. These GCPs shall be surveyed by Registered Surveyors. Additional check points may be established to support independent validation of the photogrammetric output.

(c)   Post processing and submission format

The captured images shall be processed using photogrammetry software to generate 3D mesh models and geo-referenced point cloud data. The processed outputs shall then be converted into 3D GIS format for submission (see section 6.2). GCPs and check points shall be imported during processing to support geo-referencing, registration, and quality assurance.

For further guidance on photogrammetric survey (general), please refer to the section on Photogrammetry in the *LSB Directives on Land Survey and Geomatics Practices*.

5.   Data Acquisition and Observation Standards

This section sets out the observation requirements for new as-built and trial trench utility surveys.

5.1   General

New as-built and trial trench utility surveys shall be performed on all utilities and structures listed in Table 1 below:

No.	Utilities and Structures
1.	Telecommunication
2.	Sewerage
3.	Water Supply
4.	Electricity
5.	Gas
6.	Drainage *[not applicable for trial trench survey]*
7.	Pneumatic Waste Conveyance System (PWCS)
8.	Industrial Pipes (Non-P&FM)
9.	District Cooling System (DCS)
10.	Petroleum & Flammable Material (P&FM)

Table 1: Utilities and Structures subjected to New As-Built and Trial Trench Surveys

All new as-built and trial trench utility surveys shall be performed under the direct supervision of a Registered Surveyor with a valid practising certificate. The company and registration ID of the Registered Surveyor who performs the data acquisition is also to be recorded in the data submission (see Section 6).

5.2   Survey Accuracy

All new as-built and trial trench utility surveys shall be performed to the following absolute accuracy:

- Horizontal Accuracy: ±100mm
- Vertical Accuracy: ±100mm

5.3   Direct Observation

To achieve the required accuracy, new as-built and trial trench utility surveys shall be performed directly on the utilities prior to backfilling. As such, stakeholders (e.g. Utility Owners, Contractors, Registered Surveyors) are advised to closely plan and coordinate the execution of actual site activities.

5.4   Observation Standards

5.4.1 New As-Built Utility Survey

The eventual deliverables for the new as-built survey come in the form of Point, Line or Polygon output in GIS format. For each of the output type, surveys shall be carried out at the following positions:

a. Point Output (Manholes, chambers, valves, etc.)
   i. *Easting*, *Northing* and *Top / Ground Level* shall be surveyed from the top centre of the structures, while *Invert Level* shall be surveyed from the bottom as shown in Figure 2.
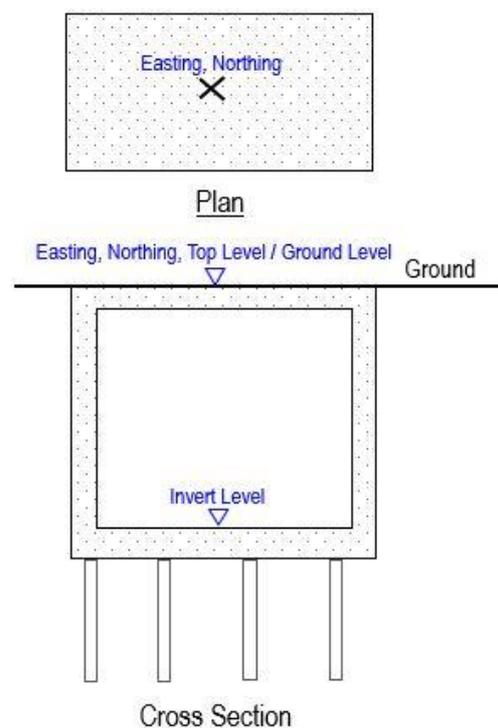

Figure 2: Manholes, Chambers, Valves
(Note: Full diagram please refer to Appendix)

b. Line Output (Pipes, cables, drains, etc.)

    i. *Easting*, *Northing* and *Top / Invert Level* shall be surveyed at positions as shown in Figures 3, 4 and 5.

    ii. For straight lines, surveys shall be carried out at not exceeding 20m intervals.

    iii. For curved lines, adequate number of surveyed points (as determined by the Registered Surveyor) shall be captured along the entire length of the curves.

    iv. Additional surveys shall also be carried out at the following points, where there are changes in:

- Alignment, at both horizontal and vertical directions.
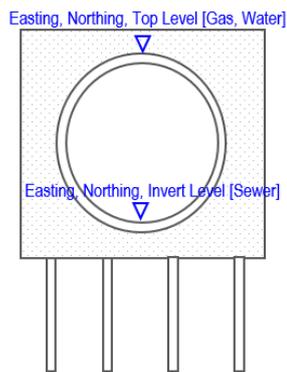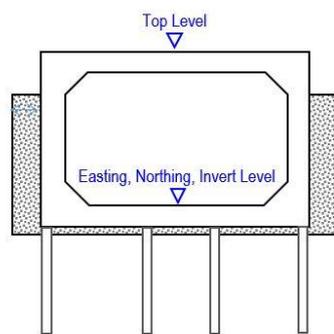- Pipes, cables, drains' size or material.
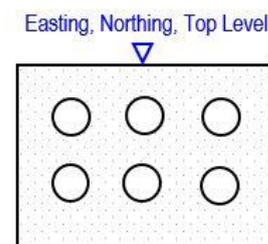

Figure 3: Pipes   Figure 4: Drains   Figure 5: Cable

(Note: Full diagram please refer to Appendix)

c. Polygon Output (Chambers, etc.)

    i. *Easting*, *Northing* for the chambers shall be surveyed from all corners (if chambers are rectangular) or from the centre (if chambers are circular), while the *Top / Invert / Formation Level* shall be surveyed at positions as shown in Figure 6.

    ii. *Easting, Northing* of both the internal and external wall for drains shall be surveyed.
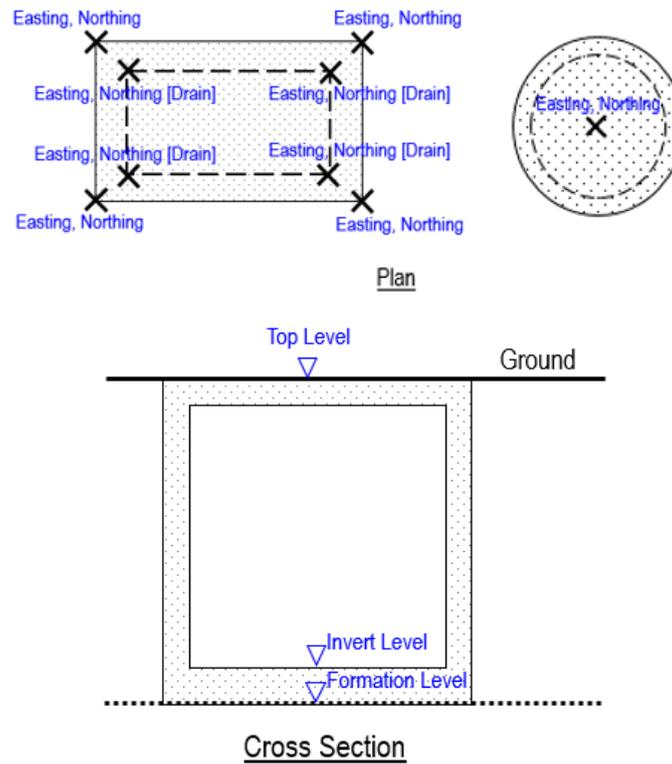
Figure 6: Chambers

(Note: Full diagram please refer to Appendix)

5.4.2 Trial Trench Utility Survey

The eventual deliverables for the trial trench utility survey come in the form of GIS (see section 6.2). For both the trench location and utilities within the trench, surveys shall be carried out at the following positions and to be indicated in the trial trench submission via LTA.Prompt and other required platforms (if any). For further details on the submission, please refer to Trial Trench Submission Guide which is available on the LTA.Prompt's road work application page.
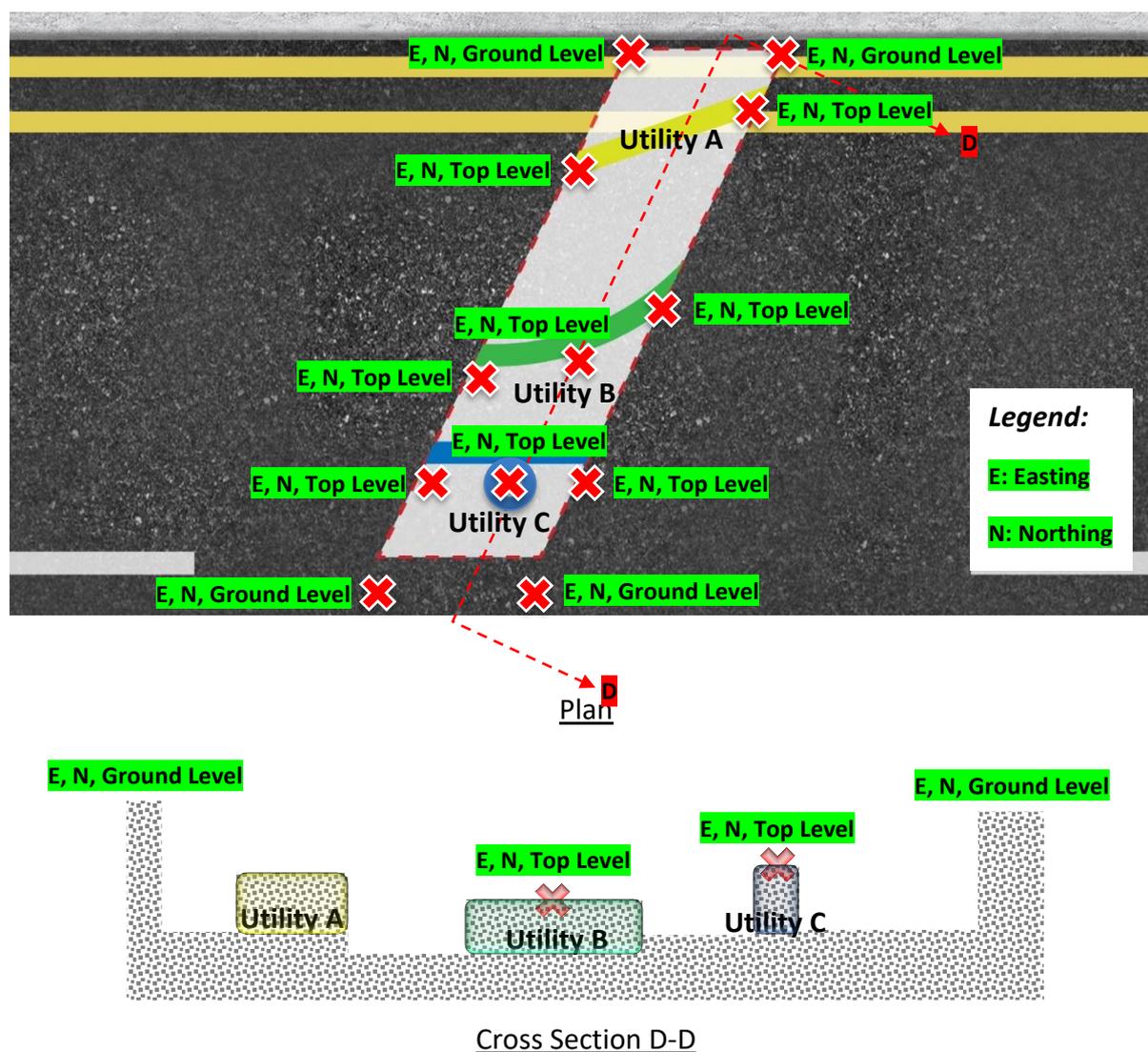
Plan

Cross Section D-D

Figure 7: An example of Trial Trench Utility Survey carried out
on a single lane within Carriageway

a. Trench location

   i.   *Easting*, *Northing,* and *Ground level (w.r.t. SHD)* shall be surveyed at four corners of the trench location as shown in Figure 7.

b. Pipes, cables, etc. within Trench

   i.   *Easting*, *Northing* and *Top Level (w.r.t. SHD)* shall be surveyed at utilities positions as shown in Figure 7.

   ii. For straight lines, surveys shall be carried out at two extreme ends of the exposed section of the utilities, as depicted by Utility A in Figure 7.

   iii. For curved lines, adequate number of surveyed points (as determined by the Registered Surveyor) shall be captured along the entire length of the curves, as depicted by Utility B in Figure 7.

   c. Manholes, chambers, valves, etc. within Trench (if any)

      i. *Easting*, *Northing* and *Top Level (w.r.t. SHD)* shall be surveyed at the top centre of the structures, as depicted by Utility C in Figure 7.

6. Submission Standards for Utility Survey

This section outlines the submission standards, which include the attributes and format of submission.

6.1 Attributes

For all new as-built and trial trench utility surveys, in addition to the requirements for surveyed coordinates covered in Section 5 (i.e. *Easting, Northing, Top/Invert Level*), additional information in the form of attributes shall also be included in the submission. The full list of the required attributes is given in the Appendix. Fields shaded in yellow are items where the Registered Surveyor's inputs are required. The Registered Surveyor's interim inputs shall be provided in either Esri Shapefile (.shp), AutoCAD (.dwg) or MicroStation (.dgn) format.

The *Attribute Name* shall strictly follow those stated in the Appendix. Also, inputs for the attributes shall:

    a. Be selected from an exhaustive list of pre-determined values, e.g. 1, 6, 7 or 8 for *Status* (if applicable), and

    b. Adhere strictly to the requirements for input format, e.g. *Invert Level* to be in mSHD to 3 decimal places, *Date of Installation* to be in YYYY-MM-DD.

Both the exhaustive lists of pre-determined values and the requirements for input format are also given in the Appendix.

6.2 Format of Submission

Submissions for both new as-built utility and trial trench surveys shall be provided in GIS format.

    a. For manholes, chambers, valves, and other structures classified as Point (as listed in the Appendix), data shall be captured in GIS Point, with X and Y recorded in the geometry and Z values (e.g. *Top / Invert Level*) recorded in the attributes table.

    b. For pipes, cables, drains, and other structures classified as Line, data shall be captured in GIS 3D Line, with X, Y, and Z recorded directly within the geometry.

This processed GIS data shall be submitted in either Shapefile (.shp) or geodatabase (.gdb) format.

References

1. Hong Kong Lands Department, Technical Specifications for Survey Works for Underground Utilities Information System (UUIS) (Available at: https://www.uuis.gov.hk/docs/Guidelines%20Part%20B%20-%20UUIS%20Technical%20Specifications_for%20UU%20Surveys.pdf)

2. Land Surveyors Board Singapore, Land Surveyors Board Directives on Land Survey and Geomatics Practices (Available at: https://lsb.mlaw.gov.sg/files/LSB_Directives_ver1.pdf)

3. Singapore Land Authority, Specifications for GNSS Surveys of ISN Markers (Available at: https://go.gov.sg/specifications-gnss-surveys-isn-markers-2021)

4. Singapore Land Authority, Standard and Specifications for 3D Topographic Surveying (Mapping) in Singapore (Available at: https://go.gov.sg/standard-specifications-3d-topographic-surveying-2013)

5. The American Society for Photogrammetry and Remote Sensing (ASPRS) (2013), LAS Specification version 1.4 – R13 (Available at: https://www.asprs.org/wp-content/uploads/2010/12/LAS_1_4_r13.pdf)

Glossary

Accuracy	The ability of a measurement to match the actual value of the quantity being measured.
Baselines	A line with a specific value that can serve as a basis of comparison or control, for the purposes of measurement, calculation, or location.
Datum	A reference from which measurements are made.
Eccentric corrections	Off-center correction
Elevation	The height of something above a given or implied place, often above datum
Ellipsoidal heights	The height of an object above the reference ellipsoid in use. This term is generally used to qualify an elevation as being measured from the ellipsoid as opposed to the geoid. GPS systems calculate ellipsoidal height.
Geoid	A model of the equipotential surface of the earth's gravity field that is best approximated by the mean sea level over the oceans which extends hypothetically beneath all land surfaces
GNSS	*Global Navigation Satellite Systems* Various operational and proposed satellite positioning systems, including the U.S. Global Positioning System (GPS), the Russian Global'naya Navigatsionnaya Sputnikovaya Sistema (GLONASS), the European Union Galileo, and others.
GPS	*Global Positioning System* A system of earth-orbiting satellites, transmitting signals continuously towards the earth, that enables the position of a receiving device on or near the earth's surface to be accurately estimated from the difference in arrival times of the signals
Height	The vertical distance from the base to the top of a feature.
Horizontal Control	A system of points whose horizontal positions and interrelationships have been accurately determined for use as fixed references in positioning and correlating map features.
ISN	Integrated Survey Network
Real Time Kinematic (RTK)	A technique used in surveying based on the use of carrier phase measurements of the GNSS signals where a single reference station provides the real-time corrections, providing up to centimetre-level accuracy.
SGeoid09	Geometric geoid model established by SLA
Singapore Height Datum (SHD)	The fixed datum surface set at 0.000 metres of Singapore's historical mean sea level
SiReNT	*Singapore Satellite Positioning Reference Network* An infrastructure set up by the Singapore Land Authority to define Singapore's official spatial reference framework and to support the gazetted cadastral system in SVY21. It is a multi-purpose high precision positioning infrastructure which provides both Post Process Differential Global Positioning System (DGPS) DGPS services and Real Time DGPS services. The system supports all types of GPS positioning modes and formats.
Surveyor	Registered Surveyor with a valid practicing certificate to carry out the utility surveys.
Vertical Control	A series of points on which precise heights, or elevations, have been established. Vertical control stations are typically called bench marks.

Appendix

Legend:

   	Items where Registered Surveyors' inputs are required

1a. Telco Manholes (Point)

Geometry			Requirements	
X Y			• Easting, Northing	
Attribute Name	**Attribute Description**	**Attribute Domain (Exhaustive)**	**Requirements**	
TOP_LVL	Top Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)	
INV_LVL	Invert Level	-		
EXT_LEN	External Length	-	• Unit: mm • Data type: Integer	
EXT_WID	External Width	-		
ORIENT	Orientation	Yes, No	• Is length of manhole along pipe? • Data type: Boolean	
MH_TYPE	MH Type	-	• To input as JX2, MX1, MX2, MX3, MX4, MX5, etc. • Data type: String	
BASE_THICK	Base Thickness	-	• Unit: mm • Data type: Integer	
SVY_BY	Surveyed by	-	• RS Company Name • Data type: String	
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer	
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)	
STATUS	Status	1, 8	• 1 – Existing (As-Built): Existing utilities (live) 8 – Abandoned: Abandoned utilities • Data type: Integer	
OWNERSHIP	Ownership	Self-owned, Co-owned, Leased	• Data type: String	
INST_DATE	Date of Installation	-	• Data type: Date (in YYYY-MM-DD)	

1b. Telco Pipes (Line)

Geometry	Requirements

X
 	
Y
	• Easting, Northing
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points

Z	• Top level
	• With respect to Singapore Height Datum (SHD)
	• Unit: m
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points
	• Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
HEIGHT	Height	-	• Unit: mm • Data type: Integer
WIDTH	Width	-	
DIA_DUCTS	External Diameter of Ducts	-	
NO_COLUMNS	No. of Columns	-	• Data type: Integer (positive value only)
NO_ROWS	No. of Rows	-	
NO_DUCTS	No. of Ducts	-	
HAUNCHES	Haunches	Yes, No	• Data type: Boolean
SVY_BY	Surveyed by	-	• RS Company Name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
STATUS	Status	1, 8	• 1 – Existing (As-Built): Existing utilities (live) 8 – Abandoned: Abandoned utilities • Data type: Integer
OWNERSHIP	Ownership	Self-owned, Co-owned, Leased	• Data type: String
INST_DATE	Date of Installation	-	• Data type: Date (in YYYY-MM-DD)

2a. Sewer Manholes (Point)

Geometry	Requirements		
X Y	• Easting, Northing		
Attribute Name	**Attribute Description**	**Attribute Domain (Exhaustive)**	**Requirements**
TLSHD	Top Level	-	• With respect to Singapore Height Datum (SHD)
ILSHD	Invert Level	-	• Unit: m • Data type: Double (to 3 decimal places)
MHType	Manhole Type	Nonstd-cir, Nonstd-rec, Std-cir, Std-rec	• Data type: String
MHExtDIM1	Dim1	-	• Unit: mm • If rectangular, input = external length along pipe • If circular, input = largest external diameter • Data type: Integer
MHExtDIM2	Dim2	-	• Unit: mm • if rectangular, input = external width • if circular, input = NULL • Data type: Integer
SupportTy	Type of Support	Bakau piles, Concrete piles, Pipe jacking, Sleeves steel, Steel piles, Timber piles	• Data type: String
LeftInStru	Left-in Structure	Caisson, Sheetpile, RC Trench, Thrust Block	• Data type: String
BaseThick	Base Thickness	-	• Unit: mm • Data type: Integer
SRVYDate	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	• RS Company Name • Data type: String
SRVYBy	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer

State	Status	1, 6, 8	• 1 – Existing (As-Built): Existing utilities (live) 6 – Proposed (Approved): Proposed infrastructure which has obtained approvals to proceed with construction 8 – Abandoned: Abandoned utilities • Data type: Integer
INSTDate	Date of Installation	-	• Contract closure or handover date for external project • Data type: Date (in YYYY-MM-DD)

2b. Sewer Pipes (Line)

Geometry	Requirements

X
 	
Y
	• Easting, Northing
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points

Z	• Invert level
	• With respect to Singapore Height Datum (SHD)
	• Unit: m
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points
	• Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
DropType	Drop Type	Backdrop, Drain-off, Drop, Indrop, Inverted Siphon, Nodrop, Raised junction, Reserved, Saddle connection, Tumbling bay, Unknown,	• Data type: String

		Vortex drop, Weir over, Y-junction	
DIA	Internal Diameter	-	• Unit: mm • Data type: Integer
Length	Pipe Length	-	• Unit: m • Data type: Double (to 3 decimal places)
ConstrMeth	Bedding	Type A, Type B, Type C, Type D	• Pipe Section • Data type: String
SupportTy	Type of Support	Bakau piles, Concrete piles, Pipe jacking, Sleeves steel, Steel piles, Timber piles	• Data type: String
LeftInStru	Left-in Structure	Caisson, Sheetpile, RC Trench, Thrust Block	• Data type: String
PipeMat	Pipe Material	Cast iron, Ductile iron, GRP, HDPE, Steel, Stoneware, Thickwall reinforced concrete, Vitrified clay	• Data type: String
PipeThick	Pipe Thickness	-	• Unit: mm • Data type: Integer
SRVYDate	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	• RS Company Name • Data type: String
SRVYBy	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
State	Status	1, 6, 8	• 1 – Existing (As-Built): Existing utilities (live) 6 – Proposed (Approved): Proposed infrastructure which has obtained approvals to proceed with construction 8 – Abandoned: Abandoned utilities • Data type: Integer

| INSTDate | Date of Installation | - | • Contract closure or handover date for external project
• Data type: Date (in YYYY-MM-DD) |

2c. Sewer Pumping Chambers (Point)

Geometry	Requirements
X Y	• Easting, Northing

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
TLSHD	Top Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
ILSHD	Invert Level	-	
CHType	CH Type	Access chamber, Air valve, Air valve chamber, Discharge chamber, Valve chamber, Washout chamber	• Data type: String
CHExtDIM1	Dim1	-	• Unit: mm • If rectangular, input = external length along pipe • If circular, input = external diameter • Data type: Integer
CHExtDIM2	Dim2	-	• Unit: mm • if rectangular, input = external width • if circular, input = NULL • Data type: Integer
SupportTy	Type of Support	Bakau piles, Concrete piles, Pipe jacking, Sleeves steel, Steel piles, Timber piles	• Data type: String
LeftInStru	Left-in Structure	Caisson, Sheetpile, RC	• Data type: String

		Trench, Thrust Block	
BaseThick	Base Thickness	-	• Unit: mm • Data type: Integer
SRVYDate	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	• RS Company Name • Data type: String
SRVYBy	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
State	Status	1, 6, 8	• 1 – Existing (As-Built): Existing utilities (live) 6 – Proposed (Approved): Proposed infrastructure which has obtained approvals to proceed with construction 8 – Abandoned: Abandoned utilities • Data type: Integer
INSTDate	Date of Installation	-	• Contract closure or handover date for external project • Data type: Date (in YYYY-MM-DD)

2d. Sewer Pumping Mains (Line)

Geometry	Requirements
X Y	• Easting, Northing • To be captured at: 　- For straight lines: Not exceeding 20m intervals 　- For curved lines: As determined by the Registered Surveyor 　- Points where there is a change of direction
Z	• Invert level • With respect to Singapore Height Datum (SHD) • Unit: m • To be captured at: 　- For straight lines: Not exceeding 20m intervals 　- For curved lines: As determined by the Registered Surveyor 　- Points where there is a change of direction • Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
DIA	Internal Diameter	-	• Unit: mm • Data type: Integer
Length	Pipe Length	-	• Unit: m • Data type: Double (to 3 decimal places)

ConstrMeth	Bedding	Type A, Type B, Type C, Type D	• Pipe Section • Data type: String
SupportTy	Pile Support	Bakau piles, Concrete piles, Pipe jacking, Sleeves steel, Steel piles, Timber piles	• Data type: String
LeftInStru	Left-in Structure	Caisson, Sheetpile, RC Trench, Thrust Block	• Data type: String
PipeMat	Pipe Material	Cast iron, Ductile iron, GRP, HDPE, Steel, Stoneware, Thickwall reinforced concrete, Vitrified clay	• Data type: String
PipeThick	Pipe Thickness	-	• Unit: mm • Data type: Integer
SRVYDate	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	• RS Company Name • Data type: String
SRVYBy	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
State	Status	1, 6, 8	• 1 – Existing (As-Built): Existing utilities (live) 6 – Proposed (Approved): Proposed infrastructure which has obtained approvals to proceed with construction 8 – Abandoned: Abandoned utilities • Data type: Integer
INSTDate	Date of Installation	-	• Contract closure or handover date for external project • Data type: Date (in YYYY-MM-DD)

2e. Sewerage Piling (excl. Bakau & Timber Piles) (Point)

Geometry	Requirements
X	• Easting, Northing
Y	

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
SizeDIM1	Dim1	-	• Unit: mm • If rectangular, input = length • If circular, input = external diameter • Data type: Integer
SizeDIM2	Dim2	-	• Unit: mm • if rectangular, input = width • if circular, input = NULL • Data type: Integer
CutLVLSHD	Pile Cut-off Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
PileLen	Pile Length	-	• Unit: m • Data type: Double (to 3 decimal places)
PileToeSHD	Pile Toe Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
PileType	Pile Type	Bakau piles, Concrete piles, Pipe jacking, Sleeves steel, Steel piles, Timber piles	• Data type: String
SRVYDate	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	• RS Company Name • Data type: String
SRVYBy	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer

3a. Drain Lines (Line)

Geometry	Requirements

X
 	
Y
	• Easting, Northing
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points

Z	• Invert level
	• With respect to Singapore Height Datum (SHD)
	• Unit: m
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points
	• Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
COPE_LVL	Cope Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
UP_DEPTH	Upstream Drain Depth	-	• Unit: m • Data type: Double (to 3 decimal places)
DN_DEPTH	Downstream Drain Depth	-	
PileType	Pile Type	Timber piles, H-piles, RC piles, Bored piles	• Data type: String
DRA_TYPE1	Drain Type 1	Open, Close	• Data type: String
DRA_TYPE2	Drain Type 2	Box Drain Box Culvert U-Drain Pipe Culvert Conduit Drain Trapezoidal Drain V channel drain Detention Tank Sump Reservoir	

DRA_WIDTH	Drain Width	-	• Refers to internal width • Unit: m • Data type: Double (to 3 decimal places)
PILE_REC	Pile record	Yes, No	• Data type: Boolean
LEFT_STRU	Left-in Structure	Yes, No	
BASE_THICK	Base Thickness	-	• Unit: m • Data type: Double (to 3 decimal places)
WALL_THICK	Wall Thickness	-	
SLAB_THICK	Slab Thickness	-	
HC_THICK	Hardcore Thickness	-	
SRVYDate	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	• RS Company Name • Data type: String
SRVYBy	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
STATUS	Status	1	• 1 – Existing (As-Built): Existing utilities (live) • Data type: Integer
INSTDate	Date of Installation	-	• Contract closure or handover date for external project • Data type: Date (in YYYY-MM-DD)

3b. Drain Outline (Polygon)

Geometry	Requirements
X	• Easting, Northing • To be captured at: - For straight lines: Not exceeding 20m intervals - For curved lines: As determined by the Registered Surveyor - Salient points • For both the internal and external wall of drains
Y	
Z	• Invert level • With respect to Singapore Height Datum (SHD) • Unit: m • To be captured at: - For straight lines: Not exceeding 20m intervals - For curved lines: As determined by the Registered Surveyor - Salient points • Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
COPE_LVL	Cope Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
MIN_DEPTH	Drain Depth Min	-	• Unit: m • Data type: Double (to 3 decimal places)
MAX_DEPTH	Drain Depth Max	-	
PileType	Pile Type	Timber piles, H-piles, RC piles, Bored piles	• Data type: String
DRA_TYPE1	Drain Type 1	Open, Close	• Data type: String
DRA_TYPE2	Drain Type 2	Box Drain Box Culvert U-Drain Pipe Culvert Conduit Drain Trapezoidal Drain V channel drain Detention Tank Sump Reservoir	
DRA_WIDTH	Drain Width	-	• Refers to internal width • Unit: m • Data type: Double (to 3 decimal places)
PILE_REC	Pile record	Yes, No	• Data type: Boolean
LEFT_STRU	Left-in Structure	Yes, No	
BASE_THICK	Base Thickness	-	• Unit: m • Data type: Double (to 3 decimal places)
WALL_THICK	Wall Thickness	-	
SLAB_THICK	Slab Thickness	-	
HC_THICK	Hardcore Thickness	-	
SRVYDate	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	• RS Company Name • Data type: String

SRVYBy	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
STATUS	Status	1	• 1 – Existing (As-Built): Existing utilities (live) • Data type: Integer
INSTDate	Date of Installation	-	• Contract closure or handover date for external project • Data type: Date (in YYYY-MM-DD)

3c. Drain Piling (Point)

Geometry		Requirements	
X		• Easting, Northing	
Y			
Attribute Name	**Attribute Description**	**Attribute Domain (Exhaustive)**	**Requirements**
PILE_SIZE	Pile Size	-	• Unit: m • Data type: Double (to 3 decimal places)
PILE_CLVL	Pile Cut-off Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
PILE_TLVL	Pile Toe Level	-	• For deepest pile • With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
PILE_LEN	Pile Length	-	• Unit: m • Data type: Double (to 3 decimal places)
PileType	Pile Type	RC pile, Bored pile, Timber pile, H-pile, Bakau pile	• Data type: String
INSTDate	Date of Installation	-	• Contract closure or handover date for external project • Data type: Date (in YYYY-MM-DD)
SRVYDate	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	• RS Company Name • Data type: String
SRVYBy	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer

3d. Drain Left-in Structures (Line)

Geometry	Requirements
X	
Y	• Easting, Northing

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
C_LVL	Cut-off Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
DEPTH	Deepest depth	-	• Unit: m • Data type: Double (to 3 decimal places)
STRU_TYPE	Structure type	Sheetpile	• Data type: String
INSTDate	Date of Installation	-	• Contract closure or handover date for external project • Data type: Date (in YYYY-MM-DD)
SRVYDate	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	• RS Company Name • Data type: String
SRVYBy	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer

3e. Drain Piling Zone (Polygon)

Geometry	Requirements
X	
Y	• Easting, Northing

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
PILE_SIZE	Pile Size	-	• Unit: m
PILE_LEN	Pile Length	-	• Data type: Double (to 3 decimal places)
PileType	Pile Type	RC pile, Bored pile, Timber pile, H-pile, Bakau pile	• Data type: String
INSTDate	Date of Installation	-	• Contract closure or handover date for external project • Data type: Date (in YYYY-MM-DD)

SRVYDate	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	• RS Company Name • Data type: String
SRVYBy	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer

4a. Water Supply Mains / Lateral Lines (Line)

Geometry	Requirements
X Y	• Easting, Northing • To be captured at: - For straight lines: Not exceeding 20m intervals - For curved lines: As determined by the Registered Surveyor - Salient points, such as bends, tees, control valves, air valves, washouts, meters
Z	• Top level of pipe • With respect to Singapore Height Datum (SHD) • Unit: m • To be captured at: - For straight lines: Not exceeding 20m intervals - For curved lines: As determined by the Registered Surveyor - Salient points, such as bends, tees, control valves, air valves, washouts, meters • Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
DIA	Nominal Diameter	-	• Unit: mm • Data type: Double
SRVYDate	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	• RS Company Name • Data type: String
SRVYBy	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
RBState	Status	1, 6, 7, 8	• 1 – Existing (As-Built): Existing utilities (live) 6 – Proposed (Approved): Proposed infrastructure which has obtained approvals to proceed with construction 7 – U/C: Proposed infrastructure under construction 8 – Abandoned: Abandoned utilities • Data type: Integer
MainType	Type	Buried, Exposed, Pipe-jacking, Tunnel, Encased	• Refers to construction method • Data type: String

WaterType	Water Type	Industrial, NEWater, Raw, Potable, Effluent, Scour	• Data type: String
LatType	Lateral Type (for lateral lines only)	Hydrant, Meter, Air valve, Washout	• Refers to connection pipes to meters, hydrants, air valves, washouts • Data type: String
INSTYear	Date of Installation	-	• Data type: Integer

4b. Water Supply Chamber (Air Valve / Control Valve / Washout / Meter) (Polygon)

Geometry	Requirements
X Y	• Easting, Northing • To be captured at corners of rectangular chambers or centre of circular chambers

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
FormSHD	Formation Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
DIM1	Dim1	-	• Unit: m • If rectangular, input = length along pipe • If circular, input = external diameter • Data type: Double (to 3 decimal places)
DIM2	Dim2	-	• Unit: m • if rectangular, input = width across pipe • if circular, input = NULL • Data type: Double (to 3 decimal places)
DIMHT	Height	-	• Unit: mm • Data type: Integer
PileType	Pile Type	Timber piles, Bakau piles, RC piles	• Data type: String
PileToeSHD	Pile Toe Level	-	• For deepest pile • With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)

MaxPileLen	Pile Length	-	- For deepest pile - Unit: m - Data type: Double (to 3 decimal places)
SRVYDate	Date of Last Survey	-	Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	- RS Company Name - Data type: String
SRVYBy	Surveyor ID	-	- RS Registration Number With LSB - Data type: Integer
RBState	Status	1, 6, 7, 8	1 – Existing (As-Built): Existing utilities (live) 6 – Proposed (Approved): Proposed infrastructure which has obtained approvals to proceed with construction 7 – U/C: Proposed infrastructure under construction 8 – Abandoned: Abandoned utilities - Data type: Integer
CHType	Chamber Type	Std Cir, Std Rec, Nonstd Cir, Nonstd Rec	- Circular or Rectangular - Data type: String
INSTDate	Date of Installation	-	Data type: Date (in YYYY-MM-DD)

4f. Water Supply Hydrant (Point)

Geometry	Requirements
X	Easting, Northing
Y	

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
RLSHD	RL	-	- To be captured at the top of Double and Triple Pillar Hydrant or ground level of Ground Hydrant chamber - With respect to Singapore Height Datum (SHD) - Unit: m - Data type: Double (to 3 decimal places)
HYDType	Hydrant_Type	GH, DPH, TPH	- GH: Ground hydrant DPH: Double pillar hydrant TPH: Triple pillar hydrant - Data type: String

SRVYDate	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SRVYCo	Surveyed by	-	• RS Company Name • Data type: String
SRVYBy	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer

5a. Power Joint Bays, PT Tanks, Link Boxes (Point)

Geometry	Requirements
X	• Easting, Northing
Y	

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
TOP_LVL	Top Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
HEIGHT	Height	-	• Unit: mm • Data type: Integer
EXT_LEN	External Length	-	
EXT_WID	External Width	-	
STRU_TYPE	Structure Type	Joint bay, Pressure Tank (PT) pit, Link box pit, Partial Discharge (PD) terminal box pit, Oil Gauge (OG) box	• Data type: String
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SVY_BY	Surveyed by	-	• RS Company Name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
STATUS	Status	1, 8	• 1 – Existing (As-Built): Existing utilities (live) 8 – Abandoned: Abandoned utilities • Data type: Integer
INST_DATE	Date of Installation	-	• Data type: Date (in YYYY-MM-DD)

5b. Power Cables Trench (Line)

Geometry	Requirements / Explanation
X	• Easting, Northing • To be captured at:

Y	- For straight lines: Not exceeding 20m intervals - For curved lines: As determined by the Registered Surveyor - Salient points

Z*	• Top level
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points
	• With respect to Singapore Height Datum (SHD)
	• Unit: m
	• Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
HEIGHT	Height	-	• Unit: mm • Data type: Integer
WIDTH	Width	-	
NO_COLUMNS	No. of Columns	-	• Data type: Integer (positive value only)
NO_ROWS	No. of Rows	-	
NO_DUCTS	No. of Ducts	-	

NO_CABLES	No. of Cables	-	• If cables are not laid within duct(s):
			  - To fill in this attribute.
			  - To indicate the 'No. of Columns / Rows / Ducts' attributes as '0' (zero).
			• If cables are laid within duct(s):
			  - To indicate this attribute as '0' (zero).
			  - To fill in the 'No. of Columns / Rows / Ducts' attributes instead.
			• Data type: Integer

HAUNCHES	Haunches	Yes, No	• Data type: Boolean
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SVY_BY	Surveyed by	-	• RS Company Name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
STATUS	Status	1, 8	• 1 – Existing (As-Built): Existing utilities (live) 8 – Abandoned: Abandoned utilities • To indicate as 'Existing', so long as there is at least one live cable within the trench. • Data type: Integer
LINE_TYPE	Type of Line	LV, Distribution, Transmission	• Data type: String

INST_DUCTS	Date of Installation (Ducts)	-	
INST_CABLE^	Date of Installation (Newest Cables)	-	• Data type: Date (in YYYY-MM-DD)

* Shall be captured in the geometry of the Line feature, or as an attribute in a separate Point feature.

^ Shall be also captured in the attributes of separate Line features.

6a. Gas Chambers (Point)

Geometry		Requirements	
X Y		• Easting, Northing	
Attribute Name	**Attribute Description**	**Attribute Domain (Exhaustive)**	**Requirements**
TOP_LVL	Top Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
HEIGHT	Height	-	• Unit: mm • Data type: Integer
EXT_LEN	External Length	-	
EXT_WID	External Width	-	
STRU_TYPE	Structure Type	Chamber, Gas regulator, Line valve pit	• Data type: String
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SVY_BY	Surveyed by	-	• RS Company Name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
STATUS	Status	1, 8	• 1 – Existing (As-Built): Existing utilities (live) 8 – Abandoned: Abandoned utilities • Data type: Integer
LINE_TYPE	Type of Line	Distribution, Transmission	• Data type: String
INST_DATE	Date of Installation	-	• Data type: Date (in YYYY-MM-DD)

6b. Gas Pipes Trench (Line)

Geometry	Requirements

X
 	
Y
	• Easting, Northing
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points

Z*	• Top level
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points
	• With respect to Singapore Height Datum (SHD)
	• Unit: m
	• Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
DIA_PIPE	External Diameter of Pipes	-	• Unit: mm • Data type: Integer
DIA_SLEEVE	External Diameter of Concrete Sleeves	-	
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SVY_BY	Surveyed by	-	• RS Company Name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
STATUS	Status	1, 8	• 1 – Existing (As-Built): Existing utilities (live) 8 – Abandoned: Abandoned utilities • Data type: Integer
LINE_TYPE	Type of Line	Distribution, Transmission	• Data type: String
INST_DATE^	Date of Installation	-	• Data type: Date (in YYYY-MM-DD)

* Shall be captured in the geometry of the Line feature, or as an attribute in a separate Point feature.
^ Shall be also captured in the attributes of separate Line features.

7a. PWCS Manholes / Bunkers (Point)

Geometry	Requirements
X Y	• Easting, Northing

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
TOP_LVL	Top Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
INV_LVL	Invert Level	-	
MH_TYPE	MH Type	Nonstd-cir, Nonstd-rec, Std-cir, Std-rec	• Data type: String
EXT_LEN	External Length	-	• Unit: mm • If rectangular, input = external length along pipe • If circular, input = largest external diameter • Data type: Integer
EXT_WID	External Width	-	• Unit: mm • if rectangular, input = external width • if circular, input = NULL • Data type: Integer
PILE_TYPE	Pile Type	Bakau piles, Concrete piles, Pipe jacking, Sleeves steel, Steel piles, Timber piles	• Data type: String
BASE_THICK	Base Thickness	-	• Unit: mm • Data type: Integer
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SVY_BY	Surveyed by	-	• RS Company Name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
INST_DATE	Date of Installation	-	• Indicates the date which the pipe / system begun operation or was completed • Data type: Date (in YYYY-MM-DD)
INFR_OWNER	Infrastructure Owner	NEA, HDB, JTC	• Data type: String

DEVT_NAME	Development Name	-	• Data Type: String

7b. PWCS Pipes (Line)

Geometry	Requirements

X
 	
 Y
	• Easting, Northing
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points

Z	• Top level
	• With respect to Singapore Height Datum (SHD)
	• Unit: m
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points
	• Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
DIA_PIPE	External Diameter of Pipes	-	• Unit: mm • Data type: Integer
DIA_SLEEVE	External Diameter of Pipe Sleeves	-	• Unit: mm • Data type: Integer • if without pipe sleeves, input = NULL
HAUNCHES	Haunching	Yes, No	• Pipe Section • Data type: Boolean
PILE_TYPE	Pile Type	Bakau piles, Concrete piles, Pipe jacking, Sleeves steel, Steel piles, Timber piles	• Data type: String
PIPE_MAT	Pipe Material	Cast iron, Ductile iron, GRP, HDPE, Mild steel, Stoneware, Thickwall reinforced	• Data type: String

		concrete, Vitrified clay, Stainless steel	
PIPE_THICK	Pipe Thickness	-	• Unit: mm • Data type: Integer
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SVY_BY	Surveyed by	-	• RS Company Name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
INST_DATE	Date of Installation	-	• Indicates the date which the pipe / system begun operation or was completed • Data type: Date (in YYYY-MM-DD)
INFR_OWNER	Infrastructure Owner	NEA, HDB, JTC	• Data type: String
DEVT_NAME	Development Name	-	• Data type: String

8a. Industrial Pipes (Non P&FM) (Line)

Geometry	Requirements

X
 	
Y
	• Easting, Northing
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  Salient points

Z	• Top level
	• With respect to Singapore Height Datum (SHD)
	• Unit: m
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points
	Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
DIA_PIPE	External Diameter of Pipes	-	• Unit: mm • Data type: Integer
PIPE_MAT	Material(s) of Pipes	-	• Date type: String
OWNER_ENT	Ownership of Pipes (Entity Name)	-	• Date type: String
OWNER_UEN	Ownership of Pipes (Entity UEN)	-	• Date type: String
PIPE_CONT	Content of Pipes	-	• Date type: String
INST_DATE	Date of Installation	-	• Indicates the date of completion for the pipe installation work • Data type: Date (in YYYY-MM-DD)
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SVY_BY	Surveyed by	-	• RS Company Name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
STATUS	Status	1, 7, 8	• 1 – Existing (As-Built): Existing utilities (live) 7 – U/C: Proposed infrastructure under construction

			8 – Abandoned: Abandoned utilities
			• Data type: Integer

9a. District Cooling System Chambers (Point)

Geometry			Requirements
X Y			• Easting, Northing
Attribute Name	**Attribute Description**	**Attribute Domain (Exhaustive)**	**Requirements**
TOP_LVL	Top Level	-	• With respect to Singapore Height Datum (SHD)
FORM_LVL	Formation Level	-	• Unit: m • Data type: Double (to 3 decimal places)
HEIGHT	Height	-	• Unit: mm • Data type: Integer
DIM1	Dim1	-	• Unit: m • If rectangular, input = length along pipe • If circular, input = external diameter • Data type: Double (to 3 decimal places)
DIM2	Dim2	-	• Unit: m • if rectangular, input = width across pipe • if circular, input = NULL • Data type: Double (to 3 decimal places)
PILE_TYPE	Pile Type	Timber piles, H-piles	• Data type: String
PILE_TLVL	Pile Toe Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
PILE_LEN	Pile Length	-	• Unit: m • Data type: Double (to 3 decimal places)
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SVY_BY	Surveyed by	-	• RS company name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
STATUS	Status	1, 8	• 1 – Existing (As-Built): Existing utilities (live) 8 – Abandoned: Abandoned utilities • Data type: Integer
LINE_TYPE	Type of Line	Distribution, Transmission	• Data type: String
INST_DATE	Date of Installation	-	• Data type: Date (in YYYY-MM-DD)

9b. District Cooling System Pipes (Line)

Geometry	Requirements

X
 	
Y
	• Easting, Northing
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points

Z	• Top level
	• With respect to Singapore Height Datum (SHD)
	• Unit: m
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points
	• Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
DIA_PIPE	External Diameter of Pipes	-	• Unit: mm • Data type: Integer
DIA_SLEEVE	External Diameter of Concrete Sleeves	-	
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SVY_BY	Surveyed by	-	• RS company name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
STATUS	Status	1, 8	• 1 – Existing (As-Built): Existing utilities (live) • 8 – Abandoned: Abandoned utilities • Data type: Integer
LINE_TYPE	Type of Line	Distribution, Transmission	• Data type: String
INST_DATE	Date of Installation	-	• Data type: Date (in YYYY-MM-DD)

9c. District Cooling System Thrust Block (Point)

Geometry			Requirements
X			• Easting, Northing
Y			

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
FORM_LVL	Formation Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
HEIGHT	Height	-	• Unit: mm • Data type: Integer
DIM1	Dim1	-	• Unit: m • If rectangular, input = length along pipe • If circular, input = external diameter • Data type: Double (to 3 decimal places)
DIM2	Dim2	-	• Unit: m • if rectangular, input = width across pipe • if circular, input = NULL • Data type: Double (to 3 decimal places)
BLK_TYPE	Block Type	Vertical bend, Horizontal bend	• Data type: String
PILE_TYPE	Pile Type	Micropiles, Concrete piles,	• Data type: String
PILE_TLVL	Pile Toe Level	-	• With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)
PILE_LEN	Pile Length	-	• Unit: m • Data type: Double (to 3 decimal places)
INST_DATE	Date of Installation	-	• Contract closure or handover date for external project • Data type: Date (in YYYY-MM-DD)
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SVY_BY	Surveyed by	-	• RS company name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer

10a. Petroleum & Flammable Material (P&FM) (Line)

Geometry	Requirements

X
 	
Y
	• Easting, Northing
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points

Z	• Top level
	• With respect to Singapore Height Datum (SHD)
	• Unit: m
	• To be captured at:
	  - For straight lines: Not exceeding 20m intervals
	  - For curved lines: As determined by the Registered Surveyor
	  - Salient points
	Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
DIA_PIPE	External Diameter of Pipes	-	• Unit: mm • Data type: Integer
DIA_SLEEVE	External Diameter of Concrete Sleeves		
PIPE_MAT	Material(s) of Pipes	-	• Date type: String
HAUNCHES	Haunches	Yes, No	• Data type: Boolean
START_PT	Starting point of the pipes (in public area)	-	• Data type: String
END_PT	Ending point of the pipes (in public area)	-	• Data type: String
PIPE_LEN	Pipe Length	-	• Unit: mm • Data type: Integer
PIPE_THICK	Pipe thickness	-	• Unit: mm • Data type: Integer
INFR_OWNER	Infrastructure / Corridor / Pipeline Owner (Entity Name)	-	• Date type: String

INFR_UEN	Infrastructure / Corridor / Pipeline Owner (Entity UEN)	-	• Date type: String
PIPE_CONT	Product in Pipes	-	• Date type: String
INST_DATE	Date of Installation	-	• Indicates the date of completion for the pipe installation work • Data type: Date (in YYYY-MM-DD)
SVY_DATE	Date of Last Survey	-	• Data type: Date (in YYYY-MM-DD)
SVY_BY	Surveyed by	-	• RS Company Name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
STATUS	Status	1, 7, 8	• 1 – Existing (As-Built): Existing utilities (live) 7 – U/C: Proposed infrastructure under construction 8 – Abandoned: Abandoned utilities • Data type: Integer

11a. Trench Location (Polygon)

Geometry	Requirements
X Y	• Easting, Northing • At least three corners are to be surveyed
Z	• Ground level • With respect to Singapore Height Datum (SHD) • Unit: m • Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
TRCH_ID	Trench Identifier	-	• Data type: String
SVY_BY	Surveyed by	-	• RS company name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
SVY_DATE	Date of Survey	-	• Data type: Date (in YYYY-MM-DD)

11b. Pipes / Cables etc. within Trench (Line)

Geometry	Requirements
X Y	• Easting, Northing • At least two extreme points are to be surveyed in order to construct a line • To be captured at salient points
Z	• Top level • With respect to Singapore Height Datum (SHD) • Unit: m • To be captured at salient points • Data type: Double (to 3 decimal places)

Attribute Name	Attribute Description	Attribute Domain (Exhaustive)	Requirements
TRCH_ID	Trench Identifier	-	• Data type: String
UTIL_TYPE	Type of Services	Telecom, Sewer, Water, Elect, Gas, PWCS, Industrial	• Data type: String

		pipes, DCS, P&FM, Unknown	
UTIL_SIZE	Size or Diameter of Services	-	• Unit: mm • Data type: Integer
SVY_BY	Surveyed by	-	• RS company name • Data type: String
SVY_ID	Surveyor ID	-	• RS Registration Number With LSB • Data type: Integer
SVY_DATE	Date of Survey	-	• Data type: Date (in YYYY-MM-DD)

Diagrams