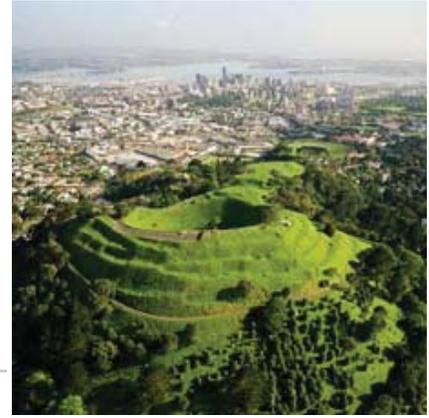


**IESE**  
Institute of  
Earth Science  
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# The DEVORA Borehole Database: Status Update and Manual

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Report 1-2011.03 | Date

## **APPENDIX 6: INTRODUCTION TO PETLAB**

PETLAB, GNS's national rock repository, is an Oracle relational database that stores the location and sample information of rock samples from across the country. The database is based on an open file, data sharing IP model. PET (sample and location) data are available free of charge. LAB (analytical) data can be acquired by contributing data or acquiring a licence for \$2,500 per year. In 2010, PETLAB was modified to include borehole interval data. Data available in PETLAB is visible online at:

<http://pet.gns.cri.nz/>

## BASIC STRUCTURE

PETLAB is designed in a multi-table set up. The key tables regarding borehole information are the:

- Site Table
- Feature Table
- Sample Table
- Lab Table
- MetaCat

Each of these tables has a unique data storage function, and they are correlated via the Collection and Collection Number categories. All of these tables are updated using a downloadable data entry Excel template. The basic structure of PETLAB can be found in the attached CD under the heading PETLAB\_Schema.

### Site Table

This table stores the location data for all samples and features within the PETLAB database. Any new location added to the system is given a unique Site ID code. This code helps to ensure that records located in the same location (ie down a borehole sequence) are correlated with each other. Coordinate information within PETLAB can be entered using any standard coordinate system. Coordinate data is then converted to NZGD 1949.

### Feature Table

This table stores all of the basic sample information (ie who collected it and when, etc...). In the case of borehole data, the Feature table stores all of the collar information.

Feature ID: a separate numbering system which allows samples to be correlated and related to specific location and/or collar data. When queried, all samples relating to this feature will be visible on the feature page. An example of a feature page is shown in Figure 6.

Feature Information				
Drillhole Name	DCore-52			
Site				
Country:	New Zealand			
Grid Ref:	(R11) 2668312 6480295 (New Zealand Map Grid)			
Lat/Long:	36.86717 S 174.77102 E (NZGD49)			
Precision [m]:	1.0			
Location:	N.I.M.T Chainage 9420 / 5L			
Location Method:				
Height [m]:				
Height Accuracy [m]:				
Height Method:				
Drillcore Details				
CollarRL [m]	69.81			
Total Depth [m]	40.5			
Old Bore Name	BH12			
Drill Company	Boart Longyear			
Consultant	Opus International Consultants Ltd.			
Client	Ontrack			
Drill Method	HQ Wireline Cored			
Data Locality	Fulton Hogan Construction - PO Box 108123,Grafton,1150			
Data Source	Opus International Consultants Ltd.,2008. Ontrack (Dart 2) Project: Geotechnical,Factual Report. For Ontrack (Dart 2). Reference: 1-C0047.06			
Drilling Date	Mar 26, 2008			
Core Storage Location	Fulton Hogan (PO Box 108123,Grafton,1150 - Stored In Car Park) / Boxed Core,Condition: Good (As Of 23/02/2009)			
Samples				
Collection Type	Collection Number	Sample Depth [m]	Stratigraphic Name	Rock types
DEVORA	<a href="#">DEV157</a>	0.0 - 0.1	Fill	silt/sand/gravel soil
DEVORA	<a href="#">DEV158</a>	0.1 - 3.45	Auckland Volcanics (T)	basaltic
DEVORA	<a href="#">DEV159</a>	3.45 - 40.5	Auckland Volcanics (L)	lava flow
Attached Images/Files				
 <a href="#">BH12</a>				
Audit Information				
Feature ID:	172426			

Figure 6: Example of a PETLAB feature page

### Sample Table

This table stores all of the data relevant to the specific individual sample (ie rock type, etc...). In the case of borehole data, the from/to depth, stratigraphic name, and hydrology data is stored in this table with each depth range representing a unique sample.

Sample ID: the sample numbering systems corresponds with the collection number used to upload the data originally. No samples can be uploaded into PETLAB without a collection number. Collection numbers can be obtained from the collection manager or booked online by registered users. An example of a sample page is shown in Figure 7.

<b>Collection Details</b>	
<b>Collection Number:</b>	DEV1591
<b>Collection Type:</b>	DEVORA
<b>Feature Type:</b>	Drillcore
<b>Drillhole Name:</b>	<a href="#">DCore-515</a>

<b>Site</b>	
<b>Country:</b>	New Zealand
<b>Grid Ref:</b>	(R11) 2664928 6478403 (New Zealand Map Grid)
<b>Lat/Long:</b>	36.88483°S 174.73351°E (NZGD49)
<b>Sample Depth:</b>	0.5 - 23.0
<b>Sample Drill Type:</b>	Core
<b>Loc Method:</b>	
<b>Precision:</b>	1.0 m
<b>Location:</b>	50 St. Luke's Rd,Mt. Albert

<b>Field</b>	
<b>Field Number:</b>	1591
<b>Colln Date:</b>	Aug 1991
<b>Collectors:</b>	Drillwell Exploration Ltd.

<b>Sample</b>	
<b>In Situ:</b>	Yes
<b>Rock Desc:</b>	lava
<b>Colour:</b>	
<b>Strat Unit:</b>	Auckland Volcanics (L)
<b>Rock Types:</b>	lava flow
<b>Age (min):</b>	Quaternary
<b>Age (max):</b>	Quaternary
<b>Sample Types:</b>	virtual aggregated sample
<b>Driller Description:</b>	hard,fractured basalt
<b>Core Loss:</b>	

<b>Other</b>	
<b>Comments:</b>	
<b>Reports:</b>	

Figure 7: Example of sample page from PETLAB

### Lab Table

This table stores all lab data associated with a sample (ie petrology data, geochemistry results, etc...). Currently no lab data is associated with borehole samples in Auckland. Uploading of lab data is done using the third tab in the PETLAB Excel template discussed below.

### MetaCat

This system allows the attachment of images/pdfs to features and samples within PETLAB. Logs, core photos, and site maps are stored in the METACAT system and correlated with PETLAB via the feature or sample ID.

## UPLOADING RECORDS INTO PETLAB

### PETLAB EXCEL TEMPLATE

A worksheet which allows users to upload and edit records within PETLAB can be downloaded from:

[http://pet.gns.cri.nz/data\\_entry.jsp](http://pet.gns.cri.nz/data_entry.jsp)

As the Excel template is frequently updated, it is best practice to always download the latest version of the template from the website prior to uploading or editing records. This worksheet is compatible with Excel 2002 and Windows XP. Win Excel 2007-2010 users should be aware that the template must be opened and saved as a 1997-2003 .xlt or .xlsm (macro enabled version) in order to guarantee functionality. The template has only limited functionality in Macintosh Excel 2003 but is fully functional in Macintosh Excel 2011 (Nick Mortimer, pers. comm.).

The Excel template contains the following categories related to borehole data in order from left to right:

- **Action Column:** Specifies type of operation to perform (ie add or edit a record).
- **Collection Type:** Refers to the Collection that the samples belong to, denoting the institution or organization that uploaded the data or that owns the samples. The choices are available from a drop down list within the PETLAB excel sheet.
- **Collection Number:** Unique numbering system within each Collection. This assigns a unique number to every record that is uploaded into the database. For most collection types, the collection number is assigned by the official administrator of the database (for example, the University PETLAB administrator).
- **Field Number:** Refers to the original number or code given to the sample in the field. For borehole data this refers to the corresponding number from the uploading database (ex: DEVORA\_0001).
- **Collector:** Refers to the person who collected the original sample. For borehole data, the driller is considered the collector.
- **Collection Date:** The date on which the sample was originally collected. For borehole data, this is the same as the drilling date.
- **In Situ:** Denotes if the sample taken was in situ or not. The available choices are: yes, no, almost, unknown. As borehole logs are taken on site, 'Yes' is usually selected.
- **Feature Type:** This refers to the type of sample collected. There are three choices: Surface, Drillcore, and Dredge.
- **Existing PETLAB Drillname/Number:** If samples need to be attached to an existing Feature, the corresponding Feature\_ID is placed here.

- New Drillhole/Cruise Name: This creates the Feature\_ID in which the collar information will be stored. Each collection type has a specific formula to be entered in this column.
- New Drillhole/Dredge Number: This creates the numeric part of the Feature\_ID. It will either be in sequence with previous Feature\_ID numbers or correspond to a number within the uploaded database.
- Top Depth (from) [m]: Specifies the ‘from’ value for a borehole depth range.
- Bottom Depth (to) [m]: Specifies the ‘to’ value for a borehole depth range.
- Drillhole Sample Type: Refers to the type of logged material taken during drilling. The choices are: core, SWC, and cuttings.
- Collar RL: The reduced level. The level at the top of the borehole with respect to a given datum, usually elevation above sea level (m).
- Total Depth: The total depth of the borehole.
- Old Bore Name: Original name of the bore stored in the project report.
- Hole Diameter: The diameter of the borehole, given in mm. This is important to note as borehole seismometers require 100 mm.
- Permit Reference: This refers to the permit number granted by the Auckland City/Regional Council. Where unknown, the project number is given instead.
- Drill Company: The company that drilled the borehole.
- Client: The person/company that the borehole was drilled for.
- Consultant: The company in charge of the project.
- Drill Method: The drilling method used (ie rotary core, percussion, etc...)
- Data Locality: The location where the data can be accessed or where the original report is stored.
- Data Source: Reference for the project or database from which the borehole information was sourced.
- Drilling Date: The date that drilling finished. If drilling took several days, the start date can be added into the Comments section.
- Core Storage Location: Denotes the location of any core from a borehole that is being stored. Due to storage costs, core is often not kept for very long. The date when the core was available should be included in this section if possible.
- Comments: Covers miscellaneous information, such as why the borehole was drilled, if the coordinates were converted originally, etc...
- Driller Description: A description (of properties and defects) of each geological unit within the borehole as given by the driller.
- Core Loss: Specifies any issues that occurred during drilling, specifically depth ranges with core loss >80%.
- Country: PETLAB stores data from across the world. Although most samples are from New Zealand, it is important to denote this information
- Coordinate System: Specifies the coordinate system in which the location data is stored. Easting/Longitude: Contains the easting or longitude data. This data will be converted into NZGD 1949 lat/long coordinates. Grid references for NZMS and NZTopo maps need to be truncated, see the PET help sheet for further details. Northing/Latitude: Contains the northing or latitude data. This data will be converted into NZGD 1949 lat/long coordinates. Grid references for NZMS and NZTopo maps need to be truncated, see the PET help sheet for further details.
- Location Method: Indicates the method used to locate the sample. A drop down list of methods is provided.
- Precision: Indicates the precision with which the sample or borehole was located. For borehole information this value is set to a default value of 1 m if the precision is unknown.

- **Site Description**: Contains the street location or location description of the sample/borehole.
- **Rock Description**: Contains a basic description of the rock or borehole sample. For down hole samples this may be the same as the driller's description.
- **Stratigraphic Unit**: The lithologic unit to which the sample belongs or that is represented in the specific borehole depth range.
- **Stratigraphic Age (min)**: Minimum age of the stratigraphic unit specified.
- **Stratigraphic Age (max)**: Maximum age of the stratigraphic unit specified.
- **Rock Type 1**: Specific rock type of the sample. If multiple rock types are present, the dominant type is given here. There are 65 rock types to select from a drop down menu.
- **Rock Type 2**: Specifies the second rock type seen in a sample, or supplements the primary Rock Type 1. A third Rock Type 3 can also be entered.
- **Sample Type 1**: This specifies the type of sample collected. For borehole data for which no actual hand sample exists, 'virtual aggregate sample' should be selected.
- **Sample Repository 1**: Indicates the physical location of Sample Type 1, for example the storage facility where the sample can be found.

Mandatory fields are shown in red. It is important to note that if you specify an existing PETLAB drillname, you are not required to fill in the remaining mandatory fields because that information already exists within the system and will be correlated appropriately.

## HOW TO UPLOAD RECORDS

The following instructions on how to upload records within PETLAB are taken from the PET help sheet in the Excel template. The buttons described here appear on the upper left hand corner of the Excel template and are shown in Figure 8.

“1. Enter data in the worksheet named "PET data sheet".

- Columns may be re-sized or hidden, but DO NOT delete or re-order columns as this will result in corruption of the data
- Red fields are mandatory, black fields are optional
- On some versions of Excel some drop-down lists do not generate properly. If this happens please see the Lists worksheet of the Excel template for the allowed values and enter them exactly as they appear in the Lists.

2. Validate data.

- You must be connected to the internet to validate data
- Press the Validate button (a PETLAB registration is not required to Validate records).
- Your data will be checked row by row
- A Collection Number is not required for validation.
- If an invalid entry is found the validation will stop, the invalid row will be highlighted in red and an error message will be displayed. The error message will also be displayed in the System Messages column at the end of the data entry columns. You then must correct the record and press the Validate button again to continue checking the rest of the records.
- Once all rows of the rows have been validated the System Messages column will display “Validated OK” for each record. The data is now ready to be loaded into the database.
- If you then edit data in a record w after it has been validated, delete the Validated OK message in the System Messages field and press the Validate button again.

### 3. Get P Numbers (GNS only)

- If you have not yet been allocated a set of P Numbers for your data you can book numbers by pressing the Get P Number button. This will populate the Collection Number column with a unique P number for each record.

### 4. Load data

- You must be connected to the internet to load data.
- You must have appropriate database rights to load data. Contact the curator of the Collection for a list of approved people.
- Press the Load button and enter your PETLAB username and password when prompted.
- The data will be re-validated and as each record is loaded into the database “Loaded OK” will appear in the System Messages column.
- If an invalid record is found the loading will stop, the invalid row will be highlighted in red and an error message will be displayed in System Messages. You must then correct the record, delete the error message from System Messages and press Load.  
(PETLAB Help Form)

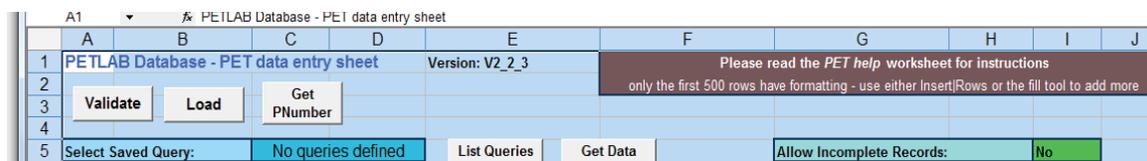


Figure 8: Buttons located in upper left hand corner of PETLAB excel template.

## EDITING/DELETING RECORDS IN PETLAB

### How to Edit Records in PETLAB

The following section was written by Nick Mortimer on 3 November 2010 and explains how to edit existing PETLAB records.

“The occasions that a Curator might want to edit PETLAB data include :

- correct a wrongly-entered grid reference (the most common reason),
- add things like stratigraphic name, comments, thin section, or
- delete horribly scrambled records and start afresh.

Editing records does not involve simply editing and re-uploading the original Excel data entry sheet,

Editing existing PETLAB records is a three-step process (applies to PET and LAB data):

- (1) save a query in PETLAB web browser,
- (2) import saved query records into Excel template for editing and uploading,
- (3) run the query again in PETLAB web browser to check changes have been made.

Step Details:

#### **(1) save a query in PETLAB web browser**

- (a) log in to PETLAB (you can't edit data without logging in)

(b) make either a Simple Query or an Advanced Query of the records you want to edit or delete. The query can contain several records and it must contain at least two records (bug at the moment) e.g.

**Simple Query:** Collection Type = DEVORA (DEV) AND Collection Number = 2863-2864

**Advanced Query:** Audit Details | PET Entered By = Tracy Howe AND PET Entered Date > 1-6-2010 (Fig. 9)

**PETLAB Database**

AND ( Audit Details = Anthony B (Tony) Christie )  
 PET Entered By

Add Line

Use the boxes above to make your query. The query will build up below as you go. You can add and remove lines of the query, but not modify them once they are in place. When you have finished building the query click the **Search** button to display the results or you can **Reset** the query.

---

PET Entered By = Tracy Howe  
[remove line](#)

AND PET Entered Date > 1-6-2010  
[remove line](#)

---

Result Type:  Sample  
 Feature

Search Reset

**Figure 9:** View of the advanced query page, which can be used to select or search multiple records using a variety of criteria. The blue circles show the select buttons that were used to create the listed query.

(c) The result list comes up. Because you are logged in, you can save this query. Type a distinctive name into the white box to the left of the result list and click the "Save Query" Button (Fig. 10).

**PETLAB**

Enter Search Go

PETLAB Home

Search Again

Result Map

Download Data

THoweNov2010 Save Query

Matching Records			
Search Criteria: PET Entered By = Tracy Howe AND PET Entered Date > 1-6-2010			
Displaying records 1 to 13 of 13			
Coll Number	Collectors	Field Num	Coll Year
DEV2863	Tracy Howe	DEVORA_0862	1999
DEV2864	Tracy Howe	DEVORA_0862	1999
DEV2865	Tracy Howe	DEVORA_0863	1999
DEV2866	Tracy Howe	DEVORA_0863	1999
DEV2867	Tracy Howe	DEVORA_0864	1999
DEV2868	Tracy Howe	DEVORA_0865	1999

**Figure 10:** View of a created query that is being saved for later use.

(d) Click “Home” in the side menu bar then “Data Entry” and download a fresh blank Excel data entry template to your PC.

## (2) Import saved query records into Excel template

(a) Open the PETLAB Excel template. Click on the “PET data sheet” or “LAB data sheet” tabs depending on what sort of data you are editing or deleting.

(b) Click on the “List Queries” button. You will be asked to enter your PETLAB username and password. Then you will be able to scroll through the “Select Saved Query” Drop Down menu to select the query you saved earlier. Do this and click on the “Get Data” button (Fig. 11).

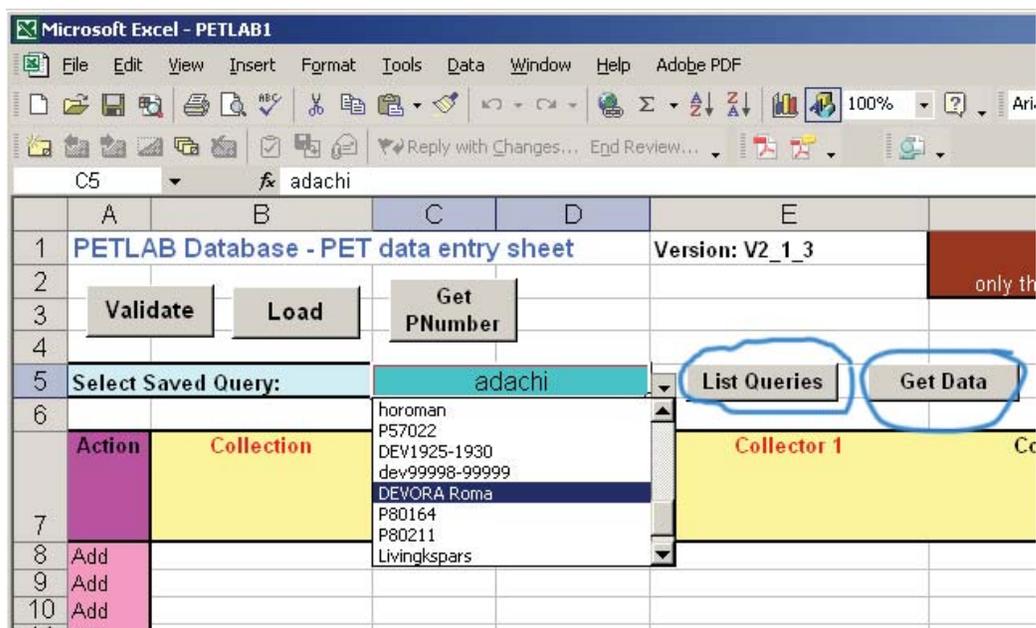


Figure 11: Screenshot of the PETLAB excel template. The 'list queries' and 'get data' buttons are circled for reference.

(c) After a warning about overwriting existing data, the records from the Saved Query will be written to the sheet.

(d) IMPORTANT: Using Excel’s “Edit | Delete” command, now is the time to delete records (rows) from the sheet that you actually want to remain intact in PETLAB. With this action, you are only deleting them from the Excel sheet, not from the main PETLAB database. If you have insufficient access rights, then get the GNS Science curators to delete them.

(e) Once you are left only with the records (rows) that you want to edit or delete, select the appropriate “Action” in column A (Figure 12) and go about making changes as you do with a normal data entry sheet.

	Action	Collection	Collection Number	Field Number	Collector 1
8	Update	DEVORA (DEV)	2863	DEVORA_0862	Tracy Howe
9	Add	DEVORA (DEV)	2864	DEVORA_0862	Tracy Howe
10	Update	DEVORA (DEV)	2865	DEVORA_0863	Tracy Howe
11	Delete	DEVORA (DEV)	2866	DEVORA_0863	Tracy Howe
12	Update	DEVORA (DEV)	2867	DEVORA_0864	Tracy Howe

Figure 12: Screenshot of PETLAB excel template showing "Action" column drop-down menu.

(f) Validate, save the sheet on your PC, then load it.

(g) Fingers crossed

### (3) Run the query again in PETLAB

It is important to check that what you wanted to happen has actually taken place.

If/when you are logged into PETLAB in the web browser, a "Saved Queries" option appears in the left hand column. For convenience, you can select the same query you saved earlier.

Good PETLAB Habits:

- Always check data (map views and a few records) after uploading
- Save and archive all Excel sheets
- Email Nick or Delia at GNS Dunedin with any questions or suggestions." (pers. comm. Nick Mortimer)

#### Protocol for Deleting PETLAB Records

Only PETLAB administrators can delete records at this point in time. Any records that require deletion must be sent to either Nick Mortimer or Lynley Smith. In order to prepare records for deletion, follow these steps:

- query the records of interest
- save the query using the 'Save Query' button
- open the query in the Excel template (instructions can be found in above section).
- change the action in Column A to delete
- save the Excel file and send the Excel file to Nick or Lynley for deletion

You will be notified when they have deleted the records. It is best to check that all the requested records were removed from PETLAB.

#### HOW TO ATTACH/DELETE IMAGES/PDFS IN PETLAB

The following was written by Nick Mortimer in November 2010. It details how JPEG, TIFF, GIF, BMP, TXT, DOC, XLS and PDF files can be uploaded and attached to sample or feature records within PETLAB.

“Multiple files can be attached to PETLAB features or to PETLAB sample records. The former might be scans of an entire borehole’s core log or a photo of a “raw” unsorted dredge haul. The latter might be photos of individual samples, or an XRD or detrital zircon pattern from a rock.

The files appear as thumbnails attached to the bottom of sample and feature record pages and can be downloaded. Unlike LAB data these are not password protected, ie. everyone has access to them. For example P78802 (Figure 13).



Figure 13: Example of PETLAB sample with attached image circled for reference.

Files are attached one at a time (there is no batch uploading). To attach a file do the following:

- 1) Log in to PETLAB. You cannot attach or delete files without logging in.
- 2a) Using Simple or Advanced Queries, navigate to the PET sample record page or the PET Feature page you want to attach a file to:

e.g. a Simple Query for DEVORA 1500 brings up the page below. To attach a file to this specific **sample** (one of many from the Galway Street D-Core-495 drillhole), click on “Edit Images/Files” in the lower left menu (Figure 14).

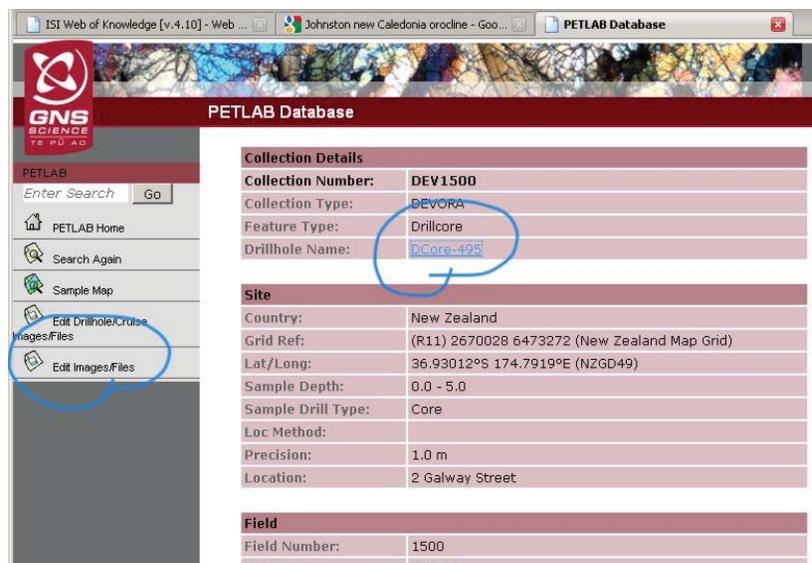
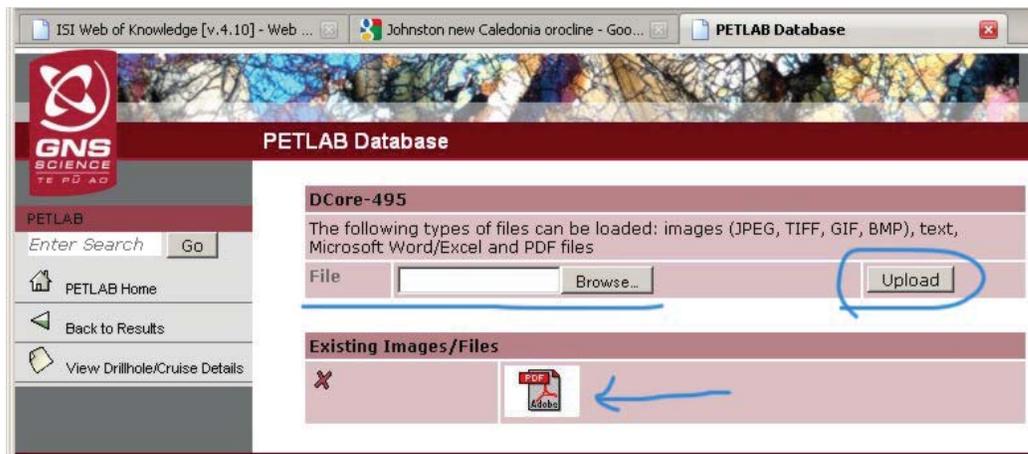


Figure 14: Queried result page. The button for editing/attaching images is circled on the left for reference. The link to the connecting feature is also circled for reference.

2b) Or to attach a file to the Galway Street D-Core-495 drillhole **feature**, hyperlink to the DCore-495 record and *then* click in the lower left menu.

3) Clicking on the “Edit Images/Files” button brings up this page (Figure 15)



**Figure 15: Editing Image/Files Page.**

Select the “Browse...” button to browse your PC/Mac/Network drives and select a file. Then click the “Upload” button. The transfer should proceed fairly quickly.

To delete records, simply query the sample or feature that has the record attached and click on the red X shown to the left of the record (see above Figure).

4) Rerun the Query and make sure a new thumbnail file appears.”

## CITING PETLAB DATA

As PETLAB is a database of information and not a source unto itself, the procedures for citing data found within the system are as follows:

- If you are citing a single sample or borehole, cite the original source of the data listed in the Source, Reports, or Bibliographic References online columns.
- If you are citing a large amount of data (ie several boreholes) check to see how many separate sources are listed in your dataset of interest. If all of the data is sourced from <5 reports, cite all 5 of the reports listed. If the data is sourced from <5 reports, please cite the database in the following format (Database Name, PETLAB, date of access). If a database has a corresponding report, please cite the report (eg. Howe et al, DEVORA Database).

## ACCESSING/DOWNLOADING PETLAB DATA

Accessing PETLAB data can be done in three ways, using a quick search tool or one of two query forms, Simple or Advanced. The quick search tool is at the top of the menu on the left side of the website, a text entry box that says Enter Search. Type your search term here and then press Go. Links to the query forms are available on the left hand side of the PETLAB website.

## SIMPLE QUERY FORM

The simple query form is a very straight forward search tool. A screenshot of the simple query form is shown in Figure 16. To use the form, simply select the appropriate collection of interest and then specify your search criteria using the predetermined categories. You can use the ‘Attached Files’ boxes to search for samples that have jpegs or other attachments. Using the ‘Result Type’ category, you can also specify whether you wish to search by sample or feature. For most PETLAB data, it is appropriate to search by sample data. When searching for borehole

data, however, it is usually most relevant to search by feature. Using this form, it is now also possible to search by area or region. Simply click on the 'Create map polygon' button. In order to select only the collection of interest, turn off all the collections except the one you want to search, on the right hand side of the map. Navigate and/or zoom to see the area of interest, then left click on the screen to begin creating a closed polygon. When the area you wish to study is fully enclosed, click submit. This will return you to the simple query form. Simply click search on the bottom of this page, and all of the samples located within the area and collection of interest will be returned.

### ADVANCED QUERY FORM

The advanced query form allows to you search on any criteria that is available within the database. Using the drop down menus, select the fields of interest. Please note that you must add or remove the query lines one by one in order to create a complete query. Once your query is complete, click search and the appropriate results will be returned.

Sample (PET) Details	
Collection Name:	-- All -- <input type="button" value="No:"/>
Collector:	<input type="text"/> (enter part of name)
Rock Type/Group:	-- All -- <input type="button" value="-- All --"/>
Sample Type:	-- All -- <input type="button" value="-- All --"/>
Country:	-- All -- <input type="button" value="Island: -- All --"/>
QMap Sheet:	-- All -- <input type="button" value="NZMS260 Sheet:"/>
Stratigraphic Unit:	<input type="text"/> (enter part of name)
Sample Depth:	From: <input type="text"/> To: <input type="text"/>
Feature Type:	-- All -- <input type="button" value="Name:"/>
Spatial filter:	<input type="button" value="Create map polygon"/>

Analytical (LAB) Details	
Material:	-- All -- <input type="button" value="-- All --"/>
Analytical Method:	-- All -- <input type="button" value="-- All --"/>
Geochron Method:	-- All -- <input type="button" value="-- All --"/>
Analytical Data:	<input type="checkbox"/> Majors <input type="checkbox"/> Traces <input type="checkbox"/> Iso meas <input type="checkbox"/> Age & iso calc <input type="checkbox"/> Volumetric <input type="checkbox"/> Petrophysical <input type="checkbox"/> Sample amount <input type="checkbox"/> Any

Other	
Attached Files:	<input type="checkbox"/> jpeg tiff <input type="checkbox"/> Any (incl. pdf)

Search	
Result Type:	<input checked="" type="radio"/> Sample <input type="radio"/> Feature
<input type="button" value="Search"/> <input type="button" value="Reset"/>	

Figure 16: The PETLAB simple query form

## **APPENDIX 7: DEVORA DATA IN PETLAB**

### **Structure of DEVORA Data in PETLAB**

All DEVORA data in PETLAB is stored within the DEVORA (DEV) Collection. Inside the collection, the information is broken down into feature and sample data. For DEVORA data, the feature category contains all the collar information of individual boreholes. These features are labelled with the standardized format D-Core-###, where the number corresponds to the DEVORA number in the Access database. For example:

Borehole DEVORA\_0508 = Feature D-Core-508.

The sample category contains each individual depth breakdown (ie from/to depths), the unit lithology, and the driller description. DEVORA samples are labelled DEV####, where the number relates to the collection number used to upload the sample. The collection number is a running index that must be kept track of as collection numbers are a unique identifier in the system.

If you want to search for full borehole records, you must make sure to select Result Type = Feature on the simple query form. On each feature page, all of the correlated samples are listed and can be accessed.

If there are multiple interpretations of a stratigraphic levels within a single borehole, a second set of 'sample records' may be attached to the D-Core Feature.

### **Downloading the Full DEVORA Dataset**

To download the full DEVORA dataset, access the PETLAB website and click simple query on the option bar located on the left side of the screen. Within this query page, change the collection name to DEVORA (DEV) and selecting Sample as the result type, click search. Once the search is complete, the option to download data will appear on left hand menu. From here you can determine what data you want to download, and whether you want a text (tab-delimited) or Excel export. The latter will download the information into a formatted Excel sheet.

### **DEVORA Dataset Fields**

#### **Coordinates:**

All borehole locations are given in New Zealand Map Grid (R11) and in Lat/Long. Where coordinates have been converted from a different system, the original system is noted in the Comments section.

#### **Location:**

If the exact street address of a borehole was given, this is noted in the location section. For those where such information was not given, the suburb or region of Auckland is noted.

#### **CollarRL:**

This is the reduced level or the level/elevation at the drill site with respect to mean sea level. If the datum of the original RL is known, it is noted in the comments section. Where the CollarRL was not provided by the driller, it has been taken from a 2 m DTM of Auckland provided by the Auckland Council.

#### **Old Bore Name:**

When drilled as part of a large project, boreholes are assigned a unique identifier. Where applicable, these names have been added under this category so that anyone wishing to reference the original borehole within the project can do so.

Permit Reference:

Drilling done within the Auckland region requires consent and permit from the Auckland Council. Where this information was available, the AC permit reference number was included. Where it was unavailable, the project number was included instead.

Drill Company:

The drill company responsible for drilling and logging the borehole is noted in this section. Where the drill company is not identified, Unknown Driller was used instead. This category was used as the 'Collector' category within PETLAB. You can search for boreholes drilled by a specific drilling by using the Collector box on the simple query form.

Data Source and Locality:

As the dataset is quite extensive, we included references to original source material and the location of that material. The project file and/or report from which the borehole information was taken is noted under Data Source. The organization that provided the information is mentioned under Data Locality.

Drilling Date:

The drilling date denotes the date that the drilling was completed. If it was a multi-stage drilling project, the date that the drilling first took place is noted in the comments section. Where no date was given, but the year of drilling is known, January 1<sup>st</sup> of that year was denoted as the drilling date.

Stratigraphic Name:

Geology information included in the DEVORA dataset is broken up by lithologic units for convenience. A list of lithologies and their descriptions is available under the Geologic Descriptions Section. In order to be included, these units had to be identified by the driller or be identified by descriptions that left no doubt as to their placement. Where a stratigraphic unit could not reasonably be identified, this category was left blank and the user is directed to read the driller's description.

Rock Types:

This category is used to help sort PETLAB samples in order to increase searchability. For every from/to within a borehole, the dominant rock type was assigned using specific PETLAB categories.

Driller's Description:

Logged information on the visual, textural, and compositional data of a specific unit was noted in this category. Where a unit spanned a large depth range, the most prevalent descriptors were taken down. Where available, further details can be found in the log PDFS attached to the feature.

**Geologic Descriptions (Updated from Steele et al 2009):**

The following geological units are observed within boreholes drilled across the Auckland volcanic field. A list of all the major stratigraphic units with their typical rock types and min/max stratigraphic ages is given in Table 2.

It is very strongly recommended that you use this list of names for Stratigraphic Unit (which is a free text entry field in PETLAB).

#### Fill/Topsoil:

Construction fills or top soil layer of variable thickness. This layer is typically a mixture of volcanic sediments and manmade materials and does not usually extend further than 5 m depth. Refuse is often common in many boreholes at this level.

#### Auckland Volcanics (T):

This stratigraphic unit denotes tephra units from the AVF. Tephra is a generic word used to describe all air-fall deposits produced by a volcanic eruption regardless of composition or size. Within the AVF, these airborne fragments or pyroclasts are basaltic and depending on the style of eruption, are characteristically varied. Descriptions of the tephra will highlight both the grain size and compositional texture observed. Some descriptive terms used include:

#### Size

<i>Ash</i>	-	Particles less than 2 mm in diameter
<i>Lapilli (Cinder)</i>	-	Particles ranging from 2 mm to 64 mm in diameter
<i>Bombs or Blocks</i>	-	Particles greater than 64 mm in diameter

#### Texture

*Tuff* - When pyroclasts fall to the ground and are hot enough to fuse or weld together.

*Scoria* - Macrovesicular volcanic rock. It differs from pumice in having larger vesicles and thicker vesicle walls. It is generally darker in colour (dark brown, black or red) and whilst it is still light in weight, is denser than its pumiceous counterpart. Its vesicularity results from the exsolution of magmatic volatiles prior to chilling. Only where it was clearly identifiable that scoriaceous material was formed by fragmental ejecta (air-fall deposit) during eruption was it denoted as Auckland Volcanics (T).

#### Auckland Volcanics (L):

This stratigraphic unit is used to denote all the lava flows across the AVF. Typically comprises dark grey, intact and strong basaltic material. Slightly to highly vesicular alternations throughout a sequence are common and a rubbly, scoriaceous layer often appears at the top of the unit, which can be used to distinguish between adjacent lava flows. Vesicles often show flow banding properties. Planar, undulating or orthogonal fractures appear, typically in zones and of which are generally clay coated or have limonitic staining. Olivine crystals are common and occasionally rare quartz, feldspar or organic material is incorporated.

#### South Auckland Volcanics:

Located in the Pukekohe region, the South Auckland field is a possible ancestor of the AVF. It is a Pleistocene age intraplate monogenetic field with about 100 centers.

#### Karioitahi Group.

The Karioitahi deposit consists of unconsolidated coastal sand deposits. These include sands of shallow marine, beach, and dune origins (Edbrooke 2001). This formation can be found across the Awhitu Peninsula and often overlies early Miocene rocks.

- *Awhitu Group* – Quartzofeldspathic dune bedded sands.

#### Tauranga Group

Consists of a series of terrestrial (volcanic & loess), alluvial and marine deposits. They are grouped:

- *Puketoka Formation* - Pumiceous alluvium interbedded with peat horizons and volcanic ash.
- *Walton Subgroup* - Pumiceous alluvium and colluviums, dominated by non-welded ignimbrite.
- *Karapiro Formation* - Highly weathered pumiceous rhyolitic sands and grits interbedded with peat.
- *Hamilton Ash Formation* - Strongly weathered tephra beds interbedded with paleosols.
- *Recent Alluvium* - Pumiceous alluvium and swamp deposits, forming recent floodplains. Comprises unconsolidated sand, silt, mud and clay with gravel layers and thin peat beds over older alluvial deposits. Shelly estuarine material is common.

#### Kaawa Formation

These Pliocene sediments comprise of pumiceous sandstone, generally underlain by a shelly calcareous layer. It typically overlies Waitemata Group Rocks and is usually a prolific water source if observed.

#### Tipakuri Sandstone Formation

These Miocene sandstones are massive, weakly bedded, macrofossiliferous, and calcareous. They are occasionally interbedded with siltstone. Outcrops appear on Motutapu and Waiheke islands as well as in South Auckland. Thicknesses range from 2-10 m generally (Hayward and Brooke 1984).

#### Waitemata Group

The Waitemata Group Rocks generally comprise interbedded layers of sandstone and siltstone. There are four distinct sequences within the Waitemata Group:

- *Waikawau Sandstone* - A massive to well bedded calcareous, glauconitic fine to medium sandstone with thin siltstone interbeds.
- *Warkworth Subgroup* – A series of interbedded turbidite sandstones and mudstones. Some redeposited conglomerates present.
- *Koheroa Siltstone* - Overlies the Waikawau Sandstone. Massive to well bedded sandy siltstone commonly with sandstone beds up to 2 m thick.
- *Amokura Formation* - Alternating 0.2 m – 1 m thick, graded sandstone and 0.05m – 0.2 m thick, laminated mudstone. Carbonaceous fragments are common throughout.
- *Papakura Limestone* – Basal layer of the Waitemata group. Consists of thick limestone layers interbedded with calcareous sandstones.

The Parnell Grit, which is a series of fine to coarse grained volcanoclastic conglomerates often forms channelised deposits within the Waitemata Group early Waitemata Group. They are usually 2 to 20m thick and are thought to be gravity flow deposits (Allen 2004).

#### Te Kuiti Group

Comprises a transgressive sequence of rocks ranging from coal measures and freshwater siltstones, grading up into marine sandstones and limestones. The group is up to 500m thick and comprises the following formations:

- *Mangakotuku Formation* - Blue-grey siltstone with muddy glauconitic green sandstone in the lower sections of the unit.
- *Glen Massey Formation* - Upper unit consist primarily of a sandy limestone followed by a grey calcareous siltstone with graded upper and lower contacts and a massive calcareous sandstone.

- *Whaingaroa Formation* - Massive glauconitic, calcareous siltstone with thin, muddy, fine grained sandstone to sandy siltstone. The siltstone commonly displays conchoidal fracturing.
- *Aotea Formation* - A cross bedded, crystalline limestone.
- *Te Akatea Formation* - Weak, grey-white calcareous massive or weakly bedded siltstone to silty, fine grained sandstone.
- *Waitomo Sandstone* - Massive muddy calcareous fine to medium sandstone with shell fragments.

Waikato Coal Measures

Made of fine grained carbonaceous mud-rocks, the Waikato Coal Measures were laid down in the Eocene. They contain large scale coal seams that can vary in thickness over very short distances (Hall 2006)

Waipapa Terrane

The Waipapa terrane consists of imbricated terrigenous clastics, red and green argillites, cherts and metabasalts. This group is generally described as greywacke and represents the oldest unit in the Auckland region.

Stratigraphic Name	Rock Type (1)	Rock Type (2)	Strat Min	Strat Max
Soil	soil		Quaternary	Quaternary
Fill	solid artif and misc		Quaternary	Quaternary
Auckland Volcanics (L)	basaltic	lava flow; scoria	Quaternary	Quaternary
Auckland Volcanics (T)	basaltic	tephra; tuff; scoria	Quaternary	Pleistocene
South Auckland Volcanics (L)	basaltic	lava flow; scoria	Quaternary	Pleistocene
South Auckland Volcanics (L)	basaltic	tephra; tuff; scoria	Quaternary	Pleistocene
Kariotahi Group	silt/sand/gravel		Quaternary	Pliocene
Tauranga Group	silt/sand/gravel		Quaternary	Pliocene
Kaawa Formation	arenaceous (sst)		Pliocene	Pliocene
Tipakuri Sandstone	arenaceous (sst)	lutaceous (mst)	Miocene	Miocene
Waitemata Group	arenaceous (sst)	lutaceous (mst)	Miocene	Miocene
Te Kuiti Group	arenaceous (sst)	calcareous	Miocene	Oligocene
Waikato Coal Measures	lutaceous (sst)	coal/organics	Oligocene	Eocene
Waipapa Terrance	calcareous		Cretaceous	Triassic

**Table 2: The basic stratigraphic units seen in the DEVORA borehole database with their typical rock type and stratigraphic minimum and maximum ages.**