5.16 Glenmalure District
5.16.1 Ballinafunshoge

Mine District: Glenmalure

Mine Name: Ballinafunshoge
Minerals Worked: Pb

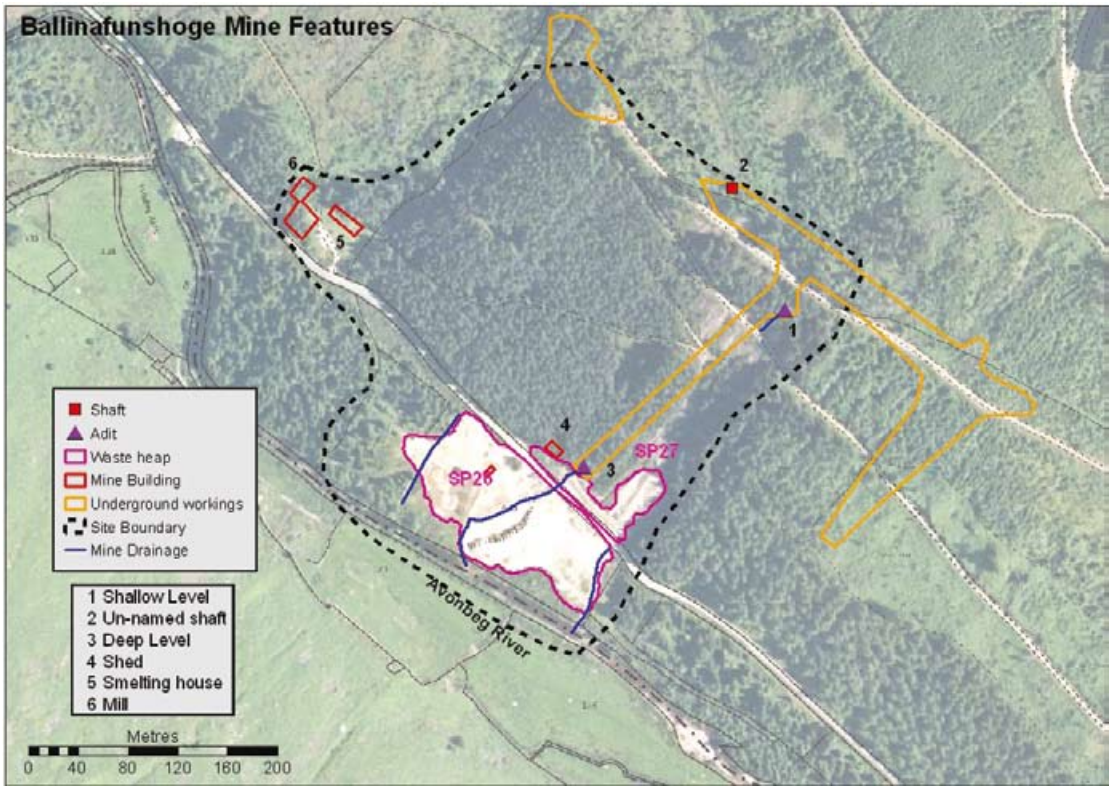
County: Wicklow
Townland: Ballinafunshoge
Grid Reference: E308265, N192695

Site Score: 305
Site Class: III (Glenmalure District)

Elements of Interest: Pb, Zn, Cu, Cd
Media of Concern: Solid waste, surface water, stream sediments

Geochemical Overview

The Ballinafunshoge site is notable for an adit discharge with very high Pb (≤6,512 µg/l) and Zn (≤15,860 µg/l) concentrations as well as an extensive area of processing waste with some very high measured concentrations of Pb (>19%). The adit discharge drains directly to the Avonbeg River and, combined with run-off from the solid waste heaps, has significant potential to contaminate the aquatic ecosystem. However, the acidity of the mine water is very low and there is no risk of AMD at the site. As is the case for most sites in the district, Cd is generally present in significant concentrations in both solid (≤238 mg/kg) and liquid (≤70 µg/l) waste. There is significant contamination of stream sediments, with high Pb (1,226 mg/kg) and Zn (475 mg/kg) concentrations recorded 200 m downstream of the mine site.



5.16.2 Barravore–Ballinagoneen

Mine District: Glenmalure

Mine Name: Barravore–Ballinagoneen
Minerals Worked: Pb

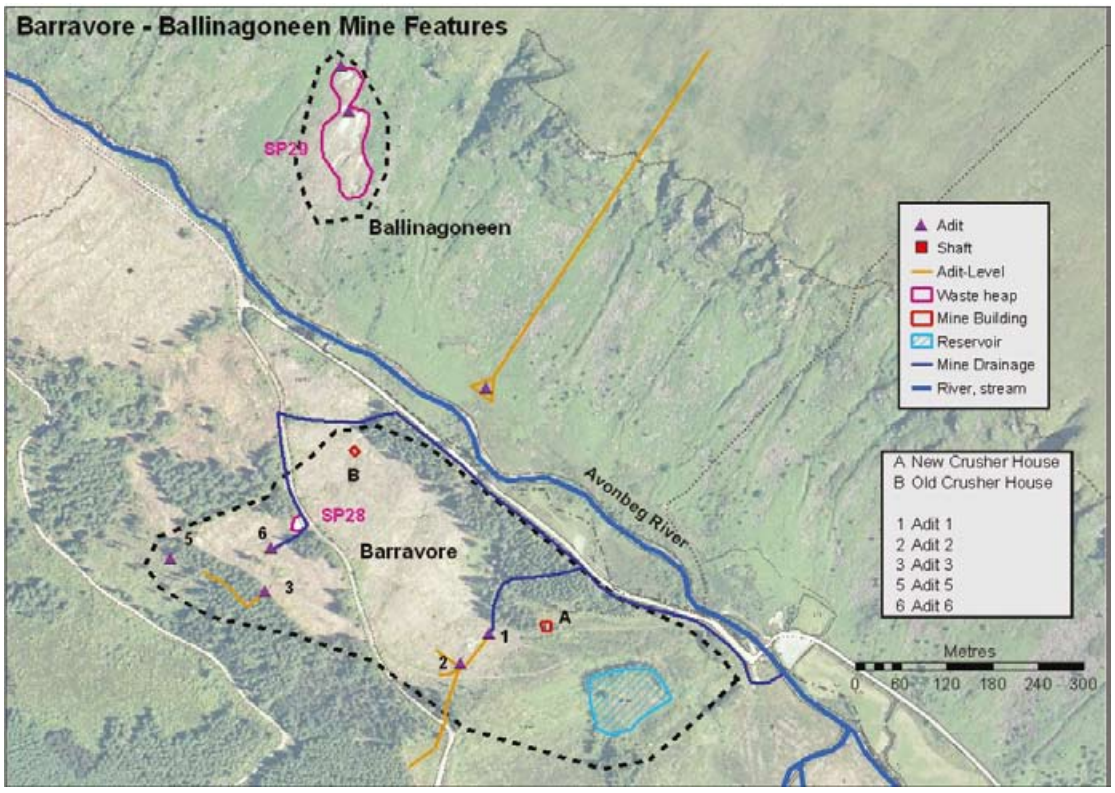
County: Wicklow
Townland: Barravore; Ballinagoneen
Grid Reference: E306180, N194231;
E306041, N194835

Site Score: 6
Site Class: III (Glenmalure District)

Elements of Interest: Pb, Zn, Cu, Cd
Media of Concern: Solid waste, stream sediments

Geochemical Overview

Stream sediment analyses indicate a significant impact on the Avonbeg River by mining activities, with the Pb concentration immediately downstream of the site in excess of 1,000 mg/kg, the guideline limit for the protection of livestock. Very limited volumes of solid waste remain on the site. One adit (Adit 6) discharges a low flow of mine water with elevated Pb (65 µg/l) and Zn (446 µg/l) but these concentrations are not particularly high. Thus, the existing waste sources on the site appear to pose only limited risk to the environment.



5.17 Glendalough–Glendasan District

Mine District: Glendalough

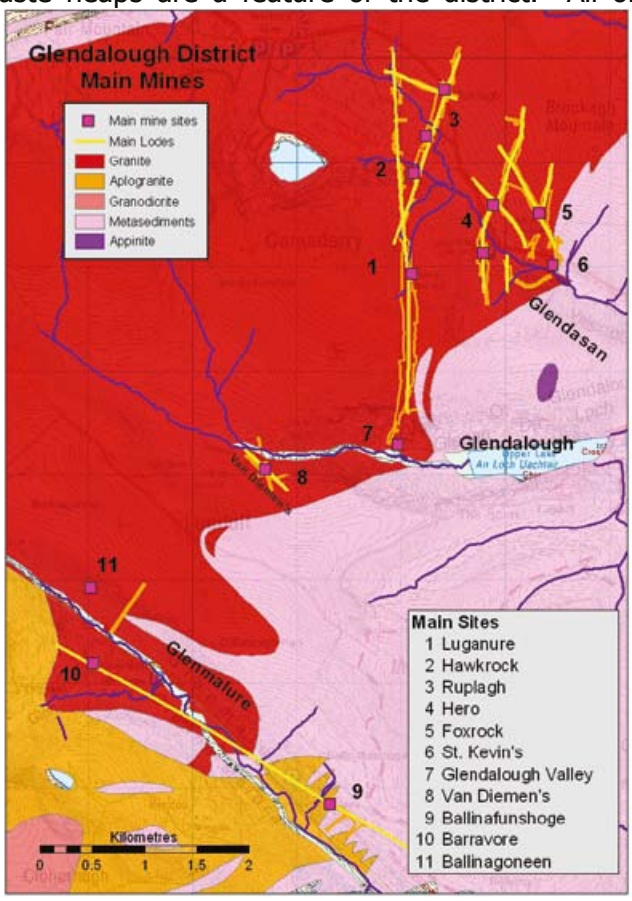
Mine Name: Various
Minerals Worked: Pb

County: Wicklow
Townland: Various
Grid Reference: E308265, N192695

Site Score: 1,457
Site Class: III (Glenmalure District)
II (Glendasan–Glendalough)
Elements of Interest: Pb, Zn, Cu, Cd
Media of Concern: Solid waste, surface water, stream sediments

Geochemical Overview

The Glendalough District has an extensive history of 19th-century lead and silver mining that has left a striking physical legacy in the three valleys that comprise it: Glendasan, Glendalough and Glenmalure. In addition to numerous ruined mine buildings, white quartz-rich solid waste heaps are a feature of the district. All of these contain significant measured concentrations of Pb and Zn and some, notably those on old ore processing sites, have very high concentrations, with maximum recorded values of Pb of almost 20%. Several significant adit discharges drain to the Glendasan, Glenealo and Avonbeg Rivers. These discharges contain significant concentrations of contaminants, chiefly Pb and Zn, but including Cu and Cd, and have a measurable impact on the water quality in the rivers downstream of the mine sites, albeit over short distances. Stream sediments, in contrast, are contaminated over very extensive lengths of the rivers downstream of the mines. The worst affected is the Glendasan River, with concentrations of up to 7.2% Pb measured in stream sediments downstream of the mines. Contamination of stream sediments has been measured at least 4 km downstream of the Glendasan sites. The total HMS-IRC score for the Glendalough District is 1,457 but this has been split into two sub-groups for the purpose of national ranking of the sites: the Glendasan–Glendalough Valley group has a HMS-IRC score of 1,122, while the Glenmalure sites have a total score of 335.



Reports for the individual mine sites in the district follow below.

5.17.1 Foxrock

Mine District: Glendalough–Glendasan

Mine Name: Foxrock
Minerals Worked: Pb

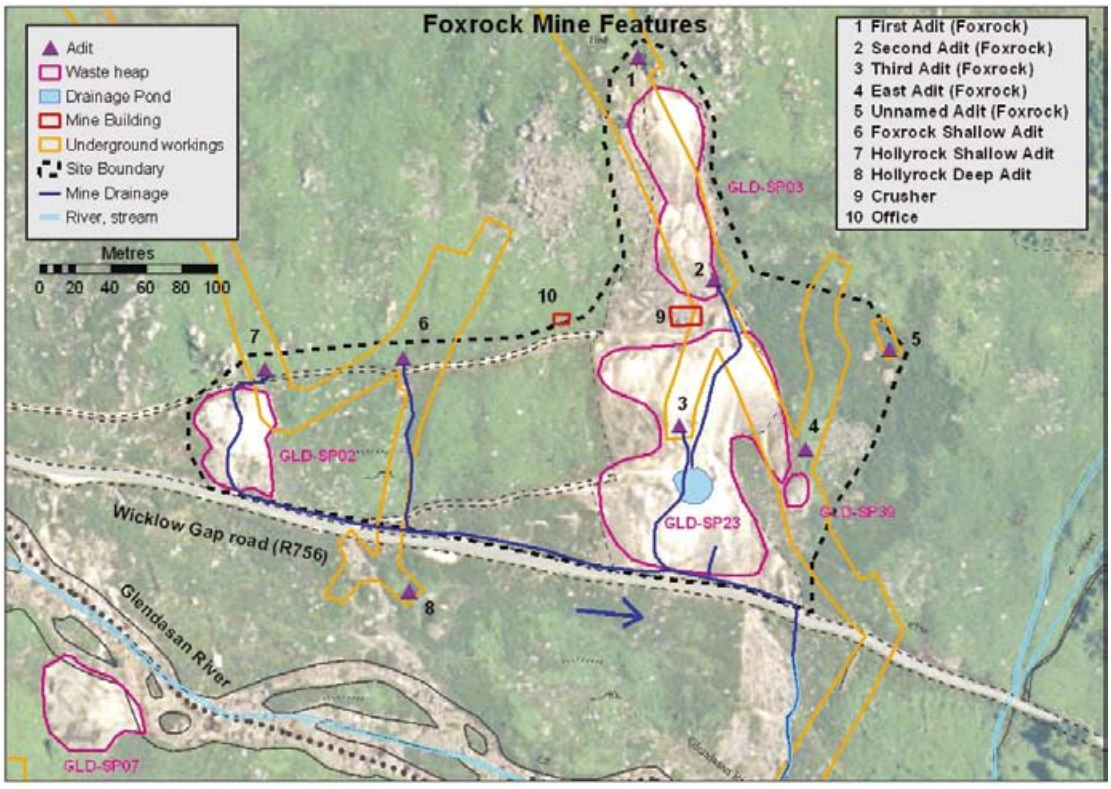
County: Wicklow
Townland: Brockagh
Grid Reference: E310367, N198209

Site Score: 197
Site Class: II (District)

Elements of Interest: Pb, Cu, Zn, Cd
Media of Concern: Solid waste, surface water

Geochemical Overview

The Foxrock site contains two adits that discharge a significant quantity of mine water to the Glendasan River. Part of the discharge flows through the largest waste heap on the site, contributing to potential undermining of the heap. The 2nd and 3rd Adits have near-neutral pH, low acidity, and metal concentrations are of the order of 700–1,800 µg/l Pb and 1,800–2,800 µg/l Zn. The solid waste chemistry is typical of the quartz-rich mine waste found in the district, with Pb concentrations typically of the order of 500–4,000 mg/kg with a maximum in excess of 1%. Zn is also present in high concentrations but apart from Cd, which is typically present in concentrations below 50 mg/kg, other elements of interest are not present in significant concentrations.



5.17.2 Glendalough Valley

Mine District: Glendalough–Glendasan

Mine Name: Glendalough Valley
Minerals Worked: Pb

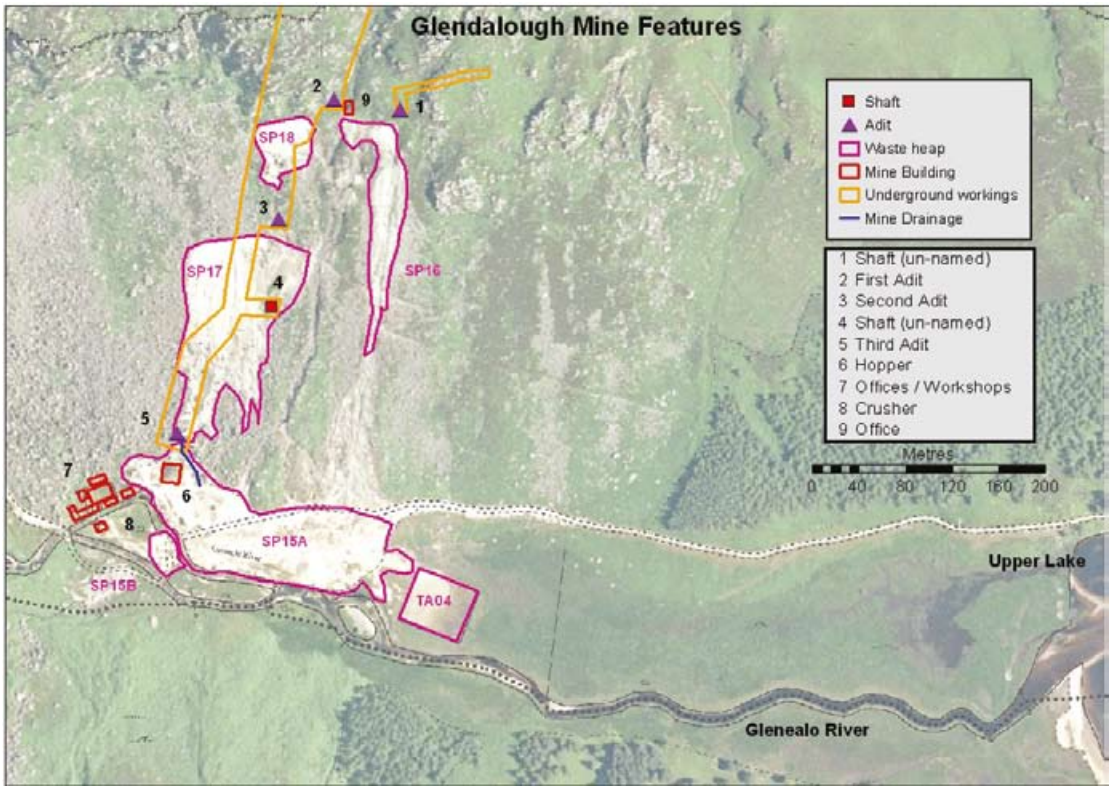
County: Wicklow
Townland: Camaderry; Lugduff
Grid Reference: E308964, N196346
E307695, N196116

Site Score: 331
Site Class: II (District)

Elements of Interest: Pb, Cu, Zn, Cd
Media of Concern: Solid waste, surface water, stream sediments

Geochemical Overview

The Glendalough Valley site contains a large volume of solid waste. Most of the solid waste chemistry is typical of quartz-rich mine waste found in the district, with Pb concentrations typically of the order of 5,000 mg/kg. However, Pb concentrations in processing waste can exceed 4%. Water seeping from the largest solid waste heap has high Pb (812 µg/l) and Zn (5,037 µg/l) concentrations. Discharge of this water to the Glenealo River contributes directly to contamination of the river water, although it recovers quickly downstream through dilution. Stream sediments in the river are seriously contaminated, however, with concentrations of Pb in excess of 6,000 mg/kg at the point of discharge to the Upper Lake.



5.17.3 Hero

Mine District: Glendalough–Glendasan

Mine Name: Hero
Minerals Worked: Pb

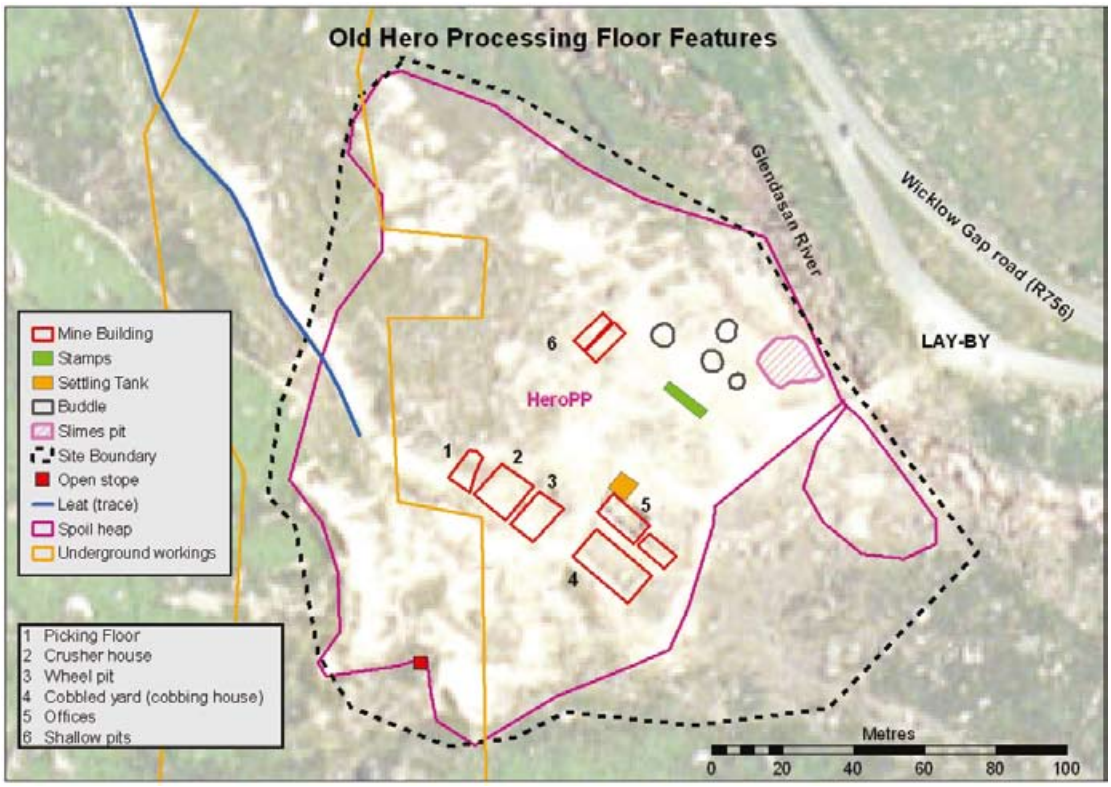
County: Wicklow
Townland: Camaderry
Grid Reference: E309848, N198158

Site Score: 183
Site Class: II (District)

Elements of Interest: Pb, Cu, Zn, Cd
Media of Concern: Solid waste, surface water, stream sediments

Geochemical Overview

This site includes the Old Hero and North Hero sites. Solid waste at the Old Hero processing site includes significant volumes of fine material with exceptionally high concentrations of Pb (≤14.5%) and Zn (≤19.3%). Cd has also been measured in relatively high concentrations (≤658 mg/kg). The site is a common stop-off point for visitors in the area. There are potential risks to humans as a result of direct contact with metal-rich waste and, additionally, to animals as a result of ingestion of same. The presence of fine waste such as slimes and the prevalence of westerly winds blowing through the Wicklow Gap raise the possibility that wind-blown metal-rich dust might be an inhalation issue in dry periods. The site is on the side of the valley and during wet weather run-off drains directly into the Glendasan River. Leachate testing indicates that the dissolved metal content of run-off is likely to be high. Stream sediment samples downstream of the site have very high concentrations of Pb and Zn, though other sites in Glendasan have also contributed to this.



5.17.4 Luganure – Hawkrock

Mine District: Glendalough–Glendasan

Mine Name: Luganure – Hawkrock
Minerals Worked: Pb

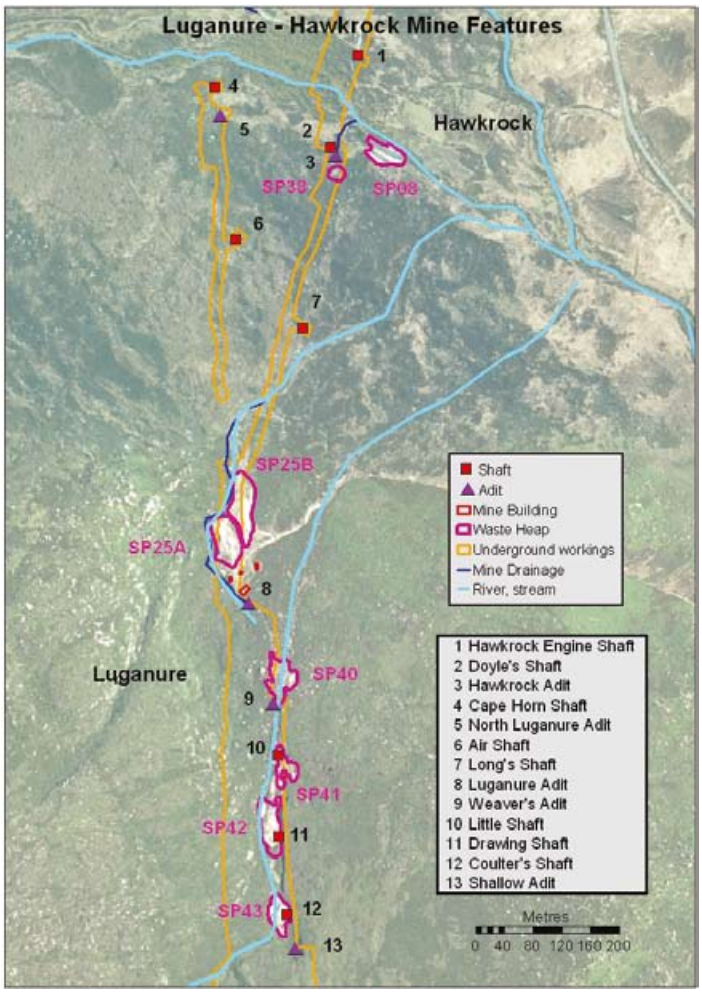
County: Wicklow
Townland: Camaderry
Grid Reference: E309055, N198177 (Luganure)
E309195, N198887 (Hawkrock)

Site Score: 48
Site Class: II (District)

Elements of Interest: Pb, Cu, Zn, Cd
Media of Concern: Solid waste, surface water, stream sediments

Geochemical Overview

High concentrations of Pb, Zn and Cd were measured in the Hawkrock Adit discharge, and stream water downstream of the mine site had relatively high concentrations of Pb (32 µg/l) and Zn (414 µg/l), at least in winter. As is the case for all mine water discharges in the Glendasan area, pH is close to neutral in the Hawkrock Adit discharge. The Luganure–Hawkrock site contains several solid waste heaps scattered along the line of the Luganure lode. The largest are found on the main Luganure mine site, in front of the Luganure Adit. These have the highest HMS-IRC scores of any waste in Luganure–Hawkrock.
Nevertheless, the total score for Luganure–Hawkrock (48) is among the lowest recorded in the district.



5.17.5 Ruplagh

Mine District: Glendalough–Glendasan

Mine Name: Ruplagh
Minerals Worked: Pb

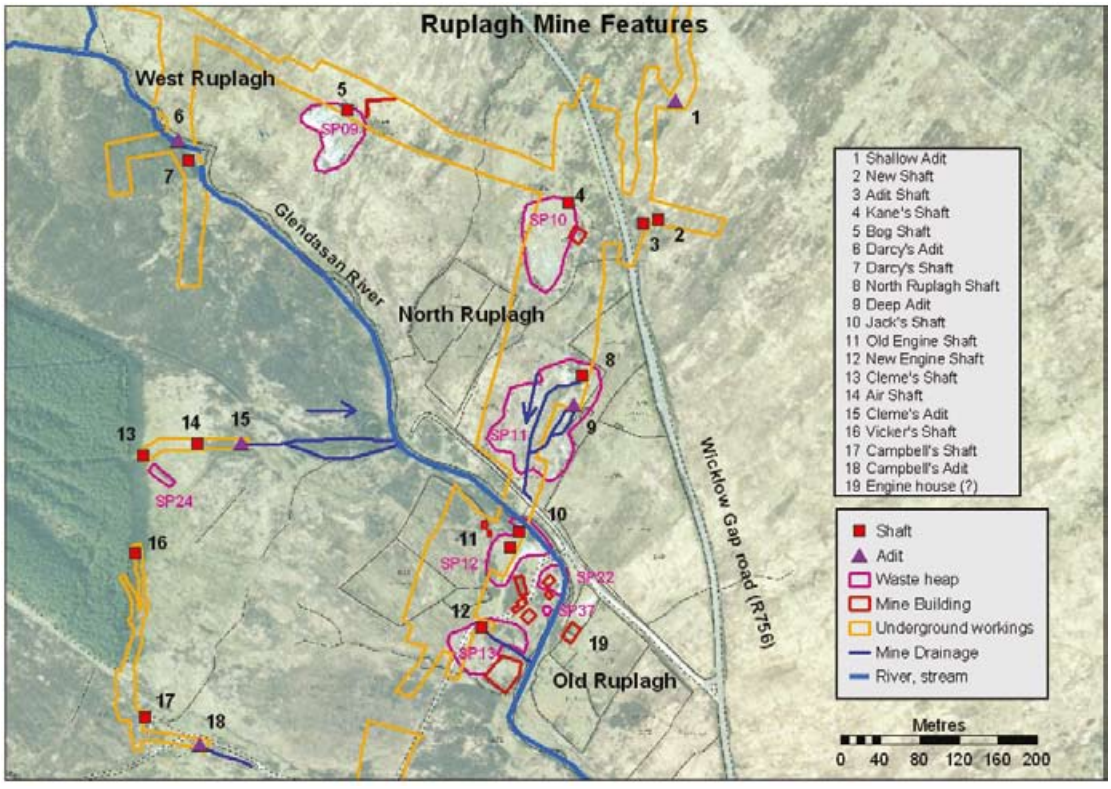
County: Wicklow
Townland: Brockagh
Grid Reference: E309295, N199494

Site Score: 45
Site Class: II (District)

Elements of Interest: Pb, Cu, Zn, Cd
Media of Concern: Solid waste, surface water, stream sediments

Geochemical Overview

Two discharges from flooded shafts at Ruplagh have elevated concentrations of Pb (≤72 µg/l) and Zn (≤994 µg/l). The maximum downstream concentration of Pb was 11 µg/l and of Zn 166 µg/l, lower than those measured in the Glendasan River downstream of the sites in Lower Glendasan (Hero, Foxrock and St. Kevin's), but still above the limits set by EC Surface Water Regulations. A stream sediment sample taken immediately downstream of the site had 6,874 mg/kg Pb and 4,876 mg/kg Zn, indicating significant contamination of stream sediments as a result of mining at Ruplagh. Concentrations of Pb and Zn in solid waste exceed 1% in some samples but median concentrations (3,301 and 5,433 mg/kg, respectively) are similar to those found in quartz- and granite-rich solid waste elsewhere in the district.



5.17.6 St. Kevin's

Mine District: Glendalough–Glendasan

Mine Name: St. Kevin's
Minerals Worked: Pb

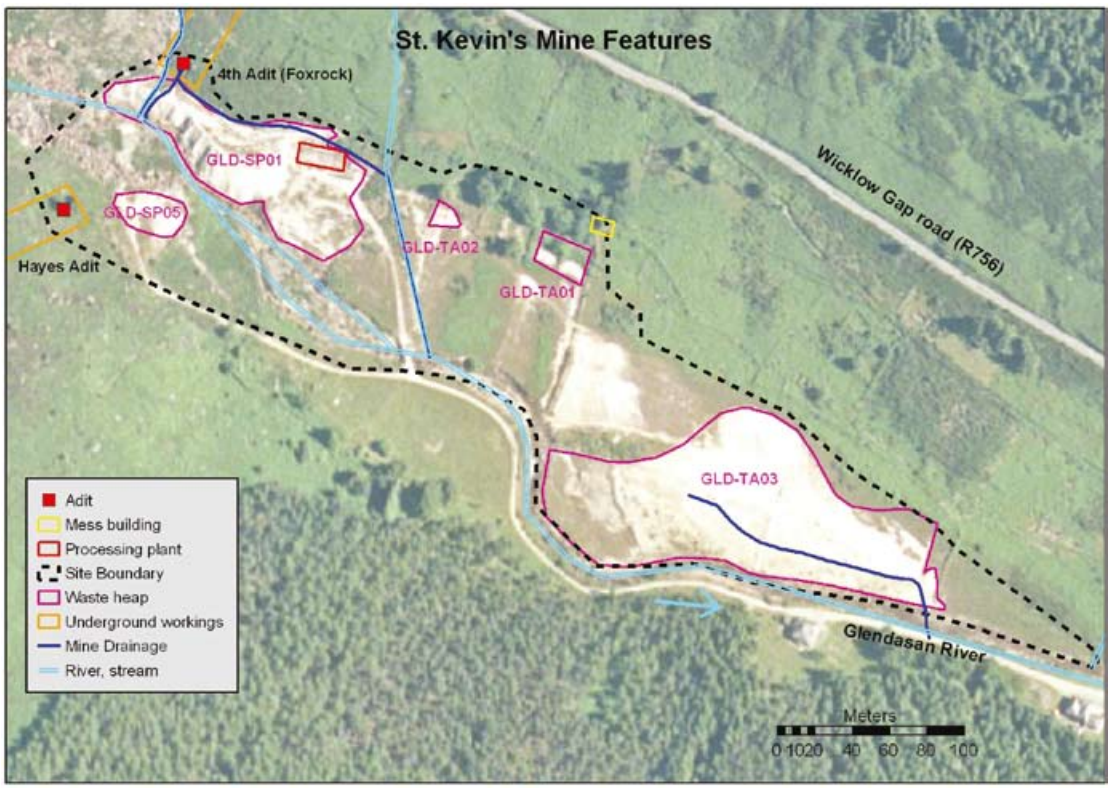
County: Wicklow
Townland: Camaderry; Sevenchurches
Grid Reference: E310646, N197839

Site Score: 129
Site Class: II (District)

Elements of Interest: Pb, Cu, Zn, Cd
Media of Concern: Solid waste, surface water, stream sediments

Geochemical Overview

The St. Kevin's site contains one of the largest spoil heaps in the district as well as its only significant accumulation of tailings. The spoil chemistry is typical of quartz-rich mine waste found in the district, with Pb concentrations typically of the order of 500–4,000 mg/kg with a maximum in excess of 2%. The tailings material generally has higher concentrations of Pb; Cd was recorded at levels of 102–660 mg/kg. The Foxrock 4th Adit discharges constantly into the Glendasan River; metal concentrations are of the order of 200–300 µg/l Pb and 1,500–2,000 µg/l Zn. In wet weather, the tailings is a source of metal-rich run-off to the river. The Glendasan River has consistently elevated Pb and Zn concentrations downstream of the site, although the 4th Adit is unlikely to be the sole source of this contamination given that other adits in Foxrock drain into the river nearby. Stream sediments immediately downstream of the tailings deposit have extremely high concentrations of Pb (7.2%), Zn (5.1%) and Cd (179 mg/kg).



5.18 Gortdrum

Mine District: Gortdrum

Mine Name: Gortdrum
Minerals Worked: Cu, Hg, Ag

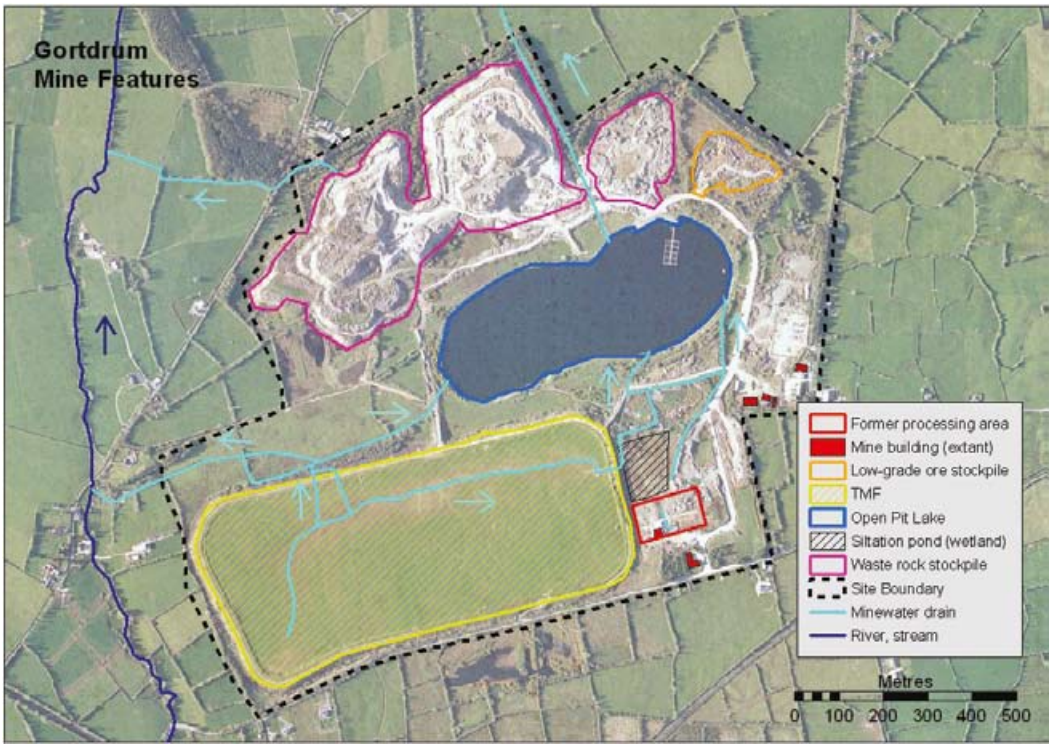
County: Tipperary
Townland: Gortdrum; Ballyryan East; Kyleagarry
Grid Reference: E187111, N141012

Site Score: 157
Site Class: IV

Elements of Interest: Cu, Sb, As, Hg, Ag
Media of Concern: Solid waste, surface water

Geochemical Overview

Gortdrum mine is one of the most extensive abandoned mine sites in the country with very large volumes of solid waste remaining on the site. The ground cover in the old processing area has high concentrations of Cu, As and Hg. The tailings management facility (TMF) has been successfully revegetated and is in general use as a cattle pasture. Cu and As concentrations in the tailings are low and Hg is typically below detection limit. The former Hg plant siltation pond is now a wetland; metal concentrations are low. The stockpile/waste heaps north of the open pit are now part of an aggregate extraction operation but significant levels of metals, including As and Hg, are contained in the aggregate. Very little water appears to flow off the site, instead draining into the flooded open pit lake. Leachate draining from waste heaps on the north-western end of the site has high concentrations of Cu, Sb, As and Hg, as does the open pit lake water. There is potential for some impact on groundwater downgradient of the site but stream sediments appear to be unaffected by mining.



5.19 Hollyford

Mine District: Tipperary

Mine Name: Hollyford
Minerals Worked: Cu

County: Tipperary
Townland: Reafadda; Lackenacree

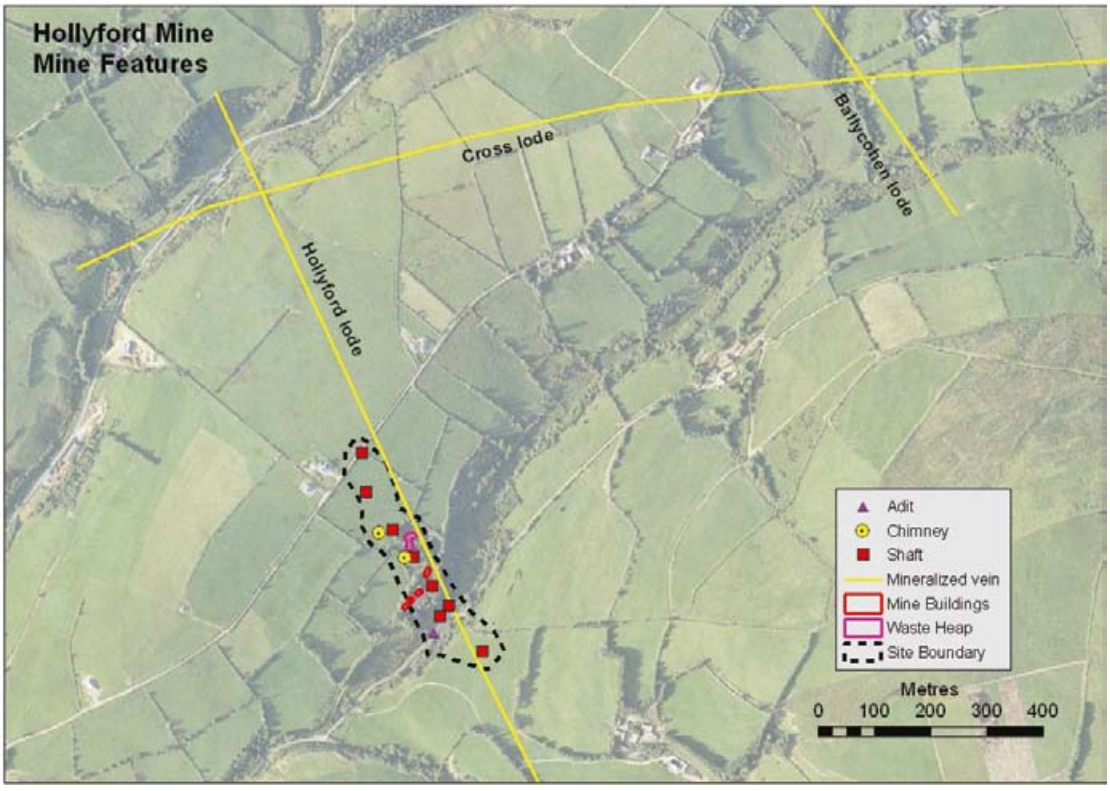
Grid Reference: E193361, N154077

Site Score: 4
Site Class: V

Elements of Interest: Cu
Media of Concern: Solid waste

Geochemical Overview

Hollyford mine was a small operation that produced several thousand tons of Cu ore over a period of 20 years in the mid-19th century. It had a correspondingly limited impact on its surroundings and today only minor amounts of solid waste remain. This waste has, by comparison with solid mine waste elsewhere in the country, relatively low levels of Cu, Pb and As. The low site score reflects the small volume of waste remaining and the low measured concentrations of metals within it. It also reflects the absence of observed mine water discharge and, perhaps, the lack of stream sediment analyses.



5.20 Leinster Coalfield

Mine District: Leinster Coalfield

Mine Name: Various
Minerals Worked: Coal (Anthracite)

County: Carlow, Kilkenny, Laois
Townland: Various

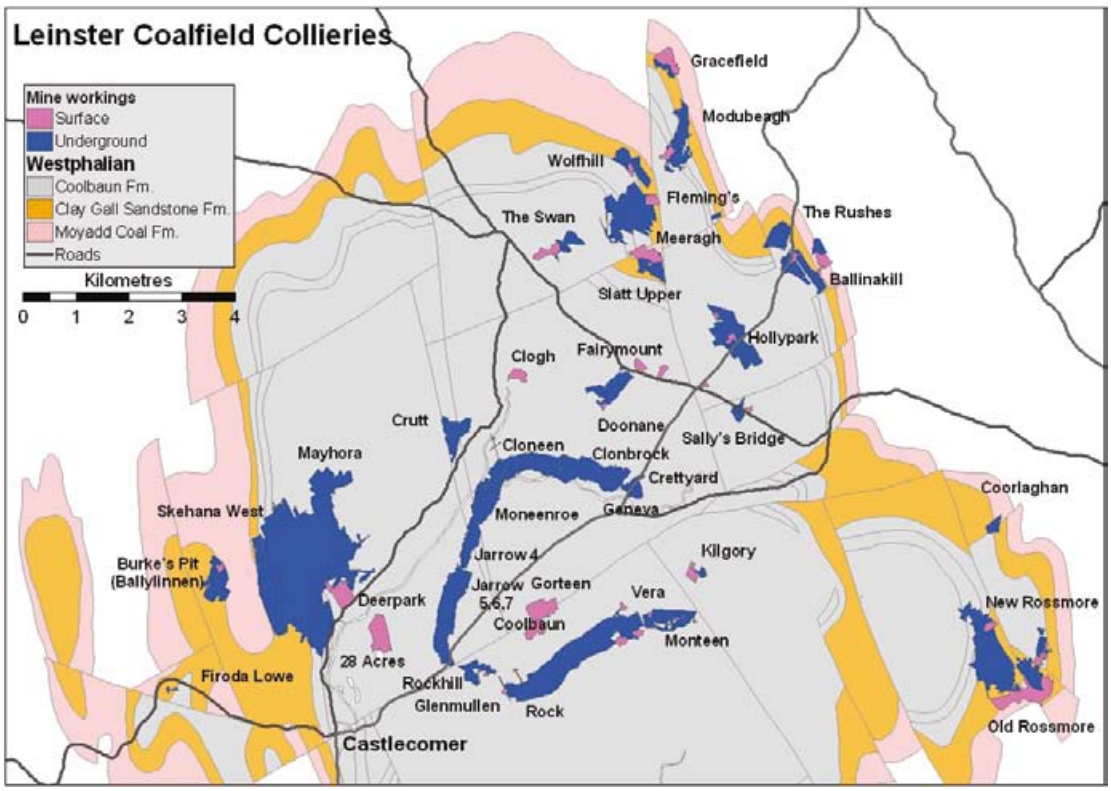
Grid Reference: E257000, N179000

Site Score: 133
Site Class: IV

Elements of Interest: As, Cu, Ni, Pb, Zn, SO_4, acidity
Media of Concern: Solid waste, surface water, stream sediments

Geochemical Overview

Many of the numerous individual collieries in the Leinster Coalfield have been partly or fully rehabilitated since closure but large waste heaps, open pit lakes and active drainage adits remain. Stream water has low concentrations of most parameters measured and shows only very limited and localised chemical impact from mining. Adit discharges in general have similar compositions to stream water. In contrast, surface run-off from solid waste has relatively high concentrations of elements such as Al, Cd, Cu, Ni, Zn and SO_4 as well as low pH and high EC. Some solid waste in the Leinster Coalfield has elevated metal concentrations, with As, Zn, Cu and Pb exceeding regional background levels for soil but the absolute concentrations measured were low. Stream sediments show some impact from mining but measured metal concentrations were below the guideline limits for the protection of livestock.



5.21 Monaghan Lead Mines – Clontibret

Mine District: Monaghan

Mine Name: Clontibret
Minerals Worked: Sb

County: Monaghan
Townland: Lisglassan; Tullybuck

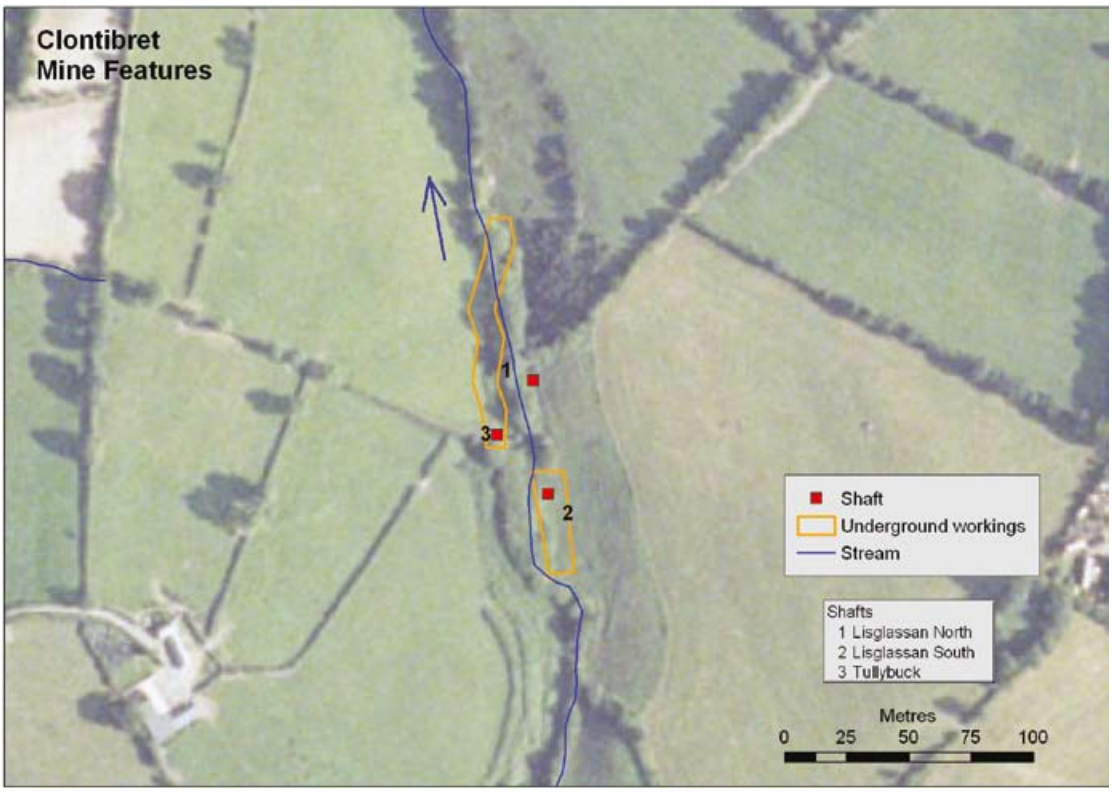
Grid Reference: E275550, N330110

Site Score: 12
Site Class: V

Elements of Interest: Sb, As, Au, Pb, Zn
Media of Concern: Stream sediments

Geochemical Overview

Mining at Clontibret was short-lived and there is now little physical trace of any former activity on the site. There are no discharges of mine water on-site and surface water samples show no evidence of any mine-related impact. Stream sediments have very elevated concentrations of Sb, As and Au that can be attributed to the mineralisation at the site. It can be assumed that mining has contributed directly to the observed stream sediment concentrations although natural erosion of mineralised veins cropping out in the Clontibret stream may have contributed also. The stream sediment contamination accounts for the entire Clontibret site score of 12.



5.22 Monaghan Lead Mines – Hope (Cornalough)

Mine District: Monaghan

Mine Name: Hope (Cornalough)
Minerals Worked: Pb, Ag

County: Monaghan
Townland: Cornalough

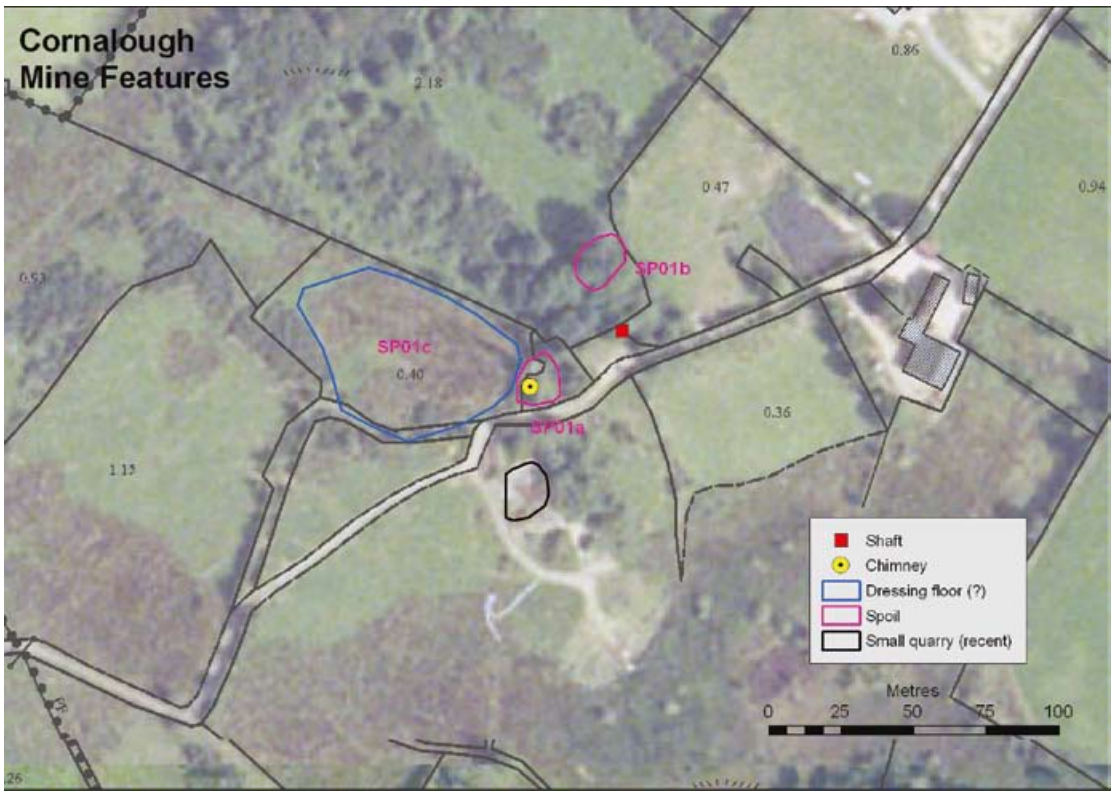
Grid Reference: E283126, N316125

Site Score: 13
Site Class: V

Elements of Interest: Pb, Zn, Ag
Media of Concern: Solid waste

Geochemical Overview

Hope mine was a small mine that produced a limited quantity of Pb ore over the course of a decade. It had a correspondingly limited impact on its surroundings and today only minor amounts of solid waste remain. This waste has, by comparison with solid mine waste elsewhere in the country, relatively low levels of Pb (2,833–3,818 mg/kg) and Zn (77–1,019 mg/kg) and very minor As levels. The low site score reflects the small volume of waste remaining and the low measured concentrations of elements.



5.23 Monaghan Lead Mines – Tassan

Mine District: Monaghan

Mine Name: Tassan
Minerals Worked: Pb, Ag

County: Monaghan
Townland: Tassan

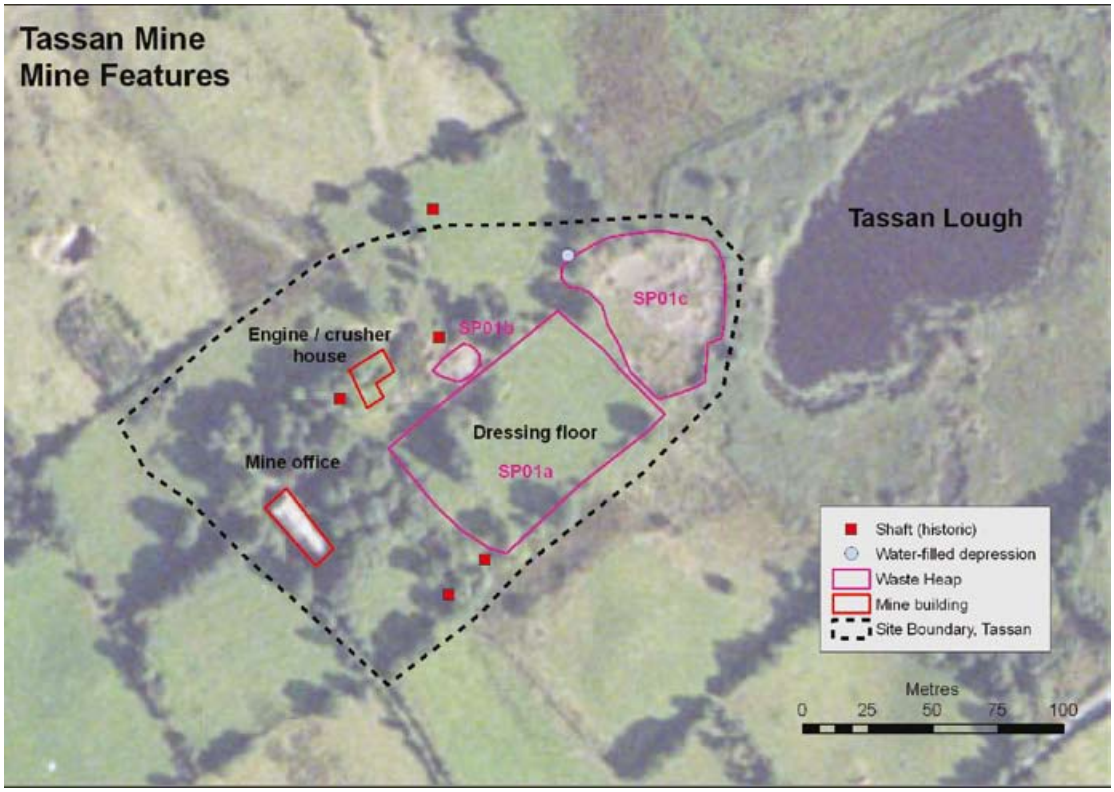
Grid Reference: E279228, N326112

Site Score: 44
Site Class: V

Elements of Interest: Pb, Zn, As
Media of Concern: Solid waste, stream sediments

Geochemical Overview

Tassan mine was the largest and most productive of the Monaghan District mines. Concentrations of Pb and Zn in the sediments of streams draining the site are much higher than regional medians and suggest a direct input from mining. However, sediments elsewhere in the area, in streams not directly draining the mine site, also have Pb and Zn concentrations well above regional median values, though they are considerably lower than those downstream of the mine. Very high (2.5%) concentrations of Pb have been measured in solid waste on the surface of the site as well as in soil on top of the former dressing floor. Concentrations of other elements are generally moderate, except perhaps for As, which has been measured at concentrations exceeding 300 mg/kg. A leachate test on the spoil at Tassan suggests very limited potential for groundwater contamination.



5.24 Silvermines

Mine District: Silvermines

Mine Name: Various
Minerals Worked: Pb, Zn, Cu, Ba, Ag

County: Tipperary
Townland: Various

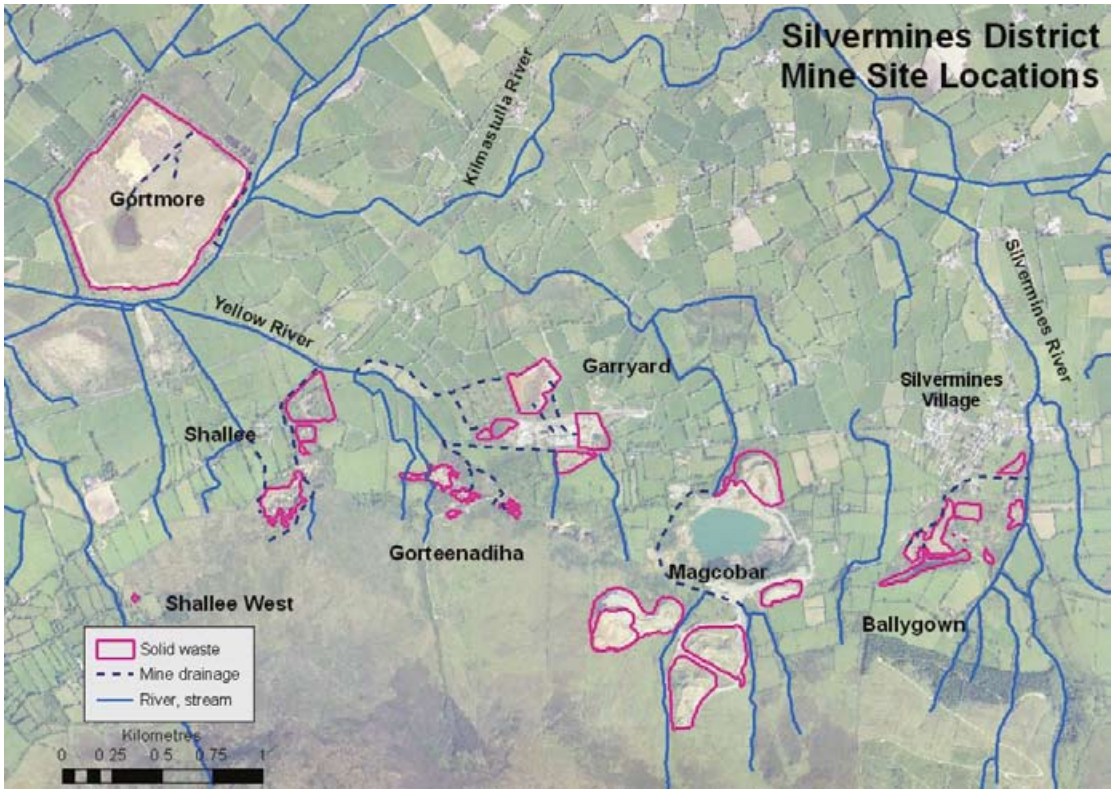
Grid Reference: E182343, N171560

Site Score: 2,545
Site Class: I

Elements of Interest: Pb, Zn, Cu, Ag, Ba
Media of Concern: Solid waste, surface water, stream sediments

Geochemical Overview

The Silvermines District is a very extensive Pb–Zn–Ag–Ba mining area located on the northern flank of Silvermines Mountain. Six individual mine sites (Ballygown, Magcobar, Garryard, Gorteenadiha, Shallee and Gortmore) have been defined, most of them abandoned in the 20th century, although some were also worked in the 19th century or even earlier. The sites are drained by a network of streams flowing north to the valley of the Kilmastulla River.



In general, surface water sampled downstream of mine sites in Silvermines contain elevated concentrations of mine-related metals such as Pb, Zn, and Cd. The median values for Pb, Zn and Cd in surface water downstream of mine sites all exceed the Draft EC Regulations for surface water. The highest concentrations of metals were found in water standing on solid waste, such as at the tailings lagoon in Garryard. The high concentrations of metals in surface water immediately downstream of solid

waste heaps at Garryard, Gorteenadiha and Shallee suggest that surface run-off and seepage have a significant impact on surface water quality in the district. Water samples taken from the Yellow River and its tributaries that drain the mine sites at Garryard, Gorteenadiha and Shallee typically had elevated Pb and Zn concentrations: upstream of its confluence with the Kilmastulla River, the measured concentrations in the Yellow River were 307 µg/l Pb and 1,298 µg/l Zn. Metal concentrations in the Kilmastulla River were generally much lower than those in the Yellow River and were only significantly elevated downstream of the tailings pond at Gortmore and downstream of the confluence with the Yellow River.

Stream sediments taken downstream of mine sites in the district typically have high concentrations of Pb and Zn. The data tend to mirror those for surface water with sediment from the Yellow River showing the highest metal concentrations (3,271–12,332 mg/kg Pb, 743–208,233 mg/kg Zn, 61–468 mg/kg As, 421–733 mg/kg Cu and 0.35–218 mg/kg Cd). The highest concentrations were measured in the sample taken immediately downstream of the Garryard tailings lagoon discharge.

Solid waste in the district is notable for its typically high concentration of Pb and Zn, with percentage levels of both common across most sites. In addition to Pb and Zn, some individual waste heaps have very high concentrations of elements of concern such as As and Cd. In combination with high volumes of material on some sites, these high metal concentrations are largely responsible for the high total HMS-IRC score of 2,545 recorded for the Silvermines District.

5.25 Slieve Ardagh Coalfield

Mine District: Slieve Ardagh

Mine Name: Various
Minerals Worked: Coal (Anthracite)

County: Tipperary
Townland: Various

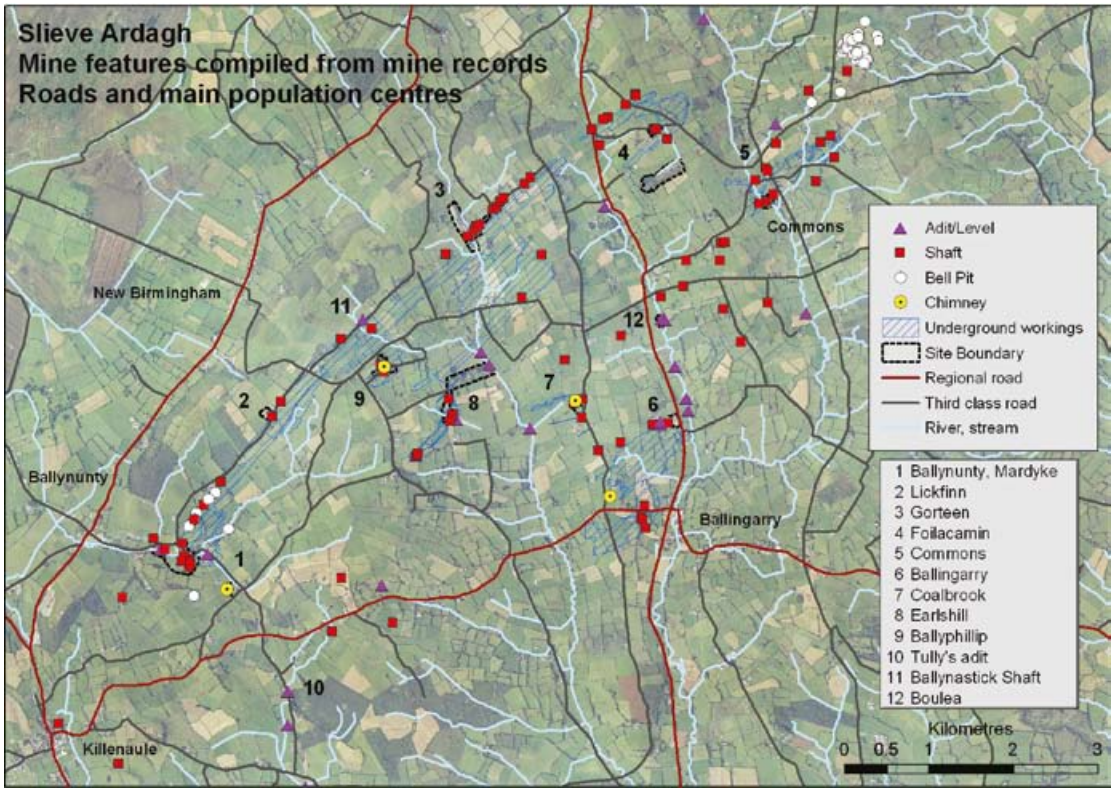
Grid Reference: E228000, N150000

Site Score: 118
Site Class: IV

Elements of Interest: As, Cu, Ni, Pb, Zn, acidity
Media of Concern: Solid waste, surface water, stream sediments

Geochemical Overview

The Slieve Ardagh District is a very extensive area with numerous abandoned mine operations. Large waste heaps, open pit lakes and active drainage adits are the main potential sources of environmental impacts in the district. Stream water generally has low concentrations of most parameters measured. Adit discharges in general have similar compositions to stream water. In contrast, surface run-off from solid waste has relatively high concentrations of elements such as Al, Cu, Ni, Zn and SO_4 as well as low pH and high EC. Surface water samples taken immediately downstream of such run-off, in open pit lakes and streams, can show raised element concentrations and reduced pH. Some coal waste in Slieve Ardagh has measured concentrations of As, Zn, Cu, Ni and Pb exceeding regional background soil levels. Stream sediments gave somewhat similar results.



5.26 Tynagh Mine

Mine District: Tynagh

Mine Name: Tynagh
Minerals Worked: Pb, Zn, Ag, Ba

County: Galway
Townland: Derryfrench; Garraunnameetagh

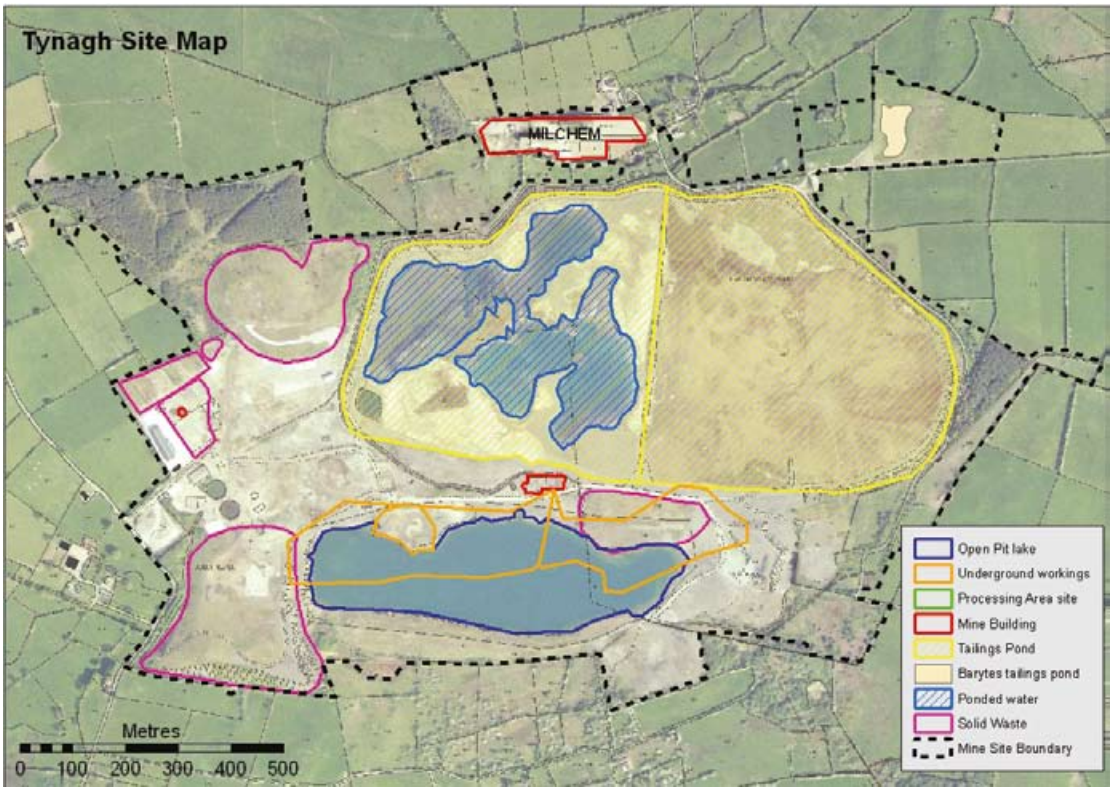
Grid Reference: E174935, N213024

Site Score: 2,712
Site Class: I

Elements of Interest: Pb, Zn, Cu, As, Hg, Ni, Cd, Sb, Ba
Media of Concern: Solid waste, surface water, stream sediments

Geochemical Overview

Tynagh Mine contains large volumes of solid mine waste with high concentrations of Pb and other heavy metals. Part of the site is occupied by two companies and, in the case of one of these, part of the work site is heavily contaminated by Pb, Zn, As, Hg and Cd. Several seepages from spoil and tailings introduce Zn, Cd and Ni to local streams and groundwater although the volume of these discharges is generally low. None of these discharges poses a threat of AMD on or around the site. Leachate testing indicates that the waste at Tynagh has the potential to contaminate groundwater; analysis of water in one well east of the site revealed a high concentration of As. Stream sediments are severely contaminated by Pb and other metals close to the site, mainly in the Barnacullia stream on the northern boundary of the tailings pond. High concentrations of mine-related metals have been detected almost 3 km downstream of the site.



5.26.1 Tynagh – Processing Area

Mine District: Tynagh

Mine Name: Processing area
Minerals Worked: Pb, Zn, Ag, Ba

County: Galway
Townland: Derryfrench

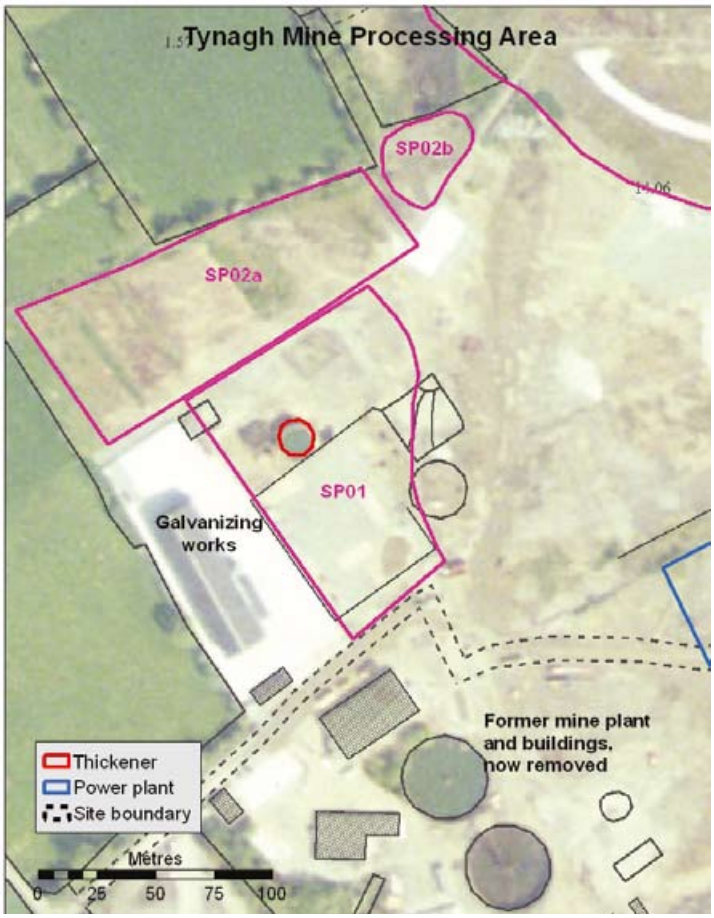
Grid Reference: E174262, N213016

Site Score: 40
Site Class: I (District)

Elements of Interest: Pb, As, Hg, Cd, Cu, Sb, Zn, Ba
Media of Concern: Solid waste

Geochemical Overview

Very high concentrations of Pb (>10%), Zn, Cu, As (>3%), Hg (287 mg/kg), Cd (573 mg/kg) and Sb have been measured in process waste on the site of the former processing plant at Tynagh. The thin cover of sand–clay-grade material on the surface of the ground around the remaining structures is also metal rich. Some of the process waste is relatively inert, e.g. the Pb-rich coatings on concrete walls, but most is in the form of loose sand–silt-grade material that is either lying on the ground around the thickener or packed in open barrels. This is an active work site: fabricated iron structures are stored here prior to and after galvanising. The hardcore layer has not made any obvious difference to the chemistry of the surface material, at least around the thickener. The very high concentrations of Pb, As, Cd and Hg represent a potential health risk to workers in this area, although access is restricted to the area around the thickeners where the highest metal concentrations were measured. The settlement ponds, outside the area used by the galvanising company, also have high Pb, Zn, Cu, As, Hg, Cd and Sb, albeit in lower concentrations than found around the thickener. There is some risk of dust blow from this material during dry weather.



5.26.2 Tynagh – Tailings Pond

Mine District: Tynagh

Mine Name: Tailings Pond
Minerals Worked: Pb, Zn, Ag, Ba

County: Galway
Townland: Derryfrench; Garraunnameetagh

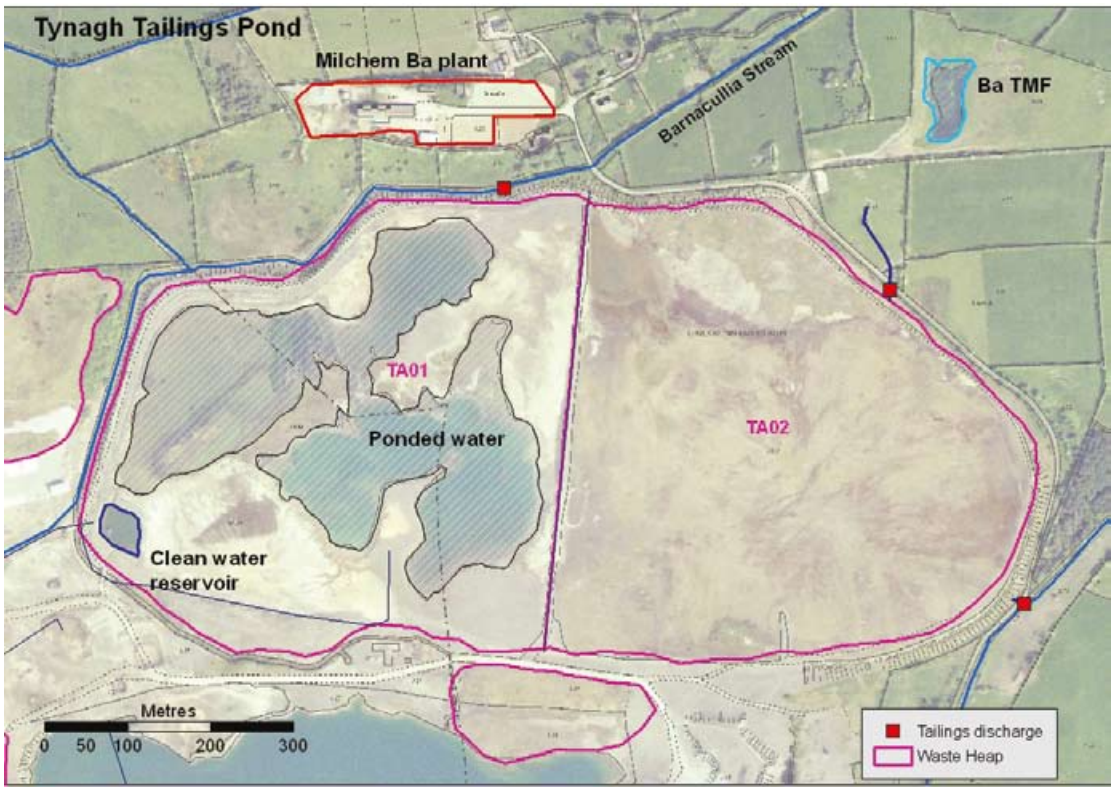
Grid Reference: E175142, N213129

Site Score: 1,246
Site Class: I (District)

Elements of Interest: Zn, Pb, Cu, As, Ni, Cd, Ba
Media of Concern: Solid waste, surface water, stream sediments

Geochemical Overview

The TMF at Tynagh has an estimated volume of more than 2.2 million m^3. Three discharges from the TMF enter local streams and, in one case, the groundwater system via a sinkhole. The discharges have high concentrations of Zn, Ni and SO_4 and elevated Cd and As levels. As expected for a limestone-hosted ore deposit, the pH of the discharges is high and there is no risk of AMD at Tynagh. Leachate analyses of tailings samples confirm the potential for groundwater contamination below the unlined tailings pond. The tailings in the western cell have very high concentrations of Pb (≤5.3%), Zn, Cu, As, Ni, Cd, Sb and Ba. Those in the revegetated eastern cell have much lower measured metal concentrations. The high site score reflects these high metal concentrations and the very large volume of the TMF.



5.26.3 Tynagh – Open Pit Area

Mine District: Tynagh

Mine Name: Open Pit area
Minerals Worked: Pb, Zn, Ag, Ba

County: Galway
Townland: Derryfrench; Garraunnameetagh

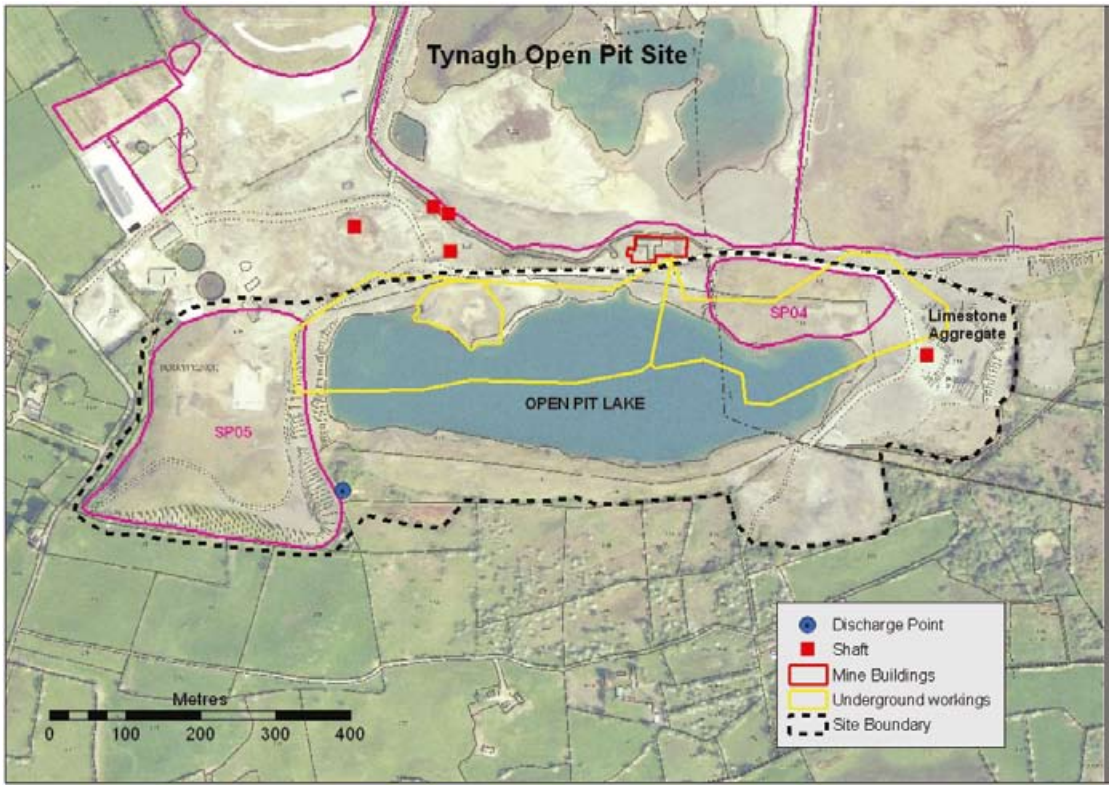
Grid Reference: E174807, N212730

Site Score: 1,292
Site Class: I (District)

Elements of Interest: Pb, As, Cd, Cu, Zn, Sb
Media of Concern: Solid waste, surface water

Geochemical Overview

The high concentrations of Cd, Ni and Zn in the seepage at the south-eastern end of SP05, first noted by the EPA, were confirmed in this study. This seepage drains into a nearby field where it seeps into the ground. The solid waste heap from which the seepage discharges (SP05) has significant Cd content (≤366 mg/kg), as well as consistently high measured concentrations of Pb (≤3.8%, median 1.4%) and Zn (≤8.5%, median 2.5%). The other waste heap on the site, SP04, on the northern side of the open pit, is a low-grade deposit, with concentrations recorded *in situ* by XRF much lower than elsewhere on the site. Nevertheless, a lab analysis of one sample yielded a Pb concentration in excess of 1%. The water in the open pit lake was not analysed – it is used by the power plant for cooling purposes.



5.26.4 Tynagh – SP06

Mine District: Tynagh

Mine Name: SP06
Minerals Worked: Pb, Zn, Ag, Ba

County: Galway
Townland: Derryfrench

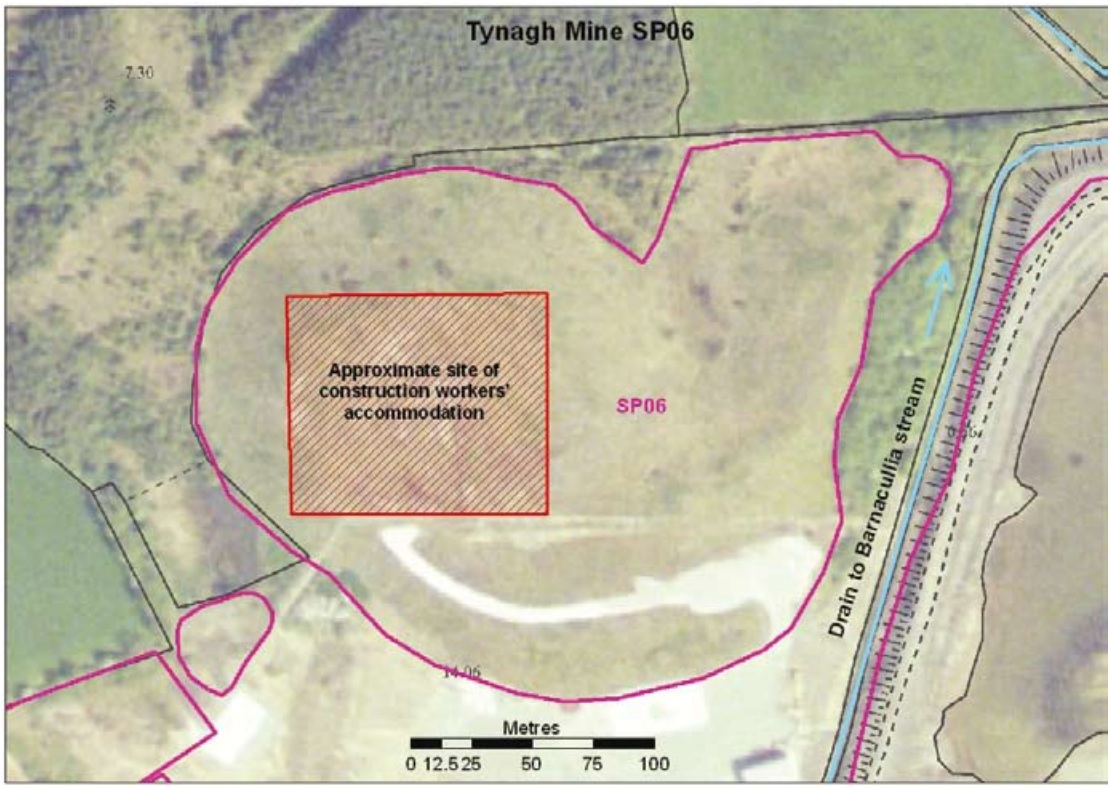
Grid Reference: E174442, N213227

Site Score: 97
Site Class: I (District)

Elements of Interest: Pb, As, Ni, Cd, Cu, Cr, Zn
Media of Concern: Solid waste

Geochemical Overview

SP06 is a waste heap that evidently contains some low-grade ore, with concentrations of almost 6% Zn and 2% Pb measured at one location. Overall, however, concentrations of elements of interest are typically lower in the samples analysed than in other sub-sites at Tynagh mine. The heap may contribute or may have contributed in the past to metal contents of surface water or stream sediments in the Barnacullia stream.



5.27 West Cork Copper–Barium Mines
5.27.1 West Cork Cu-Ba Mines – Ballycummisk

Mine District: West Cork Cu-Ba

Mine Name: Ballycummisk
Minerals Worked: Cu

County: Cork
Townland: Ballycummisk

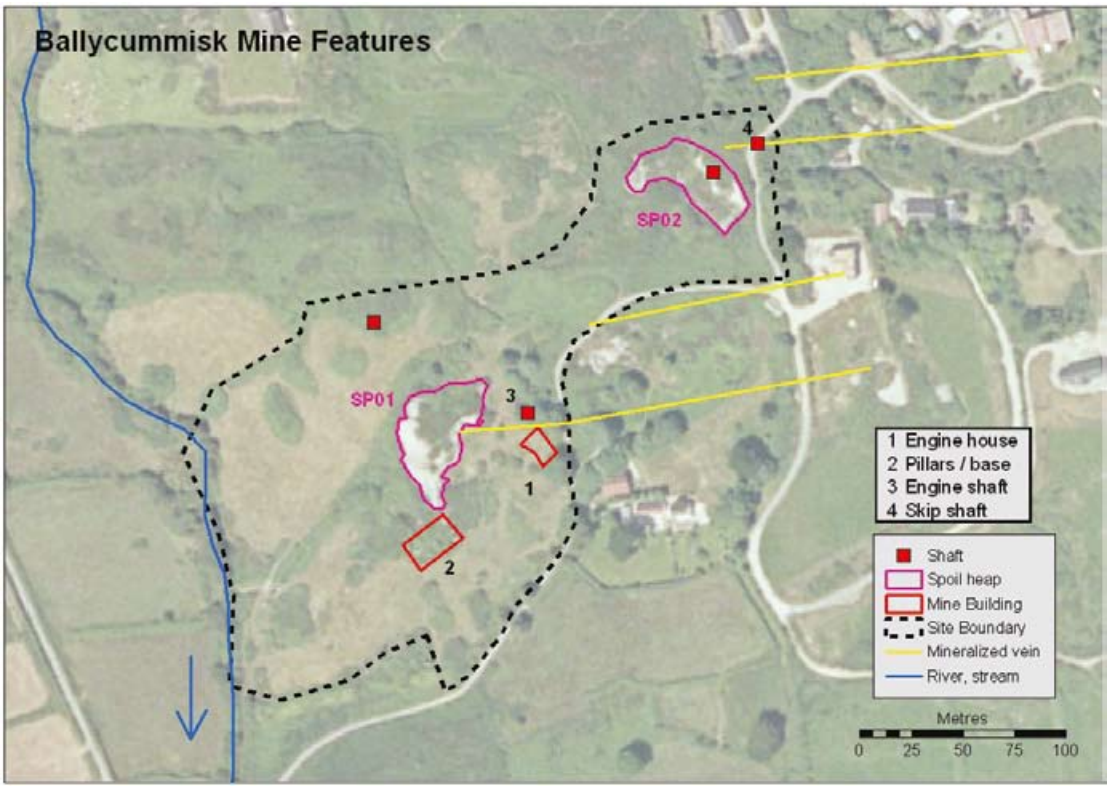
Grid Reference: E97657, N32197

Site Score: 4
Site Class: V (District)

Elements of Interest: Cu, Ba, Pb, Zn, As, Sb
Media of Concern: Solid waste, stream sediments

Geochemical Overview

Solid waste at Ballycummisk has relatively high concentrations of Cu (≤1.06%) and Ba (≤4,608 mg/kg) and above-background concentrations of As, Sb, Pb and Zn. A leachate sample derived from the waste reflected this composition, containing modest if nonetheless elevated concentrations of Ba, Cu and Sb. The most significant impact of the mine site on the environment was observed in stream sediments in which high concentrations of Cu and Ba were recorded downstream of the mine. The HMS-IRC score is 4, placing Ballycummisk at the lower end of the Class V sites.



5.27.2 West Cork Cu-Ba Mines – Brow Head

Mine District: West Cork Cu-Ba

Mine Name: Brow Head
Minerals Worked: Cu

County: Cork
Townland: Mallavoge

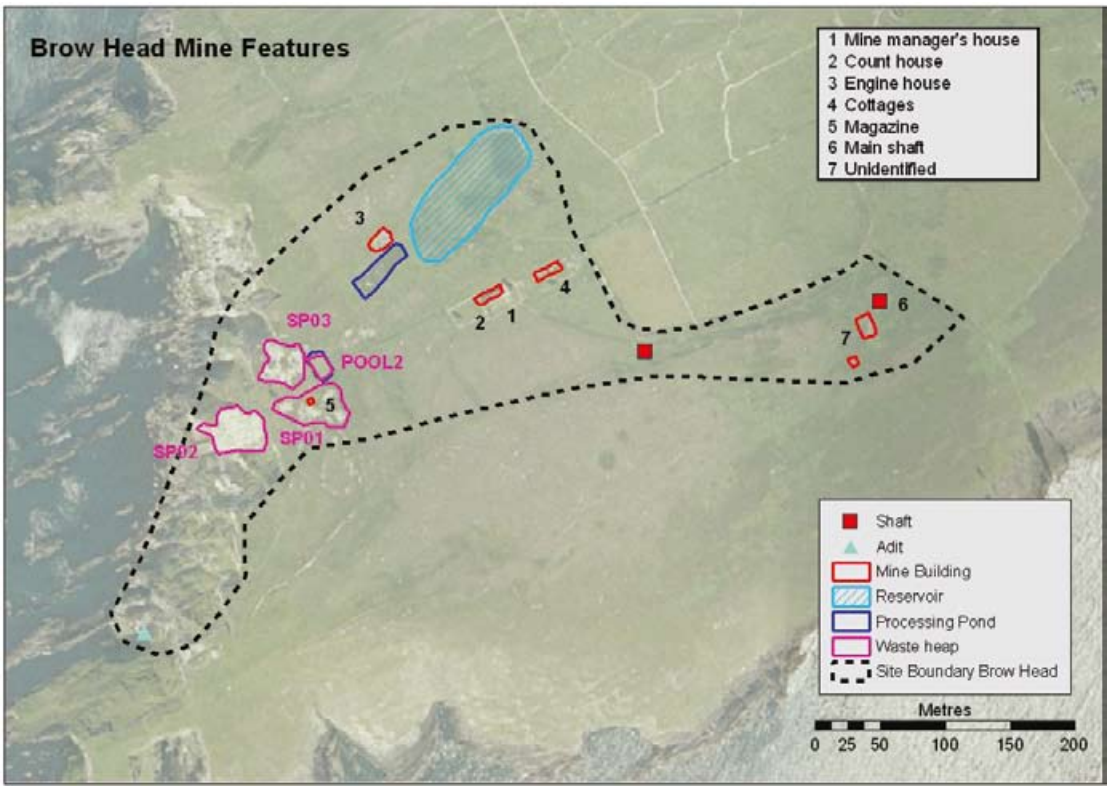
Grid Reference: E77247, N23592

Site Score: 1
Site Class: V (District)

Elements of Interest: Cu
Media of Concern: Solid waste

Geochemical Overview

Brow Head mine was exploited for a short period in the mid-19th century and again in the early 20th century. Although the underground workings are reputedly extensive, production was low and this is reflected in the modest amounts of solid waste remaining on the site. Only Cu is found in significant concentrations in the solid waste (≤2,580 mg/kg). The absence of high relative toxicity elements in the waste and the remoteness of the site, in a location where little impact on human health can be expected, give rise to a very low HMS-IRC score.



5.27.3 West Cork Cu-Ba Mines – Coosheen

Mine District: West Cork Cu-Ba

Mine Name: Coosheen
Minerals Worked: Cu

County: Cork
Townland: Coosheen

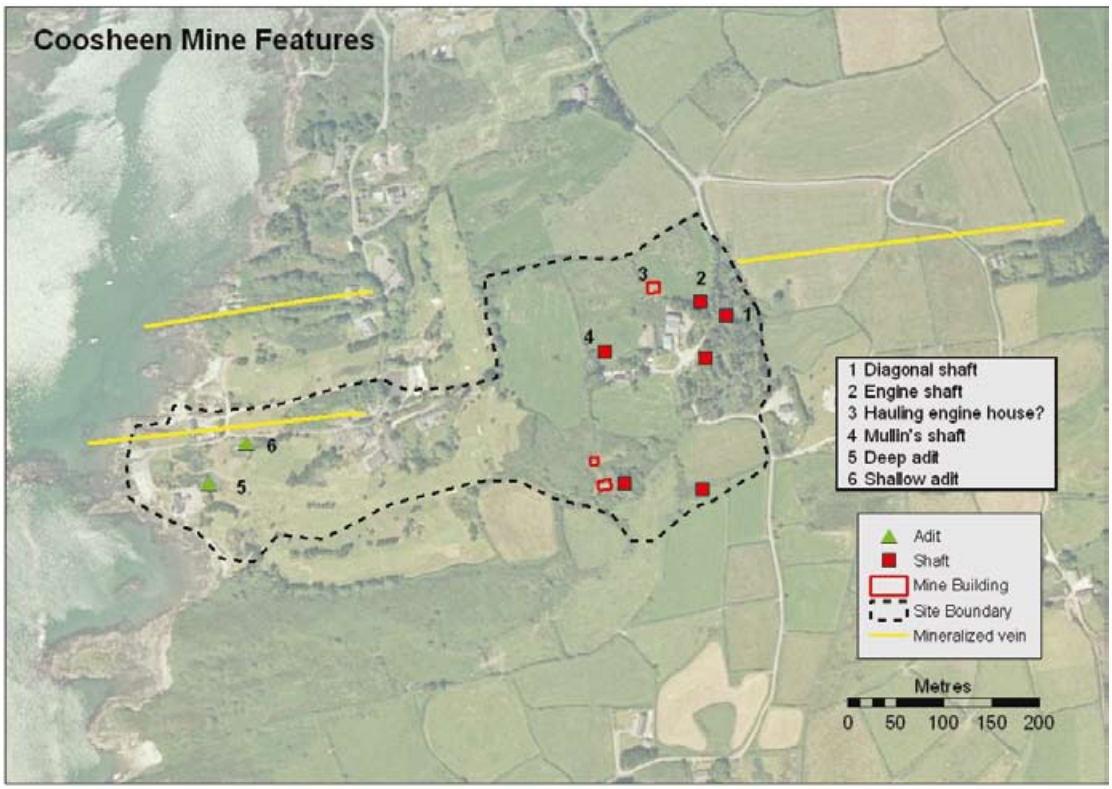
Grid Reference: E94118, N31226

Site Score: 1
Site Class: V (District)

Elements of Interest: Cu
Media of Concern: Surface water

Geochemical Overview

Much of the site of Coosheen mine is now a landscaped area surrounding residences and holiday homes on the shore of Schull Harbour. There is little mine waste on the site except for mineralised beach pebbles on the shore, at the site of what was the lower dressing floor. Only the shallow adit discharge was sampled and it has only modestly elevated concentrations of Cu (323 µg/l) and Al (459 µg/l).



5.27.4 West Cork Cu-Ba Mines – Crookhaven

Mine District: West Cork Cu-Ba

Mine Name: Crookhaven
Minerals Worked: Cu

County: Cork
Townland: Crookhaven

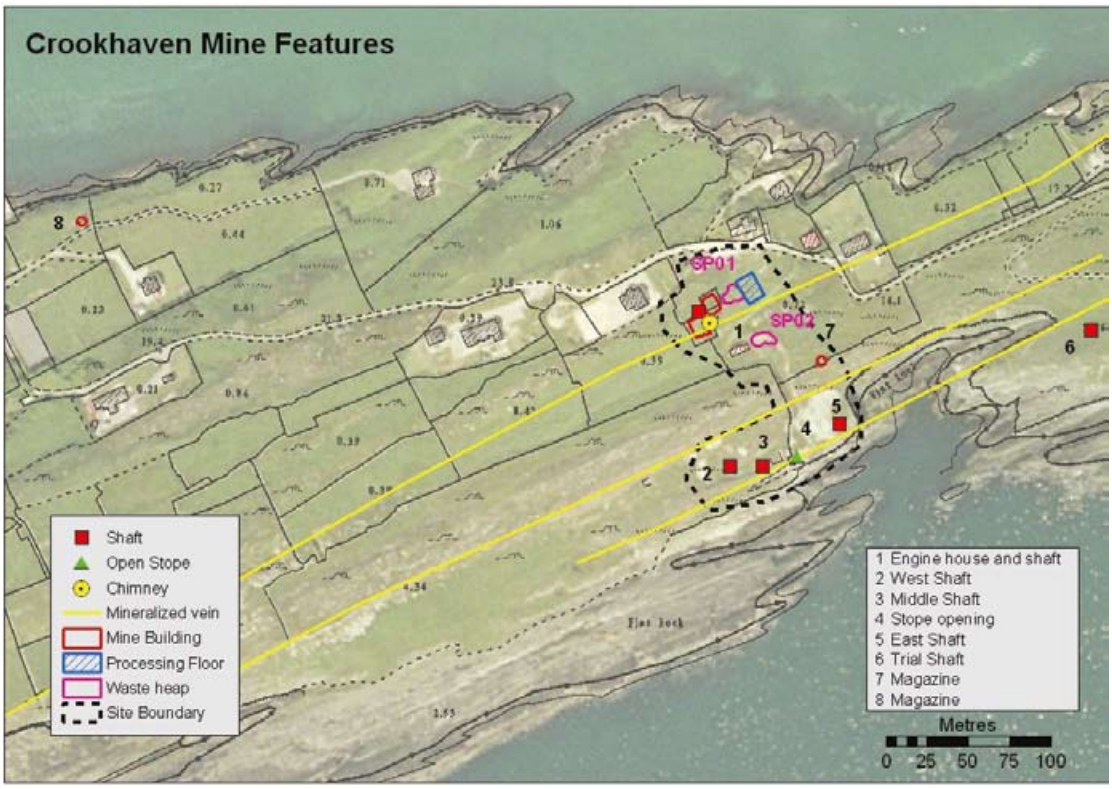
Grid Reference: E81094, N25454

Site Score: 1
Site Class: V (District)

Elements of Interest: Cu
Media of Concern: Solid waste

Geochemical Overview

The Crookhaven mine produced very little ore over almost a decade of endeavour when most of the extensive underground workings were excavated in search of mineralisation rather than in extracting it. Some small volumes of solid waste lie about the site and concentrations of Cu as high as 1.4% have been measured. However, their generally low metal content, and in particular the absence of high relative toxicity elements, combined with a paucity of potential receptors give rise to a very low HMS-IRC score for this site.



5.27.5 West Cork Cu-Ba Mines – Glandore

Mine District: West Cork Cu-Ba

Mine Name: Glandore
Minerals Worked: Cu

County: Cork
Townland: Aghatubrid Beg

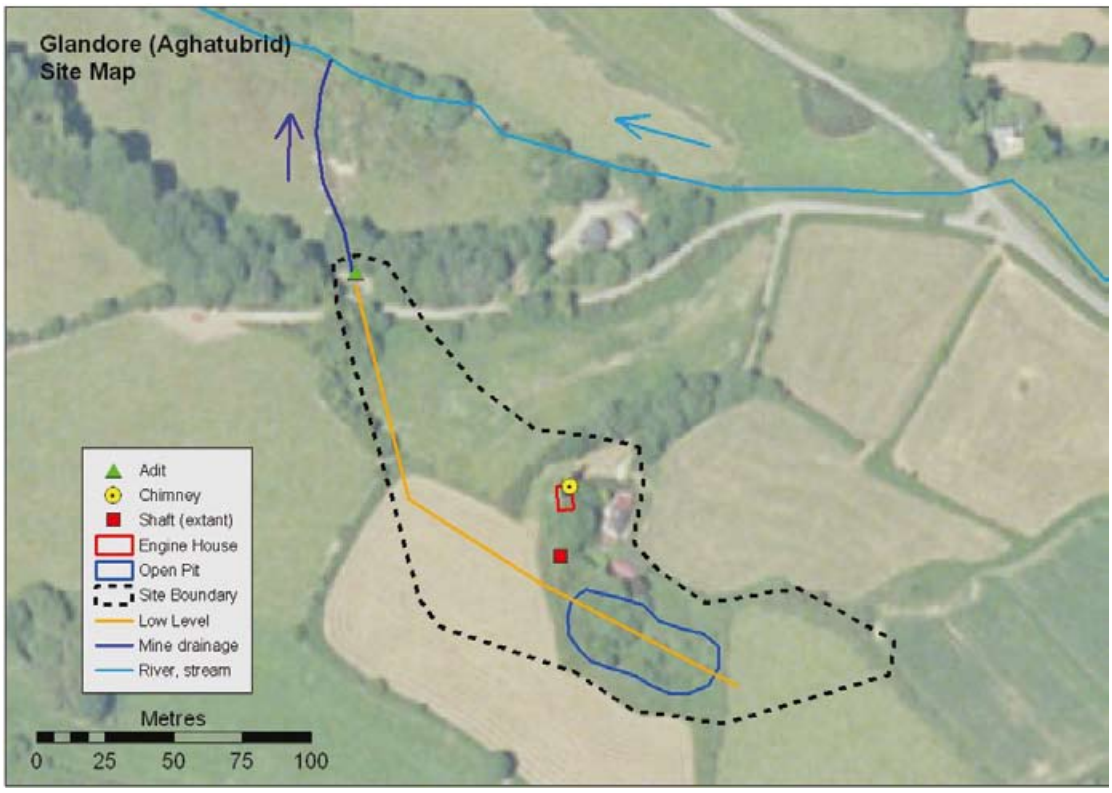
Grid Reference: E122216, N36243

Site Score: 6
Site Class: V (District)

Elements of Interest: Mn, Cu
Media of Concern: Surface water, stream sediments

Geochemical Overview

Glandore was a significant producer of Mn in the 19th century and also produced a limited amount of Cu. The workings were mainly carried on by opencast mining but exploratory underground workings were undertaken and the mine is now drained by a deep ('Low') level. The opencast is densely overgrown and no solid waste was identified on the site. The adit discharges around 1 l/s of mine water with elevated Cu concentration (215 µg/l). Stream sediments in the adjacent river have high concentrations of both Mn and Cu, in excess of guideline limits for the protection of livestock, which are most likely a consequence of mining.



5.27.6 West Cork Cu-Ba Mines – Lady's Well

Mine District: West Cork Cu-Ba

Mine Name: Lady's Well
Minerals Worked: Ba

County: Cork
Townland: Dunmore

Grid Reference: E139626, N37092

Site Score: 1
Site Class: V (District)

Elements of Interest: Ba
Media of Concern: Solid waste

Geochemical Overview

Lady's Well barite mine contains a significant concentration of Ba-rich waste but concentrations of elements of concern within it are low. A previous history of subsidence and evidence of collapse of waste represent more immediate issues of concern than the geochemistry of the waste.

5.27.7 West Cork Cu-Ba Mines – Letter

Mine District: West Cork Cu-Ba

Mine Name: Letter
Minerals Worked: Ba, Cu

County: Cork
Townland: Letter

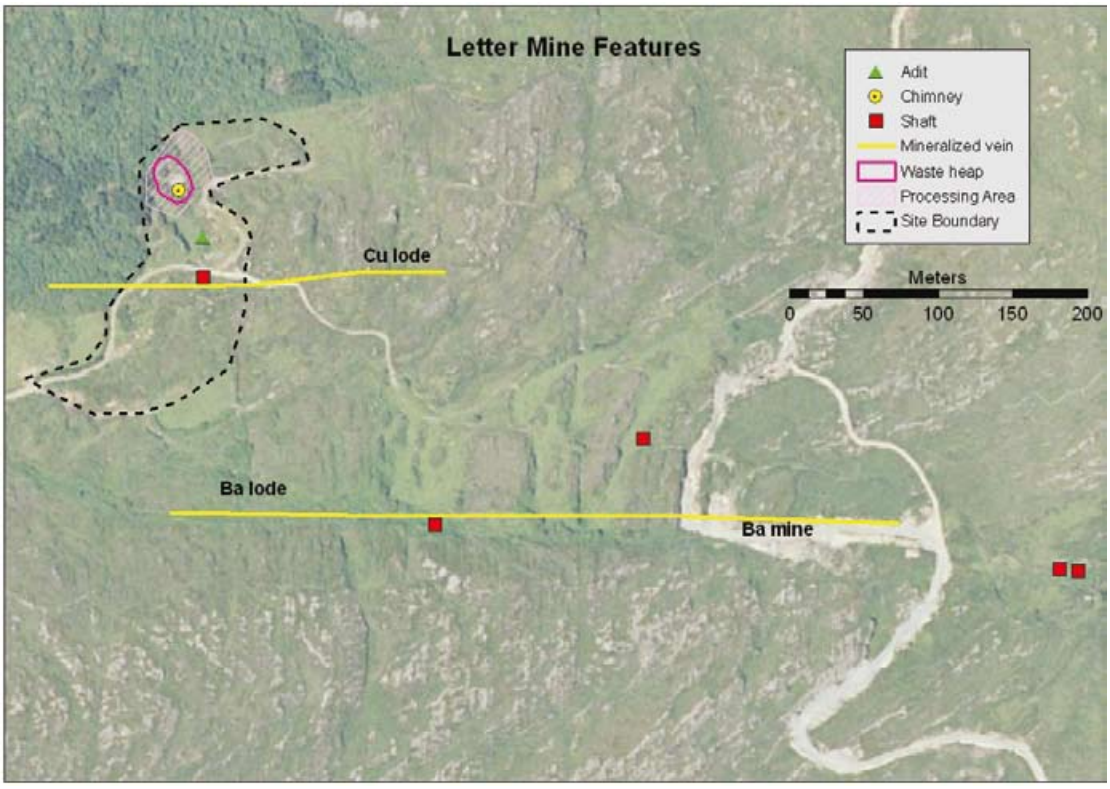
Grid Reference: E94723, N35338

Site Score: 1
Site Class: V (District)

Elements of Interest: Ba, Cu
Media of Concern: Solid waste

Geochemical Overview

Letter mine was a very minor producer of copper and barite in the 19th century. A small volume of solid waste around the processing floor of the copper mine had modest measured concentrations of Cu (6,821 mg/kg) and Ba (7,147 mg/kg). A leachate test on the waste yielded concentrations of dissolved Cu (183 µg/l) and Ba (168 µg/l) that were elevated but below limits set by the drinking water standards. The HMS-IRC score for Letter (1) is very low, reflecting the absence of major volumes of waste on-site as well as the low concentrations of high relative toxicity elements.



5.27.8 West Cork Cu-Ba Mines – Mizen Head

Mine District: West Cork Cu-Ba

Mine Name: Mizen Head
Minerals Worked: Cu

County: Cork
Townland: Cloghane

Grid Reference: E74636, N23620

Site Score: 2
Site Class: V (District)

Elements of Interest: Ba, Cu
Media of Concern: Solid waste

Geochemical Overview

The very small amount of solid waste exposed at Mizen Head has low concentrations of most elements except for Cu (≤1,979 mg/kg). None appear to represent any significant risk to human or animal health. The proximity of the site to a stream indicates the possibility of some contamination of the aquatic ecosystem. However, the site is close to the cliff edge where the stream terminates so the scope for contamination is limited.