

8. Mining of beach shingle in the Devonport area.

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The Conservation Officer of the Lands and Surveys Department (D. Steen) has suggested that mining on Northdown Beach is leading to serious erosion of the dunes and should be discontinued. The Public Works Department, the main producer, requested the Department of Mines to make an appraisal of the situation.

GEOLOGY

Nature and origin of the material

Shingle is a term in British Standards nomenclature for particle sizes in the range: coarse gravel (20-60 mm) to boulders (200 mm), which describes the size range of the material under discussion fairly accurately. The particles are predominantly quartzose, consisting of well rounded sedimentary and igneous fragments derived from a Lower Palaeozoic and Precambrian terrain. There is a less mature admixture of basaltic fragments on some sections of the deposit.

The material is believed to have been brought into Bass Strait by north flowing glacial melt waters, principally Clayton Rivulet, the Forth, Don and Mersey Rivers and distributed along the coast by eastward flowing currents. Deposition occurred at sea levels higher than the present level. The upper level of the beach shingle is now approximately 2.5 m above high water mark.

Distribution of the material

The eastward flowing currents, coupled with tides and wave action, deposited this material on all beaches east of Clayton Rivulet, (Turners, Lillicos, Pardoe, Moorland and Northdown beaches). Material of a similar maturity and origin occurs on some beaches in north-eastern Tasmania indicating the extent of the distribution. The shingle was deposited fairly continuously along these beaches except in the lee of promontories such as Mersey Bluff, Pardoe and Moorland Points. The width of the deposit is undetermined but probably covers the old shore platform and would therefore occur for some distance inland beneath the dunes. The thickness, measured in disused gravel pits behind the dunes, is approximately 2 m. Where the shingle is exposed on the berm of the beach, (which is that portion extending from high water mark to the foot of the dunes) it is wedge-shaped due to the action of waves and tides. The thin edge, at about high water mark, consists of fine material while at the foot of the dunes the shingle is at maximum thickness and is unsorted.

Workmen in the area believe that the deposit is self regenerating and that tidal action replaces material which has been mined from the berm. The reason for this belief is that wave action redistributes the shingle and obliterates the effects of mining. There is no authenticated instance along the foreshore where mined out areas of the beach have been replenished by natural processes. A possible exception to this is the Devonport Marine Board gravel reserve at East Devonport. Here the beach is replenished by wave action bringing in shingle dredged from the Mersey mouth and dumped out to sea.

History of shingle mining

Shingle mining on these beaches has operated for as long as the area has been settled which is at least a century. Unfortunately no records were kept of early production but the principal users have been the Tasmanian Government Railways from their pit at Leith, and the Public Works Department from a number of areas along the entire length of the deposit. The Public Works Department estimates its future requirements at 50 000 m³ over the next seven years. Other users are Municipal Councils and private contractors.

Lands Department records of contractors production over the past few years show an average rate of 1530-2390 m³ per year. This figure is likely to be grossly inaccurate as the returns are based on an honesty system of royalty payments.

Present operations and mining methods

Present operations are by Tasmanian Government Railways at Leith, Devonport Marine Board on the foreshore at East Devonport, the Devonport Council approximately 45 m in from the shore at East Devonport, the Public Works Department behind the dunes of Moorland Beach and on a 3.2 km reserve (on the berm) at Northdown Beach and finally private individuals on a 800 m reserve east of the Public Works Department reserve. There is a significant amount of illegal mining of both sand and shingle from the foreshore, berm and dunes, to which reference will be made in a later section.

Finally a private company hand picks quartzite pebbles for use in ball mills, the production is approximately 1530 t per annum and is insignificant in its effect on gravel reserves because of the limited shape and size of the pebble collected.

The Northdown beach shingle is mined at low tide by the use of a front end loader and truck which gain access to the mining area along the foreshore from the Wesley Vale Road. Some individuals operate beyond the demarcation notice in ground which is closed to mining.

Gravel pits behind the dunes of Moorland Beach are on private land; they have been worked to the depth of the water table and to the edge of the foreshore reserve, so are virtually worked out. Other adjacent disused pits have been inefficiently worked and large amounts of shingle remain. It may be possible to reopen this pits but they are overgrown and may be now uneconomic unless sufficient reserves of material can be proved by drilling.

Past and future production

The lack of records makes an estimate of past production conjectural but the available information, already given, suggests to the writer an amount approaching 765 000 m³. The future requirements are similarly difficult to assess because of the lack of information on which to gauge growth trends, but an amount of 15 300 m³ per annum is suggested by the available figures.

Reserves

Northdown Beach. The following assumptions are made; a length of 5 km, a width of 15 m and a thickness of 1.5 m giving 122 000 m³ or 8 years supply.

Areas behind the dunes. There is an undetermined reserve of shingle

on the landward side of the dunes. It would be necessary to drill in order to prove adequate reserves of gravel for say the next two decades from this source.

EVIDENCE OF EROSION

Pardoe Beach extends for 6 km eastwards from East Devonport. Small quantities of shingle occur and the dunes are well stabilised and little eroded. The original quantity of shingle on the beach is unknown but local information suggests that the amount of shingle mining on the beach in past years was considerable.

Moorland Beach extends eastwards for 3.2 km from Pardoe Beach, with no shingle on the western end of the beach and only minor amounts on the eastern end. There is considerable evidence of dune erosion but the shingle areas appear just as eroded as the areas devoid of shingle.

Northdown Beach extends for a further 5-6 km eastwards and is not eroded at all except at the access road from Wesley Vale where illegal dune mining has been carried out. The dunes are being mined on the landward as well as the seaward side and the operation appears to have been carried out with front-end loaders with the result that overhanging faces have been generated. When these eventually collapse, the area becomes contaminated with soil and plant debris and the operator moves to a fresh area. These operations are both unsafe and unsightly and are liable to cause severe dune erosion. Another illegal practice is the removal of sand from the foreshore (between high and low water mark). This causes a steepening of the beach profile and inevitably leads to the erosion of the berm or dune to restore beach stability.

Discussion

Although there is no dune erosion directly attributable to shingle removal, it is nonetheless true that shingle offers far greater protection to a beach profile than sand because of its openwork texture which cushions the effects of destructive waves. In a normal twelve month period the constructive and destructive forces operating on a coastline will be counter-balanced, which will be reflected in the beach profile. Any disturbance to the gradient of this profile is likely to favour the destructive forces and lead to erosion. Under these conditions the additional effect of a severe storm coupled with an abnormally high tide could irrecoverably ruin the coastline.

In the unmined areas of Northdown Beach, the shingle berm is capped by driftwood indicating that the effect of storms is at least 3 m above high water mark.

To obtain a satisfactory answer to the question of whether the removal of shingle causes erosion, it would be necessary to make observations over a number of years.

Closure of beaches to mining

It cannot be proved, except by prolonged study, whether or not shingle mining causes dune and, or, beach erosion, but the risks of overmining are great and if damage does occur in the future, it would probably be too late to do anything about it.

The present arrangements do not allow adequate control of beach mining and therefore it is difficult to eliminate illegal mining and undesirable mining methods.

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Northdown Beach is the last unspoiled portion of a unique Tasmanian landform. It is of considerable scientific interest and is of value both for teaching and research purposes. It could also remain a useful gauge to determine the effects on the environment of beach mining.

Alternative sources of gravel

The needs of the construction industry and of public works must be satisfied by providing adequate reserves in alternative areas. The obvious area to examine is the old shore platform on the landward side of the dunes. A Government drilling programme is required here to determine the width and thickness of the deposit. Once the quantity of gravel in these areas has been determined it will be necessary to officially proclaim gravel reserves to ensure a continuity of supplies for the years ahead. Some acquisition of private land is envisaged in this operation. Such gravel reserves should be clearly demarcated and strictly controlled. All individuals, companies and government bodies should use this area. The area should be staffed by an approved operator and tally clerk employed by the Government. Methods of extraction should be determined by inspectors of mines and unauthorised persons prohibited from operating.

The costs of instituting these procedures will be fully justified by increased revenues, continuity of supplies and decreased danger to the environment.

With regard to the preservation of the dunes, it should be realised that before stabilisation by marram grass, windblown sand was encroaching on the land and was considered a menace. Where the dunes are one hundred or more metres in width and covering the old shore platform and underlying gravels, it seems reasonable to allow sand as well as shingle mining. The dunes should not be removed in their entirety as they provide shelter from the sea, a source of sand to the beaches to restore a stable profile after storms, a haven for colonies of penguins and finally they have a recreational value and aesthetic appeal to the public.

These ideals can be provided for by keeping outside the foreshore reserve and stabilising the dunes where they have been disturbed.

Finally, worked out areas should be backfilled and replanted.

CONCLUSION

The recommendation that shingle mining be discontinued is supported. An alternative area has been suggested. The writer attaches great importance to the recommended procedures. The States resources of construction materials are being depleted at an alarming rate and it is imperative that greater efficiency is attained in their extraction. The controls suggested should ensure this and should set the pattern for other similar ventures not only in the operation of the pit but in the post-operational land reclamation.