Implementation of Data Alignment Measures for the Alignment of Planning, Lands and Public Works Data

Final Report (Volume 2A)
Specification and Explanatory Notes of Slope CSU

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Volume 2A – Specification and Explanatory Notes of Slope CSU

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1 Introduction

1.1 General Overview

1.1.1 The Slope Common Spatial Unit (Slope CSU) is defined as the standard unit for exchange of geospatial data of slopes, comprising spatial data and a set of common attributes, between participating departments, i.e. the Data Agent, Data Owners and Data Users.

1.1.2 This document gives the specification of Slope CSU which shall be followed by all participating departments in the data exchange process. Participating Departments are not obliged to adopt the same specification for their internal systems.

1.1.3 The CSU specification includes 4 major components:

(a) CSU Definition – to describe the scope covered in the CSU, the rules adopted for the delineation of CSU polygons, the CSU Identifier to uniquely identify a CSU, and the data custodianship;

(b) CSU Workflow – to describe the processes and workflows involved in the production and exchange of CSU data during different stages of a CSU lifecycle;

(c) CSU Data Interface Requirement – to describe the logical structure of CSU data exchanged between the interfacing systems of PDs;

(d) Maintenance of the CSU – to describe the regular mode and frequency of data provision by Data Owners, and dissemination by the Data Agent.

1.2 Enquires

1.2.1 Any enquires to the specification shall be referred to the DAM Management Committee, c/o HPLB.

2 CSU Definition

2.1 Overview

2.1.1 There are about 500 new slope registration requests and 10,000 requests for updating slope information (requests from Works Department) received by CED per year. There are also exchanges of slope data among other PDs (e.g. LandsD and CED) for other purposes. They are:

(a) Registration of slopes under relevant technical circulars;

(b) Identification of the maintenance responsibility of apportioned area of each slope feature;

(c) Tracking the maintenance state of each slope feature under the maintenance jurisdiction of PDs.

2.2 Scope

2.2.1 The scope of Slope CSU includes the slope features listed in the slope catalogue maintained by Geotechnical Engineering Office (GEO) of CED. The slope features include sizeable man-made slopes, retaining walls, disturbed terrain and natural terrain hazard mitigation measures located within HKSAR, as defined by WBTC No. 9/2000 and the subsequent revised version.

2.2.2 Within the scope of the Slope CSU, the coverage includes the following six slope feature types:

(a) CUT/CUT & RETAINING SLOPE – includes cut slopes and any associated retaining walls greater than 3m high.

(b) RETAINING WALL – any retaining wall greater than 3m high.

(c) FILL/ FILL & RETAINING SLOPE – includes fill slopes and any associated retaining walls, greater than 5m high or which pose a direct risk to life, i.e., consequence-to-life category 1 or 2 (defined in GeoGuide 5 of Geotechnical Engineering Office).

(d) DISTURBED TERRAIN FEATURE – includes repairs to landslide scars and/or a series of composite cut and/or fill slopes where the ground surface has been disturbed, and the natural slope gradient is greater than 15 degrees. (Note: Although the individual slopes do not meet the height criteria for registration, the total height does meet the criteria for registration.)

(e) NATURAL TERRAIN STABILISATION MEASURES – includes measures constructed on natural hillsides to prevent failure, e.g. boulder buttresses, soil nails and raking drains.

(f) NATURAL TERRAIN DEFENCE MEASURES – measures to contain landslide debris and hence protect buildings and infrastructure at the toe in case of landslide or boulder fall from the natural terrain above, e.g. check dams, earth bunds and boulder fences.

2.2.3 It is common that the same slope feature is split into parts and each apportioned part of the slope feature is under different maintenance jurisdictions. Maintenance responsibility will be assigned to each part accordingly.

2.3 Common Rules for Delineation and Shapes of Polygons

2.3.1 The current rules for the delineation and shape of polygons adopted by CED will be retained. There are two sets of polygons to represent Slope CSU:

(a) Slope feature polygon

(i) It is used to define the physical extent of the slope features, which is determined by land survey and recorded on the as built drawing.

(ii) As built drawing or digitized format of the record would be prepared and submitted by PD (either in the capacity of a works agent or the owner of the slope) or consultants/architects to CED for registration. On completion of the verification, CED would convert the record from the as built drawing/digitized record into the CED's Slope Catalogue System.

(iii) The spatial record will be stored in the slope features layer, which is a geospatial layer representing active, registered slope features in the HKSAR.

(b) Slope maintenance responsibility polygon

(i) It is used to define the apportioned extent of the same slope features under different maintenance (civil works maintenance) jurisdiction. The polygon will make reference to the land allocation boundary.

(ii) To assign the slope maintenance responsibility, LandsD will analyse the spatial data containing the maintenance responsibility information, e.g. the Base map from B1000 and lot information from C1000, on top of the slope features.

(iii) When required, LandsD would have to verify the maintenance responsibility from relevant documents and field surveys.

(iv) The polygons are currently stored in the slope Features Maintenance Responsibility layer which is a geospatial layer representing active, registered slope features with assigned maintenance responsibility in the HKSAR.

2.4 Common Attributes

2.4.1 The spatial data and non-locational (textual) attributes relevant to the Slope CSU are selected to form a set of common CSU data attributes. Table 1 below lists out the common data attributes based on the data entity in the exchange of Slope CSU.

Spatial
1. Cut Slope Polygon
2. Fill Slope Polygon
3. Retaining Wall Polygon
4. Disturb Terrain Polygon
5. Natural Terrain Stabilization Measures Polygon
6. Natural Terrain Defence Measures Polygon
7. Maintenance Responsibility Polygon
8. Overlapped Maintenance Responsibility Polygon
Textual
1. Basic Information
2. Construction & Ground Investigation
3. Defence Measure
4. Facility
5. Formation History
6. Feature Status
7. Responsibility
8. Responsible Party
9. Renamed Feature
10. Slope Feature
11. Stability Measure
12. Structural Measure
13. Wall Feature
14. Utility Service

Table 1 Common data attributes of Slope CSU

2.5 CSU ID

2.5.1 The CED's Feature Number will be adopted as the CSU ID for the Slope CSU. This identifier consists of three segments. For example, "11SW-A/C363" as shown in the map below:

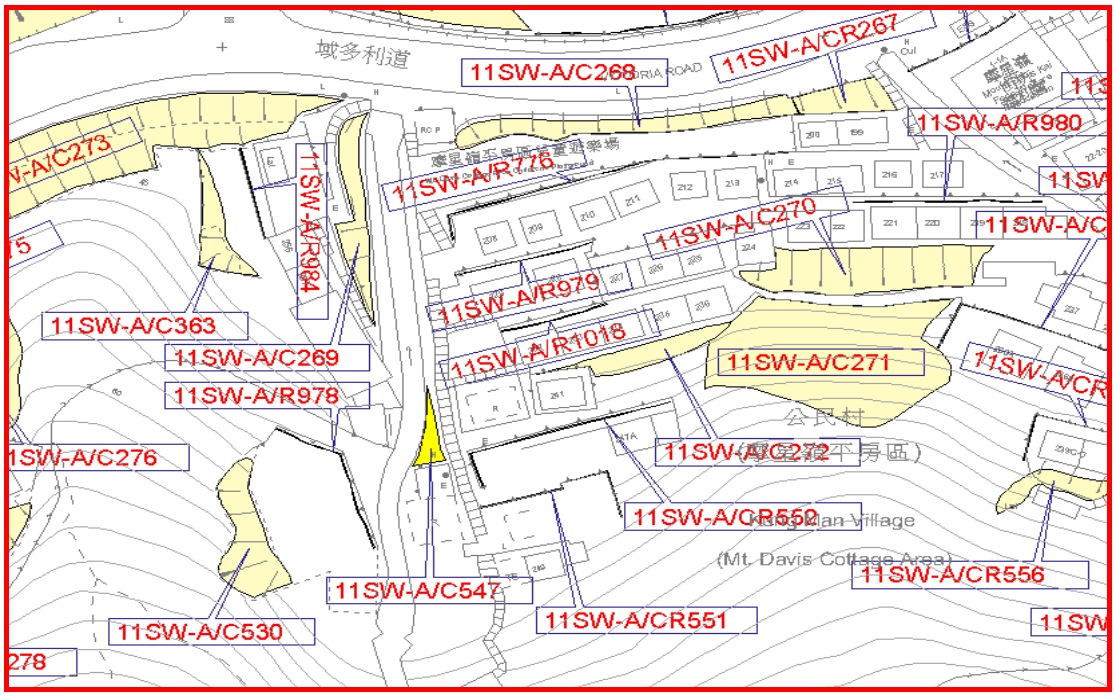


Figure 1 Map with Sample CSU IDs

2.5.2 The Slope CSU identifier is composed of the following, using "11SW-A/C363" as an example:

(a) The 1st segment "11SW-A" represents the reference of the 1:5000 scale survey sheet;

(b) The 2nd segment "C" represents slope feature types. Currently, there are 6 types:

(i) *C/CR* – Cut / Cut & Retaining slope;

(ii) *F/FR* – Fill / Fill & Retaining slope;

(iii) *R* – Retaining wall;

(iv) *DT* – Disturb Terrain;

(v) *NS* - Natural Terrain Stabilization Measures;

(vi) *ND* –Natural Terrain Defence Measures;

(c) The 3rd segment *"363"* represents a unique number on a particular 1:5000 scale survey sheet and slope feature type.

2.5.3 LandsD assigns a Sub Division Identifier to apportioned parts of each slope feature under different maintenance jurisdiction. The format for the maintenance identifier is "11SW-A/C363-1" where the 1st, 2nd and 3rd segments are brought from the Slope CSU ID, or the root identifier, while the 4th segment is uniquely assigned per each slope feature.

2.5.4 In some events of modification the slope features' physical dimension, such as, changes in feature type from C->CR, CR->C, F->FR, FR->F, only the second portion of the Slope CSU ID will be renamed, and the remaining portions remain unchanged. Since many PDs often make reference to the renamed slope features, it is necessary to retain the history of such renamed slope, and thus, the data model would handle the mapping between original Slope CSU ID and the renamed Slope CSU ID.

2.5.5 When there is a change in slope feature type from F->C and C->F, a new Slope CSU ID would be assigned by CED.

2.5.6 When a slope feature is demolished, its assigned Slope CSU ID retires and it will not be reused. There might be situations that this retired Slope CSU ID needs to be re-activated in some very exceptional case.

2.6 Data Custodianship

2.6.1 Please refer to Volume 2I – Data Custodianship and License Agreement, for details about the defined roles and responsibilities for the Data Agent, Data Owner and Data User.

Data Agent

2.6.2 CED will take up the role of Data Agent to consolidate the slope information, and then release the information to participating departments. In other context outside DAM, they also carry a similar business role to provide the same information to private sectors and the public.

Data Owner

2.6.3 Slope features could be separately owned and maintained (civil works maintenance) by various government departments and private developers.

2.6.4 PDs are the Data Owner of the slope features under the ownership or maintenance (civil works maintenance) jurisdiction.

2.6.5 Under the WBTC No. 9/2000, government departments are required to carry out routine inspection and Engineer Inspection on their owned/responsible slope features. PDs, carrying the Data Owner role, would need to ensure the data currency, accuracy and completeness of the update on completion of these inspections.

2.6.6 CED is the Data Owner for the slope features owned / maintained by the private sector. CED is responsible for preparing the relevant CSU data according to the agreed Slope CSU and exchanging the data with other PDs provided that the delegated authority permits.

2.6.7 LandsD would be the Data Owner of slope maintenance responsibility, as they are responsible for defining the maintenance responsibility. Other Data Owners of Slope CSU are highlighted in Table 2 for each of the common attributes.

2.6.8 The below table illustrate the data ownership of attributes as per slope features under their maintenance responsibilities.

	Slope Owner /Maintenance (Civil Works) Agent						
Spatial							
1. Cut Slope Polygon	ArchSD	CED	DSD	HyD	LandsD	TDD	WSD
2. Fill Slope Polygon							
3. Retaining Wall Polygon							
4. Disturb Terrain Polygon							
5. Natural Terrain Stabilization Measures Polygon							
6. Natural Terrain Defence Measures Polygon							
7. Maintenance Responsibility Polygon	LandsD	LandsD	LandsD	LandsD	LandsD	LandsD	LandsD
8. Overlapped Maintenance Responsibility Polygon							
Textual							
1.Basic Information	ArchSD	CED	DSD	HyD	NA	TDD	WSD
2. Construction & Ground Investigation							
3. Defence Measure							
4. Facility	CED	CED	CED	CED	CED	CED	CED
5. Formation History	ArchSD	CED	DSD	HyD	NA	TDD	WSD
6. Feature Status							
7. Responsibility #	LandsD	LandsD	LandsD	LandsD	LandsD	LandsD	LandsD
8. Responsible Party							

9. Renamed Feature	CED	CED	CED	CED	CED	CED	CED
10. Slope Feature	ArchSD	CED	DSD	HyD	NA	TDD	WSD
11. Stability Measure							
12. Structural Measure							
13. Wall Feature							
14. Utility Service							

 # CED is providing the data item "Initial Party for Slope Registration

Table 2 Data Ownership of Slope CSU

Data User

2.6.9 Data Users of Slope CSU includes: ArchSD, BD, CED, DSD, HyD, LandsD, TDD and WSD.

3 CSU Workflow

3.1 Overview

3.1.1 The flow charts below are used to describe the data exchange processes among the PDs in the context of Slope CSU. Hence, only those processes that are directly relevant to the update or retrieval of CSU data are indicated. Internal processes within a PD, and data exchange processes between a PD and other organization (e.g. developers, government departments other than the PDs) are not included.

3.2 Data Exchange Processes

3.2.1 The proposed workflow process will cover the data exchange in the following three stages:

(a) Construction Stage;

(b) Maintenance Stage; and

(c) Deactivation Stage.

3.2.2 The workflow is illustrated by the charts below:

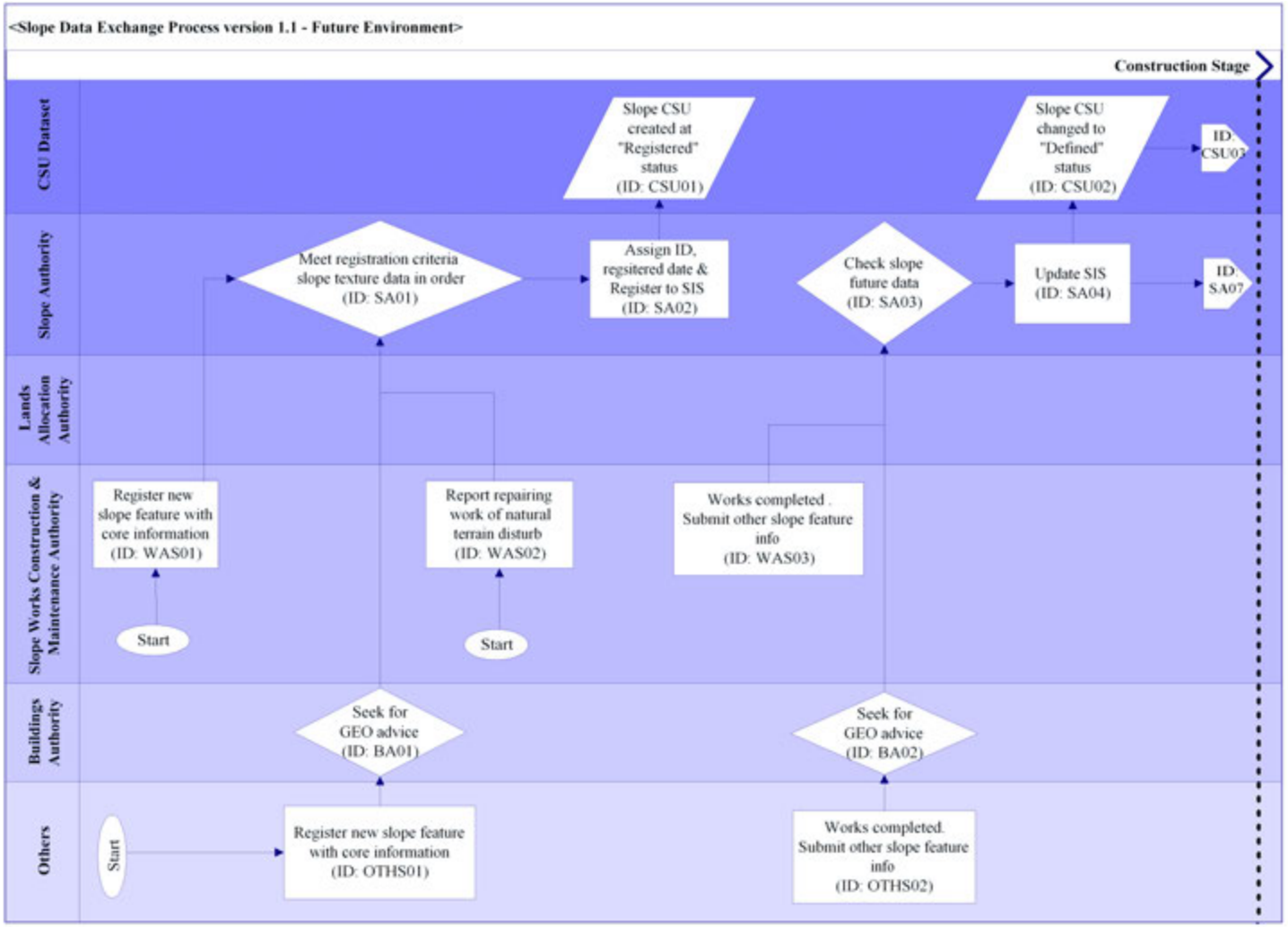


Figure 2 Workflow of Slope CSU –Construction Stage

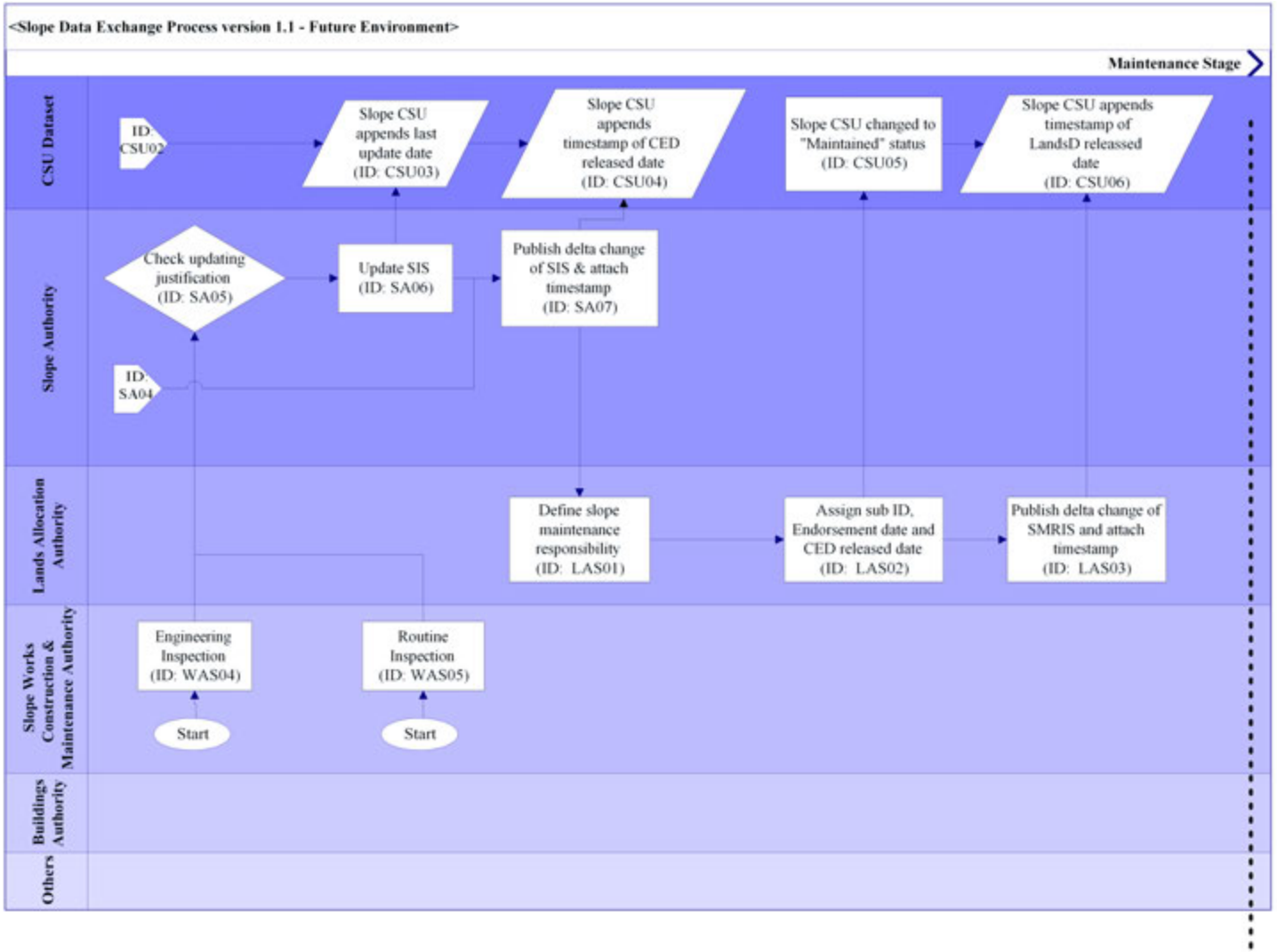


Figure 3 Workflow of Slope CSU -Maintenance Stage

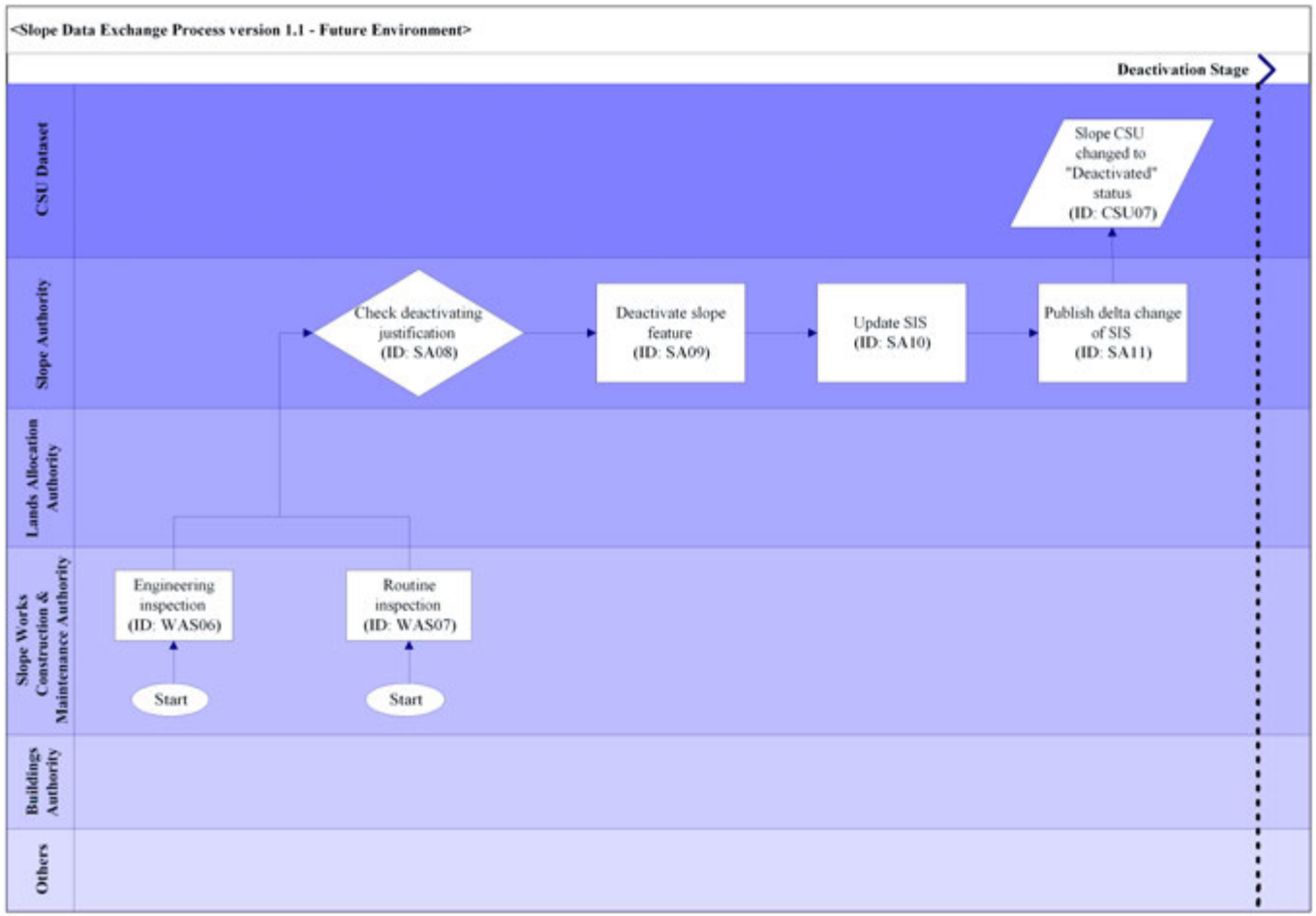


Figure 4 Workflow of Slope CSU – Deactivation Stage

3.2.3 Construction Stage

(a) All new slope feature or repairing work of natural terrain disturb need to be registered prior to the completion of the construction/repair works. PDs (Data Owners) submit the slope plans and relevant slope formation data in softcopy formats for registration. All softcopy submissions shall conform to the file format standard requirements (WAS01-03).

(b) Data Owners can either use the latest version of Slope Information Input program provided by CED for entering the slope information or they can use their own inventory systems to enter the slope information, and then export the data conforming to the Slope CSU logical data structure .

(c) CED should encourage other departments and private sectors to enter the same information via the Slope Information Input program and submit the slope plans in both hardcopy and softcopy format (OTHS01-2). In the long run, CED should consider accepting softcopy only for registration.

(d) On receiving a new slope feature registration submission, CED (Data Agent) would check if the registration criteria are all fulfilled (SA01). Once the core information is available, CED will assign a unique CSU ID, a timestamp (the date of registration) and will update the Basic Information Table in SIS (SA02). The status of the newly created Slope CSU feature is then marked "Registered" (CSU01).

(e) On completion of the construction/repair works, Data Owner should notify CED together with as built plan (WAS03). Once the information and geometry are checked correct by CED, the corresponding Slope CSU record would be changed from the "Registered" status to the "Defined" status. Both spatial and textual data of the "Defined" Slope CSU can now be exchanged amongst the PDs (SA03-04 and CSU02).

(f) CED disseminates the delta set of Slope CSU data (SA07), including new slope features data, to PDs on a monthly basis. CED disseminates the full set of Slope CSU data to PDs on an ad-hoc basis.

3.2.4 Maintenance Stage

(a) PDs (Data Owners) would need to carry out slope maintenance works in addition to Engineer Inspection (EI) and Routine Inspection. Results from these two inspections should be documented and submitted to the CED who is the Slope Authority responsible for vetting the slope registrations. (WAS04&5). The way of submission is similar to 3.2.3(a).

(b) On receiving the update request, CED (Data Agent) will check the information (SA05). If it is accepted, the corresponding common

attributes related to the Slope CSU will be updated (SA06). Similarly, a timestamp will be assigned to record its last update (CSU03).

(c) For slopes that belong to private developers or other agents from the private sector, it is difficult to enforce EI and Routine Inspection. Once the private slope features are registered, they are seldom updated.

(d) Nevertheless, the private slopes will need to be updated on completion of slope repair works, either statutory instructed under Building Ordinance or due to other reasons. AP will submit updated slope registration information to CED.

(e) There are other occasions that the private slopes would be updated:

(i) during routine spot checks of slope features, the staff of GEO's District Division may identify potential risk or significant modification of the private slope feature. He/she would then report the findings to GEO's Slope Safety division who will check and then update the related information under SIS, if required.

(ii) Also, the private slope would be updated while in the course of carrying out duties on a site supervision or project visit, an engineer identifies potential risk or significant modification of the nearby private slope feature. He/she would then report the findings to GEO's Slope Safety division who will check and then update the related information under SIS, if required.

(f) CED disseminates the delta set of Slope CSU data to PDs on a monthly basis, including modified slope feature data in that month and a timestamp would be assigned to the whole set of delta data. (SA07 & CSU04).

3.2.5 Updating Slope Maintenance Responsibility in both the construction and maintenance stage

(a) Having received the monthly delta change of Slope CSU, LandsD (Data Owner for slope maintenance information) will assign a Sub.Div.No and an Endorsement Date to the apportioned parts of each slope feature under different maintenance jurisdiction and update its graphical and textual information in the SMRIS accordingly (LAS01-2). The Slope CSU would be changed from "Defined" status to "Maintained" status (CSU05).

(b) Once the maintenance responsibility is defined, the data ownership might be shifted from the PD who made the registration to the PD who is assigned the maintenance responsibility or the principle responsibility if there is more than one PD.

(c) It would take time for LandsD to define or redefine the Slope Maintenance Responsibility (MR) based on the CED's delta change. The time lag in between would induce un-synchronization with CED's latest Slope dataset. Thus, the timestamp assigned by CED should be attached with the Slope CSU at the "Maintained" status to show which version of CED's slope feature that the maintenance responsibility is based on.

(d) LandsD would assign a timestamp on the delta change of Slope CSU at "Maintained" status released to CED (LAS03).

(e) CED would help to disseminate Slope CSU at "Maintained" status to other PDs (CSU06).

3.2.6 Deactivating Slope Features

(a) PDs, other departments, utilities and private sectors would make a request for deactivating the slope features at recommendation from EI because of routine inspection or new construction works (WAS06-7). CED would then check for the accuracy of the submission (SA08). If it is accepted, CED would set the slope feature's status as "DEACTIVATED", and a list of deactivated slope features would be released on a monthly basis (SA09-11, CSU07).

4 CSU Data Interface Requirement

4.1 Overview

4.1.1 A logical model for CSU data exchange is defined for PDs' exchange of the Slope CSU. It describes the logical structure of CSU data exchanged between the interfacing systems of PDs. PDs, as either Data Owners or Data Users, are not required to adopt the same logical data structure in their own departmental systems. However, each PD is recommended to maintain a mapping between the Common Spatial Units and their departmental records in their respective core departmental systems(s) such that:-

(a) Data Owner can extract data from her departmental system according to the definition of CSU; and

(b) Data User can import CSU data into her departmental system for further processing/ analysis.

4.1.2 Mapping of the unique CSU ID with the departmental ID may be a one-to-one, one-to-many or many-to-one relation (but a many-to-many relation is not recommended) depending on the data definition of PDs' polygons represented by their departmental ID.

4.1.3 For Slope CSU, Data Users may already have adopted CED's slope feature numbers in their departmental system. In such a case, Data Users does not require further mapping.

4.1.4 The following sections will provide details for the logical model in terms of :-

(a) CSU status – possible statuses of a CSU;

(b) Themes - thematic layers; and

(c) Logical data structure, including a detailed description of the data items and assignment of ownership.

4.2 CSU Status

4.2.1 There are four possible statuses for the Slope CSU:

(a) "Registered" is the status of a feature that is in the process of being defined. This status is formed when CED accepts the core information of the feature submitted by the slope owners for registration.

(b) "Defined" is the next status for a "Registered" feature with complete definition, unique identification, and values for the common attributes are complete.

(c) "Maintained" is the status of a "Defined" feature that has been assigned to the government departments or private sector owners for inspection and maintenance.

(d) "Deactivated" is the status of a feature that no longer exists or is maintained.

4.3 Themes

4.3.1 There will be two major sets of spatial layers in the Slope CSU upon dissemination:

(a) Slope Feature Spatial Dataset – contain polygons representing the active and registered slope features. As confirmed by the Data Agent – CED, the Disturb Terrain (DT), Natural Terrain Stabilization Measure (NS), and Natural Terrain Defence Measure (ND) polygons might overlap with Cut/Cut & Retaining slope and Fill/ Fill & Retaining slope polygon. Given that some of the Data Users' applications could not handle the overlapping polygon features in the same spatial layer, it is suggested to separate the Slope Feature Polygon layer into following six feature layers. For those PDs who want to have a single merged layer, they can make special request to CED individually.

(i) Cut Slope Polygon

(ii) Fill Slope Polygon

(iii) Retaining Wall Polygon

(iv) Disturb Terrain Polygon

(v) Natural Terrain Stabilization Measure Polygon

(vi) Natural Terrain Defence Measure Polygon

(b) Slope Maintenance Responsibility Spatial Dataset – contains registered slope features with assigned maintenance responsibility. Since some of the slope features might overlap with others and the current system cannot handle overlapping polygons, it is suggested to have an additional layer - Overlapped Slope Maintenance Responsibility Polygon layer to host the overlapped features as an interim solution. Since many PDs have already adopted the new GIS technology such as object data model in their system, in the long run, it is recommended that LandsD should

revamp their existing SMRIS and CLIS systems when financial and human resources permit.

(i) Maintenance Responsibility Polygon layer – contains polygons representing the registered slope features with assigned maintenance responsibility

(ii) Overlapped Maintenance Responsibility Polygon layer – contains polygons representing the registered slope features with assigned maintenance responsibility that are overlapped with other features

4.3.2 All polygons in each of the above layers are closed polygons features. The polygons are two-dimensional in shapes and they represent geographic features stored as a series of segments that enclose an area. No overlapping polygon within a single layer is allowed.

4.3.3 For each individual polygon, it should not be split even if the polygon lies along the tile border of 1:5000 survey sheets.

4.3.4 It is recommended that the full set of polygon should be maintained in a seamless manner, that is, the split polygon locating along the tile border has to be merged, and the border line has to be dissolved, thereby, other PDs' post processing effort on merging the polygons can be minimized, also, this can facilitate the spatial query and filtering operation.

4.3.5 The polygon layer should be confined with HK 1980 Grid Coordinate System, that is the minimum spatial extent and the maximum spatial extent is 800000, 800000 and 867500, 848000 respectively.

4.3.6 It is recommended the topological relationship that defines the behaviour of features would be established, when resource is available. This would define the rule for features to share geometry with other features (e.g. slope features cannot overlap) in a given layer or between multiple layers (e.g. the maintenance responsibility polygon should be completely fallen within the feature slope polygon.)

4.4 Logical Data Structure

4.4.1 Please refer to Appendix A for conventions used in this section. The logical relationships among entities are illustrated below.

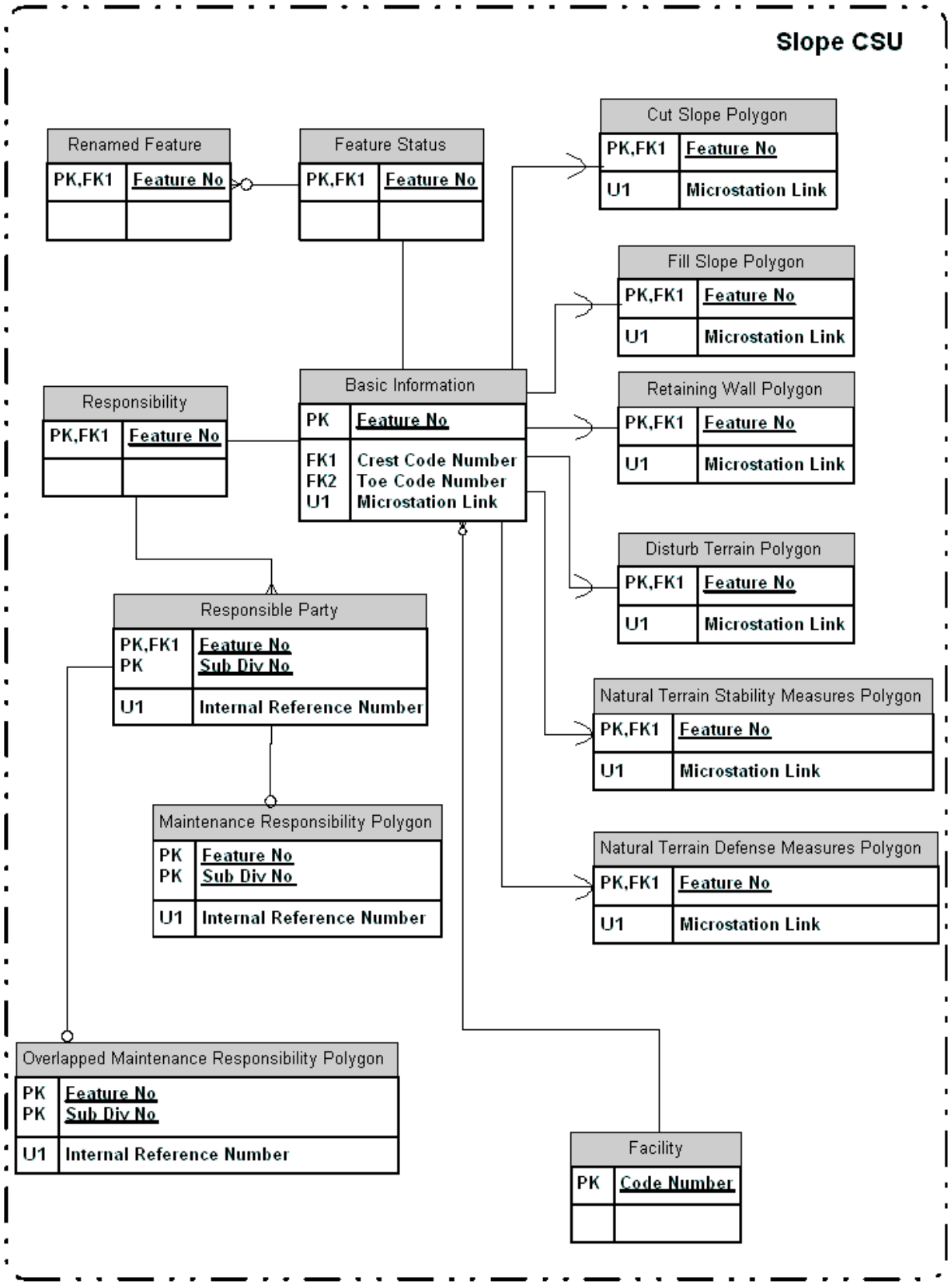


Figure 5 LDS for the Slope CSU - 1

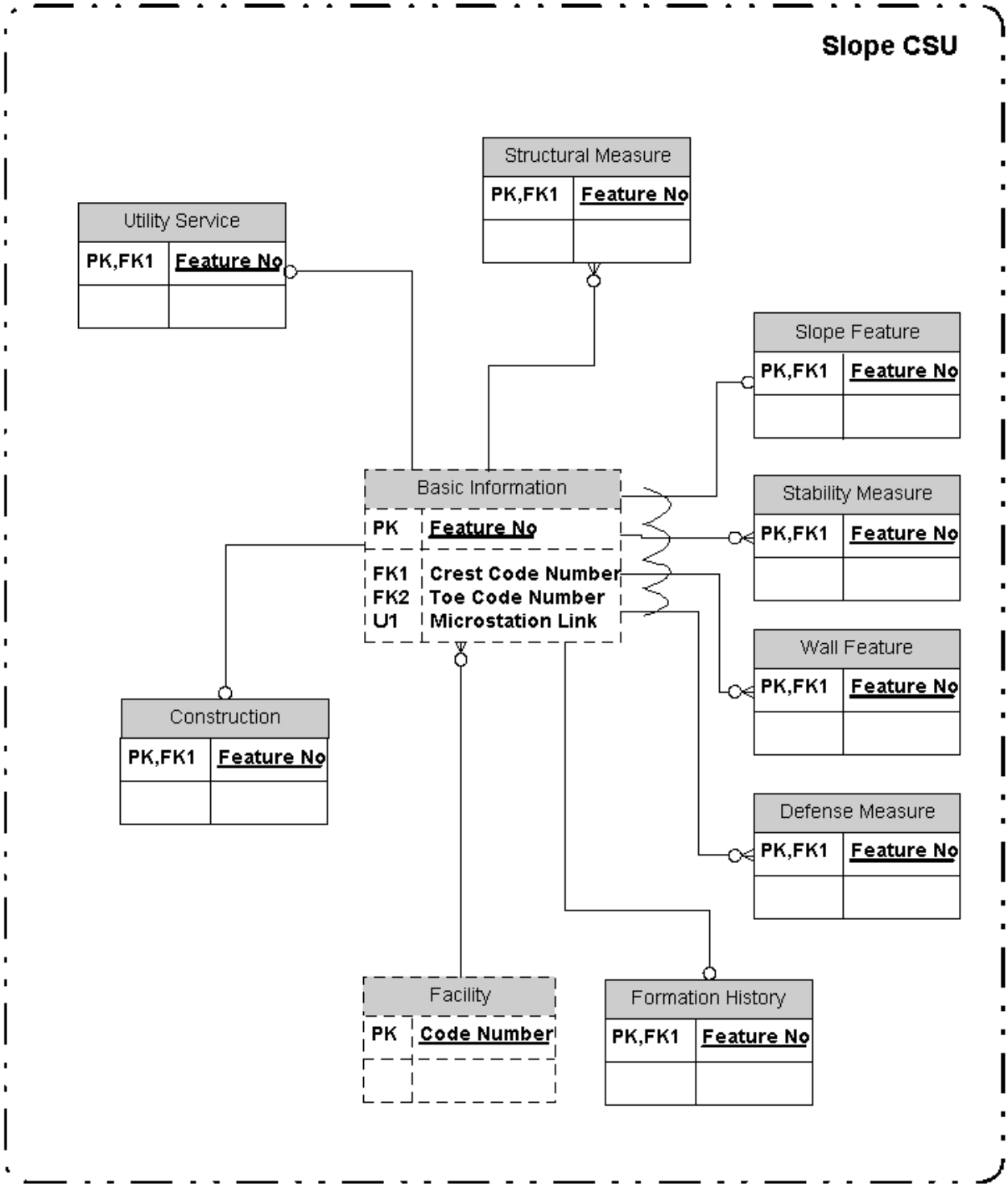


Figure 6 LDS for the Slope CSU – 2

4.4.2 The proposed data model would facilitate sharing of slope feature information and slope maintenance responsibility information. Besides, the delta change of slope features monthly released by CED would also be handled.

4.4.3 Since the GeoGuide 5 is being revised, this version of data model has to incorporate the change as per the latest release of GeoGuide 5. Therefore, some

data attributes which are no longer maintained under the latest version of GeoGuide 5 would be removed, e.g. address of ground investigation agent, whereas some data attributes would be added to be in line with the GeoGuide 5, e.g. attributes for 'Defence Measure'.

4.5 Entity Description

4.5.1 Some data items may be left as null due to time lag, but they must be filled once the CSU is completely defined. Such rules will be described in the Description column of the affected data item. Please also refer to section 3 for more information on the CSU lifecycle.

4.5.2 Basic Information

Basic information of a Slope CSU is the minimum set of information that is required to be submitted by the Data Owners for registration. Once this information is checked and accepted by CED, a CSU ID will be assigned.

(a) Data Item Description

Data Item	**Description**	**Format**	**Mandatory**
Feature No	Unique identifier of Slope CSU	X(13)	Y
Source	The source to provide data	X(20)	Y
Updated Date	Updated date of SIS	Date	Y
Location	Location of the feature	X(100)	Y
Location in Chinese	Location of the feature in Chinese	CX(100)	Y
Northing	Map Coordinates (1980 Datum) Northing	N(6)	Y
Easting	Map Coordinates (1980 Datum) Easting	N(6)	Y
Toe Elevation	Elevation of the slope toe as measured at the middle of the toe (mPD)	N(5,1)	
Consequence Category	Consequence-to-Life category if the slope feature failure. There are three categories: 1= Failures affecting occupied buildings; or failures affecting buildings storing dangerous goods 2= Failures affecting heavily used open space and recreational facilities/road with high vehicular or pedestrian traffic density 3= Failures affecting public waiting areas/country parks and lightly used air recreational areas/roads with low traffic	X(1)	Y

Data Item	Description	Format	Mandatory
	density/non dangerous good storage		
Toe Distance	Distance from feature toe to toe's facility (m)	N(5,1)	Y
Toe Code Number	Facility at the toe of the feature. The code number will be used to look up the actual value from the Facility entity	X(2)	Y
Crest Distance	Distance from feature crest to crest's facility (m)	N(5,1)	Y
Crest Code Number	Facility at the crest of the feature. The code number will be used to look up the actual value from the Facility entity	X(2)	Y
Sift Class	Sift Class. There are five classes: A - Fill feature considered to have similar circumstances to the Baguio landside site. B1 - Fill feature considered to meet GEO criteria for slope registration but does not meet criteria A and have been formed or substantially modified before 30/6/78 or have been illegally formed after 30/6/78. B2 - Fill feature considered to meet GEO criteria for slope registration but does not meet criteria A and have been formed or substantially modified after 30/6/78, studied to GEO Stage 2, or equivalent or to be Housing Department feature. C1 - Cut feature considered to meet GEO criteria for slope registration and have been formed or substantially modified before 30/6/78 or have been illegally formed after 30/6/78. C2 - Cut feature considered to meet GEO criteria for slope registration and have been formed or substantially modified after 30/6/78, studied to GEO Stage 2, or equivalent or to be Housing Department feature.	X(2)	Y
CNPCS	Score of the Combined New Priority Classification Systems. At present, when the CNPCS of a slope is greater than 6, it will be considered in the Landslip	N(6,2)	

Data Item	Description	Format	Mandatory
	Preventive Measures (LPM) selection.		
CSU Status	There are four statuses of the Slope CSU's life cycle, which are: "Register" – status of a feature that is in the process of being defined. This status is formed when CED accepts the core information of the feature submitted by the slope owners for registration. "Define" - status of a feature with complete definition, and values for the common attributes are complete. "Maintain" – status of a feature that has been assigned to the government departments or private sector owners for inspection and maintenance. "Deactivate" - status of a feature that no longer exists or is maintained. CED is required to update the slope features' status.	X(10)	Y
CSU Status Date	The date of updating CSU status. Whenever the slope feature's status is changed, a timestamp is provided	Date	Y
Feature Type	There are eight feature types representing the slope feature: C – Cut slope; CR – Cut & retaining slope; F - Fill slope; FR – Fill & retaining slope; R - Retaining slope; DT - Disturb Terrain; NS - Natural Terrain Stabilization Measures; ND - Natural Terrain Defence Measures	X(2)	Y
Microstation Link	Unique number to link with the graphical boundary and the textual data. This link will be kept to facilitate data users who already have a customized programme to process the CAD data	N(10)	Y
Preparation Date	Data collection date by the data owner	Date	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
CK	Northing	>800000 and <=848000		
CK	Easting	>800000 and <=867500		
CK	Toe Elevation	>0		
CK	Consequence Category	IN ('1','2','3')		
CK	Toe Distance	>0		
FK	Toe Code Number		Facility Table	Code Number
CK	Crest Distance	> 0		
FK	Crest Code Number		Facility Table	Code Number
CK	Sift Class	IN ('A','B1','C1','B2','C2')		
CK	CNPCS	> 0		
CK	CSU Status	In ('Register', 'Define', Maintain', 'Deactivate')		
CK	Feature Type	In ('C', 'CR', 'DT', 'F', 'FR', 'R', 'NS', 'ND')		
UK	Microstation Link			

(c) Data Ownership - vary by maintenance responsibility[1]

Data Item	Condition	Data Owner
All Records	Responsibility.Party Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private), data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

[1] It is to note that before maintenance responsibility is assigned, ownership of data belongs to the source department (or the data provider) who first submitted data to CED for registration.

4.5.3 Construction

A textual entity containing construction information.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Construction Date	Date of completion of construction/upgrading works	Date	
Improved Type 1	Improved by Type 1 Prescriptive Measures. Y – Yes, with Type 1 measures N – No, with other measures	X(1)	
Improved Type 2	Improved by Type 2 Prescriptive Measures Y – Yes, with Type 1 measures N – No, with other measures	X(1)	
Improved Type 3	Improved by Type 3 Prescriptive Measures (not up to upgrading standard Y – Yes, with Type 1 measures N – No, with other measures	X(1)	
Prescriptive Upgrade	Upgraded by prescriptive design using GEO Report No. 56 Y – Yes, with upgraded prescriptive design N – No, with other designs	X(1)	
Non Prescriptive Upgrade	Upgraded by non-prescriptive design including conventional design Y – Yes, with upgraded non-prescriptive design N – No, with other designs	X(1)	
Other Stability Information	Other information - stability assessment carried out Y – Yes, with other stability assessment N – No, without other stability assessments	X(1)	
Other Checked Information	Other information – evidence of design acceptance by GEO Y – Yes, with other evidence N – No, without other evidences	X(1)	
Remarks	Remarks	X(255)	
Remarks in	Remarks in Chinese	CX(255)	

Data Item	Description	Format	Mandatory
Chinese			
Prepared Date	Date of record sheet prepared	Date	

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
FK	Feature No		Basic Information	Feature No
CK	Improved Type 1	In ('Y','N')		
CK	Improved Type 2	In ('Y','N')		
CK	Improved Type 3	In ('Y','N')		
CK	Prescriptive Upgrade	In ('Y','N')		
CK	Non-Prescriptive Upgrade	In ('Y','N')		
CK	Other Stability Information	In ('Y','N')		
CK	Other Checked Information	In ('Y','N')		

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsibility.Party Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private) , data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.4 Cut Slope Polygon

Spatial feature representing the physical boundary of the Cut/ Cut & Retaining slope feature

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of the Slope CSU	X(13)	Y

Data Item	Description	Format	Mandatory
Microstation Link	Unique number to link with the graphical boundary and the textual data. This link will be kept to facilitate data users who already have a customized programme to process the data	N(10)	Y
Geometry	Geometry of slope feature polygon	Polygon	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
UK	Microstation Link			
FK	Feature No		Basic Information	Feature No
CP	Geometry			

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
Geometry		CED
All Records	Responsible Party.Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private) , data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.5 Defence Measure

A textual entity containing defence measures on natural terrain.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Type of Measure	Type of Defence Measures. It includes following four major types: 1 - Check Dams, 2 - Earth Bunds, 3 – Boulder Fences, 4 – Others	X(14)	Y
Measure Length	Length of Defence Measures in (m)	N(4)	Y
Measure	Maximum height of Defence Measure in	N(3)	Y

Data Item	Description	Format	Mandatory
maximum Height	(m)		
Other Measure Type	Other type of Defence Measure	X(254)	
Other Measure Type in Chinese	Other type of Defence Measure in Chinese	CX(254)	

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
FK	Feature No		Basic Information	Feature No
CK	Type of Measure	IN ('Check Dams', 'Earth Bunds', 'Boulder Fences', 'Others')		
CK	Measure Length	>0		
CK	Measure Maximum Height	>0		

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsibility.Party Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private), data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.6 Disturb Terrain Polygon

Spatial feature representing the physical boundary of the Disturb Terrain feature

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of the Slope CSU	X(13)	Y

Data Item	Description	Format	Mandatory
Microstation Link	Unique number to link with the graphical boundary and the textual data. This link will be kept to facilitate data users who already have a customized programme to process the data	N(10)	Y
Geometry	Geometry of slope feature polygon	Polygon	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
UK	Microstation Link			
FK	Feature No		Basic Information	Feature No
CP	Geometry			

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsible Party.Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private), data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.7 Facility

A textual lookup table for mapping the facility details the code number stated in Toe Facility Type and Crest Facility Type for the Basic Information entity.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Code Number	Unique code number of facility	X(2)	Y
Facility Type	Facility type nearby the toe and crest. E.g. Residential, Densely-used open space, Road with very low traffic	X(100)	Y
Facility Type in Chinese	Facility type in Chinese nearby the toe and crest.	CX(100)	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Code Number			

(c) Data Ownership

All records	CED

4.5.8 Formation History

A textual entity containing the formation history of the slope features. In the early day of slope registration, the slope construction information was derived from image interpretation on aerial photos. However, the aerial photos were not regularly captured at that time, thus, only a rough period can be defined for the slope formation. For instance, based on aerial photo captured in 1968, the slope feature – 11sw-a/1 cannot be found, but it was found in next series of aerial photo, which was captured in 1970, then the construction after year would be 1968, and construction before year – would be 1970. Nowadays, the slope formation information comes from survey and more accurate information can be obtained. So the construction before year, and construction after year would be the same value.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Construction before year	The earliest known year for construction before year "YYYY"	N(4)	
Construction after year	The latest known year for construction after year "YYYY"	N(4)	
Modification Type	Modification type. There are three modification types of slope features: "Constructed" "Substantially Modified" "Modified"	X(25)	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
FK	Feature No		Basic Information	Feature No
CK	Modification Type	In ("Constructed"		

Type	Data Item	Validation	Reference Entity	Reference Data Item
		, "Substantially Modified", "Modified")		

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsibility.Party Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private), data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.9 Feature Status

A textual entity indicates the latest status of each slope feature (e.g. whether the feature is a new feature or a deactivated feature, or if any modification made to its boundary, ID or its attributes). This data is crucial for CED to release the monthly delta change of feature information to other PDs, and stakeholder.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Status	Status of the Slope Features. It has seven statuses: MB – Modified polygon MT – Modified ID MBT – Modified Polygon and ID N – New D – Deactivated TXT – Modified core textual attributes OTH – Modified other textual attributes	X(3)	
Source Type	The source of data DI – Data provided through PNAP168 EG – Change on existing slope, data provided by government department EP – Change on existing slope, data provided by private sector GN – New slope, data provided by government department	X(2)	

Data Item	Description	Format	Mandatory
	PN – New slope, data provided by private sector		
CED Released Date	The timestamp of latest released date of slope feature	Date	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
FK	Feature No		Basic Information	Feature No
CK	Status	In ('MB', 'MT', 'MBT', 'N', 'D' 'TXT', 'OTH')		
CK	Source Type	In ('DI', 'EG', 'EP', 'GN', 'PN')		

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsibility.Party Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private), data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.10 Fill Slope Polygon

Spatial feature representing the physical boundary of the Fill/Fill & Retaining slope feature

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of the Slope CSU	X(13)	Y
Microstation Link	Unique number to link with the graphical boundary and the textual data. This link will be kept to facilitate data users who already have a customized programme to process the data	N(10)	Y

Data Item	Description	Format	Mandatory
Geometry	Geometry of slope feature polygon	Polygon	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
UK	Microstation Link			
FK	Feature No		Basic Information	Feature No
CP	Geometry			

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsible Party.Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private) , data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.11 Maintenance Responsibility Polygon

A spatial entity representing the maintenance responsibility boundary of the registered slope feature.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Sub Division Number	Identifier of apportioned slope feature for defining the slope maintenance responsibility. A sequential number starting from 1 is assigned to each feature portion if more than one maintenance party is defined for the slope feature. However, if there is only one maintenance party, this value will be 0.	X(3)	

Data Item	Description	Format	Mandatory
Microstation Link	Unique number to link with the graphical boundary and the textual data. This attribute will only be available to use when the Data Agent converts the polygon layers into Microstation format. Its value is not identical to Internal Reference Number which can facilitate the CAD users to join the spatial and textual data together, since the Feature No and Sub Division Number cannot be used when the maintenance responsibility polygon is in CAD format.	N(10)	Y
Internal Reference Number	Internal reference information of maintenance responsibility boundary. The number is formed by concatenating the x, y coordinates of a reference point for the slope feature, trimming off the first digit '8', rounding off at the decimal place, e.g. 812320.023, 852300.023, will become 1232052300. It should be noted that although this number can provide locational reference to the slope features, it might not accurately identify the feature, for example, when the retaining wall is apportioned, this number may be resided outside the slope boundary.	N(10)	Y
Geometry	Geometry of slope maintenance responsibility polygon	Polygon Type	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK, FK	Feature No, Sub Division Number		Responsible Party	Feature No, Sub Division Number
CP	Geometry			
UK	Internal Reference Number			

Type	Data Item	Validation	Reference Entity	Reference Data Item
CK	Sub Division Number	A sequential number starting from 1 is assigned if more than one maintenance party is defined. If there is only one maintenance party, this value will be 0.		

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Except for Microstation Link attribute	LandsD
All Records	Microstation Link attribute	CED

4.5.12 Natural Terrain Defence Measures Polygon

Spatial feature representing the physical boundary of the Natural Terrain Defence Measures feature

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of the Slope CSU	X(13)	Y
Microstation Link	Unique number to link with the graphical boundary and the textual data. This link will be kept to facilitate data users who already have a customized programme to process the data	N(10)	Y
Geometry	Geometry of slope feature polygon	Polygon	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
UK	Microstation Link			
FK	Feature No		Basic Information	Feature No
CP	Geometry			

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsible Party.Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private), data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.13 Natural Terrain Stabilization Measures Polygon

Spatial feature representing the physical boundary of the Natural Terrain Stabilization Measures

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of the Slope CSU	X(13)	Y
Microstation Link	Unique number to link with the graphical boundary and the textual data. This link will be kept to facilitate data users who already have a customized programme to process the data	N(10)	Y
Geometry	Geometry of slope feature polygon	Polygon	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
UK	Microstation Link			
FK	Feature No		Basic Information	Feature No
CP	Geometry			

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsible Party.Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private), data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.14 Overlapped Maintenance Responsibility Polygon

A spatial entity representing the maintenance responsibility boundary of the registered slope features which are overlapped with other features.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Sub Division Number	Identifier of apportioned slope feature for defining the slope maintenance responsibility. A sequential number starting from 1 is assigned to each feature portion if more than one maintenance party is defined for the slope feature. However, if there is only one maintenance party, this value will be 0	X(3)	
Microstation Link	Unique number to link with the graphical boundary and the textual data. This attribute will only be available when the Data Agent converts the polygon layers into Microstation format. Its value is not identical to Internal Reference Number which can facilitate the CAD users to join the spatial and textual data together, since the Feature No and Sub Division Number cannot be used when the maintenance responsibility polygon is in CAD format	N(10)	Y
Internal Reference Number	Internal reference information of maintenance responsibility boundary. The number is formed by concatenating the x, y coordinates of a reference point for the slope feature, trimming off the first digit '8', rounding off at the decimal place, e.g. 812320.023, 852300.023, will become 1232052300. It should be noted that although this number can provide locational reference to the slope features, it might not accurately identify the feature, for example, when the retaining wall is apportioned, this number may be resided outside the slope boundary.	N(10)	Y
Geometry	Geometry of slope maintenance responsibility polygon	Polygon Type	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK, FK	Feature No, Sub Division Number		Responsible Party	Feature No, Sub Division Number
CP	Geometry			
UK	Internal Reference Number			

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Except for Microstation Link attribute	LandsD
All Records	Microstation Link attribute	CED

4.5.15 Responsibility

A textual entity that provides information on the party responsible for the maintenance of the slope features.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Party Initiated the Slope Registration	Party initiated the slope registration (government departments / private party)	X(50)	
Party Type	Responsible Party.Type = PPRI (Private) Responsible Party.Type = PGVT (Government Department) Responsible Party.Type = MIX (Government Department and Private) Responsible Party.Type = PGVTMIX (Government Departments)	X(10)	Y
CED Release Date	The timestamp of latest released date of CED slope feature, e.g. 15/06/2003. This information is extracted directly from the CED's monthly delta change which is important to tell the data owners on which version that the definition of maintenance responsibility based on	Date	Y
LandsD Released Date	The timestamp of latest released date of LandsD's slope maintenance data, e.g.	Date	Y

Data Item	Description	Format	Mandatory
	15/07/2003		

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
CK	Party Type	In ('PPRI', 'PGVT', 'MIX', 'PGVTMIX')		
FK	Feature No		Basic Information	Feature No

(c) Data Ownership - vary by maintenance responsibility

All records Except "Party Initiated the Slope Registration"	LandsD
Party Initiated the Slope Registration	CED

4.5.16 Responsible Party

A textual entity that provides information on the parties responsible for the maintenance of the slope features if more than one party is assigned.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Sub Division Number	Identifier of apportioned slope feature for defining the slope maintenance responsibility. A sequential number starting from 1 is assigned to each feature portion if more than one maintenance party is defined for the slope feature. However, if there is only one maintenance party, this value will be 0	X(3)	
Internal Reference Number	Internal reference information of maintenance responsibility boundary. The number is formed by extracting an arbitrary coordinate within/near the slope feature, and then truncate the first digit of x,y coordinate, and ignore the	N(10)	Y

Data Item	Description	Format	Mandatory
	decimal number, e.g. 812320.023, 852300.023, will become 1232052300. It should be noted that although this number can provide locational reference to the slope features, it might not accurately identify the feature, for example, when a narrow retaining wall is apportioned, the extracted point may be resided outside the slope boundary. This attribute will be used to link with the Maintenance Responsibility Polygon and the Overlapped Maintenance Responsibility Polygon when they are in Microstation format.		
Maintenance Party	Maintenance agent (designated agent who actually take up the slope maintenance works	X(30)	
Responsible Party	Responsible parties (government parties or lot owners who are responsible for the slope maintenance). This value would be identical to the Principal Responsibility Party's value under the Responsibility entity when there is only one Responsible party	X(50)	
Principal Responsible Party	The principal party to take up the responsibility of the slope feature if more than one government party is assigned for the slope feature. This attribute is identical to the value of LandsD's Remark 2 field of the SMRIS	X(275)	
Endorsement Date	The date of endorsing the slope maintenance responsibility	Date	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No, Sub Division Number			
UK	Internal Reference Number			
FK	Feature No		Responsibility	Feature No

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records		LandsD

4.5.17 Renamed Feature

A textual entity indicating changes of feature number.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Current feature identifier of Slope CSU	X(13)	Y
Old Feature Number	Old Feature Number	X(13)	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
FK	Feature No		Feature Status	Feature No

(c) Data Ownership - vary by maintenance responsibility

All records	CED

4.5.18 Retaining Wall Polygon

Spatial feature representing the physical boundary of the Retaining Wall Feature

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of the Slope CSU	X(13)	Y
Microstation Link	Unique number to link with the graphical boundary and the textual data. This link will be kept to facilitate data users who already have a customized programme to process the data	N(10)	Y
Geometry	Geometry of slope feature polygon	Polygon	Y

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
UK	Microstation Link			
FK	Feature No		Basic Information	Feature No
CP	Geometry			

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsible Party.Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private), data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.19 Slope Feature

A textual entity that provides the detailed technical information on the slope part.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Slope Material	Material Description - Material Type. It has three types: Soil, Rock, Soil & Rock	X(15)	
Slope Geology Material	Material Description – Geology. It has four types: Colluvium, Decomposed volcanic, Decomposed granite, Other geology	X(20)	
Slope Height	Maximum Slope Height (m)	N(6,1)	
Slope Length	Slope Length (m)	N(7,1)	
Slope Average Angle	Average Slope Angle (deg)	N(2)	
Number of Berms	Number of Berms	N(2)	
Berms Width	Berms - Minimum width (m)	N(3,1)	
Bare Cover	Slope Surface Cover Percentage - Bare	N(3)	Y

Data Item	Description	Format	Mandatory
Percentage			
Chunam Cover Percentage	Slope Surface Cover Percentage – Chunam	N(3)	Y
Shotcrete Cover Percentage	Slope Surface Cover Percentage – Shotcrete	N(3)	Y
Vegetation Cover Percentage	Slope Surface Cover Percentage - Vegetated	N(3)	Y
Others Cover Percentage	Slope Surface Cover Percentage – Others	N(3)	Y
Weep Hole Size	Weep holes Size (mm)	N(3)	
Weep Hole Space	Weep holes Spacing (m)	N(3,1)	
Horizontal Drain Size	Horizontal Drains Size (mm)	N(3)	
Horizontal Drain Space	Horizontal Drains Spacing (m)	N(3)	
Channel Size at Crest	Channel at Crest Size (mm)	N(3)	
Channel Size at Berm	Channels on Berm Size (mm)	N(3)	
Channel Size at Toe	Channels at Toe Size (mm)	N(3)	
Channel Size on Slope	Channels on Slope Size (mm)	N(3)	
Down Pipe Size on Slope	Down Pipe on Slope Size (mm)	N(3)	

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
FK	Feature No		Basic Information	Feature No
CK	Slope Material	IN ('Soil', 'Rock', 'Soil & Rock')		
CK	Slope Geology Material	IN ('Colluvium', 'Decomposed volcanic', 'Decomposed granite', 'Other geology')		
CK	Slope Height	> 0		

Type	Data Item	Validation	Reference Entity	Reference Data Item
CK	Slope Length	> 0		
CK	Slope Average Angle	> 0 and < 90		
CK	Number of Berm	> 0		
CK	Berm Width	> 0		
CK	Bare Cover Percentage	>0 and <=100		
CK	Chunam Cover Percentage	>0 and <=100		
CK	Shotcrete Cover Percentage	>0 and <=100		
CK	Vegetation Cover Percentage	>0 and <=100		
CK	Other Cover Percentage	>0 and <=100		
CK	Weep Hole Size	>0		
CK	Weep Hole Space	>0		
CK	Horizontal Drain Size	>0		
CK	Horizontal Drain Space	>0		
CK	Channel Size at Crest	>0		
CK	Channel Size at Berm	>0		
CK	Channel Size at Toe	>0		
CK	Channel Size on Slope	>0		
CK	Down Pipe Size on Slope	>0		

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsibility.Party Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private), data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.20 Stability Measure

A textual entity containing stability measures on natural terrain.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Buttress	Stabilised by Buttress Y – Yes, with Buttress N – No, without Buttress	X(1)	
Number of Buttress	Total Nos. of Individual Buttress	N(3)	
Soil Nail	Stabilised by Soil Nail Y – Yes, with Soil Nail N – No, without Soil Nail	X(1)	
Number of Soil Nail	Total Nos. of Soil Nail Installed	N(4)	
Maximum Length of Soil Nail	Maximum Length of Soil Nail (m)	N(3)	
Raking Drain	Stabilised by Raking Drains Installed Y – Yes, with Raking Drains installed N – No, without Raking Drains installed	X(1)	
Number of Raking Drain	Total Nos. of Raking Drains Installed	N(3)	
Maximum Length of Raking Drain	Maximum Length of Raking Drains (m)	N(3)	
Other Measure	Stabilised by other stabilisation measures	X(254)	
Other Measure in Chinese	Stabilised by other stabilisation measures in Chinese	CX(254)	

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
FK	Feature No		Basic Information	Feature No
CK	Buttress	IN ('Y','N')		
CK	Number of Buttress	>0		
CK	Soil Nail	IN ('Y','N')		
CK	Number of Soil Nail	>0		
CK	Maximum Length	>0		

Type	Data Item	Validation	Reference Entity	Reference Data Item
	of Soil Nail			
CK	Raking Drain	IN ('Y','N')		
CK	Number of Raking Drain	>0		
CK	Maximum Length of Raking Drain	>0		

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsibility.Party Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private) , data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.21 Structural Measure

A textual entity containing special structural measures upgrading the stability of the feature.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Measure Type	Type of Structural Measure. It has six types: Soil Nails, Anchors, Reinforced Earth, Long Horizontal Drains, Rock Bolts, Buttress Walls	X(30)	
Application	Apply to either Slope or Wall part	X(20)	
Special Measure	Special Measures – Others	X(100)	
Special Measure in Chinese	Special Measures – others in Chinese	CX(100)	

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			

Type	Data Item	Validation	Reference Entity	Reference Data Item
FK	Feature No		Basic Information	Feature No
CK	Measure Type	In ("Soil Nails", "Anchors", "Reinforced Earth"," Long Horizontal Drains"," Rock Bolts", "Buttress Walls")		
CK	Application	In ("Slope"," Wall")		

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsibility.Party Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private) , data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.22 Wall Feature

A textual entity supplying detail technical information on the wall part.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Wall Type	Type of Wall. It includes four wall types: Retaining wall with level platform, Wall at crest, Wall at toe, Wall at mid-slope	X(38)	Y
Wall Material	Wall Material. It includes five material types: Random rubble, Masonry, Gabion, Concrete, Others	X(15)	Y

Data Item	Description	Format	Mandatory
Wall Height	Wall Height (m)	N(4, 1)	Y
Wall Length	Wall Length (m)	N(7,1)	Y
Wall Face Angle	Face Angle (deg)	N(2)	Y
Number of Berms	Number of Berms	N(2)	
Berms Minimum Width	Berms – Minimum Width (m)	N(3,1)	
Weep Hole Size	Weep holes Size (mm)	N(3)	
Weep Hole Space	Weep holes Spacing (m)	N(3,1)	
Horizontal Drain Size	Horizontal Drains Size (mm)	N(3)	
Horizontal Drain Space	Horizontal Drains Spacing (m)	N(3,1)	
Channel Size at Crest	Channel at Crest Size (mm)	N(3)	
Down Pipe Size on Wall	Down Pipe on Wall Size (mm)	N(3)	

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
FK	Feature No		Basic Information	Feature No
CK	Wall Type	IN ('Retaining wall with level platform', 'Wall at crest', 'Wall at toe', 'Wall at mid-slope')		
CK	Wall Material	IN ('Random rubble', 'Masonry', 'Gabion', 'Concrete', 'Others')		
CK	Wall Height	>0		
CK	Wall Length	>0		
CK	Wall Face Angle	>0 and <=90		
CK	Number of Berm	>0		

Type	Data Item	Validation	Reference Entity	Reference Data Item
CK	Minimum Berm Width	>0		
CK	Weep Hole Size	>0		
CK	Weep Hole Space	>0		
CK	Horizontal Drain Size	>0		
CK	Horizontal Drain Space	>0		
CK	Channel Size at Crest	>0		
CK	Down Pipe Size on Wall	>0		

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsibility.Party Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private) , data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

4.5.23 Utility Service

A textual entity indicating the type and magnitude of utility services such as Water Main, Sewer/Drain, Telecom, Cable, Electricity and Gas on the slope features. Utility Service information are provided by the slope maintenance parties who are Data Owners of this entity. The information in this entity is subject to a number of limitations, including but not limited to the methods adopted in data collection and the site conditions at the time of inspection. Subsequent changes may also affect the contents of the entity. There is no warranty made on the accuracy, completeness or correctness of any description, representation, findings, interpretation, etc. on the information provided in this entity. Users of data should check and ascertain for themselves the most up-to-date information from the relevant parties. Users of data should not rely solely on the information contained in this entity in deciding whether or not to undertake any planning/ study /construction/ remedial /maintenance works.

(a) Data Item Description

Data Item	Description	Format	Mandatory
Feature No	Unique identifier of Slope CSU	X(13)	Y
Utility Service Type	Type of Utility Service. It includes six types: Water Main, Sewer/Drain, Telecom, Cable, Electricity, Gas	X(20)	
Utility Service Size	Size of Utility Service in mm	N(4)	
Utility Service Location	Location of Utility Service. Either on slope or on crest	X(30)	

(b) Constraint Description

Type	Data Item	Validation	Reference Entity	Reference Data Item
PK	Feature No			
FK	Feature No		Basic Information	Feature No
CK	Utility Service Type	In (" Water Main", "Sewer/Drain", "Telecom", "Cable", "Electricity", "Gas")		
CK	Utility Service Size	>=0		
CK	Utility Service Location	In ("On slope", "On crest")		

(c) Data Ownership - vary by maintenance responsibility

Data Item	Condition	Data Owner
All Records	Responsibility.Party Type = PPRI (Private)	CED
All Records	If Responsibility.Party Type is not PPRI (Private) , data ownership vary by the assigned maintenance responsibility	One of: ArchSD, CED, DSD, HyD, TDD and WSD

5 Maintenance of the CSU

5.1 Data Provision Frequency

5.1.1 There are procedural requirements from GeoGuide 5 stipulating that Works Departments (Data Owners) and other responsible agents for slope works should submit the slope feature information to the CED for registration. These agents could include architects from private developments and public works consultants. These submissions could be for different purposes:

(a) Registration of newly formed slopes features.

(b) Registration of the existing slopes features which are not included in the Slope Catalogue maintained by CED.

(c) Changes made to the slopes features on completion of slope maintenance or engineering inspection.

5.1.2 Except for the submission for the registration of existing slope features (item b), there is no specific requirement from GeoGuide 5 stipulating when other submissions (item a and c) should be made to CED. The Data Provision Frequency in the context of DAM is different from data submission requirement from GeoGuide 5. Although there could be overlap between the submission details in the GeoGuide 5 context and DAM context, it is mandatory that the submission of Slope CSU data must be from the respective PDs. It is recommended that PDs should carry out internal consultation within department and review how these two submissions could be streamlined to reduce the administration overhead.

5.1.3 It is a requirement from the WBTC No. 9/2000 that Works Departments are required to submit the slope feature information (both textual and spatial data) for registration or updating of the Slope Catalogue:

(a) Upon the substantial completion of the feature formation/ modification work (no exact date specified).

(b) Within 2 months after the date of identification of the existing features.

5.1.4 In general, slope works projects' Consultants/ Architects or responsible departments would submit the as built drawings of the slopes as soon as they were built.

5.1.5 For the slope maintenance, Works Departments have different practice in their submissions, e.g. the Engineer Inspection (EI) results to CED. Please see summary in Table 3.

Works Department (Data Owner)	Submission of EI results
ArchSD	Upon the completion of the whole Engineer Inspection exercise
CED	NA
DSD	Upon the completion of the whole Engineer Inspection exercise
HyD	Right after the completion of Engineer Inspection
TDD	Upon the completion of the whole Engineer Inspection exercise
WSD	Bi-monthly

Table 3 Timeliness of EI submission

5.1.6 Since CED is now disseminating the slope data on a monthly basis, and the Data Users are satisfied with existing service level, it is recommended that the Data Provision Frequency should be compatible with that of the current data dissemination of slope data. Therefore, data provision frequency on monthly basis is recommended, i.e. Data Owners will have to provide the updated slope information on a monthly basis[2]. The Data Owners can still use their inventory system or CED's Slope Input Program to input the data, and then export it for submission, providing that the exported data format is in compliance with the Slope CSU Logical Data Model as well as the standard file format recommended by the DAM3 paper. Nil submission will be required in case when there was no slope features completed or no Engineer Inspection result available in the month. Data Owner can notify Data Agent via an email or a memo in the case of NIL submission.

5.1.7 LandsD, as the Data Owner of the Slope Maintenance Responsibility (MR) data, would provide the delta change of both spatial and textual data to the Data Agent on a monthly basis.

5.1.8 It is proposed that the Data Owners' submission of the slope maintenance data would be set by the 15th day of every month. On need basis, when considered appropriate, the Data Owners could choose to submit the CSU data more than once within the stipulated time interval, in order to speed up the registration process. This arrangement could be reviewed in the SAR stage. The data provision frequency for the future Slope CSU is summarized in Table 4.

[2] Provision of HyD consultant's slope data in compliance with the Slope CSU logical model specification and the standard file format will start after the expiry of the existing slope consultancies (the latter is expected to be completed by end of 2007).

Data Entities	Data Owner	Data Provision Frequency
Spatial		
Cut Slope Polygon	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Fill Slope Polygon	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Retaining Wall Polygon	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Disturb Terrain Polygon	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Natural Terrain Stabilization Measure Polygon	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Natural Terrain Defence Measure Polygon	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Maintenance Responsibility Polygon	LandsD	Monthly
Overlapped Maintenance Responsibility Polygon	LandsD	Monthly
Textual Entity		
Basic Information	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Construction & Ground Investigation	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Defence Measure	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Facility	CED	Ad-hoc[1]
Formation History	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Feature Status	CED	Monthly
Responsibility	LandsD, CED	Monthly
Responsible Party	LandsD	Monthly
Renamed Feature	CED	Monthly
Slope Feature	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Stability Measure	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Structural Measure	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Wall Feature	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly
Utility Service	ArchSD, CED, DSD, HyD, TDD, WSD	Monthly

Table 4: Data Provision Frequency for the Future Slope CSU

Note [1]: This entity is a look-up table, which is updated by CED on an ad-hoc basis.

5.2 Data Dissemination Frequency

5.2.1 CED will undertake a quality check on the slope data submitted by the Data Owners, and ensure a high degree of consistency between the spatial and textual data as well as completeness of the data.

5.2.2 CED will disseminate the delta change of slope feature and MR data on monthly basis, whereas they would disseminate the full set of slope feature and MR data on a need basis. For the monthly delta change, CED is recommended to update it by the 15th day of every month.

5.3 Mode of Dissemination

5.3.1 On implementation of Slope CSU, CED will provide a one-stop service to disseminate both the slope feature and MR data which are included in the Slope CSU dataset.

5.3.2 The slope feature data is now disseminated via CED 's Hong Kong Slope Safety website (Intranet version). With consideration of resources and the earliest timeframe of implementing the Slope CSU data, the Project team recommends CED to enhance it to facilitate the Slope CSU dissemination.

5.3.3 It is noted that LandsD is going to develop a Data Dissemination System (DDS), which can facilitate the collaborative updating and disseminating the Building CSU, Lot CSU and Road Centerline CSU. The same facility could be used for other CSU dissemination, e.g. Slope CSU. Nevertheless, as its timeframe (planned to be completed in 2005) cannot match with the operational requirement of the Slope CSU and there are other business considerations, e.g. dissemination of Slope CSU to non PDs and non government agencies, the DDS would not be considered.

5.3.4 The Slope Safety website is currently being hosted on the Central Cyber Government Office (CCGO), the latter of which is a one-stop general intranet hub providing information and electronic services needed by government users to support their daily work, targets at becoming an intra-governmental information sharing centre, a webcasting station and an intra-governmental business centre. Its URL address will be: http://geosis.ccgo.hksarg/hkss/eng/whatsnew/updated_SIS/index.htm (Figure 7).

5.3.5 The website would have the following features to facilitate the data dissemination:

(a) Security. The CCGO has security provisions which allow only the authorized government officers to browse, search or download information from the CCGO.

(b) Data Downloading. The current practice of downloading data through the web interface will be retained. Data Agent (CED) is required to prepare the data conforming to the CSU logical data model, and then convert them into the standard file formats as recommended by DAM3, prior to placing them on the web site. In order to meet with the Data Users' requirement on data history, last 6 month archives of the Slope CSU delta change will be placed for downloading.

(c) Data Uploading. An on-line uploading function is suggested to be incorporated in the DAF, while the Data Owners would adopt the existing practice to provide the Slope CSU data to the Data Agent.

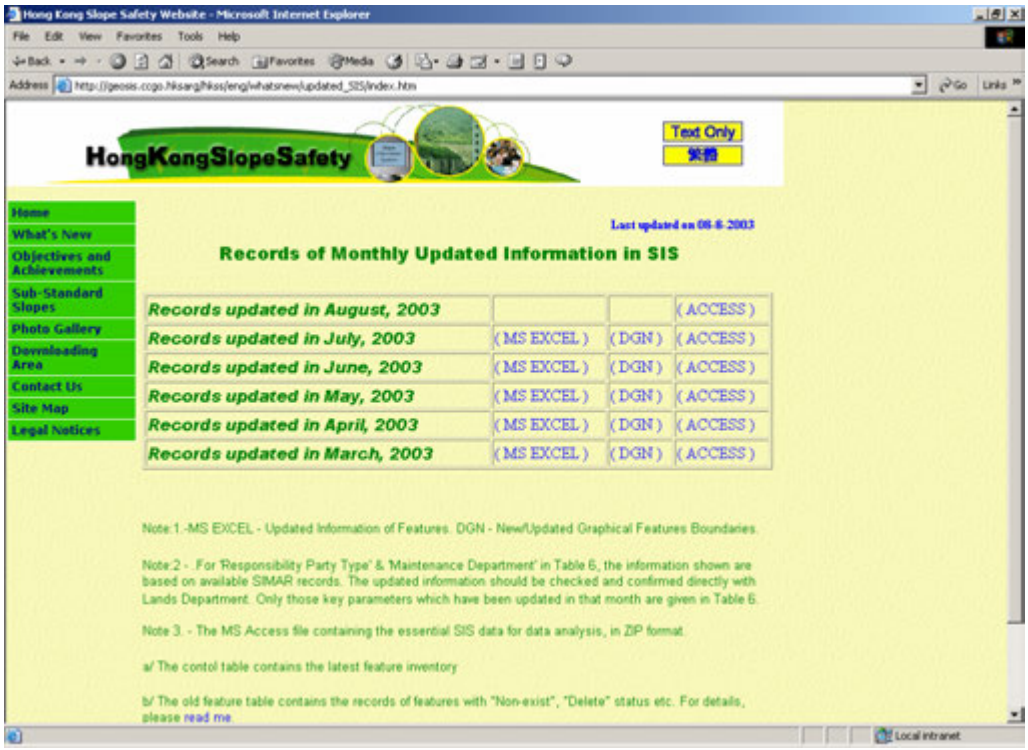
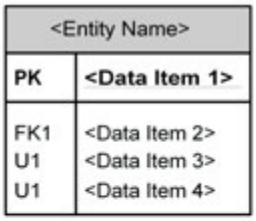


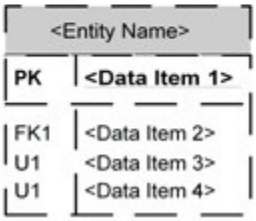
Figure 7: The Slope Safety Web Site (Intranet Version)

5.3.6 PDs seldom need a full set of Slope CSU data. Given the volume of the full set of CSU data, Data Agent could make special arrangement to meet ad hoc request for full set of data and this could be disseminated in CD-ROM.

Appendix A. Conventions for Data Interface Requirement

A.1.1 Logical Data Structure Diagram



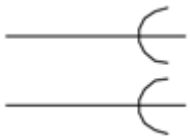


Entity
The upper part in grey shading shows the name of the entity. The lower part lists only the data items involved in the primary key, unique key(s) and foreign key(s) of the entity, while the other data items of the entity will be elaborated in Entity Description. Composite keys are represented by same key name in multiple data items (e.g. two data items marked as "U1" means a composite unique key composed of two data items) Mandatory data item(s) will be printed in bold text.
For diagrams spanned across multiple pages, the first occurrence of each entity is shown in solid-line border while all repeated occurrences in later pages are shown in dotted-line border.

Line with crow's foot
"many" end of a relation

Normal solid line
Mandatory end of a relation

Line with small circle at the end
Optional end of a relation. That is, a record on the left may not have any associated record on the right.



Line with a curve at the end
Exclusive relation. i.e. only 1 among the connected entities on left is linked to the entity on right at a time

A.1.2 Entity Description - Data Item Description - Format

(a) X(n) : Variable-length character strings of max. length n

(b) CX(n): Variable-length character strings of maximum n Chinese characters. Maximum number of bytes will depend on the character set used by the CSU dataset. E.g. CX(5) occupies at most 10 bytes if data are stored in Big5 character set.

(c) N(m,n) : Fixed and floating point numbers, where m is precision (total number of digits before and after decimal point) and n is scale (number of

digits to the right of decimal point). The n part is omitted, i.e. denoted in N(m), for integers.

(d) Date : Point-in-time values (date and time)

(e) Polygon : Closed polygon representing a spatial area.

A.1.3 Entity Description - Constraint Description - Type

(a) PK : Data item is part of primary key, which is used to uniquely identify a record in the entity.

(b) FK : Data item is part of foreign key, which means the data item values, if not null, must match the unique identifier of another entity.

(c) UK : Data item is part of alternate key, which is used as an alternate way to uniquely identify a record in the entity.

(d) CK : The value of data item should be checked ensuring that it falls within or meets the predefined values/ranges/rules. Hence, non-mandatory data items can be left as null, or otherwise must meet the criteria.

(e) CP : The value of geometry type data item should be a closed polygon.

A.1.4 Entity Description - Data Ownership - Condition

(a) RelatedEntity.DataItem : Reference to value of DataItem of the linked RelatedEntity record. For example, "CSU Feature.Status" means the Status data item of the related CSU Feature record. Unless specified, relation and linked key is determined by the concerned FK constraint as defined in Constraint Description.