UQMP
UQ Materials Performance
Materials engineering consultancy, expert opinion, evaluation and research

Phone +61 7 3365 6123
Email uqmp@uq.edu.au
Web www.uqmp.com

Lvl 5 Advanced Engineering Bldg 49
Staff House Road
The University of Queensland
St Lucia Qld 4072 Australia

A registered business of UniQuest Pty Limited (ABN 19 010 529 898)

# LABORATORY TEST REPORT

| | |
|---|---|
| **Subject:** | **EXAMINATION OF DUST FALLOUT GAUGE DEPOSIT BY STEREOMICROSCOPY AND SCANNING ELECTRON MICROSCOPY** |
| **UQMP Project No.** | C02202.37 |
| **Prepared for:** | Natalie McMillan, ALS ACIRL |
| **Prepared By:** | Fiona Jones |
| **Date:** | 9th May 2015 |

**Sample Description:**

| | Dust Gauge Sample # | Date Collected | UQMP # |
|---|---|---|---|
| **1** | Walker Quarries DG # 04 | 12/02/2016 | UQMP 14090 |

**Method Ref:** Internal UQMP method.
AS 3580.10.1 - 2003 Methods for sampling and analysis of particulate matter - Deposited matter - Gravimetric method

## 1. INTRODUCTION

The sample was supplied as washings from a dust fallout gauge deposit. The sample was filtered onto a membrane filter and examined by stereomicroscopy to check for particle distribution and general appearance. A small portion of the filter was excised and mounted onto conductive carbon tape for examination by Scanning Electron Microscopy with Energy Dispersive X-Ray Spectroscopy.

## 2. RESULTS

The deposit was rich in aluminium and silicon based mineral dust, most likely from soil and or dirt, a trace amount of copper sludge is also present. A minor amount of organic debris was observed including insect and plant debris and trace amounts of rubber dust.

A table of results is attached. Appendix A attached presents the table of results of the combined microscopy observations.

Appendix B and C attached presents illustrative SEM photomicrographs and spectra taken of the Insoluble Matter. The SEM photomicrographs were taken with Back Scattered Electron (BSE) imaging in which average atomic number is roughly proportional to brightness. For example, coal particles appear darker than siliceous mineral dust and biological particles somewhat darker again.

**Signed for and on behalf of UQ Materials Performance**

Fiona Jones

**Fiona Jones**

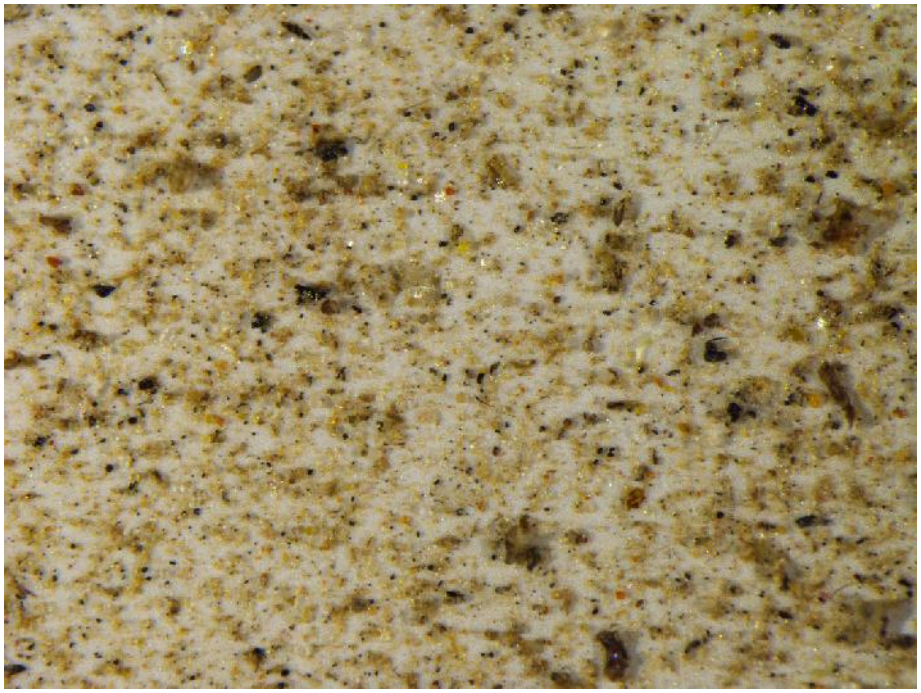
## 3. TABLE OF RESULTS APPENDIX A

| PARTICLE IDENTITY | | PERCENTAGE (Projected area basis) |
|---|---|---|
| | **SAMPLE #** | UQMP 14090 |
| | **SAMPLE ID** | *Walker Quarries DG # 04* |
| | **PARTICLE TYPE** | |
| **BLACK** | COAL | |
| | SOOT | |
| | BLACK RUBBER DUST | tr |
| **INORGANICS & MINERALS** | MINERAL DUST (Soil or Rock Dust.) | **93** |
| | MINERAL DUST (type = Fly Ash ) | |
| | MINERAL DUST (type = Cement Dust) | |
| | MINERAL DUST (type =glassy) | |
| | GLASS FRAGMENTS | |
| | COPPER SLUDGE | tr |
| | P/S SLIME & FUNGI | |
| | INSECT DEBRIS | 2 |
| | PLANT DEBRIS (General) | 5 |
| | PLANT DEBRIS (type = plant char ) | |
| | PLANT DEBRIS (type = ) | |
| **GENERAL ORGANIC TYPES** | WOOD DUST | |
| | FIBRES (type = Miscellaneous ) | |
| | STARCH | |
| | PAINT | |
| | PLASTIC FRAGMENTS | |
| | RED RUBBER DUST | |
| **COMMENTS** | | |

## 3.1 PARTICLE IDENTITY LEGEND

| | |
|---|---|
| **Insect parts/debris** | Includes arachnids. Present as crushed body fragments, trichomes, wing scales, etc. |
| **P/s slime** | Polysaccharide slime. This extra-cellular bio-polymeric material may have different sources which might include microbiological growth, vertebrate excreta, decomposing biological matter, etc. Sometimes seen in these samples as a stringy gel binding other particles together. Sometimes fungal hyphae associated with the gel. |
| **Copper sludge** | Some well developed turquoise crystal growths can be found, but usually as subhedral to euhedral grains. Sometimes as blue highlights on a greenish cakey material. This is probably copper salts precipitated from the copper sulfate algaecide solution as the hydroxide, with or without sulfate and or phosphorous inclusion. |
| **Mineral matter** | Usually equant siliceous appearance and typically colourless to brown, transparent to translucent, euhedral, rounded grains. The clays very fine particles. Other constituents of siliceous appearance, sand etc. |
| **Plant Debris/ char** | Usually as trichomes, fragmented tissue, reproductive products and structures. Sometimes charred particles from incinerator, grass or bush fires. |
| **Fly ash particles** | Appears as spheroidal particles - colourless, milky or black |
| **Coal dust** | Black, equant, sharp angled grains. Some glossy; some edges dark brown translucent. |
| **Soot** | Black glossy spherical to botryoidal aggregates, typically hollow or lacey. Usual source is incompletely burnt organic liquids, eg. fuel oils. |

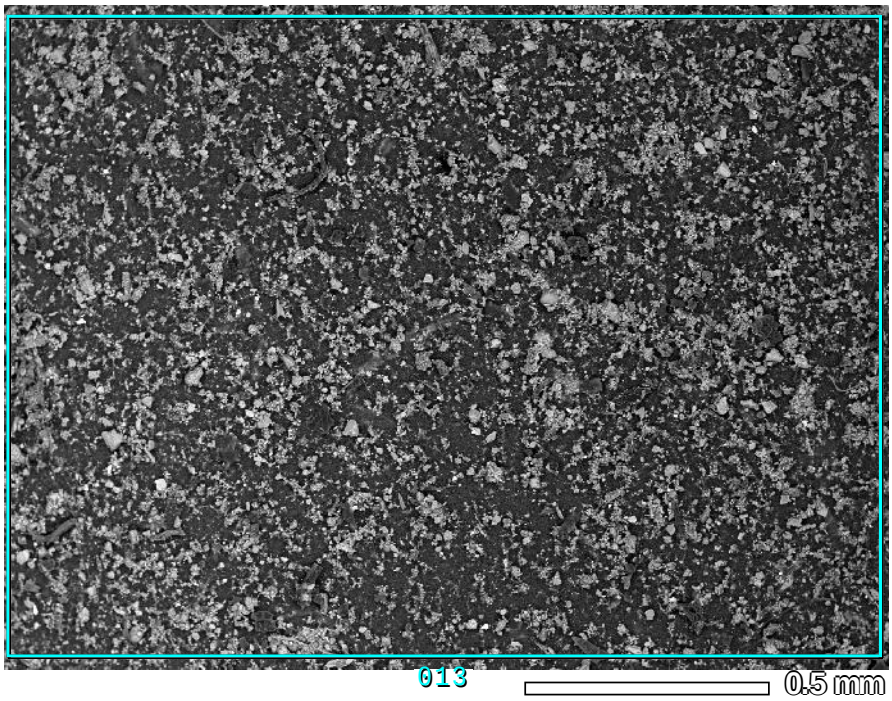
## 3.2 STEREOMICROSCOPY PICTURE MICROGRAPH



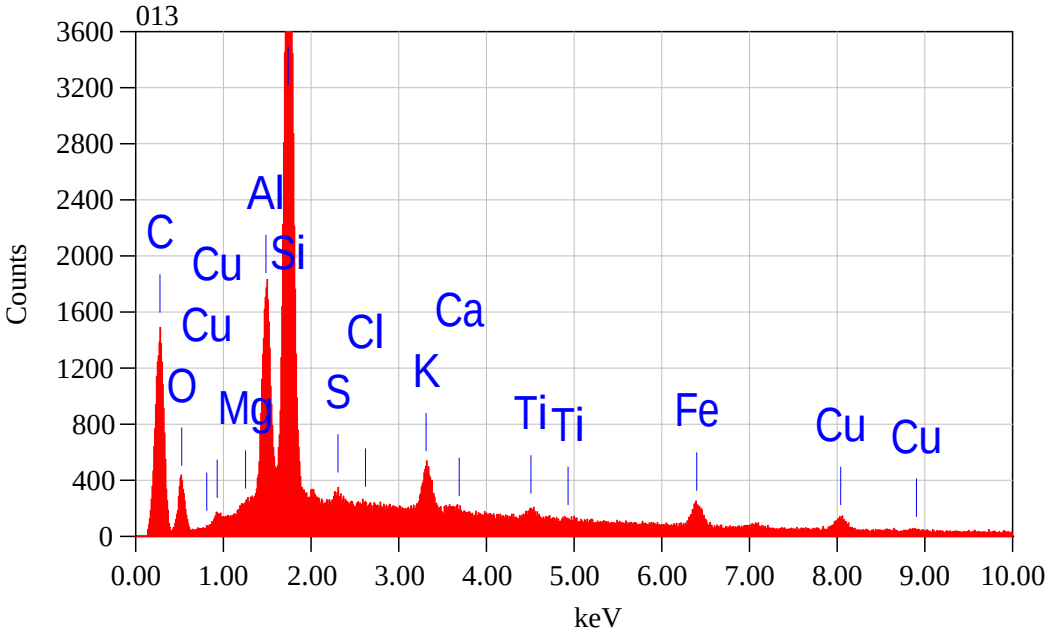
**STM1.** Walker Quarries DG # 04, UQMP # 14090. The brown and brown-orange particles are aluminium and silicon rich mineral dust particles

## 4. APPENDIX B.

### 4.1 AN SEM/BSE IMAGE AND SEM/EDS SPECTUM OF A TYPICAL OVERALL AREA OF THE DEPOSIT.



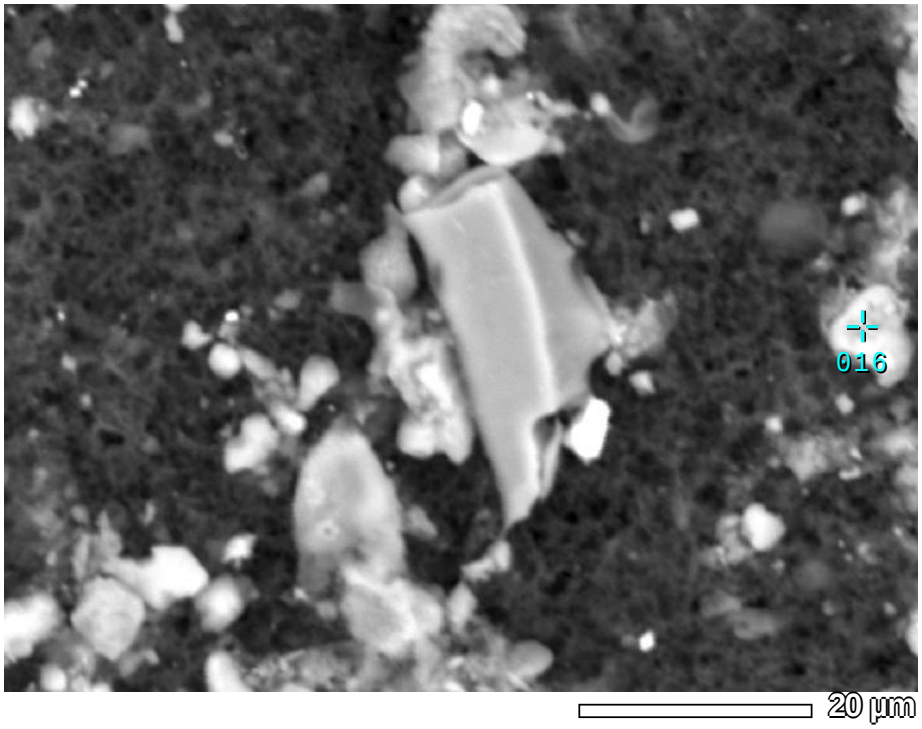

**PM1.** Walker Quarries DG # 04, UQMP 14090. An SEM/BSE image of a characteristic overall area selected for SEM/EDS analysis.



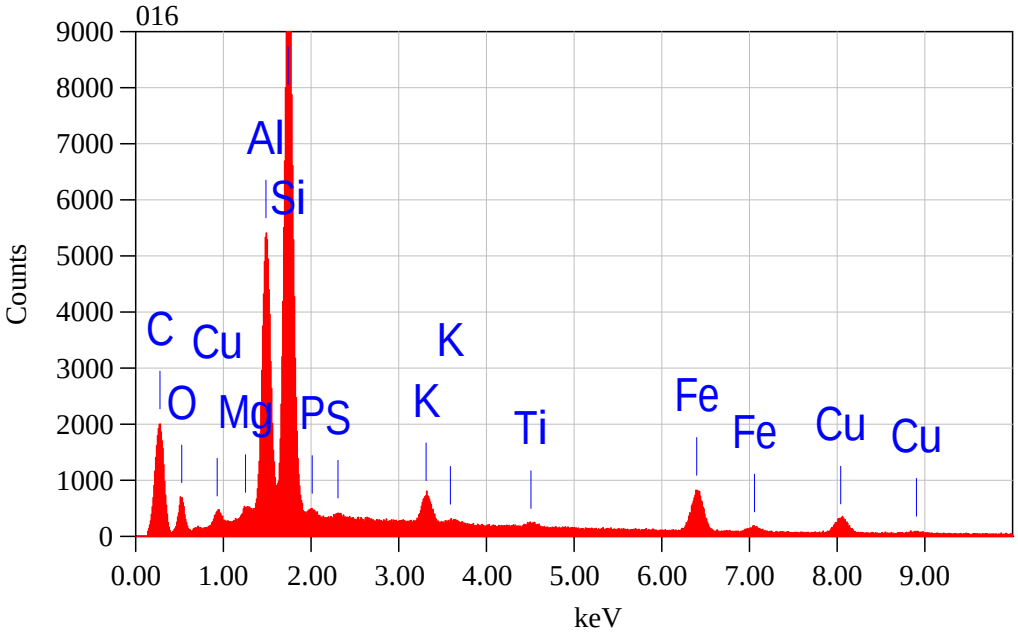

**EDS1.** Walker Quarries DG # 04, UQMP 14090. The SEM/EDS spectrum of the overall area is rich in carbon, aluminium and silicon with trace amounts of the balance of the elements. Aluminosilicate rich mineral dust is the most dominant particle type of the spectrum. A minor number of organic particulates were observed by stereomicroscopy and included insect and plant debris and traces or rubber dust. As particulates did not completely cover the membrane filter there is also a carbon contribution from the exposed filter. Trace amounts of copper sludge are also visible in the spectrum.

## 5. APPENDIX C. SEM/BSE IMAGES AND SEM/EDS SPECTRUM OF COMMON PARTICLE TYPES

### 5.1 AN SEM/BSE IMAGE AND SEM/EDS SPECTRUM OF A MINERAL DUST PARTICLE

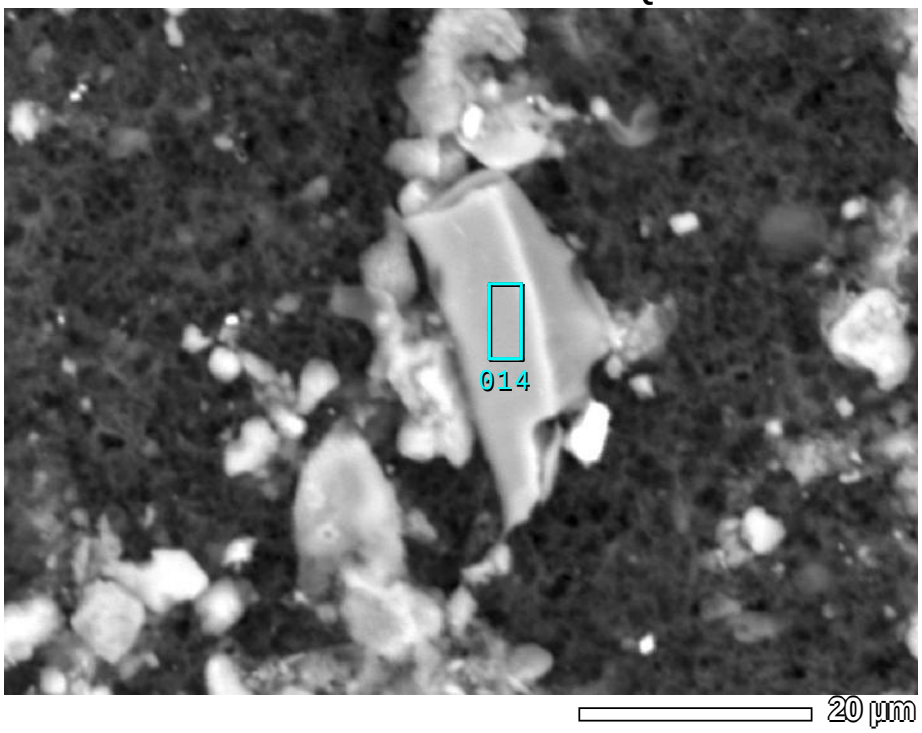



**PM2.** Walker Quarries DG # 04, UQMP 14090. An SEM/BSE image of a particulate annotated with 016 is selected for SEM/EDS analysis.

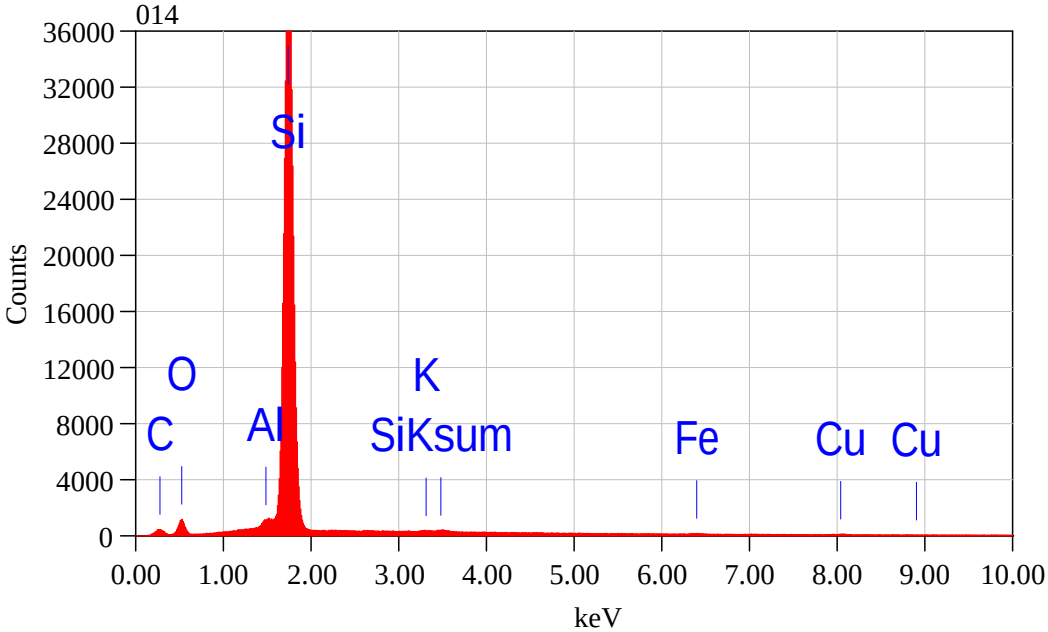



**EDS2.** Walker Quarries DG # 04, UQMP 14090. The SEM/EDS spectrum of the particle annotated with 016 shows elevated levels of aluminium and silicon with minor amounts of carbon and trace amounts of the balance of the elements. The carbon peak is inclusion from the membrane filter due to the large electron beam interaction volume and the small particle size. The elemental profile is suggestive of an aluminosilicate rich mineral dust most likely a feldspar.

## 5.2 AN SEM/BSE IMAGE AND SEM/EDS SPECTRUM OF A QUARTZ PARTICLE

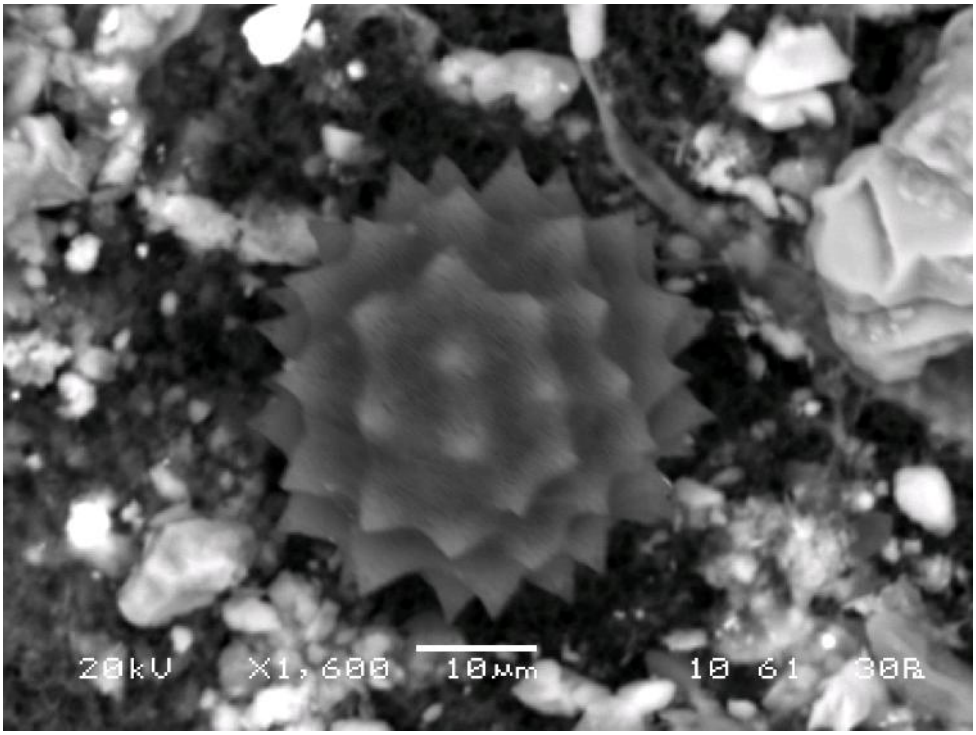



**PM3.** Walker Quarries DG # 04, UQMP 14090. An SEM/BSE image of a particulate annotated with 014 is selected for SEM/EDS analysis.




**EDS3.** Walker Quarries DG # 04, UQMP 14090. The SEM/EDS spectrum of the particle annotated with 014 shows elevated levels of silicon with trace amounts of the balance of the elements. The spectrum is typical of a quartz particle.

## 5.3 AN SEM/BSE IMAGE AND SEM/EDS SPECTRUM OF A POLLEN PARTICLE




**PM4.** Walker Quarries DG # 04, UQMP 14090. An SEM/BSE image of a pollen particulate, possibly from sunflower.

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