

# CHANGING IRELAND

*Compiled by*

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## THE NAVAN ZINC-LEAD MINE

### *Geological structure*

The giant zone of zinc-lead mineralisation at Navan, Co. Meath, was discovered in November 1970. Subsequent exploration has identified a wedge-shaped orebody, dipping from the thinner north-eastern end, where it reaches the surface, towards the south-east, where it lies at a depth of at least 600 metres (Fig. 1). The deposit is 1800 metres long, 400 metres wide, and, on average, 100 metres thick. The geological nature of the orebody is similar to other base-metal deposits found in Ireland's carboniferous limestone in that mineralisation has occurred along an E.N.E. to W.S.W. faultline and then encroached into the surrounding dolomitic limestone. The deposit therefore represents a combination of classic veined and contact metasomatic (replacement) elements, usually ascribed to deposition from mineralised hydrothermal solutions originating at depth within the earth's crust and making their way to the surface via natural rock fissures such as faultlines. The orebody at Navan is for the most part divided into distinct lenses, indicating selective replacement along the bedding planes in the host limestone.

### *Operating companies*

Development of the Navan orebody is being carried out in separate sections by two independent companies, Tara Mines Limited and Bula Limited. Tara Mines is a subsidiary of the Canadian-based Tara Exploration and Development Company which made the discovery in 1970. Originally controlled by expatriate Irishmen, Tara Exploration was the subject, in early 1974, of a takeover bid, following which 58% of the company's shares were owned by four other companies: Noranda, one of the largest and most diversified mining-smelting-fabricating companies in Canada (19.93%); Cominco, a subsidiary of the Canadian-Pacific Company (17.43%); Charter Consolidated, an associate of the Anglo-American group of South Africa (10.75%); and Northgate (9.93%). However, these companies did not all act in unison, and subsequent pledges made by independent shareholders in return for financial backing has given Noranda effective control within the company. Following an agreement reached in February 1975, Tara Exploration now owns 75% of Tara Mines Limited, the remainder having been transferred free of charge to the Irish government.

Bula Limited is entirely Irish-owned, and is developing the section of the orebody north of the River Blackwater, which enters the Boyne at Navan (Fig. 1). The original discovery was made by Tara Exploration in what is now the Bula section, but following an attempt by the government to com-

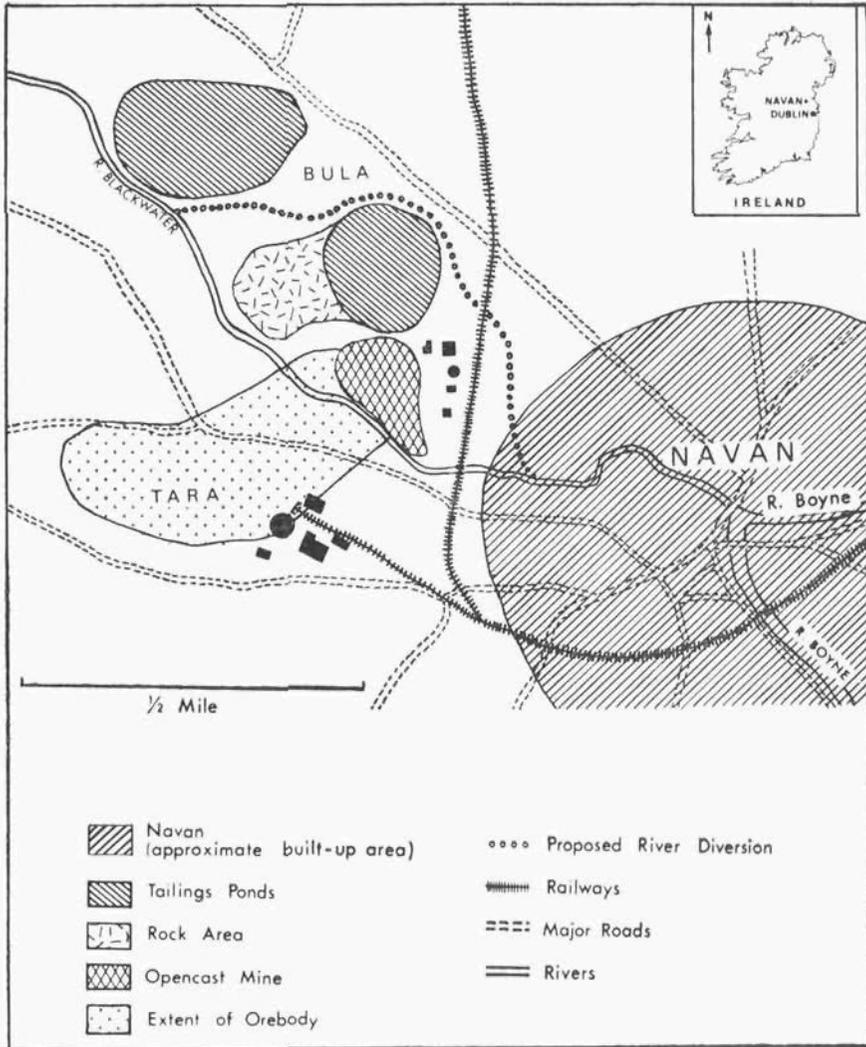


Figure 1.

pulsorily acquire the Bula minerals, the Supreme Court in 1974 confirmed Bula's ownership of these minerals. Following an agreement in March 1975, the government has acquired a 49% shareholding in Bula, 25% free of charge and 24% paid for according to the controversial Bula Limited (Acquisition of Shares) Act of 1977. The minerals in the Tara section are state-owned, so that Tara, unlike Bula, required a state mining lease before it could develop its mine, and this was issued in September 1975.

#### *Size*

The size of the Navan orebody is a matter of some uncertainty. It is normal for a mine's reserves to be continuously added to as further detailed

exploration is financed by mining revenues. At Silvermines, for instance, reserves at the beginning of 1973 were estimated at 6.8 million tonnes; by the beginning of 1976, following further extraction of 3 million tonnes of ore, estimated remaining reserves actually rose to 7.9 million tonnes. Similarly, at Tynagh, reserves in 1966 were 6.3 million tonnes, whereas following extraction of 6 million tonnes, reserves at the beginning of 1976 still stood at 3.2 million tonnes.

Apart from this, Tara has issued no estimate of reserves since its 1972 *Annual report*, when it claimed 61.1 million tonnes for its section of the orebody, at an average grade of 11.1% zinc and 2.72% lead. This report also claimed 8.89 million tonnes for the Bula section, but Bula's own subsequent investigations reported, in 1975, 19.64 million tonnes at 6.77% zinc and 1.23% lead, and this was again raised to 21.8 million tonnes (grade unspecified), following further drilling, in February 1977. It is therefore likely that Tara's own drilling programme has further enhanced preproduction reserves since 1972, and these will be further augmented in all probability during the life of the mine.

TABLE 1  
NAVAN: OFFICIAL RESERVES

Company	Reserves (million tonnes)	Grade		Metal content (million tonnes)	
		Zinc	Lead	Zinc	Lead
Tara	61.1	11.00%	2.40%	6.72	1.47
Bula	21.8	6.77%	1.23%	1.48	0.27
Total	82.9	9.89%	2.10%	8.20	1.74

Nevertheless, even accepting the estimates hitherto released by Bula and Tara, the Navan orebody is most impressive in size. It represents a metal content of 8.20 million tonnes of zinc and 1.74 million tonnes of lead (Table 1), the equivalent of an addition to total non-communist world reserves as they stood in 1971 of 9.32% in zinc and 2.26% in lead. This constitutes a remarkable contribution from a single ore deposit. Allowing for metal losses at the concentration stage, the annual metal output of the combined mining operations, given the projected extraction rates, will be 288,000 tonnes of zinc and 55,000 tonnes of lead (Table 2), the equivalent of an addition to 1974 non-communist world output of 6.41% in zinc and 2.18% in lead. The Sullivan Mine in British Columbia, which has been referred to as the world's biggest producer of zinc and lead, produced 220,000 tonnes combined zinc/lead in 1973, compared with a projected Navan combined annual output of 343,000 tonnes. The combined zinc output from Navan, Silvermines and Tynagh, estimated at 362,000 tonnes, will probably place Ireland among the top five producers in the world after Japan, USA, USSR and Canada.

#### *National impact*

The extent of the Navan mine's impact on the Irish economy will depend

on the degree to which the mine output is processed in Ireland. The only processing specifically catered for in Ireland initially is on-site concentration, whereby the natural minerals sphalerite and galena (zinc and lead sulphide) are separated both from each other and also from the worthless gangue material with which they will be extracted. Tara has already contracted to sell the resultant concentrate to smelters in Great Britain, France, Belgium, West Germany and Spain. At the smelting stage, the zinc and lead are separated from the sulphur with which they are naturally compounded, and prepared at varying levels of purity for use in fabrication. Bula has so far made no plans for disposal of its output.

Discussions are taking place between the Industrial Development Authority and various interests with respect to the possible establishment of a zinc smelter in Ireland. Bula has already committed itself to supplying an Irish smelter, while Tara's sales contracts allow for diversion of zinc concentrate to such a smelter. However, the intended smelter will use no more than one-half of Navan's zinc output and there has been no mention of possible lead smelting in Ireland.

TABLE 2  
NAVAN: ANNUAL METAL OUTPUT

Company	Annual ore production (million tonnes)	Metal recovery		Grade		Metal output (tonnes)	
		Zinc	Lead	Zinc	Lead	Zinc	Lead
Tara	2.27	90%	82%	11.00%	2.40%	225,000	44,700
Bula	1.00	93%	84%	6.77%	1.23%	63,000	10,300
Total	3.27	—	—	—	—	288,000	55,000

At March 1977 prices, the Navan output will realise about £81m. per annum, £71.4m. from zinc and £9.5m. from lead. The proportion of this entering the Irish economy is uncertain, given profit repatriation to foreign shareholders, the payments for imported materials, equipment and services, and the interest payments to external financial institutions. However, allowing for government royalties (4½% of pretax profits), shareholdings (25%) and taxes (50%) with respect to Tara, and complete Irish ownership of Bula, it appears that the bulk of the operating profit at Navan, which, going on the Silvermines and Tynagh experience should amount to about 50% of gross revenue, will remain within the national economy. It can be expected also that a substantial proportion of the operating costs (labour, fuel and power supply, ancillary services, etc.) will also be paid for within the economy. Allowances have to be made in the initial five years or so for amortisation of loans incurred in bringing the mines into production. Tara's initial capital cost is estimated at about £87 million at 1976 prices, representing the largest single industrial investment in the history of the state. All but £17 million of this is being raised externally. Bula's projected development cost of £25 million is being raised through the Irish banking system.

The annual value of Navan's unsmelted metal gives some indication of the potential wealth derivable from this metal in completely processed form. The smelting stage alone doubles the value of metal in concentrate form.

Subsequent industrial fabrication adds several times this value again to the metal. There is a wide and growing range of industrial uses of zinc and lead. The demand for zinc has been particularly buoyant, with world consumption rising by two-thirds during the 1960s. The principal industrial uses of zinc include anti-corrosive coatings, diecastings, brass, sheet zinc for construction, and dry batteries. The main uses of lead include storage batteries, sheets and pipes for construction, cable sheathing, solder, and chemicals.

Any manufacturing industries based on the Navan mine would necessarily have to be export-oriented, given the low level of consumption in the domestic market. In this context, it is foreseeable that the mining operation at Navan could give these industries an important cost advantage by transmitting low costs through the fabricating stages. Navan appears to possess an unusual range of relatively low operating costs compared with other zinc-lead mines. These consist of: ready availability of suitable labour and infrastructure, including power, transport, water, business services and residential facilities; low transport costs due to proximity to a major port and the West European market; and favourable environmental conditions. It would be necessary, however, to integrate the mining and all processing stages if these initial cost advantages were to be passed on to the final products.

#### *Local impact*

Apart from its impact at the national level, the Navan mining operation will obviously have major reverberations at the local level. These may be discussed in terms of physical effects, on the one hand, and economic and social on the other.

A major environmental aspect of the Navan mine is its proximity to a substantial and already rapidly-growing town. Between them, Tara and Bula have 'sterilised' over one thousand acres of land within two miles of Navan town centre. In addition, the market value of land and housing immediately adjacent has also dropped, whereas prices have soared on other sides of the town, due to the additional stimulus to the local economy provided by the mine. As a result, a land value surface of unusual variation for such a local scale has emerged.

Both mining companies appear to be keenly aware of the environmental implications of their operations, and between them have allotted over £8 million (1976 prices) of a total combined capital outlay of £112 million to conservation measures. As a completely underground mine, the Tara operation will have less visual impact, although the surface plant is of a scale unusual in the Irish landscape. At the same time, the sheer size of the mine produces potential problems in the realm of air, water, noise and traffic pollution. Although the surface plant will occupy just over one hundred acres of land, Tara has purchased an additional three hundred acres in order to facilitate screening of the plant. A large nursery of trees and shrubs has been developed for this purpose, while the plant buildings have been suitably designed and coloured. The concentration process will be completely enclosed, to minimise noise and dust emissions. A tailings lake has been built to store the residues from concentration, mostly water and finely ground dolomitic limestone, plus some residual zinc-lead sulphide. It is located at a relatively unobtrusive six hundred acre site three miles to the north, to which the tailings will be pumped by pipeline. The concentrate will be transported by rail to Dublin via Drogheda, thereby minimising the impact on the road system.

Although a much smaller operation, the Bula mine possesses a greater potential environmental impact, since it is proposed to mine 40% of Bula's deposit by opencast methods. The pit itself will cover some fifty-five acres, but Bula has acquired six hundred acres in all for mine-related activities. In addition to processing plant, these latter will include a rockpile deriving from the removal of overburden in gaining access to the orebody, and two tailings lakes which will take up the bulk of the site, and which it is hoped can be transformed into a golf course after cessation of mining activities. The river Blackwater is also to be diverted through the Bula site in order to facilitate complete extraction of the orebody, which will benefit both Bula and Tara. A nursery is to be developed for landscaping purposes, and Bula is satisfied that measures taken to control blasting, noise, vibration, dust and water quality will reduce disruption to an acceptable minimum. At the time of writing, Bula had not yet received planning permission for its development, and production was not scheduled until 1979. Tara was due to start up in April-May 1977.

Tara and Bula will together employ a projected 1,050 workers directly in mining activities. In addition, the mine itself and the workers as consumers will generate a considerable service and supply spin-off in the local area. The introduction of employees' families will mean a population effect far in excess of that produced by the workers themselves. There are also the intangible but real benefits generated in terms of the creation of an 'air of success' at Navan. The provision of infrastructure to service both the mine and its spin-off activities, for example, may act as an attraction for further industry. In anticipation of this, both Meath County Council and a group of local businessmen have proceeded with the development of industrial estates at Navan. There is also the possibility that a smelter, when it is established, will be located at Navan. To add to all this, there are indications that one or two more mines may be opened in the vicinity of Navan, as further zinc-lead prospects have been discovered adjacent to the present mine.

There are, of course, many problems associated with rapid expansion. Crime and prostitution are already increasing rapidly in the town. Rapid population and economic growth put constant pressure on infrastructural facilities, such as roads, telephones and schools. A particular problem is the medieval core of the town, with its characteristically narrow streets, at a time of rapid increase in the number, throughput and size of motor vehicles. A more profound fear lurking in the background is that Navan may suffer the common experience of many other mining towns, that is, severe depression following the termination of mining activities. However, this problem is at least forty years away, even allowing for the very high rate of extraction which has been permitted at Navan, and may, at least for the moment, be considered a matter for another generation.

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#### NOTE

The factual material in this article is derived mainly from trade magazines, and company and newspaper reports. Details are available directly from the author.