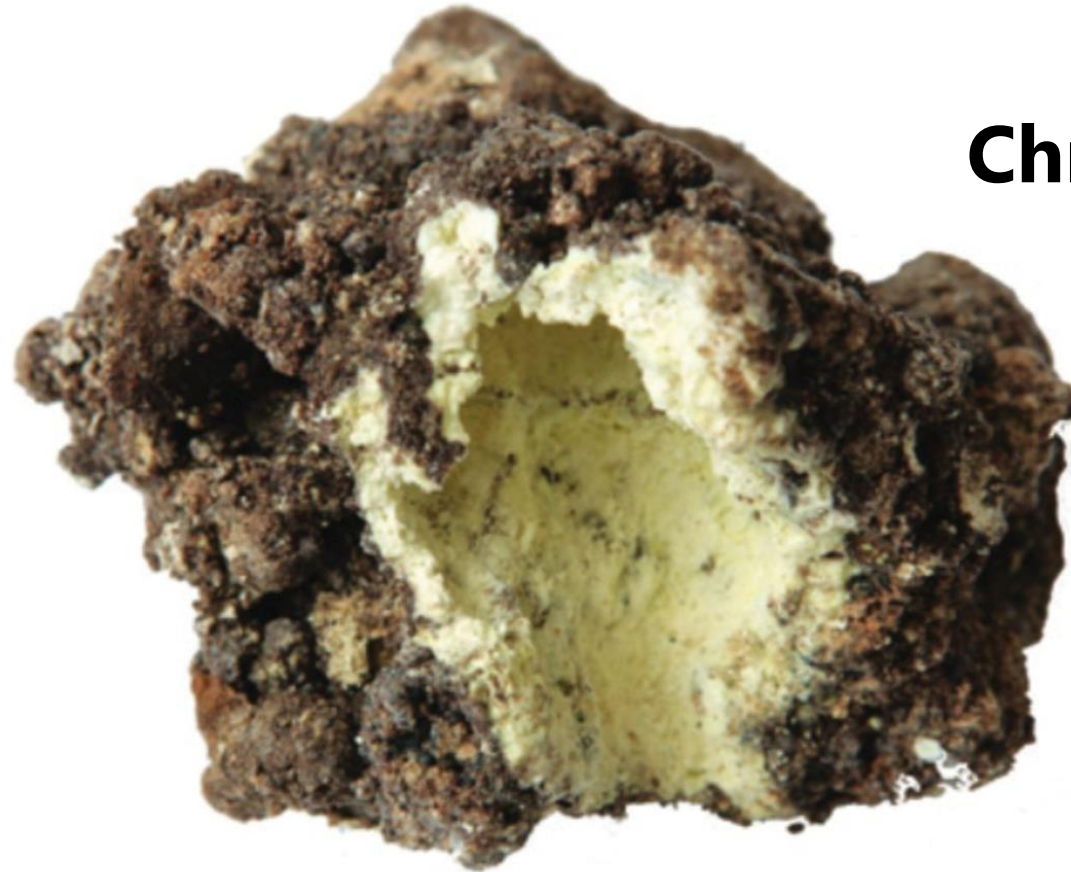


# A Brief History of Chromium in Glasgow

Andrew Mackenzie

13 September 2024



*Release the Value of Your Land*

Specialist Site Investigation and Remediation Contractor

---

## Contents

---

- Whites Chemical Works
- The Legacy
- Early Treatment Trials
- Investigation and Remediation
- Current Work
- Questions

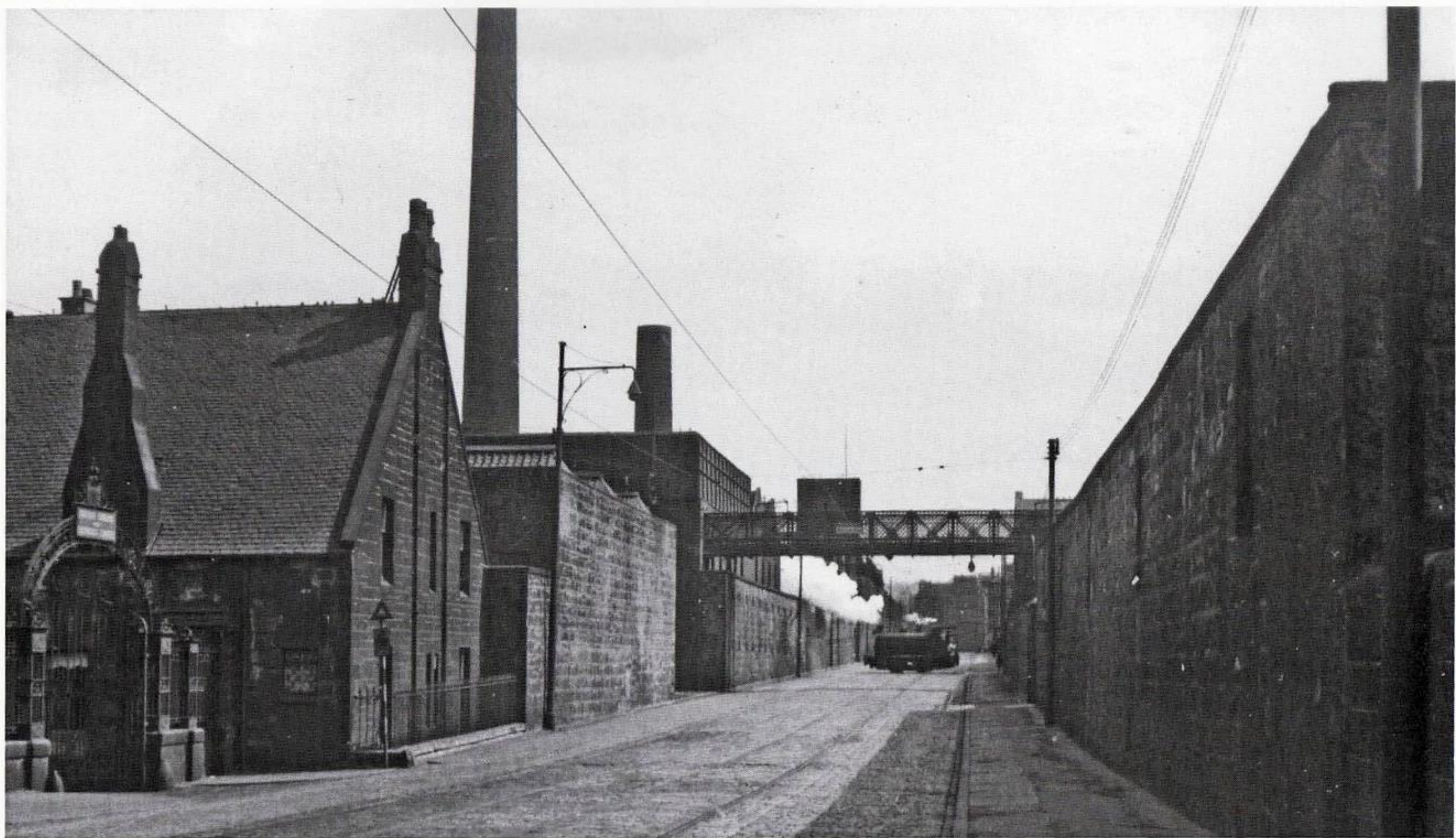




# Shawfield Chemical Works

Station



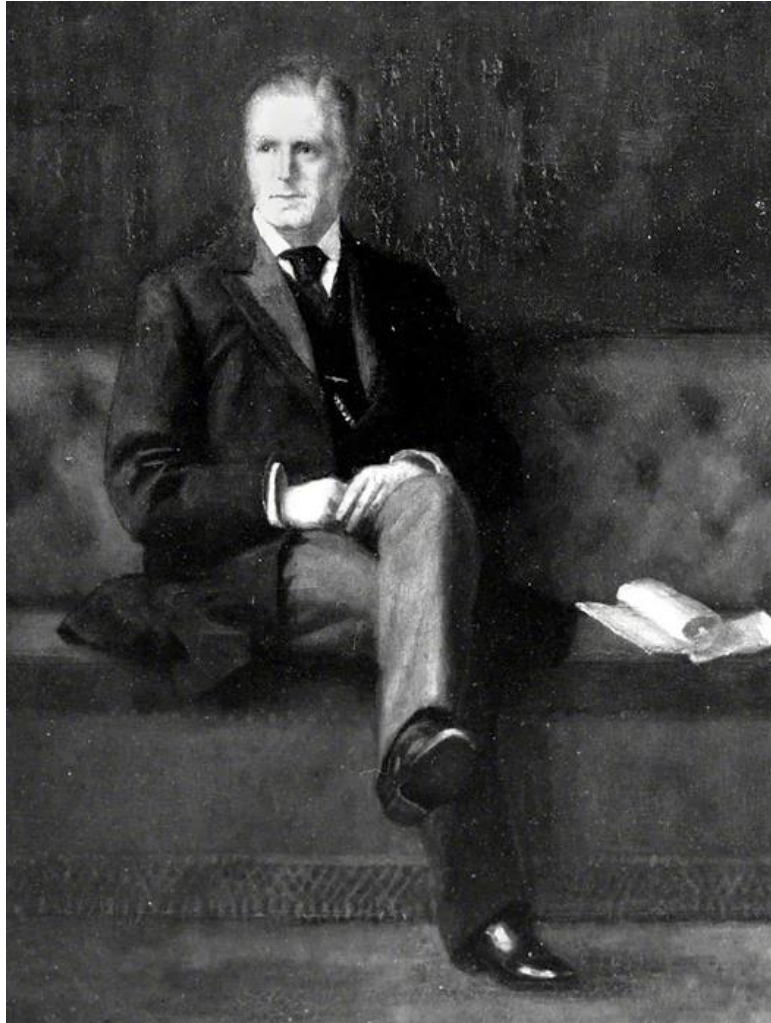




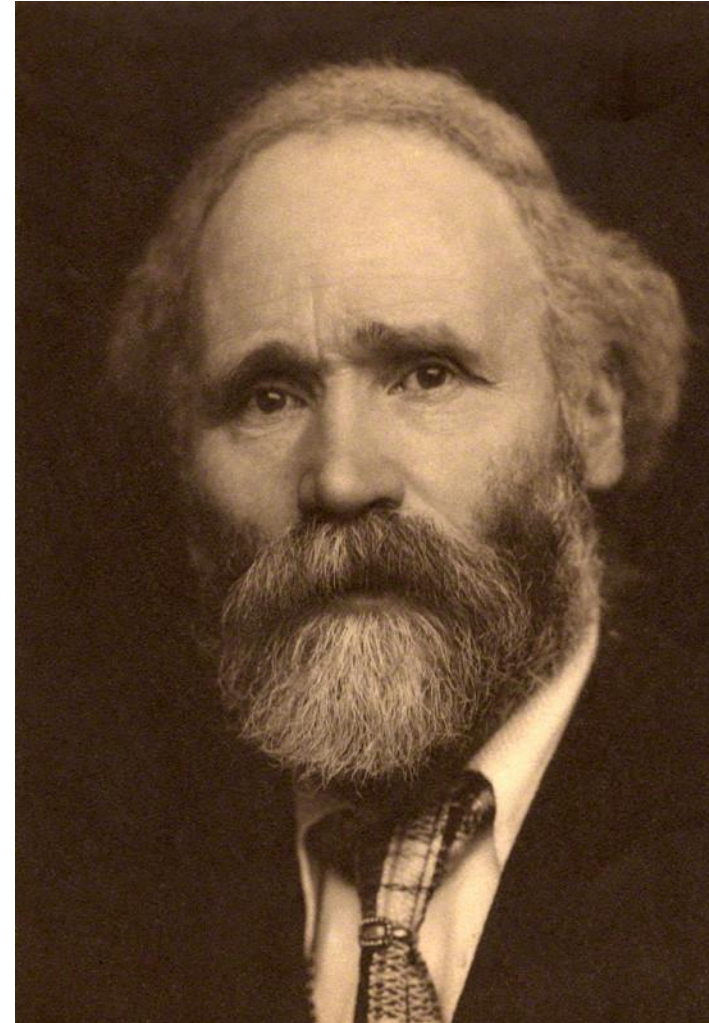
---

**Lord Overtoun**

---



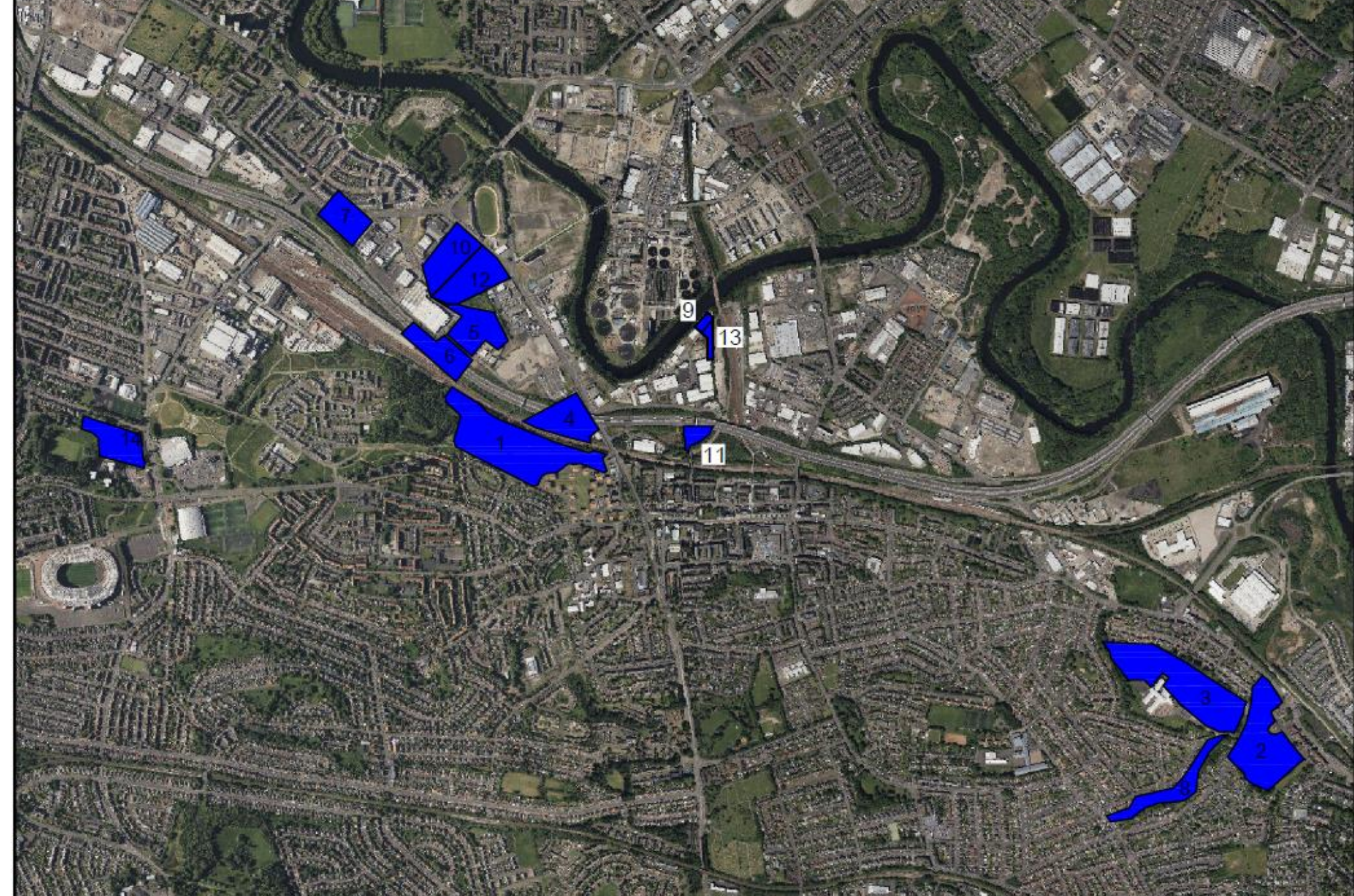
**Keir Hardie**











REV	DATE	DETAIL
-----	------	--------

Project Name  
**Glasgow**

Drawing Title  
**Site Location Plan**

Drawing Number  
**INFO ONLY**

Drawn by  
**MMc**

App'd by  
**AM**

Scale  
**NTS @ A4**

Date  
**28/08/2024**

Glasgow Head Office Westerhill Road Bishopbriggs Glasgow G64 2QH Tel:0141 772 2789 Fax:0141 762 0212	Invergordon Office Morlich House 20 Davidson Drive Invergordon IV18 0SA Tel:01463 241 222 Fax:0141 762 0212
--	---

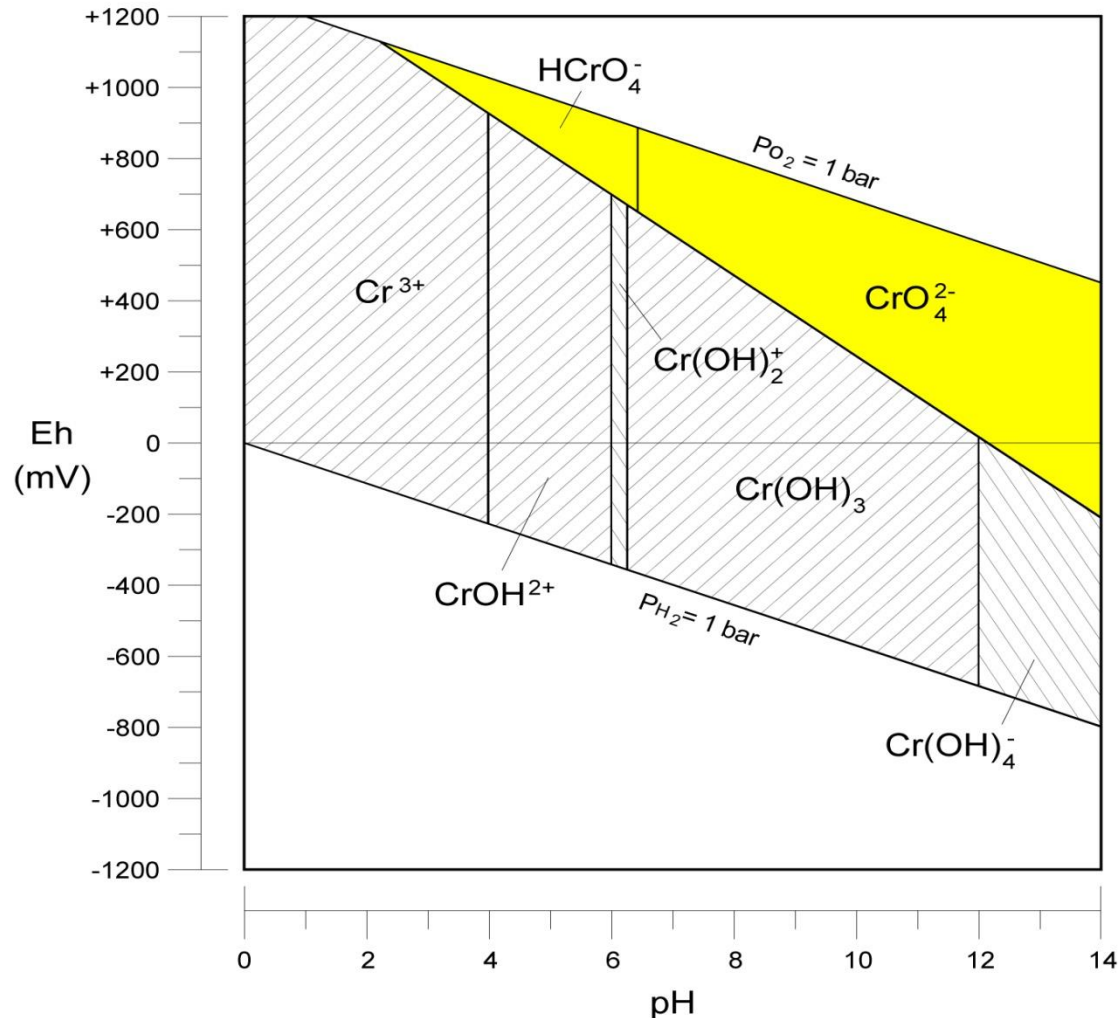






# Chemistry

Chromium Eh-pH Diagram



- Chromite is  $(Mg, Fe)(Al, Cr, Fe)_2O_4$
- CrVI present chromate
- Stability increased by high pH and oxidising conditions (high redox)
- Typical redox in groundwater from 0-400mV
- $Cr(OH)_3$  is the insoluble Cr(III) form
- Cr(III) starts to become soluble below pH6 (and above 12)

## Cr VI Health Effects

- Sodium Chromate
- R49: may cause cancer by inhalation.
- R46: may cause heritable genetic damage.
- R21: also harmful in contact with skin.
- R25: and also toxic if swallowed.
- R26: also very toxic by inhalation.
- R37/38: irritating to respiratory system and skin.
- R41: risk of serious damage to eyes.
- R43: may cause sensitisation by skin contact.
- R50/53: very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.





# DANGER IN THE SAND



**TOXIC TESTS:** yards



Jane



# KILLER IN THE

## Cancer chemical seeps into stream by playpark



Mum who won

NEWS OF THE WORLD  
INVESTIGAT



Toxin

Milngawe





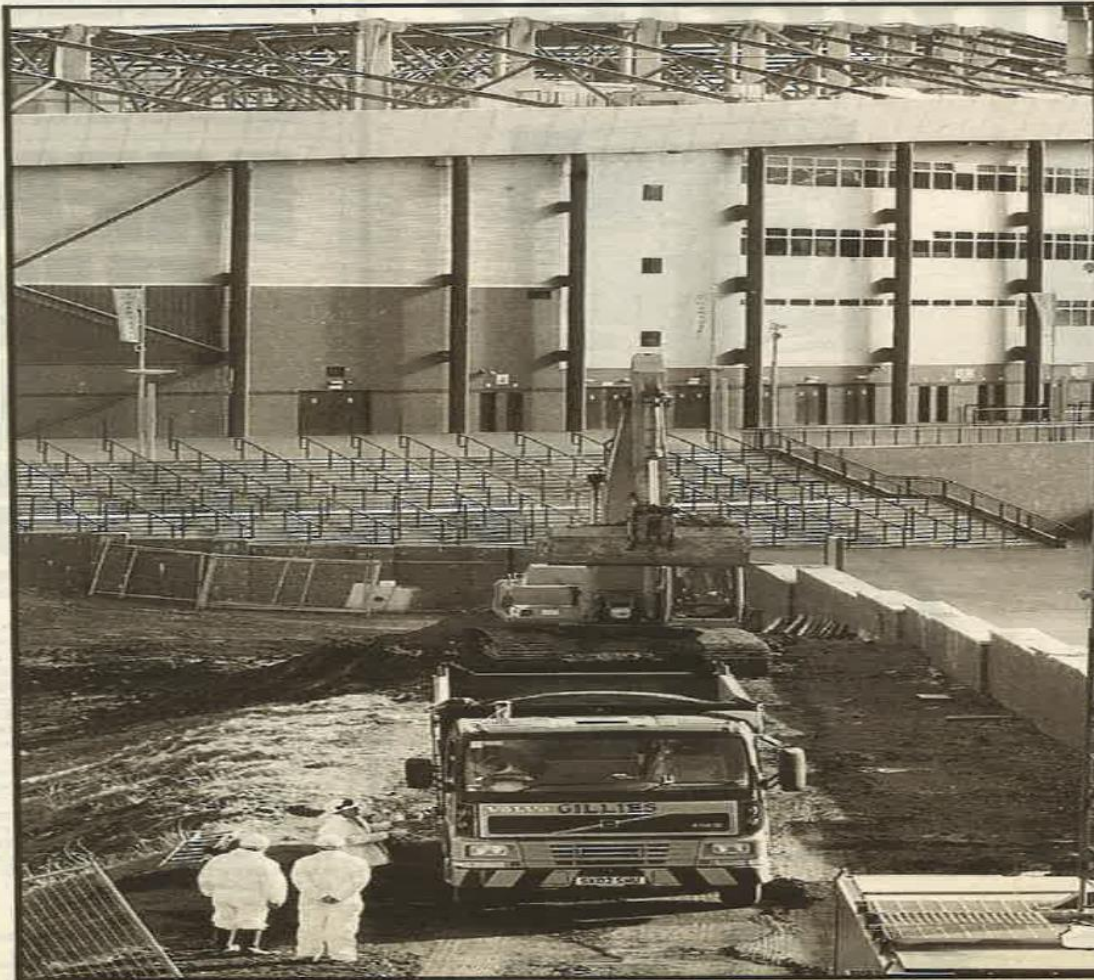






# THE HAMPDEN ORE

## Champions League Final hit by toxic waste scare



TAKEN AWAY:

Park

### been found at Hampden Stadium.

Tons of chromium-poisoned soil - which can cause cancer - was uncovered yards due to host the prestigious European Champions League Final on May 15.

Bosses at nearby Lesser Hampden training ground in Mount Florida, Glasgow found the waste in a 60-yard embankment. The venue, which is to be transformed into a tented village for sponsors and VIPs from UEFA - Europe's ruling soccer body

Training sessions and games have been stopped, the public are banned from entering and fences section off the toxic area.

Last night one worried source at Queens Park Football Club, who own the site, said: "This was the last thing we expected to find here. But bosses brought in workers to get it removed as quickly as possible."

"This is our chance of hosting Europe's

i k

Environmental health experts versaw the work - which sta weeks ago as children played nearby.

Yesterday Mount Florida residents voiced their fury at being kept in the dark.

Nurse Wilma Keir, 58, said she planned to complain to her MSP, adding: "If they are moving chromium-contaminated earth people living nearby should be informed."

"Any risk to public health should have been clearly communicated."

Chemical engineer, Kevin McMonagle, 58, asked: "How toxic is this soil? What happens if I breathe it in? There are a lot of questions I would like answered."

Kirsteen McFarlane, 27, added: "They



DANGER:

t, UEFA said problem would

The waste is thought to have been in the soil for 80 years and come from the defunct White's of Rutherglen metal works.

Queens Park FC secret Mackay added: "There is no final or the tented village."

with this problem and are confi thing will go ahead as planned."

Agency spokeswoman said: "The amount of chromium in the soil was not sufficiently high for it to be classified as special waste."

Around 600 cubic metres were taken to

S R A G E R



been known cause cancer in humans, according to recent studies. poisonous metallic element pose a risk to health by breathing it in as dust,

sting by contaminated water, food tainted by it. The World Health Organisation say certain chromium compounds are human carcinogens - cancer causing agents.



## Carnbroe

- COPR discovered on housing development site
- Carnbroe, North Lanarkshire
- Elevated hexavalent chromium
- Treatment by reduction
- Followed by disposal to landfill
- Batch treatment in tractor mounted pan mixer



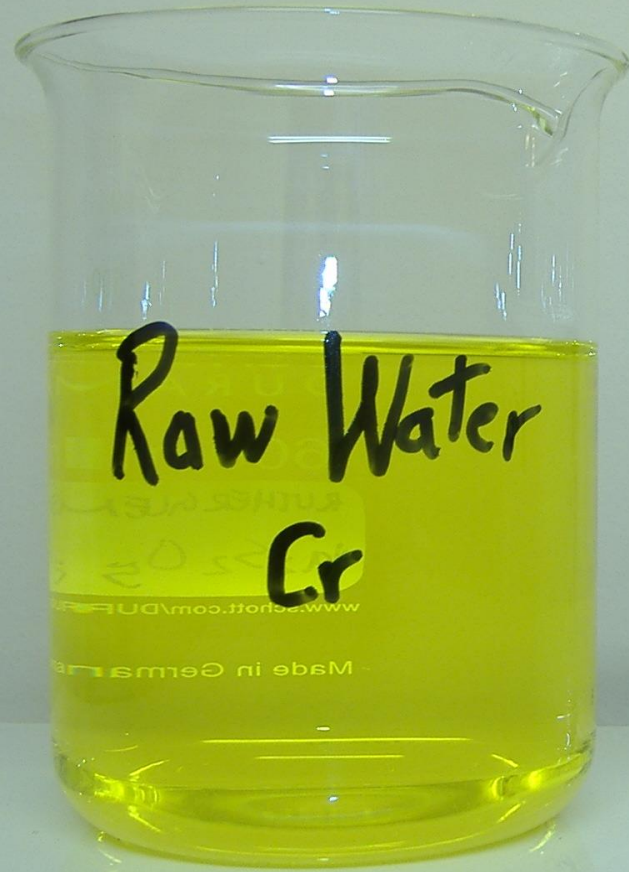


## Summerford, Falkirk

- High chromium concentrations leaching from historic landfill
- Directly into surface water
- Design flow 9m<sup>3</sup> per hour
- Inlet Cr: 8-30mg/l
- Outlet Cr: <0.1mg/l
- Chemical reduction with separation by a Dissolved Air Flotation Unit (DAF)
- Provision for overflow water (ZVI)

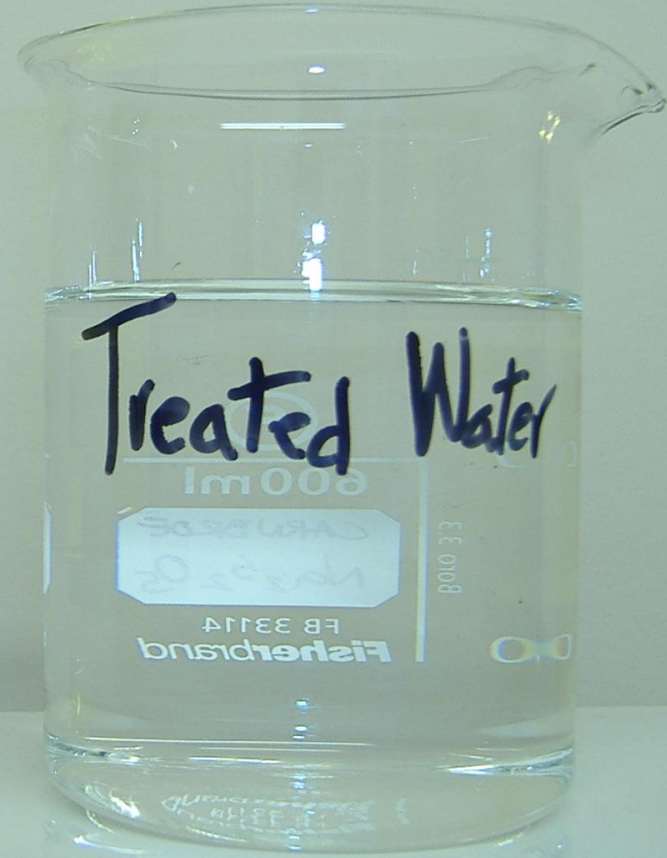






Raw Water

Cr



Treated Water













DIW37

ROAD CLOSED  
TO TRAFFIC  
ON THE  
ROAD TO THE



## Clyde Gateway ([www.clydegateway.com](http://www.clydegateway.com))

- Large and ambitious regeneration project (838Ha)
- Public and private sector investment
- Glasgow City Council, South Lanarkshire Council, Scottish Enterprise, Scottish Government
- 63ha at Shawfield – necessitated a further review of remediation techniques for the water environment
- URS engaged and work focussed on Calcium Polysulphide (CaSx) as the reducing agent
- Key issue is deliverability



## 2009 Trials

- Focussed on CaSx
- Deep Soil Mixing
- Groundwater recirculation
- Direct Injection
- “Direct injection is the most versatile of the three approaches.... It is considered likely that direct injection will represent the most appropriate way forward”





## 2009 Trials

- Focussed on CaSx
- Deep Soil Mixing
- Groundwater recirculation
- Direct Injection
- “Direct injection is the most versatile of the three approaches.... It is considered likely that direct injection will represent the most appropriate way forward”



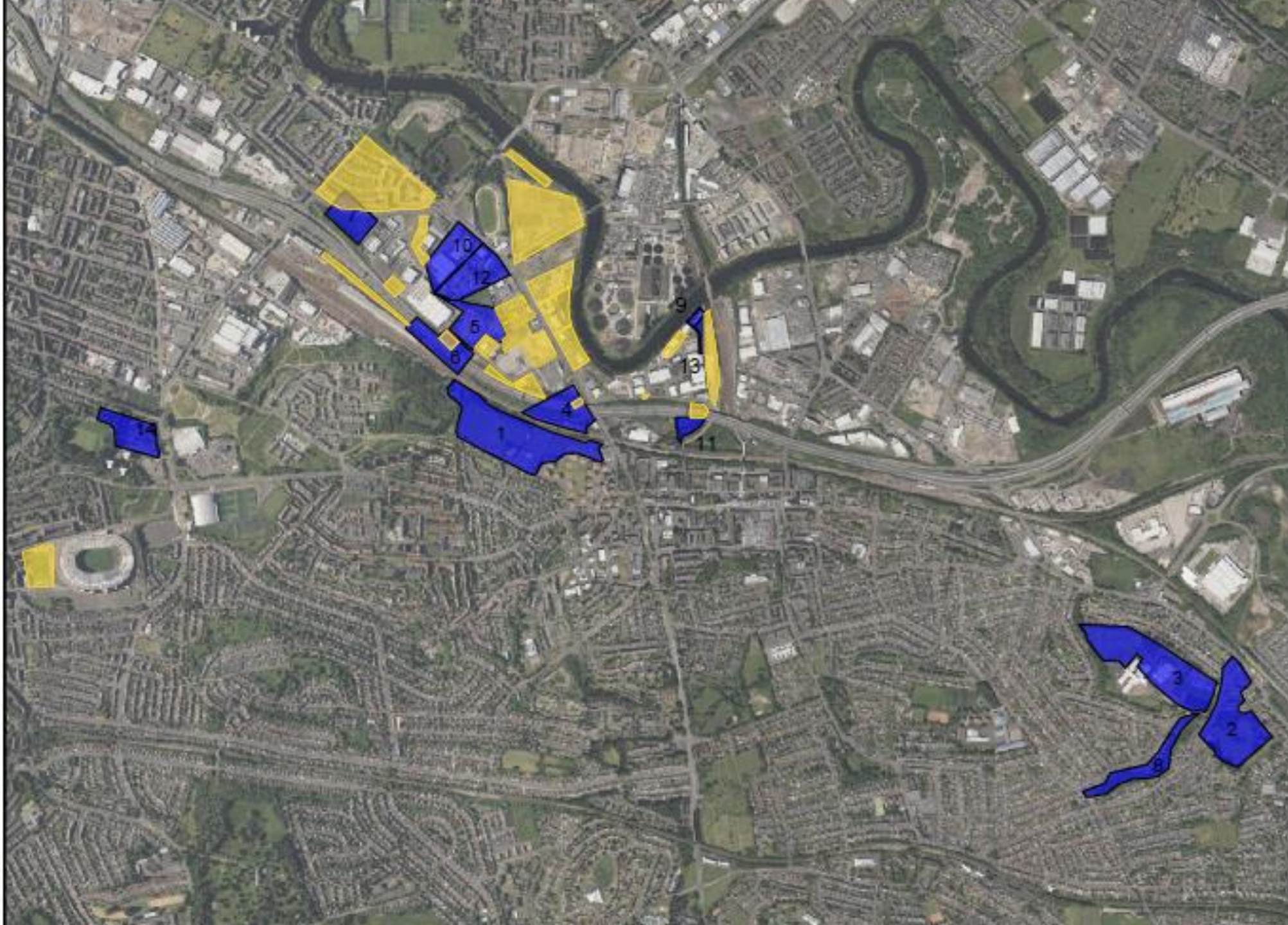


## 2009 Trials

- Focussed on CaSx
- Deep Soil Mixing
- Groundwater recirculation
- Direct Injection
- “Direct injection is the most versatile of the three approaches.... It is considered likely that direct injection will represent the most appropriate way forward”







Additional Sites

Scale 1:10,000

City of Glasgow  
Glasgow

Project Title  
COPR Sites in Glasgow

Project Number  
6681

Client  
MMc

Client Ref  
AM

Contract  
NTS @ A4

Date  
05/09/2024

Glasgow Head Office  
Westerhill Road  
Glasgow  
G8 3JH  
Tel: 0141 772 2766  
Fax: 0141 762 0212

Invercldon Office  
Muirch House  
23 Davidson Drive  
Invercldon  
NTS G8A  
Tel: 01461 341 220  
Fax: 0141 762 0212











wow desserts

SMH CAR WASH & VALET CENTRE

SOLUTIONS

AB2K

AB2K

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

SP1

Marshall's















---

## Conclusions

---

- The legacy of Whites Chemical Works is massive
- Chemistry is complex and variable
- Investigation should be well planned and completed with an attention to detail
- Remediation is challenging
- Each site is different
- The learning continues at all levels.



---

# Questions?

---

**Andrew Mackenzie**  
Managing Director

E: [andrew@ersremediation.com](mailto:andrew@ersremediation.com)  
T: 0141 772 2789  
M: 07778 349975