Report Superseded

The landslide mapping in this report has been superseded by the 2017 report:

Revised landslide database for the coastal sector of the Dunedin City district.

Please refer to the 2017 document for the most up to date landslide information.

Landslide maps and associated information are available online through the ORC's Natural Hazard Database:

https://www.orc.govt.nz/managing-our-environment/natural-hazards/otago-natural-hazards-database

Attributing and reconciling source of landslide data within the Dunedin City Council area

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GNS Science Consultancy Report 2012/279
November 2012

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BIBLIOGRAPHIC REFERENCE

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EXECUTIVE SUMMARY

The Otago Regional Council (ORC) is developing a natural hazards website depicting known hazard information. Landslides are significant and a key data set to be made available to the public via this website.

Existing landslide data for Dunedin City district as provided by the ORC contains little attribute information. The database has been reviewed and a reference source assigned that allows a user to find and examine the original information from which the landslide entity was captured. A **Sources** table has been provided which holds the reference information from which the landslide depiction has been captured, be it a map, report or dataset.

No fields have been deleted from the landslide data as supplied by the ORC, so that it can be re-amalgamated with data held from the other territorial authorities. However some fields in the original ORC database are now redundant, as they are contained in the **Sources** table, and could be deleted in the future.

The landslide dataset has been improved by adding previously un-digitised data. About 1200 additional landslide polygons have been added. Duplicate landslide depictions have been removed and new fields added to allow capture of attributes describing the landslide. Point data of landslide locations has also been added.

A *landslide_id* has been added to the **Landslide** table. This provides a unique landslide identifier, controlled by the database owner, and allows and maintains the link between **Landslides** and **Sources**, made through an intermediate table, **Landslide_Source**.

Other fields that have been added to the **Landslide** table include *Name*, *Age, Time_of_initiation, Last_known_movement,* and *Activity_status* and these have been populated with attributes where information is available.

The *Movement_type* field in the ORC database as supplied was attributed with a value of <u>Existing Landslip</u>. This attribute has been deleted and replaced to include a domain of *Movement_type* terms that comply with the international nomenclature for *Movement_type*.

It is not essential and may be inappropriate to record *Movement_geology* with the landslide data. It can easily be derived using a spatial overlay in a GIS.

The database is provided as an ArcGIS file geodatabase. Tables of preferred landslide terminology have been included and incorporated into the corresponding attribute fields as domains (sets of acceptable values).

While the database provided is improved, it is not necessarily comprehensive. There is still considerable uncertainty about landslide interpretation and accuracy in spatial location, particularly for those captured from aerial photograph interpretation.

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1 INTRODUCTION

The Otago Regional Council (ORC) is developing a natural hazards website depicting known hazard information. Landslides are a significant hazard in the Otago Region and one of the key data sets to be made available to the public via this website. Knowledge of the location and extent of historic and prehistoric slope instability (landslide movements) is a primary means of identifying and minimising hazards to development and infrastructure posed by landsliding.

1.1 Background

Digital landslide information currently held by the ORC relating to the Dunedin City Council (DCC) area was provided to them in 2006 in a regional study conducted by the Institute for International Development (IID 2006). The data has few attributes and lacks much of the necessary metadata. The ability to reference the source of information relating to a particular landslide, the location of more detailed information if any, and the scale and hence precision at which the information was collected, is a priority for the ORC. The majority of the landslide information held by the ORC from the IID 2006 study was sourced from GNS Science. The original data was captured at various scales for various projects, using different methods, and not collated on a district or regional basis.

1.2 Scope of work undertaken

The focus of the work described in this report is to reconcile the source of landslide information to produce a reliable and robust landslide dataset that is authoritative and enhances discovery of hazard information. The work has involved:

1) Reviewing the existing landslide information for Dunedin City as provided by the ORC, comparing it with GNS Science holdings and assigning source information. In particular a source has been assigned that allows a user to find and examine the original information from which the landslide entity was captured. Records for which it was not possible to verify a source have been left with the existing attribution.

2) Reconciling multiple interpretations of landslides by choosing the latest information at the best resolution where it has been obvious that this interpretation is superior to others.

3) Including attributes on landslide age, landslide activity, and landslide movement-type for those landslide records where such information exists.

4) Adding other data from within the DCC area where available.

Naming conventions in this report with regard to the database nomenclature in this report are as follows:

- **Bold** (e.g. **Landslides**) refers to a database entity or table.
- *Italicised* (e.g. *Landslide_id*) refers to a field (column name) within a database table.
- Underline (e.g. Active) refers to an attribute or value that can populate a field.

2 LANDSLIDE INFORMATION SOURCES

Landslide information from more than 70 sources in the DCC area has been identified by GNS Science. These range from sources that cover all of the district, such as Geology of New Zealand map sheets at a scale of 1:250 000, to consultancy reports that focus on a single landslide at a specific site. The **Sources** are a polygon spatial layer as depicted in Figure 1. The table definition of **Sources** is given in Appendix 2.

In many cases the landslide data has mixed and multiple source lineage. For QMAP Dunedin (Turnbull and Bishop, 1996) for example, the generalised landslides depicted at 1:250 000 scale come from:

1) Stereo aerial photo interpretation (API), drawn on to 1:50 000 NZMG topographic sheets as part of the large landslide data base project (Eng. Geol., 1993, Perrin and Coote, 1994). Only some of these had been digitised and some were generalised for QMAP cartographic purposes.

2) Stereo aerial photo interpretation (API), drawn on to 1:25 000 NZMG topographic sheets and depicted on the Southwest Dunedin Urban Map (McKellar 1990) and generalised for QMAP.

3) Any other data source where the landslide is large enough to be depicted on QMAP

Many of the landslides that are depicted in the DCC area come from GNS Science maps (Glassey and Turnbull, 1998) provided to the DCC and digitised by them for the Dunedin City Lifelines Project Report in 1998. Primarily these landslides came from the first 2 sources given above. Hence the “Source” can be somewhat convoluted at times. Where possible, we have attributed the landslide data with the original source based on largest scale of capture.

There are landslides that have occurred in the DCC area that GNS Science has not been involved with, and there are reports regarding landslides provided to the DCC by others that GNS Science is not aware of. The DCC have GIS files of land parcels that have landslide hazard-related information tagged to them, based on the landslide data provided to the ORC and forwarded on to GNS Science for this study. For newer landslides (i.e. approximately post-2000) the outline may be available in reports associated with the land parcel, but are commonly not digitised.

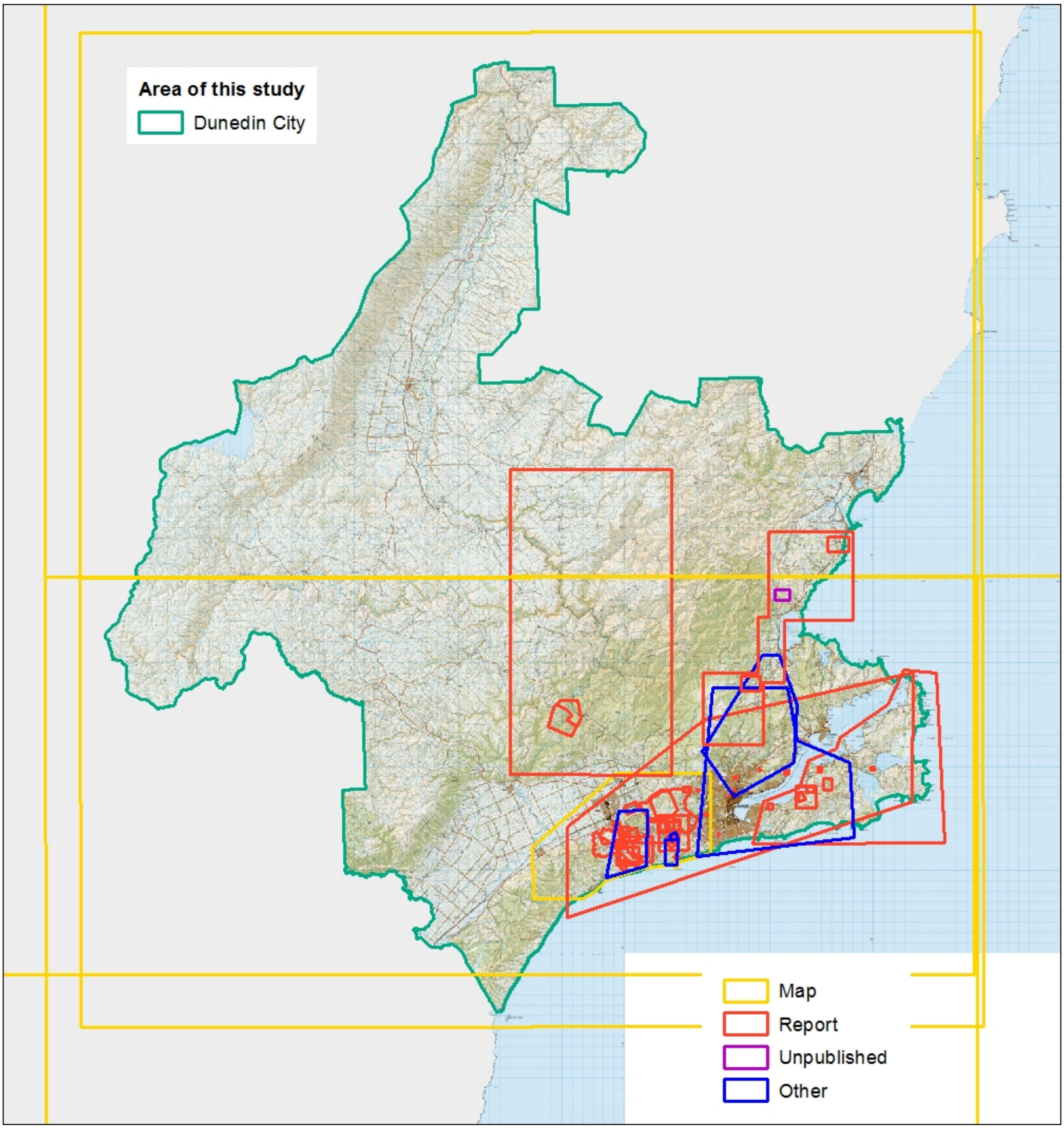

Figure 1: Sources of landslide information in the DCC area

3 DATABASE DESIGN

3.1 General

To provide a robust landslide database requires a design that allows for the source of data related to a landslide, as well as other attributes, to be added and managed. The database design is based on many components of the GNS Science landslide database. One concept of the GNS Science database design (Glassey *et al*. 2001) was to capture all features that make up a landslide, such as a vacated area, a debris area, scarps, and even landslide investigation sites or monitoring survey marks, for example, as separate landslide features. However, given that all the data supplied refers to the whole extent of a landslide, rather than any one individual part, this has not been incorporated into the ORC landslide database provided as part of this work.

In a relational database, the attribute values and descriptions are kept in separate tables and are linked to the landslide table to form a list of acceptable values and definitions that can be entered into the attribute fields (Look-up tables). Having attribute values in separate tables makes updates of the terminology and amendments to the data relatively simple. In the case of the landslide database provided, these tables have been used to create data domains that provide controlled lists of acceptable values for relevant fields. The look-up tables can be used if the data is migrated to another relational database. The field definitions in both the **Landslides** table and the domain or Look-up table must be identical.

The landslide terms and definitions are loosely based on international landslide terminology (Cruden and Varnes, 1996, Varnes, 1978) as recommended by IDD 2006, but have been modified where the terminology is complex (e.g. activity), or omitted where it has been considered inappropriate for the level of landslide detail required by the ORC.

A file geodatabase, which is specific to ArcGIS software, and allows data relationships as described above, has been created for this project, but the data should be able to be exported into any database format. A list of tables in the database are given as Appendix 1 and the database table definitions, along with the values of the attributes where appropriate are given in Appendix 2. An entity relationship diagram depicting the tables and the relationships between them is given as Figure 2.

3.2 Sources

As described above, a significant new component added to the database is a **Sources** table which contains the reference information on the report, map or project which provided the landslide data. The **Sources** table is separate from the landslide information as the source reference is an entity in itself. It may be a map, report or dataset, and can relate to subjects other than landslides, such as geology. Additionally, some landslides can have more than one source and sources can relate to more than one landslide. In database terms this is referred to as a many-to-many relationship. The **Sources** are linked to the **Landslides** table via an intermediate table (**Landslide_Source**) which is standard relational database design practice, and does away with the need for repeating data in a single table. Figure 3 shows a schematic of the Landslides-Sources relationship. The **Sources** table definition is given in Appendix 2.

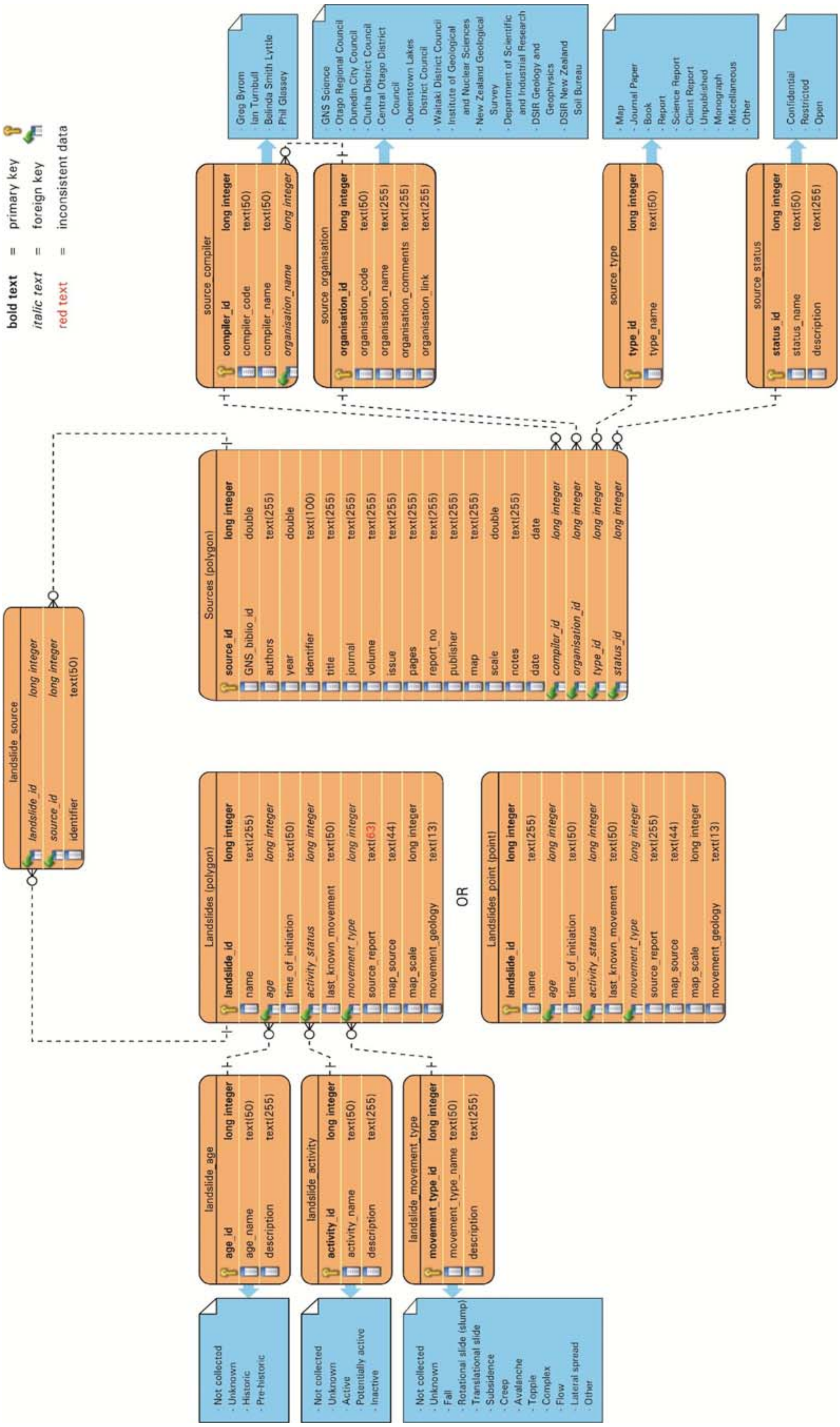

Figure 2: Entity Relationship diagram for the landslide database

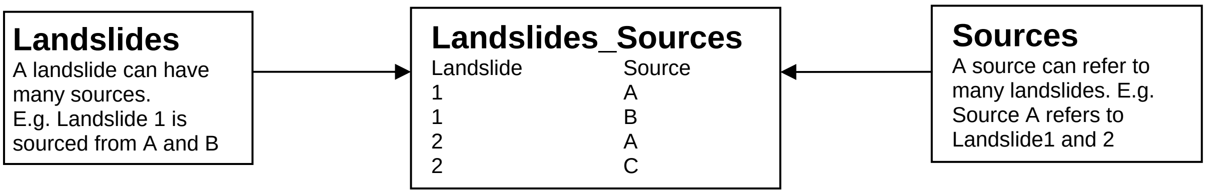

Figure 3: Schematic of the relationship between **Landslides** and **Sources**

Source_compiler, source_organisation, source_status, source_type are look-up tables that contain the attribute values and definitions for fields in the **Sources** table. These have been implemented as domains in the file geodatabase and the tables are only needed if the data is imported to another relational database. The fields in the **Sources** table to which these tables relate are described below and the definitions of the tables and attributes given in Appendix 2. A schematic of the relationship between these tables is given in Figure 4.

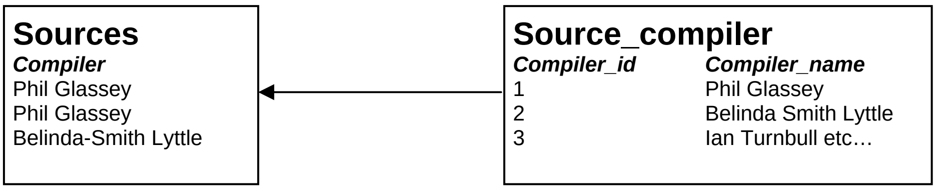

Figure 4: Schematic of the relationship between **Sources** and **source_compiler**. This relationship is the same for all of the look-up tables (Domains) provided for **Source** and **Landslide***.*

3.2.1 *Source_compiler*

The *source_compiler* is the name of the person who entered the landslide and source information into the database. An affiliation with an organisation is also included.

3.2.2 *Source_organisation*

The *source_organisation* describes the organisation which holds or provide the source information. It also provides some lineage of organisations to account for change of names e.g. NZ Geological Survey is now GNS Science. A field for an organisation web site is included.

3.2.3 *Source_status*

The *source_status* describes whether the source information is Confidential, Restricted or Open. The status depends on the organisation business rules, legislative or contractual requirments.

3.2.4 *Source_type*

The *source_type* describes whether the source material was a paper, report, map or dataset for example.

3.3 Landslides

No fields have been deleted from the landslide data supplied to us by the ORC, so that it can be re-amalgamated with data held from the other territorial authorities. However, the fields *source_report, map_source* and *map_scale* in the **Landslides** table are redundant, as these are also included in the **Sources** table. These fields have been modified and added to with data from the **Sources** table but it is recommended that these fields are removed from the

Landslides table at some time in the future when all landslide sources are reconciled for the Otago Region. In particular, the *source_report* field can only accommodate one source report, whereas there might be multiple at different scales, which can only be accommodated by a relational database structure as provided. We have retained *source_report* for the present and populated it the title of what we consider to be the main source from which the landslide data came from. If retained the *source_report* field should be modified to be 255 characters long to bring it in line with the *title* field in the **Sources** table.

A number of fields have been added to the to the **Landslides** table including a *landslide_id*, *name*, *age, time_of_initiation, last_known_movement,* and *activity_status* and these fields have been populated with attributes where information is available.

The *movement_type* field in the ORC database as supplied is attributed with a value of Existing Landslip. This attribute does not comply with international terminology for *Movement_type* (Varnes 1978, Cruden and Varnes 1996 – Appendix 2) and has been replaced a domain of *Movement_type* terms has been included. and should be used to populate this field in the future.

3.3.1 *Landslide_id*

Most significant in the database design is to create a landslide identification number *(landslide_id*) for all landslides, which is separate from the *Object_ID* created by GIS software. This has been created because the software-generated number can change if records are edited, deleted or added to the database and hence any relation to other data held in other tables would be lost. The *landslide_id* has to be unique and is controlled by the database owner. The *landslide_id* is not sequential in the database as some landslides have been deleted since the *landslide_id* was assigned.

3.3.2 *Name*

Landslides are commonly referred to by name, which relates to a location and commonly a road or area that is affected (e.g. Howard Street Slide, Abbotsford East Slide, Jeffcoates Road Slide etc.). A *name* field of 255 characters has been added to the database and assigned values where names are used.

3.3.3 *Age*, *Time of initiation* and *Last known movement*

The *age* attribute describes whether the landslide occurred in historic times (since 1840) or prior to that. It is often difficult to determine the age of a landslide, especially where there is no monitoring or readily observable deformation, therefore often the age is unknown.

The age of a landslide can be estimated from dating of material or other geomorphic features related to the landslide such as river terrace surfaces, faults or geological units of known age. Commonly, age is assigned based on the geomorphic expression of the features, or on the understanding that different geomorphic or climatic conditions prevailed at the time of initiation from those at present. For example, with the rapid retreat of glaciers from many valleys in Otago at the end of the last glaciation (approximately 15 000 years ago) many landslides were initiated on steep slopes previously supported by ice, and/or undercut by newly formed rivers. In the Dunedin area there have been changes in sea level with a post-last glacial maximum about 6000 years ago and before that a coating of loess from the last glaciation. The nature of the loess can be used to determine if it has been affected by landslides or not, and provides a coarse age control.

Associated with *age* are two other attributes; *time_of_initiation* and *last_known_movement*. The *time_of_initiation* is the date when the landslide was initiated and should be a pre-requisite for those landslides that are attributed as historic in the *Age* field. If repeated movements have occurred since initiation then the time of *last_known_movement* is recorded. Detail related to multiple movements is not recorded in this database structure at present but could be accommodated.

3.3.3 *Activity_status*

Cruden and Varnes (1996) define a number of terms to describe Activity. However, in this case we have simplified the *activity_status* as given in Appendix 2. An active landslide is one that is currently moving. A potentially active landslide is one where there is no current observed movement but there is historic evidence of movement. Inactive landslides are those with no known historic movement. Without consistent monitoring on slides it is difficult to tell whether they are active, potentially active or inactive. However, displacement of walls, road kerbs, breakages in services and deformation of houses, for example can be used to determine the activity status

3.3.4 *Movement_type*

The *movement_type* attribute of a landslide describes the fundamental movement style or styles and is based on a classification by Varnes 1978 and revised by Cruden and Varnes 1996. The types of movement are Fall, Topple, Rotational Slide (Slump), Translational Slide, Flow, Lateral Spread and Complex (see Appendix 2). We have replaced the existing *movement_type* field in the ORC database to accommodate the values given in the **Landslide_movement_type** table in Appendix 2 and created a domain of acceptable values for the field.

3.3.5 *Movement_geology*

Contrary to IID 2006, it is not considered essential to store geological information with a landslide database. Currently the assignment of geology in the database is based on QMAP 1:250 000 scale geology and is highly generalised.

Some landslide outlines cross several geological formations and the structure of the database does not allow multiple geological formations to be captured. The landslide polygon outlines do not discriminate between evacuated areas and debris areas, and hence a geological formation may be analysed as being landslide prone when in fact it is only the recipient of debris from an upslope landslide-prone formation. If it is necessary to know the geology of a landslide, it can be overlaid with digital geology layers in a GIS.

4 LANDSLIDE RECONCILIATION

Many of the landslides in the DCC database area are interpretations of geomorphic features viewed using stereo aerial photographs and plotted onto topographic map bases. Many of these features have not been mapped in the field and some may not actually be landslides. The spatial accuracy of landslides captured in this manner is expected to be low. These landslides have been assigned the scale of the map they were plotted onto rather than the scale of the aerial photographs. The maps themselves have inherent spatial inaccuracies (e.g. +/- 22 m for the LINZ NZTM series).

Additional inaccuracies have been added when mapped landslides were digitised. For example, portions of the Lifelines landslide dataset were poorly registered and roughly digitised when compared to the original georeferenced map sheet on to which they were plotted (Figure 5a and b). The original digitising of these landslides was also done in a manner which has resulted in many “sliver” landslides around the edges that are in fact part of a larger landslide, or where digitising overlapped with an adjacent feature (Figure 5b). Where possible, these errors have been corrected. In addition, at the time of data capture of the Lifeline landslides, some polygons were digitised as landslides when they actually represent voids (island or dough-nut polygons), many of which are isolated volcanic peaks or other elevated summit areas that are not landslides (Figure 5c).

Some landslides have been mapped in the field using more detailed photo-map bases. These landslides are considered to be more reliable than those captured through air photo interpretation. *Scale* in the **Sources** table records the scale at which the landslide was captured and if there are multiple depictions, scale gives an indication of the most reliable one. However, the date of capture also needs to be considered when determining reliability.

The method of capture of the landslide information has not formally been included in the landslide database, but where known, has been recorded in the *Notes* field of the **Sources** table. It is likely that method of capture can be accommodated into the landslide database structure in the future if desired. The scale of the base map on which the landslide data was original plotted is recorded in the **Sources** table and in most cases this is the scale at which the landslide feature should be portrayed. At this scale it can be relied upon as a reasonable representation. However, the original map source should be viewed as not all landslides have been accurately digitised.

The existing landslide data has been reviewed and a source has been assigned to each landslide. The most recent depiction of the landslide at the largest scale has been used as the criterion to retain a landslide interpretation, and as a result a number of duplicate landslides considered to be an inferior representation of the feature have been deleted. However, where it is not possible to reconcile the outlines from different sources, there will still be at least two interpretations of landslides.

In addition many landslide outlines, either from Perrin and Coote, 1994 or Thomson 1996, that were not captured as part of the QMAP process or the Lifelines study have been digitised and added to the database (Figure 6). This has resulted in the replacement of all but a few of the 1:250 000 QMAP landslides with better representations captured by air photo interpretation and plotted onto 1:50 000 topographic map sheets. The spatial location or outlines of landslides have been modified where it has been considered that they are poorly digitised or misrepresented.

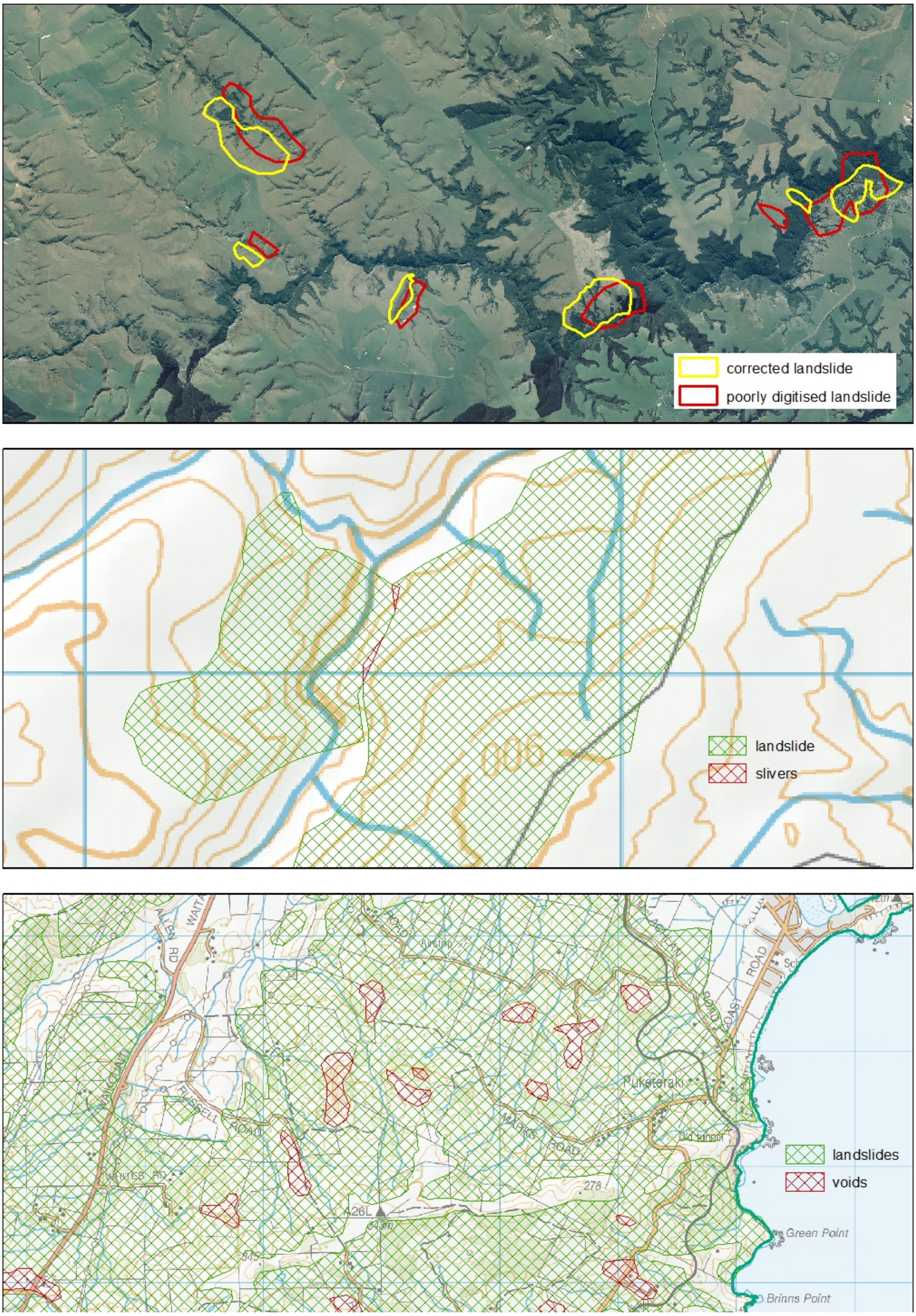

Figure 5: (a) and (b). Poorly registered and digitised landslides, (b) “sliver” landslides created at the edges of landslides by not following good editing practice and setting appropriate digitising parameters and (c) doughnut or island polygons that have been incorrectly assigned as landslides.

Landslide point data, which represent the location of a landslide but where no spatial extent of the landslide has been captured, have been added to the database. The attributes in the Point data table are the same as those for the polygon data.

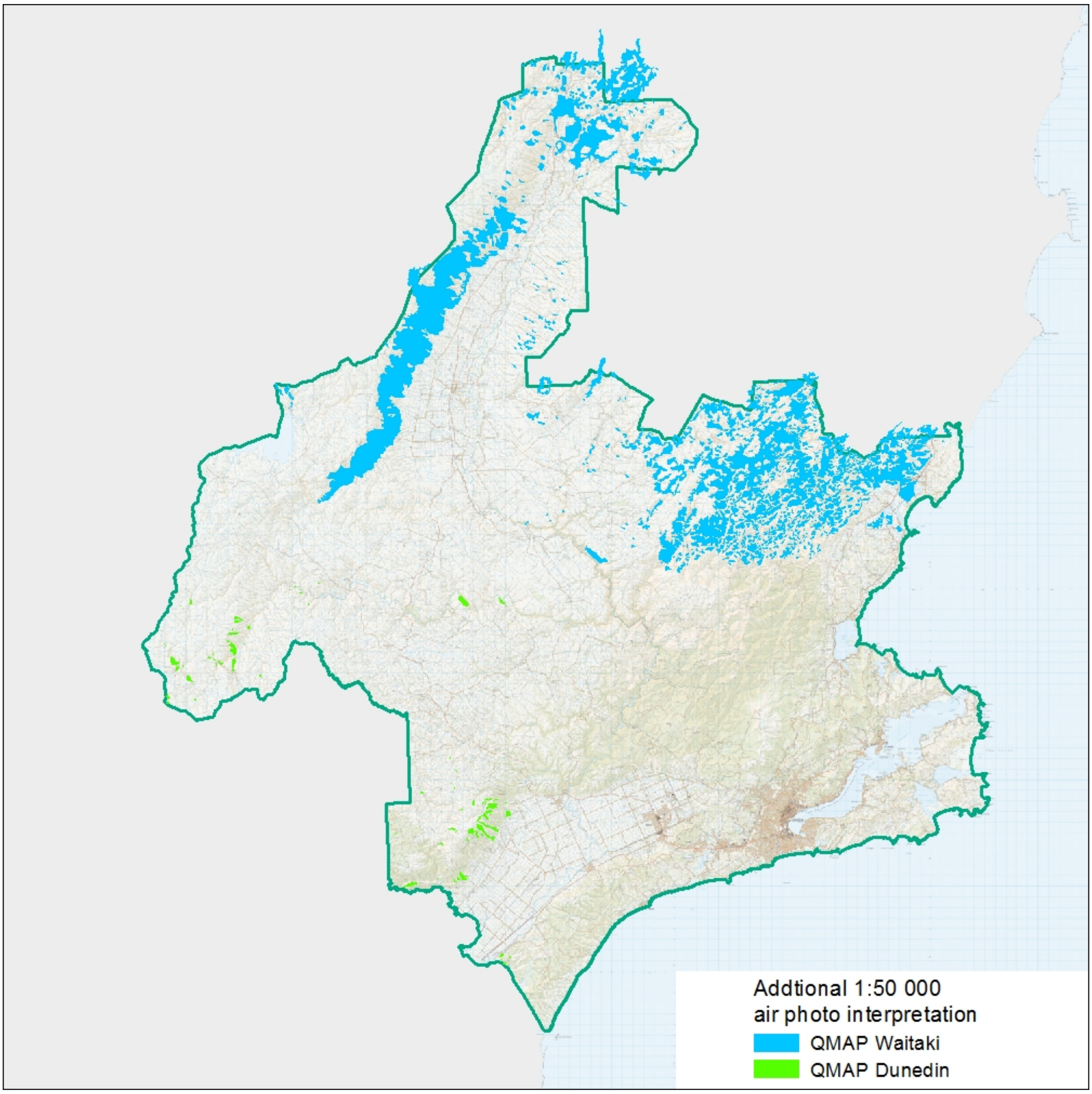

Figure 6: Areas of newly digitised landslides added to the ORC database, from Perrin and Coote, 1994 (Green) and Thomson 1996 (Blue).

5 SUMMARY AND RECOMMENDATIONS

5.1 Summary

The landslide database for the Dunedin City Council area has been reviewed and updated primarily to assign a source reference to landslides. Multiple references to a landslide, or a reference that is the source document of many landslides, can be managed and reported.

The landslide database has been considerably improved by adding previously un-digitised data, removing duplicate landslide depictions where possible, and adding new fields to allow capture of attributes describing the landslide.

The database is provided as an ArcGIS file geodatabase. Other fields and new tables defining attributes can be added to the database structure as required.

Tables of preferred landslide attribute values have been included and incorporated into the corresponding fields as data domains.

While the database provided is improved, it is not necessarily comprehensive. There is still considerable uncertainty about landslide interpretation and accuracy in spatial location, particularly for those captured from aerial photograph interpretation.

5.2 Recommendations

i. It is recommended that the database structure contained within the ArcGIS file geodatabase become the default structure for the ORC landslide data, whether it be implemented in ArcGIS or some other database software.

ii. The remainder of the landslide data within the ORC database should be modified to fit this structure.

iii. Redundant attributes in the landslide database such as *source_report, map_source* and *map_scale* should be deleted from the **Landslide** table once the remainder of the data is fitted into this structure.

iv. Territorial authorities within the ORC should be encouraged to use the database structure when recording landslide information.

v. Database reports or “Views” of the data, invoking the relational database structure, may need to be created to allow the data to be readily accessible from the web site.

vi. It is recommended that the existing *movement_type* field in the orc database be replaced to accommodate the values given in the *movement_type* table, that are based on international landslide nomenclature.

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ACKNOWLEDGEMENTS

This draft report has benefited from technical reviews by Grant Dellow and Jane Forsyth of GNS Science.

APPENDICES

APPENDIX 1: Tables contained within the file geodatabase

Table Name	Description	Type
Landslides	Landslide extent and attributes	Polygon spatial layer
landslides_point	Landslide location and attributes	Point spatial layer
landslide_activity	Look up table containing values for Landslide activity field	Look-up Table
landslide_age	Look up table containing values for Landslide age field	Look-up Table
landslide_movement_type	Look up table containing values for Landslide movement type field	Look-up Table
landslide_source	An intermediate table that maintains the link between Landslides and Sources	Look-up Table
Sources	Table which contains the landslide reference information	Polygon spatial layer
source_compiler	Look up table containing values for Source compiler	Look-up Table
source_organisation	Look up table containing values for Source organisation	Look-up Table
source_status	Look up table containing values for Source status	Look-up Table
source_type	Look up table containing values for the Source type	Look-up Table

APPENDIX 2: Database Table Definitions

NB: OBJECT ID has been omitted from the Attribute Values tables

The primary key for each table is identified as ***Bold***

A foreign key is identified with *a* #

* = mandatory fields

Landslides

Landslides: table definition

Name	AliasName	Type	Length	Description	Example
OBJECTID	*OBJECTID*	OID	4	Software generated id number	980
Shape	*Shape*	Geometry	0	Software derived defining the geometry type of the object – polygon or point depending on which table is being utilised	Polygon
landslide_id*	*Landslide_id*	Long Integer	4	Unique identifier of a landslide.	3065
Name	*Name*	String	255	Common name of the landslide.	West Abbotsford Slide
Age#*	*Age*	Long Integer	4	Integer that relates to the terms contained in the **Landslide_Age** table.	Pre-historic
time_of_initiation	*Time_of_Initiation*	String	50	A date, year or age (in years BP) when the landslide was first initiated.	unknown
activity_status#*	*Activity_status*	Long Integer	4	Integer that relates to the terms that describe the activity status a landslide contained in the **Landslide_activity** table.	Potentially Active
last_known_movement	*Last_known_movement*	String	50	Date of last known movement	1968
movement_type#*	*Movement_type*	String	27	ORC Attribute that describes the Movement type. Should be replaced with Long Integer that relates to the terms in the **Landslide_movement** table.	Complex
source_ report	*Source_ report*	String	63	ORC attribute that contains the title of the source report. Redundant field as source data is contained in the **Sources** Table. Could be deleted.	DCC water pipelines: Geological hazards in relation to the (truncated)
map_source	*Map_source*	String	44	ORC attribute that contains the Map name of the source data. Redundant field as source data is contained in the **Sources** Table. Could be deleted.	GNS
map_ scale	*Map_ scale*	Long Integer	4	ORC attribute that contains the Map scale of the source data. Redundant field as source data is contained in the **Sources** Table. Could be deleted.	10000
movement_geology	*Movement_geology*	String	13	ORC Attribute that describes the fundamental geology in which the landslide occurred. Not required as digital geology can be overlaid in GIS and assigned if required.	Null
Disclaimer	*Disclaimer*	String	160	ORC Disclaimer	
____	____	String	200	Used for ORC disclaimer	
______	______	String	83	Used for ORC disclaimer	
shape_length	*Shape_Length*	Double	8	Software generated - Length of the shape	6394.960146
shape_area	*Shape_Area*	Double	8	Software generated - Area of the shape	2489070.96

*= required field

Landslide_activity

Landslide_activity: Table definition

Name	AliasName	Type	Length	Description	Example
OBJECTID	*OBJECTID*	OID	4	Software generated id number	1
activity_id*	*Activity id*	Long Integer	4	Age Class identification number	1
*activity_name **	*Activity status*	String	50	Activity status of a landslide	Active
description	*Description*	String	255	Definition of the activity status	Currently active with observed or measured movement

*= required field

Landslide_activity: Attribute Values

Activity _id	Activity_status	Activity_description
-1	Not Collected	No information about the activity status has been looked at or sought
0	Unknown	Activity status is unknown
1	Active	Currently active with observed or measured movement
2	Potentially active	No current observed movement but historical evidence (recorded or observed) of activity
3	Inactive	Not currently active, with no known historic evidence of instability

Landslide_age

Landslide_age: Table definition

Name	AliasName	Type	Length	Description	Example
OBJECTID	*OBJECTID*	OID	4	Software generated id number	1
age_id*	*Age id*	Long Integer	4	Age Class identification number	1
*age_name**	*Age class*	String	50	Age Class	Historic
description	*Description*	String	255	Definition of the age class	Landslide known to have occurred post-1840.

*= required field

Landslide_age: Attribute Values

Age_id	Age_class	Age_description
-1	Not collected	No information on the activity of the landslide has been looked at or sought.
0	Unknown	No age or activity information for a landslide has been found or determined.
1	Historic	Landslide known to have occurred post-1840.
2	Pre-historic	Landslide pre-dates European History (pre-1840)

Landslide_movement_type

Landslide_movement_type: Table definition

Name	AliasName	Type	Length	Description	Example
OBJECTID	*OBJECTID*	OID	4	Software generated id number	1
movement_type_id*	*Movement type id*	Long Integer	4	Movement type identification number	3
*movement_type_name**	*Movement type name*	String	50	Movement type name	Rotational slide (slump)
description	*Description*	String	255	Definition of the Movement type	Move along a surface of rupture that is curved and concave

*= required field

Landslide_movement_type: Attribute Values

Movement_type_id	Movement_type_name	Movement_type_description
-1	Not collected	No information on the movement type of the landslide has been looked at or sought.
0	Unknown	No movement type or information of the landslide has been found or determined.
2	Fall	Detachment of a soil or rock from a steep slope along a surface on which little or no shear displacement takes place.
3	Rotational slide (slump)	Movement along a surface of rupture that is curved and concave
4	Translational slide	Movement along a surface of rupture that is planar or undulating
8	Topple	Forward rotation out of the slope of a mass of soil or rock about a point or axis below the centre of gravity of the displaced mass
9	Complex	The landslide comprises 2 or more movement types
10	Flow	Spatially continuous movement in which surfaces of shear are short-lived, closely spaced, and usually not preserved
11	Lateral Spread	Extension of cohesive soil or rock mass combined with a general subsidence of the fractured mass into softer underlying material. Includes lateral spreading caused by earthquake liquefaction
12	Other	

Sources

Sources: table definition

Name	AliasName	Type	Length	Description	Example
OBJECTID	*OBJECTID*	OID	4	Software generated id number	42
Shape	*Shape*	Geometry	0	Software derived defining the geometry type of the object.	Polygon
source_id*	*Source_id*	Long Integer	4	Unique identifier of Source reference	1
*authors**	*Authors*	String	255	Author(s) of document	McKellar IC
*year**	*Year*	Double	8	Year of Publication/creation	1990
Identifier	*Identifier*	String	255	Short reference for source documents	McKellar 1990
*title**	*Title*	String	255	Title of Publication, Map or Document	Miscellaneous map of New Zealand-southwest Dunedin Urban 1:25000
Journal	*Journal*	String	255	Journal of published source reference	
Volume	*Volume*	String	255	Volume of Journal of source reference	
Issue	*Issue*	String	255	Issue of Journal of source reference	
Pages	*Pages*	String	255	Number of pages or page range	Map (1 sheet) and notes (64p)
report_no	*Report_no*	String	255	Number of report	
Publisher	*Publisher*	String	255	Organisation that published the Source reference	Department of Scientific and Industrial Research
Map	*Map*	String	255	Map name or figure in Source reference that depicts the landslide(s)	Mms22
Scale	*Scale*	Double	8	Scale of the map	25000
Notes	*Notes*	String	255	Notes and comments	
compiler_id[#]	*Compiler_id*	Long Integer	4	The name of the person who entered the data	Phil Glassey. (Values come from the **Source_compiler** table (domain))
organisation_id[#]*	*Organisation_id*	Long Integer	4	Organisation from which the original document is held	GNS. (Values come from the **Source_organisation** table (domain))
type_id[#]*	*Type_id*	Long Integer	4	Type of reference source	Map. (Values come from the **Source_type** table (domain))
status_id[#]	*Status_id*	Long Integer	4	Whether the reference is open, restricted or confidential	Open. (Values come from the **Source_status** table (domain))
Date	*Date_compiled*	Date	8	Date the information was added to the database	21/05/1998
shape_length	*Shape_Length*	Double	8	Software generated - Length of the shape	6394.960146
shape_area	*Shape_Area*	Double	8	Software generated - Area of the shape	2489070.96

*= required field

Sources Table: Attribute values

Source_id	Authors	Year	Identifier	Title	Journal	Volume	Issue	Pages	Report_no	Publisher	Map	Scale	Notes	Compiler_id	Organisation	Type_id	Status_id	Date
1	McKellar IC	1990	McKellar 1990	Miscellaneous map of New Zealand-southwest Dunedin Urban 1:25000. Map (1 sheet) and notes (64 p.)						Department of Scientific and Industrial Research	Mms22	25000		4	12	1	3	21/05/1998
3	Brickell Moss & Partners	1981	Brickell Moss & Partners 1981	Slope stability Study, Green Island Borough for Earthquake & War Damage commission					51323		51323-1	5000		2	10	6	3	22/02/1994
4	Harris MJ	1984	Harris 1984a	Close Planting & Stability Works, J Palmer Saddle Hill					I1169		T11189	10000		1	2	4	3	25/01/1995
5	Harris MJ	1984	Harris 1984b	Slump Control Proposal, G Mockford, 48 Mornington RD, Dunedin					I1160		T11116	10000		1	2	4	3	25/01/1995
6	Sutcliffe CK	1986	Suttcliffe 1986	Hymac dewatering and stability Planting - Saddle Hill, M Crawford, C/- G Crawford, 15 South Road, Dunedin					I1287		T11943	5000		1	2	4	3	25/01/1995
7	Harris MJ	1985	Harris 1985	Dewatering & Close Planting Proposal, Mr C Hanson, Saddle Hill RD 1, Dunedin					I1203		T11387	6000		1	2	4	3	25/01/1995
8	Squire RJ	1985	Squire 1985	Annual soil and water conservation works programme Saddle Hill partnership					I0638		L11628/3	5000		1	2	4	3	26/01/1995
9	Harris MJ	1984	Harris 1984c	Remedial Storm Damage Repair to Proposal No.2, S.C.Allen & Co, 14 Brooklyn St, Green Is.					I0993		T11099	10000		1	2	4	3	25/01/1995
12	Harris MJ	1979	Harris 1979	Slip Control, J.A. Chalmers, 182 Gladstone Road, Mosgiel					I0939		T9059	6000		1	2	4	3	25/01/1995
13	Harris MJ	1987	Harris 1987	Annual soil and water conservation works programme, G Scurr & Co. Ltd, Abbotsroyd - A Scurr (Manager)					I1103		L10849/4	6000		1	2	4	3	25/01/1995
14	Stewart DL	1996	Stewart 1996a	Landslides Triggered by the 17-19 March 1994 rainstorm, Dunedin Area					95/42	Institute of Geological and Nuclear Sciences Ltd	4/94025	50000		4	8	5	3	21/05/1998
16	Harris MJ	1984	Harris 1984d	Proposal No.2: Close planting & dewatering works. B.D Bezett, 2 Louden St, Green Island					I1082		M11312	2500	see also N10184	1	2	4	3	25/01/1995
20	Sutcliffe CK	1988	Suttcliff 1988b	Erosion Control Forestry Proposal, K J McCarty, Blackhead Road, Dunedin					I1362		M12619	5000		1	2	4	3	25/01/1995
22	Harris MJ	1981	Harris 1981a	Erosion Control Scheme, E.M Petrie, Westwood, 4RD, Dunedin					I1087		N10277	10000	see also I0893 and N10290	1	2	4	3	25/01/1995
23	Harris MJ	1981	Harris 1981b	Slump Dewatering & Stabilisation Proposal, Mr R.J.Jury, Saddle Hill, No 1 R.D, Dunedin					I1032		T9901	1000		1	2	4	3	25/01/1995
24	Harris MJ	1981	Harris 1981c	Slump Dewatering & Open Planting, Mrs I.L.Thornton, Saddle Hill, No 1 R.D, Dunedin					I1039		T9920	1000		1	2	4	3	25/01/1995
25	Harris MJ	1984	Harris 1984g	Storm Damage Repair and Erosion Control Works, Mr J Wheeler & E Marshall, Abbots Hill Road, Abbotsford					I1165		M11165	2000	see also I1084	1	2	4	3	25/01/1995
26	Sutcliffe CK	1990	Sutcliffe 1990	Recommended Tree Planting Programme, R Wilden, RD1, Dunedin					I1452		12897	5000		1	2	4	3	25/01/1995
27	Stewart DL	1993	Stewart 1993	Stability Assessment - 191 McMaster Rd Saddle Hill					1993/75	Institute of Geological and Nuclear Sciences Ltd	4/93067	2500		2	8	6	1	21/02/1994
28	Glassey PJ	1993	Glassey 1993a	Fairfield Estates Subdivision slope stability assessment					1993/80	Institute of Geological and Nuclear Sciences Ltd	4/93072	5000		2	8	6	1	22/02/1994
29	Barrell DJA Glassey PJ	1993	Barrell & Glassey 1993	38 Waldron Cres Sunnyvale slope stability assessment					353902.13A	Institute of Geological and Nuclear Sciences Ltd	4/93126	1000		2	8	6	1	21/02/1994
31	ER Garden & Partners	1981	ER Garden & Partners 1981	Report on landslide at Church Hill Road							3745/A2	1000		2	8	6	1	21/02/1994
33	Glassey PJ	1992	Glassey 1992a	Geology and slope stability assessment, Brickworks site, Abbotsford					1992/35	DSIR, Geology & Geophysics	4/92001	5000		2	9	6	1	28/02/1994
34	Sutcliffe CK	1989	Sutcliffe 1989	Lower Taieri Flood Control and Drainage Scheme, Revised soil conservation works programme, G.J Pearson - 'The Grange', East Taieri					I0771		L12723/1	5000	see also M8311/1	1	2	4	3	25/01/1995
35	Hancox GD et.al.	1980	Hancox et. al. 1980	East Abbotsford Landslide - Presentation and assessment of engineering geological data and factors related to the cause of the slide					EG332	New Zealand Geological Survey	Fig 4	1200	See also Figure 9	2	10	6	3	1/03/1994
36	Barrell DJA	1994	Barrell 1994a	Mains Subdivision Ltd Subdivision, Burgess Street, Green Island, Dunedin - Site Investigation report					47401B.10A	Institute of Geological and Nuclear Sciences Ltd	4/94061	1000		4	8	6	1	21/05/1998
38	Coote TP	1995	Coote 1995	Skinner/Pearse Subdivision, Saddle Hill, Dunedin - Slope stability assessment					47420B.10A	Institute of Geological and Nuclear Sciences Ltd	4/95031	5000		4	8	6	1	21/05/1998
39	Harris MJ	1981	Harris 1981d	Land Inventory, George Scurr & Co. Ltd, Saddle Hill					I0921		M9994/1	10000	see also T8950	1	2	4	3	22/01/1995
45	Glassey PJ	2005	Glassey 2005	Assessment of Slope stability nd soil quality, lot 2 DP2 1474, 36 Severn St, Abbotsford Dunedin					2005/43	Institute of Geological and Nuclear Sciences Ltd	Fig 3	5000		4	8	6	1	11/11/2005
46	Glassey PJ	2001	Glassey 2001a	Slope Stability Assessment, Rapid No 44 McMaster Road, Saddle Hill Dunedin					2001/166	Institute of Geological and Nuclear Sciences Ltd	Fig 2	5000		4	8	6	1	11/11/2005
47	Glassey PJ	1991	Glassey 1991a	Slope Stability Assessment, Duke Street Slide, Dunedin					1991/76	DSIR, Geology & Geophysics	4/91010	1000		4	9	6	3	11/11/2005
48	Glassey PJ	1994	Glassey 1994b	Mt Grand reservoir Tanks Site Suitability and Foundation Assessment					47404B.10A	Institute of Geological and Nuclear Sciences Ltd	4/94026	2000		4	8	6	1	16/11/2005
49	Barrell DJA	1999	Barrell 1999a	DCC water pipelines: Geological hazards in relation to the Wingatui-Abbotsford-Mt Grand-Southern Reservoir Areas					1999/34	Institute of Geological and Nuclear Sciences Ltd	4/99007	10000		4	8	6	1	16/11/2005
50	Leslie DM	1974	Leslie 1974	Effects of Basement lithology, Regolith and slope on Landslide potential, Otago Peninsula, New Zealand					12	DSIR, NZ Soil Bureau	Fig 6	50000		4	13	5	3	17/11/2005
51	Macfarlane DF	1990	Macfarlane 1990	Howard Street Slide Area, Macandrew Bay - Engineering geological assessment of current and future stability					EGI 90/010	DSIR, Geology & Geophysics	Fig 4	2500		4	9	6	3	17/11/2005
52	Glassey PJ	1995	Glassey 1995a	Howard Street Slide, Macandrew Bay, Dunedin - Monitoring assessment July 1991 - June 1995					47414B.11A	Institute of Geological and Nuclear Sciences Ltd	Fig 2	2500		4	8	6	1	17/11/2005
53	Johnson JD	1986	Johnson 1986	Stability Assessment and Stabilisation of the Camp Road Slide, Broad Bay, Dunedin City					EGI 86/033	DSIR - New Zealand Geological Survey	Fig 3	500		4	10	6	3	17/11/2005
54	Barrell DJA	1994	Barrell 1994b	Dickson Street Slide, Macandrew Bay, Dunedin - Preliminary Engineering Geological Assessment					473014.10A	Institute of Geological and Nuclear Sciences Ltd	4/94014	2500	Figure 3	4	8	6	1	17/11/2005
55	Johnson JD	1987	Johnson 1987a	Preliminary assessment of Reservoir site, Macandrew Bay, Dunedin					EGI 87/032	DSIR - New Zealand Geological Survey	Fig 1	5000		4	10	6	3	17/11/2005
56	Glassey PJ	1999	Glassey 1999a	Slope Stability Assessment - Hammond Property, Camp Road, Otago Peninsula					1999/32	Institute of Geological and Nuclear Sciences Ltd	Fig 2	5000		4	8	6	1	17/11/2005

Source_id	Authors	Year	Identifier	Title	Journal	Volume	Issue	Pages	Report_no	Publisher	Map	Scale	Notes	Compiler_id	Organisation	Type_id	Status_id	Date
57	Macfarlane DF	1989	Macfarlane 1989	Cargill Street Slide - Engineering Geological Assessment					EGI 89/029	New Zealand Geological Survey	4/89018	200	Figure 2	4	10	6	3	17/11/2005
58	Barrell DJA	1995	Barrell 1995	Cargill Street Slide, Dunedin City - Recent Investigations					47501D.13a	Institute of Geological and Nuclear Sciences Ltd	Fig 1	200		4	8	6	1	17/11/2005
59	Johnson JD	1987	Johnson 1987b	Stability Assessment of the Albany Street Slide, Dunedin City					EGI 87/007	New Zealand Geological Survey	4/87007	500	Figure 2a	4	10	6	3	17/11/2005
60	Glassey PJ	1991	Glassey 1991b	Albany Street Slide, Dunedin City - Assessment of monitoring and remedial measures					1991/81	Institute of Geological and Nuclear Sciences Ltd	4/91012	500	Figure 1	4	8	6	3	17/11/2005
61	Johnson JD	1988	Johnson 1988	Stability Assessment of Slope Failure at 193 Evans Street, Dunedin					EGI 88/005	New Zealand Geological Survey	4/88004	200	Figure 2 and see Figure 1	4	10	6	3	18/11/2005
62	Glassey PJ	1993	Glassey 1993b	Review of slope stability, Evans Street Slide, Dunedin					353901.11A	Institute of Geological and Nuclear Sciences Ltd	4/93066	200	Figure 1	4	8	6	1	18/11/2005
63	Turnbull IM	1979	Turnbull 1979	Irvine Road Landslide, Otago Peninsula						New Zealand Geological Survey		1000	See 144/941/69	4	10	6	3	18/11/2005
64	Glassey PJ	1995	Glassey 1995b	Land stability assessment, Lot 9C/1259, Burkes Drive, Burkes, Dunedin					47401D.10B	Institute of Geological and Nuclear Sciences Ltd	4/95005	2000	Figure 2	4	8	6	1	18/11/2005
65	Turnbull IM, Glassey PJ	1991	Turnbull & Glassey 1991	Stability Assessment, Wyllie Property, Kenmure Road					1991/103	DSIR, Geology & Geophysics	4/91014	1000	Figure 1	4	9	6	3	18/11/2005
66	Glassey PJ	1999	Glassey 1999b	Slope Stability Assessment, Proposed Subdivision, Darling Property, Kenmure Road, Dunedin					1999/48	Institute of Geological and Nuclear Sciences Ltd	4/99008	500	Figure 2	4	8	6	1	18/11/2005
67	Dellow GD	1997	Dellow 1997	The Church of Jesus Christ of Latter Day Saints, Fenton Street, Dunedin - Engineering Geological Investigations of the Eastern Slope					45605B.10	Institute of Geological and Nuclear Sciences Ltd	Figure 2	500		4	8	6	1	18/11/2005
68	Bishop DG, Salt G	1980	Bishop & Salt 1980	Brockville Landslide, Dunedin						New Zealand Geological Survey	Figure 1	4000	see Dunedin File I44/941	4	10	6	3	18/11/2005
70	Glassey PJ	2001	Glassey 2001b	Air Photo interpretation only - Property Insight 2001								0	Air Photo interpretation only - Property Insight 2001	3	8	10	3	11/09/2012
71	Engineering Geology Section	1993	Eng. Geol. 1993	Large Landslide Database					NZ/943	Institute of Geological and Nuclear Sciences Ltd		50000	Point data only has been digitised for the Dunedin area as of 20/09/2012	3	8	1	3	11/09/2012
72	Thomson R	1996	Thomson 1996	Air photo interpretation for QMAP Waitaki				15 maps		unpublished		50000	Air Photo interpretation compiled as part of total data record for QMAP Waitaki	3	8	1	3	11/09/2012
73	Bishop DG, Turnbull IM	1994	Bishop & Turnbull 1994	Geology of the Dunedin area						Institute of Geological and Nuclear Sciences Ltd	Map	250000	From various sources, including air photo interpretation - generalised for QMAP	3	8	1	3	12/09/2012
74	Forsyth PJ	2001	Forsyth 2001	Geology of the Waitaki area						Institute of Geological and Nuclear Sciences Ltd	Map	250000	From various sources, including air photo interpretation - generalised for QMAP	3	8	1	3	12/09/2012
75	Cox SC	2003	Cox 2003	On the structure of Otago Schist from Barewood-Hindon, with implications for gold mineralisation: note to accompany GIS map and dataset				11 p. + 1 map + 1 data CD	2003/44	Institute of Geological and Nuclear Sciences	Map 1	50000		3	8	6	1	19/09/2012
76	Perrin N, Coote TP	1994	Perrin & Coote 1994	Air photo interpretation for QMAP Dunedin				7 maps		unpublished		50000	Air Photo interpretation compiled as part of total data record for QMAP Dunedin	3	8	1	3	19/09/2012
77	Unknown	0	ORC data I44/941	Unknown								0	Data provided by ORC, no source data available	0	0	10	0	
78	Barrell DJA, Turnbull IM	1997	Barrell & Turnbull 1997	Engineering geological evaluation, Parker property, Varleys Hill, Otago Peninsula					45601D.10c		Figure 1	1500		3	1	6	1	25/10/2012
79	Glassey PJ	2006	Glassey 2006a	Rain storm reconnaissance - April 2006								0		3	1	10	3	31/10/2012
80	Glassey PJ	2008	Glassey 2008	Deep Creek/Deep Stream Water Pipeline: Preliminary engineering geological assessment of alternative sites for crossing the Taieri River					2008/138		Figure 1	10000		3	1	6	1	29/10/2012
81	Glassey PJ	1996	Glassey 1996	Taieri River water supply pipe bridge, Landslide and erosion hazard assessment					47504B.10A		Figure 3	5000		3	1	6	1	29/10/2012
82	Glassey PJ	2006	Glassey 2006b	Sullivans Dam to Karitane Trunk Water Main: Preliminary geological assessment of pipeline routes					2006/39		Figure 3	20000		3	1	6	1	29/10/2012
83	Barrell DJA	1999	Barrell 1999b	Waitati water supply: proposed Waitati Valley Road pipeline - Preliminary engineering geology evaluation					1999/19		Figure 2	10000		3	1	6	1	29/10/2012
84	Glassey PJ	1993	Glassey 1993c	Puketeraki Landslide - Preliminary engineering geological assessment					1993/29		Figure 2	5000		3	1	6	1	29/10/2012
85	Glassey PJ	1994	Glassey 1994c	Puketeraki Landslide - Assessment of drilling and monitoring data and recommendations for remedial measures					1994/91		Figure 1	5000		3	1	6	1	29/10/2012
86	McMillan SG, Reay A	1983	McMillan & Reay 1983	Preliminary report on a mineralogical and geochemical study of the Abbotsford Formation at the 'Blue Slip', Kilmog, State Highway 1						Unpublished	Figure 2	20000		3	1	7	3	29/10/2012
87	ER Garden & Partners	1975	ER Garden & Partners 1975	Landslip measurements, District Road and Kirkland Street, Green Island					2595		Figure 2, 3	1000		3	0	10	3	29/10/2012

Source_compiler

Source_compiler: Table definition

Name	AliasName	Type	Length	Description	Example
OBJECTID	*OBJECTID*	OID	4	Software generated id number	1
compiler_id*	*Compiler id*	Long integer	4	Compiler_id	3
compiler_code	*Compiler code*	String	50	Initials of the compiler	PJG
*compiler_name**	*Compiler name*	String	255	Name of the compiler	Phil Glassey
organisation_name[#]	*Organisation name*	Long Integer	4	Name of organisation for which the compiler was working	Values from Source_organisation table, Source_organisation field e.g. GNS Science

*= required field

Source_compiler: Attribute Values

Compiler_id	Compiler_code	Compiler_name	Organisation_name
1	GB	Greg Byrom	1
2	IMT	Ian Turnbull	1
3	BSL	Belinda Smith Lyttle	1
4	PJG	Phil Glassey	1

Source_organisation

Source_organisation: Table definition

Name	AliasName	Type	Length	Description	Example
OBJECTID	*OBJECTID*	OID	4	Software generated id number	1
organisation_id*	*Organisation id*	Long integer	4	Organisation _id	3
organisation_code	*Organisation code*	String	50	Initials of organisation	GNS
*organisation_name**	*Organisation name*	String	255	Name of the organisation	GNS Science
organisation_comments	*Comments*	Long Integer	4	Contains comments about lineage of the organisation	Formerly Institute of Geological & Nuclear Sciences Limited. Prior organisations DSIR Geology and Geophysics and New Zealand Geological Survey
organisation_link	*Link*	String	255	Web site URL for organisation	http://www.gns.cri.nz

*= required field

Source_organisation: Attribute Values

Organisation_id	Organisation_code	Organisation_name	Comments	Link
1	GNS	GNS Science	Brand name of Institute of Geological and Nuclear Sciences Ltd since 2006	http://www.gns.cri.nz
2	ORC	Otago Regional Council	Formerly Otago Catchment Board, Otago Regional Water Board and Pest Destruction Boards and Noxious Plants Authorities amalgamated in 1989	http://www.orc.govt.nz
3	DCC	Dunedin City Council	Amalgamation of several councils (e.g. Dunedin City Council, Green Island Borough, Silver Peaks County etc.) with Local body reform, 1989	http://www.dunedin.govt.nz
4	CDC	Clutha District Council		
5	CODC	Central Otago District Council		
6	QLDC	Queenstown Lakes District Council		
7	WDC	Waitaki District Council		
8	IGNS	Institute of Geological and Nuclear Sciences Ltd	Name of GNS Science 1992-l 2006. Still the registered company name of GNS Science	http://www.gns.cri.nz/Home/About-Us/Our-History
9	DSIR Geol	DSIR, Geology and Geophysics	(1990-1992) now GNS Science	http://www.gns.cri.nz/Home/About-Us/Our-History
10	NZGS	NZ Geological Survey	(1865-1990) now GNS Science	http://www.gns.cri.nz/Home/About-Us/Our-History
11	MOW	Ministry of Works and Development	Became Works and Development Services Corporation NZ Limited in 1988 and OPUS Consultants in 1997	http://www.opus.co.nz/about_opus/our_history
12	DSIR	Department of Scientific and Industrial Research	Government Science Department, dis-established 1992. Parent of GNS Science and Landcare Research Ltd	
13	DSIR Soil	DSIR, NZ Soil Bureau	now Landcare Research Ltd	http://www.landcareresearch.co.nz/home

Source_status

Source_status: Table definition

Name	AliasName	Type	Length	Description	Example
OBJECTID	*OBJECTID*	OID	4	Software generated id number	1
status_id*	*Status id*	Long integer	4	Status id	3
*Status_name**	*Status name*	String	50	Access and availability of the source material	Open
description	*Description*	String	255	Description of any restrictions or otherwise on the source material	The report is published or public domain information

*= required field

Source_organisation: Attribute Values

Status_id	Status	Status_description
1	Confidential	The report has been prepared in confidence for a client. Access to the report is with permission from the client
2	Restricted	The report has restricted access
3	Open	The report is published or public domain information

Source_type

Source_type: Table definition

Name	AliasName	Type	Length	Description	Example
OBJECTID	*OBJECTID*	OID	4	Software generated id number	1
type_id*	*Type id*	Long integer	4	Status id	3
*type_name**	*Type name*	String	50	Access and availability of the source material	Open

*= required field

Source_type: Attribute Values

Type_id	Type_Name
1	Map
2	Journal Paper
3	Book
4	Report
5	Science Report
6	Client Report
7	Unpublished
8	Monograph
9	Miscellaneous
10	Other

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