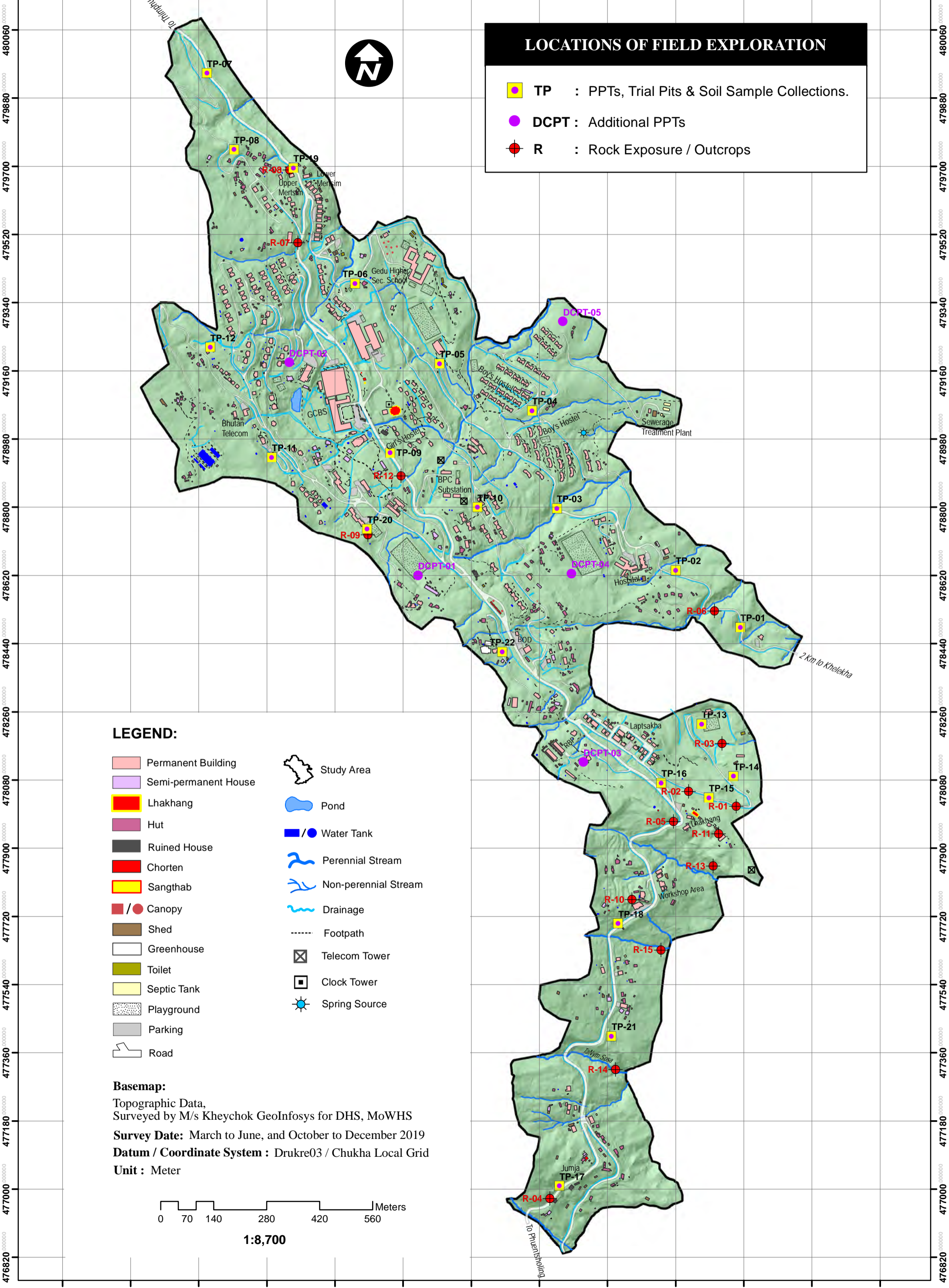


246440 246620 246800 246980 247160 247340 247520 247700 247880 248060 248240 248420 248600



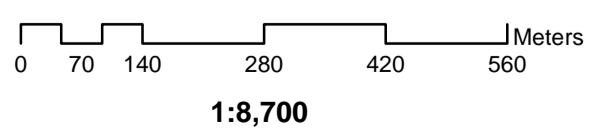
### LOCATIONS OF FIELD EXPLORATION

- TP : PPTs, Trial Pits & Soil Sample Collections.
- DCPT : Additional PPTs
- ⊗ R : Rock Exposure / Outcrops

**LEGEND:**

- |  |  |
|--|--|
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #f08080; border: 1px solid black;"></span> Permanent Building   | <span style="display: inline-block; border: 1px solid black; width: 15px; height: 10px;"></span> Study Area  |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #e6e6fa; border: 1px solid black;"></span> Semi-permanent House   | <span style="display: inline-block; width: 15px; height: 10px; background-color: #add8e6; border: 1px solid black;"></span> Pond   |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #ff0000; border: 1px solid black;"></span> Lhakhang   | <span style="display: inline-block; width: 15px; height: 10px; background-color: #0000ff; border: 1px solid black;"></span> / <span style="display: inline-block; width: 15px; height: 10px; background-color: #0000ff; border: 1px solid black;"></span> Water Tank |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #800080; border: 1px solid black;"></span> Hut  | <span style="display: inline-block; width: 15px; height: 10px; background-color: #0000ff; border: 1px solid black;"></span> Perennial Stream   |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #808080; border: 1px solid black;"></span> Ruined House   | <span style="display: inline-block; width: 15px; height: 10px; background-color: #0000ff; border: 1px solid black;"></span> Non-perennial Stream   |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #ff0000; border: 1px solid black;"></span> Chorten  | <span style="display: inline-block; width: 15px; height: 10px; background-color: #0000ff; border: 1px solid black;"></span> Drainage   |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #ffff00; border: 1px solid black;"></span> Sangthab   | <span style="display: inline-block; width: 15px; height: 10px; border-bottom: 1px dashed black;"></span> Footpath  |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #800000; border: 1px solid black;"></span> / <span style="display: inline-block; width: 15px; height: 10px; background-color: #800000; border: 1px solid black;"></span> Canopy | <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; text-align: center; line-height: 10px;">X</span> Telecom Tower   |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #808080; border: 1px solid black;"></span> Shed   | <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; text-align: center; line-height: 10px;">□</span> Clock Tower   |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #90ee90; border: 1px solid black;"></span> Greenhouse   | <span style="display: inline-block; width: 15px; height: 10px; background-color: #0000ff; border: 1px solid black; text-align: center; line-height: 10px;">☀</span> Spring Source  |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #90ee90; border: 1px solid black;"></span> Toilet   |  |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #ffff00; border: 1px solid black;"></span> Septic Tank  |  |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #d3d3d3; border: 1px solid black;"></span> Playground   |  |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #d3d3d3; border: 1px solid black;"></span> Parking  |  |
| <span style="display: inline-block; width: 15px; height: 10px; border-bottom: 1px solid black;"></span> Road   |  |

**Basemap:**  
 Topographic Data,  
 Surveyed by M/s Kheychock GeoInfosys for DHS, MoWHS  
**Survey Date:** March to June, and October to December 2019  
**Datum / Coordinate System :** Drukre03 / Chukha Local Grid  
**Unit :** Meter

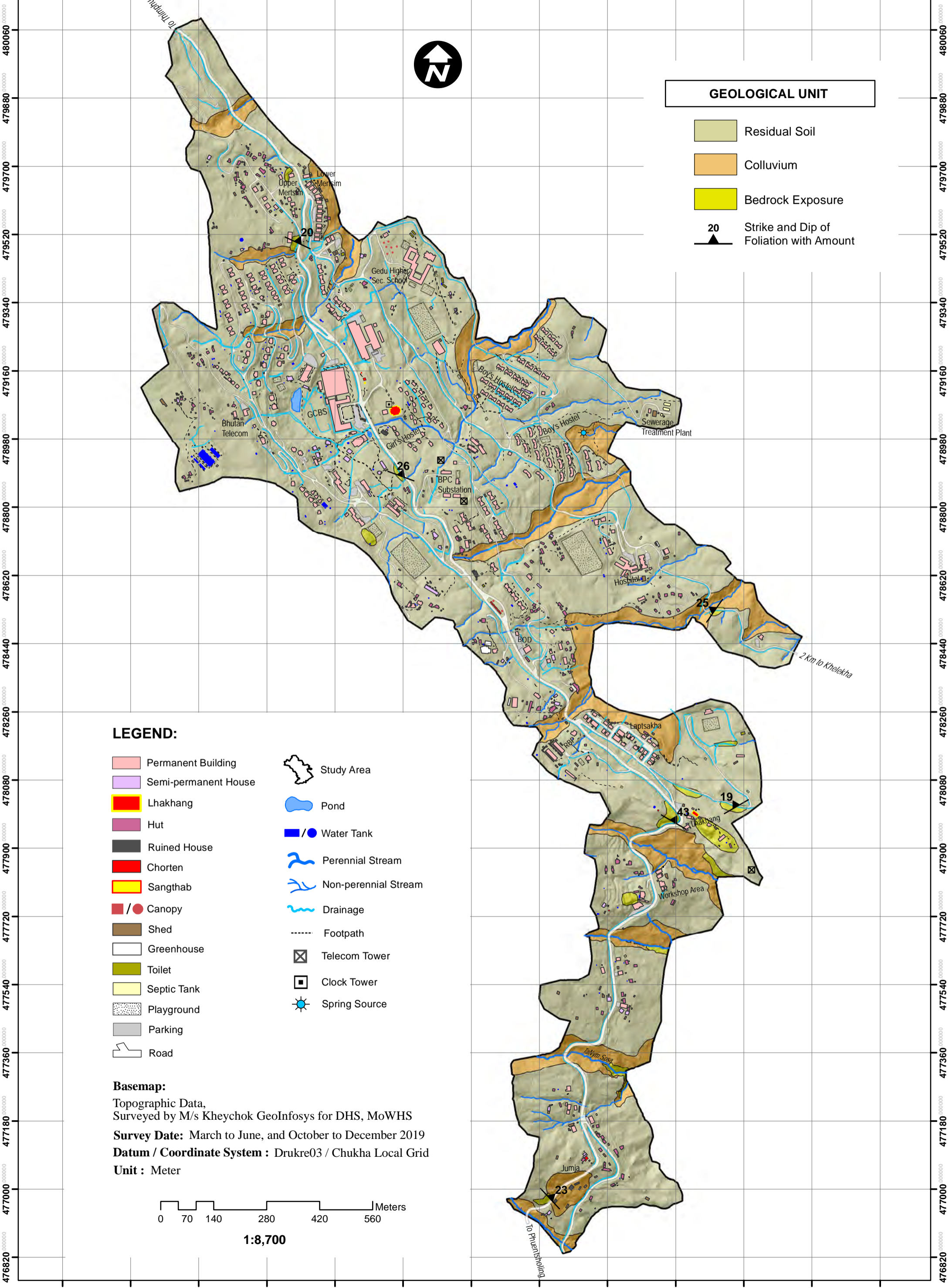


476820 477000 477180 477360 477540 477720 477900 478080 478260 478440 478620 478800 478980 479160 479340 479520 479700 479880 480060

# GEOLOGICAL MAP:

# GEOTECHNICAL REPORT FOR GEDU TOWN, CHHUKHA

246440 246620 246800 246980 247160 247340 247520 247700 247880 248060 248240 248420 248600



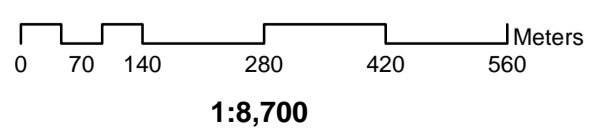
### GEOLOGICAL UNIT

- Residual Soil
- Colluvium
- Bedrock Exposure
- 20** Strike and Dip of Foliation with Amount

### LEGEND:

- |   |                      |
|---|----------------------|
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #f8bbd0; border: 1px solid black; margin-right: 5px;"></span> Permanent Building   | Study Area           |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #e1bee7; border: 1px solid black; margin-right: 5px;"></span> Semi-permanent House | Pond                 |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #ff5722; border: 1px solid black; margin-right: 5px;"></span> Lhakhang             | Water Tank           |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #9c27b0; border: 1px solid black; margin-right: 5px;"></span> Hut                  | Perennial Stream     |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #424242; border: 1px solid black; margin-right: 5px;"></span> Ruined House         | Non-perennial Stream |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #f44336; border: 1px solid black; margin-right: 5px;"></span> Chorten              | Drainage             |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #ffc107; border: 1px solid black; margin-right: 5px;"></span> Sangthab             | Footpath             |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #d32f2f; border: 1px solid black; margin-right: 5px;"></span> Canopy               | Telecom Tower        |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #795548; border: 1px solid black; margin-right: 5px;"></span> Shed                 | Clock Tower          |
| <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Greenhouse                                      | Spring Source        |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #8bc34a; border: 1px solid black; margin-right: 5px;"></span> Toilet               |                      |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #fff9c4; border: 1px solid black; margin-right: 5px;"></span> Septic Tank          |                      |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #e0e0e0; border: 1px solid black; margin-right: 5px;"></span> Playground           |                      |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #bdbdbd; border: 1px solid black; margin-right: 5px;"></span> Parking              |                      |
| Road  |                      |

**Basemap:**  
 Topographic Data,  
 Surveyed by M/s Kheychock GeoInfosys for DHS, MoWHS  
**Survey Date:** March to June, and October to December 2019  
**Datum / Coordinate System :** Drukre03 / Chukha Local Grid  
**Unit :** Meter



246440 246620 246800 246980 247160 247340 247520 247700 247880 248060 248240 248420 248600

476820

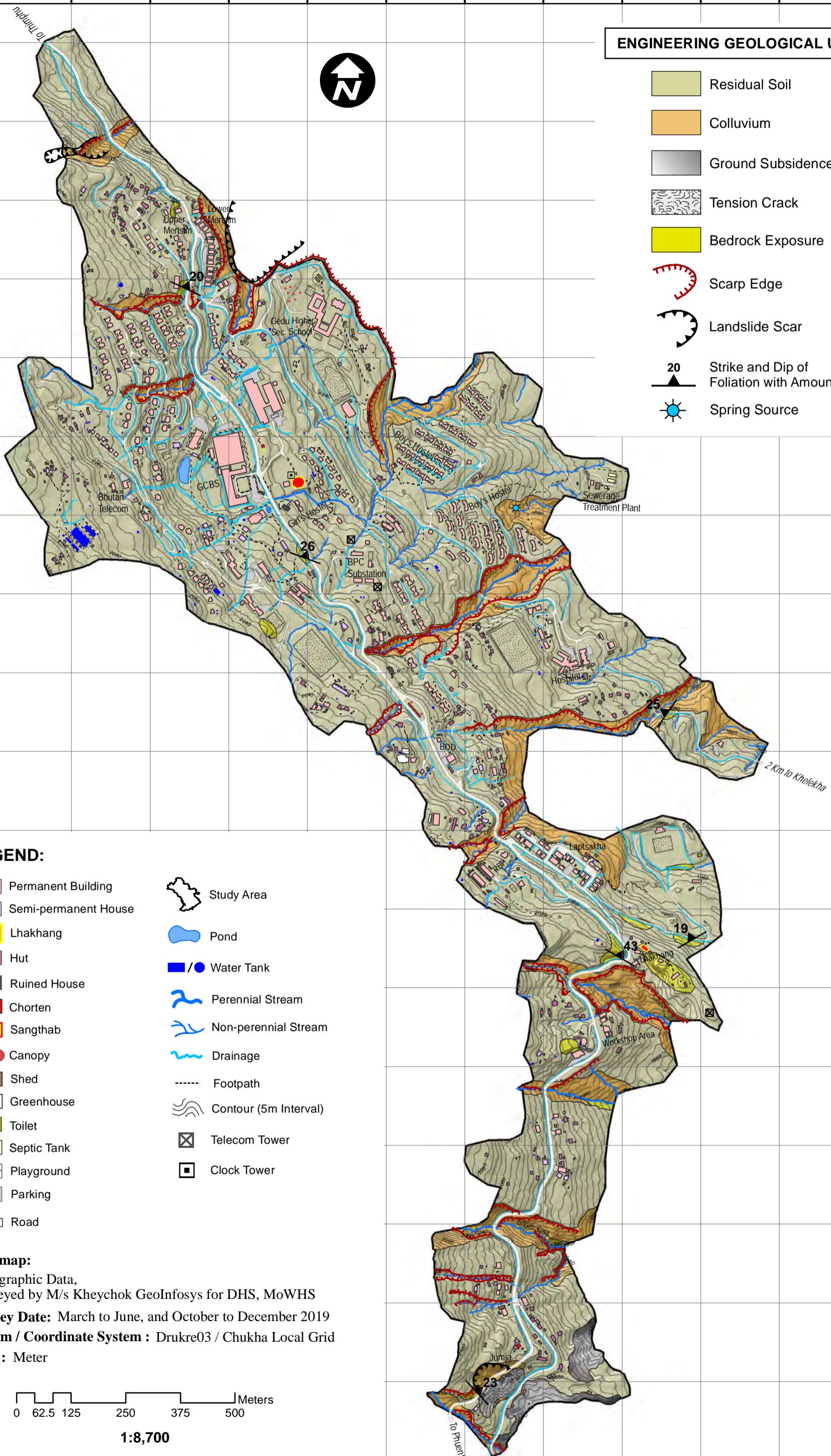
476820

# ENGINEERING GEOLOGICAL MAP: GEOTECHNICAL REPORT FOR GEDU TOWN, CHHUKHA

246440 246620 246800 246980 247160 247340 247520 247700 247880 248060 248240 248420 248600

480060  
479880  
479700  
479520  
479340  
479160  
478980  
478800  
478620  
478440  
478260  
478080  
477900  
477720  
477540  
477360  
477180  
477000  
476820

480060  
479880  
479700  
479520  
479340  
479160  
478980  
478800  
478620  
478440  
478260  
478080  
477900  
477720  
477540  
477360  
477180  
477000  
476820



**ENGINEERING GEOLOGICAL UNIT**

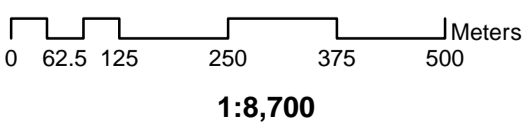
- Residual Soil
- Colluvium
- Ground Subsidence
- Tension Crack
- Bedrock Exposure
- Scarp Edge
- Landslide Scar
- 20 Strike and Dip of Foliation with Amount
- Spring Source

**LEGEND:**

- |  |  |
|--|--|
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #ffcdd2; border: 1px solid black; margin-right: 5px;"></span> Permanent Building  | <span style="display: inline-block; border: 1px solid black; margin-right: 5px;"></span> Study Area  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #e1bee7; border: 1px solid black; margin-right: 5px;"></span> Semi-permanent House  | <span style="display: inline-block; width: 20px; height: 10px; background-color: #add8e6; border: 1px solid black; margin-right: 5px;"></span> Pond  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #ff0000; border: 1px solid black; margin-right: 5px;"></span> Lhakhang  | <span style="display: inline-block; width: 10px; height: 10px; background-color: #0000ff; border: 1px solid black; margin-right: 5px;"></span> / <span style="display: inline-block; width: 10px; height: 10px; background-color: #0000ff; border: 1px solid black; margin-right: 5px;"></span> Water Tank |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #9e27b0; border: 1px solid black; margin-right: 5px;"></span> Hut   | <span style="display: inline-block; width: 20px; height: 10px; background-color: #0000ff; border: 1px solid black; margin-right: 5px;"></span> Perennial Stream  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #424242; border: 1px solid black; margin-right: 5px;"></span> Ruined House  | <span style="display: inline-block; width: 20px; height: 10px; background-color: #0000ff; border: 1px solid black; margin-right: 5px;"></span> Non-perennial Stream  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #ff0000; border: 1px solid black; margin-right: 5px;"></span> Chorten   | <span style="display: inline-block; width: 20px; height: 10px; background-color: #0000ff; border: 1px solid black; margin-right: 5px;"></span> Drainage  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #ffff00; border: 1px solid black; margin-right: 5px;"></span> Sangthab  | <span style="display: inline-block; width: 20px; border-bottom: 1px dashed black; margin-right: 5px;"></span> Footpath   |
| <span style="display: inline-block; width: 20px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> / <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Canopy | <span style="display: inline-block; width: 20px; border-bottom: 1px dashed black; margin-right: 5px;"></span> Contour (5m Interval)  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #8d6e23; border: 1px solid black; margin-right: 5px;"></span> Shed  | <span style="display: inline-block; width: 20px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Telecom Tower  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #e8f5e9; border: 1px solid black; margin-right: 5px;"></span> Greenhouse  | <span style="display: inline-block; width: 20px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Clock Tower  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #c8e6c9; border: 1px solid black; margin-right: 5px;"></span> Toilet  |  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #fff9c4; border: 1px solid black; margin-right: 5px;"></span> Septic Tank   |  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #e0e0e0; border: 1px solid black; margin-right: 5px;"></span> Playground  |  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #bdbdbd; border: 1px solid black; margin-right: 5px;"></span> Parking   |  |
| <span style="display: inline-block; width: 20px; border-bottom: 2px solid black; margin-right: 5px;"></span> Road  |  |

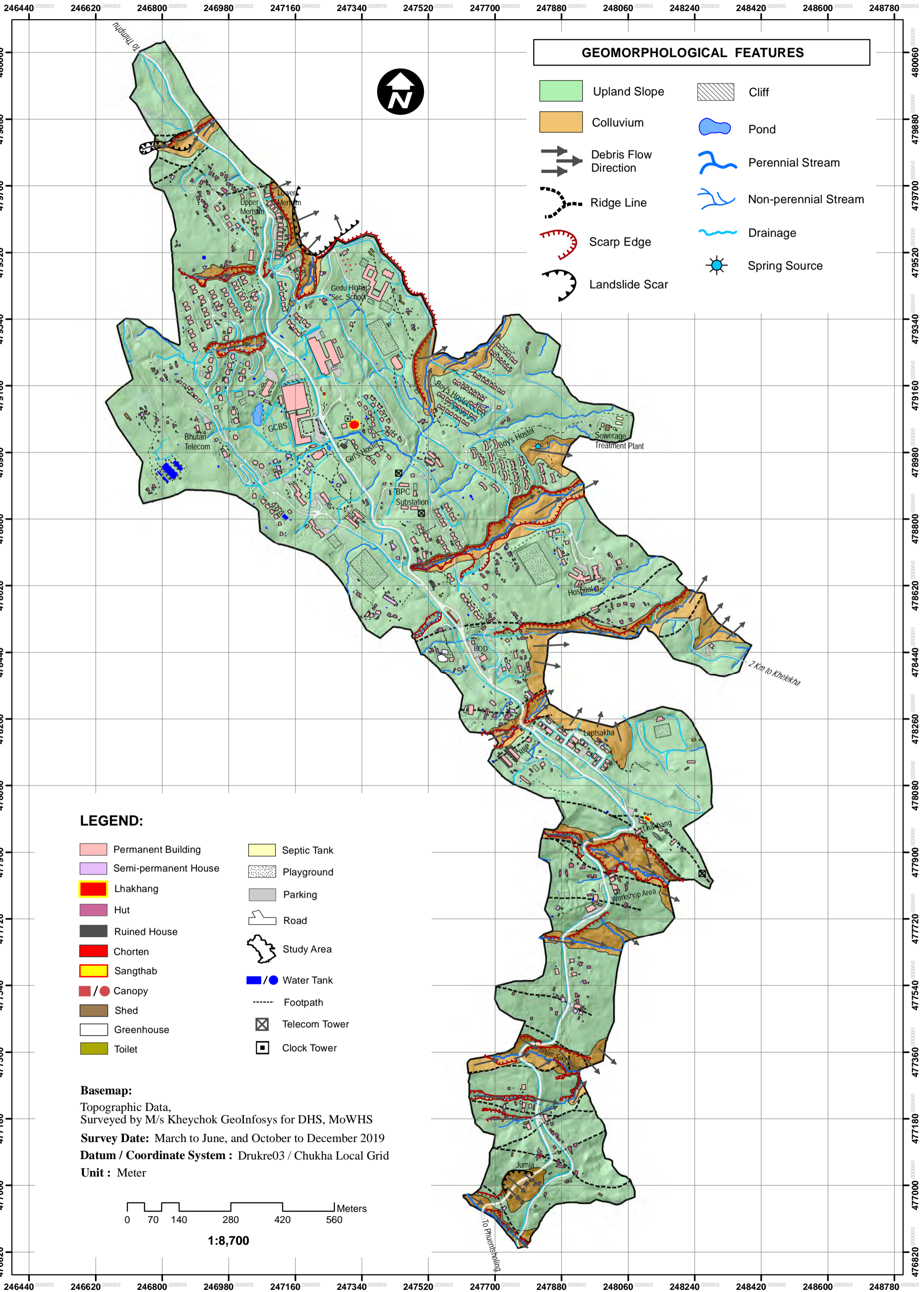
**Basemap:**

Topographic Data,  
 Surveyed by M/s Kheychock GeoInfosys for DHS, MoWHS  
**Survey Date:** March to June, and October to December 2019  
**Datum / Coordinate System :** Drukre03 / Chukha Local Grid  
**Unit :** Meter



# GEOMORPHOLOGY:

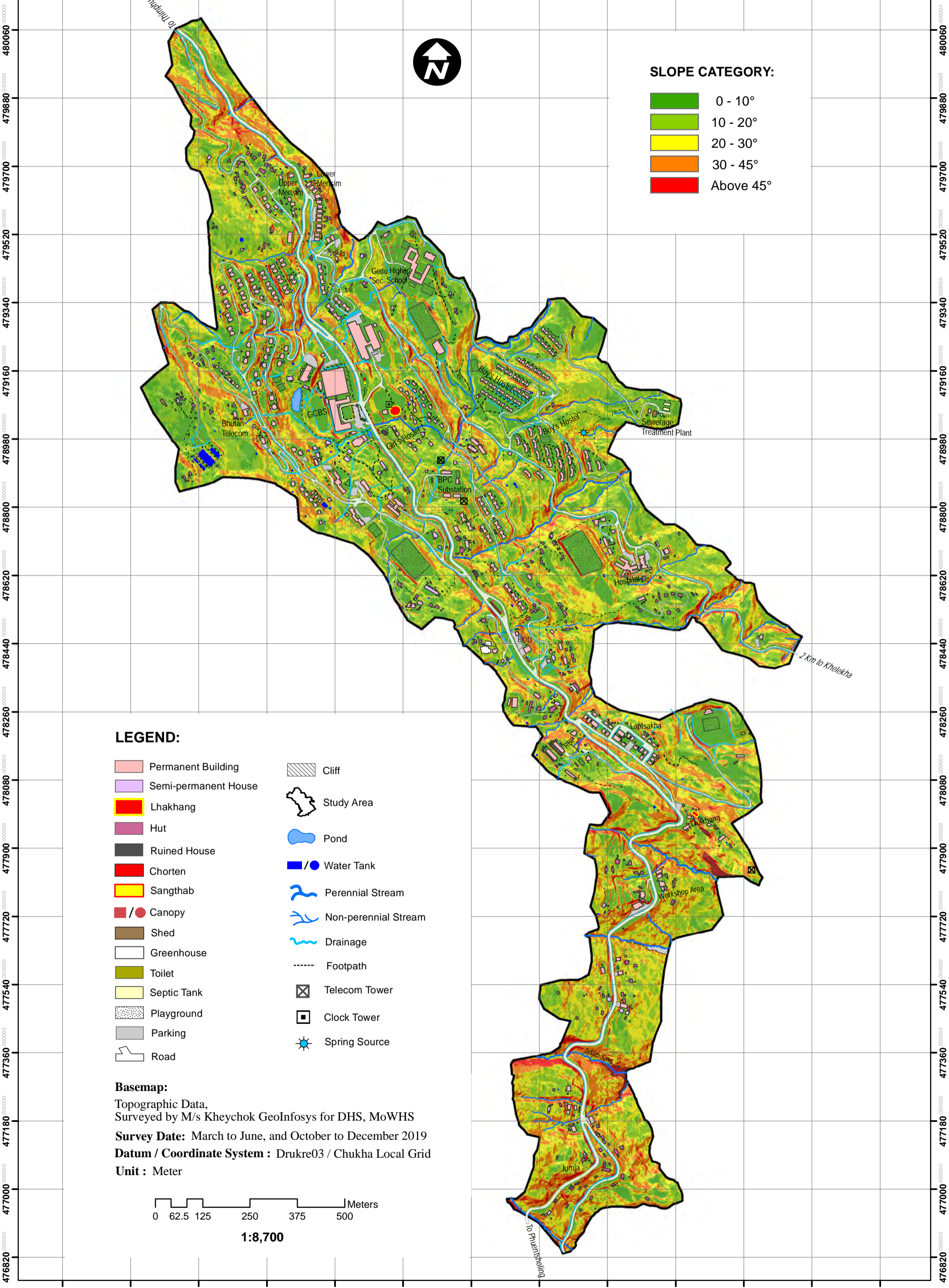
# GEOTECHNICAL REPORT FOR GEDU TOWN, CHHUKHA



# SLOPE MAP:

# GEOTECHNICAL REPORT FOR GEDU TOWN, CHHUKHA

246440 246620 246800 246980 247160 247340 247520 247700 247880 248060 248240 248420 248600



### SLOPE CATEGORY:

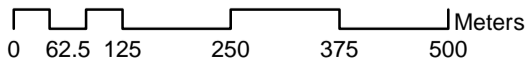
- 0 - 10°
- 10 - 20°
- 20 - 30°
- 30 - 45°
- Above 45°

### LEGEND:

- |   |   |
|---|---|
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #FFC0CB; border: 1px solid black; margin-right: 5px;"></span> Permanent Building   | <span style="display: inline-block; width: 20px; height: 10px; border-bottom: 1px solid black; margin-right: 5px;"></span> Cliff                          |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #DDA0DD; border: 1px solid black; margin-right: 5px;"></span> Semi-permanent House | <span style="display: inline-block; border: 1px solid black; margin-right: 5px;"></span> Study Area   |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #FF0000; border: 1px solid black; margin-right: 5px;"></span> Lhakhang             | <span style="display: inline-block; width: 20px; height: 10px; background-color: #ADD8E6; border: 1px solid black; margin-right: 5px;"></span> Pond       |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #800080; border: 1px solid black; margin-right: 5px;"></span> Hut                  | <span style="display: inline-block; width: 20px; height: 10px; background-color: #0000FF; border: 1px solid black; margin-right: 5px;"></span> Water Tank |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #333333; border: 1px solid black; margin-right: 5px;"></span> Ruined House         | <span style="display: inline-block; width: 20px; height: 10px; border-bottom: 1px solid blue; margin-right: 5px;"></span> Perennial Stream                |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #FF0000; border: 1px solid black; margin-right: 5px;"></span> Chorten              | <span style="display: inline-block; width: 20px; height: 10px; border-bottom: 1px dashed blue; margin-right: 5px;"></span> Non-perennial Stream           |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #FFFF00; border: 1px solid black; margin-right: 5px;"></span> Sangthab             | <span style="display: inline-block; width: 20px; height: 10px; border-bottom: 1px dotted blue; margin-right: 5px;"></span> Drainage                       |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #800000; border: 1px solid black; margin-right: 5px;"></span> Canopy               | <span style="display: inline-block; width: 20px; height: 10px; border-bottom: 1px dashed black; margin-right: 5px;"></span> Footpath                      |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #8B4513; border: 1px solid black; margin-right: 5px;"></span> Shed                 | <span style="display: inline-block; width: 20px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Telecom Tower                         |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #E0E0E0; border: 1px solid black; margin-right: 5px;"></span> Greenhouse           | <span style="display: inline-block; width: 20px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Clock Tower                           |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #808000; border: 1px solid black; margin-right: 5px;"></span> Toilet               | <span style="display: inline-block; width: 20px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Spring Source                         |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #FFFF00; border: 1px solid black; margin-right: 5px;"></span> Septic Tank          |   |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #D3D3D3; border: 1px solid black; margin-right: 5px;"></span> Playground           |   |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: #A9A9A9; border: 1px solid black; margin-right: 5px;"></span> Parking              |   |
| <span style="display: inline-block; width: 20px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Road  |   |

### Basemap:

Topographic Data,  
 Surveyed by M/s Kheychock GeoInfosys for DHS, MoWHS  
**Survey Date:** March to June, and October to December 2019  
**Datum / Coordinate System :** Drukre03 / Chukha Local Grid  
**Unit :** Meter



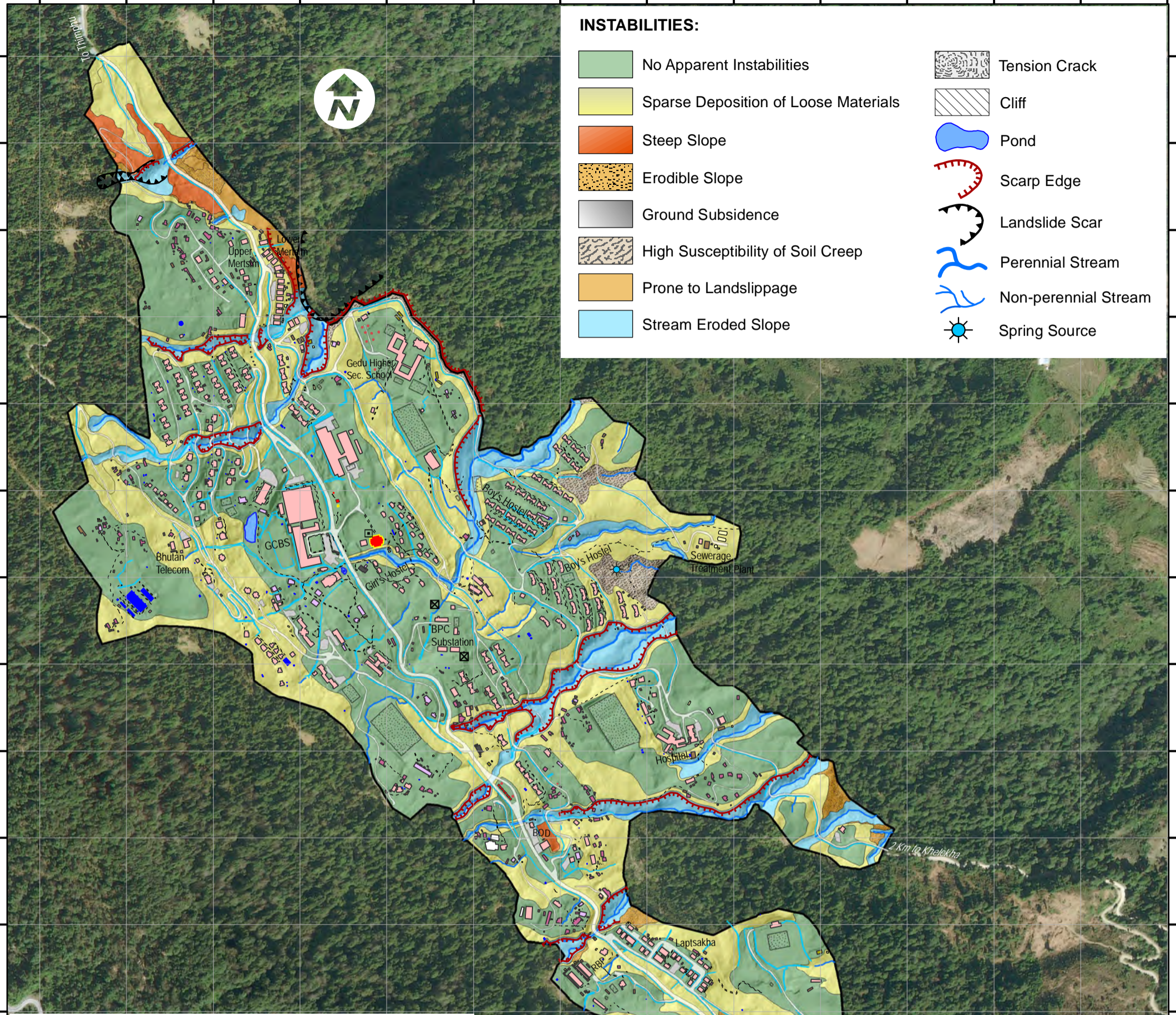
**1:8,700**

246440 246620 246800 246980 247160 247340 247520 247700 247880 248060 248240 248420 248600

















# SLOPE INSTABILITY::

# GEOTECHNICAL REPORT FOR GEDU TOWN, CHHUKHA






















246620 246800 246980 247160 247340 247520 247700 247880 248060 248240 248420 248600 248780 248960



### INSTABILITIES:

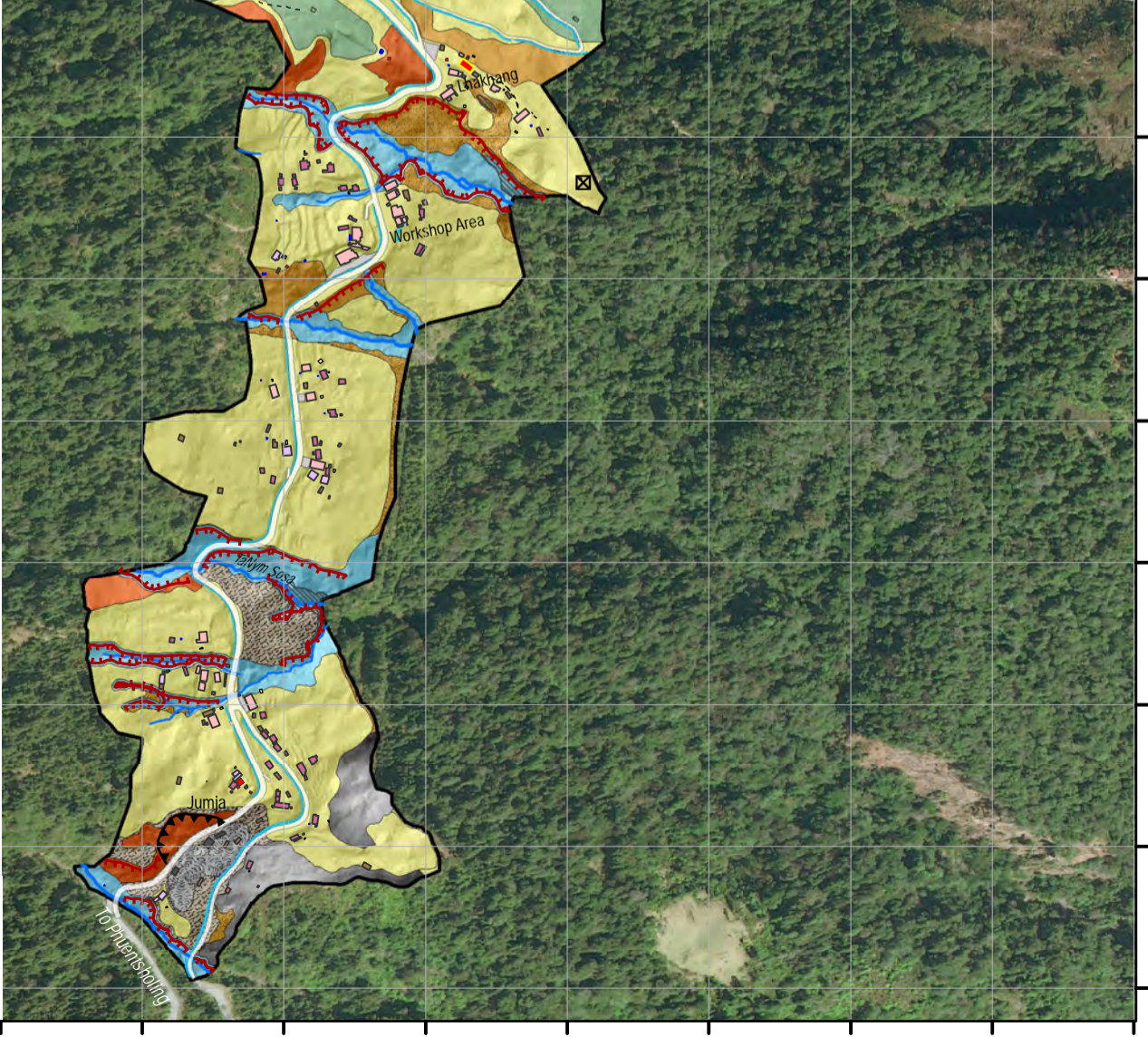
- |  |  |
|--|--|
|  No Apparent Instabilities            |  Tension Crack        |
|  Sparse Deposition of Loose Materials |  Cliff                |
|  Steep Slope                          |  Pond                 |
|  Erodible Slope                       |  Scarp Edge           |
|  Ground Subsidence                    |  Landslide Scar       |
|  High Susceptibility of Soil Creep    |  Perennial Stream     |
|  Prone to Landslipping                |  Non-perennial Stream |
|  Stream Eroded Slope                  |  Spring Source        |

### LEGEND:

 Permanent Building	 Playground
 Semi-permanent House	 Parking
 Lhakhang	 Road
 Hut	 Study Area
 Ruined House	 Water Tank
 Chorten	 Drainage
 Sangthab	 Footpath
 Canopy	 Telecom Tower
 Shed	 Clock Tower
 Greenhouse	
 Toilet	
 Septic Tank	

**Basemap:**  
 Topographic Data,  
 Surveyed by M/s Kheychock GeoInfosys for DHS, MoWHS  
**Survey Date:** March to June, and October to December 2019  
**Datum / Coordinate System :** Drukre03 / Chukha Local Grid  
**Unit :** Meter

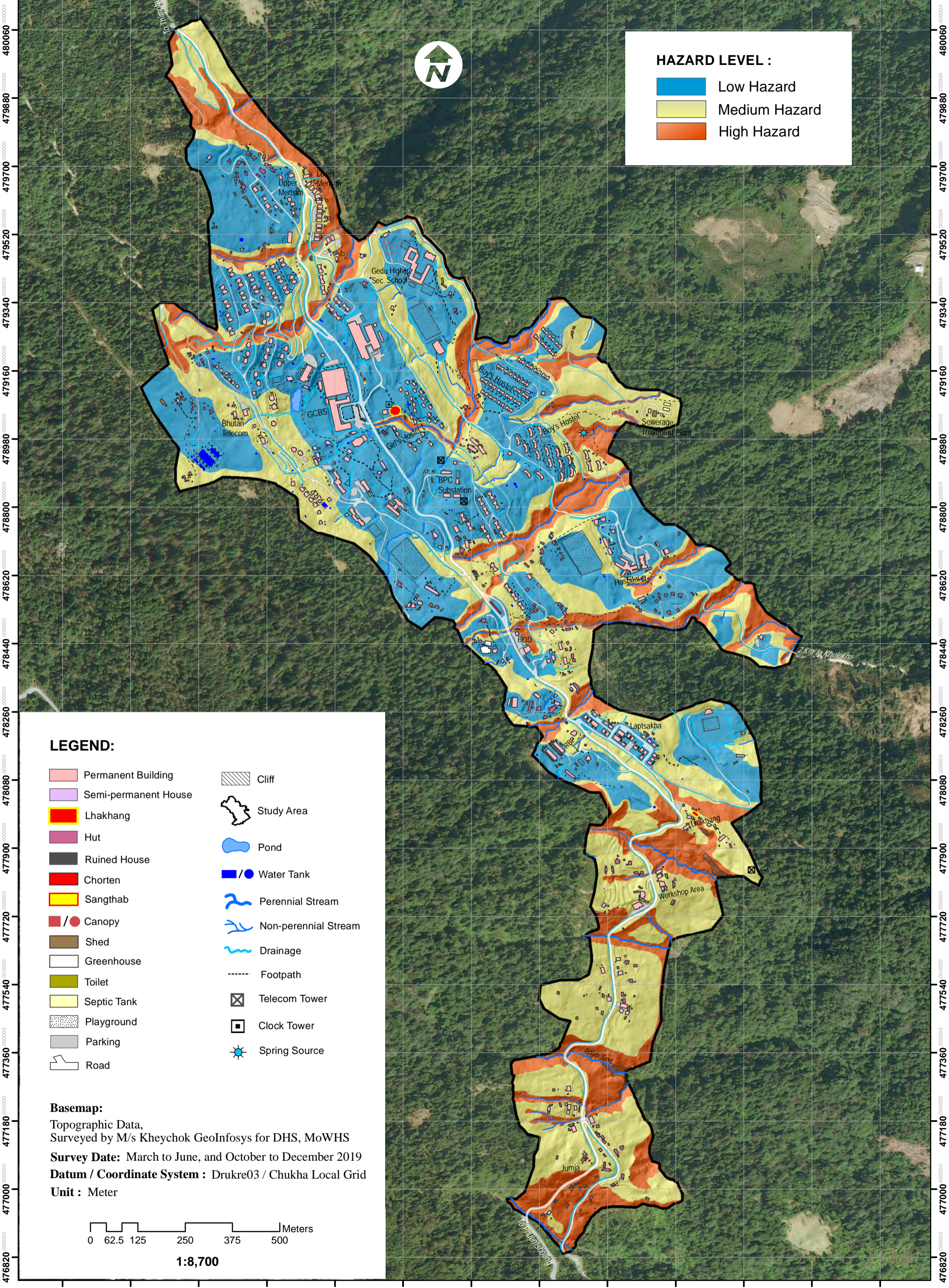
0 62.5 125 250 375 500 Meters  
**1:8,700**



246620 246800 246980 247160 247340 247520 247700 247880 248060 248240 248420 248600 248780 248960

# HAZARD ZONATION MAP: GEOTECHNICAL REPORT FOR GEDU TOWN, CHHUKHA

246440 246620 246800 246980 247160 247340 247520 247700 247880 248060 248240 248420 248600



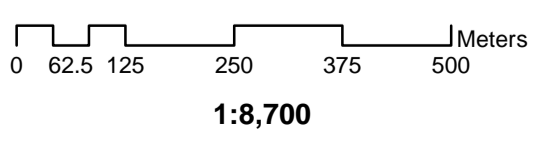
**HAZARD LEVEL :**

- Low Hazard
- Medium Hazard
- High Hazard

**LEGEND:**

- |  |  |
|--|--|
| <span style="display: inline-block; width: 20px; height: 10px; background-color: pink; border: 1px solid black;"></span> Permanent Building  | <span style="display: inline-block; width: 20px; height: 10px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px); border: 1px solid black;"></span> Cliff |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: lightpurple; border: 1px solid black;"></span> Semi-permanent House   | <span style="border: 2px solid black; padding: 2px; display: inline-block; width: 20px; height: 10px;"></span> Study Area  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: red; border: 1px solid black;"></span> Lhakhang   | <span style="display: inline-block; width: 20px; height: 10px; background-color: lightblue; border: 1px solid black; border-radius: 50%;"></span> Pond   |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: purple; border: 1px solid black;"></span> Hut   | <span style="display: inline-block; width: 20px; height: 10px; background-color: blue; border: 1px solid blue; border-radius: 50%;"></span> Water Tank   |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: grey; border: 1px solid black;"></span> Ruined House  | <span style="display: inline-block; width: 20px; height: 10px; background-color: blue; border: 1px solid blue; border-radius: 50%;"></span> Perennial Stream   |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: red; border: 1px solid black;"></span> Chorten  | <span style="display: inline-block; width: 20px; height: 10px; background-color: blue; border: 1px solid blue; border-radius: 50%;"></span> Non-perennial Stream   |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: yellow; border: 1px solid black;"></span> Sangthab  | <span style="display: inline-block; width: 20px; height: 10px; background-color: blue; border: 1px solid blue; border-radius: 50%;"></span> Drainage   |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: red; border: 1px solid black;"></span> / <span style="display: inline-block; width: 10px; height: 10px; background-color: red; border: 1px solid black; border-radius: 50%;"></span> Canopy | <span style="border-bottom: 1px dashed black; width: 20px; display: inline-block;"></span> Footpath  |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: brown; border: 1px solid black;"></span> Shed   | <span style="display: inline-block; width: 20px; height: 10px; border: 1px solid black; border-style: dashed;"></span> Telecom Tower   |
| <span style="display: inline-block; width: 20px; height: 10px; border: 1px solid black; border-style: dashed;"></span> Greenhouse  | <span style="display: inline-block; width: 20px; height: 10px; border: 1px solid black; border-style: dashed;"></span> Clock Tower   |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: green; border: 1px solid black;"></span> Toilet   | <span style="display: inline-block; width: 20px; height: 10px; background-color: yellow; border: 1px solid black;"></span> Septic Tank   |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: yellow; border: 1px solid black;"></span> Playground  | <span style="display: inline-block; width: 20px; height: 10px; background-color: grey; border: 1px solid black;"></span> Parking   |
| <span style="display: inline-block; width: 20px; height: 10px; background-color: grey; border: 1px solid black;"></span> Road  | <span style="display: inline-block; width: 20px; height: 10px; background-color: grey; border: 1px solid black;"></span> Spring Source   |

**Basemap:**  
 Topographic Data,  
 Surveyed by M/s Kheychok GeoInfosys for DHS, MoWHS  
**Survey Date:** March to June, and October to December 2019  
**Datum / Coordinate System :** Drukre03 / Chukha Local Grid  
**Unit :** Meter



476820 477000 477180 477360 477540 477720 477900 478080 478260 478440 478620 478800 478980 479160 479340 479520 479700 479880 480060