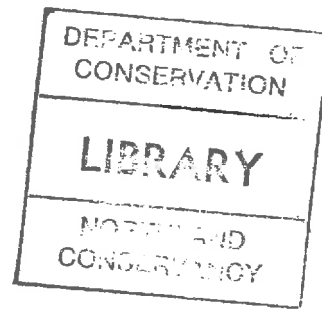


H5



Report on
Extraction of Pebbles
Onewhero Bay
for
Lands & Survey Department.

WHA
333.917
099312
REP

Jackson, Clapperton
Goldschmidt & Partners

Regd Surveyors, Consulting Engineers, Town Planners

Jackson Clapperton Goldschmidt & Partners

John N. Clapperton
Donald R. Goldschmidt
Ronald A. Jackson
A. Neville Warwick

MNZIS, MNZIE
MNZIS
MNZIS Dip TP
MNZIS

Regd Surveyors, Consulting Engineers, Town Planners

632 New North Rd, Mt Albert Box 41177, St Lukes, Auckland 3

Telephone 868-625, 868-711

Our Ref. 6267

NORTH LAND
CONSERVANCY

Your Ref.

Date May 1979



Report on Proposed Shingle Extraction Onewhero Bay.

INTRODUCTION.

The Crown is currently considering the acquisition of a portion of Onewhero Bay as a Reserve, to be included in the Bay of Islands Maritime and Historic Park.

Included in this portion of the Bay is an old shingle ridge, behind the present beach, from which it is the intention of the present owners Messrs Bayly and Binnie, to extract the shingle for marketing as decorative pebbles.

In a brief to us from the Lands & Survey Department we have been requested to act as Engineering Consultants to the Department to safeguard the options open to the Department in the event of mining rights being given to extract the pebbles from this deposit and so that the natural value of this Bay is preserved.

Points to be considered by ourselves include:

1. Possible detrimental effects to the beach by allowing mining.
2. Possible consequences of erosion by the tide into the mining area.
3. If a clay backfill is placed in the mined area what possible effect on ground water or land use.
4. Comment on possible different ages and types of deposits and likelihood of misidentification of pebbles - is material in old ridge same as on beach.
5. Market potential.
6. Mining and processing methods likely to be followed to meet market requirements.

In an endeavour to limit the inconvenience to the owners of an investigation, a joint field trip was organised and which included both a Geologist and Soil Scientist from the D.S.I.R., Geomorphologist from the University, Planning Officer from the Lands & Survey Department and an Engineering Consultant. Also included was an Anthropologist from the Museum.

This party was on the site on the 29th & 30th March 1979 and a rubber tyred hydraulic digger was on hire to the Department to dig exploratory pits as required.

The representative of the owner, Mr G. Tuohey of Messrs Murray North & Partners Ltd., was also on site on Thursday 29th.

INVESTIGATION.

Trial pits were dug in selected positions, using the hydraulic digger, and the position of these pits is shown on the enclosed plan.

The digger could reach a maximum depth of 3.5m and it is interesting to note that in the old ridge the pebbles were sufficiently well cemented or compacted to be self supporting in the pit walls during the period of investigation.

A detailed log and scientific description of the pebble deposits has been compiled by Mr Mansergh of the N.Z. Geological Survey. This description is the subject of a separate report and covers the grading of the pebbles, mineral content etc.

Our firm has compiled record sheets based on the visual appraisal and identification of the soil profiles as encountered in the trial pits.

We have not attempted a detailed description of the ground deposits as this has been covered by the Mansergh report.

DESCRIPTION OF THE SITE.

The site is on the property of Messrs Bayly & Binnie approximately 5km North of Waitangi, and lies immediately behind the beach of Onewhero Bay.

The beach at Onewhero Bay is some 800 metres in length and faces almost due East into the Bay of Islands.

The pebble deposits in question lie under a grassed ridge behind the beach and this ridge is approximately 500 metres in length and rises to a height of 7.00 metres above mean sea level.

There is a low lying swamp area behind (West) of the pebble ridge which has been drained but because the surface is only approximately 2.5 metres above mean sea level the area is still wet and soft.

A contour plan has been prepared of the gravel deposits and this plan shows the swamp area, beach, height and position of exploratory pits etc.

We have prepared cross sections through the exploratory pits from this topographical survey and a copy of the plan and these cross sections is included with this report.

The beach between high and low tides is comprised of a coarse red - brown sand while above normal high tide and extending back to the grass area the material is a clean uniform graded (3mm - 5mm) red/brown pebble.

A full description of the gravel deposits is given in the report prepared by Mr Mansergh and we will not attempt to duplicate this report.

We do however reiterate that there are two distinct periods of deposition of these gravel deposits, the higher older ridge which contains pebbles which are weathered and contain a high percentage of sand graded fines and the recent deposit immediately behind the beach which contains the clean uniformly graded red/brown pebbles of the same type which are visible on the back of the present beach. We have referred to these deposits as the "Fossil Ridge" and the "Recent Deposits"

Referring to the Photos, No1 is taken looking South down the centre of the Fossil Ridge. Between the Fossil Ridge and the beach lies the Recent Deposit, and patches of gravel can be seen lying in the trough between the two deposits. The swamp can be identified lying between the Fossil Ridge and the background hills on the right of the photo.

We have prepared Cross Section C which is drawn through the only position in which a line of investigation pits was dug and have attempted to show the different zones of pebbles and stratigraphy of the area.

From this section it can be seen that the light grey firmly cemented fine pebble material extends right across the Fossil Ridge. This band is clearly defined in Photo 2 (Pit 1), Photo 3 (Pit 2), and Photos 6, 7 & 8 being Pits 9, 10, & 11 extending along the length of the ridge.

It can also be seen that the red/brown weathered pebbles and the light grey/Yellow pebbles also run out at the edges of the fossil ridge.

As noted in the Mansergh report, Pits 2 & 4 show swamp material underlying the pebbles (Refer photos 3 & 4) and while this does not prove that the pebbles are wholly underlain by the swamp material it is suggested that this is the position.

Section C also shows the manner in which the recent pebble deposit overlies the fossil ridge. Pit No. 5 was dug on the back edge of the beach against the grass and from photo 5 it can be clearly seen how the clean uniformly graded pebbles will not stand vertically in a cut bank while in the pits dug in the fossil ridge it can be seen how the cemented pebbles will stand vertically.

It can also be seen in Pit 5 how the strata of the pebbles is sloping inland indicating the back slope of a storm tossed platform. From this we can assume that the beach is eroding but at an unknown rate.

It must also be noted that storm tossed pebbles lie in the trough between the recent deposit and the fossil ridge indicating that the recent deposit must be subjected to wave attack.

DISCUSSION.

We have compiled Cross Section C from the information currently to hand and have plotted what we believe to be the limits of the gravel deposits. We have also shown ground water level which in March was fairly level across the site and was 2.0m above mean sea level.

Although it is possible the weathered pebbles may extend below the 2.0m contour we have limited pebble extraction in our quantity calculations to above this height, as to work deeper would be below ground water level.

As noted under the "Description of the Site" we have concluded that the beach is subject to erosion but the rate is not known. (Dip of pebbles inland behind beach, storm tossed debris in trough between recent deposits and fossil ridge.)

We have noted that Pohutukawas at both ends of the beach have their roots exposed over the edge of the bank behind the beach and conclude that erosion must be currently progressing.

We would therefore suggest that as it is known that the recent deposit of pebbles can be overtopped this deposit should be left intact. We would also suggest that to a height of approximately 1 metre vertically above the level of the "trough" the fossil ridge, should be left intact.

We have drawn these lines onto Section C and have based our estimate of quantities of pebbles available for extraction on keeping 2.00m above mean sea level and outside the limits that we feel should be set for erosion control consideration.

Based on these criteria the area available for mining is approximately 40,000m² and the quantity of pebbles is approximately 105,000m³.

From an Engineering standpoint, we see no problem in backfilling the worked parts with clay, but would emphasise that this area must be kept beyond the possible reach of erosion or storm action. Wave action against the pebbles would produce sand and sorted pebbles but clay would be eroded and washed to waste.

MINING & MARKETING.

In order to determine likely market requirements we visited three major suppliers of exposed aggregate pebbles. One of these suppliers also operated a refining process.

We also showed each supplier a sample taken from the pits in the fossil ridge and recent deposit.

In all cases the suppliers confirmed our concern that the marketing of the pebbles from the fossil ridge would present considerable problems. We would also advise that in all cases our judgement was supported that the pebbles from the recent deposit were highly desirable and would command a ready market.

Among the problems noted in pebbles from the fossil ridge were the following:

1. Lack of uniformity in colour.
2. Badly graded with high percentage of fines (refer grading curves in Mansergh report.)
3. Extent of weathering and concern at ability to break some pebbles between fingers.
4. Visual evidence of rusting of pebbles.

In our discussions with the suppliers it was apparant that uniformity of colour was one of the prime considerations, and bearing in mind the variation in pebble colour within the fossil ridge it would appear that it will be necessary to selectively mine the deposits in layers based on colour.

Because of the other physical factors listed above processing will be required and due to the high percentage of fines and evidence of possibly unsuitable materials, in order to reduce transport costs it may prove economically necessary to carry out this processing and selective stockpiling on site.

Again in order to supply a given quantity of one particular colour type it may prove necessary to open up a larger area than would be the case if the pebbles were of uniform colour and quality throughout the depth of the deposit. This must also result in wastage of material between the colour types.

These considerations must influence the method of mining and we consider that it may prove impractical to limit the pit size to 20m² at any one time as given on P.3 of the Murray North report of November 1978.

The pebbles exposed on the back of the beach are well known to the exposed aggregate suppliers, have been used in many major buildings, and are known to be of high quality with a high resistance to weathering. However, the winning of material from this beach was terminated several years ago, as has all mining of beaches in the Bay of Islands.

It is accepted that the recent deposits behind the beach come within the same classification as the beach material and it is conceded that this material could be defined as unique, but it is our opinion that the fossil ridge, due to the problems outlined above, is not included in this classification.

Considerable processing would be necessary to present a marketable product and it is our opinion that a Royalty of between \$1.00 and \$2.00 would be considered more appropriate. This opinion was confirmed by the three suppliers with whom we had discussions, but is based on the pebbles being of a marketable quality.

It was difficult to establish a bulk price for a processed pebble in Auckland but for a high quality rounded coloured pebble a price of \$120.00 per tonne could be expected.

SUMMARY.

We consider that there are two completely different ages of pebbles, the recent deposits on the back of the beach and foredune, and the fossil ridge behind. The recent deposit is of high quality pebbles, the fossil ridge contains pebbles of suspect quality.

To secure the land against possible wave erosion in the foreseeable future it is our opinion that the recent deposits must be left undisturbed, and the trough between the recent deposits retained as a debris trap.

This limits the using of pebbles from the fossil ridge only and we consider that depth of mining will be limited to 2.00m above mean sea level.

This restricts the mined area to approximately 40,000m² and based on figures to hand will yield 105,000m³ of pebbles and sand.

Allowing for wastage through colour banding of a depth of .500m through any one section this results in wastage of 20,000m³ leaving a figure of 85,000m³.

Based on the grading curves which show typically 50% sand grading of samples tested this results in a quantity of 43,000m³ of pebbles (of suspect quality).

CONCLUSION.

Referring back to the points to be considered by ourselves we would summarise as follows:

1, 2, & 3 Can be considered together.

It is our opinion that the beach is eroding and we consider the recent deposit foredune should be retained to prevent accelerated erosion.

Under these conditions, from an engineering point of view, the type of backfill to the mined area is not critical, but if clay is used it should be reasonably compacted and surface erosion minimised by covering with topsoil and grassing as soon as practicable.

If the above steps are followed there should be little detrimental effects of erosion to the beach.

We would however note that due to the free draining quality of the pebble deposits, the pebble ridges quickly drain after rain and would not break down to a muddy surface under traffic. This free draining quality of the ridges under the present conditions could be of great benefit if the area is to be used for recreational purposes.

If clay backfill and topsoil surface is reinstated this free drainage, quick drying characteristic could be greatly reduced and the surface would not offer the same resistance to traffic (foot or wheeled).

4. We believe there are two major different age groupings of pebbles, the recent deposits as visible on the back of the beach and the pebbles of the fossil ridge.

In the Murray North report dated November 1978, reference is made to the resource and experience with the Onewhero Bay pebbles. This material must be those pebbles from the recent deposit.

It is our opinion that this is not the same material as is present in the fossil ridge from which it is proposed to mine the pebbles. (This opinion is clearly confirmed by the Mansergh report.)

5. In all market potential assessments reference is made to the Onewhero Bay pebbles as has been used in the past.

With reference to the pebbles from the fossil ridge, this material is banded, weathered, and contains a high percentage of sand graded fines. To date no hardness of resistance to weathering tests have been executed but based on a visual appraisal, the quality of the stones is not high and again in the Mansergh report the value of the pebbles as an exposed aggregate is strongly questioned.

6. We agree with the comments that the pebbles can be extracted with normal farm machinery such as back hoes, front end loaders, and trucks.

We doubt that it would be possible to limit the exposed area of mining to 20m² as put forward by Messrs Murray North.

In an attempt to win a marketable quantity of a single colour pebble it may be necessary to work the quarry in horizontal layers.

Because of the high percentage of fines it may prove economically necessary to process the pebbles on site to limit the high cost of freight.

We note however that in his submissions to the Bay of Islands County Council the applicant has not applied for rights to process the materials on site or open up large areas of quarry workings.

It may also prove necessary to selectively stockpile different colour types to meet market requirements.

Based on information to hand it is our estimate that working the fossil ridge in the manner described above will produce a quantity of clean graded pebbles of approximately 43,000m³. (The quality of these pebbles is suspect - refer Mansergh report.)

To fully explore the likely market value it would be necessary to bring down possibly 10m³ and allow a supplier to process the pebbles and test the market.

JACKSON CLAPPERTON GOLDSCHMIDT & PARTNERS.

per:

JW Clapperton



①



②

Pit I



③

Pit 2



④

Pit 4



⑤
Pit 5



⑥
Pit 9



⑦

Pit 10



⑧

Pit 11

RECORD OF BOREHOLE NO 1

PROJECT NO 7
 DATE 28-3-
 SHT. NO OF SHTS.

PROJECT Onewhero Bay

Depth (m)	Symbol	DESCRIPTION	SAMPLE		TEST		COMMENTS
			Depth	Type	Type	Result	
0		<u>Reduced Level (m):</u> Black gritty Top Soil					
		Light Grey, lightly cemented rounded pebbles (5mm)					
1		Light Grey cemented pebbles fine grained grey matrix - Hard in place 50mm Humus Layer					
2		Lightly compacted & cemented red brown fine to small pebbles (5mm)					
3		<u>Bottom of Pit.</u>					
		Light Grey pebbles (5mm) High % of orange/yellow silty matrix					100mm Hand Auger
4		Light Grey pebbles (10mm) Increasing pebble content Loosely compacted.					50mm Hand Auger
5		<u>Stop</u> - water flowing in hole caving in.					
6							

Signed J. Clafferton

RECORD OF BOREHOLE NO 2

PROJECT NO 67
 DATE 28-3-77
 SHT. NO OF SHTS.

Ridge / Swamp Bdy.

PROJECT Onewhero Bay

Depth (m)	Symbol	DESCRIPTION	SAMPLE		TEST		COMMENTS
			Depth	Type	Type	Result	
0		<u>Reduced Level (m)</u>					
		Black gritty Top Soil					
		Light Grey lightly compacted pebbles (3mm)					
		Light Grey pebbles in fine matrix - well cemented - Hard in Place					
1		Dark brown, soft, organic layer, with roots.					
2		Sandy Gravel - Loose					Water flows Pit covering in Roof layer.
		Brown, Lightly compacted silty sand. - Banded.					
3		Grey, soft, coarse silt.					
4							
5							
6							

Signed J. Clafferton

RECORD OF BOREHOLE NO 3

In Swamp

PROJECT NO 626
 DATE 28-3-29
 SHT. NO OF SHTS.

PROJECT Onewhero Bay

Depth (m)	Symbol	DESCRIPTION	SAMPLE		TEST		COMMENTS
			Depth	Type	Type	Result	
0		<u>Reduced Level (m):</u> Black top soil Fire pebbles Light grey firm clay - white staining.					
1		Light grey-brown firm clay root fibres.					
2		Grey-brown, medium sandy clay Grey, soft "fatty" clay.					
3		Laminated Grey-brown, medium, silty sand.					
4		Grey-brown soft silty matrix with small pebbles.					
5		Samples taken from bucket of digger :- Depths estimated.					
6							

Signed *J. H. Hapleton*

RECORD OF BOREHOLE NO 4

PROJECT NV 67
DATE 28-3
SHT. NO. 01 OF 01 SHTS.

Recent Platform

PROJECT Onewhero Bay

Depth (m)	Symbol	DESCRIPTION	SAMPLE		TEST		COMMENTS
			Depth	Type	Type	Result	
0	✓	<u>Reduced Level (m):</u> <i>Gross & Black gritty top soil</i>					
		<i>Loose Brown Small pebbles Red + Brown (5mm - 10mm)</i>					
1		<i>Dark grey lightly compacted fine pebbles (5mm)</i>					
		<i>Organic Band - water flowing in. Dipping East.</i>					
2		<i>Light grey & white pebbles (Range 3mm to 50mm) Firmly cemented, hard in place Strata Dipping West.</i>					
3		<i>Grey medium plastic clay</i>					
		<i>Stop:</i>					
4							
5							
6							

Signed *Jed Clapper*

RECORD OF BOREHOLE NO 5

PROJECT NO 6
 DATE 28-3-77
 SHT. NO OF SHTS.

Edge of Beach

PROJECT Onewhero Bay

Depth (m)	Symbol	DESCRIPTION	SAMPLE		TEST		COMMENTS
			Depth	Type	Type	Result	
0		<u>Reduced Level (m):</u>					
	•••••	Medium small brown pebbles (5mm)					
	•••••	Dark grey band of pebbles					
1	•••••	Small brown pebbles, bands, loose in place, scattered pebbles up to 15mm					
	•••••	Strata dipping West.					
2	•••••	Dark brown, medium, silt.					
3							
4							
5		No evidence Ground water					
6							

Signed _____

RECORD OF BOREHOLE NO 6

PROJECT NO 7
DATE 28-3-71
SHT. NO OF SHTS.

On Beach - Midway High + Low Tide

PROJECT Onewhero Bay

Depth (m)	Symbol	DESCRIPTION	SAMPLE		TEST		COMMENTS
			Depth	Type	Type	Result	
0		<u>Reduced Level (m)</u>					
		<i>Brown - banded Brown gravel + sand.</i>					
		<i>Grey, firm sand.</i>					
1		<i>Organic, Black, firm bands</i>					
		<i>Brown, coarse to medium banded sands, Firm in place - Level Strata.</i>					
2		<i>Grey, medium, plastic clay</i>					
		<u>Stop.</u>					
3							
4							
5							
6							

Signed *[Signature]*

OF BOREHOLE NO 2

PROJECT NO
DATE 28-3-
SHT. NO. OF SHTS.

PROJECT Onewhero Bay

Depth (m)	Symbol	DESCRIPTION	SAMPLE		TEST		COMMENTS
			Depth	Type	Type	Result	
0		<u>Reduced Level (m):</u> Black gritty top Soil					
		Light grey, loosely compacted medium pebbles (5mm)					
		Light grey, Firmly compacted fine to medium pebbles					
1		High % sandy matrix.					
		Brown, medium to coarse pebbles (15mm) Firmly compacted.					
2		Banded layers High % sandy matrix. Transition to Brown-grey med. to coarse pebbles.					
		Oxidised layer					
3		yellow-brown Firm silty clays - level strata					
		Sand bands					
4		<u>Stop.</u> Water flowing in.					
5							
6							

Signed J. Clapperton

RECORD OF BOREHOLE NO 10

PROJECT NO
DATE 29-3
SHT. NO OF SHTS.

PROJECT Onehero Bay

Depth (m)	Symbol	DESCRIPTION	SAMPLE		TEST		COMMENTS
			Depth	Type	Type	Result	
0		<u>Reduced Level (m):</u> Black gritty top soil					
		White Fine pebbles (3mm) Loosely compacted.					
		White pebbles Firmly cemented Oxidised layer					
1		Brown pebbles, well cemented generally to 5mm scatter to 10mm Grit matrix.					
2		Grey, loosely compacted pebbles, medium to 20mm silty clay matrix.					
3							
4		No evidence Ground water					
5							
6							

Signed W. Clafferton

RECORD OF BOREHOLE NO 11

PROJECT NO
DATE 29-5
SHT. NO 01 OF 01

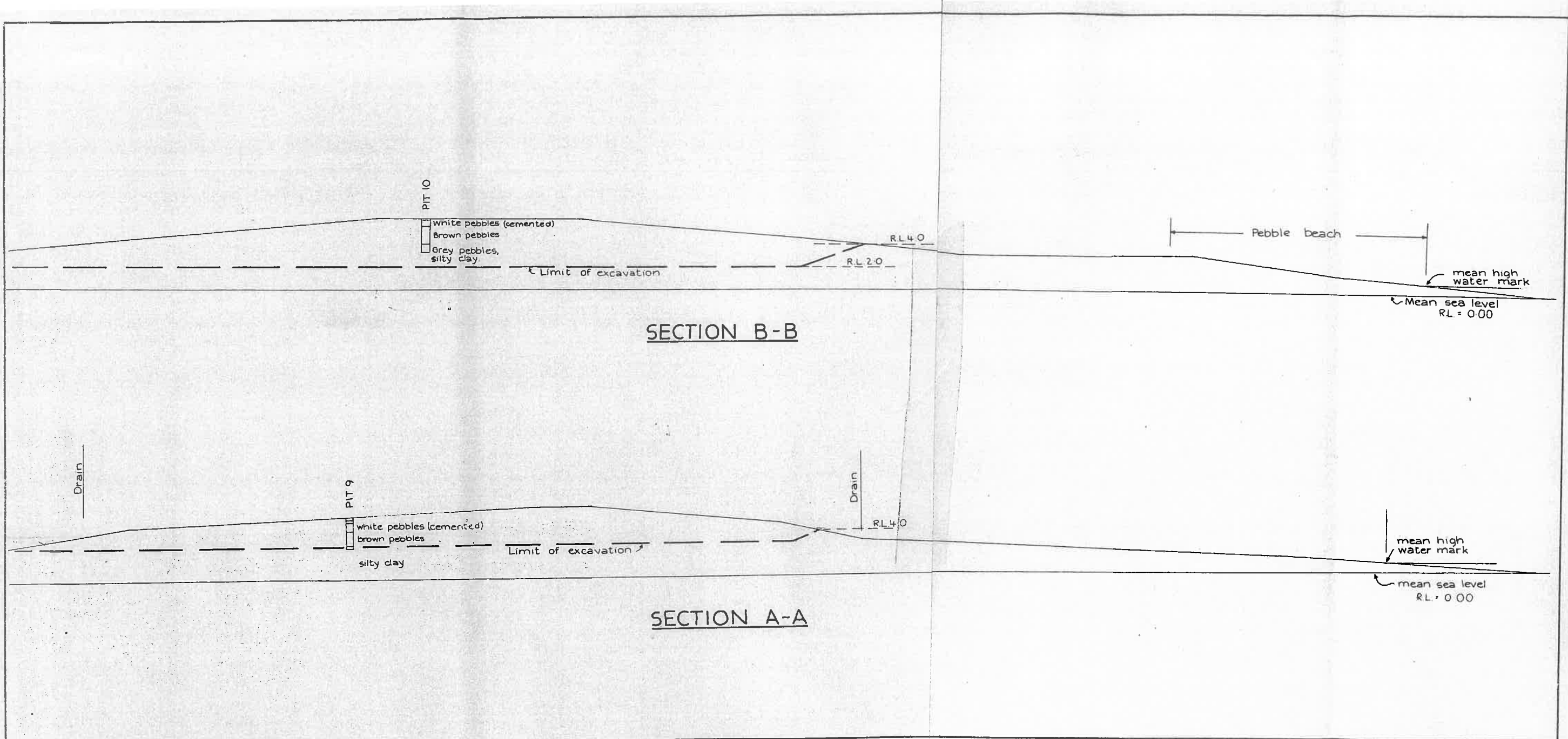
North end of Spur

PROJECT Onewhero Bay

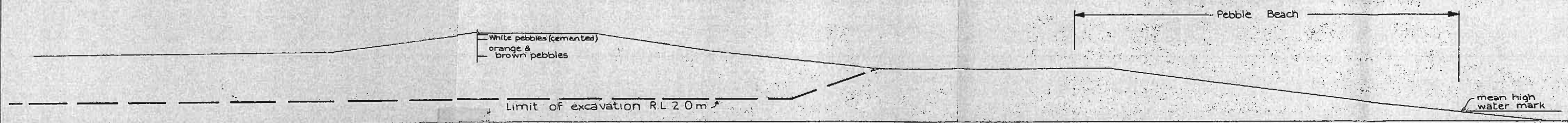
Depth (m)	Symbol	DESCRIPTION	SAMPLE		TEST		COMMENTS
			Depth	Type	Type	Result	
0		<u>Reduced Level (m):</u> Top soil - Fine grit. white, firmly cemented fine pebbles < 3mm					
1		Orange - brown cemented pebbles (5mm)					
2		Stop.					
3		No evidence Ground Water.					
4							
5							
6							

Signed

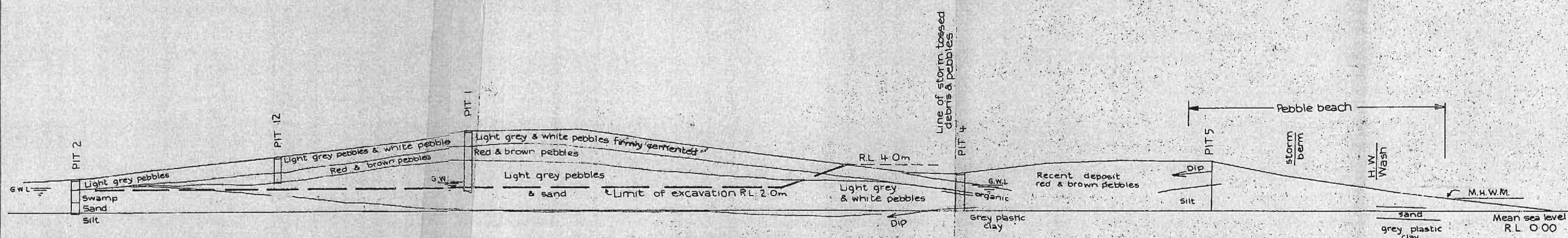
[Signature]



<p>JACKSON CLAPPERTON GOLDSCHMIDT & PARTNERS Regd. Surveyors, Consulting Engineers, Town Planners 632 New North Road, Box 41-177 St. Lukes, Telephone 868-625, 868-711</p>	<p>ONEWHERE BAY Cross Sections</p>	<p>The copyright of these plans remains the property of Jackson Clapperton Goldschmidt & Partners</p>	<p>SCALES Horizontal ... 1:250 ... Vertical ... 1:250 ...</p>	<p>Project No. <u>6267</u> Sheet No. <u>1</u> of <u>2</u> Sheets Approved: _____</p>
---	---	---	--	--



SECTION D-D



SECTION C-C

JACKSON CLAPPERTON GOLDSCHMIDT & PARTNERS
 Regd. Surveyors, Consulting Engineers, Town Planners
 632 New North Road, Box 41 177 St. Lukes, Telephone 868-625, 868-711

ONEWHERE BAY
Cross Sections

The copyright of these plans remains the property of Jackson Clapperton Goldschmidt & Partners

SCALES
 Horizontal 1:250
 Vertical 1:250

Project No. 6267
 Sheet No. 2 of 2 Sheets
 Approved: /