

EXPLORATION IN IRELAND
1960 - 2003



By

John A Clifford

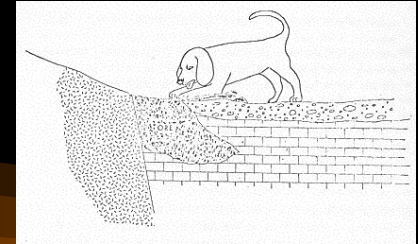
Presentation Outline



- Pre-1960 : A Forgotten History
- 1960 - 1970: The Decade of Discovery
- 1970 - 1980: Treading Water
- 1980 - 1990: Gold and the Base Metals Recovery
- 1990 - 2003: Drilling Deeper
 - : Brownfield Exploration
- Post-2003 : What Next ?



After AHM 1979



A Forgotten History

Element

▲ Zn - Pb

▲ Cu

▲ Au

▲ Gypsum

▲ Barite

Prospect

▲ Small

◆ Medium

☺ Mine

Geologic Time		Pre-1960
Cenozoic		▲
Mesozoic		▲
Palaeozoic	Permian	
	Carb	▲ ▲ ▲ ☺
	Dev	▲ ▲
	Sil	▲
	Ord	◆
	Camb	▲
Pre-Cambrian		



Image from Mining Heritage Trust of Ireland

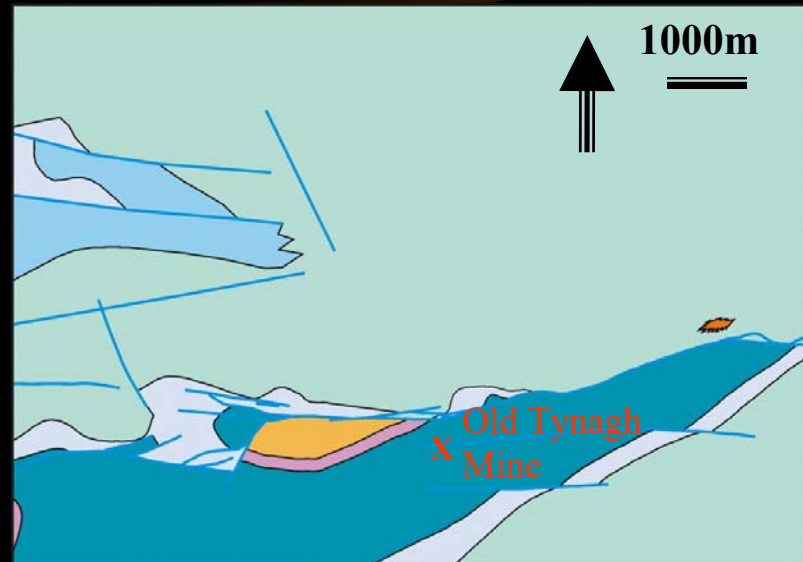
1960 - 1970



The Decade of Discovery



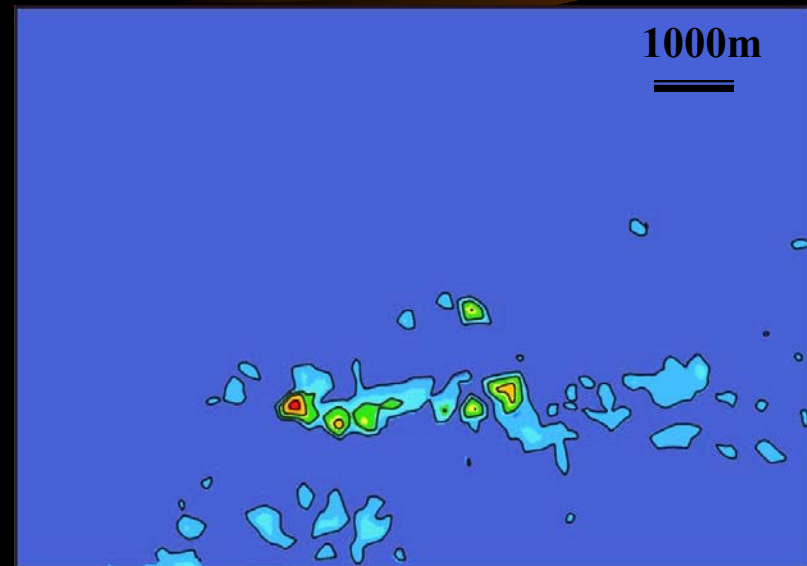
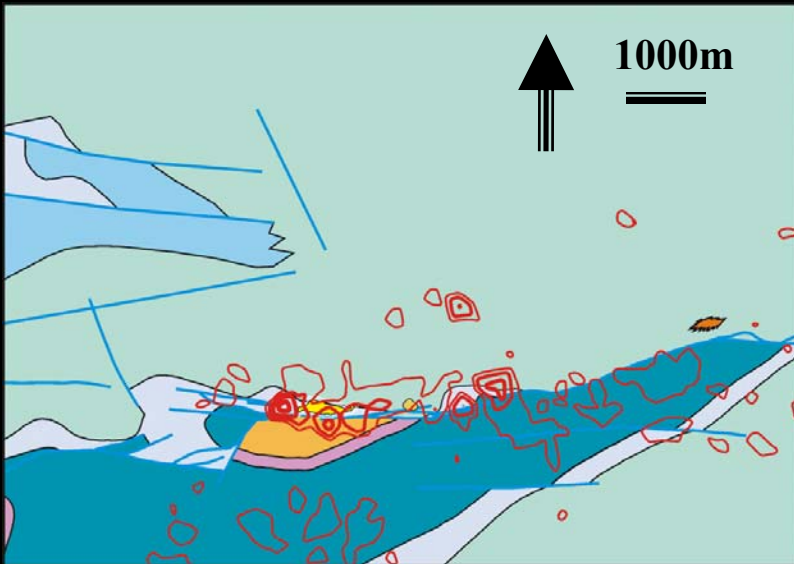
Tynagh Zn - Pb



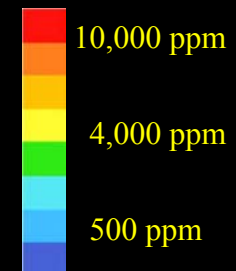
ORS ABL Reef



Tynagh Zn - Pb



Zinc Soil Geochemistry





Tynagh Zn - Pb

- Host - Waulsortian Reef
- Reserves:
 - 9 Mt @ 14.1% Zn + Pb
- Operated: 1965 - 1980



Silvermines Zn - Pb



Ref: Inter Agency Report 2000

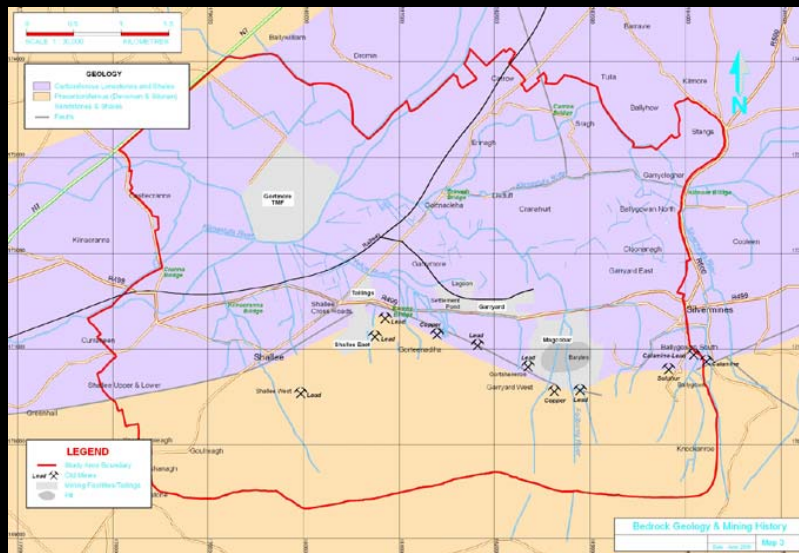


Images from SRK Report (2002)

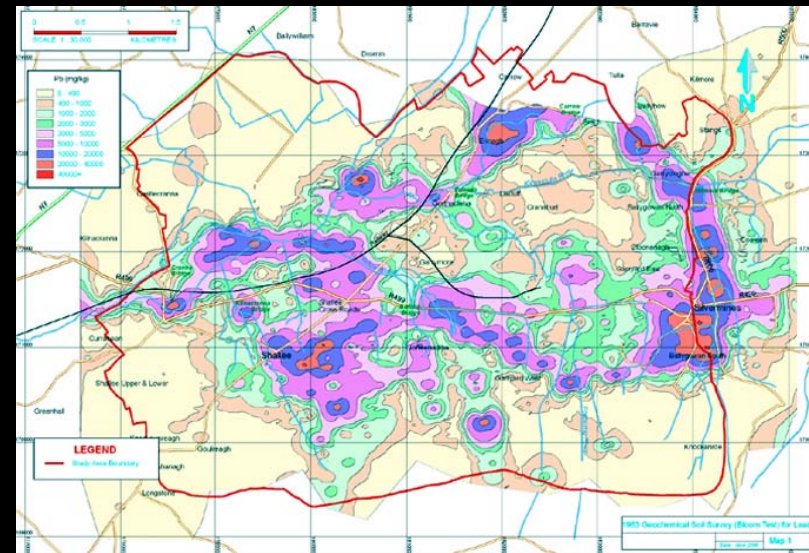


Silvermines Zn - Pb

General Geology



Lead Geochemistry 1963



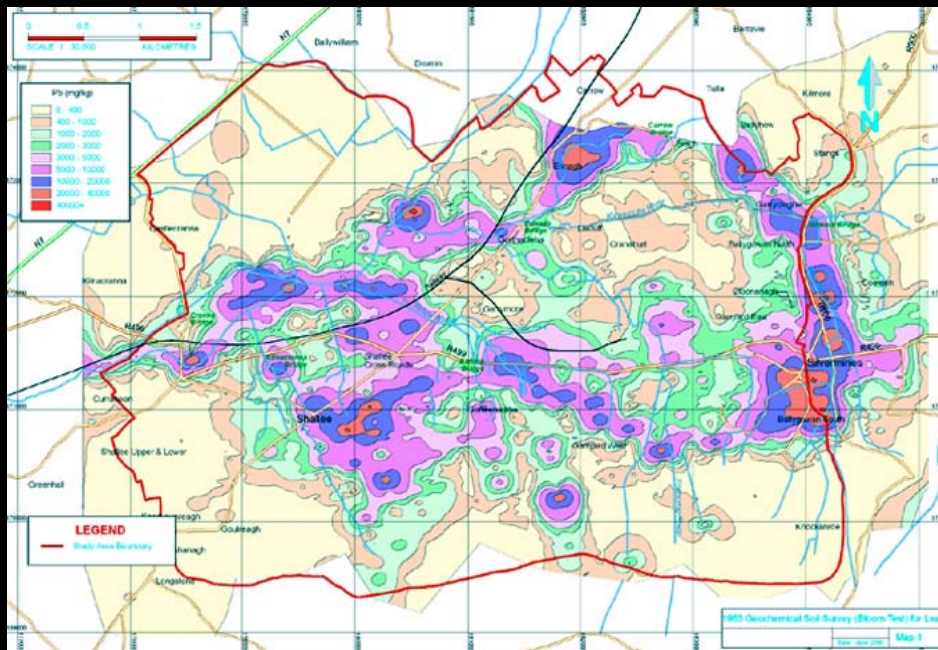
Ref: Inter Agency Report 2000

- 400 ppm
- 5,000 ppm
- > 40,000 ppm



Silvermines Zn - Pb

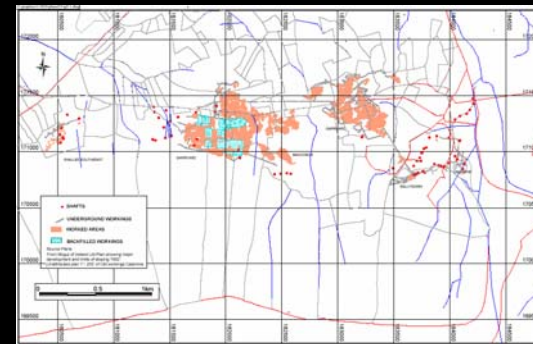
Lead Geochemistry



Ref: Inter Agency Report 2000

- 400 ppm
- 5,000 ppm
- > 40,000 ppm

Zones B and G



Ref: SRK 2002



Silvermines Zn - Pb

- Host:
 - B & G Zones: Waulsortian Reef
 - Lower G Zone: Basal Carboniferous and Devonian
- Resources:
 - 17.7Mt @ 6.43% Zn, 2.53% Pb, 23g/tAg
- Operated: 1968 - 1982

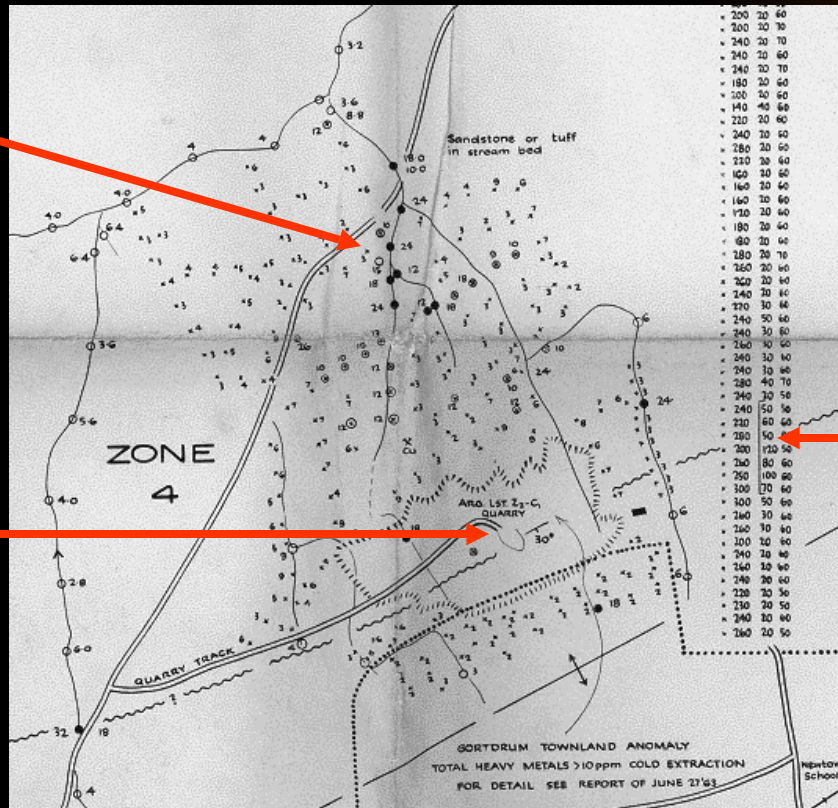


Gortdrum Cu - Ag - Hg

Stream Sediment Anomaly



Mineralised Outcrop

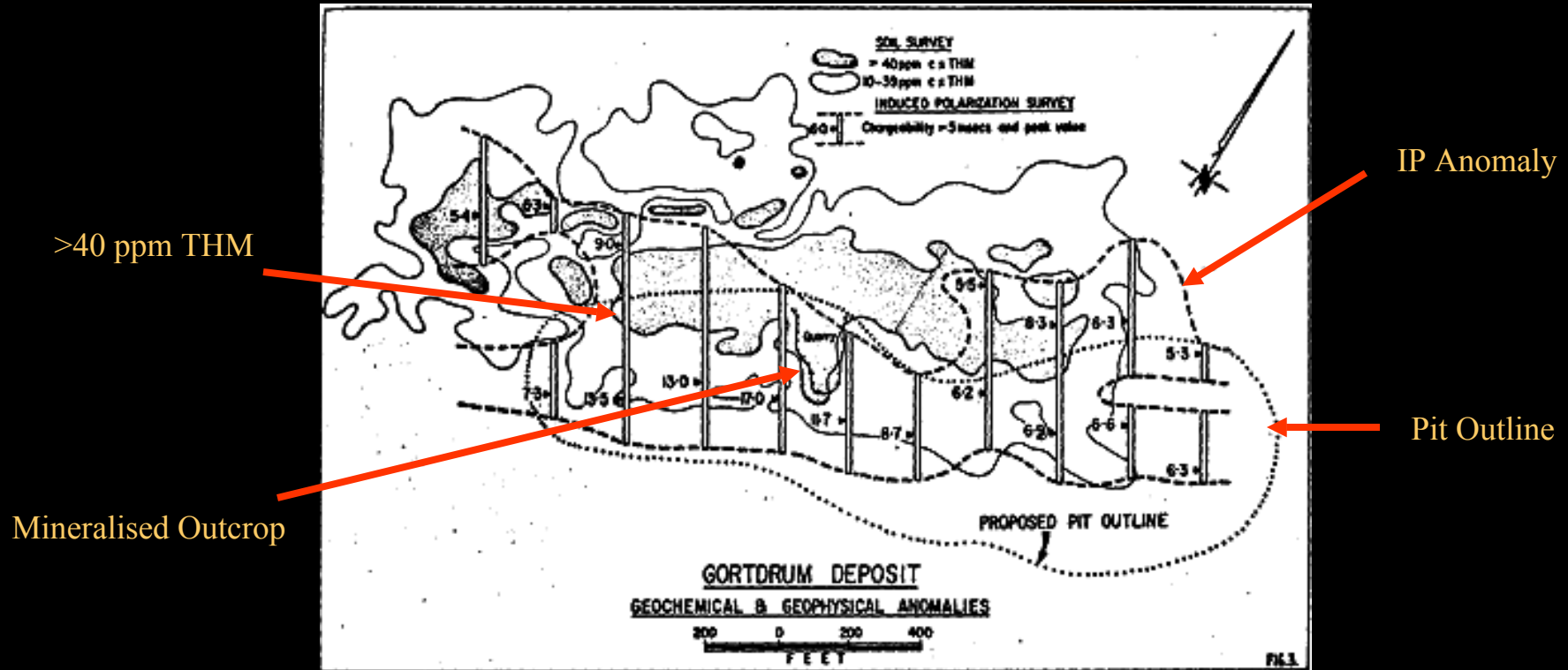


Soil Anomaly





Gortdrum Cu-Ag-Hg





Gortdrum Cu - Ag - Hg

- Host:
 - Basal Carboniferous, Devonian, Lower Palaeozoic.
- Resources:
 - 3.8Mt @ 1.19% Cu, 25g/t Ag
- Operated: 1967 - 1975



Ballinalack Zn - Pb



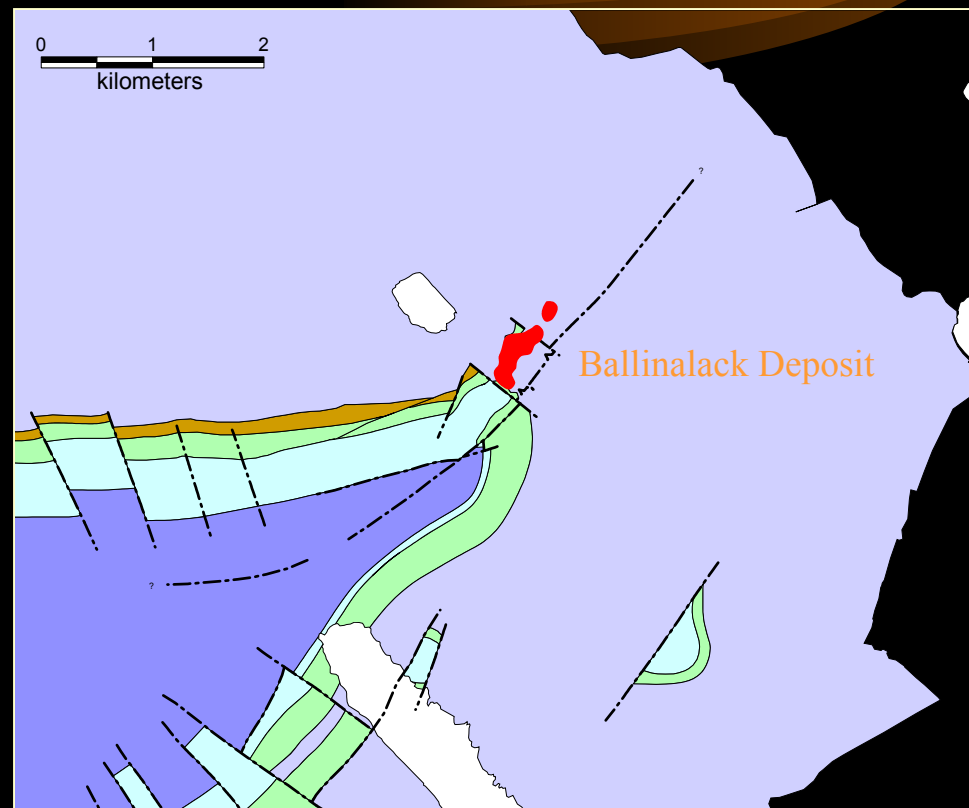
Calp



Waulsortian



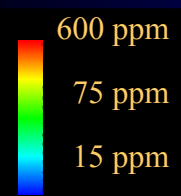
Lower ABL



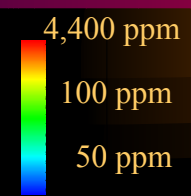
Syngenore Exploration



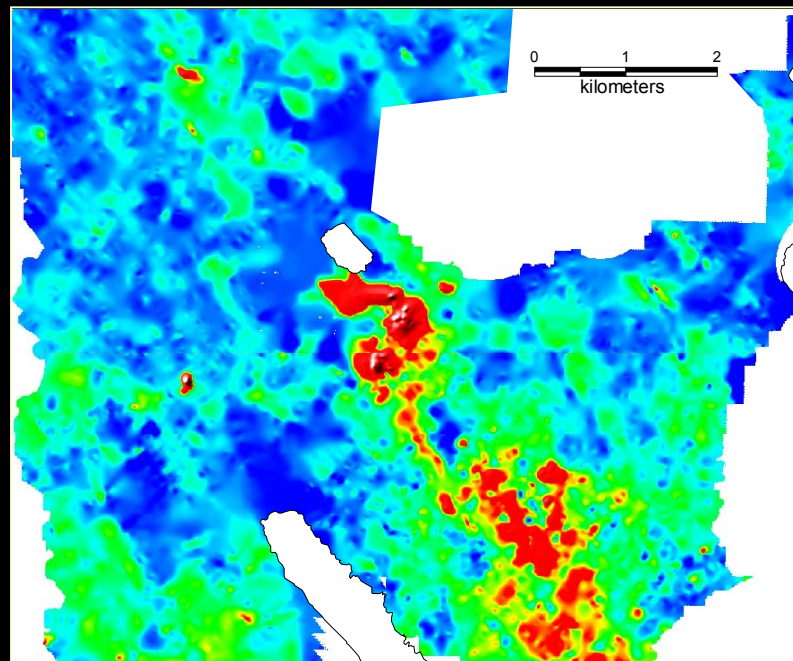
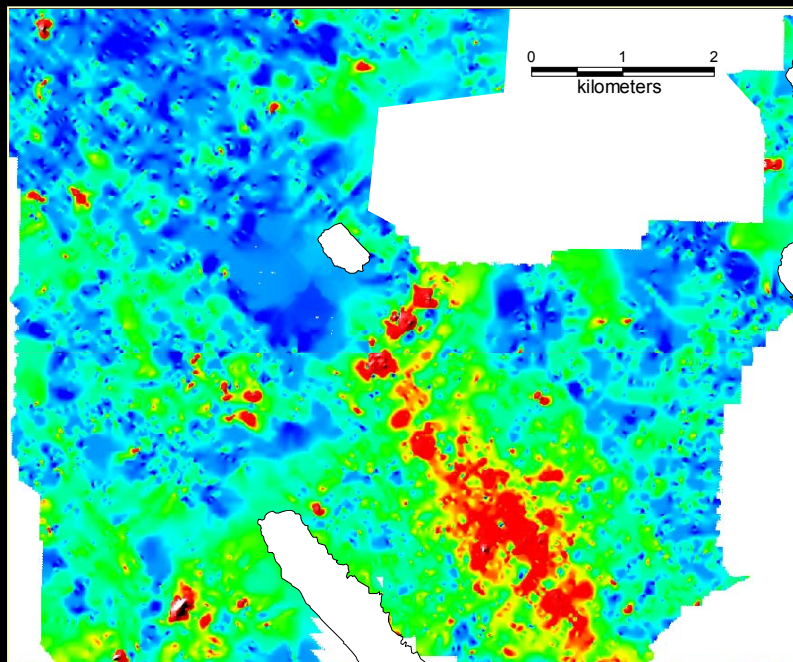
Ballinalack Zn - Pb



Lead Geochemistry

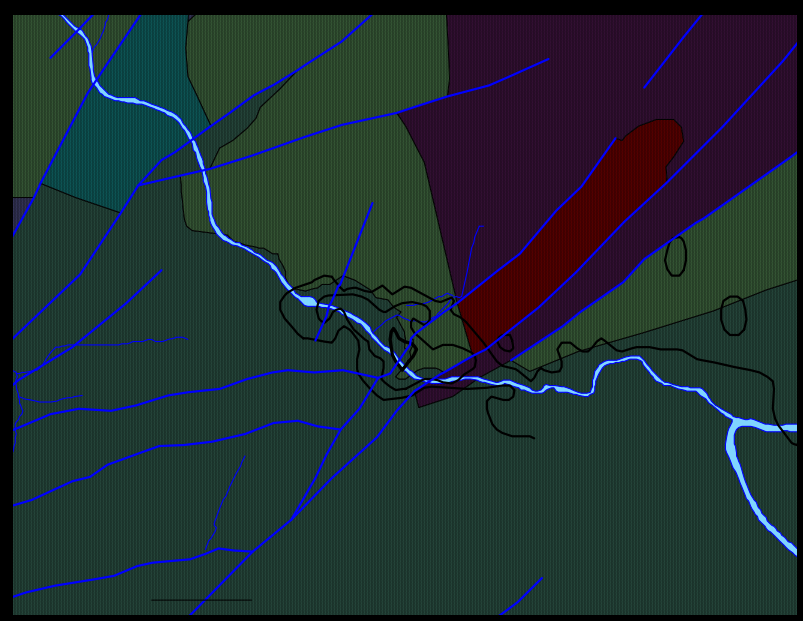


Zinc Geochemistry





Navan Zn - Pb

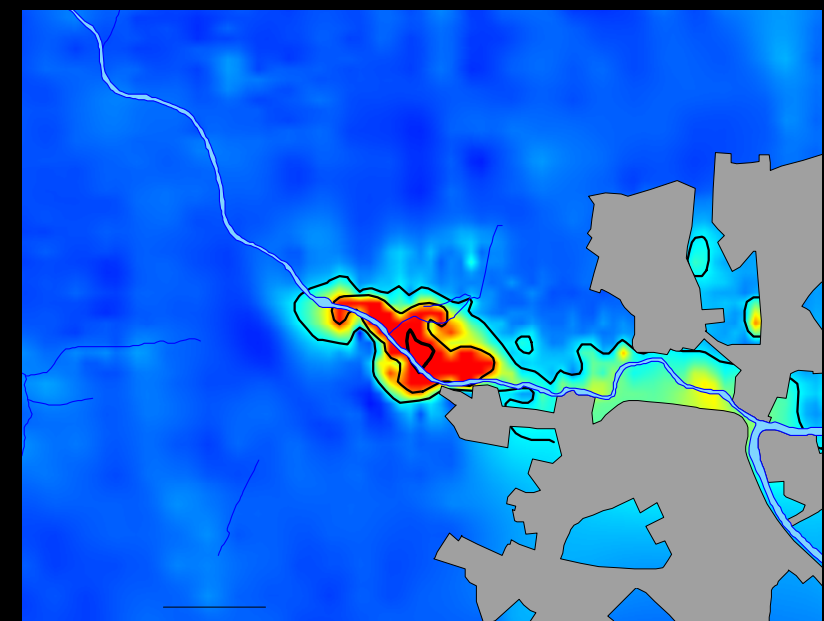


- Upper Dark Limestone
- Waulsortian Limestone
- Argillaceous Bioclastic Limestone
- Navan Group Beds
- Lower Palaeozoic
- Felsic Intrusive



500m

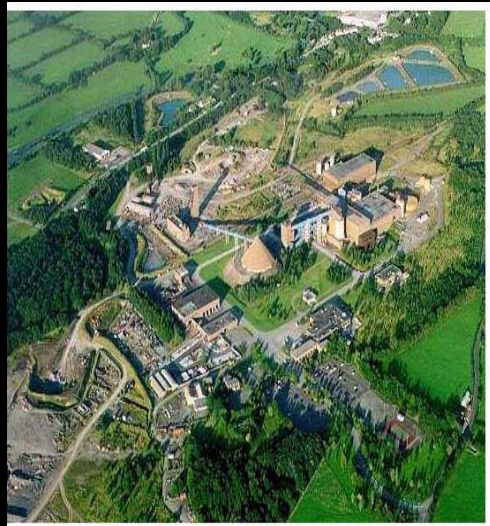
- 200 - 300 ppm Zn
- 100 - 300 ppm Zn
- <100 ppm Zn
- 500 - 20,000 ppm Zn
- 300 - 500 ppm Zn



Zinc Soil Geochemistry



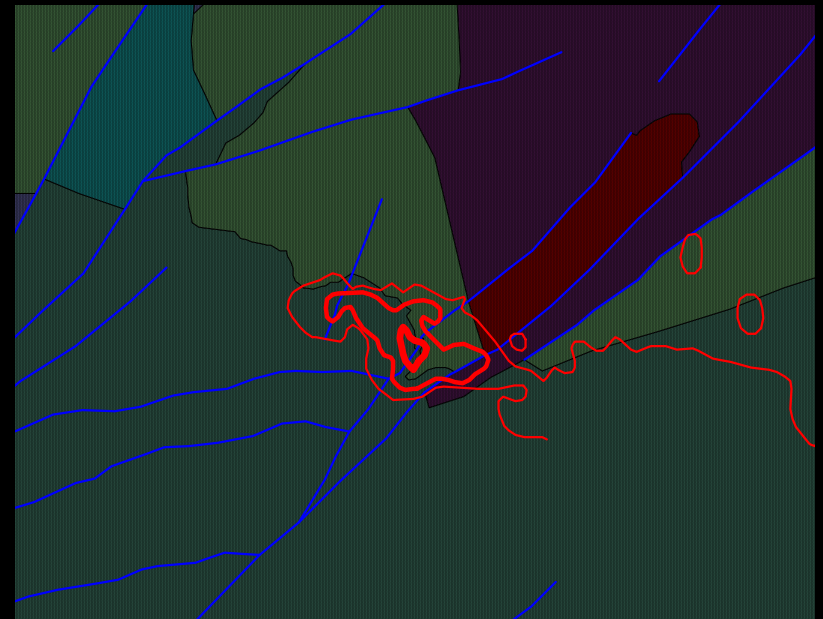
Navan Zn - Pb



500m



N

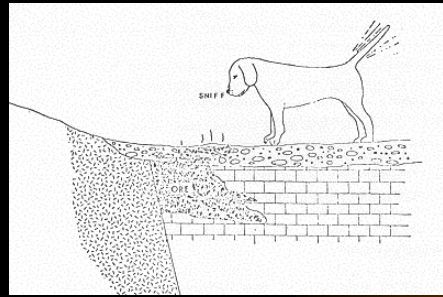
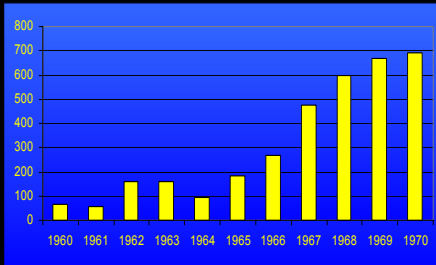


Orebody outline



Navan Zn - Pb

- Host: Basal Carboniferous shallow water carbonates
- Resources - Initial:
 - 70Mt @ 10.1% Zn, 2.6% Pb
- Production to end 2002:
 - 55.2Mt @ 8.4% Zn, 2.1% Pb
- December 2002:
 - Reserves: 18.0Mt @ 9.3% Zn, 2.0% Pb
 - Resources: 21.2Mt @ 7.3% Zn, 2.2% Pb
- Operation: 1977 - To-date



After AHM 1979

1970

Prospecting Licences 1960-1970

Element

- ▲ Zn - Pb
- ▲ Cu
- ▲ Au
- ▲ Gypsum
- ▲ Barite

Prospect

- ▲ Small
- ◆ Medium
- 😊 Mine

Geologic Time		Pre-1960	1961-1970
Cenozoic		▲	
Mesozoic			
		▲	
Palaeozoic	Permian		
	Carb	▲ ▲ ▲ 😊	😊 😊 ▲ ▲ ◆ 😊
	Dev	▲ ▲	
	Sil	▲	
	Ord	◆	
	Camb	▲	
Pre-Cambrian			

1970 - 1980

Treading Water

Post Navan Problems



- Flaws in Mineral Legislation
- Resources Protection Campaign
- Oil Crises of early-mid 1970's
- Shallow Soil Geochemical Coverage

1970 - 1980 Solutions



- Deep Overburden Sampling
- Uranium
- Lithium - Tin - Tungsten
- Industrial Minerals
- The Move Overseas

Deep Overburden Sampling



- Technical Successes
- References
 - Prospecting in Areas of Glaciated Terrain 1979
 - Mineral Exploration in Ireland - Progress and Developments 1971 - 1981



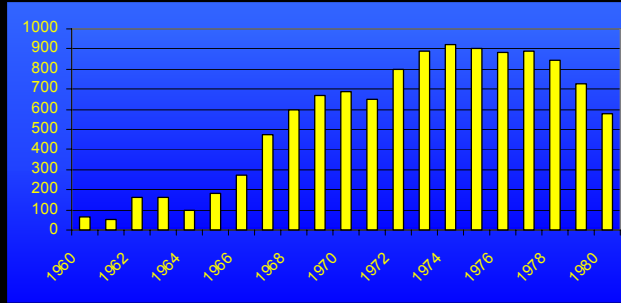
Uranium

Tullow Anomaly

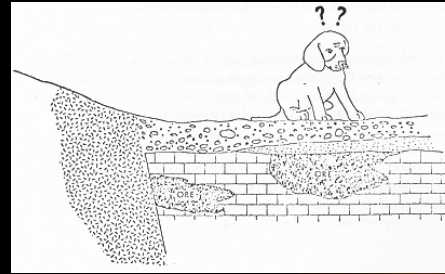
- Water: Max 36ppb
- Steam Sediment: Max 300ppm
- Peat: Max 8,000ppm
- Resource: 26 - 42t U



U Anomaly



Prospecting Licences 1960-1980



After AHM 1979

1980

Element

- ▲ Zn - Pb
- ▲ Cu
- ▲ Au
- ▲ Gypsum
- ▲ Barite

Prospect

- ▲ Small
- ◆ Medium
- 😊 Mine

Geologic Time		Pre-1960	1961-1970	1971-1980
Cenozoic		▲		▲
	Mesozoic			
Palaeozoic	Permian			
	Carb	▲ ▲ ▲ 😊	😊 😊 ▲ ▲ ◆ 😊	▲ ▲ ▲
	Dev	▲ ▲		
	Sil	▲		
	Ord	◆		● ▲
	Camb	▲		▲ ●
Pre-Cambrian				

1980 - 1990



Gold and Base Metals



1980 - 1990

Images: National Museum website

- Gold
- Lithogeochemistry
- Base Metal Revival



Gold Price 1968 - 1980

The CSA Group

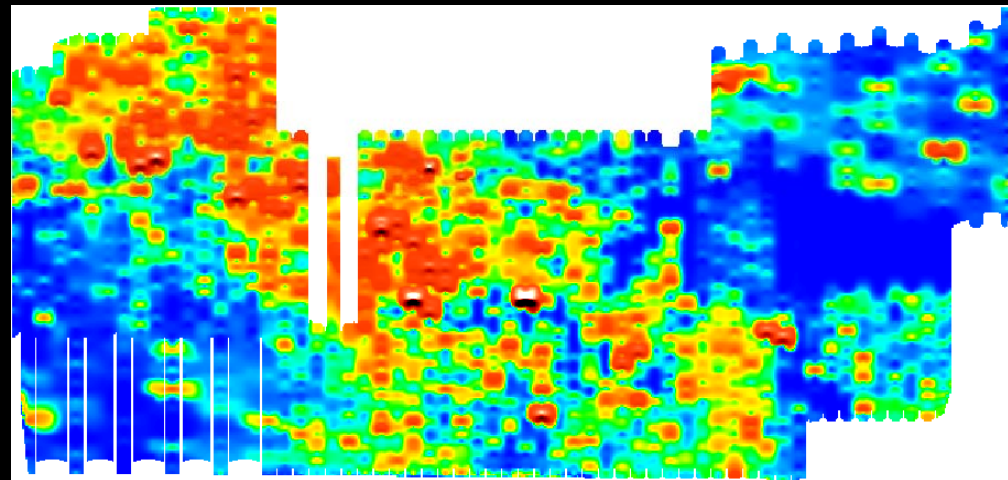
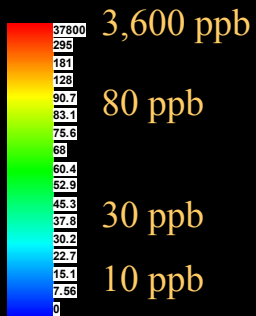
CSA



Curraghinalt Au

Deep Overburden Sampling
50m by 20m

Gold



Resource:
400,000 t @ 18g/t Au

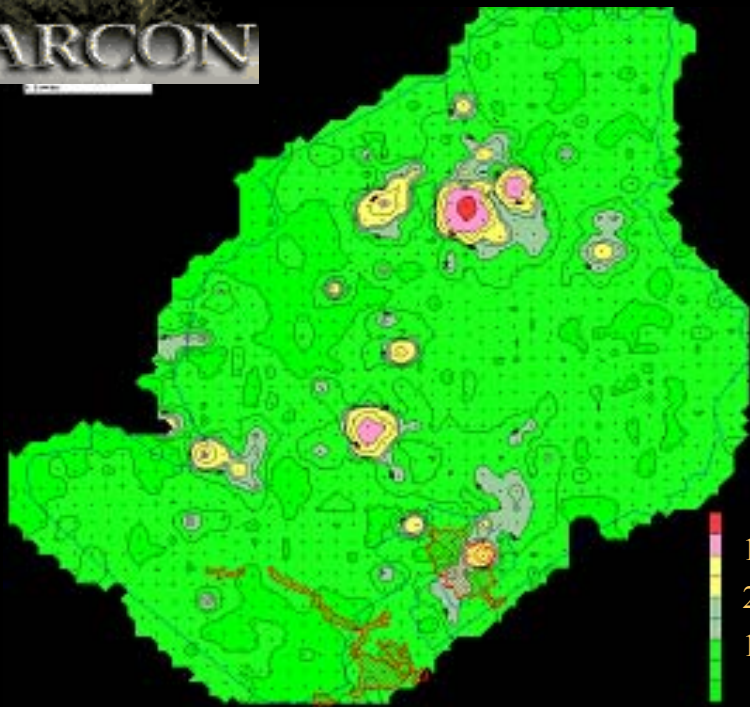


Lithogeochemistry

- Haloes of ore elements exist around mineralised bodies in carbonate environments
- Halo values can be encountered which, if intersected in an exploration drill hole, would be encouraging
- Given two, or more, holes vectors can be detected and used to guide drilling.

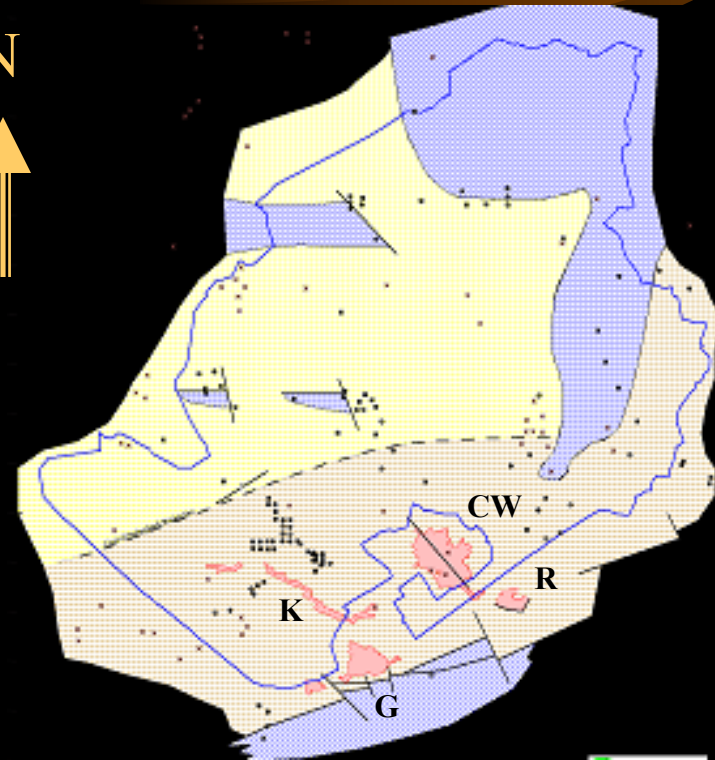


Galmoy Zn - Pb



Zinc Geochemistry

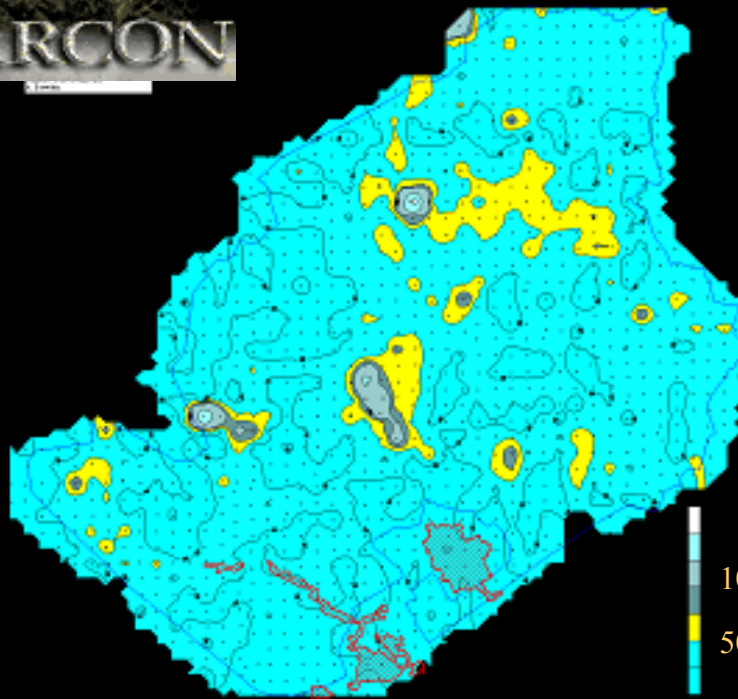
N



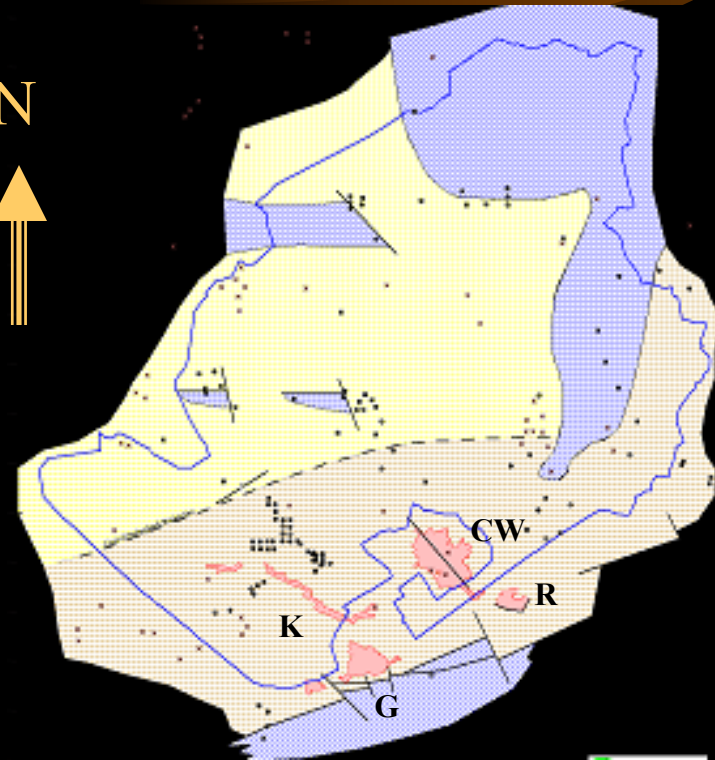
0 2,000m



Galmoy Zn - Pb



Lead Geochemistry



0 2,000m



Galmoy Zn - Pb

- Host: Waulsortian Reef
- Resources - Initial:
 - 6.5Mt @ 12.9% Zn, 1.3% Pb
- Production to end 2002:
 - 3.1Mt @ 10.6% Zn, 1.1% Pb
- December 2002
 - Reserve: 3.3Mt @ 11.0% Zn, 2.1% Pb
- 2003 R Zone Discovery
 - 2.3Mt @ 19.0% Zn, 7.2% Pb, 66g/t Ag
- Operation: 1997 - To-date








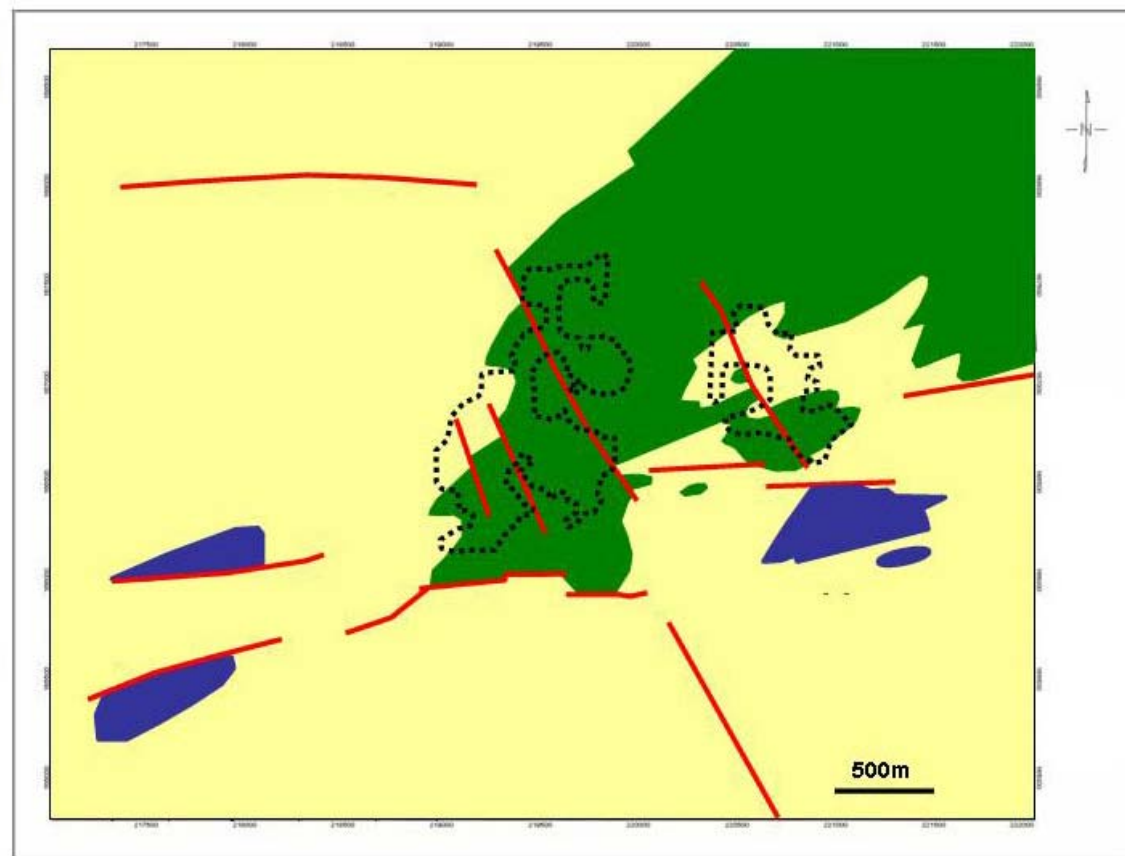
Lisheen Zn - Pb



Summary Geology of the Lisheen Area

Legend

-  Crosspatrick Fm
-  Waulsortian Reef
-  ABL Limestones
-  Fault
-  Orebody projected to surface





Lisheen Zn - Pb







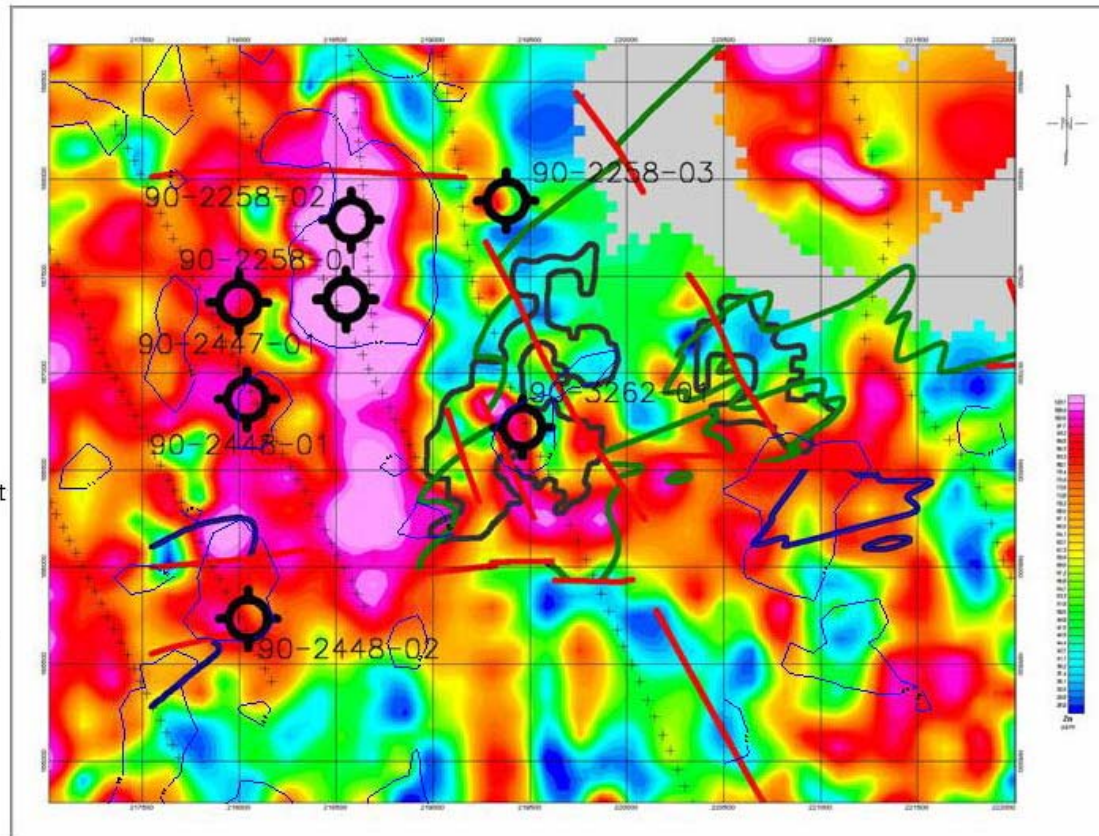
1990 Chevron Soil Survey 18" Auger

Zn (ppm) - Gridded

Pb (ppm) - Contour
@50ppm

Legend

-  Crosspatrick/
Waulsortian contact
-  Waulsortian /
ABL contact
-  Fault
-  Orebody projected
to surface
- 90-3262-01
 Drill Hole
-  IP survey station



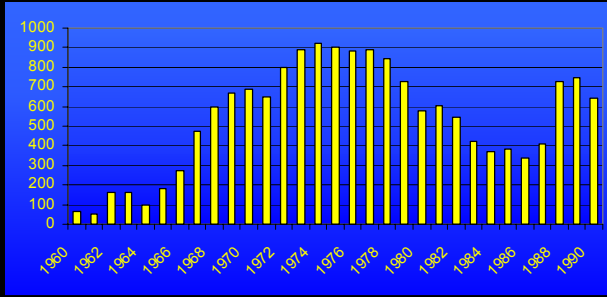
100 ppm

60 ppm



Lisheen Zn - Pb

- Host: Waulsortian Reef
- Resources - Initial:
 - 22Mt @ 11.5% Zn, 1.9% Pb, 26g/t Ag
- Production to end 2002:
 - 3.57Mt @ 11.34% Zn, 2.55% Pb
- December 2002:
 - Reserve: 12.8Mt @ 11.26% Zn, 1.96% Pb
 - Resource: 2.3Mt @ 9.9% Zn, 1.2% Pb
- Operation: 1999 - To-date



1990

Prospecting Licences 1960-1990

Element

- Zn - Pb
- Cu
- Au
- Gypsum
- Barite

Prospect

- Small
- Medium
- Mine

Geologic Time		Pre-1960	1961-1970	1971-1980	1981-1990
Cenozoic					
	Mesozoic				
Palaeozoic	Permian				
	Carb				
	Dev				
	Sil				
	Ord				
	Camb				
Pre-Cambrian					

1990 - 2003



Going Deeper
Brownfield Exploration

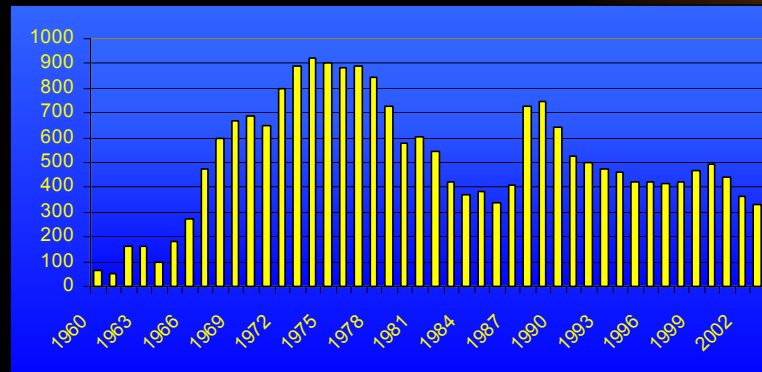
1990 - 2003



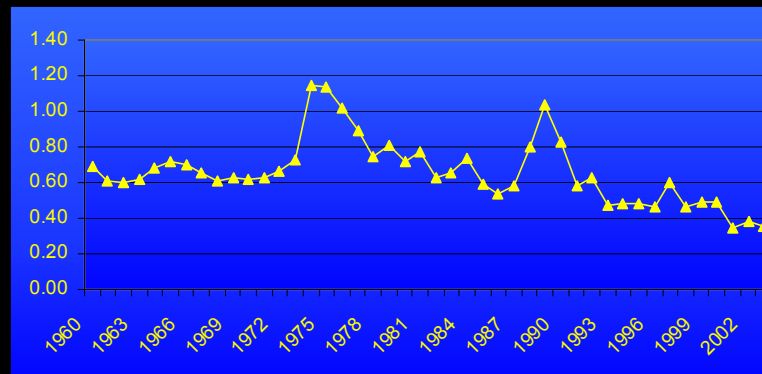
- *Drilling Deeper*
- *Geological Models*
- *Geophysics*
- *Zinc Price*

Exploration and Zinc Price

Prospecting Licences
1960-2003








Zinc Price US c/lb
Constant 1996 US \$











































1960 - 2003

Element

-  Zn - Pb
-  Cu
-  Au
-  Gypsum
-  Barite

Prospect

-  Small
-  Medium
-  Mine

Geologic Time		Pre-1960	1961-1970	1971-1980	1981-1990	1991-2003
Cenozoic						
	Mesozoic					
Palaeozoic	Permian					
	Carb	   	     	  	  	  
	Dev	 				
	Sil					
	Ord				 	
	Camb				 	    
Pre-Cambrian						

What Next ?

- Database
- Geology
- Litho-geochemistry
- Geophysics
- IQ will get you there, but NQ will find it (Sig Muessig, 1979)
- Environmental Baseline

