

Landslide Incidences on NH-22, Solan district, Himachal Pradesh

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| DATA SHEET FOR PRILIMINARY INVESTIGATION OF LANDSLIDE | | |
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| No | Field | Description |
| 1 | Slide No (LS.No.) | : <i>H.P./SOL/53F01/2018</i> |
| 2 | State | : <i>Name: Himachal Pradesh</i> |
| 3 | District | : <i>Name: Solan</i> |
| 4 | Toposheet | : <i>No. 53F/1</i> |
| 5 | Name of the slide | <i>NH-22/ RD: 87+480</i> |
| 6 | NH/SH/Locality | : <i>NH-22/ RD: 87+480/3km away from Kumarhatti to Chandigarh on Shimla-Chandigarh Road.</i> |
| 7 | Latitude | : <i>30° 53.479'</i> |
| 8 | Longitude | : <i>77°02.587'</i> |
| 9 | Length | : <i>±16m</i> |
| 10 | Width | : <i>±25m</i> |
| 11 | Height | : <i>±15m</i> |
| 12 | Area | : <i>--</i> |
| 13 | Depth | : <i>Shallow</i> |
| 14 | Volume | : <i>--</i> |
| 15 | Run out distance | : <i>6-7m</i> |
| 16 | Type of Material | : <i>Rock-cum-debris</i> |
| 17 | Type of movement | : <i>Slide</i> |
| 18 | Rate of movement | : <i>Moderate</i> |
| 19 | Activity | : <i>Active</i> |
| 20 | Distribution | : <i>Retrogressive</i> |
| 21 | Style | : <i>Single</i> |
| 22 | Failure mechanism | : <i>Shallow translational</i> |
| 23 | History | : <i>Active (During the Monsoon of 2018)</i> |
| 24 | Geomorphology | : <i>Moderately Dissected Hill</i> |
| 25 | Geology | : <i>Sandstone and mudstone of Dagshai Formation of Sirmour Group of Rocks.</i> |
| 26 | Structure | : <i>Three Sets of Joints: J₁(Bedding Plane):30⁰/N250⁰, J₂:40-50⁰/N135⁰, J₃: 45-50⁰/N135⁰</i> |
| 27 | Landuse/ Land cover | : <i>Forest/Anthropogenic activity, sparsely vegetated.</i> |
| 28 | Hydrological condition | : <i>Dry</i> |
| 29 | Triggering Factor | : <i>Rainfall/ road cutting, Highly Jointed rockmass</i> |
| 30 | Death of persons | : <i>N.A.</i> |
| 31 | People affected | : <i>N.A.</i> |
| 32 | Livestock loss | : <i>N.A.</i> |
| 33 | Communication | : <i>Road blocked at the time of incidence and subsequently cleared.</i> |
| 34 | Infrastructure | : <i>No damage</i> |

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| 35 | Agriculture/forest/Barren | : | <i>Sparsely vegetated</i> |
| 36 | Geo-scientific Causes | : | <i>Anthropogenic activities; unplanned cutting of slope, rainfall.</i> |
| 37 | Remedial measures | : | -- |
| 38 | Remarks | : | <i>N.A.</i> |



Field Photograph of Slide along NH-22, Chandigarh, Shimla, Road, at RD: 87+480



Google Earth Image of the Slide at NH-22/ RD: 87+480 (Source: Google Earth).

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| 40 | Summary/Abstract | : | <i>Slide is a shallow translational slide and is active state Rock mass is jointed. Three main discontinuities are J_1(Bedding Plane):$30^0/N250^0$, J_2:$40-50^0/N135^0$, J_3: $45-50^0/N135^0$.Lithologically the slide comprises thickly bedded, alternate mudstone and sandstone bands of</i> |
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| | | | <i>Dagshai Formation.</i> |
| 41 | Pdf | : | -- |

Date: 14/08/2018

Name: 1) Parveen Kumar, Senior Geologist
2) Dr. Vinod Kumar, Senior Geologist

Place: Dhrampur, Solan, H.P.

Division: Engineering Geology Division

| DATA SHEET FOR PRILIMINARY INVESTIGATION OF LANDSLIDE | | | |
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| No | Field | | Description |
| 1 | Slide No (LS.No.) | : | <i>H.P./SOL/53F01/2018</i> |
| 2 | State | : | <i>Name: Himachal Pradesh</i> |
| 3 | District | : | <i>Name: Solan</i> |
| 4 | Toposheet | : | <i>No. 53F/1</i> |
| 5 | Name of the slide | | <i>NH-22/ RD: 71+300 to 71+420</i> |
| 6 | NH/SH/Locality | : | <i>NH-22/ RD: 71+300 to 71+420/ChakkiMorh</i> |
| 7 | Latitude | : | <i>30° 51.186'</i> |
| 8 | Longitude | : | <i>77°00.097'</i> |
| 9 | Length | : | <i>20-35m</i> |
| 10 | Width | : | <i>100m</i> |
| 11 | Height | : | <i>18-30m</i> |
| 12 | Area | : | -- |
| 13 | Depth | : | <i>±5m</i> |
| 14 | Volume | : | -- |
| 15 | Run out distance | : | <i>15m</i> |
| 16 | Type of Material | : | <i>Rock-cum-debris</i> |
| 17 | Type of movement | : | <i>Slide</i> |
| 18 | Rate of movement | : | <i>Moderate</i> |
| 19 | Activity | : | <i>Reactivated</i> |
| 20 | Distribution | : | <i>Retrogressive/Widening</i> |
| 21 | Style | : | <i>Single</i> |
| 22 | Failure mechanism | : | <i>Shallow rotational</i> |
| 23 | History | : | <i>Started during the 2017 monsoon and reactivated on 13/08/2018.</i> |
| 24 | Geomorphology | : | <i>Moderately Dissected Hill</i> |
| 25 | Geology | : | <i>Sandstone and mudstone of Dagshai Formation of Sirmour Group of Rocks.</i> |
| 26 | Structure | : | <i>Mainly Three Discontinuities are $J_1:(\text{Bedding Plane}) 30^0-40^0/N155^0$, $J_2 = 50-75^0/N245^0$, $J_3:50^0/N180^0$</i> |
| 27 | Landuse/ Land cover | : | <i>Forest</i> |
| 28 | Hydrological condition | : | <i>Wet, seepage of water</i> |
| 29 | Triggering Factor | : | <i>Rainfall</i> |
| 30 | Death of persons | : | <i>N.A.</i> |

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| 31 | People affected | : | <i>N.A.</i> |
| 32 | Livestock loss | : | <i>N.A.</i> |
| 33 | Communication | : | <i>Road blocked on the morning of 13/08/2018 at 6 am and opened up/cleared on the evening of 14/08/2018 at 3PM.</i> |
| 34 | Infrastructure | : | <i>Road, breast wall and retaining wall are damaged</i> |
| 35 | Agriculture/forest/Barren | : | <i>Forest</i> |
| 36 | Geo-scientific Causes | : | <i>Anthropogenic activities; unplanned cutting of slope, rainfall, reduction of strength on saturation.</i> |
| 37 | Remedial measures | : | <i>--</i> |
| 38 | Remarks | : | <i>Detailed studies are required to provide suitable remedial measures for stabilization of slope.</i> |



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| 40 | Summary/Abstract | : | <i>ChakiMorh slide is a shallow rotational slide and is reactivated on 13-08-2018. Road blocked on the morning of 13/08/2018 at 6 am and opened up/cleared on the evening of 14/08/2018 at 3PM. Three Discontinuities recorded in the slide area J_1; (Bedding Plane) 30^0-40^0</i> |
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| | | | $/N155^0, J_2:50-75^0/N245^0, J_3:50^0/N180^0$ |
| 41 | Pdf | : | -- |

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| 1 | Slide No (LS.No.) | : | <i>H.P./SOL/53F01/2018</i> |
| 2 | State | : | <i>Name: Himachal Pradesh</i> |
| 3 | District | : | <i>Name: Solan</i> |
| 4 | Toposheet | : | <i>No. 53F/1</i> |
| 5 | Name of the slide | | <i>NH-22/ RD: 71+100 to 71+200</i> |
| 6 | NH/SH/Locality | : | <i>NH-22/ RD: 71+100 to 71+200/Dattyar Village, near ChakiMorh</i> |
| 7 | Latitude | : | <i>30° 51.097'</i> |
| 8 | Longitude | : | <i>76°59.950'</i> |
| 9 | Length | : | <i>25m</i> |
| 10 | Width | : | <i>100m</i> |
| 11 | Height | : | <i>23m</i> |
| 12 | Area | : | <i>m 2</i> |
| 13 | Depth | : | <i>±3m</i> |
| 14 | Volume | : | <i>m³</i> |
| 15 | Run out distance | : | <i>6m</i> |
| 16 | Type of Material | : | <i>Rock-cum-debris</i> |
| 17 | Type of movement | : | <i>Slide</i> |
| 18 | Rate of movement | : | <i>Moderate</i> |
| 19 | Activity | : | <i>Reactivated</i> |
| 20 | Distribution | : | <i>Retrogressive/Widening</i> |
| 21 | Style | : | <i>Single</i> |
| 22 | Failure mechanism | : | <i>Shallow rotational</i> |
| 23 | History | : | <i>Started in the month of June2018 and reactivated on 13/08/2018 after heavy downpour</i> |
| 24 | Geomorphology | : | <i>Hill-Slope</i> |
| 25 | Geology | : | <i>Dagshai Formation of Sirmour Group of Rocks.</i> |
| 26 | Structure | : | <i>Mainly Three Discontinuities are J_1(Bedding Plane):$65^0/N270^0$, J_2(V.D.):$70-75^0/N160^0$, J_3:$45^0/N225^0$, J_4:$45^0/N90^0$ Rock mass is sheared, shattered and crumbled.</i> |
| 27 | Landuse/ Land cover | : | <i>Forest, High tension tower.</i> |
| 28 | Hydrological condition | : | <i>Dry</i> |
| 29 | Triggering Factor | : | <i>Rainfall, Road Cutting.</i> |

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| 30 | Death of persons | : | <i>N.A.</i> |
| 31 | People affected | : | <i>N.A.</i> |
| 32 | Livestock loss | : | <i>N.A.</i> |
| 33 | Communication | : | <i>Road blocked, One-way traffic.</i> |
| 34 | Infrastructure | : | <i>Road, breast wall and retaining wall are damaged</i> |
| 35 | Agriculture/forest/Barren | : | <i>Forest</i> |
| 36 | Geo-scientific Causes | : | <i>Unplanned cutting of slope, reduction of strength on saturation.</i> |
| 37 | Remedial measures | : | |
| 38 | Remarks | : | <i>N.A.</i> |

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Field Photograph of Dattyar Village Slide at RD of 71+100 to 71+200 along NH-22



Location map of the slide along NH-22/ RD: 87+480, (Source: Google Earth)

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Summary/Abstract

Dattyar Village Slide at RD of 71+100 is a rock-cum-debris Shallow rotational slide that got activated in the month of June 2018 during road cutting and reactivated on

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| | | <i>13/08/2018 after heavy downpour. Lithologically, the slide area comprises alternate mudstone sandstone bands of Dagshai, Formation of Sirmour Group of Rocks. Main discontinuities recorded in the slide area are J₁ (Bedding Plane):65°/N270°, J₂ (V.D.):70-75°/N160°, J₃:45°/N225°, J₄:45°/N90°. The rockmass is sheared, shattered and crumbled. A shear zone on the right fringe is also present. Road, breast wall and retaining wall are damaged. The slide has resulted due to unplanned cutting of slope, making slope unstable and after heavy downpour the strength of the rock mass reduced due to saturation.</i> |
| 41 | Pdf | : -- |



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| 1 | Slide No (LS.No.) | : <i>H.P./SOL/53F01/2018</i> |
| 2 | State | : <i>Name: Himachal Pradesh</i> |
| 3 | District | : <i>Name: Solan</i> |
| 4 | Toposheet | : <i>No. 53F/1</i> |
| 5 | Name of the slide | <i>NH-22/ RD: 70+750 to 70+950</i> |
| 6 | NH/SH/Locality | : <i>NH-22/ RD: 70+750 to 70+950/Dattyar Village,</i> |
| 7 | Latitude | : <i>30° 51.033'</i> |
| 8 | Longitude | : <i>76°59.881'</i> |
| 9 | Length | : <i>5 to 20m</i> |
| 10 | Width | : <i>200m</i> |
| 11 | Height | : <i>18m</i> |
| 12 | Area | : <i>m²</i> |
| 13 | Depth | : <i>±2m</i> |
| 14 | Volume | : <i>m³</i> |
| 15 | Run out distance | : <i>5m</i> |
| 16 | Type of Material | : <i>Rock-cum-debris</i> |
| 17 | Type of movement | : <i>Slide</i> |
| 18 | Rate of movement | : <i>Moderate</i> |
| 19 | Activity | : <i>Reactivated</i> |
| 20 | Distribution | : <i>Retrogressive/Widening</i> |
| 21 | Style | : <i>Single</i> |
| 22 | Failure mechanism | : <i>Shallow failure</i> |
| 23 | History | : <i>Started in the month of June 2018 and reactivated one week ago from the date observation, i.e 14/08/2018</i> |
| 24 | Geomorphology | : <i>Moderately Dissected Hill.</i> |

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|----|--|--|---|
| 25 | Geology | : | <i>Kasuali Formation of Sirmour Group of Rocks.</i> |
| 26 | Structure | : | <i>Three sets of joints. $J_1(V.D.):40^0-60^0/N170^0$, $J_2: 45^0-75^0/N260^0$, $J_3:50^0/N50^0$</i> |
| 27 | Landuse/ Land cover | : | <i>Forest</i> |
| 28 | Hydrological condition | : | <i>Dry</i> |
| 29 | Triggering Factor | : | <i>Rainfall, Road Cutting.</i> |
| 30 | Death of persons | : | <i>N.A.</i> |
| 31 | People affected | : | <i>N.A.</i> |
| 32 | Livestock loss | : | <i>N.A.</i> |
| 33 | Communication | : | <i>Road blocked, One-way traffic.</i> |
| 34 | Infrastructure | : | <i>Breast wall damaged</i> |
| 35 | Agriculture/forest/Barren | : | <i>Forest</i> |
| 36 | Geo-scientific Causes | : | <i>Wedge failure, Reduction of strength on saturation, unplanned cutting of slope</i> |
| 37 | Remedial measures | : | <i>.....</i> |
| 38 | Remarks | : | <i>N.A.</i> |
| 39 |  <p><i>Field Photograph of Dattyar Village Slide at RD of 70+750 to 70+950 along NH-22</i></p>  <p><i>Location map of the slide NH-22/ RD: 87+480 (Source: Google Earth).</i></p> | | |
| 40 | Summary/Abstract | <i>Dattyar Village Slide at RD of 70+750 to 70+950 along NH-22 is a rock-cum-debris Shallow rotational and shallow</i> | |

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| | | <p><i>planar slide that got activated in the month of June 2018 during road cutting and reactivated one week before the date of observation. Lithologically slide area comprise sandstone bands of Kasuali Formation of Sirmour Group of Rocks. Three sets of joints recorded in the slide area are J₁ (V.D.):40°-60°/N170°, J₂: 45°-75°/N260°, J₃:50°/N50°. Breast wall is damaged. The slide has resulted due to unplanned cutting of slope, making slope unstable and after heavy downpour the strength of the rock mass reduced due to super saturation.</i></p> |
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