

# RUPLAGH

## Background information

**Mine Name:** Ruplagh  
**Mine District:** Glendalough  
**Alternative Names:**

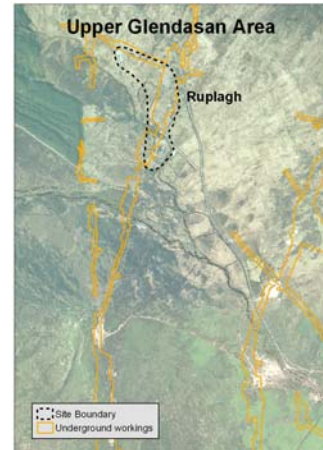
**Elements of interest:**  
Pb, Zn, Cu, Cd

**Project Prefix:** GLD-

**County:**  
Wicklow

**Townland:**  
Brockagh

**Grid Reference:**  
E309295, N199494



## Site Description and Environmental Setting

Ruplagh is at the western end of the Glendasan Valley and includes some of the most remote mine sites in the Glendalough district. The site as defined for the HMS-IRC project spreads over an area in excess of 8 ha in an area of moorland largely used for sheep pasture and hill walking. It incorporates the old mine sites of Old Ruplagh (photo, right), North Ruplagh and West Ruplagh (Fig.1). Smaller satellite sites include those around Cleme's Adit and Shaft and Campbell's Adit and Shaft (Fig.1).



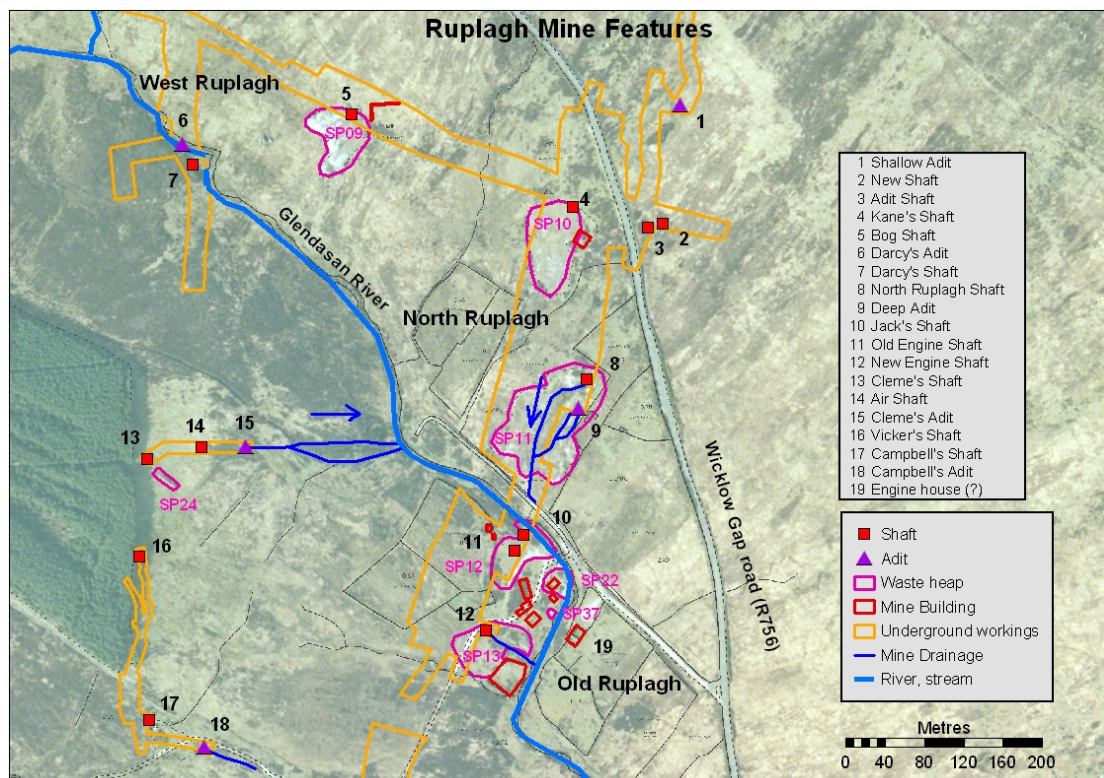
The sites were developed along the Ruplagh Lode and the West Ruplagh Lode that runs northwest from it. The Ruplagh Lode is a splay or offshoot of the Luganure Lode which runs southwards into Glendalough Valley on the opposite side of Camaderry Mountain. The workings below Darcy's Shaft, Cleme's Shaft and Campbell's Shaft were on the northern end of the Luganure Lode.

The Luganure lode was the first to be exploited in Glendasan, possibly as early as 1800, and large-scale mining in the district initially centred on this lode. The Mining Company of Ireland opened the original "Old" Ruplagh mine in 1835 but by 1844 it was almost wholly unproductive. In 1845 the North Ruplagh mine was opened as an extension of Old Ruplagh. Mining appears to have continued at Ruplagh through the following three decades until a general decline that would eventually lead to a cessation of mining in the district by 1890. The underground workings at Ruplagh are extensive. Those on the Ruplagh Lode (Old Ruplagh and North Ruplagh) reach a depth of approximately 190m, while those on the West Ruplagh Lode extend to around 110m.

The Ruplagh site is most remarkable for an abundance of extant shafts and adits. The adits are collapsed but can generally be traced from the channel made by seasonal discharges of mine water – the channels are marked by the growth of rushes. All of the shafts are collapsed and/or filled in or else they are flooded and of uncertain status (photo, right). At least two of the flooded shafts discharge mine water. All mine water discharged by shafts or adits ultimately flows into the Glendasan River.



A number of ruined mine buildings still stand on the Old Ruplagh site. The original function of most of them is unknown. The most impressive of them appears to be an engine-house ruin (Fig.1), now consisting of exterior and interior stone walls and a well preserved wheel pit (photo, right). The highest wall is 2.5 m high. This building is now part of a farm enclosure and is used as a sheep shelter.



**Fig.1 Ruplagh Mine Features**

Each of the main sites in the Ruplagh area is partly covered by solid waste, including cobbles, crusher waste and fine "tailings" washed out from the coarser material to form thin deposits on lower ground. The waste is typically white or grey quartz- or granite-rich material, similar in appearance to waste elsewhere in the district. Few of the waste heaps are particularly thick and overall volumes of waste on the site are

not as great as elsewhere in the district. In part this reflects the fact that most of the material produced at Ruplagh was processed at the Old Hero Processing site further down the valley. The area and volume of waste heaps are given in Table1.

**Table1 Area and volume of spoil heaps at St, Kevin's site**

Waste ID	Area (m <sup>2</sup> )	Volume (m <sup>3</sup> )
GLD-SP09	2901	2616
GLD-SP10	3911	13699
GLD-SP11	8432	7112
GLD-SP12	2082	3123
GLD-SP13	2854	2854
GLD-SP22	652	349
GLD-SP24	246	867
GLD-SP37	50	30

## Geochemical assessment

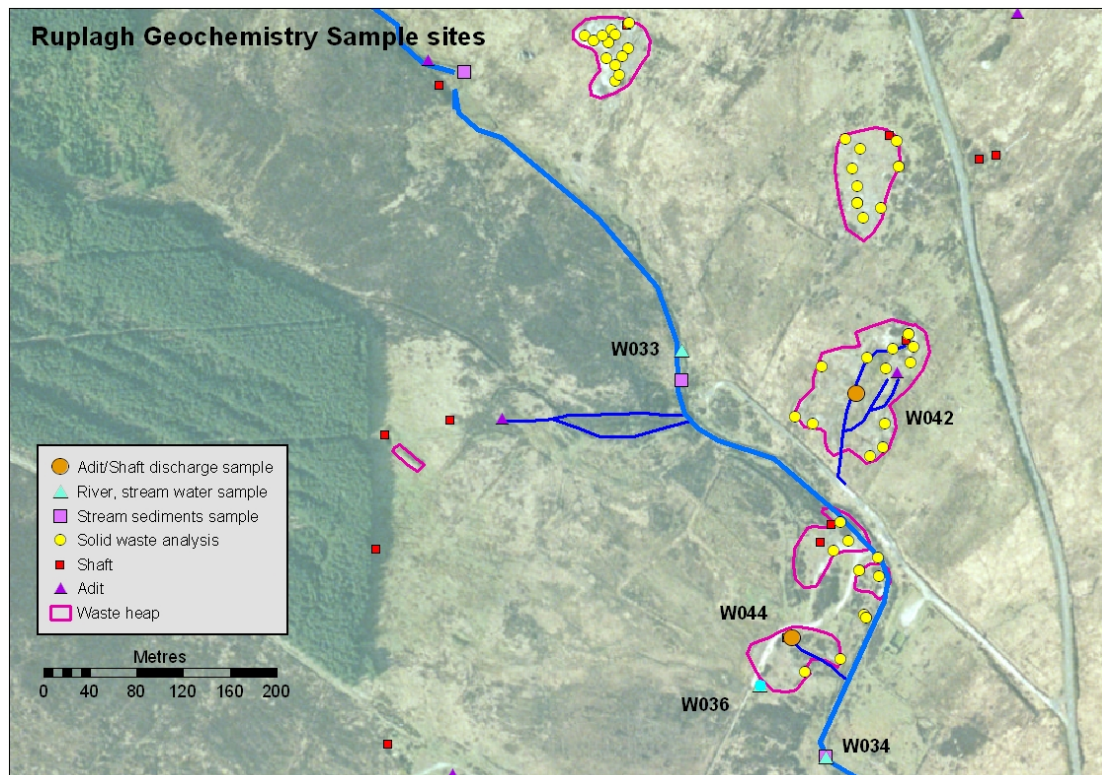
### 1. Surface water

A limited number of water samples were taken at Ruplagh in winter and summer. Water flows in July 2007 were high as a consequence of persistent rain and this is reflected in relatively similar results for water samples collected in either season (see also Glendalough District report). Table2 shows the concentrations of some metals for both periods in discharges from the New Engine Shaft in Old Ruplagh (sample W044) and the North Ruplagh Shaft (W042). There is little significant seasonal variation. The New Engine Shaft discharge is significantly more enriched in Pb and Zn than the North Ruplagh Shaft discharge. As is the case for all mine water discharges in the Glendasan area, pH is close to neutral in both discharges.

**Table2 Chemistry of shaft discharges, Ruplagh**

µg/l Sample	Winter (total metal)					Summer (total metal)				
	Pb	Zn	Cu	Cr	Ni	Pb	Zn	Cu	Cr	Ni
<b>W042</b>	6	270	18	7	4	5	293	15	5	3
<b>W044</b>	41	994	21	9	4	72	841	17	6	3

Water samples taken from the Glendasan River are discussed in the Glendalough District report. In general, metal concentrations in the river in Upper Glendasan are considerably lower than those measured downstream of the sites in Lower Glendasan (Hero, Foxrock and St. Kevin's). At Ruplagh, the maximum downstream (W034) concentration of Pb was 11 µg/l and of Zn 166 µg/l, compared to 133 µg/l and 371 µg/l, respectively, in Lower Glendasan. This may reflect the considerable difference in volumes of mine water discharged to the river: the flow from the North Ruplagh Shaft is significant, of the order perhaps of 1 – 2 l/s, but that from the New Engine Shaft is much less, whereas the combined flow from the various adits in Lower Glendasan exceeds 10 l/s.



**Fig.2 Geochemical sample sites, Ruplagh**

## 2. Groundwater

No groundwater sources were sampled for the HMS-IRC project. A leachate test on a combined solid waste sample from SP10 (GLD-LCH001) had 5712  $\mu\text{g/l}$  Pb, 2198  $\mu\text{g/l}$  Zn and 12.2  $\mu\text{g/l}$  Cd (dissolved metal in each case), suggesting significant potential for contamination of groundwater and surface water as a consequence of interaction of rainwater and solid waste at Ruplagh.

## 3. Stream sediments

A stream sediment sample taken immediately downstream of Old Ruplagh site had 6874 mg/kg Pb, 4876 mg/kg Zn and 43 mg/kg Cu. Upstream of the Ruplagh area, the concentrations were 51 mg/kg Pb and 48 mg/kg Zn, with Cu below the limit of detection. Clearly there is significant contamination of stream sediments downstream of the Ruplagh site. Stream sediment chemistry is described in more detail in the Glendalough District report.

## 4. Solid Waste

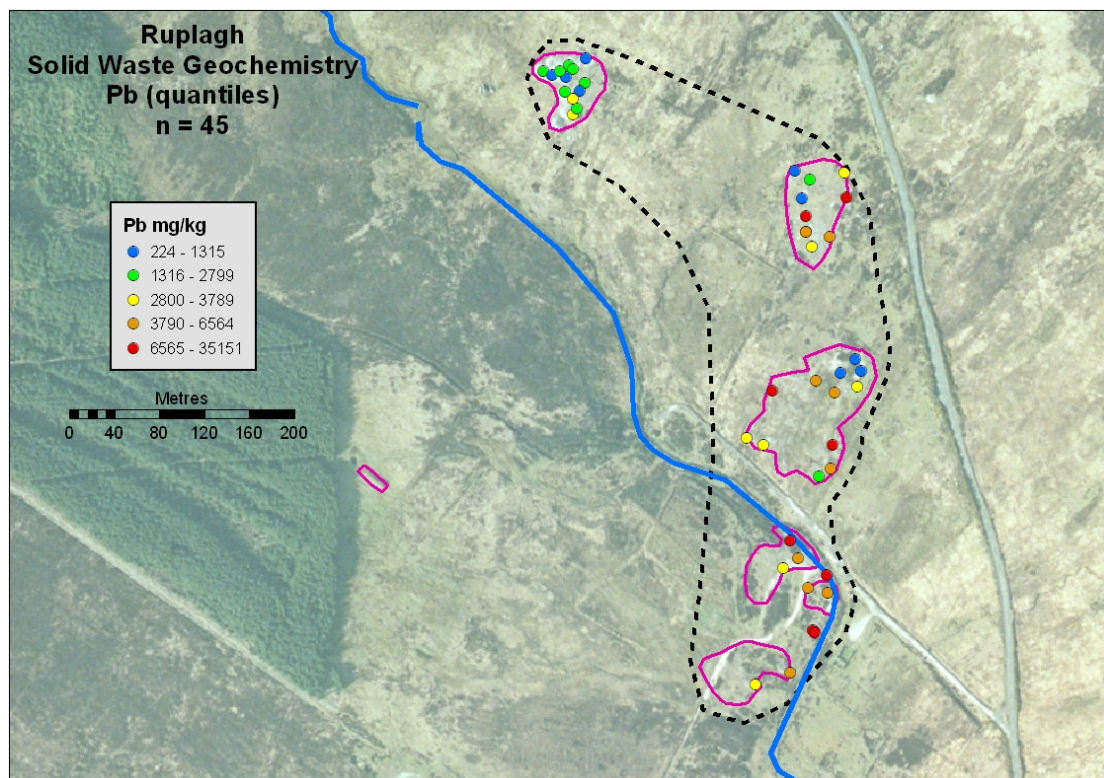
Field XRF analyses were carried out at 45 surface points on spoil at Ruplagh mine site, on waste heaps SP09, SP10, SP11, SP12, SP13, SP22 and SP37. Table 3 and Fig. 3 summarize the data. The major elements detected were Pb and Zn, with relatively minor amounts of Cu and Cd.

Fig. 3 shows the Pb distribution at Ruplagh. The values shown relate only to the samples from Ruplagh, i.e. samples from elsewhere in the district were not included when estimating quantiles. Concentrations of Pb and Zn exceed 1% in some samples but median concentrations are similar to those found in spoil elsewhere in the district, e.g. St. Kevin's. The small concentration of Cd detected in the waste is consistent with detection of Cd in adit discharges. There is a broad linear

relationship between Cd and Zn in solid waste in the Glendalough District, consistent with the presence of Cd in solid solution in sphalerite. The two metals occur in the same column of the periodic table and are isostructural. Only rarely does Cd form minerals in which it is the predominant metal – in sulphide ore deposits it is typically hosted by sphalerite.

**Table3 Field XRF data, solid waste, Ruplagh**

mg/kg	Pb	Zn	Cu	Cd
<b>n</b>	45	45	45	45
<b>Minimum</b>	224	385	0.0	0.0
<b>Maximum</b>	35151	22982	242	85
<b>Median</b>	3301	5433	65	41
<b>Mean</b>	5330	6334	67	41



**Fig.3 Ruplagh sample sites, field XRF analyses**

## 5. HMS-IRC Site Score

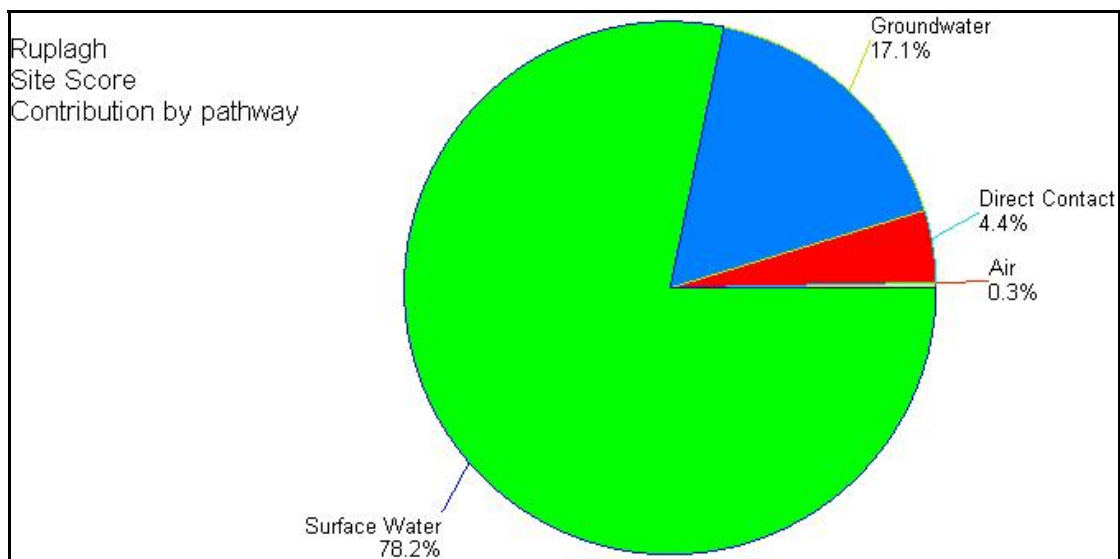
The total site score for Ruplagh is 45 (Table 4). The solid waste contributes 42, or over 93%, of the score. The relatively small score for the two adit discharges compared to discharges elsewhere in Glendasan reflects the low flow rate and low metal concentrations (Table 2) relative to other adit discharges.

**Table 4 HMS-IRC Site Scores, Ruplagh**

Waste	SP09	SP10	SP11	SP12	SP13
<b>1. Hazard Score</b>	17	34	26	32	31
<b>2. Pathway Score</b>					
<i>Groundwater</i>	0.69	1.12	0.94	1.14	1.12
<i>Surface Water</i>	1.26	2.60	1.09	8.00	5.26
<i>Air</i>	0.02	0.02	0.02	0.04	0.04
<i>Direct Contact</i>	0.16	0.33	0.31	0.54	0.54
<b>3. Site Score</b>	<b>2</b>	<b>4</b>	<b>2</b>	<b>10</b>	<b>7</b>

Waste	SP22	SP24	SP37	W042	W044	Total
<b>1. Hazard Score</b>	26	19	26	7	6	224
<b>2. Pathway Score</b>						
<i>Groundwater</i>	0.96	0.69	0.96	0.06	0.02	7.70
<i>Surface Water</i>	4.47	3.19	6.71	1.45	1.29	35.33
<i>Air</i>	0.0	0.00	0.0			0.15
<i>Direct Contact</i>	0.05	0.03	0.0			1.97
<b>3. Site Score</b>	<b>5</b>	<b>4</b>	<b>8</b>	<b>2</b>	<b>1</b>	<b>45</b>

Fig. 4 shows the contribution of the different pathways to the total site score at Ruplagh. Pathways are the routes by which receptors are exposed to the hazard. As is the case for most sites in the Glendalough District, the surface water pathway (78.2%) is the main contributor to the site score. This reflects proximity of all heaps to the Glendasan River or to drains that link them directly to the river, the remoteness of the site reduces the influence of the groundwater pathway (15.5%) because the low population density means there are few wells and few inhabitants that can be affected by contaminated groundwater. The Direct Contact pathway is low in spite of the ready accessibility of the site and the popularity of the area with tourists and walkers. This is mainly a consequence of the relatively low metal concentrations in the waste – there are no accumulations of metal-rich processing waste at Ruplagh - and the relatively low surface area of the heaps.



**Fig. 4 HMS-IRC Site Score, Ruplagh: contribution by pathway**

## 6. Geochemical overview and conclusions

Two discharges from flooded shafts at Ruplagh have elevated concentrations of Pb and, especially, Zn. Of the two, the New Engine Shaft discharge had the highest measured concentrations of Pb (72 µg/l) and Zn (994 µg/l). In general, metal concentrations in the Glendasan River are considerably lower than those measured downstream of the sites in Lower Glendasan (Hero, Foxrock and St. Kevin's). At Ruplagh, the maximum downstream concentration of Pb was 11 µg/l and of Zn 166 µg/l. A stream sediment sample taken immediately downstream of Old Ruplagh site had 6874 mg/kg Pb and 4876 mg/kg Zn; upstream concentrations were 51 mg/kg Pb and 48 mg/kg Zn, indicating significant contamination of stream sediments downstream of the Ruplagh site. Concentrations of Pb and Zn in solid waste exceed 1% in some samples but median concentrations (3301 and 5433 mg/kg, respectively) are similar to those found in quartz- and granite-rich solid waste elsewhere in the district. The modest concentrations of Pb, especially, and Zn in solid and liquid waste at Ruplagh, the relatively low volumes of the waste, the lack of any major impact on the quality of the river water and the remoteness of the area, all combine to give rise to a score of only 45 for the Ruplagh site. Stream sediments at the site are severely impacted but these are treated as part of the Glendasan Valley as a whole and not scored for individual sites.