

Environmental Impact Statement for Ballymurtagh Landfill

Volume 1 Non Technical Summary

November 2009

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Section 1 Introduction

This Environmental Impact Statement (EIS) relates to a Waste Licence Review Application being made to the Environmental Protection Agency (EPA) under the Waste Management Acts 1996 to 2008 for Ballymurtagh Landfill, Co. Wicklow.

A European Court of Justice (ECJ) Case was brought against Ireland relating to breaches of the EU Groundwater Directive (80/68/EC) with regard to Ballymurtagh Landfill. The outcome of the case (ECJ Case 248/05) was that, in the Courts view, Ireland had failed to correctly account for provisions of the EU Groundwater Directive in the planning for, operation and subsequent licensing of Ballymurtagh Landfill. At a meeting with the European Commission on 12 December 2007, it was determined that the existing Waste Licence W0011-01 should be reviewed.

The EPA have advised that the application should “*concentrate on the aspects of risk to surface and groundwaters, currently and into the future, for the facility as constructed*” and that the “scope and detail of this EIS will on account of the unique circumstances, be narrow in focus and should concentrate on risks to surface and groundwater, and any other emissions management as may be relevant”.

The ‘Grouped Format Structure’ was used in the preparation of the EIS and this format examines each aspect of the environment as a separate section referring to the existing environment, the potential impact of the development, and the mitigating measures to ameliorate these impacts.

- Volume 1 provides the Non-Technical Summary of the EIS. This is a self-contained document and presents a condensed non-technical version of the Main EIS Document.
- Volume 2 contains the Main EIS Document and details the major environmental aspects of the closed landfill and the principal measures used to mitigate against any potential impacts.
- Volume 3 contains Appendices to the Main EIS Document including supporting information such as contacts with and replies from statutory bodies and interested parties, environmental monitoring data, reports, maps and drawings.

Section 2 Waste Management Policies

The following EU and national waste policy and legislation documents are considered in the EIS:

- EU Waste Policy - Council Directive on Waste (75/442/EEC) was made in 1975 and revised in 1991(91/692/EEC, amended in 1996(96/350/EC) and amended again in 2006 as 2006/12/EC.
- Landfill Directive - Council Directive on the Landfill of Waste (99/31/EC)
- Waste Management Acts 1996 to 2003
- 1998 Policy Statement - Changing Our Ways (DELG, 1998)
- 2002 Policy Statement – Delivering Change – Preventing and Recycling Waste (DEHLG, 2002)
- 2004 Policy Statement – Taking Stock and Moving Forward (DEHLG April 2004)
- National Overview of Waste Management (DEHLG, 2004)
- County Wicklow Development Plan 2004–2010 (2004)
- County Wicklow Replacement Waste Plan 2006 – 2011.

Section 3 Description of Site

Ballymurtagh Landfill is located in the townlands of Ballymurtagh, Ballygahan Upper, Ballygahan Lower, and Tinnahinch in the Vale of Avoca approximately 1.5 km north-west of the village of Avoca in Co. Wicklow.

Wicklow County Council operated a landfill at Ballymurtagh in a part of the abandoned West Avoca Mines site in Avoca, Co. Wicklow between the years of 1989 and 2002. A Civic Waste Facility operated by the County Council is now located at the site. The site location, present layout, including the Civic Waste Facility and associated infrastructure are shown in **Figure 3-1** (at the end of the document).

An application was made to the EPA on the 1 October 1997 for a waste licence to operate the landfill under Section 39 of the Waste Management Act 1996. This application was made in response to the Waste Management (Licensing) Regulations, 1997.

A Waste Licence was granted by the EPA to Wicklow County Council in April 2001 (EPA Licence Register W0011-01). The landfill was closed in 2002. Restoration commenced in 2004, capping was carried out in 2005 and landscape works was completed in 2006. Under the terms of the current Waste Licence, the landfill is subject to on-going environmental monitoring. An Annual Environmental Report and an Environmental Management Plan are prepared on an annual basis.

Ballymurtagh Landfill is under the overall operational control of the Director of Services and Senior Engineer of the Water and Environmental Services Section of Wicklow County Council. The facility manager carries out the day-to-day management at the site.

The principal activity between 1989 and 2002, was to 'deposit [waste] in, on or under land'. It is estimated that approximately 480,000 tonnes of waste were deposited at the site from the date it became operational in 1989 until waste acceptance ceased on the 31 December 2002. The landfill accepted only non-hazardous waste. The total fill area is approximately 6.3 hectares in size.

The quantity of waste currently handled at the Civic Waste Facility in the order of 600 tonnes per annum of household recyclables.

Section 4 Human Beings

4.1 Introduction

Impacts on human beings were assessed in relation to noise, traffic, fire and nuisance impact. The other impacts on humans from the landfill activity such as air emissions, visual and landscape impact as well as material assets are assessed in separate chapters. Upon closure, the Restoration and Aftercare Plan for the landfill specifically set out to minimise the impact of the facility on human beings.

4.2 Existing Environment & Potential Impacts

Noise monitoring has been conducted at four noise sensitive locations since the Waste Licence was granted in 2001 until 2006. From 2007 monitoring has been carried out at two locations as agreed with the EPA as there has been no noise issues at the site. Noise levels continue to be monitored but do not create an environmental problem at Ballymurtagh Landfill and Civic Waste Facility.

Traffic at the facility is now entirely connected with the Civic Waste Facility, located on the old landfill access road which is off the R752, The R752 is a regional road which connects the villages of Woodenbridge, Avoca, Rathdrum and Rathnew with the N11 National Primary Route and Arklow. The facility is open to the public five days a week from Tuesday to Saturday. It is estimated that approximately 150 cars per day use the Civic Waste Facility. Traffic does not create an environmental problem at Ballymurtagh Landfill and Civic Waste Facility.

There is a risk of fire at closed landfill sites due to the emission of flammable gaseous by-products of the waste degradation process. This is reduced by the active venting system installed in the landfill mass. A flaring system is continually in operation on the site at present. There has not been any fire related incidents at Ballymurtagh Landfill facility..

The landfill is restored and the last recorded complaint with regard to any emission from Ballymurtagh Landfill was in August 2005. The closure and capping of the landfill addressed the issue of vermin and pests by covering the waste that attracted them. Vermin and litter control are still carried out at the Civic Waste Facility.

4.3 Mitigating Measures

Significant effort has been made to minimise or remove the impact on human beings from the Ballymurtagh Landfill, which is no longer operational, and the Civic Waste Facility, which continues to operate.

Monitoring of noise emissions over recent years under the waste licence has found that Ballymurtagh Landfill has no impact at the noise sensitive locations. This monitoring continues at the two most noise sensitive locations to the site.

Access traffic to the Civic Waste Facility is not perceived to have a negative impact on human beings. The facility has a positive impact as it serves the community with an essential recycling service.

To date there has been no fire related incidents at the site. Any fires on the site would be regarded as emergencies and dealt with immediately, either by extinguishing them or by calling the emergency services. This is dealt with under the Emergency Response Procedure in the Environmental Management Plan (2008).

Any nuisances relating to vermin, pests or litter are prevented and dealt with according to the Environmental Management Procedures for the site (RPS, 2008). Weekly inspections are carried out for the entire landfill site, including the Civic Waste Facility and its access road.

Section 5 Soils & Geology

5.1 Existing Environment

The Ballymurtagh Landfill is surrounded and underlain by volcanic rocks and metasediments. The rock types include tuffs and breccias, as well as mudstones, schists, and shales. The Avoca ore bodies that were mined extensively and the most important minerals include iron oxides, chalcocite (Cu₂S) and covellite (CuS) together with various copper oxides.

The upland areas immediately surrounding the Ballymurtagh Landfill are overlain by subsoils derived from glacial till and weathering of bedrock. Subsoils are mostly thin and even absent on some hilltops. In the Avoca River valley subsoils are represented by river alluvial deposits which have reported thicknesses of more than 20 metres.

The Ballymurtagh Landfill occupies the former Pond Lode/Open Pit of the West Avoca mine area. Prior to the landfill becoming operational, wet mine tailings (effectively a liquid sludge) were deposited into the open pit. The tailings consist of silt-grade waste materials from the primary and secondary crushing of ore after the base materials had been extracted. Although deposited as a liquid, the tailings were partly dried out and semi-consolidated, with only the deeper levels showing signs of softening.

5.2 Potential Impacts

Upon closure, the Restoration and Aftercare Plan for the landfill included engineering a low-permeability cap over the landfill area, constructing surface water drains and a stormwater retention pond, and diversion ditches along the perimeter of the landfill. With adequate maintenance, there are no post-closure impacts on the soils and geology of the landfill.

5.3 Mitigating Measures

Periodic inspection and maintenance of the landfill cap is carried out. In addition, slope stability inspection is carried out on an annual basis.

Section 6 Surface Water

6.1 Existing Environment

The EPA classes the Avoca River as among the most polluted in Ireland in successive national water quality reports. This is a legacy of over 200 years of industrial scale mining at Avoca, in particular from impacts of acid rock drainage to the river. The acid rock drainage enters the river primarily from adits draining both the East and West Avoca mining areas but also from more diffuse discharges associated with spoil heaps and tailings.

A proportion of the rainfall that falls over the capped landfill generates surface runoff and flows towards the Avoca river valley as “overland flow”. Several drains have been constructed within the landfill to capture the runoff. These direct the runoff water to a stormwater settlement pond near the south-eastern corner of the landfill. The surface water drains through a pipe directly to the Avoca River. The surface water drainage layout at the Ballymurtagh facility is presented on **Figure 6-1** (at the end of the document).

In 2006 and 2007 the quality of the surface water run-off discharging to the Avoca River was analysed. The test results indicated that the quality of the surface water discharge is within the EPA surface water quality standards. It was estimated that runoff generated by the landfill is only 0.05% of the estimated low flow of the Avoca River. The present runoff from the landfill is not a source of pollution to the Avoca River and no mitigating measures are required.

6.2 Potential Impacts

The Avoca River is known from numerous past studies to be impacted by acid rock drainage from the Avoca mines area, both in West Avoca and East Avoca. There are two main acid rock discharge points – the East Avoca Deep Adit and the West Avoca Ballymurtagh (Road) Adit. In addition, polluted groundwater discharges diffusively along the river, mainly related to the mine spoil and tailing heaps that cover or are stockpiled the Avoca mines area.

The surface water generated from the Ballymurtagh Landfill is discharged directly to the Avoca River, is unpolluted, and is therefore independent of the adit discharge points or any diffuse groundwater sources. As such, the present runoff from the landfill is not a source of pollution to the Avoca River.

6.3 Mitigating Measures

No mitigating measures are required in connection with runoff from the capped Ballymurtagh Landfill. However, it is recommended that estimates of discharge quantities from the settlement pond be measured regularly, to improve the certainty of the water balance associated with the landfill.

Section 7 Groundwater

7.1 Introduction

The Geological Survey of Ireland (GSI) has categorised the rocks in the West Avoca area as being of type “Pu”, defined as a “poor aquifer, generally unproductive” (GSI, 2005). Rocks of this type are generally characterised as “poorly productive aquifers” (PPAs), in other words, they tend to transmit limited quantities of water and are not generally suitable for water production.

Groundwater flow in bedrock at Avoca occurs naturally through fractures, fissures and cleavage planes. Groundwater pathways in the landfill area are complex. Under natural conditions, groundwater flow would be from topographically higher areas towards the Avoca River valley. However, the underground mine workings beneath the landfill site have significantly altered the hydrogeological conditions in the West Avoca mining area. The mine workings consist of a complex system of interconnected shafts, stopes, tunnels and haulage ways at different elevations and stages. As such, the mine workings act as preferential conduits for the captured groundwater which subsequently emerges in mine adits in the Avoca River valley. . A conceptual hydrogeological model of West Avoca is presented on **Figure 7-1** (at the end of the document).

In the West Avoca mines area, groundwater levels and discharges are primarily controlled by the Ballymurtagh Adit. Any groundwater that escapes the mine workings discharges “diffusively” to the alluvial deposits along the Avoca River valley.

The groundwater underlying the landfill is historically contaminated by Acid Mine Drainage (AMD) as a result of centuries of mining in the area. As documented in numerous past reports, the water quality and aquatic ecology of the Avoca River is impaired. The type and nature of the reported impacts are attributed to acid rock drainage from both East and West Avoca.

The presence of heavy metals and low pH of the groundwater underlying the landfill makes this groundwater body ‘*permanently unsuitable for other uses, especially domestic and agriculture*’ in accordance with Article 4(2) of the Groundwater Directive 80/68/EEC.

Ballymurtagh Landfill commenced acceptance of waste in 1989, ten years prior to the EU Landfill Directive 1999/31/EC, in 1999. The landfill was designed to operate under a ‘disperse and dilute’ method, under determined advice that this method would not result in harm to the Avoca River. The engineered landfill included a bottom liner in the form of low-permeability mine tailings whose function would reduce or limit the risk of pollution to groundwater. The embankment constructed to the front of the landfill was also partially lined to a height of 5m with butyl rubber.

Leachate attenuation takes place through the tailings at the base of the landfill. Dilution occurs in the underlying groundwater of the mines. Any leachate that escapes the underground mine workings and migrates towards the river valley becomes mixed and diluted with the groundwater in the alluvial deposits.

Although ammonium is detected in the groundwater of Ballymurtagh Road Adit, there is evidence that closure and capping of the landfill has resulted in a lowering of ammonium concentrations. A graph of ammonium concentrations from groundwater samples from the Road Adit presents a clear and distinct downward trend from a maximum of 30mg/l in 2001 to a concentration of 9mg/l at present.

Existing private wells in the mines area have been extensively tested to date and available test results do not indicate any contamination. No further wells are planned within the groundwater pathways from the landfill on the basis that groundwater beneath and downstream of the landfill is primarily impacted by acid rock drainage, and as such is not usable for drinking water purposes.

7.2 Potential Impacts

The key challenge in assessing the nature and extent of potential landfill impacts on groundwater and surface water quality in West Avoca is being able to distinguish between the impacts of the landfill from those of the mine workings. This is especially important because the landfill overlies the mine workings and therefore a co-mingling of contaminants can be expected in downgradient areas. Thus, to be able to demonstrate impacts of the landfill, it is critical that the leachate be “fingerprinted” to the extent possible, and that this fingerprinting can subsequently be used to recognise the landfill signature in co-mingled samples.

To be able to assess potential impacts of the Ballymurtagh Landfill against other potential sources of groundwater contamination in West Avoca, a method known as Principal Component Analysis (PCA) has been carried out on water quality data. PCA has been used widely in cases and situations where scientists seek to be able to assign a chemical fingerprint to a specific source area of contamination.

The basic conclusions from the PCA of water quality data from the Avoca mines area are as follows:

- Three overall, unique and distinct groups of samples are observed: background samples, acid mine impacted samples and landfill leachate impacted samples.
- The landfill leachate is associated with high levels of sodium, potassium, ammonium, chloride, magnesium, calcium, alkalinity and conductivity. Landfill leachate is not associated with metals such as cadmium, zinc, and copper.
- Acid Rock Drainage is associated with high levels of metals including zinc, copper, manganese, cadmium, iron and lead. ARD is also associated with high sulphate concentrations, high conductivity and low pH values.

Monitoring wells and boreholes outside the landfill are dominated by contamination from acid rock drainage. Boreholes and leachate wells on the landfill are dominated by landfill leachate contamination. Some stream samples at and downgradient of the Avoca mines area show contamination by acid rock drainage. No stream samples show dominant contamination by landfill leachate.

7.3 Groundwater /Surface Water Interaction

There are three basic groundwater receptors associated with the Ballymurtagh Landfill:

- Groundwater in bedrock directly beneath the landfill which is captured by the underground mine workings and which discharges to the Ballymurtagh Adit;
- Groundwater in bedrock beneath the landfill that may escape capture by the underground mine workings, and which subsequently flows and discharges into the river valley; and
- Groundwater in fill and boulder clay at the downgradient edge of the landfill, near the present recycling facility.

There are apparent leachate impacts to groundwater quality beneath and immediately downgradient of the landfill, but from existing data there is no correlation between the leachate and the quality of the water in the Avoca River.

As documented in numerous past reports, the water quality and aquatic ecology of the Avoca River is impaired. The type and nature of the reported impacts are attributed to acid rock drainage from both East and West Avoca. There are several sources of river pollution from the mining works: the Deep and Ballymurtagh Adits, runoff from spoil heaps on both sides of the river, emergency tailings in West Avoca, and diffuse groundwater discharges associated with spoil heaps and underground mine works.

Leachate that escape the underground mine workings and migrates towards the river valley becomes mixed and diluted with the groundwater in the alluvial deposits.

In summary, the groundwater quality in the entire West Avoca mining area, including the landfill, is impaired and impacted by acid rock drainage. The impacts to groundwater have been documented prior to the landfill being constructed. Impacts on both sides of the river are of a similar nature, whereby contamination to groundwater and the Avoca River are attributed to mine waste and underground mine workings.

7.4 Mitigating Measures

The landfill cap will be maintained properly in the future as outlined and described in the existing aftercare plan associated with landfill closure. This will prevent leachate seeping through the upper slope of the embankment which is controlled by the permeability of the embankment material and the leachate head within the landfill.

Quarterly and annual monitoring of leachate and groundwater is ongoing at the landfill site. This will continue with certain targeted modifications to the monitoring programme. It is also proposed that the monitoring of leachate and the Ballymurtagh Adit be expanded to include analysis for other List I and II parameters that have not been routinely monitored in the past.

Section 8 Ecology

8.1 Existing Environment

Ballymurtagh Landfill is located close to the Avoca River which is characterised as a medium sized stream with cobble and gravel substrates, little silt or fine grained sediment, iron staining of the substrates in areas most affected by low pH and elevated metals concentrations. The biological water quality assessment indicated slightly polluted conditions at the two sites upstream of the landfill. The river was moderately polluted at Avoca Bridge, which is almost 2 km downstream of the landfill and the composition of the fauna also indicated a toxic effect, primarily as a result of mine-related contamination.

There are no specially protected species of plant or animal dependent on the site and no habitats which require special conservation under the EU Habitats Directive (92-43/EEC).

Prior to the construction of Ballymurtagh Landfill little natural vegetation was present in the upland areas. The upland terrestrial environment was highly disturbed by past mining activities. These areas included open pits, waste/spoils piles and tailings.

Upon closure, the Restoration and Aftercare Plan for the landfill included regenerating the site as a grassland habitat. The surface of the landfill has been sown with grasses into which other species are now spreading, including trees and bushes at the eastern more sloping end. The established trees on the slope are now three to four metres in height and include birches, pines and willows and the gorse is now two metres high.

Prior to the construction of the landfill the vertebrate fauna of the site consisted of few species because it was a disused open pit. The grassland fauna now consists primarily of insects and the ringlet and meadow brown have which been noted in the past. Mammals are present, in the form of hare and rabbit though their grazing influence is small. Visiting species include fox and sika deer though the absence of browsing damage on the broad-leaved trees suggests their numbers are very low.

8.2 Potential Impacts

The surface now is stabilised and its vegetation coming to resemble that on the rest of the valley side, run-off from the area has been managed and a smaller area of the old mining site is exposed to weathering. In general, the reintegration of the closed landfill into the landscape has been a success.

8.3 Mitigating Measures

It is envisaged that there will be a gradual extension of the tree growth but also the further colonisation by plant and animal species from the surroundings. Vegetation management will be necessary at the site in the medium term. This should include weeding, cutting and fertilising. Fencing will be necessary for the capped landfill site in the medium term which is generally out of bounds to the public and native fauna.

Overall, the site and area in general has benefitted ecologically from the infilling of the open pit, a legacy of decades of open cast mining at Avoca and a difficult environment for fauna and flora of many types. The planned revegetation of the landfill capping has improved the habitat, both for fauna and flora. This will continue to improve with time, to a point where the landfill site is completely integrated with its surrounding environment.

Section 9 Air & Climate

9.1 Existing Environment

The air quality of the surrounding area is good with a low density of housing within 1 km of the site and no significant industrial emission sources nearby. The landfill is surrounded by relatively steep cliff walls along the western and southern boundaries. The nearest houses are situated about 200 m downslope below the grade of the landfill, along the Red Road, and are well protected by the boundary embankment and a dense stand of mature trees.

9.2 Potential Impacts

The generation of airborne dust at landfill sites is primarily related to construction activities at the site and to the transportation and deposition of waste. Dust monitoring ceased after the restoration of the landfill in 2005 as dust was no longer a potential issue as the landfill was capped and there were no more trucks along the access road.

At Ballymurtagh Landfill a network of gas wells were installed in and are connected to a flaring station to significantly reduce emissions of methane, carbon dioxide and trace constituents. Under the current Waste Licence monthly monitoring of landfill gas is carried out at Ballymurtagh Landfill at perimeter locations. Monitoring of landfill gas over the years has shown exceedances of the limit for carbon dioxide. Under the current Waste Licence, the landfill gas flare emissions have to be monitored. The landfill flare gas emissions are in compliance with the emission limit values.

Under Condition 6.1 of the current Waste Licence weekly odour inspections have to be carried out at Ballymurtagh Landfill. Prior to capping the landfill in 2005 there were a few complaints made to

Ballymurtagh Landfill in relation to short term odours detected beyond the site boundary. Odour has not been an issue since the capping of the landfill.

9.3 Mitigating Measures

As landfill gas generation continues long after the closure of the site so too will the flaring of gas and the monitoring of landfill gas generated and the flare emissions.

Weekly maintenance checks of the gas extraction system and the monitoring of the landfill gas flare will also continue. Although the potential for odour and dust generation at the site is minimal as the landfill is capped, any nuisances relating to this will be prevented and dealt with according to the Environmental Management Procedures for the site.

Section 10 Land Use & Landscape

10.1 Existing Environment

The land use in the area is dominated by agricultural production and commercial forestry. Agricultural land is generally pasture land located to the west of the site. There are plantations of coniferous woodland adjacent to the site with stands of broad leaved species lower down the slopes along the valley of the Avoca River.

The site is located just off the Avoca to Rathdrum road, however is well screened by trees and blends quite naturally into the surrounding landscape. There are views into the site from the west-facing slopes of the hills located further to the east.

10.2 Potential impacts

Upon closure, the Restoration and Aftercare Plan for the landfill included creation a woodland type habitat to blend in with the surrounding landscape. Capping and restoration took place in 2006 and the landfill is now a well established grassland habitat. The profile of the restored facility has allowed the integration of the height and form of the surrounding topography. The final configuration was planted with ecologically appropriate species, tolerant to the site conditions as woodland and wild grasses.

The combination of the profiling and revegetation has resulted in a significantly improved environment through the progressive reintegration of the site into its natural surrounding environment. The landscape is a significant improvement on the pre-landfill 'scarred' landscape which was in place prior to the commencement of landfilling.

10.3 Mitigating Measures

No mitigation measures are needed as the landscape plan has been implemented. The gradual extension of the tree growth but also the further colonisation by plant species from the surroundings in the future will further integrate the landfill into the surrounding landscape.

Overall, the site and area has benefitted from the infilling of the open pit, a legacy of decades of open cast mining at Avoca and a difficult environment for fauna and flora of many types. The planned revegetation of the landfill capping has improved the overall landscape. This will continue to improve with time, to a point where the landfill site is completely integrated with its surrounding environment.

Section 11 Material Assets

11.1 Existing Environment

Resources that are valued and that are intrinsic to specific places are called material assets. They may be of either human or natural origin and the value may arise for either economic or cultural reasons. The objective is to ensure that these resources are used in a sustainable manner so that they will be available for future generations.

Industrial-scale mining began at Avoca around 1720 and continued until the mines were closed in 1982, much of it through open cast mining. A considerable legacy of this long period of mining activity remains around Avoca in the form of heritage features and industrial archaeology sites.

There are no listed archaeological sites within the boundary of or in close proximity to the landfill, and no impacts on archaeology are envisaged during the remainder of the operation of the closed landfill site as there are no known registered archaeological sites within the boundary of the site. The landfill does not restrict access to the archaeological sites nearby and the restored landfill is sympathetic to the surrounding landscape.

Wicklow is known as the Garden of Ireland and is renowned for its scenery. The landfill is located in the Vale of Avoca a popular tourist destination with forest and hill walking being popular activities for visitors to the area.

The Meeting of the Waters which is located at the confluence of the Avonmore and Avonbeg rivers is the closest tourist attraction to Ballymurtagh Landfill. The site is also close to the village of Avoca which is on the Avoca River and famous for the hand weaving looms and the craft shop of the Avoca Handweavers. Avoca has also in recent years been recognised as the location for the well known television series "*Ballykissangel*".

11.2 Potential Impacts

No impacts on archaeology are envisaged during the remainder of the operation of the closed landfill site as there are no known registered archaeological sites within the boundary of the site. The landfill does not restrict access to the archaeological sites nearby and the restored landfill is sympathetic to the surrounding landscape.

The landfill site although situated close to the village of Avoca and the popular tourist attraction of the Meeting of the Waters, is visually well removed from both locations. The site is well screened by trees and blends quite naturally into the surrounding landscape.

The overall impact of the closure and capping of the landfill has been to improve the visual landscape in the vicinity of Ballymurtagh. Closure has also reduced traffic from heavy vehicles and other nuisances that are associated with operational landfill sites.

11.3 Mitigating Measures

No mitigation measures are required for the protection of material assets, which are not impacted by the closed landfill or the operational Civic Waste Facility.

Section 12 The Interaction of the Foregoing

Generally the interactions between the environmental parameters at Ballymurtagh Landfill are considered minimal as the facility is no longer active. The landfill has been restored as a grassland habitat that integrates well with the surrounding landscape. The facility is now in its aftercare phase and the only environmental parameters associated with the landfill are those of landfill gas, emissions to groundwater and landscape. The interaction of the various parameters is described below:

Terrestrial ecology and human beings are the two potential receptors of the impact from landfill gas. Landfill gas emissions at Ballymurtagh landfill are subject to on-going monitoring and are controlled by a gas extraction and flaring system. Until the production of landfill gas ceases the impact from landfill gas will be slightly negative in the medium-term and neutral in the long-term.

The Avoca River is the receptor of surface water run-off from the site. The quality of this surface water run-off is unpolluted and therefore has a neutral impact on the aquatic ecology. The overall impact of surface water collection at the landfill and diversion from the underground mine workings is a slightly positive long-term impact as it results in slightly less water being available for the production of AMD.

The underlying groundwater is the receptor of percolating water that escapes overland flow to the Avoca Valley and the surface water capture system of the capping but follows a pathway through the landfill waste and base lining of the landfill. Because this groundwater is historically contaminated as a result of AMD from the mines, the impact of the landfill on the underlying groundwater is neutral.

The planned revegetation of the landfill capping has improved the overall landscape. This will continue to improve with time, to a point where the landfill site is completely integrated with its surrounding environment. The overall impact of the landfill on the landscape is a long-term, moderate and positive visual impact for human beings and material assets.

The landscaping also has a positive effect on the terrestrial ecology as the landfill is located in an open pit where the flora and fauna were impoverished prior to the infill and restoration of the landfill. A new grassland habitat has been created and there will be a gradual extension of the tree growth but also the further colonisation by plant and animal species from the surroundings. The overall impact of the landfill on the ecology of the area is a long-term, moderate and positive impact.

The existence of the landfill, infilling a disused and unsafe open mining pit has a long-term, significant, positive impact for human beings and material assets. Similar open pits remaining from the era of mining at Avoca presently exist in East Avoca at Cronebane and Tigroney. These open pits continue to be compromised ecologically and could potentially represent a health and safety risk in their present condition.

Section 13 Alternatives

There are two alternatives considered for the purposes of this EIS.

- **Alternative A:** Continue to monitor the closed landfill in line with the Closure and Aftercare Plan (2003) and the annual Environmental Management Plans. In addition the proposed modifications to ongoing monitoring and mitigating measures presented in this EIS require implementation. The overall impact on the environment of Alternative A is **neutral or slightly positive**.
- **Alternative B:** Removal of waste from Ballymurtagh Landfill. The overall impact on the environment of Alternative B would be **negative** both during the removal work and in the long term. Removal of the waste from Ballymurtagh Landfill is unlikely to result in any discernible improvement in groundwater quality or in the quality of the water in the Avoca River.

Section 14 Further Considerations

A Feasibility Study for Management and Remediation of the Avoca Mining Area completed on behalf of the Minister for Communications, Energy and Natural Resources in 2008 but awaiting publication makes a number of recommendations with respect to improving the quality of the water in the Avoca. The overall impact on the environment of the Avoca River particularly the aquatic environment would be very positive if the recommendations of this Feasibility Report were implemented.

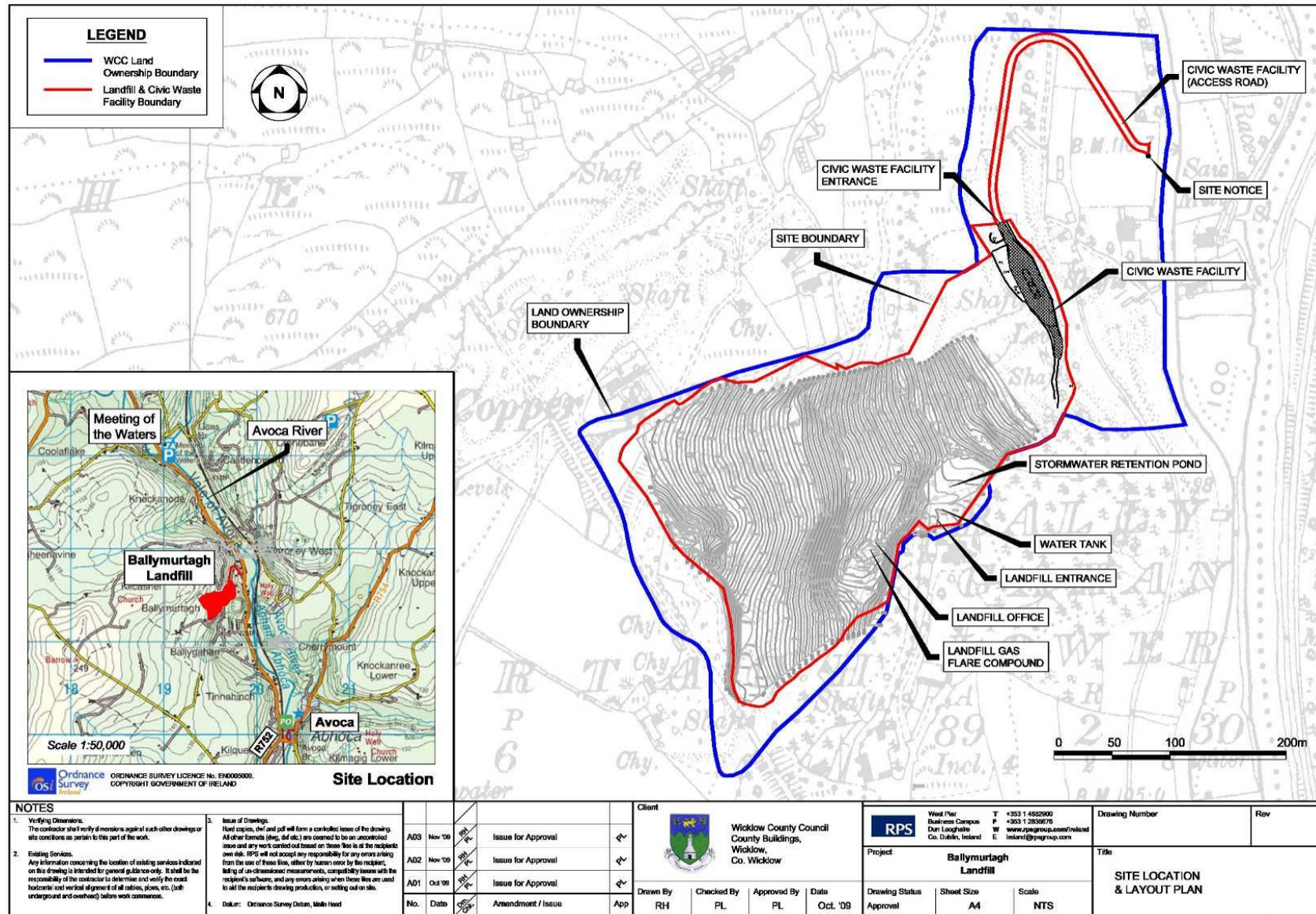


Figure 3-1: Site location, present layout, including the Civic Waste Facility and associated infrastructure (RPS, 2008)

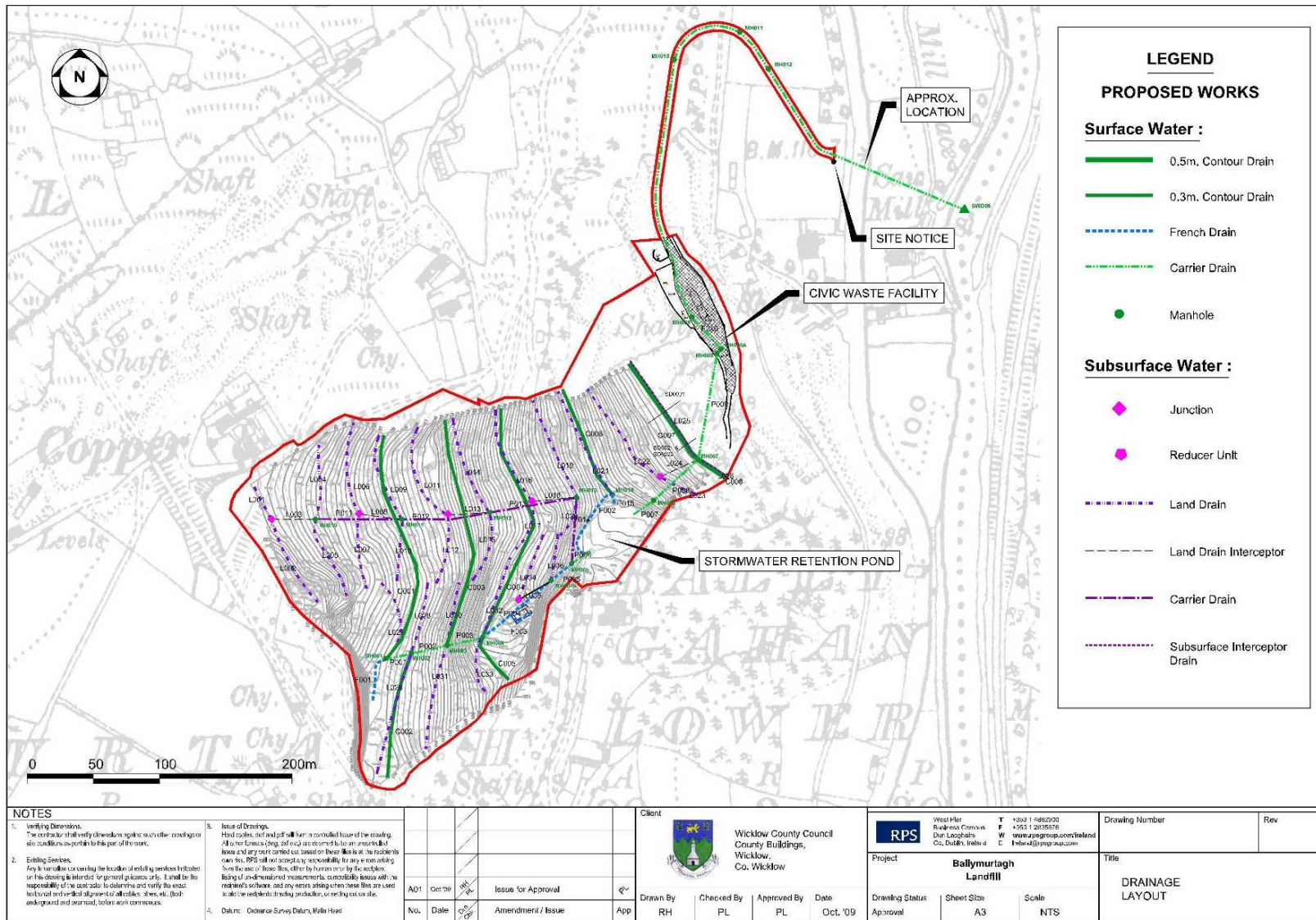


Figure 6-1: Surface water drainage layout

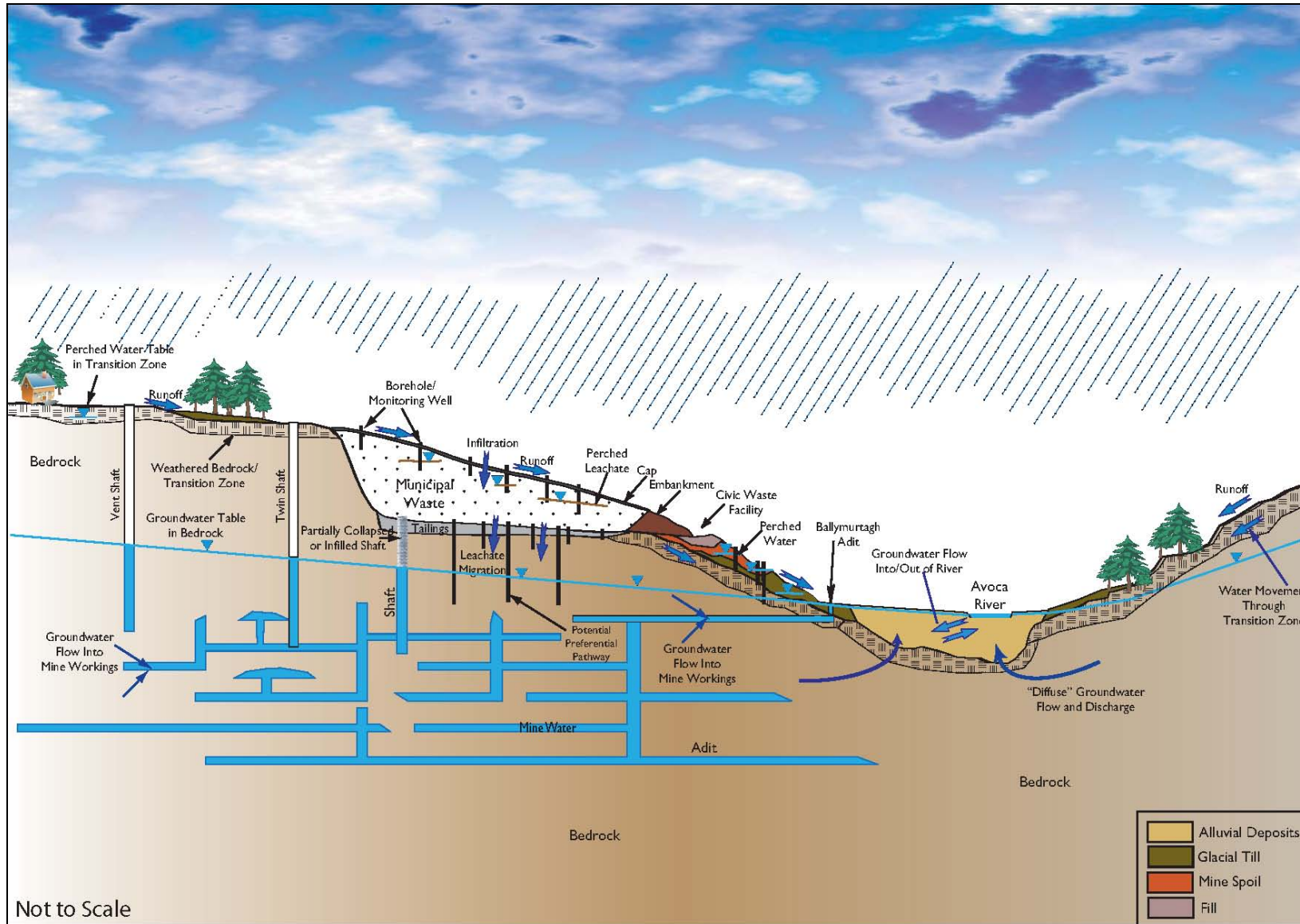


Figure 7-1: Conceptual hydrogeological model of West Avoca