



Geological Society of Australia

# Student Rock and Mineral Sample Sets



## Volume 2 Sample Set Assembly Process



G E O L O G I C A L   D A T A   D E S I G N

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## OVERVIEW

The Geological Society of Australia (Qld) committee is currently working on a project to assemble a collection of rock and mineral sample sets for high schools teaching Earth Science to Year 11&12. It is apparently very difficult to obtain such sample set materials, and the GSA saw an opportunity for a little community service in constructing some sets for these schools.

A number of rock and mineral specimen sets are currently being considered, with these falling into the following broad groups –

- Rock specimens from the three primary rock classes, along with a special set of the rocks of the Brisbane Area.
- Mineral specimens; rock-forming, Moh's hardness set, economic minerals
- Fossils
- Economic rock / mineral suites by commodity.

It is proposed each set will be supplied in a plastic sectioned box with fixed dividers.

Currently it is envisaged that each set will contain the following –

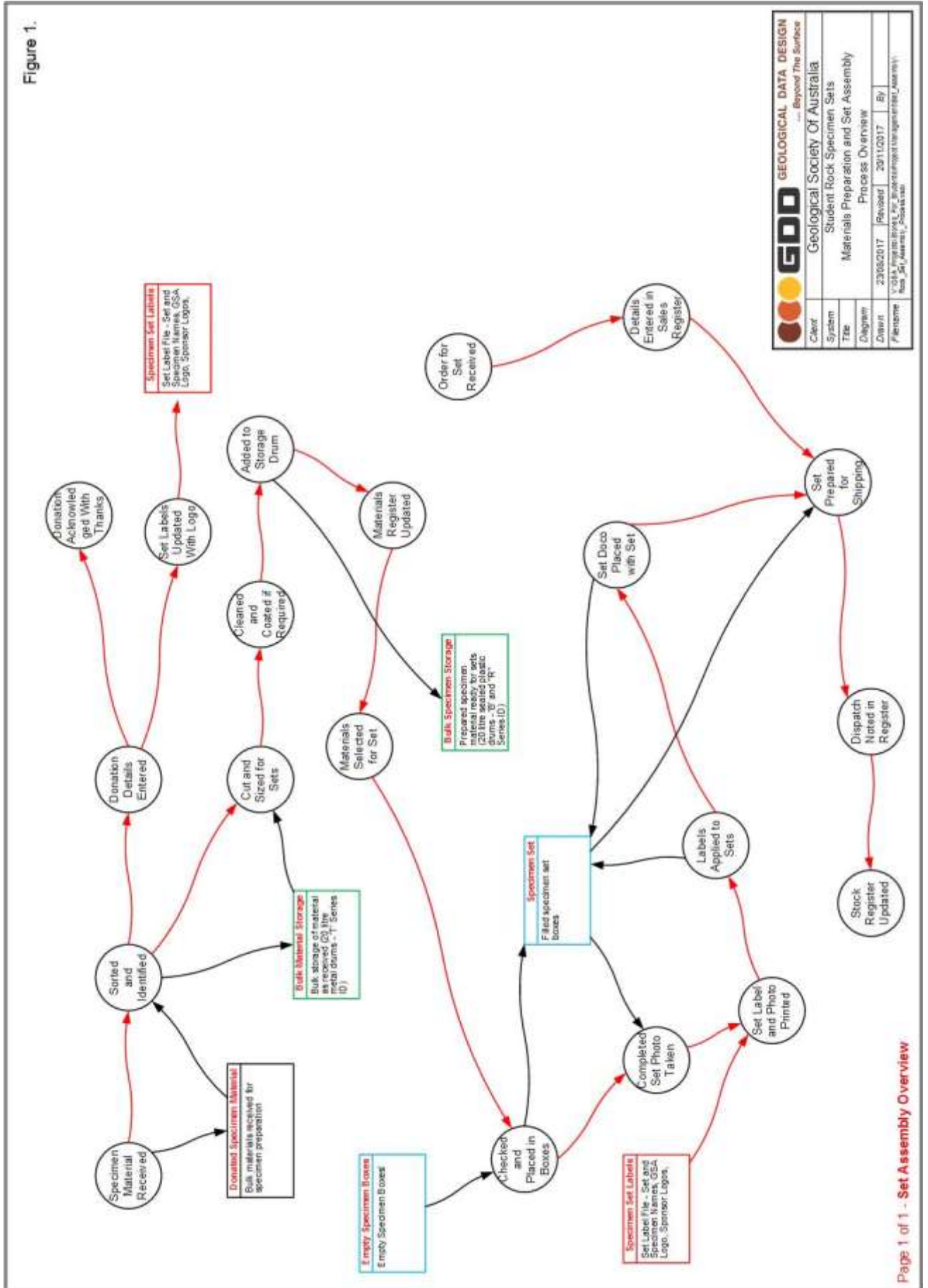
- Mineral or rock specimens.
- A list of the specimens, with short descriptions and source, inside the lid.
- A label with the rock set name, the GSA logo and name along with that of other organisations who have assisted in the supply of specimens or in the preparation of the particular set, and a list of the specimens in the set, located outside the lid on the top of the box.
- An accompanying short booklet (possibly...) containing a more detailed description of the specimens, the source location where known, along with acknowledgement of the GSA and other organisations who assisted in the assembly of the set.



## SET ASSEMBLY PROCESS OVERVIEW

- Sourcing of sample materials
  - Identify requirements
  - Identify sources
  - Grovel and crawl
  - Accept and store bulk materials (Metal drums)
  - Update inventory and donations register
- Sample preparation
  - Sort and categorise
  - Cleaning
  - Sample sizing
  - Individual sample container preparation (where required)
  - Prepared samples storage (Airtight drums)
  - Update prepared samples inventory register
- Sample set assembly
  - Select sample materials
  - Insert in boxes
  - Box labelling
    - Box content and sponsor list (external)
      - (Include an unobtrusive Set ID using mail-merge)
    - Box content photo (internal)
  - Set storage
  - Update boxed set inventory register
- (Under project S&P)
  - Identify schools
  - Establish order / dispatch / delivery / collection process
  - Maintain register of all sets dispatched, with set ID's and school contact details.

Figure 1.



<b>GDD</b> GEOLOGICAL DATA DESIGN ... Beyond The Surface	
Client	Geological Society Of Australia
System	Student Rock Specimen Sets
Title	Materials Preparation and Set Assembly
Diagram	Process Overview
Drawn	23/05/2017
Revised	20/11/2017
By	
Filename	V:\GSA_Files\GDD\GDD_LFP_SpecimenSetManagement\GDD_Assembly_Visual.docx

# SPECIMEN SET DESCRIPTION

## SAMPLE BOXES

### ROCK SPECIMEN SETS

The samples provided will be of a larger size than the proposed mineral sets, so that the various mineral constituents, structure and physical characteristics can be readily seen.

The box proposed (below) has eight sections, each is **75 x 75 x 100mm** in size, which allows for good size specimens.

The box shown retails at \$12.50 at Office Works.

A request to perhaps support the project with a discount on the boxes, perhaps in return for acknowledgement of support by way of a logo on the boxes, was made to Officeworks, but to date a response has not been received.

It has recently come to light that Bunnings also carry the same box, at a price of \$8.98.

#### Box Details –

- Model Name - Tactix 8 Compartment Storage Box Organiser
- Box Dimensions (mm) - W:355 H:95 L:274
- Compartment Size - 75 x 75 x 100mm
- Material – Polypropylene
- Prices obtained to date –
  - Officeworks - \$13.98
  - Bunnings - I/N: 2581004 - \$8.98





## MINERAL SPECIMEN SETS

The samples provided can be of a smaller size than the proposed rock sets above, as larger scale structures are not as important.

The box proposed (at left) has 12 sections, each is **50 x 50 x 75mm** in size.

### Box Details –

- Model Name - Tactix 12  
Compartment Storage Box  
Organiser
- Box Dimensions (mm) -  
W:200 H:50 L:310
- Compartment Size - 50 x  
50 x 75mm
- Material – Polypropylene
- Prices obtained to date –
  - Officeworks - \$9.98
  - Bunnings - I/N:  
2580706 - \$4.98



## BOX LABELS

Two label panels are proposed for each box; a label on the top of the box identifying the set, the names of the contained specimens, and GSA and sponsor logos, and a label inside the lid with a photograph of the actual specimens in each box, to remove any ambiguity, and the problem of painting hundreds of white dots and numbers.....

The labels will be laser printed on weatherproof vinyl labels

## MINERALS SET LABELS



**EXTERIOR LABELS**

- Dimensions – **256 x 142mm**
- Draft Version – (Sponsors to be finalised)
- X



**INTERIOR LABELS**

- Dimensions – **282 x 198mm**
- Example



# ROCK SET LABELS



**EXTERIOR LABEL**

- Dimensions – **282 x 198mm**
- Draft Version – (Sponsors to be finalised)

Pumice	Pearlite	Rhyolite	Basalt
<p><i>Proudly Assembled By -</i></p>  <p><b>GDD</b> G E O L O G I C A L D A T A   D E S I G N</p> <p><b>GEOLOGICAL SOCIETY OF AUSTRALIA</b> Southern Queensland Branch</p> <p>Department of Natural Resources and Mines</p>	<p><b>GSA Rock Specimen Set Set No. 1</b></p>  <p><b>Geological Society of Australia</b></p> <p><b>Igneous Rocks</b></p>		<p><i>Proudly Sponsored By -</i></p>  <p><b>chinova</b> resources</p>  <p><b>NEW HOPE GROUP</b></p>  <p><b>PANORAMIC</b> RESOURCES LTD</p>
Granite	Granodiorite	Diorite	Gabbro

**INTERIOR LABELS**

- Dimensions – 256 x 142mm
- Example





## ACCOMPANYING NOTES

A decision has yet to be made on the format and content of any brief accompanying notes for the sets. If produced, the notes may consist of –

- Technical description of the rock or mineral specimens
- Mineral or rock property listing
- Notes on the source of the particular specimens in the set, if known.

-

# SOURCING OF SAMPLE MATERIALS

## IDENTIFICATION OF REQUIREMENTS

The content lists for the sets were derived initially by GSA members, and subsequently tuned by information from the QCAA, using the draft versions of the new (2018?) curriculum for Earth and Environmental Science. (Ross Wilson of the QCAA has been instrumental in providing this assistance)

Considerations –

- Specimens to cover basic geological rock classes
  - Basic sets – one box (8 specimens) for each of –
    - Igneous
    - Sedimentary
    - Metamorphic
  - Specimens to cover basic mineral classes –
    - Basic sets – one box (12 specimens) for each of –
      - Rock forming minerals
      - Economic minerals
      - Mohs scale of hardness set
- A basic fossils set is also being assembled, at this stage with one box of 8 specimens. This may be expanded if materials allow.
- Possibility also of assembling more advanced sets ( e.g. two box sets of each class) if materials to allow this are available

## IDENTIFICATION OF SOURCES

The majority of materials for the rock sets have been found to be readily available from a large initial donations from the GSQ and a couple of private industry geologists. The GSA committee members and others have been researching and suggesting possible sources for some of the harder to obtain specimens.

## OBTAINING OF MATERIALS

The project was given an early and significant kick-start with a broad range of specimen materials from the GSQ, being materials excess to requirements. In particular, Friedrich von Gnielinski (GSQ) has provided several hundred specimens of both rocks and minerals for preparation and inclusion in the sets





Figure 19 - steel bins (NOTE Brisbane tuff blocks in background are NOT available for samples)

The GSQ materials consisted of two types –

- Medium to large sized samples that had been stored outside for some time. These varied greatly in condition, but cleaning has rendered the majority excellent for specimen use.
- A sample of these is shown below



- A very large number of specimen slabs that came from a duplicates collection. These are all identified by sample no. and were accompanied by an Access database identifying the sample location, geological descriptions, sample photo and in many cases, a whole rock chemistry analysis.



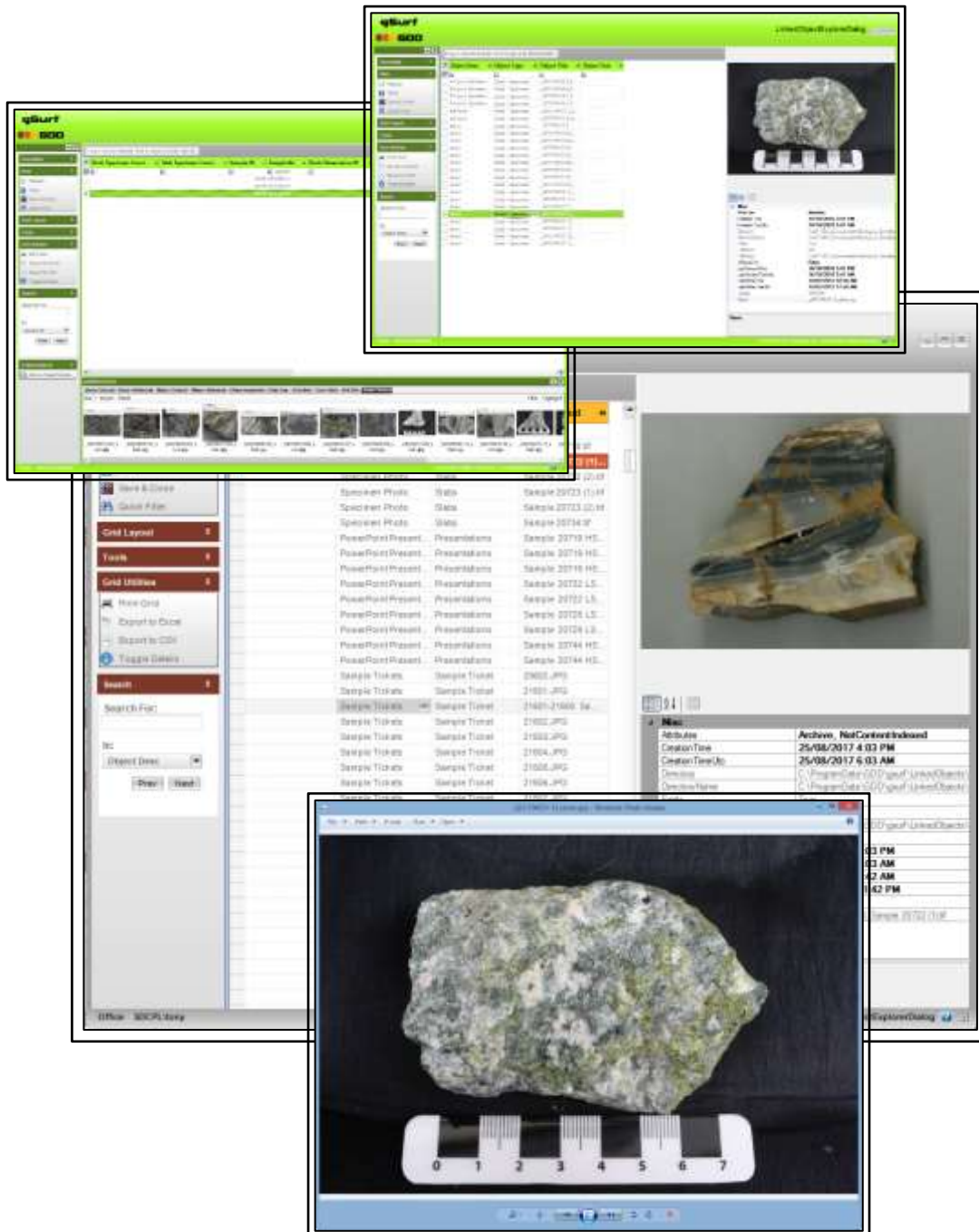
- The down-side was that the samples came unsorted...
- Which led to some sorting....



- Which was a wonderful exercise in revision of geological identification...



The GSQ data relating to the samples has been loaded into GDD's gPick database system, enabling quick access to any sample, including the sample and site photographs as the materials are being processed.



In addition, several individual geologists have made significant donations either from the organisation with which they work, or from their 'private reserve'.



*Figure 20 – Bulk samples*

A register is being maintained to recognise and record these donations.

As these materials are processed, and required minerals or rocks that are lacking are identified, GSA committee members and others have been researching and suggesting possible sources.

A rough current estimate indicates we now have sufficient materials of around 80% of the required specimens for an initial assembly of 50 sets.

## STORAGE OF BULK MATERIALS

As the bulk specimen materials are received, they are stored in numbered 20litre steel drums with lids until they can be processed.



A 'raw materials' register is maintained to help track what we have, and hence what we still require. The register also records details of the material origin if known, and the donor. Some materials have been donated by individual geologists from their personal collection; in some cases the origin of the specimen is lost in the fog of time.

## UPDATE OF INVENTORY AND DONATIONS REGISTER

# SAMPLE PREPARATION

## SAMPLE REQUIREMENTS

For the specimens to be of best use to the students, the samples must have the following attributes where possible –

- They must be large enough to handle and to display the overall characteristics of the rock or mineral.
- Smaller specimens should be provided in some form of clear container.
- They should possess surfaces that are clean and unweathered (in most cases).
- At least one naturally fractured surface is important, but a sawn and perhaps coated surface can make mineral and structural details more clearly visible.
- A numerical ID should be applied to each sample to allow reference to an index, and to ensure they are replaced in the correct box / compartment.

## SAMPLE PREPARATION OVERVIEW

- Sort and categorise
- Cleaning
- Sample sizing
- Individual sample container preparation (where required)
- Prepared samples storage (Airtight drums)
- Update prepared samples inventory register



Figure 1 - Rock specimen size examples

## PREPARATION

### MATERIAL SORTING



### SAMPLE SIZING



Initial trials in breaking down large pieces to specimen size using a jaw crusher and knocktometer were partly successful, but resulted in significant wastage as many of the fragments were too small to be of use.

Additionally access to a large enough jaw crusher is difficult, which means sample preparation cannot be continued in small batches.

Having ready access to a diamond saw, larger pieces were cut into 65-75mm slabs, and these were then split into sample size pieces with a mallet and bolster.

This method has several benefits –

- It has significantly reduced waste
- It provides a combination of freshly broken and sawn surfaces
- All equipment is available here so the sample prep can continue whenever time is available.





Figure 3 -- Original weathered faces

- 
- 



Figure 4 - Sawn face

- 
- 



Figure 5 - Freshly broken faces

- 

## SAMPLE CLEANING

Cleaning of the sample surfaces of older specimens by water blasting has been found both useful, and quick.

Where the samples carry a sample number, a series of photos of the rocks in each batch are taken, with which the samples can be matched following cleaning. (The wonders of digital photography...)



Before and after....



Figure 6 - Before cleaning



Figure 7 - After cleaning



Figure 8 - After coating

Sandblasting has likewise been found useful in enhancing the specimens where weathering or other surface deposits have been encountered...

And it's pharst!



Figure 9 - Before sandblasting



Figure 10 - After sandblasting



Figure 11 - Before sandblasting



Figure 12 - After sandblasting

### SURFACE COATING

A clear 'matt' polyurethane finish has been applied to one of the sawn surfaces, greatly enhancing the visibility of the rock texture and mineralogy, without the distracting (and crappy-looking) shininess and reflection issues of a gloss or satin finish.



Figure 23 - Application of MATT polyurethane on lower sample

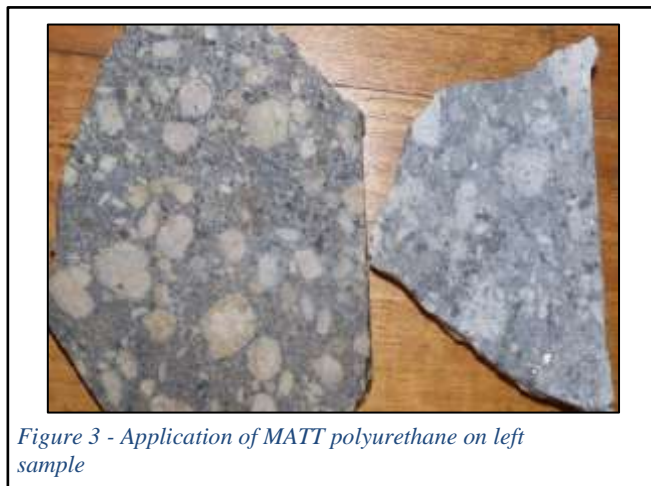


Figure 3 - Application of MATT polyurethane on left sample

### INDIVIDUAL SAMPLE CONTAINERS

Small samples are currently being assembled in either glass bottles, glass specimen tubes, or clear plastic medical specimen containers which were on hand.



Figure 45 – Small sample / specimen containers



Figure 56 – in culture dishes

Identification numbers....We had a better idea...

### PREPARED SAMPLE STORAGE

Materials prepared to date are being stored in steel drums, (courtesy of Friedrich / GSQ), and plastic buckets and bins (courtesy of GDD and Markus Maus charity group)



Figure 67 - Bottles and vials



Figure 78 - tubs



## SLAB REFERENCE SET

The 3500 slab reference set has been sorted and is currently stored in a series of sealed plastic containers

It is hoped they will then be transferred and ordered in a series of rectangular containers, enabling individual samples to be rapidly accessed for study.



# SAMPLE SET ASSEMBLY



Figure 2 - Specimen prep workbench with some donated core samples

## SAMPLE SELECTION AND INSERTION

To build a number of specimen set boxes, a single set type is assembled at a time (e.g. Igneous Rocks Set 1)

- The required samples are drawn from the airtight storage drums containing the prepared ample material.
- The specimens are inserted into the correct slot in the specimen boxes as per the exterior labels. (See below)
- The remaining stock is updated in the prepared sample register, so we know what we have left.
  - Select sample materials
  - Insert in boxes
  - Box labelling
    - Box content and sponsor list (external)
      - (Include an unobtrusive Set ID using mail-merge)
    - Box content photo (internal)
  - Set storage
  - Update boxed set inventory register



## BOX LABELS

Two labels are applied to each box -

- An external label identifying the set, the names of the contained specimens, and GSA and sponsor logos, along with a unique Serial No.
- An internal label with a photograph of the actual specimens in each box, to remove any ambiguity, and the problem of painting hundreds of white dots and numbers.....

The labels are laser printed on weatherproof vinyl labels and trimmed to size.

The labels are created in Corel Draw –

- Master label creation file –
  - *V:\GSA\_Projects\Stones\_For\_Students\Project Management\Set\_Assembly\Labels\GSA\_Specimen\_Box\_Labels.cdr*
- Each label is different, so they cannot be printed in bulk –
  - The external label has a Serial No. which is inserted using MS Word Mail-Merge using a master list of Serial No.s.
  - Each internal label is a direct photo of the contents of that box.
    - The photo is taken using an overhead frame.
    - The photo is automatically transferred to the GDD network and lined up for checking, printing and trimming.

## MINERALS SET LABELS

### EXTERIOR LABELS

- Dimensions – **256 x 142mm**
- Draft Version – (Sponsors to be finalised)
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**INTERIOR LABELS**

- Dimensions – 282 x 198mm
- Example



## ROCK SET LABELS

### EXTERIOR LABEL

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- Draft Version – (Sponsors to be finalised)

<b>Pumice</b>	<b>Pearlite</b>	<b>Rhyolite</b>	<b>Basalt</b>
<i>Proudly Assembled By -</i>  <b>GDD</b> GEOLOGICAL DATA DESIGN  <b>GEOLOGICAL SOCIETY OF AUSTRALIA</b> Southern Queensland Branch  Department of Natural Resources and Mines	<b>GSA Rock Specimen Set</b> <i>Set No. 1</i>  <b>Igneous Rocks</b>	<i>Proudly Sponsored By -</i>  <b>chinova</b> resources   NEW HOPE GROUP   <b>PANORAMIC</b> RESOURCES LTD	
<b>Granite</b>	<b>Granodiorite</b>	<b>Diorite</b>	<b>Gabbro</b>

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- Dimensions – 282 x 198mm
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- Technical description of the rock or mineral specimens
- Mineral or rock property listing
- Notes on the source of the particular specimens in the set, if known.

## SAMPLE SET DISPATCH

- Identify schools
- Establish order / dispatch / delivery / collection process
- Maintain register of all sets dispatched, with set ID's and school contact details.