Acknowledgements

Thanks to:

Andrew Gibson (BGS)
Catherine Poulton (BGS)
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• Types and scales of landslide hazard in Britain (5)
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• Conclusions
• Information
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Types and scales of landslide hazard (1)

Folkestone Warren, Kent, 1915
Chalk, clay (Cretaceous)
No fatalities
Types and scales of landslide hazard (2)
Many landslide events recorded since 1716

Folkestone Warren
2004
Types and scales of landslide hazard (3)

Nefyn, Gwynedd, North Wales, Jan 2001

Glacial deposits

1 fatality
Types and scales of landslide hazard

Whitehaven, Cumbria, Jan 2007

Mine spoil

1 fatality
Types and scales of landslide hazard (5)

St. Dogmaels, Dyfed, Wales, Feb 1994
No fatalities
National Landslide Information Centre

• Currently holds over **14,500** landslide records in Great Britain
• Is an Oracle database with a Microsoft Access front end
• Aims to collect, document and store both current and historic landslide information for Great Britain

• Displays information in database and GIS format
• Is responsive to new landslides: geologists and geomorphologists ‘on-the-ground’ as soon as possible to collect data
• Maintains contact with local government bodies to supply information
• Used by BGS, university students, commercial companies, members of the public …
National Landslide Database

History

• Inherited initial database from Geomorphological Services Ltd (GSL)
• This database documented landslides by trawling through reports, papers, maps etc
• Named and located landslides to eight-figure grid references
• Documented basic information for over 8000 landslides
• Included references
• This was then put into the BGS National Landslide Database in 2002
• Data from many other sources continually entered ever since
National Landslide Database (2)

What is recorded?

• The National Landslide Database holds records of each landslide EVENT.

• The database records are a summary of information collected during a survey.

• For landslides with more than one event, there can be multiple surveys linked to one Landslide ID number

• Differentiate information about landslide and surrounding slope

• All information is qualified using confidence and provenance fields with a stringent QA system

• Landslide information recorded for Great Britain only
National Landslide Database (3)

How are landslides located?

• Landslides are captured as point data and are located to the highest point on the backscarp to twelve-figure grid references

• Hope to link to polygon data such as BGS geological maps in near future
What is recorded?

- Grid reference (12 figs)
- Landslides name & location info
- Survey date
- Who surveyed landslide (if BGS)
- Dimensions
- Elevation
- Material
- Movement type
- Movement date
- Vegetation, water on landslide
- Age and development of landslide
- Trigger(s)
What is recorded?

- Slope angle and height
- Slope aspect
- Vegetation, water on slope
- Damage caused by landslide
- Geology down entire slope
- Presence of faults
- Fatalities and injuries
- Cost with calculator to convert into ‘today’s prices’
- Any other additional information
- Bibliographic references to where information came from
National Landslide Database (6)

Where does the information come from?

• BGS geological maps (historic and current)
• Reports (confidential and mainstream)
• Papers
• Other databases
• Regional surveys
• MSc, PhD theses
• Local government offices
• Media reports (newspapers, radio/tv reports, web pages)
National Landslide Database

How are the data qualified?

- Every change or update is automatically recorded in a QA trail integrated into the database.
- Information recorded includes who made a change or update a record and when.

- When a record is relocated or checked for location accuracy, the user records that they have checked it and that they are happy that the information in this record is correct.
National Landslide Database (8)

How are the data displayed?

• The database is linked to a GIS in which the point data are displayed
• Data can be extracted from the database as either a spreadsheet or report
National Landslide Database (9)

Databased landslides

ARC9 GIS
National Landslide Database

National Landslide Database GIS Tool

- Developed by BGS
- Enables point data to be moved in the GIS and several fields automatically updated in the database
- Enables quick selection of landslide records within a polygon. This enables rapid solution to questions such as which landslides are on the London Clay.
Problems encountered

GSL database legacy data

• Grid references not accurate enough. Are still in the process of trawling through their records, locating the original references and re-locating the landslides – very time consuming and therefore costly

• Naming of landslides. Many are named “unnamed” which makes locating them difficult and may result in duplication of records

• Getting information from one database to another

Traditional methods of mapping landslides on geological maps

• Mapped landslide deposit only and NOT the backscarp so makes locating the highest point on the backscarp impossible

• Some geologists mapped backscarps, others didn’t

Large volume of data makes managing changes and updates difficult
Landslide susceptibility rating (1)

NextMap™ DTM → Slope angle

Lithology class

Slope angle → Slope class

formula

Slope stability class → Slope stability map

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<table>
<thead>
<tr>
<th>Hazard rating</th>
<th>Implications for...</th>
<th>Planners</th>
<th>Developers/Geotechnical Engineers</th>
<th>Farmers/Estate managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>No indicators for slope instability identified.</td>
<td>No constraints to land use due to slope instability within site.</td>
<td>Normal desk study and walkover survey of site.</td>
<td>No restrictions on land use due to slope instability</td>
</tr>
<tr>
<td>B</td>
<td>Slope instability problems are unlikely to be present.</td>
<td>No constraints to land use due to slope instability within site.</td>
<td>Normal desk study and walkover survey of site including some consideration of the stability of site surroundings</td>
<td>No restrictions on land use due to slope instability</td>
</tr>
<tr>
<td>C</td>
<td>Slope instability problems may be possible after extreme adverse changes in conditions.</td>
<td>Report on implications for stability should accompany application if construction, or excavation, or major changes to drainage are proposed.</td>
<td>Site investigation should consider specifically the slope stability of the site and surroundings.</td>
<td>Consider effects of change of land use on stability of slopes.</td>
</tr>
<tr>
<td>D</td>
<td>Slope instability problems may be triggered by major adverse changes in conditions.</td>
<td>Land use changes involving, loading, excavation or changes to drainage will affect stability and mitigation measures should accompany application.</td>
<td>A specialist site investigation for slope stability may be necessary before design and construction.</td>
<td>Consider effects of removal of tree cover on slopes, disposal of surface drainage, and maintenance of ditches and culverts on slope stability.</td>
</tr>
<tr>
<td>E</td>
<td>Slope instability problems may be triggered by moderate adverse changes in conditions, such as loading or undercutting susceptible slopes.</td>
<td>Permission for development may require detailed slope stability assessment, mitigation measures and remedial works as part of the application for development. Permission for some development may not be possible.</td>
<td>A specialist slope stability assessment may be necessary. Remediation and/or mitigation works may be necessary to maintain the stability of the area.</td>
<td>Avoid clear felling. Consider slope instability when constructing access roads. Consider changes in land use to improve stability by planting vegetation or improving drainage.</td>
</tr>
<tr>
<td>F</td>
<td>Slope instability problems may be present or triggered by minor, adverse changes in conditions, such as loading or undercutting susceptible slopes.</td>
<td>Permission for development may require detailed slope stability assessment, mitigation measures and remedial works as part of the application for development. Permission for development may not be possible.</td>
<td>A specialist slope stability assessment may be essential at an early stage of ground investigation. Remediation and/or mitigation works probably necessary to maintain the stability of the area. Mitigation works may not be economically feasible.</td>
<td>Slope stability may be easily triggered by minor natural or artificial changes. Engineering work may be necessary to stabilise slopes.</td>
</tr>
</tbody>
</table>
Landslide susceptibility rating (3)
Landslide mapping (1)

Tablet PC
‘Go-Book’
+ ‘ARC9’ GIS
+ database
pro-forma

GPS
### Landslide mapping (2)

#### Location

<table>
<thead>
<tr>
<th>Section B: Landslide Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevation of Crown</td>
</tr>
<tr>
<td>Total Slide Length</td>
</tr>
<tr>
<td>Rupture Max Depth</td>
</tr>
</tbody>
</table>

#### Shape

<table>
<thead>
<tr>
<th>Section C: Landslide Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slide Material</td>
</tr>
<tr>
<td>Movement</td>
</tr>
</tbody>
</table>

#### Mechanism

<table>
<thead>
<tr>
<th>Cause Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause</td>
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</table>

#### Cause

<table>
<thead>
<tr>
<th>Sources</th>
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<tbody>
<tr>
<td>No.</td>
</tr>
<tr>
<td>1</td>
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<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
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</tbody>
</table>

#### Slope

<table>
<thead>
<tr>
<th>Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landuse Code</td>
</tr>
<tr>
<td>Lithology</td>
</tr>
<tr>
<td>Sedimentology</td>
</tr>
<tr>
<td>Bed Spacing</td>
</tr>
<tr>
<td>Bed Spacing</td>
</tr>
</tbody>
</table>

#### Geology

<table>
<thead>
<tr>
<th>Extras</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Sources</td>
</tr>
<tr>
<td>No.</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

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Surveying

Laser scanning

3D laser scanning models

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For more information contact:

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www.bgs.ac.uk/science/physical_hazards/landslides.html
Thank you