# Geotechnical Planning Review Report for Proposed House (New Territories Exempted House) Development on Lot No. 361 in D.D. 32, Ha Wong Yi Au, Tai Po, New Territories

*JDF Engineering Consultants Limited*

*March 2024*

# Contents

# 1 INTRODUCTION

A New Territories Exempted House (NTEH) is proposed to be constructed within Lot No. 361 in D.D. 32, Ha Wong Yi Au, Tai Po, N.T. This report documented the assessment of the geotechnical feasibility of the proposed development and outline of further studies that may be required.

# 2 SITE DESCRIPTION

## 2.1 Site Location

The Site, where the proposed NTEH is to be constructed, is located on a platform at Ha Wong Yi Au, Tai Po (**Plate 1 and Plate 2**). The Site is covered by concrete surface and is retained by a small non-registered retaining wall with maximum high of about 0.7m and a small cut slope of about 1.0m high at its north-eastern side. The approximate location of the lot boundary is shown in **Figure 1**. A natural terrain overgrown with dense vegetation is overlooking the Site at the south-western direction (**Plate 3**). Further details on the discussion of these features are given in Section 4 and 5 below.

# 3 DESK STUDY

## 3.1 Geological Maps

The geology of the Site is shown on the Hong Kong Geological Survey (HKGS) Map Sheet 7 (Shatin), Second Edition, 1:20,000-scale HGM20 series. The local geology of the Study Area is presented in **Figure 2** and described below.

### 3.1.1 Solid Geology

The 1:20,000 scale geological map sheet 7 (HKGS, 2010, Second Edition) indicated that the Site is likely to be underlain by Lapilli Lithic-bearing Coarse Ash Crystal Tuff (Jty_cat) of the Yim Tin Tsai Formation under the Tsuen Wan Volcanic Group in Middle Jurassic.

### 3.1.2 Superficial Geology

No superficial deposit has been recorded within the Site.

### 3.1.3 Structural Geology

No fault or photolineament has been recorded within or in vicinity of the Site.

## 3.2 GASP Report

The Geotechnical Area Studies Programme (GASP) comprised a systematic geotechnical information and assessment for land management and development planning of the Territory of Hong Kong. The findings were based on terrain classification techniques using aerial photographs, examination of geotechnical data collected from existing Site

investigation records and available literature and field reconnaissance. The study was based on the bedrock geology given on the 1:50,000 scale geological map produced by Allen & Stephens (1971) 'Report on the Geological Survey of Hong Kong', which has subsequently been superseded. The following are extracts from the relevant GASP report (GASP Report V, North New Territories, 1988):

a) Physical Constraints Map – This map has indicated the Site area is designated as zone of slopes on insitu terrain which are generally steeper than 30°.

b) Engineering Geology Map – This map indicates that the Site is covered by dominantly pyroclastic rocks with some lavas.

c) Geotechnical Land Use Map –This map indicates that the Site area is designated as Class III, which has high geotechnical limitations and is low suitability for development.

### 3.3 Enhanced Natural Terrain Landslide Inventory

In 1995, the GEO compiled the Natural Terrain Landslide Inventory (NTLI) from an interpretation of high-altitude (8,000ft and above) aerial photographs dated from 1945 to 1994 (King, 1999). In 2007, the GEO produced an Enhanced Natural Terrain Landslide Inventory (ENTLI) using low-altitude (8,000ft and below) aerial photographs to update the NTLI.

In accordance with **GEO Report No. 138** (GEO, 2003), landslides are classed as either "Relict" or "Recent", depending on their appearance in aerial photographs. "Relict" landslides are defined as those where the main scarp is well-defined but vegetation has re-established on the scar on the earliest set of available aerial photographs. "Recent" landslides are defined as having occurred within the timespan of the aerial photograph coverage. These are typically identified as having a light tone on the aerial photographs and are bare of vegetation.

No ENTLI has been recorded within or in the vicinity of the Site.

### 3.4 Historical Landslide Catchment (HLC) Inventory

Historical Landslide Catchments (HLCs) have been defined by GEO based on the results of the ENTLI. No HLC present within or in the vicinity of the Site.

### 3.5 Hillside Pocket

Hillside Pockets (HP) are defined as small tracts of predominantly natural hillside within developed areas (defined as areas with more than 10% of development within 200 m searching radius) and satisfying all three of the following criteria:

i) have an elevation difference greater than 8 m,

ii) have a maximum gradient greater than 20°, and

iii) have a plan area of greater than 400 m².

The HP Catalogue was compiled between 2013 and 2016 under Agreement No. CE 11/2013 (GE) Feasibility Study on Cataloguing and Ranking of Hillside Pockets, based on the review of 4 sets of aerial photographs, records of past instabilities (mainly the GEO landslide incident records and ENTLI features), presence of registered disturbed terrain, facilities in close proximity to the HP and site inspection.

No Hillside Pocket has been recorded within or in the vicinity of the Site.

### 3.6 Reported Landslide Incidents

The GEO landslide incidents database has indicated one incident record located at about 20m to the east of the Site (**Figure 3**). The incident was recorded as 2020/07/2727 and it involved a small slope failure ($4m^3$) within a disturbed terrain adjoining to an access road in July 2020. Detailed information of the feature extracted from SIS is presented in **Appendix A**.

### 3.7 Registered Man-made Slopes

No man-made feature has been registered within or in the vicinity of the Site, **Figure 4**.

## 4 REVIEW OF NATURAL TERRAIN OVERLOOKING THE SITE

It is noted that the Site may be affected by natural hazard aroused from a natural terrain above the Site from the elevation of about +49mPD to +22mPD. An initial screening exercise has been carried out to assess whether the proposed development falls within the "In-principle Objection Criteria" or the "Alert Criteria" with respect to the concerned natural terrain according to the guideline given in GEO Report No. 138 Second Edition. The potential hillside catchment that may affect the proposed development has been delineated based on the 1:1000 topographic map and is presented in **Figure 5**. The measured angular elevation from the top of the natural terrain to the nearest boundary of Lot no. 361 is about 25.4° and therefore satisfied the "Alert Criteria" and therefore further study of the natural terrain hazards arouse from the natural terrain to the Site is required. If found necessary, natural terrain hazard mitigation measure shall be implemented.

## 5 IMPACTS OF PROPOSED WORKS ON EXISTING SLOPES AND RETAINING WALL

Although there is no man-made feature has been registered within or in the vicinity of the Site, the Site platform was retained by a retaining wall at its north-eastern side with a maximum height of about 0.7m (**Plate 2**). There is also a small cut slope (about 1.0m high) with chunam surface below the retaining wall. No major sign of distress can be identified at the retaining wall and the cut slope during the inspection. However, the stability of these retaining wall and cut slope have to be checked with respect to the proposed development based on the subsurface conditions and shear strength parameters of soil/rock obtained from a site specific ground investigation. If found necessary, appropriate improvement/upgrading works, including slope re-profiling, installation of soil nails, and thickening of the retaining wall shall be carried out so as to meet the current geotechnical standard.

## 6 RECOMMENDATIONS AND CONCLUSIONS

A desk study has been carried out for the proposed small houses development within Lot No 361 in D.D. 32, Tai Po on all available geological and geotechnical information in GEO and relevant publications. A review on the proximities of the natural slope and man-made slope feature were conducted to assess whether the proposed development will be affected by the adjacent slope including natural terrain.

Based on the results of the review, the angular elevation from the natural terrain to the Site is 28.4°. According to GEO report No.138, the proposed development satisfied the "Alert Criteria" and therefore a further study of the natural terrain hazards posing to the proposed development is required. The proposed extent of the natural terrain hazards study is delineated in **Figure 5**. A proper natural terrain hazard mitigation measure shall be implemented, if found necessary, as part of the proposed development. Therefore, a natural terrain hazard study will be carried out in the next stage of the project.

In addition, it is essential to search and review the background information of existing building, geotechnical feature (retaining wall and cut slope below the Site) and underground services within and in the vicinity of the Site. Site investigation is proposed to reveal/confirm the subsoils and the ground profile within and in the vicinity of the Site as well as to determine the engineering properties of the soils and rock.

For safety and cost effectiveness, the foundation design, retaining wall stability assessment, excavation planning as well as the design of geotechnical structure should be based on the geological horizons obtained from the ground investigation results, groundwater table interpreted from the piezometer/standpipe monitoring records, and the geotechnical parameters determined from the field and laboratory testing. A geotechnical assessment report (GAR) is required to deal with the above issues in the later stage.

## 7 REFERENCES

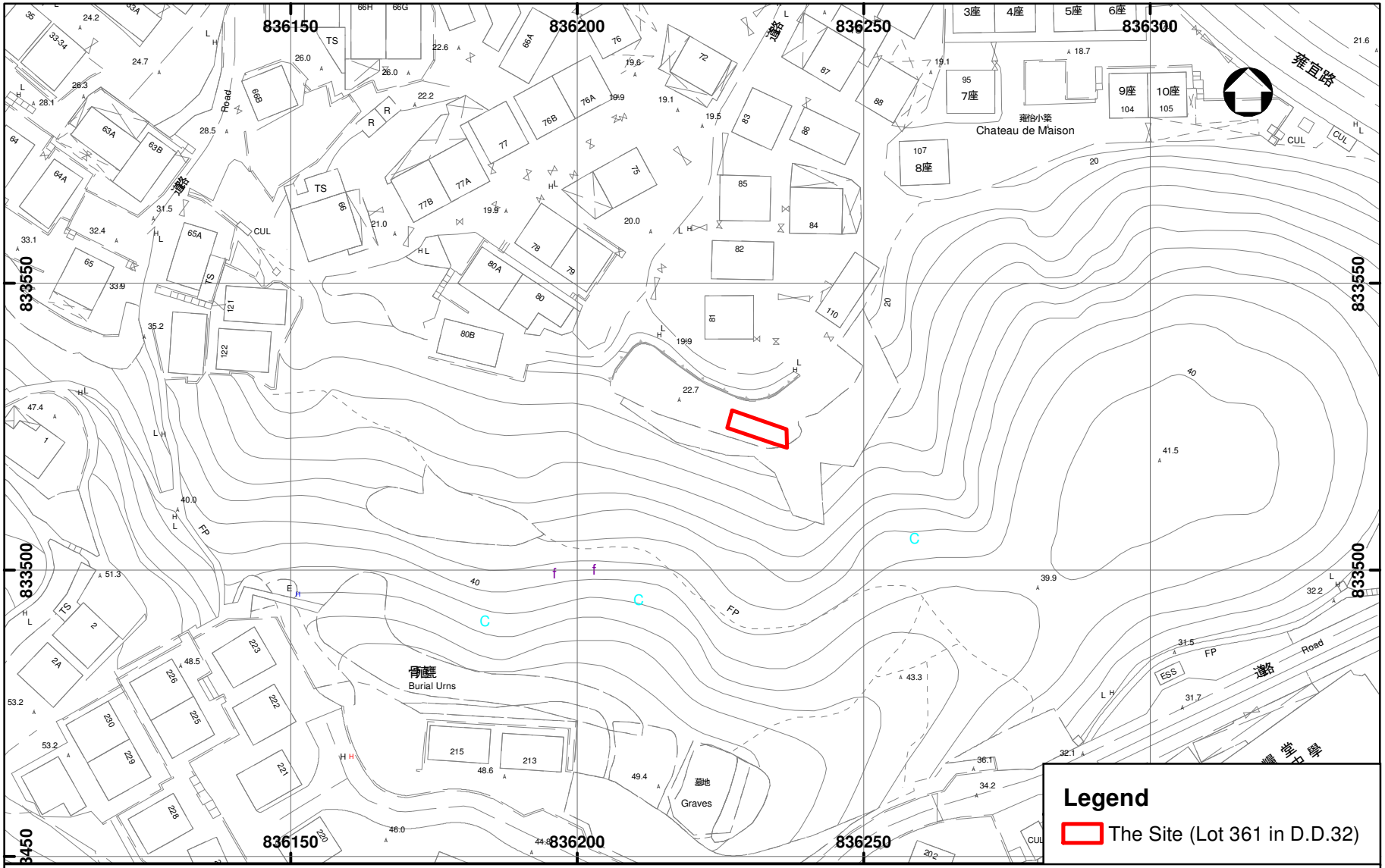
Geotechnical Engineering Office (1987). Geotechnical Area Studies Programme – North New Territories. Geotechnical Control Office, Hong Kong, GASP Report No. V.

Geotechnical Engineering Office (2016). Guidelines for Natural Terrain Hazard Studies. Geotechnical Engineering Office, Hong Kong. GEO Report No. 138, Second Edition.

Geotechnical Engineering Office (2004). Guidelines for Classification of Consequence-to-Life Category for Slope Features. Geotechnical Engineering Office, Hong Kong. GEO Technical Guidance Note No. 15 (TGN15).

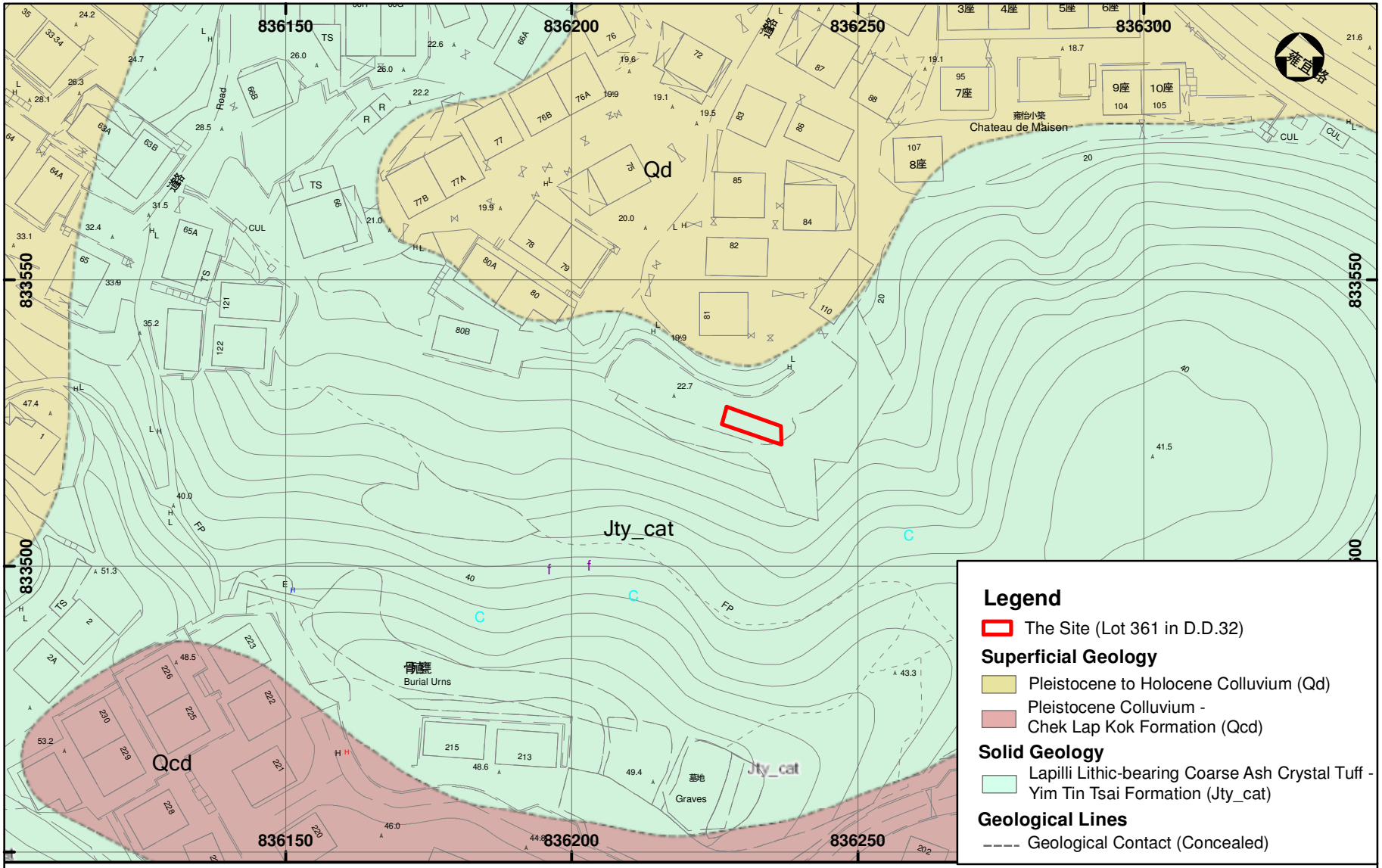
Geotechnical Engineering Office (2010), Map 7 (Shatin) Solid and Superficial Deposits, 1:20,000 scale, HGM20 series.

## LIST OF FIGURES



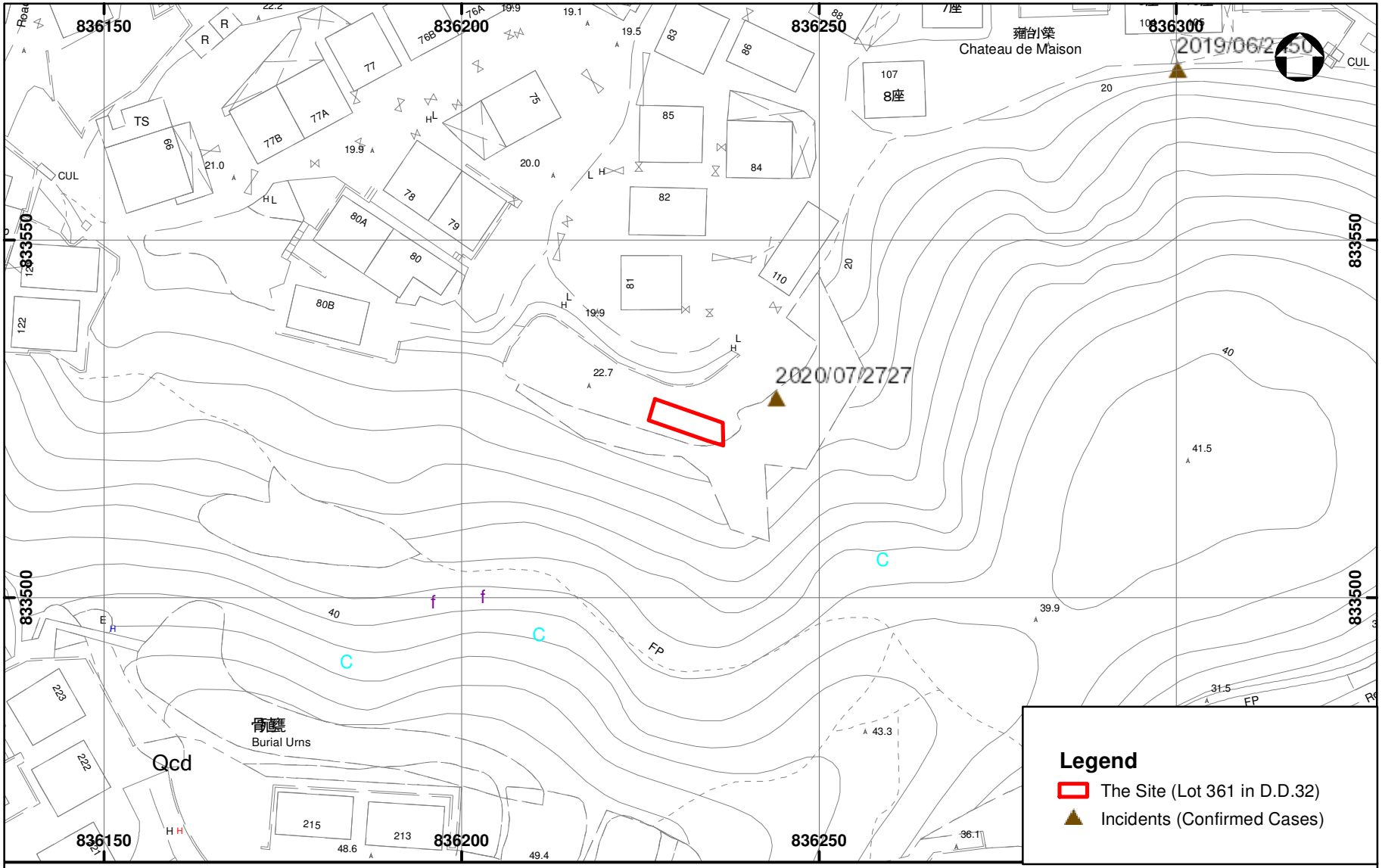

**PROJECT:** Proposed Small House Development on Lot No. 361 in D.D.32, Tai Po

| | | | |
|---|---|---|---|
| **TITLE:** Location Plan of the Site | **SCALE:** 1 : 1000 | 鼎耀工程顧問有限公司 JDF ENGINEERING CONSULTANTS LIMITED | **FIGURE NO :** FIGURE 1 |



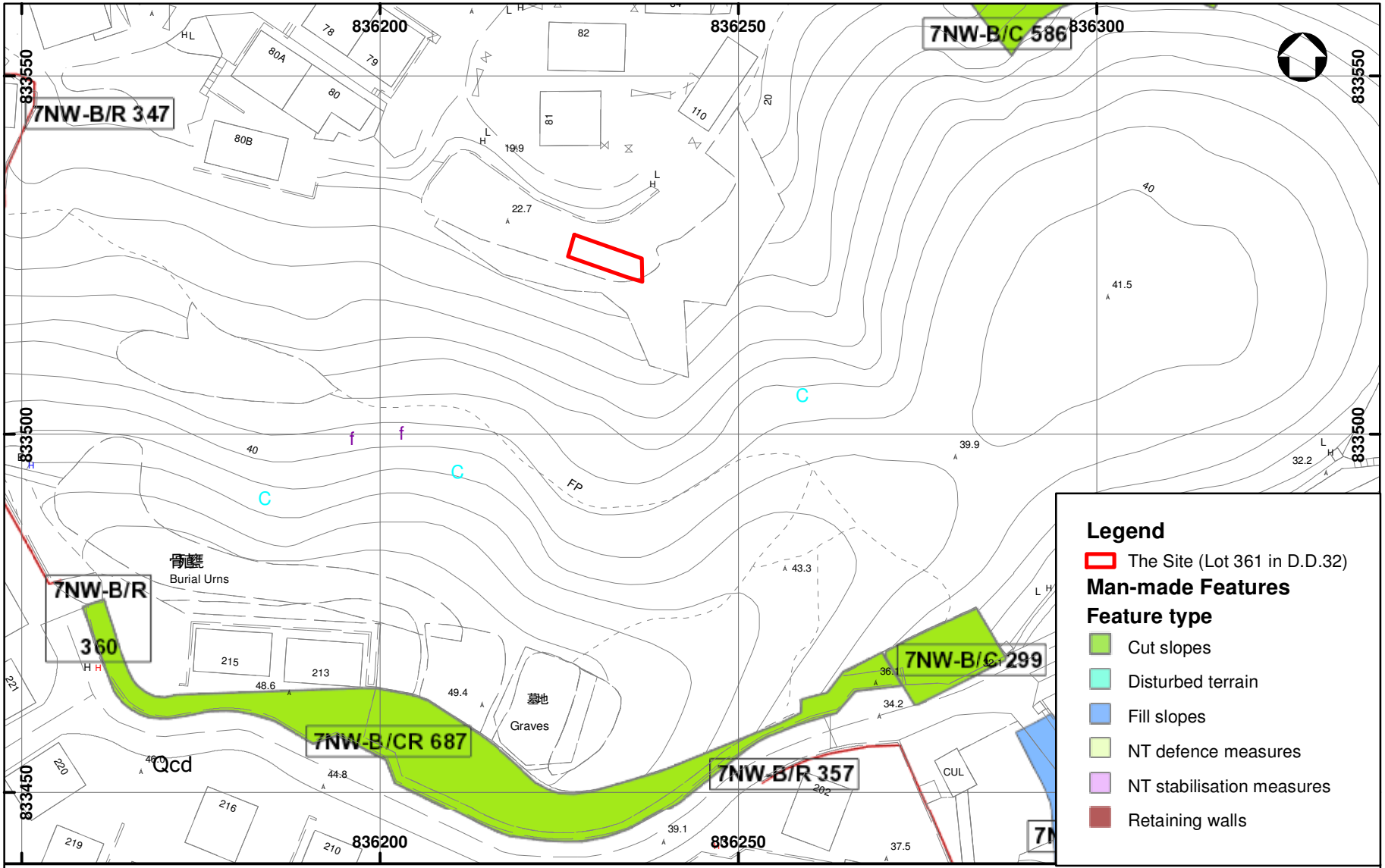

**PROJECT:** Proposed Small House Development on Lot No. 361 in D.D.32, Tai Po

| TITLE: Geological Map | SCALE: 1 : 1000 | 鼎耀工程顧問有限公司 JDF ENGINEERING CONSULTANTS LIMITED | FIGURE NO : FIGURE 2 |
|---|---|---|---|



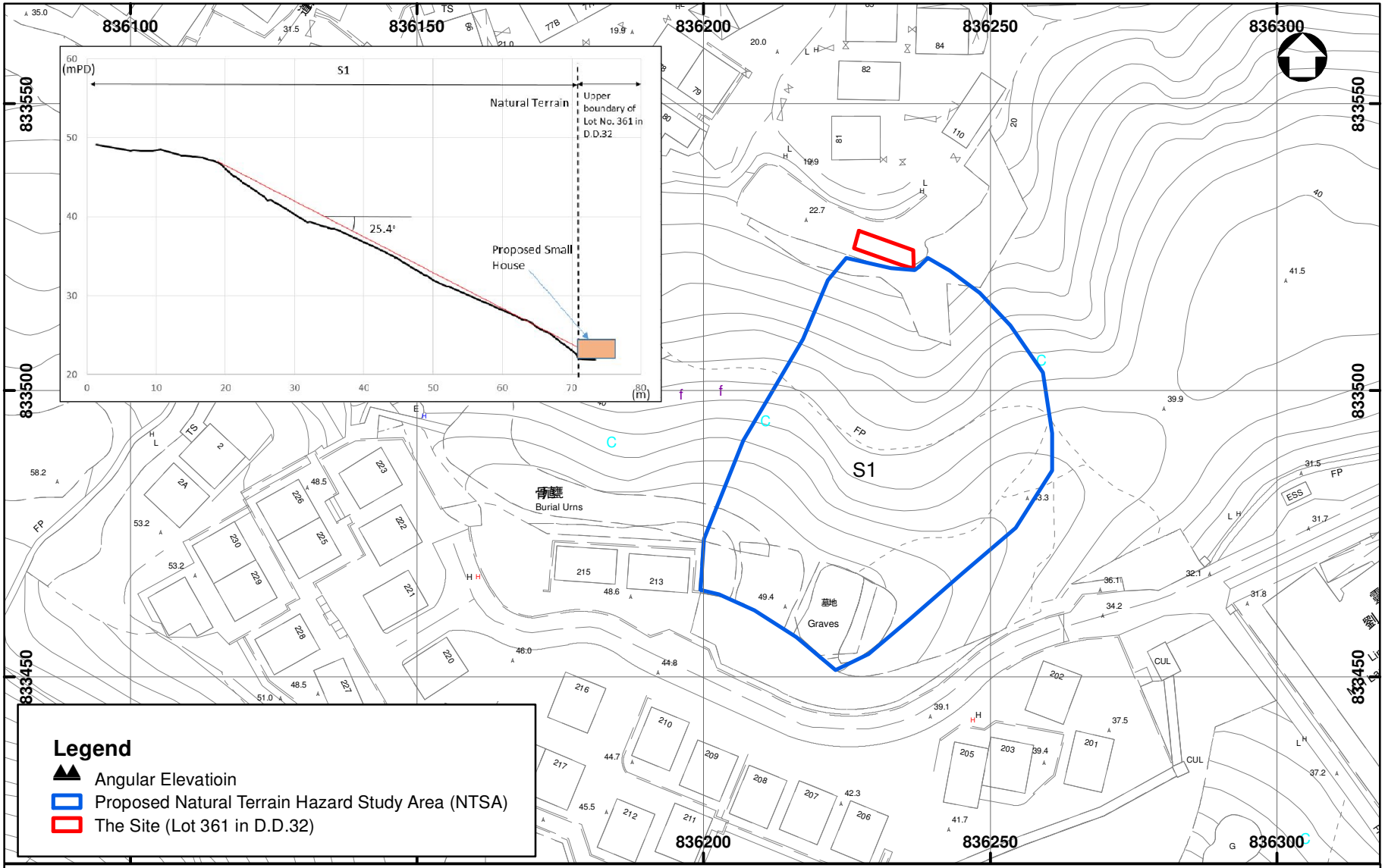

**PROJECT:** **Proposed Small House Development on Lot No. 361 in D.D.32, Tai Po**

| | | | |
|---|---|---|---|
| **TITLE:** **Recorded Past Instabilities** | **SCALE:** **1 : 800** | 鼎耀工程顧問有限公司 JDF ENGINEERING CONSULTANTS LIMITED | **FIGURE NO :** **FIGURE 3** |



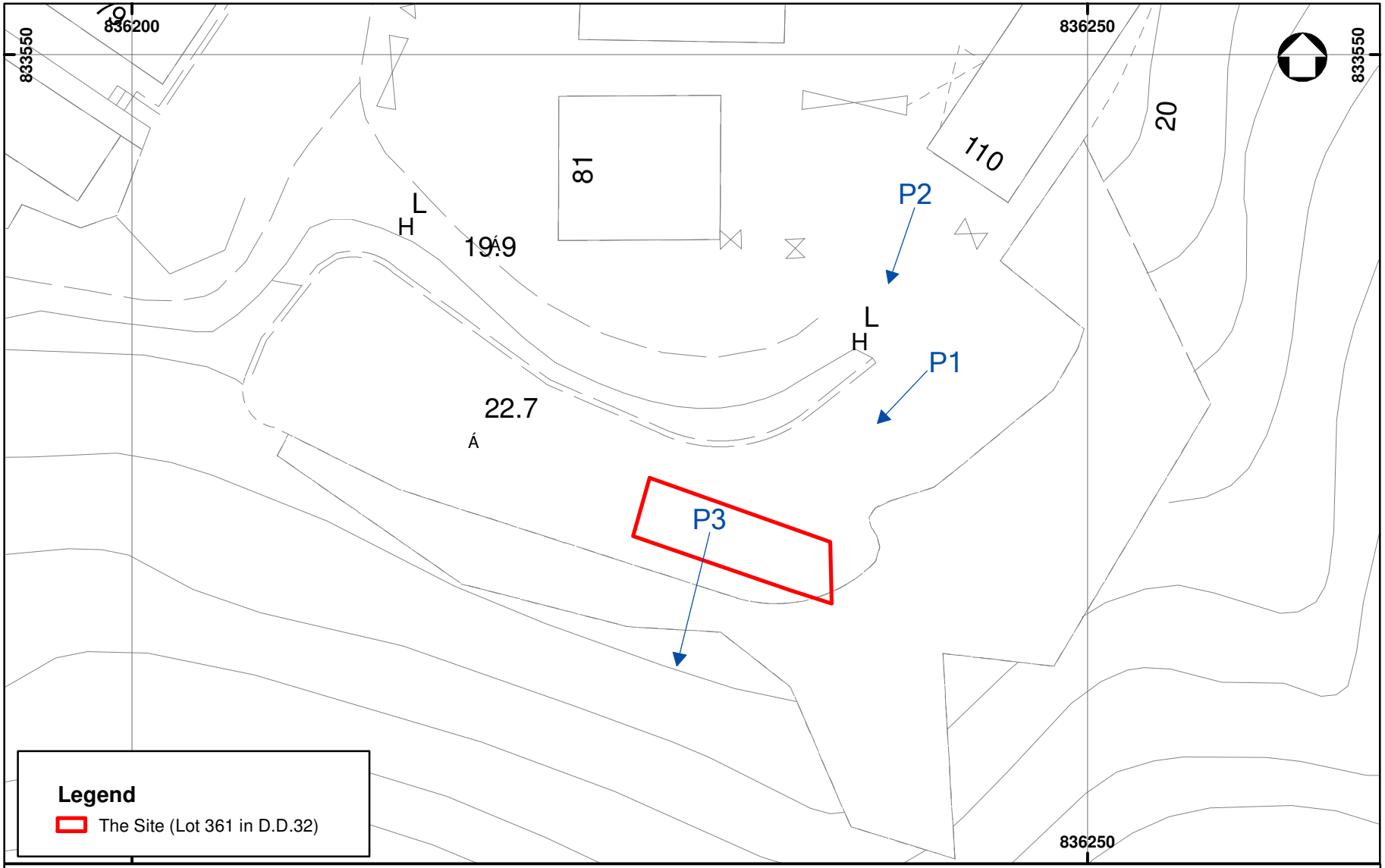

**PROJECT:** Proposed Small House Development on Lot No. 361 in D.D.32, Tai Po

| | | | |
|---|---|---|---|
| **TITLE:** Registered Man-made Features | **SCALE:** 1 : 800 | 鼎耀工程顧問有限公司 JDF ENGINEERING CONSULTANTS LIMITED | **FIGURE NO :** FIGURE 4 |




**PROJECT:** **Proposed Small House Development on Lot No. 361 in D.D.32, Tai Po**

| | | | |
|---|---|---|---|
| **TITLE:** **Angular Elevation from Natural Terrain** | **SCALE:** 1 : 1000 | 鼎耀工程顧問有限公司 JDF ENGINEERING CONSULTANTS LIMITED | **FIGURE NO :** FIGURE 5 |




**PROJECT:** **Proposed Small House Development on Lot No. 361 in D.D.32, Tai Po**

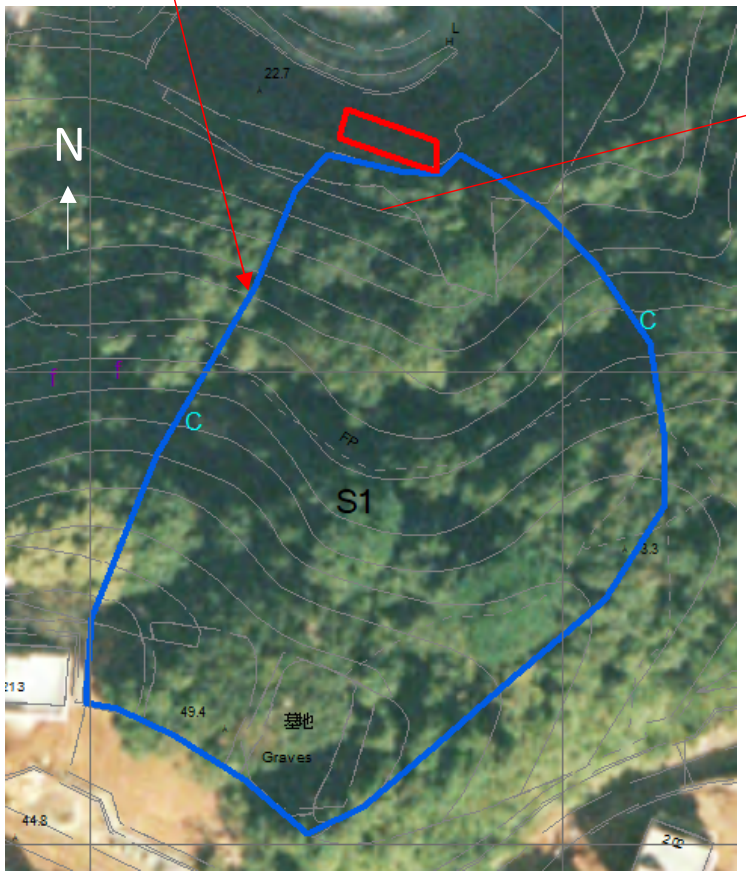
| **TITLE:** **Location of Plates** | **SCALE:** **1 : 300** | 鼎耀工程顧問有限公司 JDF ENGINEERING CONSULTANTS LIMITED | **FIGURE NO :** **FIGURE 6** |
|---|---|---|---|

## LIST OF PLATES


Plate 1 General View of the Site


Plate 2 General View of the Site, the non-registered retaining wall and the cut slope

**Proposed Natural Terrain Hazard Study Area**




**General view of the Natural Terrain above the Site**

Plate 3 Natural Terrain Overlooking the Site

# Appendix A

## Incident Records

(19)

# GEOTECHNICAL ENGINEERING OFFICE
# LANDSLIDE INCIDENT REPORT

**GEO Incident No. 2020/07/2727** **ECC Ref:**

## PART 1 --- REGISTRATION

The contents should be updated when further information is received (e.g. following site inspection) [Note 1.1]

| (1.1) INCIDENT REPORTED TO GEO | |
|---|---|
| (1.1.1) Duplicate Incident No. (if any) [Note 1.1.1] | |
| (1.1.2) Location [Note 1.1.2] * ( Confirmed with Police/FSD or GEO staff on site : **Yes**)<br>**下黃宜坳81號**<br><br>Co-ordinates of landslide Easting : **836244** Northing : **833528** | |
| (1.1.3) Nearby Lamp Post No. : | |
| (1.1.4) Feature No. | (1.1.5) District Council<br>**Tai Po District** |
| (1.1.6) Report date [Note 1.1.6] *<br>**14/7/2020** | (1.1.7) Report time [Note 1.1.7] *<br>**09:20** |
| (1.1.8) Best Estimated Date and Time of Incident [Note 1.1.8]<br><br>Source of Incident Date and Time | (1.1.9) 1823 Reference (if applicable) [Note 1.1.9] |
| (1.1.10) Reported by (Caller name) *<br>**Ms.H Y LO** | (1.1.11) Contact No. of caller *<br>**26541227** |
| (1.1.12) Affiliation<br>**DLO** | (1.1.13) Affiliation remarks (if any) |
| (1.1.14) Incident Also Recorded in LandsD's Emergency System? [Note 1.1.14]<br>**No** | (1.1.15) Corresponding LandsD's Incident No. [Note 1.1.14] |

| (1.2) TYPE OF INCIDENT |
|---|
| (1.2.1) Type of Incident<br>**Slope Failure** |
| (1.2.2) Remarks (e.g. Approximate dimensions / Volume of landslide)<br>**Nil Remark** |

| (1.3) CONSEQUENCE OF FAILURE | |
|---|---|
| (1.3.1) No. of deaths<br>**0** persons | (1.3.2) No. of injuries<br>**0** persons |
| (1.3.3) No. of road lanes closed [Note 1.3.3]<br>**0** of **0** Nos. | (1.3.4) No. of persons evacuated<br>**0** persons |
| (1.3.5) Traffic disruption / impact details [Note 1.3.5] | |

| (1.4) FACILITIES AFFECTED OR THREATENED |
|---|
| (1.4.1) Facilities affected or threatened<br>**Open space** |
| (1.4.2) Details (e.g. No. of buildings damaged / name of road sections blocked / road type under TD classification / type of Government premises, facilities or private utility services) :<br>**Nil Remark** |

| (1.5) CLASSIFICAION OF INCIDENT (Highest genuine classification) [Note 1.5] |
|---|
| (1.5.1) Incident classified to be *<br>**Minor**<br><br>Updated upon inspection : **No** Date : Time :<br>by Name : Post : |
| (1.5.2) Media attention [Note 1.5.2]<br>**Nil** |

| (1.6) INITIAL ACTION TAKEN [Note 1.6] |
|---|
| (1.6.1) Action taken<br>**GEO inspection arranged** |
| (1.6.2) **LIN Wan Kwan, Carrie (Ms)** has been assigned to inspect the incident |
| (1.6.3) Remarks |

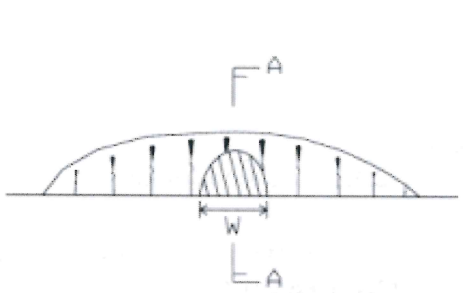
| (1.7) DISTRICT INFORMATION | |
|---|---|
| (1.7.1) District Division : **ME** | (1.7.2) District GE : **LIN Wan Kwan, Carrie (Ms)** |

| (1.8) OTHER INFORMATION | |
|---|---|
| (1.8.1) Incoming call received by<br>**District**<br><br>Name : **LIN Wan Kwan, Carrie (Ms)**<br>Post : **GE/ME23**<br>Tel : **2762 5236** | (1.8.2) Registered by<br>**District GE**<br><br>Name : **LIN Wan Kwan, Carrie (Ms)**<br>Post : **GE/ME23**<br>Tel : **2762 5236** |

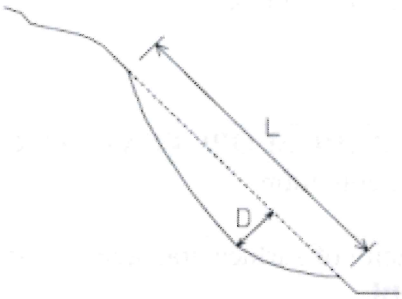
For serious incidents, the Inspection GE should provide information for completion of all key fields (item 2.7.1 and 2.8.1) marked with '*' and seek agreement from ETC/SGE(District)/Emergency Manager whoever is appropriate, before leaving the landslide site.

## PART 2 --- INSPECTION

| (2.1) DETAILS OF FIRST INSPECTION [Note 2.1] | |
|---|---|
| (2.1.1) GEO Inspection by<br>**LIN Wan Kwan, Carrie (Ms)** | (2.1.2) Inspection date<br>**17/7/2020** |
| (2.1.3) Time arrived on site<br>**11:15** | (2.1.4) Time left site<br>**11:30** |
| (2.1.5) With<br>of | (2.1.6) Contact No. (mobile) |
| (2.1.7) Weather condition at time of inspection<br>**Sunny** | (2.1.8) Feature type<br>**Disturbed terrain** |



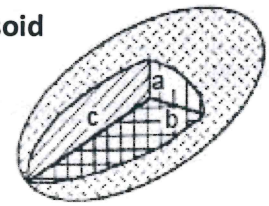

**Plan**




**Section A – A**

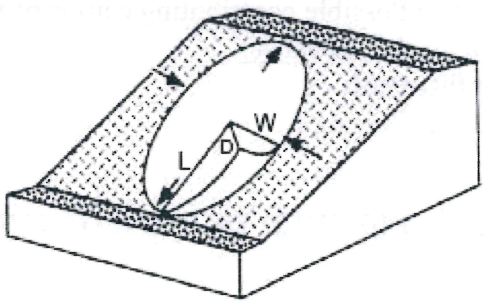
| | |
|---|---|
| (2.1.9) Scar length (L) [Notes 2.1.9]<br>**4.00** m | (2.1.10) Scar depth (D)<br>**0.25** m |
| (2.1.11) Scar width (W)<br>**8.00** m | (2.1.12) Volume of landslide debris [Notes 2.1.12]<br>**4.000** $m^3$ |

**(a) Ellipsoid**




$$VOL_{ls} = \frac{4}{6}\pi a \cdot b \cdot c$$
$$= \frac{1}{6}\pi D \cdot W \cdot L$$

**(b) Landslide**




*Extracted from "Turner & Schuster (1996). Landslides Investiagtion and Mitigation. Transportation Research Board, Specical Report 247" Chapter 3 Landslide Types and Process, p36-71.*

(2.1.13) Media on site

(2.1.14) Non-landslide Incident [Note 2.1.14]
**No**

| (2.2) MATERIAL AND MASS DESCRIPTION OF THE EXPOSURE |
|---|
| (2.2.1) Material and mass description of the exposure [refer to Geoguide 3 for soil/rock classification]<br>**Residual Soil** |
| (2.2.2) Detailed descriptions |

| (2.3) BOULDER FALL CASES [Note 2.3] |
|---|
| (2.3.1) Number of boulders involved |
| (2.3.2) Dimensions of boulders<br><br>Shape of boulders |

| (2.4) MAN-MADE SLOPE FEATURE CASES | |
|---|---|
| (2.4.1) Slope condition | (2.4.2) Locations of matters described in item 2.4.1 |
| (2.4.3) Capacity of surface drainage system<br>**Not present** | (2.4.4) Coverage of hard protection<br>**Not present** |
| (2.4.5) Surface protection material<br>**vegetation** | (2.4.6) Field evidence of past instability at or adjoining the failure location<br>**No** |
| (2.4.7) Groundwater seepage observed at the failure location<br>**No** | (2.4.8) Location of seepage / past instability |

| (2.5) CAUSES OF FAILURE | |
|---|---|
| (2.5.1) Possible contributing causes of failure | |
| Geotechnical causes<br>**Infiltration** | Non-geotechnical causes |
| (2.5.2) Remarks | |

| (2.6) FURTHER DETAILS OF THE INCIDENT [Note 2.6] |
|---|
| |

**(2.7) IMMEDIATE ADVICE GIVEN**

(2.7.1) Immediate advice given [Note 2.7.1] *

**Cordon off area in danger**
**Cover failure scar with tarpaulin properly secured against wind**
**Provide hard surface protection (with weepholes) to trimmed failure surface**
**Remove landslide debris which threatens life or property**

(2.7.2) Responsible Works Department [Note 2.7.2]

**Lands Department Slope Maintenance Section (SMS)**

SMRIS (MR) : NPRS Score :

SC Nos. :

(2.7.3) Remarks

**(2.8) EMERGENCY ACTION TAKEN**

(2.8.1) Emergency action taken at Rescue Phase [Note 2.8.1] *

**Emergency inspection by GEO completed and recommendation given**

(2.8.2) Remarks

**(2.9) ADVICE ON SUBSEQUENT EMERGENCY WORKS / ACTIONS**

(2.9.1) Subsequent advice given [Note 2.9.1]

NDC Cat 1 on squatter structures SC Nos. :

To allow re-occupation of property / re-opening of roads :

To complete recovery :

(2.9.2) Responsible Works Department [Note 2.9.2]

(2.9.3) Remarks

**(3.1) FEATURE REGISTRATION (to be completed by District GE / Technical Staff)**

(3.1.1) Has the feature been registered?

**No**

(3.1.2) Was the feature registrable before failure? [refer to DEVB TC(W) No. 2/2018 for slope registration]

**No**

**(3.2) STATUS OF LANDSLIDE INCIDENT** [Note 3.2]

(3.2.1) Status

**Closed**

| ATTACHMENTS |
|---|
| Attachment Type #<br>**Photo**<br>**Location Plan** |
| Attachment / Remarks |

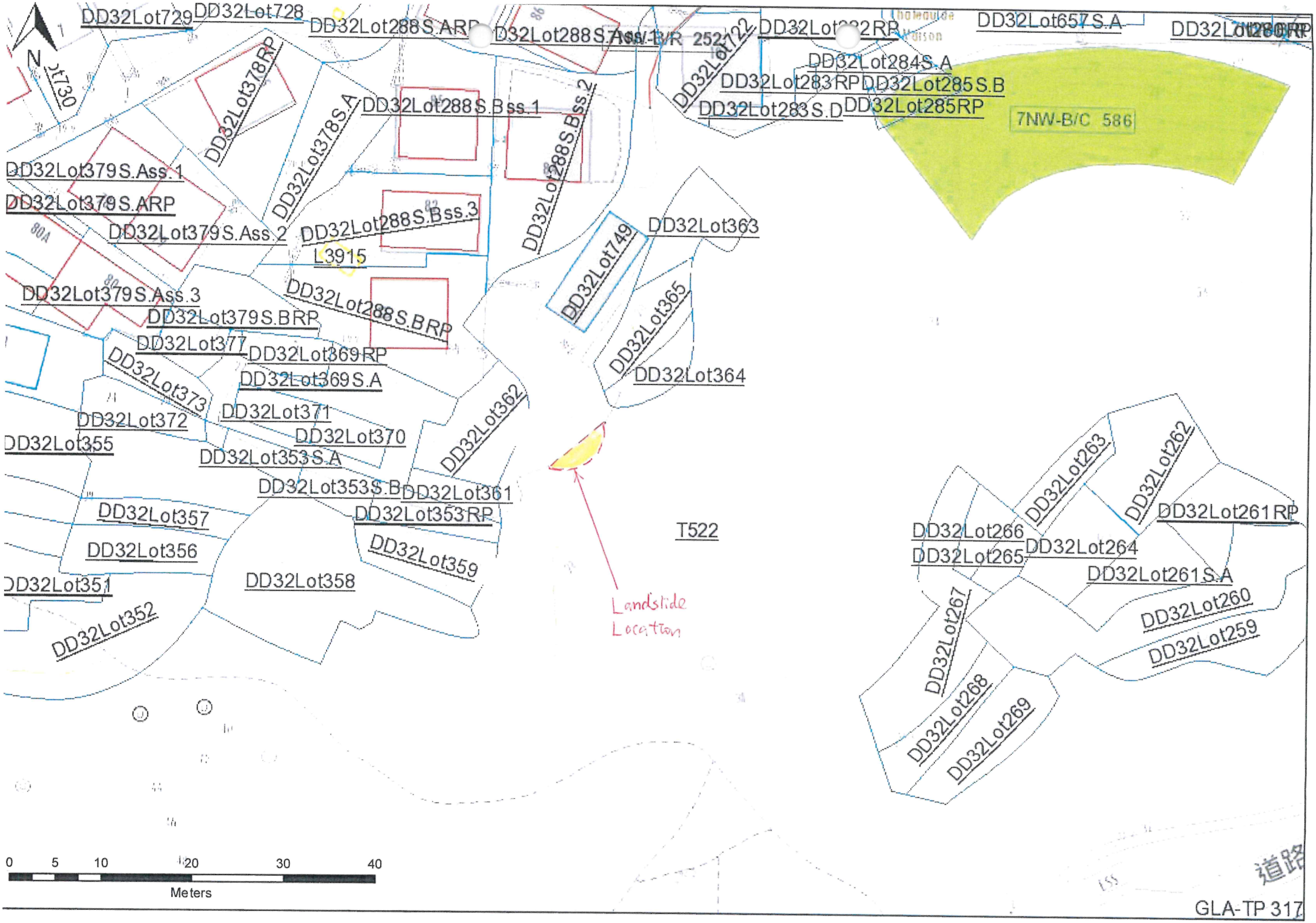
| Inspection Officer's Signature | CARRIE W K LIN, GE/ME23<br>Name in Block Letter , Post | 30 / 10 / 2020<br>Date |
|---|---|---|

Information reviewed by:

| | | | |
|---|---|---|---|
| District GE | (Signature) | CARRIE W K LIN<br>(Name) | 30/10/2020<br>(Date) |
| District SGE | (Signature) | CHRIS C W CHAN<br>(Name) | 2/11/2020<br>(Date) |
| District CGE | (Signature) | JENNY F YEUNG<br>(Name) | 2/11/2020<br>(Date) |

c.c. ~~STO(G)/ME2~~ - please update information in EILIS as necessary

# - Delete as appropriate (For significant and serious cases, plan and cross-section(s) of the landslide shall be prepared with Form ECC7 and uploaded to EILIS)


DD32Lot729
DD32Lot728
DD32Lot288S.ARP
DD32Lot288S.Ass.1
DD32Lot657S.A
DD32Lot284S.A
DD32Lot283RP
DD32Lot285S.B
DD32Lot283S.D
DD32Lot285RP
7NW-B/C 586
DD32Lot730
DD32Lot378RP
DD32Lot378S.A
DD32Lot288S.Bss.1
DD32Lot288S.Bss.2
DD32Lot379S.Ass.1
DD32Lot379S.ARP
DD32Lot379S.Ass.2
DD32Lot288S.Bss.3
L3915
DD32Lot363
DD32Lot749
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DD32Lot379S.BRP
DD32Lot288S.BRP
DD32Lot365
DD32Lot377
DD32Lot369RP
DD32Lot364
DD32Lot373
DD32Lot369S.A
DD32Lot362
DD32Lot372
DD32Lot371
DD32Lot370
DD32Lot355
DD32Lot353S.A
DD32Lot353S.B
DD32Lot361
DD32Lot357
DD32Lot353RP
T522
DD32Lot356
DD32Lot359
DD32Lot351
DD32Lot358
DD32Lot352
Landslide Location
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DD32Lot262
DD32Lot261RP
DD32Lot266
DD32Lot265
DD32Lot264
DD32Lot261S.A
DD32Lot267
DD32Lot260
DD32Lot259
DD32Lot268
DD32Lot269
0 5 10 20 30 40
Meters
道路
GLA-TP 317

Photo 1

Photo 2