CASE STUDIES USING PORTABLE XRF ANALYSERS DURING SOIL CONTAMINATION AND MINERAL EXPLORATION PROJECTS

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Introduction

- Use of field portable XRF on soil assessment and mineral exploration projects undertaken in Australia
- 2 projects in detail
- Environmental Assessment at a Derelict Mine
- Exploration Drilling (Bowdens Ag Project)
- Several other projects in brief

Portable XRF

- Derelict Mine Assessment
  - NITON XL-802S (Cd^{109} radioisotope)
  - Detection Limits typically 50-100 ppm
- Bowdens Drilling Project
  - NITON XLi 969 (Am^{241} radioisotope)
  - Detection limits typically 100-150ppm
- Elements detected
  - As, Cr, Cu, Pb, Mn, Hg, Ni, Co, Se, Zn, Fe, Rb, Sr, Zr, Mo
  - Ag, Cd, Sn, Sb, Ba

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Derelict Mine, NSW (Cu/Au/Talc)

- State funded rehabilitation program

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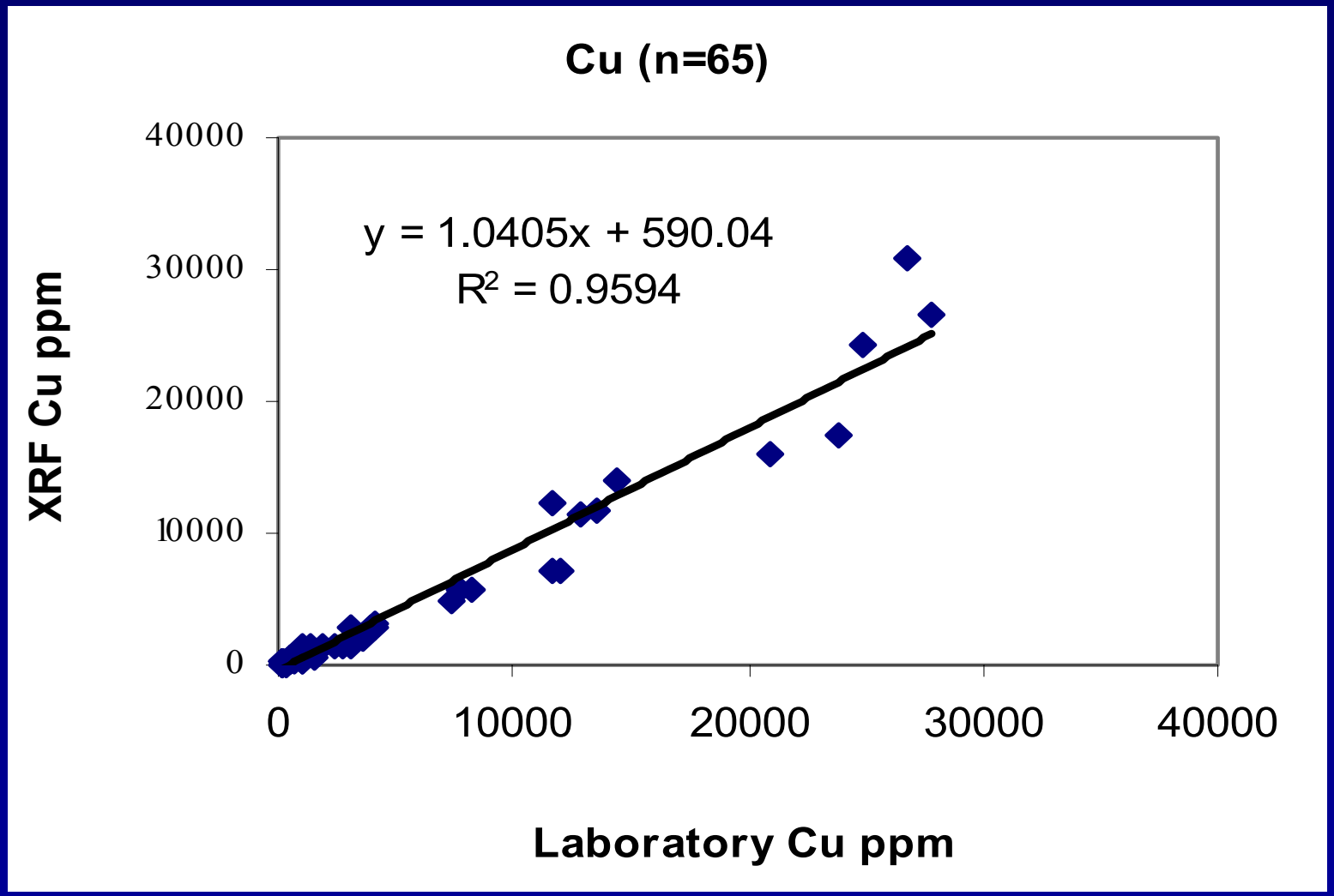
Derelict Mine Copper Data



- Threshold 5000 ppm
- 1 failure
- XRF

4869 ppm

- Lab

7411 ppm

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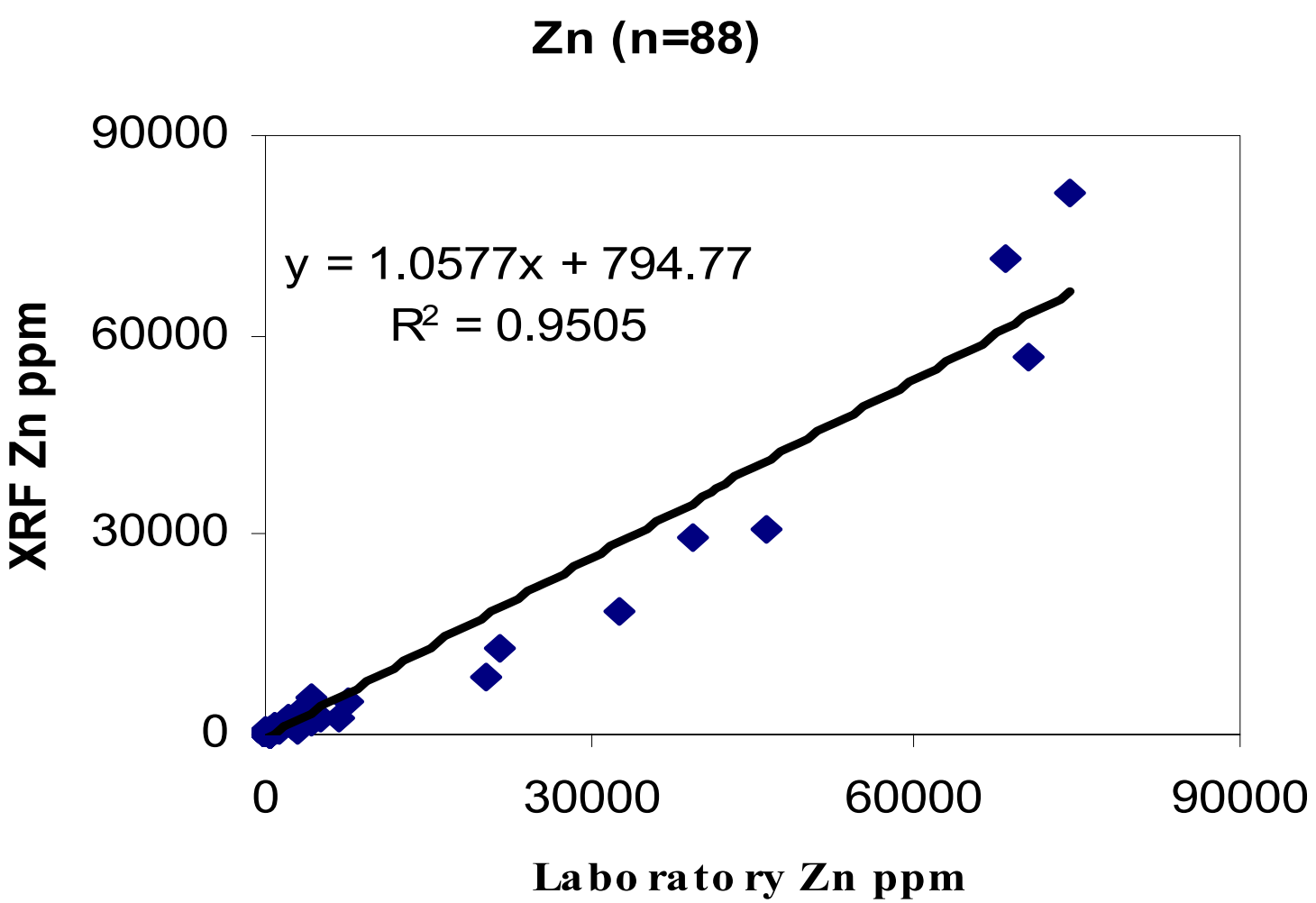
Derelict Mine Zinc Data



- Threshold

35000ppm

- 2 failures

XRF

30k and 29k

Lab

46k and 39k

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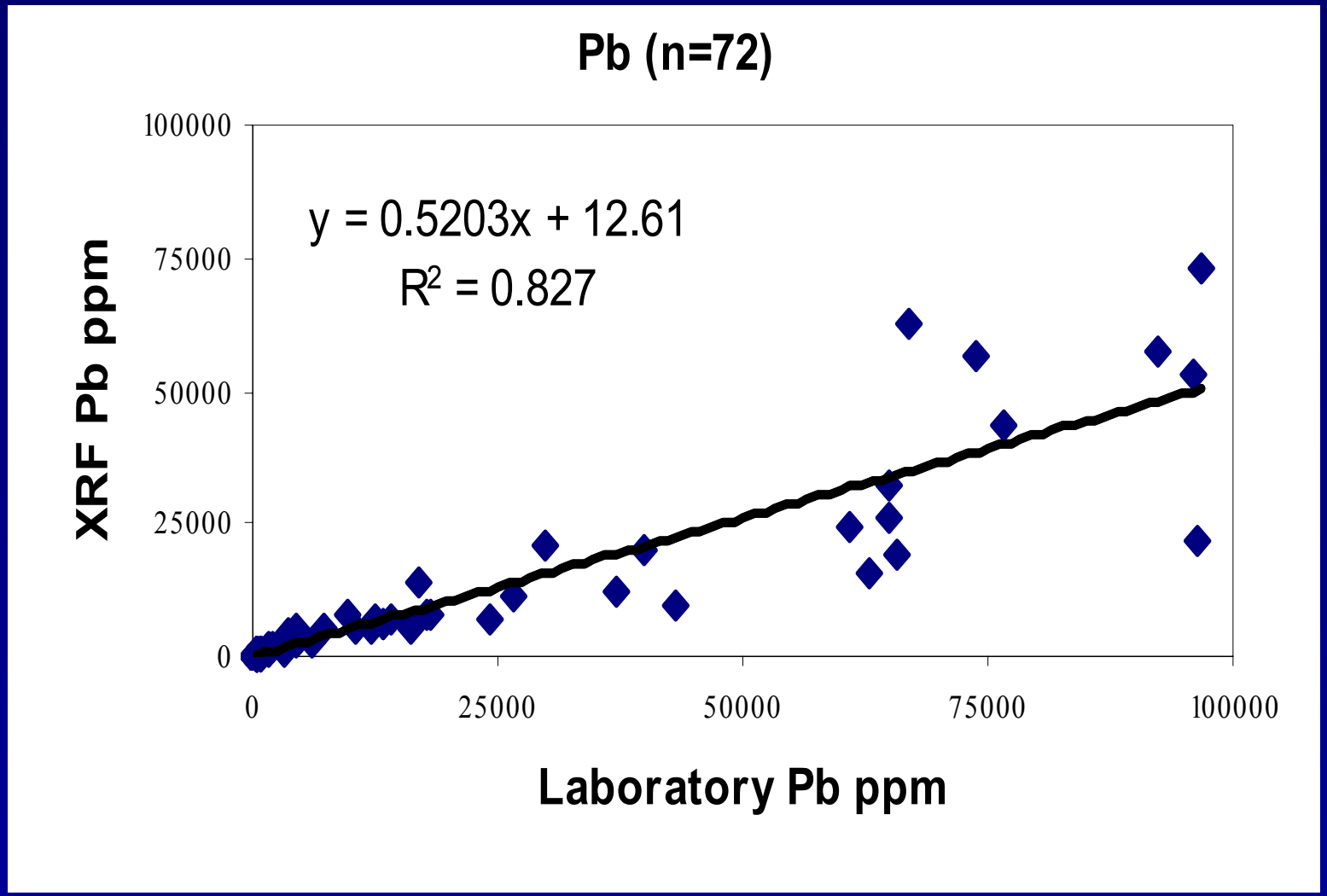
Derelict Mine Lead Data



- Threshold

1200ppm

1 failure

XRF

453 ppm

Lab

1604 ppm

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Derelict Mine Project Findings

- **Merits**

- demonstrated ability to locate ‘hot-spots’ in the field
- applicable for use as part of the derelict mines program
- rapid (multi-element) technique
- excellent for quickly mapping boundaries (mullock above/below specified threshold levels)
- remote location benefits
- project management benefits (directing clean up operations)
- public relations tool

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Other Projects (Environmental)

- Baseline Soil Survey of Broken Hill township >4000 soils tested (Pb 0.94, Zn 0.96)
- Copper Smelter Contaminated Soil Survey 400 soils tested (Cu r^2 = 0.99, As r^2 = 0.99, Pb r^2 = 0.92)
- Former Electroplater Soil Excavation and Remediation 60 soils tested (Ni r^2 = 0.91, Cr r^2 = 0.91)
- Former Dulux Lead Paint Manufacturing Facility 200 soils tested (Pb r^2 = 0.92) – published paper
- Former Cattle Tick Dip Site approx 50 soils tested (As r^2 = 0.99) – published paper with CSIRO (Commonwealth Scientific and Industrial Research Organisation)

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Silver Standard Australia (Ag with Pb, Zn and As)

Bowdens Ag Project Aims

- Can XRF be used to reduce assay costs in exploration?

  Accuracy and precision of XRF on Ag, Pb, Zn and As

- Can XRF be used to maximise drilling budgets?

  Assess last 10m of a hole

- What field testing protocol will work best

1. Testing actual sample sent for assay (apples v apples) – 20m interval
2. Testing residual cuttings (apples v nashy pears) – 50 m interval

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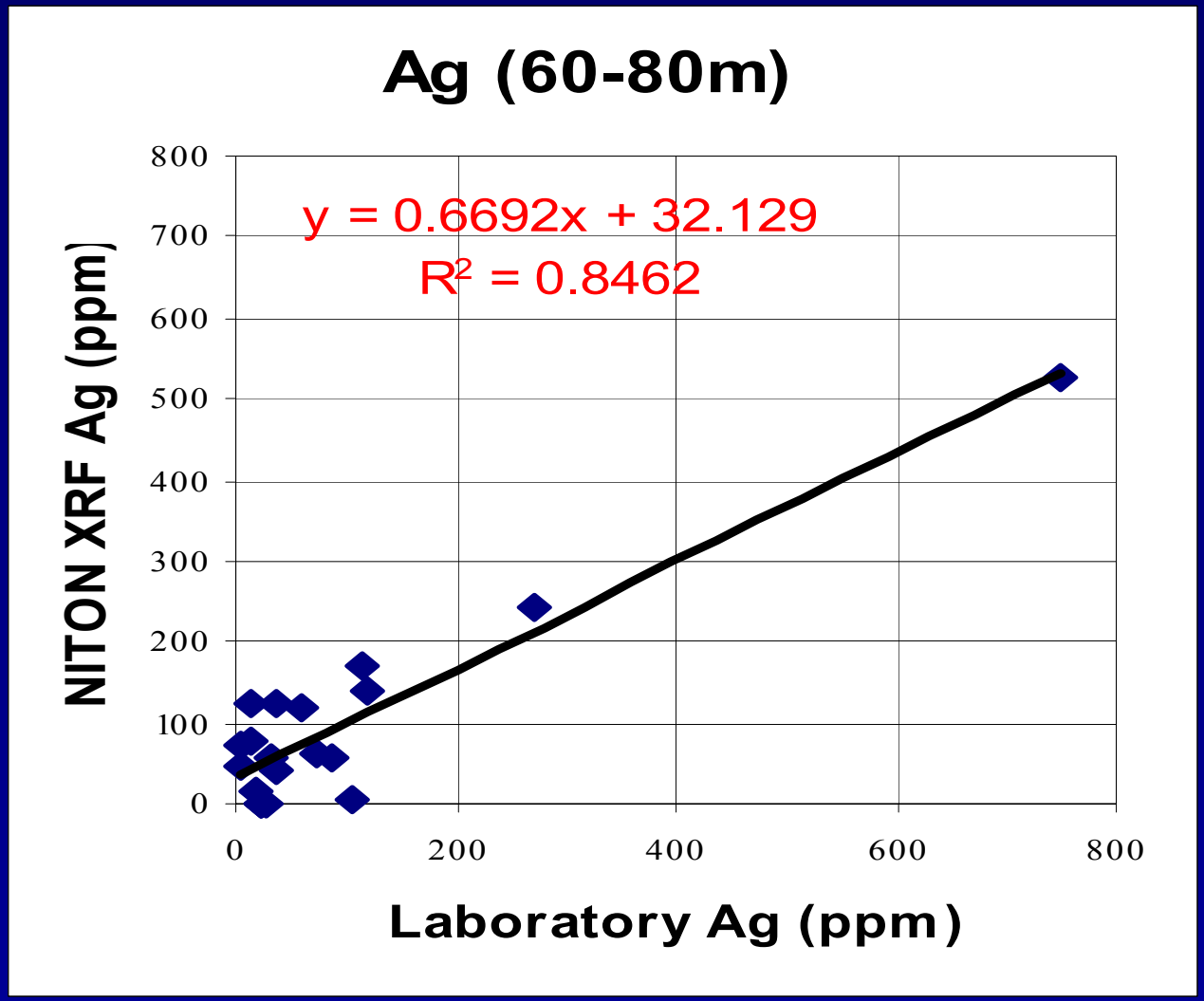
Bowdens Ag Results - Method 1



Ag

- poor accuracy & precision esp. below 100ppm
- However

Average Ag

60-80m

Lab 92 ppm

XRF 94 ppm

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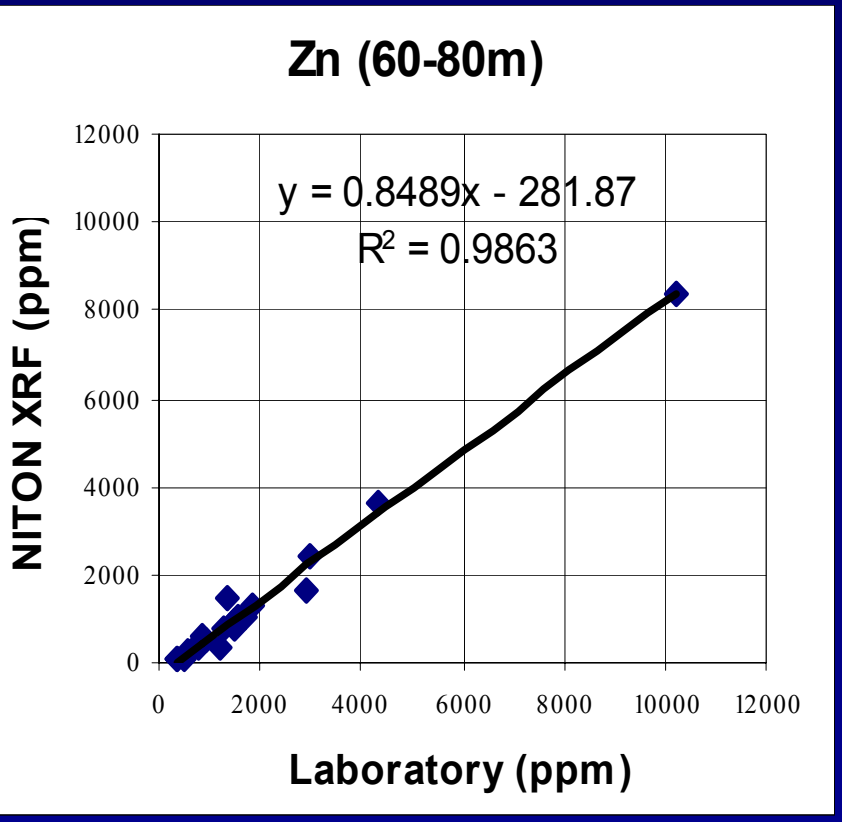
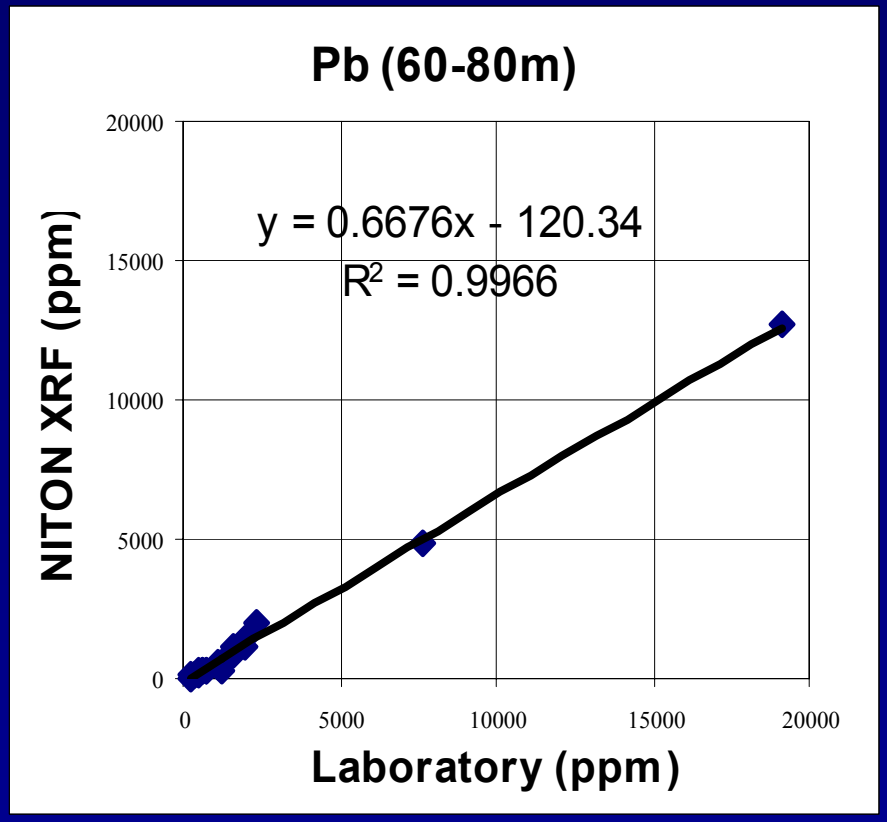
Bowdens Results – Method 1





Average Zn

Lab 1828 ppm

XRF 1308 ppm

Average Zn

Error: -28%

Average Pb

Lab 2279 ppm

XRF 1413 ppm

Average Pb

Error: -38%

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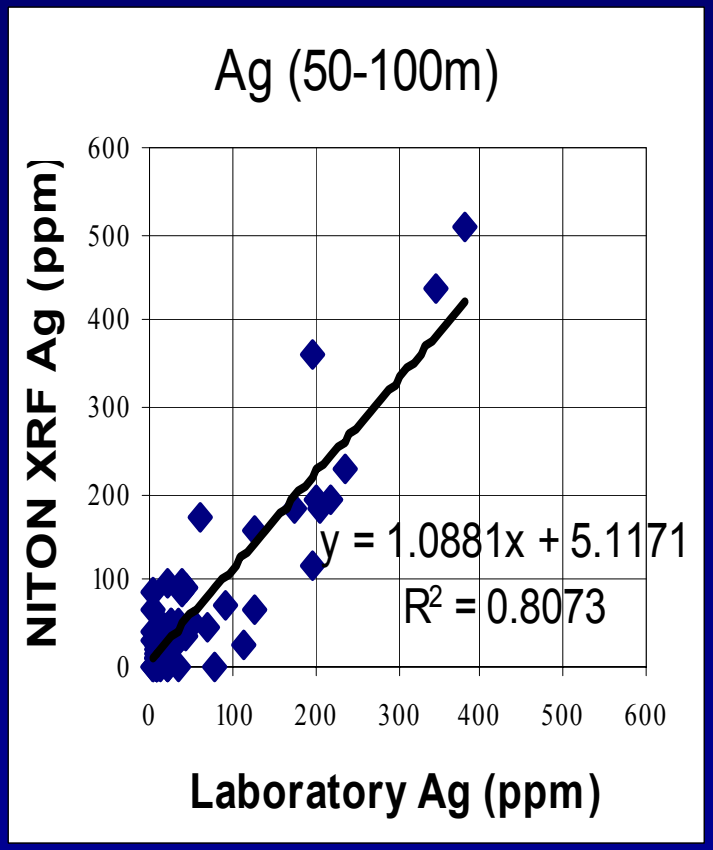
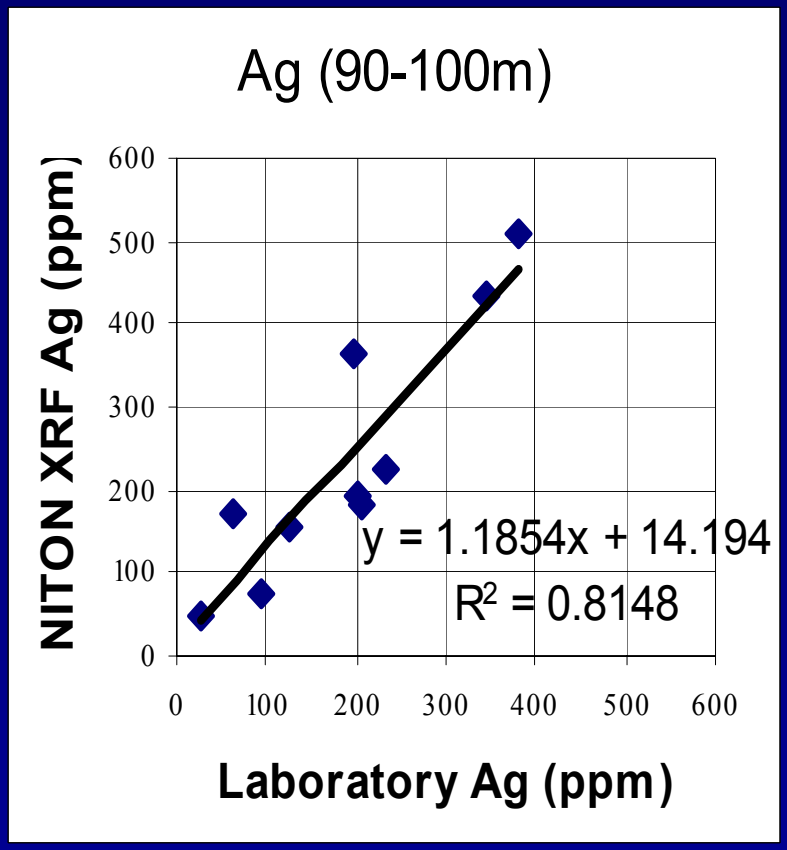
Bowdens Results – Method 2





>100ppm better

<u>90 - 100m</u>

Ag Average

Lab 187 ppm

FPXRF 199 ppm

RSD's

49% (118 ppm)

16% (663 ppm)

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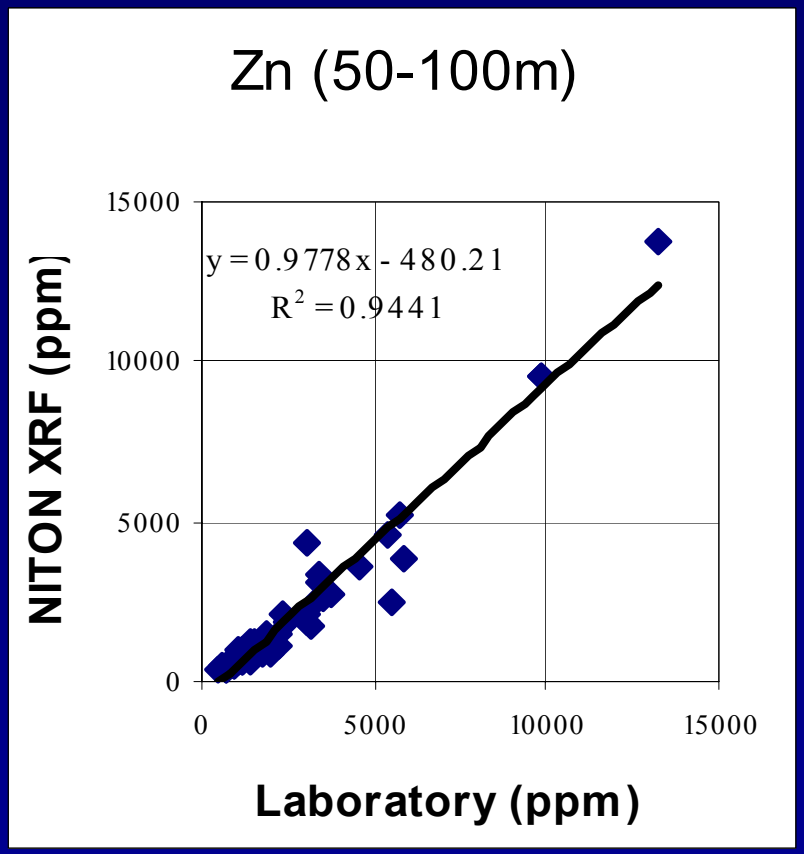
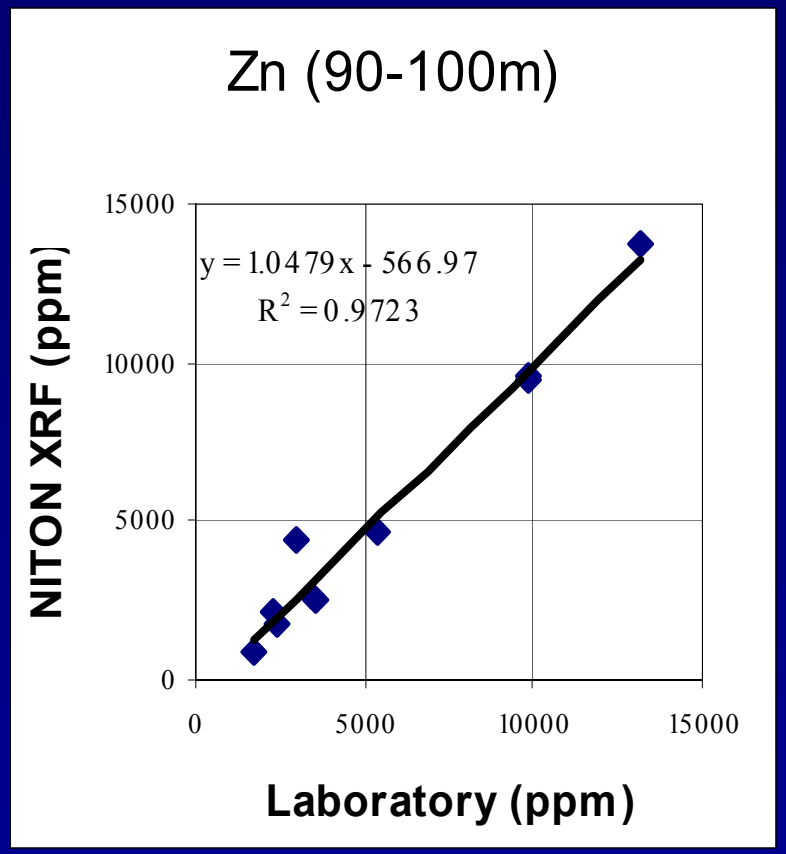
Bowdens Results – Method 2





RSDs

4% (9000 ppm)

7% (2000 ppm)

Average Zn

Lab 2657 ppm

XRF 2118 ppm

Average Zn

Error: -20%

Average Zn

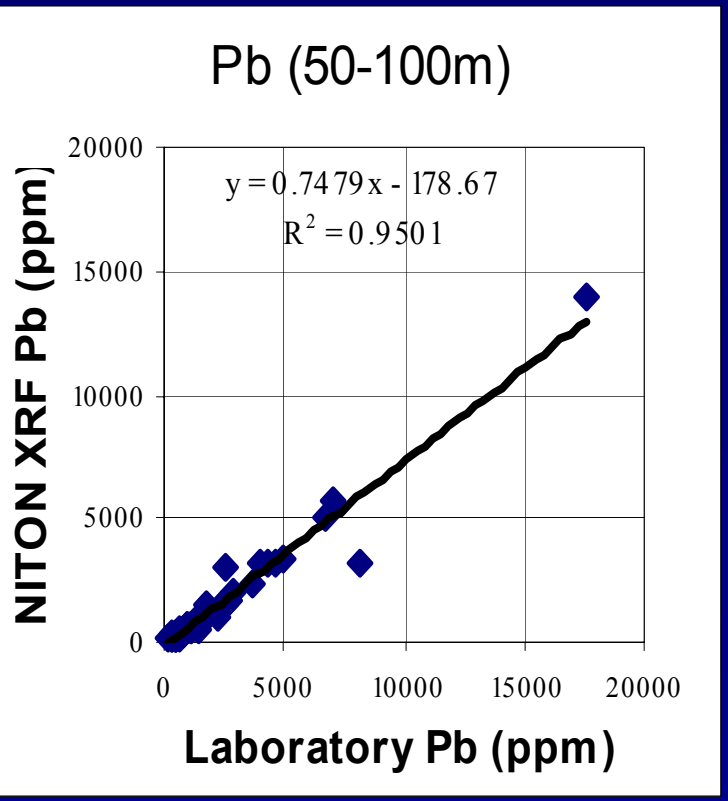
Lab 5486 ppm

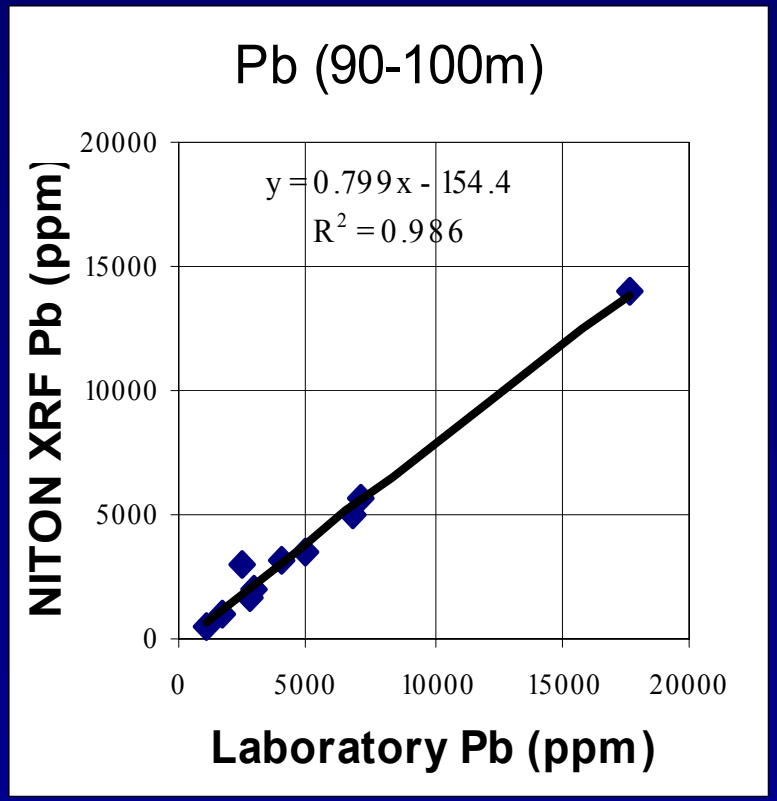
XRF 5182 ppm

Average Zn

Error: -6%

Bowdens Results – Method 2





RSDs

4.7% (18000 ppm)

6.9% (2000 ppm)

Average Pb	Average Pb	Average Pb	Average Pb
Lab 2134 ppm	Error: -34%	Lab 5139 ppm	Error: -23%
XRF 1417 ppm		XRF 3949 ppm	

Bowdens Project Findings

- XRF can be used to reduce assay costs and as first pass for grade control
- Can be used to maximise drilling budgets by directing depth of holes in the field (no re-drilling)
- XRF Testing Method

- No significant loss of precision between testing methods
- No significant difference in accuracy between testing methods
- Merit in testing RC bags in-situ

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Other Projects (Exploration)

- Exco Resources (Zn r^2 = 0.93) also Cu
- MIM (Xstrata) Exploration RC Drilling program (+200ppm Cu anomalies in basement material
- Platinum Australia Cr in PGM's
- Other
  - RC drilling Ni, Cu
  - Core drilling Ti, Cu

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Acknowledgements

- Dr Ian Pringle - Silver Standard Australia
- Paul Frederickson – NSW Department of Mineral Resources
- Alasdair Cooke – Exco Resources
- Tom Wilson - Consulting Earth Scientists
- Xstrata Copper Australia

- Thankyou

- Questions?

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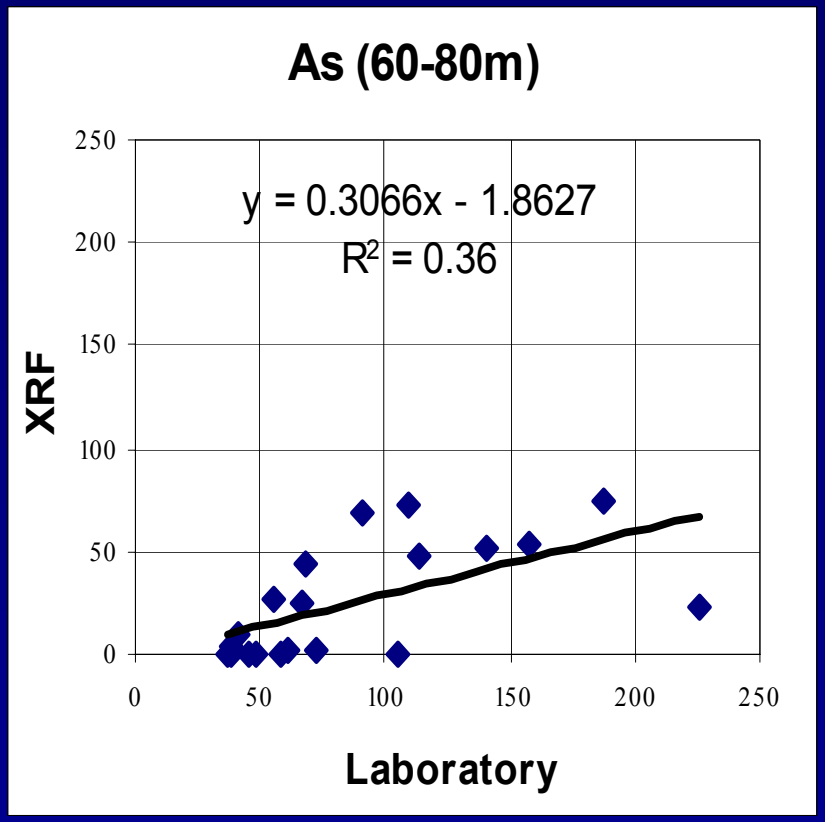
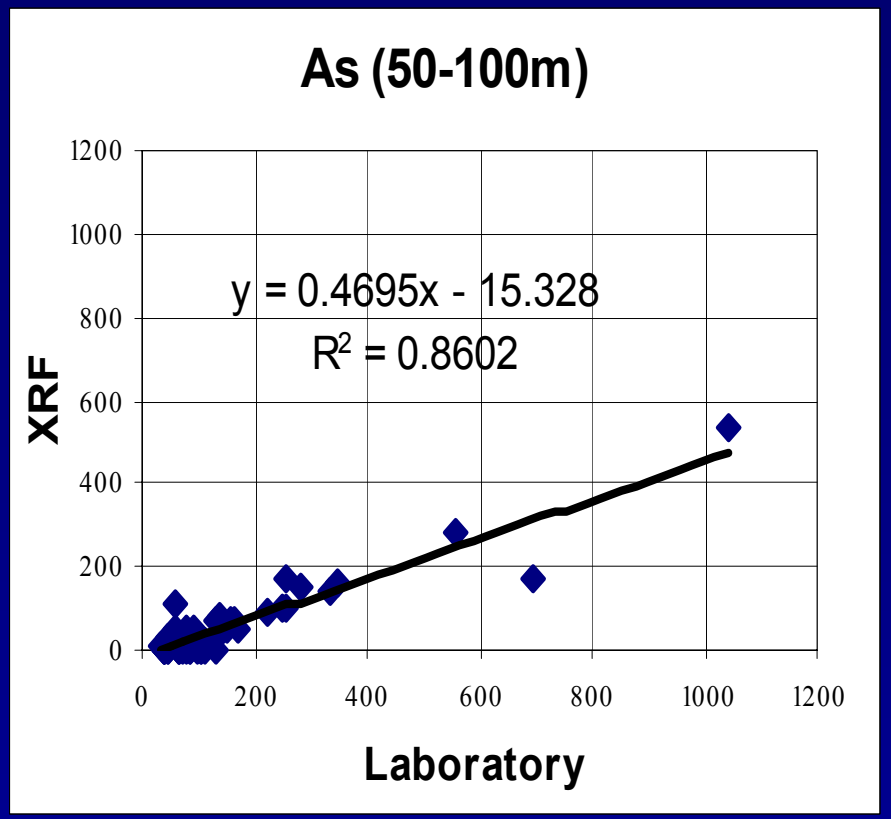
Bowdens As Data





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Core Examples

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