ASSESSMENT OF CERTAIN GRANULAR MATERIAL DEPOSITS, HAY RIVER AREA, N.W.T.

E.B. Owen
Geological Survey of Canada
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INTRODUCTION

Assignment

As the result of a request from Mr. I.G. Petrie, Head, Land Management Section, Water, Forests, Lands and Environment Division, Department of Indian and Northern Affairs, four days (July 3 to 6, 1975) was spent investigating certain granular material deposits in the Hay River area, N.W.T. for the purpose of assessing the quality of the material and the quantity available. Previous discussions with Mr. D. Longwitz, I.N.A.D. in Yellowknife had indicated that more information was urgently required regarding the granular material deposits along the Pine Point Highway (N.W.T. Hwy. 5) extending east from Hay River to the bridge over Buffalo River and, as a consequence, the investigation was concentrated in this area.

Procedure

The investigation procedure entailed a study of existing air photographs and of a report on the granular materials in the Hay River area prepared for I.N.A.D. by Ripley, Klohn and Leonoff International Ltd. in March, 1974. Two days were spent examining the various granular material deposits, one day discussing with D.P.W. (N.W.T.) engineers, and with local contractors, their granular material requirements and in observing the deposits from the air to determine their approximate extent and a fourth day re-examining the deposits in the light of the requirements expressed by the various operators. During the investigation I was accompanied by Mr. K. Owen of the Yellowknife office, I.N.A.D. whose intimate knowledge of the area greatly facilitated the work. Useful discussions were also held with Mr. A. Forbes of the Hay River office, I.N.A.D.

GRANULAR MATERIAL DEPOSITS

General Description

Three extensive granular material deposits, all easily accessible from Pine Point Highway, were examined during the investigation. These deposits have been designated as mile 12, 21 and 31 respectively. These milages relate to the distances along the Highway as measured from its junction with N.W.T. Highway 1 which extends south from the community of Hay River to the N.W.T. - Alberta boundary. The junction is about a mile south of the community. The distances are important as they have a direct bearing upon the haulage costs of contractors requiring granular materials within the community.

Two of the deposits (mile 12 and 21) are described in the Ripley, Klohn and Leonoff report and consequently, as far as the quality of the material and the quantity available is concerned, this investigation served only to confirm the findings of the consultant. The deposit at mile 31 which was located beyond the limits of the area designated in the consultant's Terms of Reference was examined in more detail.

MILE 12 (R.K.L. NO. HR-107A)

Description

This deposit consists of a low, narrow, NE-SW trending, esker-like ridge which roughly parallels the south side of the Highway for about two miles. However, because of its sinuous character, the actual deposit is about 3.5 miles long. At its east end the deposit is about 1,000 feet south of the Highway to which it is connected by a good, all-weather, gravel road.

The material is fairly well described by the consultant. Due to environmental considerations drilling was not permitted in the deposit and consequently the consultant's description was based upon the results of two shallow test pits and a visual examination of the material exposed in portions of the deposit which had been developed.

The east end of the deposit (that part nearest the Highway) has been developed continuously for a distance of about 5,000 feet. The present excavations vary from 200 to 500 feet in width and from 4 to 15 feet in depth. The material presently exposed consists of glaciofluvial sandy gravel, containing boulders up to 10 inches in diameter, overlying a grey, silty, clayey till. Boulders up to 24 inches in diameter frequently occur at the gravel-till contact. The depths of the excavation have been limited by a perched water table overlying the till or by the till (locally called "the clay") itself. As a result the floors of the depleted sections of the excavation are either covered with small ponds of water or with soft, saturated sand and gravel which has prevented further deepening. The same geological conditions were observed in many of the small, abandoned, water-filled borrow pits situated along the present Highway. Materials exposed in these pits, which were developed during construction of the Highway, usually consisted of a veneer of sand or gravel overlying till. There has been little attempt so far to rehabilitate the depleted sections of the excavation at mile 12. Bulldozed organic material and weathered soil are still piled along its edges. In some small areas, however, considerable natural revegetation is taking place on the floor.

The deposit at mile 12 was originally developed during construction of the Pine Point Highway. Subsequently, because of its quality and easy access from Hay River, it has been split up among several small operators as a source of granular materials for various uses ranging from concrete aggregate to general fill. The present problems related to the deposit could be summarized as follows:

1. The present excavation has almost been depleted. Most of the remaining material has been bulldozed into small scattered stockpiles, chiefly in the west end of the excavation.

2. Numerous operators have been given permits to excavate material from the deposits, but, so far, there are no "markers" to indicate the extent of the individual permit areas. This lack of control has resulted in some operators, who require only a small amount of material, moving about the entire excavation in their search for the better quality gravel (even to the extent of removing material from some one else's stockpile). It also hinders I. N. A. D. in its attempts to have an operator rehabilitate his permit area.

Recommendations

1. Prominent markers indicating the boundaries of any new permit area allotted for the deposit should be set out by I. N. A. D. These could be wood posts set in dug holes or pipe in drilled holes. They should be sufficiently large so that they could not be readily destroyed by construction equipment. The costs of setting the markers could be borne by the holder of the permit.

2. The present excavation could be extended west. With an estimated average thickness of 6 feet, it is believed there is about 200, 000 cubic yards of granular material in this area which would require little processing to provide suitable concrete aggregate. Access could be through the present excavation which would avoid the construction of new haul roads. Because of its narrow charactor it is suggested that permits be issued only to 1 or 2 operators requiring concrete aggregate to develop this section and not the multiplicity of operators which were permitted to work in the present excavation.

3. It will be difficult to persuade many of the operators who have had or presently have permits to remove material from the present excavation to conduct an effective rehabilitation program. Most of these operators are small and as their permit areas have never been properly designated on the ground they would be reluctant to go to the expense of rehabilitating an area which, in their opinion, may not have been used by themselves.

MILE 12 (R. K. L. Nos. 119, 121, 122)

Description

This is an extensive east-west trending, glaciofluvial deposit about 3. 5 miles long and with a maximum width of about 2, 000 feet. It is sufficiently large that the consultant, in his report, has divided it into 3 adjacent sections. During construction of the Railway and Highway, both of which cross the deposit, numerous borrow pits were developed in it to obtain excellent pit-run material for ballast and fill.

The granular material in the deposit, which has been well described by the consultant, is similar to that in the mile 12 deposit with the exception that the boulder content is higher. As a result the material has to be processed (screened and/or crushed) to obtain concrete aggregate. In general, the material varies from medium-grained sand to gravel containing numerous boulders up to 10 inches in diameter. However, large boulders up to 36 inches in diameter scattered on the floors of some of the pits indicate that, in places, the underlying till is close. Perched groundwater overlying the till has been encountered in a shallow bulldozed cut in the floor of the Dean pit. In other places, water-saturated sand on the floor indicate the till is not far below.

As indicated on the accompaning air photo mosaic the sections of the deposit adjacent to the Highway have been partially subdivided into permit areas. Permittees south of the Highway include Kaps, D.P.W. (N.W.T.) and Johnson. These permit areas have almost been depleted. With the exception of the Johnson area they have been extended laterally to the limit of the deposit. There may be however, small quantities of material remaining on the floors of the excavations. A small, esker-like ridge in the SE corner of the Kaps area should be investigated. An examination of the material exposed on ground surface along this ridge indicated there is possibly about 30,000 cubic yards of material suitable for concrete aggregate available in this area.

The Department of Public Works (N.W.T.) presently has a large stockpile of material crushed to $\frac{3}{4}$-inch size for Highway maintenance in its permit area. It was suggested by D.P.W. that, once the material in the stockpile had been used, there was sufficient material remaining in its area to warrant one more crushing. Following this, it would rehabilitate and abandon the area. D.P.W. indicated it was interested in the material in the small esker southeast of the Kaps area. However, as D.P.W. has advised that it has no requirement for concrete aggregate, it is suggested that this deposit be eventually assigned to some small, local contractor who would have a need for limited quantities of better material.

The Dean permit area is a westerly extension of several C.N.R. pits developed along both sides of the Railway right-of-way. Access to the Dean area from Pine Point Highway is by a short, gravel road which follows along the top of a narrow, esker-like ridge. The Dean pit, which is a continuation of an adjacent C.N.R. pit, is not large but could be extended west where a large quantity of bouldery gravel suitable for general fill exists. This material could be crushed to provide concrete aggregate but there is no evidence in the present pit that this has ever been attempted.

None of the several C.N.R. pits in the deposit have been worked since completion of construction of the Railway. The material exposed is similar to that in the Dean permit area. However, the Railway did not excavate as deeply as Dean and, as a consequence, there is no indication of till or groundwater in the floors of its pits. It is understood the C.N.R. has a reserve on the granular material

deposits adjacent to its right-of-way. However, there was no information available concerning the extent of the reserve nor the time limits involved. It is suggested the C. N. R. be requested to provide I. N. A. D. with information related to its future requirements from these deposits as presently it is tying up a large volume of accessible granular material which is becoming increasingly scarce in the Hay River area.

Recommendations

1. Large, permanent, easily visible markers should be set out by I. N. A. D. to designate the boundaries of the present permit areas in the mile 21 deposit. As the markers were not described in the permit this should be done in the presence of the permittee. Any new permit areas should be marked as they are assigned. I. N. A. D. has commenced setting out markers in some areas but not on a routine basis.

2. The Canadian National Railway apparently has a reserve on a large area of granular material which contains several times the quantities used during construction of the Railway. Much of this material is easily accessible from Pine Point Highway. None of the pits in the reserved area have been exploited since construction of the Railway. It is suggested C. N. R. be requested to provide I. N. A. D. with figures pertaining to its future demand for granular materials in this area with the view of opening up some pits for local use.

MILE 31

Description

This is an east-west trending, glaciofluvial deposit about 3. 3 miles long and with a maximum width of about 2, 000 feet. It is similar to the deposit at mile 21 except that its average width is considerably smaller and consequently it contains less material. The right-of-way of the Railway traverses the deposit throughout its entire length. During construction, the C. N. R. developed several borrow pits in the deposit to obtain ballast material. This material was hauled for several miles along the right-of-way, chiefly east where a shortage of suitable material existed. The mass production excavation methods used by the C. N. R. are evident on the air photographs especially in a large pit located near the west end of the deposit. Here, bulldozers pushed the material from the edge of the deposit toward the right-of-way where it was loaded onto railway cars. There has been no attempt made by the Railway to rehabilitate any of the pits. The Highway skirts the south side of the deposit along which pits were developed to obtain granular material for both construction and maintenance purposes.

The granular material exposed in the pits developed in the deposit is similar to that at mile 21. It varies from medium-grained sand to gravel containing numerous boulders, few of which exceed 14 inches in diameter. On the floor of one C.N.R. pit near the west end of the deposit the underlying till along with its perched groundwater is exposed. Pit-run granular material from the deposit should provide excellent general fill and, when crushed, satisfactory concrete aggregate.

The estimated volume of granular material remaining in the mile 31 deposit is about 2,000,000 cubic yards. However, the C.N.R. apparently has a reserve on a large part of the deposit so that the quantity presently available for local use is unknown. With the exception of one pit, it is believed there is considerable recoverable material on and beneath the floors of the present C.N.R. excavations. It is estimated that 12 to 15 feet of granular material exists beneath the farthest west pit which is the largest developed by the C.N.R. in the deposits. One reason for this is the method of excavation used by the railway where it skimmed off the surface material over a wide area rather than excavate a deeper, less extensive pit.

As indicated on the accompaning air photo mosaic D.P.W. (N.W.T.) has a permit area near the junction of Pine Point Highway and an access road into a small camp ground on Polar Lake. Here, D.P.W. has a stockpile of material crushed to $\frac{3}{4}$ inch size for Highway maintenance. The D.P.W. area is small; being confined between the Railway and Highway as well as a partially depleted C.N.R. pit. It is estimated there is a maximum of 100,000 cubic yards of granular material remaining in the D.P.W. area.

The access road to Polar Lake follows along a low, north-south trending, esker-like ridge. As exposed on ground surface, the material in the ridge appears to vary from medium-grained sand to fine-grained gravel containing very few boulders. A request by a contractor in Hay River to develop a small pit in this deposit for concrete aggregate was refused by I.N.A.D. because of environmental considerations related to the camp grounds at Polar Lake. The contractor indicated it would be extremely expensive for him to haul aggregate from the Polar Lake area into the community of Hay River but he was prepared to do so because of the shortage of good quality material closer to the community. It is suggested the material immediately SE of the Kaps area at mile 21 or that in the westerly extension of the mile 12 deposit would be suitable for the requirements of any such Hay River contractor.

Recommendations

1. The limits of the areas apparently reserved by the C.N.R. should be determined and identified on the ground. At the same time the railway should be requested by I.N.A.D. to provide figures pertaining to its future demand on the deposit. As there is a shortage of granular material to the east the railway may be reluctant to give up any part of its reserve.

2. Within 2 to 3 years D.P.W. (N.W.T.) will be faced with a shortage of granular material for Highway maintenance. D.P.W.'s permit area in the mile 21 deposit is almost depleted. This will increase the demand on the mile 31 area and at the same time increase the cost of maintaining the highway west toward Hay River. This is a further reason for requesting C.N.R. to relinquish some parts of its holdings.

CONCLUSIONS

These conclusions are based only upon an examination of three granular material deposits along Pine Point Highway which, in aerial extent, constitute less than half of the deposits investigated by Ripley, Klohn and Leonoff. However, in their report, the consultants described the deposits at miles 12 and 21 as "containing the largest volumes of material available to the community of Hay River and should be reserved for the exclusive use of the community." If the quantity of material available in the mile 31 deposit in included with that at miles 12 and 21 it is believed the three deposits would contain more than half of the total quantity available to the community.

1. There is a shortage of easily accessible granular material in the Hay River area. As the community will be a major staging area during construction of the proposed Arctic Gas pipeline the demand for granular materials could increase substantially in the next few years.

2. The east part of the mile 12 deposit which, in the past, has been the source of much of the granular material used in the community is almost depleted. There is, however, additional material available in a western extension of this deposit.

3. There is a small quantity of good quality granular material available in a small, esker-type ridge near the SE corner of the Kaps permit area in the mile 21 deposit.

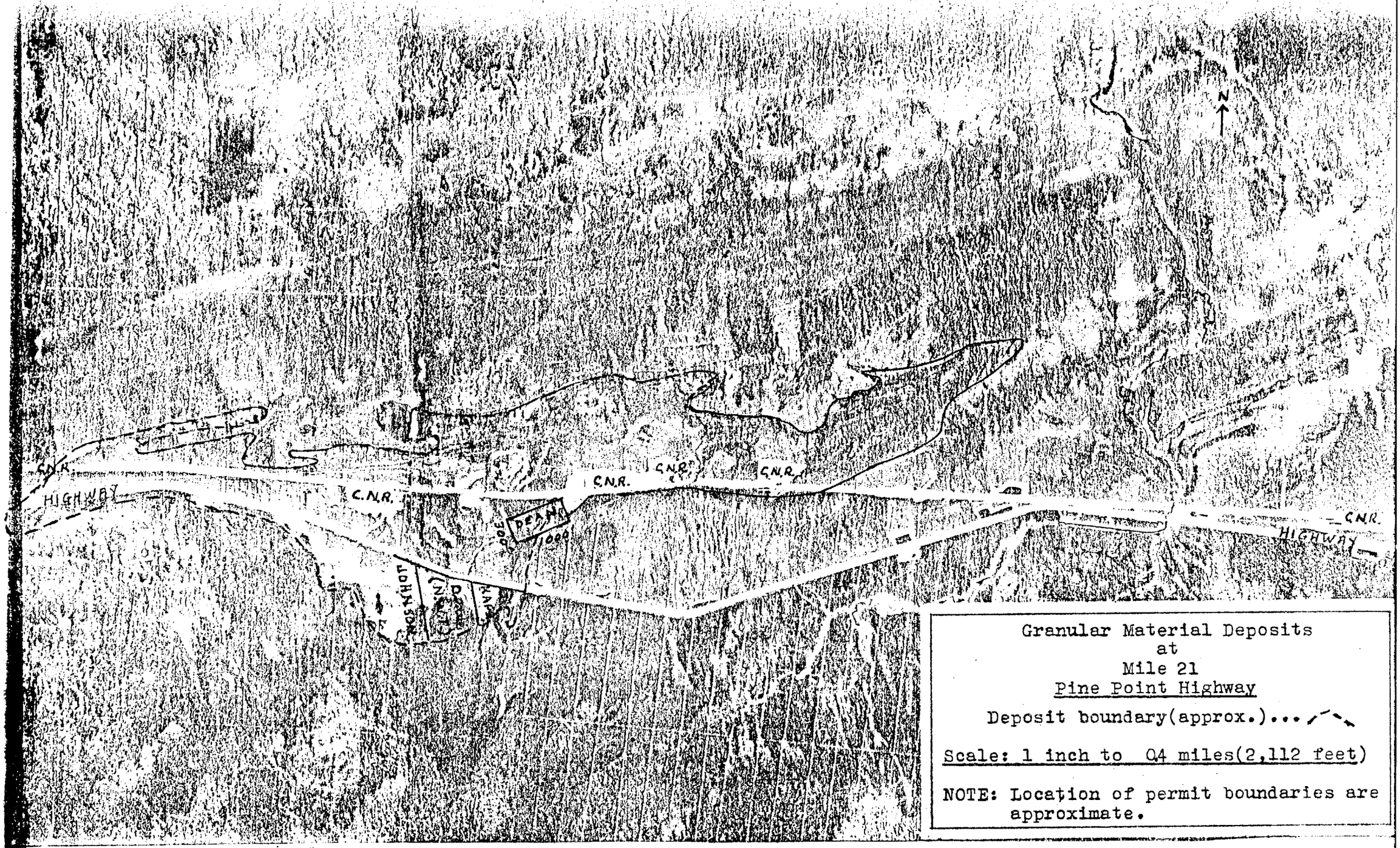
4. The C.N.R. apparently has large quantities of granular material held in reserve in the miles 21 and 31 deposits which have not been exploited since construction of the railway. The quantities in the reserved areas are believed to be larger than those used during construction of the railway. Some of this material, especially in the mile 21 deposit, should be made available for local use.

5. In applying for a permit to develope a new pit, or extract material from a previously opened pit, the operator should be asked to state the quantity of material he requires and the purpose for which it would be used. As the quality of the material varies considerably throughout the deposits this information would enable I.N.A.D. to allot the operator an area where the material is best suited for his needs.

6. Large permant maker posts showing the permit numbers should be set in the field to indicate the boundaries of each permit area. This would avoid much of the present friction between adjacent permittees and would assist I. N. A. D. in its efforts to have abandoned permit areas rehabilitated. The costs of establishing the marker posts could be borne by the permittee.

7. The Department of Public Works (N. W. T.) forsees a shortage of granular materials in the Hay River area within the next 2 to 3 years. It intends to commence prospecting for new sources during the summer of 1975. D. P. W. would like to have a reserve of 250, 000 to 300, 000 cubic yards to satisfy their long range demand for the section of Pine Point Highway between Hay River and the bridge over Buffalo River. D. P. W. has a portable crushing plant capable of accepting 30-inch boulders in the primary crushing unit and 10-inch in the secondary. They crush to $\frac{3}{4}$-inch size which is used entirely for maintenance. They do not produce concrete aggregate. D. P. W. agrees there is considerable granular material remaining in the mile 31 deposit but consider it very expensive to haul this material as far west as Hay River and conseqently would like to find a deposit closer to the community.

8. Crushing units used by local contractors in Hay River will accept boulders up to about 10 inches in diameter. Most of the material required by these operators is used as concrete aggregate. As the ideal material seldom occurs naturally in the Hay River area, and then only as isolated pockets, they must resort to costly crushing, screening and reblending to produce suitable material.

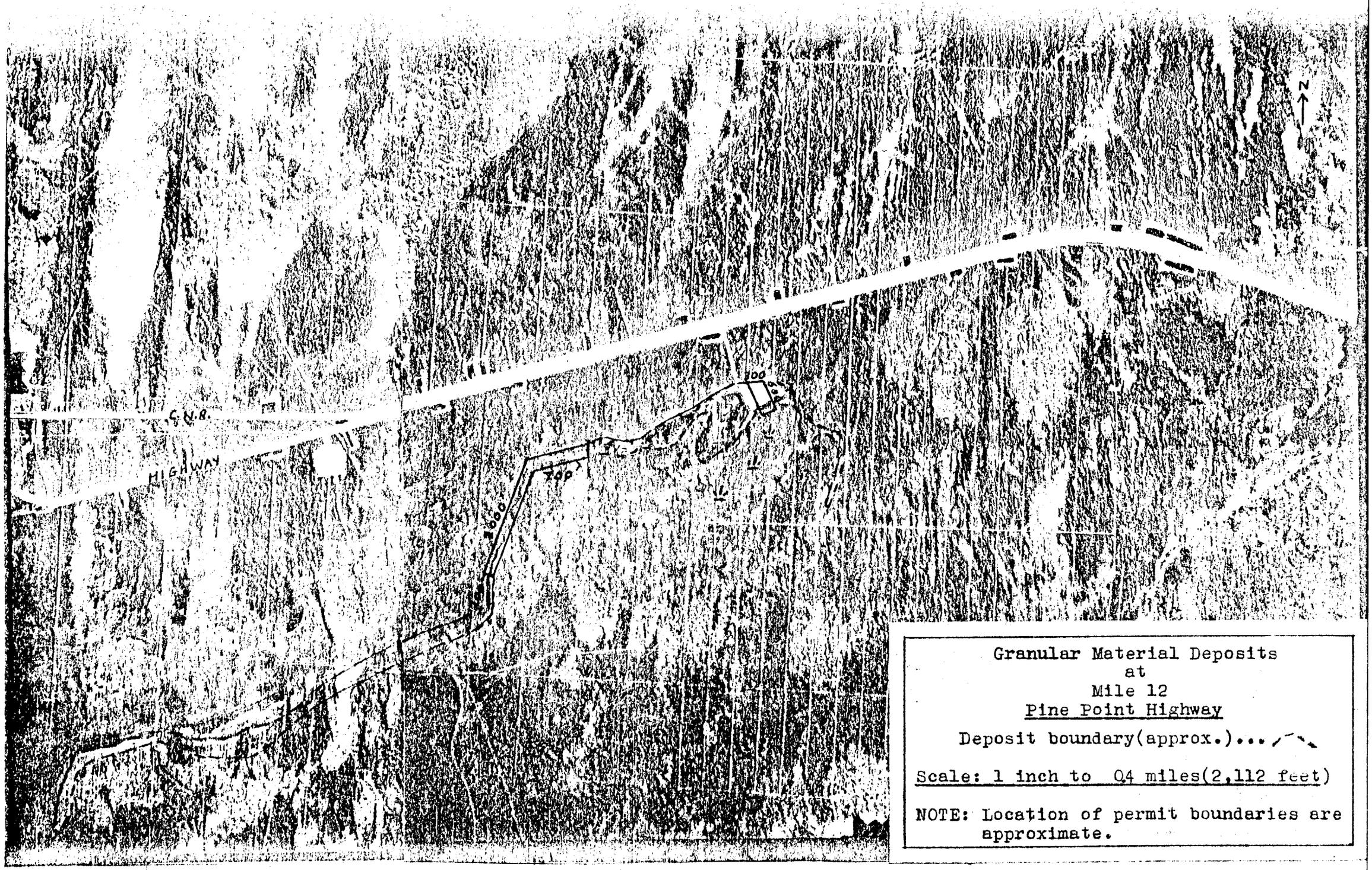


Granular Material Deposits
at
Mile 21
Pine Point Highway

Deposit boundary(approx.)....

Scale: 1 inch to .04 miles(2,112 feet)

NOTE: Location of permit boundaries are approximate.

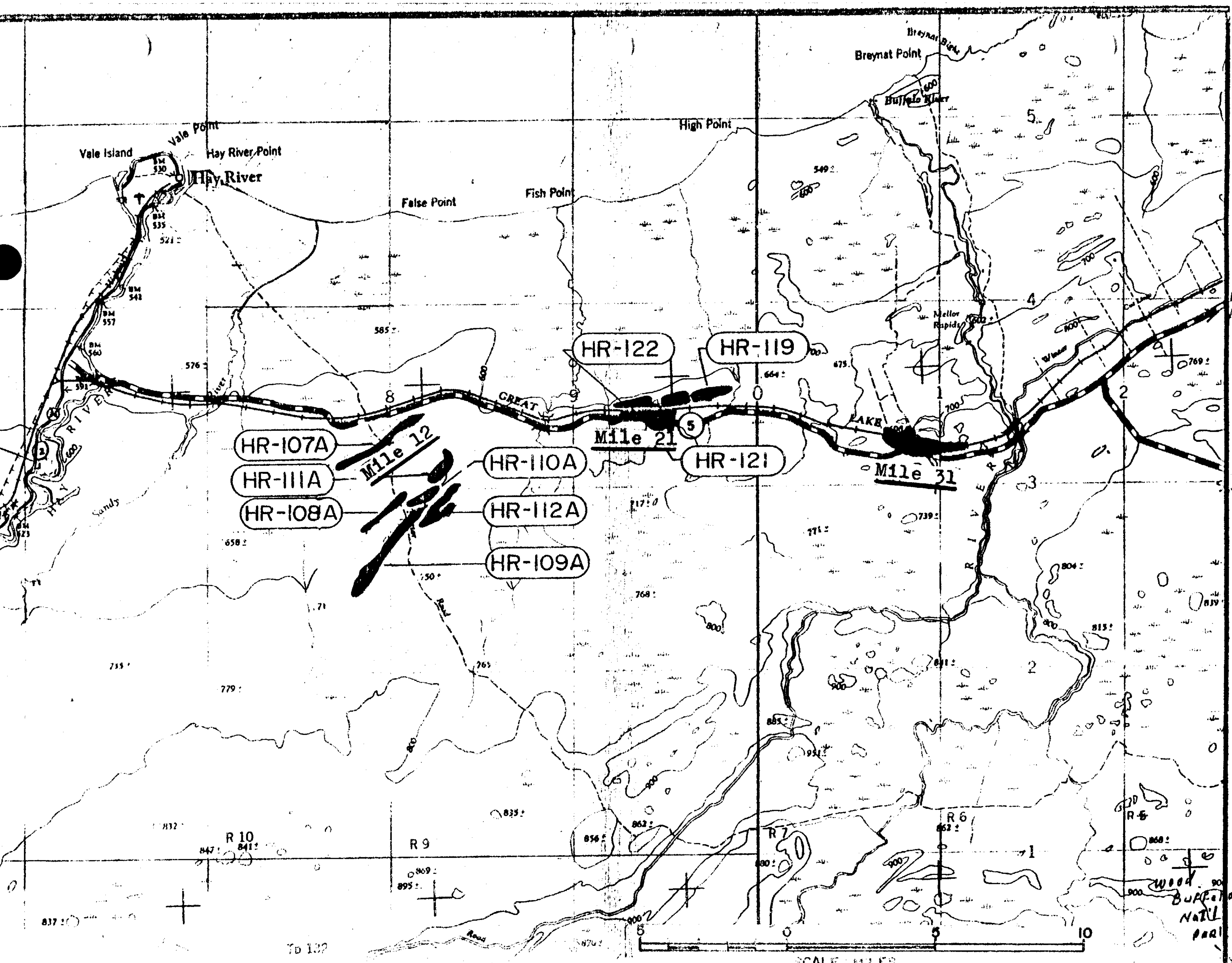


Granular Material Deposits
at
Mile 12
Pine Point Highway

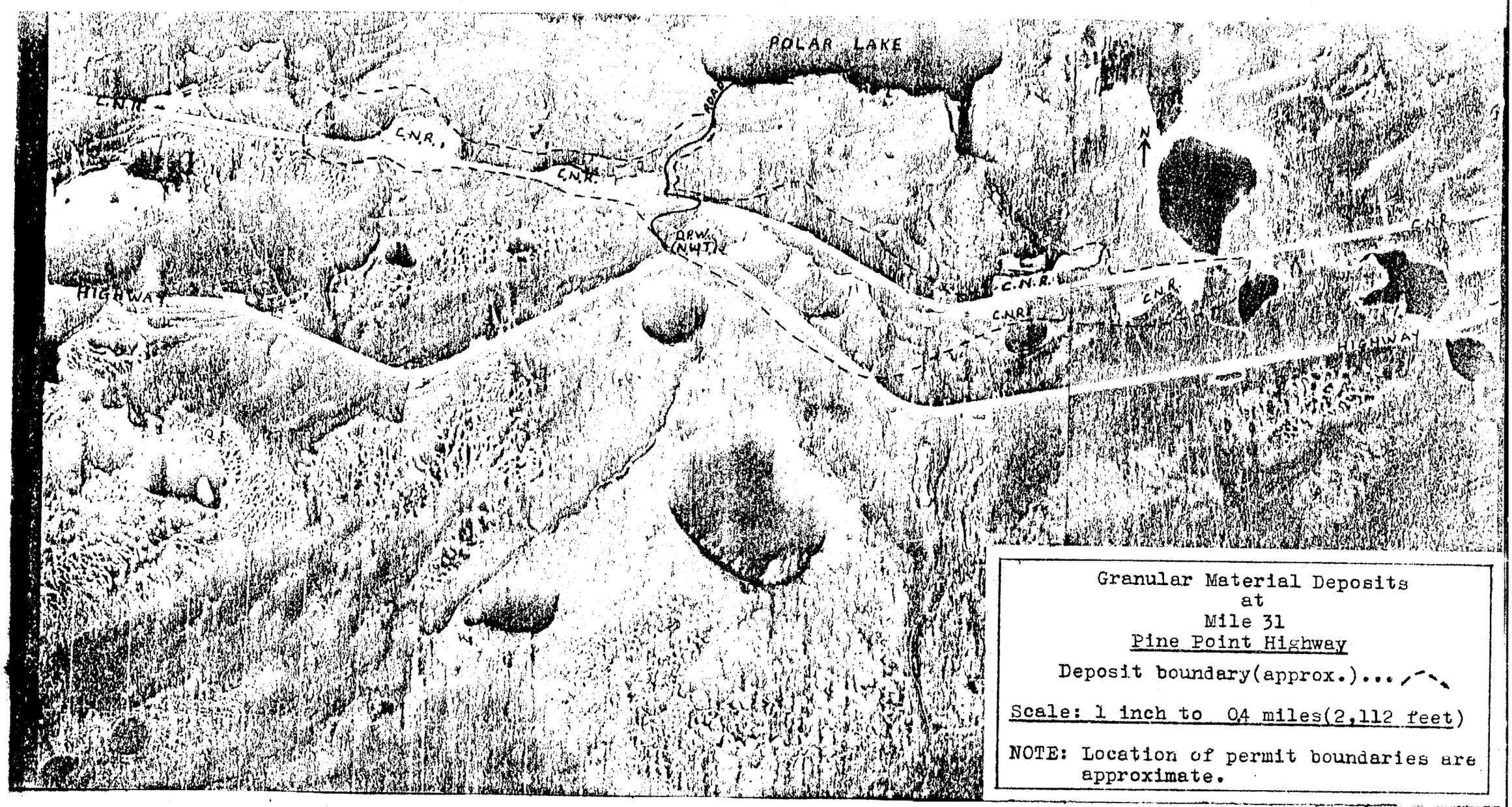
Deposit boundary(approx.)

Scale: 1 inch to .04 miles(2,112 feet)

NOTE: Location of permit boundaries are approximate.



Breynat Point
Buffalo River
High Point
Vale Point
Vale Island
Hay River Point
Hay River
False Point
Fish Point
HR-122
HR-119
HR-107A
HR-111A
HR-108A
HR-110A
HR-112A
HR-109A
HR-121
Mile 12
Mile 21
Mile 31
GREAT
LAKE
Mellor Rapids
R 10
R 9
R 7
R 6
Wood Buffalo Nat'l Park
SCALE



Granular Material Deposits
at
Mile 31
Pine Point Highway

Deposit boundary(approx.)...

Scale: 1 inch to .04 miles(2,112 feet)

NOTE: Location of permit boundaries are approximate.