
3 DESCRIPTION OF SCHEME

Introduction

- 3.1 This Environmental Impact Statement has been prepared to accompany a planning application to Monaghan County Council by Irish Gypsum Ltd., Unit 14, Park West Industrial Park, Dublin 12. Planning permission is sought by the company to extend the extraction area of the opencast gypsum mine at Knocknacran, near Carrickmacross, Co. Monaghan.
- 3.2 The proposed application area extends to 54.86 hectares (135.56 acres). This includes the existing and permitted extraction area, the proposed increase in the extraction area as well as associated earthworks. The proposed development will increase the gypsum extraction area from 19.2 hectares (47.4 acres) to 30.69 hectares (75.9 acres) representing an increase of 11.5 hectares or 60% (see Figure 3.1). The proposed development site is located in the townlands of Knocknacran East, Knocknacran West, Drummond, Derrynascobe, Enagh and Derrynaglah.

The Proposal

- 3.3 The proposed development is an extension of the existing opencast mine for which the applicant has full planning permission from Monaghan County Council and which is permitted up to and including 2018 (Monaghan County Council Planning Ref. No: 83/461). Also the applicant sought and received full planning permission from Monaghan County Council in 2004 for an underground mine adjacent to the existing opencast facility (Monaghan County Council Planning Ref. No: 03/578). The area of extraction from the underground mine is 113.7 ha (281 acres). The proposal as detailed and described in this Environmental Impact Statement, is consistent with the statements contained in documentation previously submitted to Monaghan County Council relating to the planning applications made by the Company in relation to gypsum extraction.
- 3.4 The company is seeking full planning permission from Monaghan County Council for the following;
1. The extraction of gypsum from an extended opencast area. The total area involved is 54.86 hectares which includes the permitted extraction area, the proposed extraction area and the earthworks associated with this application;
 2. Extraction of gypsum within this area by opencast mining up to and including 2018;
 3. Landscaping and screening; and
 4. Associated site works.
- 3.5 The rationale and basis for this proposal is detailed in Chapter 1.

Gypsum at Knocknacran

The Gypsum Deposit

- 3.6 The proposal is to extract gypsum from the Kingscourt gypsum deposit, which lies east of the town of Kingscourt. The deposit occurs in a narrow band about 14 kilometres long from north to south and varying in width from 800 metres to 2.5 km.
- 3.7 The deposit contains two gypsum beds of economic importance; the Lower gypsum bed, which typically exceeds 20 metres in thickness, and the Upper gypsum bed, which can exceed 9 metres in thickness, see Plate 3.1. Glacial activity has eroded some of the Upper gypsum bed in the mining area. The Upper gypsum bed is separated from the Lower gypsum bed by a band of mudstone, which can extend to a thickness of 10 metres. In some areas, a band of dolerite has been intruded between the two gypsum beds. This band of dolerite may exceed 20 metres in thickness.

Local Mining History

- 3.8 The existence of a gypsum deposit in the Kingscourt area has been known for over a century. Extraction began in 1871, when a short-lived quarry at Knocknacran provided the first recorded gypsum output in the area. Although exploration work proved gypsum in several other areas, there was no further development of the deposit until 1920 when a quarry was opened at Ballynaclose, County Meath. This venture was unable to compete with imported plasters and the company closed down in 1927. In 1936, the Ballynaclose facility was re-opened by Gypsum and Bricks Limited which is now Irish Gypsum Limited. Initial production was from the Ballynaclose quarry, but soon shifted underground to the Lisnaboe mine. This was succeeded in 1943 by an underground mine at Drumgill. During the war years, a second quarry at Knocknacran supplemented production. A rising demand for gypsum necessitated the opening of additional mines at Cormey (1952 to 1961) and Drumgoosat (1958 to 1989). Exhaustion of reserves resulted in the closure of Drumgill and Drumgoosat in 1989, with reserves being replaced by the open cast mine at Knocknacran.
- 3.9 The locations of the previously worked mines are shown in Figure 3.2. The figure also shows their linear distribution along the Kingscourt deposit.

Knocknacran Opencast Mine

- 3.10 The Company's currently active opencast mine at Knocknacran has been in operation since 1989. This followed the granting of planning permission by Monaghan County Council in 1984 (Planning Ref. No: 461/83) and An Bord Pleanála in July of 1985 (Planning Permission Reg. Ref: PL 18/5/67892).
- 3.11 Gypsum from Knocknacran supplies a plaster and plasterboard factory at nearby Kingscourt. Both the Irish cement industry and the Irish agricultural industry are also supplied with gypsum from Knocknacran. The output of the workings is dependent upon market demand as well as operating requirements. The quality of the extracted gypsum is variable so on-site crushing, blending and homogenising are employed to maximise resource recovery, and therefore, the sustainability of the operation, see Plates 3.2 and 3.3.
- 3.12 The opencast site area extends to 84 hectares but the working limits are currently confined to approximately 19 hectares.

Underground Mining

- 3.13 The reserves of gypsum at the Knocknacran opencast facility for which full planning permission was granted are nearing depletion. Irish Gypsum Ltd. applied to Monaghan County Council in 2003 for full planning permission to develop an underground mine. The mine was granted permission in 2004 and initiating work began later that year. The underground mine commenced production in 2006. The area of the underground mine is 113.7 hectares which will be worked in two seams, the upper and lower seam. The permission also allows for the continued use of the

processing facilities beyond 2018 as granted for the existing Knocknacran opencast facility. The underground mine will operate for a period of approximately 25 years though this is dependent on output which is determined by market demand.

- 3.14 The underground mine was and is required to secure gypsum over the medium to long term. The proposed extension to the opencast mine will serve to augment this supply. It will therefore ensure the best practical method of recovering the available gypsum within the Company's landholding.
- 3.15 This proposal will not increase output from the facility as this is governed by market demand. As stated, recovery of the available gypsum within the Company's property boundary will serve to augment/supplement supplies of gypsum from the underground mine.

Current Practices

- 3.16 The Company, as stated, operates two forms of resource recovery, namely opencast and underground mining. While the aim of both is to extract material from the ground the specific operations differ from each other.
- 3.17 This proposal is for an extension to the existing and currently operating opencast mine at Knocknacran. The processes will thus be the same as the existing operation. Hydraulic excavators and dump trucks are used to remove topsoil, subsoil and overburden. The gypsum is then extracted in a series of benches. Primary breaking is achieved by blasting. Rock breakers are used to carry out secondary breaking. The broken rock is then loaded onto dump trucks and transported to the primary crusher. The primary crusher reduces the run-of-mine rock to less than 300mm, known as minus 300 mm. The minus 300mm rock is delivered to a vibrating grizzly feeder. Material less than 75mm passes through the grizzly feeder and the oversize is directed to the secondary crusher. The secondary crusher reduces the oversize material (between 75 and 300mm) to less than 75mm.
- 3.18 The crushed material then travels to the on-site homogeniser, the output of which is controlled using quality data obtained from laboratory analyses of automatically selected samples. The crushed rock is conveyed from the homogeniser to an on-site storage area from where it is subsequently transported by road to the plaster and plasterboard factory near Kingscourt. Gypsum is also supplied to the cement manufacturing companies in Ireland and the Irish agricultural industry.

Underground Mining

- 3.19 The tabular deposit of gypsum is drilled and explosive charges inserted prior to detonation. The broken rock is removed from the work face by load-haul-dump vehicles. These vehicles deposit the rock in the primary crusher which is located underground at the drift bottom. As the mine face advances and the distance to the primary crusher becomes excessive the blasted material will be loaded onto tipper trucks and transported to the primary crusher.
- 3.20 The primary crusher crushes the rock to minus 300mm and from here it is conveyed to the surface via the return drift. The material is then conveyed via a transfer conveyor to the existing secondary crusher. The material is crushed to minus 75mm before being conveyed to the existing homogeniser.

Hours of operation

- 3.21 The extraction rate for gypsum will be variable and is dependent upon market conditions. Operating hours may alter from time to time depending on the level of demand. The current planning permission for the opencast mine does not specify the operating hours of the existing opencast mine, however low noise level limits are in place between the hours of 20h00 and 08h00 Monday to Saturday, all day Sunday and on Public Holidays.

3.22 Planning permission is therefore sought to continue the current hours of operation in the opencast mine which are 0800 to 2000 Monday to Saturday. No activities take place on Sundays or bank holidays. Truck movements to the site normally take place between the hours of 0500 and 2400.

Employment

3.23 The existing opencast facility and the underground mine currently provides employment for up to 55 people on a full-time and an additional 30 people on a seasonal basis. The proposed development will see a continuance of these employment figures for the duration of the proposal.

Manufacturing at Kingscourt

3.24 In the Plaster Mill at Kingscourt, the rock is processed through a third and fourth stage of crushing and grinding and is reduced to a very fine powder prior to being calcined by heating. A chemical change takes place which converts the rock from a dihydrate to a semi-hydrate form called "stucco". Stucco is the basic material for the manufacture of different types of building plasters.

3.25 Stucco produced by calcination in the plaster mill is also transferred to a plasterboard manufacturing plant on-site. There, the stucco is mixed with additional ingredients to form a slurry and is poured between continuous running sheets of upper and lower heavy (grey/ivory) paperliner. The product is cut/perforated to specific lengths and these undried boards are grouped and returned automatically through a multi-deck, multi-width dryer. After drying the plasterboards are usually grouped in pairs and stacked ready for loading and distribution.

Products and Standards

3.26 Some of the brand names used by the company include Gyproc, Pinnacle, Skimcoat, Gyplite, Artex, Gyptone, Casoprano and Blue Hawk. The company is registered to ISO 9002/EN 29002 with the National Standards Authority of Ireland (NSAI). The comprehensive quality control system in operation is checked by the Quality Control Laboratory, to ensure that all products meet their specifications and fulfil the requirements of Irish, British and International Standards (ISO).

Project Development

3.27 Over the planned operation of the opencast mine extension it is estimated that a total yield of approximately 5 million tonnes of gypsum will be recovered. However in order to achieve this some 11 million m³ of overburden material will need to be stripped and relocated elsewhere within the application site. Table 3.1 below details the extraction rates and overburden quantities while Appendix 3 contains figures showing the proposed project phasing.

3.28 Initially overburden will be stripped from the northern section of the mine, adjacent to the R179 road. A distance of approximately 22 metres and 77 metres respectively will be maintained between the road and soil stripping operations and the edge of the gypsum extraction area. In the first year of operation approximately 375,000 tonnes of gypsum from the upper seam will be extracted, some 550,000 m³ of overburden will be removed during the same period.

3.29 Extraction from the lower seam will commence in year 2 of the proposed development in the northern section of the site. By year 4 of the development the upper and lower seams will be worked yielding approximately 2 million tonnes of gypsum. In order to achieve this some 2.6 million m³ of overburden will have been relocated from its current position to elsewhere within the site.

- 3.30 During years 5 and 6 of the development, work will conclude on the eastern side of the site. Almost 1,800,000 m³ of overburden will be relocated over this 2 year period yielding approximately 1 million tonnes of gypsum.
- 3.31 Work will switch to the western portion of the site after year 6. Overburden will be removed from here and relocated to the eastern side of the site and filled to a finished floor level of approximately 65 metres above ordnance datum. Over the final 4 years of operation some 2 million tonnes of gypsum will be extracted but almost 7 million m³ of overburden will be relocated to the eastern part of the site.

Table 3.1 : Gypsum extraction rates and overburden relocation.

Phase No.	Gypsum			Overburden	
	area	tonnage	Cumulative (tonnes)	m3	Cumulative (m3)
	UB area C	280,000		194,400	
	1/2 UB area B	95,000		353,500	
1		375,000	375,000	547,900	547,900
2	LB area C1 & C2	870,000	1,245,000	390,146	938,046
3	LB 1/4D 1st	437,500	1,682,500	837,615	1,775,661
4	LB 1/4D 2nd	437,500	2,120,000	837,615	2,613,275
5	LB 1/4D 3rd	437,500	2,557,500	837,615	3,450,890
6 (6 years)	LB 1/4D 4th	437,500	2,995,000	837,615	4,288,504
7	1/2 UB area B	95,000	3,090,000	591,090	4,879,594
8	1/2 UB area A	60,000	3,150,000	785,221	5,664,815
9	LB area B	690,000	3,840,000	856,752	6,521,567
10	1/2 UB area A	60,000	3,900,000	785,221	7,306,788
11	1/4 LB area A	275,000	4,175,000	935,308	8,242,096
12	1/4 LB area A	275,000	4,450,000	935,308	9,177,404
13	1/4 LB area A	275,000	4,725,000	935,308	10,112,711
14 (10 years)	1/4 LB area A	275,000	5,000,000	935,308	11,048,019

Environmental Control

3.32 The company has and will continue to comply fully with the conditions of its existing planning permissions. In addition, the company have received an Integrated Pollution Prevention and Control Licence (No. 519) from the Environmental Protection Agency. The licence covers the activities of the existing opencast mine, the underground mine and the operations at the processing plant at Kingscourt. The licence was reviewed as recently as 2004 to incorporate the underground mine element of the Company's activities.

3.33 Table 3.2 lists the current monitoring procedures employed by the company in relation to the opencast mine. The monitoring procedures will continue to be applied to this proposal.

Blasting and Vibration

3.34 Since mining operations began at the site in 1989, over 600 blasts have taken place. Each blast is monitored using three NOMIS seismographs, each located at one of the three monitoring stations around the site. An additional NOMIS instrument, consisting of a geophone (recording vibration in 3 different directions and including a microphone to record air over pressure) is occasionally used to obtain additional blasting information. Each blast is carefully planned and since production commenced, the peak particle velocity limit as set in the planning permission has not been exceeded.

Dust

3.35 Three dust monitoring stations, with deposit gauges, are sited at different locations around the site boundary. A water tanker is used to suppress dust on all haul roads during dry conditions. The drill rig is equipped with a dust collection system. Both the primary crusher and the secondary crusher are enclosed. All conveyor belts are enclosed, as is the stockpile of crushed gypsum. A wheel wash system, located at the site exit point ensures that trucks leaving the site are washed and loose debris removed.

Effluent Treatment

3.36 The effluent at Knocknacran consists of groundwater which may have increased levels of sulphate due to its contact with gypsum or the overlying strata. Groundwater is pumped to a series of settling lagoons which allows undissolved solids to settle out. The effluent is then pumped to a holding tank where it is gravity fed to the local river by a series of controlled discharges. The automatic valves at the holding tank, which are computer controlled, open when the conductivity of the effluent is at a level that allows discharge without causing deleterious effects to the quality of the receiving water. Levels of sulphate are measured 5 metres upstream and 70 metres downstream of the discharge point. Both the receiving water and the effluent are sampled at regular intervals.

Table 3.2: Summary of environmental monitoring

Current Practices			Frequency
Air	Dust	Monitoring of ambient dust levels is carried out continuously and measured monthly at five-dust deposition sampling stations located around the existing opencast site.	Monthly
		Dust emissions from mining activities are visually checked on an on-going basis and water bowsers are used to suppress the dust as and when necessary.	On-going
Noise	Ambient	Ambient noise monitoring is carried out on a continuous and intermittent basis at three noise-monitoring stations located around the existing opencast site.	Monthly
	Blast	Air over-pressure levels are monitored during each blast occurrence at three monitoring stations located around the opencast site. Monitoring is also carried out at noise sensitive locations.	Every blast
Vibration	Vibrations	Vibration monitoring is carried out during each blast occurrence at three stations located around the site. Also carried out at noise sensitive locations.	Every blast
Water	Biological Assessment	A biological survey has been undertaken in the River Bursk, which receives the effluent discharge. This survey has been undertaken every three years to assess the quality of the water.	3 years
	Groundwater monitoring	Measurement of groundwater levels are carried out from a series of piezometers located around the site. New piezometers are monitored twice per month.	Monthly
	Emissions to water	Effluent sulphate and conductivity levels are monitored continuously and measured daily at the effluent discharge point. Water samples are taken at the effluent discharge point for a series of laboratory tests. Additional tests are performed quarterly for heavy metals.	Daily
			Weekly
	Surface water monitoring	Weekly visual checks are made on the surface water discharge location and quarterly samples are taken for a series of laboratory tests.	Weekly/Quarterly
Ambient surface water	Water samples are taken from the water receiving the effluent discharge, at 3 locations both upstream and downstream of the discharge point.	Monthly	

Planning Context

3.37 The proposed development as outlined within this Environmental Impact Statement is in accordance with the policies, aims and objectives of Monaghan County Council as outlined in the Draft Monaghan Development Plan 2006-2012.

3.38 The Draft County Development Plan contains a number of statements relevant to this proposal. The following is included on page 90 of the draft plan:

"County Monaghan contains reserves of mineral materials including stone, sand, gravel and peat which are worked at many locations across the county. The Council recognises the importance of quarrying and other extractive industries to the economic life of the county. However, the Planning Authority faces a challenge in facilitating the exploitation of the materials while minimising the impact on the environment. The planning authority will have regard to the 'Quarries and Ancillary Activities – Guidelines for Planning Authorities April 2004, issued by the Department of the Environment, Heritage and Local Government, in considering proposals for the quarrying industry." The Council have outlined a number of policies in relation to the extractive industry. They are;

EI 1 – "identify the location of all major deposits in the county (with the assistance of the Geological Survey of Ireland) and safeguard these resources for future extraction."

EI 2 – "Promote development involving the extraction of mineral reserves and their associated processes, where the Planning Authority are satisfied that they will be carried out in a sustainable manner without adversely impacting on the environment or on other land uses in the County."

EI 3 – "Restrict other development in the neighbourhood of existing extractive sites or sites which have significant resource potential, where such developments would limit the future exploitation."

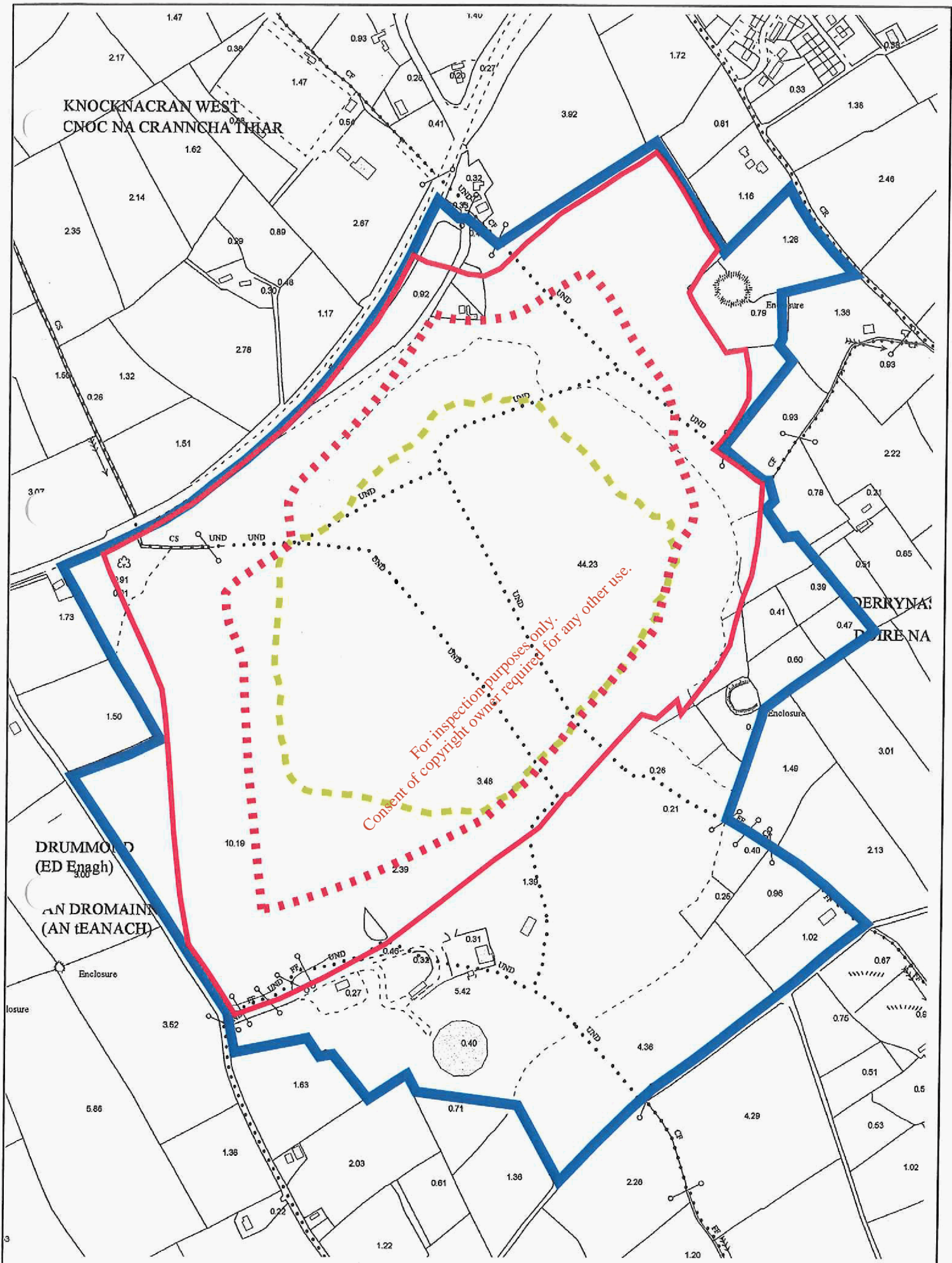
EI 4 – "Restrict development which would detrimentally impact on the natural or built environment or would otherwise be detrimental to matters of acknowledged public importance."

EI 5 – "Restrict extraction in close proximity to existing developments where potential sources of nuisance are considered to be incompatible."

EI 6 – "Ensure that land is reinstated and landscaped on a phased basis following the termination of extractive activities."

3.39 The proposed opencast mine extension accords with the policies of the Draft County Development Plan as outlined above.

3.40 In summary, the proposed development will allow for the sustainable extraction of the gypsum deposit, augmenting supplies from the company's underground facility. The proposal will operate in a manner which is not detrimental to the local environment. This Environmental Impact Statement outlines how the developer will meet its environmental responsibilities as required by the Local Authority.








KNOCKNACRAN WEST
CNOC NA CRANNCHA THAR

DRUMMOYD
(ED ENAGH)
AN DROMAINI
(AN TEANACH)

DERRYNA
DIRENA

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-  Planning Application Area
-  Property Boundary
-  Extent of Proposed Gypsum Extraction Area
-  Permitted Gypsum Extraction Area (Pl. Ref. No: 461/83)

 Fig 3.1: Existing and Proposed Opencast mine Extraction Areas.

Knocknacran Mine Extn. EIS	
Date: Feb. 2007	Job No.: 4904
 BRADY SHIPMAN MARTIN	

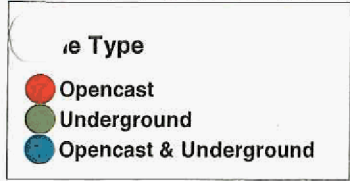
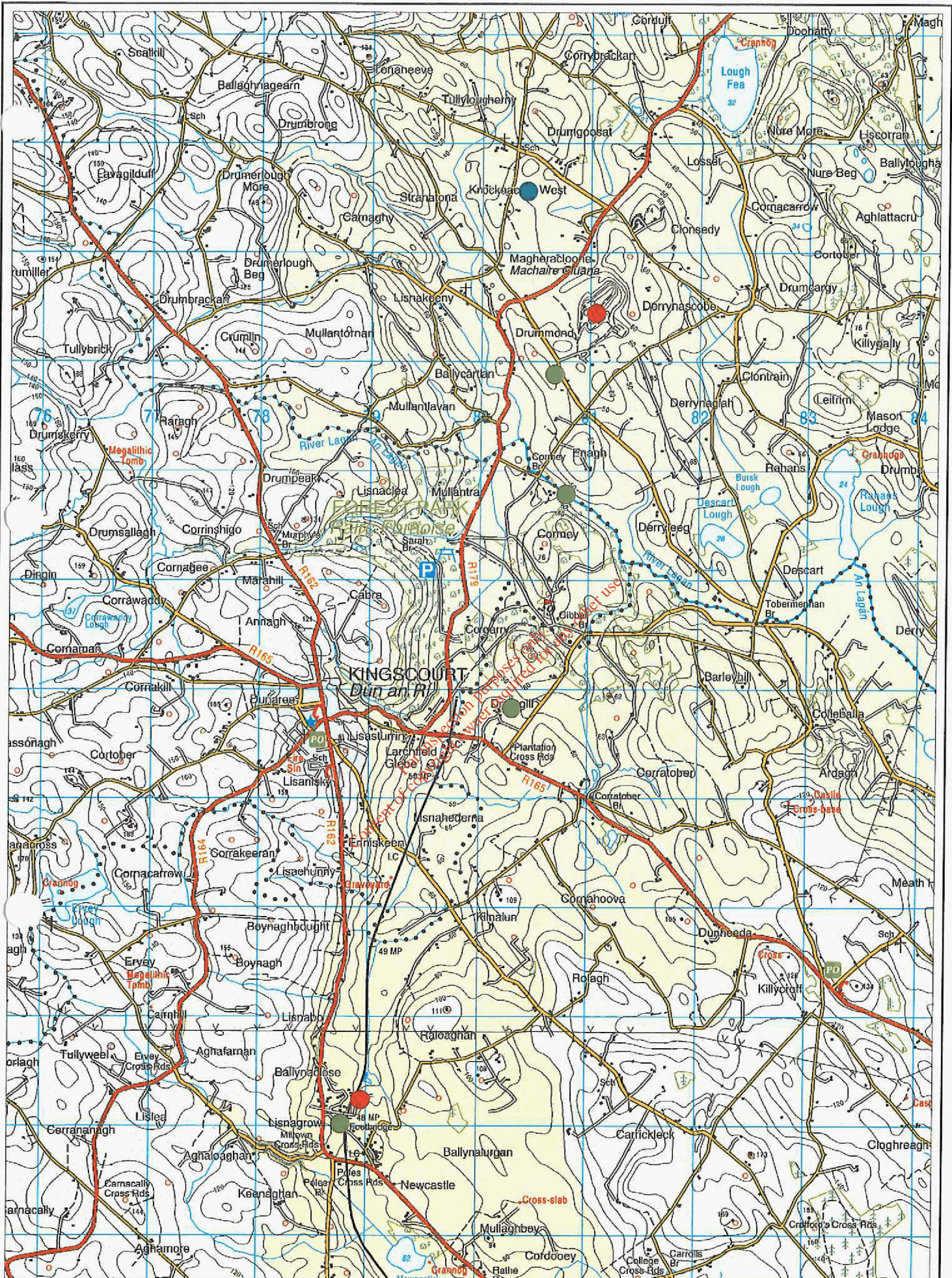


Figure 3.2: Location of Other Gypsum Mines.

Knocknacran Mine Extn. EIS	
Date: Feb. 2007	Job No.: 4904
 BRADY SHIPMAN MARTIN	



Plate 3.1: Current Opencast Pit Area Clearly Showing the 2 Seams of Gypsum Present at Knocknacran.



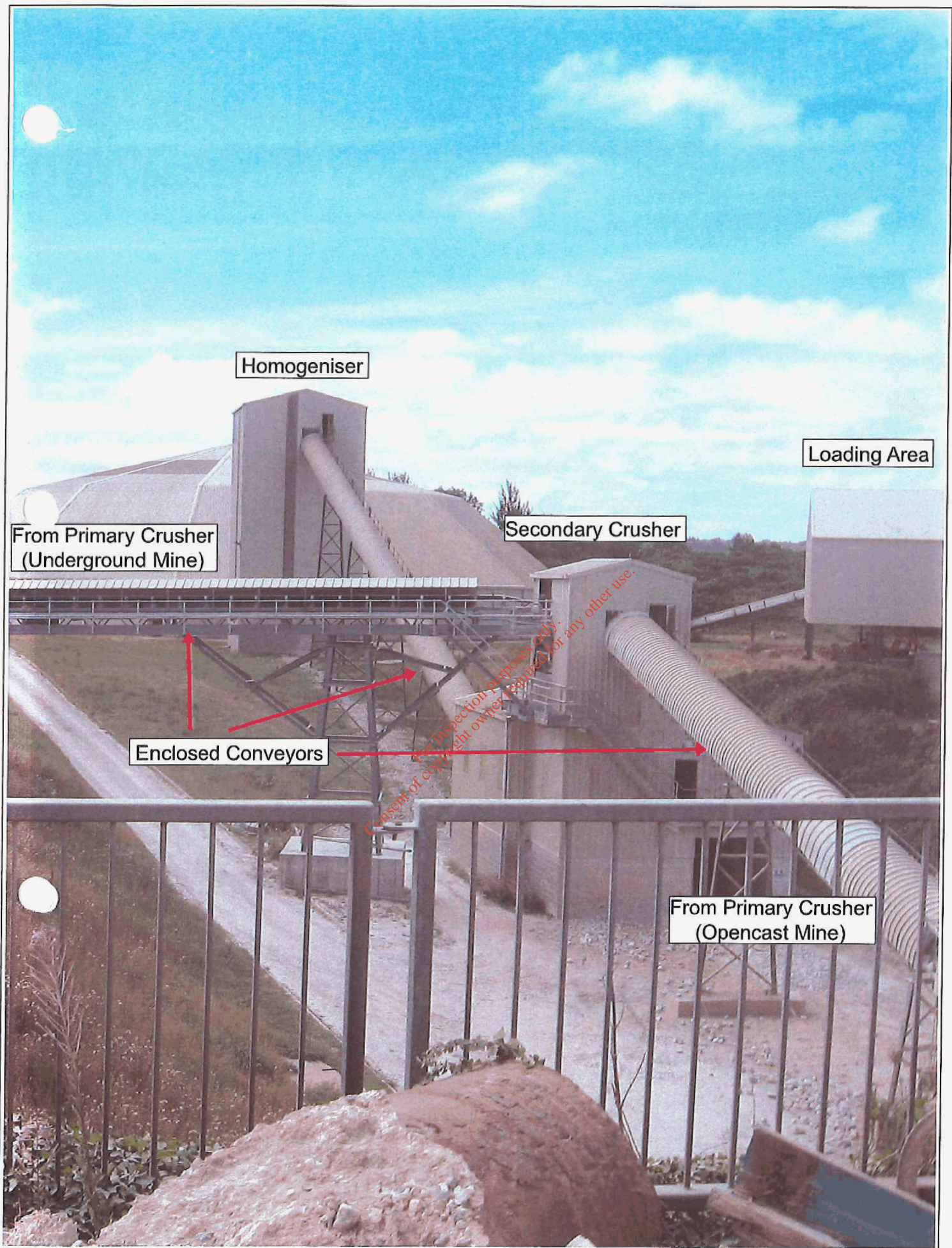


Figure 3.2: Existing Facilities at the Mine Site used for Processing Gypsum Prior to its Transportation Off-Site.





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Plate 3.3: Inside the Homogeniser: Material Enters from the Secondary Crusher and is Blended Before Conveying to the Loading Area.



4 HUMAN BEINGS

Introduction

General

- 4.1 This chapter of the Environmental Impact Statement assesses the predicted impact of the proposed development on the socio-economic characteristics of the surrounding area. The structure for assessing the impact of the development is based on guidelines prepared by the Environmental Protection Agency (EPA 2002).

Socio-economic

- 4.2 The proposed development site is located within the Electoral Division (ED) of Enagh. The Central Statistics Office (CSO) publishes statistics from information gathered from the census of population. A census is normally conducted every 5 years, however the 2001 census was postponed until 2002 due to the Foot and Mouth outbreak. The 2006 census was carried out in April and as yet only preliminary statistics are available. The remainder of the statistics used in this chapter are from the 2002 census.

Receiving Environment

Demography

- 4.3 Table 4.1 below shows the fluctuations in population at a local, County and National level. Enagh ED has experienced a rise in its population between 1996 and 2002 and again to 2006 of 2.9% and 4.3% respectively. The rise in population is marginally below that experienced in County Monaghan. The increase in the population of both the ED and the County is significantly lower than the state average.

Table 4.1: Population change at local, regional and national level between 1996, 2002 and 2006.

Area	Year			Percentage Change 1996-2002	Percentage Change 2002-2006
	1996	2002	2006*		
Enagh ED	656	674	704	2.90%	4.30%
Monaghan	51,313	52,772	55,816	2.84%	5.77%
Ireland	3,626,087	3,917,203	4,234,925	8.03%	8.11%

Source: Central Statistics Office 1996, 2002

* Preliminary Figures only

Settlement Distribution

- 4.4 Only a small percentage of the 704 people live in the direct vicinity of the site, as indicated by the location of dwelling houses in the area (See Figure 4.1). Principally residential developments in the area are 'one-off' rural houses serving local needs, with the exception of the Clonsedy residential estate which is located to the north east of the opencast mine.

Neighbouring Land Use

- 4.5 The proposed extension to the opencast mine adjoins a number of neighbouring land uses. The Company's underground mine which was granted full planning permission in 2004 is situated beneath adjoining lands. The majority of lands surrounding the site are predominantly used for agricultural purposes, the dominant agricultural use is livestock grazing, either by cattle or sheep. As stated there is some residential housing in the area, but it is sparse and generally confined to linear settlement patterns, mainly along local roads, see Figure 4.1.

Economic Activity & Employment

- 4.6 Irish Gypsum Ltd., through its mining and processing works at Knocknacran, contributes significantly to the local, regional and national economies. The Company provides employment for up to 55 people on a full-time and seasonal basis through its mining activities and generates significant additional employment in various service and supply industries.
- 4.7 Table 4.2 contains the analysis of employment statistics for Enagh ED between the years 1996 and 2002. While the population in Enagh ED has increased by only 2.9% between 1996 and 2002, the 'available workforce' and the percentage of people classed as being 'at work' increased substantially by 18.7% and 17.6% respectively. This is a reflection of the availability of opportunities for employment in the local and neighbouring areas. Correspondingly, 'unemployment' levels have declined dramatically over the inter censal period by over 44%.
- 4.8 It is worth noting that there are a number of significant industries operating in the area such as Irish Gypsum Ltd but also including Kingspan in Kingscourt and Rye Valley Foods and Bose in Carrickmacross. The employment opportunities afforded to the resident population, both directly and indirectly, is a contributing factor to the thriving local economy.

Table 4.2: Employment analysis for Enagh ED.

	1996	2002	Percentage Change
Available workforce*	407	483	18.67%
At work	222	261	17.57%
Unemployed**	43	24	-44.19%

Source: Central Statistics Office 1996 and 2002
 Note: * Working population between 15 and 65 years of age
 ** 1st job seekers plus unemployed

- 4.9 Table 4.3 contains a breakdown of employment by profession. The dominant employment industry for residents in Enagh ED is undoubtedly manufacturing. As stated, Enagh ED is located close to two of the strongest manufacturing towns in Counties Cavan and Monaghan, namely Kingscourt and Carrickmacross. The level of participation in this industry is twice that of the national average. Commerce is the second highest employment industry but this percentage is less than half that of the manufacturing industry and is below the county and national averages for this sector.

Table 4.3: Employment by profession for Enagh DED, County Monaghan and the State, 2002.

	Agriculture	Building & Construction	Manufacturing & Industrial	Commerce	Professional Services
Enagh ED	14.9%	8.8%	44.1%	18.8%	10.0%
Monaghan	13.5%	10.7%	19.3%	20.1%	14.4%
Ireland	5.9%	9.1%	16.0%	26.9%	15.4%

Source: Central Statistics Office 2002

Socio-Economic Profile

- 4.10 A socio-economic profile of the study area has been derived from statistics contained in the Small Area Population Statistics (SAPS) as supplied by the Central Statistics Office. The profile is detailed below in Table 4.4.

Table 4.4: Socio-economic profile for Enagh ED, County Monaghan and the State, 2002.

	Enagh ED	Monaghan	Ireland
ECONOMIC STATUS			
Residents classified as retired	6.2%	8.5%	8.5%
Residents classified as at work	38.7%	40.0%	41.9%
Unemployed	3.6%	4.4%	4.1%
SOCIO ECONOMIC GROUPS			
Manager / Employer	9.8%	17.4%	15.5%
Skilled Manual	17.4%	12.8%	10.2%
Unskilled manual	3.0%	5.3%	4.9%
EDUCATION ATTAINMENT			
Primary and lower secondary	49.3%	54.5%	42.6%
Third level	15.6%	16.7%	24.7%
HOUSEHOLDS			
Single person h'holds	19.5%	22.2%	21.6%
Couples with children	49.5%	45.4%	41.4%

Source: Central Statistics Office 2002

- 4.11 The level of residents who are classed as being 'retired' is lower in Enagh ED than in County Monaghan and the state as a whole. This corresponds to a higher percentage of households within the ED which contain 'couples with children'. This would suggest that the ED is one which holds a stable, family orientated population.
- 4.12 There is relative unity amongst the percentages of the population 'at work' between the three areas analysed, though the figure for Enagh ED is marginally lower than the County and State averages. The percentage of the population who are unemployed is lower than the other areas analysed indicating that there are plenty of employment opportunities available to residents.
- 4.13 The socio-economic groups highlights the type of work available and the level at which those employed are working. The percentage of the population who are employed as either 'managers or employers' is significantly lower for Enagh ED than the other areas analysed. This is offset by the higher percentage of the population who are employed as 'skilled manual labour' and the lower percentage of the population employed as 'unskilled manual labour'. Again it is a reflection of the opportunities available to the inhabitants of Enagh ED from significant manufacturing companies in nearby Kingscourt and Carrickmacross who require highly skilled operatives.
- 4.14 There are some discrepancies between the three areas in terms of educational attainment. However in considering all the relevant information as outlined above, several conclusions can be drawn. Enagh ED is a typical rural area where agriculture was the dominant industry but has over recent years been superseded by the location of significant manufacturing industries close by. The decline in the importance of agriculture has resulted in an increase in the available workforce, who have succeeded in obtaining employment in other industries.

- 4.15 The employment opportunities offered close to the area has resulted in a growing, family orientated area, where the population would be expected to stabilise and indeed increase, as has been the case between 2002 and 2006. The proposed development will help to sustain current employment levels.

Impact of the Development

- 4.16 Ultimately, all of the effects of a development on the environment impinge upon human beings, both positively and negatively. Direct effects relate to matters such as water and air quality, noise, and landscape change. Indirect effects relate to such matters as flora and fauna.
- 4.17 Accordingly, the topic of human beings is addressed in the succeeding sections of the Environmental Impact Statement by means of an appraisal of the effects of the development on the environment in general, of which human beings are an integral part.
- 4.18 The proposed extension to Knocknacran opencast mine will have a positive impact in terms of maintaining employment levels currently experienced in the gypsum works and opencast mine. Irish Gypsum Ltd's current mining operations employ up to 55 people on a full-time basis, however an additional 35 people approximately will be required on a seasonal basis to assist in soil stripping operations. Soil stripping is normally carried out between the months of May to September.
- 4.19 The applicant has engaged in a consultation process involving neighbours and local landowners (see Appendix 1). Predominantly local concerns relate to noise and vibration which is dealt with in Chapter 10.
- 4.20 In the case of the current development proposed by the company, impacts on human beings, both direct and indirect, were found to be of minor significance. However, all matters of potential concern are dealt with in the following chapters.

Mitigation Measures

- 4.21 The topic of human beings is addressed in the succeeding sections of the Statement by means of an appraisal of the effects of the development on the environment in general, including human beings. Where appropriate, mitigation measures to reduce adverse impacts are identified and incorporated into the proposal.

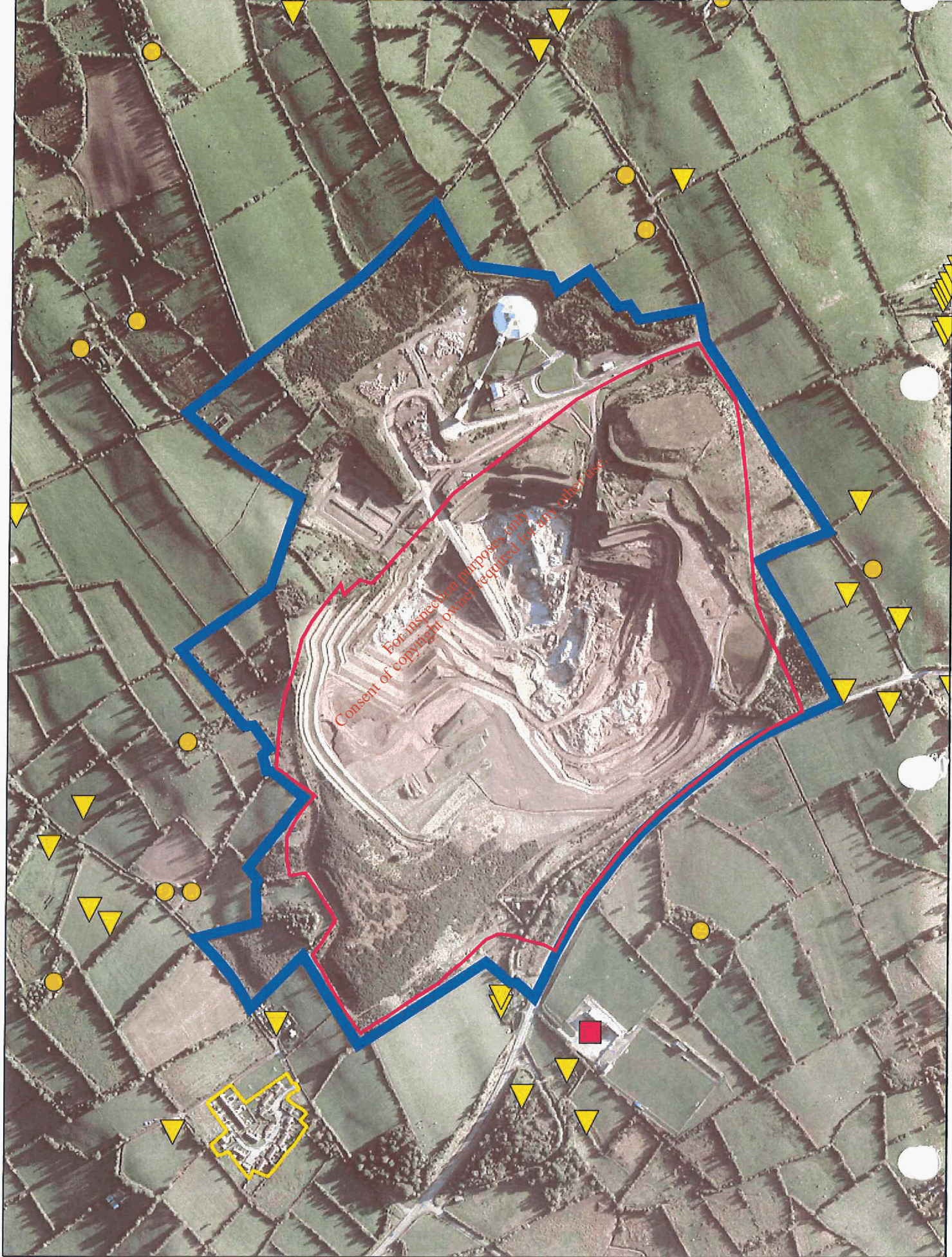


Fig 4.1: Location of Neighbouring Properties.

Application Site Boundary
Lands within the control of the landowner



- Clonsedy Housing Estate
- Magheraclone Community Centre
- Farm Buildings/unoccupied Houses
- Residential Properties



5 FLORA & FAUNA

Introduction

- 5.1 The site is located in an undulating area of low ridges and hills trending NNW-SSE. In general the soils in the area are heavy and prone to water logging and this is most apparent in the hollows where patches of rushes are frequent. Cattle grazing is the predominant type of farming and few fields have been enlarged, except along the major roads where there has been some re-seeding.
- 5.2 The site was visited in March and May 2002 when the habitat quality, both flora and fauna were assessed by a walkover survey. It was also checked in July 2006 to see what changes, if any, had occurred.

Habitats and Vegetation

- 5.3 The opencast mine pit area is currently surrounded by disturbed areas of ground, including roadways, and places where loose material has been dumped. This would be classified by Fossitt (2000) as recolonising bare ground (ED3). There are also settlement ponds (artificial lakes and ponds FL8) and further away slopes of scrub (WS1) - mostly gorse - and some patches of dry-humid acid grassland (GS3).

Bare ground

- 5.4 This habitat occurs adjacent to pathways and in a dumping area for rock north-east of the homogeniser. It is colonised by characteristic plants of damp, disturbed ground and subsoil which are then infiltrated by the species from the more established vegetation nearby. Coltsfoot *Tussilago farfara*, greater plantain *Plantago major*, annual meadowgrass *Poa annua*, daisy *Bellis perennis*, mouse-ear *Cerastium fontanum*, toad rush *Juncus bufonius* and hairy willowherb *Epilobium parviflorum* are widespread but there is also

<i>Veronica serpyllifolia</i>	thyme-leaved speedwell
<i>Leontodon saxatilis</i>	lesser hawkbit
<i>Hypochaeris radicata</i>	catsear
<i>Trifolium dubium</i>	yellow trefoil
<i>Agrostis stolonifera</i>	creeping bent
<i>Leucanthemum vulgare</i>	dog daisy
<i>Carex viridula</i>	yellow sedge
<i>Myosotis discolor</i>	changing forget-me-not
<i>Cardamine pratensis</i>	lady's smock
<i>Barbarea vulgaris</i>	winter cress
<i>Sagina procumbens</i>	pearlwort
<i>Medicago lupulina</i>	black medick
<i>Calliergon cuspidatum</i>	a moss

Settlement lagoons

- 5.5 The ponds in the south-east corner of the site have a few broad-leaved plants associated with them as well as algae. Broad-leaved pondweed *Potamogeton natans* is frequent while water plantain *Alisma plantago-aquatica*, bulrush *Typha latifolia*, marsh willowherb *Epilobium palustre*, water horsetail *Equisetum fluviatile* and jointed rush *Juncus articulatus* are found in peripheral ditches.

5.6 The banks are generally of loose stone and this is covered by rose-bay *Chamerion angustifolium*, shield fern *Polystichum setiferum* and bracken *Pteridium aquilinum* with a little sneezewort *Achillea ptarmica*. Stable slopes nearby are characterised by the lichen *Cladonia pyxidata*.

5.7 The north-west lagoon seems richer in species and Hannon (1998) records marsh horsetail *Equisetum palustre* there as well as much bulrush *Typha latifolia*.

Scrub

5.8 Gorse scrub covers the edges of the site around the homogeniser and also occurs north-east of the active opencast mine. The main species are common gorse *Ulex europaeus*, bramble *Rubus fruticosus* and broom *Cytisus scoparius* though there are occasional bushes of grey willow *Salix cinerea* as well. Little ground flora occurs as the scrub is relatively young. There is some common violet *Viola riviniana* but the main variety is of plants growing around the edges of clearings, for example bush vetch *Vicia sepium*, early vetch *V.angustifolia*, meadow vetchling *Lathyrus pratensis*, knapweed *Centaurea nigra*, curled dock *Rumex crispus* and rushes *Juncus spp.*

5.9 A small amount of gorse scrub also occurs beside the north-west lagoons where it is adjacent to planted willow, alder and ash trees. Spotted orchid *Dactylorhiza fuchsii* is a feature here (Hannon 1998).

Damp grassland

5.10 Most of the grassland around the plant is developed on overburden and where this has stabilised, as it has amongst the gorse at the south-eastern end, sweet vernal grass *Anthoxanthum odoratum* is the dominant species. It grows with Yorkshire fog *Holcus lanatus*, red fescue *Festuca rubra*, common bent *Agrostis capillaris* and meadow foxtail *Alopecurus pratensis*, depending on soil quality and proximity to water. Glaucous sedge *Carex flacca* is usually present, together with the woodrushes *Luzula multiflora* or *L.campestris*. Other species established include

<i>Prunella vulgaris</i>	primrose
<i>Juncus effusus</i>	soft rush
<i>J.acutiflorus</i>	sharp-flowered rush
<i>Ranunculus acris</i>	field buttercup
<i>Trifolium pratense</i>	red clover
<i>Rumex acetosa</i>	sorrel
<i>Potentilla anglica</i>	trailing tormentil
<i>Lotus pedunculatus</i>	greater birdsfoot trefoil
<i>Potentilla anserina</i>	silverweed
<i>Equisetum arvense</i>	field horsetail
<i>Festuca arundinacea</i>	tall fescue
<i>Cirsium palustre</i>	marsh thistle

5.11 Flat areas around the buildings are occasionally mown and add crested dogtail *Cynosurus cristatus*, white clover *Trifolium repens*, common birdsfoot trefoil *Lotus corniculatus* and knapweed *Centaurea nigra*. Compact rush *Juncus conglomeratus* seems characteristic here also in the nutritionally poor conditions. The flat areas contrast with a few seasonal ditches where lady's smock *Cardamine pratensis*, great willowherb *Epilobium hirsutum*, marsh bedstraw *Galium palustre* and bog stitchwort *Stellaria uliginosum* occur.

5.12 The mounds north-west of the gate have a less diverse composition with good grass growth on the side slopes and rushes and grasses on the top.

Adjacent habitats

5.13 The site of application is surrounded by farmland for the most part with a wetland slightly east of south and trees and woodlands on the edge of the Lagan river to the southwest.

- 5.14 The wetland is developed in an inter-drumlin hollow and is crossed by a roadway. It was probably derived from a cutover bog but is now a wet fen with a good cover of willows and water plants, somewhat reduced by roadside dumping. Much of the surface is quaking and difficult to access. Characteristic trees are downy birch *Betula pubescens* and willows *Salix cinerea*, *S.aurita*, *S.fragilis*, *S.alba*, while the herbs include

<i>Phragmites australis</i>	common reed
<i>Phalaris arundinacea</i>	reed grass
<i>Equisetum fluviatile</i>	water horsetail
<i>Potentilla palustris</i>	marsh cinquefoil
<i>Angelica sylvestris</i>	wild angelica
<i>Lythrum salicaria</i>	purple loosestrife
<i>Juncus effusus</i>	soft rush
<i>Epilobium palustre</i>	marsh willowherb
<i>Holcus lanatus</i>	Yorkshire fog
<i>Agrostis canina</i>	velvet bent
<i>Carex rostrata</i>	bottle sedge

- 5.15 The woodland by the Lagan River is derived from planting with much beech *Fagus sylvatica*, sycamore *Acer pseudoplatanus* and ash *Fraxinus excelsior* and in damp places alder *Alnus glutinosa*, goat willow *Salix caprea* and birch *Betula pubescens*. A full range of herbs occurs including wood speedwell *Veronica montana*, red campion *Silene dioica* and yellow pimpernel *Lysimachia nemorum*.

Fauna

- 5.16 Evidence of both hare and fox was seen around the opencast mine site and it is very likely that pygmy shrews occur in the scrub. A few rabbit burrows were found in surrounding fields.
- 5.17 The opencast mine area itself is currently too open to be valuable to bats but there are better habitat conditions in the general area outside. The Lagan River valley, surrounding hedgerows and the south-eastern wetland form a unit of high potential importance for these animals.
- 5.18 As regards birdlife the scrub areas on site may be singled out as a distinct habitat, offering breeding and feeding grounds to linnet, meadow pipit, reed bunting, sedge warbler and grasshopper warbler as well as wren, dunnoek, blackbird etc. The hedges add chaffinch, blue tit, chiffchaff, willow warbler, chiffchaff and song thrush. The settlement ponds support moorhen and have good feeding for sand martin and swallow. Rook, magpie, starling and jackdaw are seen in the general farmland. A pair of skylarks was seen on one visit within the mine site.
- 5.19 Butterflies are relatively frequent and there are records for ringlet, speckled wood, meadow brown, small tortoiseshell, green-veined and small whites, common blue and the migrants - painted lady and peacock. Six-spot burnets (a day-flying moth) were also seen.

Evaluation

- 5.20 The habitats and species found within the site are typical of a mine or gravel quarry and contain no species of special interest as far as is known. The area of gorse scrub is notable but again is not rare. Good habitats occur in the surrounding area at the Lagan River and the south-eastern wetland.

Designations

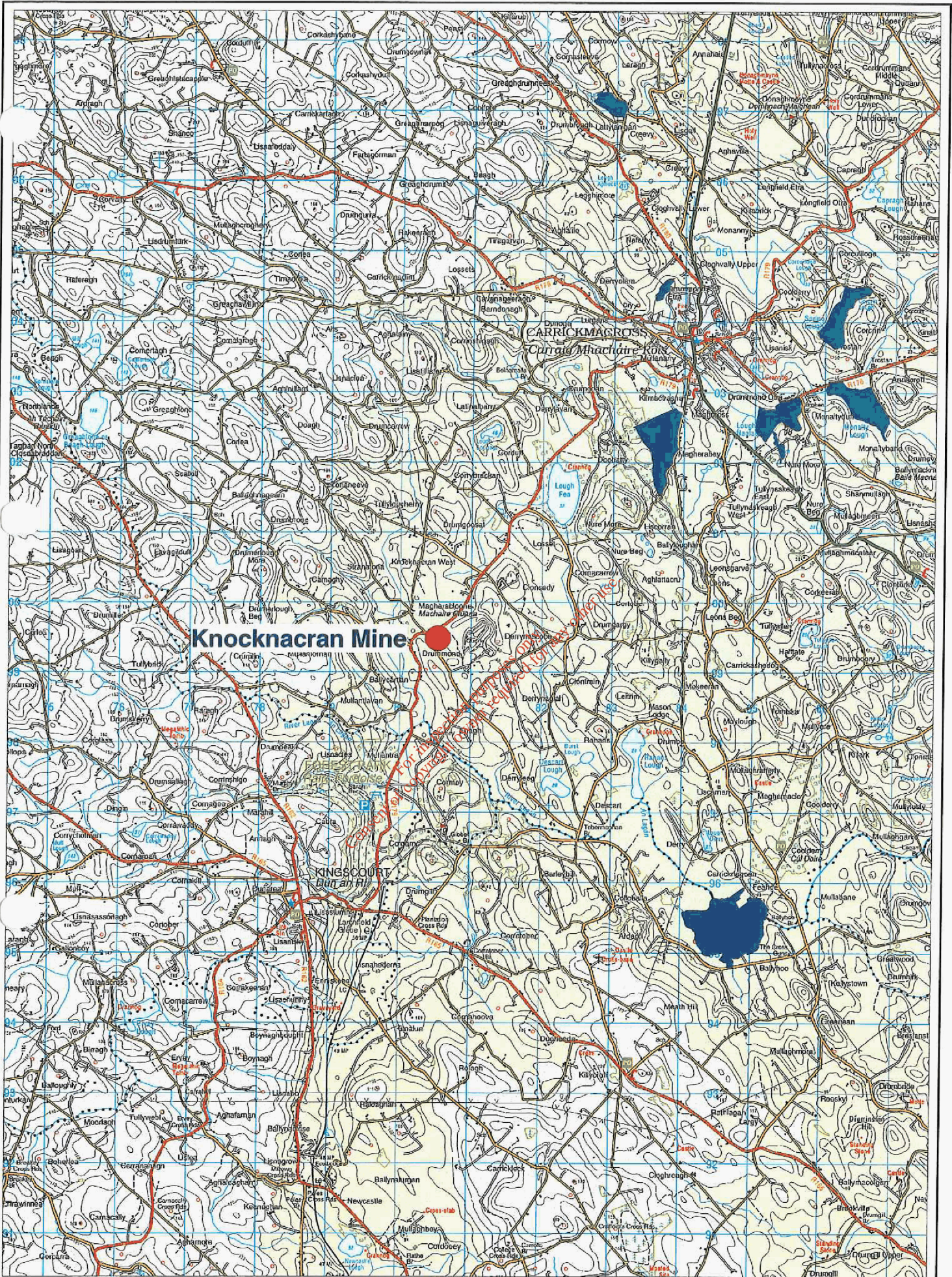
- 5.21 There is no ecological designation (cSAC, SPA or pNHA) (see Figure 5.1) on any of the area and little likelihood of one being applied. The Lagan River, though not designated a salmonid water, does contain salmon (which are listed in Annex II of the Habitats Directive, 92/43/EEC).
- 5.22 No plant species included in the Flora Protection Order 1999 occur on site or in the surrounding area.

Impacts of Development

- 5.23 The proposal involves the extension of the opencast mine, resulting in the removal of gypsum and the relocation of overburden within the application site. Overburden will be relocated within the site, see Appendix 3.
- 5.24 The result in habitat terms will be the loss of a considerable area of gorse scrub and grassed areas and also the north-western settlement lagoon. Such changes will have direct ecological effects, leading to a reduction in the dependent organisms and there may well be localised the loss of species, particularly invertebrates. The south-eastern gorse scrub and surrounds will become relatively more important for the group of grassland plants, birds, butterflies etc that are present today.
- 5.25 On cessation of mining and implementation of the closure plan areas of calcareous subsoil or rock will remain exposed which will become colonised with species-rich vegetation similar to that around other abandoned gypsum mines. This would produce a centre of biodiversity, at least for flowering plants and insects.
- 5.26 Overall these impacts are significant only on a local scale and will have no real influence on heritage values in the county.
- 5.27 The larger void of the opencast mine will have no significant effect on the wetland to the southeast as the heavy soils will support the present water table close to or at the surface. This is discussed in detail in Chapter 7.


Mitigation Measures

- 5.28 Given the nature of the site, the history of mining and industrial activities the proposed extension to the mine as detailed in this EIS will not have an adverse impact on Flora and Fauna.



 **Natural Heritage Area (NHA)**

Figure 5.1: Location of nearest designated sites.



Knocknacran Mine Extn. EIS

Date: Feb. 2007 Job No.: 4904

 **BRADY SHIPMAN MARTIN**

6 GEOLOGY & SOILS

Introduction

- 6.1 The following is a description of the geology and soils of the area in which the Knocknacran opencast mine is situated, together with an assessment of the potential impact of the proposed extension of the opencast mine on these aspects of the environment. The section also includes details of mitigation measures incorporated into the design to avoid any potential negative impacts.

Receiving Environment

Overburden Geology

- 6.2 According to soil mapping compiled by the National Soil Survey (Ref. 6.1), the principle soil types underlying the area in which the Knocknacran opencast mine is situated are grey brown podzolics and associated gleys (Figure 6.1). The parent material of these soil types is generally limestone glacial till. These soil types are classified as part of the drumlin physiographic division, which is characterised by drier mineral and organic soils.
- 6.3 According to subsoil mapping compiled by Teasagc (Ref. 6.2), the area immediately surrounding the opencast mine consists of made ground and the opencast mine itself of rock at the surface (Figure 6.2). The surrounding area is underlain predominantly by tills chiefly derived from Lower Palaeozoic rocks with deposits of alluvium and glaciofluvial sands and gravels confined to the Magheracloone Stream channel to the west, the River Lagan channel to the south and the River Burske channel to the east and southeast. Isolated deposits of peat occur to the east of the opencast mine within topographical hollows.
- 6.4 Based on the geological logs from exploration boreholes drilled by Irish Gypsum Limited (IGL) and from monitoring boreholes installed by Minerex Environmental Limited associated with the opencast mine and on the results of a 3km radius search of the National Well Database compiled by the Geological Survey of Ireland, the thickness of overburden ranges between 1-50m, with an average thickness of 13.2m. Therefore there is considerable variation in thickness of overburden over the area, typical of drumlin landscapes where the localised topographic highs are associated with thick overburden deposits (Figure 6.2).
- 6.5 The overburden and interburden (weathered bedrock beneath the overburden) within the opencast mine area has been stripped off to expose the underlying gypsum beds and has been used to form a batter¹ of material around the perimeter of the opencast mine. The batter is designed to provide a stable slope of material while exposing the gypsum beds at vertical faces.
- #### Bedrock Geology
- 6.6 The area in which the site is located is underlain by the Kingscourt Gypsum Formation, which is described as mudstone with gypsum and anhydrite of Permian age and are part of the Kingscourt Outlier, a half-graben preserving Carboniferous and Permo-Triassic rocks (Ref. 6.3) (Figure 6.3). The Permo-Triassic sequence within this outlier is predominantly red-brown mudstone and sandy mudstone up to 550m thick, within which are two distinct gypsum/ anhydrite beds in the lower part of the sequence.
- 6.7 The gypsum deposits within the Kingscourt Outlier are confined to a narrow north-south oriented belt 12km in length and 1.2km in width and form two distinct beds

¹ A backward slope in the face of a wall or bank.

- (Figure 6.3). The lower gypsum bed comprises of gypsum and anhydrite which are grey in colour and varies in thickness between 20-35m and the upper gypsum bed which is red in colour and can exceed 9m in thickness (Ref. 6.4). These sedimentary rocks record the deposition of sediments in arid deserts and temporary seas that were periodically dried out to precipitate thick evaporite sediments of gypsum (Ref. 6.3).
- 6.8 A typical sequence within the Kingscourt Gypsum Formation consists of a basal conglomerate member of some 0-18m in thickness, which is overlain by marl and mudstone which are collectively termed the lower mudstone, the thickness of which varies between 2-25m (Figure 6.4) (Ref. 6.3). Overlying the lower mudstone is the lower gypsum, which is separated from the upper gypsum by the middle mudstone of between 6-12m in thickness. The upper gypsum is overlain by the upper mudstone, which is between 26-35m in thickness (Figure 6.4).
- 6.9 The Kingscourt Gypsum formation is underlain by Carboniferous undifferentiated micaceous shale, siltstone and sandstone, and occasional thin coal beds of Westphalian and Namurian age, which outcrop in small areas to the south and north of the Kingscourt Outlier (Ref. 6.3) (Figure 6.3). The Kingscourt Sandstone formation is the youngest of the sequence and outcrops immediately to the east of the Kingscourt Fault. It is comprised of a siltstone member of 80-100m thick overlain by a sandstone member, up to 300m thick, which are typically thick bedded with parallel and cross lamination (Ref. 6.3).
- 6.10 Dolerite sills occur in the Permo-Triassic sequences at Kingscourt, with the principal intrusion in the middle mudstone between the two gypsum members, with a maximum thickness of 60m (Ref. 6.4) (Figure 6.4). A secondary intrusion is generally restricted to the lower mudstone with a maximum thickness of 8m. These sills are interpreted to have been hydrothermally altered as they were being intruded, resulting in susceptibility to weathering and being incompetent in places (Ref. 6.4). These sills are water-bearing where altered.
- 6.11 The Permo-Triassic rocks occur in a series of open north-east trending folds, with strata dipping to the west, towards the Kingscourt Fault, the western boundary of the outlier, at an angle of between 10° and 30° (Ref. 6.4). The Kingscourt Fault has a down-throw to the east of about 1.5km (Ref. 6.4). There are several other major north-south trending faults within the Permo-Triassic rocks, with opposed throws of up to 150m, forming the graben framework (Ref. 6.4) (Figure 6.3). In previous underground workings, none of these faults have been found to be significant water conduits (Ref. 6.7).
- 6.12 Structural mapping of the Knocknacran opencast mine area, compiled by Irish Gypsum Limited as based on data from exploration boreholes, shows two major north-south trending faults to the west of the current opencast mine extent (Figure 6.5). One fault (henceforth referred to as Fault A) underlies the current batter along the southwestern edge of the opencast mine, while a second fault (Fault B) is mapped 500m to the west. These faults downthrow the lower gypsum bed by 30m and the upper gypsum bed by approximately 10m to the west. Further minor faults form a dendritic pattern through the centre of the opencast mine (Figure 6.5). An interpretative report on the hydrology and hydrogeology of the Knocknacran opencast mine prior to its development details a significantly increased gradient between exploration boreholes either side of an inferred fault where Fault A has since been mapped and suggests that the fault acts as a low permeability barrier to groundwater movement (Ref. 6.6).
- 6.13 There is substantial evidence of post-depositional weathering or solution on the upper surfaces of the gypsum beds as seen in the east of the deposit exposed in the opencast mine (Ref. 6.4). However no major cave systems have been encountered in either the current opencast mine or underground workings.

Reserve Geology

- 6.14 The gypsum deposits within the Kingscourt outlier have been subject to extensive underground mining in the past to the north and northwest of the Knocknacran opencast mine. Here the decommissioned Drumgoosat Mine extends to a maximum depth of 113m below ground level, the workings of which are exposed at the base of the Knocknacran opencast mine where pillars of natural undisturbed mineral are visible. The underground workings are currently used to store mine effluent in times of low flow in the River Burske as part of the facilities water management system. To the south and southwest of the Knocknacran opencast mine is the Drummond Mine which has been in operation since 2005. The lower gypsum bed ranges between 20-30m in thickness over the planned extent of the Drummond Mine, the workings of which are planned to extend to approximately 218m below ground level.
- 6.15 Within the area surrounding the Knocknacran opencast mine, the sub-outcrop of the lower gypsum bed underlies the entire opencast mine area extending as far as the settlement ponds to the east and as far north as the extent of the decommissioned Drumgoosat underground workings (Figure 6.5). The sub-crop of the upper gypsum underlies the western side of the opencast mine only and is well exposed in the western face and part of the northern face (Figure 6.5). Bands of dolerite and mudstone are also visible in the exposed opencast mine faces.
- 6.16 Currently the base of the Knocknacran opencast mine ranges between -15 and 0mOD, which equates to approximately 50-65m below ground level (Figure 6.5). The lower gypsum bed extends to -20mOD, or 70m below ground level, within the existing extent of the opencast mine but extends to -35mOD, or 85m below ground level, within the proposed opencast mine extent.
- 6.17 Evaluation of the additional gypsum reserves is based on the extent of the lower gypsum bed available between the proposed batter and the existing pit lower bed extraction. The extent and design of the proposed batter is based on the following parameters:
- The total waste thickness i.e. overburden plus interburden (weathered mudstone);
 - A vertical face to the gypsum;
 - A 1V:2H slope angle in the waste material;
 - The gypsum (tonnes) to overburden (m^3) ratio to a maximum of 1:1.5;
 - Incorporation of a mining exclusion zone around the houses in the north to a radius of 150m;
 - A 20m barrier along the sides of all public roads and archaeological features;
 - The batter to remain entirely within Company-held land.
- 6.18 Based on data compiled by Irish Gypsum Limited from exploration boreholes, the total waste thickness, consisting of overburden and interburden, within the proposed opencast mine extent ranges from 0.8m to 82.44m, with an average of 23.4m (Ref. 6.5). A slope stability assessment prepared by Atkins Global uses minimum strength parameters from the existing stable slope to determine parameters for each stratum which will be encountered during the construction of the proposed batter. The values for each stratum are detailed below.

Table 6.1 Strength parameters of overburden and interburden at Knocknacran

Soil Type	Unit Weight (KN/m ²)	Internal Angle of Friction (ϕ')	Cohesion (c')
Current bund material	20	30	1
Firm boulder clay	20	30	1
Stiff to very stiff boulder clay	20	32	1
Mudstone (weathered)	20	35	0

- 6.19 The evaluation of the lower bed reserves is based on data compiled by Irish Gypsum Limited from exploration boreholes from within the proposed areas of extraction and also data from exploration boreholes from outside these areas in the interim prior to

the planned installation of additional boreholes. Fault A is the proposed western limit of extraction due to the downthrow which would require a significantly larger batter for a small extraction tonnage. The lower gypsum bed reserves are estimated at 3.94 million tonnes with an additional 0.47 million tonnes of anhydrite (Ref. 6.5). All reserves have been calculated with a 10% contingency factor due to the uncertainties surrounding anhydrite content, seam thickness and seam continuity.

- 6.20 The evaluation of the upper bed reserves is based on those occurring within the lower gypsum bed take. The upper gypsum bed reserves are estimated at 0.59 million tonnes with no anhydrite (Ref. 6.5).
- 6.21 Due to extensive mining in the past and subsequent increase in void space, the gypsum beds have a reduced capacity to store groundwater, in particular to the north and northwest of the Knocknacran opencast mine and therefore are most sensitive to dewatering operations. Due to the weathered and altered nature of the dolerite sills and subsequent enhanced capacity to transmit groundwater, these units are also highly sensitive to dewatering operations. The mudstone members are likely to have low permeabilities in the region of 1×10^{-11} – 1×10^{-8} m/s, leading to little groundwater storage or movement and are least sensitive to dewatering operations.

Potential Impacts

- 6.22 The proposal for the extension of the Knocknacran opencast mine is to redefine the batter to as far as is practical within the boundaries of IGL ownership to expose the lower gypsum seam beyond the current limits. Therefore the main impact on the geology will be the removal of the gypsum deposits from the subsurface and the exposure of overlying material within the slopes surrounding the development. The depth of the proposed extension is dictated by the depth to which the lower gypsum bed extends, which is mapped to be in the region of -35 - +10mOD, or 40-70m below ground level, in line with the current pit.
- 6.23 The proposed redefinition of the existing batter will required to be redesigned to effectively eliminate the risk of slope failure.

Design, Operation & Mitigation Measures

- 6.24 The proposed batter is designed to ensure that the risk of slope failure is effectively eliminated and includes appropriate mitigation measures based on experience at the current opencast mine, such as a vertical face to the gypsum, a 1V:2H slope angle in the waste material, a mining exclusion zone around housing of 150m and a 20m barrier along the sides of all public roads and archaeological features (Ref. 6.5).
- 6.25 A slope stability assessment, prepared by Atkins Global, concludes that, a revised slope profile with an overall slope angle from the top of the slope to the base of approximately 1V:2.5H will remain stable in the long term (Appendix 6). With benches at 6m intervals, the horizontal length from the top of the slope to the base of the slope would be approximately 120m with a vertical drop of approximately 45m from top to bottom. The provision of adequate drainage along the benches for perched water tables in the overburden will continue to be employed as is the current arrangement.

References

No.	Description	Minerex Doc. Ref.
6.1	National Soil Survey (An Foras Taluntais) (1980) General Soil Map for Ireland, Second Edition	F554
6.2	www.gsi.ie	
6.3	McConnell, B., Philcox, M. & Geraghty, M. (2001) Geology of Meath, Geological Survey of Ireland	M148
6.4	Gardiner, P.R.R. & McArdle, P. (1992) The geological setting of Permian gypsum and anhydrite deposits in the Kingscourt district, Counties Cavan, Meath & Monaghan, The Irish Minerals Industry	1632-033
6.5	Irish Gypsum Limited (2006) Potential Opencast mine Extension, Report 06/MR/1	1632-498
6.6	Geoffrey Walton (1982) Hydrological and hydrogeological report – Knocknacran Opencast Mine	1632-052
6.7	O'Neill Groundwater Engineering (2003) Chapters 6 & 7 for the EIS submitted as part of a planning application for the development of the underground mine at Drummond, Co. Monaghan	1632-054


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Figure 6.2
Subsoil Map


Irish Gypsum Limited
Kingscourt, County Cavan


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STATUS - FINAL - JR 19/02/07

Common legend


 Till derived chiefly from
Lower Palaeozoic rocks

 Cut peat


 Alluvium


 Bedrock outcrop &
subcrop

 Made ground

 Glaciofluvial sands &
gravels

 Drumgoose Mine
(decommissioned)

 Drummond Underground Mine
(under construction)

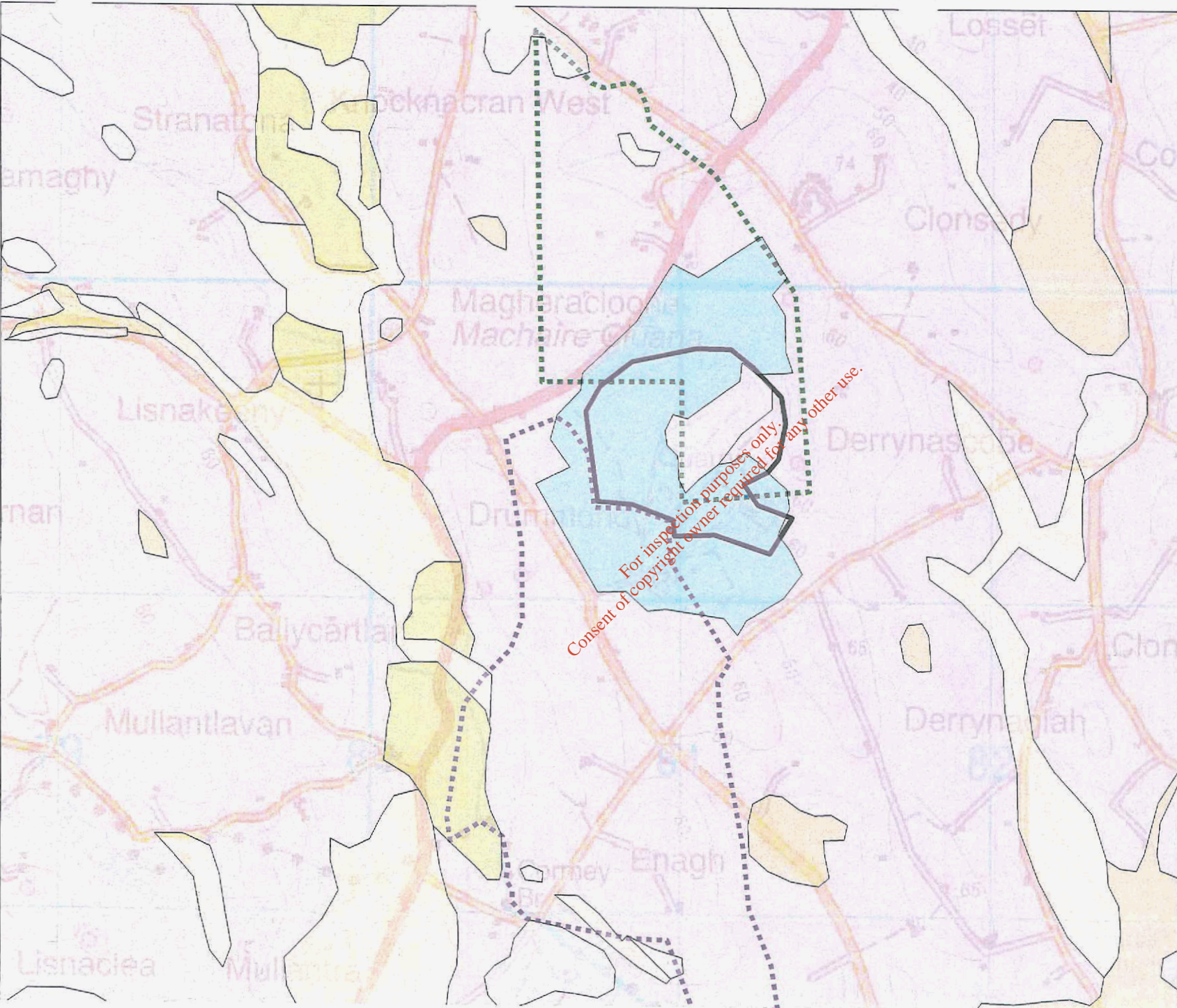
 Approximate extent of
Knacknacran open pit
(in production)



NOTES
- Basemap courtesy of Ordnance Survey of Ireland
- Subsoil mapping compiled by GS



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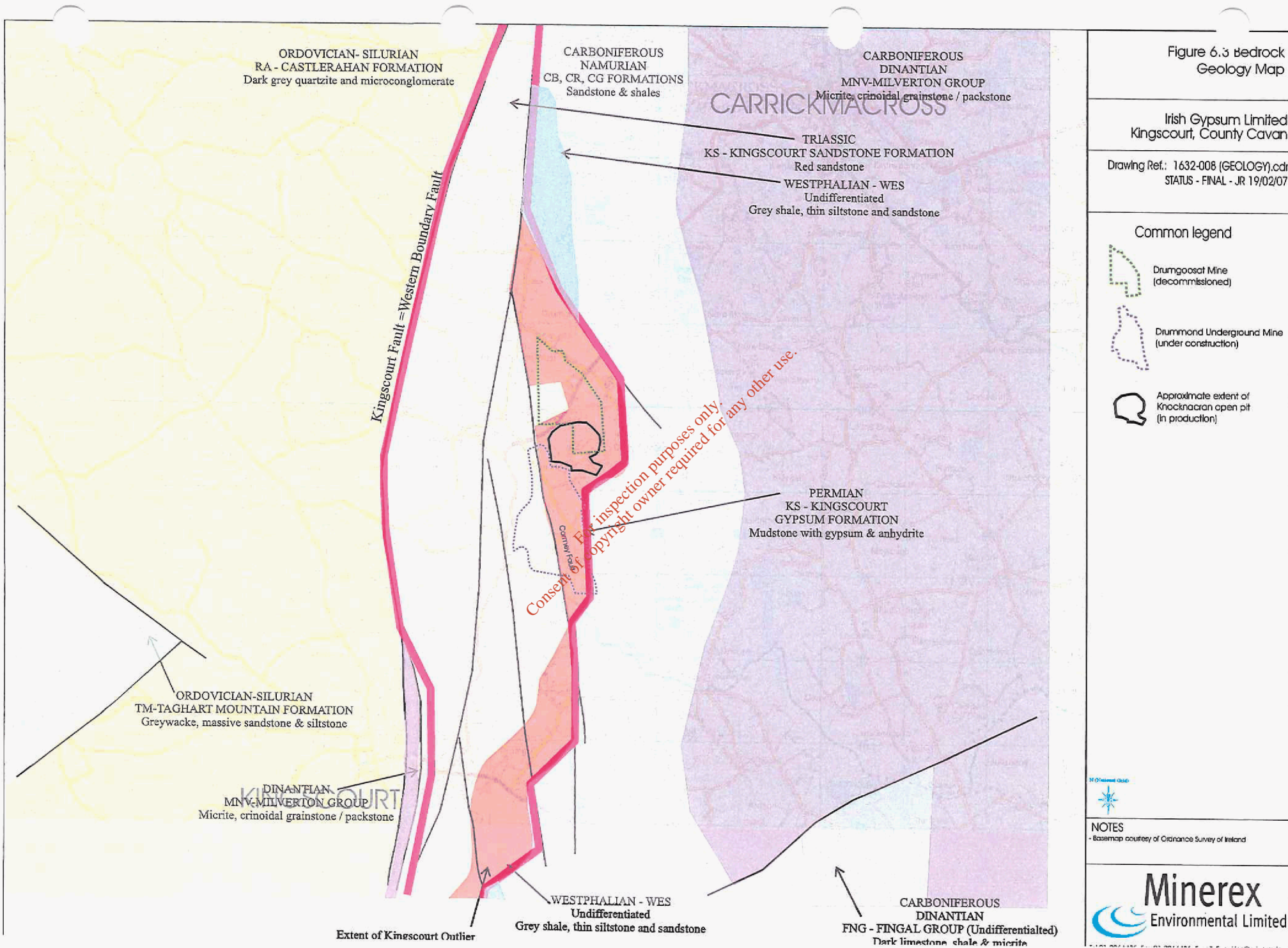
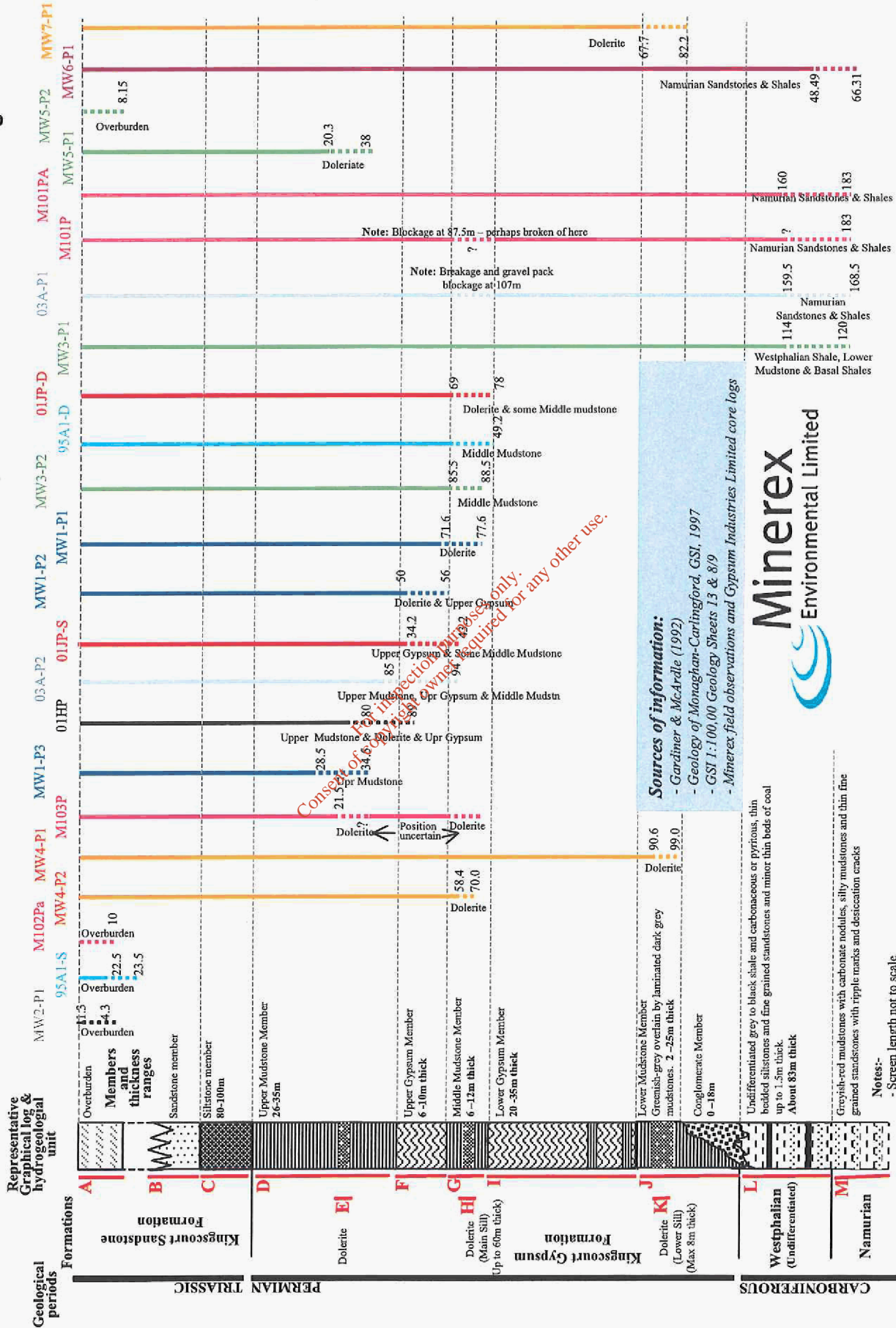


Figure 6.4

Geological positions of groundwater monitoring points



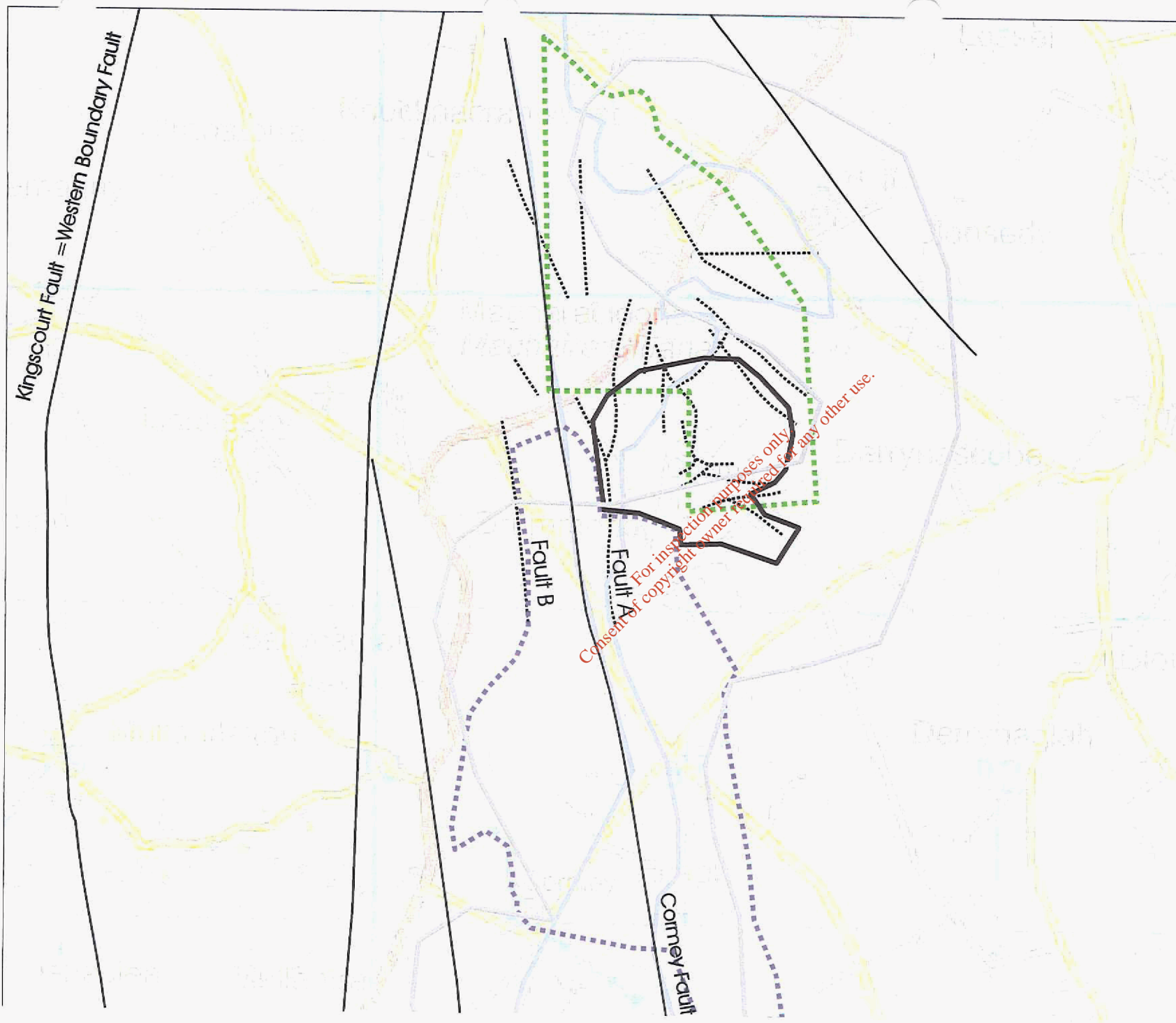










Figure 6.5
Faults and extents
of gypsum beds & dolerite sills

Irish Gypsum Limited
Kingscourt, County Cavan

Drawing Ref.: 1&32-008 (GEOLOGY).cdr
STATUS - FINAL - JR 19/02/07

Common legend

-  Drumgoosat Mine (decommissioned)
-  Drummond Underground Mine (under construction)
-  Approximate extent of Knocknaeran open pit (in production)
-  Inferred geological faults
-  Mapped geological faults
-  Extent of upper gypsum bed
-  Extent of dolerite sills
-  Extent of lower gypsum bed

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NOTES
- Basemap courtesy of Ordnance Survey of Ireland

